# LAKE HOPATCONG – 2021 AQUATIC PLANT SURVEY

## LANDING, MORRIS COUNTY, NEW JERSEY

**DECEMBER 2022**


**PREPARED FOR:**

LAKE HOPATCONG COMMISSION
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# TABLE OF CONTENTS

# 1.0 INTRODUCTION

Princeton Hydro, LLC was contracted by the Lake Hopatcong Commission to conduct submerged aquatic vegetation (SAV) surveys of select near-shore locations throughout Lake Hopatcong, Morris and Sussex Counties, NJ. Due to high densities of aquatic macrophyte communities noted along many shoreline areas, various chemical treatment techniques have been implemented to manage nuisance densities. Typically, certified applicators are contracted by private property owners or nearshore homeowner groups to conduct these treatments of aquatic pesticides along select nearshore areas.

An annual mechanical weed harvesting program has also been in operation since the mid 1980's. Originally, the program was overseen by the Lake Hopatcong Regional Planning Board and since 2001 it has been overseen by the Lake Hopatcong Commission and/or NJDEP. It should be noted that the mechanical harvesting program was minimal to non-existent over the last three years (2019 – 2021) due to various reasons. For example, in 2019 the large, lake-wide Harmful Algal Blooms (HABs) resulted in lower amounts of plant growth so harvesting operations were minimal.

In recent years, other potential management actions have been suggested and discussed in the control of nuisance plant growth in various cove and nearshore areas, such as hydro-raking and the stocking of sterile grass carp.

Princeton Hydro conducted a near-shore submerged aquatic vegetation (SAV) survey at Lake Hopatcong on 2 August 2021. The purpose of this survey was to establish an inventory of the SAV community within Lake Hopatcong, identify nuisance plant densities, and invasive/endangered species locations. In addition, these data were compared to similar data collected on the 1st of August 2018, which was the year prior to the massive, lake-wide HAB event. This information will be used going forward to help track shifts in community composition as plant management techniques continue. The program will aid in providing another means of identifying any new invasive species such as hydrilla (*Hydrilla verticillata*) that may infest the lake.

The following report discusses the results of the SAV survey conducted on 2 August 2021 and compares the data to the collected on 1 August 2018.

# 2.0 METHODOLOGY

The SAV survey in Lake Hopatcong was conducted at a number of near-shore locations around the lake on 2 August 2021. A total of twenty-two (22) sampling locations were selected by Princeton Hydro spanning the entirety of the lake, as shown in Figures 1 and 2 (Appendix I).

Within the sampling area, sampling locations were chosen with approximately 1 meter in depth or less to ensure survey work was being conducted within the littoral zone. Once located, the sampling station was recorded using a hand-held GPS device. A 1 $m^2$ floating quadrat was placed over a stand of plants within the designated sampling areas. Two areas were between an island and the shoreline, in which case plots were sampled along both the main shore and island shore. The area inside the quadrat, defined on the bed of the lake by drop chains, was observed and surveyed using an Aquascope and/or rake grabs and all plants that fell within the quadrat were identified to species. Species identifications were made utilizing previous identification knowledge and various aquatic plant field guides including (Borman, 1997, Hellquist, 1980). Species were semi-quantitatively ranked according to the following guidance:

- Abundant (greater than or equal to 50% of area)
- Common (between 10 and 50% of area)
- Present (less than or equal to 10% of area)

Locations within the River Styx/Crescent Cove area were also harvested for further analysis. The above sediment plant material was placed into plastic bags and transported to Princeton Hydro's Biological Laboratory in a cooler with ice and weighed by species to the nearest gram (wet weight). The following section provides the results of this survey.

