Connecticut River Hydrilla Control Project
Five-Year Management Plan

Salmon Cove, Haddam/East Haddam, CT (M. Burns, RiverCOG)

Northeast Aquatic Nuisance Species Panel

April 2020

Executive Summary

The federally listed noxious weed *Hydrilla verticillata* (monoecious biotype) was first discovered in the Connecticut River in 2016 near Keeney Cove and Glastonbury. In 2017 it was found in Enfield, Wethersfield Cove, and Crow Point Cove and the Mattabesset River. Surveys conducted in 2018-2019 indicate that the that infestation extends from Agawam, Massachusetts southward to Old Lyme, Connecticut within five miles of Long Island Sound. in scattered coves, creeks, and shoreline areas. Without a concerted multi-state control effort Vermont and New Hampshire may also be at risk of hydrilla infestation in their portion of the Connecticut River via transient boaters navigating upstream through the river system, or by visiting multiple launch sites along the river, or by the natural flow of water currents.

Hydrilla is a high-priority species for prevention and early detection efforts for many New England states because once it becomes established it alters native habitats, impacts fisheries, prohibits water recreation, affects local economies and is extremely difficult and expensive to remove. Hydrilla is also found in Coventry Lake, several small private ponds, and Silvermine River in Connecticut and ten other waterbodies in Massachusetts (Coachlace Pond, Hobomock Pond, Long Pond, Lower Woburn Street Pond, Magoun Pond, Oakman Pond, Mossy Pond, Mystic Lake, and South Meadow Pond (East and West Basins).

Each infestation site presents different challenges that influence management decisions. Control and management of the hydrilla infestation in the Connecticut River may impact public swimming and fishing areas; a fishery managed by Connecticut Department of Energy and Environmental Protection (DEEP); established aquatic macrophyte communities and native animals; varying flow regimes, and tidal influence throughout at least one-third of the Connecticut River which flows directly into the Long Island Sound.

Currently, the Northeast Aquatic Nuisance Species (NEANS) Panel is the lead coordinator for the Connecticut River Hydrilla Control Project. In an effort to address the complexities of the project, the NEANS Panel working group has outlined a five-year plan that relies heavily upon monitoring and adaptive management. This plan describes the foundation for the project resulting from several years of studies, field surveys, and the experience of the New York Hydrilla Task Force at other locations.

The plan examines all management options available and recommends the best management practices for this site. Also outlined is the additional work (expanding communication, education and outreach, and assessing impacts) that will occur to support the project in the future. Flexibility is essential for this project and assessments will be conducted at the end of each season. Annual updates will provide an evaluation of the previous season’s results. It is the intention of NEANS Panel working group to deliver a thorough and effective control and management plan that can serve as a template for other invasive species management projects.

Contents

List of Acronyms

CFS	Cubic Feet per Second (1 CFS = 1.858 Million Gallons per Day)
CAES	Connecticut Agriculture Experimental Station
CT DEEP	Connecticut Department of Energy and Environmental Protection
CTRC	Connecticut River Conservancy
EAF	Environmental Assessment Form
ELAP	Environmental Laboratory Approval Program
EPA	United States Environmental Protection Agency
LCBP	Lake Champlain Basin Program
MA DCR	Massachusetts Department of Conservation and Recreation
MassDEP	Massachusetts Department of Environmental Protection
NYS DEC	New York State Department of Environmental Conservation
NEANS Panel	Northeast Aquatic Nuisance Species Panel
NHDES	New Hampshire Department of Environmental Services
PPM	Parts per Million (1 ppm = 1 milligram per liter)
PPB	Parts per Billion (1 ppb = 1 microgram per liter)
River COG	Lower Connecticut River Council of Governors
SAV	Submerged Aquatic Vegetation
SEQR	State Environmental Quality Review
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
VT DEC	Vermont Department of Environmental Conservation

INTRODUCTION

Winding 660 km from the Canadian border through New Hampshire, Vermont, Massachusetts, and Connecticut, the Connecticut River empties into Long Island Sound. The river and its 38 main tributaries drain a 11,250 square mile watershed that provides recreation, wild places, and working lands critical to New England's identity (Marshall and Randhir 2008). Its water sustains terrestrial and aquatic ecosystems, farms, industry, and the domestic water needs of 2.3 million watershed residents (Clay et al. 2006). Hydrilla was confirmed in the lower Connecticut River in 2016. The plant is among the most noxious invasive aquatic plants because of its ability to adapt to a variety of environments and outcompete native vegetation (Langeland 1996, Haller 2014). Initial examination of Connecticut River specimens revealed morphological features that differed from hydrilla samples previously encountered in the state. These included a more robust nature, widely spaced whorls often of 5-10 leaves, and a darker color, which prompted concern that the Connecticut River hydrilla might be genetically different from the strains that are currently known to exist in North America. Hydrilla plants from this population were subjected to genetic testing that confirmed they were are distinct biotype from all known North American plants. This genetic novelty may present additional ecological and management challenges beyond what has been encountered for hydrilla to date (Tippery et al. 2019).

