COMPREHENSIVE POINT-INTERCEPT SURVEY REPORT

-SUNSET LAKE-

-JULY 2025-

PREPARED FOR:

SUNSET LAKE ASSOCIATION
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INTRODUCTION

Sunset Lake (Wash Pond) hired Pondweed Pursuits to perform a comprehensive submersed aquatic point-intercept survey of Sunset Lake. The survey was conducted on July 23, 2025. The weather was sunny and hot. A throw-rake was utilized as a way to collect bottom vegetation to confirm species identification and relative abundance. A hand-held Garmin GPS was used to navigate to each data point. An onboard Lowrance unit was used to collect depth and aid in determining presence of submersed vegetation.

METHODOLOGY

The point-intercept method (PIM) of sampling macrophytes is designed to determine the extent of submersed aquatic plant growth within an area of concern. The total number of sample locations is typically based on the total acreage of a site, where one sample location per acre is surveyed at a given site. Point-intercept locations within this site were determined by a 10-m grid data layer placed over an orthophoto of the pond. A total of 71 data points were developed for Sunset Lake. All data points were surveyed (if possible); however, if data points were located in an area that was not accessible, these data points were noted and were altered on site in the nearest accessible location. In addition, any unforeseen, vegetated areas that were observed during the survey but were not provided a data point initially, were given a separate data point during the survey. Please refer to Appendix B for the Data Point locations. The following data was collected at each of the survey points:

Species Identification

The rake toss method, based on protocols developed by Cornell University, was used to retrieve submersed aquatic vegetation from either side of the survey vessel (where applicable). A single rake toss was tossed overboard at each point. Each species found on the rake was identified down to species and recorded. Plant species observed in the immediate area but not found on the rake toss was also recorded. Any species not readily identified *in situ* was placed into a plastic bag labeled with the data point number and preserved for further analysis.

- Relative Abundance of each species
- Biovolume Index
- Total percent (%) cover of each species

Relative Abundance

The abundance scale, developed by the US Army Corps of Engineers and modified by Cornell, was used to categorize total growth. Each species is assigned to an abundance value, shown in the table below.

Notation	Description
Z	Zero: no plants on rake
T	Trace: fingerful on rake
S	Sparse: handful on rake
M	Moderate: handful on rake
D	Dense: difficult to bring into boat

Percent Cover

Percent cover was defined as the percent of bottom sediments obscured by vegetation. In general, an area in which no sediments are visible was classified at 100% cover; at times, bottom sediments are not visible due to water clarity, regardless of vegetative growth. An overall percentage is assigned by the abundance of plants collected on the rake.

Notation	Description
0%	No plant growth observed
1-25%	Little to no plant growth obscuring bottom layer
25-50%	Sparse patches of bottom cover
50-75%	Much of the bottom obscured by plant growth
75-100%	Little to no bottom coverage visible

Biovolume Index

The biovolume for each data point indicates the approximate height that plants are present in the water column. Each plant species is recorded on a scale from zero to four:

0	No biovolume	No plants
1	Low biovolume	Very low growth
2	Moderate biovolume	Growth extending up, into water column
3	High biovolume	Growth in water column and possibly to surface
4	Very high biovolume	Growth filling the water column and covering the surface

SURVEY RESULTS

A total of 23 vegetation species, one macro-alga (muskgrass), and filamentous algae were identified at the time of the survey. Please refer to **Table 1** (below) for overall abundance of the collected species. Please refer to the Appendix for the maps displaying the location of each species and the Macrophyte Library for descriptions of each plant. The table below represents the mean of the collected data within the categories shown. The average depth of the data points was 8.6-feet, the overall cover of submersed aquatic vegetation was 52% (considered moderate abundance), the biovolume (height of plants in the water column) was 2.7, which states on average, most species remained below the surface. And species richness (average number of species/data point) was 3.9, indicating that Sunset Lake has roughly 4 species/data point, indicating a healthy plant assemblage throughout the lake. Data points 39 and 41 had the largest number of species, at 18 and 19 species/data point, respectively. These two data points are located in the eastern-most cove. This area is relatively shallow and has a large wetland area present in the north.

DEPTH (FT.)	8.6
OVERALL % COVER	52
BIOVOLUME	2.7
SPECIES RICHNESS	3.9

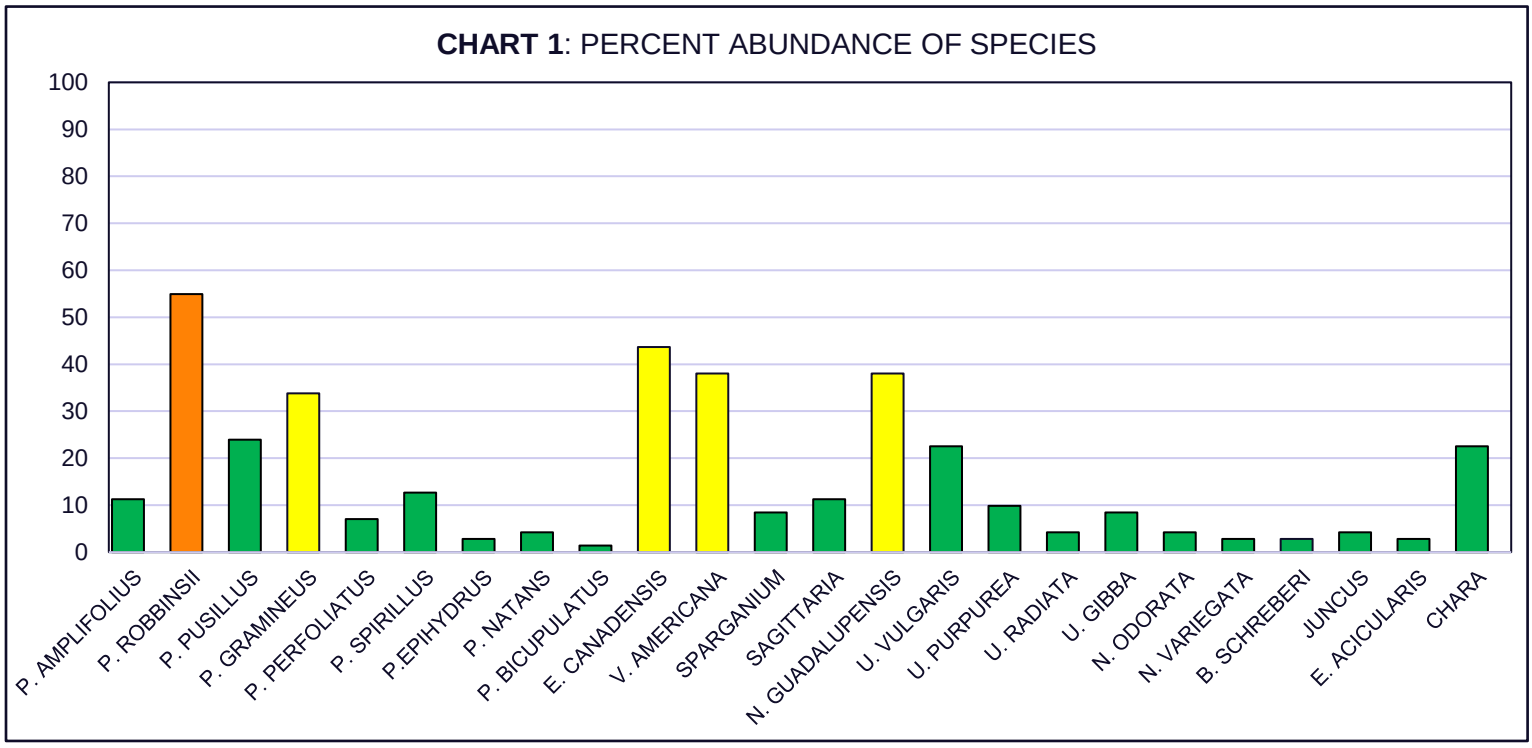
Table 1: Overall abundance of collected species

		Total		Trace		Sparse		Medium		Dense	
		Sites	%	Sites	%	Sites	%	Sites	%	Sites	%
TOTAL SITES		71									
ROBBINS PONDWEED	POTAMOGETON AMPLIFOLIUS	40	56%	13	33%	21	53%	4	13%	2	5%
WATERWEED	ELODEA CANADENSIS	31	44%	21	68%	8	0%	2	0%	0	0%
TAPEGRASS	VALLISNERIA AMERICANA	27	38%	7	26%	14	33%	6	33%	0	0%
SOUTHERN NAIAD	NAJAS GUADALUPENSIS	27	38%	7	26%	15	0%	4	0%	1	0%
VARIABLE-LEAF PONDWEED	POTAMOGETON GRAMINEUS	24	34%	4	17%	15	63%	4	17%	1	0%
THIN-LEAF PONDWEED	POTAMOGETON PUSILLUS	17	24%	2	12%	8	47%	4	24%	3	18%
COMMON BLADDERWORT	UTRICULARIA VULGARIS	16	23%	14	88%	2	0%	0	0%	0	0%
MUSKGRASS	CHARA SPP.	16	23%	6	38%	9	56%	1	6%	0	0%
SPIRAL-FRUITED PONDWEED	POTAMOGETON SPIRILLUS	9	13%	7	78%	2	22%	0	0%	0	0%
BIG-LEAF PONDWEED	POTAMOGETON AMPLIFOLIUS	8	11%	5	63%	3	38%	0	0%	0	0%
ARROWHEAD	SAGITTARIA SPP.	8	11%	6	75%	2	25%	0	0%	0	0%
PURPLE BLADDERWORT	UTRICULARIA PURPUREA	7	10%	5	71%	2	29%	0	0%	0	0%
BURREED	SPARGANIUM SPP.	6	8%	3	50%	3	0%	0	0%	0	0%
HUMPED BLADDERWORT	UTRICULARIA GIBBA	6	8%	6	100%	0	0%	0	0%	0	0%
CLASPING-LEAF PONDWEED	POTAMOGETON PERFOLIATUS	5	7%	3	60%	2	40%	0	0%	0	0%
FLOATING-LEAF PONDWEED	POTAMOGETON NATANS	3	4%	3	100%	0	0%	0	0%	0	0%
LITTLE FLOATING BLADDERWORT	UTRICULARIA RADIATA	3	4%	3	100%	0	0%	0	0%	0	0%
WHITE WATERLILY	NYMPHAEA ODORATA	3	4%	1	33%	0	0%	1	33%	1	33%
RUSH	JUNCUS SPP.	3	4%	1	33%	1	33%	1	33%	0	0%
RIBBON-LEAF PONDWEED	POTAMOGETON EPIHYDRUS	2	3%	2	100%	0	0%	0	0%	0	0%
YELLOW WATERLILY	NUPHAR VARIEGATA	2	3%	1	50%	0	0%	1	50%	0	0%
WATERSHIELD	BRASENIA SCHREBERI	2	3%	2	100%	0	0%	0	0%	0	0%
SPIKERUSH	ELEOCHARIS ACICULARIS	2	3%	0	0%	2	100%	0	0%	0	0%
SNAIL-SEED PONDWEED	POTAMOGETON BICUPULATUS	1	1%	0	0%	1	100%	0	0%	0	0%

Robbin's pondweed (P. robbinsii) was the most common species identified, present at 40 (56%) data points, and was the only species considered present in moderate abundance. Robbin's Pondweed is a beneficial native, coating the bottom of the lake, often growing deeper than other species, requiring less sunlight. In shallow areas, this plant can reach the surface but is often not considered a nuisance species. Waterweed (E. canadensis) is another beneficial native plant, was the next most common species, present at 31 data points, or 44%. Waterweed was considered trace to sparse at 29 points but was considered present in moderate abundances at 2 data points. Waterweed can grow in thick patches that can grow up or out, reaching the surface, or spread across the bottom layer. In these two instances, waterweed was thick and growing to the surface.

Tapegrass, southern naiad, and variable-leaf pondweed were present at 27 (38%) and 24 data points (34%), respectively. Tapegrass, collected at 27 points, was primarily present in trace to sparse abundances (21 points). Tapegrass is a beneficial native with long, narrow leaves that spread by rhizomes. Tapegrass *can* become a nuisance if or when plants release from the bottom sediments and float at the surface creating floating mats of plant material. Southern naiad, also present at 27 data points, remained low and patchy along the bottom layer. Variable-leaf pondweed, collected at a total of 24 data points, was present in moderate to dense abundance at 5 points, where it reached the surface and was present at nuisance abundances. Variable-leaf pondweed can grow to the surface, and spreads by seed and rhizome. It can form dense stands if allowed, as pictured to the right, and was most often present within the deeper water zones growing at non-nuisance levels. Variable-leaf pondweed is considered a beneficial native that provides habitat, shelter, and food for aquatic wildlife.

Chart 1 below displays the relative abundance of species found during the survey. The chart is a great visual to show the overall low abundance of aquatic plants present in Sunset Lake. Only Robbin's Pondweed (*R. robbinsii*) reached the moderate category of over 50% presence as mentioned in the paragraphs above. The colors of orange, yellow, and green indicate abundance; orange indicates moderate abundance, yellow indicates sparse abundance, and green indicates trace abundance. These same colors are also used to signify abundance in the abundance maps.



CONCLUSION

Overall, Sunset Lake can be considered a mesotrophic lake. Mesotrophic lakes display a healthy assemblage of aquatic plants and biological productivity. Sunset Lake has over 20 different aquatic plant species that provide food, shelter, and habitat to aquatic wildlife including fish, reptiles, invertebrates, and waterfowl.

The majority of aquatic plant species were observed as trace to sparse abundance, and rarely did plant growth present at nuisance levels. The most productive area, in terms of plant diversity and abundance, was the eastern-most end of the lake between Bonnie's Way and Blue Heron Ave. Additional areas which displayed high abundance were in the north-eastern cove between data points 45/52-56, and the western-most end of the lake at data points 1-3. These specific areas will likely present high abundance of aquatic plants annually and may pose a problem to residents who live nearby, reducing the recreational accessibility of their waterfront properties. In addition, in areas of high abundance, heavier loads of biomass add up year over year, creating a nutrient sink and thick layers of organic matter, or muck, which can feed algae or cyanobacteria growth. It is recommended that these areas, particularly the eastern-most cove and nearby wetland, be monitored on a monthly basis through the future growing seasons.

APPENDIX A

MACROPHYTE LIBRARY

AQUATIC PLANT LIBRARY

***In order listed by Table 1**

ROBBIN'S PONDWEED (*POTAMOGETON ROBBINSII*), 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.

WATERWEED (*ELODEA CANADENSIS*), 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.

TAPEGRASS, (*VALLISNERIA AMERICANA*), 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 consumes all parts of the plant. Canvasback ducks (*Aythya vallisneria*) 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.

SOUTHERN NAIAD (*NAJAS GUADALUPENSIS*), NATIVE: 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.

VARIABLE-LEAF PONDWEED (*POTAMOGETON GRAMINEUS*), NATIVE: Variable pondweed has stems that arise from a sprawling rhizome with numerous branching. Submersed lance-like leaves have 3 to 7 veins, lack a stalk, and slightly taper where they attach to the stem. Floating leaves are shaped like an ellipse, with 11 to 19 veins, and are attached to the stem via a stalk usually longer than the blade. The appearance of variable pondweed depends on where it is growing. This variability, along with its tendency to hybridize with other pondweeds makes it difficult to identify. It prefers hard sediments, and usually inhabits water less than one meter deep. Waterfowl graze on its tubers and fruits, and its dense underwater foliage provides suitable macroinvertebrate and fish habitat.

THIN-LEAF PONDWEED (*POTAMOGETON PUSILLUS*), NATIVE: Thin-leaf pondweed has slender stems and a slight rhizome that branches repeatedly near the ends. Only submersed leaves are produced, and these are linear, attaching directly to the stem of the plant. The leaves have three veins and the mid-vein is usually bordered by several rows of lacunar (hollow) cells. There is usually a pair of raised glands at the base of the leaf attachment. Membranous stipules are wrapped around the stem in early growth, but as the plant ages, these tend to break down and becoming shredded in appearance and free. Flowers and fruits are produced in 1 to 4 whorls on a slender stalk. The fruit is plump with a smooth back and a short hooked beak. Thin-leaf pondweed can tolerate turbid environments and inhabits shallow zones to a depth of 3 meters. Thin-leaf pondweed is grazed upon by waterfowl, muskrat, deer, beaver, and even moose. Locally, it can be a very important link in the ecological balance of a lake system. It also provides suitable grazing opportunities and cover for numerous fish.

COMMON BLADDERWORT (*UTRICULARIA VULGARIS*), NATIVE: Common bladderwort is a free-floating plant that can reach 2-3 meters in length. Since they are free-floating, they can grow in areas with very loose sediment. Along its stem are finely divided leaf-like branches, forked 3-7 times. Scattered about the branches are numerous bladders, used to capture prey ranging from the size of unicellular protozoans (such as Euglena), to mosquito larvae. Prey is slowly digested inside the bladders by enzymes. Common bladderwort produce small yellow flowers that protrude above the water. Stems of common bladderwort provide food and cover for fish.

MUSKGRASS (*CHARA SPP.*), NATIVE: The first thing to understand about Muskgrass, is that it is not a true aquatic plant, but instead, is a macro-alga. Muskgrass is green/gray colored and grows completely submersed in either shallow or deep water. It can vary in size, and bears whorls of branchlets at regularly spaced joints. Muskgrass can be identified quickly by its strong odor, that smells very similar to skunk or garlic. Muskgrass does not produce flowers, but instead grow one-celled sex organs called oogonia in the crotches of the whorled branches which also produce orange-colored spores in fruiting bodies. Muskgrass can be found worldwide depending on the habitat, which ranges from freshwater to brackish water, both inland and coastal, alkaline or hard water, lakes or slow-moving streams. Muskgrass can often be confused with other macro-alga, such as Stonewort (Nitella spp.); however, Stonewort lacks the odor that is produced by Muskgrass.

SPIRAL-FRUITED PONDWEED (*POTAMOGETON SPIRILLUS*), 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. The fruit itself is a 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.

BIG-LEAF PONDWEED (*POTAMOGETON AMPLIFOLIUS*), 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.

ARROWHEAD (SAGITTARIA LATIFOLIA), NATIVE (Submersed Rosette): This plant 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.

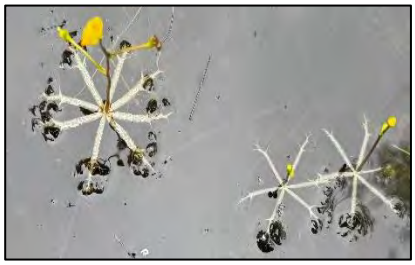
PURPLE BLADDERWORT (*UTRICULARIA PURPUREA)*, NATIVE: Purple bladderwort has free-floating stems that can reach lengths up to one meter long. Its branches are filament-like and arranged in whorls. It differs from other native bladderworts by its purple snap-dragon-like flowers and the location of the bladders. All bladders are located at the end of a branch only. It prefers soft water, low pH water, but its distribution in a lake is dependent on wind and water currents. Mats of large purple bladderwort provide habitat for a myriad of aquatic invertebrates, and forage opportunities for fish.

