



# FINAL REPORT

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**Prepared By:** Brian Greene, Aquatic Invasive Species Coordinator  
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## PREVENTING AQUATIC INVASIVE SPECIES SPREAD THROUGH TARGETED REMOVAL

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### CONTACT INFORMATION

Brian Greene  
The Nature Conservancy / Adirondack Park Invasive Plant Program  
PO Box 65 Keene Valley, NY 12943  
518-576-2082 / [brian.greene@tnc.org](mailto:brian.greene@tnc.org)

## **PREVENTING AQUATIC INVASIVE SPECIES SPREAD THROUGH TARGETED REMOVAL**

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## **EXECUTIVE SUMMARY**

The Adirondack Park Invasive Plant Program (APIPP), hosted by The Nature Conservancy, conducted a pilot program at five boat launches on the New York side of Lake Champlain that are heavily infested with aquatic invasive species (AIS). This project tested the effectiveness of reducing the spread of AIS throughout the Lake Champlain Basin by targeted removal of invasive plants at the boat launch sites.

APIPP hired a contractor to remove aquatic invasive plant species, Eurasian watermilfoil and curly leaf pondweed, by diver assisted suction harvesting (DASH) from the areas adjacent to the boat launches. APIPP staff monitored the location, abundance and frequency of invasive plants pre- and post-harvesting using visual and point-intercept monitoring methods. The contractors recorded the location and the amount of invasive plants removed from each boat launch.

The intended outcome of this project was to reduce AIS spread from retrieving boats by decreasing invasive plant propagule pressure by lowering the amount of retrieving boats with invasive plants present. APIPP partnered with the Paul Smith's College Adirondack Watershed Institute (AWI) watercraft inspection stewards that collect data on AIS presence on retrieving boats at these boat launches. The project was successful in collecting multiple lines of data to establish baseline conditions and provide a dataset to track long term trends and assess project success.

In 2023 the contractor worked at five boat launches and removed 110 bags of invasive plants estimated to weigh 3,374 lbs. The contractor was able to provide expert insights on characteristics of the launches that make DASH more efficient at some sites versus other factors, such as water clarity and native plant growth. Based on these insights in 2024 the contractor worked at three boat launches and removed 107 bags with an estimated weight of 4430 lbs. APIPP documented the presence of the AIS both in the area immediately at the boat launches and in other locations within a half-mile radius. The pre-management point-intercept surveys were conducted in late May and early June of 2023 before the first harvesting took place. The results of the post-management surveys in September 2023 and 2024 indicated that Eurasian watermilfoil populations held steady or declined at sites with two years of management, but milfoil populations increased at sites with only one year of management. This is consistent with work done at other sites that demonstrate long term management is typically needed to significantly reduce AIS populations. There were some indications of lowered spread risk due to decreases in retrieving boats with Eurasian watermilfoil, but it was not a strong signal. In part this is due to data quality issues in boat steward reporting and also due to the variability in boat steward coverage and natural year to year changes.

The results from this pilot project indicate that targeted reduction of AIS at some boat launches via DASH harvesting will help reduce the spread of AIS in sites that have favorable conditions for DASH. However, to confirm that these results are due to DASH management actions continued DASH management is needed for multiple years and better steward data collection is needed. As such, APIPP suggests that DASH continue at Port Douglas, Port Henry, and Willsboro and that the other sites less conducive to DASH be further evaluated for a different management technique (such as chemical treatment or benthic mats) or for testing whether incentives to get boaters to decontaminate when leaving Lake Champlain would be more effective strategies.

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## 1. PROJECT SYNOPSIS

Aquatic invasive species (AIS) threaten the health and resiliency of ecosystems throughout the Lake Champlain Basin and the Adirondack region. Boats (especially motorboats on trailers) are a major vector for AIS spread as they are moved from one lake to another. Most lakes in the Adirondack region are AIS free, but Lake Champlain has many AIS that threaten other lakes. The abundance of AIS in Lake Champlain makes complete eradication of AIS cost prohibitive. Communities, lake associations, and state agencies need a cost-effective and strategic way to reduce the threat of further AIS spread. Targeting AIS removal at boat launches that are heavily infested may provide a solution. This project aligns with LCBP’s Healthy Ecosystems Goal and the objective to prevent the spread of AIS (objective II.C and strategies II.C.2 and II.C.3).

The primary objective of this project is to determine if diver assisted suction harvesting (DASH) of *Myriophyllum spicatum* (Eurasian watermilfoil abbreviated as EWM) at infested boat launch sites on Lake Champlain can help prevent the spread of this species to other waterways in the Lake Champlain Basin by reducing its amount on retrieving boats. Due to the widespread distribution of EWM, it is not possible to cost-effectively control all infestations in Lake Champlain. Should this pilot project prove successful, however, it is hoped that partners and municipalities in other areas could use this management strategy to effectively limit the spread of this invasive species to other waterbodies.

To complete this objective, The Nature Conservancy (TNC) contracted with a qualified DASH team to conduct the removal of EWM and other invasive plants like *Potamogeton crispus* (curly leaf pondweed abbreviated as CLP). APIPP documented the presence of invasive plants via visual and point-intercept monitoring methods at the boat launch and in areas of up to 0.5 miles of the launches. By conducting pre- and post-management monitoring using point intercept monitoring APIPP was able to track if the abundance and frequency of AIS plants were reduced. In addition, APIPP worked with Paul Smith’s College Adirondack Watershed Institute’s (AWI) Watercraft Inspection Stewards to collect data on the presence of AIS plants on retrieving boats at the identified boat-launch sites to assess the outcomes.

## 2. TASKS COMPLETED

Task #	Task title	Objective	Deliverables and/or Outputs	Timeline
1.1	Choose contractor to harvest AIS via DASH	Contractor selected to perform the work to remove AIS.	Consultant chosen and contract signed.	March 2023

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1.2	Develop QAPP	Describe quality assurance procedures that will maintain project performance and data quality.	QAPP approved.	March - May 2023
1.3	Apply for permits	Apply for necessary permits to remove AIS from boat launches.	Permits approved.	April-May 2023
1.4	Coordinate with AWI on watercraft inspection stewards	Ensure that boat launches will have boat stewards to collect data. Provide information and meet with stewards so they understand the project.	Plan and schedule for stewards at boat launches in place.	April-June 2023
1.5	Collect pre-management data	APIPP data collection on site to record presence, area, and abundance of AIS. AWI data collection on boats with AIS observed on retrieving boats.	Pre-management data collected, including AIS frequency, area and density/abundance (APIPP) at each site and the number and percentage of retrieving boats (AWI) with AIS.	May - June 2023
1.6	Contractor removal of AIS at boat launches early season	AIS plants removed from boat launches.	Location, species, and amount of AIS harvested for each boat launch recorded at 5 launch sites.	June 2023
2.1	Contractor removal of AIS at boat launches late season	AIS removed from boat launches.	Location, species, and amount of AIS harvested for each boat launch recorded at five boat launch sites.	August 2023

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2.2	Collect post-management data	APIPP data collection on site to record presence, area, and density of AIS. AWI data collection on boats and AIS observed on retrieving boats.	Post-management data collected, including AIS frequency, area and density/abundance (APIPP) at each site and the number and percentage of retrieving boats (AWI) with AIS.	August-September 2023
3.1	Choose contractor to harvest AIS in 2024	Contractor selected to perform the work to remove AIS.	Consultant chosen and contract signed	March-June 2024
3.2	Apply for permits	Apply for necessary permits to remove AIS from boat launches.	Permits approved	April 2024
3.3	Coordinate with AWI on watercraft inspection stewards	Ensure that boat launches will have boat stewards to collect data. Assist with training of stewards.	Plan and schedule for stewards at boat launches in place	April - May 2024

