Connecticut River Conservancy

*Clean water. Healthy habitat. Thriving communities.*

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# Slowing the Spread of Invasive Hydrilla in the Connecticut River

## *A Community Based Social marketing Approach*

February 2023

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# Contents



## Overview

This project seeks to address the threat of invasive aquatic species (AIS) to the Connecticut River, specifically invasive hydrilla (*hydrilla verticillata*). Hydrilla proliferates readily with severe negative impacts on both the local ecosystem and economy. Hydrilla outcompetes native species and, as a result, replaces habitat for sensitive species, including migratory fish. In recent years, thick mats of hydrilla have crowded out boaters, anglers and those who come to recreate on the Connecticut River. Hydrilla in the Connecticut River is of particular concern for several reasons. Hydrilla propagates through fragmentation, and as fragments of the plant may float downriver and re-root, they create new mats of hydrilla at other locations.

To address the spread of invasive hydrilla, CRC is using a tool called Community Based Social Marketing (CBSM), a marketing strategy that targets environmental behavioral changes through a five-step process:

1. selecting behaviors,
2. identifying barriers & benefits,
3. developing strategies,
4. conducting a pilot,
5. and broad-scale implementation.

CBSM provides an alternative to traditional outreach efforts, which often do little to change behaviors. To-date CRC has completed steps 1 – 3 and will complete step 4 in the summer of 2023.

## Step 1: Selecting Behaviors

Hydrilla is a threat to the economic and environmental integrity of the Connecticut River valley. In the last few years, thick mats of the invasive aquatic plant, hydrilla (*hydrilla verticillata*), have inhibited access for boaters, anglers, and other recreationists 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 hydrilla infestations, limiting business opportunity.

In April 2021, a coalition of stakeholders met to discuss action items and next steps to prevent the spread of hydrilla and mitigate or eradicate the existing infestation. This partnership includes grassroots groups, nonprofit organizations, local, state, and federal government agency representatives, marine trades representatives, biologists, and state legislators. Throughout these meetings, the need for increased education, outreach and, ultimately, individual stewardship was reiterated several times.

Hydrilla can spread through a process known as fragmentation, in which the plants, due to some sort of disruption, break apart and regrow elsewhere. For this reason, it is critical that those using paddle boats, power boats, jet skis, and fishing equipment in the Connecticut River must first be aware of invasive hydrilla and then take steps to reduce its spread by cleaning, draining and drying their equipment to ensure that hydrilla does not spread to new waterbodies.

Because fragmentation is a primary means of hydrilla propagation, the desired outcome of this project is to reduce fragmentation and eliminate the transport of hydrilla from the Connecticut River to other waterbodies in the Northeast via boats and trailers. Accordingly, the relevant audiences for this work include boaters, both power boaters and paddle boaters, as well as marinas. The desired behavior changes will lead to boaters checking and cleaning their boats and trailers for hydrilla as well as marinas installing educational information about hydrilla.

The targeted, non-divisible and end-state behavior for both power boaters and paddlers is "clean, drain, dry" to prevent the spread of hydrilla and other aquatic invasive species (AIS).

## Step 2. Identifying Barriers and Benefits

There are four primary steps to identify barriers and benefits: research, observe, conduct a focus group or interviews and a survey. For the purposes of this step, CRC staff did not conduct formal observations at boat launches, but instead supplemented the findings below with anecdotal data collected from staff involved in weekly AIS programing throughout the lower watershed.

### Research

AIS and boater behavior has been studied in detail, including studies and surveys that home in on various target audiences as well as target species. These reports, academic articles and survey results helped to inform Connecticut River Conservancy's (CRC) methodology and outreach approach.

#### *Research on measuring boater awareness*

As stated above, the selected audience for this work is focused on boaters, including paddlers and powerboaters. A 2019 study of boater AIS knowledge and behavior in Oregon, which included a mix of survey types, revealed, "While 76% of boaters said they would use a boat wash station prior to its installation,

only 39% of boaters were observed using the station after it was installed. Additionally, the surveys identified knowledge gaps of boater AIS awareness, with > 20% of boaters unable to name any AIS." [1]

To better understand barriers and benefits behind this behavior, surveys in 2017 and 2021 conducted by the Invasive Species Council of British Columbia (ISCBC) explored the behaviors, motivators and barriers, and communication preferences related to invasive species. ISCBC disseminated a 48-question survey, which was used to inform the questions CRC included in our survey of boaters due to the aligned goals of this project as well as the selected behavior focus of "clean, drain, dry."[2] Encouragingly, the report also concludes that, "there has been a substantial increase in awareness and understanding of invasive species in British Columbia..." and that, "Social norms and social diffusion have emerged as effective components of the behaviour-focused outreach strategy."

Finally, and in order to further inform the question in our survey and interviews, CRC drew on a 2006 Northeast Aquatic Nuisance Species Panel (NEANS) a workshop. The NEANS workshop was focused on developing a social marketing strategy to prevent the spread of hydrilla in the Northeast.[3] This document serves to build upon that document and workshop, as we as to specially focus on preventing the spread of Connecticut River hydrilla.

