

How to Build an Oyster Reef

By Hudson Tanzmann and Bob Tymann

A Step-by-Step Planning and Permitting Guide for Long Island Schools and Organizations

Based on the South Fork Sea Farmers (SFSF) Accabonac Harbor Pilot Project

This guide is designed to help any Long Island school, marine conservation nonprofit, environmental committee, or other organization undertake an oyster reef restoration project. The permitting process is extensive yet well worth it. Oyster reefs are one of the most cost-effective tools available for improving water quality, rebuilding marine habitat, and engaging local communities in hands-on conservation efforts. This document aims to outline all necessary legal requirements to support the work of novel restoration projects.

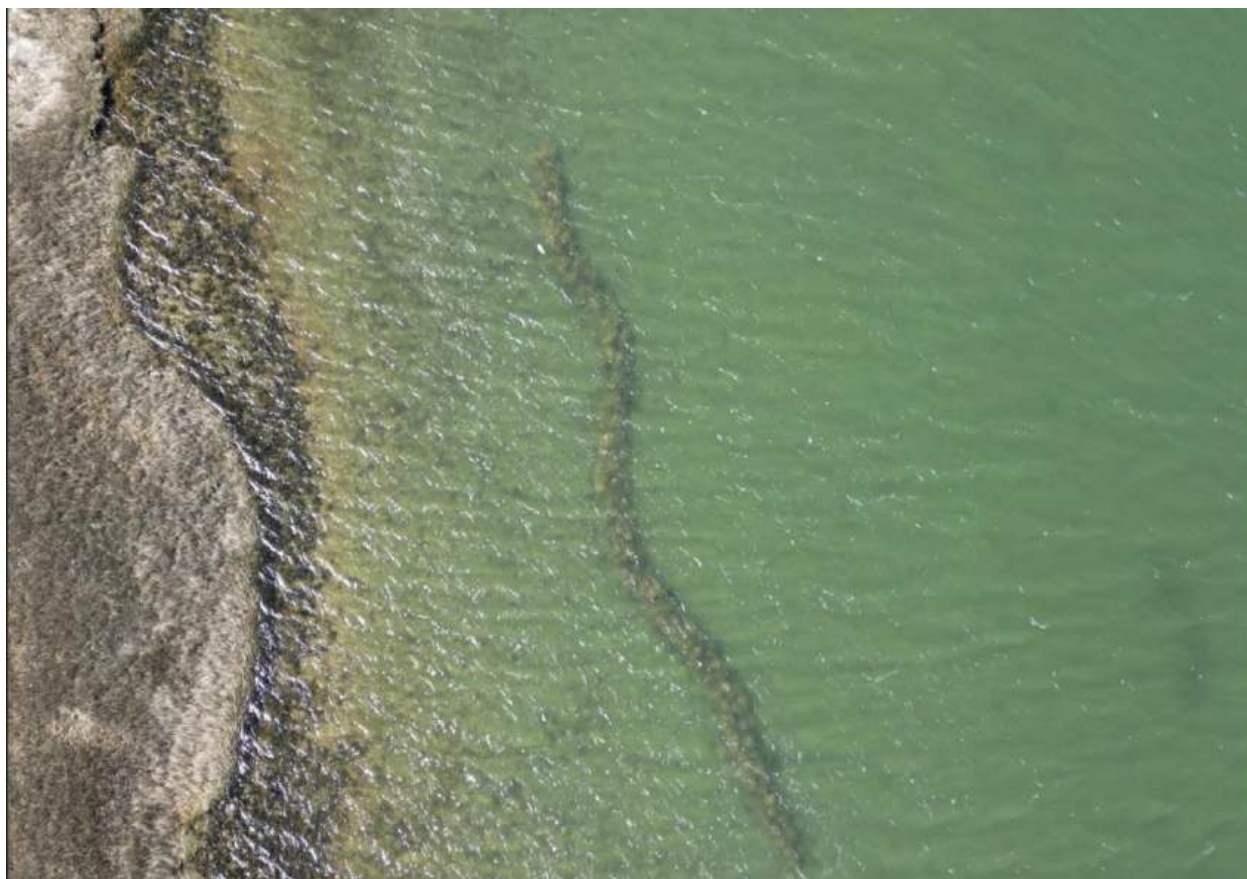


Image of an Oyster Reef Built in Partnership with the SFSF

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Background

Oysters are a keystone species, meaning they have a significant effect on keeping their surrounding coastal ecosystems healthy and balanced. Baby oysters, called spat, need to attach to a hard surface to survive, so as generations settle and grow on top of one another, they naturally form oyster reefs. These reefs create safe habitat for a wide range of other marine species, offering shelter, protection from predators, and a source of food. They also reduce erosion by absorbing wave energy and holding sediment in place along the shoreline. Beyond these structural benefits, oysters play a major role in improving water quality: as filter feeders, oysters pull water through their gills to capture plankton, straining out excess nutrients and sediment in the process. A single adult oyster can filter up to 50 gallons of water a day.

