Duxbury Beach

Piping Plover Nesting Habitat Enhancement 2017

Final Report

November 22, 2017

Duxbury Beach Reservation

Project Summary

Duxbury Beach Reservation (DBR) performed habitat enhancement on Duxbury Beach for nesting Piping Plover (*Charadrius melodus*) during the winter of 2017 through a grant provided by the Massachusetts Natural Heritage and Endangered Species Program (NHESP). Habitat enhancement at Duxbury Beach began in 1999 and has occurred using a variety of methods from 1999-2017. In 2017, habitat enhancement occurred at three existing areas of replicated habitat and at two new locations on the west side (bayside) of the site. Three pairs of Piping Plover established territories and nested within three of the replicated habitat areas in 2017. Three chicks survived to fledge from the nests located in the enhanced habitat. Based on the work that occurred in 2017 and observations made over the previous 17 years, habitat enhancement was deemed effective in attracting nesting pairs, providing suitable chick rearing habitat, and reducing interactions between recreational activities and endangered species conservation efforts on Duxbury Beach.

Project History

Duxbury Beach is a barrier beach consisting of a peninsula approximately 7 kilometers long (4 miles) and about 60 meters wide (200 feet) covering approximately 2 to 2.5 square kilometers (500 to 600 acres). Behind the beach lies Duxbury and Kingston Bays as well as the northerly part of Plymouth Bay. With the exception of the Gurnet-Saquish community situated at the extreme southerly end of the peninsula and one isolated 50-foot lot, the beach is entirely owned and managed by DBR, a 501(C) non-profit corporation.

Historically, less than 20 Piping Plover pairs have nested on Duxbury Beach. However, beginning in 2014, the number of nesting pairs has ranged from 23 to 28. Similarly, the number of chicks fledged has increased, apart from 2017. The Reservation strives to maintain a fledge rate above 1.25 chicks fledged/pair, and has been successful during 51 percent of nesting seasons since 1989. In recent years, productivity has peaked at 1.94 chicks fledged/pair in 2013 and 1.83 chicks fledged/pair in 2016. The availability of suitable nesting habitat likely has an impact on the number of pairs that nest annually on Duxbury Beach.

Based on discussions with Dr. Scott Melvin (NHESP), DBR began creating artificial nesting habitat areas in 1999. DBR placed 1,300 cubic meters (1,700 cubic yards) of quarry sand on the bayside beach between High Pines and third crossover to form a large rectangular area measuring approximately 91 meters by 45 meters (300 feet by 150 feet). Part of this area was veneered with natural beach sand to help determine if nesting pairs prefer natural beach sand to quarry sand. One pair of Piping Plover nested in this area in 1999, suggesting preference for natural beach sand and helping to determine territory size on Duxbury Beach.

The project continued in 2000 with two additional habitat areas, each 53 meters in diameter (75 feet), just south of High Pines. In these cases, natural sand was spread over the entire area of quarry sand placed over the vegetation. Two pairs nested on the three enhancement areas, fledging three chicks. Two additional areas were added south of High Pines in 2001, created in the same way as in 2000. No birds nested on the newly created areas, possibly because access for chick foraging was limited by the marsh. Lack of funding stalled the project in 2002 and vegetation regrew in the habitat enhancement areas – no plovers nested in these areas in 2002. An attempt was made to restore the areas in 2003 by

rototilling the grass. This was deemed an ineffective method as the finished surface was rough with vegetation only partially buried. Again, no pairs nested in the habitat areas.