### *Research on boater communications*

In addition to the 2006 NEANS document, an existing case study of the Clean, Drain, Dry Campaign in New Zealand serves as an example of a successful campaign to limit the spread of didymo using the CBSM process.[4] While the scope of this case study is far greater, in both geographic scope as well as resources, there are several lessons to be learned in effective social marketing. In particular the research finding that, "all waterway users were motivated by the personal consequences" will help to inform the strategy implemented through this plan.

A 2015 survey of paddlers on the Northern Forest Canoe Trail provided insights to barrier and benefits for paddlers. The final report, 'Aquatic Invasive Wash Station and Boater Survey Project'[5] sound to understand the effectiveness of "clean, drain, dry" messaging and both created a wash station for paddlers and disseminated a survey online and in person to understand paddler familiarity with AIS and prevention methods. From this, they concluded that both clean signage and placement were important aspects of message delivery.

Finally, a literature review of 278 peer-reviewed articles published from 2008–2018 sought to understand research communication styles regarding AIS. In their findings, researchers discovered that messaging generally fell evenly within two approaches: species-centered frames, and human-centered frames, which were generally adopted depending on if the study focused on prevention or on control measures. For human-centered frames, which are generally used for prevention studies, the authors write:

> "The importance of self-efficacy (i.e., beliefs that one has the ability to complete an action; Bandura 1977) in enabling people to engage in preventative measures is well-documented in the literature

[1] Samuel A. Cimino and Angela L. Strecker "Boater Knowledge and Behavior Regarding Aquatic Invasive Species at a Boat Wash Station," *Northwest Science* 92(3), 224-233, (1 October 2018). https://doi.org/10.3955/046.092.0308

[2] https://bcinvasives.ca/news/2021-invasive-species-programs-and-behaviour-survey-report/
[3] https://www.northeastans.org/docs/NEANS_Panel_CBSM_hydrilla_report_11.2006.pdf
[4] https://cbsm.com/cases/22699-the-check-clean-dry-campaign
[5] https://www.lcbp.org/publications/aquatic-invasive-wash-station-boater-survey-project/

(Niemiec et al. 2017; Landon et al. 2018; Mankad and Loechel 2020), which underscores the importance of human-centered frames that emphasize the role of humans in biological invasions"[6]

## Step 3. Survey

### Survey Overview

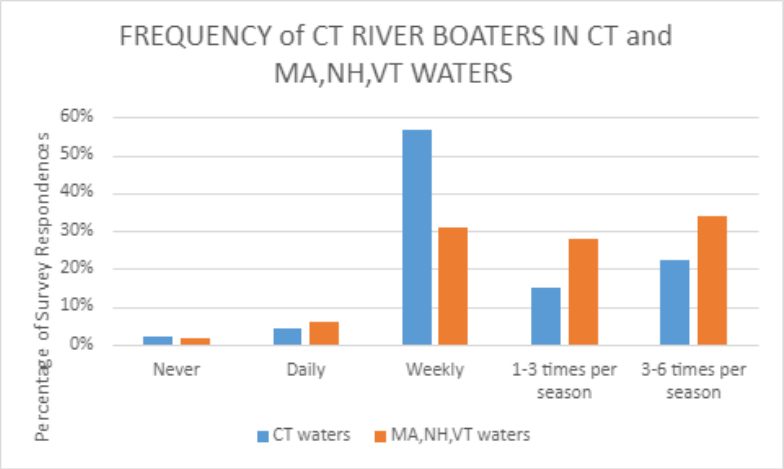
This online survey was designed with four objectives in mind:

1. To gauge current understanding of invasive species and their transport via boat
2. To estimate percentage of boaters currently practicing 'clean, drain, dry'
3. To identify barriers and benefits to adoption of 'clean, drain, dry' behavior
4. To identify possible mechanisms, incentives or nudges to change behaviors around 'clean, drain, dry'.

The survey and resulting information are not designed to be statistically significant or provide publishable results. Rather the intent of the survey was to gather information from boaters to inform decision-making regarding behavior changes to prevent the spread of hydrilla. Survey design was based on existing studies, surveys, and publications regarding both survey design and invasive aquatic species surveys.

The survey was open from July 20 through October 21, 2021 and collected 327 unique responses. We distributed the survey through a variety of mediums including CRC and partner email newsletters, posters at boat launches and marinas, Connecticut Department of Energy and Environment (CT DEEP) and CRC social media, press release and legislator promotion. All boaters were asked how frequently they boat on the Connecticut River, and within which state they spend most of their time. Following those two questions, the form divided respondents by four primary types of boaters: powerboats, jet skis, sailboats, paddle boats and other, which mostly included john boats. The survey branched into two similar but slightly different sets of questions, one for jet skis and power boats and the other for sailors and paddlers. Those who answered 'other' were grouped with powerboats and jet skis. Altogether 206 (63%) respondents fell within the first category (one was removed because of invalid responses) and 120 (37%) were in the second category.


[6] https://neobiota.pensoft.net/article/79942/




Over half of boaters surveyed indicated that they are frequent visitors of the Connecticut River, boating at minimum once per week in the Connecticut portion of the river. Owing to how we distributed this survey with focused outreach in CT, we expected that most respondents would be Connecticut residents, which may explain why 78% of respondents said that they most frequently boat in CT, as opposed to MA or VT and NH.

