The Three Lakes Council

2021 Aquatic Macrophyte Surveys at Three Lakes, Lewisburg, NY

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Contents

2021 Aquatic Macrophyte Surveys at Three Lakes: Lake Waccabuc

The Three Lakes Council

Introduction

In 2021, the Three Lakes Council contracted SŌLitude Lake Management (SŌLitude) to map the aquatic plant growth and communities throughout Lake Waccabuc of Three Lakes, specifically to document and manage any presence of invasive Brazilian waterweed (*Egeria densa*). As a part of this three-lake system, located in Lewisboro, NY, Lake Waccabuc was infested with Brazilian elodea discovered in 2008. In response to this initial discovery, an intensive Diver-Assisted Suction Harvesting (DASH) program was implemented. **Regrowth of Brazilian elodea has not been documented in the Three Lakes system since 2010.** Aquatic macrophyte surveys have been performed at Lake Waccabuc every year since 2008 (excluding 2009 and 2020). The other two lakes, Lakes Oscaleta and Rippowan, are monitored on a bi-annual basis for potential infestations and to mitigate nuisance, nonnative plant growth. Brazilian elodea has not been documented in these waterbodies. During 2021, only Lake Waccabuc was surveyed. This report includes the following components: aquatic macrophyte abundance, distribution and discussion from 2021 survey results. Maps from the aquatic macrophyte survey and aquatic macrophyte library are included in the appendix of this report.

Summary of Findings

- Eurasian water milfoil (*Myriophyllum spicatum*) continues to be the most dominant macrophyte within Lake Waccabuc.
- **No Brazilian elodea, curly leaf pondweed (*Potamogeton crispus*) and water chestnut (*Trapa natans*) were found**.
    - Brazilian elodea has not been documented since 2010, and water chestnut has not been documented since 2014.
    - Curly leaf pondweed was documented in 2019, but not observed in 2021
- Overall, there were eight submersed macrophytes that were present during the 2021 survey.
- Two non-native macrophytes were documented during the 2021 survey: Eurasian watermilfoil and brittle naiad (*Najas minor*).
- In total, six native floating macrophyte species were observed through the 2021 survey.
- White waterlily (*Nymphaea adorata*) continues to be the dominant floating-leaf macrophyte within Lake Waccabuc.

- Macrophyte diversity decreased since 2019, after remaining consistent since 2010. This lake continues to maintain high diversity compared to other lakes in the region.

Methodology

Point Intercept Submersed Aquatic Plant Mapping

The Point Intercept Method (PIM) for sampling macrophytes is designed to determine the extent of submersed aquatic plant growth within an area of concern. This method was developed by the US Army Corps of Engineers and modified by Cornell University (Lord and Johnson 2006). The total number of sample points is typically based on the total acreage of a waterbody, typically one point is surveyed per acre. In Lake Waccabuc, plant growth is found mostly in the littoral zone (the shoreline and various coves). The point-intercept locations within the lake are restricted to this area. Points were determined by a 40-m grid data layer placed over an orthophoto bathymetric map of the lake and logged during the 2010 survey using a GPS unit with sub-foot accuracy.

PIM was used to survey Lake Waccabuc on August 30th, 2021.The 120 sites sampled are the same points determined in 2010 and revisited annually since then. During every survey, each predetermined georeferenced point was accessed by boat. At Lake Waccabuc **three rake tosses** were executed at each site, as with the previous surveys, for enhanced detection of target species and other species occurring infrequently. The tosses were conducted from opposite sides of the boat and were labeled and recorded A, B, and C respectively (Table 1). The real-time GPS coordinates of the sample location were recorded using a Trimble Geo 7X, a handheld GNSS system.

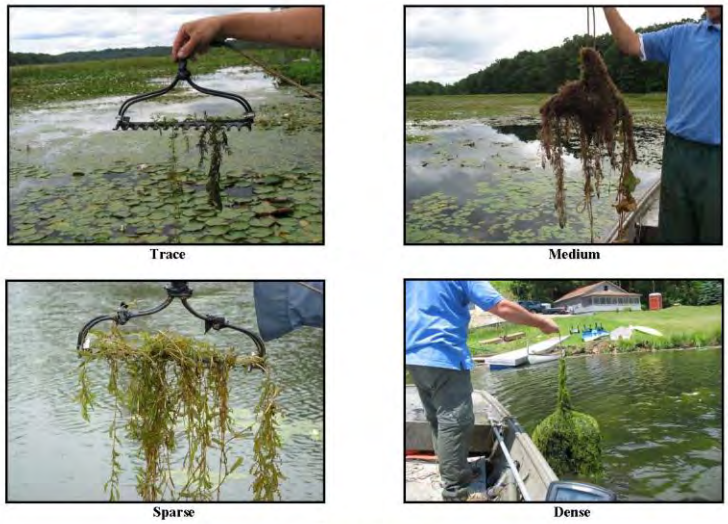
Biologists collected the following data for each rake toss: overall abundance of floating and submersed macrophyte growth, relative abundance of each species, and any other pertinent field notes regarding the sample location. The abundance scale defined by this methodology was used to categorize the observed macrophyte growth for each rake toss (Table 1). Visual depictions of this scale are shown in Figure 1. Any macrophyte specimen requiring further identification was collected and placed in a Ziploc-type bag with a reference to the sampled location. Regionally appropriate taxonomic keys were used for identification.

Table 1: PIM Descriptions

Abundance	Description
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

The overall and relative abundance values from the three 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), toss B was Sparse (2), and toss C was Medium (3) for the same macrophyte, the average abundance would be Medium (3). Raw abundance data with mean calculations can be found in the appendix of this report .

Figure 1: Aquatic Plant Densities



Lake Waccabuc

Macrophyte Abundance and Distribution Results

Table 2 provides the presence of all species from each survey year and the percent change from 2008 to 2019 per species. Graphs displaying the abundance and distribution from year to year for each macrophyte are located in Appendix.

Table 2. Summary of the species collected/observed during each survey since 2008.

Common Name	Scientific Name	Type	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2021	% Change
Arrowhead	*Sagittaria sp.*	**E**	X	X	X	X	X	X	X	X	X	X	X	X	+8.3%
Bassweed	*Potamogeton amplifolius*	**S**	X	X	X	X	X	X	X	X	X	X	X	X	-44.4%
Benthic Filamentous Algae	-	**S**	X	X	X	X	X	X	X	X	X	X	X	X	+25.5%
Brazilian Elodea	*Egeria densa*	**S**	X	X											0.0%
Brittle Naiad	*Najas minor*	**S**		X	X		X	X	X	X	X	X	X	X	+50.0%
Common Waterweed	*Elodea canadensis*	**S**	X	X	X	X	X	X	X	X	X	X	X		-100.0%
Coontail	*Ceratophyllum demersum*	**S**	X	X	X	X	X	X	X	X	X	X	X	X	-29.3%
Creeping Bladderwort	*Utricularia gibba*	**FF**	X	X	X	X	X	X	X	X	X	X	X		-100.0%
Curly-leaf Pondweed	*Potamogeton crispus*	**S**	X		X		X	X	X	X	X		X		-100.0%
Dwarf Watermilfoil	*Myriophyllum tenellum*	**S**	X	X	X	X	X	X	X	X	X	X	X	X	+50.0%
Eurasian Watermilfoil	*Myriophyllum spicatum*	**S**	X	X	X	X	X	X	X	X	X	X	X	X	0.0%
Flat-stem Pondweed	*Potamogeton zosteriformis*	**S**	X												0.0%
Floating Bur-reed	*Sparganium fluctuans**	**E/F**							X		X	X	X	X	+100.0%
Floating Filamentous Algae	-	**FF**	X	X	X	X	X	X	X	X	X	X	X		-100.0%
Great Duckweed	*Spirodela polyrhiza*	**FF**				X	X	X	X	X		X	X	X	+214.3%
Leafy Pondweed	*Potamogeton foliosus*	**S**	X	X	X	X	X	X	X	X	X	X	X	X	-81.3%
Quillwort	*Isoetes sp.*	**S**									X				0.0%
Ribbon-leaf Pondweed	*Potamogeton epihydrus*	**S**		X	X	X	X	X	X	X	X	X	X		-100.0%
Robbin's Pondweed	*Potamogeton robbinsii*	**S**	X	X	X	X	X	X	X	X	X			X	+100.0%
Slender Naiad	*Najas flexilis*	**S**			X						X				0.0%
Small Duckweed	*Lemna minor*	**FF**		X		X	X	X	X	X	X	X	X		-100.0%
Spatterdock	*Nuphar variegata*	**F**	X	X	X	X	X	X	X	X	X	X	X	X	+34.7%
Spiral-fruited Pondweed	*Potamogeton spirillus*	**S**	X	X	X	X	X						X		-100.0%
Pondweed Species	*Potamogeton sp.**	**S**						X	X	X	X	X			-100.0%
Water Chestnut	*Trapa natans*	**F**						X							0.0%
Watermeal	*Wolffia columbiana*	**FF**				X			X	X		X	X		-100.0%
Water Stargrass	*Zosterella dubia*	**S**		X	X	X	X	X	X	X	X	X	X		-100.0%
Watermoss	*Fontinalis sp.**	**S**				X	X								0.0%
Watershield	*Brasenia schreberi*	**F**	X	X	X	X	X	X	X	X	X	X	X	X	+12.1%
White Water Lily	*Nymphaea odorata*	**F**	X	X	X	X	X	X	X	X	X	X	X	X	+36.8%

Located in Table 2, the Type column is a quick classification of the macrophyte. "E" classifies an emergent, "F" is a rooted floating species, "FF" is free-floating, and "S" is a rooted submerged species. Red entries indicate invasive species and Green entries indicate algae species.

Macrophyte Abundance and Distribution Discussion

Two invasive macrophytes were present during the 2021 survey: brittle naiad and Eurasian watermilfoil. Invasive species present has ranged from one to four invasive macrophytes throughout the ten-year data set. Brazilian elodea has not been documented since 2008 and 2010, and water chestnut was only documented in 2014. Since then no water chestnut has been found.

Great Duckweed (*Spriodela polyrhiza*) had the highest positive percent change at 214.3% increase since 2019. Duckweeds are free floating species, and their abundance is often dictated by wind and current, and thus considered temporary. Several species present in 2019 were not observed in 2021. These include water stargrass (*Zosterella dubia*), ribbon leaf pondweed (*Potamogeton epihydrus*), creeping bladderwort (*Utricularia gibba*), curly leaf pondweed (*Potamogeton crispus*), spiral fruited pondweed (*Potamogeton spirillus*), small duckweed (*Lemna minor*), and watermeal (*Wolffia columbiana*). Robbin's pondweed (*Potamogeton robbinsii*) was not observed in 2019 but was found in 2021. White water lily, spatterdock (*Nuphar variegata*), floating bur-reed (*Sparganium fluctuans*), benthic filamentous algae, and watershield (*Brasenia schreberi*) all experienced significant positive percent changes since 2019.

At Lake Waccabuc, 120 sites were assessed to determine the abundance and distribution of submersed and floating vegetation. Submersed vegetation was collected at 92 sites or at 77% abundance in the basin. Overall, eight different submersed aquatic plants (including benthic filamentous algae) were observed. Two invasive aquatic plant species were found in Lake Waccabuc. Dense abundance of submersed macrophytes was supported at 6 (or 7%) of the sites surveyed. Medium abundances were observed at 17 sites (or 18%), while sparse amounts were present at 31 sites (or 34%). Trace abundances of submersed macrophytes accounted for 38 sites (or 41%).

Six floating macrophyte species were observed at Lake Waccabuc. A total of 75 sites (63%) supported floating macrophyte growth. Nuisance level abundances of floating macrophytes were present at 11 (or 15%) sites. Medium abundances were observed at 12 sites (or 16%) and sparse abundances were observed at 14 sites (or 19%). Trace amounts accounted for at 38 (or 51%) of the sites that contained floating macrophytes. The appendix contains additional information on each individual plant species.

The dominant submersed aquatic macrophyte was, Eurasian watermilfoil, a highly invasive submersed macrophyte. This species continues to be present at most sites (88 sites or 73%) throughout the surveyed locations. Trace abundances were present at 44 sites (or 50%) of the sites surveyed. Lighter abundances were observed at the mouth of the canal. Sparse populations were identified at 30 (or 34%) of the sites surveyed. Medium amounts were observed at 13 sites (15%) Meanwhile, one site (1%) was considered dense. Heavier abundances were located primarily in the northern cove behind the island. The Eurasian watermilfoil abundance variation was scattered throughout the main shorelines.

Coontail (*Ceratophyllum demersum*) was the second most common submersed macrophyte and observed at 41 sites (or 34%) of the sites surveyed. Dense amounts of coontail were observed at three sites (7%) near the canal, while six sites were recorded at medium abundance (15%). Sparse

abundances were observed at nine sites (or 22%) and trace abundances were observed at 23 sites (56%). The majority of the coontail occurrences were concentrated at the mouth of the canal and in the canal itself. Other areas were scattered with trace and sparse amounts throughout the shorelines.

A total of 59 sites (or 49%) of benthic filamentous algae was observed. Dense amounts were observed at one site (2%) and medium abundances accounted for one (2%) of the sites surveyed. Sparse abundances of benthic filamentous algae were present at 11 sites (or 19%). Trace amounts were also observed at 46 sites (78%). Higher concentrations of benthic filamentous algae were observed at the northern cove and at the mouth of the canal. Lighter populations were scattered along the shorelines throughout the entire basin. Benthic filamentous algae was not speciated.

Bassweed (*Potamogeton amplifolius*) was observed throughout Lake Waccabuc at 45 sites (38%), but at fairly low abundances. Most of the sites made up of trace abundances (23 sites, or 38%). Sparse amounts were accounted for at eight sites (18%). Nine sites (20%) were observed at medium abundance, while five sites (11%) at dense abundances of bassweed were also recorded. Bassweed was scattered throughout the shorelines, decreasing in density towards the western end of the lake. Heavier abundances were observed at the mouth of the canal. Various abundances were distributed throughout the northern cove, and along the southern shoreline.

Leafy pondweed (*Potamogeton foliosus*) was observed at three (or 3%) of the sites surveyed. All sites were observed at trace abundances scattered along the northern and southern shorelines.

Arrowhead rosettes (*Sagittaria* spp.) were observed along the shorelines at 11 sites (or 9%). At low abundances, all sites were considered trace. Low abundances were observed scattered throughout the northern shorelines, plus denser presence along the western end of the lake.

Brittle naiad, a low growing invasive species, was observed at three sites (3%) at trace abundances. This species was scattered along the north cove and near the canal. Although this species is invasive, it has only been observed at low abundances in Waccabuc surveys.

Based on the characteristics we could identify; biologist believe Floating Bur-reed was present at four sites (4%) along the northern shoreline at trace abundances. However, the samples that were examined were significantly damaged. It's possible that uprooted fragments of bur-reed may have gotten uprooted, via fish activity or recreational boaters, from the canal area and was transported to the northern shoreline area. Typically, bur-reed has historically only been found in canal area, where it prefers flowing waters.

Dwarf water milfoil (*Myriohyllum tenellum*) was accounted for at two sites (2%) at trace abundances. Dwarf milfoil continues to occur at the northwestern end of the lake where it has historically occurred.

White water lilies were observed at 52 sites (or 43%) of the sites surveyed. A number of sites were considered to have nuisance level abundance. Dense abundances were observed at five sites (10%) and medium abundances were present at four sites (8%). Sparse abundances were recorded at

eight sites (15%) and trace abundances were observed at 35 sites (67%). Densities were scattered throughout towards the western, southern cove and northern areas of the lake.

Watershield, often mixed in with other lily species, was observed at 37 sites (31%) at various abundances. No dense abundancies were observed. Medium abundances were found at six sites (16%) of the sites surveyed. Sparse amounts were identified at six sites (16%) and trace amounts were observed at 25 sites (68%) each. Heavier populations occurred at the southern cove and near the canal, and lighter abundances were present along the western and southern shorelines.

Spatterdock, also known as yellow lily, was observed at 31 sites (or 26%). Nuisance levels were observed in dense abundances at five (or 16%) sites and medium abundances at five (or 16%) sites. Sparse amounts were recorded at 10 (32%) sites and trace abundances occurred at 11 (or 35%) sites. Spatterdock was present throughout the eastern end of the lake mixed in with other lily species, as well as in the southern cove.

Great duckweed was observed at 22 (18%) of the sites surveyed. All sites were observed at trace abundances. Great duckweed was observed just outside of the canal area, southern cove, and sporadically along the western end of the lake.

Recommendations

In 2022, we highly recommend a repetition of the SAV mapping within Lake Waccabuc. However, based on an ongoing rotational SAV mapping schedule for the Three Lakes Council, both Rippowam and Oscaleta are in need of surveys during 2022. Monitoring is also important for examining and quantifying the abundance and distribution of both non-native and native macrophytes throughout the aquatic systems. Based on 2021 SAV mapping, two to three days of vegetation monitoring is recommended at Lake Waccabuc for the 2022 season. An additional one day is needed, plus 1 day for Oscaleta and Rippowam for the 2022 season.

The point-intercept methodology continues to work well in monitoring and quantifying the growth of aquatic macrophytes in Lake Waccabuc. If Brazilian elodea or water chestnut should re-infest Lake Waccabuc, the point-intercept survey is ideal to direct short- or long-term management efforts in a cost-effective manner.

It is possible that other infestations could appear or may not be within the boundaries of the survey and non-native growth can be overlooked, especially when an infestation is small or intermittent. The Three Lakes Council should consider the implementation of an additional diver survey in the North Cove specifically for Brazilian elodea. The Eurasian water milfoil population of Lake Waccabuc appears to be stable and local management via hand-pulling is likely enough to reduce impacts to recreational activity. There are other notably invasive macrophyte infestations nearby, such as water chestnut and hydrilla. Since early detection

and rapid response (similar to the Brazilian elodea discovery) is the most cost effective and suitable method to control these macrophytes, monitoring is essential.

As always, SŌLitude Lake Management would like to use this space to thank you for allowing us to be of service to the Three Lakes Council. We look forward to working with you in the 2022 season.

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Appendix

Macrophyte Photo Library and Description

Waccabuc Year Abundance Graphs

Waccabuc Raw Data and GPS Coordinates

Waccabuc Abundance Table

Species Specific Maps

AQUATIC MACROPHYTE INDEX

Table of Contents

Arrowhead – submersed rosette (*Sagittaria* sp.)

Arrowhead Native (Submersed Rosette): This 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.

Bassweed (*Potamogeton amplifolius*)

Large-leaf pondweed, Musky weed

Bass Weed Native: Bass weed has robust stems that originate from black-scaled rhizomes. The submersed leaves of bass weed are among the broadest in the region. The submersed leaves are arched and slightly folded, attached to stems via stalks, and possess many (25-37 veins). Floating leaves are produced on long stalks (8-30 cm). Stipules are large, free and taper to a sharp point. Flowers, and later in the season fruit are densely packed onto a spike. Bass weed prefers soft sediments in water one to 4 meters deep. This plant is sensitive to increased turbidity and also has difficulty recovering from top-cutting, from such devices as boat propellers and aquatic plant harvesters. As its name implies the broad leaves of this submersed plant provides abundant shade, shelter and foraging opportunities for fish. The high number of nutlets produced per plant make it an excellent waterfowl food source.

Brazilian Elodea (*Egeria densa*)

Egeria, Anacharis, Brazilian waterweed

Brazilian Elodea Invasive: Brazilian elodea is an aggressive exotic invasive submersed plant that originated from South America. It was introduced via the aquarium hobby trade, and is a top selling plant used as an oxygenator. The stems can be several meters long, and the strap-like leaves are situated in whorls of three to six, but usually four. The leaves are finely serrated, and are tightly packed together near the end of the stem. Brazilian elodea can be rooted or free floating, and due to its highly branching nature, can quickly reach nuisance densities and crowd out or block light penetration for desirable native submersed plants. Although it can be confused with *Hydrilla*, another invasive submersed plant, its lack of tuber production and leaf structure differentiates it. Although it can produce white flowers, it reproduces vegetatively in the United States. Waterfowl consume Brazilian elodea, and fish and invertebrates use the stems for refuge and habitat.

Brittle Naiad (*Najas minor*)

Brittle water nymph, European naiad

Brittle Naiad Invasive: Brittle naiad is a submersed annual that flowers in August to October. It resembles other naiads, except its leaves are highly toothed with 6-15 spinules on each side of the leaf, visible without the aid of magnification. The leaves are opposite, simple, thread-like, and usually lime-green in color, often with a "brittle" feel to them. Brittle naiad fruit are narrow, slightly curved, and marked with 10-18 longitudinal ribs, resembling a ladder. Brittle Naiad has been introduced from Europe in the early 1900's, and can be found in most of the northeastern states. Brittle naiad prefers sandy and gravel substrates, but can tolerate a wide range of bottom types. It's tolerant of turbid and eutrophic conditions. Waterfowl graze on the fruit.

Common Watermeal (*Wolffia columbiana*)

Common Watermeal Native: Common 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.

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.

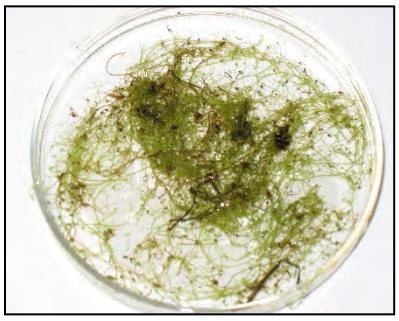
Coontail (*Ceratophyllum demersum*)

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. Bushy stems of coontail provide valuable habitat for invertebrates and fish (especially during winter), and the leaves are grazed on 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 braches 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.

Curly-leaf Pondweed (*Potamogeton crispus*)

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.

Dwarf Water Milfoil (*Myriophyllum tenellum*)

Dwarf Water Milfoil Native: Dwarf milfoil, which does not look anything like other milfoil species, has slender unbranched stems ranging from 2 cm to 15 cm in height. The leaves are reduced to scales or “bumps”. If the tips rise out of the water, they are capable of producing pale flowers and nut-like fruits. The toothpick-like stems arise from rhizomes in a chain. Dwarf milfoil is often small and overlooked, preferring sandy bottoms in waters up to four meters deep. Dwarf water milfoil provides suitable spawning habitat for panfish and adequate shelter for small invertebrates. The rhizome networks also help stabilize bottom sediments.

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.

Filamentous Algae

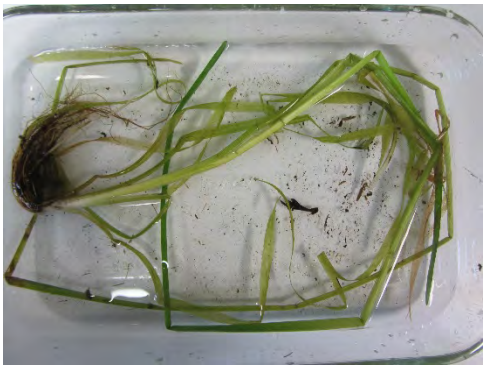
Floating Filamentous Algae, Benthic Filamentous Algae

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.

Flat-stem Pondweed (*Potamogeton zosteriformis*)

Flat-stem Pondweed Native: Flat-stem pondweed is freely branched, emerging from a delicate rhizome system. The stems are strongly flattened with an angled appearance. The long leaves are stiff and linear with a prominent midvein, and numerous fine parallel veins. This prominent midvein distinguishes this pondweed from water stargrass. The stipules are firm and free situated in the leaf axils. Flat-stem pondweed lacks floating leaves. Flat-stem pondweed inhabits a variety of water depths from shallow water to water several meters deep. It prefers soft sediment types. Although it produces nut-like fruits, it over winters primarily by rhizomes and winter buds. It can be a locally important food source to fauna, such as waterfowl, muskrat, deer, beaver, and moose. It also provides suitable habitat and food for fish and aquatic invertebrates.

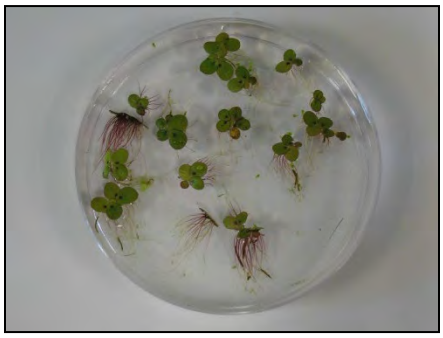
Floating Bur-reed (*Sparganium fluctuans*)



Floating Bur-reed Native: Floating bur-reed is an aquatic perennial that grows along rhizomes in static or slow-moving water. The leaves are limp, strap-shaped, float on the water's surface, often growing in the direction of any flow. At maturity (July-September), the floating bur-reed produce an emergent flowering spike that supports few white flowers with an appearance of small, fluffy cotton balls. From the flowers, floating bur-reed produces spiky fruits (seed heads) that are primarily dispersed by water. The fruits are water-repellent and can remain floating for several months. Various species of bur-reed display the floating leaves.

Great Duckweed (*Spirodela polyrhiza)*

Large 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.

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.

Quillwort (*Isoetes sp.*)

Quillwort Native: Quillwort is a low-growing, submersed aquatic plant with many leaves forming from a basal structure called a corm. The size of the hollow leaves is dependent on the species. Quillwort is actually a lycopod, and does not have 'true' rhizomes or seeds. Instead, quillwort has pseudo-rhizomes and megaspores. The megaspores act like seeds, and are found in the expanded bases of each leaf; the megaspores are the primary method for species identification of quillwort genus.

Ribbon-leaf Pondweed (*Potamogeton epihydrus*)

Ribbon-leaf Pondweed Native: Ribbon-leaf pondweed has flattened stems and two types of leaves. The submersed leaves are alternate on the stem, lack a leaf stalk, and are long tape-like in shape. Each leaf, which can reach lengths up to 2 meters long, has a prominent stripe of pale green hollow cells flanking the midvein, and 5 to 13 other veins. Stipules are not fused to the leaf. Floating leaves are egg or ellipse-shaped, and supported by a leaf stalk about as long as the leaf itself. Fruiting stalks are located at the top of the stem and packed with flattened disk-shaped fruits. It is typically found growing in low alkalinity environments, and in a variety of substrates. Seeds are highly sought after by all manner of waterfowl.

Robbins Pondweed (*Potamogeton robbinsii*)

Fern Pondweed

Robbins Pondweed Native: Robbins pondweed has robust stems that emerge from spreading rhizomes. The leaves are strongly ranked creating a fern-like appearance most clearly seen while still submerged. Its distinct closely-spaced fern-like leaves give it a unique appearance among the pondweeds of our region. Each leaf is firm and linear, with a base that wraps around the stem. At the stem it has ear-like lobes fused with a fibrous stipule. No floating leaves are produced. Robbins pondweed thrives in deeper water, and under some circumstances, it can over winter green. Robbins pondweed creates suitable invertebrate habitat, and cover for lie-in-wait predaceous fish, such as pickerel and pike.

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.

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.

