

NEW YORK STATE | Department of Environmental Conservation

Peconic *Ludwigia peploides* Control Project

FIVE-YEAR MANAGEMENT PLAN

FEBRUARY, 2022

Kathy Hochul, Governor | Basil Seggos, Commissioner

Executive Summary

The federally listed noxious weed *Ludwigia peploides* (also known as floating primrose-willow) was first discovered in the Peconic River (Suffolk County) in 2003. Within New York State, it is currently regulated by *6 New York Codes, Rules and Regulations Part 575 Prohibited and Regulated Invasive Species*. *Ludwigia peploides* is a high-priority species for New York and many other states, because once it becomes established, it is extremely difficult and expensive to remove, alters native habitats, impacts fisheries, prohibits water recreation, and affects local economies. The infestation in the Peconic River is within the towns of Brookhaven, Riverhead, and Southampton, and its control and management will involve considering rare plants, sensitive wetland habitat, and public camping, swimming, and fishing areas managed by New York State Department of Environmental Conservation (DEC) Region 1.

DEC is the lead agency and the Division of Land and Forest's (DLF) Bureau of Invasive Species and Ecosystem Health is the lead program for the Peconic River *Ludwigia peploides* Control Project. In an effort to address the complexities of the project, DLF's Invasive Species Coordination Section (ISCS) staff have outlined a five-year plan that relies heavily upon adaptive management. This plan describes the foundation for the project resulting from several years of studies, field surveys, and the experience of national experts in aquatic invasive species management. The plan examines all management options available and recommends the best management practice for this species at this site. The Five-Year Management Plan was implemented in 2021, beginning with a pilot treatment, the results of which are contained in this report. Also outlined is the additional work (expanding communication, education, and outreach, and assessing impacts) that needs to occur in order to support the project in the future. Flexibility is essential for this project and assessments will be conducted at the end of each season. Evaluations of each season's treatment results will be made available on the project webpage. It is the intention of DEC to deliver a thorough and effective control and management plan that can serve as a template for other projects.

Contents

List of Abbreviations

DEC	New York State Department of Environmental Conservation
DLF	DEC Division of Lands and Forests
DOH	New York State Department of Health
EAF	Environmental Assessment Form
EPA	United States Environmental Protection Agency
ISCS	DEC Invasive Species Coordination Section
LIISMA	Long Island Invasive Species Management Area
NYNHP	New York Natural Heritage Program
OPRHP	New York State Office of Parks, Recreation and Historic Preservation
PEP	Peconic Estuary Partnership
PPB	Parts per Billion (1 ppb = 1 microgram per liter)
PPT	Parts per Trillion (1 ppt = 1 nanogram per liter)
PRISM	Partnership for Regional Invasive Species Management
SAV	Submerged Aquatic Vegetation
SEQR	State Environmental Quality Review
SPDES	State Pollution and Discharge Elimination System
USFWS	United State Fish and Wildlife Service
USGS	United States Geological Survey

Glossary

Acute: a one-time exposure (in this case, resulting from a single application of herbicides), as opposed to chronic

Allelopathic: a plant releases chemicals into the environment that inhibit other plants from growing

Benthic barrier: A piece of material (film or sheet) that lays on the bottom of a lake or pond to prevent sunlight from reaching the soil.

Benthic macroinvertebrate: bottom-dwelling small aquatic animals, including the larvae stage of some insect species

Biodiversity: measures the number of all species within an ecosystem

Brackish: mixture of freshwater and saltwater that occurs in estuaries

Decomposition: process by which living things break down when they die

Dilution: the action of the herbicide becoming less concentrated as it is mixed with water

Dissolved oxygen: a measure of how much oxygen is dissolved in the water and available to aquatic organisms

Efficacy: the ability to produce a desired or intended result

Foliar: application of substance directly to the leaves of the plant

Hydrologic station: scientific equipment maintained by the United States Geological Survey that measures various conditions of the water and atmosphere

Mode of action: the way in which the herbicide controls susceptible plants; often describes the biological process at the tissue or cellular level

Rhizome: horizontal underground stem which grows shoots and roots

Riparian: area where the land and river meet

Sole source aquifer: an underground water source that 1) supplies at least 50% of the drinking water for its service area, and 2) has no reasonably available alternative drinking water sources should the aquifer become contaminated, as designated by the EPA.

Spray adjuvant: a seed oil that, when added to the mixture, allows the herbicides to stick to the leaves by impacting surface tension

Submerged aquatic vegetation (SAV): rooted aquatic plants that grow completely underwater; one of the most productive fish habitats on earth

Technical grade active ingredient: the pesticide chemical in pure form as produced by the manufacturer, before it is formulated into various pesticide products; the active ingredient is the biologically active component of a pesticide

Translocate: to transport a dissolved substance using the vascular tissue of the plant

Tributaries: a river or stream that flows into a larger river or lake

Wetland: distinct ecosystem that is flooded by water either permanently or seasonally

Introduction

The objective of this document is to provide a five-year management plan for the control of *Ludwigia peploides*, a highly invasive aquatic plant in the Peconic River watershed, in the towns of Brookhaven, Riverhead, and Southampton, Suffolk County, New York (see Figure 1). The plan provides transparent information to stakeholders and other interested parties as to DEC's intentions to control and manage *Ludwigia peploides* in the Peconic River, and the various constraints, opportunities, and potential impacts thereof.

Background

Creeping water primroses and water primrose-willows are among the most aggressive aquatic plant invaders in the world and can cause severe ecological, economic, and human health impacts in aquatic ecosystems and threaten critical ecosystem functions (ERDC, 2016). *Ludwigia peploides* can grow in a variety of environmental settings and regrow from fragments. It can therefore outcompete native plants and dominate aquatic ecosystems, physically and chemically altering them. It sometimes grows in nearly impenetrable mats, which can displace native plants and reduce water quality for wildlife. It can interfere with flood control and drainage systems, clog waterways, and impact navigation and recreation. *Ludwigia peploides* has allelopathic activity that can lead to dissolved oxygen crashes, and the accumulation of sulfide and phosphate (Dandelot et al., 2005; Dandelot et al., 2008). The size and stage of infestations vary depending on environmental conditions, and control strategies should be customized to the specific phase of the local invasion (ERDC, 2016).

Species Distribution

Ludwigia peploides is native to parts of the United States, but has expanded to areas outside of its original range and is now a federally listed noxious weed. It is not native to New York State, and *6 NYCRR Part 575* prohibits its

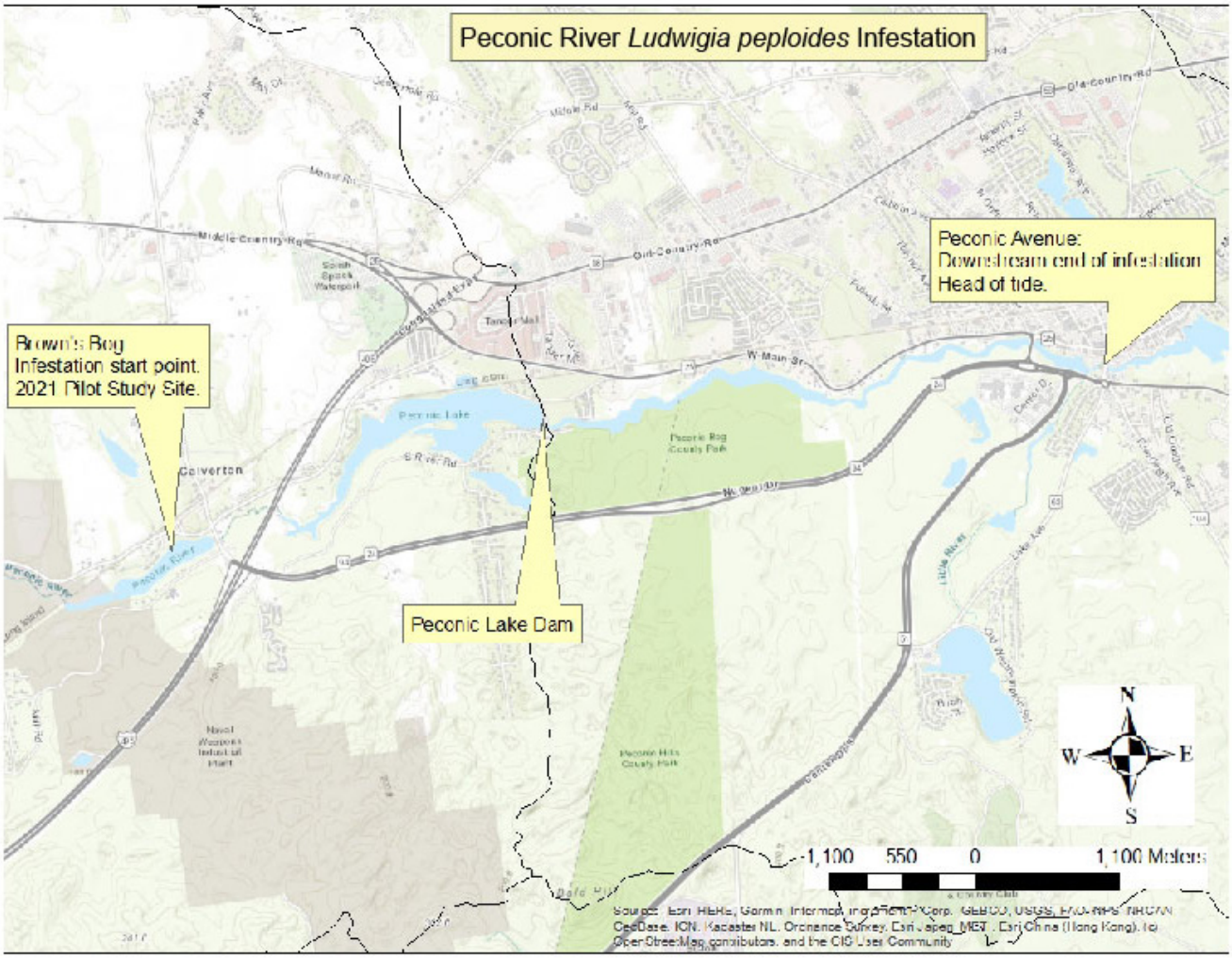

FIGURE 1 – LOCATION MAP

possession (with the intent to sell, purchase, transport, or introduce), and its sale and importation https://www.dec.ny.gov/docs/lands_forests_pdf/isprohibitedplants2.pdf.

Ludwigia peploides grows along freshwater shorelines, on the surface of lakes, ponds, streams, and in wet ditches. Reports within New York State are confined to the Peconic River system in Suffolk County (DEC Region 1, OPRHP Long Island). The Peconic River infestation is large-scale and located within the non-tidal portion of the Peconic River between Connecticut Avenue. in Calverton and Peconic Avenue. in Riverhead (Suffolk County). Since its discovery in 2003, various aquatic plant surveys have been conducted to map the extent of the infestation. The infestation is in proximity to both rare plants and important native plant habitat that are valuable for native wildlife. The infestation appears to be contained in the Peconic River system, but this may only be a short-term scenario, because viable plant fragments may easily be carried in flows, or accidentally transported on watercraft to nearby suitable habitat, which could result in new infestations. The Long Island Invasive Species Management Area (LIISMA)—one of eight statewide Partnerships for Regional Invasive Species Management (PRISMs)—ranks *Ludwigia peploides* as a Tier 2: Emerging Invasive Species on Long Island. Tier 2 invasive species are defined as just starting to become established in localized portions of Long Island, relying on early detection and rapid response efforts for successful control. They are high-impact species with low enough abundance to make eradication feasible within the PRISM.

Urgency for Response

Risk to native aquatic plants: *Ludwigia peploides* threatens to displace native species of floating aquatic plants such as white water lily (*Nymphea odorata*), spatterdock (*Nuphar advena*), and watershield (*Brasenia schreberi*). Dense mats of *Ludwigia peploides* also threaten native species of submerged aquatic vegetation (SAV), such as wild celery (*Vallisneria americana*) and coontail (*Ceratophyllum demersum*). DEC is highly invested in restoring critical SAV communities as they play a vital role in maintaining the river's dissolved oxygen levels and providing aquatic habitat in the Peconic River.

Risk to riparian and wetland habitat: *Ludwigia peploides* produces dense mats of vegetation that can sprawl along shorelines and into other moist habitats, such as wetlands. Thick growth within ditches and culverts can drastically alter habitats by impeding the movement of water and displacing native plant species.

Threat to waters in New York and adjacent states: Given the proximity to numerous waterbodies and state borders and its direct connection with the entire Peconic River watershed, this infestation poses a very serious threat to many waters in New York, Massachusetts, and Connecticut.

Threat to fish populations and biodiversity: Dense mats of *Ludwigia peploides* displace native floating plants and outshade native submersed plants that are food sources and shelter for native invertebrates and young fish. Decomposition of these extensive mats decreases the dissolved oxygen content in the water and can result in fish kills.

Threat to recreation: *Ludwigia peploides* produces dense mats of vegetation that can sprawl along shorelines and grow within slow-moving channels, impeding access and navigation within waterbodies. These mats prohibit swimming, boating, and fishing in infested areas of the river.

Peconic Infestation Overview

- 2003: *Ludwigia peploides* was first discovered by a private sector ecologist in Forge Pond (Peconic Lake), Town of Brookhaven (Suffolk County). It is believed to have escaped from an initial infestation within Sweyze Pond (which lies adjacent to the northern end of Peconic Lake, separated by the rail line).
- 2006: *Ludwigia peploides* was discovered downstream of Peconic Lake, near Middle Country Road., and again further downstream within Grangabel Park, Town of Riverhead (Suffolk County). DEC/Peconic Estuary Partnership (PEP) hand-pulled 60 yds^3 of *Ludwigia peploides* from Peconic Lake and Peconic River.
- 2007: DEC/PEP hand-pulled 60 yds^3 from Peconic Lake.
- 2008: DEC/PEP hand-pulled 10 yds^3 from Peconic Lake and the Peconic River. The Nature Conservancy treated *Ludwigia peploides* in Sweyze Pond with the herbicide glyphosate.
- 2009: DEC surveyed the Peconic River twice and only observed a few small patches of *Ludwigia peploides*. DEC/PEP hand-pulled 4 yds^3 from Peconic Lake and the Peconic River.
- 2010: DEC hand-pulled *Ludwigia peploides* during an early season survey. DEC/PEP then hand-pulled 4.5 yds^3 from Peconic Lake. *Ludwigia peploides* was once again observed in Sweyze Pond.
- 2011: DEC/PEP hand-pulled 5 yds^3 from Upper Mills Pond.
- 2012: DEC/PEP hand-pulled 20 yds^3 from Peconic Lake.

