Environmental Assessment and
Finding of No Significant Impact
for Invasive Aquatic Plant Control Demonstration

Connecticut River Hydrilla Control Research and Demonstration Project

Lower Connecticut River, Connecticut

US Army Corps of Engineers®
New England District

JULY 2024

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FINDING OF NO SIGNIFICANT IMPACT

Connecticut River Hydrilla Control Research and Demonstration Project in Lower Connecticut River, Connecticut

The U.S. Army Corps of Engineers (USACE) proposes to conduct an aquatic invasive plant control research demonstration project at sites within the Connecticut River in the lower Connecticut River, Connecticut. USACE, including the Engineer Research and Development Center (ERDC), plan to apply registered aquatic herbicides during summer 2024 to control the aquatic invasive plant, hydrilla (*Hydrilla verticillata*) that is present in the main stem of the Connecticut River and its tributaries, boat basins, and coves that abut the Connecticut River. The hydrilla control research and demonstration project is authorized by Section 104 of the Rivers and Harbors Act of 1958, as amended. Section 104 authorized the Aquatic Plant Control Research Program (APCRP), which provides an expanded aquatic plant control program that supports the "prevention, control, and progressive eradication of noxious aquatic plant growths and aquatic invasive species from the navigable waters, tributary streams, connecting channels, and other allied waters of the Unites States," (Section 104 of the River and Harbor Act of 1958, Public Law (P.L.) 85-500, as amended, 33 USC 610(a)(1)). This includes continuous research into efficient and economical methods for aquatic plant control.

The purpose of the proposed project is to provide a field-scale demonstration of technology developed under the USACE APCRP, which is evaluating the effectiveness of aquatic herbicides to manage hydrilla in challenging water exchange environments, such as the tidal, riverine environment of the lower Connecticut River. This field demonstration will provide valuable information for developing future guidance on how to manage this invasive aquatic plant which is rapidly expanding throughout the Northeast and threatens critical freshwater systems across the U.S. In addition, this field demonstration will evaluate herbicide efficacy where hydrilla is most problematic, optimal timing of treatment, non-target impacts, and herbicide concentration-exposure time (CET) requirements for effective control of hydrilla.

The need for the proposed project is to address impairments to the natural and human environment by invasive hydrilla. Invasive aquatic plants are plant species that are considered non-native to an aquatic ecosystem and whose establishment in a system causes economic, human health, and/or environmental harm. These species can alter native habitats by limiting the species diversity, which can in turn limit shelter and foraging resources, and severely impact fisheries in aquatic systems. They also inhibit recreation by clogging water bodies used for boating, fishing, and swimming. Effects to local economies can be severe and include causing obstacles to the transport of goods and services, lowering property values, limiting agricultural productivity, and impacting public utility operations, on top of the costs of invasive species control measures. Additionally, the hydrilla present in the Connecticut River is a new genotype within the United States. Because this strain of hydrilla is unique, it is unknown if this genotype is responsive to the established management practices for hydrilla in the rest of the U.S.

The proposed action is the application of herbicide to sites within the Connecticut River watershed for the control of hydrilla. Various physical, biological, and chemical methods have been used for control and eradication of hydrilla. The most effective and economical method of control for well-established, large-scale populations is typically a chemical approach using tested and approved aquatic herbicides. Several herbicides have been used to control hydrilla throughout the country. Treatment and monitoring data from the New York Croton River, Cayuga Lake Inlet, Tonawanda Creek/Erie Canal, and management projects in other states show that several consecutive seasons of herbicide treatments are necessary to control hydrilla populations.

Site specific treatments consider environmental characteristics of the site (e.g., water movement and retention, and native species presence) and chemical properties of the herbicides (e.g., target plants and concentrations) needed for control. The herbicides proposed for use are diquat dibromide, dipotassium salt of endothall, and florpyrauxifen-benzyl or a combination of these herbicides. Proposed sites for the project include: (1) Chapman Pond in Haddam, CT; (2) Chester Boat Basin in Chester, CT; (3) Keeney Cove in Glastonbury, CT; (4) Selden Cove in Lyme, CT; and (5) Portland Boat Works in Portland, CT.

I find that based on the evaluation of environmental effects discussed in the Environmental Assessment, this project is not a major federal action significantly affecting the quality of the environment. The Environmental Assessment includes an evaluation of the affected environment and the geographical context and intensity of the direct, indirect, and cumulative long-term and short-term effects of the action. The effects of the recommended plan relative to significance criteria are summarized below. None are implicated to warrant a finding of National Environmental Policy Act significance.

The degree to which the action may adversely affect public health and safety. The project is expected to have a positive effect on public health and safety by investigating efficient and effective control of invasive hydrilla that will minimize the impacts to navigation, and recreation. None of the herbicides that will be applied are known to have an adverse effect on human health or the environment.

The degree to which the action may adversely affect unique characteristics of the geographic area such as historic or cultural resources, parks, Tribal sacred sites, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas. The project impacts to the environment are short-term and not significant. The project will result in temporarily decreased dissolved oxygen from the decomposition of the hydrilla as well as indirect impacts to the density and availability of aquatic vegetation for habitat for fish and wildlife. These short-term effects will not significantly affect the environment and will have no significant impacts on unique characteristics of the geographic area such as historic or cultural resources, parks, Tribal sacred sites, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.

Whether the action may violate relevant Federal, State, Tribal, or local laws or other requirements or be inconsistent with Federal, State, Tribal, or local policies designed for the protection of the environment. The action will not violate federal, state, tribal, or local laws, policies, or other requirements protecting the environment.

The degree to which the potential effects on the human environment are highly uncertain. The project effects are not uncertain. All of the herbicides to be applied have been authorized for use by the US Environmental Protection Agency in the conditions where they will be applied and will be applied consistent with regulatory requirements; their potential effects are well known.

The degree to which the action may adversely affect resources listed or eligible for listing in the National Register of Historic Places. The project will have no known negative impacts on any pre-contact or post-contact archaeological sites recorded by the state of Connecticut. No historic properties will be affected by the proposed project.

The degree to which the action may adversely affect an endangered or threatened species or its habitat, including habitat that has been determined to be critical under the Endangered Species Act of 1973. The project will have no effect on threatened or endangered species under the jurisdiction of the U.S. Fish and Wildlife Service, and is not likely to adversely affect any threatened or endangered species or designated critical habitat under the jurisdiction of the National Marine Fisheries Service.

The degree to which the action may adversely affect communities with environmental justice concerns. The project will not adversely affect communities with environmental justice concerns. The project is entirely located in riverine waters and will have positive community effects.

The degree to which the action may adversely affect rights of Tribal Nations that have been reserved through treaties, statutes, or Executive Orders. The project will not adversely affect rights of Tribal Nations that have been reserved through treaties, statutes, or Executive Orders.

Based on my review and evaluation of the environmental effects as presented in the Environmental Assessment, I have determined that the Connecticut River hydrilla control research and demonstration project is not a major federal action significantly affecting the quality of the environment and is therefore exempt from requirements to prepare an Environmental Impact Statement.

23 July 2024
Date

Justin R. Pabis, PE
Colonel, Corps of Engineers
District Engineer

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1.0 Introduction

The purpose of this Environmental Assessment (EA) is to present information on the environmental features of the project area and to review information to assess the potential environmental impacts of the proposed project. This EA describes U.S. Army Corps of Engineers (USACE) project compliance with the National Environmental Policy Act of 1969 (NEPA) and all applicable federal and state environmental regulations, laws, and executive orders. Methods used to evaluate the environmental resources of the area include a review of available information and coordination with appropriate environmental agencies and knowledgeable persons. This report provides an assessment of environmental impacts and alternatives considered for the current proposed action as well as future actions of a similar nature within the described affected environment.

The hydrilla control demonstration project is authorized by Section 104 of the Rivers and Harbors Act of 1958, as amended. Section 104 authorized the Aquatic Plant Control Research Program (APCRP), which provides an expanded aquatic plant control program that supports the “prevention, control, and progressive eradication of noxious aquatic plant growths and aquatic invasive species from the navigable waters, tributary streams, connecting channels, and other allied waters of the Unites States,” (Section 104 of the River and Harbor Act of 1958, Public Law (P.L.) 85-500, as amended, 33 USC 610(a)(1)). This includes continuous research into efficient and economical methods for aquatic plant control. The research is being led by the research branch of USACE, the Engineer Research and Development Center (ERDC).

This EA provides information on the potential effects of the proposed action. Analysis of the potential effects of the proposed project will determine if the project is a major federal action significantly affecting the quality of the human environment. This EA facilitates compliance with NEPA and includes discussion of the purpose and need for the action, the affected environment, a description of the proposed action and alternatives, its environmental impacts, environmental compliance, and a list of agencies, interested groups, and individuals consulted.

1.1 Location

The Connecticut River is a tidally influenced river that flows from the Canadian border to Long Island Sound (LIS) running through New Hampshire, Vermont, Massachusetts, and Connecticut and spanning about 410 miles, which makes it the longest river in New England, (Figure 1). The upper Connecticut River in New Hampshire and Vermont flows mainly through a confined valley. The lower Connecticut River in southern Massachusetts and Connecticut flows through the Hartford Basin and becomes slow-moving and meandering (USACE Institute for Water Resources, n.d.). The focus of the proposed project is on the lower Connecticut River watershed, outlined in the red in Figure 1.

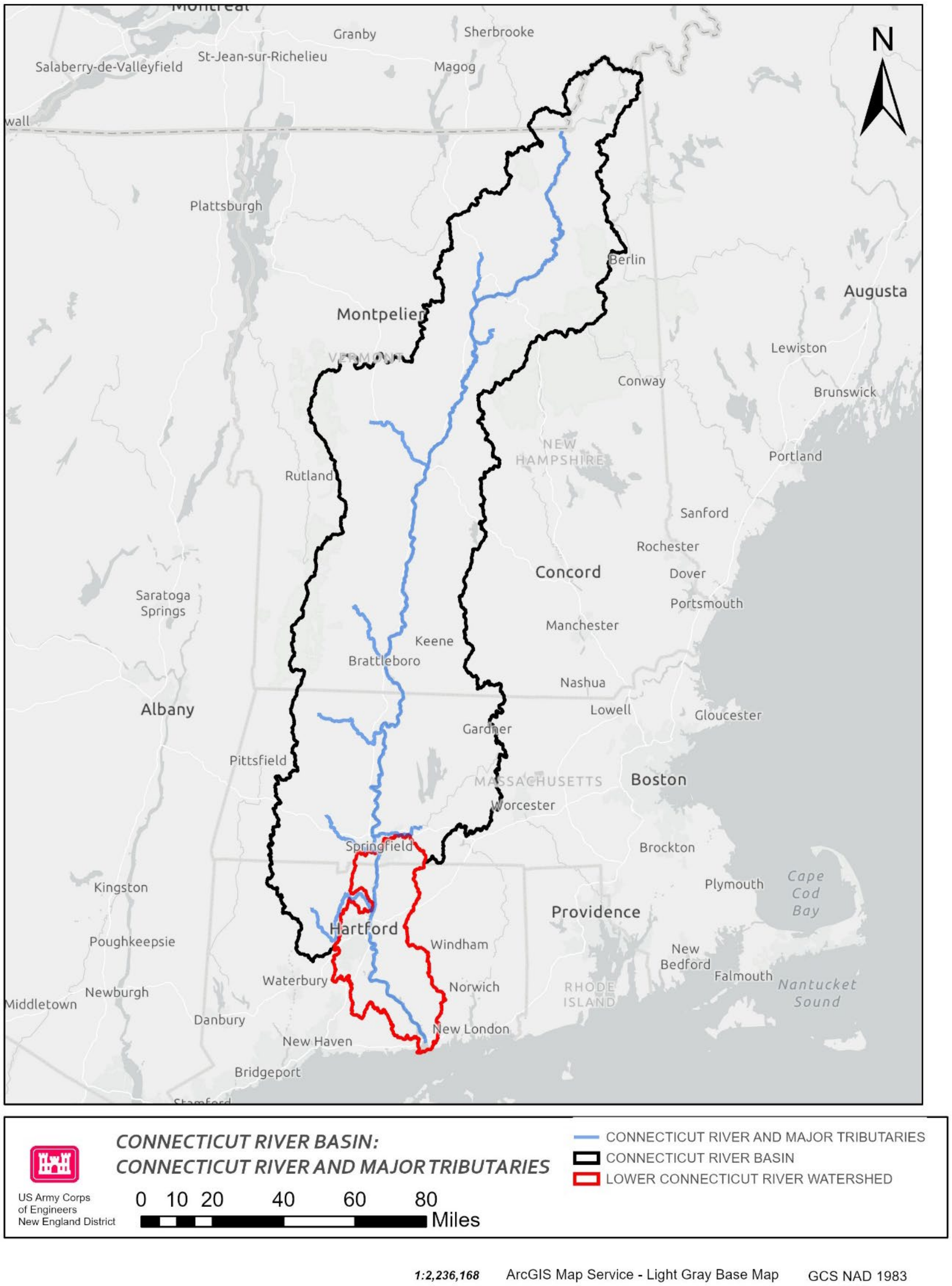

Figure 1. The Connecticut River Basin and lower Connecticut River watershed. This EA focuses on the Connecticut River, tributaries, coves, ponds, and lakes within with the red watershed boundary.

1.2 Target Invasive Plant

Invasive aquatic plants are plant species that are considered non-native to an aquatic ecosystem and whose establishment in a system causes economic, human health, and/or environmental harm. The invasive aquatic plant hydrilla (*Hydrilla verticillata*) was first discovered in the United States in Florida during the 1960s and is believed to have been introduced by two separate occurrences since there are multiple variants. The species now occurs in many states along the East Coast and Gulf of Mexico as well as California, Washington, and Arizona and is recognized as a Federal Noxious Weed (SE-EPPC, n.d.).

Hydrilla was first detected within the Connecticut River in 2016 in Glastonbury, CT. The Northeast Aquatic Nuisance Species Panel (NEANS) and other partner organizations surveyed and sampled the populations in 2018. Genetic testing determined that the hydrilla present in the Connecticut River was a new genotype within the United States. This genotype of hydrilla primarily reproduces and spreads by fragmentation and turions, which are dormant buds that grow from the axils of the leaves. Plant fragments can survive, spread, and reproduce additional plants in new locations while turions drop off and spread similarly to the plant fragments (NEANS, 2020). The methods by which the hydrilla propagates and disperses, as well as the plant's competitive growth morphology favors its dominance within disturbed aquatic ecosystems, such as those in the river. The dense surface mats that hydrilla forms can absorb all light at the surface, and its rapid growth under suboptimal conditions (disturbance, nutrient limitations, salinity, etc.) lead to its dominance in frequently disturbed environments, regardless of if the disturbance is caused by humans (drawdown, increased turbidity or sedimentation, boating) or nature (storms, flooding, climate change) (Smart *et al.*, 1994). Hydrilla is also able to tolerate varied water conditions, including oligotrophic (low plant nutrients and high oxygen in deep waters) and eutrophic (rich in nutrients that causes depletion of dissolved oxygen) waters, as well as a wide range of pH, and salinities up to 7% (Langeland, 1996).

2.0 Purpose and Need

The purpose of the proposed project is to provide a field-scale demonstration of technology developed under the Aquatic Plant Control Research Program (APCRP), which is evaluating the effectiveness of an aquatic herbicide to manage monoecious hydrilla in high water exchange environments, such as the tidal, riverine environment of the lower Connecticut River. This field demonstration will provide valuable information for developing future guidance on how to manage this invasive aquatic plant which is rapidly expanding throughout the Northeast and threatens critical freshwater systems across the U.S. In addition, this field demonstration will evaluate herbicide efficacy where hydrilla is most problematic, optimal timing of treatment, non-target impacts, and herbicide concentration-exposure time (CET) requirements for effective control of hydrilla. The proposed project will also provide control of hydrilla at sites in the lower Connecticut River for the duration of the research and demonstration project to demonstrate and understand effective management practices.

The need for the proposed project is to address impairments to the natural and human environment by invasive hydrilla. Invasive aquatic plants are plant species that are considered non-native to an aquatic ecosystem and whose establishment in a system causes economic, human health, and/or environmental harm. The species has quickly spread to other parts of the Connecticut River and, in 2019 and 2020, the Connecticut Agricultural Experiment Station (CAES) reported it was covering at least 774 acres of the river from Agawam, Massachusetts to LIS. It infests coves, creeks, and shorelines, having a variety of impacts to the human and natural environment. Hydrilla can alter native habitats by limiting the species diversity, which can in turn limit shelter and foraging resources, and severely impact fisheries in aquatic systems. It also inhibits recreation by clogging water bodies used for boating, fishing, and swimming. Effects to local economies can be severe and include causing obstacles to the transport of goods and services, lowering property values, limiting agricultural productivity, and impacting public utility operations, on top of the costs of invasive species control measures. In addition, the thick hydrilla infestations can provide a suitable environment for a cyanobacterium that produces a neurotoxin that can be fatal to wildlife if exposed to bromide, which is a compound often associated with human pollution (CAES, 2021). Additionally, the hydrilla present in the Connecticut River is a new genotype within the United States. Because this strain of hydrilla is unique, it is unknown if this genotype is responsive to the established management practices for hydrilla in the rest of the U.S.

Within the Connecticut River system, hydrilla is found in both high flow and quiescent river conditions with control of hydrilla in high flow areas posing a complex challenge. Factors such as water flow, suspended silt, tidal flow, and salinity contribute to the complexity of controlling hydrilla in a system like the Connecticut River. Investigations into herbicide application methods and techniques that address the conditions specific to the Connecticut River will allow for more effective hydrilla control to prevent further spread and impact to other parts of the river and watershed (NEANS, 2020).

3.0 Alternatives

This section presents the various alternatives and the proposed action, and briefly discusses the reasons why some alternatives were eliminated from further detailed study.

3.1 No Action Alternative

The no action alternative serves as a baseline against which the proposed action and alternatives can be evaluated. Evaluation of the no action alternative involves assessing the environmental effects that would result if the proposed action did not take place. Under the no action alternative, there would be continued adverse impacts to the Connecticut River. Control of the invasive aquatic plant, hydrilla, would not occur and the plant would continue to occur and rapidly spread through the Connecticut River system, surrounding systems, and across the U.S. Adverse impacts to boat traffic, recreational opportunities, and the integrity of aquatic communities in the system would continue to occur. Additionally, under the no action alternative, USACE and ERDC would not be conducting this field demonstration and will not be able to develop future guidance on how to manage this invasive aquatic plant. This future guidance includes the determining herbicide efficacy where hydrilla is most problematic, optimal timing of treatment, understanding non-target impacts, and herbicide CET requirements for effective control of hydrilla. Without this project, USACE and ERDC would not obtain this information for future studies and communicate to other agencies and organizations to use for hydrilla control.

Under this alternative, hydrilla will continue to grow and spread without control. This invasive plant primarily spreads through the movement of plant fragments from one location to another on boat trailers, hulls, propellers, that are introduced in different waterbodies as boats are moved. Wildlife is also capable of moving plant fragments to new locations (e.g., reptiles, waterfowl, etc.). The plant fragments are deposited in the substrate of lakes, ponds, rivers, coves, marinas, etc. and establish new individual plants that then grow into new infestations. Hydrilla infestations form dense mats that impede the operation of boats as it gets caught in props and narrows usable waterways. The river is used for recreational and commercial fishing and has many marinas and harbors that support the fishing industry. Recreational vessels, including motorboats, kayaks, and canoes, used by locals and tourists, also benefit from the river. Clogged waterways will limit access to recreational areas and opportunities that benefit the communities and local economies through tourism and local businesses that provide access to the river. In addition, the clogged waterways may lead to safety concerns as it causes boats to breakdown and/or get stranded. Additionally, clogged waterways will increase flood risk as hydrilla impedes water flow and flood control structures. The spread of hydrilla will cause further degradation of the native aquatic plant assemblages in the river system negatively impacting the native fish and wildlife that use the river for habitat.