Long Island has recently struggled to combat eutrophication, that being the overenrichment of water by nutrients such as nitrogen and phosphorus, which cause massive algae growth. Decades of excessive nutrient pollution from aging septic systems and fertilizer runoff off agricultural land have fueled chronic eutrophication in local bays and the Long Island Sound. These harmful algal blooms pose a risk to marine ecosystems as well as safe swimming, crabbing, and fishing across Long Island. Oysters have the ability to take such algal pollutants out of the water. Unfortunately, Long Island's oyster populations have declined due to historic overharvesting, pollution, and disease. Thus, building an oyster reef in a local bay is one of the most direct ways to fight eutrophication and start restoring a damaged ecosystem. Reef restoration also provides a wonderful opportunity to engage local youth and community members in marine conservation education and activism.

Permitting Overview

#	Agency	Permit / Purpose	Typical Response Timeline
1	Town Trustees or Local Governing Agency	Local land-use permit for bay access	2–4 weeks
2	NYSDEC	State environmental permit (Joint Application)	2–6 months
3	NYS Dept. of State	Federal coastal consistency review + FCAF	1–2 months
4	U.S. Army Corps of Engineers	Section 404/10 Permit, reviewed concurrently through NYSDEC Joint Application	1-2 months
5	NYS Office of General Services	Submit with other permits	1-2 months
6	NYSDEC Marine Resources	License to Collect or Possess Marine Resources	~45 days

Tip:

Start Steps 2, 3, and 4 at the same time. These permits are reviewed independently, but the agencies communicate. Submitting them simultaneously can save weeks. Step 5 can be initiated once Step 1 is approved.

Step 1: Town Trustee or Local Governing Agency Permit

Permits

Before any physical work can begin, a permit must be obtained from the local Town Trustees or equivalent local governing agency. In East Hampton, this is the Trustees of the Freeholders and Commonalty. In other Long Island towns, the equivalent body may be a harbor management committee or town board. This permit establishes that the town officially approves the project location and scope. This permit is required before any application to state agencies will be accepted.

Site Selection

Before submitting the permit application, you must identify and confirm a suitable reef site. Site selection should happen before preparing the application, as the specific location and site conditions are required in the application materials.

Identify a suitable location within a saltwater bay. Common locations in East Hampton include Accabonac Harbor and Three-Mile Harbor. We access the site by kayak and use a kayak paddle to probe the sediment at multiple points.



Image of Kayak Site Exploration

- A firm substrate is required. Sediment that is too soft will cause oyster bags to sink and become buried over time.
- Avoid sediment that billows up and clouds the water when disturbed; this signals an unstable bottom and makes monitoring extremely difficult.
- A firm bottom allows students and researchers to walk the site safely at low tide, which is important for construction and monitoring.
- Check proximity to a road end or public access point. This makes student involvement and regular maintenance far more practical.
- Avoid areas with heavy boat traffic, existing duck blinds, or other active public uses that may interfere with public activity and/or the reef's growth and integrity.

What the Application Requires

- A detailed written description of the project, including purpose, ecological goals, materials, and construction method.
- A site map showing the proposed reef location relative to shore, water depths, and any nearby structures.
- Application fee: typically \$100–\$200, depending on project type and municipality.

Setting Up the Grid and Building the Reef

Once a suitable site is confirmed, mark out the reef footprint. The reef should be designed to meet the project's objectives. More linear reef shapes are overall better. A square or rectangle with more than a six-foot depth across makes it hard to place oysters in the center; a line parallel to shore is also superior because it helps reduce wave energy reaching the shore. The South Fork Sea Farmers reef covers just under 50 square yards (the maximum legal limit) and reaches a maximum height of 18 inches. The reef is constructed by hand using biodegradable mesh bags. It normally takes us three days to build a reef. On the first day, we go to the site and stake out where the reef will be. On day 2, we place the oyster bags without spat as the bottom layer of the reef. On the third day, we place the oyster bags with live spat on them directly on top of the base layer. For our most recent reef, we chose a linear shape. See below for an explanation of each layer.