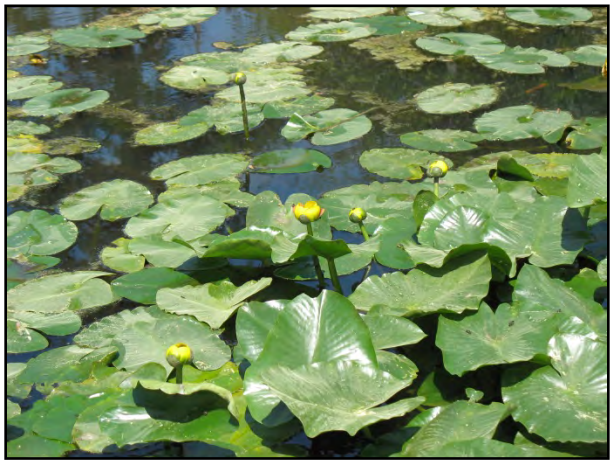
Southern Naiad (*Najas guadalupensis*)

Southern Water Nymph, Bushy Pondweed

Southern Naiad Native (*Najas guadalupensis*. Common Names: Southern water nymph, bushy pondweed.): 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.

Spatterdock (*Nuphar variegata*)

Yellow Pond Lily, 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.

Spiral-fruited Pondweed (*Potamogeton spirillus*)

Spiral-fruited Pondweed Native: Spiral-fruited pondweed has slender stems that originate from a delicate, spreading rhizome. The stems tend to be compact and have numerous branches. Submersed leaves are linear with a curved appearance. Floating leaves are delicate, ellipse-shaped and range from 7 to 35 mm long and two to 13 mm wide. Stipules are fused to the leaf blade for more than half of their length. Nut-like fruits are produced on stalks of varies lengths. Shorter stalks tend to be on lower axils with fruit arranged in a compact head, while longer stalks tend to appear on upper axils, with fruit arranged in a cylindrical head. The fruit itself is a flatten disc with a sharply-toothed margin. Its smooth sides appear like a tightly coiled embryo, a distinguishing characteristic. Spiral-fruited pondweed prefers shallow water with sandy substrate, but can inhabit a wide range of bottom substrates. It serves as an important stabilizer and cover for fish fry and invertebrates.

Water Bulrush (*Scirpus subterminalis, Schoenoplectus subterminalis)*

Bulrush

Water bulrush Native (*Scirpus subterminalis*; = *Schoenoplectus subterminalis*). Common names: water bulrush, bulrush. 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.

Water Chestnut (*Trapa natans*)

Water nut

Water Chestnut Invasive: Water chestnut is native to Europe and Asia, and was first observed in the United States in the late 1800's in Massachusetts. Water chestnut has two types of leaves, submerged and floating rosettes. The submersed leaves are delicate, opposite and contain numerous adventitious roots. Floating leaves are strongly toothed triangular leaves displayed in a rosette fashion, supported by long petioles with spongy inflated bladders for buoyancy. These petioles can reach lengths of up to 16 feet. Water chestnut prefers to inhabit nutrient-rich slow moving waters in lakes, ponds or streams. Although water chestnut can reproduce via fragmented rosettes, the plant produces numerous single-seeded horned nuts armed with sharp ½" barbs. After maturation, these nuts fall off the plant and over winter, producing 10-15 new rosettes the

following season. These nuts can inflict painful wounds to swimmers if stepped on. Studies have shown a water chestnut can lie dormant on a lake bottom for up to 12 years, and still germinate. Water chestnut is a poor source of food for waterfowl. High densities of water chestnut can inhibit boating and fishing.

Water Pennywort (*Hydrocotyle sp.*)

Water Pennywort: Water pennywort varies in appearance depending on the species, but most possess the same general characteristics. The leaves are circular, umbrella-shaped, and about the size of a half-dollar coin. The leaves are shiny green and leathery in texture with long leaf stalks attached to the center. The color of pennywort flowers can be white, green, or yellow. Fruit are typically egg-shaped with a flattened appearance. Pennywort can become a nuisance as they can form dense mats in lakes, pond, rivers, or marshes. The seeds of pennywort provide food for some waterfowl and the plants themselves provide habitat for aquatic biota. Several species of water pennywort, including native and invasive, are common throughout the United States, especially in Florida.

Water Stargrass (*Zosterella dubia*)

Water Stargrass Native: Water stargrass has slender free-branched stems that originate from rhizomes. The leaves are narrow and alternate, attaching directly to the stem. Leaves can be up to 15 cm long, and lack a prominent midvein, a distinguishing characteristic. Water stargrass can inhabit a wide range of water depths and sediment types, and can tolerate reduced clarity environments. Yellow star-shaped flowers are produced by midsummer, but reproduction is usually via over wintering rhizomes. Water stargrass is a locally important waterfowl food source, and provides suitable cover and foraging for fish.

Water-thread Pondweed (*Potamogeton diversifolius*)

Variable-leaf Pondweed, Snailseed Pondweed

Water-thread Pondweed Native (*Potamogeton diversifolius*. Common Names: Water-thread pondweed, variable-leaf pondweed, snailseed pondweed.): Variable-leaf pondweed 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, Variable-leaf pondweed 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.

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.

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.

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.

Wild celery (*Vallisneria Americana*)

Eel-grass, Tape-grass

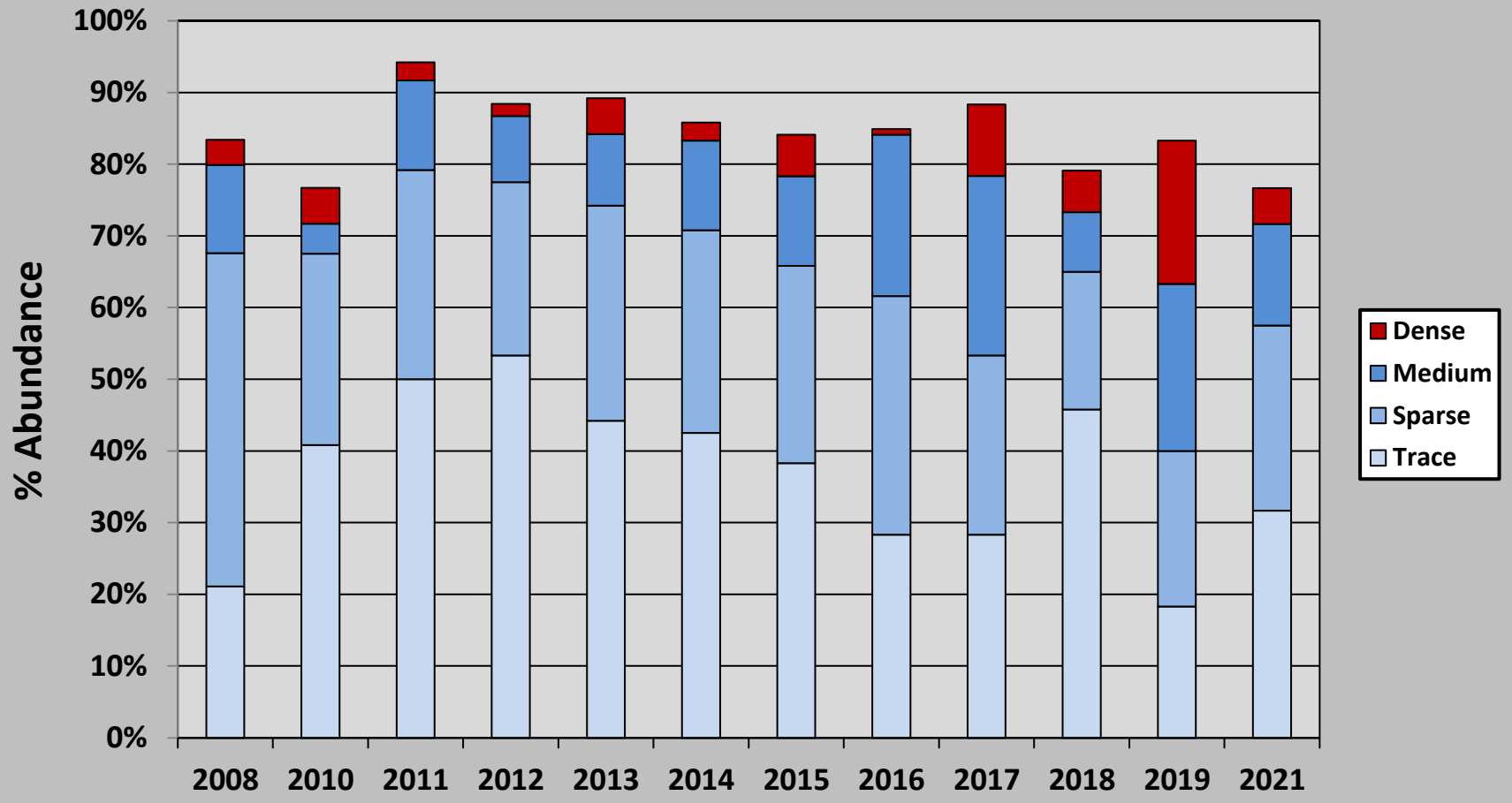
Tape-grass (*Vallisneria americana*. Common Names: Wild celery, eel-grass, tape-grass. **Native**.): Tape-grass has long flowing ribbon-like leaves that have a basal arrangement from a creeping rhizome. The leaves can be up to two meters long, have a cellophane-like texture, with a prominent center stripe 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. Tape-grass usually inhabits hard substrate bottoms in shallow to deep water. It can tolerate a wide variety of water chemistries. Tape-grass 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.

SOLITUDE LAKE MANAGEMENT

Total Submersed Vegetation

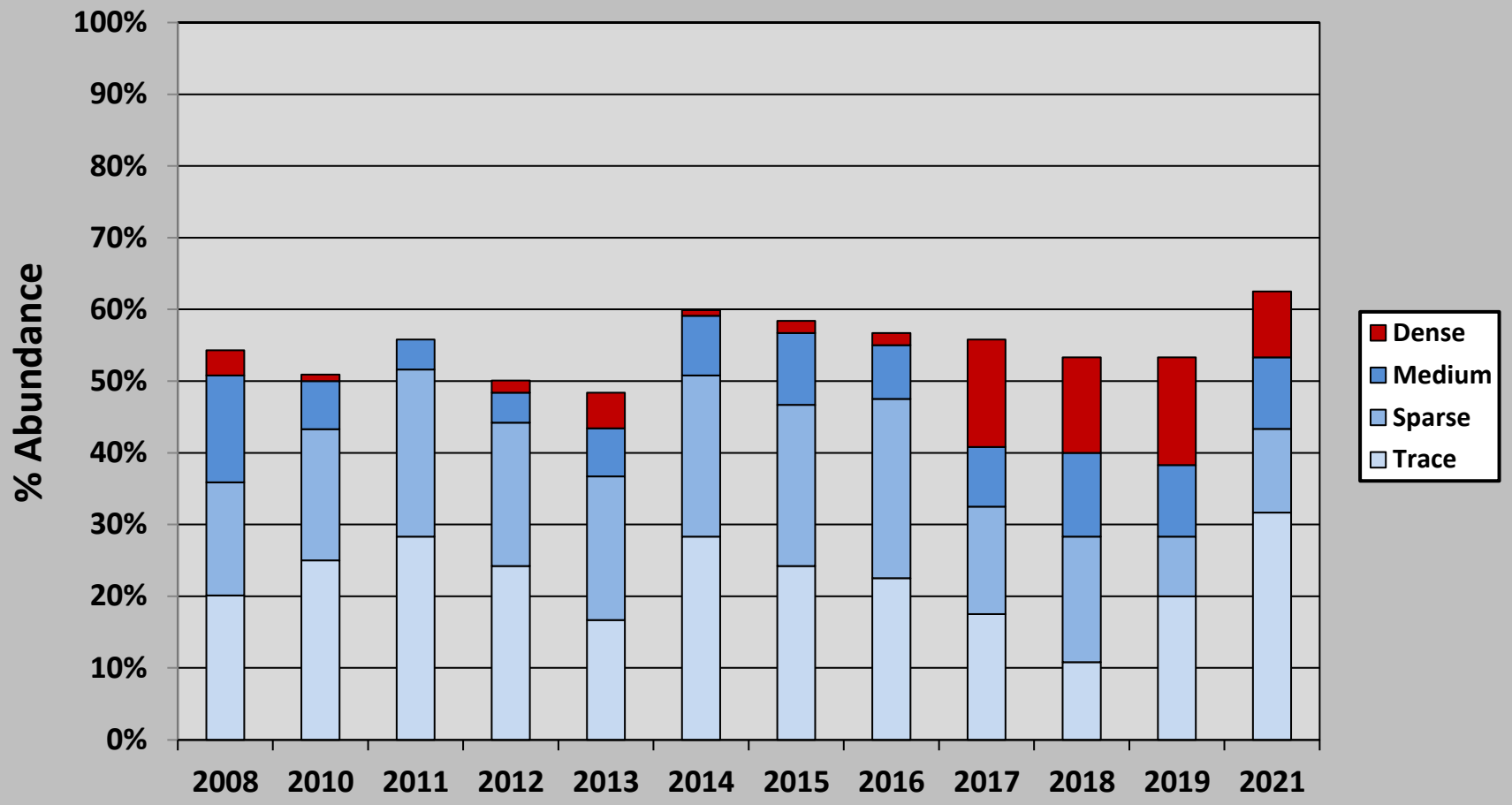
2008 to 2021 Percent Abundance

Lake Waccabuc



SOLITUDE LAKE MANAGEMENT

Total Floating Vegetation
2008 to 2021 Percent Abundance
Lake Waccabuc

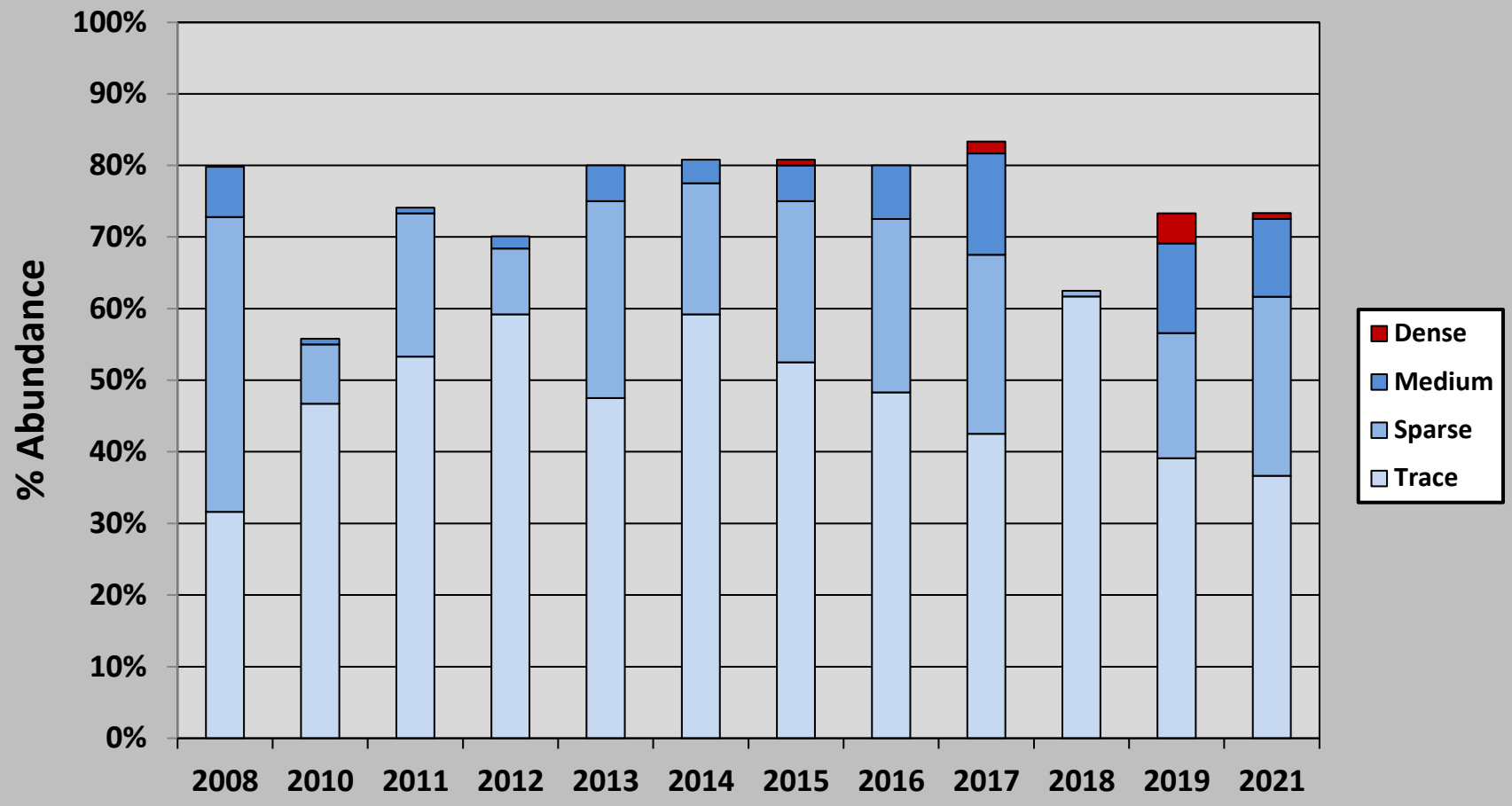


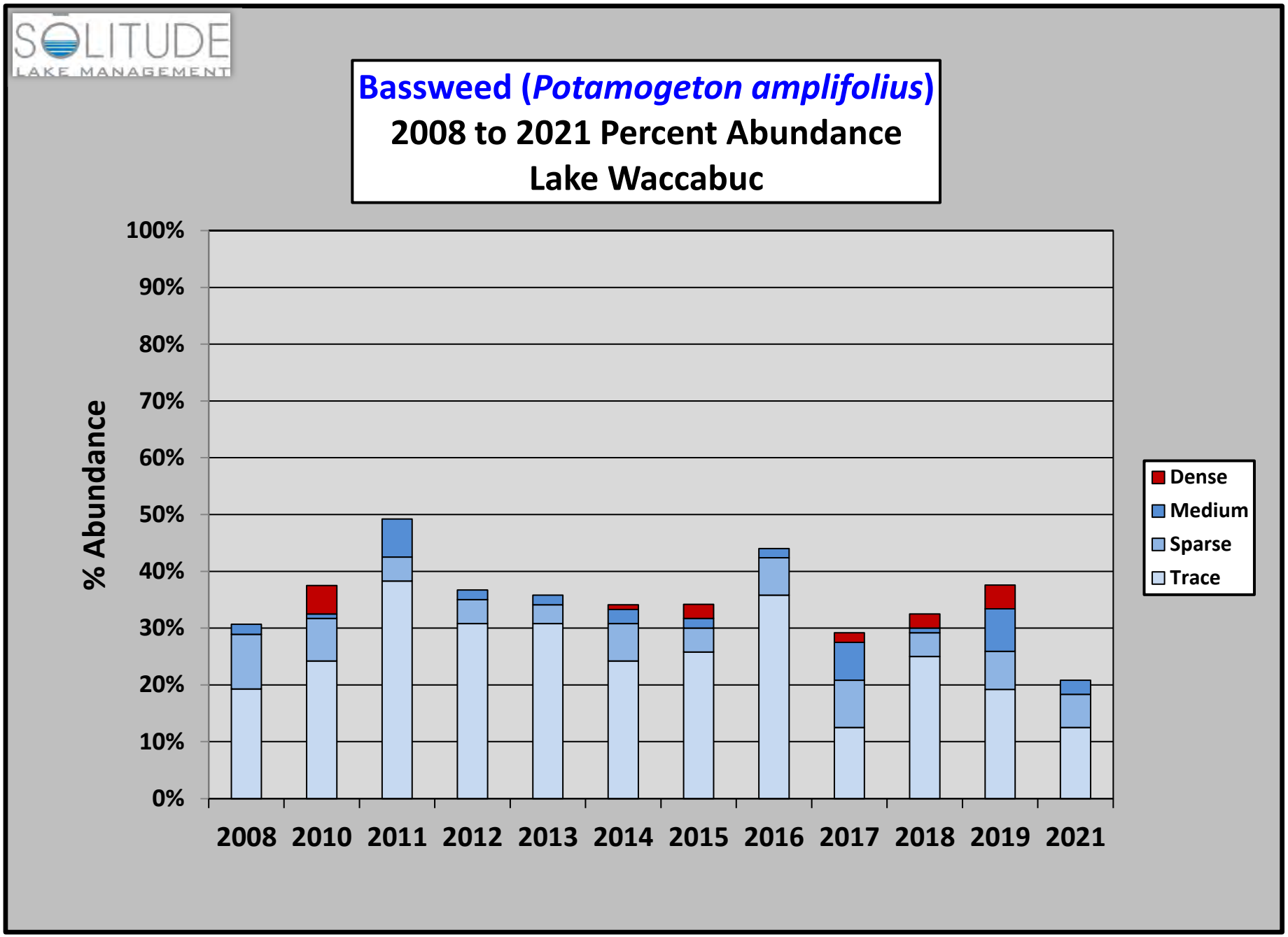
SOLITUDE LAKE MANAGEMENT

Eurasian Watermilfoil (*Myriophyllum spicatum*)

2008 to 2021 Percent Abundance

Lake Waccabuc




SOLITUDE
LAKE MANAGEMENT
Bassweed (Potamogeton amplifolius)
2008 to 2021 Percent Abundance
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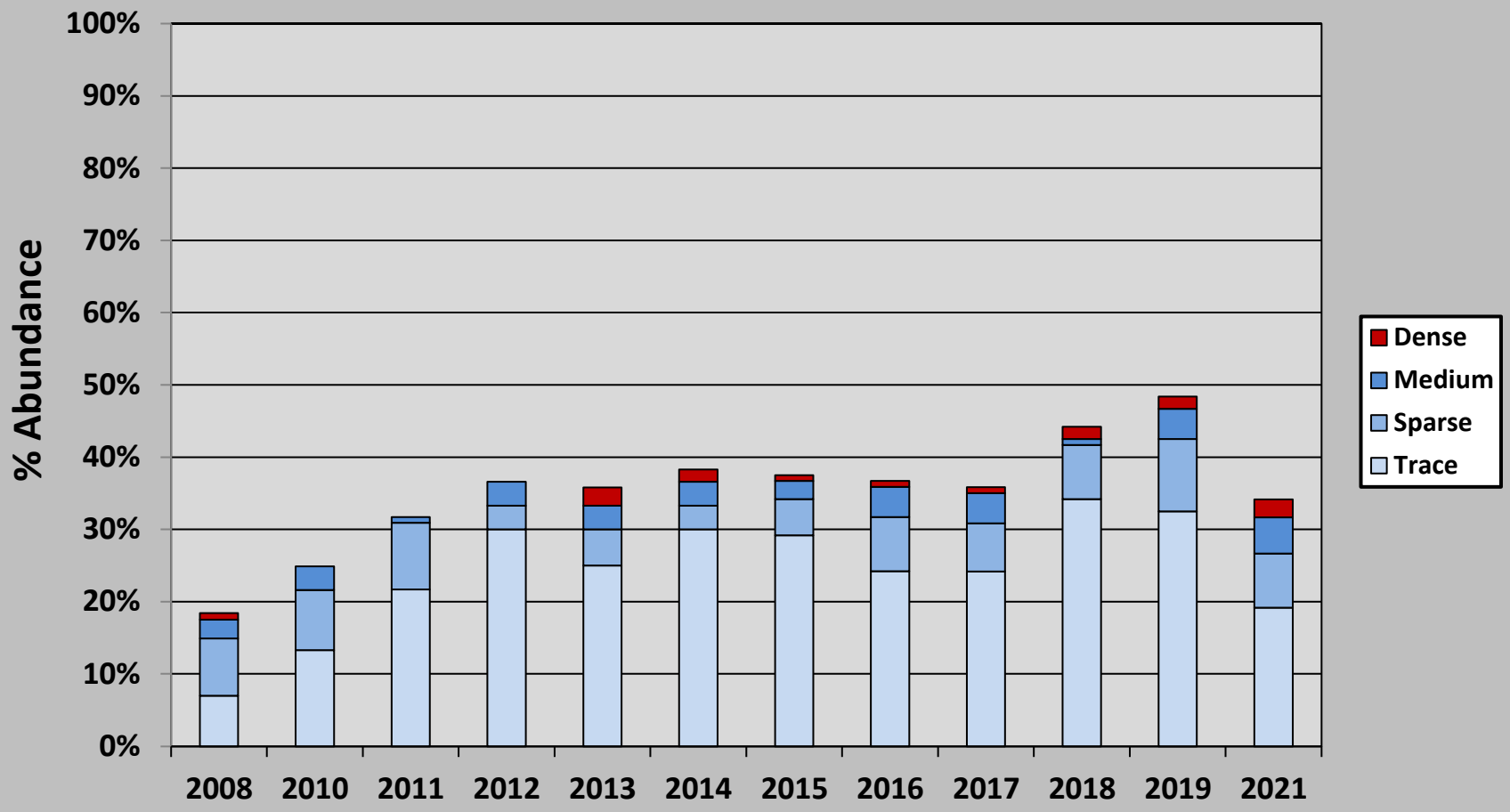
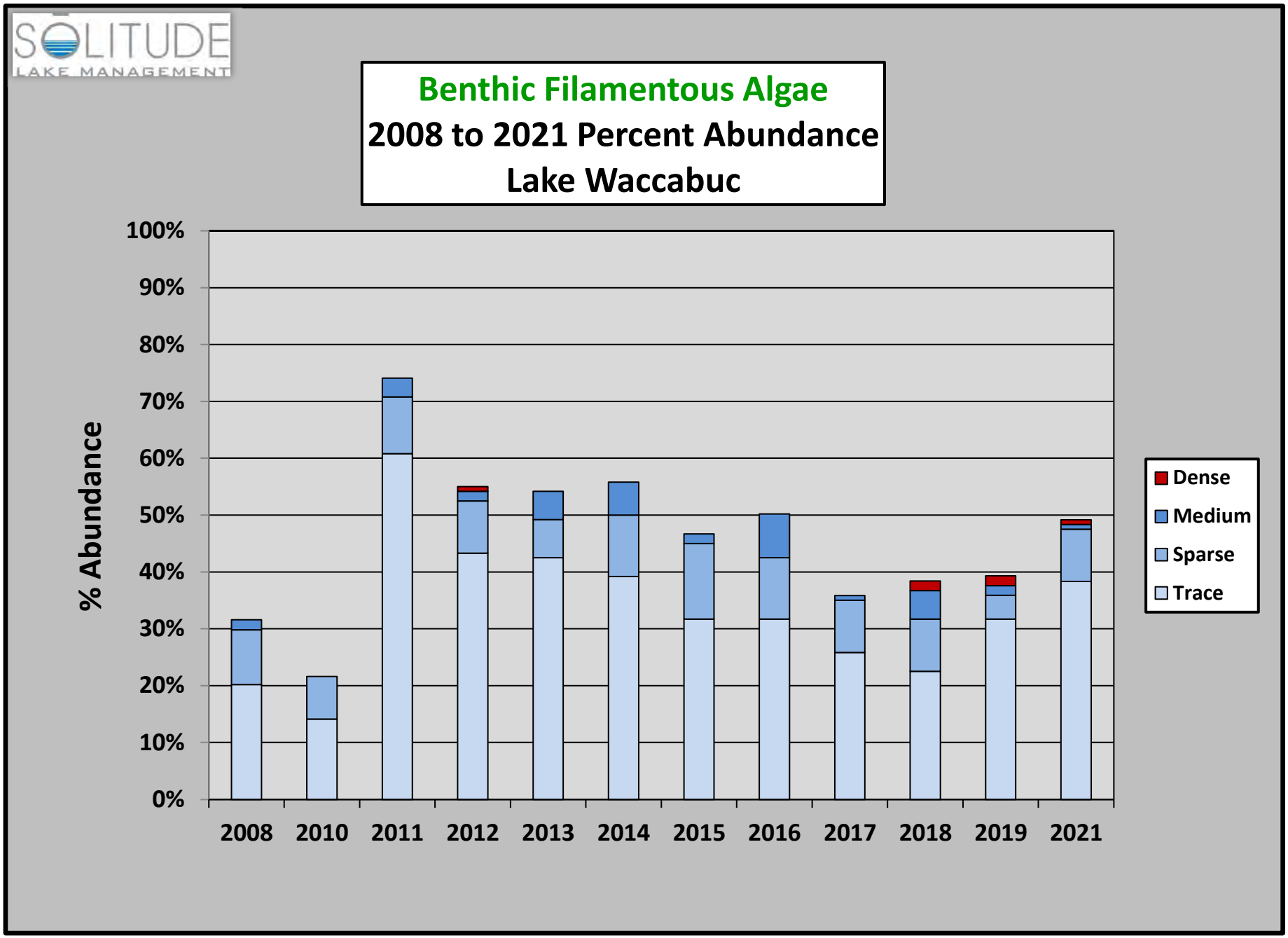
SOLITUDE LAKE MANAGEMENT