The objective of this document is to provide a five-year management plan for the control of *Hydrilla verticillata* in the Connecticut River Watershed which includes Connecticut, Massachusetts, New Hampshire, and Vermont (see Figure 1). The plan provides transparent information to stakeholders and other interested parties as to the intentions of NEANS Panel working group to control and manage hydrilla in the Connecticut River and the various constraints, possibilities, and potential impacts thereof.

Hydrilla in New England

Hydrilla verticillata is a federally listed noxious weed that is a prohibited species in Connecticut and a number of other states in the Northeast region. It has been found in all northeastern states except New Hampshire and Vermont. With the possible exception of the Connecticut River biotype all northeastern populations are likely the monoecious biotype (having both male and female organs on the same plant) which is characterized by the ability to overwinter in waters throughout New England. Hydrilla was first found in late 1980s in Connecticut in a pond at Mystic Seaport in New London County (Les et al. 1989) and can now be found in several waterbodies in Connecticut, Massachusetts. and Maine. Infestations have been identified in small isolated ponds and lakes as well as riparian habitats. The large-scale infestation of hydrilla in the southern portion of the Connecticut River is the subject of this five-year plan.

Background

The infestation is in a tidal river that flows into the Long Island Sound and is in proximity to important native plant habitat that is valuable for native wildlife. In tidal coves in CT River estuary, state listed species that stand to be impacted by hydrilla include

Sagittaria montevidensis ssp spongiosa, *Limosella subulata* (Mudwort) (CT Special Concern species) and the State endangered *Eriocaulon parkerii* (Parkers Pipewort). The lower river has nine special natural and cultural resource designations from state, national, and the international Ramsar Wetland of International Importance, with a pending designation from NOAA for a National Estuarine Research Reserve (NERRS). Many of the natural communities identified within the coves and embayments, including submerged aquatic vegetation, are also highly ranked and support significant populations of migratory and resident birds, diadromous fish species, and are important nursery habitat for Long Island Sound fish species.

During the spring 2018 NEANS Panel meeting, members voted to support a CT Agricultural Experimental Station and other partner surveys in CT and conduct additional surveys in the Massachusetts, Vermont, and New Hampshire portions of the Connecticut River. No hydrilla was found in Vermont and New Hampshire to date, but a small infestation was discovered near Agawam, MA in 2018. Currently comprehensive surveys of the Connecticut portion of the river include only the southern third conducted by CAES. In the spring of 2019, the NEANS Panel convened a meeting in Springfield, MA with a focus on this project and training for surveys and monitoring.