In 2005, DBR received a five-year permit from the Massachusetts Department of Environmental Protection to burn grass to create replicated habitat areas. This was first done in the fall of 2005 and in the spring of 2006, plovers nested on three of the five burned areas. Unfortunately, burning was deemed to be an unsuitable solution as the vegetation grew back too quickly. DBR then instituted the method of scraping replicated habitat areas using a small "bobcat" in the early spring to scrape and bury vegetation. This method was deemed effective because while the grass grows back, it allows a window of no vegetation during egg laying and hatching. In 2010, at the recommendation of Mass Audubon Coastal Waterbird Program staff, DBR began to scrape areas to resemble a naturally occurring washover rather than the previously used 53 meters diameter circle. Each area was approximately 279 and 371 square meters (3,000 and 4,000 square feet) and is level with the surrounding beach, typically 0.3 meters (1 foot) above the extreme high tide.

The "scraping" enhancement method continued in 2011, 2012, and 2013 with moderate success as at least one nesting pair used the areas each season. No maintenance work was performed at the habitat enhancement areas in 2014 and 2015 due to winter storms which either diverted DBR resources or prevented access to the areas. In 2016, three areas were scraped, and two pairs of plovers nested at the enhanced habitat areas, fledging three chicks.

Methodology

Replicated habitats were maintained and created in 2017 using the method employed on Duxbury Beach from 2010-2013 and 2016. The current method is to remove and bury vegetation in randomly shaped areas designed to appear similar to a wash over area. This scraping method of habitat enhancement consists of a using a small "bobcat" to scrape the surface of the beach and bury the vegetation. Based on past efforts to enhance habitat, DBR has determined that Piping Plovers may prefer nesting areas on natural beach sand rather than quarry sand. Scraping and burying vegetation exposes the native beach sand.

DBR restored the three replicated habitats that were created in 2016. The newly constructed areas were created in locations identified by Sue MacCallum (Mass Audubon), Morgan Billings (Duxbury Harbormasters Office), and Joe Grady (Duxbury Conservation Agent). All areas were located on the west side (bayside) of Duxbury Beach between High Pines and the third crossover (Map 1). This area was chosen as it reduced the likelihood of broods crossing the road. In addition, the areas provided easy access to the bayside wrack line.

Habitat enhancement in 2017 occurred between last week of February and first week in March and was performed Duxbury Construction Inc.

Project Budget

	Price per replicated habitat area	Total price for replicated area type	
Maintain existing habitat areas (three)	$2,100	$6,300	
Construct new habitat areas (two)	$3,600	$7,200	
		Total spent	**$13,500**

Habitat Enhancement Results

Enhanced habitat, created by scraping and burying vegetation, are areas designed to replicate natural and suitable Piping Plover nesting habitat. Each area was shaped irregularly and meant to mimic the appearance of an area naturally overwashed. Replicated habitat areas ranged in size from 422 to 968 square meters, with a total of 3,100 square meters (33,368 square feet) of enhanced habitat.

The timing of work allowed for a window during egg laying and hatching during which the areas were unvegetated – providing an open sand/cobble area for nesting and adjacent vegetation for chicks to hide in or access shade. Vegetation did begin to return to the areas but after nesting activity was complete.

Symbolic fencing was placed around the replicated habitats on April 2, 2017 to protect the areas from pedestrian traffic. In addition, the location chosen on the bayside between High Pines and the third crossover has very little pedestrian traffic. The bayside location provides access to prime foraging for broods on intertidal flats and bayside wrack line in a low wave activity habitat. Access to suitable foraging near the nest site decreases the likelihood of broods attempting to cross the road, lessening potential risk from vehicles and decreasing management of vehicles in that area.

Table 1. Summary of size and location of replicated habitat areas restored in 2017 (constructed in 2016) and constructed in 2017.

