



2021 Annual Report

Restoring oyster reefs to New York Harbor through public education initiatives

Vision & Impact

We envision a future in which New York Harbor is the center of a rich, diverse, and abundant estuary. The communities that surround this complex ecosystem have helped construct it, and in return benefit from it, with endless opportunities for work, education, and recreation. The harbor is a world-class public space, well used and well cared for—our Commons.



Our Work to Date

75 million oysters
introduced to NY Harbor

18 restoration sites; 12 are
field stations (see map)
designed to engage the local community

1.9M pounds of shell
reclaimed from NYC restaurants

11K volunteers
engaged by the project



New York City Comprehensive Waterfront Plan (2021)

In December 2021, New York City released its latest 10-year vision for the City's 520 miles of waterfront. The report contains several references to Billion Oyster Project and New York Harbor School, recognizing them as leaders in oyster habitat restoration, public engagement, and environmental education (including restoration-based marine STEM education at all grade levels).

A System-wide Approach to Restoring the Natural Environment

"The Billion Oyster Project, in collaboration with scientists, maintains monitoring stations and community oyster reefs throughout all five boroughs. The Wallabout Oyster Nursery in Brooklyn is an example of a spawning sanctuary, where oysters spawned on Governors Island grow and breed, adding to the larvae in Upper New York Harbor and increasing the diversity of life at the Brooklyn Navy Yard's edge." (p. 32)

Community Services and Social Infrastructure

"Projects like the Billion Oyster Project are organizing and educating residents on how to boost ecosystem services in natural areas, including at Bayswater Point State Park." (p. 73)

Positioning the Next Generation for Career and Technical Education on the Waterfront

"The Harbor School, which has been operating on Governors Island since 2010 is a NYC public school with approximately 430 students enrolled. All Harbor School students participate in traditional State Regents-based academic courses and one of [seven] CTE programs of study. CTE programs include aquaculture, marine policy and advocacy marine systems technology, marine biology research, ocean engineering, vessel operation and professional diving. In addition to achieving industry certification, students have access to paid internships, service-learning opportunities, professional visits, conference presentations and work-site tours." (p. 189)

A 10-Year Vision

"Oyster monitoring stations and community oyster reefs – maintained by the Billion Oyster Project in collaboration with community scientists – are located throughout the five boroughs." (p. 211)

“We have a weapon as we fight for clean water and protection from storm surges and extreme flooding: Oysters. Millions of them.”

– **New York City Mayor Eric Adams**



Restoration

2021 Oyster Habitat Restoration by Project Site	Structure Type	# of Structures	Oysters
Tribeca Pier 26 – Hudson River Park	Reef Ball	96	To be measured in 2022
	Gabion	80	9,822,203
Soundview Park – Bronx	Supertray	200	7,207,432
Ecodock Nursery / Oyster Research Stations	Supertray	98	3,638,473
SUNY Maritime College	Supertray	60	2,570,689
Pier 88 – Manhattan	Piling Wrap	16	1,076,775
One°15 Marina – Brooklyn Bridge Park <i>(see next slide)</i>	Gabion	5	588,861
	Cabinet	3	185,071
Domino Park – Two Trees	Biodegradable Bag	36	30,000
	Piling Wrap	1	398,448
Williamsburg Field Station	Cabinet	4	151,422
Coney Island Creek	Cabinet	1	117,772
Governors Island – Project SOAR	Biodegradable Bag	125	5,000

Project Highlight: Brooklyn Bridge Park Field Station



Gabion Reef (Accessible by Divers)*

Installation Date: August 2021

5 Gabions

588,861 Spat on Shell

Oyster Nursery

Installed Summer 2020

25 SEAPAR® Baskets

215,000 Oysters

Community Reef (Accessible by Wading)*

Installation Date: September 2021

3 Community Cabinets

185,071 Spat on Shell

Oyster Research Stations (Accessible by Pier)*

Installed Summer 2020

20 oyster research stations

1,200 Oysters

* Locations are approximate

West Pond, Jamaica Bay, Queens



In 2021 we participated in the construction of a new living shoreline at West Pond in the Jamaica Bay Wildlife Refuge, an effort led by the Jamaica Bay-Rockaway Parks Conservancy.

As a living shoreline, the restoration project uses natural features to protect West Pond and adjacent loop trail, limiting erosion along this vulnerable shoreline while enhancing the shoreline with native plants creating habitat in Jamaica Bay.

The living shoreline includes a shell-bag breakwater system providing wave attenuation and erosion control, along with fascines and coir logs. Shells were collected by Billion Oyster Project's Shell Collection Program and were placed in 5,000 biodegradable bags by BOP volunteers on Governors Island before being transported to Jamaica Bay.

Support provided by the Fund for the City of New York and the Jamaica Bay-Rockaway Parks Conservancy.