Finally, this methodology followed the same protocol that was utilized during 1 August 2018 SAV survey. The same sampling sites were surveys so a direct comparison between the 2018 and the 2021 data could be conducted. For convenience the sampling location and their associated station label are listed below:

| **Location** | **Station** | **Location** | **Station** |
|---|---|---|---|
| Landing | HC-1 | Great Cove | HC-12 |
| Landing Island | HC-2 | Davis Cove | HC-13 |
| Near Silver Springs | HC-3 | Byram Cove | HC-14 |
| King Cove | HC-4 | Henderson Cove | HC-15 |
| Ingram Cove | HC-5 | Halsey Island Shore | HC-16 |
| River Styx | HC-6 | Halsey Main Shore | HC-17 |
| Crescent Cove | HC-7 | N Cherry Rd Cove | HC-18 |
| Crescent Cove | HC-8 | Below Espanong Rd Bridge | HC-19 |
| Crescent Cove | HC-9 | Flash Marina | HC-20 |
| Crescent Cove | HC-10 | Liffy Island Shore | HC-21 |
| Van Every Cove | HC-11 | Liffy Main Shore | HC-22 |

# 3.0 RESULTS & DISCUSSION

## *3.1 COMMUNITY COMPOSITION ANALYSIS*

SAV community structure results within Lake Hopatcong from the August 2021 sampling event are provided in Table 3.1.

Community composition and abundance were highly variable throughout the lake. High densities of species were observed at HC-3, HC-4, HC-16, HC-17, and HC-21.

HC-1 was characterized by an abundance of white-water lily (*Nymphaea odorata*) and lower densities of Eurasian watermilfoil (*Myriophyllum spicatum*), while HC-2 had a more diverse plant community. HC-2 was dominated by tapegrass (*Vallisneria americana*) and to a lesser degree, slender naiad (*Najas flexilis*). Lower densities of large-leaf pondweed and Eurasian watermilfoil were also noted at this site, similar to 2018.

HC-3 had relatively high richness observed in 2021 with five species noted but this was less than that observed in 2018 (nine species). The SAV community was dominated by slender naiad during the 2021 event. Robbin's pondweed (*Potamogeton robbinsii*), an endangered species in New Jersey, was identified in low densities at HC-3.

Stations at King and Ingram Coves (HC-4 and HC-5) were both dominated by slender naiad with all other species only listed as 'present.' Robbin's pondweed was again identified in low densities at HC-4.

HC-11 in Van Every Cove consisted of slender naiad and large-leaf pondweed (*Potamogeton amplifolius*) with no tapegrass, which was observed in 2018. Communities observed within Great Cove (HC-12) were dominated by slender naiad and Eurasian watermilfoil with lower amounts of tapegrass and large-leaf pondweed. No aquatic plants were observed within Davis Cove (HC-13), Byram Cove (HC-14), and Henderson Cove (HC-15). In 2018, tapegrass was present at all three locations and was abundant at HC-15.

Two sampling locations were chosen adjacent to islands, including Halsey Island and Liffy Island. Plots were sampled against both the mainland and island shores at both these sites. Stations at Halsey Island (HC-16 and HC-17) yielded a similar community composition. HC-16 (island shore) was dominated by Eurasian watermilfoil and coontail (*Ceratophyllum demersum*) and contained moderate densities of tapegrass. The main shoreline (HC-17) was dominated by the macroalgae *Nitella* and slender naiad, similar to 2018.

The stations observed at Liffy Island (HC-21 and HC-22) showed slightly different SAV communities. HC-21 (island shore) was characterized by copious amounts of floating-leaved macrophytes, including white water lily and spatterdock (*Nuphar advena*). Large-leaf pondweed and common bladderwort (*Utricularia vulgaris*) were also noted in moderate densities. Abundant densities of spatterdock were observed at HC-22 while white water lily was less abundant. Coontail and brittle naiad (*Najas minor*) was also identified in low densities.