BURREED (SPARGANIUM SPP.), NATIVE: Burreed is an emergent plant that reaches heights of 1.5 meters. It prefers the moist soil of lake margins, to a depth of one meter. The leaves (6 to 12 mm wide) are spongy with a compressed triangular cross-section. Ribbon-like floating and submersed leaves may also be present. Rhizomes are shallow, intricate networks. The zig-zag flower stalks are covered with gumball-like spherical blooms. The individual fruits mature with outward facing beaks that can be used for positive identification to species. Common bur-reed has two stigmas on each nutlet and a wide flat top. Burreed is a perennial that overwinters with hardy rhizomes. Common bur-reed has many beneficial ecological traits, such as sediment stabilization, providing nesting sites for waterfowl. The whole plant is consumed by deer and muskrat.

HUMPED BLADDERWORT (*UTRICULARIA GIBBA*), NATIVE: Humped bladderwort is a free-floating aquatic perennial herb. The stems are both floating and creeping usually no more than 75 cm long. The stem is densely lined with leaves bearing the bladders. The bladders are used to capture prey, such as protozoa, zooplankton, and even small insect larvae. The leaves are linear, flat, and bristle-tipped, generally three parted at the base and forked 1 to 3 times. Small yellow snap dragon-like flowers are produced. S ince it is free floating, and it derives nutrients from captured prey, it can inhabit low nutrient waters. It is not limited to substrate type, water clarity, or water depth, due to its lack of roots, but it is at the mercy of wind or water currents.

CLASPING-LEAF PONDWEED (*POTAMOGETON PERFOLIATUS*), NATIVE: Clasping-leaf pondweed has alternate leaves and tend to be short (ranging from 1 to 6 cm), somewhat rounded, and completely wrap around the base of the stem, the latter being a distinguishing characteristic. Leaves typically have 7-15 veins. Stipules are present but tend to disintegrate later into the season. Floating leaves are not produced, but cylindrical flower spikes adorned with fruit are produced. Fruits have a short beak and 3 indistinct dorsal ridges. Clasping-leaf pondweed prefers clear soft water, but can occur in shallow or deep water, with a preference for sandy substrates.

FLOATING-LEAF PONDWEED (*POTAMOGETON NATANS*), NATIVE: Floating-leaf pondweed has stems that emerge from a red-spotted rhizome. Submersed leaves are stalk like, with no obvious leaf blade. Floating leaves are heart-shaped at their base and appears like someone pinched the stalk and bent it, which allows the leaf blade and stalk to form a right angle for floating leaves. The pinched region is usually lighter in color than the rest of the stalk. Floating-leaf pondweed can tolerate a variety of sediment types and water chemistries. New stems develop in spring from buds located on the rhizome. Flowering occurs in early summer and fruit are produced by mid-growing season. In the fall, the upper portion of the stems die back. This plant is considered good fish habitat because is provides shade and foraging opportunities.



LITTLE FLOATING BLADDERWORT (*UTRICULARIA RADIATA*), NATIVE: Little floating bladderwort is a free-floating plant with medium length stems (typically up to one meter long). Since they are free-floating, they can grow in areas with very loo se sediment. Leaf arrangement is alternate, but they may appear to occur in pairs or lopsided whorls. Leaves are tightly to moderately arranged, but have a delicate, often pale appearance. Scattered about the edges of divided leaves are numerous bladders, used to capture prey ranging from the size of unicellular protozoans (such as Euglena) to mosquito larvae. Prey is slowly digested inside the bladders by enzymes. Bladders too are pale and delicate. The flower of floating bladderwort is suspended above the water on a whorl of inflated scapes. Flowers are yellow and snap-dragon-like in shape. Sterile, or specimens without flowers, are difficult to distinguish between other bladderwort species. It prefers to inhabit quiet waters with a low pH. It can reproduce both by seed and fragmentation.

WHITE WATERLILY (*NYMPHAEA ODORATA*), 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.

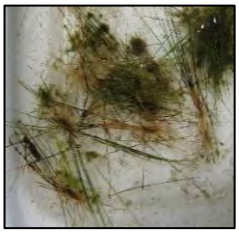
RUSH (*JUNCUS SPP.*), NATIVE: Rushes are a large genera of diverse herbaceous plants primarily found in wetlands that resemble grasses or sedges. The form of the flower differentiates rushes from other sedges as it is comprised of five whorls of floral parts and stems are round in cross-section. The flowers are brown or yellow and bloom throughout the summer months. Rushes provide habitat and food for wildlife and stabilizing soil with fibrous roots.

RIBBON-LEAF PONDWEED (*POTAMOGETON EPIHYDRUS*), 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 manners of waterfowl.

YELLOW WATERLILY (*NUPHAR VARIEGATA*), NATIVE: Yellow waterlily leaf stalks emerge directly from a submerged fleshy rhizome. It 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 yellow waterlily 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. It 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.

WATERSHIELD, (*BRASENIA SCHREBERI),* 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. 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.

NEEDLE SPIKERUSH (*ELEOCHARIS ACICULARIS*), NATIVE: Needle spikerush is a widespread species found throughout New England. It can form dense rooted and floating mats that can be a nuisance in swimming areas. The inflorescence is a seed surrounded by scales and is found at the tip of the plant. This species spreads via rhizome and has one or more storage organs, called tubers, that aid in reproduction success. This plant can be found in lakes, ponds, rivers, streams, meadows, floodplains, and along shorelines.

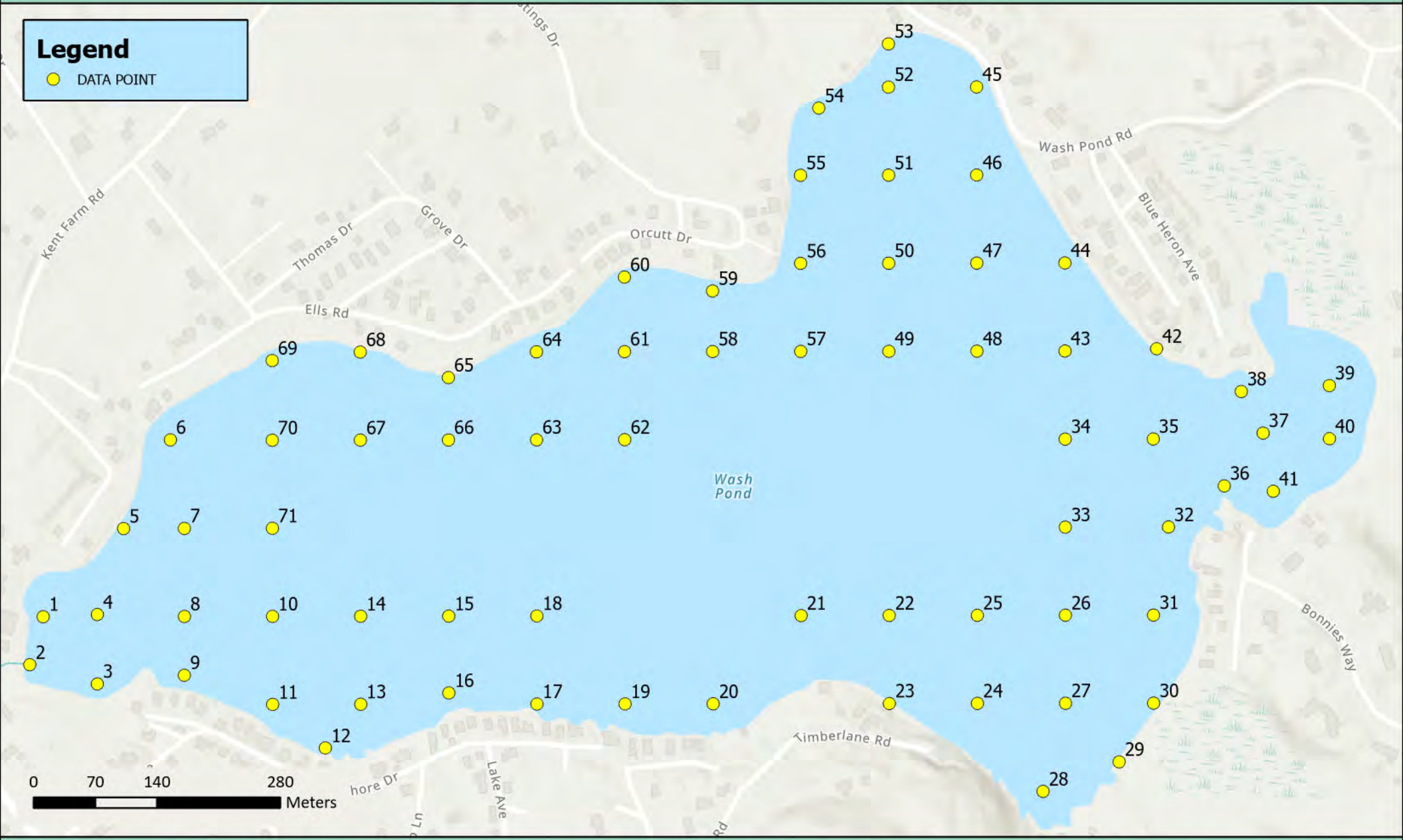


SNAIL-SEED PONDWEED (*POTAMOGETON BICUPULATUS*), NATIVE: Snail-seed pondweed is a very delicate, submergent plant with both floating and submersed leaves. The submersed leaves are extremely fine, less than 0.3mm thick. If present, the floating-leaves are small & oval, about 1cm wide and 2cm long. Habitat range varies from sandy to silty sediment along the shores of shallow lakes. This species spreads by rhizome and seed. Snail-seed pondweed can grow as tall as 3-6 feet tall, reaching the surface where it's floating leaves are produced. The seed of snail-seed pondweed has 2-3 sculpted ridges around the rim.

APPENDIX B

MAPS

DATA POINT



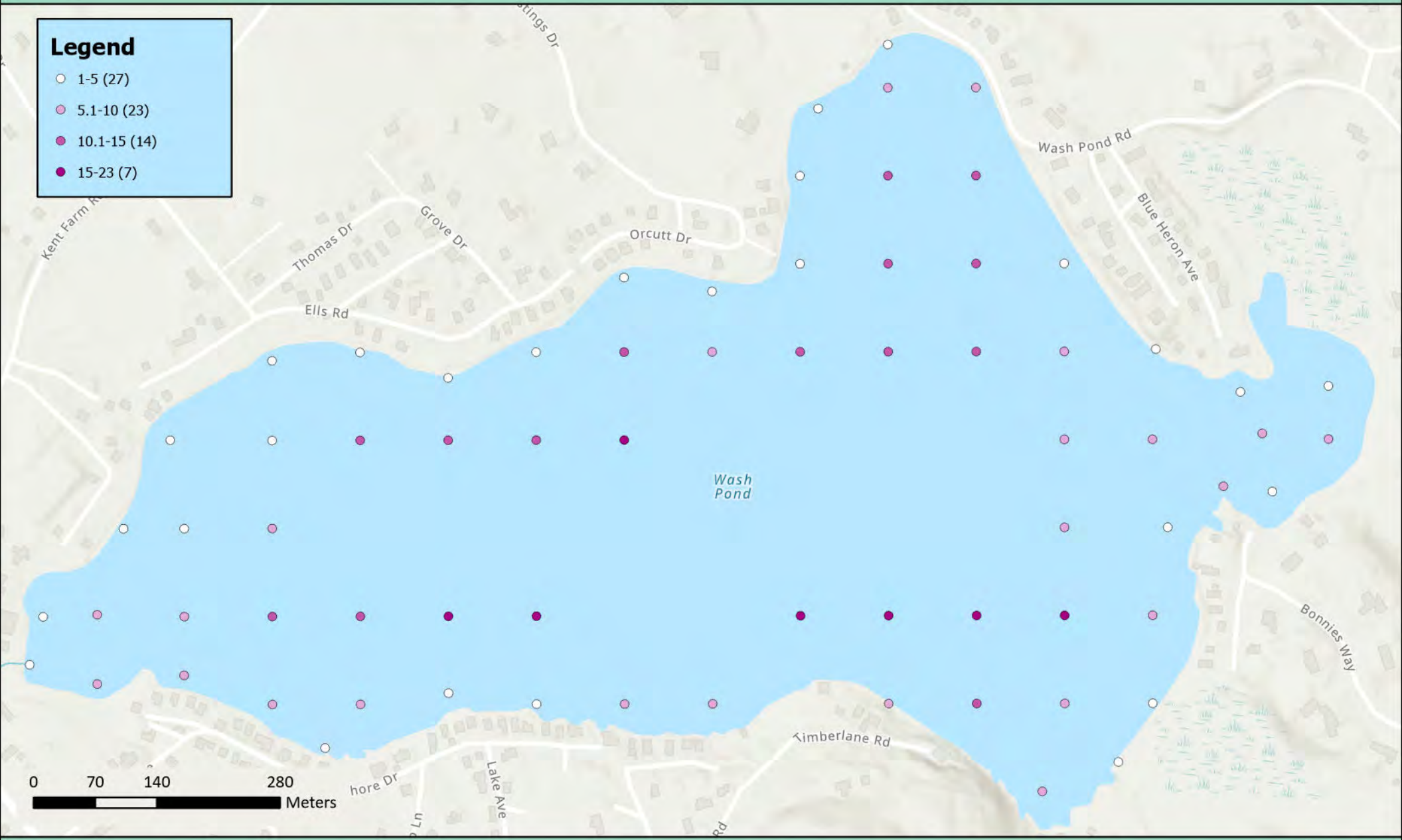
SUNSET LAKE (WASH POND)
HAMPSTEAD, NH
42.886968°, -71.176752°

COMPREHENSIVE POINT-INTERCEPT SURVEY

N

Pondweed Pursuits

DEPTH (FEET) OF DATA POINTS



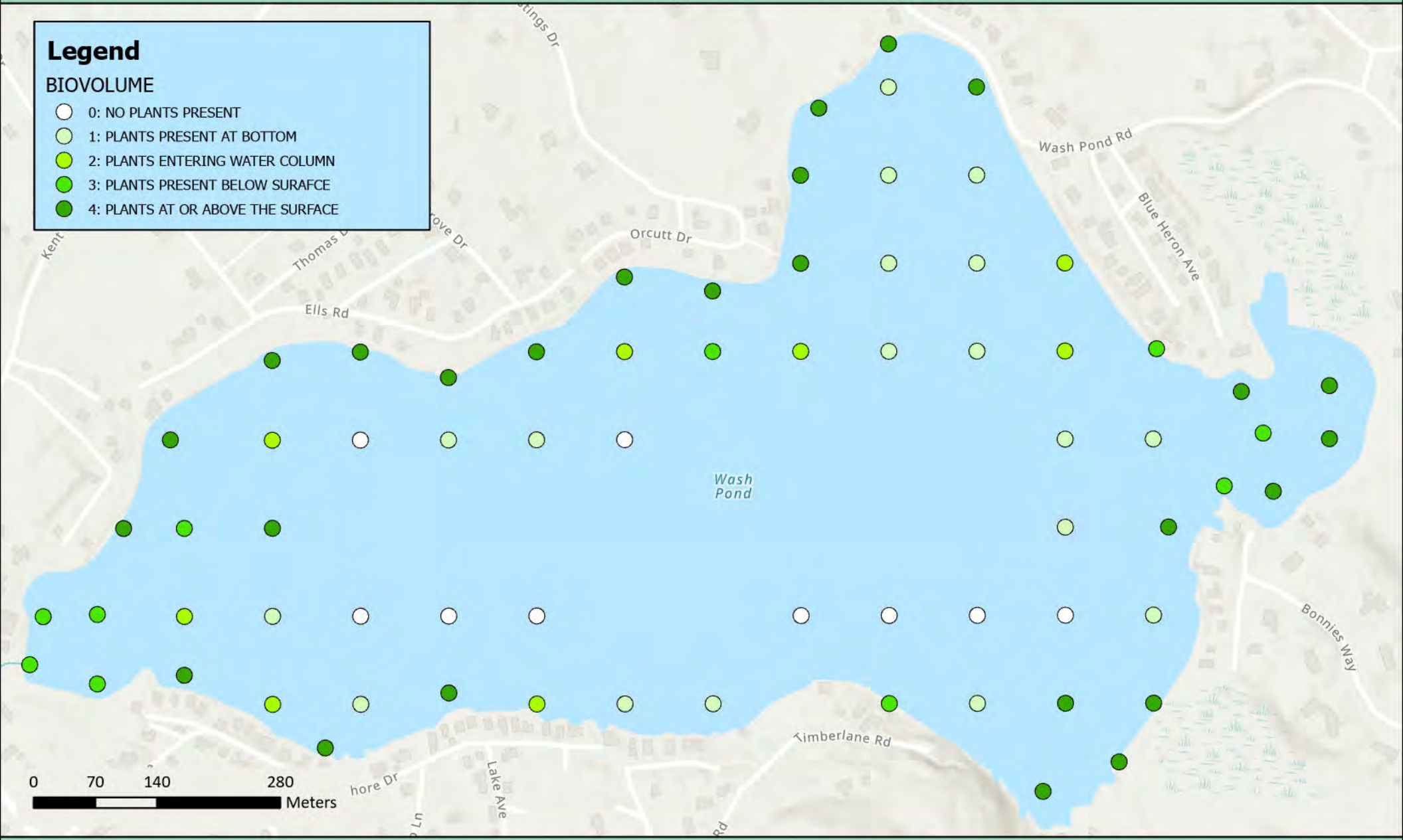
SUNSET LAKE (WASH POND)
HAMPSTEAD, NH
42.886968°, -71.176752°