- 2013: *Ludwigia peploides* was discovered upstream of Peconic Lake within Brown's Bog and DEC hand-pulled 24.5 yds^3 from that site.
- 2014: *Ludwigia peploides* was discovered in Swan Pond (south of Peconic Lake) and a private pond north of Peconic Lake on Golden Spruce Dr. (Windcrest East Estates) in Calverton. A private lake management company treated the latter with glyphosate. DEC/PEP hand-pulled 25 yds^3 from Upper Mills Pond.
- 2015: DEC/PEP hand-pulled 25 yds^3 from the Peconic River.
- 2016: DEC/PEP hand-pulled 20 yds^3 from Brown's Bog. DEC observed blue-green algae blooms in Peconic Lake and Upper Mills Pond downstream from Edwards Avenue.
- 2017: DEC/PEP hand-pulled 18 yds from the Peconic River. DEC installed informational signage and disposal stations at various locations along the Peconic River.
- 2018: LIISMA/DEC surveyed for aquatic plants within the Peconic River from Brown's Bog to Peconic Avenue in Riverhead. *Ludwigia peploides* was widespread.
- 2019: DEC/LIISMA surveyed Donahue Pond for aquatic plants, and no *Ludwigia peploides* was found. DEC met with the Long Island-Metro Aquatic Invasive Species (LI-Metro AIS) Task Force (made up of regional agencies and stakeholders) to discuss the infestation.
- 2020: The *Ludwigia peploides* infestation in the private pond at Windcrest East Estates in Calverton was again treated with glyphosate by a private lake management company.
- 2020: DEC conducted aquatic plant surveys throughout Brown's Bog. DEC ISCS presented at the Suffolk County Conservation Advisory Council meeting about the biology of *Ludwigia peploides*, status of the infestation, and the proposed pilot treatment methods for a control project.
- 2021: DEC hired a private lake management company to conduct pre – and post-treatment aquatic plant surveys of the Peconic River—from Donahue Pond to Grangabel Park—as well as a pilot herbicide treatment in a 0.97-acre treatment area adjacent to DEC's Edwards Avenue Fishing/ Boat Access Site in Brown's Bog (Calverton, Suffolk County). Volunteers hand-pulled approximately 1300 lbs of *Ludwigia peploides* near Forge Pond Boat Launch.

Ludwigia peploides Management Options

Physical

Manual removal/Hand-pulling: Since 2006, dedicated volunteers have conducted thousands of hours of hand pulling *Ludwigia peploides* (see "Peconic Infestation Overview" section for timeline). These manual removal efforts have been an important management tool and have helped maintain access to key recreational locations. However, hand removal has been ineffective as a lone control method in part because *Ludwigia peploides* can spread from both above – and below-ground fragments.

Benthic barriers: Benthic barriers (also called benthic mats) are not an effective control method for *Ludwigia peploides* as the plant is able to sprawl along shorelines from long stems and reproduce from both small fragments and from seeds. Mats may be an effective management tool for suppression in limited instances (infestations of less than 0.25 acre), but are ineffective if eradication is the goal, especially within flowing waters.

Shading: A study to investigate shading as a control method for European frogbit (a floating aquatic invasive plant) concluded that shading can effectively remove the plant likely with minor impacts on the environment (Zhu, B., 2014). This management tool could be investigated for use with *Ludwigia peploides* in limited instances; however, based on the plant's ability to reproduce from small fragments and seeds, eradication is unlikely using shading as the lone control method in flowing systems.

Biological

There are currently no known biological control options for *Ludwigia peploides*.

Chemical

Several aquatic-use herbicides, including both contact and systemic herbicides, have been used to control *Ludwigia peploides*.

Contact herbicides immediately kill the aboveground parts of treated plants. If plants are treated early in the growing season, a reduction in plant fitness can hinder growth of the reproductive structures (rhizomes and buds) that overwinter and sprout into new plants each growing season. Post-treatment surveys would reveal whether repeated applications of the contact herbicides would be required throughout the growing season to prevent recovery of target plants and/or newly sprouting plants from underground rhizomes. Any rhizomes already deposited in the sediment may remain viable and allow

the plant to reemerge during the following growing season. Therefore, treatment needs to be repeated until the seed bank/rhizomes in the sediment are exhausted.

Systemic herbicides are absorbed by the floating plant tissue and translocated to the belowground parts of plants (e.g., rhizomes) that can overwinter and sprout into new plants each growing season. Treatment needs to be repeated until the seed bank/rhizomes in the sediment are exhausted. Many systemic herbicides are most effective on rapidly growing plant tissues. Therefore, an early season application is important to impact plant fitness and prevent formation of reproductive structures. The Nature Conservancy used the systemic herbicide glyphosate to control *Ludwigia peploides* in Sweyze Pond (adjacent to the Peconic Lake) in 2008; however, the plant was again found within Sweyze Pond by 2010. A private lake management company used glyphosate to treat *Ludwigia peploides* in a private pond at Windcrest East Estates in both 2014 and 2020. The systemic herbicides florpyrauxifen-benzyl and imazamox have been found to provide control of *Ludwigia peploides*, when applied in combination. See the "Information about Florpyauxifen-benzyl" and "Information about Imazamox" sections of this plan for detailed information.

Staff Recommendation

The recommended control option is the use of the systemic herbicides florpyrauxifen-benzyl and imazamox. Eradication may not be feasible even with the chemical option. Herbicide treatment may greatly reduce the size of the infestation, but it is expected that continued maintenance efforts (i.e, chemical spot treatments and manual removals) will be required to keep the remaining small populations in check. Additional off-load sites will need to be identified to properly dispose of the plant waste generated by hand-removal projects. As with any control project, adaptive management will be applied and changes will be made to strategies as treatment outcomes are assessed and options are weighed.

Proposed Control Project

Proposed Control Scenario

This five-year plan outlines the proposed control methods that have the highest likelihood of eradicating *Ludwigia peploides* from the Peconic River. The *Ludwigia peploides* Control Project would involve pre – and post-treatment aquatic plant monitoring and systemic herbicide treatment for locations of infestation throughout the freshwater portions of the Peconic River (see w A: 2021 *Ludwigia peploides* Distribution Maps). Aquatic plant surveys conducted in 2021 were used to generate point and polygon maps delineating the *Ludwigia peploides* infestation within the Peconic River. This data has been used to outline precise proposed treatment areas for the 2022 season and calculate acreage for Article 15 Aquatic Pesticide Permit applications. A combination of two systemic herbicides (florpyrauxifen-benzyl and imazamox) will be applied using foliar application at approximately 25 ppb concentration to treatment areas. Foliar application done with a spray adjuvant allows for the most targeted treatment and will minimize impacts to rare wetland plants and other native aquatic plants. The application time frame targeted should be late July when plant tissue is actively growing. These systemic herbicides have no label restrictions regarding swimming or recreation when administered according to the product labels. Data from the post-treatment aquatic plant survey will be used to assess treatment efficacy and to delineate new treatment polygons for any treatments needed the following seasons. Given the complexity and significance of the Peconic River *Ludwigia peploides* Control Project, it is critical to recognize that flexibility and adaptability are essential. Each year of management will involve its own process of analyzing the success of the previous year's efforts, determining and implementing the appropriate control strategy, properly documenting variables and results, and follow-up monitoring and communication, etc. A detailed treatment and monitoring plan for each season will be developed based on the efficacy of the previous year. Based on data from several case studies, herbicide treatment is anticipated to be highly effective after a single application. For each year of the project, new treatment areas will need to be delineated but are likely to be significantly smaller and less dense.

Limited Scenario

A limited scenario would employ the combination herbicide treatment in several small treatment areas within the Peconic River, with particular focus on public access areas such as boat launches and campgrounds. Pre – and post-treatment aquatic plant monitoring would be analyzed to determine treatment efficacy and any impacts to non-target species. Under this scenario, public access to key areas would be maintained. However, *Ludwigia peploides* fragments might still be carried downstream (and to other waterbodies) from untreated sections and eradication would be unlikely. Additional monitoring of priority freshwater waterbodies within a 10-mile radius of the Peconic River would be proposed.

No-treatment Scenario

Under a no-treatment scenario, DEC would take no action to control or manage *Ludwigia peploides* in the Peconic River. The *Ludwigia peploides* infestation would grow unchecked and spread to new areas of the Peconic River. During summer and early autumn, dense mats of vegetation growing along the shoreline and on the surface of the Peconic River and Peconic Lake would prohibit swimming, kayaking, canoeing, boating, and fishing. DEC-regulated wetlands and Significant Coastal Fish and Wildlife Habitats might also be impacted. In mid – to late-autumn, the thick mats of vegetation will start to decompose, which would impact water quality and greatly reduce the dissolved oxygen in the water, likely resulting in fish kills. Annual monitoring of the infestation through volunteer efforts would be recommended. Large-scale efforts would be proposed to increase public awareness and the practice of measures to prevent spread into other waterbodies (preventing transportation on recreational watercraft such as kayaks, canoes, and boats). Additional monitoring of priority freshwater waterbodies within a 10-mile radius of the Peconic River as well as adjacent wetlands and sites with listed plant species would be proposed. Salinity in Peconic Bay may prevent establishment of healthy, reproducing *Ludwigia peploides*, but fragments of the plant could be transported from the Peconic River to connecting tributaries and other locations where they could easily become established and grow.

Results of 2021 Pilot Study

In 2021, DEC hired a private lake management company to survey the Peconic River for aquatic plants and to treat the *Ludwigia peploides* infestation adjacent to DEC's Edwards Avenue Canoe/Fishing Access Site with systemic herbicides as a pilot project. The following permits were obtained for the pilot project:

- NYSDEC Article 15 Aquatic Pesticide permit for ProcellaCOR EC® – Permit #AV042021AH101,
- NYSDEC Article 15 Aquatic Pesticide permit for Clearcast® – Permit #AV042021AH102,
- NYSDEC Article 24 Freshwater Wetlands – Permit ID 1-4722-02195/00014,
- NYSDEC Article 15, Title 27 Wild, Scenic & Recreational Rivers – Permit ID 14722-02195/00015
- SPDES Notice Of Intent (NOI) – Permit ID NYP160548,
- U.S. Fish and Wildlife Service Pesticide Use – Permit Grant No. F20AP11967-01, and
- SEQR Negative Declaration issued April 7, 2021.

Biologists from a private lake management company conducted pre-treatment aquatic plant surveys in 213 acres of the Peconic River between the Donahue Pond inlet and Grangabel Park. In total, 25 aquatic plant species (19 native and 6 non-native) were found (See "Appendix B: 2021 SAV Abundance Data Tables" for complete species list). Approximately 50 surface acres of *Ludwigia peploides* were observed. The 0.97-acre pilot treatment area was also surveyed prior to treatment and contained 11 species of aquatic plant, 8 native and 3 non-native (see Pilot Project section within "Appendix B: 2021 SAV Abundance Data Tables" for complete species list).

Herbicide Treatment

As per the DEC Article 15 Aquatic Pesticide Permit requirements, two rounds of riparian landowner notification letters were mailed (on April 1, 2021, and August 19, 2021) and shoreline signage notifying of treatment was posted prior to treatment at all public access points between Brown's Bog and Dam Road. in the town of Riverhead. Pre-treatment site photos were taken the day of treatment. On August 26, 2021, the systemic herbicide products ProcellaCOR EC® (florpyrauxifen-benzyl) and Clearcast® (imazamox) were foliar applied in combination with a spray adjuvant to the *Ludwigia peploides* plants within the treatment area. Post-treatment area site photos were then taken to assess impacts at one week and three weeks after treatment (see "Appendix D: Pilot Treatment Area Site Photos"). DEC conducted a post-treatment aquatic plant survey three weeks after treatment and determined that the abundance of *Ludwigia peploides* was reduced 50% within the treatment area during that time. Significant impacts to invasive European frogbit plants that were growing among the *Ludwigia peploides* plants were also observed three weeks after treatment. Impacts to floating foliage were observed in two of the eight native species within the treatment area (spatterdock and watershield) and were photographed both one and three weeks after treatment. No impacts to aquatic plant species were observed outside of the treatment area. This finding demonstrates the importance of spray adjuvant utilization in keeping foliar application within distinct treatment areas where possible and limiting application to direct spot treatments where *Ludwigia peploides* occurs in trace and sparse abundance. Both spatterdock and watershield are common outside of the mapped *Ludwigia peploides* polygons, and it is anticipated that these native species would be able to recolonize the available habitat once *Ludwigia peploides* is controlled.

Formulating a River-Wide Control Project

Experts conceptually divided the geographic area of the non-tidal Peconic River into nine distinct sections in order to account for significant changes in habitat type and to accurately capture survey and treatment results (see "Figure 2: Peconic River Project Sections"). The bounds of each river section are described below. Wherever possible, *Ludwigia peploides* beds were delineated into distinct treatment polygons (see River Sections 2, 5, and 6 of "Appendix A" for polygon maps). In some sections of river, *Ludwigia peploides* is trace or sparsely growing and survey points will be treated as spot treatments (see "Appendix A" maps for point data). If *Ludwigia peploides* is found during the proposed annual surveys, new treatment polygons/ spot treatment points will be established. While there is no herbicide treatment proposed for the tidal portion of the Peconic River, an assessment of impacts from herbicide application upstream is warranted, therefore, a discussion of the tidal portion of the Peconic River has been included in this report.

- **Section 1:** extends east from the Connecticut Avenue crossing to the railroad crossing just upstream of Brown's Bog. Within this section, the USGS hydrologic station 01304440 is located near the Connecticut Avenue overpass. Various historical data from this hydrologic station will be utilized in flow models to predict herbicide dilution within downstream sections. No *Ludwigia peploides* was found within this section during 2021 aquatic plant surveys, and therefore, no herbicide application is proposed for this section.
- **Section 2:** includes the entirety of Brown's Bog from the railroad crossing on the western side to the Edwards Avenue Dam on the eastern side. This section contains the 0.97-acre 2021 Pilot Treatment area adjacent to DEC's Edwards Avenue Canoe Access Site. Approximately 5.3 acres of *Ludwigia peploides* were found within this section during the 2021 aquatic plant survey, and herbicide application is proposed within delineated treatment polygons.
- **Section 3:** is a relatively short and shallow section of river extending from the Edwards Avenue Dam downstream to the 495 (Long Island Expressway) Overpass. A single sparse patch of *Ludwigia peploides* was found within this section during 2021 aquatic plant surveys, and a spot treatment herbicide application is proposed.
- **Section 4:** begins at the 495 (Long Island Expressway) Overpass and extends downstream to where the railroad line crosses River Road. Eight out of 18 survey points contained *Ludwigia peploides* within this section during 2021 aquatic plant surveys at trace and sparse densities, and therefore, spot treatment herbicide application is proposed.