The presence of various invasive species is a concern for the health of the lake and often outcompete the more desirable native plants. If these plants are left unchecked, they can take over entire areas of the lake, outcompeting natives and eliminating valuable habitat for fish and other aquatic organisms. This can cause a shift in the ecosystem and ultimately the health of the waterbody. The main species of concern are Eurasian watermilfoil (*Myriophyllum spicatum*), curly-leaf pondweed (*Potamogeton crispus*) and tapegrass (*Vallisneria americana*). While tapegrass is a native to this region and does have a value relative to aquatic habitats, it often attains nuisance densities within Lake Hopatcong. Water chestnut (*Trapa natans*) is also an invasive species that has been identified in Lake Hopatcong over the last eight (8) to ten (10) years but has been closely monitored and hand pulled. No water chestnut was identified in any of the sampling plots for this study. Eurasian Watermilfoil

was noted at 13 of the stations during this survey with densities higher than that noted in 2018. Curly-leaf pondweed was only identified in low densities at a single station (HC-8). Tapegrass was observed in variable densities at seven (7) stations compared to fourteen (14) stations in 2018.

***Table 3.1: Full 2021 data set***

| Lake Hopatcong 2021 SAV | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Station | White Water Lily | Slender naiad | Tape Grass | Large Leaf Pondweed | Eurasian watermilfoil | Variable-leaf Milfoil | Robbin's Pondweed | Elodea | Coontail | Nitella | Curly Leaf Pondweed | Variable Leaf Pondweed | Leafy Pondweed | Spatterdock | Common Bladderwort | Humped/ Creeping Bladderwort | Brittle naiad | Aquatic Moss | Notes |
| | | *Nymphaea odorata* | *Najas flexilis* | *Vallisneria americana* | *Potamogeton amplifolius* | *Myriophyllum spicatum* | *Myriophyllum heterophyllum* | *Potamogeton robbinsii* | *Elodea canadensis* | *Ceratophyllum demersum* | *Nitella Flexilis* | *Potamogeton crispus* | *Potamogeton gramineus* | *Potamogeton foliosus* | *Nuphar advena* | *Utricularia vulgaris* | *Utricalaria gibba* | *Najas minor* | *Fontinalis sp.* | |
| Landing | HC-1 | A | | | | P | | | | | | | | | | | | | | |
| Landing Island | HC-2 | | C | A | P | P | | | | | | | | | | | | | | |
| Near Silver Springs | HC-3 | | C | P | | | | P | | P | P | | | | | | | | | |
| King Cove | HC-4 | | C | | | | | P | P | P | | | | | | | | P | | |
| Ingram Cove | HC-5 | | | P | P | P | | | | | | | | P | | | | | | Plants mostly dead. |
| River Styx | HC-6 | | | | | C | | | | | | | | | | | | | C | |
| Crescent Cove | HC-7 | | | | | A | | | | P | | | | | | | | | | |
| Crescent Cove | HC-8 | | | | | A | | | | | | P | | | | | | | | Single turion of CLP. Dense *Spirogyra* and EWM mats on other side of cove |
| Crescent Cove | HC-9 | | | | | C | | | | | | | | | | | | | | EWM more common 100' on N and S |
| Crescent Cove | HC-10 | | | | | P | | | | | | | | | | | | | | |
| Van Every Cove | HC-11 | | P | | C | | | | | | | | | | | | | | | |
| Great Cove | HC-12 | | A | P | P | C | | | | | | | | | | | | | | |
| Davis Cove | HC-13 | | | | | | | | | | | | | | | | | | | |
| Byram Cove | HC-14 | | | | | | | | | | | | | | | | | | | |
| Henderson Cove | HC-15 | | | | | | | | | | | | | | | | | | | |
| Halsey Island Shore | HC-16 | | P | C | | A | | | P | A | | | | | | | | | | Taken 100' from shore |
| Halsey Main Shore | HC-17 | | C | P | | P | | | | P | C | | | | | | | | | |
| N Cherry Rd Cove | HC-18 | | C | | | | | | | | | | | P | C | | | | | Spatterdock dying |
| Below Espanong Rd Bridge | HC-19 | | | | | | C | | | P | | | | | | C | | | | |
| Flash Marina | HC-20 | | | | | C | | | P | | | | | | | P | | | | |
| Liffy Island Shore | HC-21 | A | | P | | C | | | | | | | | | | C | P | | | EWM denser in other parts of cove. |
| Liffy Main Shore | HC-22 | P | | | | | | | | P | | | | | A | | | P | | |

### *3.2 RIVER STYX/CRESCENT COVE ANALYSIS*

SAV community structure at the River Styx and Crescent Cove sampling stations for the August 2021 event are presented in Table 3.2.