3.2 Alternative Treatment Sites

Hydrilla has infested much of the lower Connecticut River, many of its coves and tributaries, and ponds and lakes in the river's watershed (Figure 2). Under this EA, the environmental resources within this system are being assessed for effects that would result from the proposed action. The specific sites proposed for treatment in the summer of 2024 are discussed in further detail below as well as within the affected environment. From all the locations at which hydrilla is found, seven sites of known hydrilla infestation were suggested by the Connecticut Agricultural Experiment Station (CAES) for potential management because they are heavily trafficked, represent a variety of water exchange characteristics, and have dense stands of hydrilla. These sites were also proposed because the surrounding communities use them for recreation and livelihood, or owners or managers expressed interest in participating in the project and benefiting from the control of hydrilla. Following information collection on the seven sites, including bathymetry (water depths), tidal fluxes, and presence/absence of sensitive species, and site observations by the research team, the team chose five sites for further investigation and herbicide treatment applications. As part of the research and demonstration project, there is another study investigating hydrilla's development throughout the growing season to inform optimal herbicide treatments. As part of this study, control sites that have not been managed for hydrilla were needed to understand the growth dynamics of the target species. Deep River and Mattabesset River will be used for this study and will help to inform timing of herbicide treatments. Accordingly, these two sites were not selected for further analysis in this study, will not be affected by the proposed action, and were not carried forward for further analysis in this EA.

In August and September of 2023, USACE and ERDC conducted dye dissipation studies at the five sites to understand water exchange dynamics for further analysis and development of individual herbicide treatment plans for hydrilla control. During the dye studies, licensed herbicide applicators applied Rhodamine WT (RWT) tracer dye at a target concentration of 10 ppb to the sites using the same methods used during an herbicide application to replicate that management activity. The research team collected dye concentrations in the water following initial dye treatment to determine spatial and temporal patterns of dye retention in selected treatment areas. This information was used to determine herbicide active ingredient and associated rates in the selected study sites in 2024.

Figure 2. Mapped hydrilla (*Hydrilla verticillata*) within the Connecticut River system (CAES, 2020).

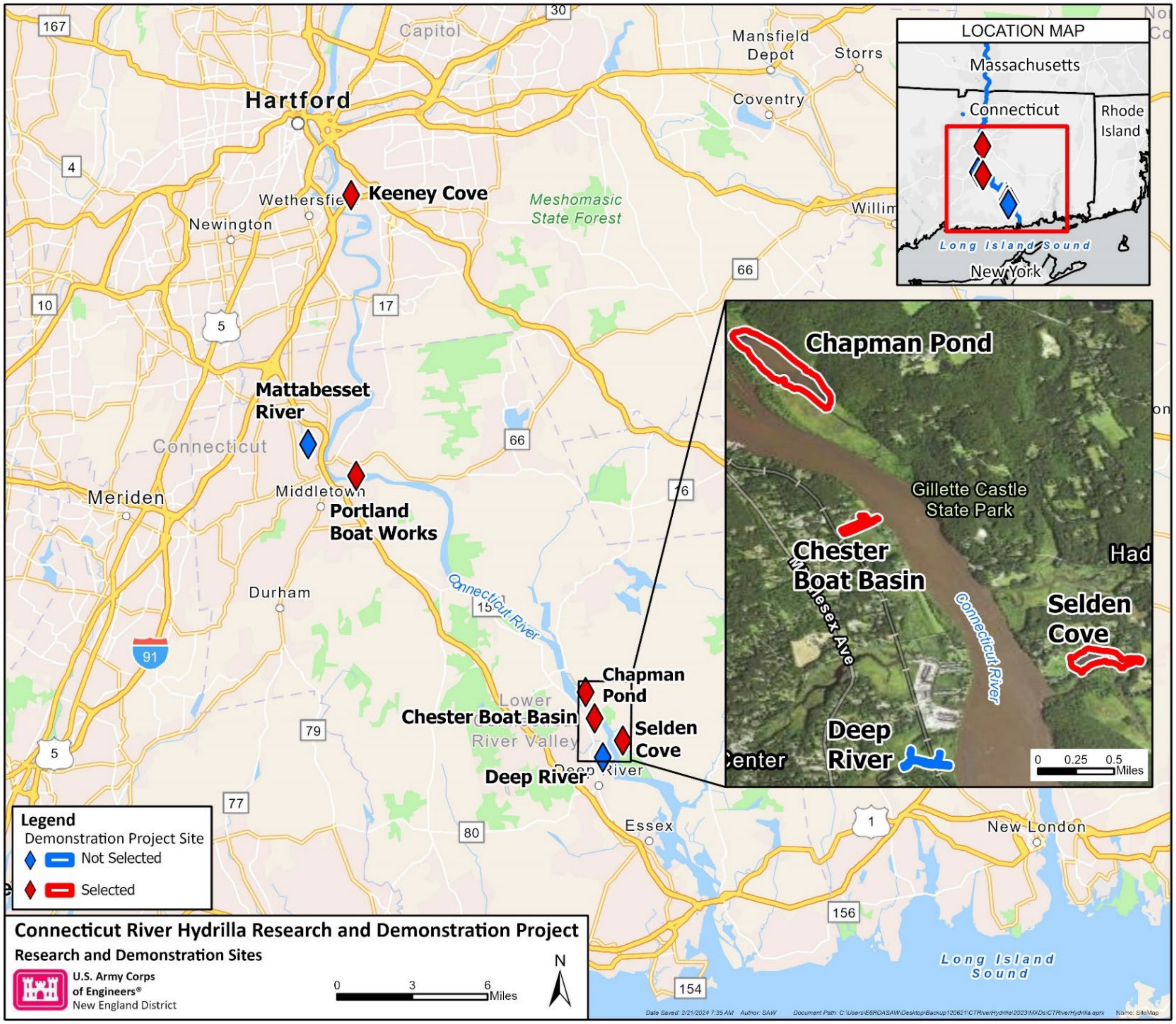

Figure 3. The potential demonstration sites within the Connecticut River system.

A. Chapman Pond

Chapman Pond is a tidal pond that is connected to the Connecticut River by two creeks. It is located in East Haddam, Middlesex County, CT and is centered at 41.439° N, 72.446° W (Figure 4). The total treatment area is approximately 50.1 acres. The pond is surrounded by land designated for recreation and conservation as part of Chapman Pond Preserve, managed by The Nature Conservancy and East Haddam Land Trust.

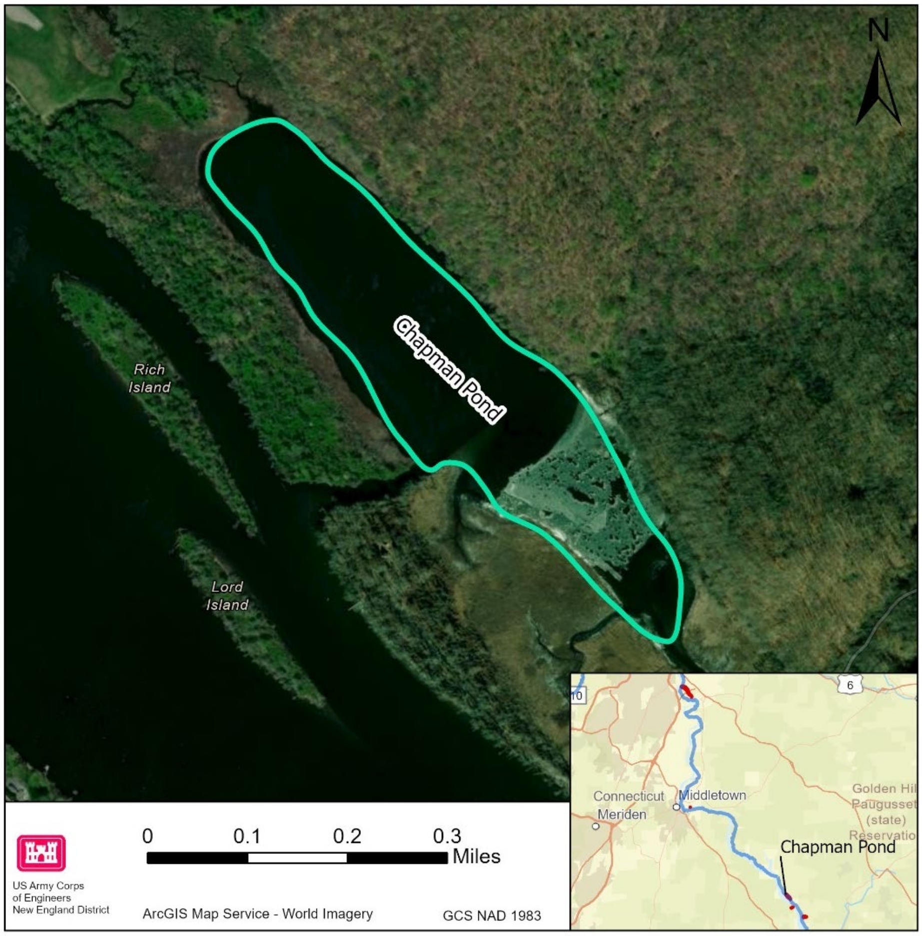

Figure 4. Satellite imagery of treatment site Chapman Pond.

B. Chester Boat Basin

Chester Boat Basin is a man-made boat basin located in Chester, Middlesex County, CT and centered at 41.424° N, 72.439°W (Figure 5). The total treatment area is 4.1 acres. The boat basin is located off the main stem of the Connecticut River and is surrounded by rural residential area as well as open space that includes wetlands to the south.

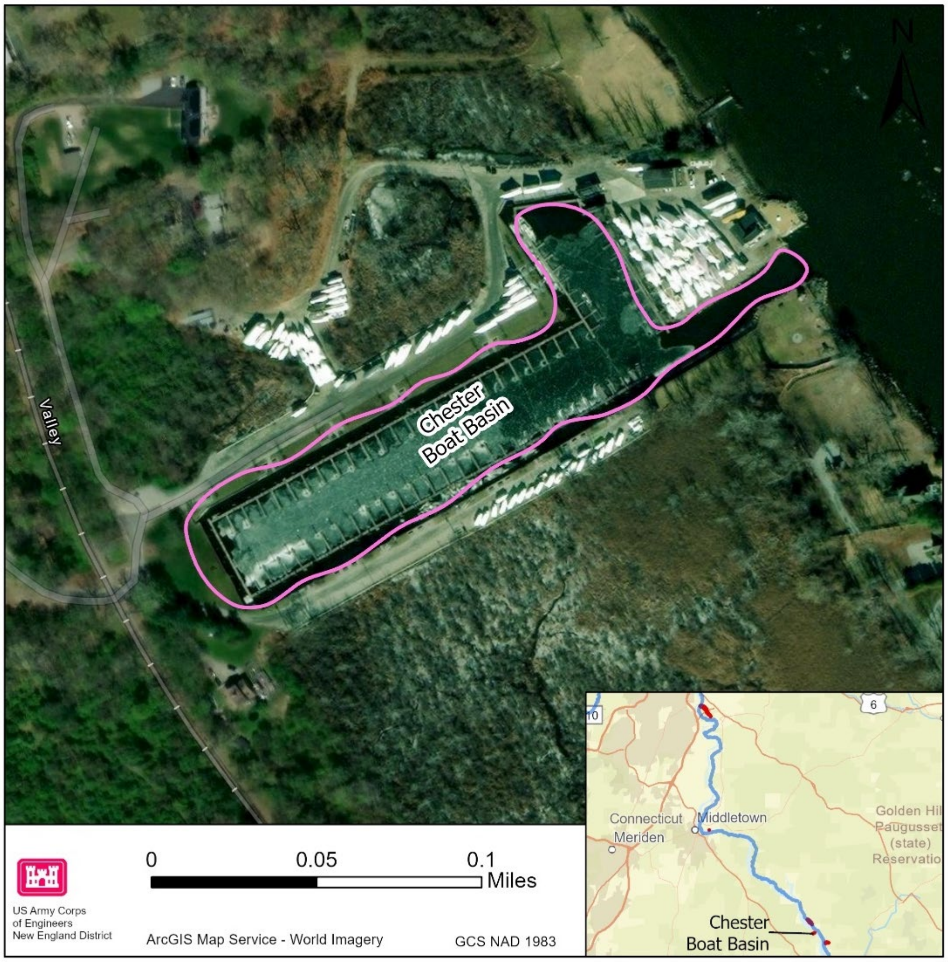

Figure 5. Satellite imagery of treatment site Chester Boat Basin.

C. Keeney Cove

Keeney Cove is a cove off the main stem of the Connecticut River connected by a narrow channel and located in Glastonbury and East Hartford, Hartford County, CT and centered at 41.721° N, 72.629°W (Figure 6). The total treatment area is 70.3 acres. The cove is located in commercial and residential area as well as open space that includes farmland and floodplain to the west.

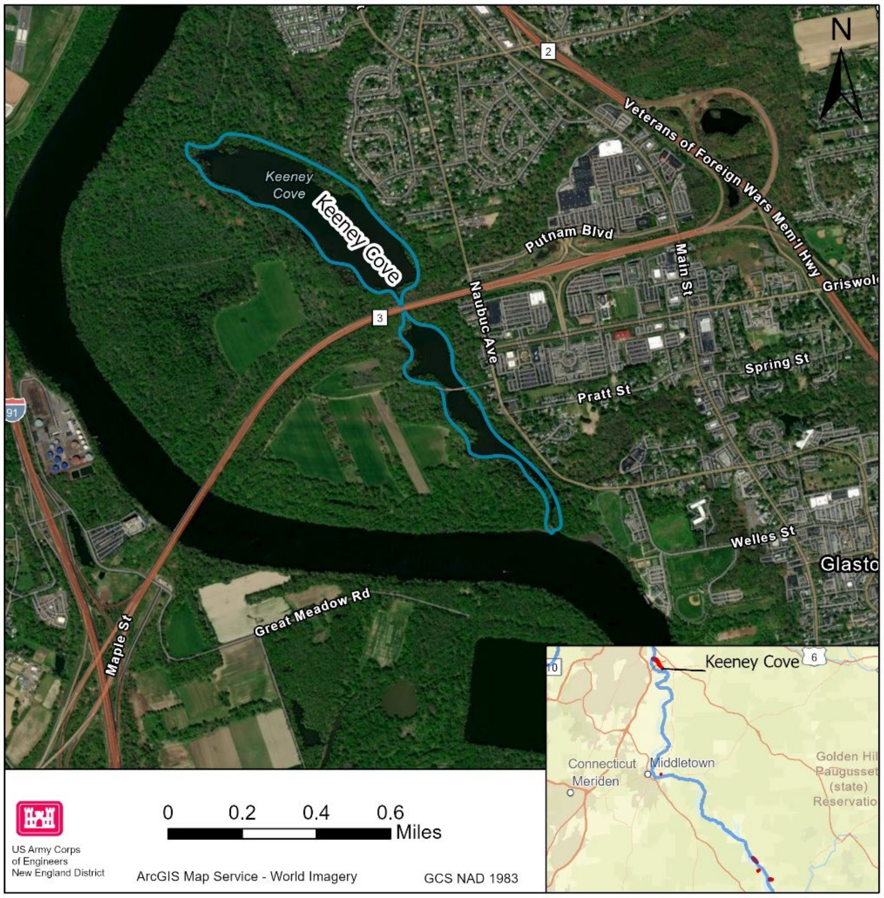

Figure 6. Satellite imagery of treatment site Keeney Cove.

D. Selden Cove

Selden Cove is a cove off the Connecticut River located in Lyme, Middlesex County, CT and centered at 41.411° N, 72.417°W (Figure 7). The total treatment area is 16.1 acres. The cove is connected to the main stem of the Connecticut River by Selden Creek to the west and south and is approximately 0.25 miles from the river. It is abutted by rural residential area as well as recreation and conservation land that is part of Selden Neck State Park, managed by Connecticut Department of Energy and Environmental Protection (CTDEEP).

Figure 7. Satellite imagery of treatment site Selden Cove.

E. Portland Boat Works

Portland Boat Works is an operating marina located in Portland, Middlesex County, CT and centered at 41.562° N, 72.624° W (Figure 8). The total treatment area is 0.6 acres. The marina is located along the shore of the main stem of the Connecticut River and is adjacent to the commercial area for the marina with residential area surrounding that.

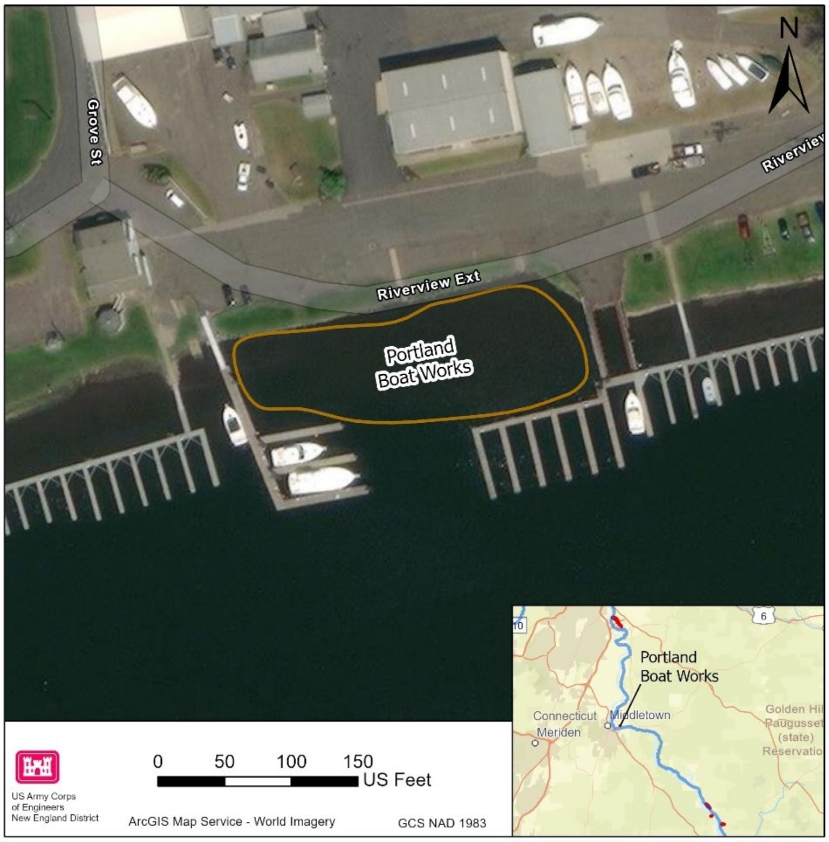

Figure 8. Satellite imagery of treatment site Portland Boat Works.

3.3 Alternative Control Methods

The following methods and their associated environmental impacts were considered to study the control of hydrilla in the Connecticut River. It is important to note that none of the alternative control methods considered would result in the complete eradication of hydrilla but would rather inform the most efficient, safe, and effective management practice to reduce its spread, which is causing economic and environmental harm from hydrilla infestations.

3.3.1 Mechanical

The primary mechanical method of aquatic invasive control is mechanical harvesting. Plant material is cut and removed using specialized harvester boats and material is disposed of at an upland site. This method can be useful for short-term relief of small infestations in water greater than two feet deep but hydrilla typically grows back quickly in these areas and harvesters often increase fragmentation, which promotes spread to new areas. In addition, this method is non-selective and affects both native submerged aquatic vegetation (SAV) and wildlife in the harvested area. The high cost of maintenance and disposal of the material are also limiting factors for the use of this method (UF/IFAS, n.d.). Due to the high possibility of fragmentation and spread of hydrilla as well as the associated disturbance to the system, this method is not considered a feasible alternative.

3.3.2 Physical

There are a number of commonly used methods of physically controlling invasive species. Hand pulling is a useful method for the immediate control of small populations (i.e., less than 0.5 acre), usually before a species has established a monoculture in any given environment. This method is labor intensive and requires the complete removal and disposal outside of the environment (UF/IFAS, n.d.). Given the densities at which hydrilla is found in the Connecticut River system as well as the viability of hydrilla fragments in forming new plants and populations, this method is not suitable for the control of hydrilla in this system. The populations of hydrilla are widespread and dense within the river system, and therefore, this method was not considered practical.

Water level drawdown is another physical method that is used to control aquatic invasive plant species. Drawdown is used to expose plants to air and dry them out, causing desiccation and freezing. This method requires impoundment of water by a dam or other water control structure that enables water levels to be drawn up and down so that plants are exposed to the air. The change in water levels can interfere with fish and wildlife habitat utilization and reproduction depending on the time of year and system conditions. Often, hydrilla populations can resist the effects of drawdowns with underground turions and are able to recolonize (UF/IFAS, n.d.). Since the Connecticut River in the state of Connecticut is not impounded by any water control structure, this method is not a viable form of treatment.