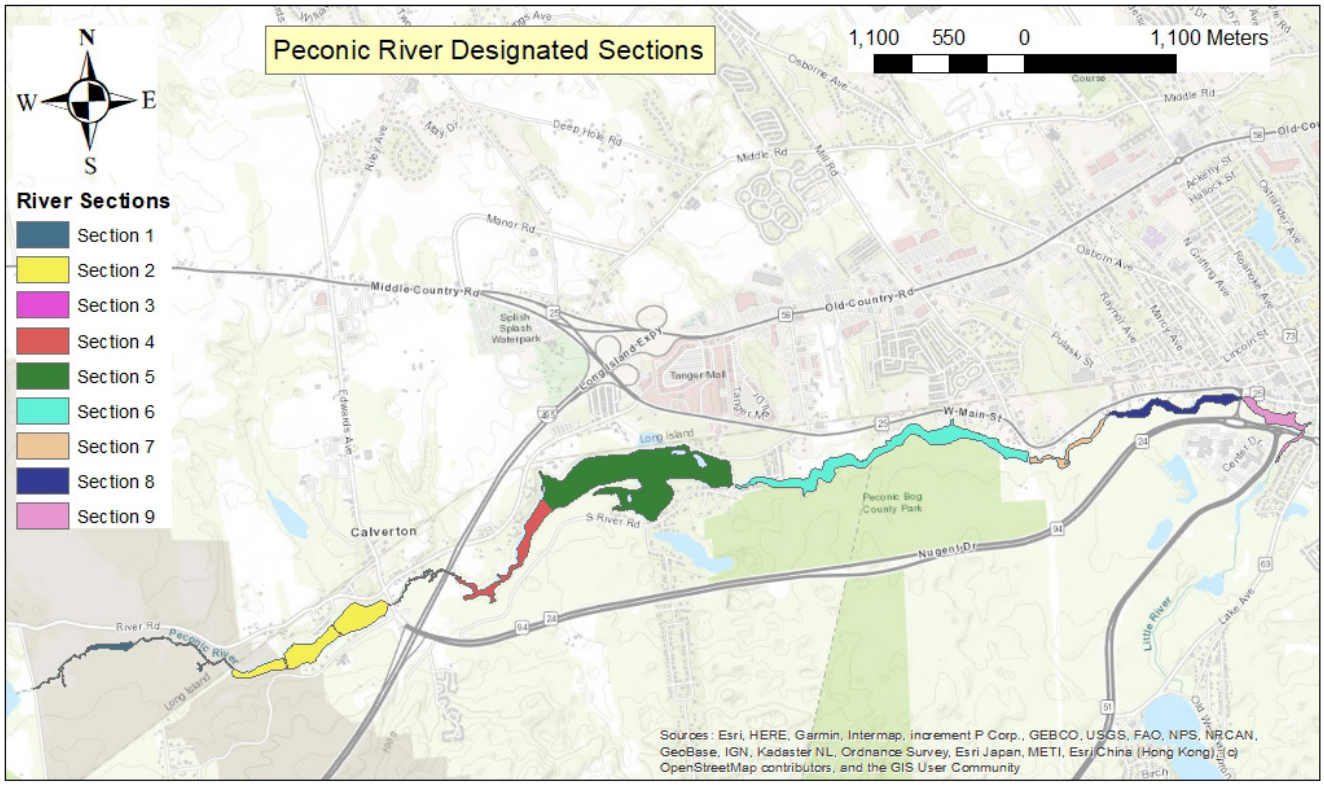

FIGURE 2 - PECONIC RIVER PROJECT SECTIONS

- **Section 5:** reaches from where the railroad crosses River Road downstream to Dam Road. Approximately 8.7 acres of *Ludwigia peploides* were found within this section during the 2021 aquatic plant survey, and herbicide application is proposed within delineated treatment polygons.
- **Section 6:** extends from Dam Road downstream to the Middle Country Road overpass. Approximately 25.4 acres of *Ludwigia peploides* were found within this section during the 2021 aquatic plant survey, and herbicide application is proposed within delineated treatment polygons.
- **Section 7:** extends from the Middle Country Road overpass downstream to Weeping Willow Park. No *Ludwigia peploides* was found within this section during 2021 aquatic plant surveys, and therefore, no herbicide application is proposed for this section.
- **Section 8:** extends from Weeping Willow Park downstream to the Center Dr. overpass. Four out of 12 survey points contained *Ludwigia peploides* within this section during 2021 aquatic plant surveys, and therefore, spot treatment herbicide application is proposed.
- **Section 9:** extends from the Center Dr. overpass downstream to head of tide at Grangabel Park Dam. Ten out of 17 survey points contained *Ludwigia peploides* within this section during 2021 aquatic plant surveys, and therefore, spot treatment herbicide application is proposed.
- **No herbicide treatment is currently being proposed within the tidal/brackish portion of the river.** The tidal portion of the Peconic River stretches from head of tide at Grangabel Park Dam to Flanders Bay. To date, *Ludwigia peploides* has not been discovered downstream of Grangabel Park Dam, most likely due to higher salinity as the river shifts from freshwater to brackish along a tidally influenced gradient. The USGS hydrologic station 01304500 is tidally influenced and located under the overpass at Highway 105 (Cross River Dr.) in Riverhead (https://waterdata.usgs.gov/nwis/uv?site_no=01304562). Various historical data from this hydrologic station will be utilized in flow models to predict how application of herbicide in designated treatment areas upstream will be diluted downstream. Flanders Bay is a tidal area, which is a poor candidate for any control measures due to the unfavorable conditions for *Ludwigia peploides* survival and the extreme technical challenges in developing a feasible treatment regime.

Required Permitting and Non-regulatory Special Designations

Article 15

DEC regulates the use of aquatic herbicides under *6 NYCRR Article 15 Part 327 Use of Chemicals to Control Aquatic Vegetation*. A DEC Article 15 Aquatic Pesticide permit application will be submitted annually for the use of herbicide(s) as proposed in the project description and according to product label restrictions. DEC's ISCS staff will need to work closely with DEC Region 1 staff to determine permitting needs for each treatment season. Individual Article 15 Permits for each herbicide product will need to be obtained each year.

SPDES

DEC's Division of Water oversees SPDES, which controls point source discharges to groundwaters as well as surface waters in New York State. Under the SPDES Aquatic Pesticides General Permit, a Notice of Intent must be filed for the project.

Article 24

Under *6 NYCRR Article 24 Parts 663–664*, DEC regulates activities conducted in wetlands greater than 12.4 acres in size, such as vegetation removal and pesticide applications. Both freshwater emergent wetlands and freshwater forested/shrub wetlands are located adjacent to the proposed treatment area (see "Appendix F" for map) and *Ludwigia peploides* control activities potentially impacting the wetlands will require an Article 24 Freshwater Wetlands Permit.

SEQR

Any *Ludwigia peploides* control activity in the Peconic River that proposes to alter vegetation populations greater than 10.0 acres will constitute a Type 1 Action under the State Environmental Quality Review Act. DEC will seek to maintain its role as lead agency of the project in future years and will thus be required to determine significant impacts for proposed work. In 1981, a Programmatic Environmental Impact Statement (EIS) for the Aquatic Vegetation Control Program was prepared to satisfy the State Environmental Quality Review (SEQR) for projects with impacts covered in the document. In addition, an Environmental Assessment Form (EAF) was prepared for the 2021 Pilot Project to address impacts not included in the EIS (i.e., impacts to wetland vegetation and endangered species). To comply with SEQR, the towns of Brookhaven and Riverhead and any other entity with jurisdiction in the proposed project area participated in the process and the coordinated review. Ultimately, a Negative Declaration was declared

for the pilot project and the determination was published in the DEC Environmental Notice Bulletin on April 7, 2021. A new EAF form and coordinated review with the towns of Brookhaven, Riverhead, and Southampton will be completed for treatment in 2022 and beyond.

DOS CAF

The Department of State regulates designated New York State waterbodies and inland waterways as "Coastal Areas of New York", which include the Peconic River basin. The towns of Brookhaven, Riverhead, and Southampton all participate in the Long Island Sound Coastal Management Program and have prepared and adopted Local Waterfront Revitalization Programs (https://lirpc.org/wp-content/uploads/2017/10/LISCMP.pdf). Components of a proposed *Ludwigia peploides* control project will need to comply with the adopted program as determined in part by the Water Control Commission and the Waterfront Advisory Committee. A Coastal Assessment Form package was completed for the 2021 pilot project and submitted to the Department of State on May 1, 2021. A new Coastal Assessment Form package will be completed and submitted to the Department of State annually, prior to each treatment season.

USFWS PUP

The U.S. Fish and Wildlife Service (USFWS) requires that a Pesticide Use Proposal (PUP) be submitted and approved before a pesticide application utilizing USFWS funds or on USFWS property. A PUP was submitted to USFWS on April 13, 2021, for the 2021 pilot project, as the project was funded by a USFWS grant. Additional PUPs will not be required as the funding source for 2022–2026 will be the New York State Environmental Protection Fund.

NYNHP Designation

Several site constraints and limitations must be considered with project design each year. The project must carefully develop management strategies to protect local ecological communities. The tidal portion of the Peconic River is designated by the New York Natural Heritage Program (NYNHP) as a Significant Natural Community which has "rare or high quality" habitats or ecosystems. Several threatened and endangered plant species were identified in both the tidal and non-tidal portions of the river. Potential non-target impacts to these species and ecosystems will be evaluated as part of the Article 24 and SEQR permit processes.

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) Section 2(ee) Recommendation

European frogbit (*Hydrocharis morsus-ranae*) is a floating invasive aquatic plant species that was found within the Peconic River during the aquatic plant surveys conducted in 2020 and 2021. DEC wanted to assess whether the proposed systemic herbicide application for *Ludwigia peploides* would also be an effective control for European frogbit. The current product label for imazamox (Clearcast®) does not list European frogbit as a target species; however, under FIRFA, DEC can review the use of pesticides on unlabeled pests with adequate data. In 2021, concurrent lab trials were conducted by an independent researcher from the University of Hartford (Connecticut) and the product manufacturer for Clearcast® at SePRO Labs (North Carolina) to test control of European frogbit using imazamox (Clearcast®). According to both herbicide trials, Clearcast® applied at the same concentration as the proposed *Ludwigia peploides* Control Project (both alone and when applied in combination with florpyrauxifen-benzyl [ProcellaCOR® EC]) was effective at controlling European frogbit (pre-published data: Zhu, B., 2021; SePRO, 2021). Therefore, a 2ee recommendation will be sought by DEC for use on European frogbit within the Peconic River.

Wild, Scenic, and Recreational River Designation

Under *6 NYCRR Part 666 Article 15 Title 27*, DEC regulates the state's Wild Scenic and Recreational Rivers to protect those rivers of the state that possess outstanding scenic, ecological, recreational, historic, and scientific values. These attributes may include value derived from fish and wildlife and botanical resources, aesthetic quality, archaeological significance, and other cultural and historic features.

The following text describes the sections of the Peconic River that are designated as:

- Scenic: (a) Approximately ten and one-half miles from the western boundary of the Red Maple swamp to the Long Island railroad bridge between Connecticut and Edwards Avenue; and (b) Approximately three miles from Middle Country Road (State Route 25) to the confluence with the previously described segment of the Peconic, including tributaries T112-5, T112-6 and T112-7.

- Recreational: (a) Approximately five and one-half miles from the Long Island railroad bridge between Connecticut and Edwards Avenue to Grangabel Park dam in Riverhead; (b) Approximately two miles of the Little River (tributary T112-2) from and including Wildwood Lake to its confluence with the Peconic River.

Long Island Pine Barrens Designation

The Long Island Pine Barrens Maritime Reserve Act, Environmental Law, Article 57 was adopted in 1993 for the purpose of protecting approximately 102,500 acres of the Long Island Pine Barrens located within the towns of Brookhaven, Riverhead, and Southampton. Much of the treatment area outlined in this five-year plan is located within the Central Pine Barrens Core Preservation Area (also sometimes called the Core Protection Zone), with the rest being located within the Compatible Growth Area. More information about the protection of groundwater as is pertinent to this special designation can be found in the Water Sampling section of this report.

Monitoring/Surveys

Water Sampling

Herbicide level monitoring is designed to monitor groundwater safety (sole source aquifer), protect environmental resources, and maintain adequate herbicide levels for effective treatment. The proposed control scenario would include an assessment of the Long Island sole source aquifer. USGS is currently conducting a long-term study, "Hydrologic Monitoring in the Central Pine Barrens," which routinely samples both surface water in the Peconic, Carmans, and Nissequogue rivers and groundwater throughout the Central Pine Barrens Core Preservation Area. Samples are analyzed for 200+ pesticides and pesticide degradates, measured in concentration at the parts-per-trillion (ppt) level. This project would be the first time imazamox has been applied for aquatic use within the Central Pine Barrens Core Preservation Area (it has been previously used for agricultural purposes in Suffolk County). USGS sampled groundwater from five wells within the Core Preservation Area between 2016 and 2018 to a ppt-detection limit and imazamox was not detected (Fisher et. al., 2020). USGS sampled Peconic River surface water from two locations (USGS Hydrologic Stations 01304440 and 01304500) between 2018 and 2019 to a ppt-detection limit and imazamox was not detected (Bayraktar et al., 2020). The maximum application rate for Clearcast® (imazamox) is 200 ppb (if applied within ¼ mile of a potable water intake) or 500 ppb (if no water intakes are present) according to the product label. The proposed concentration for this treatment project is 25 ppb for both Clearcast® and ProcellaCOR® EC. DEC has requested that USGS add florpyrauxifen-benzyl to the list of monitored pesticides and to share data from their routine sampling events within the Core Preservation Area throughout the treatment project.

The Article 15 Aquatic Pesticide permits for this project require Peconic River surface water be sampled and analyzed for herbicide concentration following application to ensure herbicide concentration is within the permitted range. A detailed herbicide sampling plan (HAP) will be submitted as part of the SEQR process, which will include surface water sampling downstream of all treatment sections both 24–48 hours after treatment and again at 5–7 days post treatment or until herbicides are non-detect. Samples will be sent to an independent laboratory and analyzed for concentrations of imazamox and florpyrauxifen-benzyl to the parts-per-trillion level. Results will be forwarded to DEC and shared with stakeholders upon receipt from the laboratory. Results will be posted on DEC's project webpage. These results will also be compared to the independently analyzed water quality data from USGS's long-term study.