Coontail (*Ceratophyllum demersum*)
2008 to 2021 Percent Abundance
Lake Waccabuc

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LAKE MANAGEMENT
Benthic Filamentous Algae
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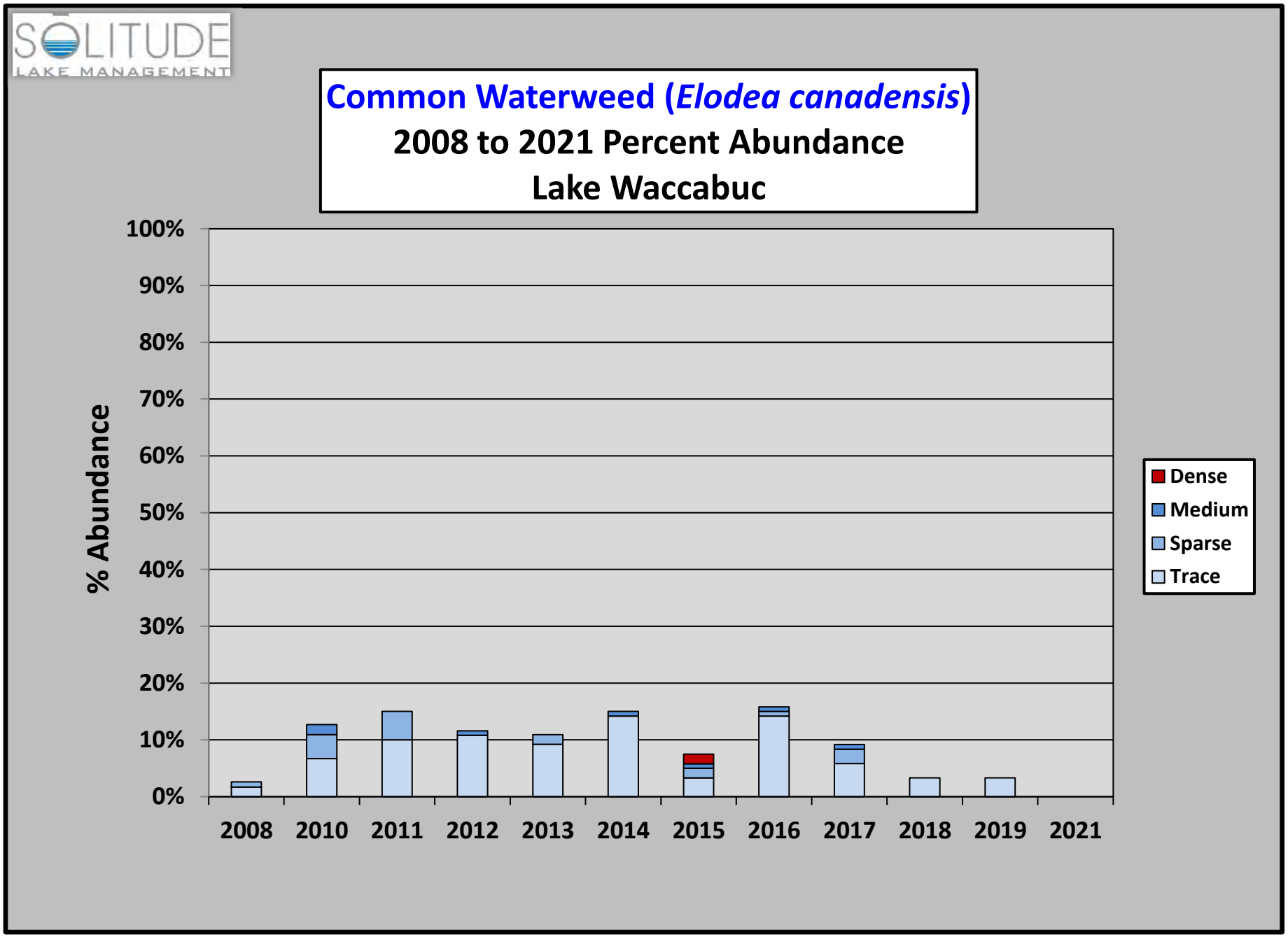
SOLITUDE
LAKE MANAGEMENT
Common Waterweed (*Elodea canadensis*)
2008 to 2021 Percent Abundance
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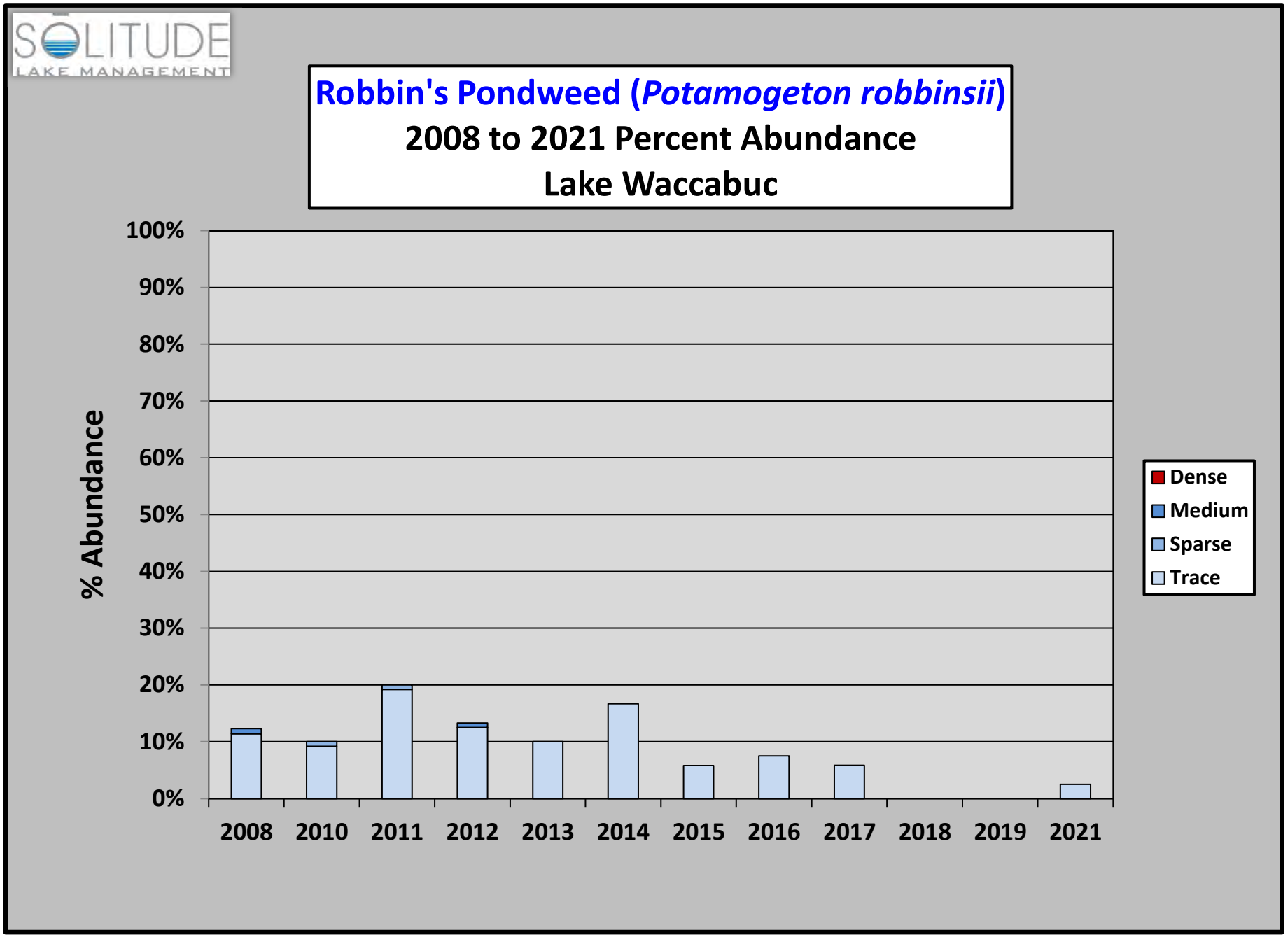
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LAKE MANAGEMENT
Robbin's Pondweed (Potamogeton robbinsii)
2008 to 2021 Percent Abundance
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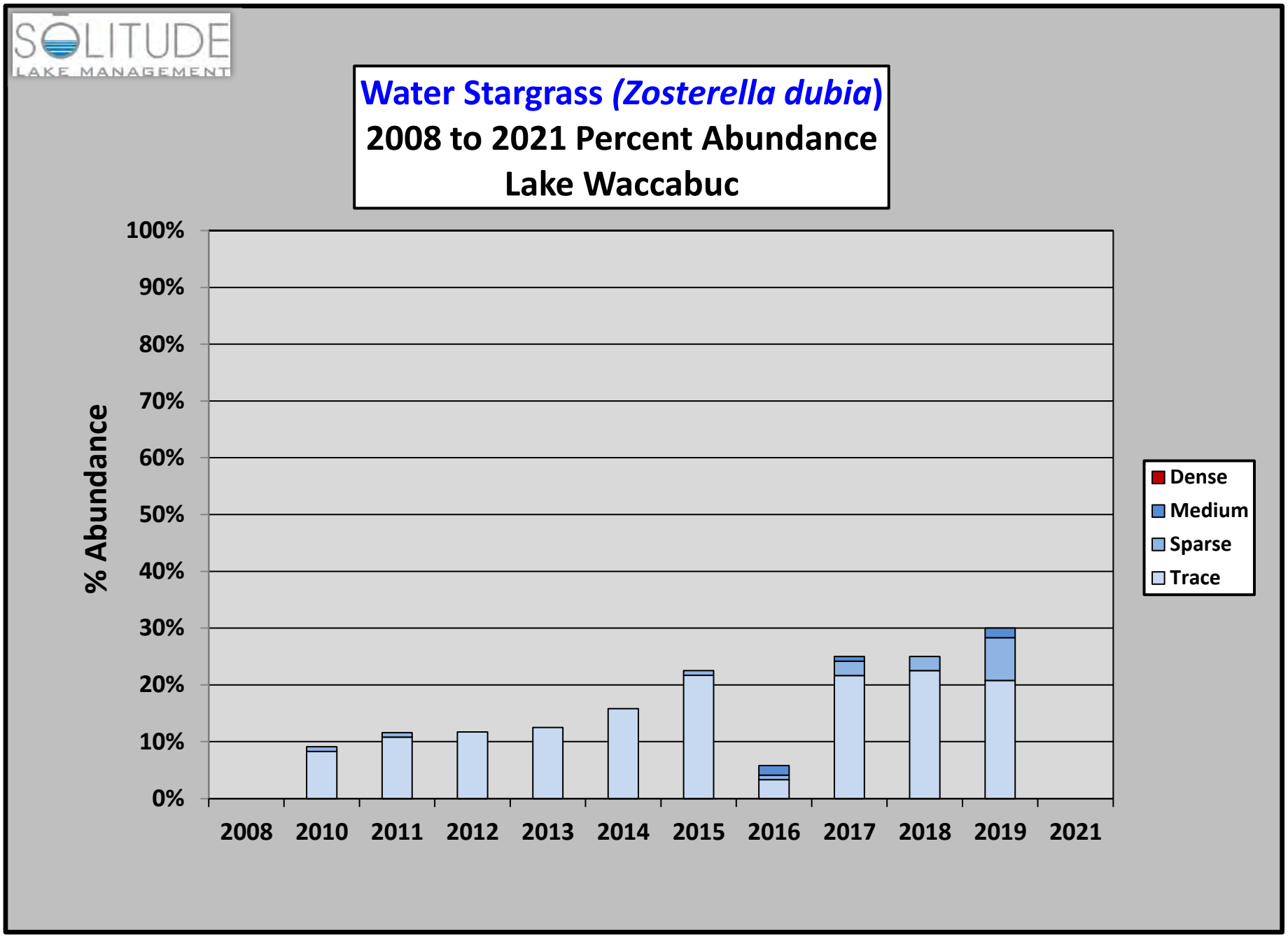
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LAKE MANAGEMENT
Water Stargrass (Zosterella dubia)
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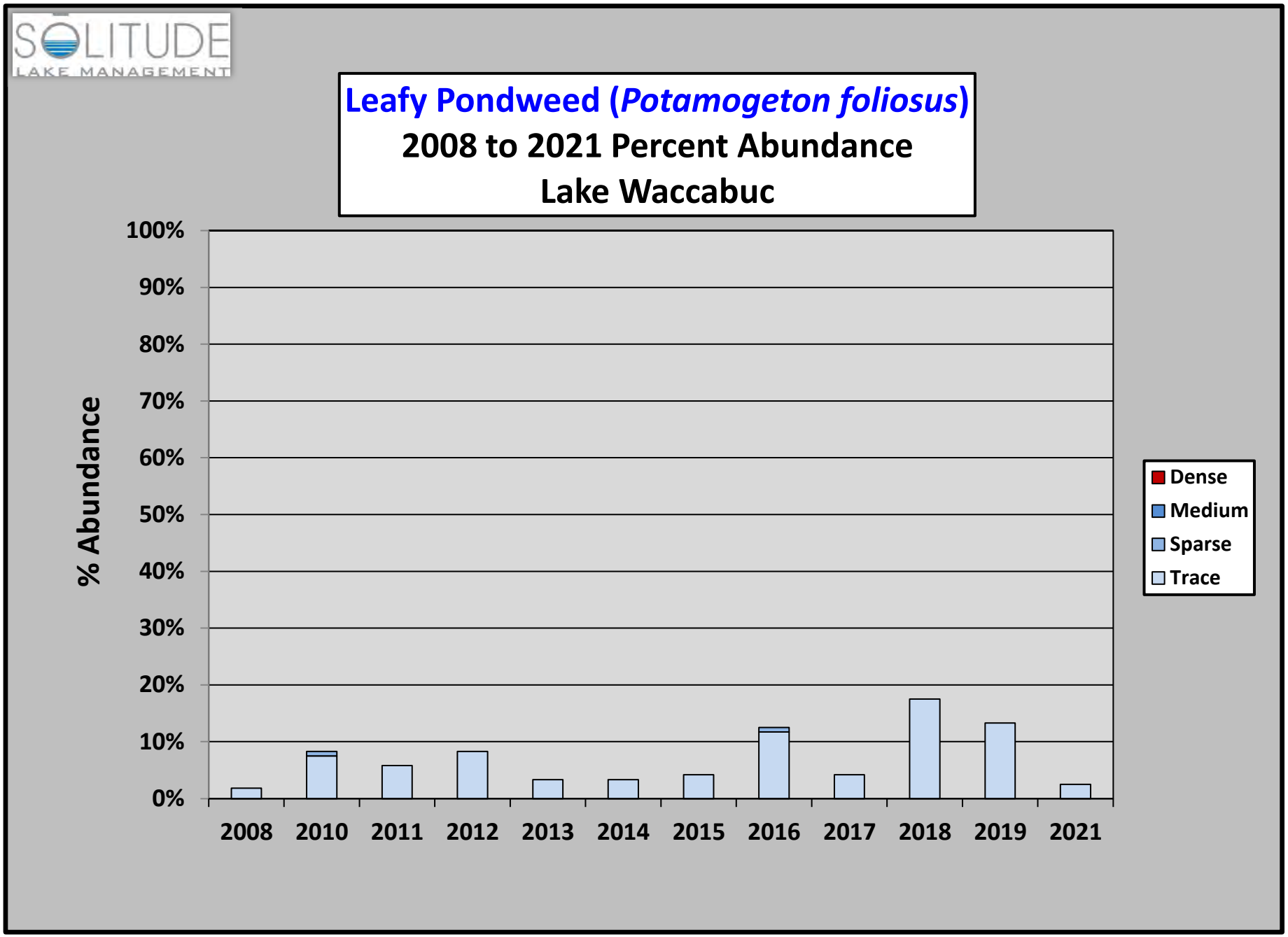
SOLITUDE
LAKE MANAGEMENT
Leafy Pondweed (Potamogeton foliosus)
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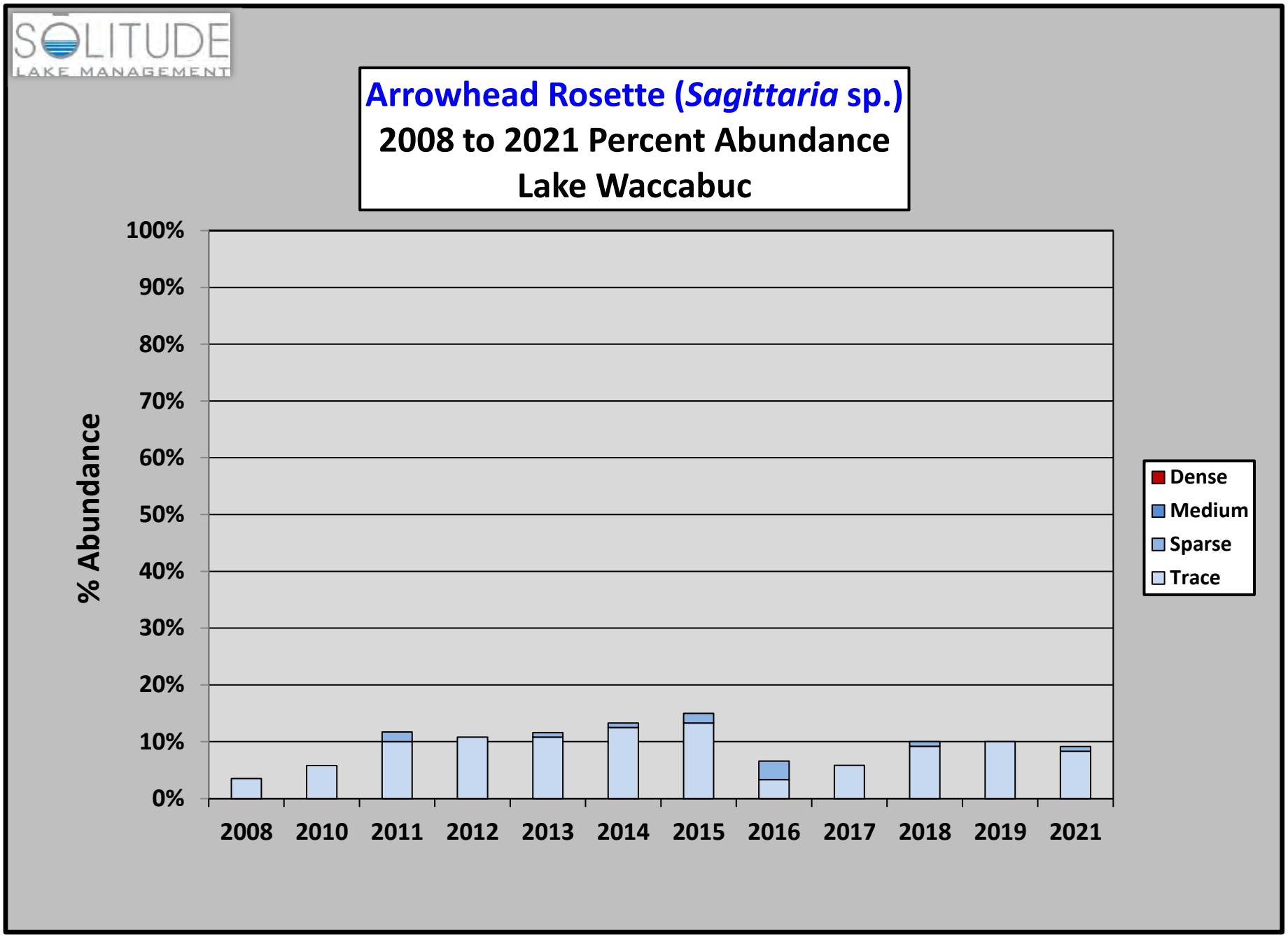
SOLITUDE
LAKE MANAGEMENT
Arrowhead Rosette (Sagittaria sp.)
2008 to 2021 Percent Abundance
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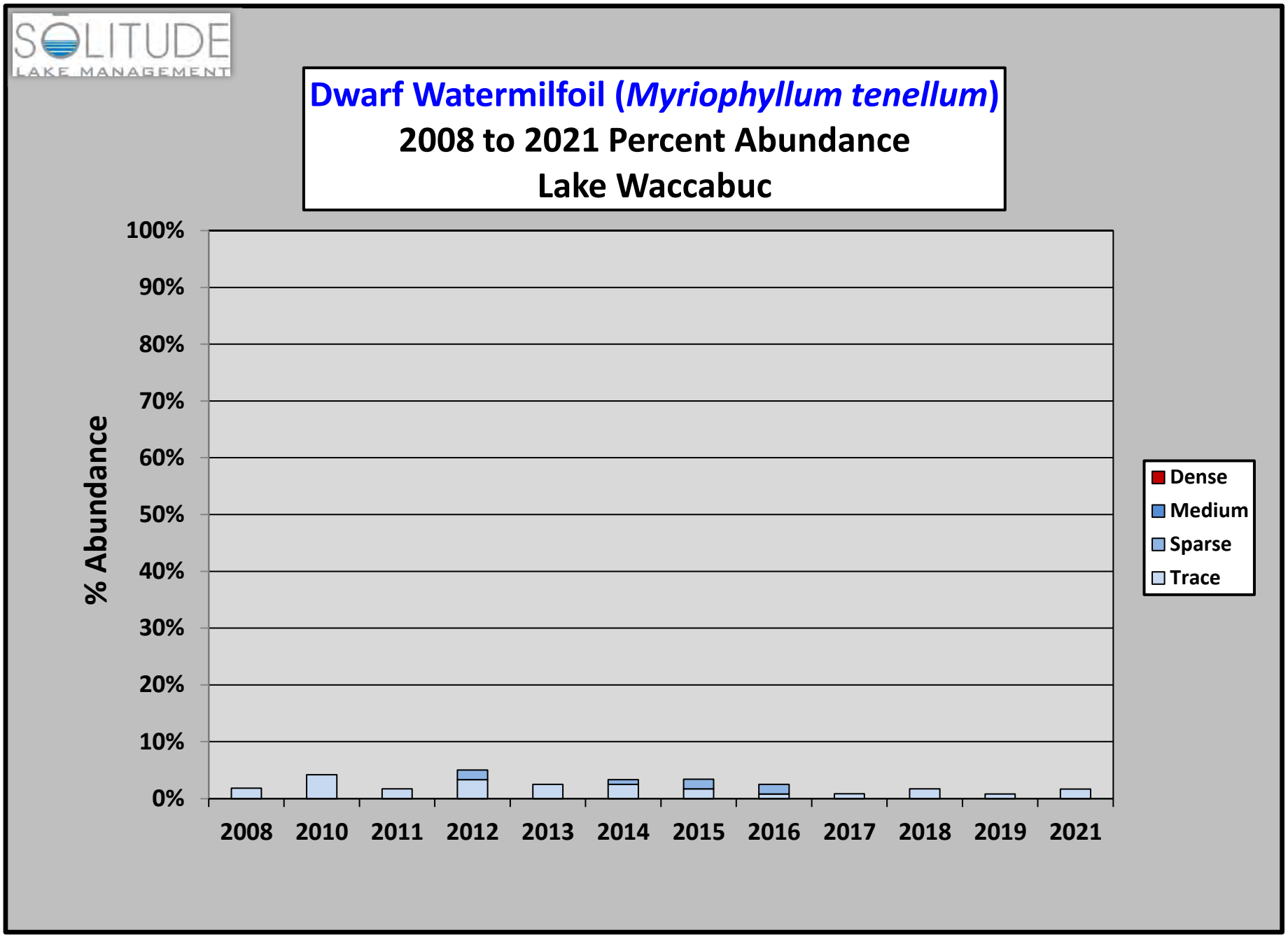
SOLITUDE
LAKE MANAGEMENT
Dwarf Watermilfoil (*Myriophyllum tenellum*)
2008 to 2021 Percent Abundance
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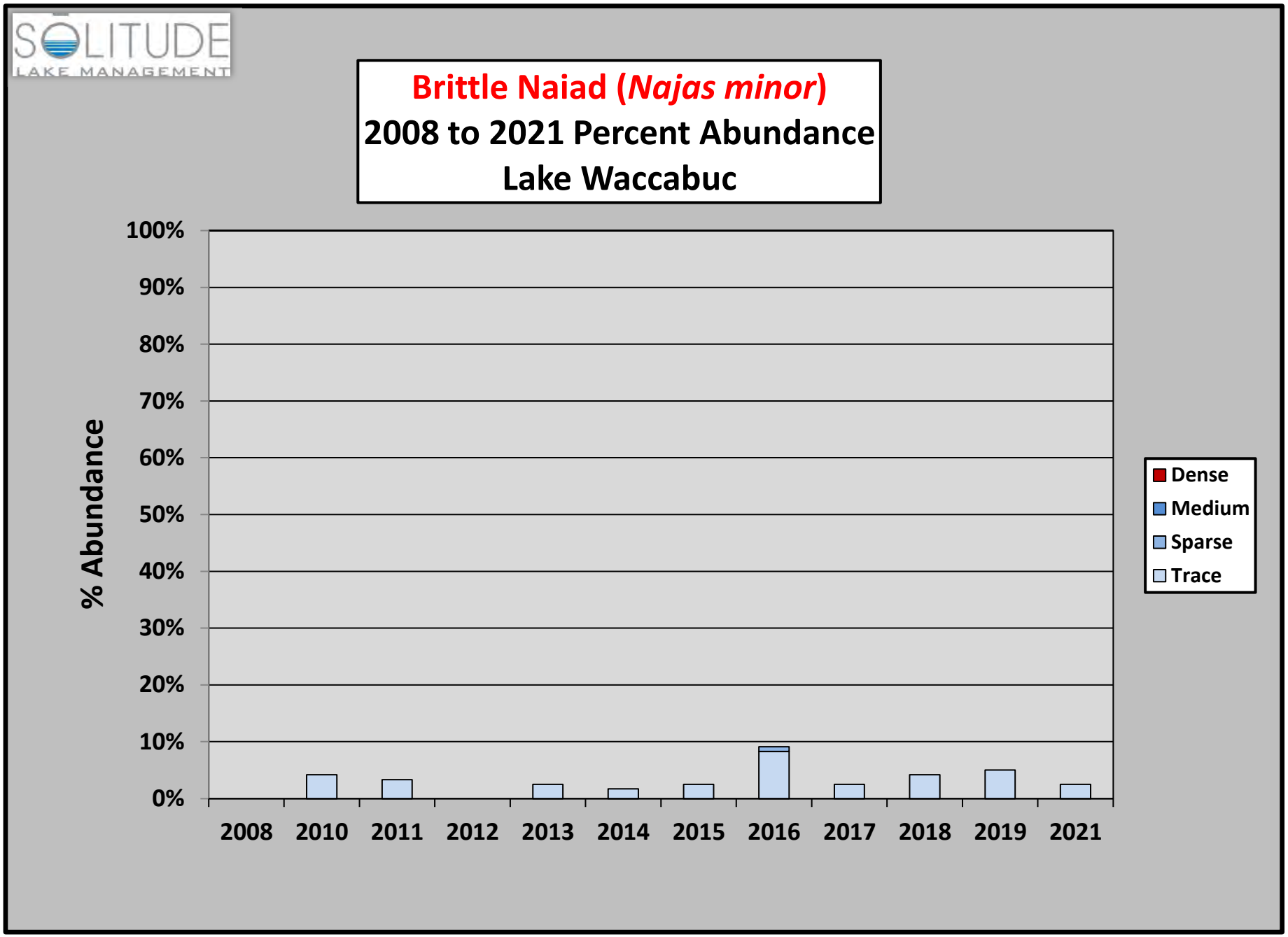
SOLITUDE
LAKE MANAGEMENT
Brittle Naiad (*Najas minor*)
2008 to 2021 Percent Abundance
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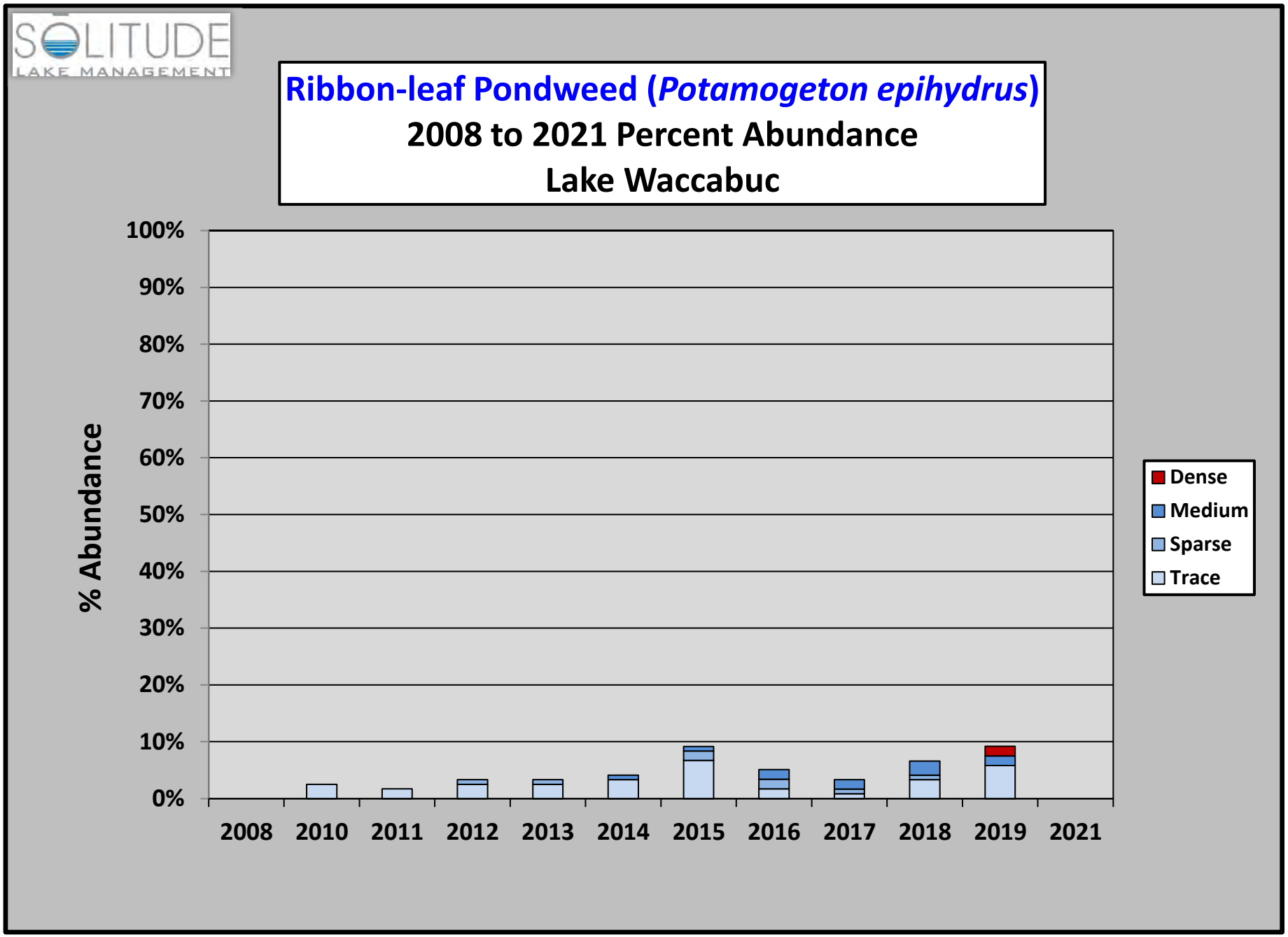
SOLITUDE
LAKE MANAGEMENT
Ribbon-leaf Pondweed (Potamogeton epihydrus)
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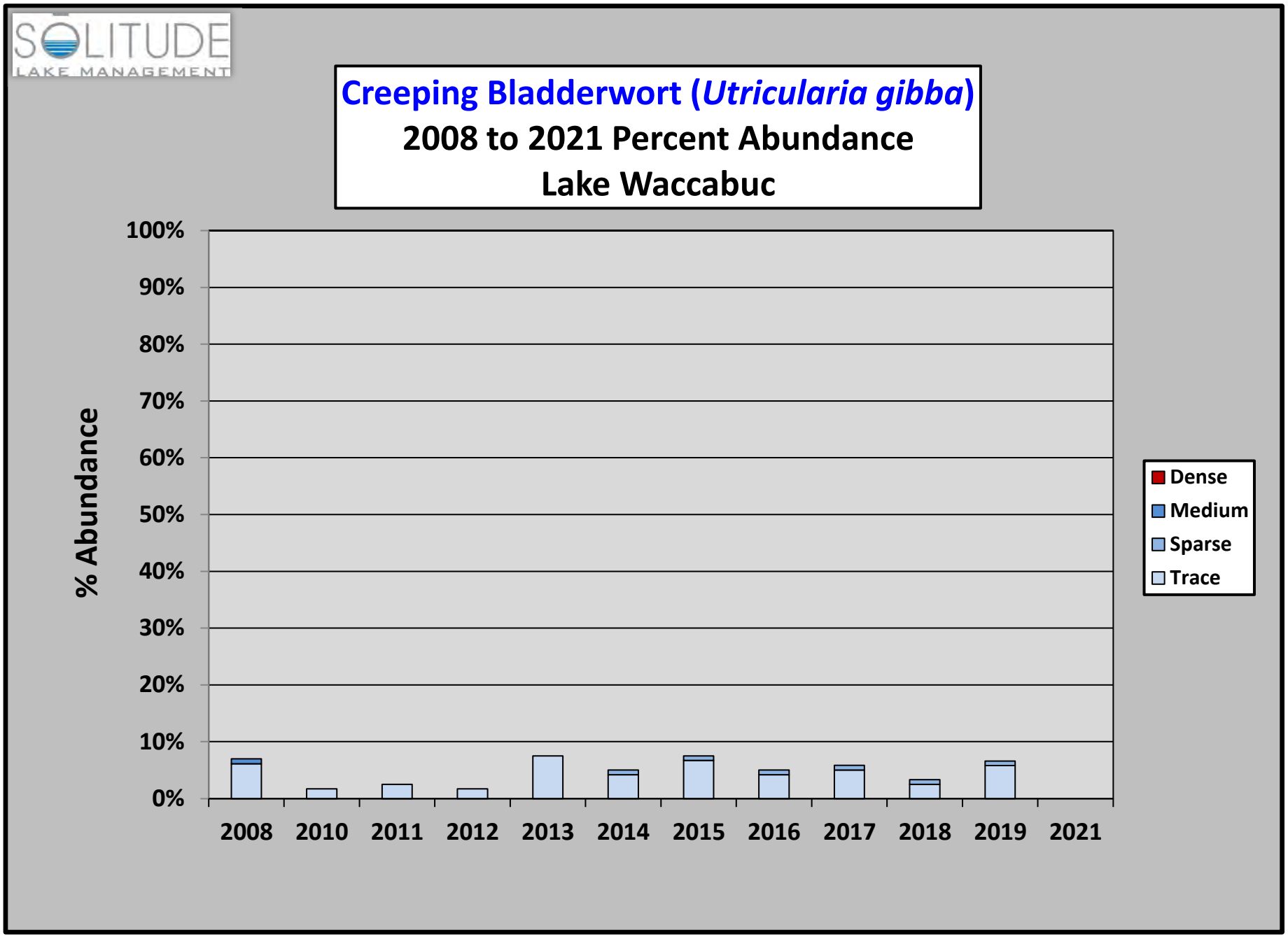
SOLITUDE
LAKE MANAGEMENT
Creeping Bladderwort (Utricularia gibba)
2008 to 2021 Percent Abundance
Lake Waccabuc
% Abundance
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2008
2010
2011
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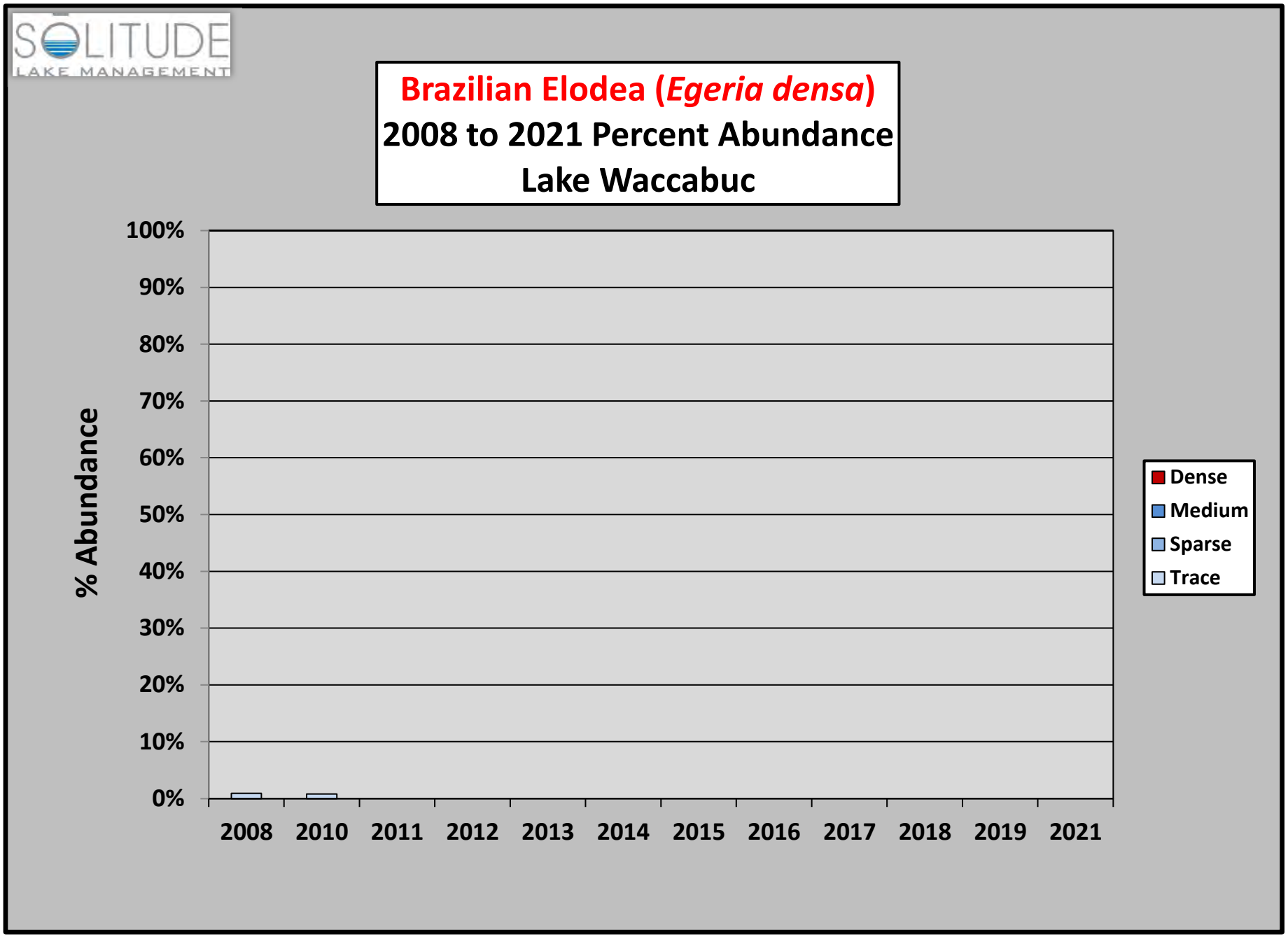
2021
Dense
Medium
Sparse
Trace


