Clean Ocean Access 2016 - 2018 Marina Trash Skimmer Report

PROGRAM OVERVIEW, DEVELOPMENT AND EXPANSION

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EXECUTIVE SUMMARY

Plastic pollution and ocean litter, commonly referred to as marine debris, is a globally defined problem and an identified issue on the shoreline of Aquidneck Island, Rhode Island. Clean Ocean Access (COA) is working to address the problem with technology through partnerships with the sailing community, marine trade industry, local governments, and state agencies. The efforts feature an innovative technology, the Marina Trash Skimmer (MTS) that works to remove floating surface debris, break down hydrocarbons, emulsify oil sheen and allow concentrated pollutants to collect within the skimmer, all while oxygenating the surrounding water. This technology and partnership model serves as a scalable and transferable innovative solution to advance marine debris removal and prevention.

MTS technology was first adopted on the east coast of the United States in 2016 when Clean Ocean Access received funding through 11th Hour Racing to install two units in Newport Harbor. This initial funding also allowed the development of the COA Marina Trash Skimmer Program. The MTS program aims to educate, inspire and empower the community to prevent litter from becoming marine debris. The goals of the program are fulfilled by using the MTS technology as a tool to collect citizen science itemized debris data and educate professional and student groups on plastic pollution and waste management.

To date, COA-operated units have removed 20,615 pounds of comingled debris from Aquidneck Island shoreline. COA staff and interns performed a total of 166 site visits at the four MTS units across Aquidneck Island, documenting over 27,000 items of debris. The site visits indicated that the most common marine debris items fall under the shoreline and recreational activities category and are primarily composed of single-use consumer waste. Since 2016, the MTS data, along with growing awareness of plastic pollution in our marine environment, was used to educate and engage 959 individuals at a total of 31 education, including groups of elementary students, college graduates, and senior level scientist studying marine debris.

This report provides a high-level overview of Clean Ocean Access involvement with MTS technology and the expansion of the program between 2016 and 2018. The report is broken up by program components and will highlight the development of the MTS program.

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MARINA TRASH SKIMMER PROGRAM

The mission of Clean Ocean Access (COA) is to act locally so future generations can enjoy ocean activities with a vision of a healthy ocean that is free of marine debris, water that is safe for all ocean activities, and a shoreline that is accessible to the public. COA began addressing the problem of marine debris in 2006 with small friends-and-family shoreline cleanups, later expanding to monthly community gatherings that removed a wide variety of debris from the coastline. These initial events were the foundation for a grassroots approach for local environmental awareness, which promoted the evolution of the organization that it is today.

In 2016, COA expanded its marine debris removal efforts beyond the physical shoreline through the installation of two Marina Tash Skimmers (MTS) in Newport Harbor. These initial installations sparked a new innovative way to address floating surface debris along the Aquidneck Island coastline. The technology has proved effective in addressing the buildup of marine debris in localized areas, and in stimulating discussion of scalable solutions using the marine debris technology. The 2016 installations allowed COA to develop and grow the MTS Program.

The MTS Program was made possible by 11th Hour Racing, which funded three crucial MTS projects: Newport Harbor Marina Trash Skimmer Project (NHMTSP), Aquidneck Island Marina Trash Skimmer Project (AITSP), and the Southeast New England Marina Trash Skimmer Project (SNEMTSP). 11th Hour Racing establishes strategic partnerships within the sailing and maritime communities to promote collaborative, systemic change benefitting the health of our ocean – one degree at a time. The outcome of these granted projects is the physical installations of seven MTS units across Southeast New England and the establishment of the MTS Program. The MTS Program, as described below, encompasses six main components: (1) partnership (2) debris removal (3) data analysis (4) education (5) outreach and (6) advocacy.

Partnership:

The power of partnerships is extremely important for the success of the MTS program. These partnerships are developed between sailing centers, marine trade industries, and local governments to address persistent marine debris and pollution issues, with a goal to foster environmentally responsible behaviors on land to eliminate marine debris.

MTS partners are responsible for daily operations, such as removal of debris from the unit, weekly upkeep, and seasonal maintenance, such as anti-fouling and removing the units from the water in below freezing temperatures. As the primary operator of the MTS units, COA helps to facilitate and direct partners on maintenance requirements and coordinates debris removal around data collection, as well as education and outreach events.

Debris Removal & Data Analysis:

COA performs an inspection of the debris removed by the MTS units two to three times a week. Inspection procedures include tracking and itemizing the debris removed using the Ocean Conservancy International Coastal Cleanup tally sheet. All site visit inspections are photo-documented, helping to visualize debris patterns in MTS installed areas. Working with MTS partners, COA estimates debris collected daily providing metrics on pounds of debris removed each year. Data collected helps to tell the story of the type of debris found within our waters and acts as a tool in which educated decisions can be directed to the source of the debris.

Education and Outreach:

Weekly debris inspection aligns directly with the educational portion of the MTS program. In 2017, COA developed a hands-on education and outreach program that brought both professional and student groups to visit the MTS units for one-hour long sessions. These MTS tours aim to educate the community about MTS technology and the growing problem of plastic pollution in the marine environment.

Advocacy:

COA uses the MTS data collected by interns, students, and volunteers to form a multi-generational community-based, data-driven citizen science campaign on Aquidneck Island. Data is presented to city officials and skimmer partners as a means of collaborating on solutions to reduce land litter from turning into marine debris. COA-driven advocacy has resulted in plastic bag bans throughout Aquidneck Island retailors and a ban of smoking on island beaches.

MARINA TRASH SKIMMER TECHNOLOGY

The MTS unit is a 6x4x5 foot plastic molded container that can be easily attached to any powered stationary dock (Image 1). The unit operates on a 3⁄4 horsepower motor that circulates 375 gallons per minute with power requirements of 30A 120V. The unit is estimated to use 13 Kwh/day. All units are made to be securely attached to a dock via ¾ inch mounting brackets that allows it to move vertically with the tidal cycle.

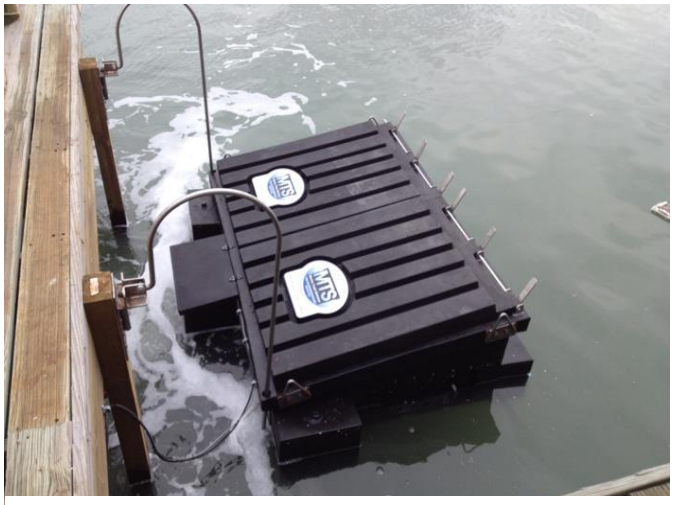


Image 1. MTS attached to a floating dock

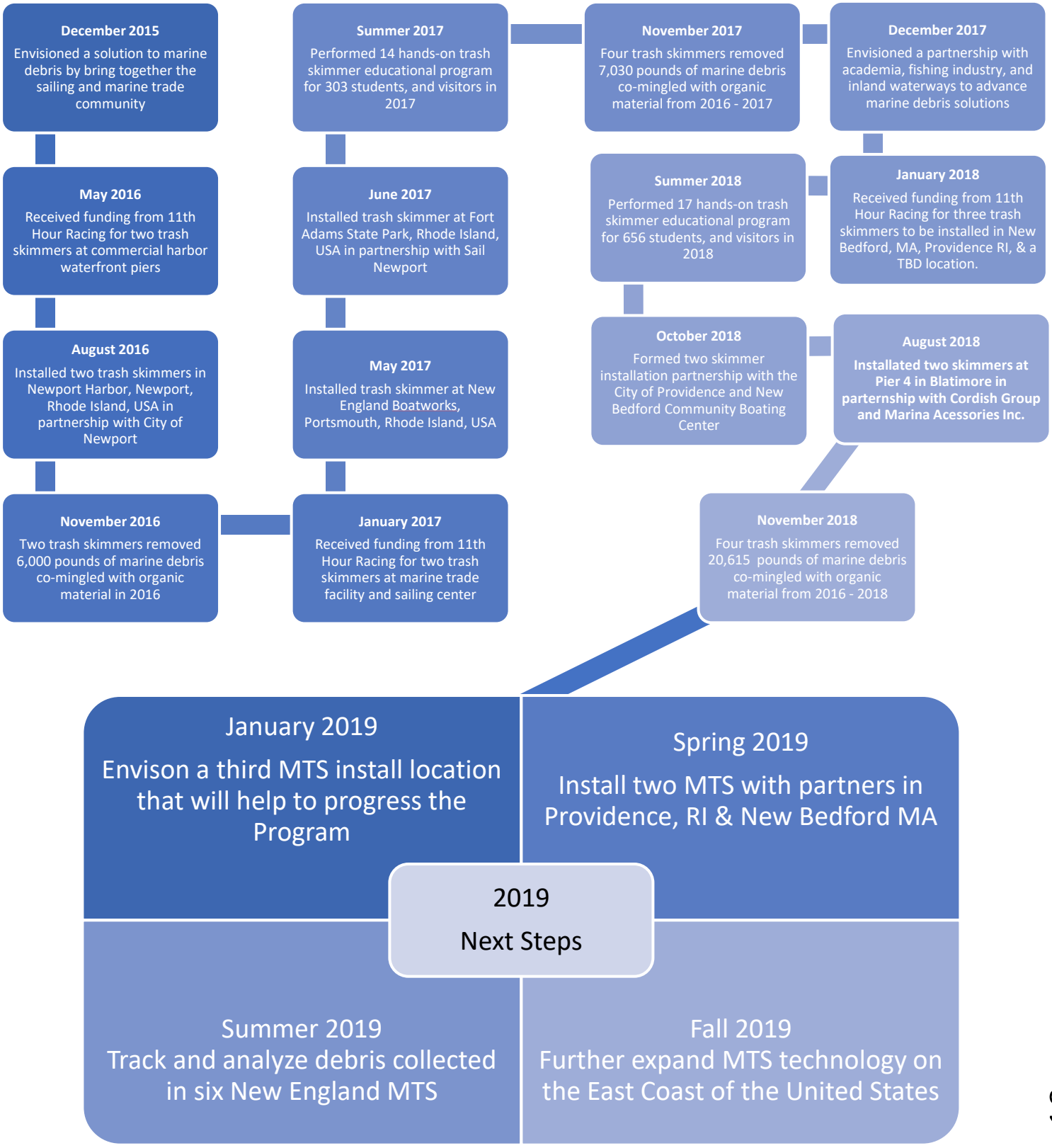
Image 2. MTS doors open exposing inner collection tank

Units run 24 hours a day and 7 days a week, drawing water through the input doors, where it can flood the unit's well pump. From there, water is easily circulated back out into the water column by the motor. This process creates a continuous surface current that draws all floating inorganic and organic debris into its collection tank. The MTS technology collects debris ranging in size from microparticles to large wooden planks. In addition to debris removal, each unit is equipped with an aerator to help oxygenate the surrounding water, which provides dual purposes of benefiting the local biota and emulsifying oil and hydrocarbons. Free floating organic material that is inevitably trapped within the system serves as a natural sponge removing pollution, such as oil sheen and hydrocarbons.

MTS units are primarily located in southern California, where the technology was first invented by Louis Pasoz in 1999. Pasoz's drive to create this innovative technology was sparked after observing a piece of plastic floating by him as he enjoyed his waterside lunch. Eight years after the first installation in Half Moon Bay, Shelter Island San Diego, Pasoz's technology expanded to approximately 60 locations across the United States (Figure 2). The MTS technology has made a huge leap forward in preventing land litter from becoming offshore marine debris.