***Table 3.2: River Styx/Crescent Cove – 2021 SAV***

| **Lake Hopatcong - River Styx/Crescent Cove 2021 SAV** | | | | | | |
|---|---|---|---|---|---|---|
| Location | Station | Eurasian watermilfoil | Coontail | Curly Leaf Pondweed | Aquatic Moss | Total Mass |
| | | *Myriophyllum spicatum* | *Ceratophyllum demersum* | *Potamogeton crispus* | *Fontinalis sp.* | (g/m2) |
| River Styx | HC-6 | C | | | C | 72 |
| Crescent Cove | HC-7 | A | P | | | 402 |
| Crescent Cove | HC-8 | A | | P | | 298 |
| Crescent Cove | HC-9 | C | | | | 13 |
| Crescent Cove | HC-10 | P | | | | 9 |

Overall, macrophyte densities were variable in 2021 but were generally higher than those measured in 2018. Species richness was poor, with most stations dominated by Eurasian watermilfoil. The lowest biomass values were identified at HC-9 and HC-10 with 13 g/m$^2$ and 9 g/m$^2$ of macrophytes observed, respectively. Highest biomass values were noted at HC-7 (402 g/m$^2$) followed by HC-8 (298 g/m$^2$).

Biomass was further broken down by species to determine exact abundance, which can help determine if future management practices are more effective on some plants rather than others. Biomass data collected from these five sites can be found in Table 3.3 below.

***Table 3.3: Lake Hopatcong – River Styx/Crescent Cove 2021 Biomass***

| Lake Hopatcong - 2021 River Styx/Crescent Cove Biomass | | | |
|---|---|---|---|
| Station | Common Name | Scientific Name | Mass (g/m2) |
| HC-6 | Eurasian Watermilfoil | *Myriophyllum spicatum* | 36 |
| | Aquatic Moss | *Fontinalis* sp. | 36 |
| | | **Total** | **72** |
| HC-7 | Eurasian Watermilfoil | *Myriophyllum spicatum* | 362 |
| | Coontail | *Ceratophyllum demersum* | 40 |
| | | **Total** | **402** |
| HC-8 | Eurasian Watermilfoil | *Myriophyllum spicatum* | 295 |
| | Curly-leaf Pondweed | *Potamogeton crispus* | 3 |
| | | **Total** | **298** |
| HC-9 | Eurasian Watermilfoil | *Myriophyllum spicatum* | 13 |
| | | **Total** | **13** |
| HC-10 | Eurasian Watermilfoil | *Myriophyllum spicatum* | 9 |
| | | **Total** | **9** |

As described above, Eurasian watermilfoil was the dominant plant at all five (5) stations with peak density at HC-7. The native large-leaf pondweed, which was identified in 2018, was not noted in 2021. Coontail, another native, was also present in more abundance and at more stations than in 2021.

Comparisons of total biomass between 2018 and 2021 are provided in Table 3.4.

***Table 3.4: Lake Hopatcong – River Styx/Crescent Cove Biomass – 2018 vs 2021***

| Lake Hopatcong - River Styx/Crescent Cove Biomass | | | | | |
|---|---|---|---|---|---|
| | HC-6 | HC-7 | HC-8 | HC-9 | HC-10 |
| | (g/m2) | (g/m2) | (g/m2) | (g/m2) | (g/m2) |
| **2018** | 417.5 | 117 | 3.5 | 0.5 | 4 |
| **2021** | 72 | 402 | 298 | 13 | 9 |
| **Change** | -345.5 | 285 | 294.5 | 12.5 | 5 |
| **%** | -480% | 71% | 99% | 96% | 56% |

As shown above, biomass at HC-6 was markedly lower in 2021 compared to 2018 with a reduction of 345.5%. In contrast, biomass at HC-7 through HC-10 all increase with net positive increases of 56% to 99% compared to 2018.

