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August 20, 2025

John Gregoire
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Boston, Massachusetts 02129

Re: ***Swollen Bladderwort Control at Pottapaug Pond, O'Loughlin Pond, and Quabbin Reservoir Quabbin Reservoir***
Petersham, Massachusetts
TRC Project No. 657596.0000.0000

Dear Mr. Gregoire,

TRC provides this swollen bladderwort (Utricularia inflata) management report for Quabbin Reservoir, O'Loughlin Pond, and Pottapaug Pond to the Massachusetts Water Resources Authority (MWRA). A brief description of the water bodies and the target invasive species is presented below, followed by the approach of this management program, a summary of results, and recommendations for management actions in the coming seasons.

Background

Quabbin Reservoir is an approximately 24,960-acre drinking water reservoir in central Massachusetts. Pottapaug Pond is an approximately 596-acre regulating pond located east of Quabbin Reservoir, and is connected at its southern end to Quabbin Reservoir via a horseshoe weir, near Boat Launch Area (BLA) #3. O'Loughlin Pond is an approximately 83-acre regulating pond located north of Quabbin Reservoir, and is connected at its southern end to Quabbin Reservoir via a horseshoe weir, near BLA #2. Fragment barriers are located upstream of the horseshoe weirs at both the Pottapaug Pond and O'Loughlin Pond inflows to Quabbin Reservoir.

Historically, only one swollen bladderwort plant was ever observed in this area. In August, 2017 ESS Group, Inc. (now TRC) removed the plant from the northernmost part of Quabbin Reservoir near BLA #2. In June 2023, a new population of swollen bladderwort was discovered in Pottapaug Pond by the Massachusetts Department of Conservation and Recreation (DCR), Division of Water Supply Protection (DWSP) staff. DWSP's initial management efforts were conducted in June and July of 2023 and included removal of a total of 115 gallons of bladderwort. Harvesting operations continued until the plants were too degraded to remove.

In 2024, widespread surveys and bladderwort harvesting efforts were conducted by TRC at Pottapaug Pond and O'Loughlin Pond. TRC identified swollen bladderwort throughout most of the coves and some shorelines in Pottapaug Pond. TRC harvested approximately 1,527 gallons of swollen bladderwort over the course of 21 days in June of 2024. Swollen bladderwort was observed to be far less dense at O'Loughlin Pond, with only sparse coverage observed in a few locations in June of 2024. Approximately one gallon of swollen bladderwort was harvested from O'Loughlin Pond over the course of three days in June 2024. Quabbin Reservoir, which was not the main harvesting priority in the 2024 season, was also surveyed in June 2024. Swollen bladderwort was confirmed to be present in two coves, one along the northern shoreline and one along the eastern shoreline close to BLA #3, and several additional areas of potential bladderwort growth were also documented. These areas were identified as primary targets for survey efforts in future seasons.

For the 2025 harvesting season, DCR established a workflow to prioritize the different waterbodies. Quabbin Reservoir was identified as the top priority, and management efforts included both surveying and harvesting. O'Loughlin Pond was identified as second priority and also included both surveying and harvesting efforts.

Pottapaug Pond was identified as third priority, which included harvesting and the deployment of an MWRA-procured fragment barrier (500 LF and 5 ft. mesh skirt depth) across a southern cover (Figure PC-1 below).

Swollen bladderwort is a rootless carnivorous plant. The underwater portion of the plant has branched leaves with small bladders used to prey on planktonic organisms. In early spring, the plant develops a floating pontoon of four to ten inflated leaves (referred to in this report as “floats”). These floats are arranged radially like the spokes of a wheel. A flower stalk emerges from the floats and bears three to 15 yellow flowers. Not all plants will form these flowering structures. Mitchell (1994) documented the presence of swollen bladderwort in New York, noting that in one pond only about 40 inflorescences were observed, while hundreds of plants were present in a vegetative (i.e., non-flowering) state, suggesting that plants may not flower every year and may only flower under certain environmental conditions. TRC is not aware of published research on potential factors that cause the plant to grow back in the vegetative form and not produce an inflorescence. Vegetative swollen bladderwort is typically found below the water’s surface; therefore, it is not as easily spotted from the water’s surface in its vegetative form compared to when it is exhibiting flowering structures and floats. Both the vegetative and flowering growth forms were observed at Pottapaug Pond, O’Loughlin Pond, and Quabbin Reservoir in past years.

Swollen bladderwort at Pottapaug Pond in May 2025. Top plant just the vegetative portion, bottom plant beginning to develop floating structures.

Swollen bladderwort is typically found in shallow, protected areas where water movement is minimal. The plant may be displaced to greater depths if shallower areas are subject to water movement or are more exposed to the wind (Urban and Titus, 2010).

Swollen bladderwort can reproduce by fragmentation and seed formation. Studies have shown that fragments as small as 1.0 centimeter (cm) in length can survive and regenerate branches, indicating that these small fragments can form new plants (Titus and Urban, 2013). The plant also forms turions (winter buds) which develop in the fall and settle to the bottom allowing the plant to overwinter. Dispersal of fragments, seeds, and turions can occur by water currents, boaters, or wildlife.

Swollen bladderwort is invasive in Massachusetts. Swollen bladderwort can form dense mats, resulting in potential degradation to water quality. As swollen bladderwort begins to die off later in the growing season, decomposition of this plant material can decrease dissolved oxygen levels in the water column, disrupting the natural balance of the aquatic ecosystem. Swollen bladderwort can also outcompete and negatively impact native vegetation. Dense floating mats of swollen bladderwort can limit light penetration through the water column, decreasing submersed native plant growth. Due to its reproductive capabilities and growth habit, swollen bladderwort has a high potential to spread throughout the source water system.

Survey Efforts

Approach

TRC completed an initial survey on May 12, 2025. TRC visited Quabbin Reservoir, near BLA #3 and a few fragments were observed floating in one of the northern coves. During this initial survey, TRC also visited Pottapaug Pond and observed mainly vegetative forms of swollen bladderwort, with a few floating structures beginning to develop.

Following the initial survey, TRC mobilized and performed a point-intercept survey at Quabbin Reservoir on May 14th and 15th. Prior to field efforts, TRC worked with MWRA and DCR to establish over 400 survey points in Quabbin Reservoir in the vicinity of BLA #3. In the field, TRC visited each survey point and used direct observation from the surface to map swollen bladderwort coverage. Not all plants will form floats or flowering structures, so a handheld plant rake was also used to gently pull up any plants present below the water's surface. A throw plant rake was not used during surveying efforts to limit the potential of fragmenting the plants. Swollen bladderwort coverage was visually ranked using the following scale:

- 0 = 0% (no cover)
- 1 = 1-24% cover
- 2 = 25-49% cover
- 3 = 50-74% cover
- 4 = >75% cover

Swollen bladderwort coverage was recorded at each survey point and positions were collected with a sub-meter accurate GPS receiver. While in the field, TRC added additional points to enhance survey coverage if a plant was observed, resulting in a total of 436 points surveyed in May 2025. Data collected from the point-intercept survey was then analyzed to delineate the extent and density of swollen bladderwort coverage in Quabbin Reservoir.

TRC conducted a second survey and harvesting effort at Quabbin Reservoir on June 5th and 6th. Areas previously surveyed were revisited, and TRC collected additional points where swollen bladderwort plants were found, resulting in a total of 443 points. Because of the small number of swollen bladderwort plants observed in Quabbin Reservoir, harvesting of plants occurred simultaneously with the point-intercept survey.

A similar survey and harvesting approach was used at O'Loughlin Pond on June 4, 2025. A total of 125 survey points were established by TRC, MWRA, and DCR, with additional points added in the field to enhance coverage, resulting in a total of 153 points. TRC visited each survey point and visually ranked swollen bladderwort coverage using the approach outlined above.

No point-intercept survey was conducted at Pottapaug Pond this year per the directive of MWRA and DCR. Harvest and removal was the management focus at this location.