Williamsburg Field Station



Education: MS 50 summer school, Oyster Research Station and classroom tank trainings

Community Science: 20-week water quality testing season with sampling at 70 sites, North Brooklyn Comparative Oyster Growth Study

Community Outreach & Advocacy: “The Big Oyster” mini-golf hole, Oyster shell drop-off at River Farm, Nov. 4 Field Station Open House, Community Board and City Council Testimony on behalf of River Ring

Restoration Structures Installed:

- 36 biodegradable mesh bags
- 5 gabions
- 1 piling wrap

Total Juvenile Oysters Introduced: Approx. 430,000

Exciting Discovery: Wild oysters living on the seawall ledge



Hudson River Park Estuarine Sanctuary



Tribeca Enhancement Project (2021)

Billion Oyster Project supplied 11.2 million juvenile oysters to the Tribeca Habitat Enhancement Project in the Hudson River Park Estuarine Sanctuary. With volunteers, Billion Oyster Project built 80 steel mesh inserts for welding into gabions and cleaned over 700 super trays of cured shell in preparation for setting. Each gabion was filled with cured shell and set with oyster larvae at Billion Oyster Project's remote setting facility at Red Hook Terminals. 96 reef balls were also set with oyster larvae.

Gansevoort Peninsula Project (2022)

Billion Oyster Project has been engaged by Hudson River Park Trust for a similar project at Gansevoort Peninsula to fabricate 227 gabions, filled with cured shell; 144 of the gabions will be set with oyster larvae, with adult oysters added to some of the remaining gabions. 44 reef balls will be

added to the remaining gabions. With volunteers, Billion Oyster Project fabricated 144 mesh inserts in fall 2021, and will fabricate an additional 80 with volunteers in spring 2022.



Shell Collection

This year, our Shell Collection Program focused on re-scaling after city-wide restaurant shutdowns in 2020. We have not reached pre-pandemic collection levels, but are growing closer.

We started the year off operating the program just two days a week. By August, we added another collection day, operating our truck on a 3 days per week. Adding an additional day to the route allowed us to add 15 new partners to the program, growing from 30 restaurant partners to 45 restaurant partners.

In 2021, we collected 214,640 lbs of shell or 263 cubic yards. We collected between 3,000 to 5,000 lbs of shell a week.

From the program's inception, we've collected 1.9 million lbs of shell and deployed about 780,685 lbs around various reef sites in NY Harbor.



Oyster Production

2021 was our most successful year to date for oyster production!

In total, we deployed approximately 25.8 million oysters in New York Harbor across nine reef sites and various Oyster Research Stations, and created 2.5 acres of oyster reef habitat.

At our remote setting facility, located at Red Hook Terminals, we set tens of millions of oyster larvae across three setting events between June and August.

Our oyster production team is currently determining the extent to which we need to scale Billion Oyster Project's remote setting facility to stay on pace to reach one billion oysters by 2035.



Innovative Structures

In 2021, we designed, built, and installed a **piling wrap** beneath the Domino Park esplanade along the East River in Williamsburg, Brooklyn. Strong wave energy and the piling dimensions required careful consideration of the materials and installation logistics.

The design features a stainless steel tension clamp system, 4 stainless steel panels, 8 mesh “pockets” of juvenile oysters, and sliding PVC closures to facilitate monitoring. The wrap introduced approximately 30,000 juvenile oysters to the site.

Studies suggest that piling wraps enhance marine biodiversity, and may protect pilings against erosional forces.

We will refine the design and monitor the wrap in 2022, with the goal of installing additional piling wraps at the site.





Education

Marine STEM Education in New York City

With a new waterfront-themed middle school coming to Red Hook, Brooklyn, New York City is now home to an elementary school, middle school, high school, and college, where local students can explore marine studies and prepare for careers on and around our waterways.

1

The Harbor View School (SI)

PS 59 on Staten Island has participated in BOP for years, and sends elementary students to the Symposium every June.

2

Red Hook Neighborhood School (BK)

PS 676 in Brooklyn has plans to convert from an elementary school to the first Harbor Middle School.

3

New York Harbor School (M)

The Urban Assembly New York Harbor School on Governors Island will be expanding into a new building with an indoor pool and 400 more seats.

4

SUNY Maritime College (BX)

SUNY Maritime in the Bronx is a popular destination for Harbor School graduates interested in a maritime career.



Curriculum Development

Overview

- Developed with National Science Foundation support
- Aimed toward upper middle and high school students

Unit 1 - Oyster Research

- Focus on research and data analysis using oyster research station (ORS) and oyster reef datasets
- Unit with four chapters and over 16 lessons.
- ~110 new, unique curriculum resources, including data sets, assessment rubrics, worksheets and source libraries
- Piloted by 13 NYC teachers in Spring 2021

Unit 2 - Where Should Future Oyster Restoration Take Place?

