2017 Oyster Conservationist Report

The Nature Conservancy

University of New Hampshire

2017 New Hampshire Oyster Conservationist Program

FINAL REPORT

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Introduction

The native Eastern oyster (*Crassostrea virginica*) is a keystone species in the Great Bay Estuary. These important bivalves serve as the estuary's water purification system, filtering excess nutrients and suspended solids from the water column, improving water quality and clarity. Oyster reef aggregations also provide structural complexity in the nearshore environment and serve as rich feeding grounds for fish and invertebrates. By the early 2000s, nearly 90% of the oyster population in Great Bay had been lost due to disease, excessive sedimentation and human harvest. In response to the decline in oyster reefs and subsequent loss of vital ecosystem services, The Nature Conservancy (TNC) of New Hampshire and the University of New Hampshire's Jackson Estuarine Laboratory (UNH-JEL) have been working collaboratively to restore this critical habitat since 2006.

Now in its 12th year, the Oyster Conservationist (OC) program is a popular public engagement component of reef restoration effects in Great Bay Estuary. The OC program works with community members to improve the health of the estuary by growing oyster spat for reef restoration projects. Oyster Conservationist volunteers adopt and care for a cage of oyster spat throughout the growing season, in addition to collecting site-specific growth and survival data that can be used to inform science and management. The OC program has grown steadily over time and now includes 89 locations in 15 towns in New Hampshire and southern Maine. OC sites are located in six of the seven of the major tributaries to Great Bay Estuary—the Lamprey, Oyster, Squamscott, Winnicut, Bellamy, and Piscataqua Rivers. Additional sites, are located in Little Bay, Great Bay proper, Rye and Hampton Harbors and the York River. Ultimately, data collected by volunteers will be used to assess spatial and temporal data on oyster survival and growth to inform reef restoration efforts.

Methods

Volunteer recruitment and training

The 89 OC sites—each representing a participating individual, family, business or school—were distributed across the Great Bay Estuary in Dover, Durham, Greenland, Newington, Stratham, Exeter, Portsmouth, Newcastle, Rye, Newmarket, Newfields and Hampton, and extended into Maine waters in Eliot, Kittery, Kittery Point, and York (Fig. 1). Nearly all of the program participants were returning volunteers, so there was minimal recruitment and training required this season. In past years, OC volunteers were provided with training in oyster ecology, restoration efforts, cage management and data collection. TNC's Oyster Conservation Coordinator was available throughout the season to answer questions and provide feedback to volunteers as needed.