Results

Pre-management swollen bladderwort coverage at Quabbin Reservoir was visually observed to be sparse along shorelines in the vicinity of BLA #3 during the May 2025 survey (Figure 1). No floating or flowering structures were observed. The only plants observed were relatively small fragments located on the water's surface, typically pushed up against the shoreline with other plant debris. Overall, out of the 436 total points surveyed, sparse swollen bladderwort coverage (1% to 25% cover) was observed at just 6 points. Typically, only one or two floating fragments were observed at each location where sparse coverage was documented, and no one location had greater than six fragments. The June survey identified seven additional points of sparse swollen bladderwort coverage (Figure 1).

Pre-management swollen bladderwort coverage at O'Loughlin Pond was visually observed to be sparse along the shorelines (Figure 2). Out of the 153 survey points, sparse coverage was observed at 34 points, and moderate coverage (26% to 50%) was observed at one point. O'Loughlin Pond was surveyed in both 2024 and 2025. A comparison between the two years of survey data shows an increase in swollen bladderwort coverage. Locations

where the plant was found have shifted slightly from 2024 to 2025, but the plants remained present in the cove areas both years. This increase is attributed to use of the rake to better survey the plant underwater, as opposed to relying solely on the floating structures. In 2024, over the span of three visits, TRC observed sparse coverage at 19 points, typically where only one or two swollen bladderwort plants were observed. In 2025, TRC observed sparse swollen bladderwort coverage at 34 points and moderate coverage at one point.

Harvesting Efforts

Approach

Harvesting efforts in 2025 were conducted by a 4-person field crew using single-person kayaks. Crews pulled the plants by hand or, when growth was too deep to reach by hand, using handheld rakes. Plants were placed in five-gallon buckets stored in the kayaks. Buckets were then carried to disposal areas, previously established by DCR and enclosed by silt fencing, where the plants were stockpiled. Total gallons harvested were tallied at the end of each day (one full bucket of plants equates to 5 gallons of plants harvested).

Disposal area at BLA #3 on May 30, 2025.

TRC observed few plant fragments at Quabbin Reservoir and harvested this material during the point-intercept surveys. Therefore, per the request of DCR, the remaining 2025 harvesting effort was directed at Pottapaug Pond and O'Loughlin Pond.

Harvesting at Pottapaug Pond was conducted from May 19 through June 3, 2025. Harvesting focused on "high priority" areas identified by DCR, which included zones PBLA and PC-1, and medium-priority area PMB-2 (Attachment A). At the end of each day, a Survey123 form created by DCR was filled out describing the work performed and the total gallons of swollen bladderwort harvested.

TRC conducted harvesting at O'Loughlin Pond from June 9 through June 13, 2025. Harvesting focused on areas where plants were found in the 2025 point intercept survey and included high priority areas OBLA and OFRAG, and medium priority areas OMB-3 and OMB-5 (Attachment A).

Results

The following sections describe the harvesting results at Pottapaug Pond and O'Loughlin Pond. A timeline of the work performed for each water body is included in Attachment B.

Pottapaug Pond

Over 8 days, a total of 275 gallons of swollen bladderwort were removed from three harvest zones within Pottapaug Pond. TRC harvested in zones PBLA, PC-1, and PMB-2, focusing the majority of effort on PC-1 where DCR installed a fragment barrier in April 2025. A total of 3 gallons were harvested from PBLA, 36 gallons from PMB-2, and 246 gallons from PC-1 (Figure A). A total of 5 hours of harvesting effort were spent at PBLA, 36 hours spent at PMB-2, and 175 hours spent at PC-1 (Figure B).

In 2024, 21 days were spent harvesting at Pottapaug, and a total of 1,527 gallons were removed from nine harvesting zones. Therefore, on average, approximately 73 gallons of plants were harvested per day. By contrast, only approximately 34 gallons were harvested per day in 2025.

No post-harvest survey was conducted in 2024 and no pre- or post-harvest surveys were conducted in 2025 at Pottapaug Pond. Therefore, assessing total percent reduction over the past two years is difficult. However, based on the pre-harvest survey conducted in 2024 and visual observations by field crews at the end of the harvesting

season in 2025, TRC estimates an approximate 25% reduction in plants from 2024 to 2025 in PC-1 and an approximate 60% reduction in plants from 2024 to 2025 in PBLA. TRC does not estimate a significant reduction in plants in PMB-2. If MWRA and DCR wish to further explore percent reduction over periods of time at Pottapaug Pond, TRC recommends conducting pre- and post-harvest surveys each year at Pottapaug Pond for more accurate estimations.

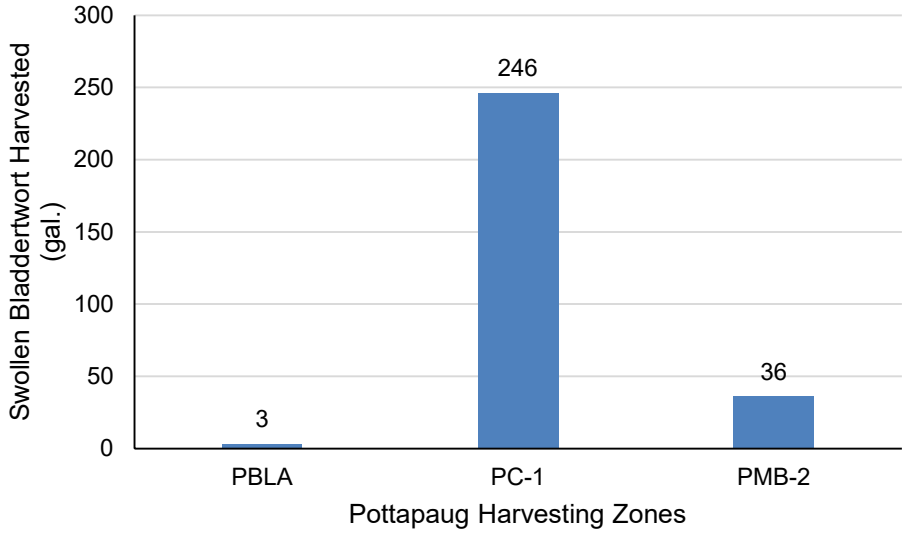

Figure A. Amount of Swollen Bladderwort Removed Per Harvesting Zone at Pottapaug Pond in 2025

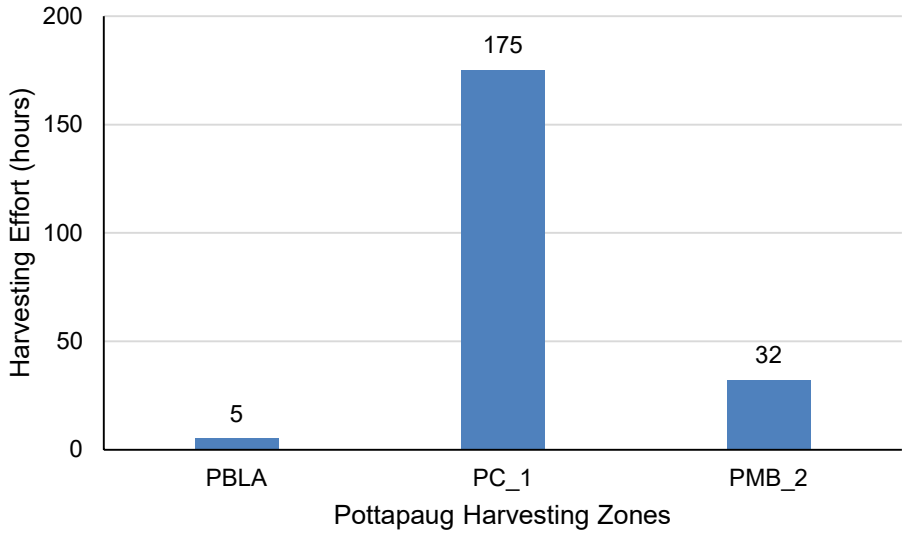

Figure B. Harvesting Effort Spent at each Harvesting Zone at Pottapaug Pond in 2025

Throughout the 2025 harvesting period, TRC staff spent a total of 224 person-hours of field effort at Pottapaug Pond. The amount of swollen bladderwort removed per hour of effort varied daily depending on where harvesting occurred. The amount of swollen bladderwort harvested per unit effort varied throughout the day but generally increased over the course of the 8-day harvest period (Figure C). This was likely related to the increased growth of

plants as time progressed further into the season. Effort varied throughout each day depending on the zones targeted and the environmental conditions during the day (i.e. wind and rain).