Another physical method of control is the use of benthic barriers which are mats made of plastic, fiberglass, or nylon that are placed over vegetation and anchored to block sunlight from reaching the river bottom. They work by shading out existing plants as well as preventing germination of new plants (Cornell Cooperative Extension, 2016). Benthic barriers are effective for smaller infestations (less than .25 acres) and are not usually useful for complete eradication. They are most effective in small areas or for early detection and rapid response to new populations. This method may be useful for small infestations at marinas but is ineffective as a primary control method in flowing waters. The barriers also block light for native species on the water bottom. There can be difficulties in installation and maintenance, and high cost for the area of control (NEANS, 2020). For these reasons, this method was not considered practical for control of hydrilla in the Connecticut River.

3.3.3 Biological

Several organisms are known to feed on hydrilla and have been used as a biological control (biocontrol) for the species in other parts of the country. These include the tuber-feeding weevil

(*Bagous affinis*), the Australian stem-boring weevil (*Bagous hydrillae*), the leaf-mining fly (*Hydrellia pakistane* and *Hydrellia balciunasi*), and triploid grass carp (*Ctenopharyngodon 15ucius*). The insect species have been primarily used to treat the dioecious hydrilla strain that is established in the southern U.S. (Van Driesche *et al.*, 2002). The strain that is found in the Connecticut River is monoecious and a distinct genotype from all known North American hydrilla plants, presenting challenges in implementing the same treatments, including biocontrol (Tippery *et al.*, 2020). Insect biocontrol has not been used for management of this hydrilla genotype for this reason and more research and experimentation is needed to determine an effective biocontrol insect.

Grass carp are generalist herbivores that have been used in systems throughout the country and have been shown to effectively shift vegetation dominance from hydrilla to native SAV, especially when used in conjunction with herbicide treatments. Although they are generalists, grass carp have shown feeding preference for hydrilla over other aquatic vegetation and target resprouting hydrilla (Schad & Dick, 2018). However, they are still capable of causing imbalance in a system if a preferred feeding plant, like hydrilla, is not present and they consume significant amounts of native SAV, impacting the availability of forage and habitat for native aquatic fish and wildlife. In Connecticut, grass carp are used for the control of a variety of invasive aquatic plants in contained systems, such as ponds and lakes. Grass carp have not been considered as a control agent for the Connecticut River system due to its size and its connectivity to other waters (NEANS, 2020). Therefore, biological control is not currently an effective means of controlling hydrilla in the Connecticut River watershed.

3.3.4 Chemical

Chemical control using herbicides is an efficient way to manage infestations of hydrilla and other invasive aquatic plants. There are different classes of herbicides that are useful for different species and site settings: contact and systemic herbicides. The application of the below listed individual herbicides, or a combination of these products, is the preferred control method for the management of Connecticut River hydrilla.

Contact herbicides quickly absorb into exposed plant surfaces and kill the aboveground plant material while limiting the emergence of new reproductive structures for a given period (NEANS, 2020). Currently, the potential contact herbicides for control of hydrilla in the Connecticut River include diquat dibromide, and dipotassium salt of endothall. Diquat dibromide is a fast-acting herbicide that disrupts cell membranes and interferes with photosynthesis. Following treatment, aboveground plant material will die within a week (WDNR, 2012a). Dipotassium salt of endothall is a selective herbicide that interferes with plant respiration by affecting protein and lipid biosynthesis and disrupting plant cell membranes (WDNR, 2012b).

Systemic herbicides are usually slow-acting and inhibit enzyme activity in target plants, which requires intermediate to long exposure periods with target plants. These herbicides are absorbed into the plant and moved or translocated within the plant tissue, causing death of the whole plant including belowground structures that can overwinter and resprout into new plants if concentration-exposure time requirements are met (NEANS, 2020). A potential systemic herbicide to be used at sites within the river system is florpyrauxifen-benzyl. This herbicide acts as a synthetic auxin that causes rapid and uncontrolled growth until plant death.

Various physical, biological, and chemical methods have been used for control and eradication of hydrilla. The most effective and economical method of control for well-established, large-scale populations is typically an herbicide approach using tested and U.S. Environmental Protection Agency (USEPA)-registered aquatic herbicides. Several herbicides have been used to control hydrilla throughout the country. Treatment and monitoring data from the New York Croton River, Cayuga Lake Inlet, Tonawanda Creek/Erie Canal, and management projects in other states show that several consecutive seasons of herbicide treatments are necessary to control hydrilla populations since turions can persist in the benthic substrate.

3.4 Proposed Action

The proposed action is the application of herbicide for the control of hydrilla to study the effectiveness of these herbicides and application methods for the control of this genotype of hydrilla in high water exchange systems. The proposed action is to provide a field-scale demonstration of technology to evaluate the effectiveness of an aquatic herbicide to manage hydrilla in high water exchange environments, such as the tidal, riverine environment of the lower Connecticut River. This action will provide valuable information for developing future guidance on how to manage hydrilla including the efficacy of certain herbicides, the optimal timing of treatment, the impacts on non-target species, and herbicide CET requirements for effective control of hydrilla. At the conclusion of the research and demonstration project, this information will be transferred to regional, state, and local agencies, and non-governmental organizations to use for effective control of hydrilla within the Connecticut River system.

Site specific treatments were developed considering environmental characteristics of the site (e.g., water movement and retention and native species presence) and chemical properties of the herbicides (e.g., target plants and concentrations) needed for control. The herbicides proposed for use are diquat dibromide (diquat), dipotassium salt of endothall, and florpyrauxifen-benzyl or a combination of these herbicides. The herbicide will be evenly distributed across each of the treatment areas using a boat-based, subsurface injection application method by licensed applicators and in accordance with product labels. Monitoring of the treatment sites will occur to understand efficacy of the herbicide treatments and non-target impacts to apply to management of other hydrilla infestations. The monitoring protocol can be found in Appendix E. Plans for the sites proposed for treatment are listed below in Table 1.

Table 1. Treatment plans for the selected sites in 2024. All treatments will occur after July 4, 2024.

Site	Herbicide(s)	Concentration(s)
Chapman Pond	Florpyrauxifen-benzyl	48 parts per billion (ppb)
Chester Boat Basin	Dipotassium salt of endothall Diquat dibromide	1.8 parts per million (ppm) 0.36 ppm
Keeney Cove	Florpyrauxifen-benzyl	48 ppb
Selden Cove	Dipotassium salt of endothall	5 ppm
Portland Boat Works	Diquat dibromide	370 ppb; two treatments 14 days apart

4.0 Affected Environment

The affected environment for the proposed action includes the lower Connecticut River watershed where any treatment demonstrations may occur in the future, including ponds, lakes, tributaries, coves, and the mainstem of the river. Site-specific environmental features that have been determined to be sensitive and/or distinct within a particular site are included within this section under relevant resource subsections.

4.1 General Setting

The Connecticut River watershed covers 7.2 million acres and is the largest in New England, flowing primarily through forested areas with pockets of agricultural and urban lands, including Springfield, Massachusetts and Hartford, Connecticut (Kennedy *et al.*, 2018). Land use within the watershed includes agriculture (11%), open water (20%), urban (32%), and forest (37%). The Connecticut River becomes an estuary where the freshwater mixes with saltwater in LIS.

The Connecticut River contains a Federal Navigation Project (FNP) that includes multiple channels, jetties, anchorage and turning basins, dikes, and revetments from Old Saybrook to Hartford (Figure 9). The project serves recreational harbors and commercial waterfronts. Generally, hydrilla does not grow at the water depths at which the FNP is maintained. The proposed sites being evaluated under this EA are not associated with the FNP.

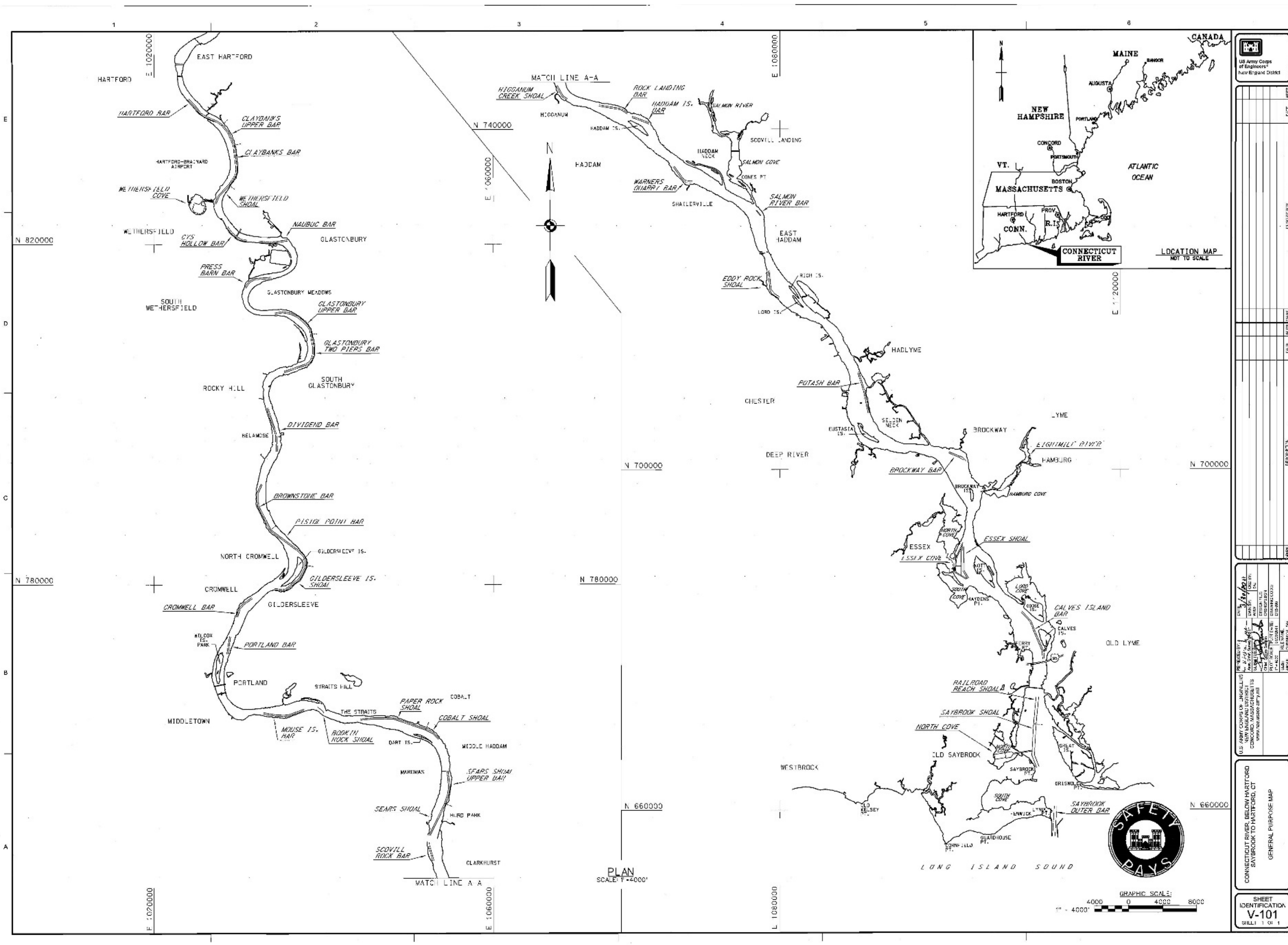

Figure 9. Map of features of the Connecticut River FNP south of Hartford, CT.

4.2 Physical Environment

4.2.1 Hydrology

The Connecticut River in Connecticut runs 65.5 miles from Suffield to Old Saybrook where it meets LIS. The mean annual discharge is 19,200 cubic feet per second (Kennedy *et al.*, 2018). Tidal influence exists for most of the river in Connecticut and reaches 60 river miles upstream of LIS to Windsor Locks, Connecticut. Tidal volume flux within the river is relatively low due to the ratio of tidal inflow volume to freshwater flow volume during peak flood tide. The salinity in the river has wide daily fluctuations due to the strength of tides and freshwater river discharges, which determine how far the salt wedge moves up into the estuary. Salinity can vary based on the freshwater inflow that can change seasonally and with storm events. Snowmelt and rains in the spring cause the greatest freshwater flows, which can create low salinity in surface waters of the entire Connecticut River estuary. In the summer, salt water is detected further upriver (Ramsar, 1994).

4.2.2 Water Quality

The surface water quality within the Connecticut River system is highly variable because of the size of the system and assorted land and water uses that line different parts of the river. The lower part of the mainstem river, south of Windsor, CT is classified as SB waters, which indicates there are moderate changes from the natural conditions in the structure of the biological communities with minimal changes in the ecosystem function that still sustain a healthy, diverse biological community with native species. These waters are designated for marine fish habitat; other aquatic life and wildlife; commercial shellfish harvesting; recreation; industrial water supplies; and navigation (CTDEEP, 2011).

North of Windsor and in the larger tributaries of the river, surface water quality is classified as B waters, which indicates there are moderate changes from natural conditions in the structure of the biological communities with minimal changes in ecosystem function. These waters likely have small amounts of sludge deposits, solid refuse floating solids, oils and grease and scum as well suspended solids that do not exceed 10 mg/L over ambient concentrations. The waters are designated for habitat for fish and other aquatic life and wildlife; recreation; navigation; and industrial and agricultural water supply (CTDEEP, 2011).

Smaller tributaries and creeks within the system have surface waters that are classified as A waters, which indicates there are moderate changes from natural conditions in the structure of the biological communities with minimal changes in ecosystem function. These waters do not contain sludge deposits, etc. of class B waters or suspended solids that significantly alter the physical or chemical composition of the bottom or impact aquatic organisms living in or on the bottom substrate. These surface waters are designated for habitat for fish and other aquatic life and wildlife; potential drinking water supplies; recreation; navigation; and water supply for industry and agriculture (CTDEEP, 2011).

Two areas, Hamburg Cove and Chester Creek, which are small tributaries into the mainstem of the Connecticut River, are classified as SA waters, which indicates that there are moderate changes from the natural conditions in the structure of the biological communities with minimal changes in the ecosystem function that still sustains a healthy, diverse biological community with native species. These waters have higher thresholds for dissolved oxygen with only sludge deposits, etc., suspended solids, and turbidity of natural origin or resulting from normal agricultural, construction activity, dredging with reasonable control and best management practices. These surface waters are designated for habitat for marine fish, other aquatic life and wildlife; shellfish harvesting for direct human consumption; recreation; industrial water supply; and navigation (CTDEEP, 2011).

Infestations of hydrilla are known to change the water chemistry and quality due to their processes and decay. Hydrilla raises pH and water temperatures and reduces dissolved oxygen. When the plant senesces in the fall, the decay of the plant material increases the organic matter in the system, causing hypoxia (low oxygen) as the material is readily decomposed by microbes (Langeland, 1996; Wright *et al.*, 2018).

4.2.3 Geology and Sediments

The geology within the Connecticut River system in Connecticut varies from the flat Central Valley in the north to the Eastern Crystalline Highlands as the river flows south to the LIS. The Central Valley in Hartford County contains soft sedimentary strata with the river lined with floodplain alluvium, sand, and sand and gravel overlying other sediment types (Stone *et al.*, 1992). South of Hartford, the Eastern Crystalline Highlands contain hard metamorphic rock that has been eroded and glacially scoured, constricting the river to its existing channel (Ramsar, 1994). This lower part of the river is lined with sand, sand and gravel, maybe overlying sand, and salt marsh and tidal marsh deposits (peat and mulch interbedded with sand and silt) (Stone *et al.*, 1992).

4.3 Biological Environment

4.3.1 Wetlands

The wetlands of the Connecticut River watershed consist of estuarine wetlands near the mouth of the river and freshwater emergent and forested/shrub wetlands higher in the watershed. In 1994, the Ramsar Convention on Wetlands listed the Connecticut River estuary and its tidal river wetlands complex as wetlands of international importance based on their rare and unique wetland types, biological diversity, and presence of waterbirds, fish, and other taxa (Ramsar, 1994). The main factors that influence the types of wetlands that develop are water depth, changes in water levels, soil moisture, and salinity, as well as plant competition, and animal and human activities that alter any of the preceding factors. Within the Connecticut River system, there are estuarine, riverine, and palustrine wetlands. The proposed sites are tidal freshwater systems and may only contain or be adjacent to riverine and palustrine wetlands.

Riverine wetlands line river systems, between the riverbanks and deep water (greater than six feet), and include nonpersistent emergent wetlands, aquatic beds, unvegetated flats, and shallow water. Within the Connecticut River these types of wetlands occur between Great Meadows and Connecticut’s northern boundary, with their greatest extent occurring within the tidally influenced freshwater section of the river (Metzler & Tiner, 1992). Some riverine wetlands along the Connecticut River appear as intertidal flats during the winter and are dominated by wild rice (*Zizania aquatica*), pickerelweed (*Pontederia cordata*), and three-square club-bulrush (*Schoenoplectus pungens*) during the growing season due to the tidal flooding and the ability of these species to germinate and grow in dynamic hydrologic conditions (Ramsar, 1994; Metzler & Tiner, 1992).

The majority of wetlands in the Connecticut River system are freshwater palustrine wetlands that have a wide range of water regimes. Due to the various types of water regimes and the presence of freshwater, these wetlands are the most diverse floristically, supporting species ranging from SAV like tapegrass (American eelgrass; *Vallisneria americana*) to facultative shrubs like highbush-blueberry (*Vaccinium corymbosum*) depending on the frequency of flooding and soil saturation (Table 2; Metzler & Tiner, 1992).

Table 2. Dominant hydrophytic vegetation present in different water regimes in palustrine wetlands in Connecticut (Metzler & Tiner, 1992).

Water Regime	Scientific Name	Common Name	Plant Life Form
Permanently Flooded	*Vallisneria americana*	Tapegrass	Submergent
	Nymphaea odorata	Fragrant White Water Lily	Floating-leaved
	Lemna minor	Duckweed	Floating
	Pontederia cordata	Pickerelweed	Emergent
Semipermanently Flooded	*Sparganium americanum*	Bur-reed	Emergent
	Typha latafolia	Common Cattail	Emergent
	Decadon verticillatus	Water Willow	Shrubby Emergent
	Cephalanthus occidentalis	Buttonbush	Shrub
Seasonally Flooded	*Carex stricta*	Tussock Sedge	Emergent
	Symplocarpus foetidus	Skunk Cabbage	Emergent
	Calamagrostis canadensis	Bluejoint Grass	Emergent
	Vaccinium corymbosum	Highbush-blueberry	Shrub
	Ulmus americana	American Elm	Tree
	Fraxinus pennsylvanica	Green Ash	Tree
Temporarily Flooded	*Eupatorium* spp.	Joe-Pye-weeds	Emergent
	Solidago spp.	Goldenrods	Emergent
	Lilium canadense	Canada Lily	Emergent
	Quercus palustris	Pin Oak	Tree
	Nyssa sylvatica	Black Gum	Tree
	Carya ovata	Shagbark Hickory	Tree

A. Chapman Pond

Chapman Pond is a tidal freshwater pond connected to the mainstem of the river by two tidal creeks. The pond is surrounded by tidal freshwater marsh dominated by wild rice, green arrow arum (*Peltandra virginica*), river bulrush (*Bolboschoenus fluviatilis*), and common reed (*Phragmites australis*), along with floodplain forest (Ramsar, 1994; Padgett, 2023).

B. Chester Boat Basin

The wetlands that surround Chester Boat Basin contain tidal freshwater wild rice marsh as well as patches of phragmites. There are also freshwater forested/shrub wetlands dominated by scrub-shrub vegetation with broadleaf deciduous trees that are seasonally flooded (USFWS, 2023).

C. Keeney Cove

Keeney Cove was formerly the main channel of the Connecticut River in the 17th century that appears as a depression in the river's floodplain and is still connected to the mainstem of the river (Grant, 2015). It is lined intermittently by tidal freshwater emergent marsh that is flooded during hightide but is primarily surrounded by floodplain forested wetlands that are dominated by broadleaf deciduous trees (USFWS, 2023). The littoral zone of the northern portion is dominated by water chestnut (*Trapa natans*) and river bulrush, especially on northern and western shores. Other emergent plants observed included smartweed (*Persicaria* spp.), broadleaf arrowhead (*Sagittaria latifolia*), and pickerelweed (*Pontederia cordata*) (Padgett, 2023).

D. Selden Cove

Selden Cove is lined with freshwater tidal marsh and alluvial mudflat wetlands dominated by wild rice and pickerelweed with instances of green arrow arum, purple loosestrife (*Lythrum salicaria*), arrowhead species, and phragmites (Ramsar 1994; Padgett, 2023). Selden Creek that flows through and past the cove is lined with substantial stands of wild rice dominated freshwater tidal marsh.