SOLITUDE
LAKE MANAGEMENT
Brazilian Elodea (Egeria densa)
2008 to 2021 Percent Abundance
Lake Waccabuc
% Abundance
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2008
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Dense
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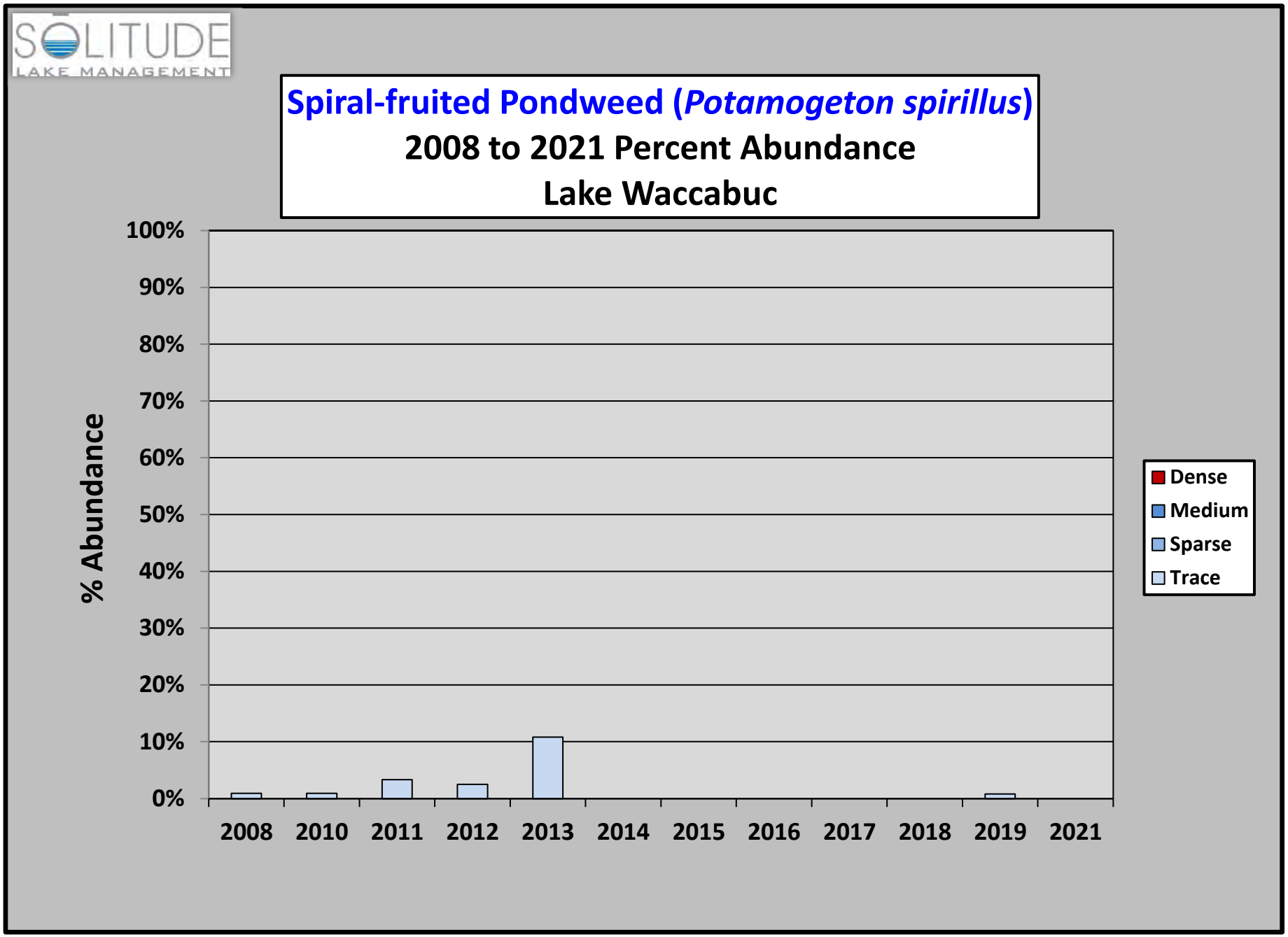
Sparse
Trace


SOLITUDE
LAKE MANAGEMENT
Spiral-fruited Pondweed (Potamogeton spirillus)
2008 to 2021 Percent Abundance
Lake Waccabuc
% Abundance
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2008
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Dense
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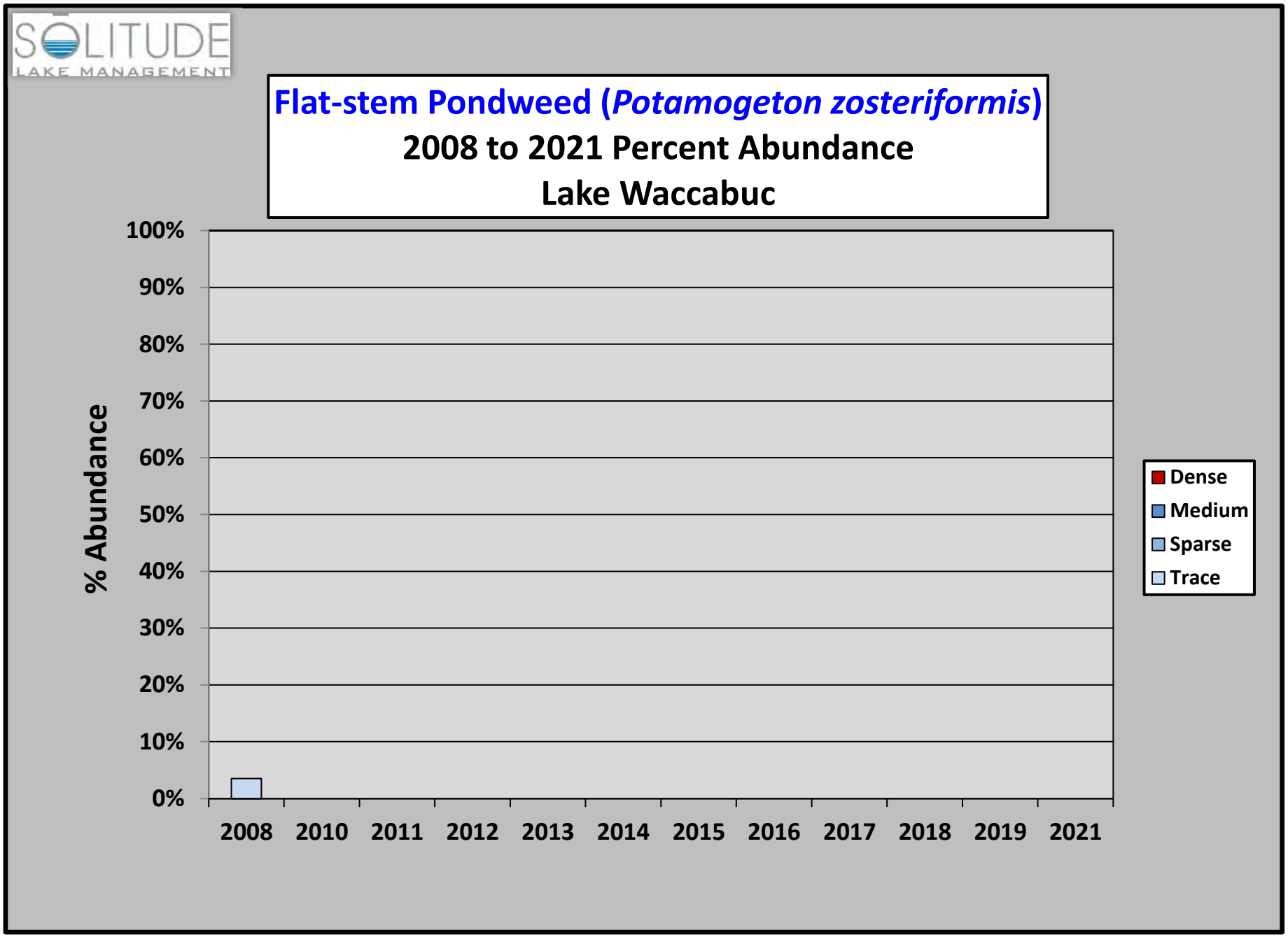
Sparse
Trace


SOLITUDE
LAKE MANAGEMENT
Flat-stem Pondweed (Potamogeton zosteriformis)
2008 to 2021 Percent Abundance
Lake Waccabuc
% Abundance
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2008
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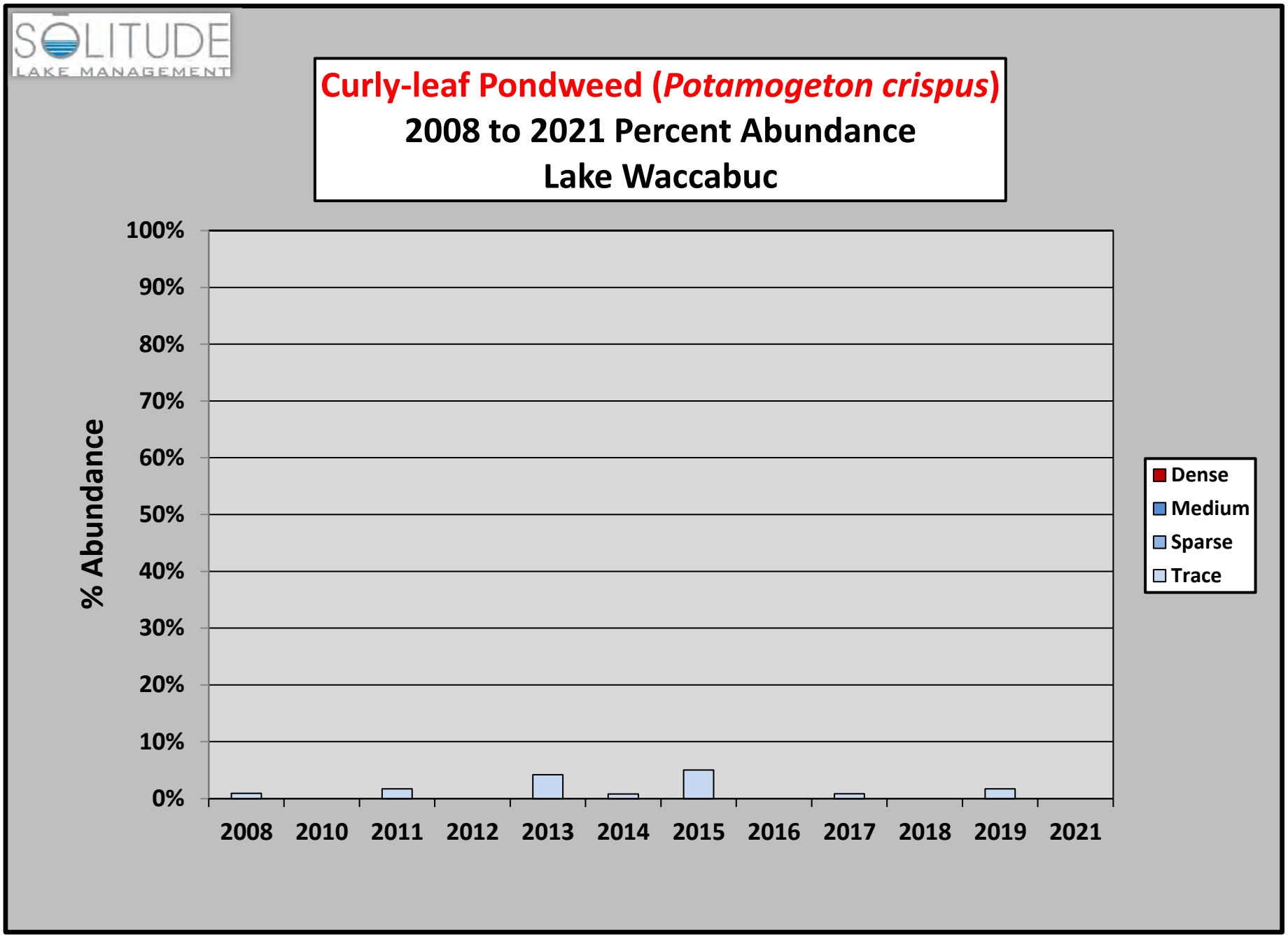
2021
Dense
Medium
Sparse
Trace