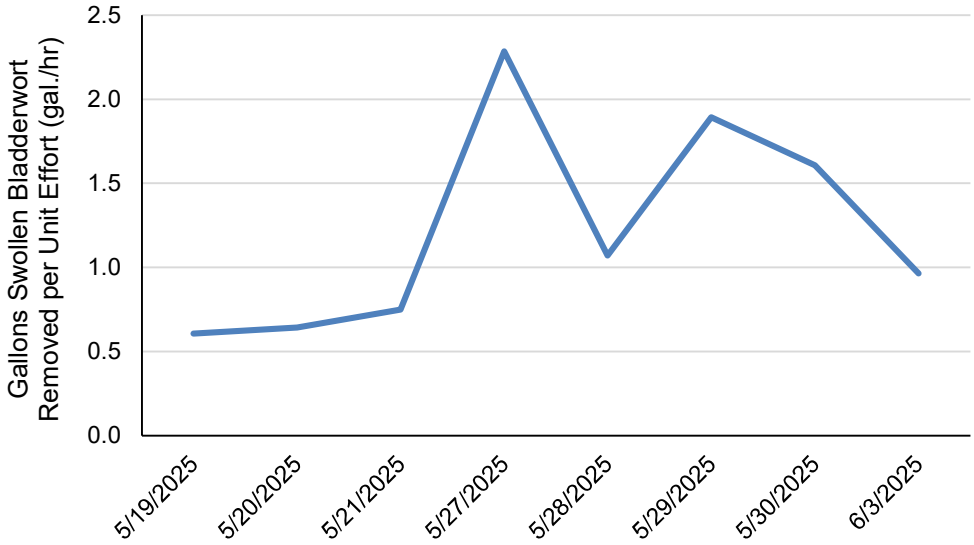

Figure C. Swollen Bladderwort Harvest Rate at Pottapaug Pond in 2025

During the first week of harvesting (May 19th through May 21st), TRC observed that very few swollen bladderwort plants were developing floating structures and that the majority of plants were in a vegetative form and were found down by the sediment. Research into the environmental conditions that cause this trend is scant and it is unknown what factors resulted in fewer flowering plants this year as compared to last year; however, it may have been spurred by the 2024 drought season or by the colder winter weather in 2024-2025. Further research would be needed to confirm these theories. This same trend of few observed flowering structures was observed throughout the harvesting season. Very few floats and flowering structures were observed, marking a notable decrease from the number of floating and flowering structures observed in 2024.

Harvesting by kayaks. June 3, 2025.

TRC also noted that although no survey was performed at Pottapaug Pond in 2025, swollen bladderwort growth in harvested areas seemed to be less dense compared to 2024, mainly as a result of fewer flowering plants observed at the water's surface (though swollen bladderwort coverage remained high in these areas). When TRC returned to Pottapaug Pond in mid-June to inspect and clean the fragment barrier, TRC observed non-flowering plants that appeared to be large and healthy, indicating the presence of these plants after the harvesting season into mid-June.

In 2025, TRC focused harvesting effort on the vegetative form of swollen bladderwort. This was difficult to accomplish by hand, as these portions of the plant were often found close to the sediment. Using the handheld

plant rakes allowed harvesting in deeper areas, where plants would have been unreachable by hand. However, effective harvesting can only be accomplished in relatively shallow waters (approximately 5 feet) with rakes, due to reach limitations.

In 2025, TRC noted additional native bladderwort species in Pottapaug Pond, including purple bladderwort (Utricularia purpurea), creeping bladderwort (U. gibba), flat-leaved bladderwort (U. intermedia), and common bladderwort (U. vulgaris). The presence of native bladderworts growing amongst swollen bladderwort, as well as growth of the other aquatic plants, including native water lilies and the invasive variable leaf milfoil, resulted in bycatch during harvesting efforts (estimated to be approximately 5%, based on visual observations in the field).

O'Loughlin Pond

Harvesting at O'Loughlin Pond was conducted on June 4, 2025, simultaneously with the point-intercept survey. Follow up harvesting was conducted on June 9th, June 11th, and June 13th. Over four days, a total of 48 gallons of swollen bladderwort were harvested from O'Loughlin Pond. TRC harvested from OFRAG, OMB-1, OMB-3, and OMB-5 (Figure D). A total of 81 harvesting effort hours were spent at O'Loughlin Pond, with the most amount of hours being spent at PMB-5 (Figure E). No floating structures or flowers were observed, and only plants in their vegetative state were harvested.

In 2024, Only 33 swollen bladderwort plants were observed and harvested at O'Loughlin Pond, amounting to approximately one gallon of swollen bladderwort. The large increase in harvest volume from 2024 to 2025 can partly be attributed to targeting all forms of the plant in 2025 even when they are not exhibiting flowering features and remain in their vegetative state below the surface. Use of the handheld rakes also allowed for more efficient harvesting of swollen bladderwort plants found close to the sediment.

Notably, when harvesting around the O'Loughlin Pond fragment barrier, approximately 10 swollen bladderwort plants were observed and harvested on the downstream side of the barrier (toward Quabbin Reservoir).

Additional native bladderwort species observed in O'Loughlin Pond in 2025 included common bladderwort (which appeared to be the most dominant), purple bladderwort, and flat-leaved bladderwort.

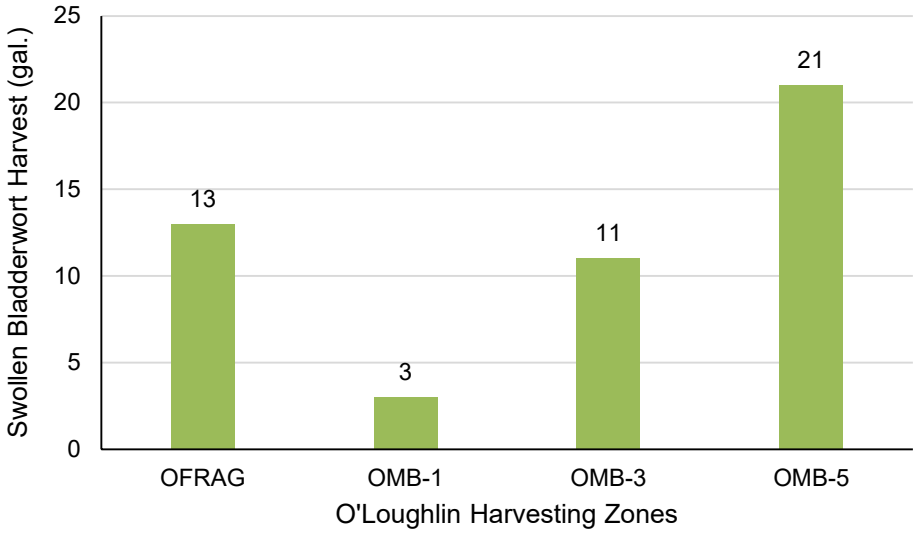

Figure D. Amount of Swollen Bladderwort Removed Per Harvesting Zone at O'Loughlin Pond in 2025