COMPREHENSIVE POINT-INTERCEPT SURVEY

N

Pondweed Pursuits

OVERALL BIOVOLUME (HEIGHT OF PLANTS IN WATER COLUMN) OF DATA POINTS



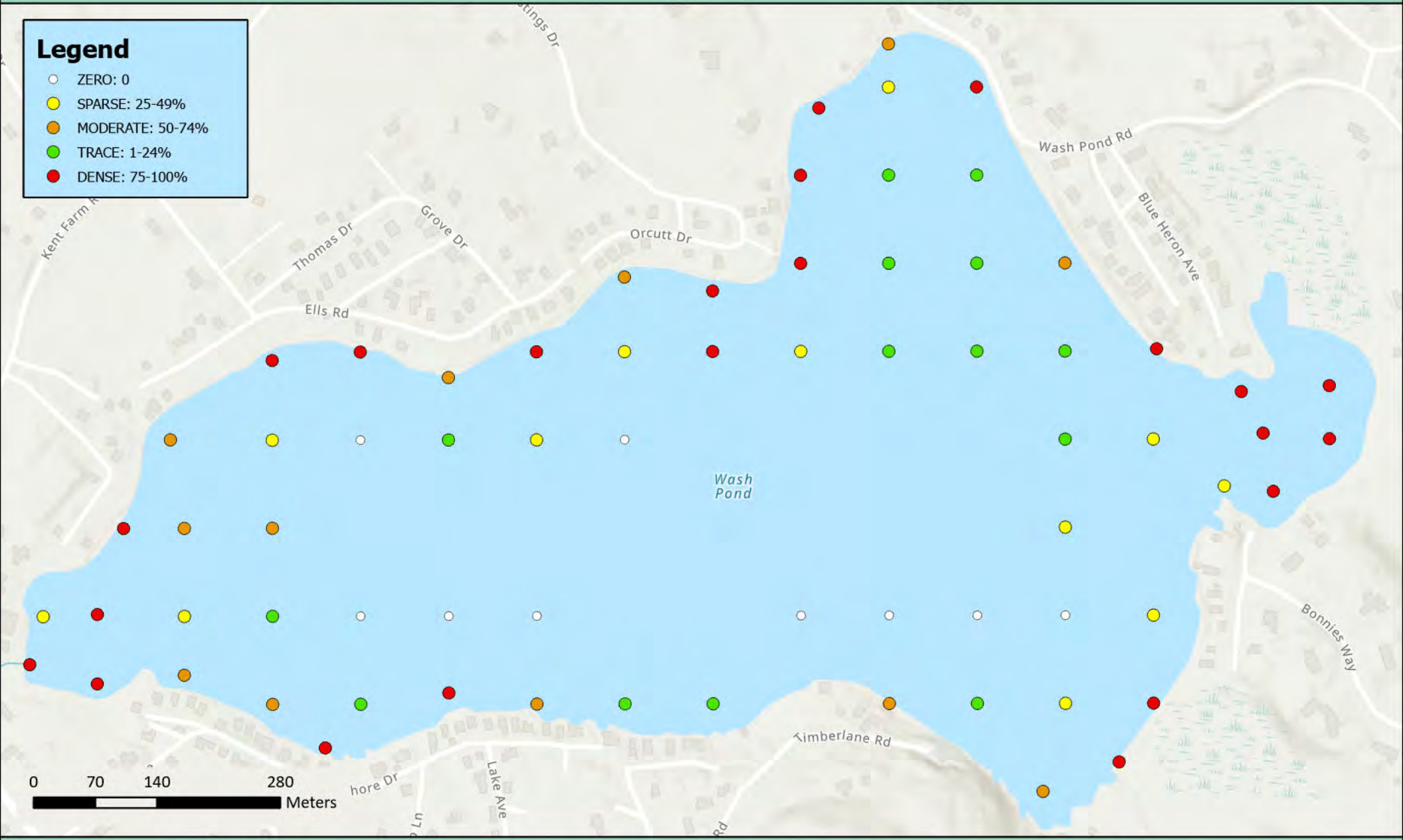
SUNSET LAKE (WASH POND)
HAMPSTEAD, NH
42.886968°, -71.176752°

COMPREHENSIVE POINT-INTERCEPT SURVEY
JULY 23, 2025

N

Pondweed Pursuits

OVERALL PERCENT (%) COVER OF ALL SPECIES



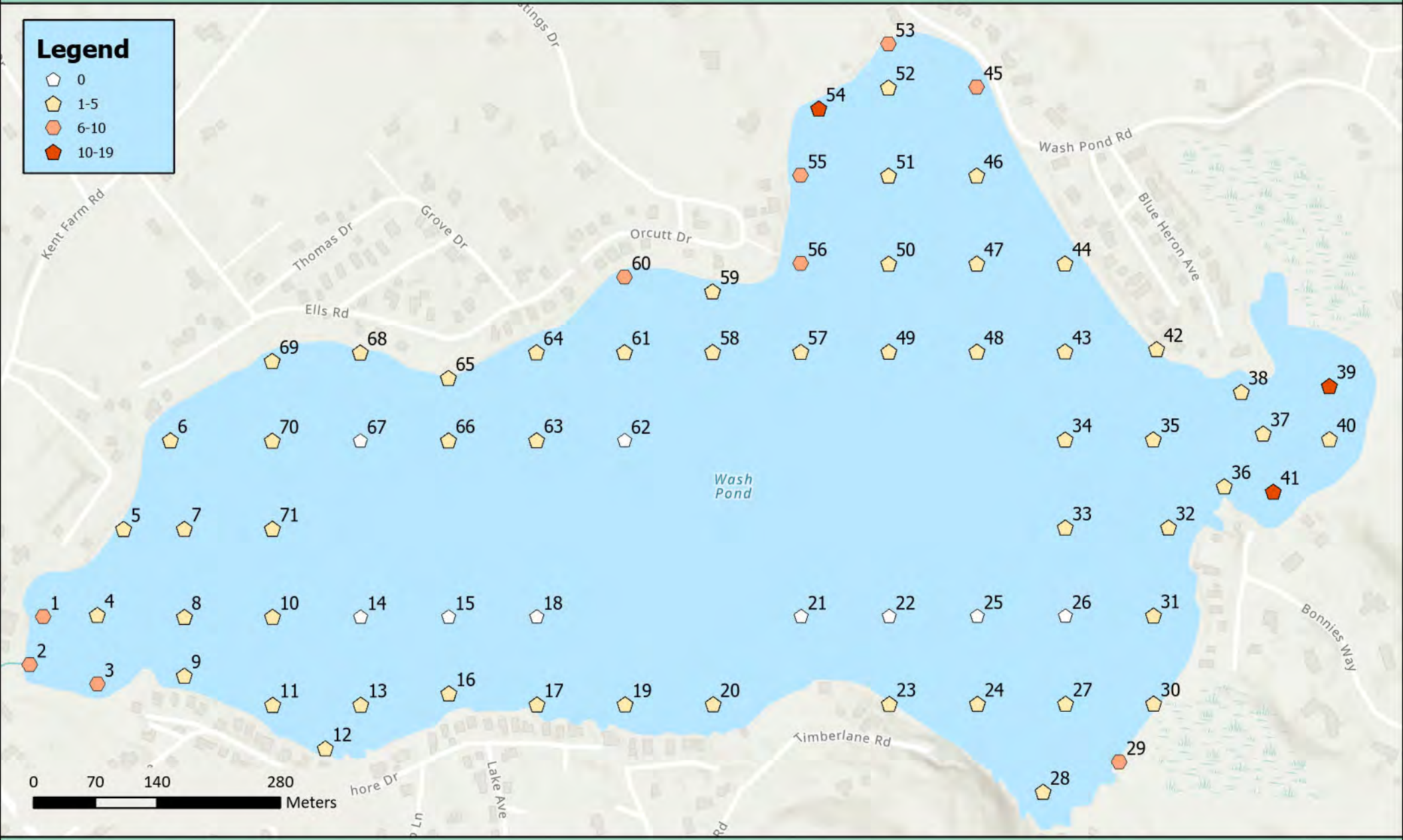
SUNSET LAKE (WASH POND)
HAMPSTEAD, NH
42.886968°, -71.176752°

COMPREHENSIVE POINT-INTERCEPT SURVEY

N

Pondweed Pursuits

SPECIES RICHNESS PER DATA POINT



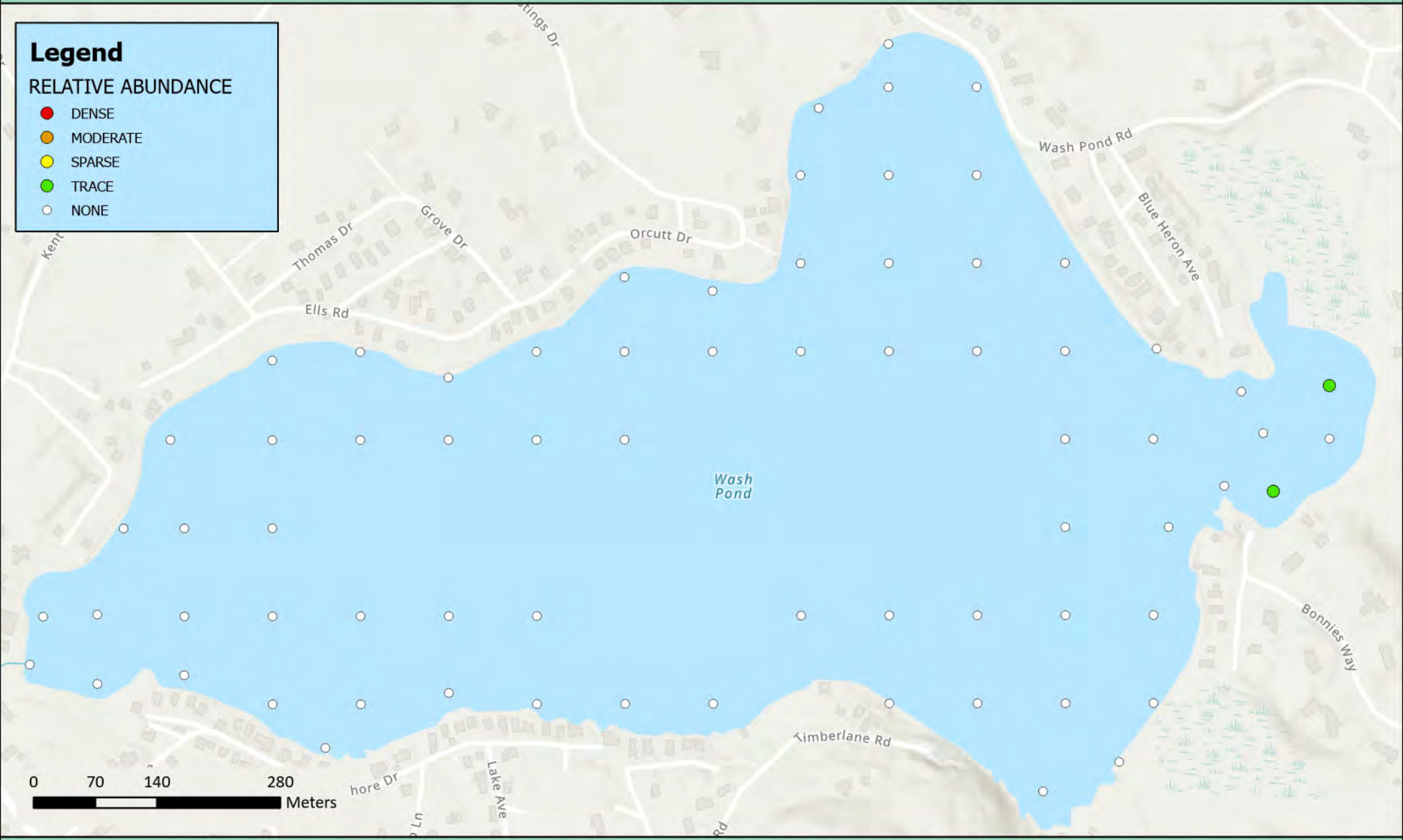
SUNSET LAKE (WASH POND)
HAMPSTEAD, NH
42.886968°, -71.176752°

COMPREHENSIVE POINT-INTERCEPT SURVEY

N

Pondweed Pursuits

RELATIVE ABUNDANCE OF WATERSHIELD (B. SCHREBERI) (2 PTS, OR 3%)

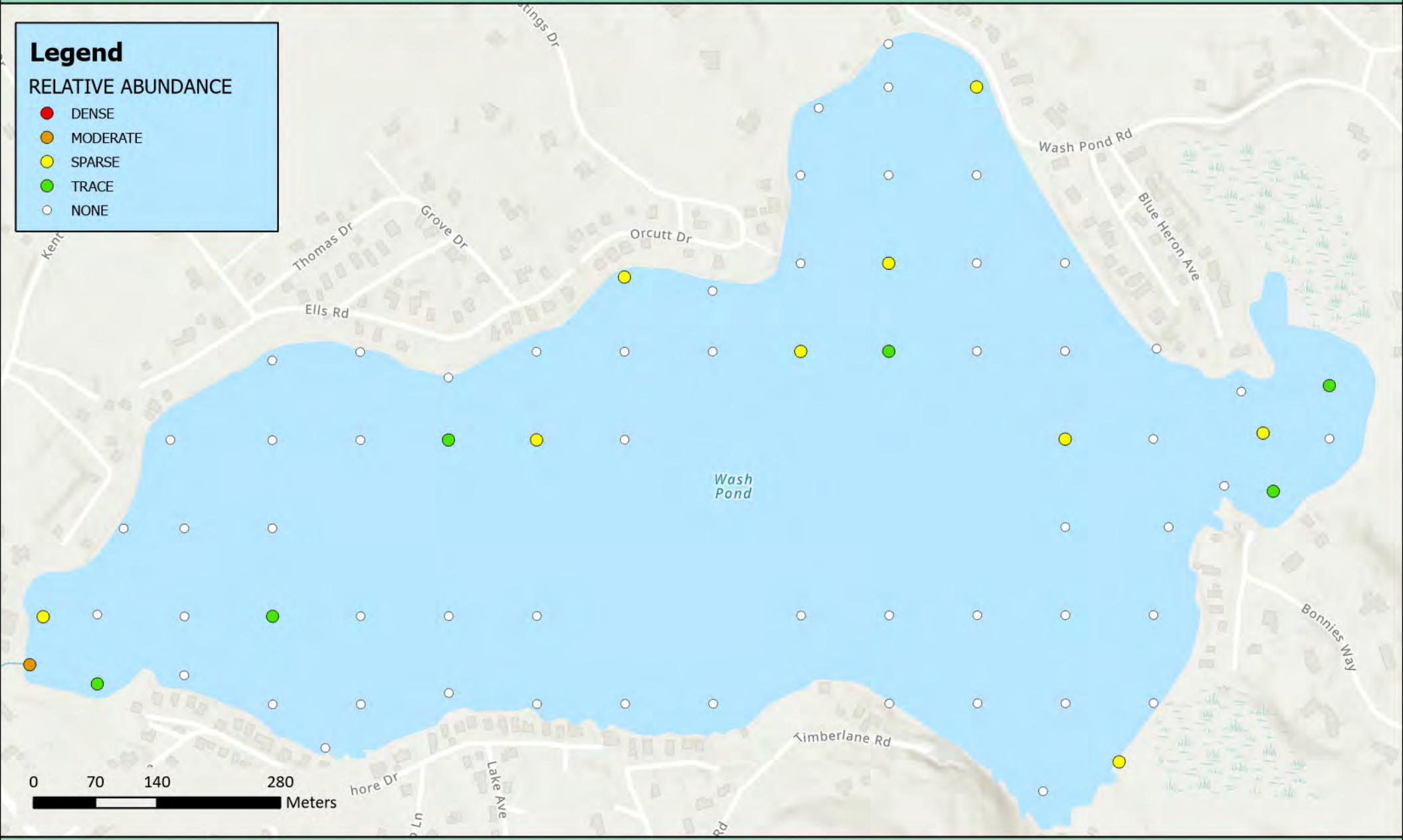


SUNSET LAKE (WASH POND)
HAMPSTEAD, NH
42.886968°, -71.176752°

COMPREHENSIVE POINT-INTERCEPT SURVEY
JULY 23, 2025

Pondweed Pursuits

RELATIVE ABUNDANCE OF MUSKGRASS (CHARA SPP.) (16 PTS, OR 23%)



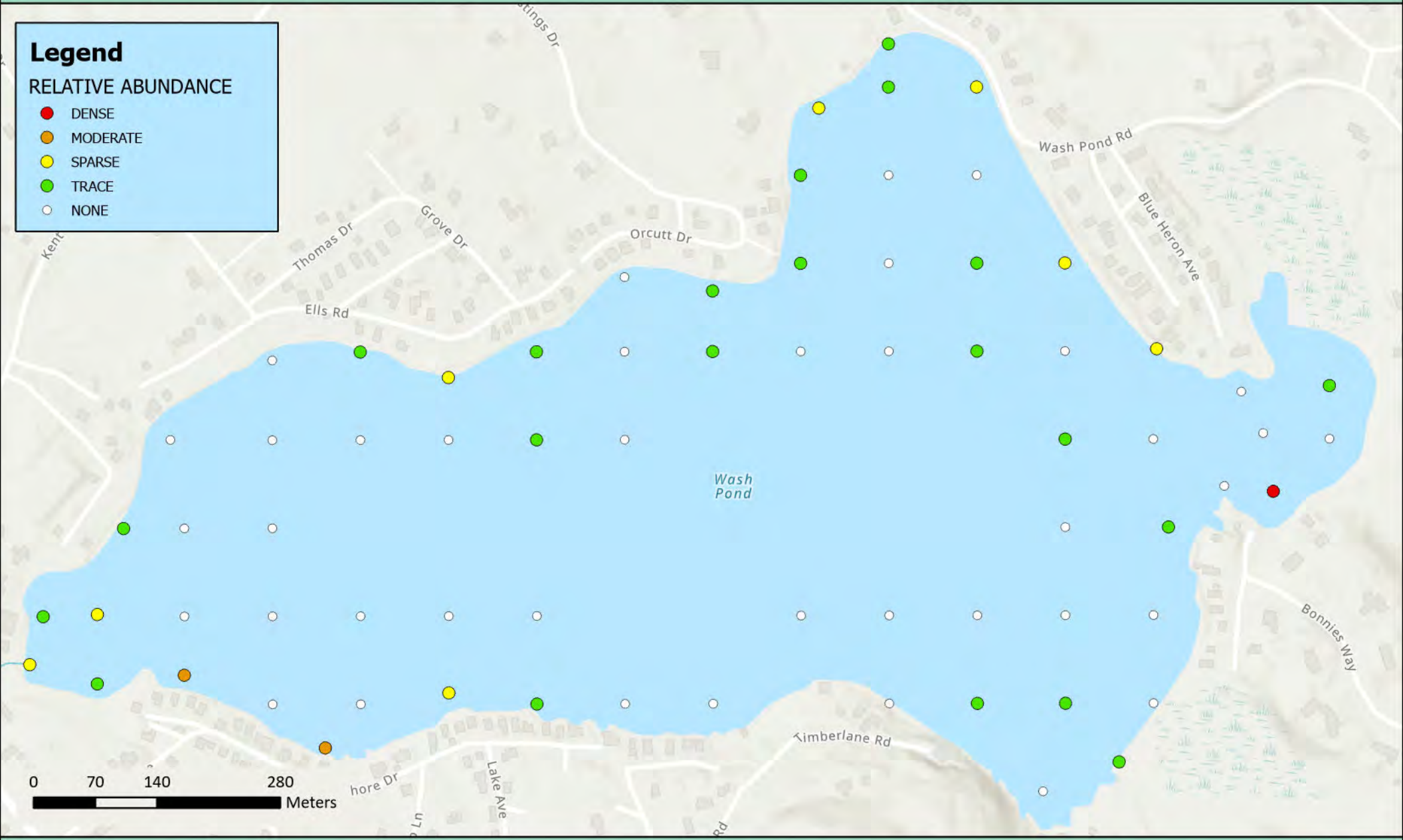
SUNSET LAKE (WASH POND)
HAMPSTEAD, NH
42.886968°, -71.176752°

COMPREHENSIVE POINT-INTERCEPT SURVEY
JULY 23, 2025

N

Pondweed Pursuits

RELATIVE ABUNDANCE OF WATERWEED (E. CANADENSIS) (31 PTS, OR 44%)