- Layer 1 (Base): Six rows of bags filled with blank clam and oyster shells. The base has no spat (oyster larvae). These form a stable structural foundation directly on the bay bottom. We use 450 bags for the base. This means 6 bags across and 75 bags long for a linear reef.
- Layer 2 (Spat Layer): An additional row placed on top in a pyramid formation, filled with shells seeded with oyster larvae (spat on shell). We used 375 bags of spat for the top layer; there has to be more base so all the bags with spat can lie above and away from sediment. There are 75 fewer spat than base bags because the spat goes in between the spaces formed by the base bags.
- The reef will be partially exposed at low tide, which helps prevent fouling organisms. Brief exposure to freezing temperatures does not harm the oysters.

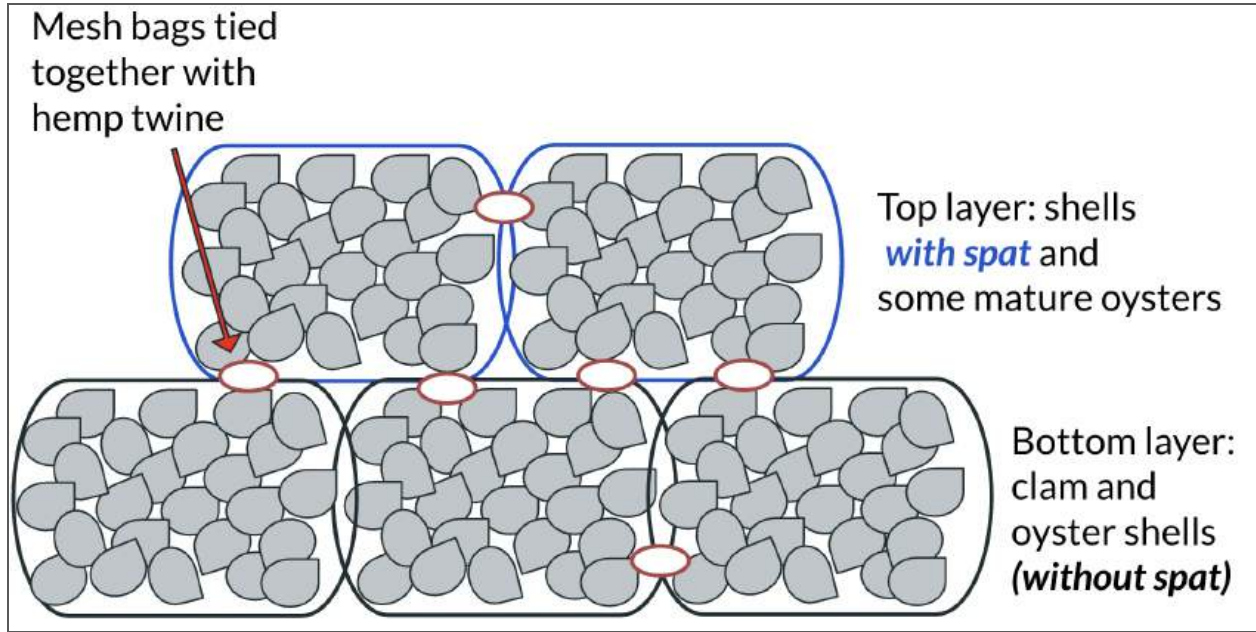


Diagram of Reef Cross Section (simplified)



Image of Grid Reef Formation



Image of Linear Reef Formation

Reef Building Shell Collection

Blank Shell (Base Layer)

Blank shell for the base layer can be collected in a few ways. Local seafood restaurants are a strong source: set up collection bins so kitchen staff can save oyster and clam shells instead of throwing them out, then arrange regular pickups. Volunteers can also get involved directly by collecting shucked shells from restaurants or community events and bringing them to a central drop-off point. However the shell is collected, it should be rinsed clean and left to cure and dry outdoors for a period before bagging, to reduce bacteria and odor as well as sediment buildup when placing the reef.