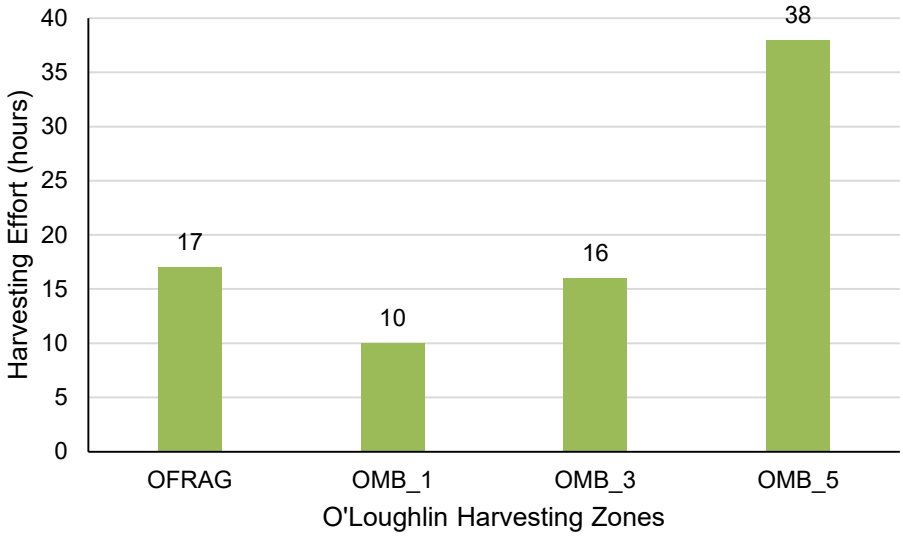

Figure E. Harvesting Effort Spent at each Harvesting Zone at O'Loughlin Pond in 2025

Management Options and Strategies

Hand Harvesting

Hand harvesting has been implemented as the primary management approach for removing swollen bladderwort at Pottapuag Pond, O'Loughlin Pond, and Quabbin Reservoir to date. Hand harvesting is the best way to manage this species while also minimizing fragmentation and impacts to surrounding native species. However, the extensive distribution of swollen bladderwort in Pottapaug Pond and O'Loughlin Pond makes it particularly challenging to achieve widespread control through hand harvesting efforts alone. Additionally, the plant is known to be found close to the sediment-water interface, and only a small percentage of plants develop floats and become reachable from the water's surface. Due to these factors, the use of handheld rakes in 2025 to harvest areas previously unreachable by hand was helpful. Dense growth of native water lilies and native bladderwort in Pottapaug Pond and O'Loughlin Pond also made it difficult to extract swollen bladderwort from shallow cove areas. However, conducting swollen bladderwort harvesting earlier in the season in 2025 than in prior years helped to reduce this impediment.

Diver Assisted Suction Harvesting (DASH)

Diver assisted suction harvesting (DASH) technology is similar to hand harvesting but uses divers to harvest in areas below the water's surface. DASH may be considered as a future alternative given the abundance of swollen bladderwort plant material near the sediment-water interface (in areas inaccessible to hand harvesters). An advantage of DASH is that divers can directly confirm removal of entire individual plants. Additionally, because DASH uses suction to bring harvested plants to the surface, it may result in less fragmentation of swollen bladderwort than hand harvesting.

Costs for implementing a DASH program can vary substantially dependent upon such factors as plant bed density, visibility, water current, availability of dewatering locations, and disposal. Particularly dense and extensive weed beds are likely to require multiple rounds of harvesting per season over several years to exhaust the beds. Additionally, fluctuating water levels and inability to access shallow areas of infestations may limit the effectiveness of DASH. Therefore, cost and operational feasibility may prohibit using DASH in certain areas, but it potentially could be a useful management technique under the correct environmental conditions.

Fragment Barriers

Fragment barriers are designed to contain aquatic plants and help prevent their spread to other areas of a water body. Fragment barriers consist of a floating boom with a weighted skirt beneath it, typically comprised of netting or mesh fabric that is sized to allow for water to pass through but captures plant fragments. Fragment barriers are currently placed at the Pottapaug Pond and O'Loughlin Pond inlets to Quabbin Reservoir, upstream of each horseshoe weir. A new fragment barrier was also placed at Pottapaug Pond along cove PC-1 in April 2025 (adjacent figure).

Fragment barrier deployed along cove PC-1 at Pottapaug Pond. May 28, 2025.

Additional fragment barriers may be added to help segregate areas of particularly dense swollen bladderwort growth from the rest of a waterbody. Fragment barriers may reduce the migration of plant fragments from one area of a water body to another and help slow down or prevent the spread of this aquatic species. Plant harvesting crews can also work within areas protected with fragment barriers, with less risk of fragments escaping the work areas. In order for fragment barriers to be effective, they need to have fine netting, as even small fragments of swollen bladderwort can spread and regrow. Fragment barriers should be placed where there is shoreline access. Areas of high currents should be avoided. Fragment barriers should periodically be maintained to ensure optimal functionality. In addition to adding more fragment barriers, TRC recommends maintaining the existing fragment barriers at Pottapaug Pond and O'Loughlin Pond. Particular care should be taken to monitor the area immediately upstream and downstream of the outlet fragment barriers to limit the chances of swollen bladderwort plant entering Quabbin Reservoir.

Water-Level Drawdown

Water-level drawdown can help control aquatic plants because it exposes plants to desiccation. Drawdown can temporarily reduce plant density in exposed areas. In Pottapaug Pond, O'Loughlin Pond, and Quabbin Reservoir, drawdown would need to occur to at least a depth of approximately 10 feet to cover the estimated suitable habitat range for swollen bladderwort.

Water-level drawdown is not recommended at Pottapaug Pond, O'Loughlin Pond, or Quabbin Reservoir. Drawdown can impact non-target organisms as water levels recede, and aquatic macrophyte species can respond differently to drawdown. Some species can increase in abundance with drawdown, while others may decrease. Utricularia sp. are shown to have no change in abundance with drawdown, likely due to their rootless nature (NHDES, 2010). Water level drawdowns are typically designed to occur gradually to allow for aquatic fauna to adapt to the change in water levels. However, this may provide rootless plants, such as Utricularia species, the ability to migrate with the receding water levels. Additionally, swollen bladderwort has been shown to adapt to receding water levels by forming branches with starch-filled tubers, that are believed to germinate once water levels rise, although the longevity of these tubers is unknown (Reinert and Godfrey, 1962). Drawing down water levels, particularly at Quabbin Reservoir, would also result in the displacement of a large volume of drinking water, which is not desirable for a source water reservoir.

TRC notes that water levels were lower from fall 2024 to spring 2025, causing a natural drawdown scenario at Quabbin Reservoir. In the 2025 harvest season, swollen bladderwort plants developed very few floats and flowering structures, which may have been a response to drought conditions. However, the effects of such environmental conditions on the plants have not been confirmed.

Benthic Barriers

This management method involves the use of negatively buoyant materials, usually in sheet form, to create benthic barriers, i.e., barriers that limit plant growth by obscuring light penetration, physically obstructing growth, and encouraging chemical reactions that are unfavorable to plants. Benthic barriers are a non-selective measure that will kill all plants under the sheets. Plants under the barrier will usually die within about a month following installation and barriers may be removed at that time or left in place indefinitely, although the latter approach is not generally recommended. In the case of plants that spread by seed or turion formation, benthic barriers should be kept in place over multiple growing seasons to exhaust the seedbank that may have been left behind by the original infestation. Where barriers are left in place, they should be monitored for condition and cleaned or replaced once they have begun to degrade or become covered by sediments.

Benthic barriers will not have a direct effect on swollen bladderwort, which is a free-floating rootless submersed plant that can survive in the water above benthic barriers. Although benthic barriers may not directly help control swollen bladderwort, benthic barriers can be used around boat launches to help minimize overall plant growth. This will make it easier for boaters to navigate to open waters and may reduce fragmentation of all plants. Additionally, by minimizing plant growth surrounding boat launches, it may be easier for swollen bladderwort to be spotted above the benthic barriers and will limit entanglement of swollen bladderwort with rooted native vegetation near the launches.

Herbicide

Several herbicides can be used to control bladderwort, including diquat (trade name Reward), fluridone (trade name Sonar), and flumioxazin (trade name Clipper). Diquat and flumioxazin are contact herbicides and are suitable for spot treatments. Fluridone is a systemic herbicide and must be applied to the entire water body and maintained at an effective concentration for a sufficient time period to be effective.