Aquatic Plant Surveys

Aquatic plants will be surveyed throughout the Peconic River pre – and post-treatment to track herbicide impacts on native vegetation and assess the efficacy of a select herbicide regime to reduce *Ludwigia peploides* and European frogbit populations. Pre-treatment surveys will occur up to one month prior to treatment, and post-treatment surveys will be conducted six to eight weeks after treatment. The contractor will utilize treatment polygons established during the 2021 SAV survey as a baseline for survey area. Within the polygons, visual surveys will determine change in abundance of vegetation at the water's surface as well as changes to plant condition. In order to assess changes in plant abundance over time, rake toss surveys will be utilized. Survey grids of various scales, depending on level of detail needed, will be placed over sections of the Peconic River. Intersection locations of the grid will serve as sampling points with two rake tosses conducted at each. Samples from the rake toss will be identified to species when possible and percent cover estimated. Additional information about this protocol can be found in several publications (Madsen, 1999; Johnson, 2014). The contractor will conduct the aquatic plant surveys of the Peconic River (from Connecticut Avenue to Grangabel Park Dam) using rake toss protocols, DEC-approved remote survey methods, and a pre-determined GPS survey grid based on a combination of desktop survey and previous field survey data. To survey, a double-sided rake head will be tossed 10 feet from the intersect points on the grid and pulled in toward the boat or shore. Two tosses will be made at each intersection. The surveyor will identify and record the plant species found on the rake and estimate the percentage of each plant species in

the sample. When identification is questionable, voucher specimens will be collected for verification by local botany experts identified by DEC. GPS point locations (survey grids) will remain the same throughout the length of the project. The contractor will aggressively monitor for early signs of herbicide resistance development and/or weed escapes in all areas where herbicides are used. Indicators of possible herbicide resistance include: (1) failure to control a weed species normally controlled by the herbicide at the dose applied, especially if control is achieved on adjacent weeds; (2) a spreading patch of non-controlled plants of a particular weed species; (3) surviving plants mixed with controlled individuals of the same species. If resistance is suspected, the contractor will prevent weed seed production in the affected area by employing either spot treatments of an alternative herbicide from a different group (according to project permits) or hand-removals. For detailed information about herbicide resistance, see the "Information about Florpyrauxifen-benzyl" section of this report.

Benthic Macroinvertebrates

A few studies have been published that assess the chronic and acute toxicity of imazamox and florpyrauxifen-benzyl (technical grade active ingredient), its transformation products/degradates, and effects on various taxonomic groups, including species in the benthic macroinvertebrate community. Impacts to freshwater and estuarine/marine invertebrates which reside primarily in the water column are not anticipated for this project (see the "Toxicity Risk Assessment" sections of this report). Impacts to benthic (sediment-dwelling) macroinvertebrates are not anticipated as the herbicide will be foliar applied to floating vegetation, and then translocated from the floating parts of the plants to the roots. Therefore, in-water concentrations of herbicides should be less than 10 ppb and are anticipated to be less than 1 ppb within 24 hours of application. In 2021, as a component of the Pilot *Ludwigia peploides* Control Treatment Project, DEC's ISCS sampled benthic macroinvertebrates to assess change in macroinvertebrate community assembly pre – and post – treatment. Pre-treatment surveys were conducted on June 18, 2021 at three sites in the freshwater Peconic River. Post-treatment survey were conducted on October 5, 2021 at the same sites. No changes in community assemblage were observed. DEC's ISCS plans to work closely with DEC's Stream Monitoring and Assessment Section (Division of Water), which has collected biomonitoring data for the past 40 years, to assess whether any changes to the freshwater macroinvertebrate community are observed in Peconic River sample sites as a result of the herbicide treatment.

The salinity changes from freshwater to brackish via a tidally influenced gradient beginning from head of tide at Grangabel Park Dam. Water quality data collected from the USGS hydrologic station 01304500 (located at Highway 105/Cross River Drive in the Town of Riverhead) illustrates fluctuating environmental conditions within the estuary based on weather and tide stage. While no herbicide application is proposed downstream of the Grangabel Park Dam, flow models will be needed to predict to what extent herbicide could be diluted from designated treatment areas into the Peconic River Estuary. Macroinvertebrate communities within the Peconic River Estuary are subject to vast seasonal changes, including coastal plankton blooms and winter breakdown of the thermocline. Each spring, diatom blooms are followed by copepods, then moon jellies, hydrozoans, and mysids. Each April and May, the most abundant of the mysid shrimp species, *Neomysis americana,* congregate at the mouth of the Peconic River in calm areas where there is some freshwater input and salinity generally measures between 10–20 ppt, including along Peconic Riverfront Park. These vast, yet temporary, mysid swarms are a keystone member of the food chain, impacting river herring and the fish and bird species that prey on herring. More research is needed to determine whether florpyrauxifen-benzyl is toxic to mysids, even at low concentrations. This plan does not propose herbicide applications within brackish water. Furthermore, the application of herbicides proposed under this plan would be conducted in late July, thus temporally avoiding the seasonal spring migration (April–June) of mysids in the Peconic River. This plan proposes pre-treatment mysid monitoring in the estuary if dilution models predict concentrations of herbicide greater than 1 ppb below the Grangabel Park Dam. Mysid surveys would be scheduled to occur in early July (less than 1 week prior to herbicide treatment) to assess whether mysid swarms are still present within the river.

Since dense plant stands (such as *Ludwigia peploides*) can directly or indirectly disrupt the fish and macroinvertebrate utilization of plant beds by affecting light penetration, temperature regimes, and water chemistry (Lillie and Budd, 1992) the potential risks of acute herbicide exposure may be outweighed by the risk of *Ludwigia peploides* expansion within the Peconic River.

Herbicide Information

Why Combine Herbicides?

It is common practice for applicators to combine herbicides with more than one mode of action. The purpose of combining herbicides is to exploit the strong properties of each herbicide while also minimizing any weaknesses or undesirable properties. The use of both imazamox and florpyrauxifen-benzyl have been widely studied on various submersed, floating, and emergent aquatic plant species. A study on *Ludwigia* spp. showed florpyrauxifen-benzyl provided 77–100% control at 35 days after treatment, but allowed significant regrowth between 35 and 60 days after treatment (Enloe et. Al., 2007). In the same study, imazamox worked slowly and showed control by 60 days after treatment. In combination, the overall treatment was highly successful.

Information about Imazamox

Product Background

Imazamox was first registered with the EPA in 1997 under the product name Raptor® (EPA registration number 241-379) and was used in New York for post-emergence grass and broadleaf weed control in alfalfa, edible legumes, and soybeans. In 2008, imazamox underwent a major change in labeling, was approved by EPA, and registered in New York State as an aquatic use herbicide under the product name Clearcast® (AECOM, 2009). Imazamox, the active ingredient in Clearcast®, is an extremely selective chemical that works by inhibiting an enzyme (found only in plants) needed for amino acid production, thus disrupting the plant's metabolism (AECOM, 2009).

Water Use Restrictions

Clearcast® is restricted for use for irrigation at concentrations above 1 ppb for greenhouse or nursery plants based on label requirements. Clearcast® has no label restrictions for swimming or fishing. The Clearcast® label prohibits applications within ¼ mile of an active potable water intake unless the resulting water concentration does not exceed 50 ppb. No potable water intakes have been identified within the Peconic River. The proposed concentration for Peconic River's treatment of 25 ppb is well below EPA's maximum application rate of 500 ppb.

Filtration

Low-level concentrations of the herbicide can be removed from water using activated carbon filtration.

Transport Pathways

Aquatic photolysis and microbial breakdown are significant degradation pathways for imazamox, meaning the chemical is destroyed when exposed to sunlight. Imazamox is stable to hydrolysis at pHs of 5, 7, and 9. (AECOM, 2009). Volatilization (the process by which droplets at the soil surface are vaporized) is not a significant fate and transport pathway (AECOME, 2009). There are no chemical specific federal or New York State drinking water/groundwater standards for imazamox. Based on its chemical structure, imazamox falls under the 50 micrograms/L New York State drinking water standard for "unspecified organic contaminants" (10 NYCRR Part 5, Public Water Systems). Nicotinic acid and di – and tricarboxylic acids are the major breakdown products of imazamox in waterbodies.

Toxicity Risk Assessment

No reproductive or neurotoxic effects from imazamox were found in reviewed studies and imazamox is not likely to be carcinogenic to humans (EPA, 2008). The toxicity potential to non-target animal species is negligible (AECOM, 2009). Imazamox is practically non-toxic to fish and aquatic invertebrates (EPA 2008). Imazamox does not persist in the environment or bioconcentrate in fish (EPA, 2008b). The concentration proposed for the Peconic River *Ludwigia peploides* Control Project (25 ppb) is well below the maximum application rate of 500 ppb. None of the breakdown products are herbicidal nor suggest concerns for aquatic organisms or human health (EPA, 2008).

Inert Ingredients

87.9% of the ingredients in Clearcast® are not ammonium salt of imazamox, which is the active ingredient in Clearcast®. The inert ingredients are considered confidential business information and cannot be released by DEC. EPA does approve inert ingredients to be used in products and New York State's Department of Health (DOH) checks products to see what the inert ingredients are. DOH does not conduct a human health review associated with these ingredients. Information on inert ingredients can be found on the EPA's website at: https://www.epa.gov/pesticide-registration/inert-ingredients-overview-and-guidance.

Information about Florpyrauxifen-benzyl

Product Background

Florpyrauxifen-benzyl is the active ingredient in the systemic herbicide ProcellaCOR® EC. ProcellaCOR® EC was first registered with the EPA in 2018 (EPA registration number 67690-80) and was approved for use in New York State as an aquatic herbicide under a Special Local Needs Label (SLN) in 2019 (NY SLN-190001). Florpyrauxifen-benzyl is a synthetic auxin with a mode of action impacting cell division and growth (WSSA, 2021). ProcellaCOR® EC was successfully used to selectively treat invasive aquatic plants in Lake Carl Blackwell, OK (the drinking water source for Oklahoma State University) in 2019. ProcellaCOR® EC was approved for use within the Adirondack Park by the Adirondack Park Agency and was successfully used to treat invasive Eurasian watermilfoil in Minerva Lake in 2020. ProcellaCOR® EC was also used successfully to treat Eurasian watermilfoil in Cazenovia Lake in 2021.

Water Use Restrictions

According to the SLN, ProcellaCOR® EC is restricted for use for irrigation at concentrations above 1 ppb for agricultural crops, greenhouse, nursery, or hydroponic plants based on label requirements. The product is restricted for use for livestock watering at concentrations above 1 ppb. ProcellaCOR® EC has no label restrictions for drinking, swimming, or fishing. The proposed concentration for Peconic River treatment of 25 ppb is the maximum application rate according to the product label.

Filtration

Low-level concentrations of the herbicide can be removed from water using activated carbon filtration.

Transport Pathways

Florpyrauxifen-benzyl is destroyed by exposure to sunlight. Volatilization, (the process by which droplets at the soil surface are vaporized) is a moderate fate and transport pathway (EPA, 2017). In soil and water sediment systems, biodegradation are the processes expected to affect the fate of the chemical. XDE-848 acid is the major degradate of florpyrauxifen-benzyl in waterbodies. XDE-848 is expected to have the same or lesser toxicity and hazard concerns to its parent.

Toxicity Risk Assessment

According to the Environmental Fate and Ecological Risk Assessment for Florpyrauxifen-benzyl conducted by the EPA in 2017:

- Florpyrauxifen-benzyl was not chronically toxic to freshwater fish up to the limit of functional solubility (~40 ppb) nor acutely toxic up to its tested solubility limit (~25–60 ppb) in studies conducted on freshwater and estuarine/marine invertebrates residing in the water column.
- A bioconcentration factor (BCF) study on bluegills revealed florpyrauxifen-benzyl has low potential to bioaccumulate in fish tissue and is relatively short-lived in aquatic metabolism systems (2–6 days), which further limits its potential for bioconcentration in the environment.
- All tested transformation products were not acutely toxic to freshwater invertebrates at concentrations up to and exceeding the maximum aquatic use application rate of 150 ppb. Therefore, multiple lines of evidence suggest florpyrauxifen-benzyl has a low potential for acute risk to freshwater and estuarine/marine invertebrates which reside primarily in the water column.

ProcellaCOR® EC was not acutely toxic to juvenile freshwater mussels (family Unionidae), indicating minimal risk from florpyrauxifen-benzyl applications in the environment for aquatic weed control. (Buczek, 2020)

Inert Ingredients

97.3% of the ingredients in ProcellaCOR® EC are not florpyrauxifen-benzyl, which is the active ingredient). The inert ingredients are considered confidential business information and cannot be released by the DEC. EPA does approve inert ingredients to be used in products and NYSDOH checks products to see what the inert ingredients are. DOH does not conduct a human health review associated with these ingredients. Information on inert ingredients can be found on EPA's website at: https://www.epa.gov/pesticide-registration/inert-ingredients-overview-and-guidance.

Herbicide Resistance

ProcellaCOR® EC is classified as a WSSA Group 4 Herbicide (HRAC Group O). According to the product label, weed populations may contain or develop biotypes that are resistant to ProcellaCOR® EC and other Group 4 herbicides. If herbicides with the same mode of action are used repeatedly at the same site, resistant biotypes may eventually dominate the weed population and may not be controlled by these products. The product manufacturer therefore recommends ProcellaCOR® EC not be used alone in the same treatment area for submersed and emergent plant control for more than two consecutive years, unless used in combination or rotated with an herbicide with an alternate mode of action. DEC therefore proposes to use ProcellaCOR® EC only in combination with Clearcast® and to aggressively monitor for signs of resistance or escape from treatment areas (see "Monitoring" section above for additional information).

Outreach and Communication

Educational Materials

The DEC's Bureau of Invasive Species and Ecosystem Health will continue to work with the DEC Region 1 Fisheries, Long Island Invasive Species Management Area (LIISMA), LI-Metro AIS Task Force, Peconic Estuary Partnership, and other partners to provide education and outreach products (ID cards, ID sheets, and fact sheets) and messaging to target audiences that include residents, municipalities, recreationists, yacht clubs, marinas, etc. The *Ludwigia peploides* fact sheet can be found here: https://www.dec.ny.gov/docs/lands_forests_pdf/waterprimrosefs.pdf. The Peconic River *Ludwigia peploides* Control Project webpage can be found here: https://www.dec.ny.gov/animals/122333.html. For additional questions, please contact DEC's ISCS at isinfo@dec.ny.gov or 518-402-9425.

Two Chronolog® stations were installed along the Peconic River in 2021 as a tool for the public to assist in monitoring invasive species phenology and treatment efficacy. Chronolog® stations are designed to crowdsource citizen science by creating time lapses from public photos at designated stations. One Chronolog® station was installed at DEC's Edwards Avenue Canoe/Fishing Access Site, directly adjacent to the pilot treatment area. The other was installed at DEC's Forge Pond Access Site. Visitors to each site are encouraged to add photos throughout the season in order to assist in monitoring: https://www.chronolog.io/site/DEC104.