E. Portland Boat Works

Portland Boat Works is located within the mainstem of the river but does not have any wetlands adjacent to it. The closest wetlands that are hydrologically connected to the river near Portland Boat Works are upstream of a creek that feeds into the river from Pecausett Pond approximately 0.25 miles downstream of the treatment site (USFWS, 2023).

4.3.2 Floodplains

The Federal Emergency Management Agency (FEMA) defines A zones as areas that will become inundated by a flood event having a 1% chance of being equaled or exceeded in any given year and a 26% chance of flooding over the life of a 30-year mortgage. The 1% annual chance flood is also referred to as the base flood or 100-year flood (FEMA, 2020). Major flooding of large rivers in Connecticut, such as the Connecticut River, with loss of life and structural damage occurs about every 30 years. The Capitol Region of the Connecticut River valley has about 8.5% of its land located within floodplains with the lower Connecticut River valley having about 0.9% of land within floodplains (CRCOG, 2019; RiverCOG, 2021)

4.3.3 Aquatic Vegetation

The Connecticut River watershed supports a variety of aquatic vegetation that serve as important habitat and forage for fish and wildlife species within the system (Table 3). The most common of these species native to the area that are found in the watershed are American eelgrass and coontail (*Ceratophyllum demersum*), which are both found through much of the US and New England in lakes and slow-moving rivers. In addition to the native aquatic vegetation, there are invasive aquatic plants, such as hydrilla, curlyleaf pondweed (*Potamogeton crispus*), Eurasian watermilfoil (*Myriophyllum spicatum*), fanwort (*Cabomba caroliniana*), variable-leaf watermilfoil (*Myriophyllum heterophyllum*), and water chestnut. These species also provide habitat and forage for fish and wildlife, but because their growth and populations are left unchecked, the habitat is lower quality (i.e., high densities of plant material, changes to water temperature and pH, and underutilization by native prey species).

Though they share a common name, common eelgrass (*Zostera marina*) that is only found in marine environments, is different from the freshwater American eelgrass. During a survey within the Connecticut River in 2019, American eelgrass was found to have the highest frequency of occurrence for native aquatic vegetation, with its presence observed at 33% of transect points (Bugbee & Stebbins, 2020). Eelgrass is a perennial, dioecious plant that reproduces by fruits as well as by asexual propagules, rhizomes, and winter buds, which are similar to tubers and turions (McFarland, 2006). This species supports invertebrates, fish, and waterfowl and is especially important to canvasback ducks (*Aythaya valisineria*) that are known to change their migration patterns based on the plant’s distribution (Native Plant Trust, n.d.). Hydrilla and eelgrass often cohabit systems and can be competitive under certain conditions as these species employ different strategies for establishment and growth, with eelgrass being most competitive with hydrilla during an established phase and at a disadvantage during colonization. Eelgrass seeds do not disperse as far as propagules of hydrilla, and eelgrass invests carbohydrates more evenly between biomass aboveground and belowground, which causes slower growth and a greater need for resources such as light, carbon, and nitrogen to establish itself during colonization (Smart *et al.*, 1994).

The survey performed by Bugbee & Stebbins (2020) in 2019, found coontail to be the second most abundant native SAV species, with a frequency of occurrence of 32% of transect points. This species forms large, dense, monotypic stands in lakes and slow-moving rivers and spreads primarily by vegetative means through winter buds and fragmentation, and rarely reproduces with flowers and fruits. Coontail grows underwater and its leaves often grow to the water’s surface, but the species does not produce roots to secure itself into the substrate, and instead loosely anchors to sediment with pale modified leaves. A variety of fish and wildlife use coontail for food and shelter as the plant supports insects that fish and ducklings eat and provides cover for young fish (MNDNR, n.d.).

Table 3. Common native aquatic plant species found in the Connecticut River with their frequency of occurrence (FOQ) (Bugbee & Stebbins, 2020):

Common Name	Scientific Name	FOQ (% of transect points)
Arrowhead	*Sagittaria spp.*	4
Cattail	*Typha spp.*	1
Clasping-leaf pondweed	*Potamogeton perfoliatus*	22
Common duckweed	*Lemna minor*	7
Coontail	*Ceratophyllum demersum*	32
American eelgrass	*Vallisneria americana*	33
Great duckweed	*Spirodela polyrhiza*	12
Horned pondweed	*Zannichellia palustris*	19
Primrose-willow	*Ludwigia spp.*	3
Sevenangle pipewort	*Eriocaulon aquaticum*	8
Waterwort	*Elatine spp.*	2
Western waterweed	*Elodea nuttallii*	15
White water lily	*Nymphaea odorata*	7

4.3.4 Benthic and Shellfish Resources

Freshwater mussels are filter feeders that live partially buried on the bottom of streams, rivers, ponds, and lakes, eating algae and zooplankton, and serving as food for fish and mammals. They are often the largest proportion of animal biomass in water systems, filtering water and storing minerals and nutrients (Nedeau & Victoria, n.d.). Freshwater mussels differ from marine mussels in a significant way in that they rely on host fish species during a crucial stage of their reproduction cycles. Microscopic larvae of the freshwater mussels, called glochidia, attach to the fins or gills of fish and drop off when mature, burying themselves into the sediment (Kennedy *et al.*, 2018). Due to their feeding and reproductive habits, these mussels are often vulnerable to disturbance, pollution, and competition with exotic species, affecting their population sizes (Nedeau & Victoria, n.d.).

Within the Connecticut River watershed, there are 12 species of freshwater mussels of varying densities, and rarities that are adapted to the natural variability of this dynamic water system. These species include: dwarf wedge mussel (*Alasmidonta heterodon*), triangle floater (*Alasmidonta undulata*), eastern pondmussel (*Ligumia nasuta*), tidewater mucket (*Leptodea ochracea*), yellow lampmussel (*Lampsilis cariosa*), eastern lampmussel (*Lampsilis radiata radiata*), eastern pearlshell (*Margaritifera margaritifera*), brook floater (*Alasmidonta varicosa*), creeper (*Strophitus undulatus*), eastern elliptio (*Elliptio complanata*), eastern floater (*Pyganodon cataracta*), and alewife floater (*Anodonta implicata*). The eastern elliptio is the most abundant and widespread freshwater mussel in the Connecticut River watershed as well as the northeast region of the United States due to its ability to parasitize a variety of host fish, inhabit flowing and stagnant waters, and tolerate disturbance and pollution. Six of the mussel species are specially listed in Connecticut by CTDEEP, USFWS, or both, which includes the dwarf wedgemussel (federally and state endangered), eastern pondmussel (state species of special concern), tidewater mucket (state threatened), eastern pearlshell (state species of special concern), brook floater (state endangered), and yellow lampmussel (state species of special concern; presumed extirpated). These species are sensitive to pollution and habitat degradation and are impacted by declines of their host fish species (Nedeau & Victoria, n.d.).

There are also a variety of snail species that inhabit the Connecticut River system, using streambanks and SAV for shelter and forage habitats. Piedmont elimia (*Elimia virginica*) have thick, elongated shells and are found in freshwater rivers and streams with large rocks. They have slow-growing, strong shells that allow them to withstand predation but causes slow individual and population growth rates. High water temperature and alkalinity have caused a decrease in abundance in the river (Kipp *et al.*, 2023).

4.3.5 Fish and Wildlife

The Connecticut River is home to rich communities of both migratory and resident fish populations that use its waters for foraging, migration, and spawning. Resident fish species include longnose dace (*Rhinichthys cataractae*), fallfish (*Semotilus corporalis*), white sucker (*Catostomus commersonii*), brook trout (*Salvelinus fontinalis*), slimy sculpin (*Cottus cognatus*), tessellated darter (*Etheostoma olmstedi*), yellow perch (*Perca flavescens*), northern pike (*Esox lucius*), largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieu*), channel catfish (*Ictalurus punctatus*), and white catfish (*Ameiurus catus*) among many others (Ramsar, 1994; Kennedy *et al.*, 2018).

There are 13 species of migratory fish, both anadromous and catadromous, some of which have had notable declines in recent decades due to barriers (*e.g.,* dams) to suitable habitat for spawning, foraging, and juvenile development and rearing as well as overfishing by the commercial fishing industry and habitat loss (USFWS, n.d). Of these 13 species, Atlantic salmon (*Salmo salar*), American eel (*Anguilla rostrata*), alewife (*Alosa pseudoharengus*), blueback herring (*Alosa aestivalis*), shortnose sturgeon (*Acipenser oxyrinchus*), and sea lamprey (*Petromyzon marinus*) have had the greatest decline in species numbers but are still important recreational fish species (Ramsar, 1994; Kennedy *et al.*, 2018).

There are three species of riparian tiger beetle species in the Connecticut River watershed. Riparian tiger beetles live exclusively on narrow bars of sand and cobble at the river's edge and rely on the variable water dynamics to build new bars and control vegetation growth, and depend on stable flows for foraging, reproduction, and larval development (Kennedy *et al.*, 2018). They feed on smaller insects and are preyed upon by dragonflies and flies. The Puritan tiger beetle (*Cicindela puritana*) is the only species of tiger beetle that resides in Connecticut. This species is a federally threatened riparian tiger beetle that is only found in New England in two small areas along the Connecticut River, following the sand and clay deposits formed by glacial lakes during the last ice age. The populations in the Connecticut River are limited by the availability of this kind of habitat that has been lost due to bank stabilization and flooding (CTDEEP, 1999).

The freshwater turtle species in the Connecticut River watershed are common musk turtles (*Sternotherus odoratus*), snapping turtles (*Chelydra s. serpentine*), northern diamondback terrapin (*Malaclemys t. terrapin*), eastern painted turtle (*Chrysemys picta picta*), spotted turtle

(*Clemmys guttata*), and wood turtle (*Glyptemys insculpta*). Most of these species prefer slow-moving waters, with soft, muddy, sandy, or gravelly bottoms often with plentiful aquatic vegetation for feeding and shelter. Snapping turtles, diamondback terrapins, and painted turtles are all tolerant of brackish water conditions with diamondback terrapins exclusively inhabiting these waters, feeding on fish, marine snails, crabs, marine and tidal mollusks, clams, worms, and carrion. The omnivorous diets of the other freshwater turtles are relatively similar and include aquatic vegetation, mussels, snails, crayfish, insects, fish, tadpoles, and carrion. Three of these species are Species of Special Concern in the state of Connecticut, including the northern diamondback terrapin, the spotted turtle, and the wood turtle (CTDEEP, 2023b).

Several snake species may inhabit the waters or adjacent wetlands of the proposed treatment sites. These species include northern watersnake (*Nerodia sipedon*), Dekay's brownsnake (*Storeria dekayi*), and common ribbonsnake (*Thamnophis sauritus*). These snakes either exclusively or partially inhabit aquatic and/or wetland areas, and at least part of their diets include aquatic organisms (e.g., frogs, fish, snails, salamanders, etc.) (CTDEEP, 2018a; CTDEEP, 2018b; CTDEEP, 2022b). Common ribbonsnake is a state Species of Special Concern (CTDEEP, 2018a).

A variety of amphibians may be present at the sites within the Connecticut River. There are four species of frog that may inhabit the waters of the project areas or the adjacent habitats: American bullfrog (*Lithobates catesbeianus*); green frog (*Lithobates clamitans*); Mid-Atlantic coast leopard frog (*Lithobates kauffeldi*); and pickerel frog (*Lithobates palustris*). All species inhabit rivers or bordering wetlands for at least a portion of their life cycles. Prey species include insects and other invertebrates, as well as other frogs (Watkins-Colwell, n.d.).

While primarily terrestrial mammal species, like eastern gray squirrel (*Sciurus carolinensis*) and white-tailed deer (*Odocoileus virginianus*) may be present in the project areas while traversing between pieces of land, more common mammals that may be present in the areas include muskrats (*Ondatra zibethicus*), river otters (*Lontra canadensis*), and beavers (*Castor canadensis*). These species are semi-aquatic, spending a majority of time in the rivers and ponds where their dens are located. Beavers and muskrats are primarily herbivores, feeding on woody trees and shrub species, and aquatic plants, respectively (CTDEEP, 2000; CTDEEP, 2009). River otters prefer fish, frogs, shellfish, insects, small birds, and small mammals (CTDEEP 2008).

The Connecticut River is part of the Atlantic flyway for neotropical migratory birds and provides nesting and resting habitat for important bird species including waterfowl, raptors, and federally threatened and endangered species. The diverse wetland types and intertidal flats that line the river provide for a high diversity and number of waterbirds (Ramsar, 1994). Bald eagles (*Haliaeetus leucocephalus*) and osprey (*Pandion haliaetus*) and their nests are commonly seen in large trees and snags along the edges of the river. Ospreys use the river for forage, feeding on menhaden (*Brevoortia tyrannus*), herring (*Alosa* spp.), and other fish species. Bald eagles are both a predator and a scavenger, hunting or scavenging when it is most opportunistic. They forage over both water and land and are likely to fish in spawning runs where fish are abundant but may also steal fish from ospreys and other birds (Audubon, 2023).

Waterfowl are common along the river and use the area for breeding, overwintering, and migration. American black ducks (*Anas rubripes*) are common dabbling foragers in marshes as well as the river due to their tolerance to a variety of aquatic habitats with the majority wintering in coastal estuaries, such as the lower Connecticut River. Their diets vary with location and season, consisting of primarily of plant material and occasionally small mollusks, crustaceans, and aquatic arthropods (Audubon, 2023).

Migratory birds identified by the U.S. Fish and Wildlife Service's (USFWS) Information, Planning, and Conservation System (IpaC) that may be present within the entire project area are listed in Table 4. Birds that are of Conservation Concern (BCC) by the USFWS are denoted with an "*". Bird species considered for the BCC include nongame birds, game birds without hunting season, subsistence-hunted nongame birds in Alaska, and Endangered Species Act (ESA) candidate, proposed, and recently delisted species. The overall goal of the BCC designation is to accurately identify the migratory and non-migratory bird species (beyond those already designated as federally threated or endangered that represent the USFWS's highest conservation priorities (USFWS, 2023a).

Table 4. Migratory birds that may utilize project area (USFWS, 2023a).

Common Name	Scientific Name	Common Name	Scientific Name
Bald eagle	*Haliaeetus leucocephalus*	Kentucky warbler*	*Oporornis formosus*
Black-billed cuckoo*	*Coccyzus erythropthalmus*	Lesser yellowlegs*	*Tringa flavipes*
Blue-winged warbler*	*Vermivora pinus*	Long-eared owl*	*Asio otus*
Bobolink*	*Dolichonyx oryzivorus*	Prairie warbler*	*Dendroica discolor*
Canada warbler*	*Cardellina canadensis*	Red-headed woodpecker*	*Melanerpes erythrocephalus*
Cerulean warbler*	*Dendroica cerulea*	Rusty blackbird*	*Euphagus carolinus*
Chimney swift*	*Chaetura pelagica*	Short-billed dowitcher*	*Limnodromus griseus*
Eastern whip-poor-will*	*Antrostomus vociferus*	Willet*	*Tringa semipalmata*
Golden eagle	*Aquila chrysaetos*	Wood thrush*	*Hylocichla mustelina*

4.4 Essential Fish Habitat

Pursuant to the Magnuson-Stevens Fishery Conservation and Management Act and amended by the Sustainable Fisheries Act of 1996, an Essential Fish Habitat (EFH) consultation is necessary for this project. EFH is broadly defined as “those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity.” The project areas fall into this category and thus have the potential to provide habitat for EFH fish species (see Appendix B). Table 5 lists the EFH-managed species and life stage present within the treatment sites as identified by the National Marine Fisheries Service (NMFS) EFH Mapper.

See Section 5.4 for the anticipated effects to species with EFH designations in the project areas and Appendix A for correspondence with NMFS. The specific action areas identified in Table 5 were also identified as being within the summer flounder (*Paralichthys dentatus*) SAV Habitat Area of Particular Concern (HAPC). The summer flounder HAPC recognizes the importance of inshore sandy, shallow coastal and estuarine water habitat areas (MAFMC, 2020). Only species that have been identified as potentially occurring at the selected sites in Section 3.4 will be addressed below.

Table 5. Summary of Essential Fish Habitat Designations (NMFS, 2023b) in Chapman Pond (denoted with an “C”), Chester Boat Basin (denoted with a “B”), Keeney Cove (denoted with a “K”), Selden Cove (denoted with a “S”), and Portland Boat Works (denoted with a “P”).

Species	Eggs	Larvae	Juveniles	Adults
Atlantic butterfish (*Peprilus triacanthus*)	C B K S P	C B K S P	P	C B K S P
Atlantic herring (*Clupea harengus*)			C B K S P	C B K S P
Atlantic mackerel (*Scomber scombrus*)	C B K S P	C B K S P	C B K S P	C B K S P
Atlantic salmon (*Salmo salar*)	P	P	P	P
Black sea bass (*Centropristis striata*)			C B K S P	
Bluefish (*Pomatomus saltatrix*)			C B K S P	C B K S P
Little skate (*Leucoraja erinacea*)			C B K S P	C B K S P
Longfin inshore squid (*Doryteuthis pealeii*)	C B K S P		C B K S P	C B K S P
Pollock (*Pollachius virens*)			C B K S P	C B K S P
Red hake (*Urophycis chuss*)	C B K S P	C B K S P	C B K S P	C B K S P
Scup (*Stenotomus chrysops*)	C B K S P	C B K S P	C B K S P	C B K S P
Summer flounder (*Paralichthys dentatus*)			C B K S P	C B K S P
Windowpane flounder (*Scophthalmus aquosus*)	C B K S P	C B K S P	C B K S P	C B K S P
Winter flounder (*Psuedopleuronectes americanus*)	C B K S P	C B K S P	C B K S P	C B K S P
Winter skate (*Leucoraja ocellata*)			C B K S P	C B K S P

4.5 Threatened and Endangered Species

The project areas provide potential habitat for federally listed species under the Endangered Species Act (ESA) as well as protected state-listed threatened and endangered species. Species that have been identified as potentially occurring at the selected sites in Section 3.4 will be addressed below.

4.5.1 Northern Long-eared Bat

The federally endangered northern long-eared bat (*Myotis septentrionalis*; NLEB; listed May 2015) is found across much of the eastern and north central United States and all Canadian provinces from the Atlantic coast west to the southern Northwest Territories and eastern British Columbia. The species' range includes 37 states. White-nose syndrome, a fungal disease known to affect bats, is currently the predominant threat to this bat, especially throughout the Northeast where the species has declined by up to 99 percent from pre-white-nose syndrome levels at many hibernation sites.

During summer, NLEBs roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees. Males and non-reproductive females may also roost in cooler places, like caves and mines. Northern long-eared bats emerge at dusk to fly through the understory of forested hillsides and ridges feeding on moths, flies, leafhoppers, caddisflies, and beetles, which they catch while in flight using echolocation. Breeding begins in late summer or early fall when males begin swarming near hibernacula. Most females within a maternity colony give birth around the same time, which may occur from late May or early June to late July, depending on where the colony is located within the species' range. Young bats start flying by 18 to 21 days after birth (USFWS, 2015). No known maternity roost trees or hibernacula are located within or adjacent to the project areas (CTDEEP, 2019).

4.5.2 Tricolored Bat

In September 2022, USFWS proposed the listing of the tricolored bat (*Perimyotis subflavus*; TCB) as an endangered species under ESA. Finalization of this listing is expected to occur during 2024, when the proposed action is expected to occur. TCB is found across central America, southeastern Canada and eastern and central United States. The species' range includes 39 states. White-nose syndrome has also become the predominant threat to this bat species as well and has led to 90 to 100% declines in TCB winter colony abundance at sites with the disease.

During spring, summer, and fall, TCB roost among live and dead leaf clusters of live or recently dead deciduous hardwood trees, as well as in Spanish moss (*Tillandsia usneoides*) and *Usnea trichodea* lichen. The species has also been observed roosting among pine needles, eastern red cedar (*Juniperus virginiana*), and in artificial roosts (i.e., barns, bridges, concrete bunkers, etc.), and are rarely found roosting in caves. TCB emerge early in the evening and forage at treetops or above, until later in the evening when they forage closer to the ground, most commonly over waterways or along forest edges. They feed on small insects, such as caddisflies, moths, beetles, wasps, flying ants, and flies. Male and female TCBs meet at cave and mine entrances between mid-August and mid-October to swam and mate. Females give birth to two young during the following spring to summer. Young bats begin to fly at three weeks after birth and can fly and forage like adults at four weeks. Female TCBs return to the same summer roosting locations year after year, forming maternity colonies while males roost singly. TCBs hibernate in the winter in caves and mines as well as less commonly in culverts, tree cavities, and abandoned water wells (USFWS, 2022).