# 4.0 SUMMARY & RECOMMENDATIONS

Princeton Hydro conducted a mid-summer submerged aquatic vegetation survey at 22 separate near-shore stations at Lake Hopatcong on 2 August 2021. This survey was conducted at the request of the Lake Hopatcong Commission in order to determine the abundance and distribution of the macrophyte community throughout the lake and to compare SAV composition to that surveyed in 2018.

The most commonly found plants during this survey were Eurasian watermilfoil followed by slender naiad and tapegrass. Historically, Eurasian watermilfoil and tapegrass were the dominant species in Lake Hopatcong so the increased abundance of slender naiad does indicate a slight shift in the SAV community. However, slender naiad is a desirable native species and while it has the potential to attain nuisance densities in isolated, shallow areas it not typically problematic in Lake Hopatcong.

The majority of the macrophytes identified were native, but two invasive species were identified during this survey, including Eurasian watermilfoil (observed at 13 sites) and Curly-leaf pondweed (observed at 1 sites). Eurasian watermilfoil distribution was similar to that in 2018 but densities and abundance were higher in 2021.

Two endangered species were also observed during this survey, including Robbin's pondweed and humped bladderwort (*Utricularia gibba*). Robbin's pondweed was identified at HC-3 and HC-4 while humped bladderwort was identified at HC-21. Note, both Robbin's pondweed and humped bladder were also identified at the same locations they were during the 2018 SAV survey.

River Styx / Crescent Cove quantitative analysis showed high densities of plants throughout the cove with dominance exerted by Eurasian watermilfoil. Of the five quantitative sampling sites in River Styx / Crescent Cove, four of the five had higher amount of plant biomass in 2021 when compared to 2018. The 2021 plant biomass values were 59 to 99% higher than the respective 2018 plant biomass values. The only exception to this was at HC-6, where 2018 plant biomass values were lower compared to 2018.