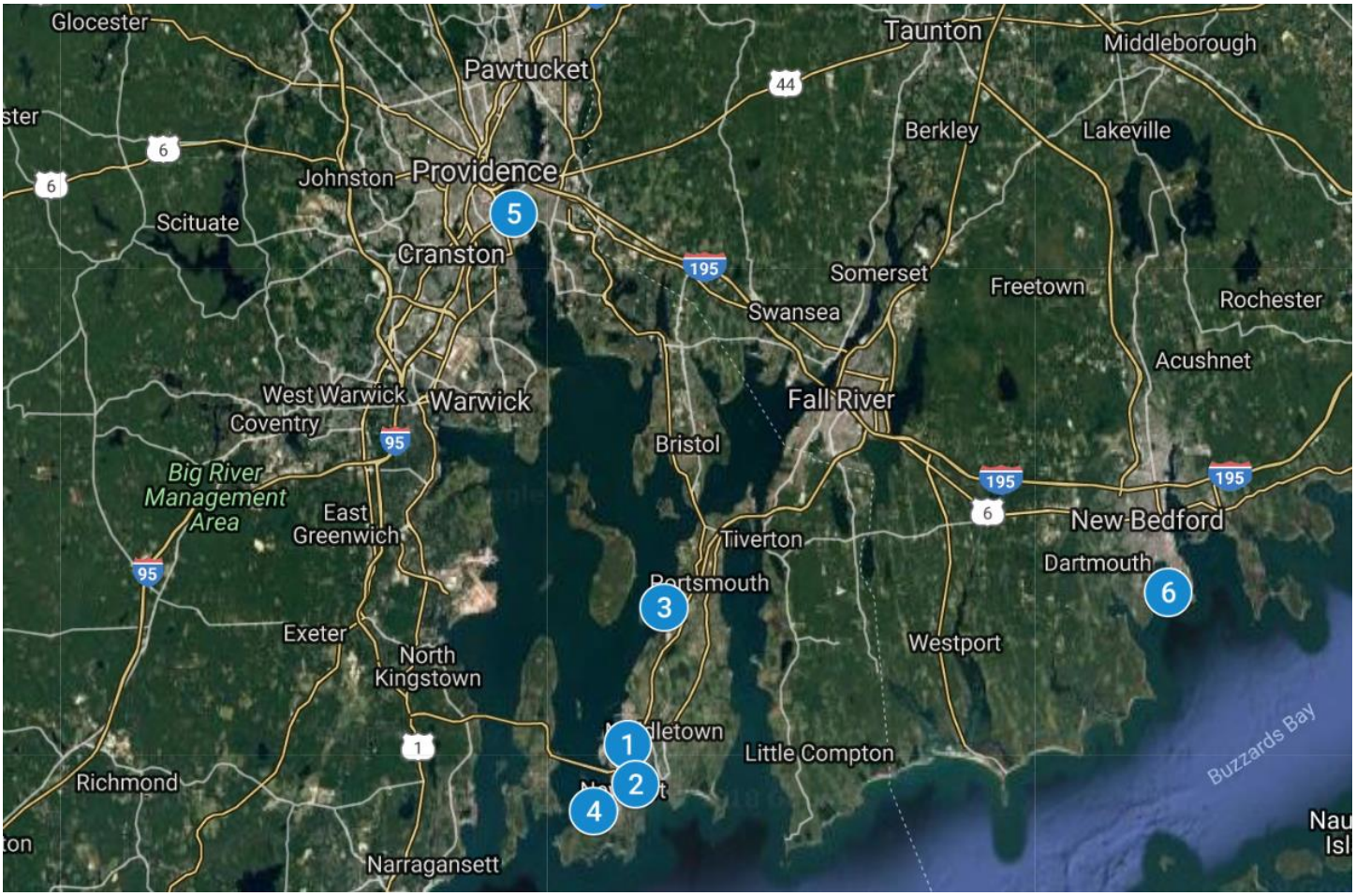
TIMELINE

Figure 1. Timeline of MTS History & COA Involvement



MARINA TRASH SKIMMER INSTALLATIONS & PARTNERSHIPS

INSTALLATION MAP



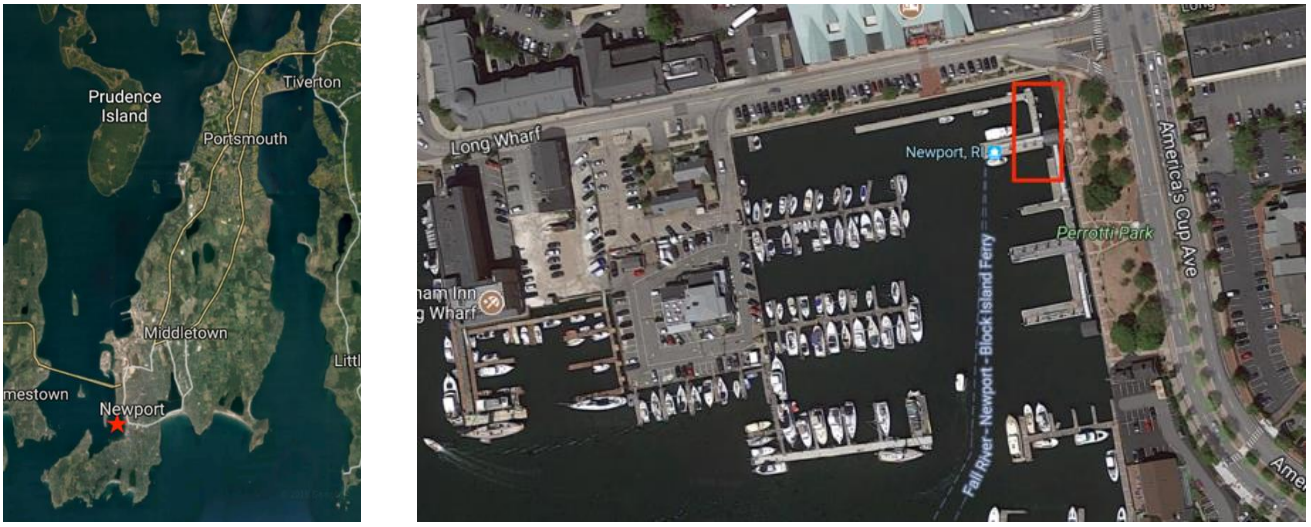
Map 1. Map of all MTS installation

Number	Location	Install Date
1	Newport Harbor, Newport RI	August 2016
2	Newport Harbor, Newport RI	August 2016
3	New England Boatworks, Portsmouth RI	May 2017
4	Fort Adams State Park, Newport RI	June 2017
5	Hot Club, Providence RI	April 2019
6	New Bedford Harbor, New Bedford MA	April 2019

2016 INSTALLATION

PERROTTI PARK, NEWPORT HARBOR, NEWPORT, RI

Location: **39 America's Cup Avenue, Newport, RI 02840**
Partner: **City of Newport // Newport Harbormaster**
Installation Date: **August 2016**



Map 2. Newport Harbor Skimmer

This initial installation fostered the expansion of COA's CLEAN program. The organizational goal of the CLEAN program is to reduce and eliminate marine debris on Aquidneck Island. The installation of the MTS aims to fulfill this goal and provide the Newport community with an education and outreach tool to address the issue of plastic pollution and to generate measurable, scalable, solutions.

The geological structure, prevailing winds, and storm water outfall pipes make Perrotti Park an ideal location to house an MTS unit. Organic and inorganic debris accumulates in mass amounts in the north eastern corner of the harbor. Data collected between 2016 to 2018 demonstrates that the marine debris accumulating in this area primarily consists of single-use plastic consumer waste. When the winds are right, these two units can fill up multiple times in one day removing on average 50 pounds of debris.

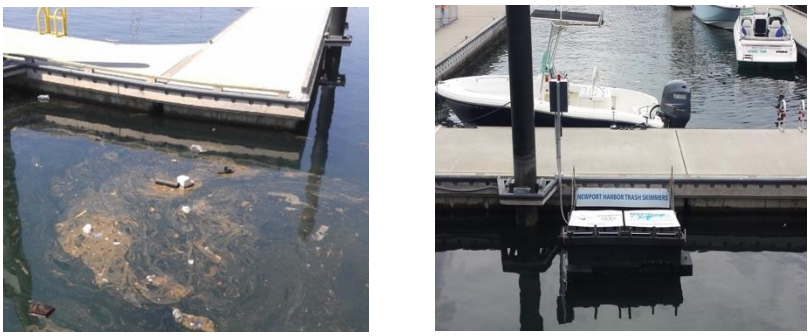
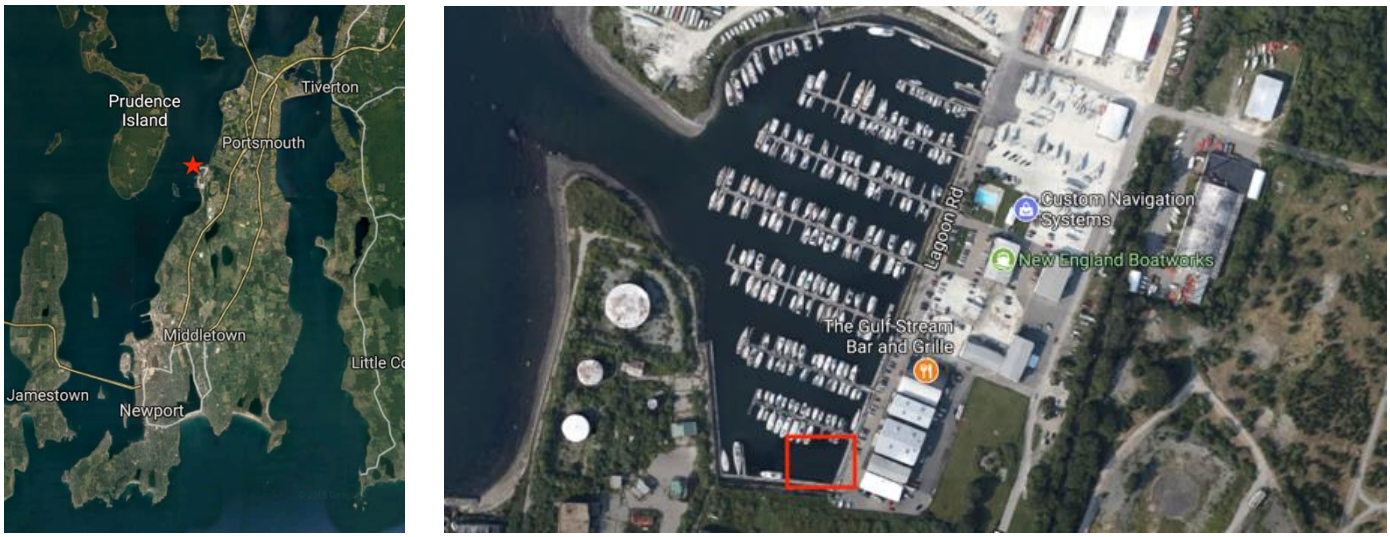


Image 3. Newport Harbor Skimmer before (left) and after (right) installation

2017 INSTALLATIONS

NEW ENGLAND BOATWORKS, MELVILLE PARK, PORTSMOUTH, RI

Location: **1 Lagoon Road, Portsmouth, RI 02871**
Partner: **New England Boatworks**
Installation Date: **May 2017**



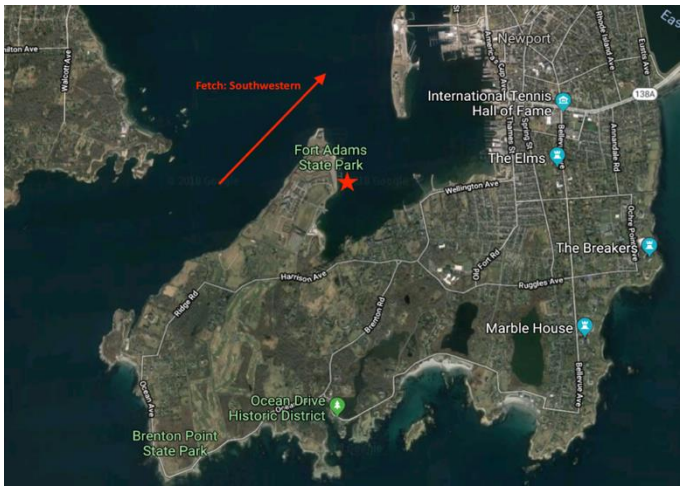
Map 3. New England Boatwork Skimmer

The positive environmental outcome and overwhelming public attention of the 2016 MTS installs led to additional funding from 11th Hour Racing in 2017 to introduce two additional MTS units at new locations on Aquidneck Island. In partnership with New England Boatworks (NEB), COA helped to install one skimmer at the NEB marina in Portsmouth, Rhode Island. NEB is more than just a high service marina, it also boasts a state-of-the-art boatbuilding facility.

The location of this MTS unit is strategically mounted adjacent to the NEB fuel dock. This unit is highly effective at condensing and trapping excess diesel and hydrocarbons that are emitted into the water. Unlike the Perrotti Park MTS, this unit does not collect a mass influx of consumer waste. Data collected since 2017 indicates that much of the debris collected at this location consists of broken-up foam. From site inspections COA was able to determine that the source of the foam is from onsite eroding docks.

