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Connecticut River Conservancy

The Use of Benthic Barriers to Suppress *Hydrilla verticillata* in the Connecticut River

December 2021

Problem Statement

Hydrilla (H*ydrilla verticillata*) is an invasive aquatic plant that threatens the ecological and economic viability of the Connecticut River. Considered the most destructive submersed aquatic plant in many southern states and previously rare in Connecticut, hydrilla was found in the Connecticut River in 2016. Surveys by the Connecticut Agricultural Experiment Station (CAES) Invasive Aquatic Plant Program (IAPP) from 2019 - 2021 found that hydrilla covers over 750 acres from Agawam, MA to the Long Island Sound (CAES IAPP, 2021). Hydrilla outcompetes native species and replaces critical habitat for migratory fish and other wildlife. Often referred to as the perfect weed, hydrilla can spread and persist by multiple methods including fragments, turions, tubers, and possibly seeds (Langeland, 1996). Unlike hydrilla from elsewhere in North America, the strain in the Connecticut River is genetically distinct (Tippery et al. 2020) and appears to possess a more aggressive growth habit (Bugbee and Stebbins, 2021). Numerous bald eagle pairs breed along the Connecticut River and their recovery from near extinction is considered a major ecological accomplishment (Buck, 2020). Cyanobacteria associated with the hydrilla have been linked to neurotoxins that have caused deaths of bald eagles in the southern US (Breinlinger et al. 2021). In recent years, large acreages of dense hydrilla have interfered with boaters, anglers and those who come to recreate on the Connecticut River. Marinas and municipalities have reported that they can no longer access boat slips and docks due to the severity of the infestations (Figure 1).

Figure 1. Hydrilla in St. Clements Marina, Portland CT.

Proposed Project

In 2021, the Connecticut River Conservancy (CRC) received grant funding from the Connecticut Department of Energy and Environmental Protection (CT DEEP) to conduct a feasibility study, in collaboration with CAES, on the use of benthic barriers to suppress the growth of hydrilla in localized areas such as marinas. Benthic barriers are heavy fabric or plastic sheets that are placed on the bottom over nuisance aquatic vegetation. Control can occur in as little as four weeks (Laitala et al. 2012). CAES successfully used short-term placement of benthic barriers on numerous lakes in Connecticut to suppress the growth of aquatic invasive species however their applicability for controlling hydrilla in river systems is unknown. CAES has found that placing the barriers early in the growing season and removing them four to six weeks later leads to season-long control. Reasons for the control likely include light restriction, oxygen deprivation, and buildup of toxic gases (Ussery et al. 1997).

The goal of the project was to assess if the barriers managed the growth of hydrilla so that stakeholders are equipped to manage hydrilla on small scales and address the following questions:

- Can benthic barriers be successfully installed and remain in place in a tidal river system?
- What are the best methods for installation and removal? When should the barriers be removed?
- Do benthic barriers effectively suppress the growth of hydrilla in the Connecticut River?
- Can benthic barriers be used by dock owners and managers to control hydrilla?

As a pilot project, this work does not serve as a comprehensive study of the efficacy of benthic barriers in the Connecticut River. Rather the project will provide useful preliminary information on feasibility of using benthic barriers in marinas and other small areas.

Project Activities

For the pilot project, CRC and CAES partnered with Portland Boat Works in Portland, CT. This site was selected because of a severe infestation of hydrilla that CAES recorded in their river survey in 2020. Additionally, the site is in a somewhat protected area on the eastern side of the river and surrounded by pilings and boat slips on the north and south ends of the project area. Finally, the owners and managers at Portland Boat Works were eager and accommodating partners interested in learning more about hydrilla management techniques.

Given the uncertainty surrounding how or if benthic barriers would stay in place in a tidal river, we decided to begin by installing two 10' x 20' and two 10' x 30' barriers (Lake Bottom Blanket Co. Wayne, NJ) . The barriers were prepared by inserting ½ inch rebar into the benthic mat sleaves positioned at 5-foot increments to weigh down the barriers. In the second week of May 2021, CRC and CAES worked together to install the barriers working from docks and a boat, leaving approximately ten feet between the barriers to serve as a control area. Barriers remained in the river for four weeks and then were removed.

Installation:	Removal:
1. The barriers were prepared by inserting ½ inch rebar into the benthic mat sleaves placed at 5-foot increments to weigh down the barriers. 2. Barriers were installed with a team of 4-6 working from docks and a boat. From the dock, 2-3 people handed off the barriers to two people on a Jon boat. 3. Barriers were slowly driven out to the appropriate spot with the white sides facing up for visibility. 4. Once the location was reached, the boat paused to let the barriers sink. Barriers were attached to a buoy to identify the mat and help with retrieval.	1. Again, working in a team of 4-6, with 2-3 people at the boat launch/shore and two on the Jon boat. The Jon boat pulled up barriers by their buoys. 2. Once the buoys were in-hand, the Jon boat pulled the barriers along the bottom until the barriers flipped, removing sediment that had built up. 3. The barriers were driven to the boat ramp, where the remainder of the team took the barriers from the boat by wading into the water and pulling them to shore. 4. Barriers were dried and transported for storage until reuse in the next season.