4.5.3 Atlantic Sturgeon

Atlantic sturgeon (*Acipenser oxyrinchus*) of all age classes from any of the five Distinct Population Segments (DPS) may be present in the project area. The Gulf of Maine DPS is listed as threatened with the other four DPSs listed as endangered. The species is also listed as a state endangered species. The Connecticut River is classified as critical habitat for the New York Bight DPS.

After emigration from the natal estuary, subadult and adult Atlantic sturgeon forage within the marine environment, typically in waters less than 50 meters depth (ASSRT, 2007). Adult Atlantic sturgeons may visit the project area for foraging, migration, and spawning. Young of year likely occur year-round above the salt wedge at the mouth of Hamburg Cove to Holyoke Dam (Savoy *et al.*, 2017). Adult sturgeons are expected to occur along the full reach of the river between mid-April through November up to the dam and at the spawning grounds from April to August. Eggs and yolk-sac larvae will be present in the river from April 15 to September 30 above the salt wedge to the dam due to the possible presence of young of year sturgeon (Kynard *et al.*, 2012). Hard substrate bottoms are used for spawning and egg development, before larvae drift downstream along the bottom to brackish waters (NMFS, 2023a).

4.5.4 Shortnose Sturgeon

Shortnose sturgeon (*Acipenser brevirostrum*) are federally and state designated as endangered and are considered amphidromous, spawning in freshwater and making short feeding or migratory trips to salt water. They live in rivers and coastal waters from Canada to Florida and spend most of their lives in estuaries with relatively little time in the ocean. When they are present in marine waters, they generally stay close to shore during the winter months. As benthic feeders, they use areas with aquatic vegetation to feed, consuming a variety of foods including small mollusks, insect larvae, and crustaceans (NMFS, 2023c).

Due to its amphidromous behavior, all life stages are likely to be present in Connecticut River throughout the year between the Holyoke Dam and the mouth of the river. Post yolk-sac larvae are present from April 15 to July 31 and is based on the spawning time in the river plus an additional 60 days to account for the larvae stage. Juvenile and adult shortnose sturgeon are likely to use the entirety of the species’ range in the Connecticut River to forage and overwinter from November 15 to April 15 in areas such as the Agawam Concentration Area, Holyoke Dam, Hartford, and Portland (Kynard *et al.*, 2012). They spend most of the late summer through winter and early spring in the northern areas of the river, and spawn April to May. After spawning, the sturgeon migrate to the estuary and remain there until June or July (Jacobs *et al.*, 2009).

4.5.5 State-Listed Species

CTDEEP has a program that protects Connecticut's native biological diversity and emphasizes the state's most vulnerable species and ecosystems. The Natural Diversity Data Base (NDDB) protects at-risk species listed under the State Endangered Species Act by conducting project review to balance land use needs and mitigate any adverse ecological impacts of these actions. NDDB must review any application for aquatic pesticide use within state waters and provides species lists for specific sites and requests that applicants survey for and/or implement protection plans to mitigate any impacts the pesticide may cause. Table 6 shows the species identified as potentially occurring within project areas based on historical records and the available habitat, as well as critical habitat present.

Table 6. State-listed species occurring at the selected sites for the research and demonstration project, which includes listed status of species of special concern (denoted by "SC"), threatened (denoted by "T"), and endangered (denoted by "E" for state-listed species, and "FE" for federally endangered). Surveyed plants are denoted with a "*".

Site	Species	Status
Keeney Cove	Yellow lampmussel (*Lampsilis cariosa*)	E
Critical Habitat	Tidewater mucket (*Leptodea ochracea*)	SC
Floodplain Forest	Eastern pondmussel (*Ligumia nasuta*)	SC
	Shortnose sturgeon (*Acipenser brevirostrum*)	E/FE
	Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*)	E/FE
	Blueback herring (*Alosa aestivalis*)	SC
	Burbot (*Lota lota*)	E
	David's sedge (*Carex davisii*)	T
	Cattail sedge (*Carex typhina*)	SC
	Northern arrowhead (*Sagittaria cuneata*)*	T
Portland Boat Works	Tidewater mucket (*Leptodea ochracea*)	SC
	Eastern pondmussel (*Ligumia nasuta*)	SC
	Cobra clubtail (*Gomphus vastsus*)	SC
	Shortnose sturgeon (*Acipenser brevirostrum*)	E/FE
	Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*)	E/FE
	Blueback herring (*Alosa aestivalis*)	SC
	Spotted turtle (*Clemmys guttata*)	SC
	Bald eagle (*Haliaeetus leucocephalus*)	T
	Northern leopard frog (*Lithobates pipiens*)	SC
Chapman Pond	Tidewater mucket (*Leptodea ochracea*)	SC
Critical Habitat	Eastern pondmussel (*Ligumia nasuta*)	SC
Freshwater intertidal marsh	Riverine clubtail (*Stylurus amnicola*)	T
Floodplain Forest	Shortnose sturgeon (*Acipenser evirostrum*)	E/FE
	Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*)	E/FE
	Blueback herring (*Alosa aestivalis*)	SC
	Bald eagle (*Haliaeetus leucocephalus*)	T
	Bridle shiner (*Notropis bifrenatus*)	SC
	Awl-leaved arrowhead (*Sagittaria subulata*)*	SC
	Torrey bulrush (*Schoenoplectus torreyi*)*	T
Chester Boat Basin	Tidewater mucket (*Leptodea ochracea*)	SC
	Eastern pondmussel (*Ligumia nasuta*)	SC
	Riverine clubtail (*Stylurus amnicola*)	T
Selden Cove	Tidewater mucket (*Leptodea ochracea*)	SC
Critical Habitat	Eastern pondmussel (*Ligumia nasuta*)	SC
Freshwater intertidal marsh	Wood turtle (*Glyptemys insculpta*)	SC
	Cattail sedge (*Carex typhina*)	SC
	Golden club (*Orontium aquaticum*)*	SC
	Awl-leaved arrowhead (*Sagittaria subulata*)*	SC
	Beck's water-marigold (*Bidens beckii*)*	SC
	Parker's pipewort (*Eriocaulon parkeri*)*	E
	Small yellow pond lily (*Nuphar microphylla*)*	SC
	Torrey bulrush (*Schoenoplectus torreyi*)*	T

Surveys for intertidal and subtidal plants, including awl-leaved arrowhead, northern arrowhead, golden club, dwarf bulrush, torrey bulrush, Beck's water-marigold, Parker's pipewort, and small yellow pond lily were conducted at the sites listed in Table 6 due to their vulnerability to herbicide applications because they are located within the intertidal and subtidal zones. See Appendix D for complete field survey results.

4.6 Historic and Archaeological Resources

The National Historic Preservation Act of 1966, as amended, established a national policy for historic preservation, authorized the Secretary of the Interior to expand and maintain a National Register of Historic Places designation, and created the Advisory Council on Historic Preservation. Section 106 of the National Historic Preservation Act of 1966 specifies that federal agencies, before approval of any expenditure or issuing any license, must consider the effect of the action on any property included in or eligible for the National Register of Historic Places.

The prehistory of the Lower Connecticut River Valley was examined in a regional cultural history collected over a four-year period by Kevin McBride (1984). Over 350 pre-Contact archaeological sites were identified through field surveys and interviews with local informants, ranging in age from 8,000 B.C. to A.D. 1700. McBride identified nine distinct phases in the lower Connecticut River Valley from the Archaic Period (2,500 B.C.) to the Contact Period (A.D. 1600). Two major changes in Native settlement patterns were detected. The first at around 1,000 B.C. consisted of large seasonal occupations along the Connecticut River, with smaller temporary task-specific sites in the uplands. This trend continued through the Woodland Period where it is replaced by the appearance of sedentary villages around A.D. 1000. The second major change arrived around A.D. 1500 with the appearance of small, seasonal camps in the uplands associated with a smaller nuclear or extended family unit. McBride examined possible explanations for these settlements shifts to include a focus on riverine resources along the Connecticut River or trade in the upper Hudson Valley in the former and an increased reliance on horticulture and contact with Europeans in the latter (McBride 1984).

The 1625 Griswold Map, available on the Connecticut State Historic Preservation Office's Connecticut Cultural Resources Information System (ConnCRIS) Geographic Information System (GIS) database depicts numerous Native American villages on both sides of the river associated with the Sicaog, Tunxis, Wangunk, and Hammonassett peoples on the western bank, and the Hockanum, Podunk, Mohegan, Uncas, and the Nehantic on the eastern bank. In relation to the current hydrilla project, village sites are noted in the Naubec area (East Hartford and Wethersfield), Hockanum (East Hartford), Pyquag (Wethersfield west), Mattabesex and Pocowset (Portland, Middletown), Machamoodus (East Haddam area), Cossonnacock (Hadlyme), and Pattaquonk (Chester and Deep River) (ConnCRIS 2024).

The Native inhabitants of the Valley used the river for navigation and trade, as well as for the fertile lands for hunting and farming. The first Europeans who arrived in Connecticut were the Dutch in 1614 who established a fort at what is today Hartford. During the 1620s, the Dutch and the Pequots, based in southeastern Connecticut, controlled all trade in the region.

However, in the 1630s, with the arrival of the English, conflicts and competition arose as the new settlers tried to wrest control of trade from the Dutch and Pequots. The murders of English traders by the Pequot ultimately resulted in the Pequot War in 1636 (Connecticut History.org, 2012 and 2020a).

After the English wrested control from the Pequots and their allies, the colony of Connecticut was established recognizing the value of the Connecticut River for travel and commerce and eventually reaching north into New Hampshire and Vermont in the search for trade goods. By the late 18th and early 19th centuries, the river became a prime location for the shipbuilding industry and became a vital route for transporting lumber. Industrialization in the 19th Century transformed the river as the need for power generation diverted the natural flow, while in the 20th Century commercial farming and tobacco cultivation contributed to further degradation and pollution of the river (Connecticut History.org, 2020a).

In 1998, the Connecticut River was designated an American Heritage River, one of only 14 rivers that have received this designation. “The American Heritage River program was designed to restore the historic, economic, and environmental viability of some of the nation’s most important waterways” (Connecticut History.org, 2020b).

A. Chapman Pond

Chapman Pond is located in East Haddam, Middlesex County, Connecticut. There are no recorded historic properties within or in the vicinity of the treatment site location. Several Native American archaeological sites are noted to the north-northwest of the pond. To locate sites, a buffer of approximately 1,000 feet was placed around the boundary of Chapman Pond and one site is noted on the edge of the buffer, known as the Chapman Pond site (041-081), a rock shelter located on private property. This site is said to have been extensively “pot hunted” during the 1960s and 1970s and consisted of clam shells and lithic materials. One additional site (041-116) is recorded a short distance north of the previous site.

B. Chester Boat Basin

Chester Boat Basin is located in Chester, Middlesex County, Connecticut. There are no known or recorded historic properties within or in the vicinity of this site location. There is one Native American archaeological site (026-005) located well north of the 1,000-foot site buffer. The Banning Shore site is located on the western shore of the Connecticut River, and was an unspecified Archaic Period campsite that was extensively “pot hunted” during the 1970s. The Chester-Hadlyme Ferry (west side crossing) is located about 2,200 feet south of the Chester Boat Basin on Route 148.

C. Keeney Cove

Keeney Cove is located in East Hartford and Glastonbury, Hartford County, Connecticut. Although there are no recorded historic properties in or around the cove, there are several to the east of the water bodies. Naubuc Avenue – Broad Street Historic District in East Hartford is located to the east of the upper cove area, north of State Route 3 and west of State Route 2.

The Curtisville Historic District is located in Glastonbury, just east of the lower segment of the Cove on Naubuc Avenue and Pratt Street. There is also Bridge No. 3671, which spans Porter Brook, on Naubuc Avenue in Glastonbury, north of Route 3 and dates from 1871. Each of the above historic properties are outside of the Keeney Cove area but within the 1,000-foot buffer.

The 1874 Petersen Collection map of Glastonbury depicts the Connecticut Arms and Manufacturing Company site on the east bank of the Connecticut River just south of the Naubuc area listed above. The notation describes the Company as the maker of "firearms, spectacles, and spoons" and includes the location of a dock on the river (Petersen Collection 1874).

Several Native American archaeological sites are recorded to the east of the lower portion of the cove, and within the buffer along Naubuc Avenue. Site 054-074 is a Late Archaic campsite (north of Pratt Street and Naubec Avenue) with surface finds collected from plowed, cultivated fields, while Site 054-075 is a Late Archaic/Woodland site also collected from plowed fields. Lastly, 054-009, a Late Archaic/Early Woodland campsite, is located about 1,000 feet east of Keeney Cove and was identified by surface finds and testing including diagnostic projectile points.

D. Selden Cove

Selden Cove is located in Lyme, Middlesex County, Connecticut. There are no historic properties recorded within or around the cove area. However, several historic buildings are located north along Selden Road: the Joseph Selden, Jr. House (circa 1695), the Selden House (circa 1759), and 28 Selden Road, a circa 1740 vernacular structure. These buildings range from about 400-500 feet north of Selden Cove and are also depicted on the 1868 Town of Lyme map (Petersen Collection 1868). There are no Native American archaeological sites within Selden Cove or the 1,000-foot buffer around the cove. Numerous sites are noted outside of the buffer to the north, south, and east; however, unless this treatment location is expanded or work/access areas extend beyond the cove, no further action is likely.

E. Portland Boat Works

Portland Boat Works is located in Portland, Middlesex County, Connecticut. There are no recorded historic properties within the proposed treatment area. One Native American Pre-Contact site (113-027), identified by the Office of State Archaeology, is located to the east near the outlet of Pecausett Pond. Two inventoried historic homes are identified to the west on Riverview and Grove Streets: the John McCleve House (circa 1795) and the Henry McCleve House (circa 1875), both about 300-400 feet away from the treatment area. Both properties amongst others are also depicted on the 1868 Town of Portland map in the Grove and Riverview Street neighborhood (Petersen Collection 1868).

4.7 Hazardous, Toxic, Radiological Waste

The EPA's National Priorities List (NPL) is the list of sites of national priority among the known release or threatened releases of hazardous substances, pollutants, or contaminants throughout the United State and its territories. These substances are also known as hazardous, toxic, and radioactive waste (HTRW). The proposed sites and their neighboring towns do not have any sites listed on the existing or proposed NPL (USEPA, 2024). There is an underground storage tank (UST) at Chester Boat Basin (CTDEEP, 2024).

The EPA's Toxic Release Inventory (TRI) tracks the management of certain toxic chemicals that may pose a threat to human health and the environment. Certain industrial facilities in the U.S. must report annually how much of each chemical is recycled, combusted for energy recovery, treated for destruction, and disposed of or otherwise release on-and off-site. Middletown Power, LLC, located approximately 2.3 miles downstream of Portland Boat Works, released approximately 72,802 lbs of ammonia, 24 lbs of polycyclic aromatic compounds, and 15 lbs of naphthalene on-site in 2022. Kleen Energy Systems, LLC, located approximately 1.5 miles downstream of Portland Boat Works, released approximately 30,649 lbs of ammonia on-site in 2022 (USEPA, 2022).

4.8 Noise

Noise along the Connecticut River relates to nature, recreation, and transportation along and across the river, as well as residential and commercial activities. The land use around the river varies from the urban landscape of Hartford to the nature and recreation of state parks such as Selden Neck. The loudest levels of noise come from the urban environment including car and train traffic and construction, with the sounds from watercraft being the loudest contributor of noise directly on the river.

The current priority areas are primarily concentrated in more rural and recreational areas and have a relatively low noise volume that primarily come from watercraft, nature, and some traffic noise with Keeney Cove having the highest volume of traffic and urban noise.

4.9 Air Quality

The Clean Air Act (CAA) establishes the framework for modern air pollution control, and delegates primary responsibility for regulating air quality to the States, with oversight by the U.S. Environmental Protection Agency (EPA). The EPA develops rules and regulations to preserve and improve air quality as minimum requirements of the CAA, and delegates specific responsibilities to state and local agencies. Seven specific pollutants (called criteria pollutants) have been identified to be of concern with respect to the health and welfare of the general public. The criteria pollutants are carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), particulate matter 10 micrometers or less in aerodynamic diameter (PM_{10}), particulate matter 2.5 micrometers or less in aerodynamic diameter ($PM_{2.5}$), and lead (Pb). The EPA has established the National Ambient Air Quality Standards (NAAQS) for these pollutants.

Areas that do not meet the NAAQS are called non-attainment areas. For non-attainment areas, the CAA requires States to develop and adopt State Implementation Plans (USEPA, 2012). The state of Connecticut is designated as attainment with respect to the NAAQS for the following five criteria air pollutants: particulate matter; sulfur dioxide; nitrogen dioxide; carbon monoxide; and lead. The entire state of Connecticut is designated a non-attainment zone for ozone (O_3). It is also part of the Northeast Ozone Transport Region, which requires the northeast states to submit SIPs and install certain level of controls for the pollutants that form ozone, even if they meet the ozone standards (USEPA, 2023). Non-attainment zones are areas where the NAAQS have not been met. Nitric oxide (NO), hydrocarbons, oxygen (O_2), and sunlight combine to form ozone in the atmosphere. Nitrogen oxides are released during the combustion of fossil fuels. Although classified as nonattainment, Connecticut's peak ozone levels have improved dramatically since 1980 as a result of numerous local, regional, and national emission control strategies (CTDEEP, 2023a).

4.10 Climate Change

Connecticut is within a humid continental climate that is distinguished by four distinct seasons and large seasonal temperature differences with even distribution of precipitation across the four seasons and influence from the maritime environment producing bouts of humid weather. Temperatures are highly variable both seasonally and daily. During winter, average temperatures can range from 17°F to 40°F and in summer they range from 56°F to 85°F (RiverCOG, 2021). Annual precipitation accumulations range from 35 inches to 47 inches near the coast with average annual precipitation of about 45 inches of rain and about 40 inches of snow (Kennedy *et al.*, 2018; RiverCOG, 2021). The climate and weather trends have changed over the last century with an increase in average temperatures by almost 2°F. Precipitation has also increased about 10% with a 70% increase in the occurrence of heavy storm events with a decrease in snow accumulation. This has caused an increase in flood events and an earlier spring snowmelt (Kennedy et al., 2018).

4.11 Greenhouse Gases

Greenhouse gases (GHGs) trap heat within the earth's atmosphere which increases temperatures. The largest source of greenhouse gas emissions from human activities in the United States is from burning fossil fuels for electricity, heat, and transportation. Each federal agency project's NEPA assessments need to consider and evaluate GHGs consistent with Council on Environmental Quality (CEQ) interim guidance released on the consideration of GHGs emissions and the effects of climate change (CEQ, 2023). CEQ defines GHGs as carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Also, "emissions" includes release of stored GHGs as a result of destruction of natural GHG sinks such as forests and coastal wetlands, as well as future sequestration capability. The common unit of measurement for GHGs is metric tons of carbon dioxide (CO_2) equivalent [mt CO_2-e]).

The Connecticut Global Warming Solutions Act, passed in 2008, established a mandate to reduce statewide GHG emissions 10 percent below 1990 levels by 2020 and 80 percent below 2001 levels by 2050. As a result, a Greenhouse Gas Emissions Inventory was first published in 2003 and provides a report card on 30 years of GHG emissions in the state and tracks progress toward the state's GHG emission reduction targets. The CTDEEP estimates emissions using million metric tons of carbon dioxide equivalent (MMTCO2e) which includes CO_2, methane, nitrous oxide, sulfur hexafluoride, hydrofluorocarbons, and perfluorocarbons (CTDEEP, 2023a). The latest data available from the CTDEEP GHG Emissions Inventory is from 1990 to 2021. In 2021, Connecticut emitted 34.7 MMTCO2e, which is 23.9% lower than in 1990. The sector that has produced the highest amount of GHG emissions since 1990 is transportation, which accounted for approximately 39% of the states total emissions and is twice as high as the next biggest emitter in 2021, residential sources (CTDEEP, 2023a).