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3.4	Contractor removal of AIS at boat launches in 2024	EWM removed from boat launches.	Location, species, and amount of AIS harvested for each boat launch recorded at 2 launch sites	August 2024
3.5	Collect post-management data	APIPP data collection on site to record presence, area, and density of AIS. AWI data collection on boats and AIS observed on retrieving boats.	Post-management data collected including AIS frequency, area and density/abundance (APIPP) at each site and the number and percentage of retrieving boats (AWI) with AIS	August-September 2024
4.1	Analysis	Data analysis to compare the success of the AIS removal and the effectiveness of decreasing the percent of retrieving boats with AIS.	Tables, charts, and reports prepared.	October-December 2024
4.2	Reporting	<p>Complete quarterly reporting requirements.</p> <p>Compile project summary and all project deliverables (data, maps, charts, photographs, etc.) into a final report and project metrics report.</p>	<p>Quarterly Reports submitted.</p> <p>Final report approved (pending )</p> <p>Data and photos submitted.</p>	<p>Quarterly reports submitted throughout contract period.</p> <p>Final Report due 12/31/24</p>



### **3. METHODOLOGY**

#### AIS Plant Harvesting

APIPP hired New England Aquatic Services to perform DASH. Their work focused on the removal of EWM and CLP. APIPP created a [data reporting survey123 form](#) to collect the following information at each location on the water where they removed plants.

- Location
- Species or species harvested
- Number of bags harvested at that location
  - A subsample of the bags were weighed and the weight was recorded in pounds. From this APIPP was able to create an average weight per bag for each boat launch and used that to calculate an overall estimated weight of plants removed.

New England Aquatic Services completed the forms each day they worked and APIPP reviewed the data for QAQC.

#### Aquatic Plant Monitoring

APIPP conducted two types of aquatic plant surveys to assess the population of AIS. First at the 10 acres immediately adjacent to the boat launch APIPP conducted a standard point-intercept monitoring method using rake tosses to assess the frequency and abundance of invasive plant species. Each site had 20 monitoring points in a half-acre grid. At each site two rake tosses were collected to assess the plant populations. Data were recorded using the relative abundance scale based on US Army Corp/Cornell/Citizens Statewide Lake Assessment Program. At each monitoring point the following protocol was used to collect information that was recorded in a [survey123 form](#):

1. Navigate to monitoring point and lower anchor to steady boat.
2. Perform two rake tosses at each location. Rake will be thrown out on either side of the boat and dragged across the bottom to collect plants. The following data will be collected:
  - a. Location
  - b. Boat Launch
  - c. Point ID Number
  - d. Rake Toss Number
  - e. Depth

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- f. Total whole rake plant abundance following the [Cornell/CSLAP scale](#)
  - i. 0 – No plants, bare rake
  - ii. 1 –Trace, fingerful of plants on rake
  - iii. 2 –Sparse, handful of plants on rake
  - iv. 3 –Medium, most to all times on rake covered with plants
  - v. 4 –Dense, difficult to bring into boat
- g. Invasive species:
  - i. Identification
  - ii. Total plant abundance following Cornell/CSLAP scale
  - iii. Percent of rake toss the IS plants represents
- h. Native Species
  - i. Total plant density following Cornell/CSLAP scale
  - ii. Percent of rake toss the collective native species represents
- i. Rough Species Richness – The count of total species. While not the goal to identify every species - a general identification will be performed.
- j. Notes and Photos – as needed

This aquatic plant point-intercept monitoring was conducted once in early June before any harvesting occurred and served as APIPP’s pre-management data set. It was then repeated in September 2023 and 2024, using the same locations and methods, following the DASH activities that removed AIS and served as the post-management data set. All data collection was carried out by the project manager, Brian Greene, and APIPP aquatic seasonal assistant Dana Holmlund. This helped to minimize potential variation between data collection. All data was entered in the field on electronic tablets and checked for QAQC.

The second type of plant monitoring used standard visual and rake-toss survey methods to identify and map areas of invasive plant beds. This work was conducted in 2023 by Adirondack Research’s early detection team, under a contract with APIPP that was funded from private funds from TNC. In this monitoring protocol the contracted team used a meander pattern through the littoral zone of a lake looking for AIS visually and using random rake tosses to search for invasive plant beds. Once found AIS are identified and delineated in the field using GPS enabled tablets. The early detection team searched in an approximately half-mile radius around the boat launches to identify any potential AIS beds that could be sources of fragments but that are outside the immediate 10-acre zone of point-intercept monitoring and DASH treatment area.

### AWI Watercraft Inspection

Each of the boat launches had AWI watercraft inspection stewards stationed at them. Commonly called boat stewards, they are trained staff that focus on educating boaters and preventing the spread of AIS by identifying boats that are transporting AIS. All staff go through an extensive training program, so they are properly able to identify and report AIS moving on boats, trailers, and other equipment. All data are recorded on the statewide Watercraft Inspection Stewardship Program Application (WISPA) which is a survey123 form that collects a suite of information for each boat entering and leaving a boat launch while a steward is present. This data is reviewed by AWI staff for QAQC. Each time a boat left the launch while a boat steward was on duty, permission would be asked for a steward to do a visual survey of the boat, equipment, and the trailer. The boat steward would visually check if any AIS material such as plant fragments or invasive mussel shells were present on the equipment. These observations

were recorded in a standardized way on the WISPA database. This systematic monitoring allows for a comparison of results and trends over time from each of the boat launches.

APIPP acquired all records submitted to the WISPA database for 2021-2023 for the five boat launches that this project worked on. To assess the effectiveness of DASH to reduce the spread of invasive plants, APIPP focused on the data variables of 1) number of retrieving boats (those are boats leaving a launch) and 2) the count of these boats that had EWM or CLP.

It is important to note that boat stewards are not present at all times. Thus this data only reflects boats that were inspected when stewards were on duty. Also the number of days boat stewards are on duty varies by boat launch and year-to-year. Add on top of this the natural variability in outdoor recreation use, weather, having multiple boat stewards working at locations, and different patterns of plant growth over the years, which creates a lot of variables that make comparing data a challenge. Efforts were taken to standardize the data-collection efforts, such as comparing percent of boats with AIS present or focusing in on key periods of time, but the small number of boats with AIS and the non-normal distribution of the data made statistical analysis a challenge.

### **3. QUALITY ASSURANCE TASKS COMPLETED**

APIPP wrote a [QAPP](#) that was approved by NEIWPC and the US EPA on May 22, 2023. APIPP distributed electronic and paper copies to all parties that were involved and reviewed the relevant sections that people needed to follow with them. The monitoring data collected about aquatic plants and recreational boat use met the quality assurance objectives outlined in the QAPP. Data quality was measured in terms of accuracy and precision, completeness, representativeness, and comparability. All data was collected by trained professionals using documented standard operating procedures and was reviewed by the project manager. Suspect or questionable data was corrected if possible and, if not possible, removed from data sets and not used for reporting or analysis.

After review of the data there were only a few incidents where transcription errors occurred (like recording the wrong date or boat launch location) or entering duplicate records. These errors were fixed by the project manager in the QAQC data review. All data has been stored on TNC's cloud-based storage software and are ready to be transferred to LCBP/NEIWPC in electronic formats when LCBP/NEIWPC is ready to accept the files.

Proper steps were taken by all staff to ensure that all equipment was cleaned, drained, and dried before entering a new waterbody.