## Boating Behaviors

In an effort to understand the frequency with which boaters transport their vessels between water bodies, the survey included sequential questions about how boaters store their vessels (i.e. land vs. water), where they are most often boating and how they most often use their boat (see appendix for question details). Again, these responses were divided by types of boat, separated into two categories: paddle and sailboats, and powerboats and jet skis. For the next section these groups have been simplified to "paddlers" and "powerboaters," respectively.

For those using powerboats and jet skis, 58% of respondents keep their boat in the water during the boating season, while the remainder store their boats on land at a private residence or facility and, finally, a small fraction responded with "other." The majority of powerboaters also said their boat remained in the same body of water for the entire boating season, leaving just 26% to move between different waterbodies. Of those 26%, the top five locations power boaters are traveling to are:

1. Long Island Sound
2. Connecticut River
3. Block Island Sound
4. Mystic River
5. Gardner Lake.

Finally, while out boating, 65% of those with power boats and jet skis responded that their primary activity was 'leisure' while about 31% responded their primary activity was either 'recreational fishing' or 'sport'.

For those using paddle boats or sailboats, 99% of respondents store their boat on land; it should be noted only six respondents indicated they use or own a sailboat. Unlike power boaters, paddlers

were much more likely to travel to different water bodies, as indicated by 73% of respondents who transported their boat around the region. The top five locations paddlers are travelling to include:

1. Connecticut River
2. Farmington River
3. Long Island Sound
4. Salmon River
5. Swift River, MA.

When asked about how they most often use their boats, 62% of paddlers responded with 'leisure' while roughly 27% responded with "recreation fishing" or "exercise or competition."

### Boater Knowledge & Behavior Regarding Hydrilla

Both groups of boaters were asked to rank their familiarity with hydrilla prior to receiving this survey on a five-point scale; 1 as not at all and 5 as very familiar. The responses for both groups were similar with an average of 3.08 for powerboaters and 3.04 for paddlers.

| Knowledge of hydrilla | Powerboaters | | Paddleboaters | |
|---|---|---|---|---|
| Not at all-1 | 50 | 26% | 30 | 26% |
| 2 | 23 | 12% | 17 | 15% |
| 3 | 36 | 19% | 15 | 13% |
| 4 | 34 | 18% | 23 | 20% |
| Very familiar-5 | 51 | 26% | 29 | 25% |
| Total | 194 | 100% | 114 | 100% |

After providing a description of the impact of hydrilla, as well as resources for further exploration, boaters were then asked about what impacts of hydrilla they felt were of greatest personal importance to them. For powerboaters, the top three areas of concern were:

1. Water quality degradation
2. Loss of native plants and fish
3. Limited access for boats in coves, small rivers or along the shoreline

The least important area of concern for powerboaters was limited fishing opportunities. While this response may be because of prioritization of other areas for respondents, many anglers also value hydrilla because it is considered to create optimal fishing conditions.[1]

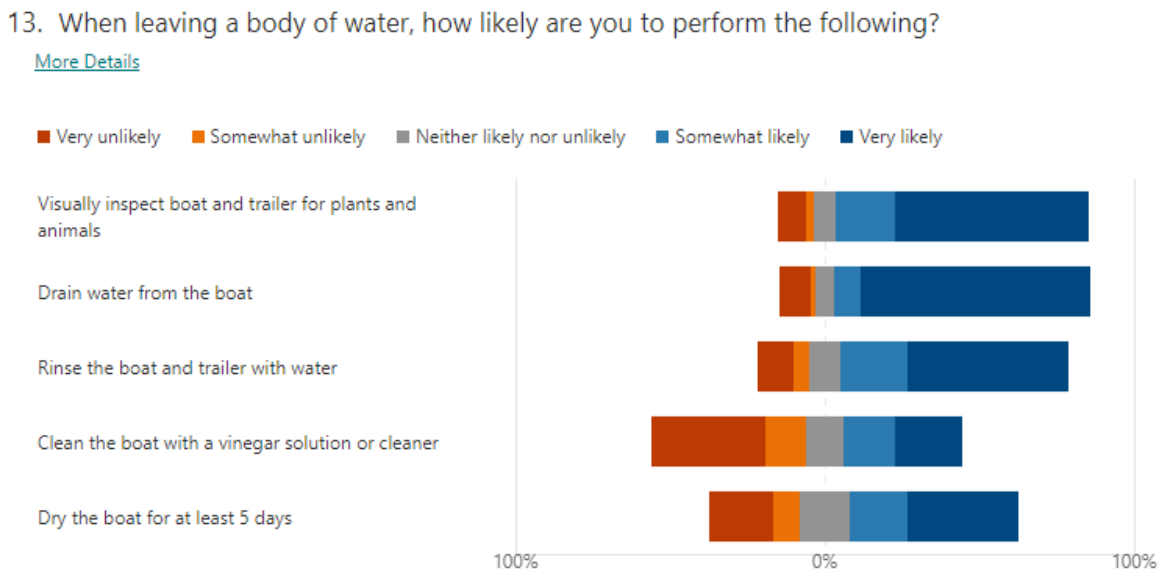
Similarly to powerboaters, paddlers were least concerned with limited fishing opportunities and their top three areas of concern were:

1. Loss of native aquatic plants and fish
2. Water quality degradation
3. Limited access for boats in coves, small rivers or along the shoreline

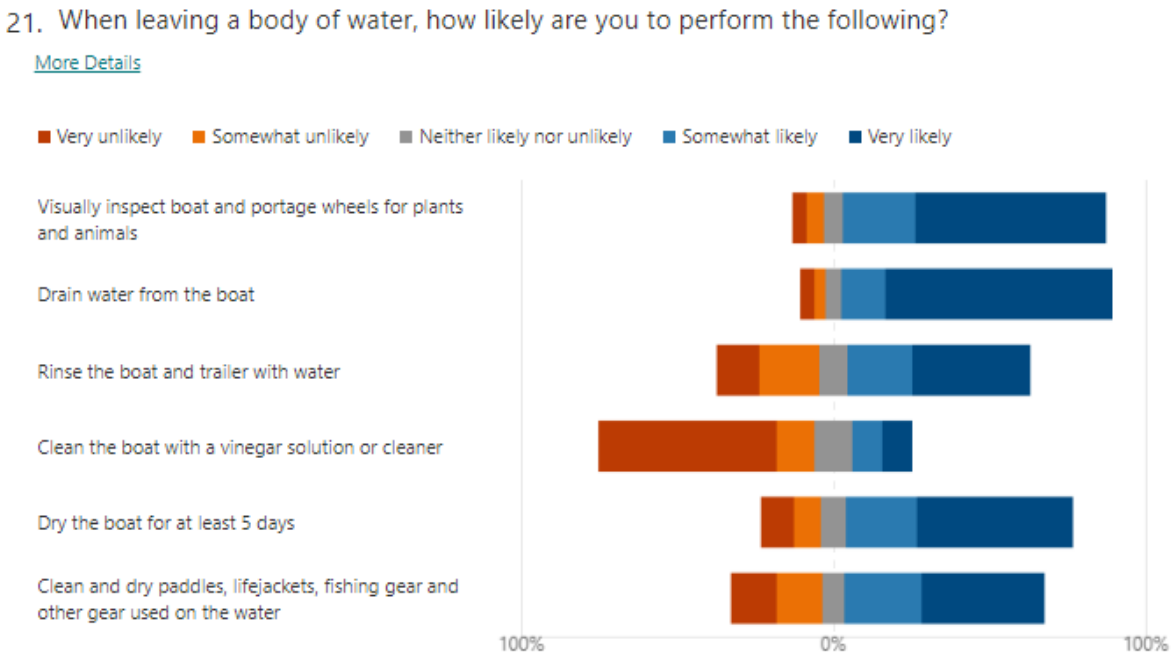
Survey respondents were asked to rank how likely they were to take particular action in order to prevent the spread of hydrilla followed by a question asking them to rank the reasons why they may

not perform an action specified in the previous question. The responses are shown in the figures below.

73% of powerboaters responded they were "very likely" to drain water from the boat while 62% of powerboaters responded they were "very likely" to visually inspect the boat and 51% were "very likely" to rinse the boat and trailer with water. 36% of powerboaters were "very unlikely" to clean the boat with a solution and 20% were "very unlikely" to dry the boat for at least five days.




For paddlers, 72% indicated they were "very likely" to drain water from the boat, 60% were "very likely" to visually inspect the boat and 50% were "very likely" to dry the boat for at least five days. Much like powerboaters, cleaning the boat with a solution was "very unlikely" for 56% of paddlers followed by rinsing other gear used on the water.




Following the question of how likely boaters were to take specific actions to prevent the spread of hydrilla, respondents were then asked to identify reasons that may prevent them from taking the actions listed in the previous question. Looking at the responses in the chart below, lack of knowledge was the number one response for both powerboaters and paddlers.

| | Powerboaters | | Paddle boaters | |
|---|---|---|---|---|
| I do not know how to do this | 96 | **49%** | 54 | **47%** |
| I do not know why this is important | 21 | **11%** | 4 | **4%** |
| I do not have the equipment I needed | 15 | 8% | 4 | 4% |
| Does not apply, I always take these actions | 27 | 14% | 15 | 13% |
| It takes too long to do | 12 | 6% | 10 | 9% |
| I forget to do it | 14 | 7% | 12 | 11% |
| I do not believe it is necessary for small boats | 0 | 0% | 12 | 11% |
| There are no invasive species where I boat | 9 | 5% | 3 | 3% |
| Total | 194 | 100% | 114 | 100% |

Finally, we asked both groups of boaters to identify ways of sharing information that would personally help them learn more about hydrilla and the ways to stop its spread. Both groups responded similarly, with posters at boat launches and marinas ranking high, followed by images, graphics and videos shared on social media.