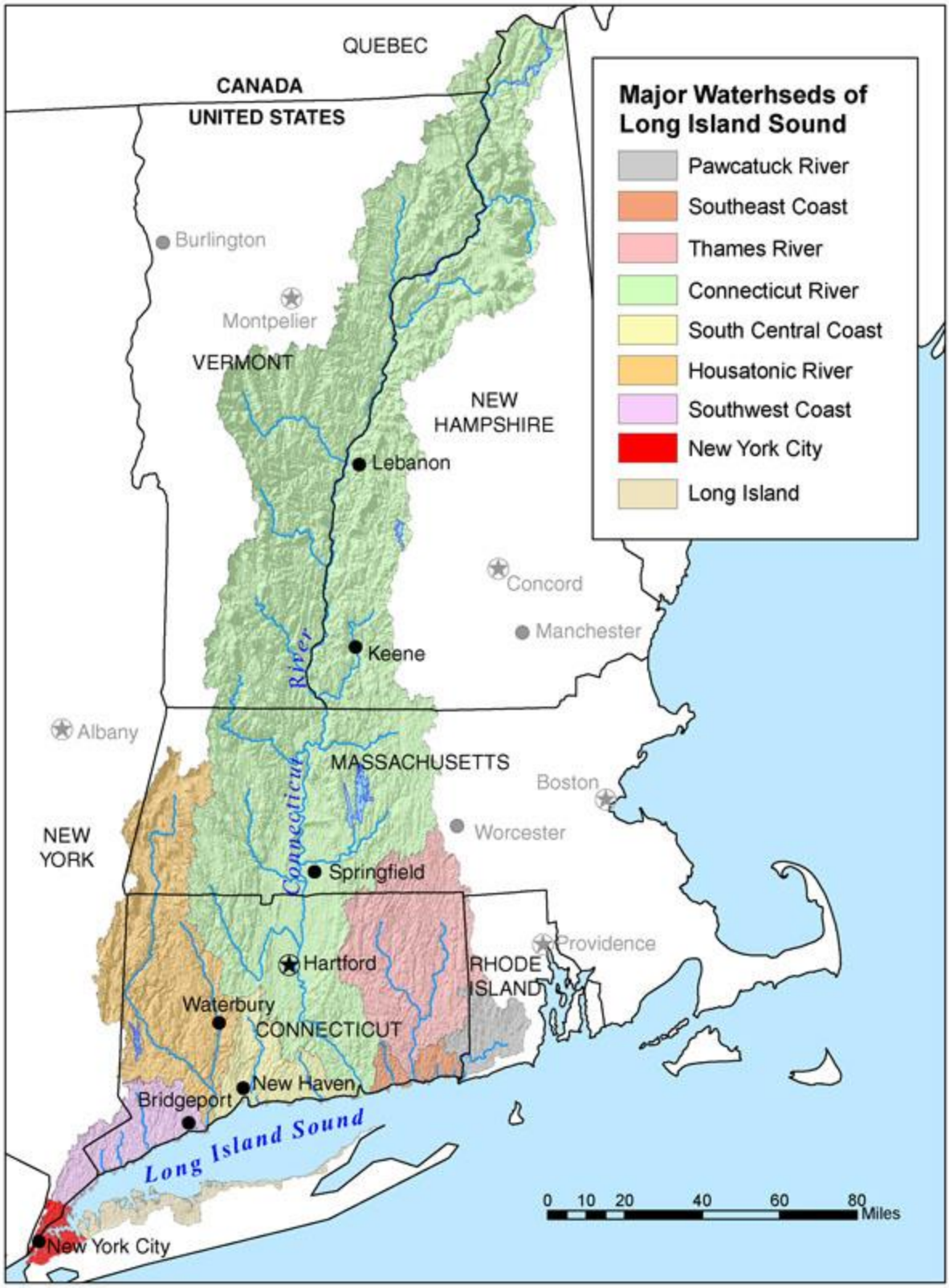

Figure 1. Map of Connecticut River Watershed (American Rivers website)

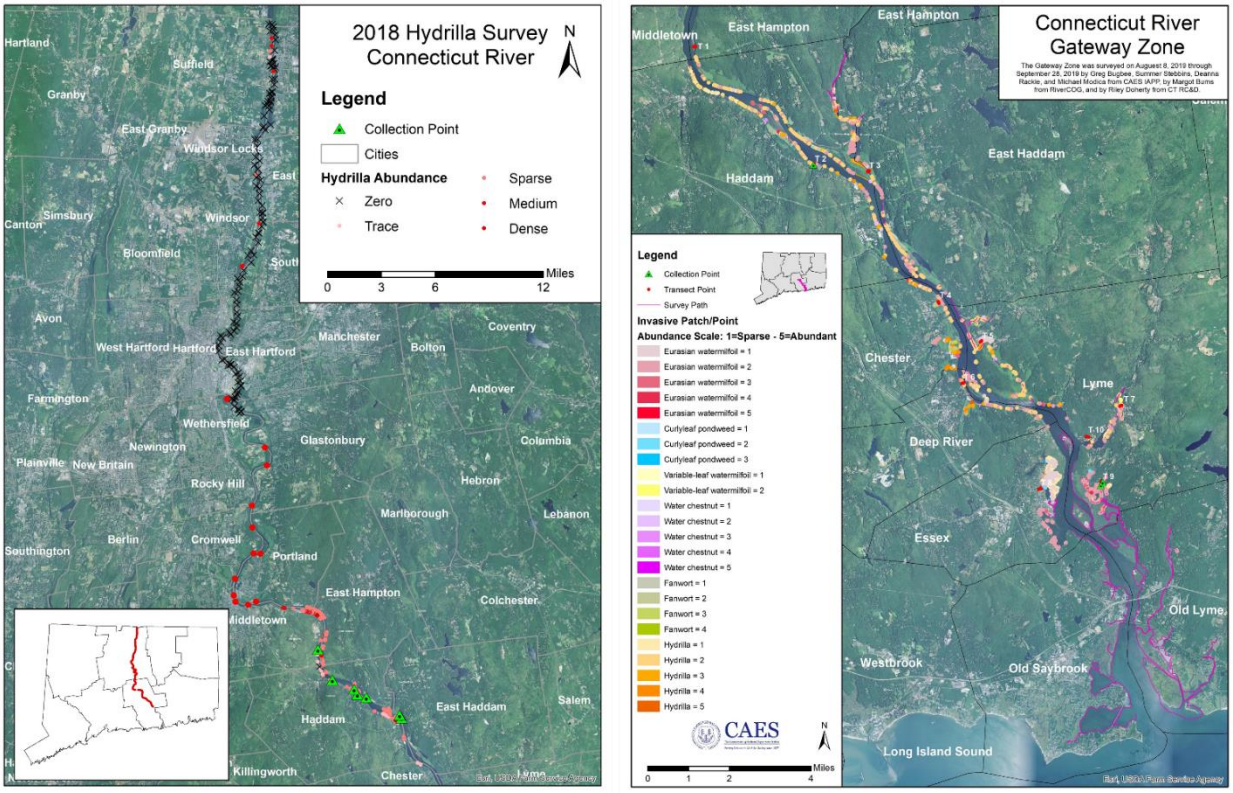

Figure 2. Hydrilla locations in the Connecticut portion of the Connecticut River (CAES)

Urgency for Response

1) **Potential impact to the Hartford water supply:** Hydrilla could spread from the Connecticut River into not only the Farmington River Watershed which is a source of drinking water for a number of municipalities in central Connecticut including the City of Hartford (feeds Barkhamsted Reservoir and Nepaug Reservoir), but also to other Connecticut River subregional watersheds which serve as sources of drinking water for smaller Connecticut River communities. If the hydrilla infestation increases to the point of impacting a significant portion of these watersheds, there is the potential for some changes in water chemistry such as decreasing dissolved oxygen, localized increasing organic content, and variation in pH levels over time. An increased organic material in the surface water from increased plant biomass could result in the production of harmful byproducts (trihalomethanes) during the disinfection process if chlorine is used (citation ??)