SAIL NEWPORT, FORT ADAMS STATE PARK, NEWPORT, RI

Location: **72 Fort Adams Drive, Newport, RI 02840**
Partner: **Sail Newport**
Installation Date: **June 2017**



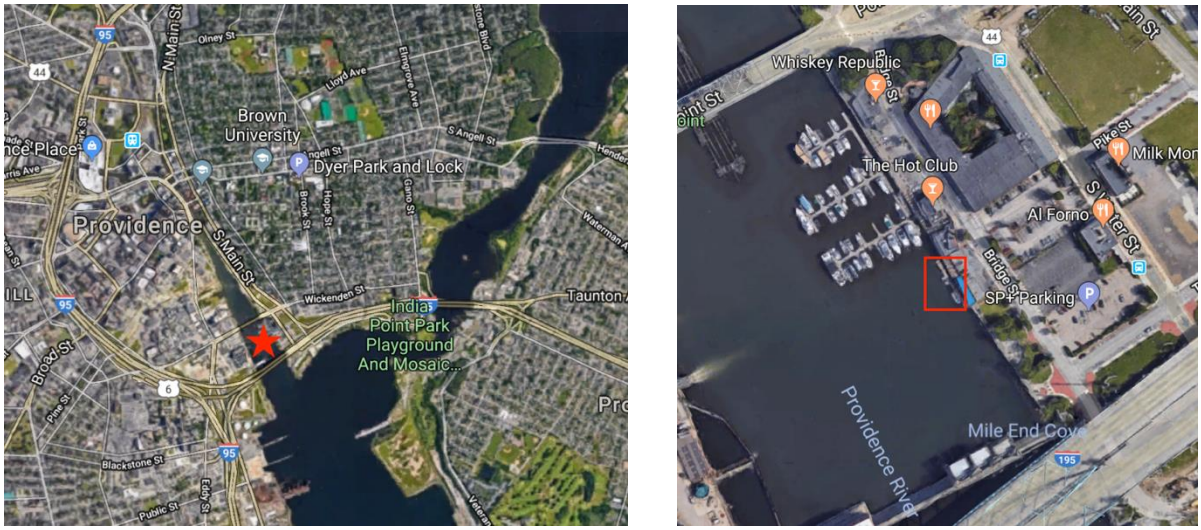
Map 4. Sail Newport Skimmer

The positive environmental outcome and overwhelming public attention of the 2016 MTS installs led to additional funding from 11th Hour Racing in 2017 to introduce two additional MTS units at new locations on Aquidneck Island. In partnership with Sail Newport, COA helped to install another skimmer at Sail Newport's competitive sailing docks located at Fort Adams State Park in Newport, RI.

This unit was a learning experience and is a great example of the limitations of the MTS technology. With southwest prevailing winds debris was not seen to accumulate at this site. The geographical land structure and ocean characteristics were also not favorable for an MTS unit. Rough seas would often overpower the MTS unit's ability to create a surface current. For these reasons the unit was not able to efficiently track and remove debris. Data from the Sail Newport MTS unit will be omitted from this report.

HOT CLUB, PROVIDENCE RIVER, PROVIDENCE, RI

Location: **25 Bridge Street, Providence, RI 02903**
Partner: **Hot Club Owners // City of Providence**
Installation Date: **April 2019**



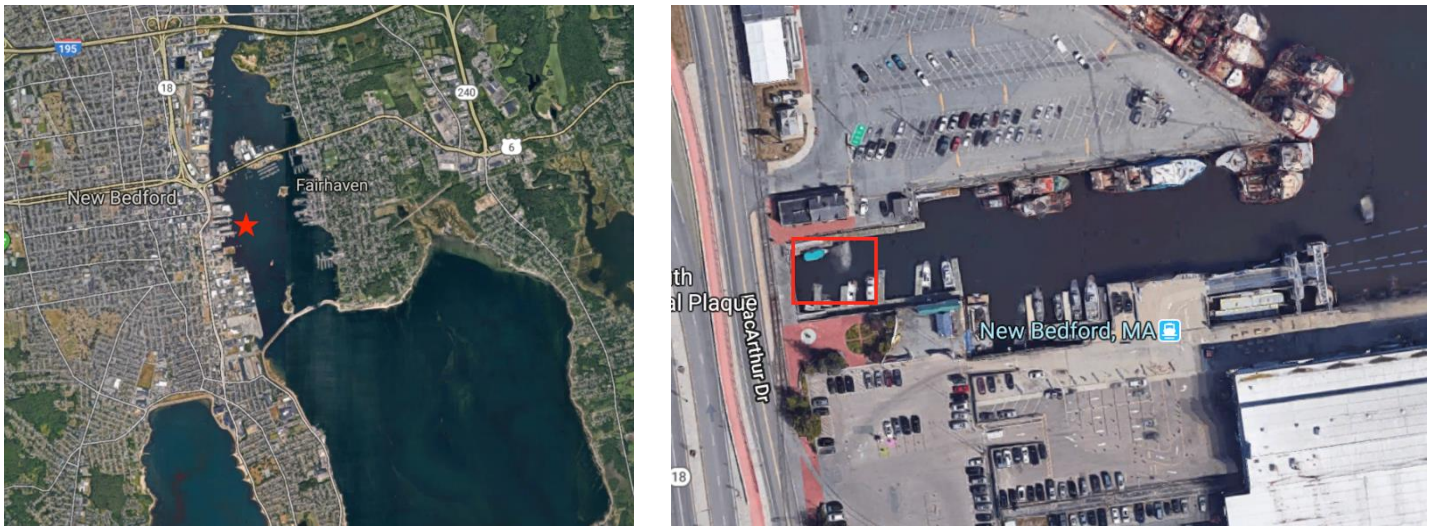
Map 5. Providence River Hot Club Skimmer

In 2018, 11th Hour Racing granted COA additional funding to leverage, facilitate, and establish MTS installations in Southeast New England. In partnership with the City of Providence and the proprietors of the Providence-based bar, The Hot Club, one MTS will be installed in the Providence River in the spring of 2019.

Densely populated areas are known to have a higher rate of debris entering the water way. This site was chosen for an MTS installation based on the numerous debris sources: I-195 Cross Over, 2 city outfall pipes, waterfront restaurants, and a fishing pier. The Providence River runs through the heart of the City and travels down to this installation site. The MTS unit will have the ability to remove mass amounts of debris before eventually passing through the Providence Hurricane Barrier into Narragansett Bay. This unit has the potential to reach new audiences in Rhode Island's capital city and engage students in Providence public schools, allowing for new education and community awareness opportunities.

PIER 4, NEW BEDFORD, MA

Location: **52 Fisherman's Wharf, New Bedford, MA 02740**
Partner: **City of New Bedford // New Bedford Community Boating Center**
Installation Date: **April 2019**



Map 6. New Bedford Skimmer

In 2018, 11th Hour Racing granted COA additional funding to leverage, facilitate, and establish MTS installations in Southeast New England. In partnership with the City of New Bedford and New Bedford Community Boating Center, one MTS unit will be installed on Pier 4 Town Docks in the spring of 2019.

New Bedford is historically known for its fishing industry. New Bedford Harbor has similar characteristics to that of Newport and will make for a promising installation to reduce and trap plastic debris at its source. The major indicated sources of debris at this installation site are materials coming directly from fishing vessels and storm water outfall pipes. The dual partnership with the City of New Bedford and New Bedford Community Boating Center will engage young sailors and New Bedford residents on the issues of plastic pollution with the goal to actively address the problem.

DATA COLLECTION METHODOLOGY

MTS data collection operates very similarly to COA citizen science beach cleanups. Following the Ocean Conservancy Tally Sheet, COA environmental science skim-terns (skimmer interns) and volunteers spend approximately 60 to 90 minutes sorting through the previous day's skimmer collection (Image 5). COA-operated units run for approximately 250 days out of the year and are examined one to three times per week. Depending on the season, a day's collection can weigh anywhere between 20 and 200 pounds.

Image 4. COA Skim-terns conducting skimmer debris analysis

The tally sheet helps to keep track of the parameters for that day's collection and organizes the findings into recognizable items that are grouped with four subcategories: (1) Shoreline / Recreational activities (2) Ocean / Waterway activities, (3) Smoking related actives and (4) Medial / Personal Hygiene. Items that cannot be identified are accounted for by their make-up: Plastic, Foam or Paper.

The goal of data collection is not to extrapolate values and quantify debris, but to gain a better understanding of what types of debris are building up at the different MTS locations, and to be able to identify the most frequently found items.

Determination of poundage of debris collected on a yearly basis is a combination of approximately both COA and skimmer partners daily logs. With a signed agreement, skimmer partners are required to estimate and record the poundage of debris removed on a daily basis. The numbers provided by our partners are used to cross calculate the average debris removed per day multiplied by the amount of days of operations.

The findings presented in this report are broken up by year and by location. Locations in which data was nonsignificant were omitted from this report. Nonsignificant data is labeled when a location's total site visits has an item count of less than 100. Comparisons of yearly and site data were conducted for the units that underwent data collection.

RESULTS

HIGH LEVEL SUMMARY

Table 1. 2016 - 2018 Skimmer Summary

Number of Site Visits:	**166**
Items Collected:	**27,799**
Pounds of Debris Removed:	**20,615 lbs.**
Annual Average Debris Removed in Newport Harbor / Average Debris Removed Per Unit	**6,262 / 3,131 lbs.**
Annual Average Debris Removed at New England Boatworks	**914 lbs.**

After comparing Tables 1 – 7, we can determine that most of the bulk debris collected is from the collections of the Newport Harbor MTS units. Of the 20,615 pounds removed from all COA operated units, the Newport Harbor MTS units removed 18,786 pounds or about 91% of the total. The total mass of debris removed from the Newport Harbor units can be associated with this location housing two units opposed to one and for operating for an additional year. Regardless of the installment date and the number of units operating, Newport Harbor skimmers are averaging per unit 2,217 pounds more than the New England Boatworks (Table 8). This can be associated with the type of debris and organic matter being collected factoring the overall total weight. Newport Harbor Perrotti Park seasonally has more organic material in the summer months and can factor the overall totals at the end of each year.

When examining debris by category, Figures 2, 4, and 8 display that most of debris found is grouped within Shoreline and Recreational activities. Via the Ocean Conservancy tally sheet this is labeling debris that is mostly single use consumer waste: food wrappers, water bottles, plastic bags, straws, caps and lids, and unidentified plastic and foam particles. From the data collected from 2016 to 2018, approximately 60 to 70% of debris collected and analyzed weekly is being placed in this category. The remaining 30% to 40% of debris recorded is being grouped within the Smoking Related and Ocean Related Activities at 30% and 10% respectfully. Understanding the categorical groupings allows a greater understanding of what type of debris is being collected.

There is minor variance between years associated with overall percentage within group items. This means that no matter the number of site visits per year the categorical grouping of debris being found is falling within the same percentage. When comparing the overall summaries in 2017 and 2018 (Table 2 & 5), the total number of site visits in 2018 was down by 59 visits compared to 2017. The tables also label that 17,866 and 4,233 items were collected and counted in 2017 and 2018 respectfully. This data is important because it states and validates that the number of site visits directly correlates to the amount of itemized debris

recorded, but regardless of the number of items recorded, the categorical grouping of debris will remain the same.

When examining the total counts of individual items collected, we are able to define the results by categorical grouping graphs and make educated decisions on where particular debris originates. In Perrotti Park, the top two item polluters, Cigarettes and Food Wrapper, have remained constant in the last three years of data collection. Since 2016, the Newport Harbor MTS units were able to successfully trap 4,475 cigarettes and 4,058 food wrappers in just the 88 site visits. Perrotti Park is located in downtown Newport where millions of people visit each year. The top items collected are directly related to consumer and smoking waste that are often a huge source of litter, which inevitably turns into marine debris. The mass influx of cigarettes and food wrappers within the harbor can be sourced from the outfall pipe located directly next to the units. During rain events, food wrappers and cigarettes can be washed down from the city roads where they are released into the marine environment.

The debris from Newport Harbor MTS units and New England Boatworks unit are drastically different. In 2017 and 2018 (Figure 7 & 11) the top three item polluters captured at New England Boatworks MTS were foam, plastics, and food wrappers. As a private marina, New England Boatworks is not exposed to as much single-use consumer items as Newport Harbor is. The top items are directly related to boat building materials, dock products and consumer food wrappers. Foam was identified as the top item polluter and was sourced back to the marina's docks. Most of the docks are constructed with foam floaters that break down over time. This information can be displayed to marina staff so that proper measures can be taken to address the issue.

2016 SUMMARY

Table 2. 2016 Newport Harbor Skimmer Summary

Number of Site Visits:	**24**
Items Collected:	**5,710**
Pounds of Debris Removed:	**6,000 lbs.**

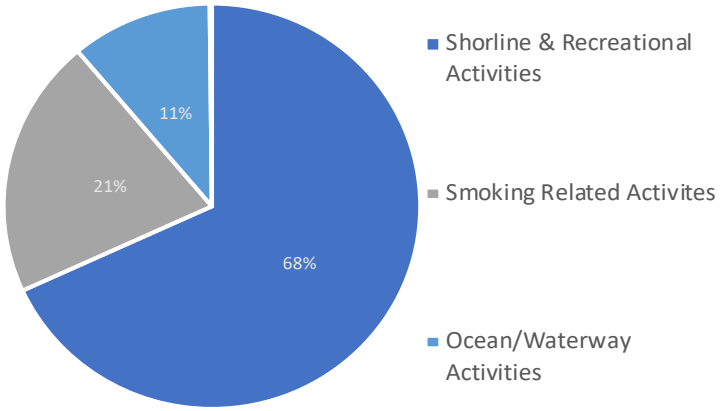


Figure 2. 2016 pie chart of total items collected within categorical subgroupings.