## Reflections and Takeaways

We recognize that this survey of 327 boaters does not provide a comprehensive understanding of boating behaviors regarding hydrilla and that boaters are not homogeneous, rather they come to the water from varied walks of life and for diverse reasons. It is our hope that this information can serve as a starting point for better connecting with boaters in the region on the issue of hydrilla, as boaters are a critical demographic for preventing its spread. The objectives of this survey were:

1. To gauge current understanding of invasive species and their transport via boat
2. To estimate percentage of boaters currently practicing 'clean, drain, dry'
3. To identify barriers and benefits to adoption of 'clean, drain, dry' behavior
4. To identify possible mechanisms, incentives or nudges to change behaviors around 'clean, drain, dry'.

### *To gauge current understanding of invasive species and their transport via boat*

Overall, respondents indicated a fairly high level of familiarity with hydrilla and its transport mechanisms, as shown by the average of 3.06 rating when asked. However, given the pervasiveness of hydrilla in the Connecticut River, which in some areas is nearly ubiquitous, there is significant opportunity to increase understanding of what hydrilla is, how it impacts the river and how boaters can actively contain it. Additionally, when asked about why boaters may not take a particular action to stop the spread of hydrilla, such as cleaning their boats with a solution, respondents pointed to a lack of information and understanding of how to perform these actions. Finally, it is of note that paddlers in this survey were far more likely to transport their boats between waterbodies than powerboaters. This may point to a gap in outreach and education, which is often targeted at powerboaters as the drivers of AIS spread; additionally, 11% of paddlers indicated that they did not think 'clean, drain and dry' methods were necessary for small paddle crafts. Therefore, there is an opportunity to design nudges and outreach materials specifically for paddlers.

### *To estimate percentage of boaters currently practicing 'clean, drain, dry'*

While survey responses did not explicitly identify a percentage of boaters participating in 'clean, drain, dry,' they did indicate that a majority of boaters are 'somewhat likely', and 'very likely' fact drain their boats (86% of paddlers and 81% of powerboaters). Visual inspection, followed by rinsing with water, were the second and third actions most likely to be undertaken by both groups of boaters while drying the boat fell significantly behind both actions. Field observations and phone interviews, which are to be included in this project, may help supplement this information to better understand what percentage of boaters perform actions such as 'clean, drain, dry.'

### *To identify barriers and benefits to adoption of 'clean, drain, dry' behavior*

Boaters participating in the survey very clearly identified a lack of understanding as the primary barrier for carrying out actions to prevent the spread of hydrilla. This was closely followed by uncertainty about why a specific action was important, which was then followed by it taking too long or simply forgetting to do the action. Paddlers diverged from powerboaters in this response, indicating that they did not believe it necessary to undertake the action for small boats. For benefits, both groups of boaters indicated that ecosystem impacts, such as water quality and the health of native species were primary reasons respondents cared about the spread of hydrilla, followed by limited access to coves and shorelines.

These benefits and barriers suggest that marketing tools and nudges should be crafted to clearly demonstrate ecosystem benefits of 'clean, drain, dry,' and with the intent of empowering boaters with the know-how to perform these preventative actions themselves. While lack of knowledge was cited as the primary barrier, it should also be considered that some respondents may feel hesitant to answer with 'it takes too long' or 'I forget', as these responses could be perceived as a personal failing. Marketing strategy should still consider the length of time and ease when it comes to designing tools for outreach.

*To identify possible mechanisms, incentives or nudges to change behaviors around 'clean, drain, dry*

Interestingly, powerboaters and paddlers alike responded that signs at points of entry would be most effective in learning about hydrilla and the ways to stop its spread. Through CT DEEP and partner organizations, posters have been installed at most boat launches along the Connecticut River. Given the difference between the level of understanding of hydrilla and the demand for signs, it may be the case that existing posters and signs are not noticeable enough for boaters to stop and read them. New or existing posters could also be better distributed to marinas and yacht clubs, many of which do not yet have materials to post. Next steps might include piloting different types of signage at boat launches, such as banners or feather flags to observe their efficacy.

Following signage at points of entry, online and social media graphics and video ranked highly as an effective outreach tool. Given the number of groups and communities in the online world, this may be an effective way to spread awareness, but creates a challenge for measuring uptake of a specific behavior change. Social media and online campaigns could be effectively used to supplement nudges and outreach in the field. Finally, stickers, key floats and trinkets ranked low in terms of effective messaging for boaters, which runs contrary to the findings of many CBSM campaigns. It may be worth continuing to explore this option on a small scale to understand how boaters respond when such items are distributed in the field.

## Step 4. Interviews

### Overview

As a part of the Community Based Social Marketing process (CBSM), interviews are used to supplement and clarify data collected through the online survey responses. While the online survey provided valuable information to understand current boater behaviors and trends, in-depth phone interviews provide the opportunity to ask specific questions of individuals and to better understand personal reasons for both caring about hydrilla and taking action to prevent its spread. The interview was designed with the following objectives in mind:

1. Assess current understanding of aquatic invasive species (AIS) and identify hydrilla knowledge gaps among boaters,
2. Understand personal motivations for deciding to use or not use spread prevention techniques,
3. Identify resources and tools boaters are already using to learn about AIS or prevent its spread.