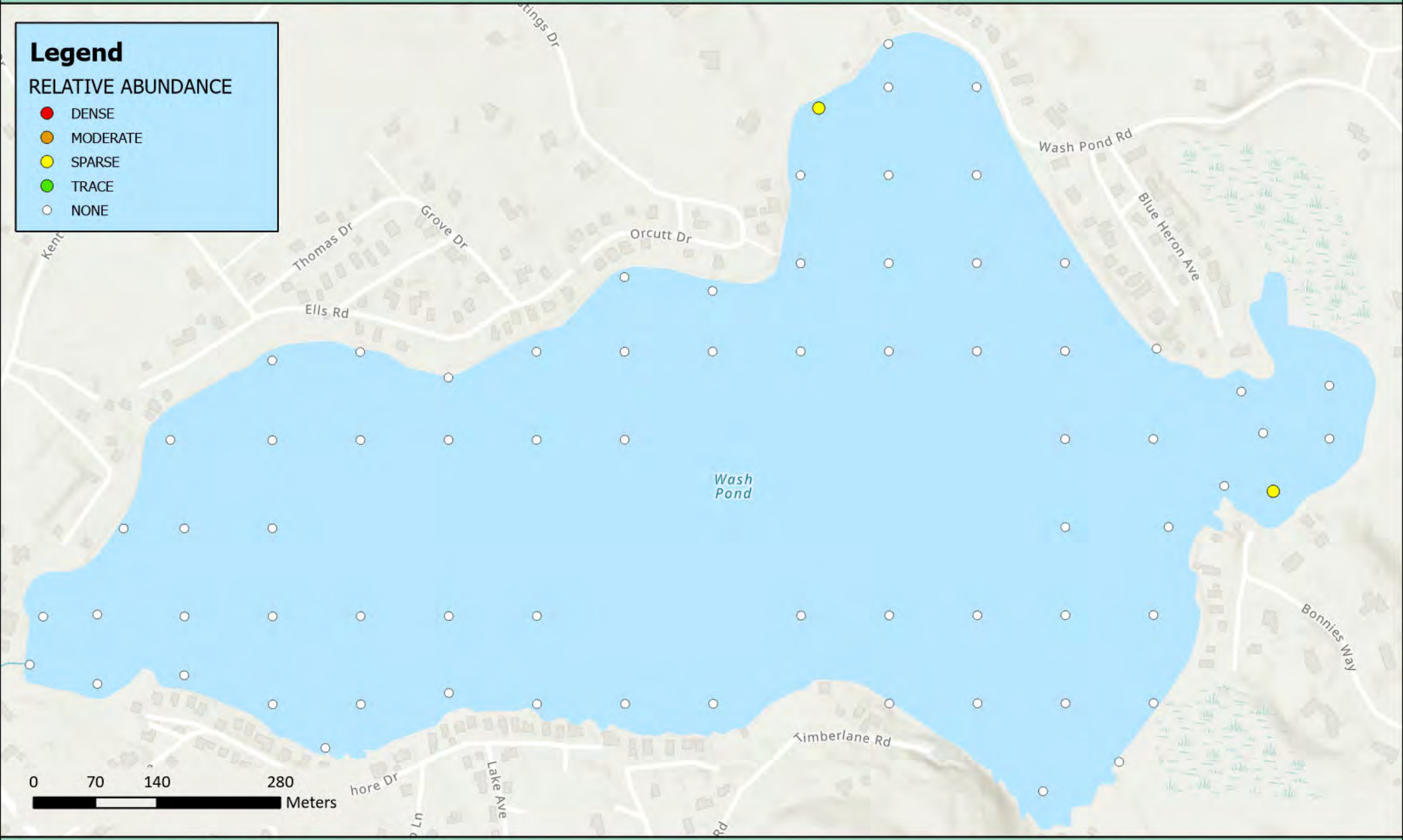
SUNSET LAKE (WASH POND)
HAMPSTEAD, NH
42.886968°, -71.176752°

COMPREHENSIVE POINT-INTERCEPT SURVEY
JULY 23, 2025

N

Pondweed Pursuits

RELATIVE ABUNDANCE OF NEEDLE SPIKERUSH (E. ACICULARIS) (2 PTS, OR 3%)



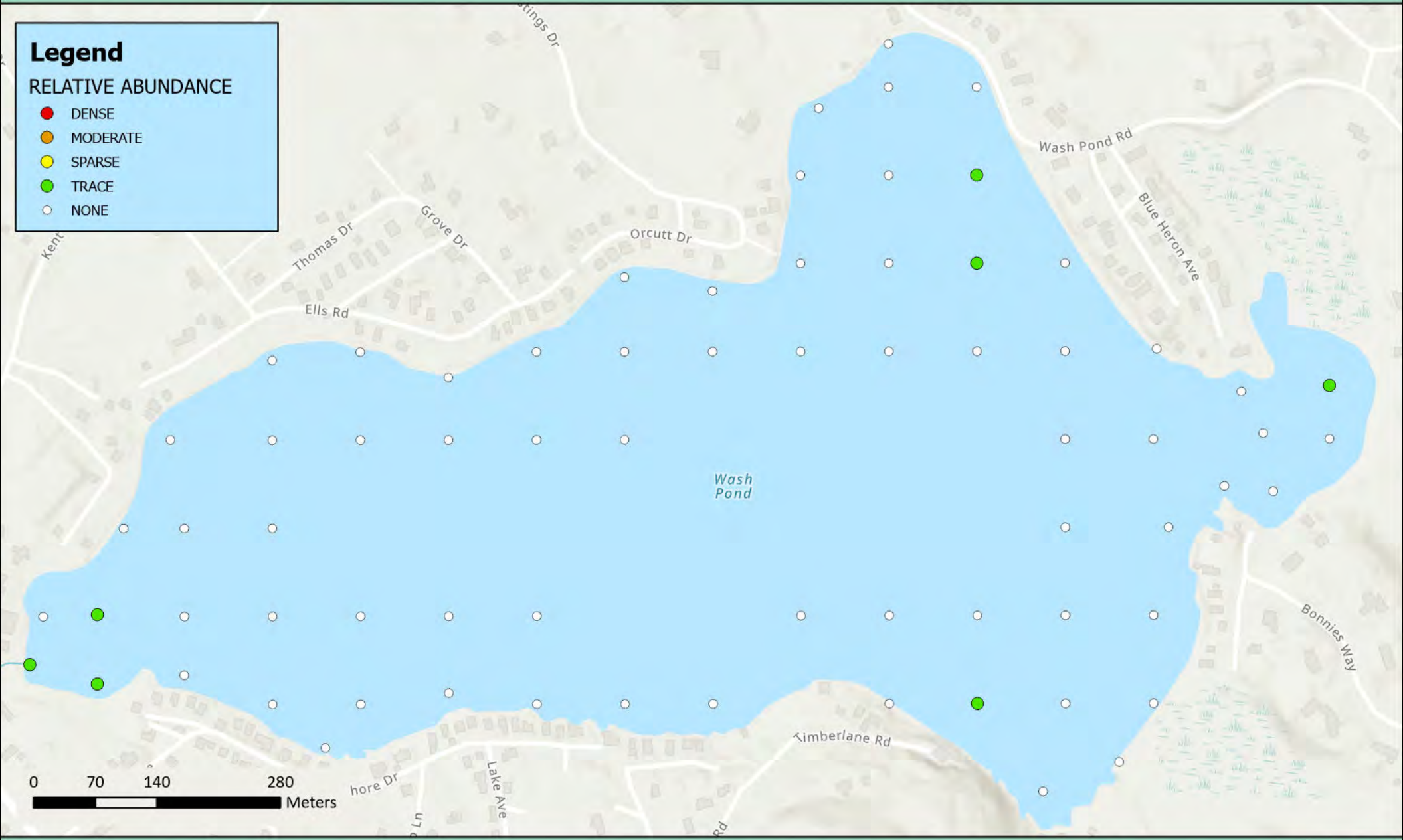
SUNSET LAKE (WASH POND)
HAMPSTEAD, NH
42.886968°, -71.176752°

COMPREHENSIVE POINT-INTERCEPT SURVEY
JULY 23, 2025

N

Pondweed Pursuits

RELATIVE ABUNDANCE OF FILAMENTOUS ALGA (7 PTS, OR 10%)



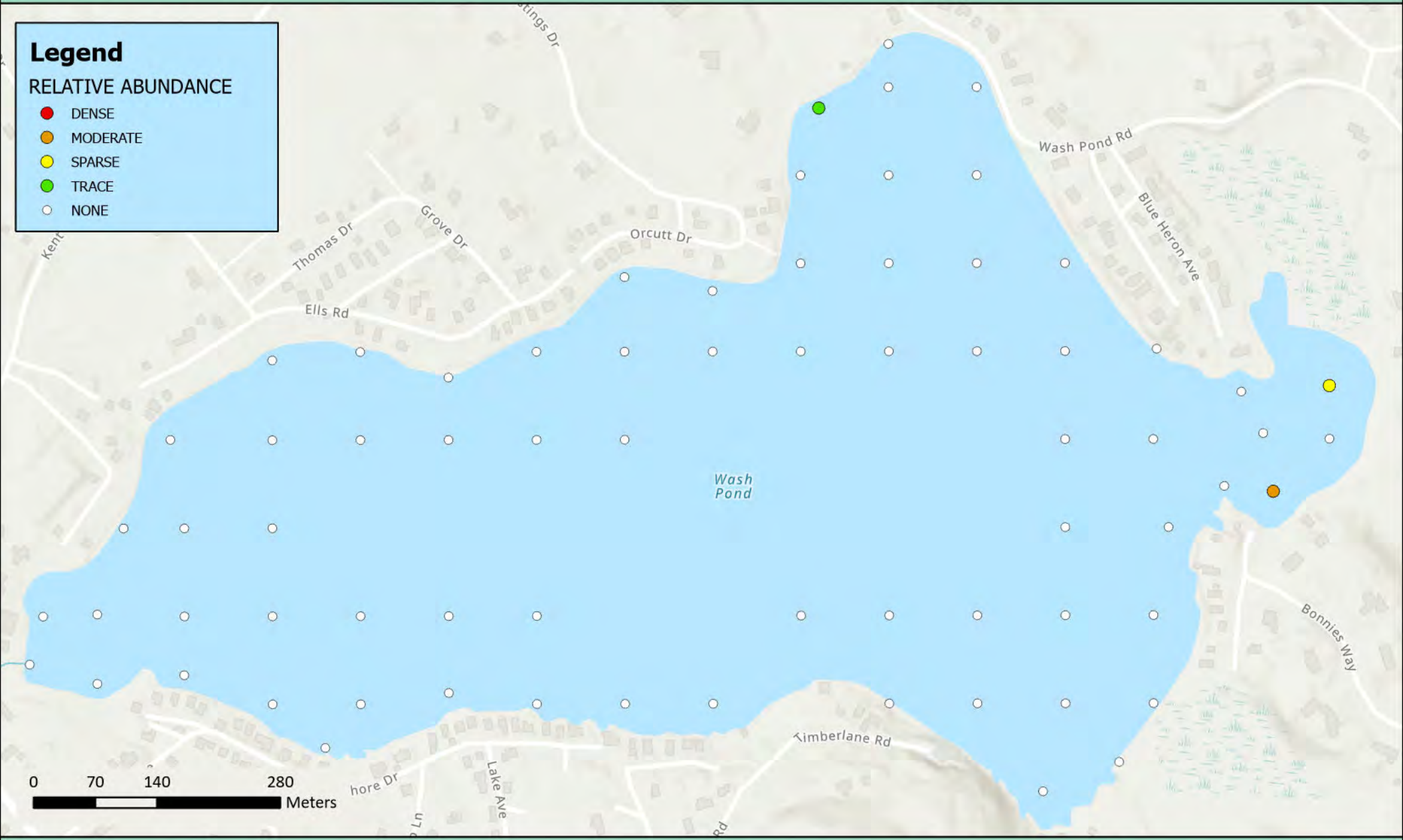
SUNSET LAKE (WASH POND)
HAMPSTEAD, NH
42.886968°, -71.176752°

COMPREHENSIVE POINT-INTERCEPT SURVEY
JULY 23, 2025

N

Pondweed Pursuits

RELATIVE ABUNDANCE OF BAYONET RUSH (J. MILITARIS) (3 PTS, OR 4%)



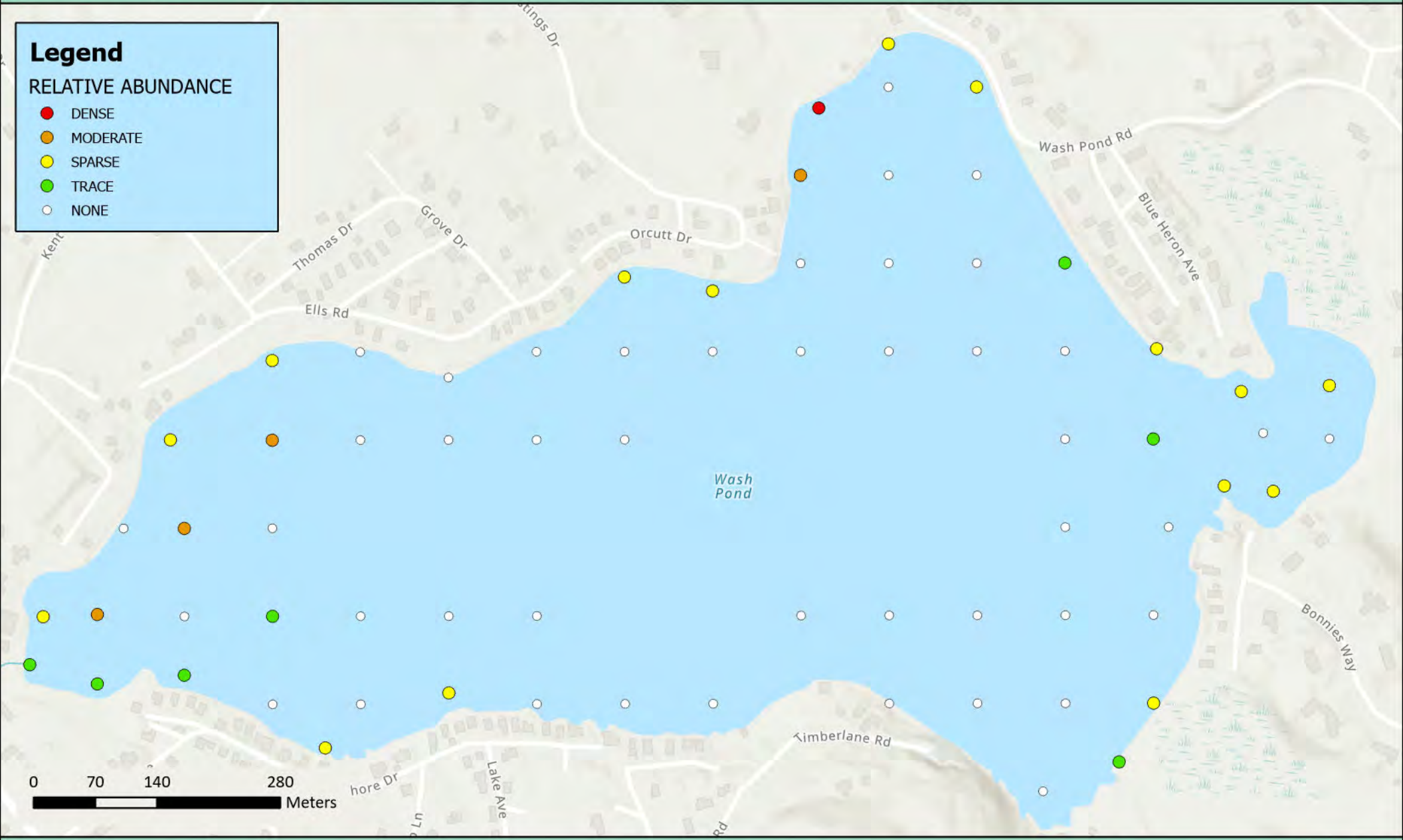
SUNSET LAKE (WASH POND)
HAMPSTEAD, NH
42.886968°, -71.176752°

COMPREHENSIVE POINT-INTERCEPT SURVEY
JULY 23, 2025

N

Pondweed Pursuits

RELATIVE ABUNDANCE OF SOUTHERN NAIAD (N. GUADALUPENSIS) (27 PTS, OR 38%)



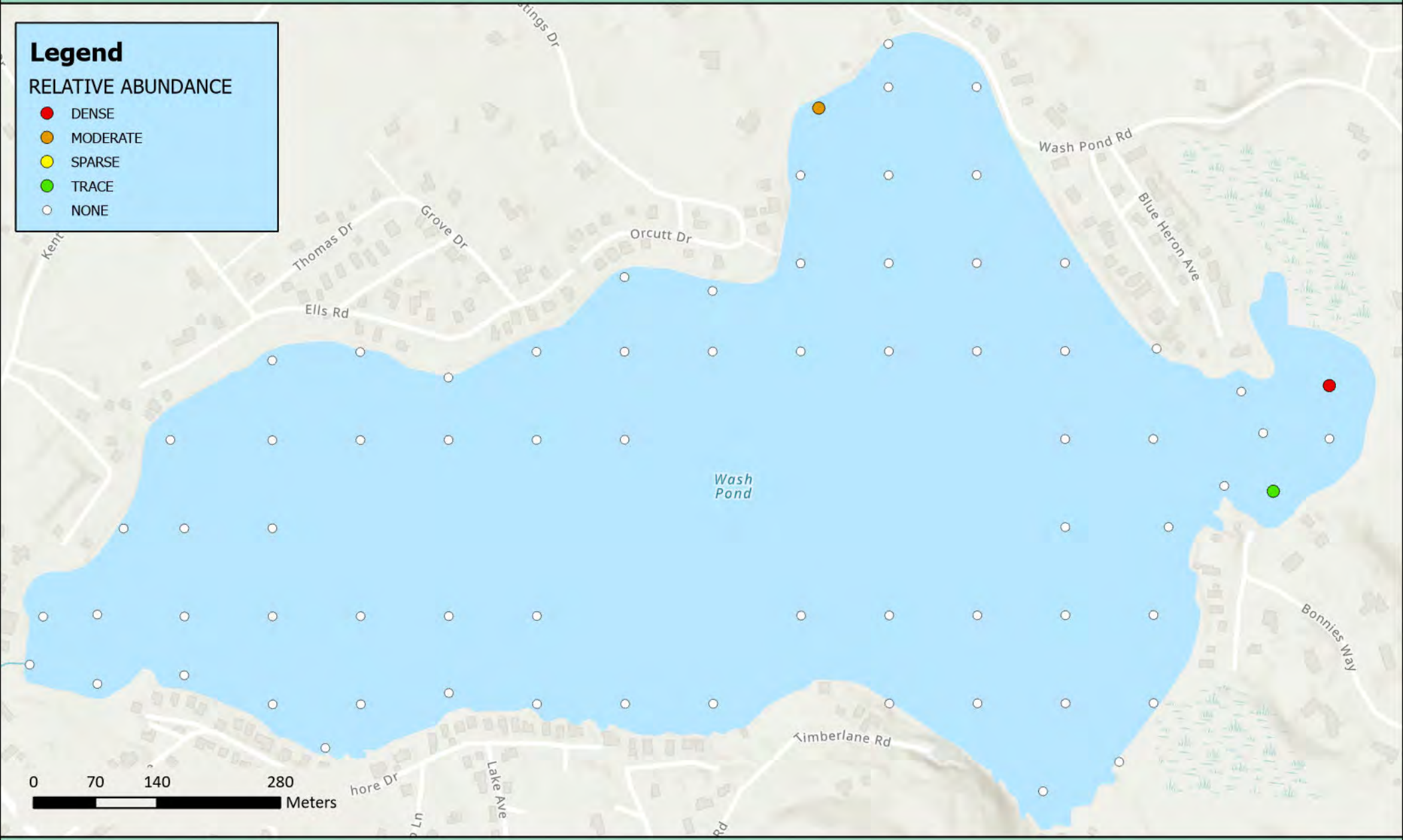
SUNSET LAKE (WASH POND)
HAMPSTEAD, NH
42.886968°, -71.176752°