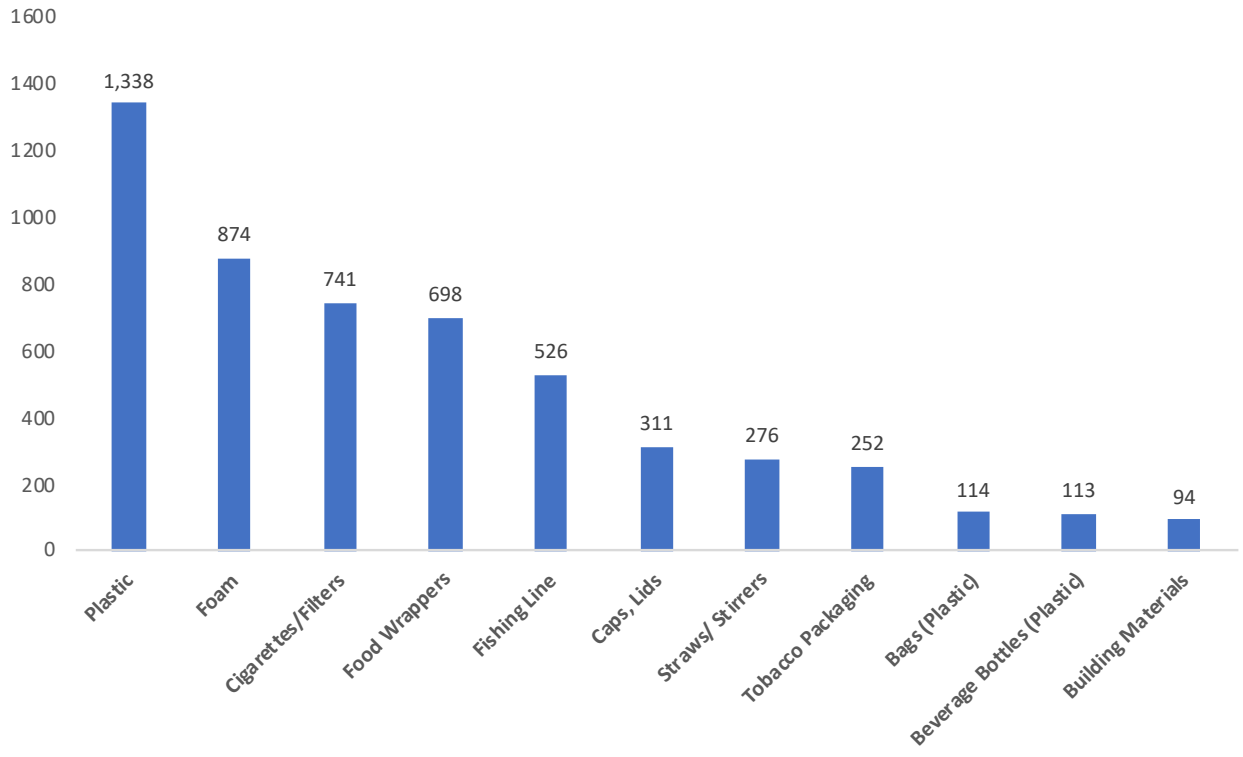


Figure 3. 2016 total itemized debris of material items with a count of over 90. *(X-Axis – Items // Y-Axis = Total Count)*

Table 3. 2017 Skimmer Summary (All Locations)

Number of Site Visits:	**95**
Items Collected:	**17,866**
Pounds of Debris Removed:	**8,730 lbs.**

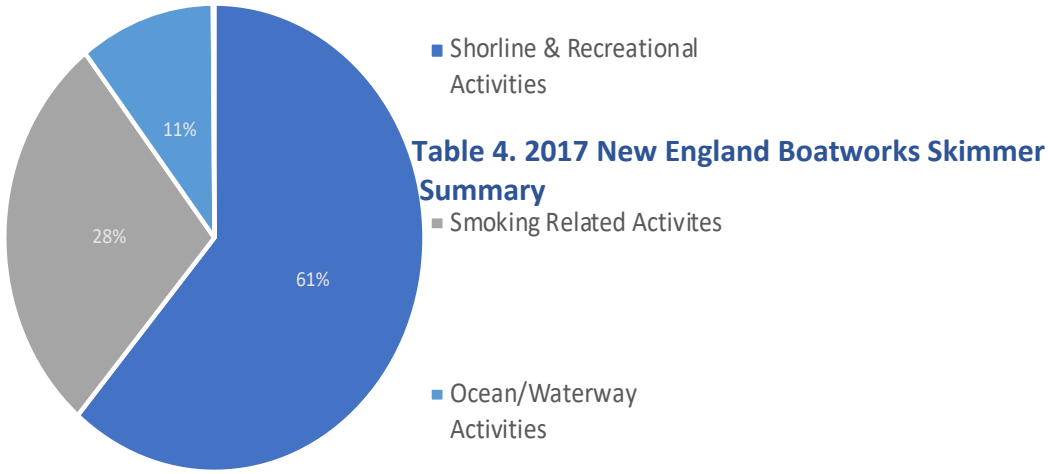


Table 4. 2017 New England Boatworks Skimmer Summary

Figure 4. 2017 pie chart of total items collected within categorical subgroupings.

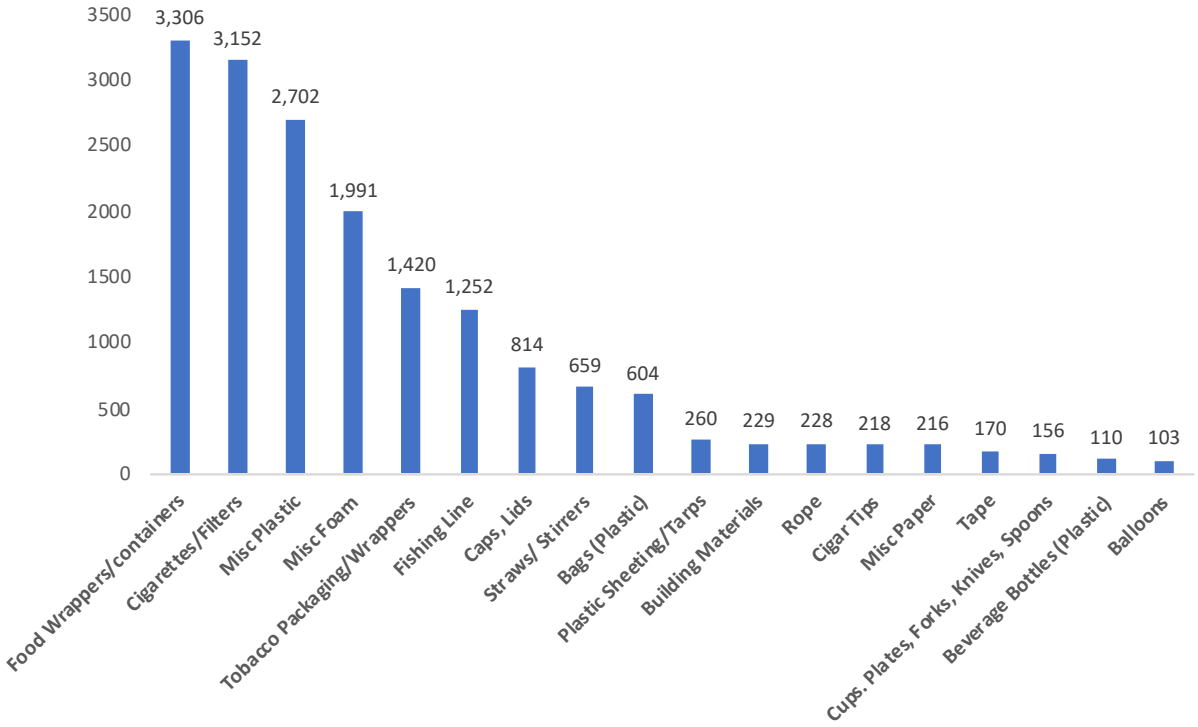


Figure 5. 2017 total itemized debris of material items with a count of over 100. *(X-Axis – Items // Y-Axis = Total Count)*

Table 5. 2017 Newport Harbor Skimmer Summary

Number of Site Visits:	**42**
Items Collected:	**15,306**
Pounds of Debris Removed:	**7,701 lbs.**
Percent of Debris Analyzed:	**25%**

Number of Site Visits:	**50**
Items Collected:	**2,257**
Pounds of Debris Removed:	**1,029 lbs.**
Percent of Debris Analyzed:	**43%**

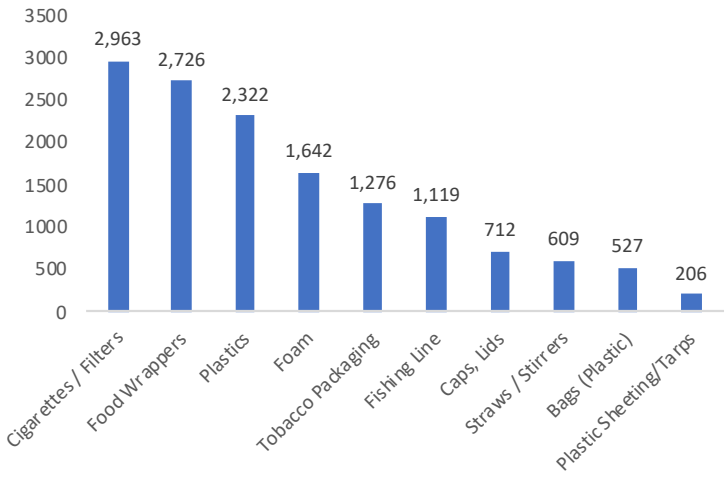


Figure 7. 2017 Top Ten Items Newport Harbor Trash Skimmer

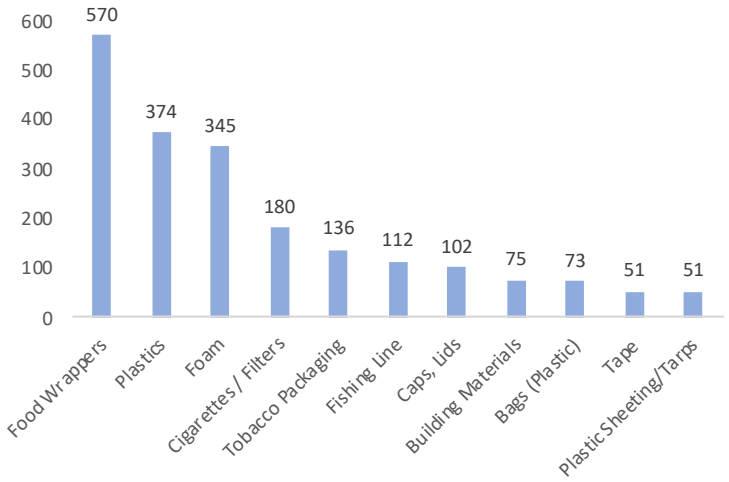


Figure 6. 2017 Top Ten Items New England Boatworks Trash Skimmer

Image 6. Foam commonly found in NEB skimmer

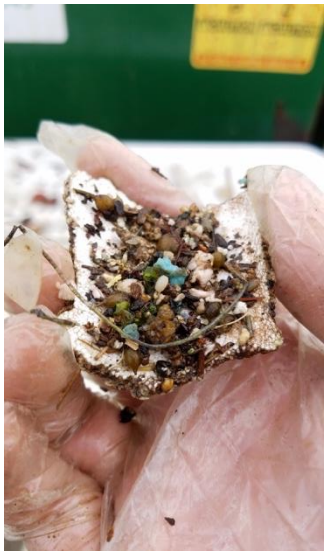


Image 5. Commonly found consumer waster in Newport Harbor Skimmer

Table 6. 2018 Skimmer Summary (All Locations)

Number of Site Visits:	**36**
Items Collected:	**4,223**
Pounds of Debris Removed:	**5,885 lbs.**

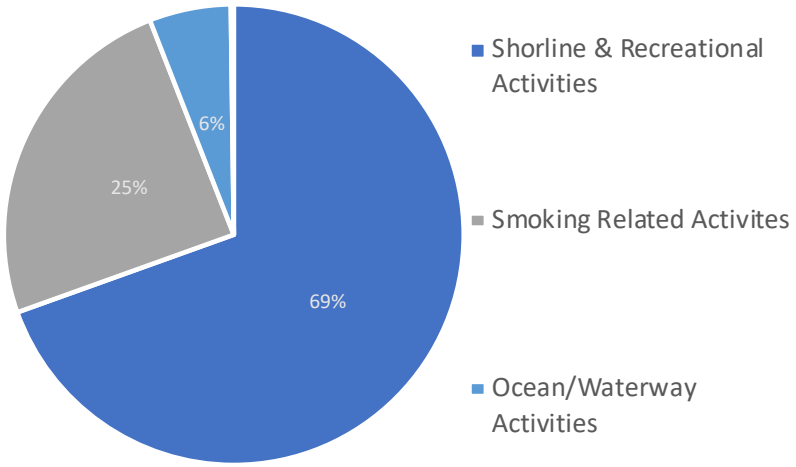


Figure 9. 2018 pie chart of total items collected within categorical subgroupings.