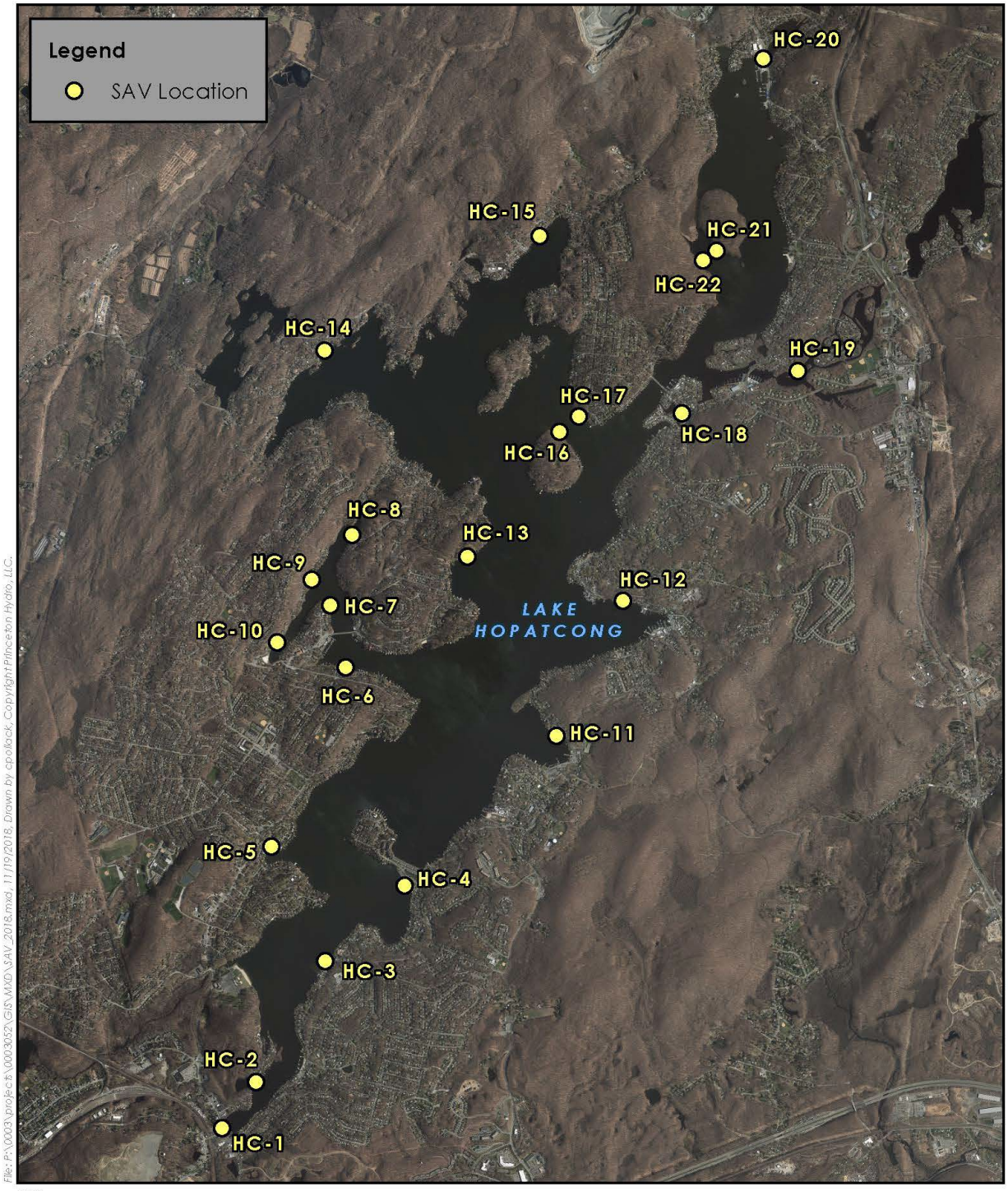
The quantitative difference between the 2021 and 2018 plant biomass values in River Styx / Crescent Cove indicate that plant densities were higher in 2021 in spite of the general prospection that they were lower in 2021. However, in general, since the summer HAB events of 2019, water clarity has been slightly lower, particularly in the first half of the growing season. This, in turn, has resulted in lower amounts of plant biomass being mechanically harvested. Yet, on a quantitative basis, there were higher amounts of aquatic vegetation in River Styx / Crescent Cove in 2021 when compared to 2018.

It is recommended that similar SAV plant survey occur every other year to track the development of the macrophyte community, creating a historical database. It is also recommended that biomass samples continue to be collected from the River Styx / Crescent Cove areas.

The generated SAV database of Lake Hopatcong can be utilized to assess the effectiveness of various management practices, weather and climactic influences and can serve to easily identify invasive species introduction to an area. The SAV data can also be used to assess the relative effectiveness of lake-wide drawdowns for SAV control. While the 2022-2023 winter drawdown is tentatively scheduled for a water level drop of 22", the 2023-2024 winter drawdown is tentatively scheduled for 60". Thus, it is recommended that the next SAV survey be conducted during the 2024 growing season.

# Appendix I

## Figures




NOTES:
1. SAV locations are approximate.
2. 2015 orthoimagery obtained from NJ Office of Information Technology (NJOIT), Office of Geographic Information Systems (OGIS).