   In addition, reservoirs nearby may be at risk by accidental transport of hydrilla fragments, turions, or tubers. Turions are overwintering buds found where leaves attach to stems. They may break off and be carried by current to new locations where they can settle, overwinter, and grow into new plants. Tubers are the potato-like reproductive structures that form on the roots of hydrilla plants each fall and allow the plants to store energy and regenerate the following spring. They may break off and be carried by current to new locations where they can settle, overwinter, and grow into new plants. Tubers are the potato-like reproductive structures that form on the roots of hydrilla plants each fall and allow the plants to store energy and regenerate the following spring. One of the characteristics of the genetic strain found in the CT River appears to be abundant turion production which possibly allows it to spread quickly through riverine systems (need citation for this).

2) **Risk to submerged aquatic vegetation (SAV):** Hydrilla threatens to displace SAV beds, particularly those with native *Vallisneria americana*, in the Connecticut River and its 95 tributaries. NEANS Panel is highly vested in protecting critical SAV communities as they play a vital role in maintaining the river's dissolved oxygen levels and providing aquatic habitat in the Connecticut River Estuary.

3) **Threat to waters in New York and New England states:** Given the proximity to numerous waterbodies and state borders and the documented movement of boats from the Connecticut River to New York and New England, this infestation poses a very serious threat to the ecological, recreational, economic, and aesthetic values of many waters in Connecticut, Massachusetts, New Hampshire, New York, and Vermont.

4) **Threat to fish populations and biodiversity:** Dense mats of hydrilla can displace native plants that are food sources and shelter for native

invertebrates and young fish. Of particular concern is the encroachment into native water celery/American eelgrass beds (*Vallisneria americana*) Decomposition of these extensive mats decreases the dissolved oxygen content in the water and can result in fish kills.

5) **Threat to recreation:** Hydrilla produces dense mats of vegetation extending from the bottom of the river to the surface. These mats will prohibit swimming, boating, and fishing in infested areas of the river. Many infested areas now occupy shorelines of the River's many Connecticut State Parks, important conservation lands, marinas and river dependent commercial uses which are critical to the economic health of the lower River. Some of these include Hurd State Park, Haddam Meadow State Park, and Selden Island State Park as well as the Salmon River Division of the Silvia O. Conte National Fish and Wildlife Refuge. Additionally, several marina establishments along the river are heavily infested with hydrilla, leading to inevitable fragmentation and further spread of plants from boat propellors.

6) **Threat to industry:** Power plants or other water-drawing plants along the river may experience decreased or inhibited performance due to the accumulation of hydrilla fragments on intake screens.

7) **Risk to waterfowl and raptors:** A toxic cyanobacteria (*Aetokthonos hydrillicola*) may grow on the underside of hydrilla leaves. This cyanobacterium causes avian vacuolar myelinopathy (AVM), a deadly neurological disease, in waterfowl and the bald eagles that consume them. AVM has been linked to the deaths of more than 100 bald eagles in South Carolina and Arkansas (Wilde et al. 2014). We will collect samples from the Connecticut River for testing. This species of algae is a recent discovery and little is known about its potential to spread north.

Generic Hydrilla Management Options

No action: No active management, including the use of physical, biological, or chemical control methods, would be conducted. Existing populations will continue to grow and spread to new locations. Each season, hydrilla will grow into dense mats that will outshade and outcompete native plants and then will decompose and decrease the dissolved oxygen in the water, which may result in fish kills. As the infestation spreads throughout the Connecticut River it will put the river's tributaries and surrounding inland waterbodies at greater risk of infestation. Intensive education and outreach in the surrounding area would be undertaken to raise awareness about hydrilla and other aquatic invasive species in an effort to help prevent the spread of these species by human activity (transported on recreational water vehicles such as kayaks, canoes, and boats). In addition, annual monitoring of the infestation through volunteer efforts would be recommended. Salinity in the most southern end of the Connecticut River may prevent establishment of healthy, reproducing hydrilla, but fragments of hydrilla from the

Connecticut River could be transported to its tributaries and inland locations where they can easily become established and grow.

Physical: Benthic barriers (mats) are the most often used physical control methods. They can be effective management tools in limited instances (infestations of less than 0.25 acre), but are ineffective if eradication is the goal. Benthic barriers have been used in a very limited capacity as a supplemental control agent in several New York hydrilla control projects in Cayuga Lake Inlet/Fall Creek and Tonawanda Creek/Eric Canal. However, benthic mats were ineffective as a primary control agent in flowing waters. They may be an option for select marinas in the case of the Connecticut River.