Herbicide use is not recommended at Pottapaug Pond, O'Loughlin Pond, or Quabbin Reservoir as they are part of a drinking water system. The use of herbicides for invasive plant control by MWRA and DCR is not a decision made lightly. Any such targeted application to control an aquatic invasive plant would require detailed analysis and authorization before being undertaken.

Boating-Related Risk

The potential for the spread of swollen bladderwort increases significantly when a water body is used by boats, especially motorized boats, which are more likely to cause fragmentation and facilitate dispersal of the plant. Swollen bladderwort is known to spread through fragmentation and even fragments as small as 1 cm can survive and re-grow (Titus and Urban, 2013).

In 2025, this plant was typically not observed in areas greater than 10 feet in depth and was absent from areas of greater fetch and water movement, preferring more shallow protected coves. However, it is understood that any boat fishing activity strictly limited to areas greater than 10 feet in depth would be difficult to enforce. Boats could drift into shallower areas and fishing lines can further spread this plant. Given the current distribution and density of swollen bladderwort on Pottapaug Pond and O'Loughlin Pond, a conservative and prudent approach would be to restrict all public boating on the pond until plant densities have decreased. A reassessment of recreational boating could be made once densities have been reduced through control efforts. Ideally, this would entail clearing coves entirely and opening up the pond incrementally, as even the smallest fragment can survive and re-grow. However, a more pragmatic approach could allow boating in areas where plants are not present above trace levels (i.e. no areas of contiguous plant cover). Boats should not be allowed into Quabbin Reservoir after visiting a regulating pond like Pottapaug Pond or O'Loughlin Pond without decontamination.

Recommendations

Should MWRA and DCR wish to continue to manage swollen bladderwort at Pottapaug Pond, O'Loughlin Pond, and within Quabbin Reservoir, TRC recommends the following:

1. TRC recommends continuing to harvest early in the season in May before the plant loses its key identifiable features and prior to the other native species, particularly the water lilies, reaching peak growth, making it difficult to navigate through the cove areas.
2. Pre-harvest surveys should continue at Quabbin Reservoir and O'Loughlin Pond to document the spread of swollen bladderwort and the success of any management activities. Surveys should focus particularly on the protected littoral areas of the waterbodies where the plant will most likely be found. Surveys should quantify both plant floating structures and the density of the underwater portions of the plant. TRC recommends using methods like handheld rakes or underwater cameras to better capture density of the plant that may not be visible from the water's surface.
3. TRC recommends continuing to prioritize Quabbin Reservoir. Although very few swollen bladderwort fragments were observed in Quabbin Reservoir during the 2025 harvesting season, potential plant beds were observed during the 2024 harvesting season. These areas of potentially dense swollen bladderwort growth were located in cove areas that were exposed during the 2024 drought, and some of these locations remained inaccessible during the 2025 survey and harvesting period. However, future years should continue to investigate these areas if reachable to ensure no plant beds are present.
4. TRC recommends including a pre-harvest survey at Quabbin Reservoir near BLA #2 in 2026. Risk of introduction to this areas of the reservoir is high; swollen bladderwort was observed between the fragment barrier and outlet at O'Loughlin Pond in June 2025. It would be prudent to map additional areas of Quabbin Reservoir to ensure the plant is not growing in other sections of the reservoir not captured by the 2025 surveys near BLA #3.
5. Assuming the priority of harvesting efforts at the waterbodies remains 1) Quabbin Reservoir, 2) O'Loughlin Pond, and 3) Pottapaug Pond, TRC recommends completing harvesting efforts at O'Loughlin Pond prior to relocating harvesting efforts to Pottapaug Pond. At the current level of effort, substantial control may be possible at O'Loughlin. Eradication at Pottapaug is not realistic, although focused harvesting could be used to maintain small areas near the boat launch.

Please do not hesitate to contact the undersigned at (781) 419-7707 should you have any questions.

Sincerely,

TRC ENVIRONMENTAL CORPORATION

Margaret O'Brien
Project Manager

Attachments: Figure 1 – Swollen Bladderwort Cover – Quabbin Reservoir
Figure 2 – Swollen Bladderwort Cover – O'Loughlin Pond
Attachment A – DCR AIS Management Priority Zones
Attachment B – Summary of Survey and Harvesting Work in 2025

References

GEI Consultants. May 2024. “2023 MWRA Reservoir Aquatic Macrophyte and Water Quality Analysis Draft Report, Massachusetts Water Resource Authority, Southborough, MA”.

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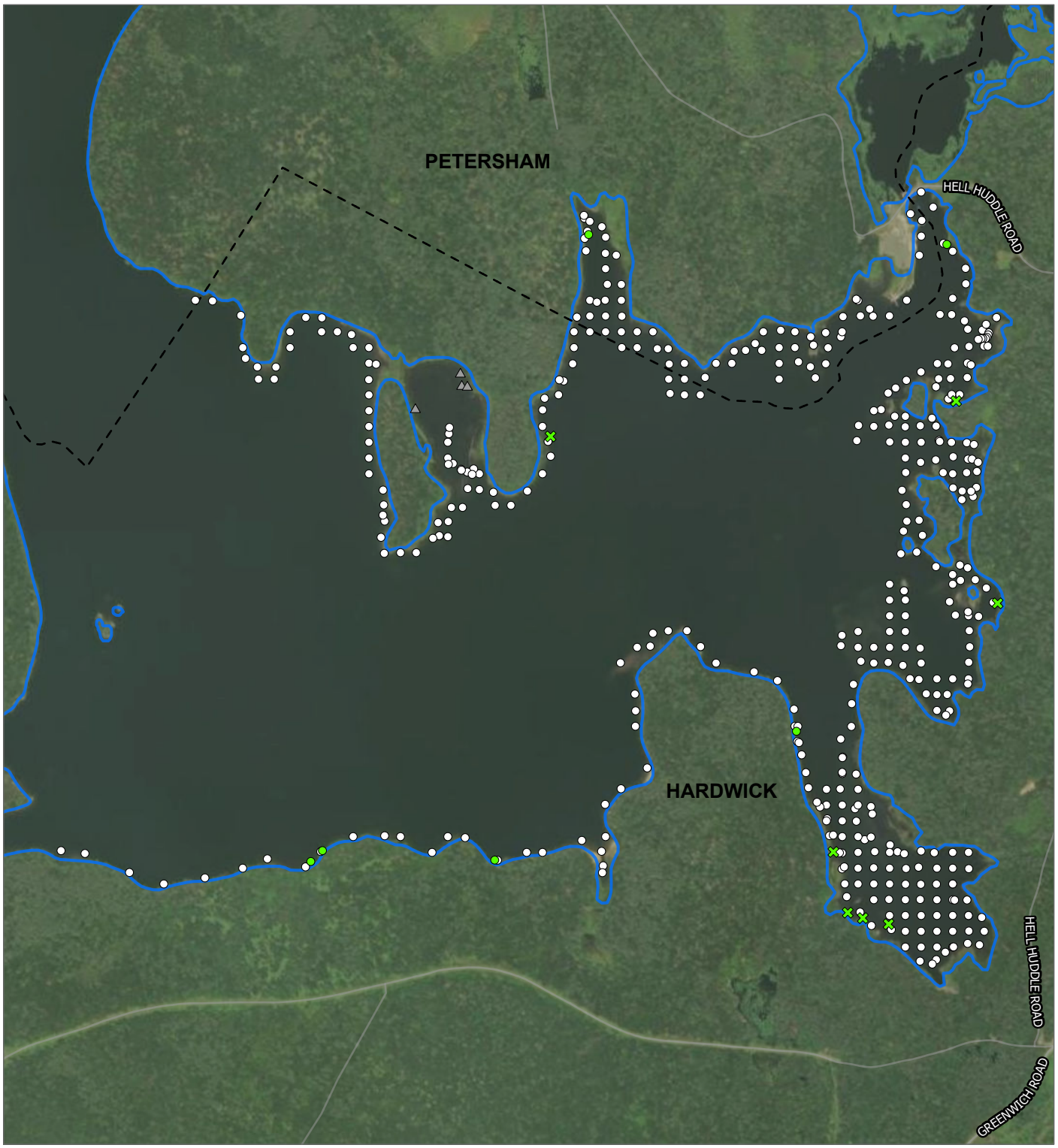
FIGURES



SWOLLEN BLADDERWORT COVERAGE

*MAY 2025 SURVEY**

- 0% (430 POINTS)
- 1% - 25% (6 POINTS)
- 26% - 50% (0 POINTS)
- 51% - 75% (0 POINTS)
- 76% - 100% (0 POINTS)

*JUNE 2025 SURVEY***

- 1% - 25% (7 POINTS)
- NOT SURVEYED DUE TO DROUGHT (4 POINTS)

SHORELINE

TOWN BOUNDARIES

*ONLY FLOATING FRAGMENTS OF SWOLLEN BLADDERWORT WERE OBSERVED DURING THE MAY SURVEY.