Spat on Shell (Top Layer)

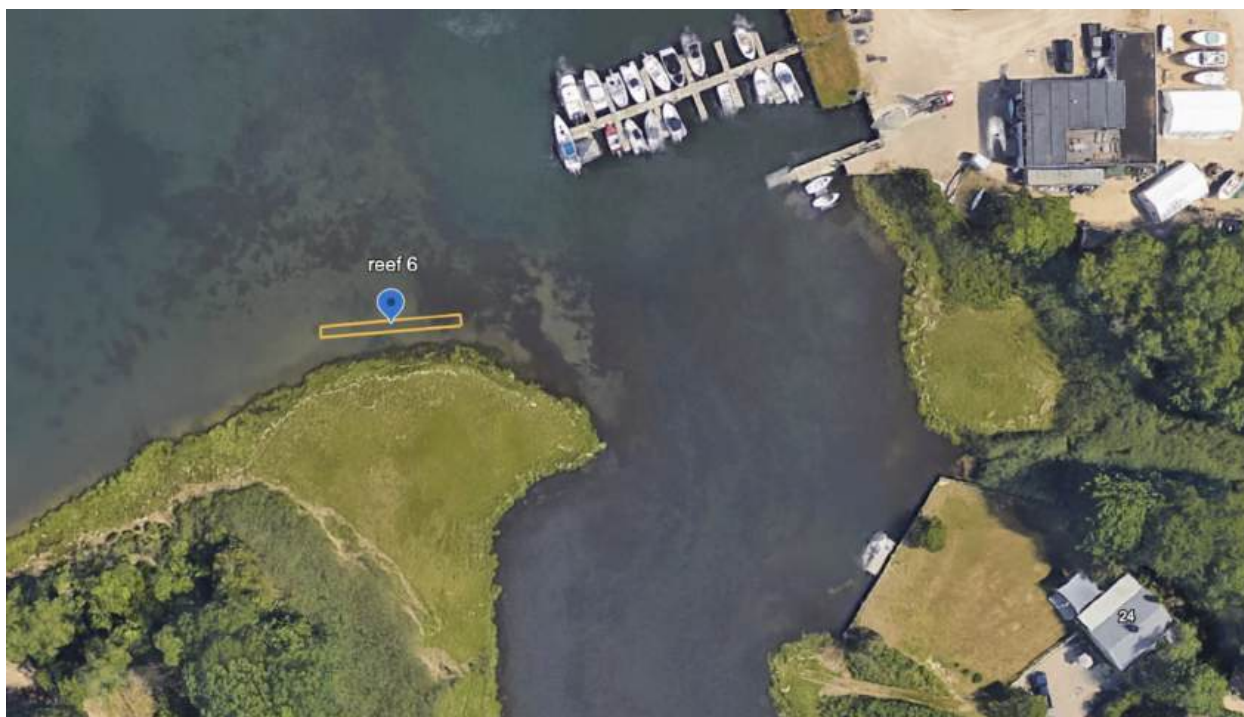
Spat on shell is harder to source and typically comes from a shellfish hatchery. At South Fork Sea Farmers, we get our spat on shell from the East Hampton Town Marine Hatchery, which spawns oysters and sets the larvae onto shell before it is ready for reef placement. We are extremely grateful to be able to coordinate with John “Barley” Dunne, who is an expert in this field at the East Hampton Shellfish Hatchery. However, not every town has its own hatchery. If yours doesn’t, reach out to a neighboring town or regional hatchery about partnering; many hatcheries have the capacity to seed shell for outside towns or organizations, especially for habitat restoration projects like this one.

Step 2: NYSDEC Joint Application

The NYSDEC Joint Application is the primary state-level environmental permit for any project involving work in or near navigable waters or tidal wetlands in New York State. It is called a 'Joint Application' because it coordinates review across multiple agencies. This includes the NYSDEC, the U.S. Army Corps of Engineers, and the NYS Office of General Services, through a single submission.

What to Include in Your Submission

- Detailed project description: purpose, reef dimensions, materials (mesh bags, hemp twine, shell types), construction method, and timeline.
- Overhead (aerial) site plan and cross-section side view, both drawn to scale. These can be screenshots taken directly from Google Earth. These should include the altitude/height of the shot and the compass direction shown in the bottom-right corner of the screen.