Responsible use of the river by boaters, anglers, and swimmers will be an integral part of preventing the spread of *Ludwigia peploides* in future years. Outreach regarding compliance and awareness of *6 NYCRR Part 576 Aquatic Invasive Species Spread Prevention* will be increased in the Peconic River area, particularly at boat launches and public access areas. More information on the regulations of Part 576 and aquatic invasive species spread prevention can be found on the webpage, http://www.dec.ny.gov/regulations/104431.html. Aquatic invasive species tip strips can be requested from the DEC's ISCS (see above for contact information). More information about boat steward programs can be found on the webpage, http://www.dec.ny.gov/animals/107807.html.

Public Stakeholder Meetings

DEC will hold annual public stakeholder meetings to provide updates on the Five-Year Control Project. Meetings will take place in spring. DEC will provide the results of treatment and monitoring conducted by the contractor as well as ongoing project considerations on the project webpage, https://www.dec.ny.gov/animals/122333.html.

Webpage

The project webpage on the DEC website will be updated regularly with information from the contractors and staff and will provide resources for residents, municipalities, and environmental stakeholders. Annual updates, work plans, and survey results will be made available on the project webpage, https://www.dec.ny.gov/animals/122333.html.

Shoreline Signs

As per the Article 15 permit requirements, weatherproof, bilingual signs with information about water use restrictions will be placed at public access areas during treatment.

Involved Staff and Stakeholders

DEC staff included:

- Cathy McGlynn, PhD. – DLF ISCS
- Steven Pearson, PhD. – DLF ISCS
- Nicole White, CLM – DLF ISCS
- Heidi O'Riordan, Region 1 Fisheries
- Ashley Morris, DLF ISCS/Fisheries Region 1

Peconic River Watershed Stakeholders included:

- Central Pine Barrens Joint Planning and Policy Commission
- Peconic Estuary Partnership
- LIISMA
- Suffolk County Conservation Advisory Council
- Suffolk County Water Authority
- Suffolk County Parks
- Town of Brookhaven
- Town of Riverhead
- Town of Southampton
- Long Island/Metro AIS Task Force
- USFWS

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Additional Resources

6 NYCRR Part 575 Prohibited and Regulated Invasive Species https://www.dec.ny.gov/docs/lands_forests_pdf/islist.pdf

Long Island Sound Coastal Management Program https://lirpc.org/wp-content/uploads/2017/10/LISCMP.pdf

U.S. Fish and Wildlife Service – Significant Habitats and Habitat Complexes of the New York Bight Watershed

https://nctc.fws.gov/pubs5/web_link/text/li_pine.htm

Appendix A

2021 *Ludwigia peploides*

Distribution Maps

POST-TREATMENT SURVEY - PECONIC RIVER SECTION 2

WATER PRIMROSE (*Ludwigia peploides*) DISTRIBUTION

SOLITUDE LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com

PECONIC RIVER - SECTION 2
Ludwigia peploides Control Project
Post-Treatment Aquatic Vegetation Survey
September 7, 2021
Sample Stations: 49 out of 50
Station not surveyed:

Plant Density

- = No Plants
- T = Trace Plants
- S = Sparse Plants
- M = Medium Plants
- D = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	13	27%
Trace	1	8%
Sparse	1	8%
Medium	3	23%
Dense	8	62%

N

0 265 530 Feet

Prepared by: KM

POST-TREATMENT SURVEY - PECONIC RIVER SECTION 3

WATER PRIMROSE (*Ludwigia peploides*) DISTRIBUTION

SOLITUDE LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com

PECONIC RIVER - SECTION 3
Ludwigia peploides Control Project
Post-Treatment Aquatic Vegetation Survey
September 7, 2021
Sample Stations: 8

Plant Density

- = No Plants
- T = Trace Plants
- S = Sparse Plants
- M = Medium Plants
- D = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	1	13%
Trace	0	0%
Sparse	1	100%
Medium	0	0%
Dense	0	0%

N

0 145 290 Feet

Prepared by: KM

POST-TREATMENT SURVEY - PECONIC RIVER SECTION 4

WATER PRIMROSE (*Ludwigia peploides*) DISTRIBUTION

SOLITUDE LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com

PECONIC RIVER - SECTION 4
Ludwigia peploides Control Project
Post-Treatment Aquatic Vegetation Survey
September 7, 2021
Sample Stations: 18

Plant Density

- = No Plants
- T = Trace Plants
- S = Sparse Plants
- M = Medium Plants
- D = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	8	44%
Trace	3	38%
Sparse	5	63%
Medium	0	0%
Dense	0	0%

N

0 340 680 Feet

Prepared by: KM

Imagery Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

POST-TREATMENT SURVEY - PECONIC RIVER SECTION 5

WATER PRIMROSE (*Ludwigia peploides*) DISTRIBUTION

SOLITUDE LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com

PECONIC RIVER - SECTION 5
Ludwigia peploides Control Project
Post-Treatment Aquatic Vegetation Survey
September 8, 2021
Sample Stations: 79

Plant Density

- = No Plants
- (T) = Trace Plants
- (S) = Sparse Plants
- (M) = Medium Plants
- (D) = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	41	52%
Trace	19	46%
Sparse	13	32%
Medium	3	7%
Dense	6	15%

0 345 690 Feet

Imagery Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Prepared by: KM

POST-TREATMENT SURVEY - PECONIC RIVER SECTION 6

WATER PRIMROSE (*Ludwigia peploides*) DISTRIBUTION

SOLITUDE LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com

PECONIC RIVER - SECTION 6
Ludwigia peploides Control Project
Post-Treatment Aquatic Vegetation Survey
September 8, 2021
Sample Stations: 64

Plant Density

- = No Plants
- T = Trace Plants
- S = Sparse Plants
- M = Medium Plants
- D = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	59	92%
Trace	6	10%
Sparse	13	22%
Medium	13	22%
Dense	27	46%

N

0 475 950 Feet

Prepared by: KM

POST-TREATMENT SURVEY - PECONIC RIVER SECTION 8

WATER PRIMROSE (*Ludwigia peploides*) DISTRIBUTION

SOLITUDE LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com

PECONIC RIVER - SECTION 8
Ludwigia peploides Control Project
Post-Treatment Aquatic Vegetation Survey
September 7, 2021
Sample Stations: 12

Plant Density

- = No Plants
- (T) = Trace Plants
- (S) = Sparse Plants
- (M) = Medium Plants
- (D) = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	4	33%
Trace	4	100%
Sparse	0	0%
Medium	0	0%
Dense	0	0%

N

0 212.5 425 Feet

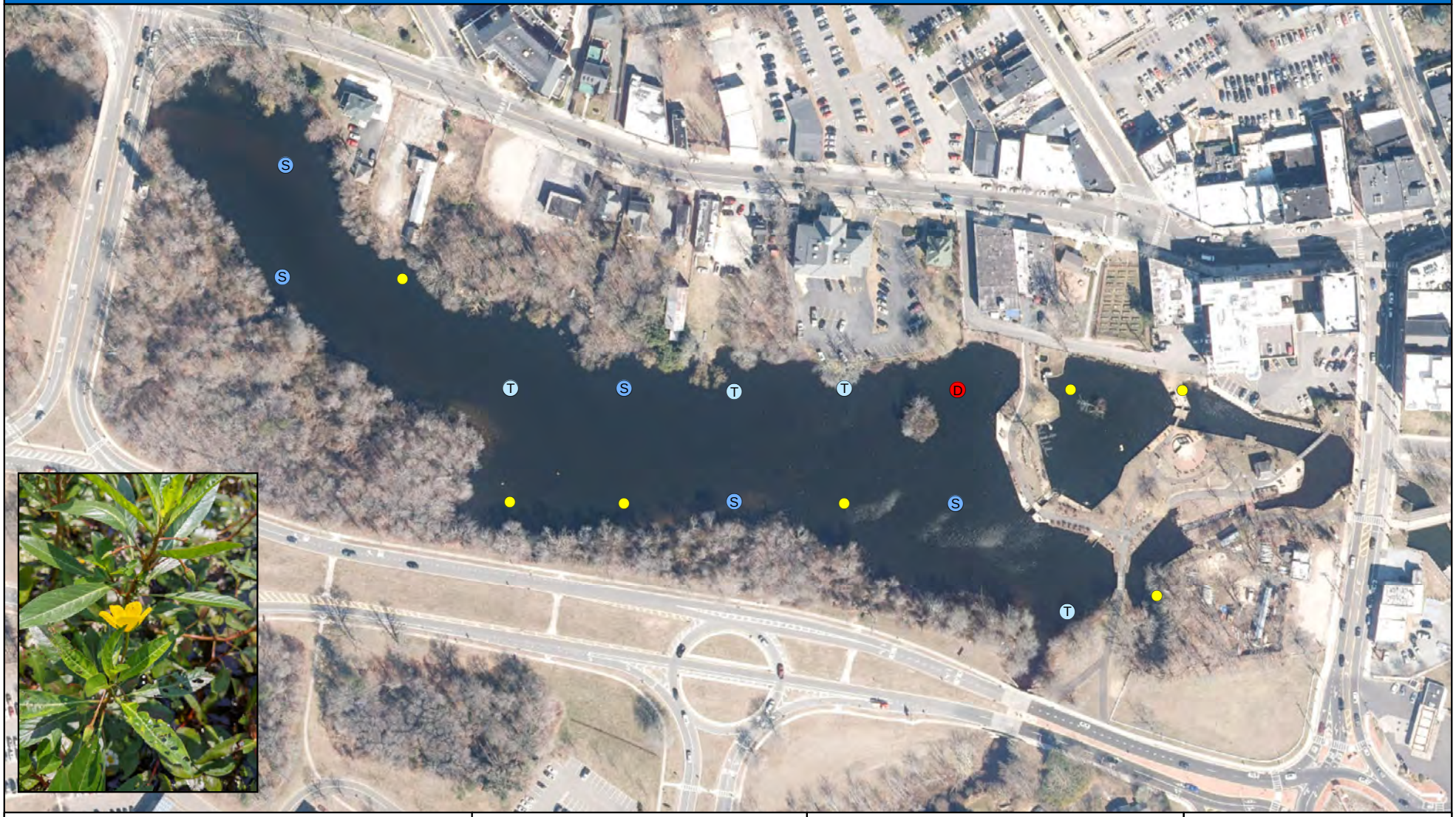
Imagery Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Prepared by: KM

POST-TREATMENT SURVEY - PECONIC RIVER SECTION 9

WATER PRIMROSE (*Ludwigia peploides*) DISTRIBUTION

SOLITUDE LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com



PECONIC RIVER - SECTION 9
Ludwigia peploides Control Project
Post-Treatment Aquatic Vegetation Survey
September 7, 2021
Sample Stations: 17

Plant Density

- = No Plants
- T = Trace Plants
- S = Sparse Plants
- M = Medium Plants
- D = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	10	59%
Trace	4	40%
Sparse	5	50%
Medium	0	0%
Dense	1	10%

N

0 130 260 Feet

Imagery Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Prepared by: KM

Appendix B

2021 SAV Abundance Data Table

Floating Aquatic Plant Density

Trace

Sparse

Medium

Dense

SOLITUDE
LAKE MANAGEMENT

Submersed Aquatic Plant Density

Trace

Sparse

Medium

Dense

SOLITUDE LAKE MANAGEMENT

Peconic River
Section 1
Aquatic Macrophyte Abundance Distribution
September 7, 2021

	Total		Trace		Sparse		Medium		Dense	
	Sites	%	Sites	%	Sites	%	Sites	%	Sites	%
TOTAL SITES	26									
OVERALL	25	96%	9	36%	9	36%	4	16%	3	12%
Watermoss	19	73%	19	100%	0	0%	0	0%	0	0%
Smartweed sp.	16	62%	7	44%	7	44%	0	0%	2	13%
Sago pondweed	13	50%	4	31%	5	38%	3	23%	1	8%
Bur-reed sp.	12	46%	9	75%	3	25%	0	0%	0	0%
Common bladderwort	11	42%	11	100%	0	0%	0	0%	0	0%
Leafy pondweed	10	38%	6	60%	2	20%	1	10%	1	10%
Spatterdock	6	23%	6	100%	0	0%	0	0%	0	0%
European frogbit	5	19%	5	100%	0	0%	0	0%	0	0%
Small duckweed	4	15%	3	75%	1	25%	0	0%	0	0%
Wild celery	3	12%	2	67%	1	33%	0	0%	0	0%
Benthic filamentous algae	3	12%	3	100%	0	0%	0	0%	0	0%
Pickerelweed	2	8%	2	100%	0	0%	0	0%	0	0%
Fanwort	2	8%	2	100%	0	0%	0	0%	0	0%

Peconic River
Section 2
Aquatic Macrophyte Abundance Distribution
September 7, 2021

	Total		Trace		Sparse		Medium		Dense	
	Sites	%	Sites	%	Sites	%	Sites	%	Sites	%
TOTAL SITES	49									
OVERALL	49	100%	0	0%	0	0%	1	2%	48	98%
Small duckweed	44	90%	19	43%	15	34%	7	16%	3	7%
European frogbit	41	84%	12	29%	5	12%	2	5%	22	54%
Fanwort	41	84%	2	5%	0	0%	3	7%	36	88%
Smartweed sp.	26	53%	9	35%	2	8%	9	35%	6	23%
Spatterdock	25	51%	16	64%	5	20%	4	16%	0	0%
Common bladderwort	24	49%	18	75%	1	4%	5	21%	0	0%
Ludwigia peploides	13	27%	1	8%	1	8%	3	23%	8	62%
Benthic filamentous algae	7	14%	1	14%	6	86%	0	0%	0	0%
Watershield	4	8%	3	75%	1	25%	0	0%	0	0%
Bur-reed sp.	3	6%	1	33%	0	0%	2	67%	0	0%
Long-leaf pondweed	2	4%	0	0%	2	100%	0	0%	0	0%
Sago pondweed	1	2%	0	0%	0	0%	1	100%	0	0%
Leafy pondweed	1	2%	0	0%	0	0%	1	100%	0	0%
Pickerelweed	1	2%	0	0%	0	0%	1	100%	0	0%

Peconic River
Section 3
Aquatic Macrophyte Abundance Distribution
September 7, 2021