### Design and Selection

All interview participants were selected from the pool of online survey respondents. These participants self-selected into the group by first indicating their willingness to be contacted for a following the online survey and then in response to email follow-up asking for their participation. Subjects were selectively contacted to achieve an interview pool whose makeup was half reactional paddler and half recreational powerboater. There was no financial and material incentive to encourage participation and the process of self-selection is noted to

introduce biases into the overall process. In this case, we assumed that respondents were more likely to be concerned with stewardship of the river or natural environment and that they may have greater familiarity with hydrilla. Altogether, we conducted 10 phone interviews in the span of two weeks. The average interview lasted for about 20 minutes.

Interviews were conducted over the phone/video conference as the safest and most convenient option during the ongoing covid pandemic. The interviews were semi-structured, allowing for flexibility and for participants to introduce unanticipated topics or questions. A list of pre-set interview questions ensured that the conversations focused on key research questions and led to information gathering relevant to these questions. These questions, listed below, acted as a conversation guide throughout the interviews to provide structure, while the interviewer posed follow-up questions to further probe into topics of interest to this project. Interview subjects were asked to testify not only to their behaviors, but to observed practices of other boaters on the Connecticut river.

## Interview Questions

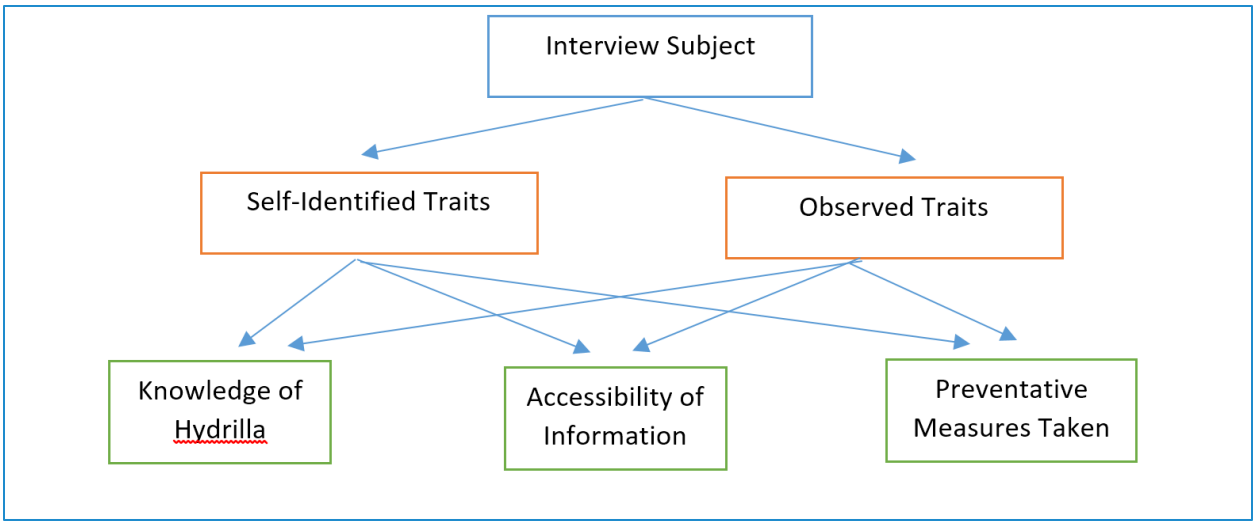
1. What motivated you to participate in this interview today and why do you personally care about the impact of hydrilla? Have you noticed any changes to the river over your time on river? Why do you think other members of your community might care?
2. Are you familiar with and do you practice the principles of Clean, Drain, Dry? If so, how did you first learn about this process? (Witnessing others, educational signage, talking with a volunteer, etc...)
3. Are there any other barriers to the Clean, Drain, Dry process that you have witnessed or experienced?
4. Do you largely recreate at a single marina/launch site, or do you travel to different locations? If you mainly launch from one site, what do you think you can do to prevent the spread of aquatic invasive plants like hydrilla?
5. At various waterways or marinas you have visited, have you encountered a particularly effective piece of marketing with information about aquatic invasive species? If so, what did it look like?
6. If you had any questions about Aquatic Invasive Species, what sources of information have you used or would you seek out to learn more? (Signage, books, Google, social media, etc...)
7. Do you have any personal experience or an anecdote of how Hydrilla has affected your enjoyment of the Connecticut River?

All interviews were recorded and saved as audio files before using speech-to-text software to transcribe the interviews; however, each audio file and transcription were also reviewed by CRC staff to ensure a greater degree of accuracy. Once transcription was complete, the files were uploaded to Quirkos, a qualitative data analysis software, which was used to code the interviews.

## Coding and Analysis

Throughout the interview and analysis process we sought to identify and separate both personal behaviors/attitudes of the interview subject and observed behaviors/attitudes of members of the boating community by said subject.

From these categories of personal traits and observed traits we aimed to distinguish between interview answers pertaining to knowledge base, accessibility of existing information and preventative measures taken.