**FOR THE JUNE SURVEY, ONLY POINTS WHERE SWOLLEN BLADDERWORT WAS FOUND ARE SHOWN. ALL OTHER TARGET POINTS HAD NO SWOLLEN BLADDERWORT.

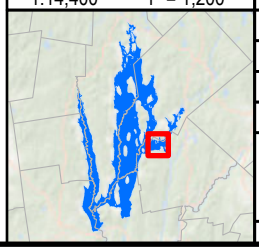
BASE MAP: ESRI WORLD IMAGERY 2023
DATA SOURCES: TRC GPS LOCATIONS 05/14, 05/15, 06/05, 06/06 2025

N

0 600 1,200

FEET

1:14,400 1" = 1,200'



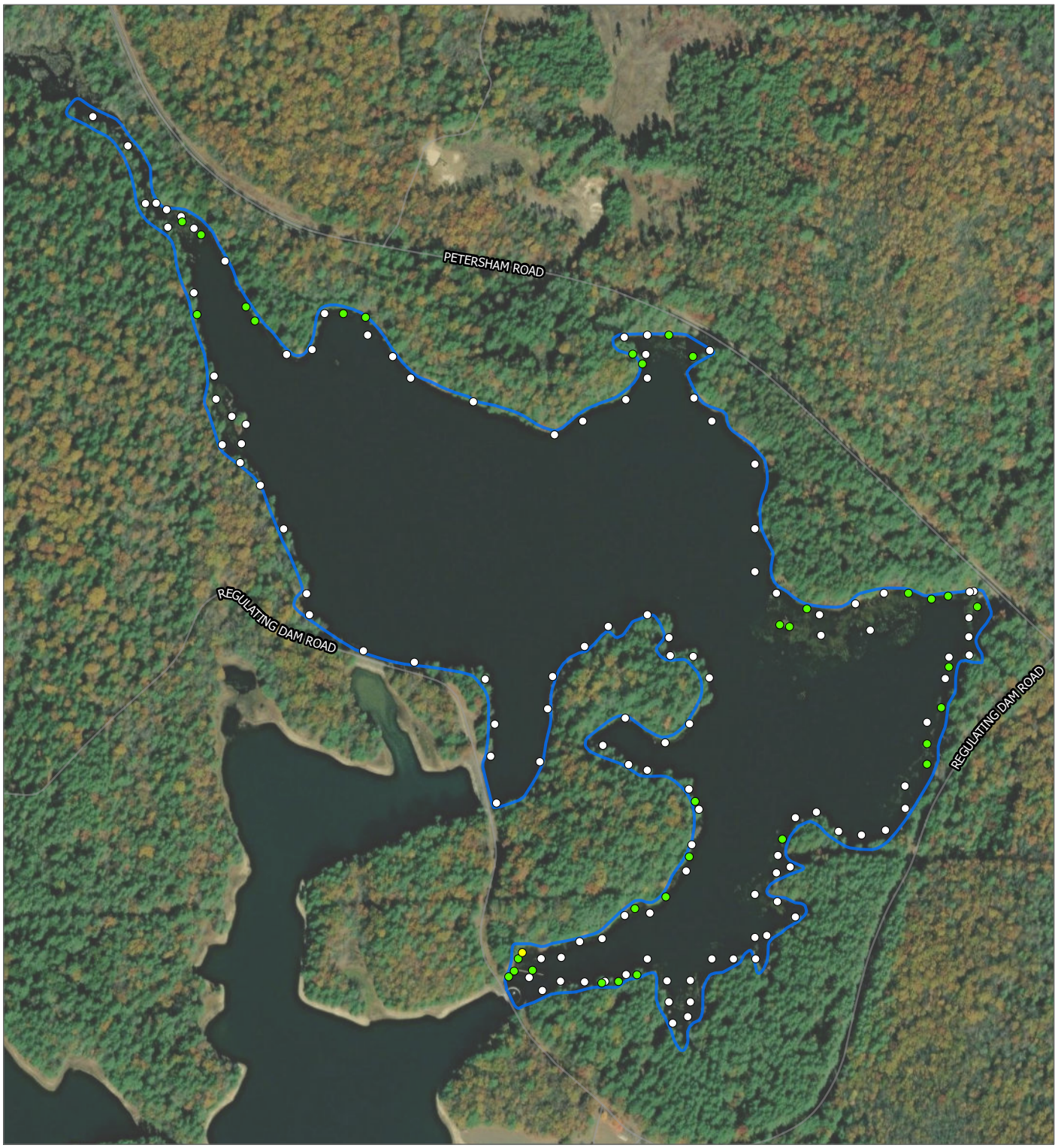
PROJECT: **MWRA BLADDERWORT MANAGEMENT**
QUABBIN RESERVOIR - EAST BASIN
TOWNS OF PETERSHAM AND HARDWICK, MA

TITLE:
QUABBIN RESERVOIR SWOLLEN BLADDERWORT COVERAGE

DRAWN BY:	T. LATHAM	PROJ. NO.:	657596.0000.0000
CHECKED BY:	K. BACHAND		
APPROVED BY:	M. O'BRIEN		**FIGURE 1**
DATE:	JULY 2025		

TRC
404 WYMAN STREET
SUITE 375
WALTHAM, MA 02451
PHONE: 781.419.7696

FILE: 657596_QUABBINBLADDERWORT_FIGS



SWOLLEN BLADDERWORT COVERAGE

- 0% (118 POINTS)
- 1% - 25% (34 POINTS)
- 26% - 50% (1 POINTS)
- 51% - 75% (0 POINTS)
- 76% - 100% (0 POINTS)

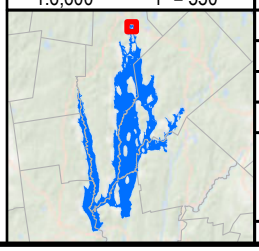
SHORELINE

N

0 275 550

FEET

1:6,600 1" = 550'