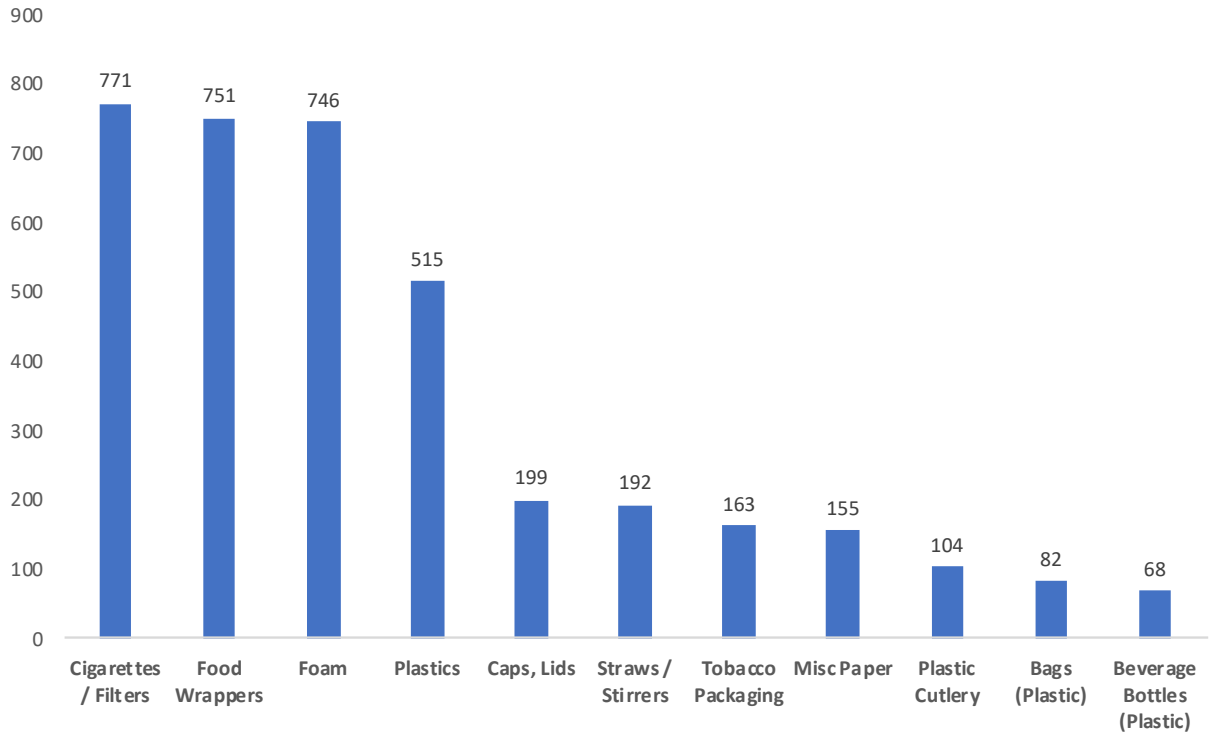


Figure 8. 2018 total itemized debris of material items with a count of over 100. *(X-Axis – Items // Y-Axis = Total Count)*

Table 7. 2018 Newport Harbor Skimmer Summary

Number of Site Visits:	**22**
Items Collected:	**2,939**
Pounds of Debris Removed:	**5,085 lbs.**
Percent of Debris Analyzed:	**34%**

Table 8. 2018 New England Boatworks Skimmer Summary

Number of Site Visits:	**14**
Items Collected:	**1,284**
Pounds of Debris Removed:	**800 lbs.**
Percent of Debris Analyzed:	**27%**

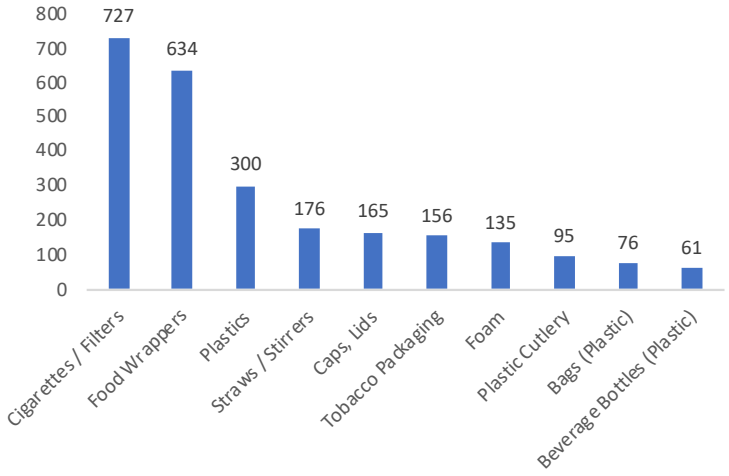


Figure 11. 2018 Newport Harbor Top Ten

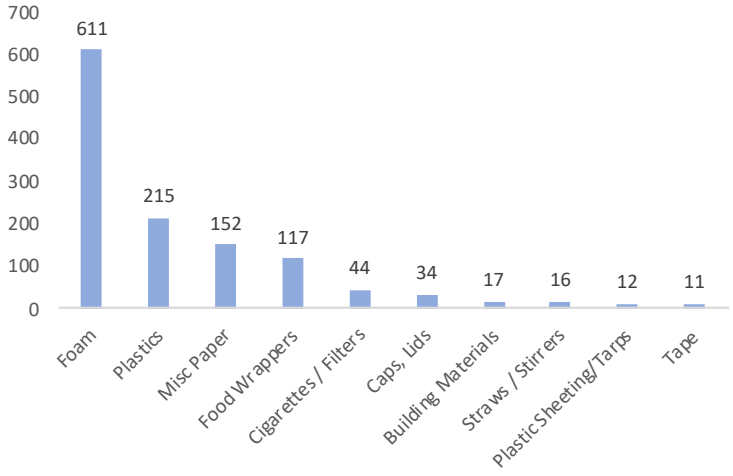


Figure 10. 2018 New England Boat Works Top Ten

Image 8. Cigarettes found in Newport Harbor skimmer

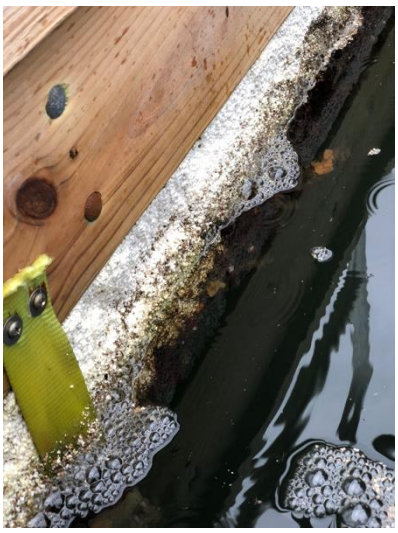


Image 7. Eroding foam docks at New England Boatworks contributing to the highest item count

Table 9. 2018 Newport Harbor Skimmer Summary

Number of Site Visits:	7
Total weight of Foam (g)	54
Total weight of Fibers (g)	5
Total weight of Plastic > 1.5'' (g)	93
Total weight of Plastic < 1.5'' (g)	38

Table 10. 2018 New England Boatworks Skimmer Summary

Number of Site Visits:	4
Total weight of Foam (g)	15
Total weight of Fibers (g)	0
Total weight of Plastic > 1.5'' (g)	34.8
Total weight of Plastic < 1.5'' (g)	0

In 2018, COA expanded data collection procedures to target foam and plastic that were less than 1.5 centimeter in length. When using solely the tally sheet to record data we exclude the chance of being able to track trends in micro debris. The objective of adding this level of detail to skimmer data collections allows us to make visual assessments of microparticles being collected.

Image 9. COA Skim-tern conducting micro level debris sort at New England Boatworks skimmer.

Methodology:

Once a week COA skim-terns sorted through skimmer collections from the previous day for 60 to 90 minutes. During the sort they grouped together four different microparticles commonly found within the units: Foam, Fibers, and Plastics and greater than 1.5 centimeters in length. Once separated, particles were washed, dried, and weighed. Particles were then added to a master collection for each grouping by site.

Image 12. Micro Foam

Image 11. Micro Fibers

Image 10. Micro Plastics greater than 1.5 cm

Image 13. Micro Plastics smaller than 1.5 cm

Image 14. Common skimmer collections displaying all four grouping of microparticles examined. (Foam, Fibers, 1.5"<Plastics<1.5")

Visual Results:

As more site visits were conducted more reoccurring debris items began to appear. From just 11 total site visits between the two locations we were able to document and identify three reoccurring unrecognizable items. When possible these items where tracked to their original source.

Plastics Larger than 1.5 cm:

Multiple oddly shaped black plastic discs were found weekly at both the Newport Harbor and New England Boatworks skimmers. These black discs were found throughout the summer and varied in count by week. These discs were tracked and identified as waste treatment plant discs, which are used in aeration tanks to increase the surface area to culture bacteria to ultimately help breakdown raw sewage. These discs were able to be tracked to the East Providence Waste Water Treatment plant where an unknown amount of them escaped the facilities secondary clarification and disinfection stages.

Image 15. Waste water treatment discs recovered.

Plastics Smaller than 1.5 cm:

A small white cylindrical plastic filler was another reoccurring item commonly found week to week regardless of the location. This item was first thought to be the remaining plastic found within inside a cigarette butt. However, no further research was conducting to identify the item.

Image 16. Reoccurring unidentified item

Micro Fibers:

Common fibers found were identified as cut fishing line or colored particles from clothing. After accessing the total jar of fibers, an oddly shaped rigid strand stuck out in abundance. This white V shaped fiber was found in consistent length and shape. From our observations we were able to estimate that these fibers originate from specific kinds of brushes used to clean the side of boats. No further investigation was conducted.

The 2018 microparticle testing was a success as COA was able to identify, label, and track numerous reoccurring micro items collected in the MTS units. If we did not participate in this subset of data collection, we would not have observed these visual trends. Due to the time intensive nature of microplastic identification process, we may not continue this portion of data collection as we focus on maximizing staff and volunteer time to collect meaningful data using the itemized tally collection.

EDUCATION & OUTREACH EVENTS

PROGRAM DETAILS

COA environmental education focuses on immersing students in their local environment, either through cleanups, marina trash skimmer tours, water testing or modeling the Aquidneck Island watershed, and then following up with practical ways that the students can become stewards of their environment on a daily basis.

COA has five areas of Experiential Environmental Education (EEE): environmental stewardship, watershed pollution, Ocean pollution, MTS and conservation. MTS is the fourth area and focuses on the how and where this technology operates, as well as an overview on the most common debris found.

Although COA works mainly to protect and preserve the coastal and marine ecosystems on and around Aquidneck Island, the organization understands the importance of engaging and educating adults and youth. Over the years COA has worked with both on and off Island groups to raise awareness of ocean health issues. At COA, we share our education procedures and are always available to schedule education events year-round.

In the summer months MTS tours are open to the public and are available biweekly to anyone interested in the work we do and how MTS technology works. The open tours are a great opportunity for COA to teach the community about simple ways to be sustainable by examining the material found within the trash skimmer. At every tour we encourage individuals to ask the important questions and get involved with volunteer efforts.

Within this section each year is broken up into subsections that aim to give a high-level overview of the number of events conducted, number of people reached, contact hours of events and people, and a description of each group that attended for that given year. In 2016, the MTS were installed in August and no education events were conducted.

HIGH LEVEL EDUCATION SUMMARY

Table 11. 2017 - 2018 Education Summary

Number of Education Events	**31**
People Reached:	**959**
Contact Hours:	**738**
Age Range:	**All Ages**
Differing Programs:	**14**

2017 SUMMARY

Table 12. 2017 Education Summary

Number of Education Events	**14**
People Reached:	**303**
Contact Hours:	**312**
Age Range:	**All Ages**
Differing Programs:	**8**

2017 PROGRAMS

PELL ELEMENTARY SCHOOL:

The students at Pell Elementary School were introduced to the topic of marine debris pollution and were asked to define or explain what the subject meant to them. After a brief discussion about what marine debris pollution meant, the students were taken down to the dock where the Newport Harbor MTS units reside. Staff then explained the purpose of the skimmers and how they work, scooping out the contents of the skimmer in front of the students. The students gained first-hand experience sorting through the collected debris and tallying the trash they found. The program concluded with students brainstorming ways they can reduce the amount of single-use plastic in their daily lives and what ways they think the marine debris issue should be addressed. These students were appalled with how much trash they found from the skimmer and by the fact that it was all removed from the harbor. They were very motivated to promote environmental stewardship and use environmentally-friendly products!