	Total		Trace		Sparse		Medium		Dense	
	Sites	%	Sites	%	Sites	%	Sites	%	Sites	%
TOTAL SITES	8									
OVERALL	8	100%	1	13%	3	38%	1	13%	3	38%
Watermoss	8	100%	4	50%	4	50%	0	0%	0	0%
Smartweed sp.	4	50%	0	0%	1	25%	1	25%	2	50%
Wild celery	3	38%	2	67%	1	33%	0	0%	0	0%
Bur-reed sp.	3	38%	0	0%	2	67%	1	33%	0	0%
Parrot feather	2	25%	1	50%	1	50%	0	0%	0	0%
European frogbit	2	25%	1	50%	1	50%	0	0%	0	0%
Fanwort	2	25%	0	0%	2	100%	0	0%	0	0%
Pickerelweed	1	13%	1	100%	0	0%	0	0%	0	0%
Ludwigia peploides	1	13%	0	0%	1	100%	0	0%	0	0%
Sago pondweed	1	13%	1	100%	0	0%	0	0%	0	0%
Floating-leaf pondweed	1	13%	1	100%	0	0%	0	0%	0	0%
Leafy pondweed	1	13%	1	100%	0	0%	0	0%	0	0%

Peconic River
Section 4
Aquatic Macrophyte Abundance Distribution
September 7, 2021

	Total		Trace		Sparse		Medium		Dense	
	Sites	%	Sites	%	Sites	%	Sites	%	Sites	%
TOTAL SITES	18									
OVERALL	18	100%	2	11%	0	0%	6	33%	10	56%
Small duckweed	16	89%	8	50%	6	38%	2	13%	0	0%
Smartweed sp.	16	89%	5	31%	4	25%	7	44%	0	0%
European frogbit	15	83%	7	47%	6	40%	2	13%	0	0%
Benthic filamentous algae	12	67%	8	67%	4	33%	0	0%	0	0%
Fanwort	11	61%	0	0%	2	18%	0	0%	9	82%
Ludwigia peploides	8	44%	3	38%	5	63%	0	0%	0	0%
Parrot feather	6	33%	6	100%	0	0%	0	0%	0	0%
Bur-reed sp.	6	33%	6	100%	0	0%	0	0%	0	0%
Pickerelweed	5	28%	5	100%	0	0%	0	0%	0	0%
Spatterdock	5	28%	4	80%	1	20%	0	0%	0	0%
Long-leaf pondweed	4	22%	2	50%	1	25%	1	25%	0	0%
Watermoss	4	22%	3	75%	1	25%	0	0%	0	0%
Coontail	3	17%	1	33%	2	67%	0	0%	0	0%
Common bladderwort	1	6%	1	100%	0	0%	0	0%	0	0%
Muskgrass	1	6%	1	100%	0	0%	0	0%	0	0%

Peconic River
Section 5
Aquatic Macrophyte Abundance Distribution
September 8, 2021

	Total		Trace		Sparse		Medium		Dense	
	Sites	%	Sites	%	Sites	%	Sites	%	Sites	%
TOTAL SITES	79									
OVERALL	76	96%	0	0%	4	5%	7	9%	65	86%
Fanwort	73	92%	1	1%	6	8%	6	8%	60	82%
Benthic filamentous algae	45	57%	29	64%	11	24%	2	4%	3	7%
Ludwigia peploides	41	52%	19	46%	13	32%	3	7%	6	15%
European frogbit	21	27%	15	71%	3	14%	3	14%	0	0%
Parrot feather	20	25%	19	95%	1	5%	0	0%	0	0%
Spatterdock	20	25%	12	60%	3	15%	1	5%	4	20%
Bur-reed sp.	12	15%	12	100%	0	0%	0	0%	0	0%
Coontail	11	14%	5	45%	6	55%	0	0%	0	0%
White water lily	11	14%	1	9%	4	36%	1	9%	5	45%
Small duckweed	9	11%	8	89%	1	11%	0	0%	0	0%
Watershield	9	11%	6	67%	0	0%	2	22%	1	11%
Smartweed sp.	9	11%	4	44%	2	22%	0	0%	3	33%
Pickerelweed	9	11%	8	89%	0	0%	1	11%	0	0%
Common bladderwort	8	10%	8	100%	0	0%	0	0%	0	0%
Wild celery	7	9%	2	29%	2	29%	2	29%	1	14%
Brazilian elodea	5	6%	5	100%	0	0%	0	0%	0	0%
Bassweed	2	3%	1	50%	1	50%	0	0%	0	0%
Watermoss	1	1%	1	100%	0	0%	0	0%	0	0%

Peconic River
Section 6
Aquatic Macrophyte Abundance Distribution
September 8, 2021

	Total		Trace		Sparse		Medium		Dense	
	Sites	%	Sites	%	Sites	%	Sites	%	Sites	%
TOTAL SITES	64									
OVERALL	64	100%	1	2%	3	5%	7	11%	53	83%
Fanwort	61	95%	1	2%	2	3%	6	10%	52	85%
Small duckweed	60	94%	12	20%	25	42%	12	20%	11	18%
Ludwigia peploides	59	92%	6	10%	13	22%	13	22%	27	46%
Benthic filamentous algae	36	56%	17	47%	18	50%	1	3%	0	0%
Coontail	24	38%	18	75%	6	25%	0	0%	0	0%
Brazilian elodea	19	30%	14	74%	4	21%	1	5%	0	0%
European frogbit	14	22%	14	100%	0	0%	0	0%	0	0%
Parrot feather	7	11%	7	100%	0	0%	0	0%	0	0%
Long-Leaf pondweed	6	9%	6	100%	0	0%	0	0%	0	0%
Common bladderwort	4	6%	4	100%	0	0%	0	0%	0	0%
Sago pondweed	3	5%	1	33%	2	67%	0	0%	0	0%
Spatterdock	2	3%	2	100%	0	0%	0	0%	0	0%
Pickerelweed	2	3%	2	100%	0	0%	0	0%	0	0%
Bur-reed sp.	2	3%	2	100%	0	0%	0	0%	0	0%
Water stargrass	1	2%	1	100%	0	0%	0	0%	0	0%
Watermoss	1	2%	1	100%	0	0%	0	0%	0	0%
Wild celery	1	2%	0	0%	1	100%	0	0%	0	0%

Peconic River
Section 7
Aquatic Macrophyte Abundance Distribution
September 7, 2021

	Total		Trace		Sparse		Medium		Dense	
	Sites	%	Sites	%	Sites	%	Sites	%	Sites	%
TOTAL SITES	17									
OVERALL	17	100%	1	6%	4	24%	7	41%	5	29%
Coontail	12	71%	6	50%	5	42%	0	0%	1	8%
Benthic filamentous algae	11	65%	7	64%	4	36%	0	0%	0	0%
Watermoss	9	53%	6	67%	3	33%	0	0%	0	0%
Long-leaf pondweed	8	47%	3	38%	2	25%	2	25%	1	13%
Fanwort	8	47%	5	63%	3	38%	0	0%	0	0%
Muskgrass	8	47%	2	25%	3	38%	0	0%	3	38%
Small duckweed	7	41%	4	57%	2	29%	1	14%	0	0%
Sago pondweed	7	41%	5	71%	2	29%	0	0%	0	0%
Leafy pondweed	4	24%	4	100%	0	0%	0	0%	0	0%
Floating-leaf pondweed	3	18%	0	0%	1	33%	2	67%	0	0%
Naiad sp.	3	18%	3	100%	0	0%	0	0%	0	0%
Common waterweed	2	12%	2	100%	0	0%	0	0%	0	0%
Wild celery	2	12%	2	100%	0	0%	0	0%	0	0%
European frogbit	2	12%	2	100%	0	0%	0	0%	0	0%
Bur-reed sp.	1	6%	0	0%	0	0%	1	100%	0	0%
Water stargrass	1	6%	0	0%	1	100%	0	0%	0	0%
Smartweed sp.	1	6%	0	0%	1	100%	0	0%	0	0%
Brazilian elodea	1	6%	0	0%	1	100%	0	0%	0	0%
Parrot feather	1	6%	1	100%	0	0%	0	0%	0	0%

Peconic River
Section 8
Aquatic Macrophyte Abundance Distribution
September 7, 2021

	Total		Trace		Sparse		Medium		Dense	
	Sites	%	Sites	%	Sites	%	Sites	%	Sites	%
TOTAL SITES	12									
OVERALL	12	100%	0	0%	3	25%	5	42%	4	33%
Fanwort	9	75%	3	33%	3	33%	2	22%	1	11%
Small duckweed	8	67%	3	38%	3	38%	2	25%	0	0%
Muskgrass	8	67%	2	25%	2	25%	4	50%	0	0%
Long-leaf pondweed	8	67%	5	63%	1	13%	0	0%	2	25%
Benthic filamentous algae	7	58%	3	43%	3	43%	0	0%	1	14%
Coontail	5	42%	4	80%	0	0%	1	20%	0	0%
European frogbit	5	42%	4	80%	1	20%	0	0%	0	0%
Parrot feather	4	33%	3	75%	1	25%	0	0%	0	0%
Ludwigia peploides	4	33%	4	100%	0	0%	0	0%	0	0%
Leafy pondweed	1	8%	1	100%	0	0%	0	0%	0	0%
Spatterdock	1	8%	1	100%	0	0%	0	0%	0	0%

Peconic River
Section 9
Aquatic Macrophyte Abundance Distribution
September 7, 2021

	Total		Trace		Sparse		Medium		Dense	
	Sites	%	Sites	%	Sites	%	Sites	%	Sites	%
TOTAL SITES	17									
OVERALL	14	82%	0	0%	5	36%	4	29%	5	36%
Benthic filamentous algae	13	76%	10	77%	1	8%	2	15%	0	0%
Duckweed	12	71%	8	67%	2	17%	2	17%	0	0%
Muskgrass	11	65%	4	36%	6	55%	1	9%	0	0%
Ludwigia peploides	10	59%	4	40%	5	50%	0	0%	1	10%
Fanwort	9	53%	2	22%	1	11%	2	22%	4	44%
European frogbit	6	35%	4	67%	2	33%	0	0%	0	0%
Coontail	2	12%	0	0%	2	100%	0	0%	0	0%
Sago pondweed	2	12%	1	50%	1	50%	0	0%	0	0%
Brazilian elodea	2	12%	2	100%	0	0%	0	0%	0	0%
Pickerelweed	2	12%	2	100%	0	0%	0	0%	0	0%
Curly-leaf pondweed	1	6%	1	100%	0	0%	0	0%	0	0%
Naiad sp.	1	6%	1	100%	0	0%	0	0%	0	0%
Common waterweed	1	6%	1	100%	0	0%	0	0%	0	0%
Parrot feather	1	6%	1	100%	0	0%	0	0%	0	0%
Long-leaf pondweed	1	6%	1	100%	0	0%	0	0%	0	0%

Appendix C

2021 European Frogbit Distribution Maps

POST-TREATMENT SURVEY - PECONIC RIVER SECTION 1

EUROPEAN FROGBIT (*Hydrocharis morsus-ranae*)) DISTRIBUTION

SOLITUDE LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com

PECONIC RIVER - SECTION 1
Ludwigia peploides Control Project
Post-Treatment Aquatic Vegetation Survey
September 7, 2021
Sample Stations: 26 out of 27
Station not surveyed:

Plant Density

- = No Plants
- (T) = Trace Plants
- (S) = Sparse Plants
- (M) = Medium Plants
- (D) = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	5	19%
Trace	5	100%
Sparse	0	0%
Medium	0	0%
Dense	0	0%

N

0 325 650 Feet

Prepared by: KM

POST-TREATMENT SURVEY - PECONIC RIVER SECTION 2

EUROPEAN FROGBIT (*Hydrocharis morsus-ranae*) DISTRIBUTION

SOLITUDE LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com

PECONIC RIVER - SECTION 2
Ludwigia peploides Control Project
Post-Treatment Aquatic Vegetation Survey
September 7, 2021
Sample Stations: 49 out of 50
Station not surveyed:

Plant Density

- = No Plants
- T = Trace Plants
- S = Sparse Plants
- M = Medium Plants
- D = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	41	84%
Trace	12	29%
Sparse	5	12%
Medium	2	5%
Dense	22	54%

N

0 265 530 Feet

Prepared by: KM

POST-TREATMENT SURVEY - PECONIC RIVER SECTION 3

EUROPEAN FROGBIT (*Hydrocharis morsus-ranae*) DISTRIBUTION

SOLITUDE LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com

PECONIC RIVER - SECTION 3
Ludwigia peploides Control Project
Post-Treatment Aquatic Vegetation Survey
September 7, 2021
Sample Stations: 8

Plant Density

- = No Plants
- (T) = Trace Plants
- (S) = Sparse Plants
- (M) = Medium Plants
- (D) = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	2	25%
Trace	1	50%
Sparse	1	50%
Medium	0	0%
Dense	0	0%

0 145 290 Feet

Prepared by: KM

POST-TREATMENT SURVEY - PECONIC RIVER SECTION 4

EUROPEAN FROGBIT (*Hydrocharis morsus-ranae*) DISTRIBUTION

SOLITUDE LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com

PECONIC RIVER - SECTION 4
Ludwigia peploides Control Project
Post-Treatment Aquatic Vegetation Survey
September 7, 2021
Sample Stations: 18

Plant Density

- = No Plants
- T = Trace Plants
- S = Sparse Plants
- M = Medium Plants
- D = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	15	83%
Trace	7	47%
Sparse	6	40%
Medium	2	13%
Dense	0	0%

N

0 340 680 Feet

Prepared by: KM

Imagery Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

POST-TREATMENT SURVEY - PECONIC RIVER SECTION 5

EUROPEAN FROGBIT (*Hydrocharis morsus-ranae*) DISTRIBUTION

SOLITUDE LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com

PECONIC RIVER - SECTION 5
Ludwigia peploides Control Project
Post-Treatment Aquatic Vegetation Survey
September 8, 2021
Sample Stations: 79

Plant Density

- = No Plants
- T = Trace Plants
- S = Sparse Plants
- M = Medium Plants
- D = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	21	27%
Trace	15	71%
Sparse	3	14%
Medium	3	14%
Dense	0	0%

N

0 345 690 Feet

Prepared by: KM

Imagery Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

POST-TREATMENT SURVEY - PECONIC RIVER SECTION 6

EUROPEAN FROGBIT (*Hydrocharis morsus-ranae*) DISTRIBUTION

SOLITUDE LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com

PECONIC RIVER - SECTION 6
Ludwigia peploides Control Project
Post-Treatment Aquatic Vegetation Survey
September 8, 2021
Sample Stations: 64

Plant Density

- = No Plants
- (T) = Trace Plants
- (S) = Sparse Plants
- (M) = Medium Plants
- (D) = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	14	22%
Trace	14	100%
Sparse	0	0%
Medium	0	0%
Dense	0	0%