### **4. DELIVERABLES COMPLETED**

Overall, APIPP was able to complete all tasks and deliverables successfully and on time. This project has created a wealth of data and knowledge about management and assessment of aquatic invasive plant control at boat launches. APIPP was able to reach the primary goal of this pilot project which was to learn and assess the effectiveness of using DASH at areas around boat launches to reduce the spread of aquatic plant propagules. The data indicate that one year is not enough time to significantly reduce AIS populations or see measurable decreases in the amount of invasive plant propagules leaving on boats. This was not unexpected as aquatic plant management typically takes years to reach its goals. The sites that had two years of management had EWM populations that remained stable or decreased, but sites with only one

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year of management saw EWM populations increase. APIPP was able to learn about what areas respond well to DASH and which boat launches future efforts should focus on to continue work. APIPP anticipates that a few sites could see long term reductions in invasive plant populations and a decrease in AIS propagule spread on boats if DASH work is continued in future years.

The following paragraphs will focus on monitoring data collected for DASH management, aquatic plant surveys, and recreational boat use from the WISPA database. There is also an appendix for each of these sections that has full maps and graphs for each boat launch.

### **DASH Management - Tasks 1.6, 2.1, and 3.3**

In a pre-project proof of concept test, in 2022, APIPP contracted with a company to have DASH removal work done at Westport, Port Henry, and Ticonderoga for one day each. This was to test if it was possible to harvest at these locations; only a small number of plants were removed. APIPP assumes that the influence of this single-day management was relatively limited, but it is important to note that there could be some influences on these sites having had an extra day of management in the previous year.

In 2023 APIPP contracted with New England Aquatic Services to remove EWM and CLP by the DASH method. New England Aquatic Services has years of experience doing this type of work and worked closely with the APIPP project manager to assure that all staff followed the correct reporting standard operating procedures. The team of divers had all equipment decontaminated by the AWI boat stewards before they started work in Lake Champlain.



Photo 1 – Equipment being decontaminated by AWI boat steward.

The team conducted the DASH removal at two time periods in 2023. First there was an early season removal that occurred June 12-16. This earlier date allowed for the team to remove CLP that was present before it went dormant. The team was also able to remove Eurasian watermilfoil that was present, but not yet at full growth. The team then returned and harvested

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invasive plants on July 31 – Aug. 3 and then again on Aug. 15-17. The primary target in this second period was mature EWM, but the team did also find some curly leaf pondweed still present, but at much lower amounts than the removal in June. See Graph 1 in the DASH Appendix for results.

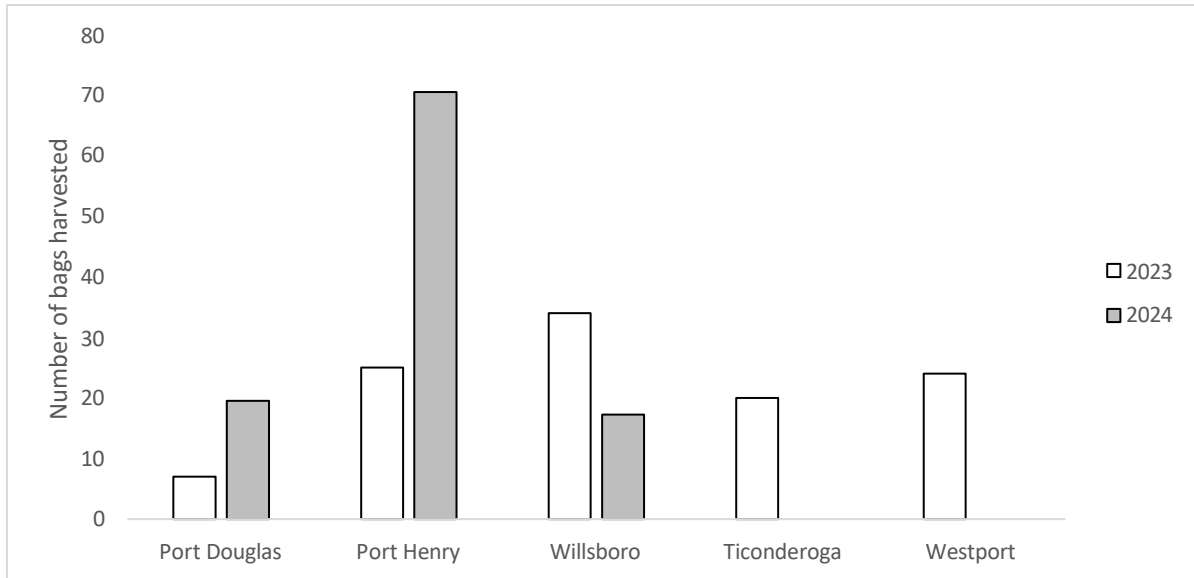
In 2024 New England Aquatic Services returned to conduct another year of AIS removal. This year the team focused on EWM harvesting at the three boat launches that were most favorable for DASH management (Port Douglas, Willsboro, and Port Henry). The team worked from August 12-17 and focused on removing EWM.



Photo 2 – Bags of invasive plant material collected and the DASH equipment.

All data was recorded in a survey123 form and reviewed by the project manager. Overall for the two years the team was able to remove 217 bags of invasive plant material. This is an estimated 7800 lbs. Amounts varied from seven bags at Port Douglas to 70 bags at Port Douglas (see Table 1 and 2 in Appendix DASH). Here is a graph of the invasive plants removed.

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Graph 1 – 2023 and 2024 DASH harvesting amounts by boat launch.

In the Appendix for Diver Assisted Suction Harvesting you can see a map of the locations around the boat launch where plants were harvested. The color of the point is based on the species or species collected and the size of the point is related to the number of bags collected at that location. Each point represents plants harvested in an approximately 25-foot circle around the location.

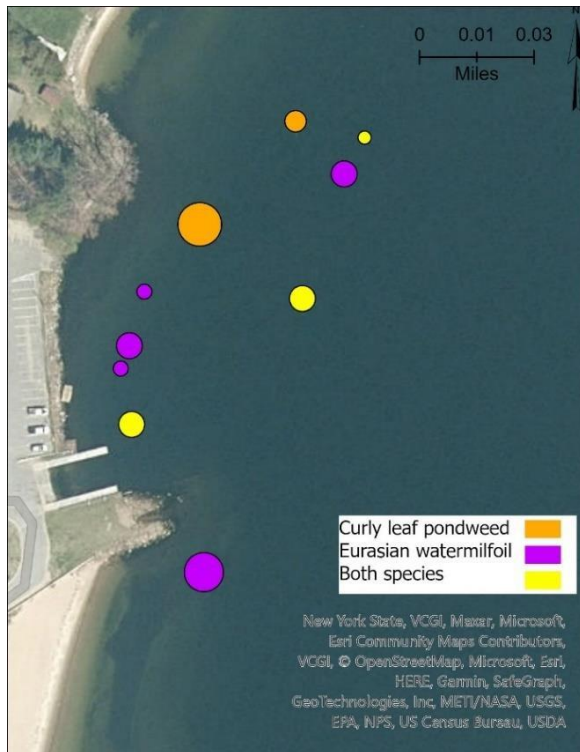


Photo 3 – Map showing DASH results from Port Douglas.

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### Aquatic Plant Surveys

Two types of plant surveys were conducted. The first was a visual top-water survey by the APIPP early detection team. The team used a meander pattern through the littoral zone looking visually for invasive plant beds and using rake tosses to identify and delineate the area of invasive plant beds. The team covered an approximately 0.5-mile radius from the boat launch to look for populations of AIS that were outside the immediate boat launch area. The only species that the team identified were EWM and CLP. Appendix Aquatic Plant Surveys has a map for each boat launch and all this data has been uploaded to the NY invasive species database, iMapInvasives.