SOLITUDE
LAKE MANAGEMENT
Curly-leaf Pondweed (Potamogeton crispus)
2008 to 2021 Percent Abundance
Lake Waccabuc
% Abundance
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2008
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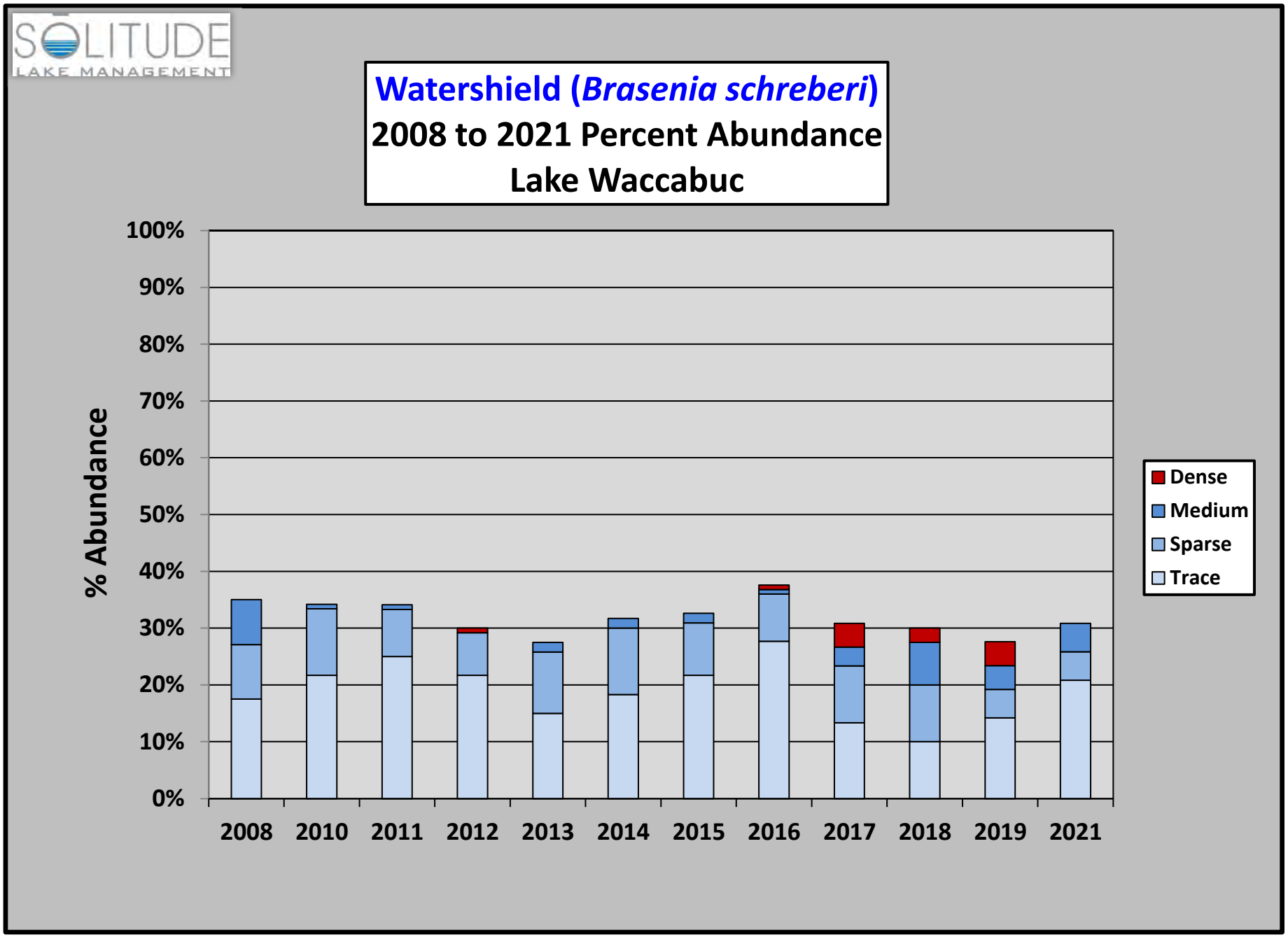
2021
Dense
Medium
Sparse
Trace


SOLITUDE
LAKE MANAGEMENT
Watershield (Brasenia schreberi)
2008 to 2021 Percent Abundance
Lake Waccabuc
% Abundance
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2008
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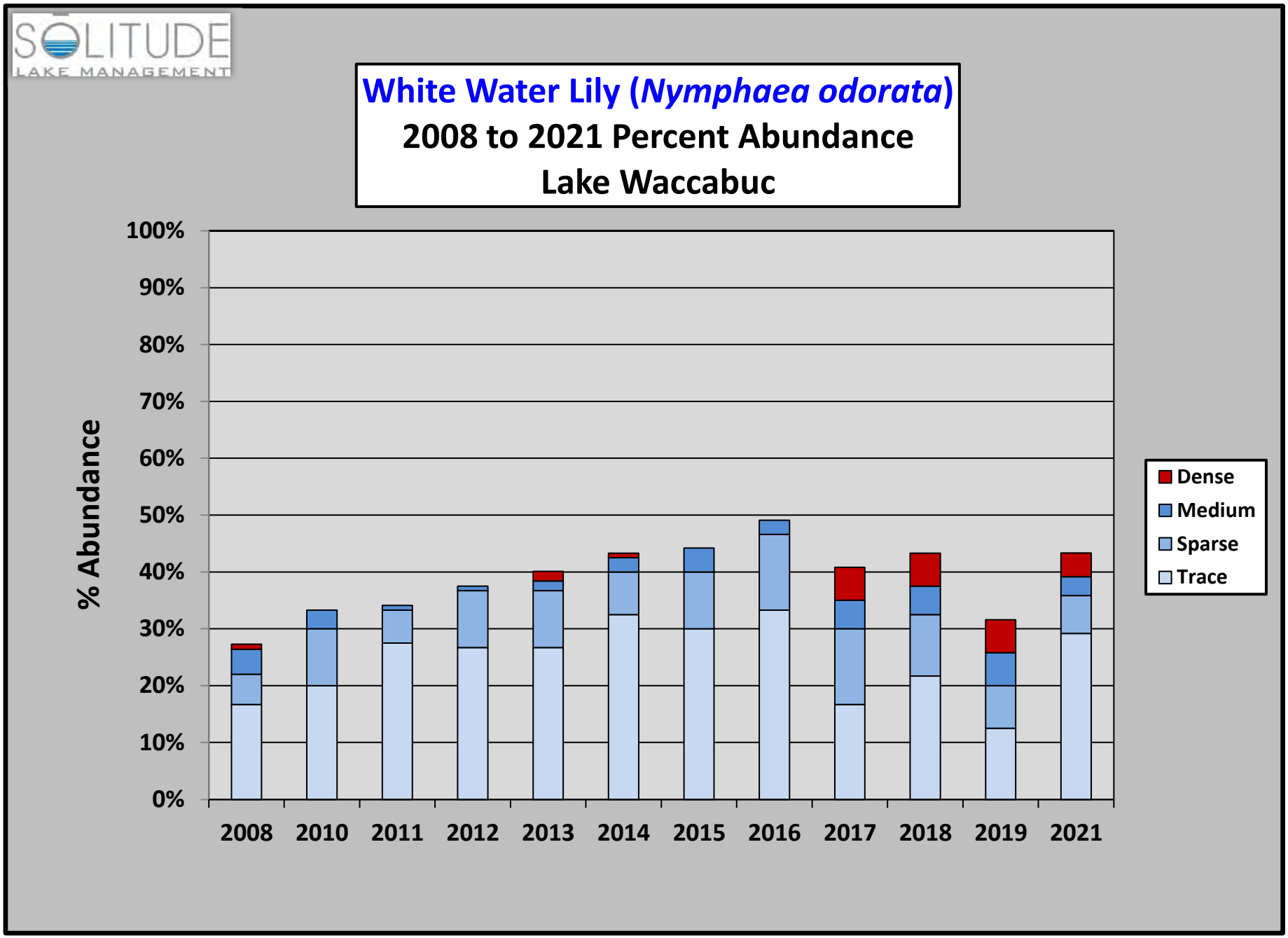
Dense
Medium
Sparse
Trace


SOLITUDE
LAKE MANAGEMENT
White Water Lily (Nymphaea odorata)
2008 to 2021 Percent Abundance
Lake Waccabuc
% Abundance
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
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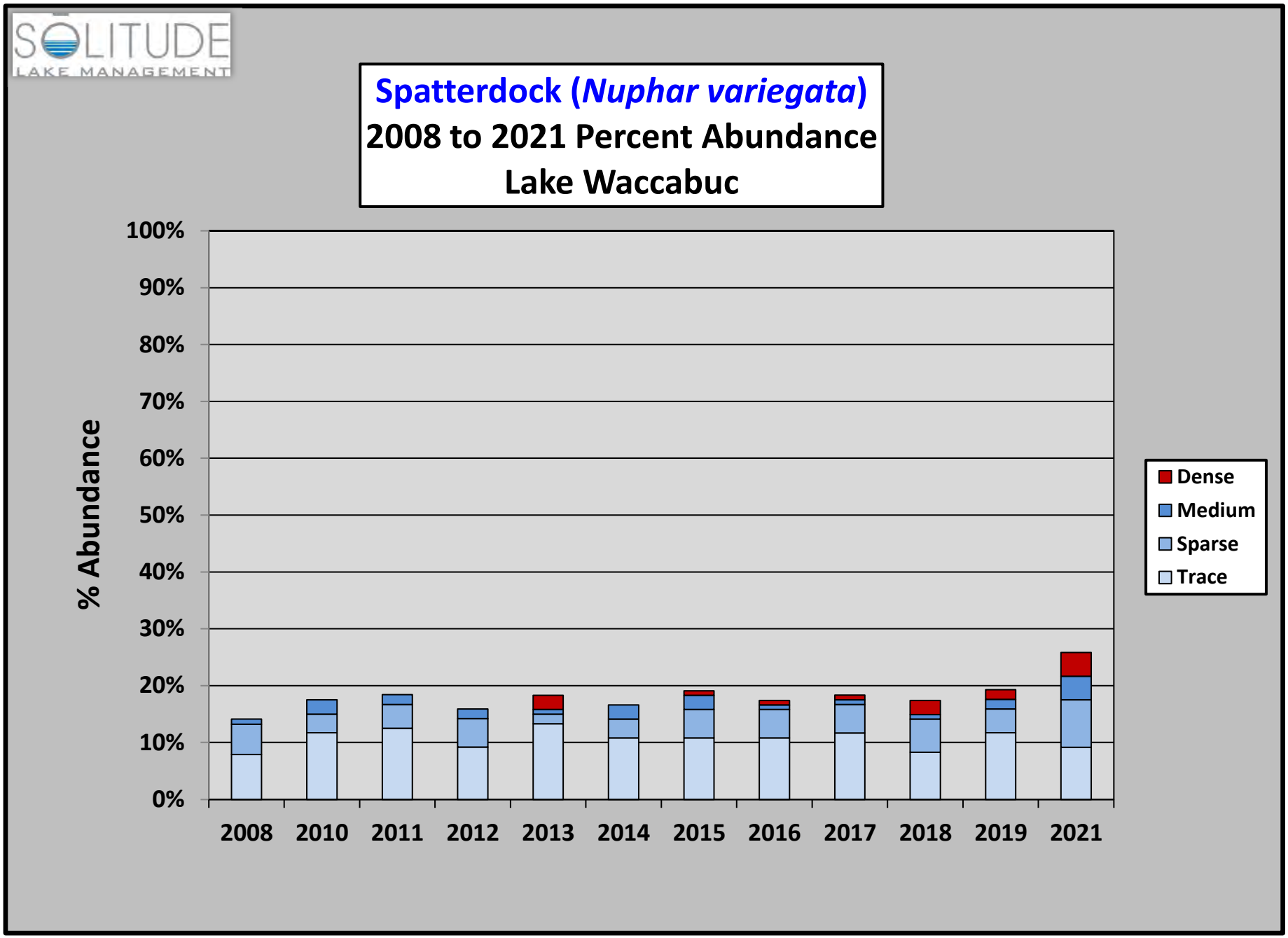
2021
Dense
Medium
Sparse
Trace


SOLITUDE
LAKE MANAGEMENT
Spatterdock (Nuphar variegata)
2008 to 2021 Percent Abundance
Lake Waccabuc
% Abundance
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2008
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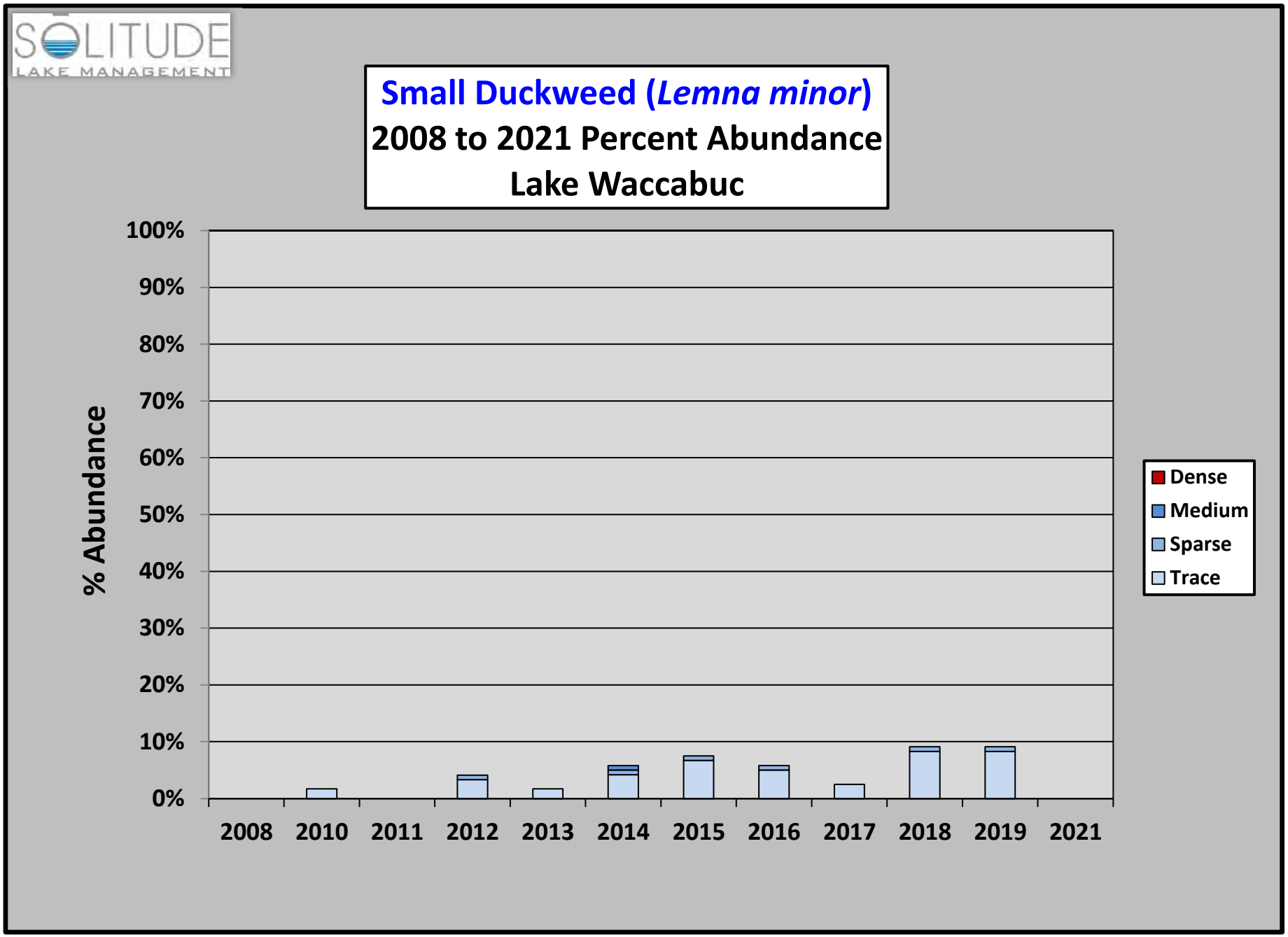
2021
Dense
Medium
Sparse
Trace


SOLITUDE
LAKE MANAGEMENT
Small Duckweed (Lemna minor)
2008 to 2021 Percent Abundance
Lake Waccabuc
% Abundance
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2008
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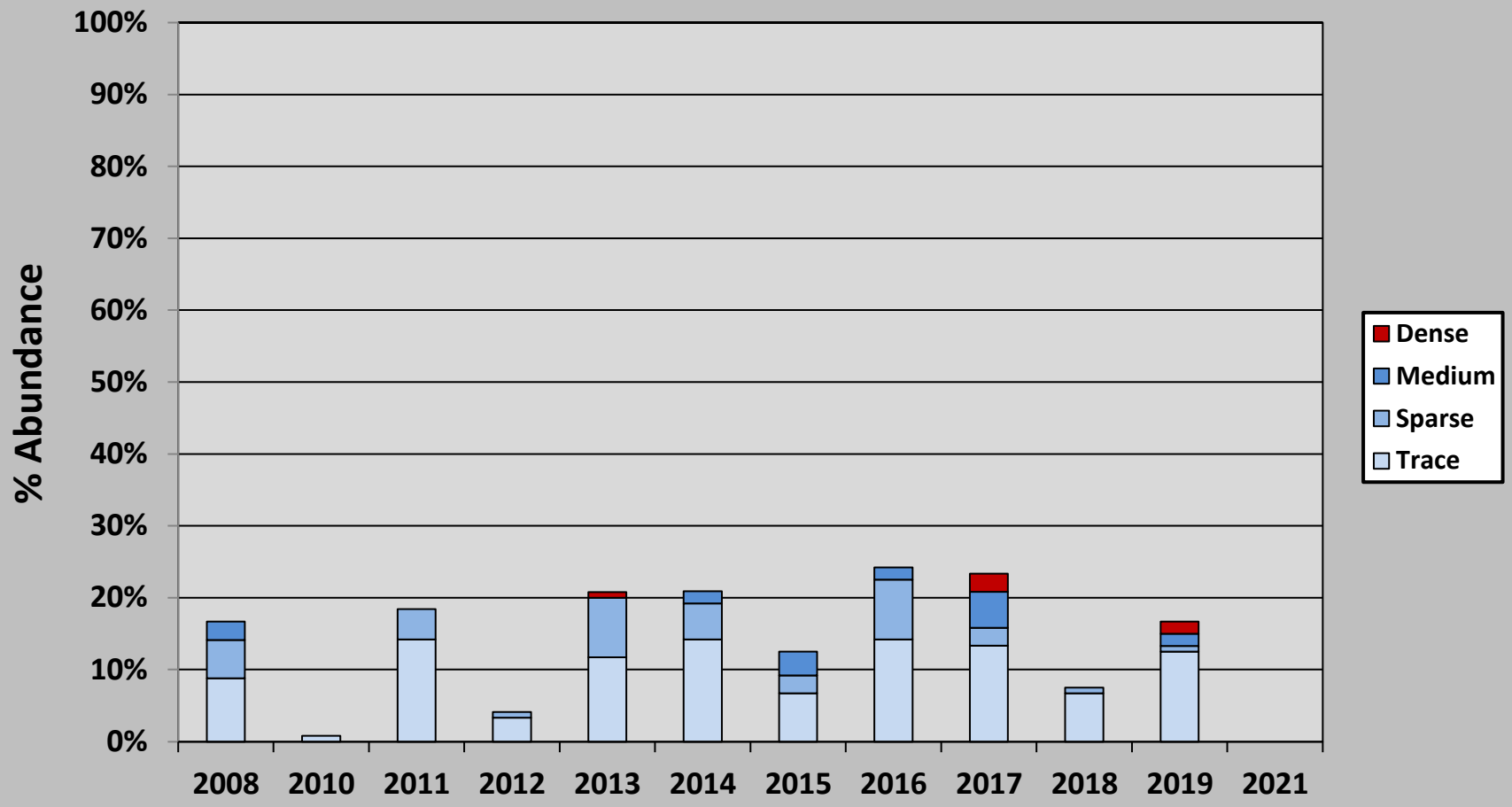
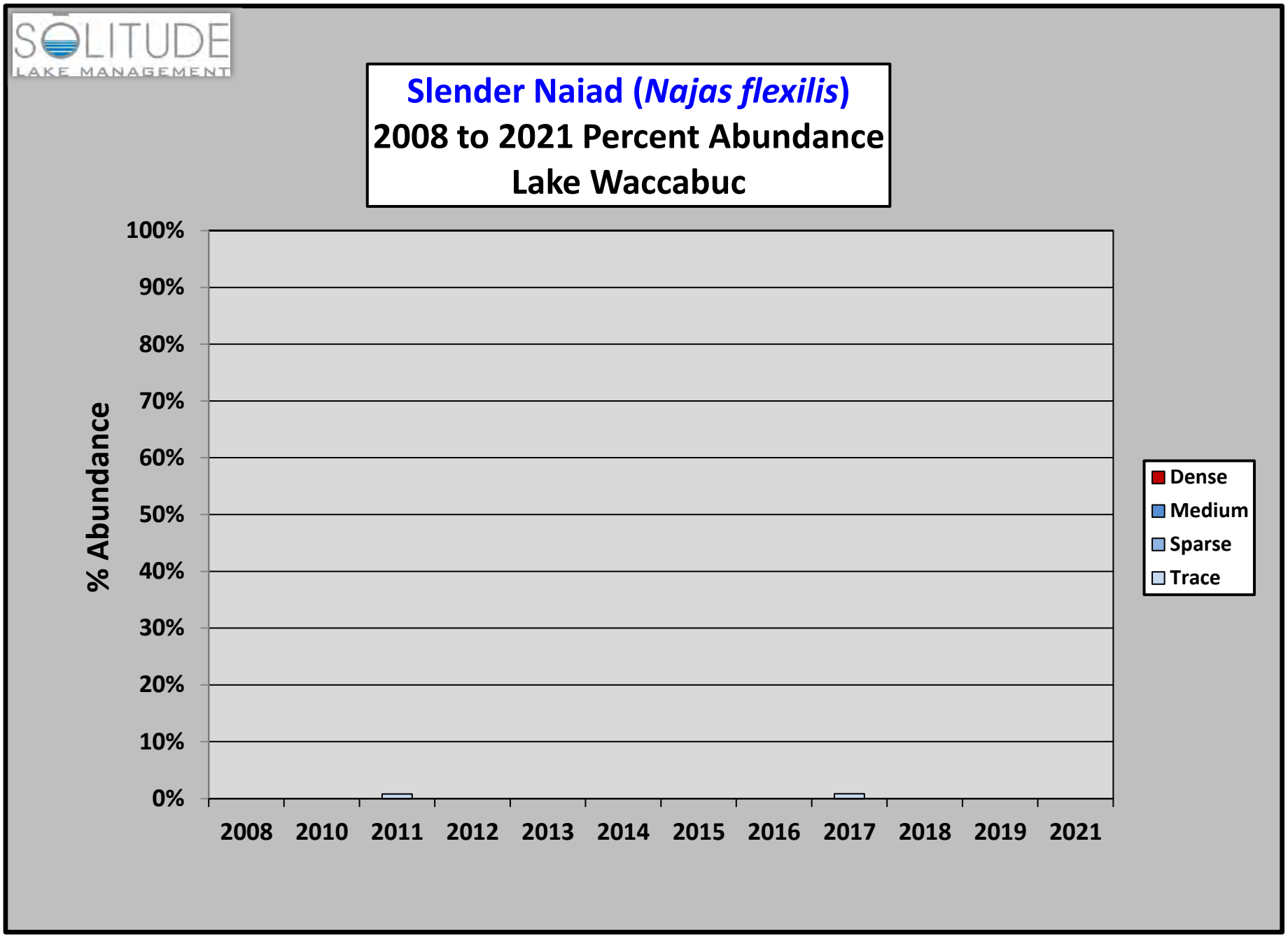
2021
Dense
Medium
Sparse
Trace