N

0 475 950 Feet

Prepared by: KM

Imagery Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

POST-TREATMENT SURVEY - PECONIC RIVER SECTION 7

EUROPEAN FROGBIT (*Hydrocharis morsus-ranae*) DISTRIBUTION

SOLITUDE LAKE MANAGEMENT
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PECONIC RIVER - SECTION 7
Ludwigia peploides Control Project
Post-Treatment Aquatic Vegetation Survey
September 7, 2021
Sample Stations: 17

Plant Density

- = No Plants
- (T) = Trace Plants
- (S) = Sparse Plants
- (M) = Medium Plants
- (D) = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	2	12%
Trace	2	100%
Sparse	0	0%
Medium	0	0%
Dense	0	0%

0 240 480 Feet

Prepared by: KM

POST-TREATMENT SURVEY - PECONIC RIVER SECTION 8

EUROPEAN FROGBIT (*Hydrocharis morsus-ranae*) DISTRIBUTION

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PECONIC RIVER - SECTION 8
Ludwigia peploides Control Project
Post-Treatment Aquatic Vegetation Survey
September 7, 2021
Sample Stations: 12

Plant Density

- = No Plants
- (T) = Trace Plants
- (S) = Sparse Plants
- (M) = Medium Plants
- (D) = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	5	42%
Trace	4	80%
Sparse	1	20%
Medium	0	0%
Dense	0	0%

N

0 212.5 425 Feet

Prepared by: KM

POST-TREATMENT SURVEY - PECONIC RIVER SECTION 9

EUROPEAN FROGBIT (*Hydrocharis morsus-ranae*) DISTRIBUTION

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888.480.5253
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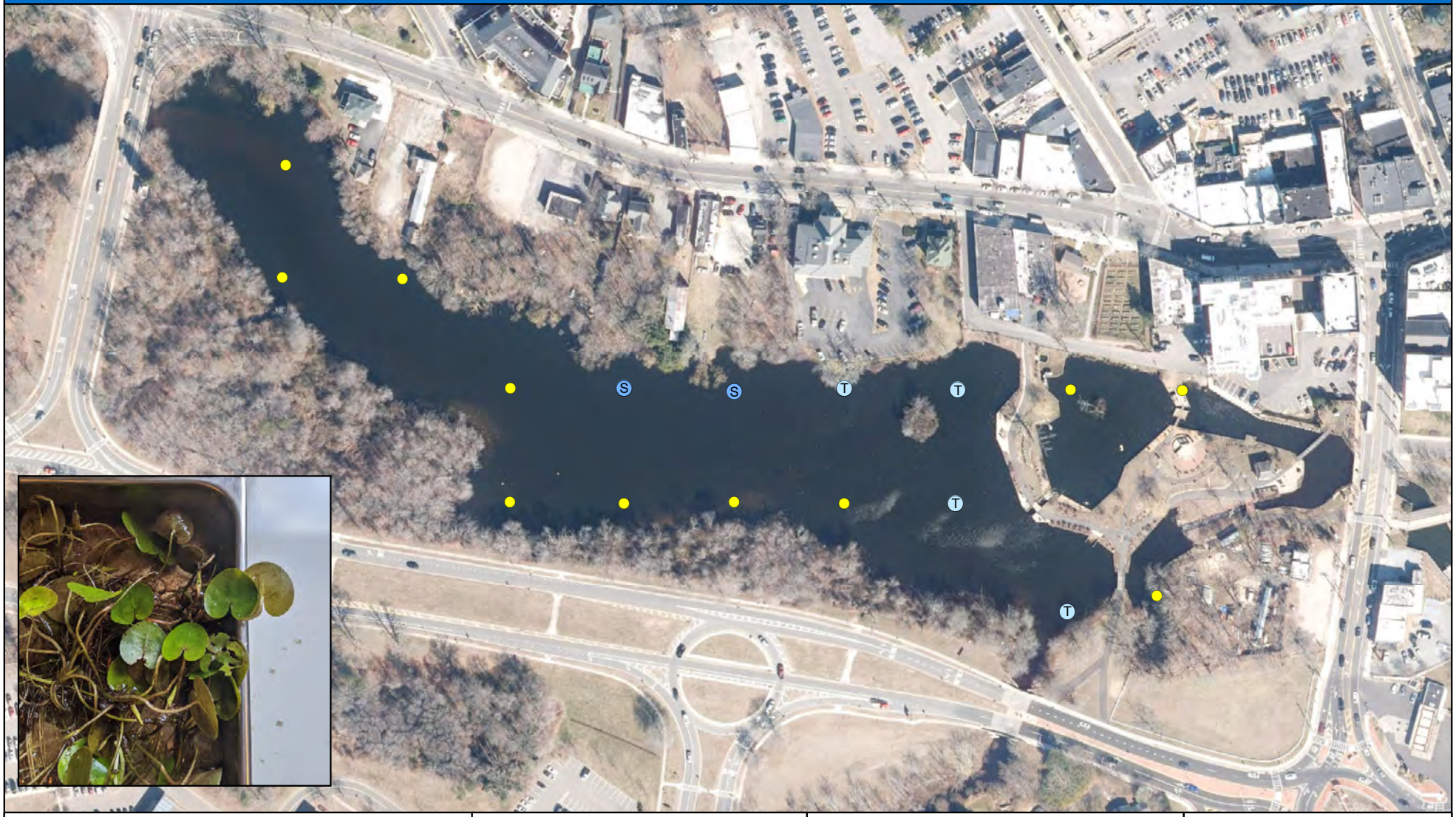


PECONIC RIVER - SECTION 9
Ludwigia peploides Control Project
Post-Treatment Aquatic Vegetation Survey
September 7, 2021
Sample Stations: 17

Plant Density

- = No Plants
- T = Trace Plants
- S = Sparse Plants
- M = Medium Plants
- D = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	6	35%
Trace	4	67%
Sparse	2	33%
Medium	0	0%
Dense	0	0%

N

0 130 260 Feet

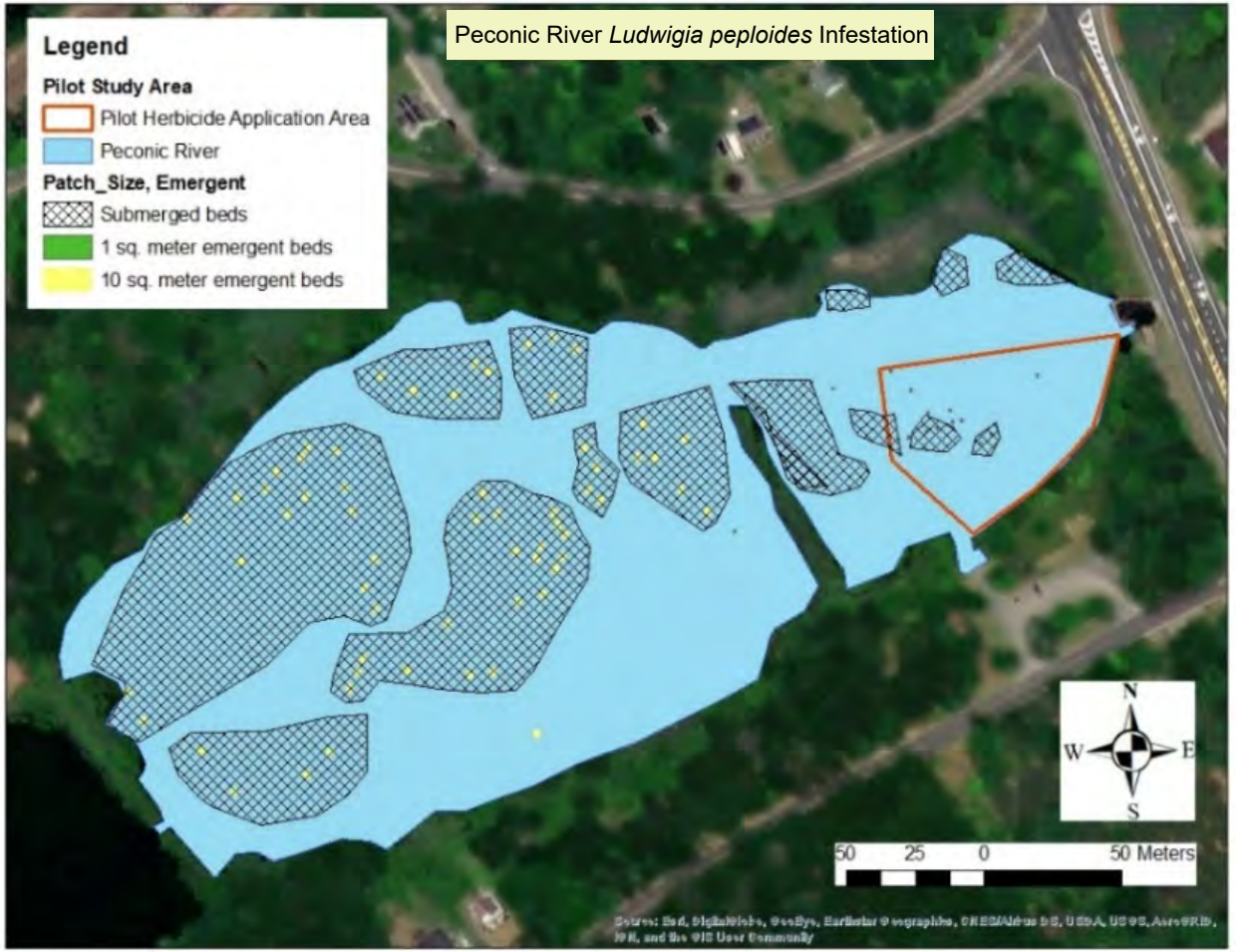
Imagery Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Prepared by: KM

Appendix D

2021 Pilot Treatment Area Site Photos

Adjacent to: DEC Edwards Ave. Launch (Edwards Ave., Calverton)



Clear distinction visible between treated and untreated floating vegetation. Product foliar applied to floating vegetation with spray adjuvant allows for targeted control. Dense floating mats can be targeted while limiting impacts to non-target species.

NEW YORK STATE | Department of Environmental Conservation

Ludwigia peploides within the treatment area appeared green and healthy on the day of application (pre-treatment).

By one week after treatment, impact to *Ludwigia peploides* leaves and some stems is significant.

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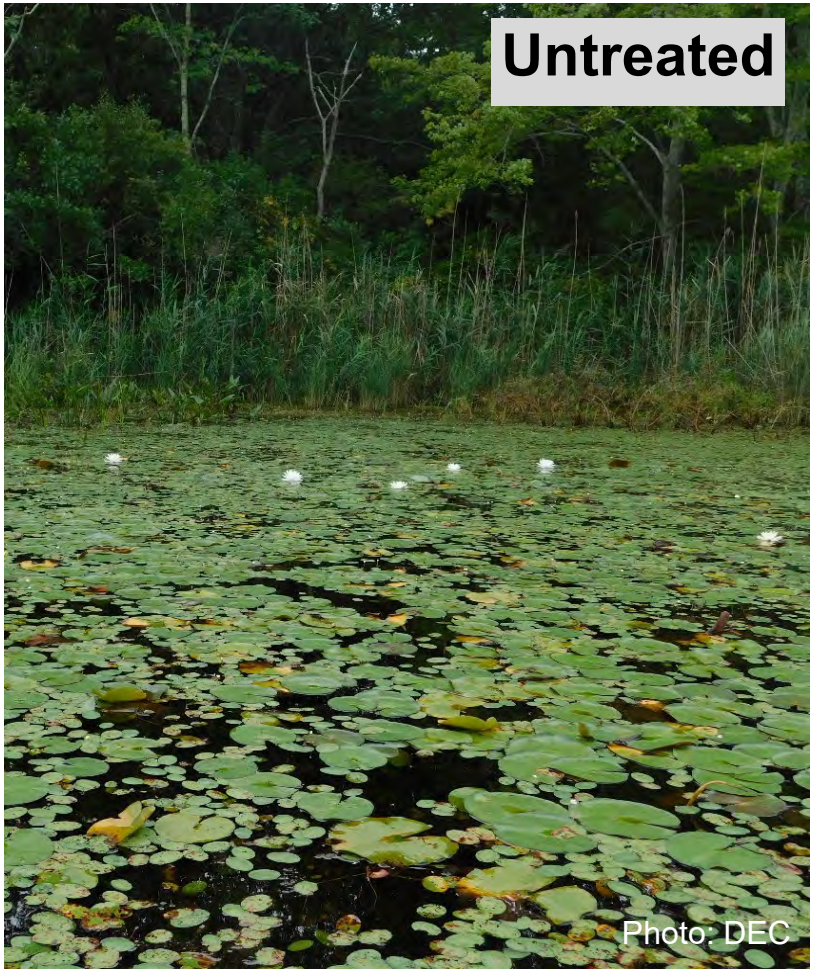


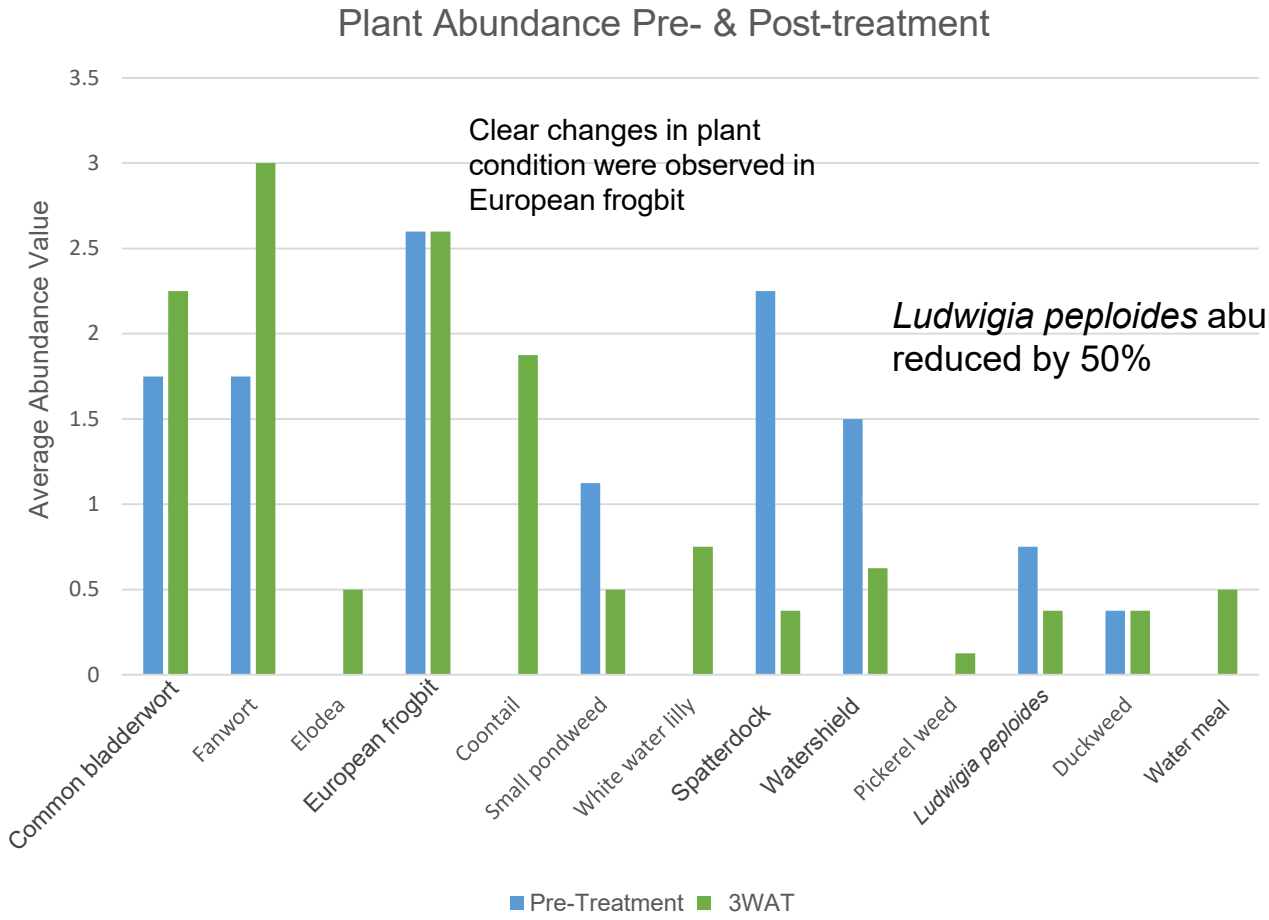
Only one acre within Brown's Bog was treated.