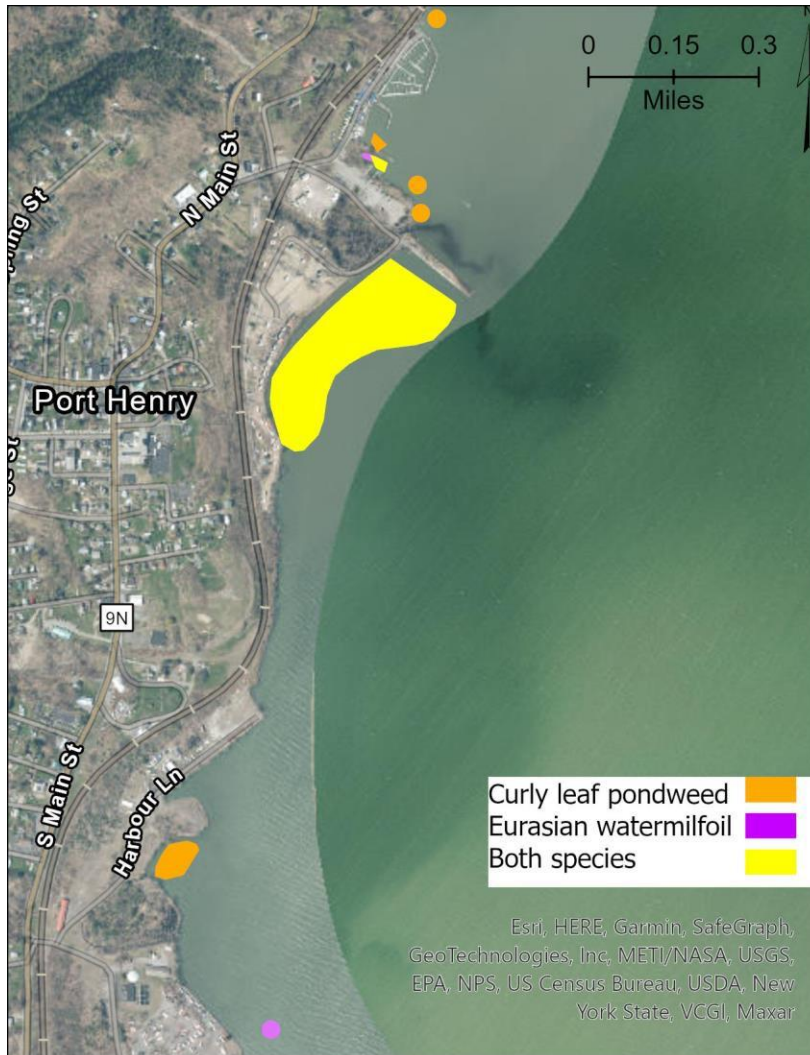
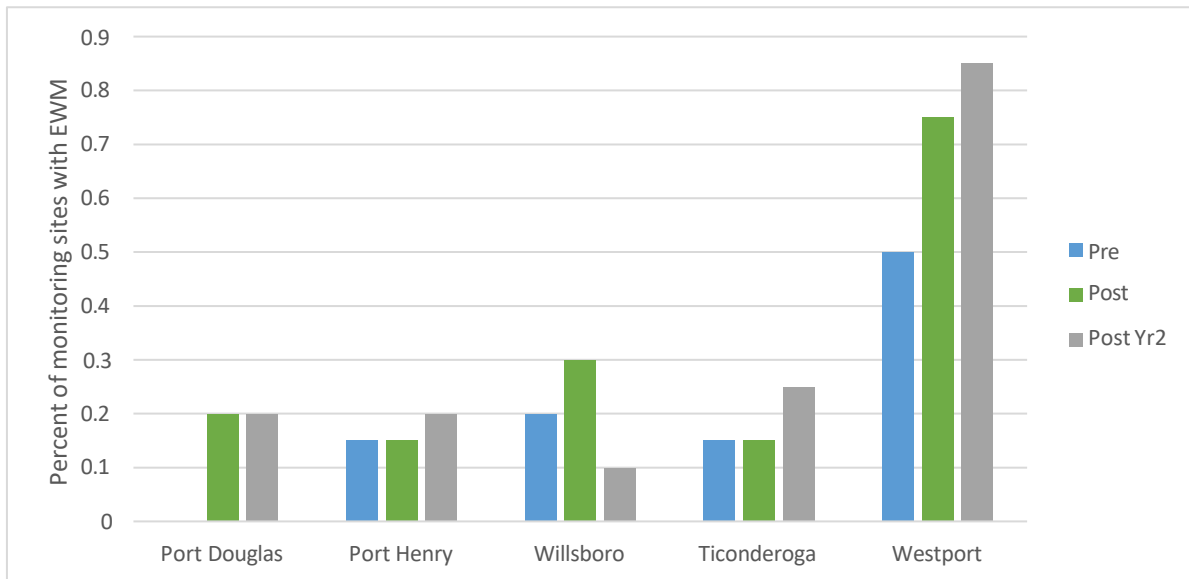


Photo 4 - Mapping of AIS plant locations around the Port Henry boat launch

All of the boat launches had abundant populations of aquatic plants in the areas surveyed. This underscores the challenges of permanently reducing the populations of AIS around boat launches because there are nearby populations that can reestablish previously managed areas. These nearby populations are also sources of fragments that can spread with currents to the boat launches or be trapped on boats when they travel through these areas.

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The second type of plant survey was a point intercept monitoring survey focused on the 10 acres immediately adjacent to each boat launch. This area was divided into 20 half acre grids and a monitoring site was established in the center of each grid. This was the location for two rake tosses to assess the presence and abundance of AIS at each monitoring site. If a species was detected on at least one of the two rake tosses it was counted as being present for that site. Surveys for each location were conducted three times, once in early June before any DASH removal occurred (pre-management) and again in early September after all DASH work had occurred (post-management and post-management year 2). By monitoring the same locations using the same methods before and after, APIPP could attempt to measure the success of DASH to reduce AIS populations around the boat launches.

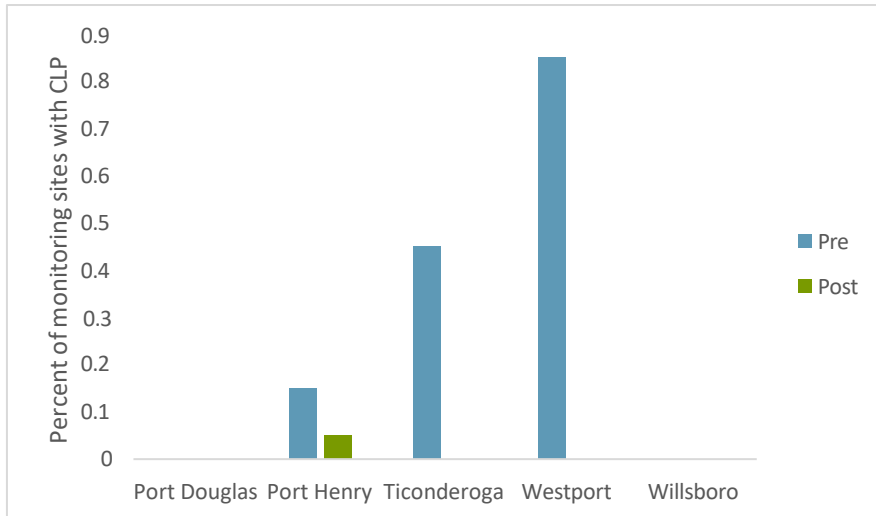


Graph 2 – 2023 and 2024 Results of point-intercept surveys percent of Eurasian watermilfoil pre- and post- DASH.

This work was done for both EWM and CLP, but since CLP has a phenology where it goes dormant in early summer, the second survey only detected curly leaf pondweed at a single monitoring location in 2023 and 2024. Also interesting to note is that no curly leaf pondweed was detected at Port Douglas or Willsboro via the point intercept monitoring, but the DASH dive team did collect some at each of these launches.



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Graph 3 – 2023 Results of point intercept surveys percent of curly leaf pondweed pre- and post-DASH.