BASE MAP: ESRI WORLD IMAGERY 2023
DATA SOURCES: TRC GPS LOCATIONS 06/04/2025

PROJECT: **MWRA BLADDERWORT MANAGEMENT**
QUABBIN RESERVOIR - O'LOUGHLIN POND
TOWN OF NEW SALEM, MA

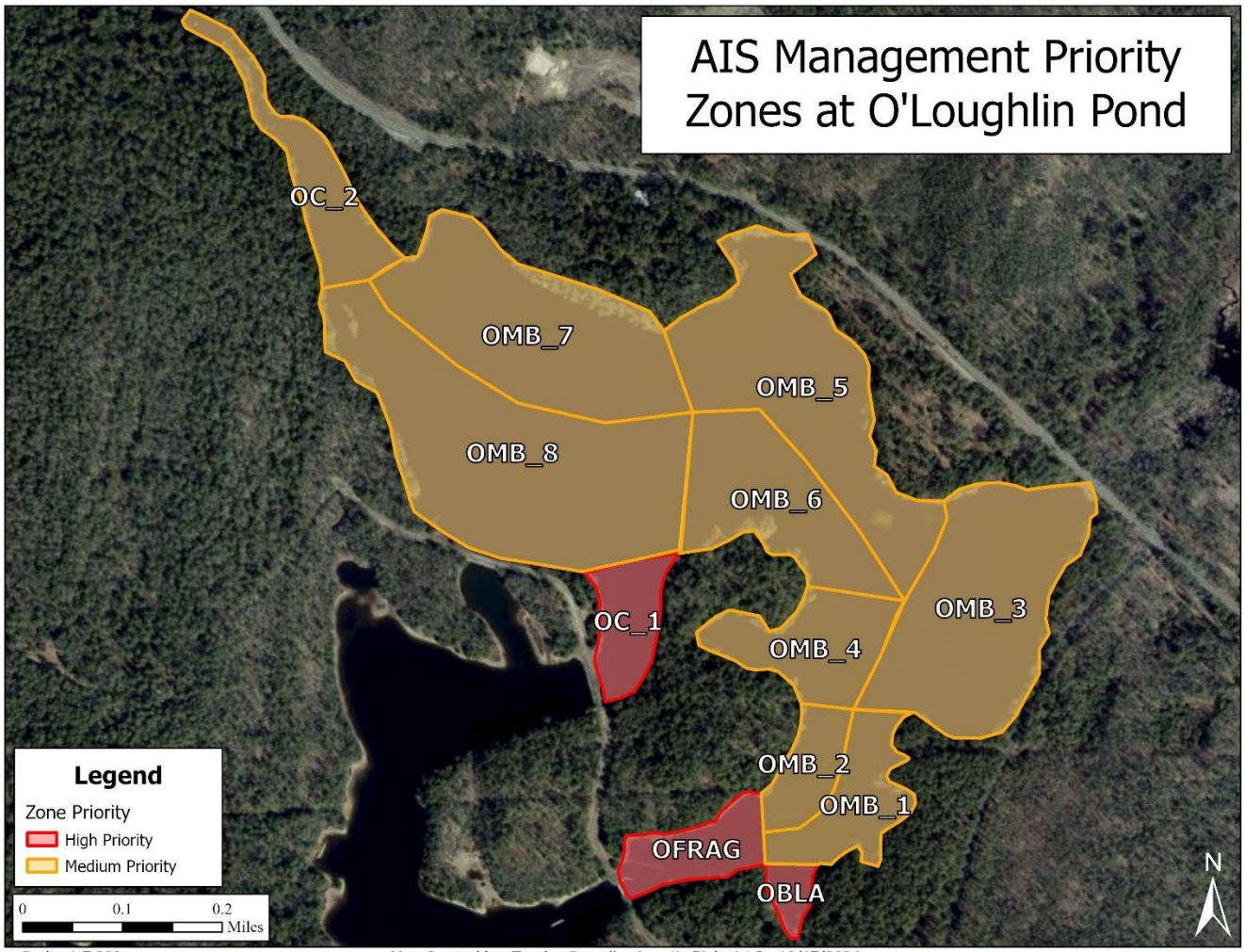
TITLE:
O'LOUGHLIN POND
SWOLLEN BLADDERWORT COVERAGE

DRAWN BY:	T. LATHAM	PROJ. NO.:	657596.0000.0000
CHECKED BY:	K. BACHAND		
APPROVED BY:	M. O'BRIEN		**FIGURE 2**
DATE:	JULY 2025		