Once the initial four barriers had been removed, we planned to install a larger set; this second phase was delayed, and eight barriers were installed in mid-July. For this phase, we installed four 10' x 20' barriers and four 10' x 30' barriers. The barriers were installed in two rows of four, with the four barriers in each row.

Barriers were overlapped approximately one foot. The barriers were removed five weeks later in mid-August and final monitoring via drone imagery was performed in mid-September.

Challenges and Lessons Learned

The summer of 2021 saw intense and frequent rainfall, including two major storms that led to higher-than-average flows in the Connecticut River. Weather and high-water levels presented an obstacle to this project, though, when possible, we worked around these precipitation events. Our work was also delayed in part due to administrative holdups that postponed installation of the second phase of barriers, which we had intended to install earlier in the growing season.

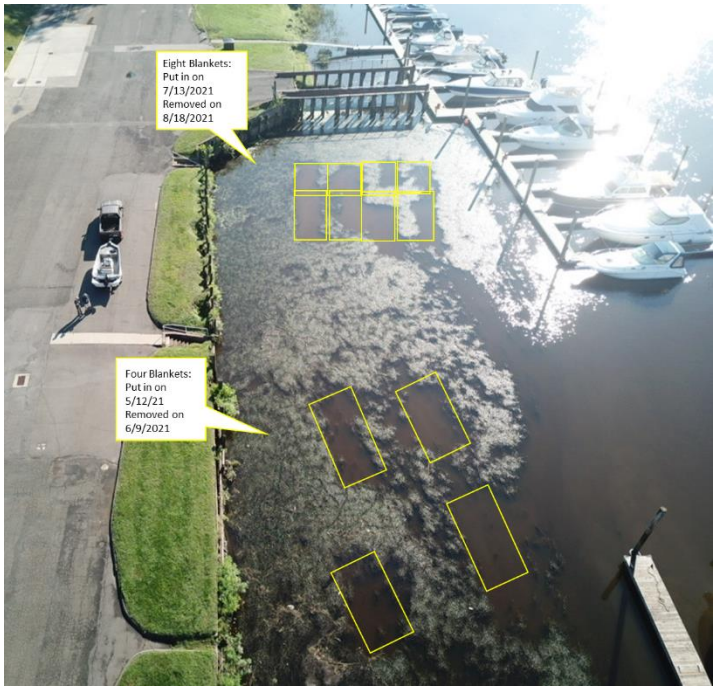

Figure 2. Locations and results of benthic barrier placement at Portland Boat Works marina.

This pilot project provided useful information that answers the questions we posed earlier on using benthic barriers to control hydrilla in marinas, around and dock owners, and other small areas along the Connecticut River.

- *Can benthic barriers be successfully installed and remain in place in a tidal river system?*
  We found that benthic barriers were installed and removed successfully. Barriers moved slightly or slightly folded up, but generally stayed in position even during intense rain events.
- *What are the best methods for installation and removal of benthic barriers? When should benthic barriers be installed and removed?*
  Benthic barriers can be successfully installed using a team of boat and onshore people to help place the mat in the water, allowing it to be pulled into place by the boat. Benthic barriers installed around docks could also likely be placed directly off a dock. Benthic barriers should be installed in the early growing season, between May and mid-June and removed after 4-6 weeks. Barriers should not be left in longer than this as sediment may build up and trap the barriers on the bottom of the river.
- *Do benthic barriers effectively suppress the growth of hydrilla in the Connecticut River?*
  Looking at the aerial footage (Figure 2), we found that benthic barriers worked well to suppress the growth of hydrilla in the Connecticut River. Barriers were most effective when applied early (May). When applied in July, established tall hydrilla tended to flop along the sides of the overlapped barriers and grow to the water's surface. This is illustrated by the surface hydrilla between the overlapped July placed mats. Outside of the barriers, hydrilla grew up and over the barriers in some places, but overall, we observed minimal growth of hydrilla in areas that had been covered with barriers and little hindrance to navigation would be expected.
- *Can benthic barriers be used by dock owners and managers to control hydrilla and open access?*

Docks owners and managers can consider installing and removing benthic barriers at their facilities but should ensure that they consult with CAES IAPP, CT DEEP and other experts to determine correct installation/removal methods as well as to determine that there will be minimal or no harm to other aquatic life in the area.

Other Considerations

Benthic barriers suppress the growth and life of most organisms the mat covers. Anyone considering using benthic barriers must first determine if the site is suitable. To install benthic barriers, Connecticut DEEP requires applications to complete a Natural Diversity Data Base application to determine if sensitive or threatened species will be impacted by the project.

Another consideration is the cost of installing benthic barriers. For this project, barriers cost roughly $1,500 and rebar was an additional $300 plus the costs associated with staff time to install the barriers. We covered a relatively small area with the barriers and a larger project may run into cost restraints. However, these barriers can be reused for multiple years, so after the first year of the project, only staff time would be needed to install the barriers.

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