The tables in Appendix Aquatic Plant Survey show all the results from these surveys. The data indicates that there was little reduction in the pre- and post-management monitoring for Eurasian watermilfoil. Only one site (Willsboro) saw a reduction in sites with EWM and the other four had increases from the pre-management monitoring. Sites that had two years of DASH held similar results between 2023 and 2024, but sites without a second year (Ticonderoga and Westport) had larger increases in the number of sites with EWM. This is likely due to the need for long term management with DASH taking repeated years to slowly bring down a plant population. APIPP proposes that future assessments of plant populations should occur annually in late summer, and this should be the basis for long term management assessment. As we have seen in other lakes in the region AIS plant management will take many years to successfully suppress invasive milfoil populations.

In addition to the tables and charts, there are four maps for each boat launch showing the locations and abundance of AIS using the point intercept monitoring:

- A pre-management map of CLP
- A pre-management map of EWM
- A post-management map of EWM from 2023 and 2024
- A difference in abundance between pre- and post-management monitoring for EWM

Here is an example map:



Photo 5 – Map of the Willsboro boat launch showing the locations of Eurasian watermilfoil and the highest abundance at each location from the post management monitoring in Sept 2023.

#### Watercraft Inspection Stewards Monitoring

Each boat launch has an AWI watercraft inspection steward monitoring the launches to aid in preventing the spread of AIS. Commonly called boat stewards, they are the front-line workers participating in the largest AIS prevention program on the eastern United States. This program is very successful and has extensive staff training, standard operating procedures, and detailed data collection on WISPA. This incredibly rich database allows for partners and researchers to examine patterns of recreational boat use, pathways of spread, and the effectiveness of AIS management. APIPP worked with AWI to receive and analyze the data at each of these boat launches for 2021-2024. Using the past multiple years of data allowed for APIPP to compare the 2023 and 2024 records and assess if the removal of invasive plants at the boat launch resulted in stewards reporting less invasive plant propagules on boats leaving the launch. There are a couple of items to note about the data:

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- Boat launches do not have boat stewards on duty every day or at all hours of the day. Their typical schedule of 8am to 4pm means that they do not inspect boats going in early in the morning or late in the evening.
- Both between boat launches and between years there is different coverage so the time periods between years does not always overlap. Some sites could have half as many days from one year to the next. 2022 was a difficult year for staffing, so it had less staff coverage and thus less inspections of boats.
- There is year-to-year variation in outdoor recreation use. Boater interest, weather patterns, and fuel prices all influence how many boaters use the boat launches each year. The COVID pandemic created conditions that increased boat use, so 2020 and 2021 numbers show these were high use years.
- Natural variation in weather and seasons influences aquatic plant growth. Some years have conditions that are conducive for certain species to have abundant plant growth, both for native and invasive species. This natural variation can influence the number of boats that leave with AIS propagules.

For this analysis, APIPP focused on the retrieving boats (boats leaving a boat launch) and the number of boats that had EWM or CLP on the boat or trailer when they left the launch. These were the species that the DASH team removed so APIPP is evaluating if these management efforts resulted in reducing the spread of AIS from the boat launch. These were the most common species reported on boats leaving the boat launches for all sites and years analyzed.



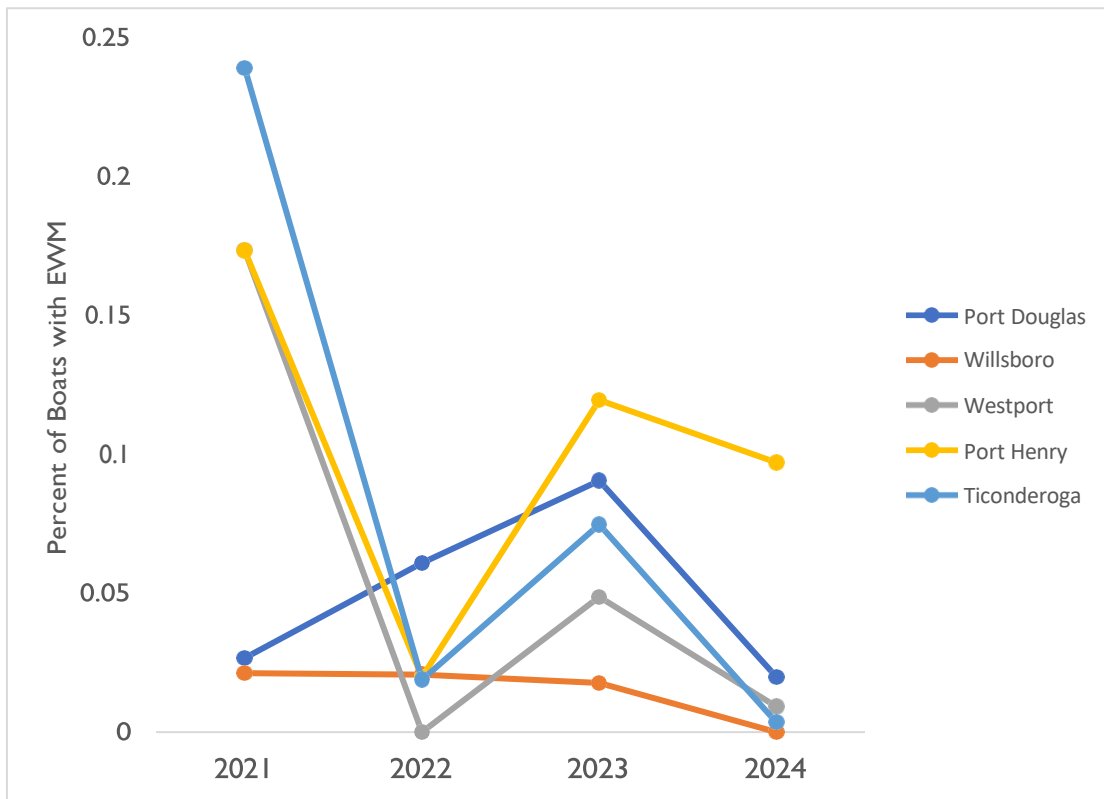
Photo 6 -Example of AIS attached to a boat trailer.

Overall, for all five boat launches over the four-year period 11,159 retrieving boats were inspected. There were 933 (8.4%) with Eurasian watermilfoil present and 645 (5.8%) with curly leaf pond weed. There is substantial variation between boat launches and between years of a single boat launch. See the tables in Appendix Watercraft Inspection Stewards Data for data from each boat launch location by year.

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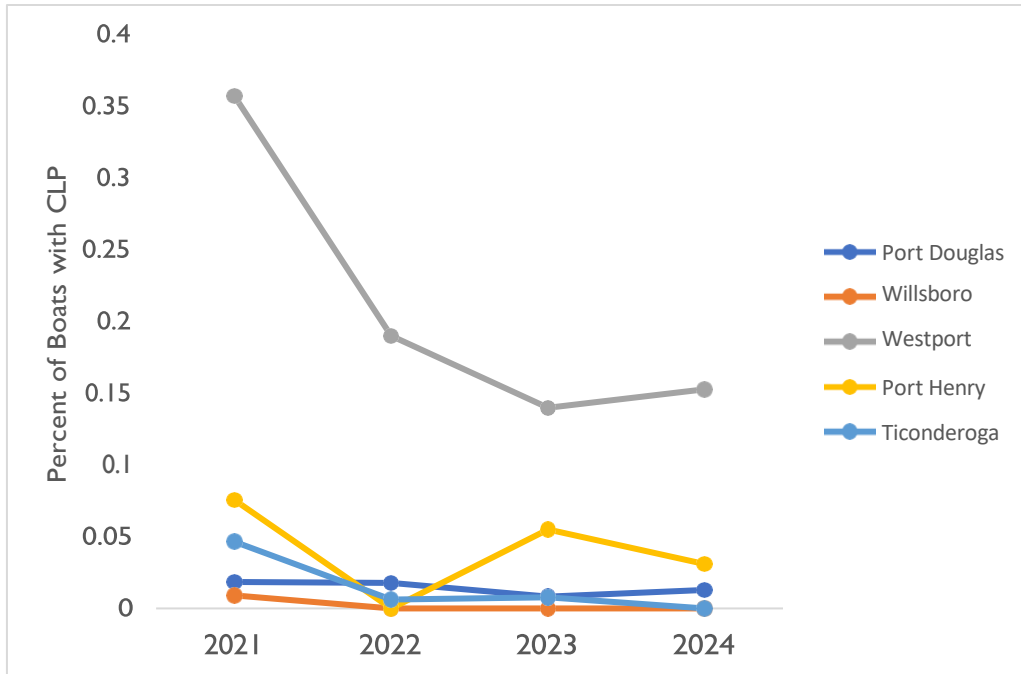
Year	Days	Retrieving Watercraft Inspected	Retrieving boats with Eurasian watermilfoil	Retrieving boats with curly leaf pondweed
2021	83	488	13	9
2022	81	674	41	12
2023	111	851	77	7
2024	116	1007	20	13