- Focus on using spatial analysis to analyze ecological and social data to determine potential sites for restoration.
- Unit with 5 chapters and 13 lessons
- ~90 new curricular resources, including data libraries, source libraries, ArcGIS Story Maps, and worksheets
- To be piloted by 6 NYC teachers in Winter/Spring 2022



[New York Harbor Species ID Guide \(2021\)](#)

- Over 65 species covered
- More than 850 copies distributed
- 940 link clicks since June 2021
- Funded by New York State Department of Environmental Conservation

Teacher Training – ORS, ORT & GIS

Oyster Research Station (ORS) Training Workshops

- ORS are small cages populated with live oysters
- ORS are installed at waterfront sites around NYC
- 90+ participants in 5 two-part workshops (Apr-Dec)
- 24+ datasets submitted by 20+ community scientists

Oyster Research Tank (ORT) Training Workshop

- ORT are fish tanks populated with live oysters
- ORT are installed in NYC public school classrooms
- 13 NYC school teachers trained in September 2021
- 390+ students engaged by this curricular resource

Geographic Information System (GIS) Training Workshop

- See prior slide to learn about our GIS curriculum
- Two GIS training workshops were held in fall 2021
- 34 participants, including 22 teachers, attended



7th Annual BOP Student Symposium

The annual Billion Oyster Project Student Symposium culminates a year of learning for NYC students, who meet on Governors Island to share the results of their BOP work throughout the year. Like last year, this year's edition was held virtually.

[Click here for exemplary projects!](#)

15 schools

16 teachers

124 [projects](#)

213 students



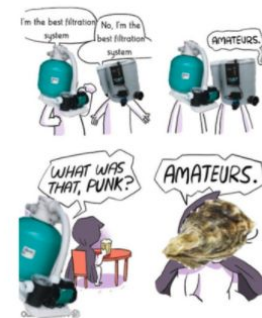
Are Oysters Growing Wild in NY Harbor?
Wild Mollusk Survey of Bush Terminal Park, Brooklyn

Alice C. and Christine L.
The Math and Science Exploratory School, MS 447



3-6th Grade: American Eel Project

Zach C. / Hudson Montessori School



7-8th Grade: Filtration Memes

Brian R. / Academy of the City



Community Engagement

Field Stations Program



2021 Metrics

- 58 total field events
- 11 active field stations
- 20 school partners
- 19 community partners

Field Activities

- Oyster monitoring
- Water quality testing
- Shoreline cleanup
- Boating & boatbuilding

Highlights

- Brooklyn Bridge Park - oyster install
- Williamsburg - official opening
- Bush Terminal Park - new storage



Oyster Research Stations



Oyster research stations (ORS) are integral components of Billion Oyster Project. ORS stewards – students and community scientists – contribute to Billion Oyster Project in two primary ways:

1) Students and community scientists experience first-hand what scientific monitoring and data collection in the field entails, while developing their own questions that parallel BOP's investigations. They do this by growing and monitoring oysters in diverse locations and microniches around the Harbor. Student scientists try to answer questions such as: where do native oysters grow best in a highly urbanized estuary? What organisms (predators and associates) are commonly found in and around oyster restoration sites?

2) The second major contribution of oyster research stations is to increase the total number of breeding adult oysters in the ecosystem. While a few hundred oysters in a cage may seem insignificant when compared to the project's goal of one billion, each breeding female is capable of producing up to 25 million eggs every time she spawns (two or three times per summer).

In 2021 we trained a total of 112 people on ORS monitoring protocols, including 49 educators.