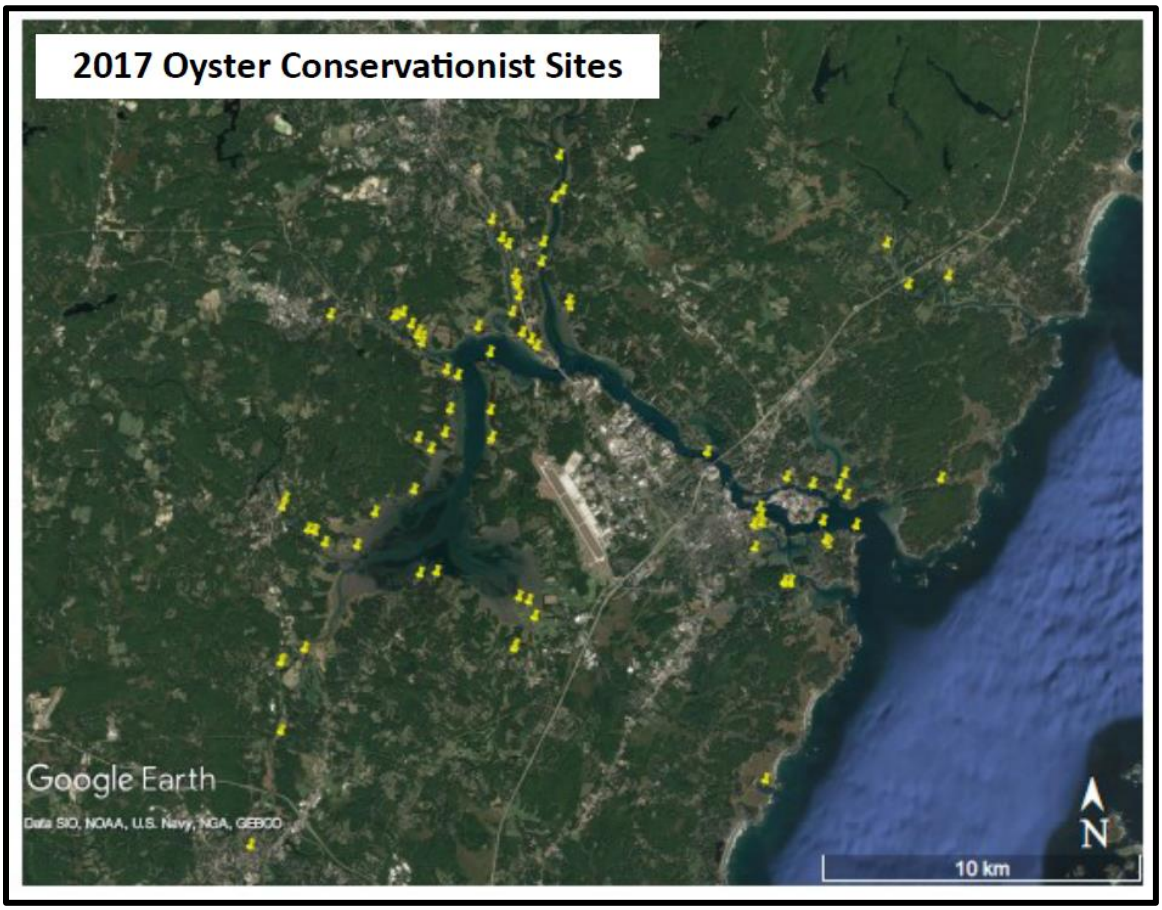

Figure 1. Map of OC sites across the Great Bay Estuary, coastal New Hampshire, and Southern Maine.

In addition to Oyster Conservationist volunteers, spat count volunteers were recruited by The Stewardship Network New England using their website and social media outlets. In addition to community volunteers, three high school interns from TNC's Leaders in Environmental Action for the Future program and one intern with New Hampshire Sea Grant assisted with cage preparation and data collection. In total, 237 people participated in the 2017 Oyster Conservationist program in 2017, not including project staff and students from local elementary, middle, and high schools.

Oyster Spat Production

Permitting

Nature Conservancy staff acquired the necessary permits from New Hampshire Department of Fish and Game (Permit # MFD 1738) and Maine Department of Marine Resources (License # 2017-85-01) for growing oyster spat at OC sites in accordance with state shellfish regulations.

Shell collection and preparation

Coastal Conservation Association (CCA) collected recycled oyster shells from local restaurants and markets, in addition to training restaurant staff. All collected recycled shells were transported to UNH's Kingman Farm for drying and quarantine for at least one year before they are used in restoration projects. Several trailer loads of recycled shells were placed in cages and cleaned using a power-washer prior to spat-on-shell production.

Spat-on-shell production

Remote setting of oyster larvae took place at the Jackson Estuarine Laboratory in Durham, New Hampshire under the supervision of Dr. Ray Grizzle and Krystin Ward. Larvae from disease-resistant broodstock (Haskin Northeast High Survival) were purchased from Muscongus Bay Aquaculture in Bremen, Maine and arrived via FedEx on July 12th, 2017. Twelve million oyster larvae were added to four seawater tanks with clean oyster shells to produce live oyster spat-on-shell. The larvae were fed and inspected daily by JEL staff and set on the shells within five days. On July 17th, cages of oyster spat were moved from the tanks to the nursery raft at Adams Point where they remained until reaching sufficient size to be counted and measured by TNC staff and a large crew of volunteers.

Program delivery

After oyster spat were counted and measured in late-July, TNC staff and volunteers prepared and distributed cages to OC sites. Each OC received one cage with 50-100 shells with spat from the setting tank and a bag of clam shell in a bait bag to test for wild oyster set. Volunteers were also provided with calipers, one data sheet, a copy of permit and a predator/invasive species identification guide. Oyster Conservationist volunteers were instructed to check and cleaned cages weekly and record data growth data two times during the project period. The Oyster Conservation Coordinator (Amanda Moeser) was available to answer any questions or address any issues that emerged during the growing season. Cages and data sheets were picked up in late-September and final oyster spat counts and measurements were taken at JEL the following week. Oysters were stored on the dock at JEL until they were deployed on the reef. On October 5th, oysters were loaded aboard the historic sailing barge *Piscataqua* and distributed on the newly-constructed reef near Nannie Island in Great Bay by Oyster Conservationists.