4.12 Socioeconomic Environment

The Connecticut River flows through three counties in Connecticut: Hartford, Middlesex, and New London. Each of these counties has a wide range of land uses with Hartford being the most urban. The bordering areas are primarily residential and commercially and industrially developed with varying degrees of residential density. The densest developed areas in Connecticut are concentrated in the upper reaches of the river valley with development lessening south towards LIS. Open space accounts for the next largest acreage for land use and includes state parks, forests, wildlife areas, and any land with conservation restrictions (RiverCOG, 2021; CRCOG, 2019).

According to U.S. Census 2021 data, Hartford County had an estimated population of 896,854 and about 79% of the population was over 18 years of age. Approximately 61% of the population were white, 14% were black or African American, and 6% were Asian. The rate for individuals living below the poverty level was 10.3%, which is lower than the national average (12.8%) for 2021. The median household income for Hartford County was $80,069 in that year. Middlesex County had an estimated population of 164,759 and about 83% was over 18 years of age. Approximately 82% of the population were white, 5% were black or African American, and 3% were Asian. The rate of individuals living below the poverty level was 5.7%, which is lower than the national average for 2021. The median household income was $94,887 that year. In 2021, New London County had an estimated population of 268,805 and about 81% was over the age of 18. Approximately 75% of the population were white, 6% were black or African American, and 4% were Asian. The rate of individuals living below the poverty level in New London County was 8.6%, which is below the national poverty level. The median household income was $78,828 in 2021 (U.S. Census Bureau, 2021).

The Connecticut River contributes to the economic value to the region by supporting a “lifestyle economy” where many people live and work in the area because of the natural resource and recreation amenities, and high quality of life. Approximately 13,000 to 15,000 jobs are associated with the “lifestyle economy” with at least $450 million in wages (RiverCOG, 2016). The spread of hydrilla in the Connecticut River has caused impacts to the economic environment by causing the loss of swimming, fishing, and boating opportunities with the decreased navigability of the river. The impacts to the accessibility of the river may cause a decline in property values and tourism-based revenues that are critical to the local economies surrounding the river (RiverCOG, 2016).

4.13 Environmental Justice

Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no racial, ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental consequences resulting from an action, including the execution of federal, state, local, and tribal programs and policies. Factors considered in determining whether the proposed project would significantly affect environmental justice include the extent or degree to which its implementation would (1) change any social, economic, physical, environmental, or health conditions so as to disproportionately affect any particular low-income or minority group or (2) disproportionately endanger children in areas within or near the project site. These factors are consistent with the requirement for compliance with EO 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations), EO 13045 (Protection of Children from Environmental Health Risks and Safety Risks), and EO 14008 (Tackling the Climate Crisis at Home and Abroad).

EO 12898 requires federal agencies to identify and address the disproportionately high and adverse human health or environmental effects of their actions on minority and low-income populations, to the greatest extent practicable. The objective of EO 13045 is to make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children. EO 14008 requires federal agencies to make achieving environmental justice part of their missions by developing programs, policies, and activities to address disproportionately high and adverse human health, environmental, climate-related, and other cumulative impacts on disadvantaged communities, as well as the accompanying economic challenges of such impacts.

The CEQ compiles climate environmental justice information to compare populations vulnerable to environmental factors across the United States in their Climate and Economic Justice Screening Tool (CEJST). According to CEJST, environmentally disadvantaged communities are found along the river in the Hartford and Middletown metropolitan areas. A tract is considered disadvantaged if it meets more than one burden threshold and the associated socioeconomic threshold. Burden categories include climate change, energy, health, housing, legacy pollution, transportation, water and wastewater, and workforce development. Each category has a few specific threshold attributes that are assessed and paired with a socioeconomic threshold: low income or high school education percentiles, depending on the burden category (CEQ, 2023). The sites that are currently being evaluated under this EA are not located within disadvantaged community tracts. Additional sites evaluated for treatment in the future will be screened using the CEJST for impacts to disadvantaged communities.

A. Chapman Pond

The tract that surrounds Chapman Pond has a population of 3,867 and approximately 1% of the population are classified as people of color, 12% as low income (percent of people in households where income is less than or equal to twice the federal poverty level), and 18% as over the age of 65. None of the burden or socioeconomic thresholds are met.

B. Chester Boat Basin

The tract that encompasses Chester Boat Basin has a population of 4,234 and approximately 1% of the population are classified as people of color, 22% as low income, and 25% as over the age of 65. This site meets the burden threshold for wastewater discharge at the 91st percentile (modeled toxic concentrations at stream segments within 500 meters, divided by distance in kilometers) but none of the socioeconomic thresholds.

C. Keeney Cove

The two tracts that encompass Keeney Cove have a total population of 7,368 and approximately 21% and 36% of the population are classified as people of color, 27% and 45% as low income, and 21% and 18% as over the age of 65, respectively. The first tract meets the burden threshold for expected agriculture loss rate at the 97th percentile (economic loss to agricultural value resulting from natural hazards each year) but none of the socioeconomic thresholds. The other tract meets the burden threshold for lack of indoor plumbing at the 97th percentile (share of homes without indoor kitchens or plumbing), and wastewater discharge at the 91st percentile but none of those associated socioeconomic thresholds. This tract did meet the socioeconomic threshold for high school education (percent of people ages 25 or older whose high school education is less than a high school diploma) at 12%.

D. Selden Cove

The tract that surrounds Selden Cove has a population of 2,499 and approximately 3% of the population was classified as people of color, 23% as low income, and 27% as over the age of 65. None of the burden or socioeconomic thresholds are met.

E. Portland Boat Works

The tract that encompasses Portland Boat Works has a population of 5,683 and approximately 1% of the population are classified as people of color, 14% as low income, and 18% as over the age of 65. This site meets the burden threshold for wastewater discharge at the 91st percentile but none of the socioeconomic thresholds.

4.14 Recreation and Aesthetics

The lower Connecticut River provides many opportunities for recreational activity and tourism. The untouched beauty of the lower river valley and quaint nature of the riverine towns draws in tourists for recreation, cultural, and historic activities, from boating and fishing on the river to steam train and riverboat excursions and museum and castle tours (RAMSAR, 1994).

Twelve Connecticut state parks abut the river providing hiking, fishing, and camping opportunities. Four of these parks, including Selden Neck, Gillette Castle, Hurd, and River Highlands, offer river camping that can be accessed by boat (Figure 10), allowing access to wide range of recreational activity, including hiking, birdwatching, fishing, and paddling (CTDEEP, 2022a). In the springtime, anadromous fish run up the rivers of the northeast to spawn which provides opportunity for recreational fishing of alewife, blueback herring, American shad, and sea lamprey among others (CTDEEP, 2021).

Under the Wild and Scenic Rivers Act, the Eightmile River, a tributary of the Connecticut River, has 25.3 miles that have been designated as Scenic, and the lower Farmington River and Salmon Brook, also a tributary, has a Recreational classification for 61.7 miles. This Act was established to preserve rivers with outstanding natural, cultural, and recreational value to develop river management goals that retain and enhance the unique value and characteristics of the designated rivers (NWSRS, n.d.).

Figure 10. Connecticut state parks that offer primitive riverside camping along the Connecticut River (CTDEEP, 2022).

5.0 Environmental Consequences

5.0.1 No Action Alternative

Under the no action alternative, the conditions within the Connecticut River and its harbors, coves, and tributaries would worsen as hydrilla clogs the waterways and outcompetes native SAV. Control of the invasive aquatic plant, hydrilla, as well as the research investigating effective management tools and protocols would not occur and the plant would continue to inhabit and spread through the Connecticut River system and surrounding areas. Without the research into the effective methods for hydrilla control, management actions for the control of hydrilla implemented by other agencies and organizations will not be effective. Hydrilla would continue to negatively affect boat traffic, recreational opportunities, and the integrity of aquatic communities in the system. As a result, losses to the river's recreational, aesthetic, economic, and natural value would endure. The hydrilla problem would continue to expand within the river and watershed causing increased spending on control and removal.

5.0.2 Proposed Action

The proposed action involves treatment of the aquatic invasive plant hydrilla using herbicide as part of a field-scale study through demonstration of technology to evaluate the effectiveness of an aquatic herbicide to manage hydrilla in high water exchange environments, such as the tidal, riverine environment of the lower Connecticut River. This action will provide valuable information for developing future guidance on how to manage hydrilla including the efficacy of certain herbicides, the optimal timing of treatment, the impacts on non-target species, and herbicide CET requirements for effective control of hydrilla. The data and observations collected from the herbicide treatments and subsequent monitoring will be used to develop future treatment plans as part of the research, and determine effective herbicides, timing, and CET requirement for this hydrilla genotype in this environment. The conclusions from this investigation will be used to develop treatment procedures to transfer to regional, state, and local agencies, and non-governmental organizations to use for effective control of hydrilla.

The proposed project will involve the direct application of herbicide to the sites located on the Connecticut River and in its coves and tributaries to control populations of hydrilla that inhibit use of the river for recreation, and navigation among its other uses. These sites include Chapman Pond, Chester Boat Basin, Keeney Cove, Portland Boat Works, and Selden Cove. Each target treatment site within the system will have a site-specific treatment plan based on the site conditions, including but not limited to water flow dynamics, water depths, and plant densities. The treatment plans for the sites that are currently being evaluated can be found detailed in Section 3.4.

5.0.3 Direct and Indirect Effects

This section describes the environmental effects of the proposed action and alternatives. Effects or impacts are changes to the human environment from the proposed action or alternatives. Impacts can be beneficial or adverse, can be a primary result of an action (direct) or a secondary result (indirect), and can be permanent/long-term or temporary/short-term.

Indirect effects are effects that occur later in time or are further removed in distance but are still reasonably foreseeable. Impacts can vary in degree from minor and temporary to significant and permanent. All identified impacts resulting from the treatment of hydrilla with aquatic herbicides are addressed in the succeeding sections.

5.0.4 Cumulative Impacts

Cumulative impacts are those resulting from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions. Cumulative effects can result from individually minor but collectively significant actions taking place over time. Relevant past and current activities in the Connecticut River and its coves and tributaries include previous aquatic invasive plant treatment, dredging, and recreational activities. Reasonably foreseeable future actions include the continuation of the abovementioned activities. The cumulative impacts on the affected environment are included within each section of the environmental consequences.

5.1 Physical Environment

5.1.1 Hydrology

Under the no action alternative, hydrilla will continue to spread within the waterways of the river system forming dense stands and mats. The water flow and velocities in stands of aquatic invasive plants such as hydrilla differ from flows of native aquatic vegetation stands and open channels due to the dense growth habits of the hydrilla. A study by Rybicki *et al.* (1997) found that tidal flux water velocities in a hydrilla stand were 10 times slower than those in the channel outside of the stand and slowed the movement of water into and out of the stand during the flood and ebb tides. This will cause impediments to water flow of the river and its tributaries, primarily in the narrower and shallower sections. The changes in water flows may result in flooding and damage to banks as well as impact water movement into water supply and irrigation intakes (Langeland, 1996).

No anticipated adverse direct or indirect impacts are expected to the hydrology of the river system with the implementation of the proposed action. The treatment of hydrilla in the river, coves, and tributaries with registered aquatic herbicides will provide benefits to the hydrology of the system by reducing and potentially eliminating hydrilla populations from obstructing the flow of water. This will prevent flooding and return these systems to a more natural state of flow. There are no cumulative impacts expected to hydrology with implementation of the proposed action.

5.1.2 Water Quality

Without management of hydrilla, water quality will decline in the areas that it is present due to its ability to change natural temperature, pH, and dissolved oxygen of the system. The fluctuations in these measures can contribute to the release of nutrients, such as phosphorus, from the sediments. There would continue to be a seasonal decrease in dissolved oxygen when hydrilla senesces and decomposes causing harm and imbalances over the long-term.

These factors can contribute to large algal blooms causing eutrophication and fish kills (Hou *et al.*, 2013).

Under the proposed action, short-term adverse impacts would occur, including the temporary increase in turbidity due to the reduction and removal of hydrilla as well as a short-term decrease in dissolved oxygen due to the death and decomposition of hydrilla from herbicide treatment. Dense infestations of hydrilla decrease the baseline turbidity by lowering water flow and increasing settling of suspended sediment compared to a native SAV community (Shrivastava & Srivastava, 2021). Hydrilla dieback from the proposed action will result in a localized increase in baseline turbidity but these conditions will be more natural as the native vegetation community and density is restored. The short-term decrease in dissolved oxygen will be temporary and the effects would be localized to treatment areas for a short period of time. Since project areas are connected to the main river, water exchange is highly dynamic due to river flow and tidal influence. Consequently, any waters with low dissolved oxygen will be replaced quickly during tidal exchanges and due to flow-through within the river channel.

The herbicides may adsorb to sediments or persist in the waters for varying amounts of time depending on environmental conditions. Diquat dibromide that does not get adsorbed to sediment, will remain in waters for two to four weeks (USEPA, 2014). Florpyrauxifen-benzyl will degrade by photolysis and microbial activity in one to six days (WDNR, 2022). Dipotassium salt of endothall will degrade in water with a half-life of approximately five to ten days under aerobic conditions with complete degradation by microbes occurring 30 to 60 days after application (WDNR, 2012a). Long-term beneficial impacts are anticipated to water quality with the treatment of hydrilla including the return of naturally occurring water temperatures, pH, and dissolved oxygen levels. No adverse cumulative impacts are anticipated from the proposed action because of the low frequency and targeted concentrations of the herbicide treatments.

5.1.3 Sediments

Under the no action alternative, hydrilla will continue to impact the accumulation of sediments in the Connecticut River system, affecting the natural deposition and movement of sediment in the environment.

The proposed action of applying herbicides to the aquatic environment for the treatment of hydrilla will not adversely impact sediments in the short or long-term. The herbicides currently proposed for use either adsorb to sediments and deactivate, becoming biologically unavailable and causing no toxicity or biological harm to organisms in the system, or degrade by light and microbes.

Diquat dibromide, which will be applied at Chester Boat Basin and Portland Boat Works, binds with organic matter and soil colloids either in the sediment or suspended in the water column within hours or up to 30 days depending on the herbicide concentration and the availability of organic matter and soil colloids (WDNR, 2012a). When residual diquat dibromide is bound to the sediments it deactivates and is no longer biologically active and is degraded slowly by microbial organisms in the sediment without residual toxicity (WDNR, 2012a; NIWA, n.d.). Florpyrauxifen-benzyl, which will be applied at Chapman Pond and Keeney Cove, is readily absorbed by plant material and adsorbed to soil and sediments with a half-life of approximately one to six days. Chester Boat Basin and Selden Cove will be treated with dipotassium salt of endothall which does not adsorb to soil and remains in the water column until degraded by microbes within 30 to 60 days after application (WDNR, 2012b). The reduction of hydrilla in the system will help return the sediment dynamics to a more natural condition that serves the river's character and available habitats to fish and wildlife. Other than Portland Boat Works, all sites will be treated once during the growing season in summer 2024. Portland Boat Works will be treated twice because of how quickly water is exchanged in the system, so it is not expected that the diquat dibromide will linger in the system and readily adsorb to sediment. Based on the half-lives of the proposed herbicides, no cumulative impacts are anticipated from the proposed action because the residual herbicide either do not adsorb to soil or will be degraded before the sites are considered for treatment again.

5.2 Biological Environment

5.2.1 Wetlands

Under the no action alternative, hydrilla will spread to inhabit the fringes of the river, coves, ponds, lakes, and tributaries including the permanently flooded portions of wetlands that line these waterbodies. In the Connecticut River watershed, hydrilla has been observed in the intertidal zone. Without management, hydrilla will continue to spread to tidal and shallow wetlands, outcompeting native vegetation and altering the water conditions that will lead to less diverse wetlands, reducing important ecosystem services such as fish and wildlife habitat, carbon sequestration, and others.

The treatment of hydrilla in the Connecticut River will provide beneficial long-term impacts to wetlands by controlling hydrilla to levels that don't allow encroachment into wetlands and densities that will not alter the integrity of the wetlands. The herbicides concentrations and timing of treatment that are proposed at the five sites are unlikely to cause a significant effect on wetlands adjacent to the sites. The treatment may affect susceptible plants that are on the fringe of the treatment areas by killing the aboveground material, but these impacts will be temporary as plants would recover in following growing seasons from rhizomes or propagules (Parsons *et al*. 2004, 2019; Skogerboe and Getsinger 2001, 2002). Selective herbicide treatments do not kill native plant seed banks nor non-exposed rhizomes. Vegetation within the treatment areas will be monitored after treatment to determine impacts to non-target submerged and emergent vegetation. No anticipated long-term adverse or cumulative impacts are anticipated from the proposed action.

5.2.2 Floodplains

With the no action alternative, hydrilla will continue to form dense stands and mats that cause impediments to water flow within the system. Water flow rates during high waters will decrease, making it difficult for excess water to leave the system through existing channels and flood protection structures, and causing water levels to spill out into the floodplain (Thunberg *et al*., 1992). Hydrilla can increase the severity of flood events by affecting the flood levels, according to a model prepared for Lake Istokpoga in Florida by USACE. The model showed that hydrilla would increase the flood levels to between 0.5 feet for a five-year event and 5.1 feet for a storm more severe than a 100-year storm within the lake (Searcy, 1994).

Under the proposed action there will be long-term beneficial impacts to the floodplain. Control of hydrilla will lessen the chances that severe storm events will overflow into floodplains or will lessen the severity of the flooding impacts from those events. There are no anticipated short-term or cumulative impacts to the floodplain from the proposed action.

5.2.3 Aquatic Vegetation

Without the proposed action, hydrilla will continue to spread throughout the Connecticut River system, outcompeting native aquatic vegetation such as American eelgrass and coontail, which provide suitable food and habitat to native fish and wildlife species and their prey.

The proposed action involving the application of dipotassium salt of endothall, diquat dibromide, florpyrauxifen-benzyl, or any combination of these herbicides may have direct short-term impacts to aquatic vegetation at a treatment site. Monitoring will occur after treatments to understand the efficacy of the herbicide treatments to control hydrilla and understand the plant communities that return. Common native aquatic plants, such as elodea, eelgrass, and coontail, have a range of sensitivities to these herbicides and may be impacted by the hydrilla treatment as discussed below, but are likely able to recover in the following growing seasons. Since hydrilla primarily reproduces vegetatively by fragment, tuber, or turion, it will be more difficult for it to persist in the ecosystem if it is treated over multiple years during the growing season as it will be unable to put energy into growing those reproductive structures. The herbicide treatment plans proposed for each site are based on two main factors that limit impacts to native species: 1) the water exchange rates and anticipated herbicide concentration-exposure times to effectively and selectively control hydrilla; and 2) the chosen herbicide and concentration to prevent impacts to non-target plants in the treatment area. Selective herbicides do not kill all plants so repeated herbicide use will be selective even when used over multiple years.

Dipotassium of endothall and diquat dibromide are fast-acting herbicides that cause rapid death in susceptible plant species. Native aquatic plants, such as coontail and eelgrass, that can disperse by seed or rhizomes can sustain herbicide injury from fast-acting herbicides under certain herbicide concentration-exposure time scenarios but commonly reestablish later in the growing season or the following season (Parsons *et al*. 2004, 2019; Skogerboe and Getsinger 2001, 2002). Based on the plant composition and treatment concentrations at the Connecticut River sites, this reestablishment of native vegetation is expected to occur under the proposed action unless a treatment plan does not effectively control hydrilla. If hydrilla is not controlled by the proposed treatment plans, hydrilla will continue to outcompete native plants. A study by Getsinger *et al*. (2014) found that native plant species, such as coontail and elodea, while initially affected by separate diquat dibromide and dipotassium salt of endothall treatments, persisted in the ecosystem at least a year after treatment. While some of the non-target species saw a slight decline in the frequency of occurrence a year after treatment, frequency of occurrence remained the same or was higher than before treatment while achieving control of the invasives, Eurasian watermilfoil and curlyleaf pondweed (Getsinger *et* *al.*, 2014). Similar results would be expected in the use of diquat dibromide and dipotassium of endothall at label rates in the control of hydrilla in the Connecticut River.