TRC
404 WYMAN STREET
SUITE 375
WALTHAM, MA 02451
PHONE: 781.419.7696

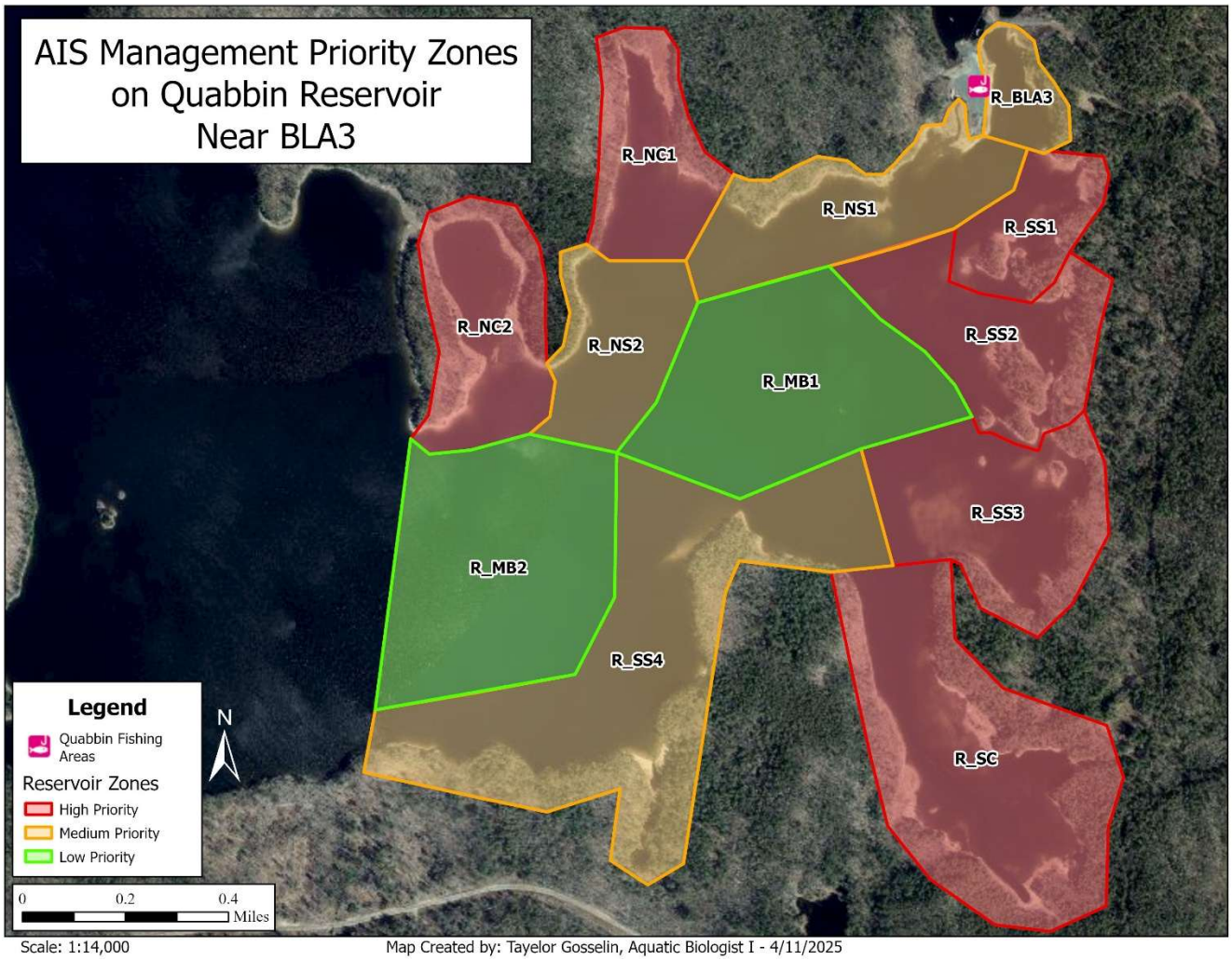
FILE: 657596_QUABBINBLADDERWORT_FIGS

Attachment A – DCR AIS Management Priority Zones



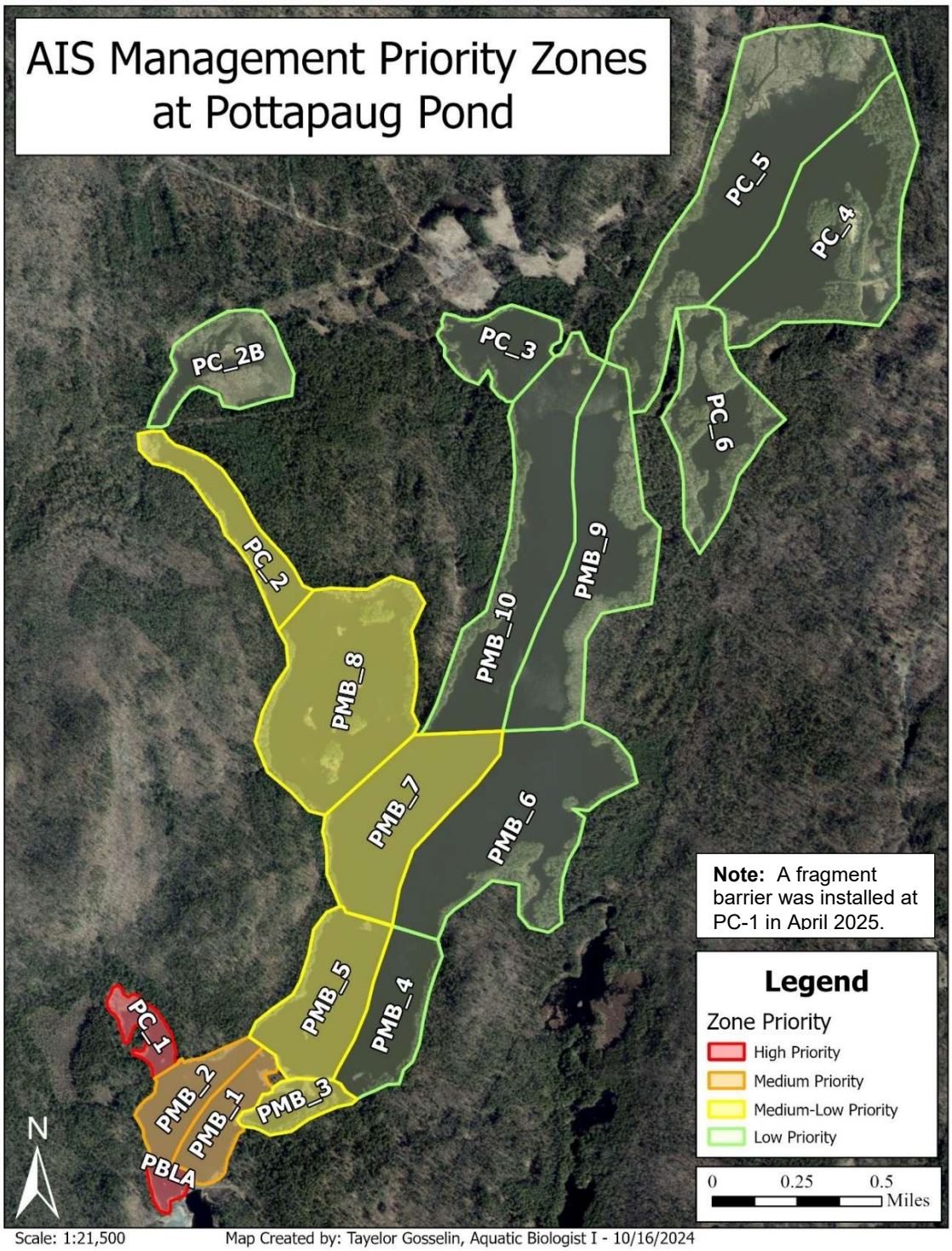
Scale: 1:7,300

Map Created by: Tayelor Gosselin, Aquatic Biologist I - 10/17/2024



Scale: 1:14,000

Map Created by: Tayelor Gosselin, Aquatic Biologist I - 4/11/2025



Scale: 1:21,500

Map Created by: Tayelor Gosselin, Aquatic Biologist I - 10/16/2024

Attachment B – Summary of Survey and Harvesting Work

Date	Harvest Day No.	Event	Location	# TRC Staff	Notes
May 12		Initial Survey	Quabbin	2	Surveyed Quabbin's northern shoreline from kayaks. Observed some potential swollen bladderwort fragments. Harvested any fragments observed.
May 14-15		Point-Intercept Survey	Quabbin	4	Surveyed Quabbin area around BLA #3. Observed a few more floating fragments for potential swollen bladderwort. Harvested any fragments observed.
End of Survey Week					
May 19	1	Harvesting	Pottapaug	4	Harvested in PBLA. Completed harvesting in this area so moved to PC-1. Very few floating structures observed. Most of the plant mass observed down by the sediment in dense mats. Growth in PBLA and PC-1 notably less dense than last year. 3 gallons harvested (PBLA) and 14 gallons harvested (PC-1)
May 20	2	Harvesting	Pottapaug	4	Harvested in PC-1. Completed harvesting in this area so moved to PMB-2. Very few floating structures observed. Most of the plant mass observed down by the sediment in dense mats. 13 gallons harvested (PC-1) and 15 gallons harvested (PMB-2)
May 21	3	Harvesting	Pottapaug	4	Harvested in PMB-2. Very few floating structures observed. Most of the plant mass observed down by the sediment in dense mats. 21 gallons harvested (PMB-2)
May 22		NA	NA	NA	Cancelled because of weather
May 23		NA	NA	NA	Cancelled because of weather
End of Harvesting Week 1					
May 27	4	Harvesting	Pottapaug	4	Harvested in PC-1. Observed dense plant beds closer to the fragment barrier down by the sediment. Only around 5 floating structures observed. Algal bloom observed in the rest of the pond. 64 gallons harvested (PC-1)
May 28	5	Harvesting	Pottapaug	4	Harvested in PC-1. Second check upstream in cove area and did not find much. Denser plant beds south of the island in the cove. Algal bloom still apparent but not as bad as 5/27. 30 gallons harvested (PC-1)
May 29	6	Harvesting	Pottapaug	4	Harvested in PC-1. Continued harvesting dense plant beds down by sediment. 53 gallons harvested (PC-1)

Date	Harvest Day No.	Event	Location	# TRC Staff	Notes
May 30	7	Harvesting	Pottapaug	4	Harvested in PC-1. Continued harvesting dense plant beds down by sediment. 45 gallons harvested (PC-1)
End of Harvesting Week 2					
June 2		NA	NA	NA	Cancelled because of staffing shortage
June 3	8	Harvesting	Pottapaug	4	Harvested in PC-1. Continued harvesting dense plant beds down by sediment. 27 gallons harvested (PC-1)
June 4		Survey	O'Loughlin	4	Conducted survey at O'Loughlin. No flowers/floating structures observed. Several floating plant fragments observed and harvested. A few areas were plants seemed to be denser down by the sediment. 6 gallons harvested (OFRAG)
June 5	9	Harvesting	Quabbin	4	Conducted second harvest/survey at Quabbin. Very few floating fragments of the plant observed. No plants observed down by the sediment.
June 6	10	Harvesting	Quabbin	4	Conducted second harvest/survey at Quabbin. Very few floating fragments of the plant observed. No plants observed down by the sediment.
End of Harvesting Week 3					
June 9	11	Contingency Harvesting	O'Loughlin	4	Conducted harvesting at O'Loughlin. Started at OFRAG, and then moved to cove in OMB_5. 7 gallons harvested at OFRAG and 15 gallons harvested at OMB_5.
June 10		NA	NA	NA	Cancelled because of weather
June 11	12	Contingency Harvesting	O'Loughlin	4	Conducted harvesting at O'Loughlin. Started at OFRAG, but harvested only a handful of plants. Looked along shoreline of OMB_2. Then moved along shoreline to cove in OMB_3 and cove in OMB_5. Targeting mostly scattered floating fragments, some difficulty in winds. 2 gallons harvested at OMB_3 and 2 gallons harvested at OMB_5.
June 12		NA	NA	NA	Cancelled because of weather

Date	Harvest Day No.	Event	Location	# TRC Staff	Notes
June 13	13	Contingency Harvesting	O'Loughlin	4	Conducted harvesting at O'Loughlin. Started along shoreline from launch to OMB_1 and OMB_3. Worked in OMB_3. Then double checked the OFRAG and then moved along shoreline up to OMB_5. Observed many floating fragments. 3 gallons harvested in OMB-1, 9 gallons harvested in OMB_3 and 4 gallons harvested in OMB_5.
End of Harvesting Week 4					
June 17		Initial Survey	Pottapaug	2	Cleaning Pottapaug fragment barrier.