COMPREHENSIVE POINT-INTERCEPT SURVEY
JULY 23, 2025

N

Pondweed Pursuits

RELATIVE ABUNDANCE OF WHITE WATERLILY (N. ODORATA) (3 PTS, OR 4%)



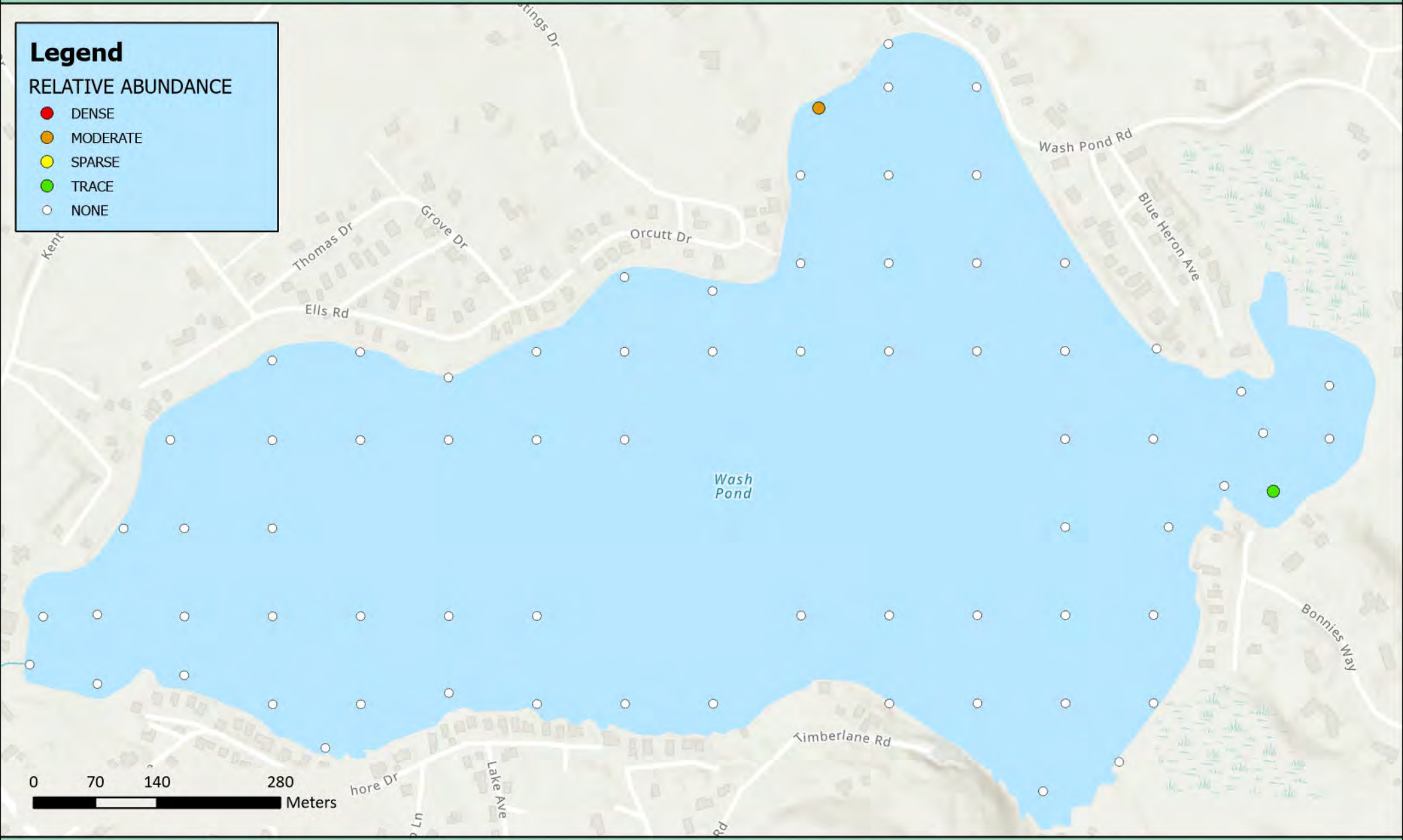
SUNSET LAKE (WASH POND)
HAMPSTEAD, NH
42.886968°, -71.176752°

COMPREHENSIVE POINT-INTERCEPT SURVEY
JULY 23, 2025

N

Pondweed Pursuits

RELATIVE ABUNDANCE OF YELLOW WATERLILY (N. VARIEGATA) (2 PTS, OR 3%)



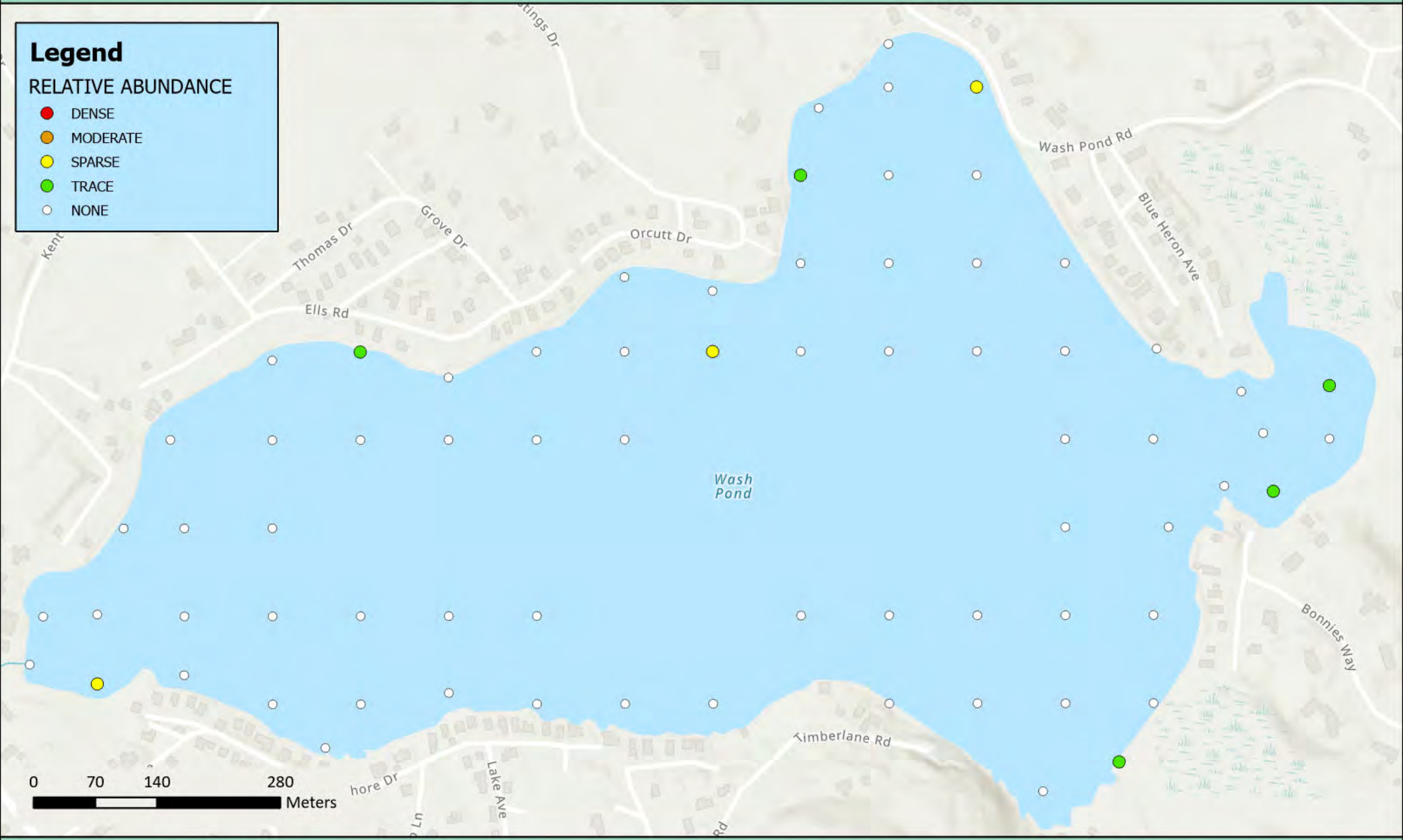
SUNSET LAKE (WASH POND)
HAMPSTEAD, NH
42.886968°, -71.176752°

COMPREHENSIVE POINT-INTERCEPT SURVEY
JULY 23, 2025

N

Pondweed Pursuits

RELATIVE ABUNDANCE OF BIG-LEAF PONDWEED (P. AMPLIFOLIUS) (8 PTS, OR 11%)



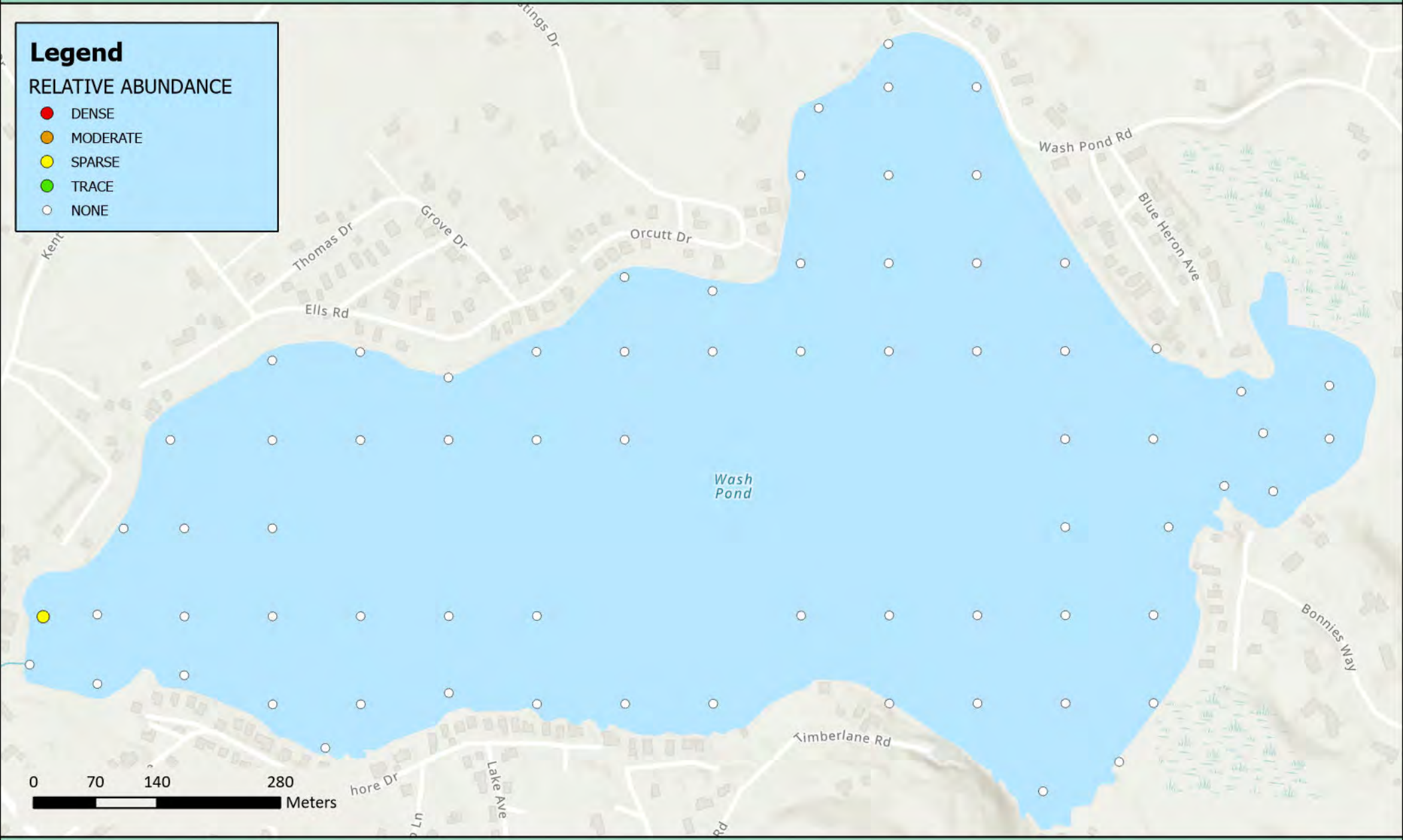
SUNSET LAKE (WASH POND)
HAMPSTEAD, NH
42.886968°, -71.176752°

COMPREHENSIVE POINT-INTERCEPT SURVEY
JULY 23, 2025

N

Pondweed Pursuits

RELATIVE ABUNDANCE OF SNAIL-SEED PONDWEED (P. BICUPULATUS) (1 PTS, 0R 1%)



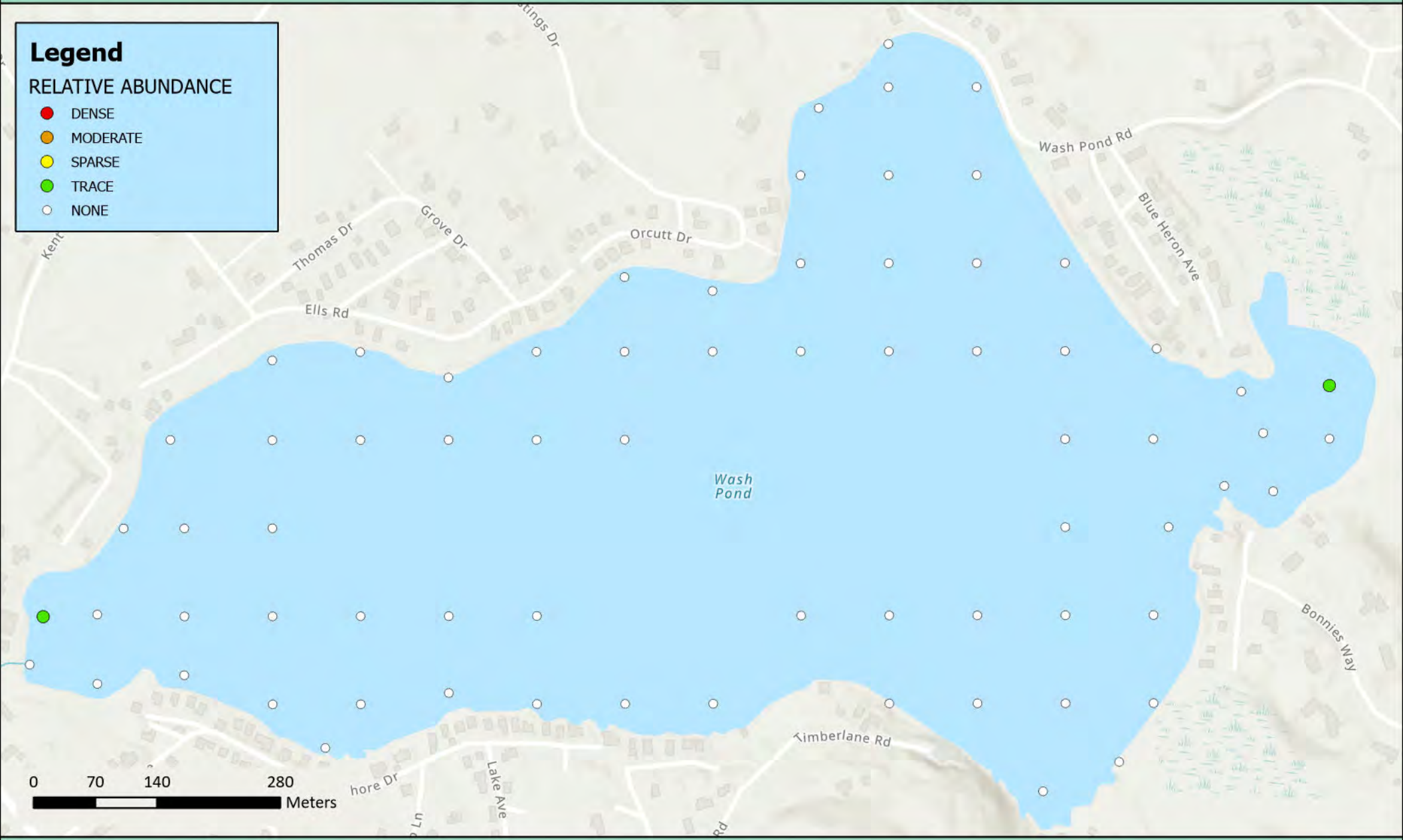
SUNSET LAKE (WASH POND)
HAMPSTEAD, NH
42.886968°, -71.176752°

COMPREHENSIVE POINT-INTERCEPT SURVEY
JULY 23, 2025

N

Pondweed Pursuits

RELATIVE ABUNDANCE OF RIBBON-LEAF PONDWEED (P. EPIHYDRUS) (2 PTS, OR 3%)