### *Knowledge of Hydrilla*

While coding for this branch of the interviews we wanted to investigate both how much people knew about the varietal of Hydrilla existing in Connecticut River, its impact, and what they could do about it. By including members of both paddling and powerboat communities we would be able to identify if one group could need additional marketing and educational targeting. Knowledge of Hydrilla was considered to have come from a number of sources including experience with the plant, signage at boat launches published by nonprofit/governmental agencies, and research conducted by individuals outside of the recreation space. We also aimed to track attitudes and concerns of boaters in regard to Hydrilla because that would highlight if not a firm knowledge of the plant, at least an awareness of the issue on the Connecticut River

### *Accessibility to Information*

This branch is tied to the knowledge base and sought to identify what methods of information dissemination were effective in the recreational boater community. Sources such as signage at boat launch areas were discussed as we wanted to see how familiar interview subjects were with them and how effective they have been. Outside of the boating space we wanted to identify which online tools were trusted and used by interview subjects. There was not much observed trait data for this topic, so it relies heavily on personal experience of interview subjects.

### *Preventative Measures Taken*

For this question a higher significance was placed on answers pertaining to observed behaviors as personal bias to appear compliant to regulations may have affected answers of personal behaviors. We asked interview subjects if they participated and observed clean drain dry activities and asked them to explain any obstacles that might inhibit community participation. These roadblocks were categorized as knowledge based and location based. Through the coding process we aimed to see if barriers were caused by the attitude of boaters or if logistical concerns at boat launches prevented compliance.

## Reflections and Takeaways

The interviews sought to home in on specific aspects of the survey by focusing on three primary areas of understating:

1. Assess current understanding of aquatic invasive species (AIS) and identify hydrilla knowledge gaps among boaters,
2. Understand personal motivations for deciding to use or not use spread prevention techniques,

3. Identify resources and tools boaters are already using to learn about AIS or prevent its spread.

Respondents in the interviews were familiar with hydrilla through their experience paddling or boating on the river, though previous to this project, some were familiar with the plant but unfamiliar with its name and behaviors. Several interviewees mentioned physical signage and interactions with CT DEEP boating stewards as their primary source of information about prevention mechanisms, specifically the "clean, drain, dry" behavior. Social media, including Facebook was not frequently used as a source of information for boaters and instead the primary source of information was through conversation and signage at boat launches. While most power boaters and paddlers claimed knowledge of hydrilla, many of them also suggested that other boaters were less knowledgeable on the subject than themselves. This sentiment was represented by one respondent who suggested a focused educational effort on the impacts of hydrilla, "*I mean, I don't think they know about it. I don't think most people know about a lot of this. So I think maybe if they could be educated that there, if they don't do that like, you know, the impact, like they won't be able to boat in certain areas because these certain areas are being overtaken by this.*"

In terms of barriers and benefits, a frequently cited benefit of adopting the "clean, drain, dry" behavior was maintaining the health of the river for future generations and ensuring physical access for boating. Access for boating was particularly emphasized for paddlers that have the ability to navigate in a greater variety of aquatic habitat. One respondent emphasized the importance of lost habitat and access alike, "*... with kayaking, it really is an issue and especially in great places that we have on the river to kayak the nice, shallow places of all the fish and the frogs and the wildlife and everything. I'd hate to see that, you know, be impacted negatively.*"

Similarly, powerboaters expressed lack of access and ecosystem health as motivating factors to adopt preventative behaviors, "*I mean, there's a clear and present danger here because we will lose the river, we will lose its oxygenation, we will lose the fish. I mean, it's not trivial. There are bodies of water that are useless now. There are lakes where people drain the lake in the middle of the winter, sending a vacuum cleaner or a lawnmower to cut down all that stuff and then expensively rebuild the lake.*"

Succinctly put by one respondent, "W*e all know how beautiful [the Connecticut River] is and you know how sensitive it could be to change.*"

For barriers to adopting the "clean, drain, dry" action, powerboaters in particular emphasized the timing and convenience of the action, "*... a lot of times people are just rushing to get out of the way*." Another respondent shared a similar sentiment, saying, "...A*nd a lot of people who are at the point of launch and are so eager to launch that couldn't care less.*" Put into context, a final respondent likewise homed in on the importance of timing the behavior as a major barrier, "T*here's a lot out there, but it's timing and everything. I will be launching in Portland, and in saying I'm gonna go pick up someone Middletown by Harbor Park and so it's, it's like, oh, I don't have time to sit and read, or Q*R *it*."