SOLITUDE LAKE MANAGEMENT

Floating Filamentous Algae
2008 to 2021 Percent Abundance
Lake Waccabuc




SOLITUDE
LAKE MANAGEMENT
Slender Naiad (Najas flexilis)
2008 to 2021 Percent Abundance
Lake Waccabuc
% Abundance
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2008
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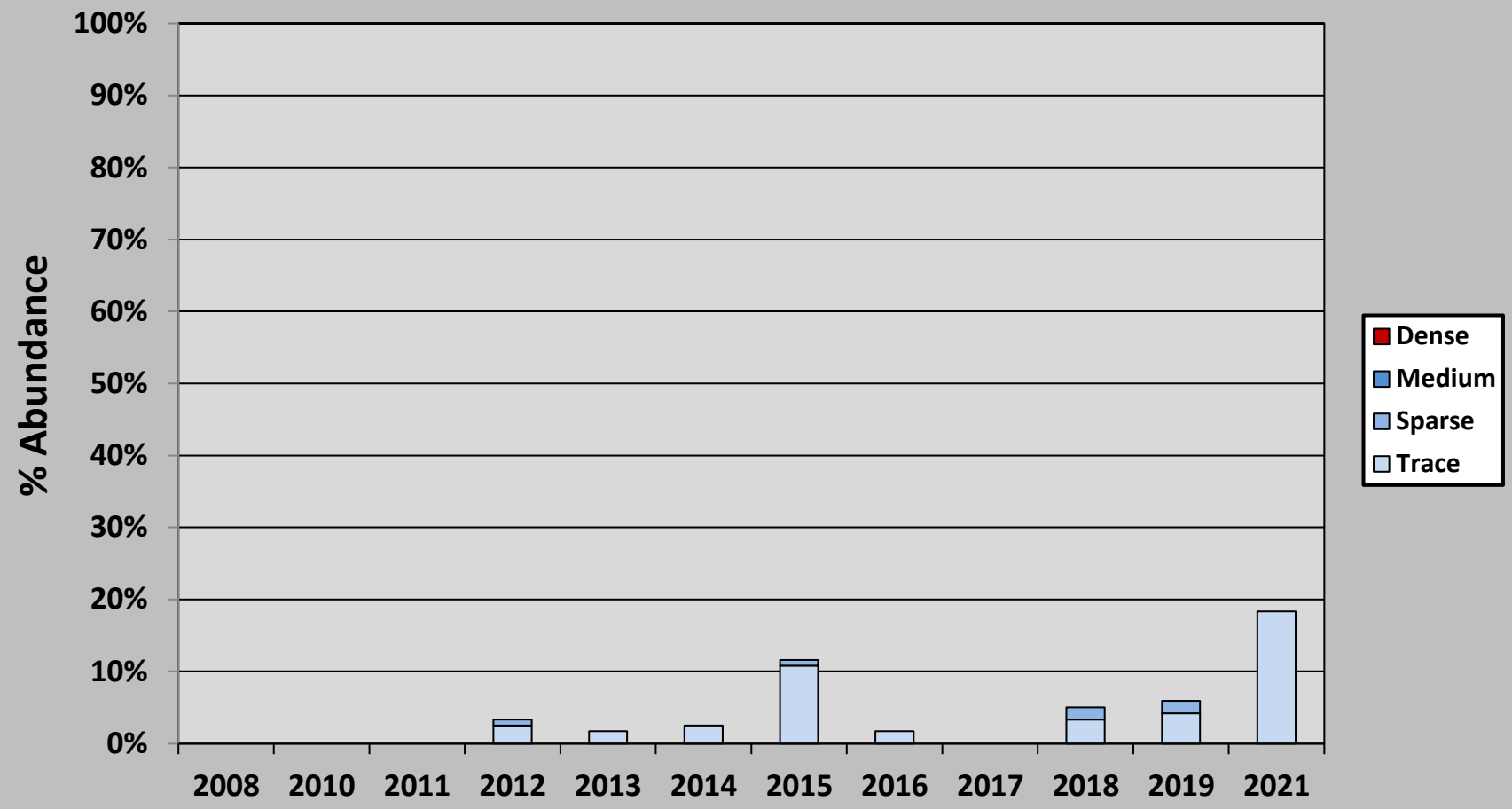
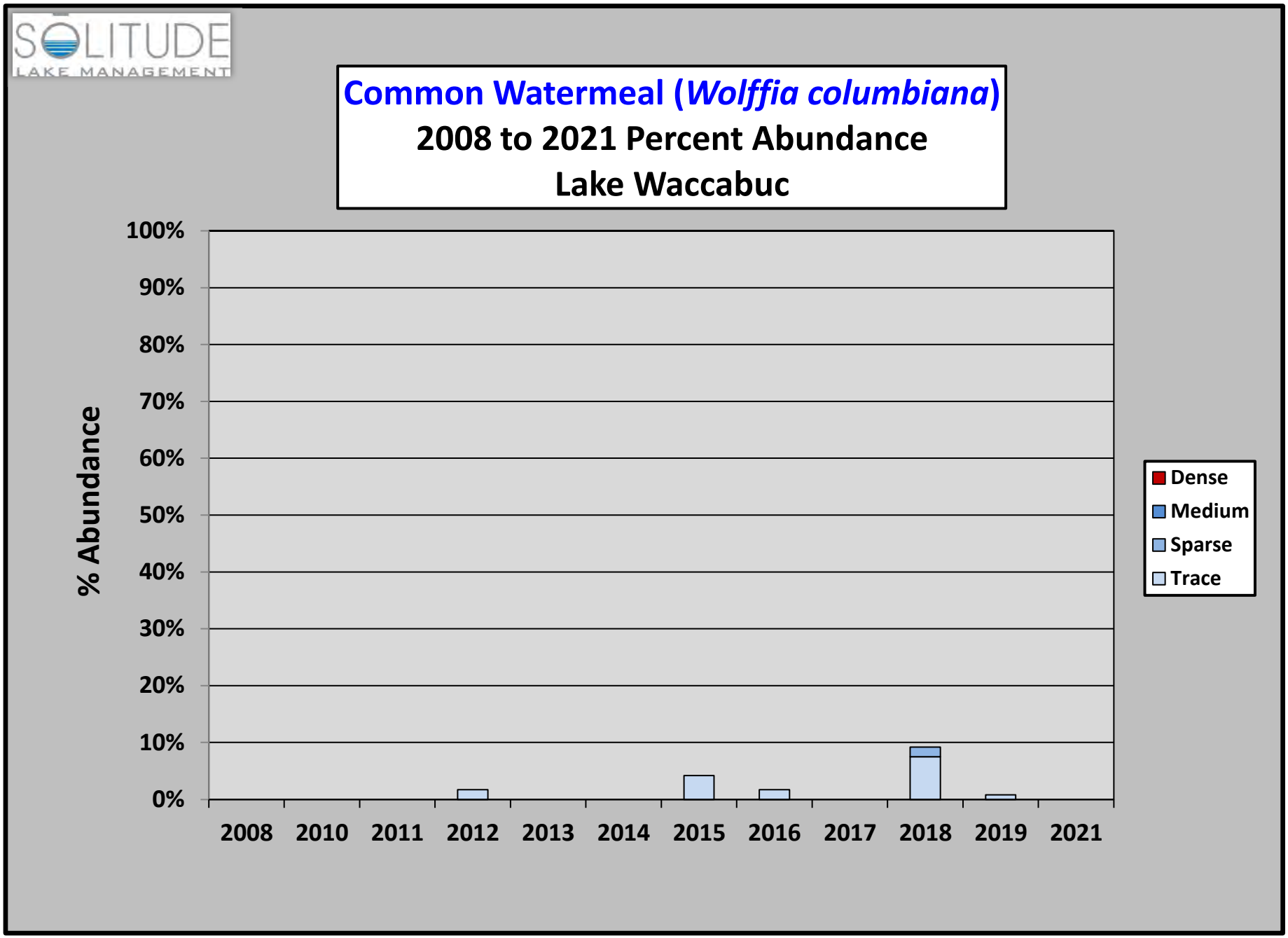
Sparse
Trace

SOLITUDE LAKE MANAGEMENT

Great Duckweed (*Spirodela polyrhiza*)
2008 to 2021 Percent Abundance
Lake Waccabuc




SOLITUDE
LAKE MANAGEMENT
Common Watermeal (*Wolffia columbiana*)
2008 to 2021 Percent Abundance
Lake Waccabuc
% Abundance
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
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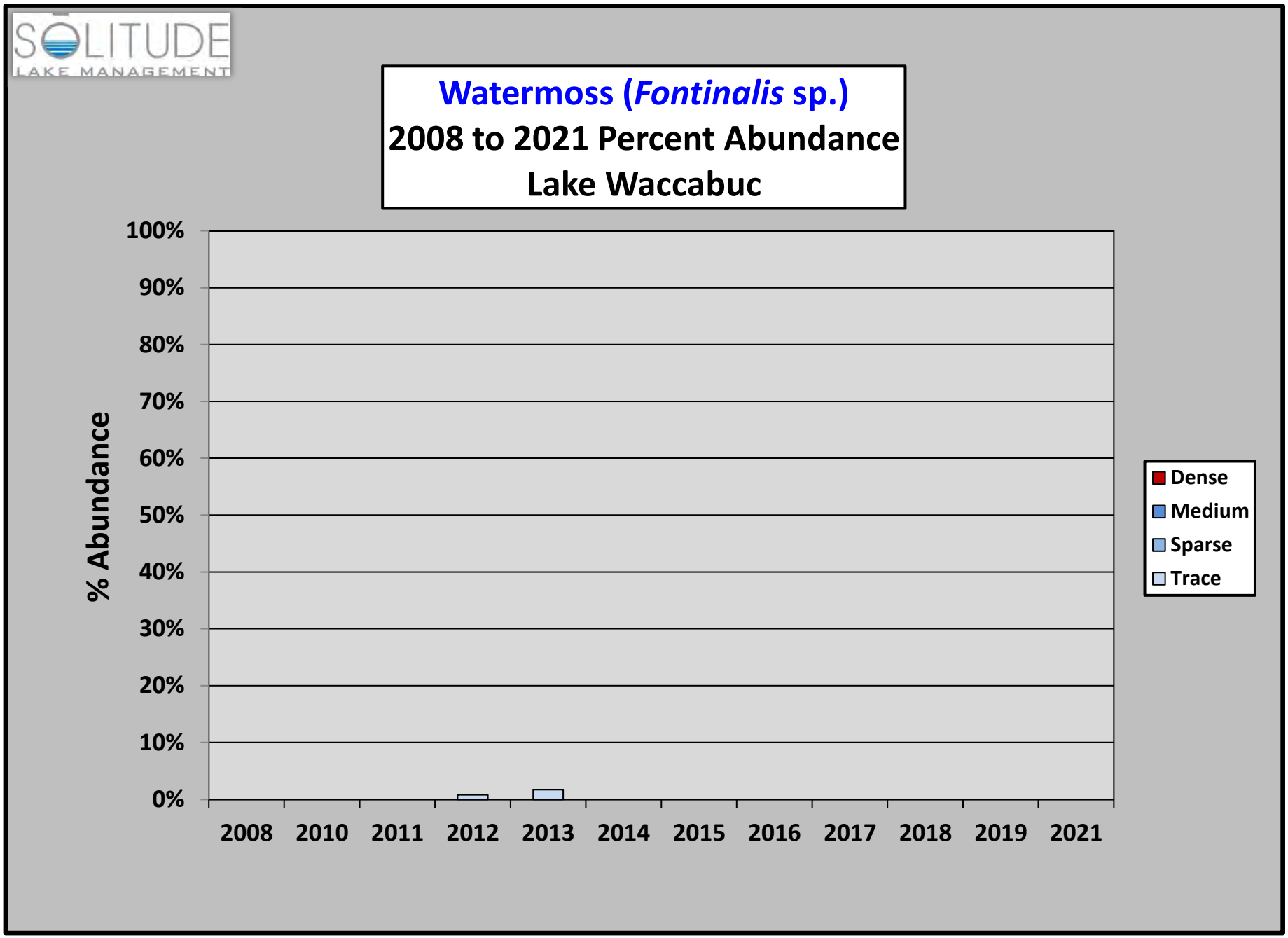
Sparse
Trace


SOLITUDE
LAKE MANAGEMENT
Watermoss (Fontinalis sp.)
2008 to 2021 Percent Abundance
Lake Waccabuc
% Abundance
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
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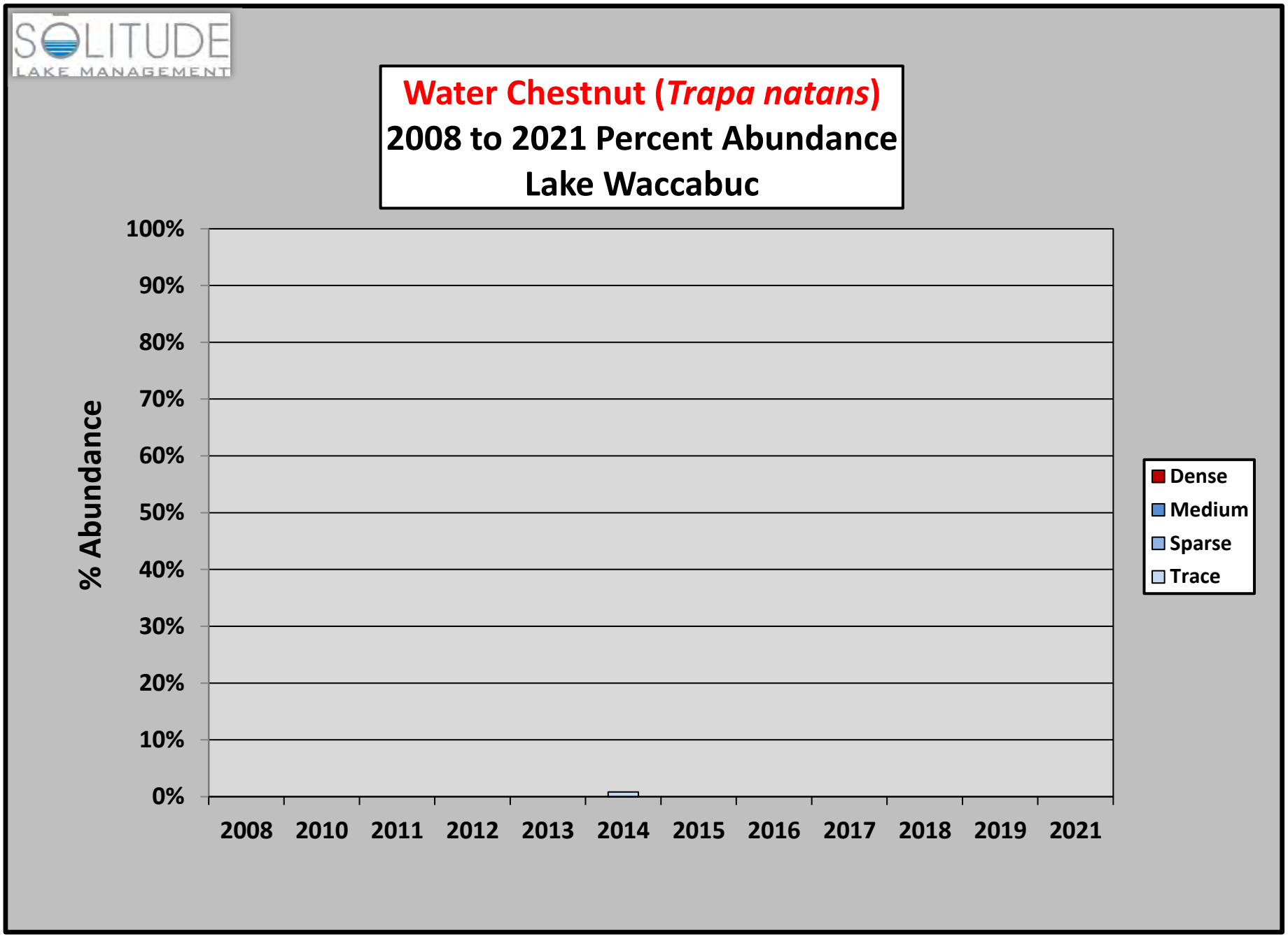
2021
Dense
Medium
Sparse
Trace


SOLITUDE
LAKE MANAGEMENT
Water Chestnut (*Trapa natans*)
2008 to 2021 Percent Abundance
Lake Waccabuc
% Abundance
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2008
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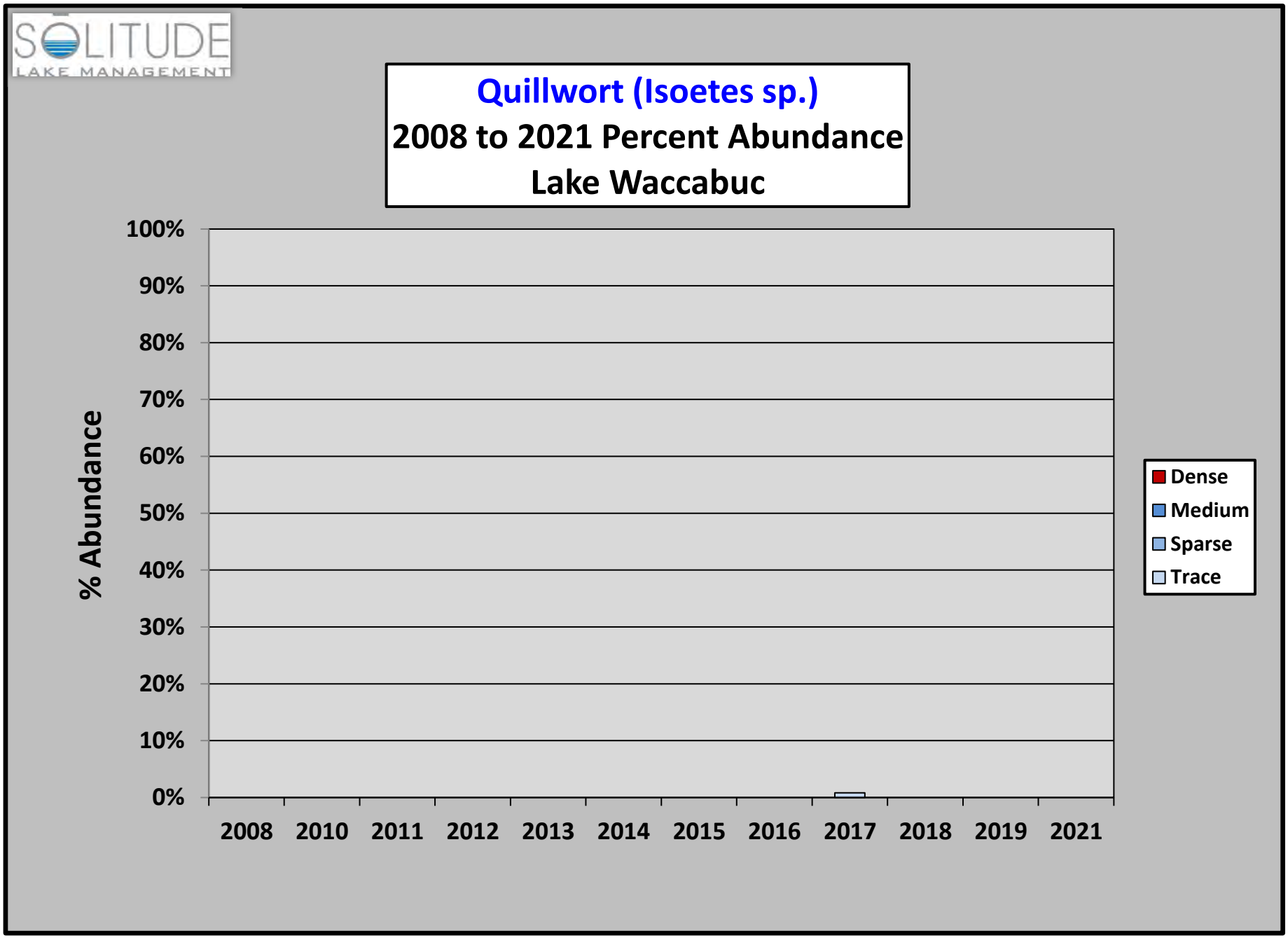
2021
Dense
Medium
Sparse
Trace


SOLITUDE
LAKE MANAGEMENT
Quillwort (Isoetes sp.)
2008 to 2021 Percent Abundance
Lake Waccabuc
% Abundance
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2008
2010
2011
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2014
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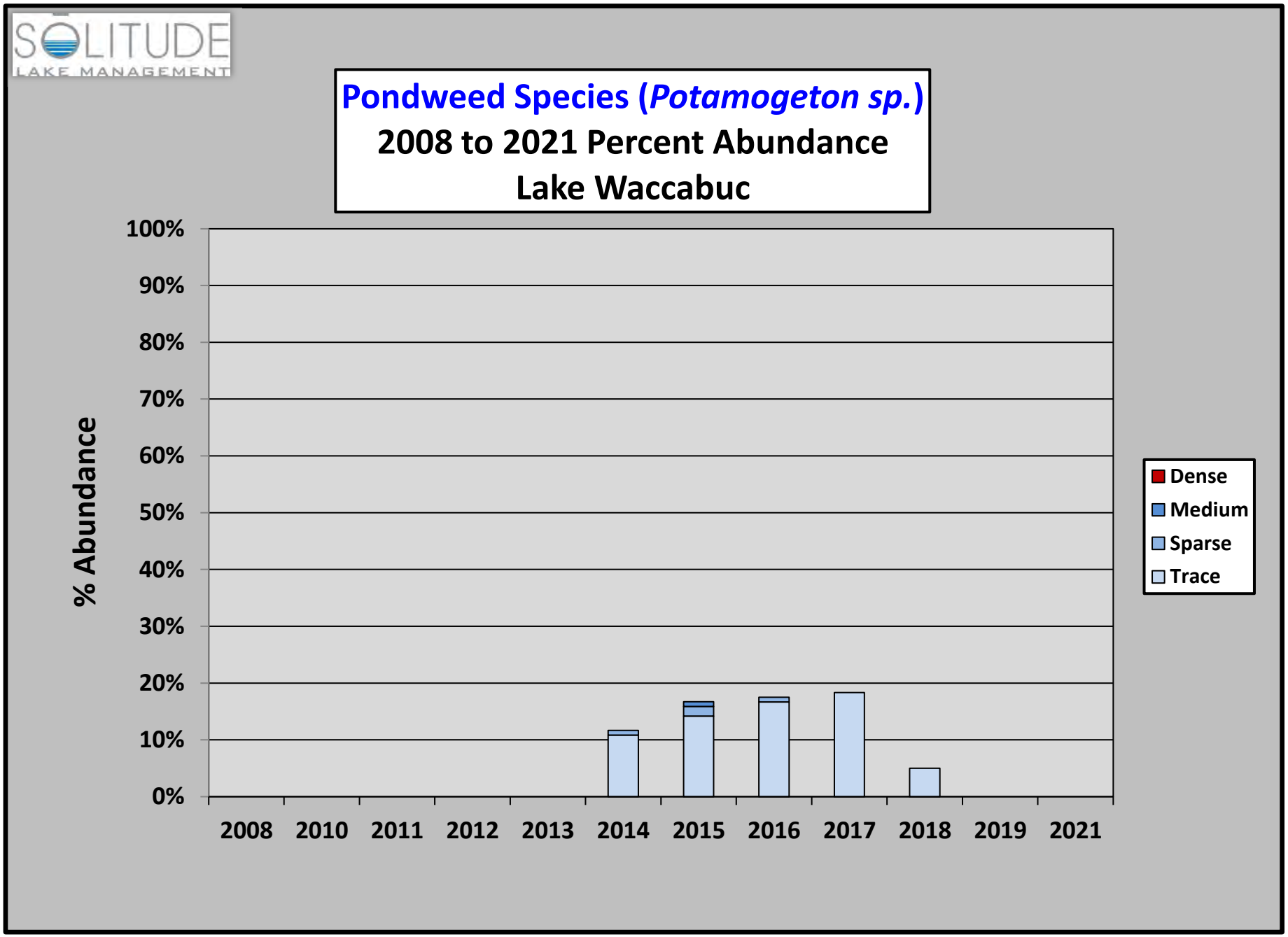
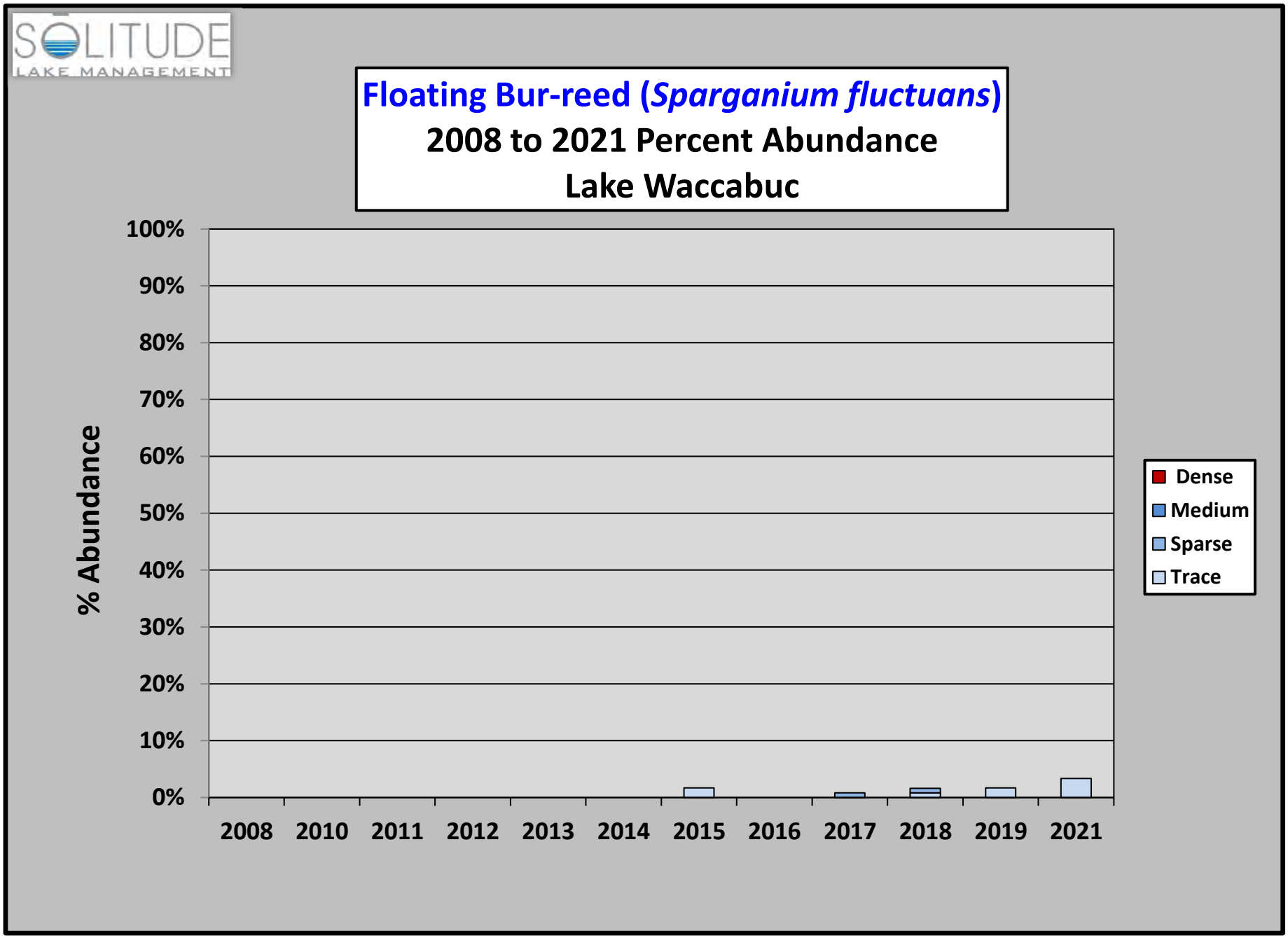
2016
2017
2018
2019
2021
Dense
Medium
Sparse
Trace


SOLITUDE
LAKE MANAGEMENT
Pondweed Species (Potamogeton sp.)
2008 to 2021 Percent Abundance
Lake Waccabuc
% Abundance
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2008
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2021
Dense
Medium
Sparse
Trace


SOLITUDE
LAKE MANAGEMENT
Floating Bur-reed (Sparganium fluctuans)
2008 to 2021 Percent Abundance
Lake Waccabuc
% Abundance
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2008
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2021
Dense
Medium
Sparse
Trace

Three Lakes - Lake Waccabuc
Aquatic Macrophyte Survey
August 30, 2021

Lake Waccabuc	STATION	SAMPLE	LATITUDE (NAD83)	LONGITUDE (NAD83)	DEPTH (FT)	Total Submersed Vegetation	Total Floating Vegetation	Arrowhead	Bassweed	Benthic Filamentous Algae	Brittle Naiad	Coontail	Dwarf Watermilfoil	Eurasian Watermilfoil	Floating-Leaf Bur-Reed	Great Duckweed	Leafy Pondweed	Robbin's Pondweed	Spatterdock	Watershield	White Water Lily
	1	A			1	T	D			T				T					D		
	1	B			1	T	D			T				T					D		
	1	C			1	T	D			T				T					D		
	1	M	41.297713	-73.571637	1	T	D			T				T					D		
	2	A			1	T	D			T				T					D		
	2	B			1	T	D			T				T					D		
	2	C			1	T	D			T				T					D		
	2	M	41.297818	-73.572004	1	T	D			T				T					D		
	3	A			2	S	S		S			S		S					S		
	3	B			2	S	S		S			S		S					S		
	3	C			2	M	D		S			M		S					D		
	3	M	41.297919	-73.572367	2	S	M		S			S		S					M		
	4	A			2	S	S		S			S		S					S		
	4	B			2	S	S		S			S		S					S		
	4	C			2	M	M		S			M		M					M		
	4	M	41.298002	-73.572754	2	S	S		S			S		S					S		
	5	A			2	S	S		S			S		S					S		
	5	B			2	S	S		S			S		S					S		
	5	C			2	D	D		D			S		S					D		
	5	M	41.297913	-73.573074	2	M	M		M			S		S					M		
	6	A			2	S	S		S	T		S		T		T			S		
	6	B			2	T	T		T			T							T		
	6	C			2	S	S		S			S		T					S		
	6	M	41.29764	-73.573063	2	S	S		S	T		S		T		T			S		
	7	A			2	S	S		S	T		S				T			S		
	7	B			2	S	T		S			T							T		
	7	C			2	S	T		S			T							T		
	7	M	41.297719	-73.572773	2	S	T		S	T		T				T			T		
	8	A			2	S	M			S				T		T			S	M	M
	8	B			2	S	S							S					S	S	
	8	C			2	S	M			T				S					T	M	T
	8	M	41.297345	-73.573038	2	S	M			T				S		T			S	M	T
	9	A			2	S	M			S				T		T			S	M	M
	9	B			2	S	S							S					S	S	
	9	C			2	S	M			T				S					T	M	T
	9	M	41.297125	-73.573167	2	S	M			T				S		T			S	M	T
	10	A			2	S	M			S				T					S	M	M
	10	B			2	S	S							S					S	S	
	10	C			2	S	M			T				S		T			T	M	T
	10	M	41.297062	-73.573482	2	S	M			T				S		T			S	M	T
	11	A			4	M	S		M	T		M		M					S	S	
	11	B			4	M	S		M			M		T					S	T	
	11	C			4	M	S		T	T		M		M					S		
	11	M	41.297419	-73.573428	4	M	S		S	T		M		S					S	T	
	12	A			4	M			M			M		S							
	12	B			4	M			M			M		T							
	12	C			4	S			S			T		S							
	12	M	41.297692	-73.573421	4	M			M			S		S							
	13	A			2	D	D		S	T		D		S					D		
	13	B			2	D	D					D		T					D		
	13	C			2	D	D		S			D		S					D		
	13	M	41.297941	-73.573496	2	D	D		T	T		D		S					D		
	14	A			3	D	D		S	S		D		S					D		
	14	B			3	D	D		S	S		D		S					D		
	14	C			3	D	D		S	S		D		S					D		
	14	M	41.298244	-73.573469	3	D	D		S	S		D		S					D		
	15	A			3	M	D			S		M		M					D		
	15	B			3	M	D			S		M		M					D		
	15	C			3	M	D		T	T		S		M					D		
	15	M	41.298473	-73.573792	3	M	D		T	S		M		M					D		
	16	A			4	S			S			S		S							
	16	B			4	S						S		T							
	16	C			4	S			S			S		T							
	16	M	41.298191	-73.573794	4	S			T			S		T							
	17	A			4	D			D			S		D							
	17	B			4	D			S			D		T							
	17	C			4	D			S			D		D							
	17	M	41.297884	-73.573825	4	D			M			M		M							
	18	A			3	D						D									
	18	B			3	D						D									
	18	C			3	D			T			D		T							
	18	M	41.297623	-73.573768	3	D			T			D		T							