Biological: Triploid (sterile) grass carp is a biological control agent used to control aquatic vegetation in small ponds or lakes where fish can be contained within the waterbody. These fish are not being considered for the Connecticut River system due to the river's size, connectivity to other waters, and the inability to prevent carp from escaping to tributaries. Use of grass carp is also prohibited in some jurisdictions along the river.

Chemical: Several herbicides have been used to control hydrilla. Autumn treatments combining contact (copper-based herbicides or endothall) and systemic herbicides (fluridone) can provide both short- and long-term benefits. Contact herbicides immediately kill the above-ground parts of plants and can hinder growth of new reproductive structures (i.e., turions and tubers). Systemic herbicides can provide longer-term control by eliminating the below-ground parts of plants that can overwinter and sprout into new plants each spring. This cycle needs to be repeated until the tuber bank in the sediment is exhausted. Improved herbicide technologies that address conditions specific to the CT River will need to be explored.

Data from the New York Croton River, Cayuga Lake Inlet, Tonawanda Creek/Erie Canal and management projects in other states indicate that depletion of the tuber banks will require several consecutive seasons of treatment. However, hydrilla is found in high flow areas in the Connecticut River as well as more quiescent waters. Unfortunately, control of hydrilla in high flow areas is very challenging. Management will need to focus on high-use areas such as marinas, yacht clubs, and boat launches. Containment of the infestation through education and outreach and courtesy boat inspections will be a priority.

NEANS Panel recommendation Connecticut: The recommended management option is the use of herbicide in quiescent waters outside the mainstem of the river (where flow rates which range from 4,000 to 100,000 cfs annually). Eradication is unlikely even with the herbicide treatment, but it may greatly reduce the size of the infestation, allow for recreational access to the river, and help to prevent spread of hydrilla to lakes, ponds, and other river system. It is expected that continued maintenance efforts will be required to keep select areas free of hydrilla. Benthic barriers may be appropriate as maintenance for infestations under one acre. As with any control project, adaptive management will be applied and changes made to strategies as treatment outcomes are assessed and options are weighed.

In addition, more surveys are needed to delineate locations of infestation in the upper two thirds of the river and monitoring suitable habitat that is yet uninvaded is also a priority. As containment is a very important part of this management plan, NEANS Panel will work with CT to obtain stakeholder support and funding to develop a boat steward program that covers all high traffic access points on the CT River, a standardized boater survey connected to a centralized database, and supporting education and outreach materials. A plan for outreach to riverside businesses and towns will also be needed.

Massachusetts: MA DCR has chosen to use diver assisted suction harvesting (DASH) combined with fragment containment barriers to address the limited infestation of scattered hydrilla plants in Agawam. Working with MA DCR and other agencies, MassDEP maintains and updates the distribution status of hydrilla in Massachusetts for public awareness and education. During water quality assessment, waterbodies infested will be added to the Massachusetts Integrated Report 303d list to fulfil the requirement of the Clean Water Act. For projects within the infested watershed subject to jurisdiction of the 401 Water Quality Certification, conditions on invasive species prevention and decontamination are provided in the certificate. In addition, during routine MassDEP summer monitoring season, standard operating procedures for water quality monitoring gears and watercrafts decontamination are implemented to prevent the potential spread of hydrilla and other invasive species to other waterbodies and watersheds.

Additional information:

Technology to treat hydrilla in the mainstem is confounded by river flow, suspended silt, tidal flow, and possible salinity. NEANS Panel has applied for a Woodard and Curran Impact Grant to fund a pilot study to determine the best management practices for herbicide treatment of the Connecticut River.

Connecticut River Infestation Timeline

- **2016:** Hydrilla was first discovered by in June by participants in a bioblitz in Keeney Cover. Later that year (September) CT DEEP Fisheries field staff observed some hydrilla near the Glastonbury boathouse on the Connecticut River.
- **2017:** CT River Hydrilla working group convened at the Northeast Aquatic Plant Management Society meeting in Portsmouth, NH
- **Spring 2018:** NEANS Panel meeting and collective surveys during late summer-early autumn.
- **Summer 2018:** Surveys conducted in CT, MA, NH, and VT
- **Autumn 2018:** NEANS Panel meeting project season debrief
- **Spring 2019:** NEANS Panel meeting/project workshop in Springfield and field training conducted by USACE
- **Summer 2019:** Aquatic plant surveys on CT River in MA, NH, and VT; convening of project working group via conference calls
- **Summer 2019:** Aquatic Invasive Plant Survey Lower River – Connecticut River Gateway Conservation Zone – from Haddam and East Haddam to Long Island Sound. Performed by the Connecticut Agricultural Experiment Station (CAES) and funded by the Connecticut River Gateway Commission and the Eightmile Wild and Scenic Watershed through Connecticut Resource Conservation and Development Area (RC&D) and the Lower Connecticut River Valley Council of Governments (RiverCOG).
- **Autumn 2019:** Project presentation at USACE led AIS workshop in Boston; NEANS Panel meeting
- **Winter 2019/2020:** Project presentation at the Northeast Aquatic Plant Management Society (NEAPMS); Five-year management plan and discussions about how to collaborate with USACE and USFWS; meeting led by CAES to bring CT DEEP officials and other leaders in CT together to coordinate project efforts.
- **Summer 2020:** Continued survey of upper two thirds of the Connecticut portion of the Connecticut River by CAES

The infestation by this biotype currently appears to be contained in the Connecticut River system, but this may only be a short-term scenario due to the river's numerous access points and high rates of use.