Florpyrauxifen-benzyl is a systemic herbicide that translocates within plants to kill both above and belowground structures. Like other herbicides, native aquatic plants have varying degrees of sensitivity to the florpyrauxifen-benzyl. A study by the Vermont Department of Environmental Conservation (2022) found that after two treatments of florpyrauxifen-benzyl to eleven Vermont lakes, the target invasive plant (Eurasian watermilfoil; *Myriophylum spicatum*) significantly decreased in frequency of occurrence while most native vegetation had no significant change. This study focused on the treatment of Eurasian watermilfoil while also observing frequency changes in 24 native species. They found that a few of the non-target species significantly increased in frequency after treatments with only coontail showing a slight decrease in frequency (VTDEC, 2022). Another study by Mudge *et al*. (2021) showed that non-target aquatic species (pondweed, common waterweed, and coontail) were tolerant to low concentrations and short exposure times with minimal injury or loss of biomass while the same treatment allowed for complete control of the target species, Eurasian watermilfoil. Additionally, Sperry et al. (2021) reported several months of hydrilla control and selectivity towards eelgrass following treatment with florpyrauxifen-benzyl under field conditions. Similar results would be expected in the treatment for the control of hydrilla using the same herbicides at label rates; therefore, adverse effects on aquatic vegetation other than hydrilla are expected to be insignificant. Cumulative impacts on aquatic vegetation are expected to be beneficial from the proposed action. The herbicides proposed are primarily selective towards hydrilla and other aquatic invasive plants. If these herbicides are used to manage hydrilla in the future, hydrilla populations will decrease in size and native aquatic vegetation will reestablish and dominate the area, returning the area to more natural vegetation communities.

5.2.4 Benthic and Shellfish Resources

Under the no action alternative, hydrilla will continue to spread and form dense stands in suitable mussel and fish habitat. Changes in water movement and turbidity due to the dense stands, as they slow waters and cause deposition of suspended sediment and organisms, would affect mussel populations feeding habits since they are filter feeders that eat suspended algae and zooplankton. The mussels would also be indirectly impacted if their host fish species are unable to use areas that are overgrown with hydrilla, affecting a significant step in their reproduction processes.

The proposed action will not have significant adverse effects on benthic organisms and shellfish. Treatment of hydrilla by use of herbicides will limit the direct impacts of other control methods, that are not as effective and would cause physical removal or disturbance to benthic and shellfish resources. Native aquatic vegetation will reestablish where there was hydrilla, providing natural habitat to host fish species.

The proposed herbicides have passed comprehensive EPA risk assessment processes for registration of aquatic use at both the state and federal levels (EPA, 1995; EPA, 2005; EPA, 2017). These decisions are based on field and laboratory studies and observations that analyze whether the active ingredient causes unreasonable risk to humans or the environment, including determining toxic concentrations for aquatic invertebrates. Registration of the herbicides implies that the active ingredients will not have significant, lasting adverse impacts to the invertebrates that may be present (EPA, 1995).

The three herbicides considered for use under the proposed action, diquat dibromide, dipotassium salt of endothall, and florpyrauxifen-benzyl, have varying degrees of acute risks to invertebrates but any impacts are minimal. Diquat dibromide was shown to have slight toxicity for mollusks at levels above labelled use but do not have impacts if used below label application rates (EPA, 1995; WDNR, 2012a). One study tested the impacts of diquat on the New Zealand freshwater mussel (*Hyridella menziesi*) and concluded that diquat had no significant effects on freshwater mussels and therefore was non-toxic to these organisms when applied at rates needed to kill most aquatic weeds (Clayton and Severne, 2005).

Dipotassium salt of endothall at or below labelled application rates is considered to be not toxic to invertebrates. A study investigating impacts of dipotassium salt of endothall concentrations ranging from 0.5 to 1000 ppm on juvenile and glochidia fatmucket mussels (*Lampsilis siliquoidea*) found that dipotassium salt of endothall was not found to be acutely toxic to them at the application rates needed for hydrilla treatment. Median lethal concentrations were substantially higher (6-34 times higher) than recommended dipotassium salt of endothall application rates for hydrilla treatment (1-5 ppm) (Archambault *et al.*, 2015). Dipotassium salt of endothall has also been tested on dreissenid mussels, specifically zebra and quagga mussels. At the highest concentration applied (5 ppm) maximum mortality of 5% was observed for quagga mussels. Zebra mussels had zero mortality to any dipotassium salt of endothall concentration (Claudi *et al.*, 2013).

Florpyrauxifen-benzyl has also been studied to determine impacts to mussels and other invertebrates. One study examined the impacts of florpyrauxifen-benzyl applications on juvenile fatmucket and Eastern lampmussel (*Lampsilis radiata*) and determined that this compound was not acutely toxic to juveniles of these species. While potential chronic or sub-lethal effects require further investigation to characterize, this study concluded that the short-term exposure risk of these freshwater mussels to florpyrauxifen-benzyl for the purposes of aquatic weed control are minimal (Buczek *et al.*, 2020). Based on the studies characterizing the risks to benthic and shellfish resources, adverse impacts to these resources resulting from the proposed action are expected to be minimal.

The three proposed herbicides do not bioaccumulate in organisms and will be applied no more than two times during the summer of 2024 (WDNR, 2018a; WDNR, 20218b; WDNR, 2022). Based on this and impacts to benthic and shellfish resources are minimal, there are no cumulative impacts expected as a result of the proposed action.

5.2.5 Fish and Wildlife

Under the no action alternative, hydrilla would continue to grow uncontrolled, displacing native aquatic vegetation. Invasive aquatic plants can be beneficial to fish and other wildlife in the same way that natives are by providing surfaces for algae and small animals to live that serve as food and providing structure for cover and shelter (UF/IFAS, n.d.). However, invasive aquatic plants like hydrilla will often exceed densities of native aquatic vegetation while expanding into areas that do not contain natives at all. This can concentrate fish and wildlife into small areas of open water which exposes them to predators and limits their use of available habitat (UF/IFAS, n.d.). Hydrilla is able to grow into the intertidal zone, emerging from the water during low tide. Riparian beetles that use riverbanks for habitat may be negatively impacted by the encroaching hydrilla by limiting open space along the shoreline and impacting access to the water's edge. Additionally, hydrilla can host a cyanobacterium that produces a neurotoxin that can be fatal to wildlife if the toxin is exposed to bromide, which is a compound often associated with human pollution (CAES, 2021). Turtles and birds are negatively impacted by the cyanobacteria because it causes a neurological disease which can be fatal (Mercurio, 2014; CCE, 2019).

As mentioned in previous sections, the herbicides considered under the proposed action have passed comprehensive EPA risk assessment processes for registration of aquatic use at both the state and federal levels (EPA, 1995; EPA, 2005; EPA, 2017). They are not anticipated to have significant, lasting effects on fish and wildlife resources. However, some aquatic organisms that are plant-dwelling may be adversely affected temporarily due to habitat loss following herbicide treatment (WDNR, 2012b). These impacts are expected to be minimal since aquatic organisms will be able to relocate to other locations within the river or waterbody and native plant species will reestablish in the next growing season.

Diquat has relatively low toxicity to fish and does not appear to significantly bioaccumulate in fish tissue (BLM, 2005). The results of acute exposure studies on freshwater fish have been summarized as "slightly toxic to practically non-toxic for diquat dibromide" (Hartless and Lin, 2010). No adverse effects are anticipated for the fish species of concern in the project area given that the proposed application rates are within the concentration limits specified on the EPA-approved herbicide. Dipotassium salt of endothall is not expected to impact fish and wildlife resources. At labelled rates, dipotassium salt of endothall does not have any short-term effects on fish species that have been tested (WDNR, 2012b). Dipotassium salt of endothall applications do not impact spawning or rearing behaviors of fish, maintaining density and biomass of fish populations even if applications occurred during spawning season (Maceina *et al.*, 2008). Florpyrauxifen-benzyl is considered to be practically nontoxic to freshwater fish (WDNR, 2022; Levey, 2022; USEPA, 2017). Studies of florpyrauxifen-benzyl impacts on fish and aquatic organisms largely did not observe toxicity even when applied up to its functional limit of solubility (Levey, 2022; USEPA, 2017). Results of bioaccumulation studies in fish suggested rapid and extensive metabolism of florpyrauxifen-benzyl, indicating that bioaccumulation potential for his herbicide is low (USEPA, 2017). The proposed herbicide application rates are at or below the maximum allowable concentration as indicated on EPA-approved product labels at which neither acute nor lethal toxicity in fish has been previously demonstrated. Further, chronic toxicity in these species is also not considered to be a concern as the proposed treatment activity only includes one herbicide application, and florpyrauxifen-benzyl has been shown to rapidly degrade through aerobic aquatic metabolism and aqueous photolysis once applied (USEPA, 2017).

With respect to potential effects on reptiles, Paul and Simonin (2007) monitored diquat dibromide and dipotassium salt of endothall toxicity to the eastern spiny softshell turtle

(*Apalone spinifera spinifera*) over time as they were exposed to a range of in-water herbicide concentrations. No toxic effects were observed to any of the turtles and none of the turtles died during either the exposure or post-exposure monitoring. This study concluded that softshell turtles were therefore not sensitive to diquat dibromide (Paul and Simonin, 2007). This study also found that when eastern spiny softshell turtles were exposed to 5 and 25 times the maximum dipotassium salt of endothall application rate, no observable toxic effects were recorded for any of the turtles, and none of the test turtles died during any part of the experiment (Paul and Simonin, 2007). Based on EPA's Environmental Fate and Ecological Risk Assessment for florpyrauxifen-benzyl, the herbicide is non-toxic to reptiles (USEPA, 2017). We expect that these results translate to the effects on reptile species that are present within the Connecticut River.

Impacts to amphibians are expected to be insignificant. A study on the northern leopard frog (*Lithobates pipiens*) found that in a 16-day exposure period to diquat dibromide, adverse effects were observed at 5mg/L concentrations, however no adverse effects were observed at 2mg/L concentrations (Dial and Dial, 1987). Both concentrations are substantially higher than the proposed treatment application rates at the treatment sites so the risk of negative impacts to amphibians is expected to be minimal should they be present at the time of treatment. Additionally, amphibians are semi-terrestrial, utilizing aquatic environments for winter hibernation and breeding in the spring, but spending summer months primarily out of the water feeding in grasslands and woodlands (U.S. Fish & Wildlife Service, n.d.). Given the timing of the proposed treatment activity (July through August), adult amphibians are not anticipated to be present in the aquatic environment in which the treatment will be applied, further minimizing the risk of potential impacts. Based on EPA's Environmental Fate and Ecological Risk Assessments for dipotassium salt of endothall and florpyrauxifen-benzyl, the herbicides are non-toxic to amphibians (USEPA, 2005; USEPA, 2017).

The risk of acute impacts to birds from the proposed treatment activities using diquat dibromide, dipotassium salt of endothall, and florpyrauxifen-benzyl are expected to be low. While diquat dibromide and dipotassium salt of endothall have been found to be moderately toxic to birds in acute oral exposure studies, these studies were conducted at much higher concentrations than what is approved for use under the herbicide labels (USEPA 1995; Emmett, 2002; BLM, 2005; CCE, 2012). The risk of acute impacts of florpyrauxifen-benzyl to birds is also considered to be low. Florpyrauxifen-benzyl has been shown to be acutely non-toxic to multiple bird species (Levey, 2022; USEPA, 2017) and because herbicides will be applied using subsurface injection methods, no airborne exposure risks to nearby birds at the time of application are anticipated. Therefore, no long-term direct, indirect, or cumulative effects are expected as a result of the proposed action.

5.3 Essential Fish Habitat

Under the no action alternative, the expansion of hydrilla would continue and conditions of fish habitat would degrade as hydrilla would displace native aquatic vegetation that provides shelter and forage for designated fish species and their prey. Although exotic SAV, such as hydrilla, can provide habitat to fish and their prey species, they alter vegetation communities character and species richness, impacting the overall quality of the habitat.

Under the no action alternative, the conditions within the Connecticut River and its harbors, coves, and tributaries would worsen as hydrilla clogs the waterways and outcompetes native SAV. Control of the invasive aquatic plant, hydrilla, would not occur and the plant would continue to inhabit and spread through the Connecticut River system and surrounding areas. Hydrilla would continue to negatively affect boat traffic, recreational opportunities, and the integrity of aquatic communities in the system. As a result, losses to the river's recreational, aesthetic, economic, and natural value would endure.

The Essential Fish Habitat Assessment (Appendix B) of the areas identified for treatment of hydrilla in the Connecticut River and its tributaries concluded that the proposed action will have no significant impacts to Essential Fish Habitat, as defined by the Magnuson-Stevens Fishery Conservation and Management Act and amended by the Sustainable Fisheries Act of 1996. "Essential fish habitat" is broadly defined to include "those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity." Impacts to essential fish habitat (EFH) from this project include temporary impacts to non-target aquatic plants and hydrilla eradication due to the herbicide treatments. Hydrilla and other SAV provide habitat to fish by providing structure and cover as well as serving as habitat to animals that provide forage for fish. Although there may be impacts to habitat availability to native fish with the treatment of hydrilla, the goal of the project is to manage hydrilla to a level that allows native SAV to reestablish and provide the same area of higher quality and natural habitat.

The treatment plans for hydrilla management within the Connecticut River have been designed to avoid impacts to native SAV to the maximum extent practicable. Although it is likely that there will be impacts to non-target SAV, the impacts will be minimized by incorporating information on tides, water flow dynamics, and prescriptive herbicide concentrations to target only hydrilla. Additionally, the management of hydrilla will lead to native SAV establishment and expansion that will provide EFH. Appendix B contains the EFH assessment for potential impacts from the hydrilla herbicide treatments. NMFS provided two conservation recommendations: 1) a work restriction between April 1 and June 30 of any year to avoid the diadromous fish spring migration period, and 2) eelgrass monitoring to be conducted within 1-2 months post-treatment and during subsequent growing seasons for two years and reports to be sent to NMFS. USACE concurred with both recommendations and requested that post-treatment monitoring surveys cease after one year of monitoring if no effects were shown. NMFS agreed with the request and coordination was thus concluded (Appendix A).

5.4 Threatened and Endangered Species

5.4.1 Northern Long-eared and Tricolored Bats

No impacts to NLEBs or TCBs will occur as a result of the no action alternative or the proposed action. No known maternity roost trees or hibernacula are within the project areas or within any of the counties within the Connecticut River watershed. USACE thus determined there would be no effect to NLEB or TCBs and no further consultation with the USFWS was required.

5.4.2 Atlantic and Shortnose Sturgeon

Under the no action alternative, Atlantic and shortnose sturgeon may be affected by localized habitat conversion with the continued spread of hydrilla in the Connecticut River, displacing native aquatic vegetation. Invasive aquatic plants can be beneficial to fish in the same way that natives are by providing surfaces for algae and small animals to live that serve as food and providing structure for cover and shelter (UF/IFAS, n.d.). However, invasive aquatic plants like hydrilla will often exceed densities of native aquatic vegetation while expanding into areas that do not contain natives at all. This can concentrate fish and wildlife into small areas of open water which exposes them to predators and limits their use of available habitat (UF/IFAS, n.d.). Since sturgeon are bottom features, dense hydrilla stands may make it difficult for fish to access their prey on the river bottom.

Both Atlantic and shortnose sturgeon may be affected by the proposed action, but they are not likely to be adversely affected. The three potential herbicides to be used (diquat dibromide, dipotassium salt of endothall, and florpyrauxifen-benzyl) do not have any known toxicity to fish, including Atlantic sturgeon and shortnose. Decreased dissolved oxygen conditions from the decomposition of hydrilla after herbicide treatment will be localized. The removal of hydrilla will also impact the insects, mollusks, and worms that sturgeon feed on by eliminating viable habitat. Sturgeon will be able to move to areas that are either not infested with hydrilla or have not been treated for the removal of hydrilla to avoid hypoxia and find more aquatic vegetation to forage for food. Due to the riverine environment, there is also high-water exchange that prevents hypoxic waters from stagnating in any particular area. Since sturgeon need hard bottom substrates for spawning, it is unlikely that areas that allow for hydrilla establishment and growth would also support sturgeon eggs and larvae thus their eggs and larvae are not expected to be in treatment areas (NOAA Fisheries, 2023a). Therefore, the proposed action is not likely to adversely affect Atlantic or shortnose sturgeons. The NMFS Protected Resources Office concurred with this determination on 11 July 2024 (Appendix A).

5.4.3 State-Listed Species

Protection and mitigation measures or evidence of minimal effects from the selected herbicides are required by NDDB to receive a pesticide permit for application of herbicide to state waters. Coordination was completed with CTDEEP NDDB. A qualified botanist surveyed rare plant species in all suitable habitats found at the potential treatment sites during the growing season. A rare species report and site-specific protection plans were developed to minimize potential impacts to state rare species (Appendix F).

Under the no action alternative, state-listed species are expected to be adversely impacted. Hydrilla may displace or outcompete native rare plant species since hydrilla can grow unchecked without natural predators. The expansion of hydrilla will convert habitat that supports state-listed wildlife, limiting available shelter and forage resources.

A. Chapman Pond

The two state-listed plant species listed at and surveyed for at Chapman Pond, awl-leaved arrowhead and Torrey bulrush, were not found in the treatment site. One individual of golden club was found in the creek that exits the pond to the southeast (Padgett, 2023; Figure 11). This plant will be monitored following herbicide treatment of hydrilla to assess if there are impacts. Preliminary assessments identified potential state and/or federally listed species that may be present on the site including: tidewater mucket, eastern pondmussel, riverine clubtail, shortnose sturgeon, Atlantic sturgeon, blueback herring, bald eagle, and bridle shiner. Protection measures for these potential species are in Table 7.

Figure 11. Golden club observation (yellow circle) in the creek southeast of Chapman Pond (Padgett, 2023).

B. Chester Boat Basin

Preliminary assessment of CT’s Natural Diversity Database (NDDB) identified no state-listed plant species. As a result, no surveys were performed at Chester Boat Basin. The following state-listed species may be present on the site: tidewater mucket, eastern pondmussel, and riverine clubtail. Protection measures are contained in Table 7 for the potential state-listed species.

C. Keeney Cove

Three potential state-listed plant species were identified: Davis' sedge, cattail sedge, and northern arrowwood. The potential species were not found at the site during surveying. Preliminary assessment indicated the following state-listed species may be present: yellow lampmussel, tidewater mucket, eastern pondmussel, shortnose sturgeon, Atlantic sturgeon, blueback herring, and burbot. Protection measures for state-listed species not targeted by the survey are found in Table 7.

D. Selden Cove

Six potential state-listed plant species were identified, including: beck's water-marigold, parker's pipewort, small yellow pond lily, golden club, awl-leaved arrowhead, and torrey bulrush. Awl-leaved arrowhead was present at Seldom Cove outside the proposed treatment area: on a large island-like mudflat in Selden Cove and along the exposed western shore of Selden Creek (Padgett, 2023; Figure 12). Both observed populations contained about 30-50 individuals at each site. (Padgett, 2023). These plant populations will be monitored following herbicide treatment of hydrilla to assess if there are impacts. Preliminary assessment identified potential state-listed species on the site including tidewater mucket, eastern pondmussel, and wood turtle. Protection measures for potential non-target state-listed species are in Table 7.

Figure 12. Awl-leaved arrowhead observations (yellow circle) in Selden Cove and Selden Creek (Padgett, 2023).

E. Portland Boat Works

Preliminary assessment of CT’s NDDB identified no state-listed plant species. No surveys were performed at Portland Boat Works. Potential state-listed species include: tidewater mucket, eastern pondmussel, cobra clubtail, shortnose sturgeon, Atlantic sturgeon, blueback herring, spotted turtle, bald eagle, and northern leopard frog. Protection measures for potential non-target species are contained in Table 7.

Table 7. State and federally listed species that are assumed to be present at all of the above sites. Species within the same taxon and with similar protection measures are grouped.

Species	Protection Measures
<u>Mussel</u>	
Tidewater mucket Eastern pondmussel Riverine clubtail Cobra clubtail	• Legal recommended doses of dipotassium salt of endothall for hydrilla treatment are not acutely toxic to freshwater mussels (Archambault *et al.*, 2015) • There is low potential for acute effects to invertebrate species with the use of florpyrauxifen-benzyl (Meléndez *et al.*, 2017)
<u>Fish</u>	
Shortnose sturgeon Atlantic sturgeon Blueback herring Bridle shiner	• EPA-approved application rates of diquat dibromide, dipotassium salt of endothall and florpyrauxifen-benzyl are not toxic to fish (BLM, 2005; Maceina *et al.*, 2008; WDNR, 2022)
<u>Herptiles</u>	
Spotted turtle Wood turtle Northern leopard frog	• No toxic effects to turtles in diquat dibromide and dipotassium salt of endothall exposure study (Paul & Simonin, 2007) • No adverse effects observed to norther leopard frogs at 2000 ppb of diquat dibromide, which is substantially higher application rate than proposed (370 ppb) (Dial & Dial, 1987)
<u>Birds</u>	
Bald eagle	• Herbicides will be applied using subsurface injection methods, no airborne exposure risks to bald eagles • Bioaccumulation of diquat dibromide and dipotassium salt of endothall in fish species is low and therefore, will not impact birds of prey (BLM, 2005).