PORTSMOUTH ABBEY SCHOOL SUMMER CAMP:

Over the span of four weeks, four groups of the Portsmouth Abbey Summer Camp visited the Newport Harbor MTS units. Each group included both international campers and campers residing on Aquidneck Island. Each program began by defining marine debris and the six different of water pollution. We then discussed the different sources of water pollution, which brought us to the topic of the watershed. After a brief discussion addressing the concept of a watershed, we brought the campers down to the skimmers to illustrate how COA actively cleans marine debris in the Newport Harbor. The students learned how the skimmers not only clean

up floating debris on the top of the water, but also how they break down the petroleum products in the water, as well as through the process of oxidation. The students were then tasked with sorting the contents of the skimmers themselves and tallying the types of marine debris they found. This exercise provided a first-hand experience showing just how much marine debris can be found in one small harbor. Finally, we asked the students how they thought the MTS units could be improved to which they responded with some great, thought-provoking and creative ideas!

SUMMER SUCCESS CAMP:

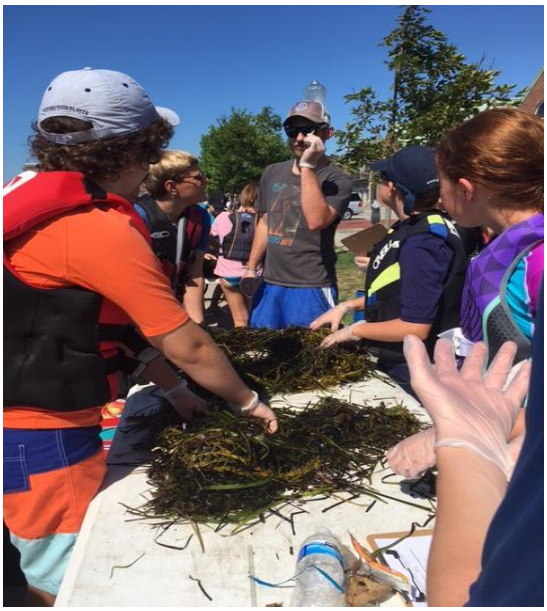
This was our second education event with the Summer Success Camp of the summer. During the second event we added MTS education to the program. This was the only group that we worked with throughout the summer, where the students received watershed and marine debris education from COA. We began by defining marine debris and discussing the six different types of water pollution: oil, nutrients, debris, microplastics, pathogens and noise. We then discussed the different sources of water pollution, which brought us to the topic of the watershed. After a brief discussion addressing the concept of a watershed, we brought the campers down to the MTS units to illustrate how COA actively cleans marine debris in the Newport Harbor. The students learned how the MTS units not only clean up floating debris on the top of the water, but how they also break down the petroleum products in the water as well through the process of oxidation. The students were then tasked with sorting the contents of the skimmers themselves and tallying the types of marine debris they found. This exercise provided a first-hand experience showing just how much marine debris can be found in one small harbor. Finally, we asked the students how they thought the trash skimmers could be improved to which they responded with some great, thought-provoking and creative ideas!

NEWPORT COUNTY BOYS & GIRLS CLUB:

The Boys and Girls Club Camp G.R.E.A.T. consisted of a five-week education program with various topics focusing around water pollution. Each week, the same topic was taught to three different age groups: rising 4th, 5th, 6th and 7th graders. During week four the curriculum focused on the question: How do we clean up water pollution? To demonstrate one of the approaches for cleaning up water pollution, we took each group to the Newport Harbor MTS unit, located just a few blocks away from the Boys and Girls Club. While at the unit we recapped the topic of marine debris, explained how the skimmers function, their purpose and discussed other possible ways for cleaning up marine debris in the ocean. This site visit gave the students a

real-life example of the amount of trash accumulating right in their harbor, while also illustrating ways that their city is trying to help address the problem.

NEWPORT YACHTING CENTER SUMMER CAMP:



Over the span of two weeks, we engaged two groups from the Newport Yacht Club's Summer Adventure Camp, a sailing camp focused on geography and sustainability, in trash skimmer education. We began by defining marine debris and discussing the six different types of water pollution: oil, nutrients, debris, microplastics, pathogens and noise. We then discussed the different sources of water pollution, which brought us to the topic of the watershed. After a brief discussion addressing the concept of a watershed, we brought the campers down to the skimmers to illustrate how COA is actively cleaning up some of the marine debris in the Newport Harbor. The students learned how the MTS units not only clean up floating debris on the top of the water, but how they also break down the petroleum products in the water as well through the process of oxidation. The students were then tasked with sorting the contents of the skimmers themselves and tallying the types of marine debris they found. This exercise provided a first-hand experience showing just how much marine debris can be found in one small harbor. Finally, we asked the students how they thought the trash skimmers could be improved to which they responded with some great, thought-provoking and creative ideas!

NEWPORT COUNTY GIRL SCOUTS:

COA visited the Newport Harbor MTS units with a group of four Girl Scouts to talk about what the skimmer does, how it works and what kind of trash it collects. The girls were then brought down to the MTS unit to see its contents and watch it being emptied before getting the chance to sort through its contents. This event provided a hands-on opportunity as well as a visual representation of what can be found in Newport Harbor. To conclude the program, the girls brainstormed ways that they can help reduce the amount of trash found in the water and they came up with some great ideas!

2017 COASTWEEKS:

COA participated in 2017 Coastweeks, a program designed and executed by RI Sea Grant, the Coastal Resources Center at the University of Rhode Island's Graduate School of Oceanography and the RI Coastal Resource Management Council, to raise awareness and create a greater understanding of our local coastline. COA provided a tour of the Newport Harbor MTS unit to the public. The program began with a brief introduction to COA followed by a detailed discussion of the MTS on the dock. First, we talked about the current initiatives in place working to remove marine debris from the ocean. We then introduced the MTS unit discussing how it works, its purpose, and how COA uses it to educate the community about marine debris pollution and promote environmental stewardship. Following discussion, we emptied the contents of the MTS and brought the contents to our table setup on the sidewalk to be sorted. With the younger children actively sorting, we ended the day by brainstorming ways to keep some of the types of trash we found out of the water as well as informing the group about the upcoming plastic bag ban being implemented in Newport and Middletown on November 1st. Our audience was amazed at the amount of plastic removed by the MTS in just a few short hours.

HOMESCHOOLING MARINE BIOLOGY CLASS:

COA visited the Newport Harbor MTS with a group of homeschool students taking a marine biology course who were from Aquidneck Island. The program began by defining marine debris and the six different types of water pollution. We then discussed the different sources of water pollution, which brought us to the topic of the watershed. After a brief discussion addressing the concept of a watershed, we brought the class down to the skimmers to illustrate how COA actively cleans marine debris in the Newport Harbor. The students learned

how the skimmers not only clean up floating debris on the top of the water, but how they also break down the petroleum products in the water as well through the process of oxidation. The students were then tasked with sorting the contents of the MTS themselves and tallying the types of marine debris they found. This exercise provided a first-hand experience showing just how much marine debris can be found in one small harbor. We ended the program by having each student say one thing that they could do to reduce the amount of single-use plastic they use each day.

2018 SUMMARY

Table 13. 2018 Education Summary

Number of Education Events	**17**
People Reached:	**656**
Contact Hours:	**426**
Age Range:	**All Ages**
Differing Programs:	**10**

2018 PROGRAMS:

6IMDC FIELD LEARNING ACTIVITY

COA hosted two MTS tours at the 6th International Marine Debris Conference in San Diego, CA. COA executive director, Dave McLaughlin, led the tour and informational session along with Eva Touhey, COA program manager, and Max Kraimer, COA marine debris specialist. The inventor of the MTS technology, Louis Pasoz was in attendance and helped to run the entire event. Louis, along with the COA staff, explained the mechanics, history and importance of the MTS to all the attendees, while also including a hands-on experience of emptying the skimmer and sorting through the debris to give everyone a real time example of what the skimmer collects.

6IMDC TECHNICAL POSTER SESSION

COA hosted an informational poster session at the 6th International Marine Debris Conference about the MTS and marnie debris removal technology. Over 350 people were able to check out the poster and discuss the work of COA with executive director, Dave McLaughlin, COA program manager, Eva Touhey, and COA marine debris specialist, Max Kraimer. Everyone was excited to see the hard work we are doing in eliminating marine debris and get a better understanding of what a MTS is and how it operates.

NEWPORT YACHT CLUB

COA led a tour of and education lesson for the kids from the Newport Yacht Club about the MTS located at Perrotti Park in Newport, RI. The tour was led by COA marine debris specialist, Max Kraimer. Max taught the children how the trash skimmers operate and discussed the importance of the MTS in helping with the problem of marine debris in the Newport Harbor. Then, the children sorted through the debris that was collected in the skimmer over the past few hours, tallying what kind of debris they found. This led into a final discussion about what kind of debris is ending up in the harbor, and ways that we can prevent in from ending up in the harbor. The children were all enthusiastic and creative in their ideas of how to improve ocean health.

SUMMER SUCCESS CAMP

The Summer Success Program consisted of 4 separate sessions with the same students. All sessions were led by COA education intern, Chrissy Leonard. During week two, the curriculum focused on the question: How do we clean up water pollution? To demonstrate one of the approaches for cleaning up water pollution, we took the group to the Newport Harbor MTS at Perrotti Park where Chrissy Leonard and COA environmental science intern, Paige Myatt, led a lesson about the MTS and marine debris. While at the unit, we revisited the topic of marine debris, explained how the unit functions, the purpose of MTS, and discussed other ways for cleaning up marine debris in the ocean. This site visit gave the students a real-life example of the amount of trash and type of trash accumulating right in their harbor, while also illustrating ways that their city is trying to help address the problem. The students sorted through the seaweed ad debris collected by the MTS working together to examine the debris and tally the types of debris they found.

BRADLEY SCHOOL SKIMMER TOUR

COA led a tour and education lesson of the MTS at Perrotti Park, for the kids from The Bradley School. The Bradley School located in Portsmouth, RI and is one of many Bradley Schools located in Rhode Island and Connecticut that provides a private educational program for students whose psychiatric and behavioral needs are not met by the public-school system. COA program coordinator, Jessica Frascotti, led the skimmer education lesson along with COA environmental science interns, Lauren Richards and Jill Chopin. The lesson began with a discussion about water pollution and marine debris and the kids and teachers hypothesized what items they thought they would find in the MTS. Then, Jill and Lauren explained how the MTS units operate using a visual poster located above the units at Perrotti Park and also brought the students down to the skimmer where they got to see first-hand how the MTS operates. Everyone then returned to the grass in the park to sort through the debris and seaweed that was collected by the MTS overnight. The children were enthusiastic and excited to sort through the debris and see what they could find. While sorting through the piles, they tallied the different types of debris. The lesson ended with a discussion on what the students learned, whether their hypotheses were correct, and a brainstorming on simple ways to improve ocean health in their everyday lives.

THOMPSON MIDDLE SCHOOL

COA hosted a tour of the MTS for the students from Thompson Middle School in Newport, RI. The students met COA marine debris specialist, Max Kraimer, at the two skimmers located at Perrotti Park. Max began the lesson with a discussion about marine debris and plastic pollution, leading into the importance of the MTS. Max described how the unites operate, while bringing the students down to one of the MTS units and opening the lid to provide the kids a live view of the MTS in operation, slowly collecting debris and aerating the water. The students were intrigued by the machine that, from afar, looks like a floating dumpster. Max ended the lesson by discussing simple ways we can improve ocean health and having the students brainstorm ways they can influence change, reduce the amount of single-use plastics in their lives, and help push for a more sustainable future.

NEWPORT COUNTY BOYS & GIRLS CLUB

The Camp GREAT consisted of a five-week education program with various topics focusing on water pollution. Each week, the same topic was taught to three different age groups: rising 4th, 5th, and 6th/7th graders. During week three, the curriculum focused on plastic pollution, marine debris degradation, and different ways to help clean up marine debris and improve ocean health. To demonstrate one of the approaches for cleaning up marine debris, we took each group of kids to the Newport Harbor MTS, located just at Perrotti Park. While at the skimmer, we discussed what marine debris is, how the skimmers function, the purpose of the MTS, and other possible ways for cleaning up marine debris. This site visit gave the students a real-life example of the amount of trash and type of trash accumulating right in their local harbor, while also illustrating ways that their city is trying to help address the problem. The students sorted through the seaweed and debris collected by the MTS, examining the litter and tallying what type of trash they found. This brings real-time awareness to the problem of litter and the type of litter ending up in our oceans.

SAILING EDUCATION ON THE ADIRONDACK II

COA went aboard the Adirondack II for a sailing excursion on August 14, 2018. During the sailing excursion, COA program manager, Eva Touhey and COA program coordinator, Jessie Frascotti led an educational lesson about marine debris and environmental stewardship. Jessie and Eva introduced everyone to COA and the programs we offer. Then, they discussed the problem of marine debris and importance of education and awareness when addressing the problem of marine debris. Eva discussed the different citizen-science initiatives people can get involved in, as well as the volunteer opportunities available through COA. Then, Jessie discussed plastic pollution and marine debris degradation, going into depth about the four MTS on Aquidneck Island and how they operate. The lesson ended with Jessie and Eva bringing around jars with small plastic and Styrofoam collected at the Perrotti Park skimmers. The guests from out of state were extremely interested to learn more about COA and seemed eager to get involved in citizen-science

initiatives in their own community and the local guests were excited to learn more about the environmental initiatives going on in their community.