During aquatic plant surveys in October no tubers were found in areas with actively growing hydrilla, but it was unclear if the mats of hydrilla had floated to the sampling

locations instead of being rooted there. Additional field work is required to determine how this biotype of hydrilla is reproducing.

Management Scenarios in the Connecticut River

Preferred scenario: A five-year plan would involve pre- and post-treatment aquatic plant monitoring, tuber monitoring, and herbicide treatment or manual removal for locations of infestation within the entire Connecticut River where treatment is feasible: high-use areas such as marinas, yacht clubs, and boat launches.

No-treatment scenario: The Task Force would take no action to control and manage hydrilla in the Connecticut River. The infestation would be monitored on a regular basis and large-scale efforts will be made to increase public awareness and the practice of measures to prevent spread into other waterbodies. Additional monitoring of priority waterbodies within a ten-mile radius of the Connecticut River will also continue. The hydrilla infestation may grow unchecked and spread to new areas of the river and nearby lakes and ponds. During summer and early autumn, dense mats of vegetation growing from the bottom of the river to the surface will prohibit swimming, kayaking, canoeing, boating, and fishing. In mid- to late autumn, the thick mats of vegetation will start to decompose, which would impact the taste and odor of the water, and reduce the dissolved oxygen in the water, likely resulting in fish kills.

OUTREACH AND COMMUNICATION

AIS Monitor Program and Application

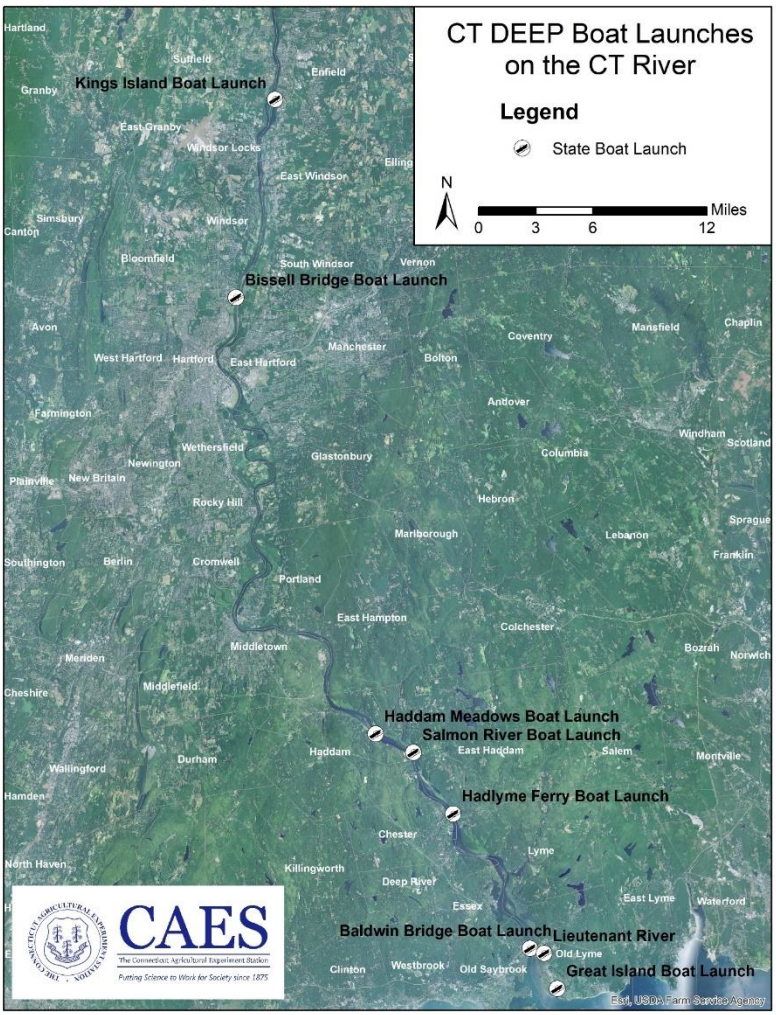

Figure 3. Boat launch locations on Connecticut portion of Connecticut River

NEANS Panel and CT DEEP will collaborate with the Connecticut River Conservancy to place AIS monitors at boat ramps along the Connecticut River from Memorial Day to Columbus Day. All monitors will use a standardized survey and store data in centralized database by using the AIS Monitor Program app and an associated ESRI ArcGIS account. These monitors will interact with boaters when they are launching and retrieving with an emphasis on education and inspections as boaters are exiting the waterbody.