5.5 Historic and Archaeological Resources

Under the no action alternative, there would be no change in the current conditions within the Connecticut River and its harbors, coves, and tributaries. Control of the invasive aquatic plant, hydrilla, would not occur and the plant would continue to inhabit and spread through the Connecticut River system and surrounding areas. Historic properties along the river and within coves and other waterbodies could potentially be impacted by flooding and damage to banks and bank erosion if the hydrilla is allowed to continue to proliferate.

Impacts to historic properties are not anticipated from the proposed action of herbicide application for hydrilla management. Implementation of this action will need to be evaluated as it pertains to site access and staging areas, if any, as historic properties are noted in the vicinity of all treatment locations. On 3 May 2024, CT SHPO concurred that no historic properties will be affected by the proposed project. The tribes were contacted by letter on 3 April 2024 (Appendix A). No responses were received within 30 days; therefore, consultation is complete, and all Section 106 responsibilities are fulfilled.

5.6 Hazardous, Toxic, Radiological Waste

The no action alternative will have no temporary or permanent, direct or indirect impacts related to HTRW.

The proposed action will have no impacts to any USTs or HTRW sites located in or near the project areas as the proposed action only involves the application of herbicides to the waters. The herbicides that will be used under the proposed action are not anticipated to pose any risk to the environment or humans. The herbicides will be stored in approved locations that comply with applicable regulations, standards, and policies. The herbicides will be transported, handled, and applied in accordance with USEPA approved label instructions. All individuals conducting the herbicide treatments will be certified pesticide applicators and knowledgeable of appropriate actions to take should a spill occur or accidental exposure to the herbicides.

5.7 Air Quality

Section 176 (c) of the CAA requires that Federal agencies assure that their activities are in conformance with Federally approved CAA State SIPs for geographic areas designated as non-attainment and maintenance areas under the CAA. The USEPA General Conformity Rule to implement Section 176 (c) is found in 40 CFR Part 93. Also, Section 309 of the CAA, authorizes USEPA to review certain proposed actions of other Federal agencies in accordance with the NEPA.

CAA compliance, specifically with USEPA's General Conformity Rule, requires that all Federal agencies, including the Department of the Army, review new actions and decide whether the actions would worsen an existing NAAQS violation, cause a new NAAQS violation, delay the SIP attainment schedule of the NAAQS, or otherwise contradict the State's SIP (EPA, 2021).

General Conformity: The general conformity rule was designed to ensure that federal actions do not impede local efforts to control air pollution. It is called a conformity rule because federal agencies are required to demonstrate that their actions "conform with" (i.e., do not undermine) the approved SIP for their geographic area. Aquatic invasive plant control studies are exempt from performing a conformity review based on 40 CFR 93.153(d) "Notwithstanding the other requirements of this subpart, a conformity determination is not required for the following Federal actions (or portion thereof)*: ... (3) Research, investigations, studies, demonstrations, or training (other than those exempted under paragraph (c)(2) of this section), where no environmental detriment is incurred and/or, the particular action furthers air quality research, as determined by the State agency primarily responsible for the applicable SIP."*

The no action alternative will not have impacts to air quality and any impacts to air quality. The existence and spread of hydrilla is not anticipated to directly affect air quality over the short or long-term.

The proposed action will produce temporarily localized emission increases from the boat and pumping equipment working onsite. These localized emission increases will last only during the project's work and monitoring period and end when the herbicide applications and monitoring is over, thus any potential impacts will be temporary in nature. Based on a qualitative assessment of the construction requirements, it is anticipated that this project will be within the de minimis levels in any one year. Coordination with the U.S. Environmental Protection Agency on this project's impacts as they apply to the Clean Air Act was completed.

5.8 Noise

Under the no action alternative, there would be no direct, indirect, or cumulative impacts to the noise environment. Under the proposed action, the Chester Boat Basin and Portland Boat Works treatments will be applied using a 20- foot aluminum skiff with a 90 horsepower (HP) four-stroke outboard engine with a spray system consisting of a 100-gallon tank and 2.0 inch 223 cylinder capacity gasoline pump. Selden Cove, Chapman Pond, and Keeney Cove treatments will be applied using a 16- foot airboat with a 350HP motor with the same spray system described above. The noise levels from the application equipment will not exceed 100 decibels and would last for a day. Post-treatment monitoring would be performed from jon boats with appropriate engines, that would be similar to recreational vessels that may be in the area. The addition of the monitoring vessels to each site for the duration of monitoring activities is not expected to significantly increase the noise above baseline conditions. Noise impacts from the equipment used to treat the invasive aquatic plants would be direct and short-term and would cease after herbicide applications and monitoring activities are complete. There would be no indirect, long-term or cumulative impacts to noise levels associated with the proposed action.

5.9 Climate Change

Under the no action alternative, with the predicted increase in heavy storm events, drought, water temperatures, and sea level change, water dynamics of the Connecticut River will change with an increase of freshwater flows outside of the typical spring snowmelt and unusual periods of drought. With sea level change, the salt wedge of the river's estuary will shift upstream during periods of normal or below average freshwater flows. These changes in the water dynamics will impact the distribution of hydrilla as well as the native aquatic plant and animal species that may be impacted by the treatment of hydrilla. Flooding events and increased water temperatures due to climate change may also impact the growth and phenology of hydrilla as well as the efficacy of herbicide treatments to control hydrilla. The proposed research project and associated herbicide applications will inform effective management techniques to control this strain of hydrilla in this specific environment and inherently considers these climate change impacts. The proposed action is not expected to exacerbate the effects of climate change.

5.10 Greenhouse Gases

Under the no action alternative, there would likely be an increase in the use of heavy machinery to clear boat launches, marinas, in-river infrastructure (e.g., irrigation intakes), and other structures via dredging and mechanical removal, which would increase emissions of greenhouse gases. This removal technique would increase in frequency with the spread and growth of hydrilla within the river system.

The proposed action will cause a short-term increase in the release of greenhouse gases with the use of motorboats and application equipment and boat trailering during the treatments of hydrilla, but these emissions would be negligible and will not cause long-term impacts to the environment. There would be a decrease in demand to mechanically remove hydrilla to access water-based structure and services. The cumulative impact to the greenhouse gas emissions with repeated treatments of hydrilla would be minimal.

5.11 Socioeconomic Environment

The no action alternative would lead to increased long-term, indirect impacts to the local economies with the spread of hydrilla causing an increased burden on the natural resource and recreation features that support the jobs and wages of the “lifestyle economy” of the Connecticut River valley. The proliferation of hydrilla will also continue to cause interference of drinking water, irrigation, and hydropower infrastructure, as well as flood control capabilities by causing blockages of intake and outtake structures. Impairments to this infrastructure will also have devastating consequences to the local economy and the public’s health and safety through the limited access to these services as well as the costs to the public to clear and maintain blocked structures (Connecticut RC&D, 2021).

Beneficial impacts to the socioeconomic environment will occur with the implementation of the proposed action. The long-term impacts will be the prevention of further damage to infrastructure, lowering the cost to local businesses and the public for clearing and maintenance of the flood prevention, hydropower, irrigation, and drinking water structures. The property of values along the river will not continue to decrease and people will continue to live near and travel to the river for recreation, improving the “lifestyle economy” and maintaining the revenue to the area through tourism.

5.12 Environmental Justice and Protection of Children

Executive Order 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of its program, policies, and activities on minority and low-income populations in the U.S., including Native Americans. Executive Order 13045, “Protection of Children from Environmental Health Risks and Safety Risks,” requires federal agencies to identify and assess environmental health risks and safety risks that may disproportionately affect children. Executive Order 14008, “Tackling the Climate Crisis at Home and Abroad,” requires federal agencies to make achieving environmental justice part of their missions by developing programs, policies, and activities to address disproportionately high and adverse human health, environmental, climate-related, and other cumulative impacts on disadvantaged communities, as well as the accompanying economic challenges of such impacts.

Under the no action alternative, impacts to the local economy and environment will likely occur due to increased long-term, indirect impacts to the local economies caused by an increased burden on the natural resource and recreation features that support the jobs and wages in the area. These impacts will not disproportionately effect children, minority, or low-income populations surrounding the proposed action areas.

No significant adverse impacts to children, minority or low-income populations are anticipated as a result of the proposed action. The proposed project is to manage an aquatic invasive species that impacts the local economy and environment thus improving those elements of the community. No significant effects to minorities, those below the poverty line, or children are expected as a result of the management of hydrilla within the Connecticut River system.

5.13 Recreation and Aesthetics

Under the no action alternative, hydrilla would continue to spread through the river, and its coves and tributaries causing direct impacts to the accessibility of the river to recreation activities such as paddling, swimming, camping, and boating. Boat launches and swimming at the state parks and recreation areas along the river would be blocked and would likely be closed. The spread of hydrilla and the dense mats it forms on the surface of waterbodies would decrease the aesthetic value of the river.

Short-term direct impacts to recreation will result from the proposed action as sections of the river system may be closed during the treatment activities for public safety. The impacts would be minimal and temporary as treatment areas will likely be relatively small and areas would be opened after the treatment. Indirect positive impacts to recreation and aesthetics will occur as a result of the proposed work. The treatment of hydrilla will decrease population sizes, shrinking current patches and mats of hydrilla within the river and contribute to the prevention of the spread to other parts of the river, maintaining and reopening access to the river for water-based recreational activities. The aesthetic value of the river would be improved and resemble its previous condition prior to the introduction of hydrilla.

6.0 Actions Taken to Minimize Impacts

1. Application of aquatic herbicides will be avoided March 1 to June 30 to avoid the spawning season for migratory fish species, such as alewife and blueback herring.
2. All herbicide applications will adhere to EPA and label requirements.
3. Post-treatment monitoring will occur to assess the efficacy of the herbicide treatments and non-target impacts.

4. Monitoring plots will be established at Selden Cove and Chapman Pond to monitor non-target impacts to state-listed species that occur adjacent to the treatment sites.
5. Post-treatment monitoring of freshwater eelgrass (*Valisneria americana*) will take place one to two months post-treatments and survey results will be provided to NMFS.

7.0 Public Communication

An initial public meeting introducing the project was held on 29 June 2023 and a website was established to inform the public about the progress of the project at https://www.nae.usace.army.mil/Missions/Projects-Topics/Connecticut-River-Hydrilla/. A Public Notice announcing rhodamine dye studies to support the project was published on 31 July 2023. A 30-day Public Notice describing the proposed project was published on 4 April 2024 for public and agency comment on the Draft EA. Then, a Public Notice advertising public meetings to explain the project was put out on 22 May 2024, and public meetings were held on 29 May 2024 in East Hartford, 4 June 2024 in Middletown, and 27 June 2024 in Moodus. Appendix A contains these notices and supporting documentation that was collected during preparation of this EA. The agencies and organizations listed below provided information and input as part of the preparation of this EA.

Federal
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
National Marine Fisheries Service
National Oceanic and Atmospheric Administration

State of Connecticut
Connecticut Agricultural Experiment Station
Connecticut Office of Aquatic Invasive Species
Connecticut Department of Energy and Environmental Protection (DEEP)
Connecticut Natural Diversity Data Base
Connecticut Pesticide Management Program
Connecticut Fisheries Division
Connecticut State Historic Preservation Office

Tribal Nations
Mohegan
Mashantucket Pequot
Narragansett Indian Tribe
Wampanoag Tribe of Gay Head (Aquinnah)

Regional
Northeast Aquatic Nuisance Species Panel
Connecticut River Conservancy

Local
Lower Connecticut River Valley Council of Governments
Capitol Region Council of Governments

8.0 Environmental Compliance

This section describes the Federal laws, regulations and programs that are relevant to the herbicide treatments of sites in the Connecticut River.

8.1 Federal Statutes

1. *Archaeological Resources Protection Act of 1979, as amended, 16 U.S.C. 470aa et seq.*

Compliance: Not applicable to this project.

2. *Preservation of Historic and Archeological Data Act of 1974, as amended, 54 U.S.C. 312501 et seq.*

Compliance: Coordination with the State Historic Preservation officer (SHPO). On May 3, 2024, SHPO concurred that the proposed actions are unlikely to impact intact archaeological resources and that no historic properties will be affected by the proposed project.

3. *American Indian Religious Freedom Act of 1978, 42 U.S.C. 1996.*

Compliance: This project will not impede access by Native Americans to sacred sites, possession of sacred objects, and the freedom to worship through ceremonials and traditional rites.

4. *Clean Air Act, as amended, 42 U.S.C. 7401 et seq.*

Compliance: Public notice of the availability of this report to the Environmental Protection Agency is required for compliance pursuant to Sections 176c and 309 of the Clean Air Act. Record of Non-Applicability of general conformity rule shows compliance with Section 176(c). A Public Notice was published and coordination with USEPA was completed.

5. *Clean Water Act of 1977 (Federal Water Pollution Control Act Amendments of 1972) 33 U.S.C. 1251 et seq.*

Compliance: An emergency authorization request with the Section 402 National Pollutant Discharge Elimination System (NPDES) General Permit for the state of Connecticut was filled as a part of the aquatic pesticide use permit application with CTDEEP.

6. Coastal Zone Management Act of 1972, as amended, 16 U.S.C. 1451 et seq.

Compliance: A CZM consistency determination was provided to the state for Chester Boat Basin and Selden Cove pursuant to Section 307 of the Coastal Zone Management Act with the CT Coastal Management. On 16 May 2024, CTDEEP concurred with the determination that the proposed project is consistent to the maximum extent possible.

7. Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 et seq.

Compliance: The project complies with this act. USACE made a no effect determination for threatened and endangered species under jurisdiction of the USFWS, thus no consultation was necessary. NMFS concurred with USACE's determination that the project is not likely to adversely affect species or critical habitat under their jurisdiction on 11 July 2024, thus concluding informal consultation pursuant to Section 7 of the Endangered Species Act.

8. Estuarine Areas Act, 16 U.S.C. 1221 et seq.

Compliance: Not applicable.

9. Federal Water Project Recreation Act, as amended, 16 U.S.C. 460l-12 et seq.

Compliance: Public notice of availability of this report to the National Park Service (NPS) and Office of Statewide Planning relative to the federal and state comprehensive outdoor recreation plans signifies compliance with this Act.

10. Fish and Wildlife Coordination Act, as amended, 16 U.S.C. 661 et seq.

Compliance: Coordination with the USFWS, NMFS, and state fish and wildlife agencies signifies compliance with the Fish and Wildlife Coordination Act.

11. Land and Water Conservation Fund Act of 1965, as amended, 54 U.S.C. 200302 et seq.

Compliance: Public notice of the availability of this report to the NPS and the Office of Statewide Planning relative to the federal and state comprehensive outdoor recreation plans signifies compliance with this Act.

12. Marine Protection, Research, and Sanctuaries Act of 1971, as amended, 33 U.S.C. 1401 et seq.

Compliance: Not applicable; project does not involve the transportation nor disposal of material in ocean waters pursuant to Sections 102 and 103 of the Act, respectively.

13. National Historic Preservation Act of 1966, as amended, 54 U.S.C. 3001010 et seq.

Compliance: Coordination with the State Historic Preservation Office pursuant to Section 106 of the National Historic Preservation Act. On 3 May 2024, SHPO concurred that the proposed actions are unlikely to impact intact archaeological resources and that no historic properties will be affected by the proposed project.

14. Native American Graves Protection and Repatriation Act (NAGPRA), 25 U.S.C. 3001-3013, 18 U.S.C. 1170

Compliance: Regulations implementing NAGPRA will be followed if discovery of human remains and/or funerary items occur during implementation of this project.

15. National Environmental Policy Act of 1969, as amended, 42 U.S.C 4321 et seq.

Compliance: Preparation of this Environmental Assessment signifies partial compliance with NEPA. Full compliance shall be noted at the time the Finding of No Significant Impact is signed.

16. Rivers and Harbors Act of 1899, as amended, 33 U.S.C. 401 et seq.

Compliance: No requirements for projects or programs authorized by Congress. The proposed demonstration project is being conducted pursuant to the Congressionally-approved authority.

17. Watershed Protection and Flood Prevention Act as amended, 16 U.S.C 1001 et seq.

Compliance: Not applicable.

18. Wild and Scenic Rivers Act, as amended, 16 U.S.C 1271 et seq.

Compliance: Not applicable.

19. Magnuson-Stevens Act, as amended, 16 U.S.C. 1801 et seq.

Compliance: Coordination with the National Marine Fisheries Service and preparation of an Essential Fish Habitat (EFH) Assessment signifies compliance with the EFH provisions of the Magnuson-Stevens Act. Conservation recommendations provided by NMFS were accepted and coordination concluded on 3 May 2024.

20. Coastal Barrier Resources Act, as amended, 16 U.S.C. 3501 et seq.

Compliance: Not applicable.

21. Marine Mammal Protection Act of 1972, 16 U.S.C. 1361-1407

Compliance: Not applicable.

22. Bald and Golden Eagle Protection Act, 16 U.S.C. 688 et seq.

Compliance: The project does not involve take, sale, purchase, or transport of any Bald or Golden Eagles.

23. *National Invasive Species Act (NISA), as amended, 16 U.S.C. 4701 et seq.*

Compliance: This project focuses on the management of an invasive aquatic plant species. The project will not promote or cause the introduction or spread of invasive species into waters of the United States.

8.2 Executive Orders

1. Executive Order 11593, Protection and Enhancement of the Cultural Environment, 13 May 1971.

Compliance: Coordination with the State Historic Preservation Officer signifies compliance.

2. Executive Order 11988, Floodplain Management, 24 May 1977 amended by Executive Order 12148, 20 July 1979.

Compliance: Public notice of the availability of this report or public review fulfills the requirements of Executive Order 11988, Section 2(a)(2).

3. Executive Order 11990, Protection of Wetlands, 24 May 1977.

Compliance: This project does not include construction in wetlands and preserves and enhances the value of these natural systems by controlling invasive aquatic plants.

4. Executive Order 12114, Environmental Effects Abroad of Major Federal Actions, 4 January 1979.

Compliance: Not applicable; project is located within the United States.

5. Executive Order 12898, Environmental Justice, 11 February 1994.

Compliance: Project is not expected to have a disproportionate impact on minority or low-income populations, or any other population in the United States.

6. Executive 13007, Accommodation of Sacred Sites, 24 May 1996

Compliance: Access to and ceremonial use of Indian sacred sites by Indian religious practitioners will be allowed and accommodated. No adverse effects to the physical integrity of such sacred sites will occur.

7. Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks, 21 April 1997.

Compliance: The project will not create a disproportionate environmental health or safety risk for children.

8. Executive Order 13061, and Amendments – Federal Support of Community Efforts Along American Heritage Rivers

Compliance: The Connecticut River is an American Heritage River. The proposed action evaluated in this EA will not impact the character or resources of the river.

9. Executive Order 13112, Federal Agencies may not authorize, fund, or carry out actions likely to cause or promote the introduction or spread of invasive species

Compliance: The project will not promote or cause the introduction or spread of invasive species.

10. Executive Order 13175, Consultation and Coordination with Indian Tribal Governments, 6 November 2000.

Compliance: Consultation with Indian Tribal Governments, where applicable, and consistent with executive memoranda, DoD Indian policy, and USACE Tribal Policy Principals signifies compliance.

11. Executive Order 14008, Tackling the Climate Crisis at Home and Abroad, 27 January 2021

Compliance: Vulnerable populations within a one-mile buffer of the Connecticut River have a comparatively medium exposure to environmental hazards relative to the rest of Connecticut (EPA, 2022b), and the project will not exacerbate hazards.

8.3 Executive Memorandum

1. Analysis of Impacts on Prime or Unique Agricultural Lands in Implementing NEPA, 11 August 1980.

Compliance: Not applicable; the project does not involve or impact agricultural lands.

2. White House Memorandum, Government-to-Government Relations with Indian Tribes, 29 April 1994.

Compliance: Consultation with Federally Recognized Indian Tribes signifies compliance.

9.0 References

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