Example of a Google Earth Screenshot of Linear Reef

- Site plans must show: North arrow, name of preparer, date prepared, reef dimensions, and distance from seaward edge of intertidal marsh vegetation.
- Water depth measurements at Mean High Water (MHW), Mean Low Water (MLW), and Mean Low Low Water (MLLW).
- Whether the reef will be exposed at any point in the tidal cycle, including spring low tide, and whether winter ice is a concern.
- Copy of Town Trustee permit or letter of permission (Step 1).
- A Short Environmental Assessment Form (Short EAF).
 - https://extapps.dec.ny.gov/docs/permits_ej_operations_pdf/amendedshorteaf.pdf, Link to EAF

- A pre- and post-construction monitoring and sampling plan (*this is a great opportunity to involve local students in marine research and education*).
- Whether bay constables or harbor masters will be made aware of the reef location.
- Whether there are plans for future reef expansion or additional reefs in the area.

Important Note: Adult Oysters and Certified Waters

Even when a reef site is located within seasonally certified waters, NYSDEC may still decline to permit the inclusion of adult single-set oysters. Spat on shell (baby oysters) is generally acceptable. Applicants should confirm the current DEC policy on adult oysters for their specific site at the time of application, and should not assume certification status alone will allow adult oysters to be included.

Siting Criteria

The siting criteria section of the application should explain why the specific location was chosen. A strong siting criteria statement covers:

- The ecological purpose of the project. This may include factors such as natural filtration, habitat creation, and reef self-sustainability.
- GPS coordinates of the reef and its orientation (e.g., running west parallel to shore).
- Confirmation of Town Trustee approval.
- Historical context, for example, the shellfish hatchery seeding history, prior oyster survival data, salinity measurements.
- Why the location deters unauthorized harvesting (e.g., Shellfish Sanctuary designation, reef structure makes oysters unpalatable for direct harvest).
- Hard bottom confirmation and site accessibility for students and researchers.
- Confirmation that the site poses no hazard to navigation.

Structure Criteria

- Exact dimensions and total coverage area in square yards.
- Materials: biodegradable mesh bags, hemp twine, shell types (blank shell base layer, spat on shell upper layer).
- Layering structure: three base rows directly on bay bottom, one upper row in pyramid formation.
- Access and placement method: by kayak, filled and transported by students and staff.
- Whether any adjacent property access is needed (ideally none).

Alternatives Analysis

NYSDEC and the NYS Dept. of State both require a written analysis of design alternatives considered. The South Fork Sea Farmers response covered the following:

- Pyramid structures of combined shells and spat on shell (as used in the Great Bay Estuary Project in New Hampshire) were considered but deemed too large-scale for the harbor.
- The chosen design would be biodegradable mesh bags with hemp twine. You can say this was selected because it is temporary, natural, and fully biodegradable.

Monitoring Plan

Monitoring every six weeks between April and November for 2–3 years.

- Metrics like oyster density, dead oyster count, size-frequency distribution, growth of marked oysters, spat settlement on clean shell, and all other organisms observed should be recorded.
- Water quality: surface and bottom temperature, salinity, dissolved oxygen, and turbidity at the reef site and a separate control site. Such data can be measured using equipment like HOBO Loggers (this is the tool I am using for my personal science research experiment).
- Annual monitoring report submitted to NYSDEC by December 31st each year.

Step 3: NYS Department of State: Federal Consistency Review

Whenever a project like this requires a federal permit, the U.S. Army Corps of Engineers permit is coordinated through the NYSDEC Joint Application. New York State's Coastal Management Program must also review it under the federal Coastal Zone Management Act. The NYS Department of State, Office of Planning and Development, conducts this review.

The state needs to confirm the project is consistent with New York's coastal policies. An oyster reef project aligns strongly with these policies. However, the alignment must be documented in writing. This is done through the Federal Consistency Assessment Form (FCAF) and an accompanying policy analysis.

The Federal Consistency Assessment Form (FCAF)

The FCAF collects basic applicant and project information, then walks through a series of yes/no questions in Section C about whether the project affects any coastal resources or policies. For an oyster reef project, most answers will be NO, but a few will be YES, which triggers the written policy analysis. Here is what is YES for the FCAF:

- Section C, Question 2c: YES, the project is located adjacent to state-designated significant fish and/or wildlife habitat (Policy #7).
- Section C, Question 3a: YES, the project requires a waterfront site (Policies #2, #21, #22).
- Section C, Question 2a: YES, the project may be located adjacent to a state-designated tidal wetland (Policy #44).