Connecticut

Charter Oak Launch

Haddam Meadows

Riverside Park Boat Launch

Rocky Hill Ferry Park

Wethersfield Cove

Massachusetts

At this time Massachusetts priorities are the following:

1.start informing the boaters in the area (there are dams above the know site that prevent boats from boating directly upstream)

2. id and post the high use boat ramps on the entire river (there are only a few major ramps)

3. enlist user groups of the river to keep their eyes open

Educational Materials

NEANS Panel has developed tip strips, signage, and key floats to raise awareness about aquatic invasive species with a focus on hydrilla. CT, MA, NH, VT, and NY will 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, and other relevant groups and entities. Additional resources can be found online at northeastans.org

Responsible use of the river by boaters, anglers, and swimmers will be an integral part of preventing the spread of hydrilla in future years, and requires appropriate behavioral changes when it comes to recreation and transporting recreational gear. Outreach regarding appropriate protocols for cleaning, draining, and drying watercraft and equipment will be emphasized at boat launches and public access areas.

Public Stakeholder Meetings

CT DEEP, in collaboration with CAES, Lower Connecticut River COG, and MA DCR will hold public stakeholder meetings to provide updates on the project. An annual early summer meeting will outline the plan for the coming season and an end-of-year meeting will provide the results of the treatment and monitoring conducted by the Task Force.

Web Page

The project webpage on the NEANS Panel website will be updated regularly with information from the Task Force 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 at www.northeastans.org.

Shoreline SignsNEANS Panel has developed hydrilla education signs and keychains for the Connecticut River. The signs outline the threat and the Clean, Drain, Dry message for the Connecticut River. The Panel will work MA DCR to place these signs at high priority locations (selected with agency data). CT DEEP has developed its own signs that have been posted at state and Riverfront Recapture launches along the river.

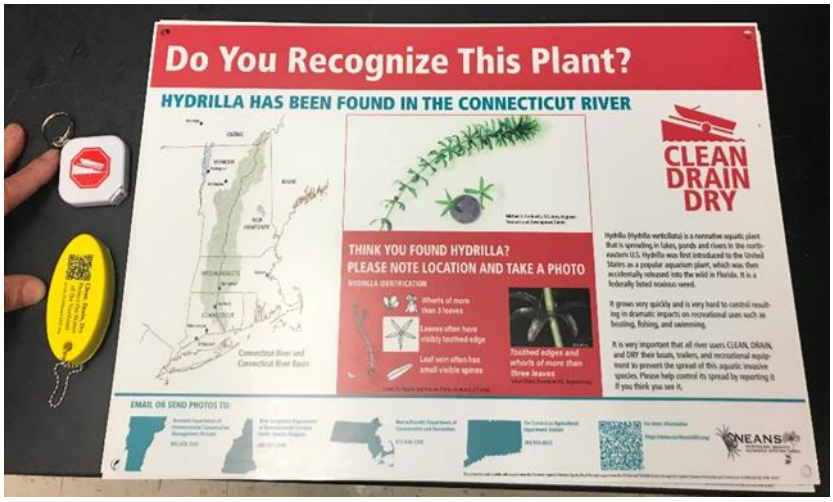

Figure 4. Hydrilla sign and key chains developed by NEANS

MONITORING

Aquatic Plant Surveys

Aquatic plants will be surveyed throughout the Connecticut River pre- and post-treatment in order to track impacts on native vegetation and assess the efficacy of a chosen treatment to reduce hydrilla populations. Pre-treatment surveys will occur no earlier than one month prior to treatment, and post-treatment surveys will be conducted four to six weeks after treatment. Survey grids of various scales, depending on level of detail needed, will be placed over sections of the Connecticut 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 (Johnson 2014; Doyle 2014, 2015, 2016a and b).

A double-sided rake head will be tossed 10 feet from the intersection 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 the NEANS Panel. GPS point locations (survey grids) will remain the same throughout the length of the project. The protocol for this procedure is outlined in Doyle 2015 and 2016a.

Polygons of dense infestations will also be captured during the survey using a combination of notes and boundary coordinates.

In addition to the aquatic plant survey, tuber monitoring will take place at designated locations each season. Density of tubers in each sediment core will be used to assess effectiveness of herbicide treatment. Controlling tuber development is key to preventing

further establishment of hydrilla. Sampling will be conducted with a 10.2-cm diameter sediment core puller. One sediment core (0.008 m^2) per site will be collected at designated sites and sieved, and tubers and turions will be collected and counted to provide information on tuber density to assess effectiveness of herbicide treatment.

Water Quality

Where herbicide is the chosen treatment herbicide concentration monitoring is designed to fulfill two purposes:

- Environmental protection (CT DEEP and MA DCR sites)
- Maintenance of adequate herbicide levels for effective treatment

Monitoring will occur in accordance with herbicide label requirements.

CONTROL AND MANAGEMENT

Adaptive Management

Given the complexity and significance of the Connecticut River Hydrilla 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, proper documentation of variables and results, follow-up monitoring and communication, clearly defined goals, etc. In other words, a detailed plan for each season is not described herein because it is anticipated that each year will be more progressive and fine-tuned. Instead, it is expected that the efforts for the current year will be dependent on the results of the previous year's efforts and outcomes. All stakeholders involved in the project understand that given the species of concern present in the ecosystem and the number of communities along the plan and its implementation will be a thorough and thoughtful endeavor.