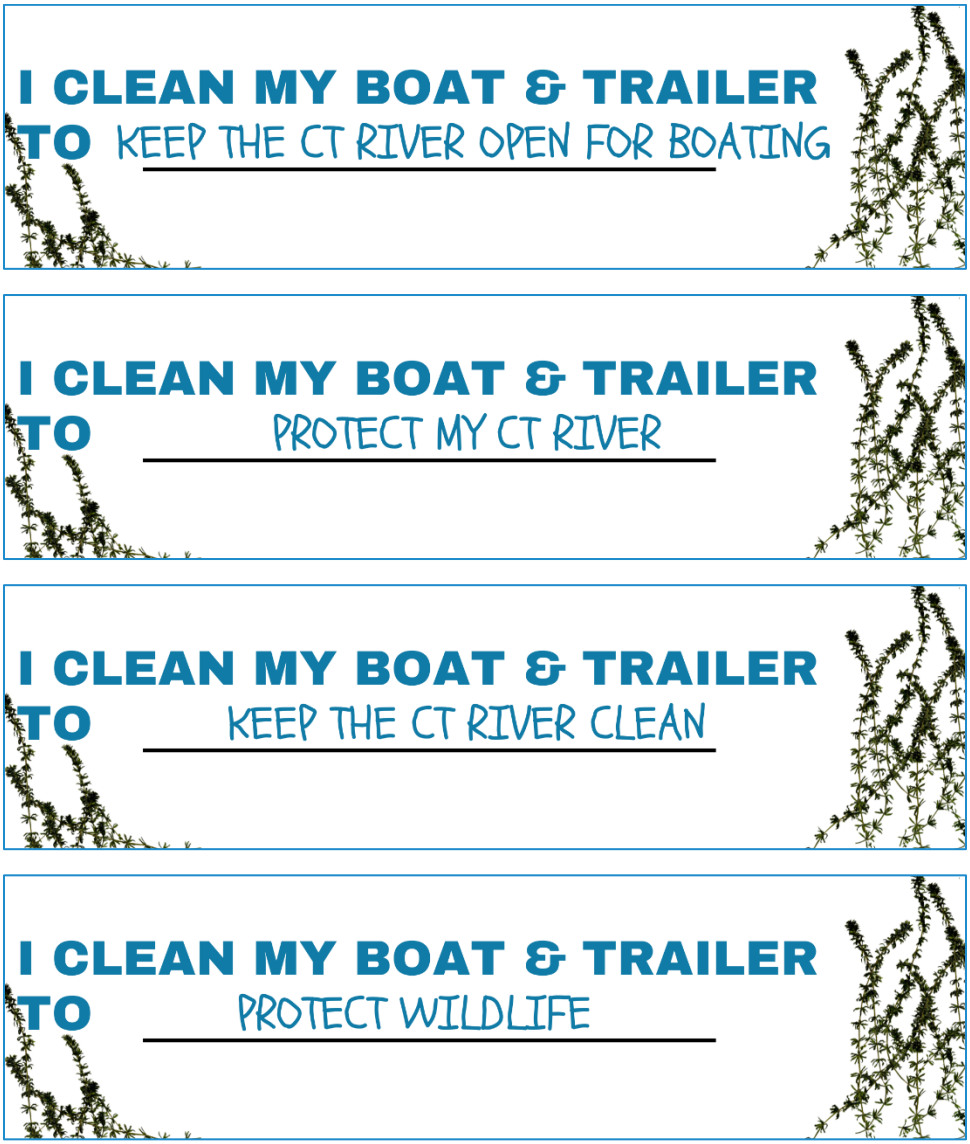
For paddlers, timing was less of an issue as there seemed to be less concern about quickly launching onto the river. Instead, paddlers cited outdated information and the lack of perceived necessity as the primary barriers to taking up prevention actions. Demonstrating the efficacy of boat launch signs, one responded focused on the age of the information, "*People would pay more attention to it if they felt like there was something to see, kind of like if you made a website and just like left it there for like 10 years. No one's probably going to give any credit to any of the stuff that's on there anymore. If they come and look and see at the bottom, it says like 2005.*"

The divergence in barriers between paddlers and powerboaters raises questions about both the timing and location of prevention messaging. One respondent suggested information should be on the boat itself or in stores, "I *don't know if the best point is the boat supply places. I don't know if someone should almost be required to place something that sticks to the boat where you have to see it, even while steering it or paddling it. And that is waterproof. That is your constant reminder, right, where you are on your boat."*

Finally, boat washing equipment was pointed to a primary means of preventing spread among both groups of boaters. Powerboaters, in particular, were familiar with boat washing stations in other northeastern states and suggested these resources as an effective way to minimize spread.

## Step 5. Strategy and Next Steps

Based on the findings of the survey and interviews, we determined that messaging to prompt adoption of the "clean, drain, dry" behavior should be focused on individual empowerment to protect the Connecticut River ecosystem as well as maintaining open water for recreation. Accordingly, messaging was designed to reflect boaters' stated desire to feel empowered to take an action that addresses the spread and growth of hydrilla. We created four sticker designs below that use a first-person declarative, taking responsibility for cleaning boats and trails in order to achieve goals that were identified as motivating benefits.




The decision to create four options is intended to further develop the sense of ownership of the "clean, drain, dry" action, allowing each boater to select which reason they prefer. Additionally, these stickers are intended for application on both powerboat trailers as well as paddler boats. This speaks to concerns surrounding the timing of the "clean, drain, dry" action by nudging powerboaters to take the cleaning action either at the boat

launch or at home, and providing a constant reminder for paddlers, who would instead see the sticker on their boat or car rack.

For the next step, CRC will be working in communication with partners to apply these stickers to boats and boat trailers in the summer of 2023. CRC has secured additional funding to continue to measure the efficacy through boat launch observations and other data collection methods.

In addition to these stickers, CRC will be deploying AIS boxes[7] at select boat launches to serve as both a reminder to "clean, drain, dry" as well as a receptacle for AIS once it's removed from boats. This speaks to concerns that when boaters do remove AIS from boats and trailers and simply throw it back into the water. We will continue to monitor the appropriate use of these boxes as well as any observed activity changes in response to these two behavior change mechanisms.

[7] https://www.dec.ny.gov/docs/fish_marine_pdf/isdsplanssign.pdf