Results

Initial Spat

At each OC location, volunteers measured spat growth throughout the 8-week program period. The week prior to

delivery to OC sites (end of July), all spat were visible on the recycled shells but were too small to measure (<1mm); however, we were able to determine the average number of spat per shell for each cage. A total number of 66,147 oyster spat were distributed to OC sites. The average number of spat per shell varied greatly at the beginning, ranging from 0.01 to 19.8 spat per shell, with an average of 11.1 ± 0.7 spat per shell (mean ± standard error).

Growth

This year's overall average ending size of oyster spat was 23.3 ± 1.6 mm (mean ± standard error) with ending sizes ranging from 4 to 55 mm. To better assess spatial patterns in growth, the OC sites were groups by combining sites in close proximity to one another. Similar to previous years, growth was highest in the Cocheco, Oyster, and Bellamy Rivers, followed by Great Bay and Little Bay, with the slowest growth occurring at sites in the Piscataqua River, Rye Harbor, and Hampton Harbor (Fig. 2). These rivers typically have warmer water and higher phytoplankton concentrations which promotes fast growth. Moreover, this pattern reflects the distribution pattern of large, productive oyster reefs that historically occurred in New Hampshire.

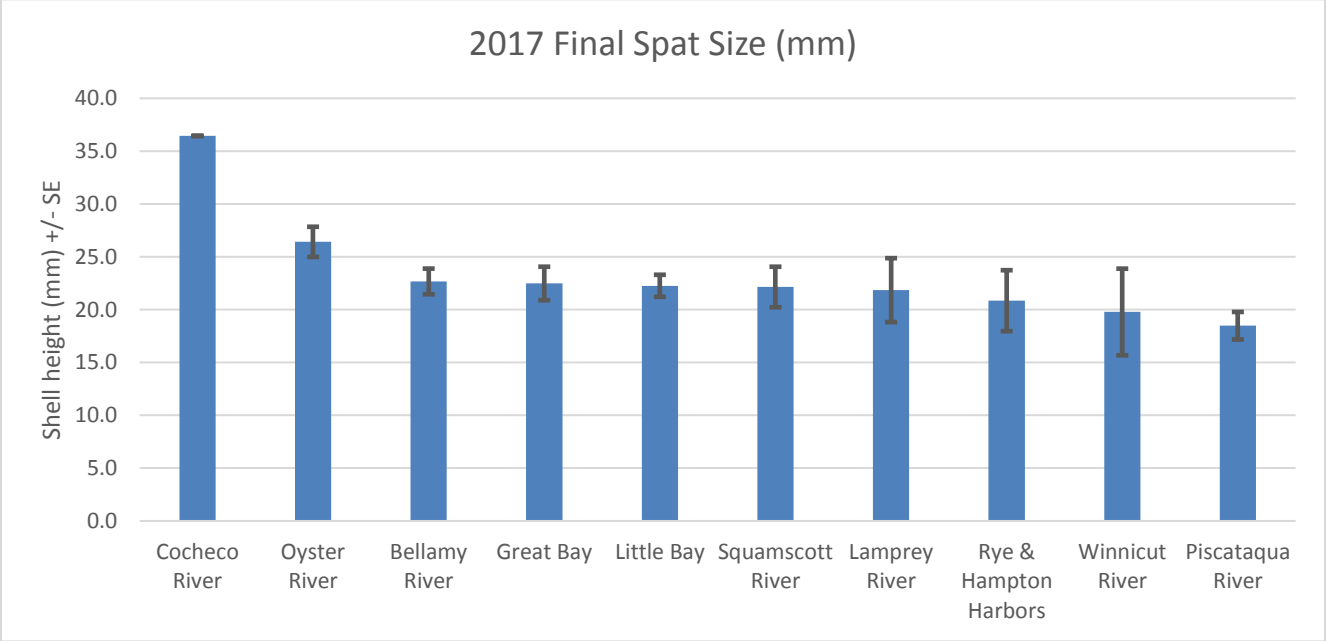

Figure 2. Mean final spat size (mm) grouped by combining data from nearby sites.

Survival

Oyster Conservationists raised a total of 42,854 oyster spat with a total return of 64% of initial spat deployed. As would be expected, average survival varied across locations ranging from 49% at the Winnicut River to 79% in Lamprey River (Fig. 3). Survival greater than 100% was observed at several OC sites and can be attributed to the collection of wild spat on the shells during the summer months. Fewer wild spat were observed than in previous years with the possible

explanation that cages were distributed past the time that wild oysters spawned this summer. Overall, survival rates were consistent with the range observed in previous years.