Table 1 – Example of WISPA data from Port Douglas



Graph 5 – Graph of percent of boats with Eurasian watermilfoil present by boat launch and year.

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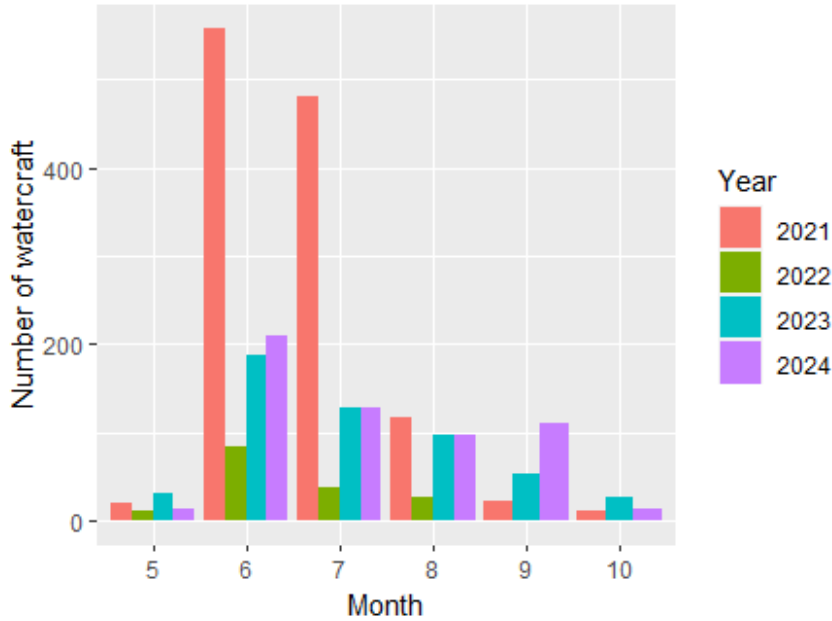
Graph 6 – Graph of percent of boats with curly leaf pondweed present by boat launch and year.

As seen in the above graphs, this variation can make it difficult to assess a specific reason for why the amount of AIS varies by boat launch and year. APIPP analyzed the data on a month and daily timescale to see if there were any insights or signals from the 2023 and 2024 management. In the Appendix Watercraft Inspection Steward Data you can see the following graphs for each boat launch:

- Bar chart of total watercraft by month for each boat launch
- Bar chart of sum of boats with EWM by month for each boat launch
- Bar chart of sum of boats with CLP by month for each boat launch
- A violin chart showing distribution of daily percentage of boats with EWM

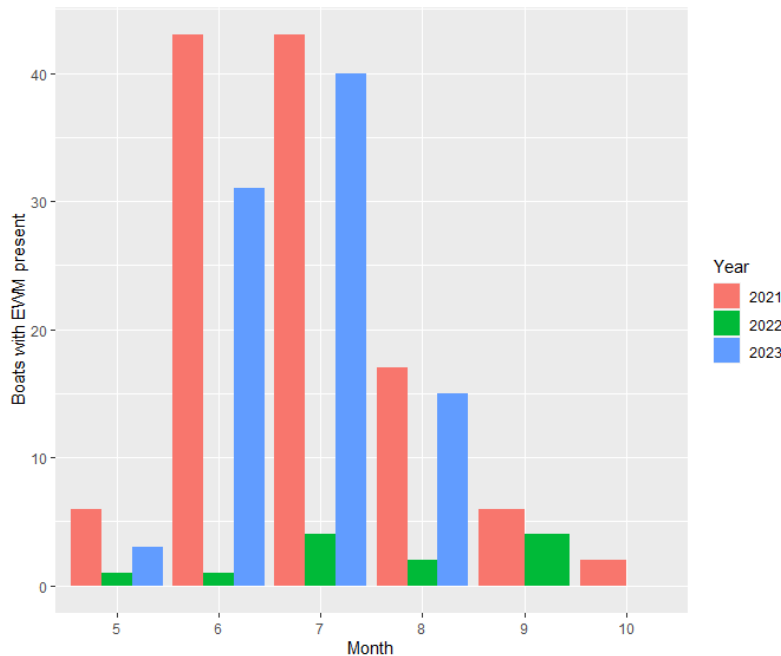
Here is a brief discussion of some of the patterns from the data with example graphs. See the appendix for full tables and graphs for each boat launch. The majority of the discussion and figures focus on EWM, because the phenology of CLP makes it not present in the post-management time period and is less frequently reported by boat stewards later in the year and thus difficult to compare.

The amount of watercraft varies by year and by month. Overall, most inspections occur in June and July, but these are also the months with the most coverage. Some sites, like Ticonderoga, had large differences in boats inspected between year due to outdoor recreation use and boat steward coverage.



Graph 7 – Total number of retrieving watercraft inspected at Ticonderoga each month for four years.

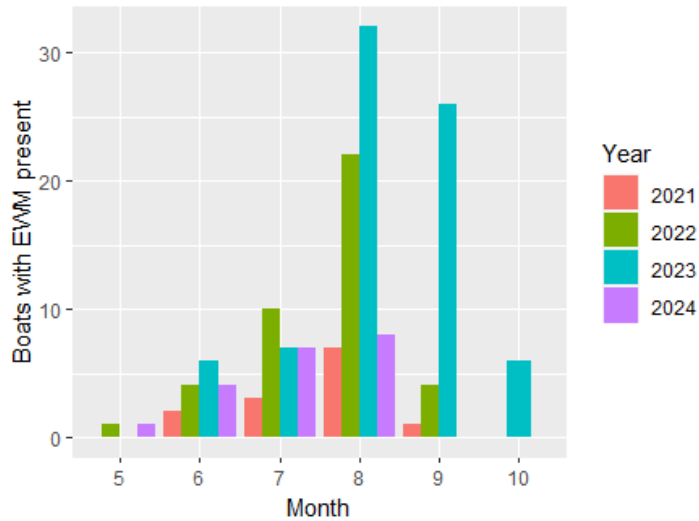
When you look at the sum of boats with EWM leaving the boat launches the variation in watercraft by year and boat steward coverage makes it hard to see a consistent pattern. For example, graph 8 at Port Henry shows there is a decrease in Eurasian watermilfoil on boats from 2021 to 2023, but an increase compared to 2022. This increase from 2022 to 2023 is likely due to very different coverage by boat stewards between these years.



Graph 8 –Data from Port Henry of sum of retrieving boats with Eurasian watermilfoil by month for three years.