One week after treatment, adjacent untreated areas still appeared healthy and vigorous.

There was not a significant decrease in biomass between one and three weeks after treatment. However, there were observable impacts to plant condition. This was the same as the results in the lab, which saw that the same treatment had median effects in the first two weeks and killed all plants by the end of four weeks.

Appendix E

2021 Pilot Treatment Results Graph

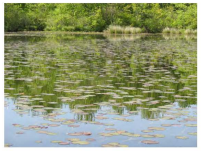


Ludwigia peploides abundance reduced by 50%

Abundance Values

0 = No Plants
1 = Trace
2 = Sparse
3 = Moderate
4 = Dense


Trace


Sparse


Medium


Dense

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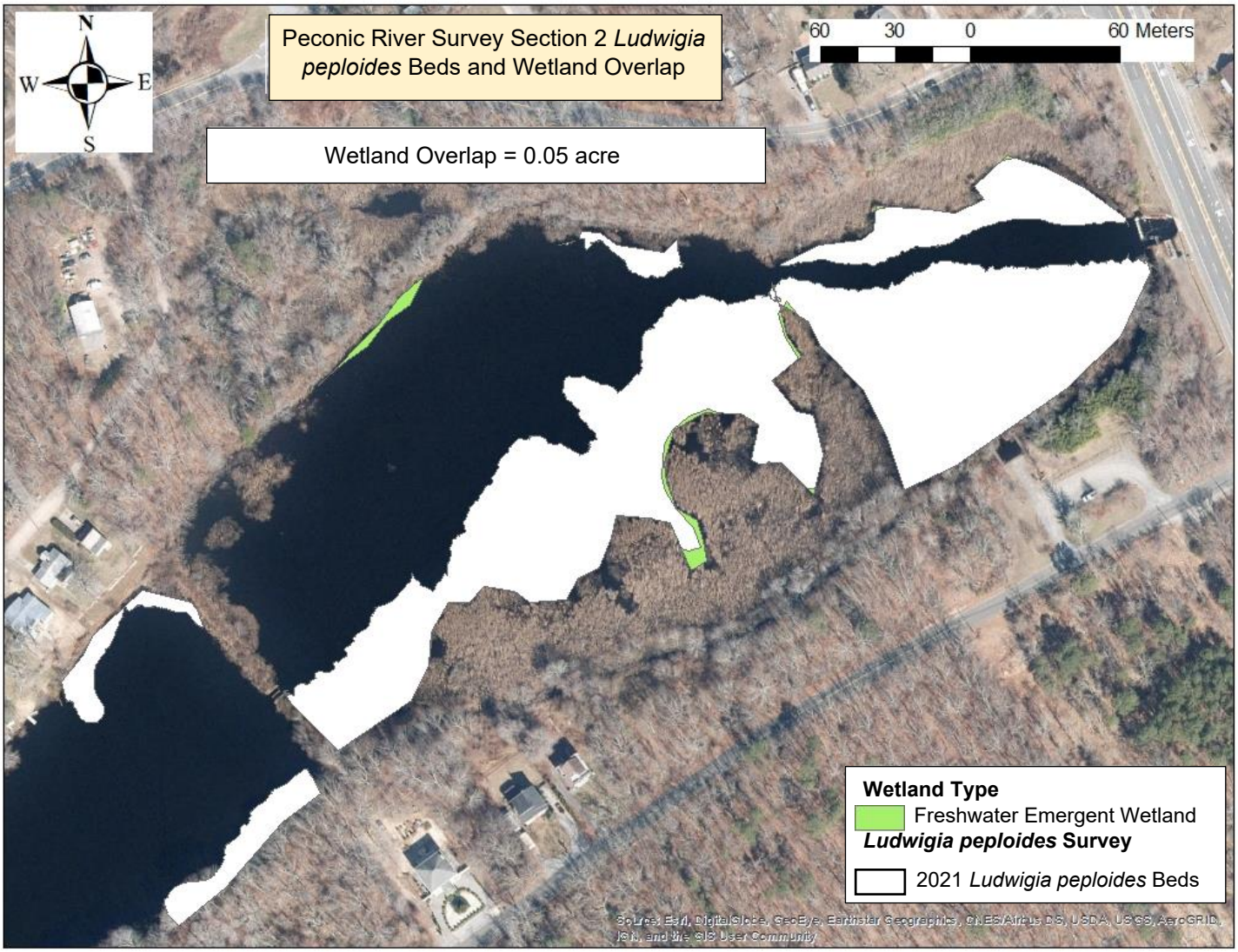
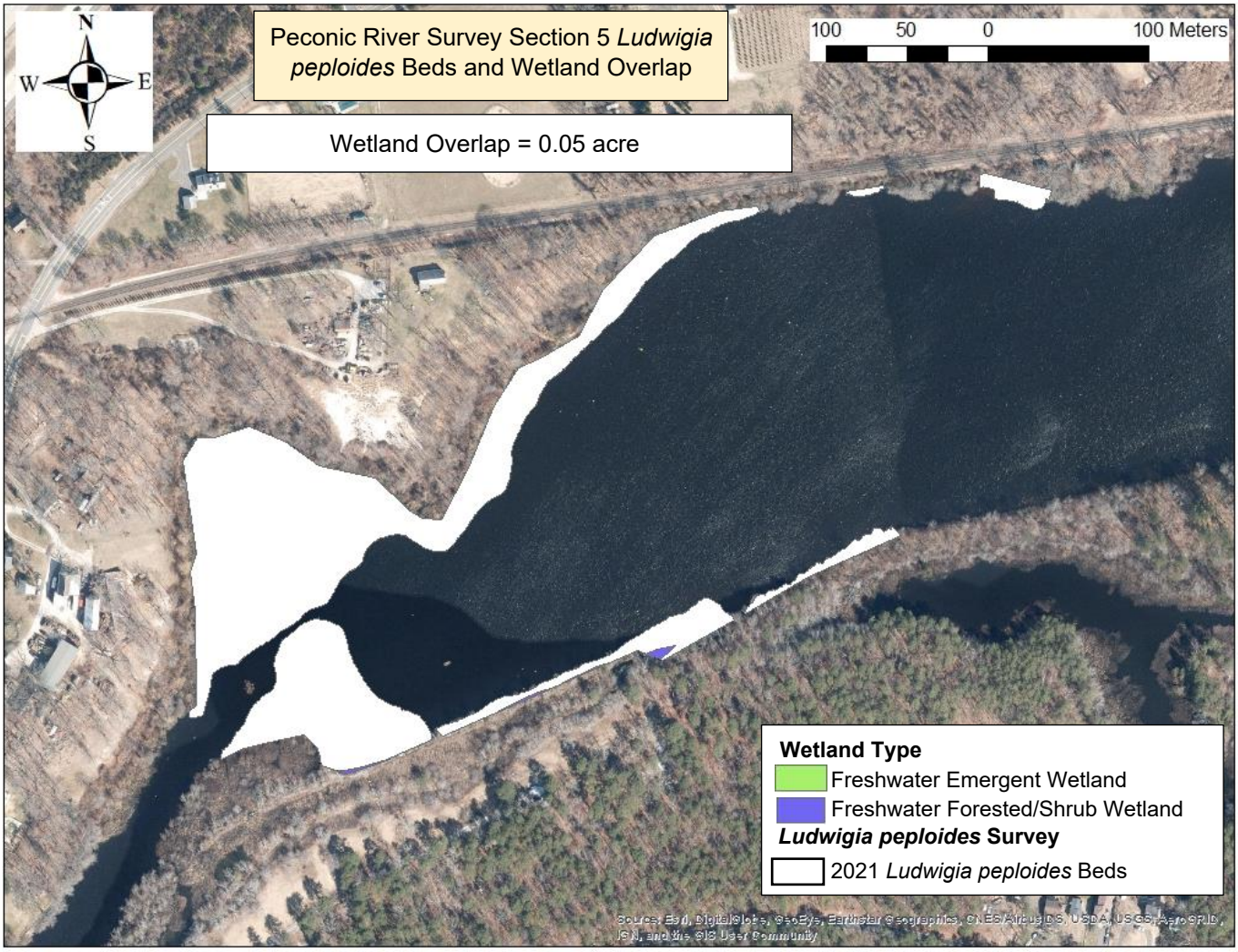
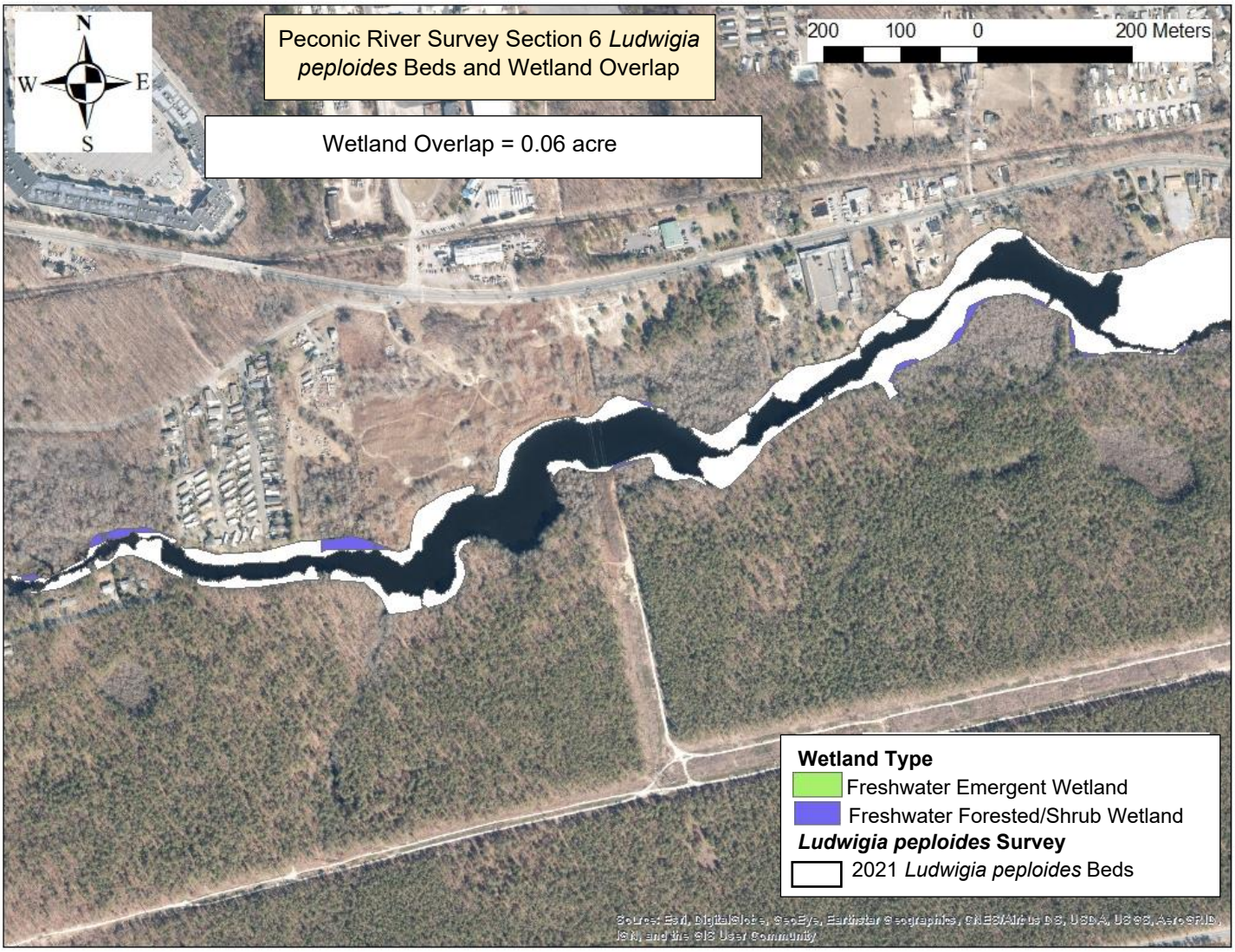
Appendix F

Peconic Overlapping Wetlands Map


N
W
E
S
Peconic River Survey Section 2 *Ludwigia peploides* Beds and Wetland Overlap
Wetland Overlap = 0.05 acre
60 30 0 60 Meters
Wetland Type
Freshwater Emergent Wetland
***Ludwigia peploides* Survey**
2021 *Ludwigia peploides* Beds
Sources: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


Peconic River Survey Section 5 *Ludwigia peploides* Beds and Wetland Overlap
Wetland Overlap = 0.05 acre
N
W
E
S
100 50 0 100 Meters
Wetland Type
Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
***Ludwigia peploides* Survey**
2021 *Ludwigia peploides* Beds
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


Peconic River Survey Section 6 *Ludwigia peploides* Beds and Wetland Overlap
Wetland Overlap = 0.06 acre
N
W
E
S
200 100 0 200 Meters
Wetland Type
Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
***Ludwigia peploides* Survey**
2021 *Ludwigia peploides* Beds
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community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