Three Lakes - Lake Waccabuc
Aquatic Macrophyte Survey
August 30, 2021

Lake Waccabuc	STATION	SAMPLE	LATITUDE (NAD83)	LONGITUDE (NAD83)	DEPTH (FT)	Total Submersed Vegetation	Total Floating Vegetation	Arrowhead	Bassweed	Benthic Filamentous Algae	Brittle Naiad	Coontail	Dwarf Watermilfoil	Eurasian Watermilfoil	Floating-Leaf Bur-Reed	Great Duckweed	Leafy Pondweed	Robbin's Pondweed	Spatterdock	Watershield	White Water Lily
	19	A			3	D			T			D									
	19	B			3	D						D									
	19	C			3																
	19	M	41.297417	-73.573808	3	M			T			M									
	20	A			2	S	M			S				T					S	M	M
	20	B			2	S	S							S					S	S	
	20	C			2	S	M			T				S					T	M	T
	20	M	41.297134	-73.573708	2	S	M			T				S					S	M	T
	21	A			5	S	M					S		T							M
	21	B			5																
	21	C			5	T	S					T		T						T	S
	21	M	41.297058	-73.57418	5	T	S					T		T						T	S
	22	A			12																
	22	B			12																
	22	C			12																
	22	M	41.297448	-73.574157	12																
	23	A			12																
	23	B			12																
	23	C			12																
	23	M	41.297696	-73.574235	12																
	24	A			10	M						M		M							
	24	B			10	M						M		M							
	24	C			10	M						M		M							
	24	M	41.297922	-73.574122	10	M						M		M							
	25	A			5	M						M		M							
	25	B			5	M						M		M							
	25	C			5	M						M		M							
	25	M	41.298234	-73.574188	5	M						M		M							
	26	A			3	S								S							
	26	B			3	S								S							
	26	C			3	T	M							T							M
	26	M	41.298519	-73.574167	3	S	T							S							T
	27	A			3	S	T			T				S							T
	27	B			3	S				S				S							
	27	C			3	S	T			S											T
	27	M	41.29852	-73.574638	3	S	T			S				T							T
	28	A			12																
	28	B			12	T				T	T										
	28	C			12	T				T	T										
	28	M	41.298181	-73.574559	12	T				T	T										
	29	A			4	S	T					S		T						T	
	29	B			4	T								T							
	29	C			4	S						S		T				T			
	29	M	41.296966	-73.574516	4	S	T					T		T				T		T	
	30	A			3	D	T			S		D		S		T		S			
	30	B			3	T						T		T							
	30	C			3	T				T		T		T				T			
	30	M	41.297039	-73.575209	3	S	T			T		S		T		T		T			
	31	A			4	S			S			T		T							
	31	B			4	T								T							
	31	C			4	T			T			T		T							
	31	M	41.296835	-73.57609	4	T			T			T		T							
	32	A			4	S			T			T		S							
	32	B			4	T								T							
	32	C			4	T	T		T			T			T						
	32	M	41.296643	-73.576377	4	T			T			T		T	T						
	33	A			2	T	D							T		T			S	T	D
	33	B			2	T	S							T					S		T
	33	C			2	T	T							T							T
	33	M	41.296586	-73.576756	2	T	S							T		T			T	T	S
	34	A			2		D									T			D	S	S
	34	B			2		S												S		T
	34	C			2		S												S		S
	34	M	41.296564	-73.577181	2		M												M	T	S
	35	A			2		D									S			T	D	T
	35	B			2		T												T	T	T
	35	C			2	T	S							T					S	S	S
	35	M	41.296606	-73.577476	2	T	S							T		T			T	S	T
	36	A			2	M	D			S				M		S			D	T	M
	36	B			2	M	D			S				M					S		D
	36	C			2	D	D							D					S	T	D
	36	M	41.296282	-73.5775	2	M	D			T				M		T			M	T	D

Three Lakes - Lake Waccabuc
Aquatic Macrophyte Survey
August 30, 2021

Lake Waccabuc	STATION	SAMPLE	LATITUDE (NAD83)	LONGITUDE (NAD83)	DEPTH (FT)	Total Submersed Vegetation	Total Floating Vegetation	Arrowhead	Bassweed	Benthic Filamentous Algae	Brittle Naiad	Coontail	Dwarf Watermilfoil	Eurasian Watermilfoil	Floating-Leaf Bur-Reed	Great Duckweed	Leafy Pondweed	Robbin's Pondweed	Spatterdock	Watershield	White Water Lily
	37	A			2	T	D							T		S			T	D	T
	37	B			2		T												T	T	T
	37	C			2		S												S	S	S
	37	M	41.296255	-73.57714	2	T	S							T		T			T	S	T
	38	A			2	S	D			S				T		T			D	D	M
	38	B			2		D												S	T	D
	38	C			2	S	D			S										S	D
	38	M	41.296273	-73.576709	2	T	D			T				T		T			S	S	D
	39	A			3	S	D			S				T		S			D	D	M
	39	B			3		D												S	T	D
	39	C			3	S	D			S										S	D
	39	M	41.295993	-73.576724	3	T	D			T				T		T			S	S	D
	40	A			2	S	S		S	T		T		S					T	S	S
	40	B			2	T	D					T		T					T	D	
	40	C			2	T	T		T	T		T		T					T	T	T
	40	M	41.296055	-73.577133	2	T	S		T	T		T		T					T	S	T
	41	A			2	S	D							S					D	M	
	41	B			2	S								S							
	41	C			2	S	S							S					S		
	41	M	41.295762	-73.577017	2	S	S							S					S	T	
	42	A			2	M	D			S				M					D		M
	42	B			2	M	D			S				M					S		D
	42	C			2	D	D			S				D					S		D
	42	M	41.296053	-73.577429	2	M	D			S				M					M		D
	43	A			4	S	S			S				S					S	S	
	43	B			4		T												T	T	
	43	C			4	T	T			T				T					T	T	
	43	M	41.29636	-73.577875	4	T	T			T				T					T	T	
	44	A			5		T												T		
	44	B			5																
	44	C			5	T	T							T					T		
	44	M	41.296536	-73.578542	5	T	T							T					T		
	45	A			6																
	45	B			6																
	45	C			6																
	45	M	41.296478	-73.579316	6																
	46	A			6																
	46	B			6																
	46	C			6																
	46	M	41.296412	-73.580224	6																
	47	A			4	S	S			S		T		S				S	S		
	47	B			4																
	47	C			4	T	T					T							T		
	47	M	41.296542	-73.581069	4	T	T			T		T		T				T	T		
	48	A			10																
	48	B			10																
	48	C			10																
	48	M	41.296511	-73.581778	10																
	49	A			8																
	49	B			8																
	49	C			8																
	49	M	41.296582	-73.582606	8																
	50	A			3	S	S			S		T		T			T			S	
	50	B			3																
	50	C			3	T								T							
	50	M	41.296417	-73.583399	3	T	T			T		T		T			T			T	
	51	A			5	S	S			T		T		S		T				T	S
	51	B			5	T	T							T						T	
	51	C			5	T	S							T							S
	51	M	41.296244	-73.584188	5	T	S			T		T		T		T				T	T
	52	A			6	M	S			S		T		M		T			S	T	S
	52	B			6	T								T							
	52	C			6	T	T			T				T							T
	52	M	41.295979	-73.585063	6	S	T			T		T		S		T			T	T	T
	53	A			6	M	S			S				M		T			S		S
	53	B			6	T								T							
	53	C			6	T	T			T										T	
	53	M	41.296512	-73.586169	6	S	T			T				T					T	T	T
	54	A			5	S	S			S				T		T				S	S
	54	B			5	T								T							
	54	C			5	T	S							T							S
	54	M	41.29675	-73.586787	5	T	T			T				T		T				T	T

Three Lakes - Lake Waccabuc
Aquatic Macrophyte Survey
August 30, 2021

Lake Waccabuc	STATION	SAMPLE	LATITUDE (NAD83)	LONGITUDE (NAD83)	DEPTH (FT)	Total Submersed Vegetation	Total Floating Vegetation	Arrowhead	Bassweed	Benthic Filamentous Algae	Brittle Naiad	Coontail	Dwarf Watermilfoil	Eurasian Watermilfoil	Floating-Leaf Bur-Reed	Great Duckweed	Leafy Pondweed	Robbin's Pondweed	Spatterdock	Watershield	White Water Lily
	55	A			5	M	M			T		T		M		T				S	M
	55	B			5	T	T					T		T		T					
	55	C			5	T								T							
	55	M	41.296857	-73.587467	5	S	T			T		T		S		T				T	T
	56	A			9																
	56	B			9																
	56	C			9	T				T											
	56	M	41.296934	-73.58833	9	T				T											
	57	A			3	S	T		S	T				S							T
	57	B			3	S	T							S							T
	57	C			3	T	T							T							T
	57	M	41.296765	-73.589146	3	S	T		T	T				S							T
	58	A			4																
	58	B			4																
	58	C			4	T				T											
	58	M	41.296541	-73.589935	4	T				T											
	59	A			5		M														M
	59	B			5																
	59	C			5																
	59	M	41.296349	-73.590817	5		T														T
	60	A			6	S	S			S				S						S	
	60	B			6	T	T			T				T						T	
	60	C			6	M								M							
	60	M	41.29645	-73.591649	6	S	T			T				S						T	
	61	A			10																
	61	B			10																
	61	C			10																
	61	M	41.296376	-73.592372	10																
	62	A			5	T				T				T							
	62	B			5	T			T	T				T							
	62	C			5	M		T		M				M							
	62	M	41.296266	-73.593276	5	S		T	T	S				S							
	63	A			6	D				D				S							
	63	B			6	T	T							T						T	T
	63	C			6	D				T				D							
	63	M	41.296041	-73.594035	6	M	T			S				S						T	T
	64	A			5	M	S	T		S				M		T				S	S
	64	B			5	S				S											
	64	C			5	S	T							S						T	
	64	M	41.295827	-73.594979	5	S	T	T		T				S		T				T	T
	65	A			4	M	S	T		T		M		M		T				S	
	65	B			4	T			T					T							
	65	C			4	S				T				S							
	65	M	41.296354	-73.595653	4	S	T	T	T	T		T		S		T				T	
	66	A			7	D	S	T				M		D						T	S
	66	B			7	T	T							T						T	T
	66	C			7	M	S							M							S
	66	M	41.296976	-73.595741	7	M	S	T				T		M						T	S
	67	A			6	D				T		S		D							
	67	B			6	T						T		T							
	67	C			6	M	M			T				M						T	M
	67	M	41.297297	-73.594999	6	M	T			T		T		M							T
	68	A			5	M	D	T				S		M		T				D	
	68	B			5	M	D					T		M							D
	68	C			5	D	D							D						D	
	68	M	41.297631	-73.594181	5	M	D	T				T		M		T				M	T
	69	A			10	S	T	T				T		S						T	
	69	B			10	M	M	T		M		T		S							M
	69	C			10	T	S							T							S
	69	M	41.298366	-73.593558	10	S	S	T		T		T		S							S
	70	A			7	M	M	T		M		M		M		T				T	M
	70	B			7	M	T			T		T		M						T	T
	70	C			7	D	D			S				D							D
	70	M	41.298618	-73.593	7	M	M	T		S		T		M		T				T	M
	71	A			6	S	T	T		S				S		T				T	T
	71	B			6	S	T			S				S						T	
	71	C			6	D	S							D						T	S
	71	M	41.29857	-73.592166	6	M	T	T		T				M		T				T	T
	72	A			6	D	D	S	S	D			T	S		T				D	D
	72	B			6	M	M	S		M				S						S	M
	72	C			6	S	M	T						S						T	M
	72	M	41.298898	-73.591659	6	M	M	S	T	S			T	S		T				S	M

Three Lakes - Lake Waccabuc
Aquatic Macrophyte Survey
August 30, 2021

Lake Waccabuc	STATION	SAMPLE	LATITUDE (NAD83)	LONGITUDE (NAD83)	DEPTH (FT)	Total Submersed Vegetation	Total Floating Vegetation	Arrowhead	Bassweed	Benthic Filamentous Algae	Brittle Naiad	Coontail	Dwarf Watermilfoil	Eurasian Watermilfoil	Floating-Leaf Bur-Reed	Great Duckweed	Leafy Pondweed	Robbin's Pondweed	Spatterdock	Watershield	White Water Lily
	73	A			8	T	S			T		T		T							S
	73	B			8	T	S			T		T		T							S
	73	C			8																
	73	M	41.298934	-73.590831	8	T	T			T		T		T							T
	74	A			21																
	74	B			21																
	74	C			21																
	74	M	41.298483	-73.59016	21																
	75	A			9	T	S			T				T							S
	75	B			9	S	S		T					S							S
	75	C			9	S	S			T				S							S
	75	M	41.298625	-73.589103	9	S	S		T	T				S							S
	76	A			10	T	T			T											T
	76	B			10	T	T			T											T
	76	C			10		T														T
	76	M	41.298849	-73.588326	10	T	T			T											T
	77	A			7																
	77	B			7																
	77	C			7																
	77	M	41.299055	-73.587559	7																
	78	A			16																
	78	B			16																
	78	C			16																
	78	M	41.299327	-73.586625	16																
	79	A			9	T								T							
	79	B			9																
	79	C			9																
	79	M	41.299522	-73.585825	9	T								T							
	80	A			11																
	80	B			11																
	80	C			11																
	80	M	41.299551	-73.585034	11																
	81	A			12																
	81	B			12																
	81	C			12																
	81	M	41.29984	-73.584129	12																
	82	A			6									T							
	82	B			6									T							
	82	C			6									S							
	82	M	41.299143	-73.583351	6									T							
	83	A			5	M			M	T		M		M							
	83	B			5	S			S	T		S		S							
	83	C			5	T	T							T						T	
	83	M	41.299347	-73.582934	5	S	T		S	T		S		S						T	
	84	A			7	T	T			T		T		T						T	T
	84	B			7	T	M					T		T							M
	84	C			7	T	M							T							M
	84	M	41.299375	-73.582604	7	T	S			T		T		T						T	S
	85	A			5	M	T							M							T
	85	B			5	T	T							T							T
	85	C			5	T				T				T							
	85	M	41.299073	-73.58251	5	S	T			T				S							T
	86	A			5	D				D		M		D							
	86	B			5	D				D		M		M							
	86	C			5	M	T			T		T		M							T
	86	M	41.298926	-73.582887	5	D	T			M		S		M							T
	87	A			5	T								T							
	87	B			5																
	87	C			5	T								T							
	87	M	41.298883	-73.583351	5	T								T							
	88	A			19																
	88	B			19																
	88	C			19																
	88	M	41.300246	-73.583392	19																
	89	A			14																
	89	B			14																
	89	C			14																
	89	M	41.300647	-73.582293	14																
	90	A			15																
	90	B			15																
	90	C			15																
	90	M	41.300876	-73.581731	15																

Three Lakes - Lake Waccabuc
Aquatic Macrophyte Survey
August 30, 2021

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	91	A			17																
	91	B			17																
	91	C			17																
	91	M	41.301002	-73.581321	17																
	92	A			4	T	T			T		T		T							T
	92	B			4	T								T							
	92	C			4	T	T			T		T		T							T
	92	M	41.301026	-73.581062	4	T	T			T		T		T							T
	93	A			5	D				D				D							
	93	B			5	D				D				D							
	93	C			5	M				M				M							
	93	M	41.300993	-73.580658	5	D				D				D							
	94	A			2	S	S			S		T		T							S
	94	B			2																
	94	C			2	T								T							T
	94	M	41.300914	-73.580279	2	T	T			T		T		T							T
	95	A			3	T	T					T									T
	95	B			3																
	95	C			3	S	S			S				T							S
	95	M	41.300743	-73.580272	3	T	T			T		T		T							T
	96	A			4	S	D			T				S							D
	96	B			4		D														D
	96	C			4	S			T					S							
	96	M	41.300518	-73.580674	4	T	M		T	T				T							M
	97	A			7	S						T		S							
	97	B			7	T						T		T							
	97	C			7	S								S							
	97	M	41.300782	-73.580769	7	S						T		S							
	98	A			5	S	D			S				S							D
	98	B			5	S	D			S				S							D
	98	C			5	S	D			S				S							D
	98	M	41.300204	-73.581088	5	S	D			S				S							D
	99	A			3	S	M				T			S							M
	99	B			3	S	M				T			S							M
	99	C			3	T	D			T	T			T							D
	99	M	41.300485	-73.581057	3	S	M			T	T			S							M
	100	A			13																
	100	B			13																
	100	C			13																
	100	M	41.300814	-73.581077	13																
	101	A			21																
	101	B			21																
	101	C			21																
	101	M	41.300772	-73.581508	21																
	102	A			24																
	102	B			24																
	102	C			24																
	102	M	41.300546	-73.581475	24																
	103	A			8	S	M	S						T						M	S
	103	B			8	T	M							T						M	S
	103	C			8	T	D							T						D	S
	103	M	41.300214	-73.581383	8	T	M	T						T						M	S
	104	A			9	S	T			S				S							T
	104	B			9	S	T			S				S							T
	104	C			9	S	T			S				S							T
	104	M	41.299838	-73.581605	9	S	T			S				S							T
	105	A			10																
	105	B			10																
	105	C			10																
	105	M	41.299473	-73.581707	10																
	106	A			15		T														T
	106	B			15																
	106	C			15																
	106	M	41.299371	-73.581071	15		T														T
	107	A			11	T								T							
	107	B			11	T								T							
	107	C			11																
	107	M	41.299203	-73.580142	11	T								T							
	108	A			20	T								T							
	108	B			20																
	108	C			20																
	108	M	41.29929	-73.579378	20									T							

Three Lakes - Lake Waccabuc
Aquatic Macrophyte Survey
August 30, 2021

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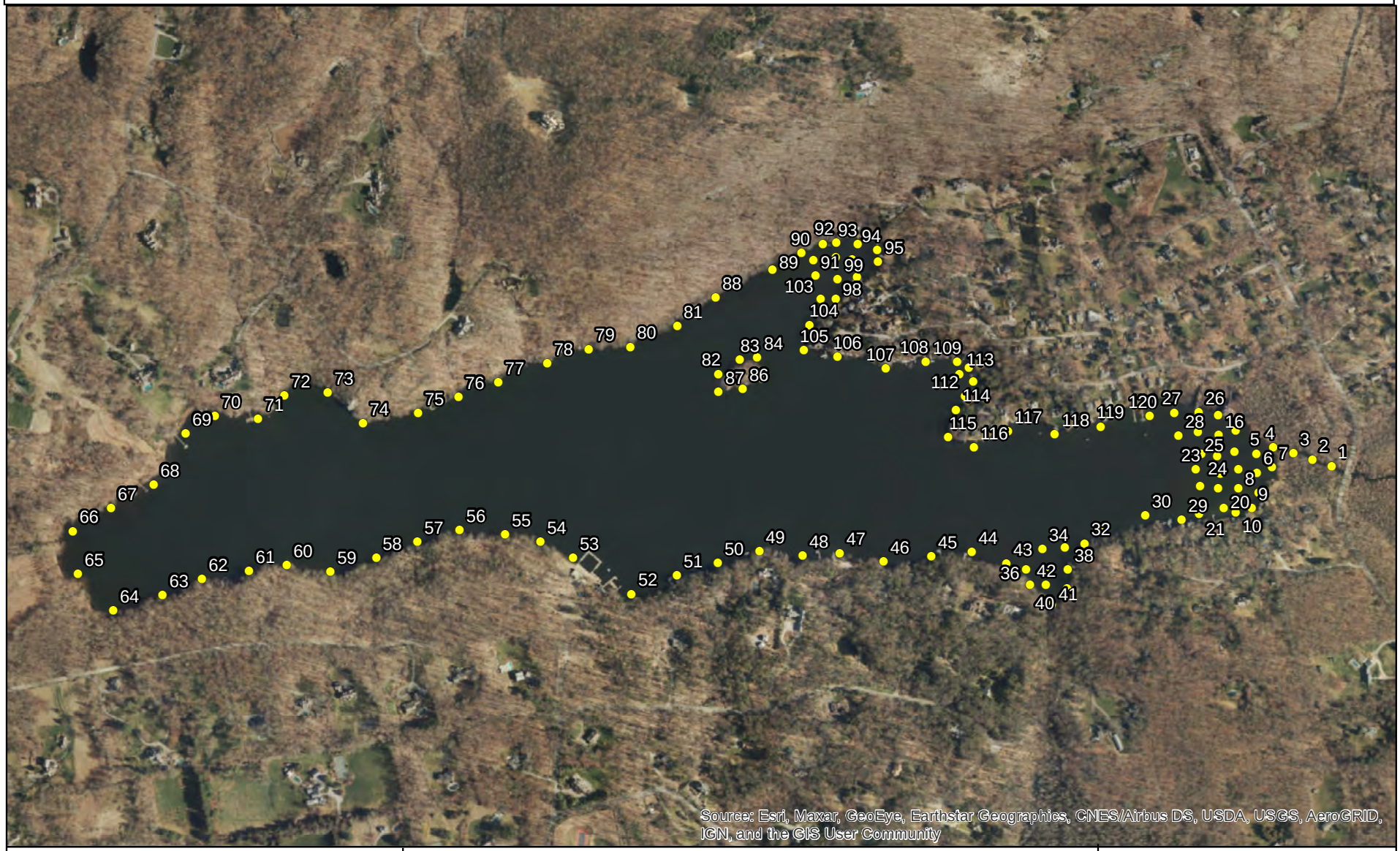
	109	A			20	T	T							T							T
	109	B			20																
	109	C			20																
	109	M	41.29928	-73.578785	20	T	T							T							T
	110	A			10	T	T							T	T		T				
	110	B			10																
	110	C			10	T			T												
	110	M	41.299198	-73.578561	10	T	T		T					T	T		T				
	111	A			3	T	T						T	T						T	
	111	B			3																
	111	C			3	T							T								
	111	M	41.299005	-73.578469	3	T	T						T	T						T	
	112	A			4	T								T							
	112	B			4	T								T							
	112	C			4																
	112	M	41.298784	-73.57864	4	T								T							
	113	A			4	T					T			T							
	113	B			4																
	113	C			4																
	113	M	41.299112	-73.578739	4	T					T			T							
	114	A			2	S				S				T							
	114	B			2	T								T							
	114	C			2	S	T							S	T						T
	114	M	41.298589	-73.578812	2	S	T			T				T	T						T
	115	A			15																
	115	B			15																
	115	C			15																
	115	M	41.298193	-73.57897	15																
	116	A			20																
	116	B			20																
	116	C			20																
	116	M	41.298049	-73.578477	20																
	117	A			27																
	117	B			27																
	117	C			27																
	117	M	41.298274	-73.577818	27																
	118	A			20																
	118	B			20																
	118	C			20	T	T	T		T				T							T
	118	M	41.298222	-73.576921	20	T	T	T		T				T							T
	119	A			6	S	S							S	T					S	S
	119	B			6	T								T			T				
	119	C			6	T								T							
	119	M	41.298329	-73.576048	6	T	T							T	T		T			T	T
	120	A			2	S	S			S				S					S		T
	120	B			2	S	T							S					T		
	120	C			2	D	T			D				D							T
	120	M	41.298473	-73.575102	2	M	T			S				M					T		T

Lake Waccabuc
Aquatic Macrophyte Abundance Distribution
August 30, 2021

	Total		Trace		Sparse		Medium		Dense	
	Sites	%	Sites	%	Sites	%	Sites	%	Sites	%
TOTAL SITES	120									
Total Submersed Vegetation	92	77%	38	41%	31	34%	17	18%	6	7%
Eurasian Watermilfoil	88	73%	44	50%	30	34%	13	15%	1	1%
Benthic Filamentous Algae	59	49%	46	78%	11	19%	1	2%	1	2%
Coontail	41	34%	23	56%	9	22%	6	15%	3	7%
Bassweed	25	21%	15	60%	7	28%	3	12%	0	0%
Brittle Naiad	3	3%	3	100%	0	0%	0	0%	0	0%
Leafy Pondweed	3	3%	3	100%	0	0%	0	0%	0	0%
Robbin's Pondweed	3	3%	3	100%	0	0%	0	0%	0	0%
Dwarf Watermilfoil	2	2%	2	100%	0	0%	0	0%	0	0%
Total Floating Vegetation	75	63%	38	51%	14	19%	12	16%	11	15%
White Water Lily	52	43%	35	67%	8	15%	4	8%	5	10%
Watershield	37	31%	25	68%	6	16%	6	16%	0	0%
Spatterdock	31	26%	11	35%	10	32%	5	16%	5	16%
Great Duckweed	22	18%	22	100%	0	0%	0	0%	0	0%
Arrowhead	11	9%	10	91%	1	9%	0	0%	0	0%
Floating-Leaf Bur-Reed	4	3%	4	100%	0	0%	0	0%	0	0%