COX AUTOMOTIVE SKIMMER TOUR

COA hosted an education beach cleanup at Kings Beach Fishing Area in Newport followed by a tour of the MTS at Perrotti Park in collaboration with Cox Automotive. COA program coordinator, Jessica Frascotti, led the beach cleanup at Kings Beach challenging the participants to reflect on the debris they found and ways that we can reduce pollution, improve ocean health, and influence positive and sustainable behavior change. Then, COA executive director, Dave McLaughlin led an educational tour about the MTS, showing the group how the unites operate and discussing how Newport is working to reduce marine debris. The participants were really interested in the MTS and began conversation about the engineering of the unit and how to get this technology to spread throughout the country and world. We were excited to work with adults from across New England to spread awareness about marine debris removal technology and the power of environmental stewardship.

COASTWEEKS

COA hosted a tour of the MTS at Perrotti Park as part of Coastweeks 2018! Coastweeks is a series of events put on by the RI Sea Grant and the Coastal Resources Center at the University of Rhode Island's Graduate School of Oceanography and the RI Coastal Resource Management Council, that happens every autumn to celebrate Rhode Island's Coast and build awareness about current projects and initiatives. COA hosted a Newport Harbor MTS tour on Friday, October 12th to educate participants about the MTS, how they operate, what kind of debris is collected, and ways that Newport is trying to clean up marine debris. At

this tour, due to increased precipitation, the outflow pipe was noticeably releasing cigarette butts, food wrappers, and other debris. The tour was led by COA marine debris specialist, Max Kraimer, who is an expert on the MTS. After the tour of the skimmer, Max offered tips on what participants can do to reduce waste entering our water systems.

2018 SWIM TO SKIM

On Sunday July 8, 2018, COA took ownership and hosted the first every Swim to Skim race in Newport Harbor. This fundraising event is to highlight improved water quality in Newport Harbor from the reduction of marine debris by Perrotti Park MTS units, emphasize the dependence that Aquidneck Island's economy has on a clean ocean celebrate the diversity of people that use our surrounding waterways and emphasize the importance of keeping our waterways accessible for all users!

There were 2 distances to the course (0.9 miles and 1.5 miles) with categories based on gender and wet suit (including lava pants) and no wet suits. Awards are giving to the 1st and 2nd place finishes in each category.

Results for the 2018 event can be viewed through the COA webpage:
http://www.cleanoceanaccess.org/swim-to-skim/

Below is a Newport Daily News article written by staff writer Sean Flynn, featuring the 2018 Swim to Skim event.

SWIM

From Page A1

"This is my first time in this event and it's only my second open-water competition," Cai said. "Normally I swim in a pool and get the brief stop at the wall. But I loved this. The three of us did it together the whole way."

The race across the harbor took place in four previous years to benefit Clean Ocean Access, but then it was called Sharkfest and had different sponsors. In past years, there were age categories, but this event was divided differently: women and men's divisions for the 1.5-mile swim, with wetsuit and without wetsuit; and women and men's divisions for the 0.9-mile swim, with wetsuit and without wetsuit.

Jill Lancaster of Barrington, wearing a wetsuit, and Bruce Novis of Jamestown, in just swim trunks, both competed in the 0.9-mile swim, and were the first out of the water overall.

Lancaster had an official time of 20 minutes and 43 seconds, while Novis clocked in at 20:52.

"He was leading the whole time," Lancaster said with a smile.

This was a good-natured competition and no one was charging out of the water to cross the line ahead of others.

"The water temperature was 67 degrees, not too bad, but I chickened out and wore a wetsuit," Lancaster said. "I swam in the race twice before when it was Sharkfest, so I'm familiar with the course."

"This was my first swim in this event," Novis said. "It's a beautiful swim. It's perfect. Most of us are a close-knit group of swimmers. We all know each other. Some of us have been competing against each other for more than 30 years."

Many of the participants compete on the Swim Rhode Island masters team.

Doug Sayles, the team's coach and chairman of the U.S. Masters Swimming New England Chapter, announced the event and knew almost everyone's name as they came out of the water.

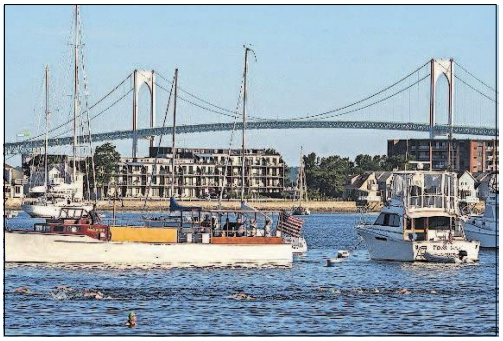
In 2013, Sayles recommended Newport as a Sharkfest site to Dave Horning, executive producer of Enviro-Sports, the sponsor that at that time named Clean Ocean Access as the beneficiary.

Olivia Bull ,12, of Worcester, Mass., wins her age group in the 0.9 mile Swim to Skim on Sunday at King Park in Newport.
[DAVE HANSEN/ STAFF PHOTOS]

Swim to Skim swimmers Victor Cai, 18, Elizabeth Beisel, Stuart Crommarty and Albert Garcia talk after the race.

Swimmers depart from Perrotti Park during the Swim to Skim on Sunday in Newport Harbor.

Swimmers congratulate each other as they head for the finish line.



Swimmers traverse Newport Harbor on Sunday.

SWIM TO SKIM: TOP FINISHERS

Women — 0.9 mile
No wetsuit: Ivy Richter, 18, 21:43; Sara DiNardo, 32, 22:08; Olivia Bull, 12, 26:28.
Wetsuit: Jill Lancaster, 20:43; Pamela Wallace, 29:47; Andrea Halpin, 33:40.
Men — 0.9 mile
No wetsuit: Bruce Novis, 53, 20:52; Jim Hartnett, 54, 22:38; Chris Doppke, 52, 26:10.
Wetsuit: David Barber, 23:05; Jim Porter, 27:01; Robert Nelson, 27:35.

Women — 1.5 mile
No wetsuit: Beatrix Lavigueur, 21, 29:50; Wynter Sands, 16, 32:28; Stephanie Winslow, 37, 38:17.
Wetsuit: Elizabeth Beisel, 25, 28:37; Katie Marshall, 29, 31:47; Jen Morin, 44, 32:13.
Men — 1.5 mile
No wetsuit: Victor Cai, 18, 28:38; Matthew Alford, 30, 28:59; Matt Gilson, 30, 29:05.
Wetsuit: Albert Garcia, 47, 28:44; Stuart Cromarty, 54, 29:05; Tim Morse, 69, 33:15.

"We own the event now," McLaughlin said.

The current sponsors are Amica Insurance, Hotel Viking, Pangaea Logistics and Blue Isle Power Docks, he said.

Trent Theroux, 50, of Barrington, the winner of the first Sharkfest in 2013, was among the competitors this year. He later swam the 47 miles around Aquidneck Island in 2013, as a way to show he was back to full competitiveness.

He was kayaking in September 2002 when a motorboat drove over him and his kayak. The propeller severed major back muscles and cut into five bones in his spine, leaving Theroux bedridden and in rehabilitation for years.

He plans to swim the English Channel in August this year to benefit a group that helps people with paralysis.

"It's wonderful to swim among the multimillion yachts," he said jokingly after he came out of the water on Sunday.

New competitors to the event were impressed.

"This is my first real open-water swim," said Kristina Cotoia of Jamestown, who did the 0.9-mile swim in a wetsuit. "It was harder than I thought."

She swam alongside Kathleen Rendos of Newport, who was also participating in her first open-water swim.

"It was great," Rendos said. "Maybe we'll work up to the 1.5-mile course next year. Anything to support Clean Ocean Access. They are a great local organization."

"This is my first swim race," said Todd Oneto, 55, of Newport. "It's more difficult than running. That's for sure. I've been swimming, but in pools for the most part."

Jane Phillips, 12, of Middletown was among the younger contestants and she swam with her father, Jonathan Phillips, 43.

"It was cold and we went the wrong way, but it was very fun," Jane said. "I'd do it again."

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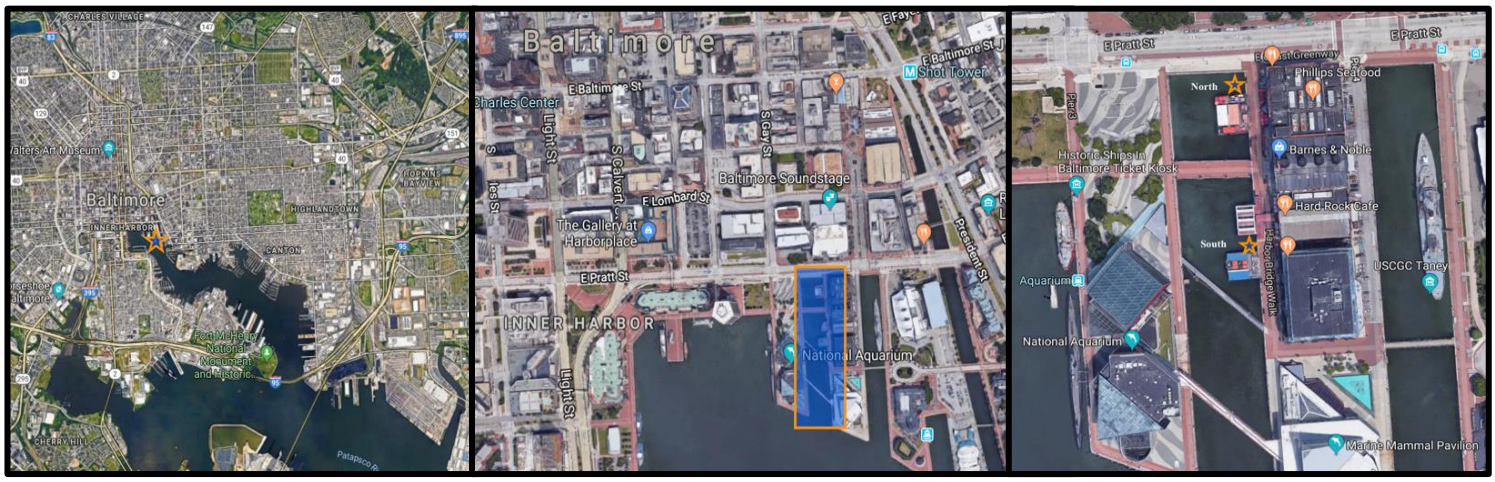
BALTIMORE INSTALLATION

On the week of August 20th 2018, COA team members Dave Mclaughlin and Max Kraimer traveled to Baltimore, MD to help facilitate the installation of two MTS units. MTS units were installed in the inner harbor of Baltimore on private leasing grounds of The Cordish Company. This trip was designed to network connections and form partnerships between Marina Accessories Inc., The Cordish Company, and COA. These connections resulted in a proposal to introduce more MTS units in order to reduce the amount of marine debris in Baltimore Harbor, improve water quantity, and promote environmental stewardship.

Image 17. Debris found at Pier 4, Inner Harbor, Baltimore MD

Upon arrival on August 23rd, our first stop shortly after checking into the hotel was to the purposed MTS installation site. Four locations on Pier 4 at the Pratt Street Power Plant were posed to us as potential locations to install the new MTS units. It did not take long until debris was spotted by our COA marine debris experts. Debris observed traveled in alarming groups and mostly consisted of single use food wrappers, bottles, and plastic bags (Figure 1). Limited organic material was amongst the plastic pollutants. Determining that debris would collect at all four regions we chose the two best install locations based on electrical power input and high public visibility (Figure 2). The north unit is located in a high foot traffic area and is in close proximity to Phillip's Seafood outdoor seating. This location has great potential to collect and trap debris and pollutants that are emitted into the water by a nearby outflow pipe. The second southern location is further down the pier, directly across from Baltimore's National Aquarium. Although we were not able to get a tour of the Aquarium on this trip, we did make connections and were promised a tour on the next visit. The southern unit will mostly likely collect debris that has traveled in from the outer harbor.



Map 7. Map of Pier 4 & Locations of MTS install

Image 18. MTS trailer delivery by Bellingham Marine

Installation started promptly at 7:00 A.M. the morning of the 24th. Marina Accessories sister company Bellingham Marine Industry, helped with the final shipment of the MTS units from York, PA to Baltimore, MD (Figure 3). The units suffered limited damage during traveling, which allowed for a quick turnaround from pre-install steps to physically lifting the units up to splash them in the water. Good News Electric, The Cordish Companies go to electricians helped to lower the units into the water with the use of a boom bucket truck. The process of splashing and mounting the MTS units into the water went smoothly and efficiently, ending before 9:30 A.M. (Figure 4,5). The rest of the day was used to wire the units properly (Figure 6). These units are mounted on fixed piers verse floating docks as our unit are in Newport. This allows the MTS unit to move vertical down the mounting rod with the tide which posed a challenge for wiring. All in all, the units were fully operations and were collecting debris by 3:30 P.M.