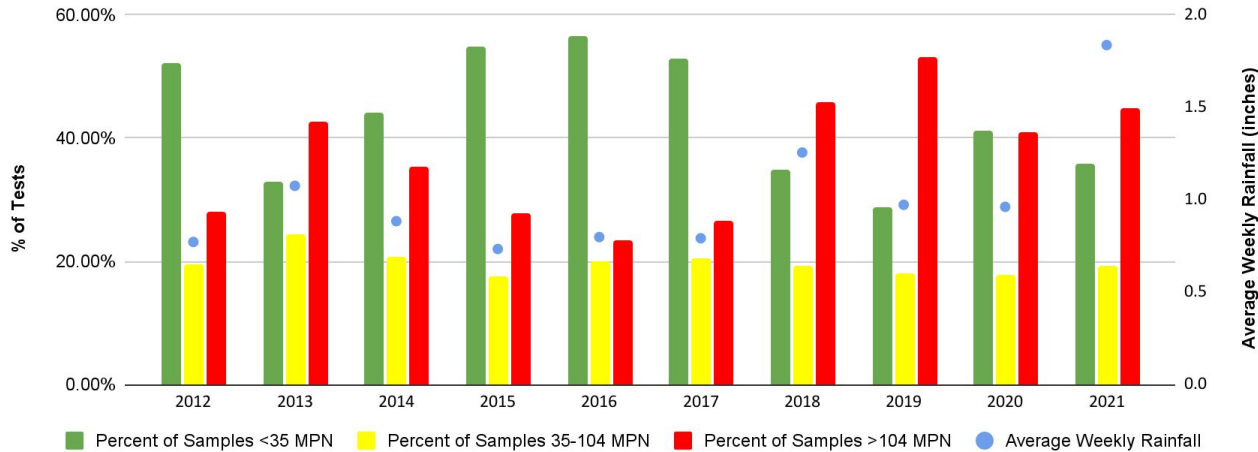
Water Quality Testing

A long-running dataset that can inform the development of a model connecting rainfall to sewage pollution, helping to identify risk of exposure to pathogens while engaging in recreational activities or working in the water.

This year we:

- Monitored sewage pollution via fecal indicator bacteria
- Tested water samples from ~70 sites on a weekly basis (seasonal w/partner labs)
- Performed year-round testing at six East River sites
- Supported student and community researchers

CWQT Results and Average Weekly Rainfall 2012-2021



Volunteer Programs

Public Volunteers

In 2021, we had held 68 public volunteer events at which 1,199 total public volunteers served 5,056 total hours (~5 hours per event on average). Volunteers prepped shell and fabricated reef structures.

BOP Ambassadors

We also trained 63 Ambassadors at 11 workshops covering reef monitoring, ORS monitoring, and wild oyster surveys. Ambassadors installed oysters at Soundview Park and Brooklyn Bridge Park, made “breakwater burritos” for the living shoreline at West Pond in Jamaica Bay, helped prepare and deliver gabions, filled super trays with oyster spat-on-shell for use in various projects, conducted spat counts at our Red Hook Terminals setting facility (which is how we know how many oysters we are deploying), assisted staff at a field event at the Coney Island Creek Field Station, helped construct a feature of the Billion Oyster Project hole at the Williamsburg Field Station mini golf course, represented Billion Oyster Project at public events, and served as guest reviewers for student presentations at the Annual Research Symposium in June.



Corporate Volunteers

Corporate volunteer days are a way for companies to gain hands-on experience and knowledge of oyster restoration while building camaraderie with their team, and we received excellent feedback from participants in our 2021 volunteer season.

In 2021, we hosted 29 corporate volunteer days, engaging 135 people from 26 organizations who contributed a combined 358 hours of service toward bagging shell for the West Pond living shoreline project and fabricating mesh inserts for the Gansevoort peninsula installation.

During our corporate volunteer days, we also educate participants on our mission by giving them a tour of our work sites on Governors Island and sharing more information about our work to date with the goal of deepening these partnerships in the future.



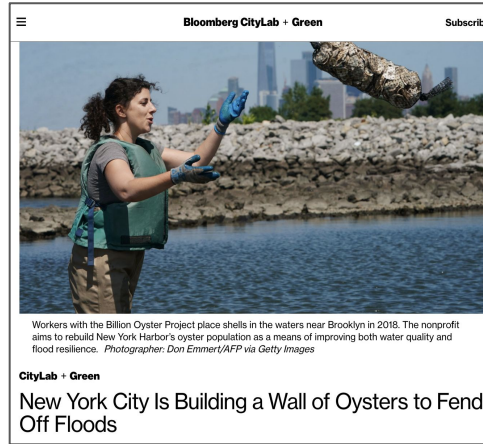


Project Highlights

BOP in the News

- ABC News
- Associated Press
- Bloomberg
- Freethink
- National Geographic
- NBC News
- Scientific American
- The New Yorker
- The New York Times
- Time Out

See a full list on our [Press](#) page



The New York Times

11 Million New Oysters in New York Harbor (but None for You to Eat)

The oysters, which act as nonstop water filters, were added to the Hudson River as part of an ongoing project to rehabilitate the polluted waterways around the city.



Social Media Highlights

Facebook, Instagram, LinkedIn & Twitter:

2.0M
Impressions

↑ 18.9%

120.3K
Engagements

↑ 33.2%

5.1K
New Audience Members

↑ 664.6%

Compared to last year



BILLION OYSTER PARTY

Nearly 1,000 vaccinated guests joined us for our 7th annual Billion Oyster Party, hosted on Thursday, Sept. 24, at The Liberty Warehouse in Red Hook, Brooklyn. The Billion Oyster Party is the ultimate oyster eating celebration and education experience. Guests interact with farmers and chefs while enjoying live music, unlimited oysters from oyster farms from around the country, and delicious bites from top NYC restaurants that participate in our shell collection program.



<https://www.youtube.com/watch?v=FIcbslnzsw>