Completed FCAF Example

A1. Applicant Name	South Fork Sea Farmers / [Your Organization Name]
A2. Address	PO Box 1421, East Hampton, NY 11937 / [Your Address]
B1. Brief Description	Construction of a pilot man-made oyster reef using biodegradable mesh bags filled with blank shell and spat on shell, arranged in a pyramid structure on the bay bottom.
B2. Purpose	To create the base for a self-sustaining oyster reef as a natural water filter, habitat for juvenile aquatic species, and a replicable model for reef development across Long Island.
B3. Location	Suffolk County East Hampton Accabonac Harbor (Lat: 41.022, Long: -72.150)
B4. Federal Permit	U.S. Army Corps of Engineers Section 404/10 Permit
B6. State App. No.	NYSDEC Application #1-4724-02499/00001

Coastal Policy Analysis

Because some Section C questions are answered YES, a written policy analysis is required. South Fork Sea Farmers addressed five policies. The key points from their analysis are shown below and can serve as a template for any similar project.

Policy #2

The reef is a water-dependent project that takes no resources from the environment while improving recreational activities such as fishing, swimming, and boating. It improves these activities by improving water quality and increasing natural habitat. The site is not in a navigable channel, is compatible with adjacent uses, requires no public facilities, and will be accessed for monitoring by a small boat. The reef will also serve as a natural breakwater to help prevent erosion.

Policy #7

The reef directly restores marine habitat and enhances the survival of many species across their life stages. It is fully consistent with coastal policies promoting habitat restoration.

Policy #21

The reef promotes water-related recreation while preserving and enhancing coastal resources, including fish and wildlife habitats. Improved water quality and habitat will increase water-related recreational development. No adverse environmental impact will occur; negative effects from excess nutrients will be mitigated.

Policy #22

The primary purpose is to restore local waters to a more balanced ecosystem, remove excess nutrients, lower pH, and create habitat for various species. Recreational activities in adjacent areas, such as fishing, swimming, sightseeing, boating, and snorkeling, will simply be enhanced, not mitigated.

Policy #44

This project advances Policy #44 and goes further: it seeks to restore the wetlands to a prior, more pristine condition. Oyster reefs were historically ubiquitous in Long Island bays, providing filtration that maintained water chemistry balance, habitat for many species, and water clarity for aquatic plant growth. Benefits of these reefs include wildlife and commercial fish habitat, contribution to aquatic food chains, erosion and flood control, natural pollution treatment, groundwater protection, recreational and educational opportunities, and aesthetic open space.

Where to Submit

- NYS Department of State, Office of Planning and Development, Attn: Consistency Review Unit, One Commerce Plaza, Suite 1010, 99 Washington Ave, Albany, NY 12231.
- Also send a copy of the FCAF directly to the Army Corps of Engineers.
- Questions: (518) 474-6000. Reference your file number in all correspondence.

Step 4: Section 404/10 Permit (U.S. Army Corps of Engineers)

A Section 404/10 Permit from the U.S. Army Corps of Engineers (USACE) is required for any work that involves the placement of fill material in waters of the United States, including navigable tidal waters. For an oyster reef project, this covers the placement of shell bags on the bay bottom.

In New York State, this permit is processed concurrently with the NYSDEC Joint Application. You do not need to file a separate application directly with the Army Corps. NYSDEC coordinates the review and forwards your materials. The Army Corps will conduct its own independent review but will communicate with NYSDEC throughout the process.

Special Heads Up

- The Army Corps review runs concurrently with NYSDEC, so no separate submission is needed beyond the Joint Application.
- The NYS Dept. of State Federal Consistency Assessment Form (Step 3) must be completed as part of this process. You should submit a copy of the FCAF to the Army Corps as well.
- Processing time varies but generally aligns with the NYSDEC timeline (2–6 months).
- The Army Corps may issue a Nationwide Permit (NWP) for small, low-impact projects like an oyster reef. This is a streamlined authorization and is preferable to an Individual Permit.

Important Note: Nationwide Permit 27 — Aquatic Habitat Restoration

Oyster reef restoration projects often qualify under Nationwide Permit 27, which covers activities in waters of the U.S. associated with the restoration, enhancement, and establishment of tidal and non-tidal wetlands and riparian areas. This streamlined permit authorization can significantly reduce processing time. Confirm eligibility when submitting your NYSDEC Joint Application.

Step 5: License to Collect or Possess Marine Resources

Licensing

A License to Collect or Possess Marine Resources is required under New York State Environmental Conservation Law (ECL Section 11-0515) for any individual or organization intending to collect or possess fish, shellfish, or other marine species for scientific research or education. For an oyster reef project, this covers collection and handling of oysters and all other organisms encountered during monitoring.