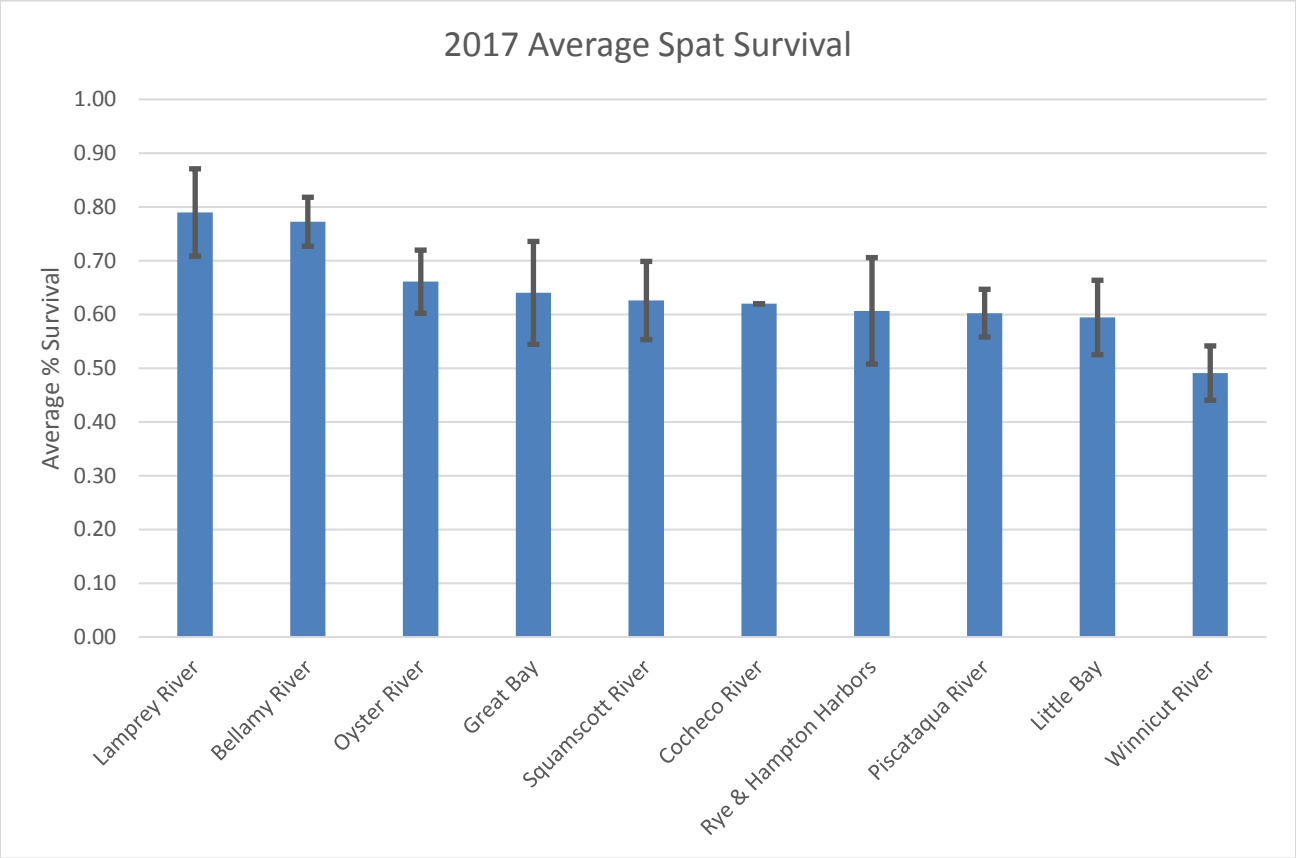

Figure 3. Mean percent survival with standard error bars grouped by combined data from nearby sites.

Discussion

A major goal of the OC program is to involve the public in the important task of restoring oysters to Great Bay. This has been accomplished with increasing success from year-to-year by increasing the number of participating OC locations and number of oysters reared by volunteers. The 2017 OC Program involved more OC sites and a higher number of participants than previous years. In addition, TNC staff hosted or participated in 6 oyster-related special events and delivered 8 public presentations in local communities. Public interest in oyster restoration continues to increase and New Hampshire's OC program is playing an important role in raising awareness of the importance of oysters in Great Bay.

Thank you & Acknowledgements

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