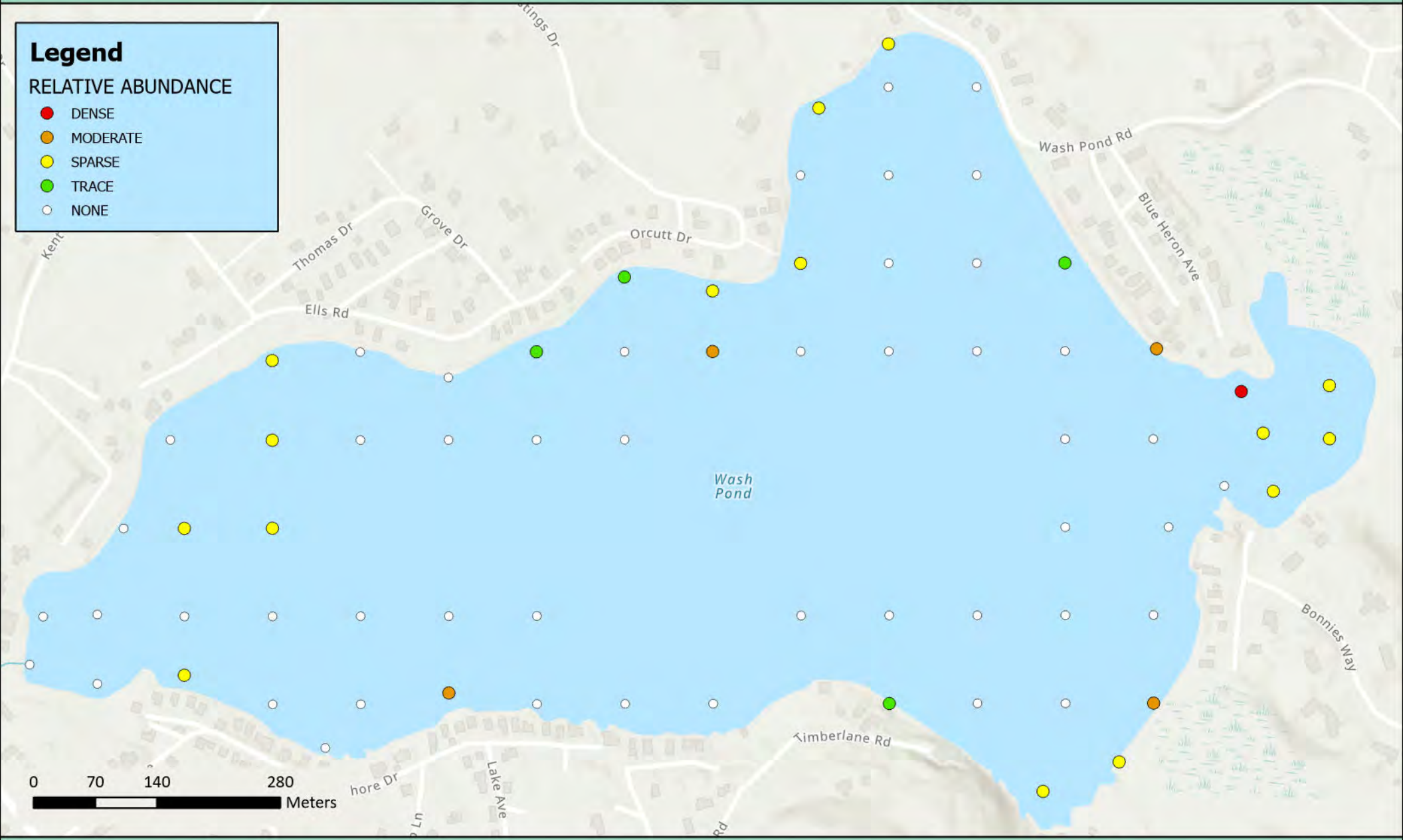
SUNSET LAKE (WASH POND)
HAMPSTEAD, NH
42.886968°, -71.176752°

COMPREHENSIVE POINT-INTERCEPT SURVEY
JULY 23, 2025

N

Pondweed Pursuits

RELATIVE ABUNDANCE OF VARIABLE-LEAF PONDWEED (P. GRAMINEUS) (24 PTS, OR 34%)



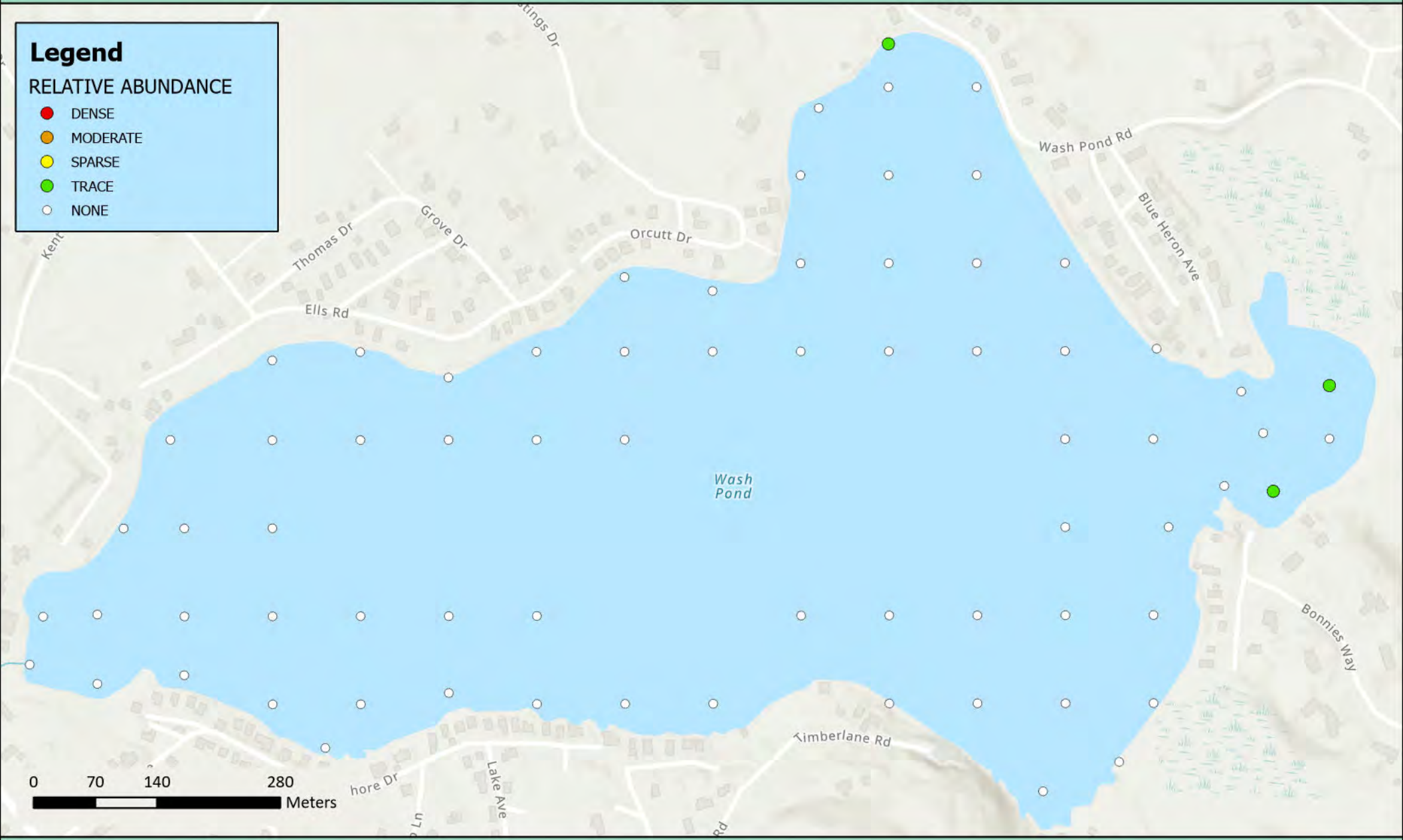
SUNSET LAKE (WASH POND)
HAMPSTEAD, NH
42.886968°, -71.176752°

COMPREHENSIVE POINT-INTERCEPT SURVEY
JULY 23, 2025

N

Pondweed Pursuits

RELATIVE ABUNDANCE OF FLOATING-LEAF PONDWEED (P. NATANS) (3 PTS, OR 4%)



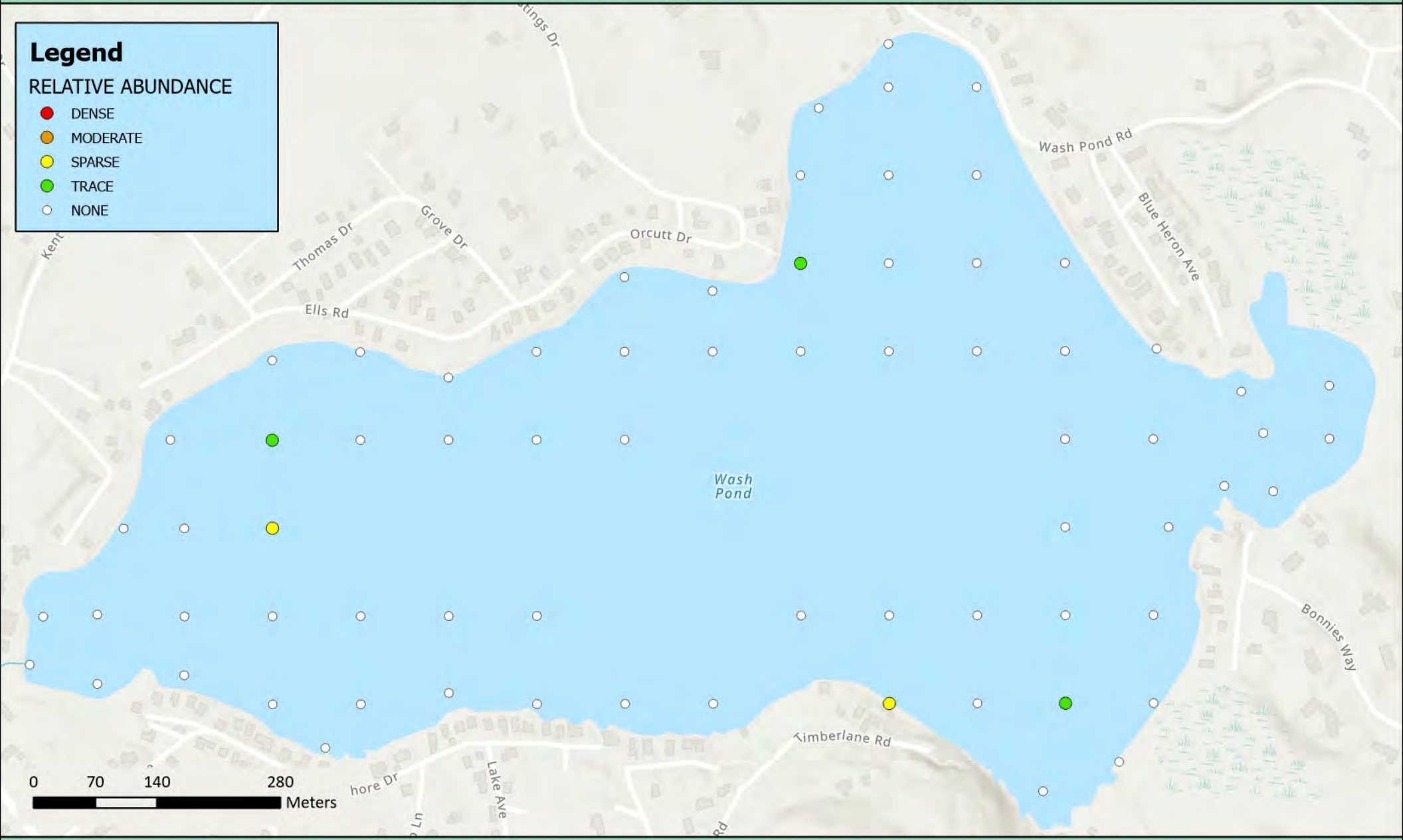
SUNSET LAKE (WASH POND)
HAMPSTEAD, NH
42.886968°, -71.176752°

COMPREHENSIVE POINT-INTERCEPT SURVEY
JULY 23, 2025

N

Pondweed Pursuits

RELATIVE ABUNDANCE OF CLASPING-LEAF PONDWEED (P. PERFOLIATUS) (5 PTS, OR 7%)



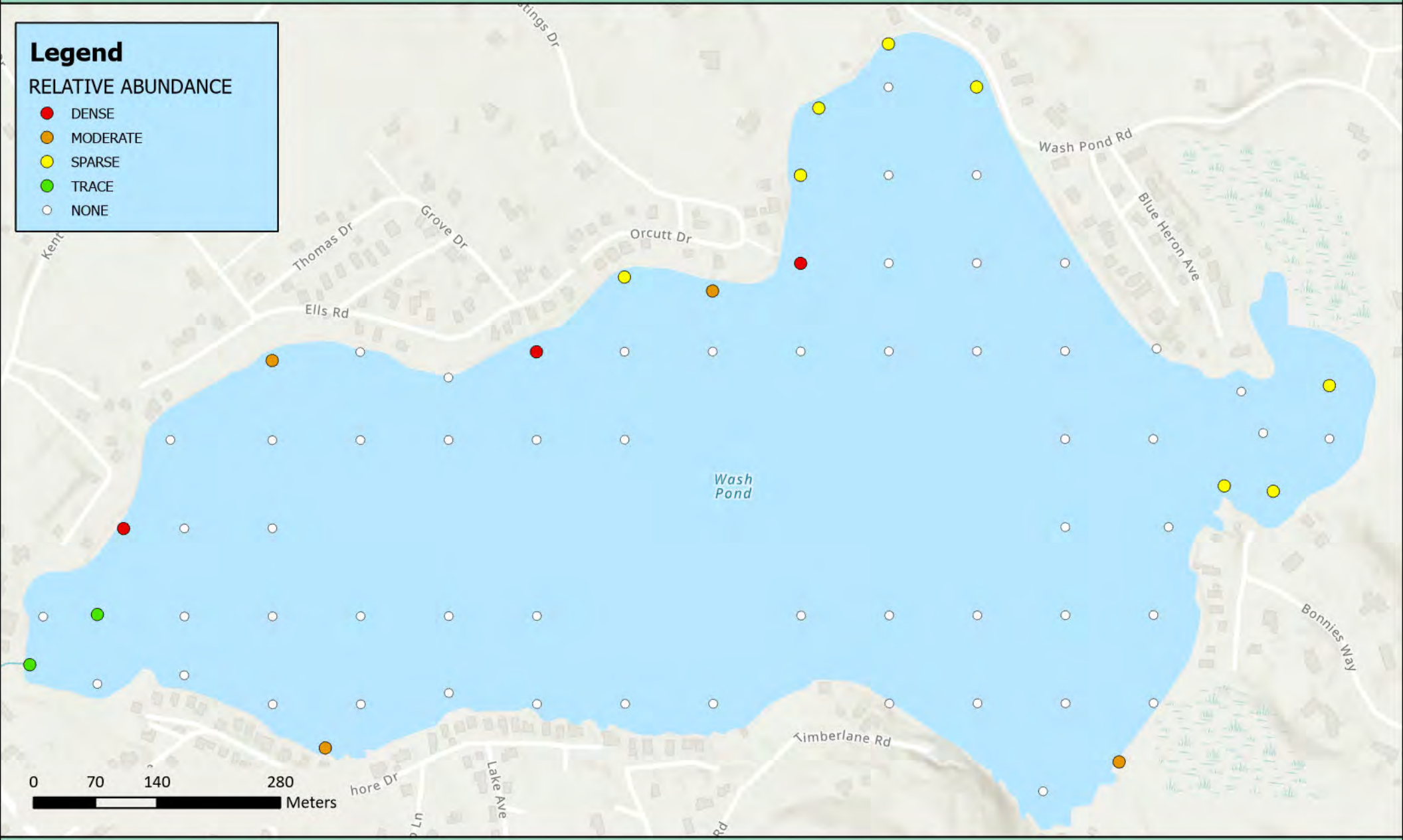
SUNSET LAKE (WASH POND)
HAMPSTEAD, NH
42.886968°, -71.176752°

COMPREHENSIVE POINT-INTERCEPT SURVEY
JULY 23, 2025

N

Pondweed Pursuits

RELATIVE ABUNDANCE OF THIN-LEAF PONDWEED (P. PUSILLUS) (17 PTS, OR 24%)



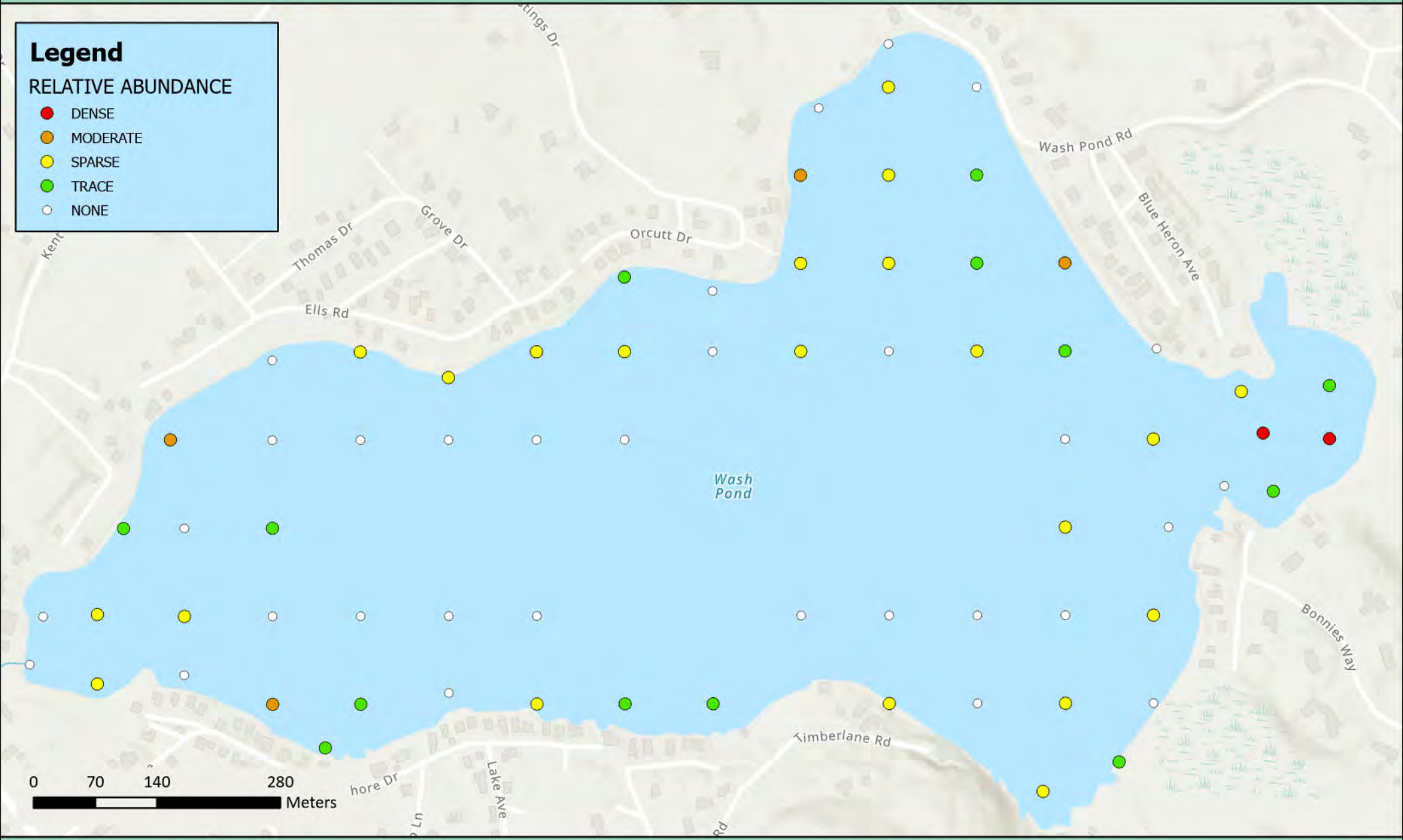
SUNSET LAKE (WASH POND)
HAMPSTEAD, NH
42.886968°, -71.176752°

COMPREHENSIVE POINT-INTERCEPT SURVEY
JULY 23, 2025

N

Pondweed Pursuits

RELATIVE ABUNDANCE OF ROBBIN'S PONDWEED (P. ROBBINSII) (40 PTS, OR 56%)