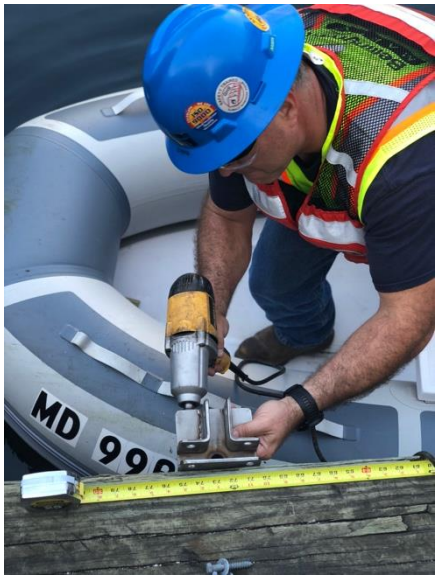


Image 19. Good News Electric using boom truck to lower MTS // Bellingham Marine installing Mounting Brackets // Good News Electric configure MTS wiring into control planal.

The day after installation was devoted to fine tuning and optimizing the units. The MTS inventor, Louis Pasoz, arrived early Friday morning to help with this process. After installation on the 24th both units had a float switch issue indicated by the control panels alert light tripping. Troubleshooting the issue with Louis was a great learning experience and helped us fix one of our units in Newport. The process of tuning a MTS includes: addition of extra zinc electrolysis protection, sharpening of motor blade, positioning unit's aerator, adjusting

ballast tanks for proper floatation, and addition of stress impact door stops. These few additions and modifications are a crucial step to making sure the units are running to the best of their ability.

After the installation and tuning were completed COA staff debriefed The Cordish Company on steps to operate the units on a daily, weekly, and monthly level. The individuals from The Cordish Company were impressed with, not only the technology, but the professional manor of both COA and Marina Accessories Inc. He discussed many possible investors and educational partners that might be willing to expanding MTS technology in the Baltimore area. Now that the units have been operating for a week, The Cordish Company has reach out to us on multiple occasions excited with the collections the unit. In the first weekend of operation the unit was successfully able to remove over 100lb of debris. COA is excited to partner with The Cordish Company to install multiple MTS units throughout Baltimore and join the areas growing trend of turning the tide on plastic.

UNIVERSITY OF BROWN ENGINEERING GROUP

In the Fall of 2018, five students studying Engineering at Brown Univeristy collaborated with COA to find a better way of tracking and managing marine debris collected in MTS. As part of a capstone class, the team researched methods of separating organic matter, like seaweed and macro-algae, from inorganic matter, like plastic debris and microplastics. Using weekly seaweed samples collected from the Newport Harbor MTS, the students worked to engineer a device that will assist COA with post-separation processing, properly managing marine debris, and with streamlining data collection from the skimmers. The team presented their research on December 4th at the Newport Public Library as part of COA's monthly Ocean Science Speaker Series.

Image 20. Brown Engineer Team (Left to Right): Erin Cole, Isabelle Bauman, Bianca Antonio, Sam Frolichstein-Appel

Student Biographies:

Bianca Antonio is a senior at Brown University studying mechanical engineering. She is interested in the intersection of design, technology and social innovation. After graduating, she hopes to blend all of her interests to create products and structures that people love to use. Bianca is originally from the Philippines and Singapore (two countries made up of islands in the Pacific) so she's very grateful to experience working with coasts and conservation through Clean Ocean Access in Rhode Island.

Sam Frolichstein-Appel is a senior studying mechanical engineering. Originally from Chicago, he's very interested in big things (e.g., trains and skyscrapers), and is interested in working in transportation, infrastructure, or construction after graduating. Coming to Rhode Island has introduced him to new concepts such as small things (e.g., microplastics and strands of seaweed) and the ocean, and working with Clean Ocean Access has enabled him to appreciate the connections between such big and small ideas.

Erin Cole is a senior studying mechanical engineering at Brown University. She grew up in a small mountain town in Colorado, where her love for the environment began. While at Brown, Erin has focused on design and education, working to make engineering more accessible. She has loved working with Clean Ocean Access to address ocean pollution while learning more about environmental efforts in Rhode Island!

Isabelle (Izzy) Bauman is a senior at Brown studying Mechanical Engineering with a focus in renewable energy. Izzy grew up in Los Angeles California, but her family has been in Jamestown, RI, since 1634! At Brown, she is president of Climate Action League, a student group that implements energy-efficient technology on campus. She has research and industry experience in wind energy, solar energy, and sustainable building design. Izzy is

excited to apply her backgrounds in engineering and environmental advocacy with Clean Ocean Access this semester.

MEDIA & COMMMUNCIATIONS

Since launching the MTS program in August 2016 COA has used the power of digital media to communicate the importance and success of the program to the more than 5,000 followers across our Facebook, Twitter, and Instagram platforms. Over the past two years we have engaged and informed thousands of people about the problem of ocean pollution and the important role MTS technology plays in marine debris removal, monitoring, and data collection.

Through our frequent and engaging social media posts featuring the MTS units and our education and outreach events throughout Aquidneck Island, COA has garnered the attention of local, state, and industry media outlets and brought increased visibility to the MTS technology, as well as the issue of marine debris pollution in Rhode Island. Since 2016, the MTS program has been featured in dozens of news stories and briefs in outlets such as the Providence Journal, Rhode Island Monthly, ecoRI News, The Newport Daily News and Newport This Week. Below are high level overviews of the reach and engagement of the MTS program across our social media platforms, as well as media highlights of the program in local, state and industry news outlets.

The social media metrics below capture the reach, impressions, and engagement of all social media posts referencing the MTS program across COA's Facebook, Twitter, and Instagram platforms between August 1, 2016 and November 30, 2018. References to the MTS program include any posts referring to the program by name (Marina Trash Skimmer or Newport Harbor Trash Skimmer) and/or using any of the following hashtags: #MarinaTrashSkimmer, #TrashSkimmers #Skimmers, and #MTS. Facebook Insights, Twitter Analytics, and Instagram Insights were used to gather metrics for this section of the report.

MARINA TRASH SKIMMER PROGRAM SOCIAL MEDIA REACH & ENGAGEMENT

Table 14. Facebook Aug 2016 – present

Number of Posts Highlighting MTS program	Lifetime Post Total Reach[1]	Lifetime Post Total Impressions[2]	Lifetime Engaged Users[3]
78	6,1073 users	94,013	3,333 users

Table 15. Twitter Aug 2016 – present

Number of Posts Highlighting MTS program	Total Post Impressions[4]	Total Post Engagement[5]
35	20, 219	459

Table 16. Instagram Aug 2016 – present

Number of Posts highlighting MTS program	Total Post Likes	Total Followers (as of Nov. 2018)
62	3,997	1,918

[1] The number of people who had your Page's post enter their screen. Posts include statuses, photos, links, videos and more. (Unique Users)

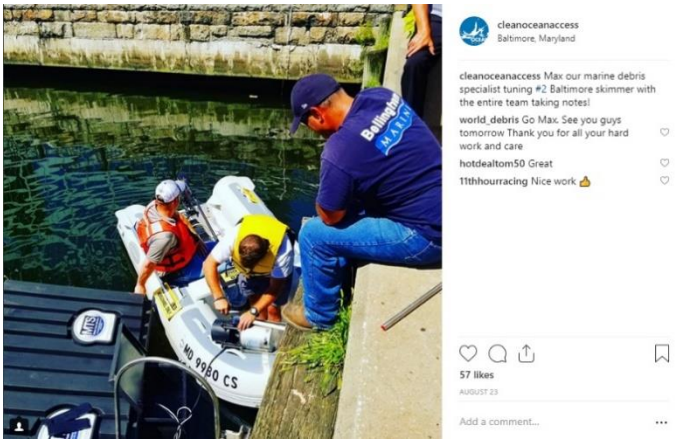
[2] The number of times your Page's post entered a person's screen. Posts include statuses, photos, links, videos and more. (Total Count)

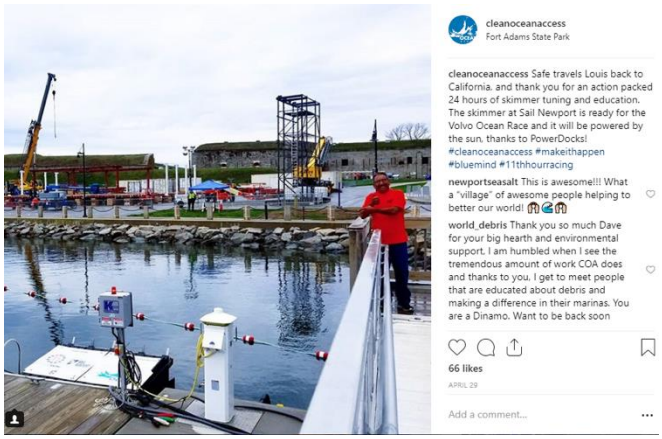
[3] The number of unique people who engaged in certain ways with your Page post, for example by commenting on, liking, sharing, or clicking upon particular elements of the post. (Unique Users)

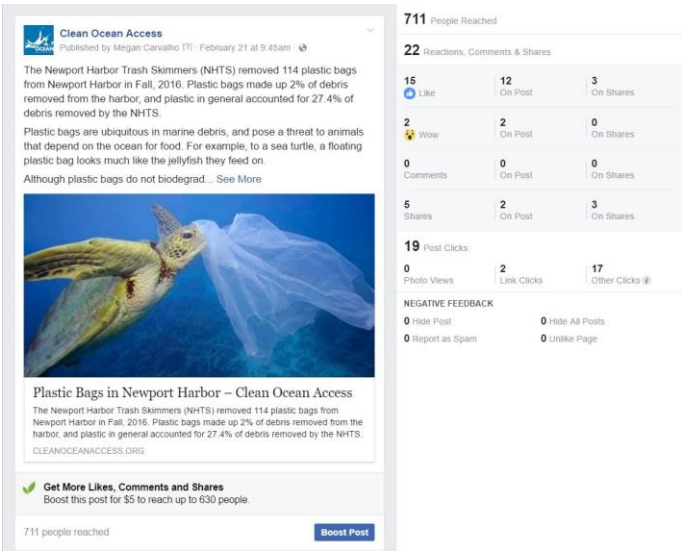
[4] Number of times users saw the Tweet on Twitter

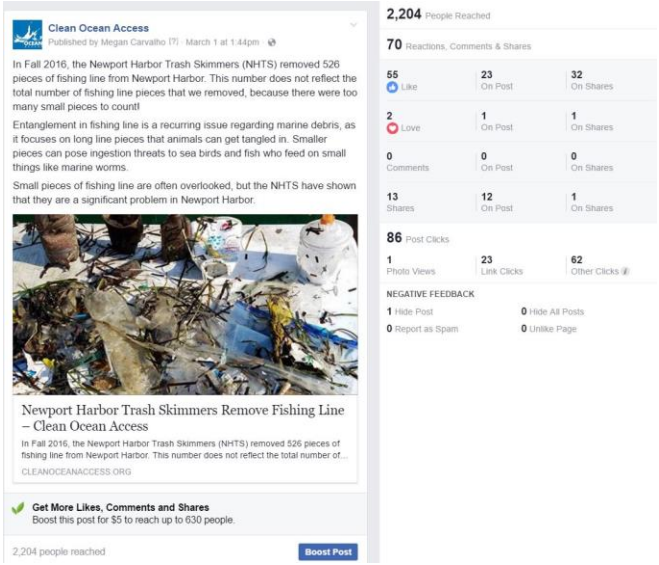
[5] Total number of times a user interacted with a Tweet. Clicks anywhere on the Tweet, including Retweets, replies, follows, likes, links, cards, hashtags, embedded media, username, profile photo, or Tweet expansion

SAMPLE SOCIAL MEDIA POSTS









TOP HEADLINES & MEDIA HIGHLIGHTS

[Clean Ocean Access Receives $66,000 Grant to Install New Trash Skimmers in Newport And Portsmouth]

[Newport Harbor Trash Skimmers Removed 6,000 Pounds of Debris in 2016]

[Trash Skimmers Installed in Newport Harbor]

[An Ocean State of Trash]

[Cleaner seas is goal of Volvo Ocean Race]

[Marine Debris Growing Problem for Beaches, Wildlife]

[New England Boatworks Becomes Rhode Island's Largest Clean Marina]

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New England Boatworks

Sail Newport

Port of New Bedford // New Bedford Harbormaster

Hot Club

COA Skimterns (Skimmer Interns):

Cole Tretter

Bonny Turek

Paige Myatt

Jill Chopy

Lauren

Emma Gettman