What the Application Requires

- Applicant's full name, date of birth, affiliated organization, mailing address, email, and phone number.
- Facility information: the physical address where licensed animals or specimens will be housed.
- Purpose of the license: scientific research and habitat monitoring.
- Whether species will be collected from the wild in New York State. For an oyster reef, and therefore for this, you answer YES.
- Collection details: location(s), dates, method(s), number of traps/nets if applicable, length of possession.
- Species list: common name, scientific name, total number, and whether any are endangered.
- Disposition plan: how specimens will be treated, what holding facilities are available, and final disposition.
- Copies of any other relevant state or federal licenses already held.

How to Fill Out the Species Section

List the eastern oyster (*Crassostrea virginica*) as the primary species. For the collection description, reference the monitoring schedule (every six weeks, April through November). Describe the protocol: 1x1 foot sample quadrants, counting and measuring all live mollusks, and recording all other organisms. This matches the approach used by South Fork Sea Farmers in their Accabonac Harbor project.

Where to Submit

- NYS DEC, Division of Marine Resources — Marine Permit Office, 123 Kings Park Blvd. (Nissequogue River State Park), Kings Park, NY 11754.
- Phone: (631) 444-0470 | Email: MPO@dec.ny.gov
- Website: www.dec.ny.gov/outdoor/116021.html

After Approval: Community Involvement!

Congratulations! After months of submitting detailed permits, you have received approval for the construction of your oyster reef. The construction process offers an exciting, valuable opportunity to involve local students in marine conservation. Thus far, the most rewarding part of my experience in oyster reef construction with the South Fork Sea Farmers has been the opportunity to inspire and engage other students in my efforts. I have found that reef construction makes for a very exciting field trip.

Prior to construction day, I suggest scheduling a brief presentation at the local school to introduce students to the importance of oysters. This is a great time to explain oysters' role as a keystone species, their ability to filter and clean water, and the impact their decline has had on Long Island's coastal ecosystems. This groundwork helps students understand why the project matters before they participate in it firsthand. This presentation is also a good time to explain field trip expectations, safe water practices, and what appropriate clothing to wear (water shoes, swimsuits, gardening gloves, as oysters can be sharp, etc). When students know what to expect, they are less likely to be nervous or surprised when asked to get their hands dirty.

Construction day itself is a wonderful field trip, and one that can accommodate students across a wide range of ages. Wading into the water and physically building the reef gives students a direct, hands-on understanding of coastal restoration that classroom instruction alone cannot provide.

For middle and high school students in particular, the opportunity extends beyond construction day. Ongoing reef monitoring, including tracking spat settlement, measuring growth, and recording water quality data, offers a meaningful introduction to scientific research methods and can serve as a foundation for independent research projects.

Taken together, these activities allow local youth to participate meaningfully in marine conservation while gaining practical experience that extends well beyond a single day of construction. Time to hit the water!



Images of the first reef construction field trip with East Hampton Elementary School students

Acknowledgments

I would love to give a special thanks to the South Fork Sea Farmers, a 501(c)(3) nonprofit organization, that has assisted me in making this guide. With the help of Bob Tymann, I created this document to inspire other students across Long Island to pioneer novel reef restoration projects, and to lighten the administrative burden involved in gaining legal approval for such projects. Thank you to John “Barley” Dunne and the rest of the crew at the East Hampton Shellfish hatchery, who spawn our oysters and make all our work possible. I would like to end this guide with a testament to the value of the work this guide supports and a reminder of why we love what we do.

Every oyster placed on a reef is a small act of faith. A belief that the waters we grew up around, swam in, and fished from can be restored to something closer to what they once were. Oyster reefs filter millions of gallons of water, shelter the fish and invertebrates that define our bays, and give students a reason to wade into the harbor and find purpose in what they learn.



Left to right: Image of Bob Tymann, Hudson Tanzmann, and John “Barley” Dunne

Questions & Contact Information

If you are interested in hosting a general overview of this work at your school, covering the importance of oysters and the value of reef restoration projects, I would be glad to schedule a time to present and facilitate that discussion. Please reach out.

I am also happy to provide personalized guidance to any student or school looking to undertake their own reef restoration project, from navigating the permitting process to planning school engagement. Please do not hesitate to reach out with any questions.

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