SAMPLE POINT LOCATION

SOLITUDE LAKE MANAGEMENT



LAKE WACCABUC
Aquatic Vegetation Survey
August 30, 2021

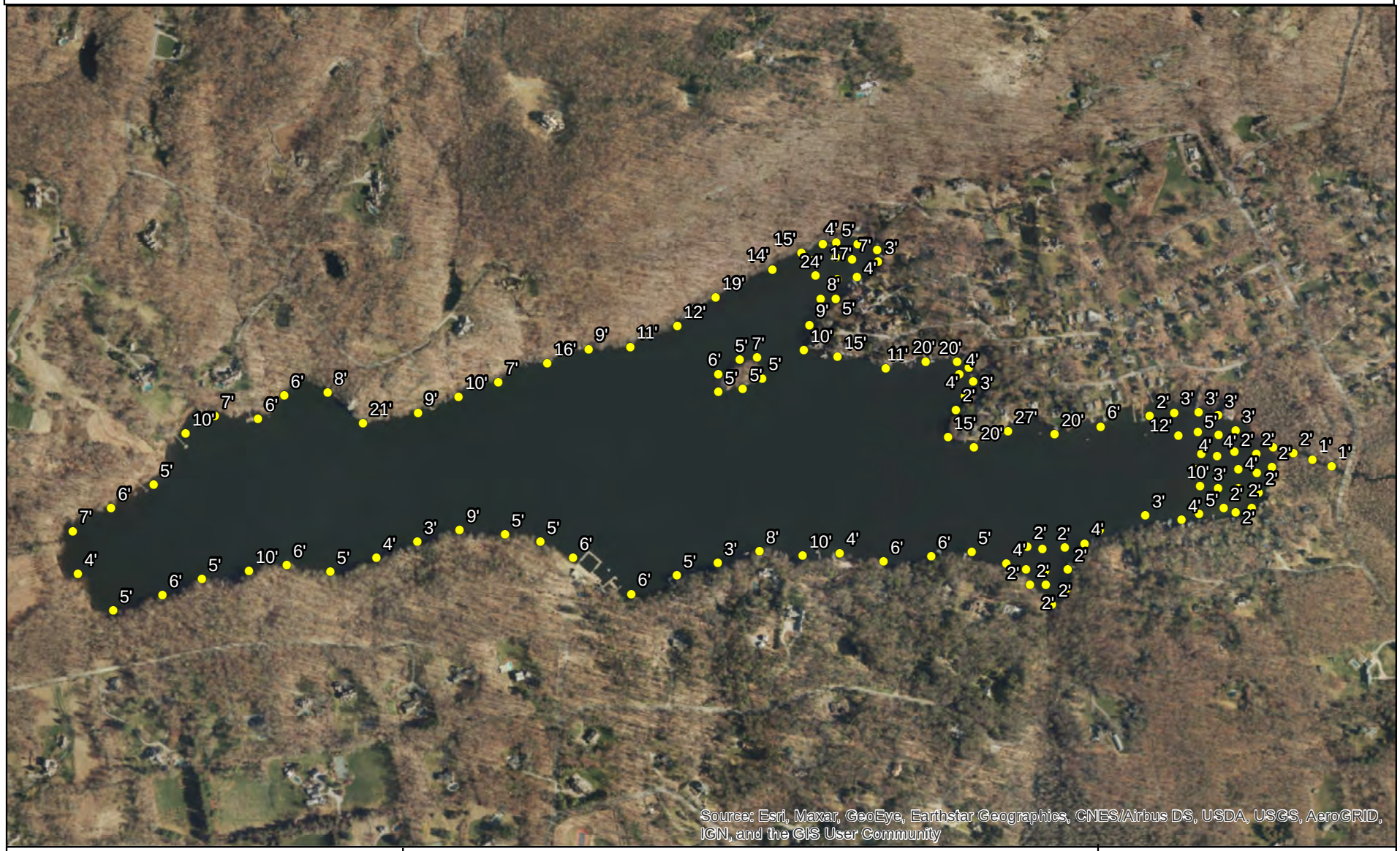
Sampling Stations: 120

Sample Point

0 675 1,350 Feet

DEPTH

SOLITUDE LAKE MANAGEMENT



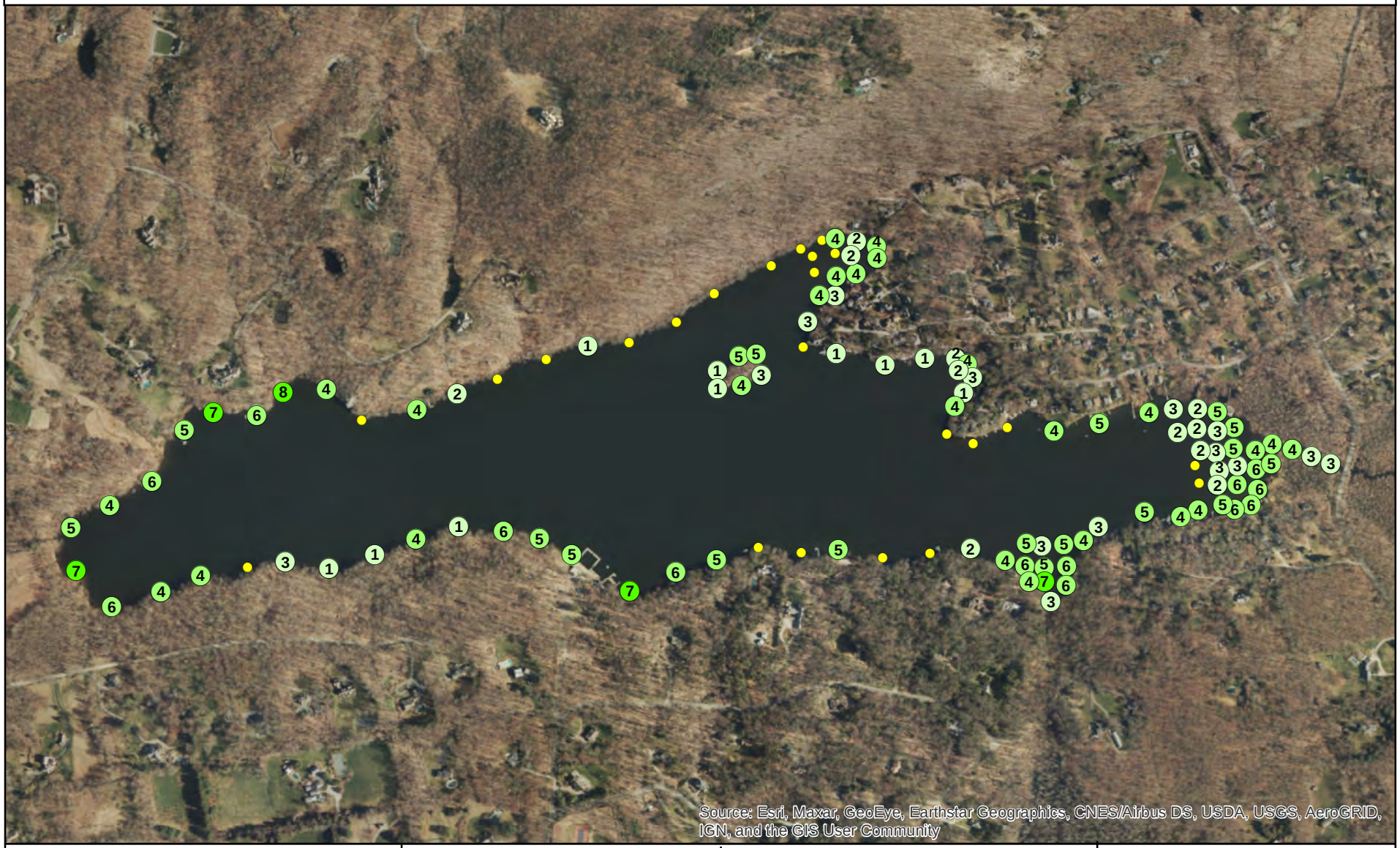
LAKE WACCABUC
Aquatic Vegetation Survey
August 30, 2021

Sampling Stations: 120

Water Depth in Feet

0 675 1,350 Feet

SPECIES RICHNESS



LAKE WACCABUC
Aquatic Vegetation Survey
August 30, 2021

Sampling Stations: 120

Plant Richness

- No Plants
- 1-3 Species
- 4-6 Species
- 7-9 Species
- 10+ Species

Percent Distribution

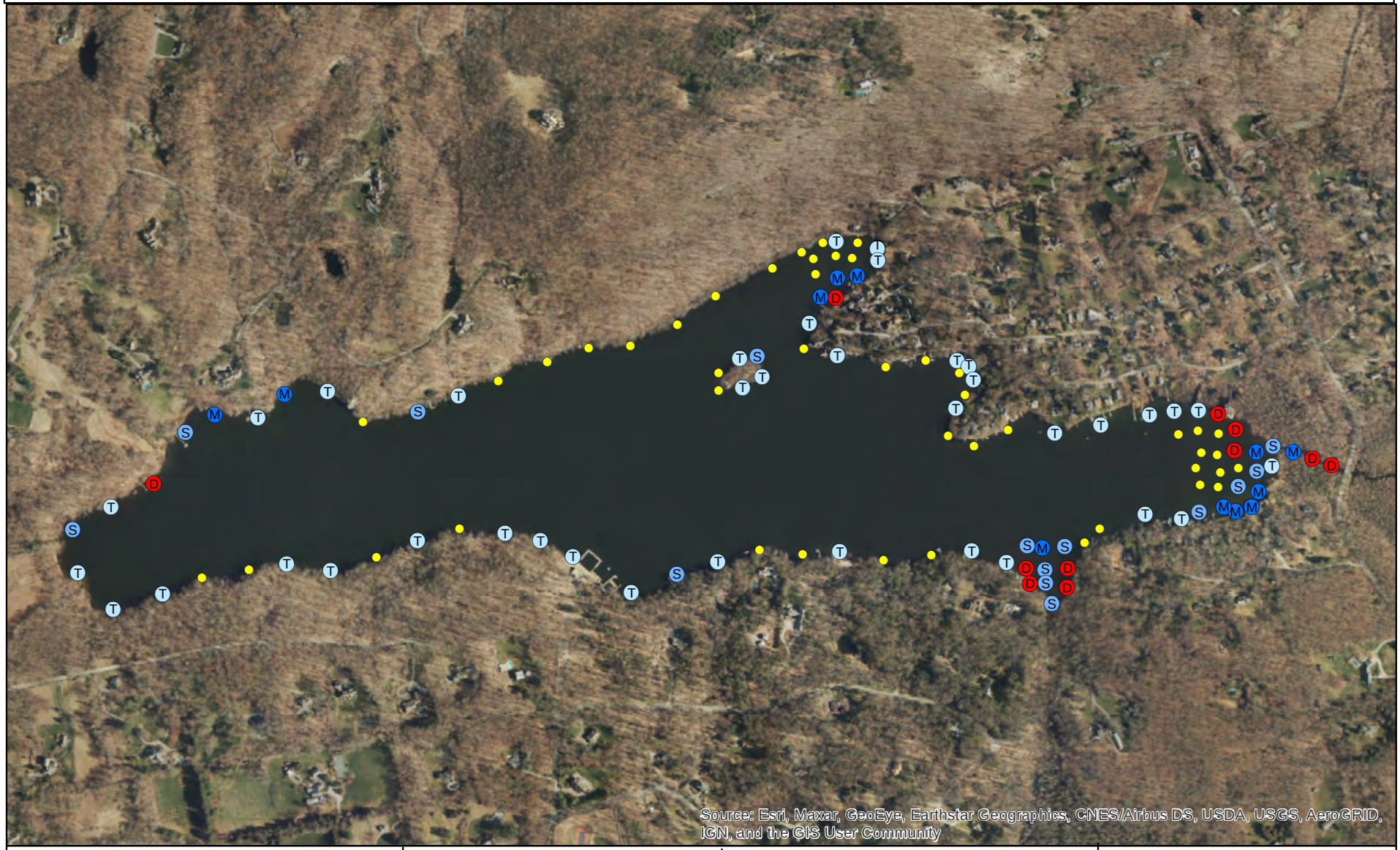
Richness	Sites	Percent
No Plants	23	19%
1-3	36	30%
4-6	56	47%
7-9	5	4%
10+	0	0%

N

0 510 1,020 Feet

TOTAL FLOATING VEGETATION

SOLITUDE LAKE MANAGEMENT



LAKE WACCABUC
Aquatic Vegetation Survey
August 30, 2021

Sampling Stations: 120

Plant Density

- No Plants
- Trace Plants
- Sparse Plants
- Medium Plants
- Dense Plants

Percent Distribution

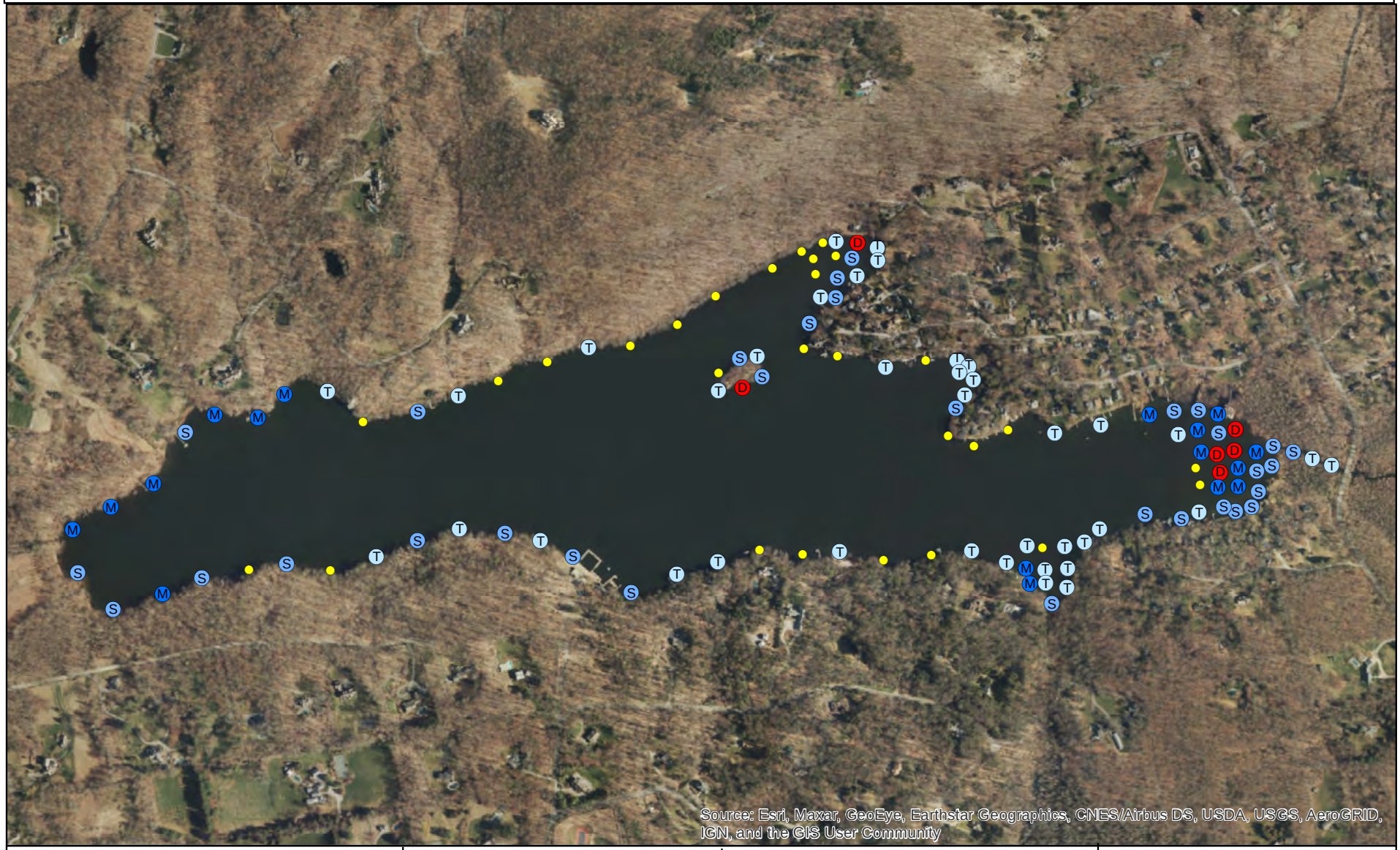
Abundance	Sites	Percent
Total	75	63%
Trace	38	51%
Sparse	14	19%
Medium	12	16%
Dense	11	15%

N

0 675 1,350 Feet

TOTAL SUBMERGED VEGETATION

SOLITUDE LAKE MANAGEMENT



LAKE WACCABUC
Aquatic Vegetation Survey
August 30, 2021

Sampling Stations: 120

Plant Density

- No Plants
- Trace Plants
- Sparse Plants
- Medium Plants
- Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	92	77%
Trace	38	41%
Sparse	31	34%
Medium	17	18%
Dense	6	7%

N

0 675 1,350 Feet

ARROWHEAD (*Sagittaria* spp.) DISTRIBUTION

SOLITUDE LAKE MANAGEMENT

LAKE WACCABUC
Aquatic Vegetation Survey
August 30, 2021

Sampling Stations: 120

Plant Density

- No Plants
- Trace Plants
- Sparse Plants
- Medium Plants
- Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	11	9%
Trace	10	91%
Sparse	1	9%
Medium	0	0%
Dense	0	0%

N

0 675 1,350 Feet

BASSWEED (*Potamogeton amplifolius*) DISTRIBUTION

SOLITUDE LAKE MANAGEMENT

LAKE WACCABUC
Aquatic Vegetation Survey
August 30, 2021

Sampling Stations: 120

Plant Density

- No Plants
- Trace Plants
- Sparse Plants
- Medium Plants
- Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	25	21%
Trace	15	60%
Sparse	7	28%
Medium	3	12%
Dense	0	0%

N

0 675 1,350 Feet

BENTHIC FILAMENTOUS ALGAE DISTRIBUTION

SOLITUDE LAKE MANAGEMENT

LAKE WACCABUC
Aquatic Vegetation Survey
August 30, 2021

Sampling Stations: 120

Plant Density

- No Plants
- Trace Plants
- Sparse Plants
- Medium Plants
- Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	59	49%
Trace	46	78%
Sparse	11	19%
Medium	1	2%
Dense	1	2%

N

0 675 1,350 Feet

BRITTLE NAIAD (*Najas minor*) DISTRIBUTION

SOLITUDE LAKE MANAGEMENT

LAKE WACCABUC
Aquatic Vegetation Survey
August 30, 2021

Sampling Stations: 120

Plant Density

- No Plants
- Trace Plants
- Sparse Plants
- Medium Plants
- Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	3	3%
Trace	3	100%
Sparse	0	0%
Medium	0	0%
Dense	0	0%

N

0 675 1,350 Feet

COONTAIL (*Ceratophyllum demersum*) DISTRIBUTION

SOLITUDE LAKE MANAGEMENT

LAKE WACCABUC
Aquatic Vegetation Survey
August 30, 2021

Sampling Stations: 120

Plant Density

- No Plants
- Trace Plants
- Sparse Plants
- Medium Plants
- Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	41	34%
Trace	23	56%
Sparse	9	22%
Medium	6	15%
Dense	3	7%

N

0 675 1,350 Feet

DWARF MILFOIL (*Myriophyllum tenellum*) DISTRIBUTION

SOLITUDE LAKE MANAGEMENT

LAKE WACCABUC
Aquatic Vegetation Survey
August 30, 2021

Sampling Stations: 120

Plant Density

- No Plants
- Trace Plants
- Sparse Plants
- Medium Plants
- Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	2	2%
Trace	2	100%
Sparse	0	0%
Medium	0	0%
Dense	0	0%

N

0 675 1,350 Feet

EURASIAN WATER MILFOIL (*Myriophyllum spicatum*) DISTRIBUTION

SOLITUDE LAKE MANAGEMENT

LAKE WACCABUC
Aquatic Vegetation Survey
August 30, 2021

Sampling Stations: 120

Plant Density

- No Plants
- Trace Plants
- Sparse Plants
- Medium Plants
- Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	88	73%
Trace	44	50%
Sparse	30	34%
Medium	13	15%
Dense	1	1%

N

0 675 1,350 Feet

FLOATING LEAF BUR-REED (*Sparganium fluctuans*) DISTRIBUTION

SOLITUDE LAKE MANAGEMENT

LAKE WACCABUC
Aquatic Vegetation Survey
August 30, 2021

Sampling Stations: 120

Plant Density

- No Plants
- Trace Plants
- Sparse Plants
- Medium Plants
- Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	4	3%
Trace	4	100%
Sparse	0	0%
Medium	0	0%
Dense	0	0%

N

0 675 1,350 Feet

GREAT DUCKWEED (*Spirodela polyrhiza*) DISTRIBUTION

SOLITUDE LAKE MANAGEMENT

LAKE WACCABUC
Aquatic Vegetation Survey
August 30, 2021

Sampling Stations: 120

Plant Density

- No Plants
- Trace Plants
- Sparse Plants
- Medium Plants
- Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	22	18%
Trace	22	100%
Sparse	0	0%
Medium	0	0%
Dense	0	0%

N

0 675 1,350 Feet

LEAFY PONDWEED (*Potamogeton foliosus*) DISTRIBUTION

SOLITUDE LAKE MANAGEMENT

LAKE WACCABUC
Aquatic Vegetation Survey
August 30, 2021

Sampling Stations: 120

Plant Density

- No Plants
- Trace Plants
- Sparse Plants
- Medium Plants
- Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	3	3%
Trace	3	100%
Sparse	0	0%
Medium	0	0%
Dense	0	0%

N

0 675 1,350 Feet

ROBBIN'S PONDWEED (*Potamogeton robbinsii*) DISTRIBUTION

SOLITUDE LAKE MANAGEMENT

LAKE WACCABUC
Aquatic Vegetation Survey
August 30, 2021

Sampling Stations: 120

Plant Density

- No Plants
- Trace Plants
- Sparse Plants
- Medium Plants
- Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	3	3%
Trace	3	100%
Sparse	0	0%
Medium	0	0%
Dense	0	0%

N

0 675 1,350 Feet

SPATTERDOCK (*Nuphar variegata*) DISTRIBUTION

SOLITUDE LAKE MANAGEMENT

LAKE WACCABUC
Aquatic Vegetation Survey
August 30, 2021

Sampling Stations: 120

Plant Density

- No Plants
- Trace Plants
- Sparse Plants
- Medium Plants
- Dense Plants

Percent Distribution

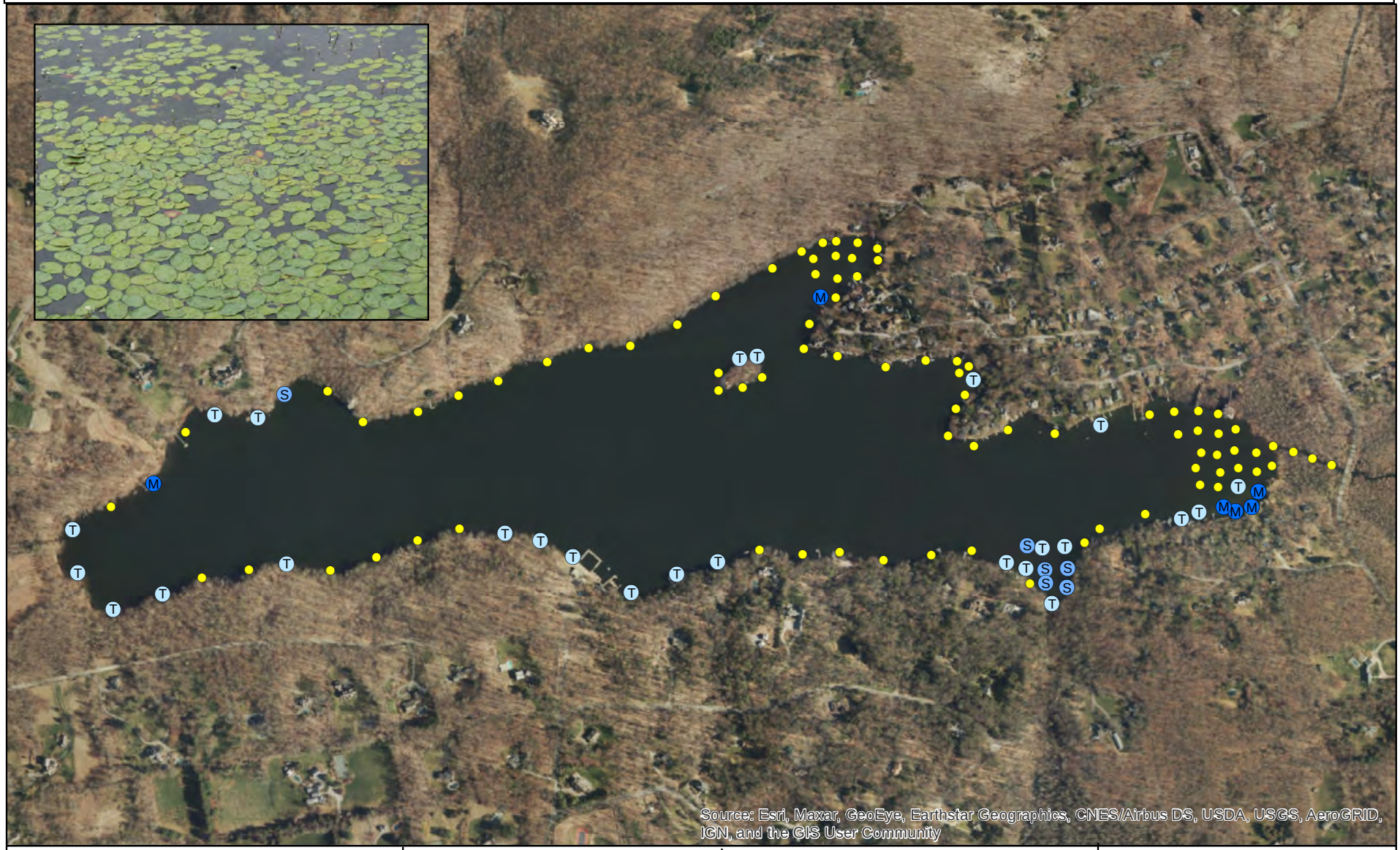
Abundance	Sites	Percent
Total	31	26%
Trace	11	35%
Sparse	10	32%
Medium	5	16%
Dense	5	16%

N

0 675 1,350 Feet

WATERSHIELD (*Brasenia schreberi*) DISTRIBUTION

SOLITUDE LAKE MANAGEMENT



LAKE WACCABUC
Aquatic Vegetation Survey
August 30, 2021

Sampling Stations: 120

Plant Density

- No Plants
- Trace Plants
- Sparse Plants
- Medium Plants
- Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	37	31%
Trace	25	68%
Sparse	6	16%
Medium	6	16%
Dense	0	0%

0 675 1,350 Feet

WHITE WATER LILY (*Nymphaea adorata*) DISTRIBUTION

SOLITUDE LAKE MANAGEMENT

LAKE WACCABUC
Aquatic Vegetation Survey
August 30, 2021

Sampling Stations: 120

Plant Density

- No Plants
- Trace Plants
- Sparse Plants
- Medium Plants
- Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	52	43%
Trace	35	67%
Sparse	8	15%
Medium	4	8%
Dense	5	10%

N

0 675 1,350 Feet