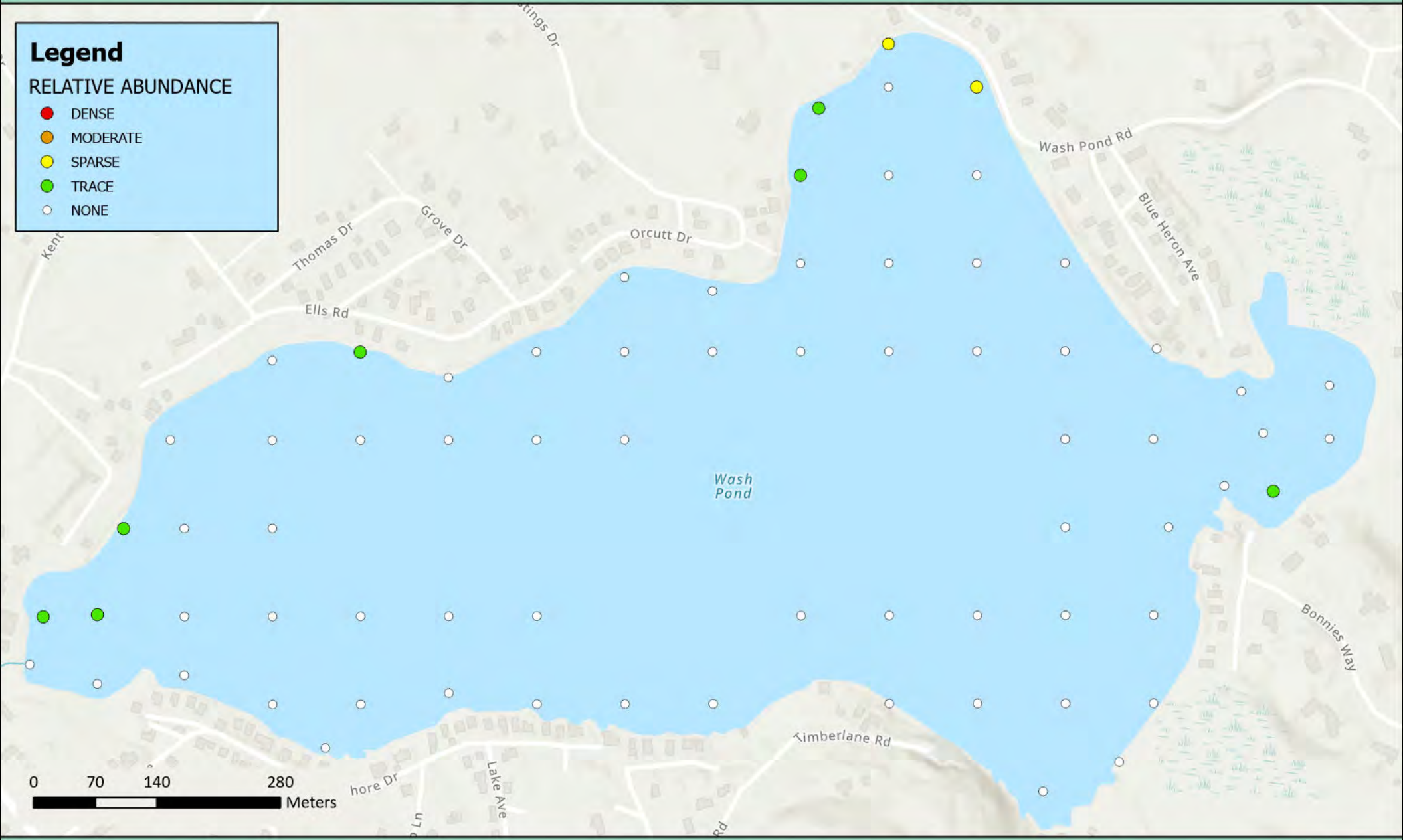
SUNSET LAKE (WASH POND)
HAMPSTEAD, NH
42.886968°, -71.176752°

COMPREHENSIVE POINT-INTERCEPT SURVEY
JULY 23, 2025

N

Pondweed Pursuits

RELATIVE ABUNDANCE OF SPIRAL-FRUITED PONDWEED (P. SPIRILLUS) (9 PTS, OR 13%)



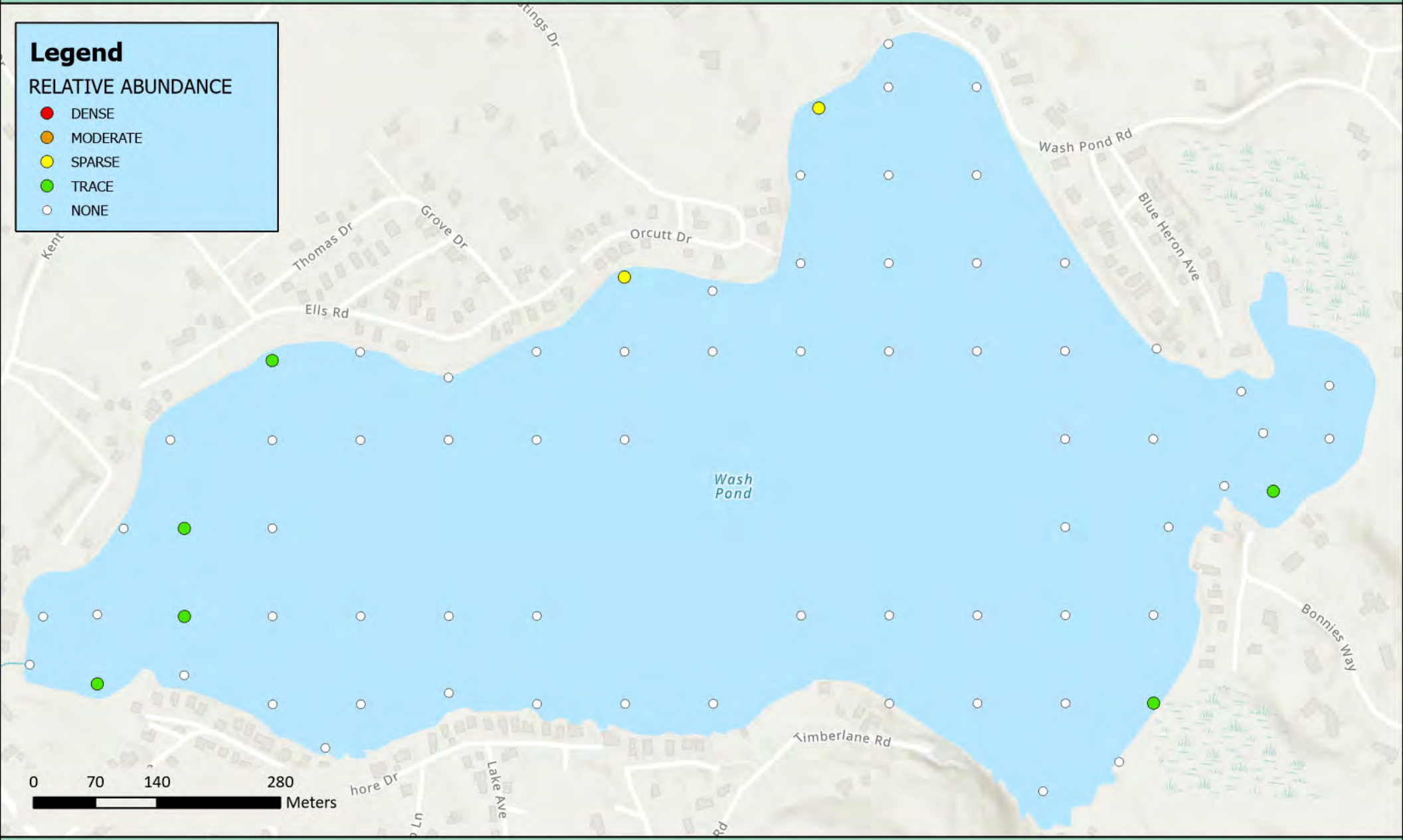
SUNSET LAKE (WASH POND)
HAMPSTEAD, NH
42.886968°, -71.176752°

COMPREHENSIVE POINT-INTERCEPT SURVEY
JULY 23, 2025

N

Pondweed Pursuits

RELATIVE ABUNDANCE OF ARROWHEAD (SAGITTARIA SPP.) (8 PTS, OR 11%)



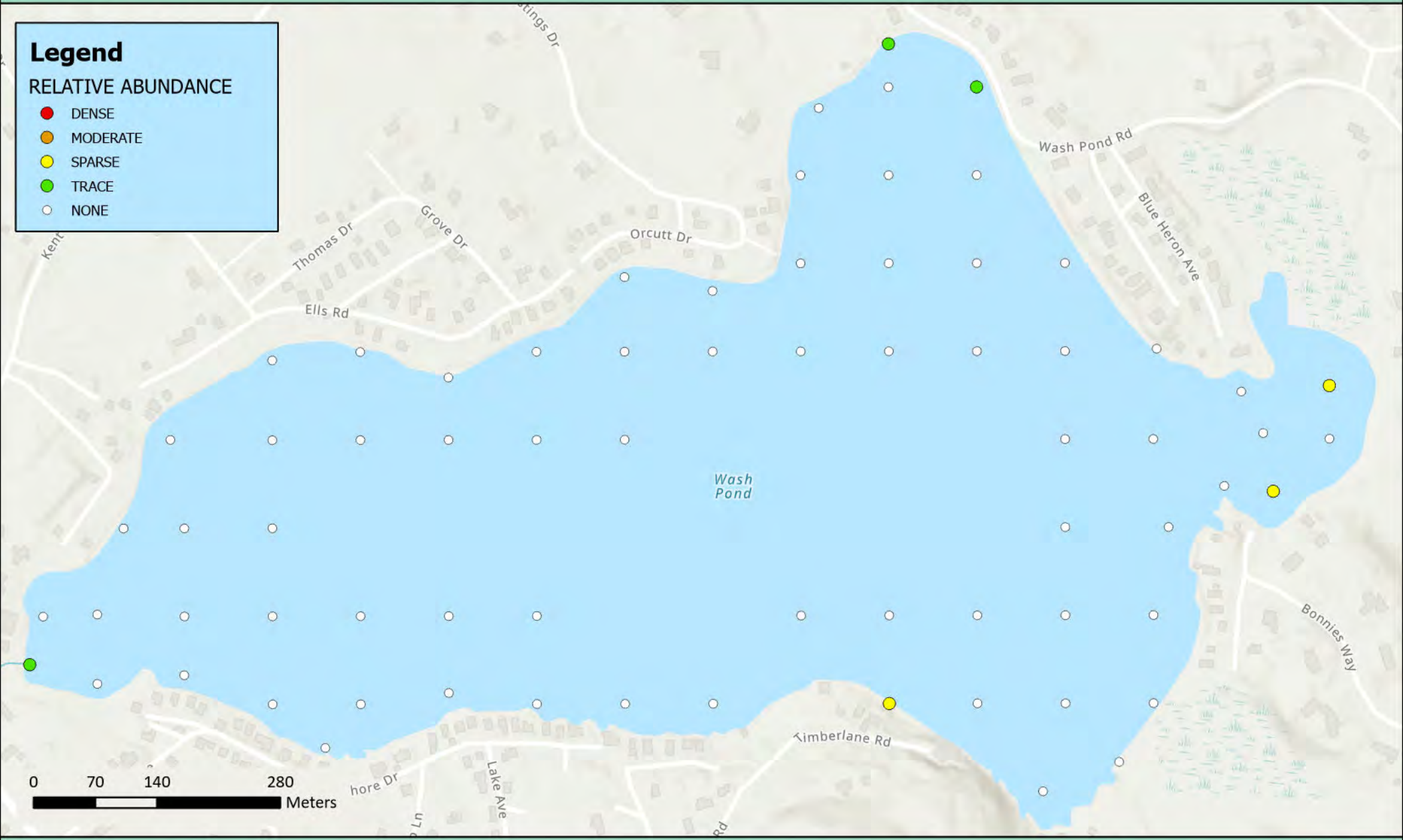
SUNSET LAKE (WASH POND)
HAMPSTEAD, NH
42.886968°, -71.176752°

COMPREHENSIVE POINT-INTERCEPT SURVEY
JULY 23, 2025

N

Pondweed Pursuits

RELATIVE ABUNDANCE OF BURREED (SPARGANIUM SPP.) (6 PTS, OR 8%)

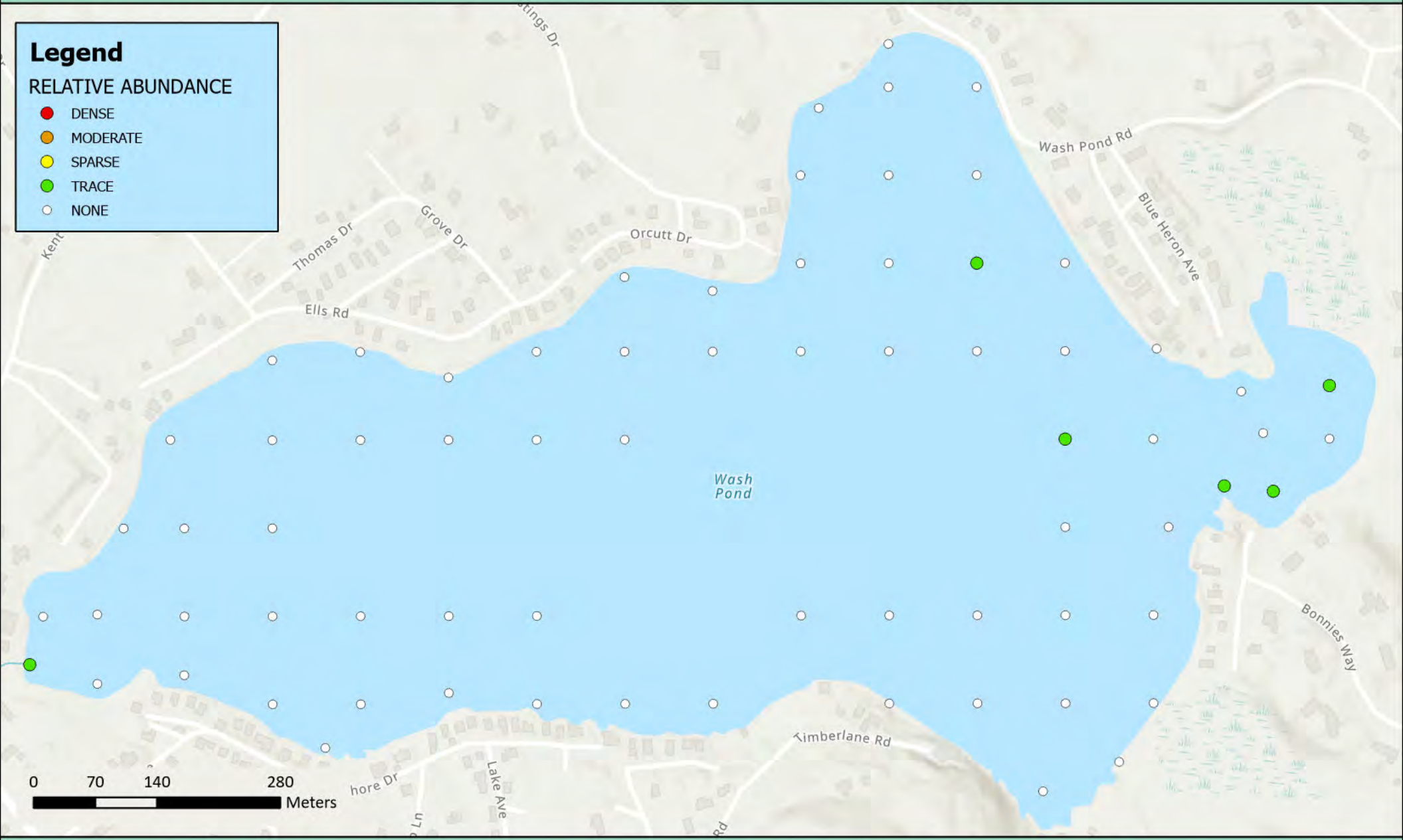


SUNSET LAKE (WASH POND)
HAMPSTEAD, NH
42.886968°, -71.176752°

COMPREHENSIVE POINT-INTERCEPT SURVEY
JULY 23, 2025

Pondweed Pursuits

RELATIVE ABUNDANCE OF HUMPED BLADDERWORT (U. GIBBA) (6 PTS, OR 8%)



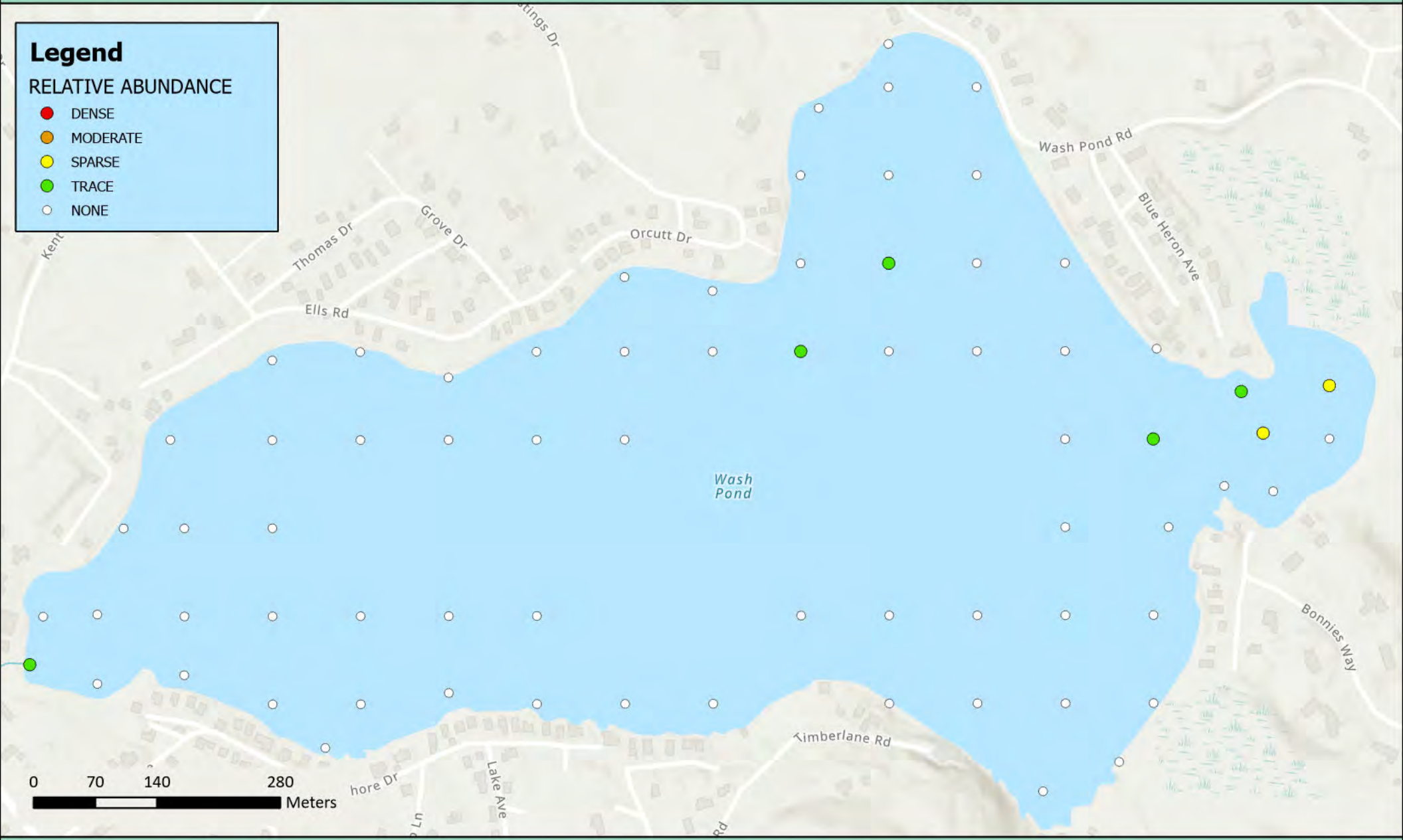
SUNSET LAKE (WASH POND)
HAMPSTEAD, NH
42.886968°, -71.176752°