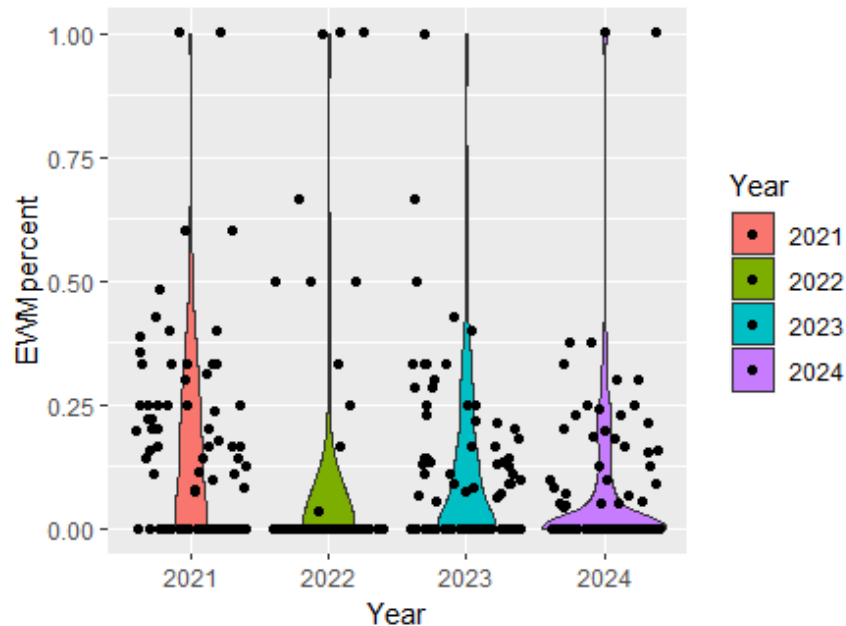
## PREVENTING AQUATIC INVASIVE SPECIES SPREAD THROUGH TARGETED REMOVAL

In another example from Port Douglas the pattern shows an increase in 2023 of retrieving boats with EWM, but then a decrease in 2024.



Graph 9 - Data from Port Douglas of sum of retrieving boats with Eurasian watermilfoil by month for four years.

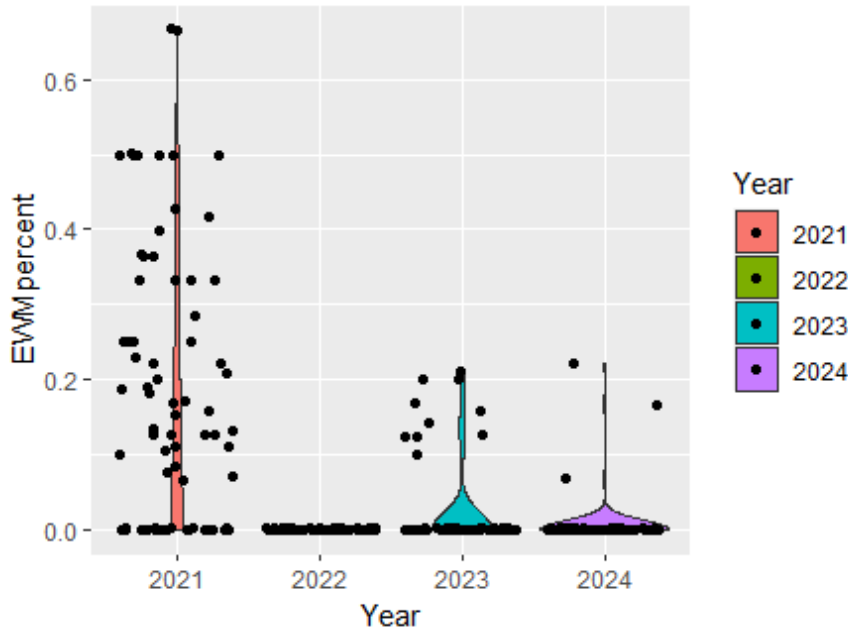
In an attempt to control for the differences of number of boats inspected and days with boat steward coverage, APIPP analyzed the daily percent of boats with EWM. APIPP compared the distribution of these data points from the days in the months following the first harvesting in June. This standardized the data and made it easier to compare. Four of the five sites showed patterns that indicate little change between years in Eurasian watermilfoil on retrieving boats.



Graph 10 – A violin chart of Port Henry data showing the distribution of percent of retrieving boats with Eurasian watermilfoil present for each day in the time period post-management (July-October). Each dot represents an individual day.

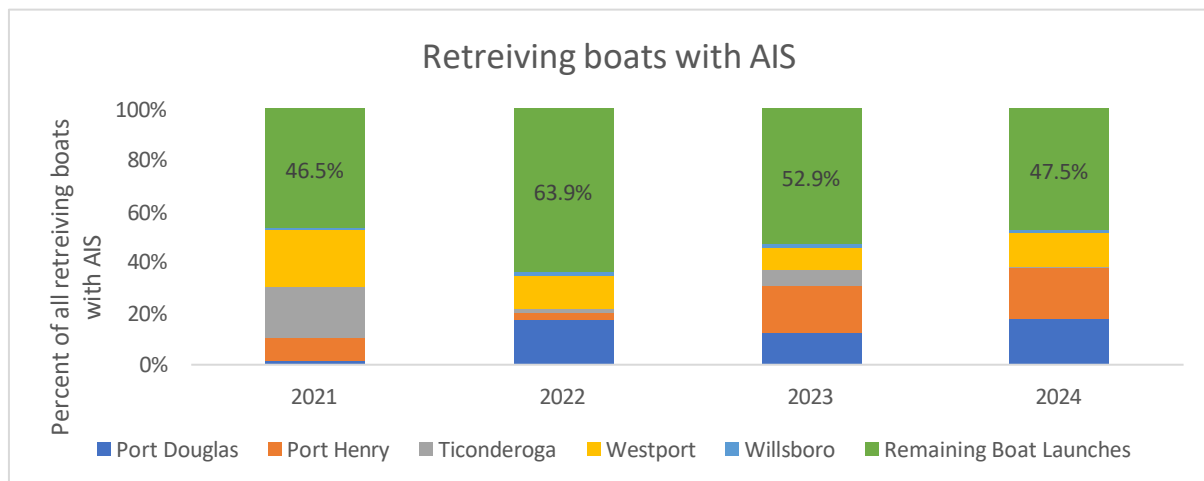
**PREVENTING AQUATIC INVASIVE SPECIES SPREAD THROUGH TARGETED REMOVAL**

The only boat launch that did show a different pattern between years was for Westport. Interestingly in 2022 no Eurasian watermilfoil was reported from this boat launch. 2021 to 2023 and 2024 did show a reduction.



Graph 11 – A violin chart of Westport data showing the distribution of percent of retrieving boats with Eurasian watermilfoil present for each day in the time period post-management (July-August). Each dot represents an individual day.

Looking at the big regional picture of AIS spread from retrieving boats Lake Champlain boat launches remain the largest source of AIS in the region. We compared these five boat launches to all the other boat launches (35+) that AWI monitors for all AIS on retrieving boats. While there is variation from year to year, these five sites comprise over half of all AIS spread risk in the region. This indicates that on a large scale, our management efforts did not reduce spread risk.



Graph 12 – Percent of all retrieving boats from the five monitored sites.



## **5. CONCLUSIONS**

Overall, this project was successful at evaluating the effectiveness of using a management strategy of DASH at the area around a boat launch to reduce the spread of AIS propagules. APIPP and its partners successfully collected a robust data set, removed thousands of pounds of AIS, and gained important insights about how to use this management strategy effectively. First, the data indicate that one or two years of management is not enough to reduce invasive plant populations or strongly influence the number of retrieving boats with aquatic invasive plant propagules. Second, the field work showed that some boat launch sites were more conducive to DASH than others. Third, there is a high degree of variation in data that boat stewards report and this is due to a variety of reasons.