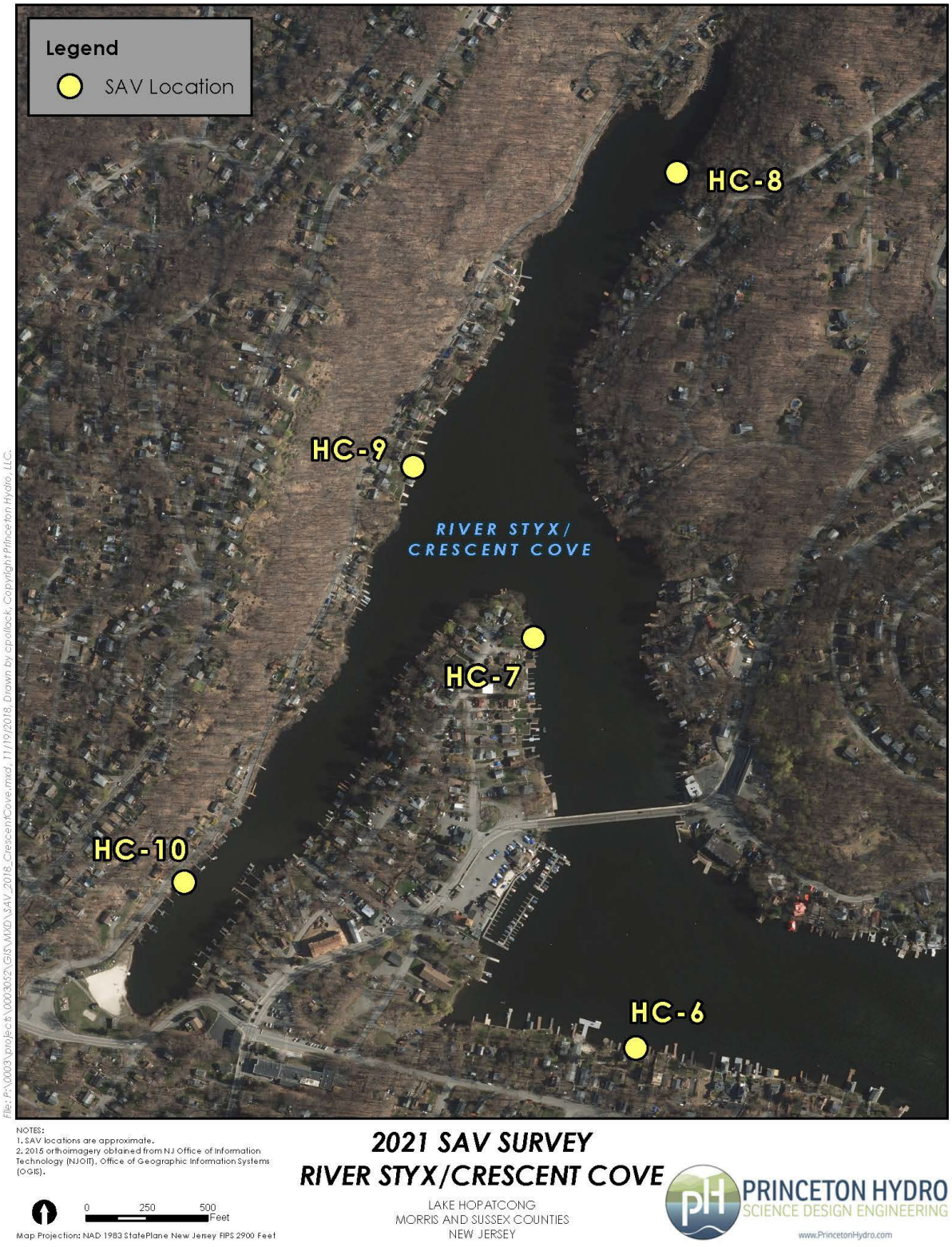
0 2,000 4,000 Feet

Map Projection: NAD 1983 StatePlane New Jersey FIPS 2900 Feet

## 2021 SAV SURVEY

LAKE HOPATCONG
MORRIS AND SUSSEX COUNTIES
NEW JERSEY

PRINCETON HYDRO
SCIENCE DESIGN ENGINEERING
www.PrincetonHydro.com




**2021 SAV SURVEY**
**RIVER STYX/CRESCENT COVE**

LAKE HOPATCONG
MORRIS AND SUSSEX COUNTIES
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