Massachusetts Habitat Conservation Plan for Piping Plover

2018 Annual Report

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MASSWILDLIFE

Prepared by: Natural Heritage & Endangered Species Program
Massachusetts Division of Fisheries & Wildlife

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I. Executive Summary

On July 8, 2016 the United States Fish and Wildlife Service (USFWS) issued a 25-year Incidental Take Permit (ITP) to the Massachusetts Division of Fisheries and Wildlife (MassWildlife) in accordance with Section 10(a) (1) (B) of the Endangered Species Act of 1973 (ESA), as amended, 16 U.S.C. 1539 (a) (1) (B). Pursuant to the ITP, MassWildlife is responsible for administering the Massachusetts Statewide Habitat Conservation Plan (HCP). The HCP identifies covered activities that are authorized by the ITP that could expose Piping Plovers (*Charadrius melodus)* to "take." Incidental Take coverage can be extended by MassWildlife to approved landowners and beach managers through Certificates of Inclusion (COIs). During the 2018 beach season, seven beach operators held valid COIs encompassing ten distinct beaches. Covered activities were carried out at seven beaches: Nauset Beach, Orleans; Plymouth Long Beach, Plymouth; Sandy Neck Beach Park, Barnstable; Revere Beach Reservation, Revere; Winthrop Shore Reservation, Winthrop; Duxbury Beach, Duxbury; and Horseneck Beach State Reservation, Westport. Statewide, 19 pairs of Piping Plovers were exposed to covered activities: 15 broods to the operation of a road, 2 pairs to reduced proactive symbolic fencing, 1 brood to escorted recreational oversand vehicle use, and 1 pair to both reduced symbolic fencing around the nest and use of a parking lot. Intensive impact avoidance and minimization measures were implemented by COI holders. Required HCP compliance and effectiveness monitoring were carried out by both MassWildlife and COI holders.

The 19 pairs exposed to covered activities had excellent productivity, fledging 39 chicks (2.05 chicks per pair). Of the 15 broods that crossed roads, all but one fledged at least one chick. Although two known chick mortalities occurred while chicks were crossing the road, 33 of the 41 chicks that crossed roads fledged. Of the two pairs subject to reduced proactive symbolic fencing, one departed the site without nesting, and the other successfully nested nearby, hatching four eggs and fledging two chicks. All three chicks from the brood exposed to oversand vehicle use fledged. The pair that nested in a parking lot hatched three chicks, all of which relocated to the beachfront within 24 hours and one of which fledged.

Participation in the HCP expanded recreational opportunities at all seven beaches. Plymouth Long Beach and Duxbury beach operated roads for 42 days and 76 days respectively when access might otherwise have been limited by the presence of unfledged plover chicks. As a result of reduced proactive symbolic fencing, Revere Beach maintained unimpeded emergency vehicle access and full access to one of its two bathrooms, Winthrop Shore regularly groomed the main beach area, and Sandy Neck kept its groomed "Recreation Zone" open to oversand vehicles for the entire season. Nauset Beach allowed escorted oversand vehicles past chicks for 17 days when access would otherwise have been restricted. Horseneck Beach continued using the parking lot where a pair of plovers nested, closing only 127 out of 1,350 parking spaces in the lot during the 30-day egg-laying and incubation period.

On- and off-site mitigation was carried out in the form of selective predator management designed to increase productivity and more than offset any harm resulting from exposure to the covered activities. In all, 122 breeding pairs of Piping Plover benefited from selective predator management under the HCP, substantially more than the minimum benefit of 55.5 pairs required pursuant to the HCP. This report documents compliance with the HCP and provides information about other state-listed species, Least Terns and Diamond-backed Terrapins, exposed to potential take by the covered activities.

II. Annual Report Requirements

This annual report summarizes HCP implementation activities during 2018 and has been prepared by MassWildlife in accordance with the requirements of the HCP.

The goals of the annual report are as follows:

- To provide the information and data necessary for MassWildlife to demonstrate to the USFWS and the public that the HCP is being implemented properly.
- To disclose any problems with HCP implementation and the corrective measures planned or implemented to address the problems.
- To identify administrative or minor changes to HCP components required to increase the success of conservation actions.
- To identify the results and/or need for adaptive management and changed circumstances, and whether any HCP or ITP changes may be subsequently proposed as a result pursuant to Chapter 3.3.3. of the HCP.

A bulleted list of the required contents of the annual report is provided on page 5-9 of the HCP. To facilitate review by USFWS and the public, the remainder of this report systematically addresses each item on the list. Supporting documentation and data is included in the Appendices, which are available upon request.

II.1 Description of All Covered Activities Implemented During the Reporting Period by Activity Type and Location.

In total, 19 pairs of Piping Plovers were exposed to covered activities under the HCP. At Duxbury Beach, Duxbury, 12 broods were subject to *Use of Roads and Parking Lots in Vicinity of Unfledged Chicks*, as were three broods at Plymouth Long Beach, Plymouth. Of the 31 chicks that crossed the road at Duxbury Beach, 23 fledged, as did all of the 11 chicks in close proximity to roads and parking lots at Plymouth Long Beach. Two pairs were exposed to *Reduced Proactive Fencing of Habitat*: one at Revere Beach, Revere, where the pair departed the site without nesting, and one at Sandy Neck Beach Park, Barnstable, where the pair attempting to use the area relocated and nested successfully in a fenced area nearby, fledging two chicks. Winthrop Shore Reservation, Winthrop also implemented *Reduced Proactive Fencing of Habitat*, impacting Least Terns but not Piping Plovers. (See Section II.22 for information about Least Terns.) At Nauset Beach, Orleans, one brood was subject to *Oversand Vehicle Use in Vicinity of Unfledged Chicks*; all three chicks fledged. One pair at Horseneck Beach, Westport nested in a parking lot, where it was subject to *Reduced Symbolic Fencing Around Nests* and briefly to *Use of Roads and Parking Lots in the Vicinity of Unfledged Chicks* before the brood relocated to the beachfront, where one of the three chicks fledged. Additional information about implementation at each site, including duration of covered activities and productivity of exposed pairs, is provided in Table 1. More detailed information, including figures showing the specific locations of the covered activities at each site, can be found in Appendices A-I.