Based on these findings, APIPP recommends continuing to use DASH at three of the boat launches (Port Douglas, Port Henry, and Willsboro) because they have characteristics that support effective DASH management. The results of this pilot project show trends that, with consistent DASH management, it could be possible to have success at controlling the target plant populations and AIS spread at these sites. At the other sites, APIPP recommends assessing other management methods (i.e. chemical control or benthic mats) or incentive programs aimed at increasing decontamination rates on retrieving boat launches.

### Accomplishments:

- Removed 7800 lbs. of invasive plants from the five boat launches.
- Collected a robust dataset on invasive plant locations, frequency, and abundance at each of the boat launches.
- Analyzed the WISPA data to inform future management, better understand the pathway of AIS spread, and assess the effectiveness of DASH.
- Tested a management strategy that can be employed at other boat launches across the region and documented new insights about where and how this strategy can be effective.

### Lessons learned:

- Overall, APIPP learned how important and site-specific boat launches are. Each one has its own set of characteristics and constraints that will influence how successful AIS removal is at the site. Some of the boat launches have characteristics that make them better suited for DASH. Factors like water clarity (making it hard to see) and amount of native plant growth (challenging to remove the roots of invasive plants from dense network of native plants) make it difficult for divers to be most effective at removing invasive plants. Based on the comments from the dive teams and APIPP staff site observations here are some assessments of the five boat launches:
  - Port Douglas – Had good water clarity that made harvesting easier, but the site drops off in depth quickly meaning that divers must go deeper down to harvest. Overall, it had moderate plant growth in the area around the boat launch with a few large patches of EWM growing in deeper water.
  - Willsboro – Had good water clarity that was conducive to harvesting. Moderate depth that slowly deepens. Extensive dense beds of native plants (coontail, Robbins pondweed) made harvesting challenging. Also had some native Northern milfoil present but it is a challenge to distinguish for the divers and is sometimes removed with the invasive EWM.

## **PREVENTING AQUATIC INVASIVE SPECIES SPREAD THROUGH TARGETED REMOVAL**

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- Westport – Poor water clarity that made harvesting a challenge. The overall water depth was shallow and had very dense beds of native plants. This site also had the highest frequency of CLP and EWM making the large amounts of this plant a long-term challenge to bring under control.
- Port Henry – Had good water clarity that was conducive to harvesting. The boat launch has a narrow initial channel that has large amounts of native plants present which makes harvesting a challenge. Also, this narrow channel was, at times, a challenge for divers to work in as there is not much space for other boat users entering and leaving the boat launch. In 2024 DASH removed the highest amount, but this also included native plants like elodea and coontail that was enmeshed with the EWM.
- Ticonderoga – Very poor water clarity that makes harvesting extremely challenging. The generally shallow area has moderate native plant growth. There was extensive CLP growth, but relatively low EWM present. However, there were large areas with EWM just outside the boat launch and APIPP frequently saw large mats of EWM floating into the boat launch.
- Management of aquatic invasive plants is a long-term commitment. When populations of invasive plants become well established it will take significant time and effort to significantly reduce their abundance. Strong results or progress in a short time span, like this one-to-two-year project, should not be expected. This pilot project reinforces lessons learned from previous management in other locations--namely that successful aquatic invasive plant management requires setting goals, having a long-term commitment, and being persistent with management efforts for multiple years to ultimately have a successful result.
- The phenology of CLP makes it a difficult species to control and monitor. Curly leaf pondweed reaches full growth and maturity in the April/May timeframe and begins to go dormant by June and was virtually undetectable from July on. This makes it a challenge to effectively remove since by the time the divers are working, the plant has already deposited its turions that provide the next generation of plants. It also makes the monitoring difficult because when most aquatic plants are at their peak growth in late summer, it is already dormant and not easily detectable.
- The initial monitoring in 2023 made it difficult to assess the effectiveness of management. The traditional before and after management of trying to monitor plant abundance and frequency did not align with the plant growth seasonality. As such monitoring in late May/ early June (pre-management) before the harvesting in June and August, then followed by monitoring in September, reflects more the change in seasons than an assessment of the management effectiveness. In 2024 monitoring occurred once a year in late summer to assess the long-term effectiveness of EWM management. We recommend continuing this annual monitoring in future years.
- It is important to have consistent boat steward coverage across years to be able to make comparisons over the long term. When looking at the retrieving boat data there were differences in periods of coverage and overall number of boats. Some of this variation is due to the boat stewards and some of this variation is due to the year-to-year difference in boater use and weather that influences the amount of use a boat launch receives.
- The quality of the individual boat steward matters. There were years that had exceptionally low reports for AIS at some of these boat launches and this was most likely due to boat stewards not correctly reporting AIS on retrieving boats. It would be a good quality control step to produce some live dashboards so boat stewards and supervisors could keep better track of the data in real time and make needed adjustments during the season if numbers appear anomalous.

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- The ultimate outcome of reducing the spread risk of AIS was not documented in this two year pilot project. We did see some reductions in the percentage of boats with EWM leaving the boat launches in 2023/2024 vs 2021. Still, the overall percent of AIS from these five boat launches remained high with a 2023-2024 average of 50% of all AIS leaving a boat launch being from the five boat launches we worked at on Lake Champlain.
- While there are the largest amounts of EWM leaving these launches in Lake Champlain, it varies greatly by boat launch and year. In some years a boat launch might only report 5 or fewer boats with EWM present. This makes it very difficult to assess the effectiveness of harvesting AIS via boats with retrieving AIS because the margins are so small.

### Future Actions:

- Continue harvesting at Port Douglas and Port Henry because these sites have characteristics that make them well suited for successful management with continued harvesting of EWM.
  - These sites had a high number of boats with EWM leaving the launches indicating a higher return on investment.
  - These sites have characteristics that make them better suited for harvesting EWM.
  - The amount of EWM is substantial, but not as much in other boat launches (like Westport) so management success is more likely.
- Evaluate other sites for possible chemical management or use of benthic mats to control invasive plants.
- Evaluate alternate spread-prevention measures at boat launches to determine if other strategies could be more effective, such as incentives to encourage retrieving boaters to decontaminate their boats. This could be a more cost-effective strategy to deal with the vector than trying to reduce the source of invasive propagules.
- Work with the WISPA program to create real-time dashboards that will aid boat stewards and managers in monitoring AIS data as the summer progresses and provide corrections as needed during the season.

## **6. REFERENCES**

## **7. APPENDICES**

### **Appended Documents:**

#### [Appendix – Diver Assisted Suction Harvesting](#)

- Table of AIS removed at boat launches
- Graph of AIS removed at boat launches
- Maps of AIS removed at boat launches

#### [Appendix – Aquatic Plant Surveys](#)

- Table of AIS results from point-intercept survey

## **PREVENTING AQUATIC INVASIVE SPECIES SPREAD THROUGH TARGETED REMOVAL**

- Graphs of AIS frequency at boat launches
- Maps of AIS locations around boat launches
- Maps of AIS results from point-intercept survey

### **Appendix – Watercraft Inspection Stewards Data**

- Table of WISPA data for each boat launch
- Graphs of watercraft, CLP, and EWM by month for each boat launch
- Violin charts of daily percent EWM on retrieving boats for each boat launch
- Graphs of yearly percent of CLP and EWM on retrieving boats at boat launches

AIS – Aquatic Invasive Species

APIPP – Adirondack Park Invasive Plant Program

AWI – Adirondack Watershed Institute

CLP – Curly leaf pondweed (*Potamogeton crispus*)

DASH – Diver Assisted Suction Harvesting

EWM – Eurasian watermilfoil (*Myriophyllum spicatum*)

WISP – Watercraft Inspection Steward Program

### **Photos:**

[Here is a link to a folder with photos and videos from the project.](#)

### **Electronic Data:**

When the project officer is ready we can provide links to cloud based datasets.