Ongoing Project Considerations

Several site constraints and limitations must be considered with project design each year. The project must carefully develop a management plan based on actual field conditions, and include elements to protect significant local ecological communities.

Other considerations include the regulated wetlands located at the mouth of the Connecticut River as well as unintended impacts to fisheries. Lastly, the Connecticut River is very popular for recreational activities and includes many high-traffic public-use areas for boating, swimming, fishing, etc. Management activities (e.g. temporary closure of boat launches) that limit or prevent these uses will require detailed coordination and outreach efforts with various municipalities, businesses, residents, and the general public. The project team is already working with Lower Connecticut River COGs and will include other local and organizations.

PERMITTING

Massachusetts

In Massachusetts, the following permits are required:

1) Application of herbicides/pesticides: Pursuant to MGL Ch. 111, § 5E, a license is required for application of chemicals to water bodies for the control of nuisance aquatic vegetation, with certain exceptions as are detailed on the BRP WM 04 application form. If it is a new chemical, it needs to be registered with MA Department of Agricultural Resources and a MEPA (Massachusetts Environmental Policy Act) review should be conducted to develop information about its use. Once done, an applicant could then get an Order of Conditions from the Conservation Commission after required review by Massachusetts Department of Fisheries and Wildlife.

2) Mechanic control includes dredging, mechanical harvesting, drawdown, and benthic barriers. Depends on the nature of each project, the following permits may be needed: 401 Water Quality Certification, Chapter 91 Waterways License/Permit, Order of Conditions, Notice of Intent, Water Management Act (MGL Ch. 21G.), and Negative Determination of Applicability.

3) Biological control projects shall be implemented in accordance with the performance guidelines in the Final Generic Environmental Impact Report (GEIR)'s Eutrophication and Aquatic Plant Management in Massachusetts and The Practical Guide to Lake and Pond Management in Massachusetts. Massachusetts Environmental Policy Act (MEPA) review is required for new biological control techniques.

ADDITIONAL RESEARCH

Cyanobacteria Testing

The cyanobacteria *Aetokthonos hydrillicola* grows on the undersides of hydrilla leaves and is incidentally consumed by waterfowl that in turn are consumed by raptors and other waterfowl, including bald eagles. *A. hydrillicola* contains a toxin that causes a neurological breakdown producing unique holes in the brain and spinal cord and then death. (Wilde et al. 2005). The Task Force plans to submit samples on a regular basis to determine the presence of this cyanobacterium. More information about this research can be found at https://www.warnell.uga.edu/research/dr-susan-wilde-avm-research.

Vallisneria Biotype and Herbicide Sensitivity Tests

CAES and NEANS Panel will work with researchers from North Carolina State University to determine genotypes and assess potential impacts of fluridone on different biotypes (genotypes) of *Vallisneria americana* growing in the Connecticut River.

Populations of *Vallisneria* in the Connecticut River area represent unique, high- quality native plant habitat in the Connecticut River Estuary. This habitat provides food and shelter for a plethora of aquatic species and contributes various services important to the health of the ecosystem, such as improving water clarity and oxygenation and removing pollutants. Limiting herbicide impacts to these populations is a priority of the five- year management plan.

UPDATES TO PLAN

This document was reviewed and finalized in January 2021. Any updates to the plan will henceforth be provided by separate annual reports that will be posted at the same location as this management plan (www.northeastans.org/resources).

TASK FORCE AND STAKEHOLDERS

Northeast Aquatic Nuisance Species Panel Task Force

Connecticut

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Amy Smagula, New Hampshire Department of Environmental Services

Michele L. Tremblay, Panel Coordinator

New York

Michael Greer, U. S. Army Corps of Engineers, Buffalo District

Heidi Himes, U.S. Fish and Wildlife Service, Lower Great Lakes Fish and Wildlife Office

Sandra Keppner, U.S. Fish and Wildlife Service, Lower Great Lakes Fish and Wildlife Office

Catherine McGlynn, New York State Department of Environmental Conservation

Steven Pearson, New York State Department of Environmental Conservation

Michael Vissichelli, U.S. Army Corps of Engineers, North Atlantic Division

Nicole White, New York State Department of Environmental Conservation

Vermont

Ann Bove, retired Vermont Department of Conservation

Andy Fisk, Connecticut River Conservancy

Kim Jensen, Vermont Department of Conservation

Meg Modley, Lake Champlain Basin Program

Stakeholders

Margot Burns, Lower Connecticut River Valley Council of Governments

Connecticut River Gateway Commission

Connecticut Resource, Conservation and Development Area

Eightmile Wild and Scenic Watershed

Capitol Region Council of Governments

Judy Preston, CT Sea Grant

Farmington River Wild and Scenic

Connecticut River Conservancy

Funding Possibilities

Long Island Sound Futures Fund

https://longislandsoundstudy.net/about/grants/lis-futures-fund/

Woodard and Curran Impact Grants

https://www.woodardcurranfoundation.org/impact-grants

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