Replicated Habitat ID	Center of area (latitude, longitude)	Area (square meters)	Area (square feet)	Year habitat created	Piping Plover activity 2017	Piping Plover activity 2016
Area #1	42.026266, -70.622584	458	4,930	2017	No activity	No activity
Area #2	42.025992, -70.621953	968	10,419	2016	Nests 4a, 4b, 4b-cont, 4c	Nest 17a
Area #3	42.025336,	531	5,522	2016	Nest 3a	Nest 12a

	-70.621291					
Area #4	42.024944, -70.621023	422	4,542	2017	No activity	No activity
Area #5	42.024478, -70.620479	721	7,761	2016	Nest 2a	No activity

Shorebird Nesting Activity

Piping Plover: In 2017, three pairs of Piping Plover nested within the replicated habitat areas (Table 2). Five nests were laid in six locations (one continuation nest) within three of the habitat areas. Each pair only nested within one replicated habitat area (Map 1). Of the 20 eggs laid, eight hatched (from two nests) and three chicks survived to fledge. This was an increase from 2016, when two pairs of plovers nested in the three replicated habitat areas. Overall, eight eggs were laid (two nests), five hatched, and three chicks fledged during the 2016 season.

Although productivity at the replicated habitats decreased in 2017 compared to 2016, from 1.5 chicks fledged/pair to 1 chick fledged/pair, this may be due to overall lower productivity in 2017 compared to 2016. Overall productivity for Duxbury Beach was 2.3 chicks fledged/pair in 2016 and 0.4 in 2017. The chicks fledged from the replicated habitat areas represented only 6 percent of total fledglings in 2016 compared to 27 percent in 2017.

The first nest of each pair was discovered on 4/27/2017 and these nests were some of the earliest laid on Duxbury Beach this season. In Massachusetts, the earliest nests are typically laid around April 17. This suggests that the replicated habitat was favored by nesting pairs. It is also possible these pairs were more experienced and returned to previous nesting sites.

Table 2. Piping Plover nesting activity occurring within replicated habitats in 2017.

Pair	Nest #	Eggs laid	Eggs hatched	Chicks fledged	Date clutch found	Eggs when clutch found	Date clutch completed	Hatched failed	Cause of loss
02	A	4	4	1	04/27/2017	3	04/29/2017	Hatched	-
03	A	4	4	2	04/27/2017	1	05/03/2017	Hatched	-
04	A	4	0	0	04/27/2017	3	04/28/2017	Failed	Unknown
04	B	3	0	0	06/04/2017	1	Unknown	Failed	Coyote
04	B-cont	1-2	0	0	06/10/2017	1	Unknown	Failed	Coyote
04	C	4	0	0	06/15/2017	1	06/20/2017	Failed	Coyote

Least Tern: No Least tern (*Sternula antillarum*) nested within the replicated habitat areas in 2017. Least Tern have not typically established colonies on the bayside of the site, however, it is believed that the habitat enhancement for Piping Plovers may also create suitable nesting habitat for a small Least Tern colony.

Recommendations

Based on the Piping Plover nesting activity and success in 2017 – three nesting pairs (of 28) produced 27 percent of the fledged chicks for the season, we recommend continuing habitat enhancement efforts. Providing plover pairs with suitable habitat in areas that lessen management necessary for vehicles and pedestrians is ideal for the species and recreationalists on Duxbury Beach and Gurnet-Saquish residents.

We recommend maintaining the current level of effort in habitat enhancement, especially in regard to areas existing in 2017. Prior experience has suggested that maintaining already existing replicated habitat areas is more financially feasible than creating new habitat areas as the cost is approximately one third less. In addition, it is likely that pairs will attempt to return to the same nesting area in subsequent seasons. Maintaining these replicated habitat areas where birds previously nested and fledged chicks will provide pairs with the best opportunity for success rather than allowing these areas to become inferior nesting habitat.

Appendix 1: Map and Aerial Photographs

Figure 1. Area of habitat enhancement located on the bayside of Duxbury Beach between High Pines and the third crossover. Replicated habitat areas numbered 1 through 5, extending north to south. In 2017, three pairs of Piping Plover laid a total of 5 nests within the replicated habitat areas.

Figure 2. Figure 3. Aerial view of habitat enhancement project and resulting replicated habitat areas, viewed towards the east (A) and north (B).