COMPREHENSIVE POINT-INTERCEPT SURVEY
JULY 23, 2025

N

Pondweed Pursuits

RELATIVE ABUNDANCE OF PURPLE BLADDERWORT (U. PURPUREA) (7 PTS, OR 10%)



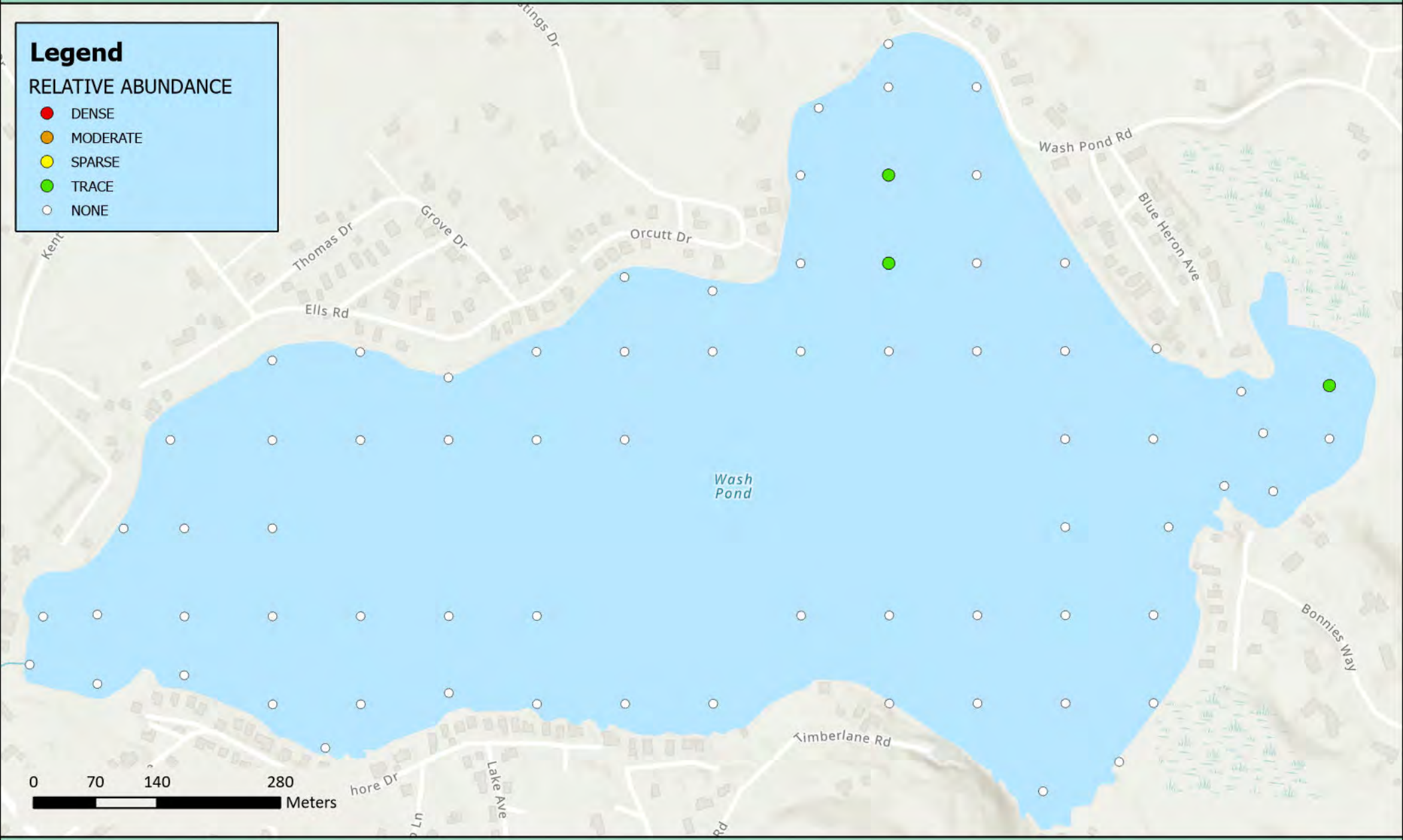
SUNSET LAKE (WASH POND)
HAMPSTEAD, NH
42.886968°, -71.176752°

COMPREHENSIVE POINT-INTERCEPT SURVEY
JULY 23, 2025

N

Pondweed Pursuits

RELATIVE ABUNDANCE OF LITTLE-FLOATING BLADDERWORT (U. RADIATA) (3 PTS, OR 4%)



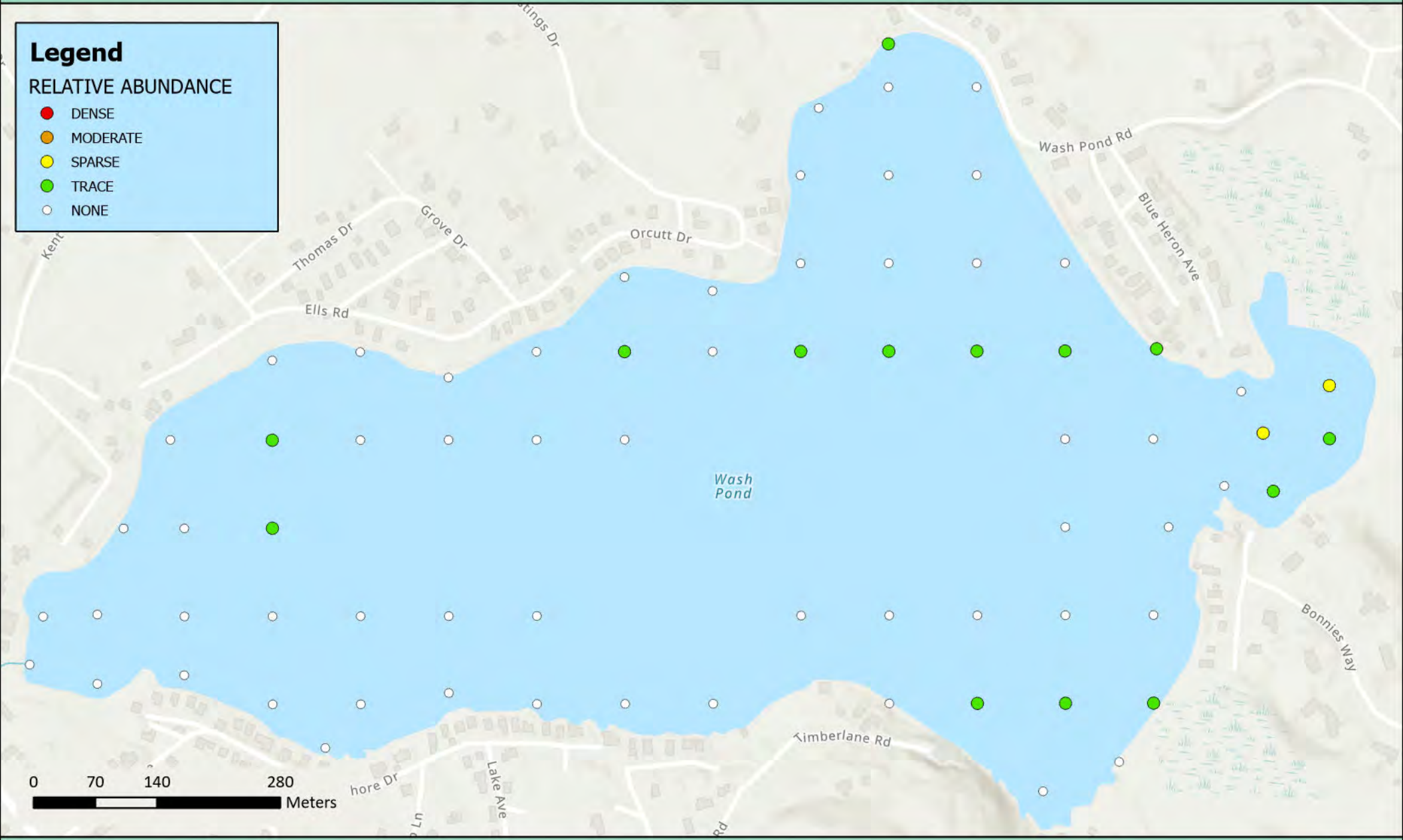
SUNSET LAKE (WASH POND)
HAMPSTEAD, NH
42.886968°, -71.176752°

COMPREHENSIVE POINT-INTERCEPT SURVEY
JULY 23, 2025

N

Pondweed Pursuits

RELATIVE ABUNDANCE OF COMMON BLADDERWORT (U. VULGARIS.) (16 PTS, OR 23%)



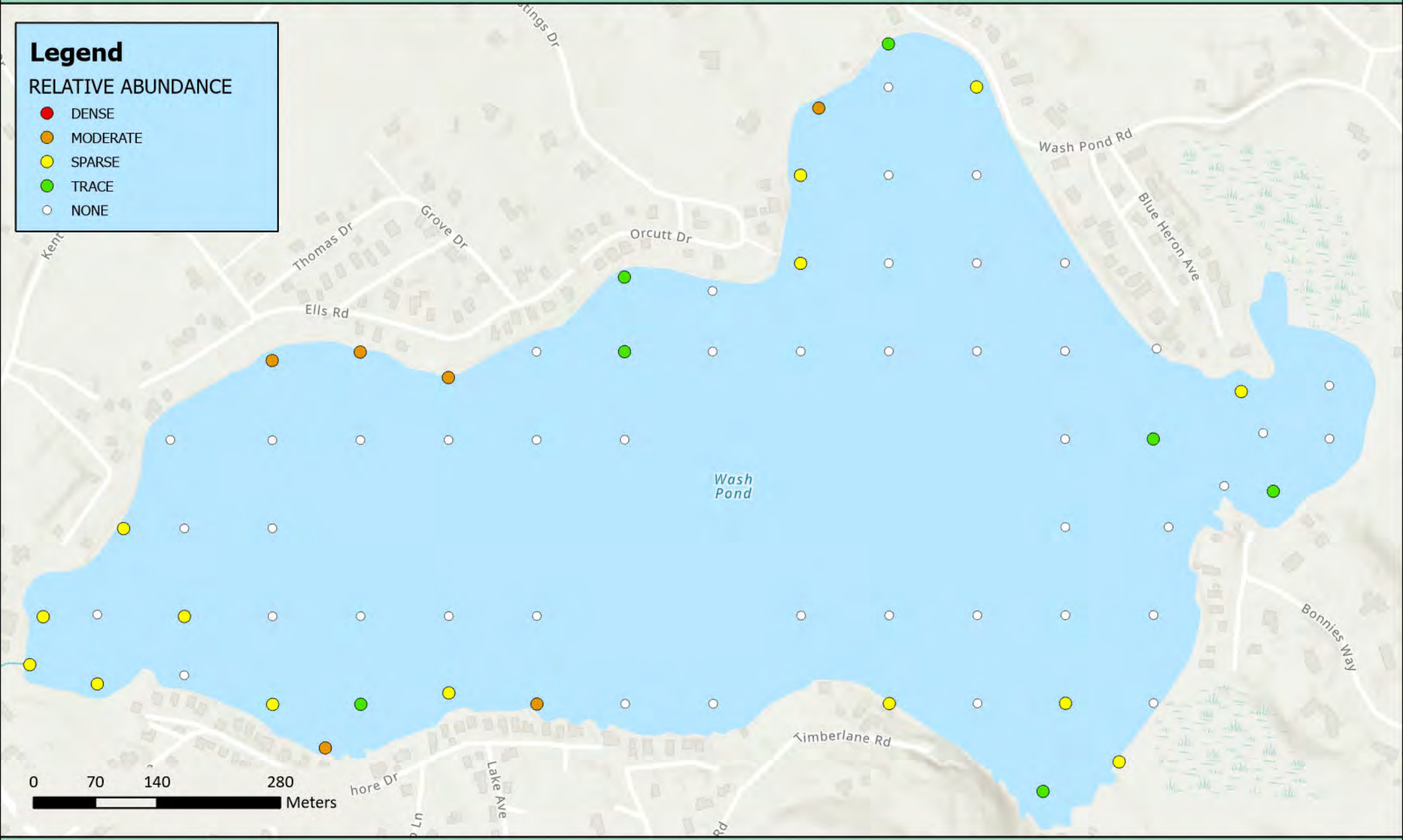
SUNSET LAKE (WASH POND)
HAMPSTEAD, NH
42.886968°, -71.176752°

COMPREHENSIVE POINT-INTERCEPT SURVEY
JULY 23, 2025

N

Pondweed Pursuits

RELATIVE ABUNDANCE OF TAPEGRASS (V. AMERICANA) (27 PTS, OR 38%)



SUNSET LAKE (WASH POND)
HAMPSTEAD, NH
42.886968°, -71.176752°

COMPREHENSIVE POINT-INTERCEPT SURVEY
JULY 23, 2025

Pondweed Pursuits

APPENDIX C

RAW DATA TABLE

DATA POINT	DEPTH	BIOVOLUME	PERCENT (%) COVER ALL	BIG-LEAF PONDWEED	ROBBINS PONDWEED	THIN-LEAF PONDWEED	VARIABLE-LEAF PONDWEED	CLASPING-LEAF PONDWEED	SPIRAL FRUIT PONDWEED	RIBBON-LEAF PONDWEED	FLOATING-LEAF PONDWEED	SNAILSEED PONDWEED	WATERWEED	TAPEGRASS	BURREED	ARROWHEAD	SOUTHERN NAIAD	COMMON BLADDERWORT	PURPLE BLADDERWORT	LITTLE FLOATING BLADDERWORT	HUMPED BLADDERWORT	WHITE WATERLILY	YELLOW WATERLILY	WATERSHIELD	RUSH	SPIKERUSH	MUSKGRASS	FILAMENTOUS ALGAE
1	4	3	45						T	T		S	T	S			S										S	
2	5	3	80			T							S	S	T		T		T		T						M	P
3	6	3	80	S	S								T	S		T	T										T	P
4	9	3	75		S	T			T				S				M											P
5	3	4	60		T	D			T				T	S														
6	3.5	4	60		M												S											
7	5	3	60				S									T	M											
8	7.1	2	30		S									S		T												
9	5.3	4	50				S						M				T											
10	11	1	5														T										T	
11	9	2	50		M									S														
12	4	4	100		T	M							M	M			S											
13	8	1	15		T									T														
14	14	0	0																									
15	20	0	0																									
16	5	4	80				M						S	S			S											
17	5	2	60		S								T	M														
18	25	0	0																									
19	6.5	1	10		T																							
20	7.6	1	10		T																							
21	22	0	0																									
22	23	0	0																									
23	7.2	3	50		S		T	S						S	S													
24	13	1	15										T					T										P
25	21	0	0																									

DATA POINT	DEPTH	BIOVOLUME	PERCENT (%) COVER ALL	BIG-LEAF PONDWEED	ROBBINS PONDWEED	THIN-LEAF PONDWEED	VARIABLE-LEAF PONDWEED	CLASPING-LEAF PONDWEED	SPIRAL FRUIT PONDWEED	RIBBON-LEAF PONDWEED	FLOATING-LEAF PONDWEED	SNAILSEED PONDWEED	WATERWEED	TAPEGRASS	BURREED	ARROWHEAD	SOUTHERN NAIAD	COMMON BLADDERWORT	PURPLE BLADDERWORT	LITTLE FLOATING BLADDERWORT	HUMPED BLADDERWORT	WHITE WATERLILY	YELLOW WATERLILY	WATERSHIELD	RUSH	SPIKERUSH	MUSKGRASS	FILAMENTOUS ALGAE
26	22	0	0																									
27	8.7	4	45		S			T					T	S				T										
28	5.6	4	60		S		S							T														
29	4	4	75	T	T	M	S						T	S			T										S	
30	4	4	80				M									T	S	T										
31	7.2	1	30		S																							
32	6	1	5										T															
33	16	0	0																									
34	13	1	20										T								T						S	
35	8	1	30		S									T			T		T									
36	6	3	30			S											S				T							
37	5.5	3	100		D		S											S	S								S	
38	3.2	4	90		S		D							S			S		T									
39	3	4	100	T	T	S	S			T	T		T		S		S	S	S	T	T	D		T	S		T	P
40	7	4	100		D		S											T										
41	2	4	90	T	T	S	S		T		T		A	T	S	T	S	T			T	T	T	T	M	S	T	
42	5	3	80				M						S				S	T										
43	8	2	15		T													T										
44	4	2	60		M		T						S				T											
45	6.5	4	90	S		S			S				S	S	T		S										S	
46	11.5	1	5		T																							P
47	11.6	1	10		T								T								T							P
48	10	1	20		S								T					T										
49	11.8	1	5															T									T	
50	10.6	1	15		S														T	T							S	

DATA POINT	DEPTH	BIOVOLUME	PERCENT (%) COVER ALL	BIG-LEAF PONDWEED	ROBBINS PONDWEED	THIN-LEAF PONDWEED	VARIABLE-LEAF PONDWEED	CLASPING-LEAF PONDWEED	SPIRAL FRUIT PONDWEED	RIBBON-LEAF PONDWEED	FLOATING-LEAF PONDWEED	SNAILSEED PONDWEED	WATERWEED	TAPEGRASS	BURREED	ARROWHEAD	SOUTHERN NAIAD	COMMON BLADDERWORT	PURPLE BLADDERWORT	LITTLE FLOATING BLADDERWORT	HUMPED BLADDERWORT	WHITE WATERLILY	YELLOW WATERLILY	WATERSHIELD	RUSH	SPIKERUSH	MUSKGRASS	FILAMENTOUS ALGAE
51	11	1	15		S															T								
52	6.5	1	40		S								T															
53	3	4	50			S	S		S		T		T	T	T		S	T										
54	2	4	100			S	S		T				S	M		S	D					M	M		T	S		
55	3	4	100	T	M	S			T				T	S			M											
56	4	4	80		S	D	S	T					T	S														
57	11	2	30		S													T	T								S	
58	8	3	75	S			M						T															
59	3	4	90			M	S						T				S											
60	3	4	65		T	S	T							T		S	S										S	
61	11	2	35		S									T				T										
62	28	0	0																									
63	15	1	30										T														S	
64	2	4	75		S	D	T						T															
65	5	4	70		S								S	M														
66	14	1	10																								T	
67	11	0	0																									
68	4.5	4	90	T	S				T				T	M														
69	2	4	90			M	S							M		T	S											
70	4.4	2	40				S	T									M	T										
71	7.6	4	50		T		S	S										T										