Table 1. Piping Plover HCP Covered Activities Implemented in 2018

Location	Covered Activity	Description of Covered Activity Implementation	# Permitted Take Exposures	# Take Exposures Used; % of Total Pairs Exposed	Pair Identifier	# Chicks Exposed	# Fledged from Exposed Pairs	Start of Imple-menta-tion	End of Imple-menta-tion	# Days Pair/Brood Exposed to Covered Activity	Age of Chicks When First Exposed (Days)	Produc-tivity (Fledges/ pair)
Nauset Beach, Orleans	Oversand Vehicle (OSV) Use in the Vicinity of Unfledged Chicks, Reduced Symbolic Fencing Around Nests, Nest Moving	Oversand vehicles, self-escorted through a narrow corridor by passengers walking in front of each vehicle, were allowed past 1 brood of unfledged plover chicks.	2	1; 4% of pairs	RS-A	3	3	7/19	8/4	17	17	2.68 (28 nesting pairs, 28 broods)
Plymouth Long Beach, Plymouth	Use of Roads and Parking Lots in the Vicinity of Unfledged Piping Plover Chicks	The covered area was along Ryder Way, which provides access to private residences at the north end of the barrier beach and recreational access to the beachfront. Multiple broods crossed or were in close proximity to roads and parking lots. IAMP included intensive brood monitoring, recreational traffic restriction when unfledged chicks were on or near the road, and escorted access for essential vehicles.	3	3; 12% of pairs	8A	4 (including 1 "adopted" chick from a nearby brood)	4 (including 1 "adopted" chick from a nearby brood)	6/20	7/9	20	14	2.0 (26 nesting pairs, 23 broods)
					21B	3	3	7/4	8/1	29	0	
					6B	4	4	7/14	7/30	17	17	

Location	Covered Activity	Description of Covered Activity Implementation	# Permitted Take Exposures	# Take Exposures Used; % of Total Pairs Exposed	Pair Identifier	# Chicks Exposed	# Fledged from Exposed Pairs	Start of Imple-menta-tion	End of Imple-menta-tion	# Days Pair/Brood Exposed to Covered Activity	Age of Chicks When First Exposed (Days)	Produc-tivity (Fledges/ pair)
Sandy Neck Beach Park, Barnstable	Reduced Proactive Symbolic Fencing of Habitat	Proactive symbolic fencing was reduced throughout the Recreation Zone, impacting 1.2 acres of potential habitat. Fencing was limited to a narrow 5-10 foot-wide strip to protect the base of the dune over a stretch of approximately 1,678 feet. Beach raking (8 times) and coverboards (9 times) were used to deter 1 pair attempting to nest in the Recreation Zone. The pair successfully nested in a proactively fenced area nearby.	1	1; 4% of pairs	8A	0 (although pair hatched 3 chicks)	2	4/13	5/8	26	N/A	1.56 (27 nesting pairs, 22 broods)
Nauset Beach (North Beach), Chatham	Reduced Proactive Symbolic Fencing of Habitat, Reduced Fencing Around Nests, Oversand (OSV) use in the Vicinity of Unfledged Chicks.	No covered activities were implemented in 2018.	1	0; N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.76 (21 nesting pairs, 14 broods)
East Beach and Leland Beach, Edgartown (The Trustees of Reservations)	Use of Oversand (OSV) Vehicles in the Vicinity of Unfledged Chicks	No covered activities were implemented in 2018.	2	0; N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.0 (19 nesting pairs, 16 broods)

Location	Covered Activity	Description of Covered Activity Implementation	# Permitted Take Exposures	# Take Exposures Used; % of Total Pairs Exposed	Pair Identifier	# Chicks Exposed	# Fledged from Exposed Pairs	Start of Imple-menta-tion	End of Imple-menta-tion	# Days Pair/Brood Exposed to Covered Activity	Age of Chicks When First Exposed (Days)	Produc-tivity (Fledges/ pair)
Coskata-Coatue, Nantucket (The Trustees of Reservations)	Use of Oversand (OSV) Vehicles in the Vicinity of Unfledged Chicks	No covered activities were implemented in 2018.	1	0; N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.0 (1 nesting pair, 1 brood)
Revere Beach Reservation, Revere and Winthrop Shore Reservation, Winthrop (Department of Conservation and Recreation)	Reduced Proactive Symbolic Fencing of Habitat	Proactive symbolic fencing was reduced in a 0.96 acre area in front of the Shirley Ave bath house, which also provides emergency vehicle access. Beach raking occurred every other day through early August to deter 1 pair of Piping Plovers scraping in the area. Piping Plovers were not present and therefore were not impacted by 0.44 acres of reduced symbolic fencing around a Least Tern nest at Winthrop Shore. Raking at Winthrop Shores began on June 11 and continued until early August.	4	1; non-nesting pair not included in total count	Non-nesting pair at Revere Beach - South	N/A	N/A	5/24	early June (when the pair stopped scraping in the area of reduced symbolic fencing; raking continued into August)	<14 (pair attempted to move into a fenced area but was deterred by other territorial pairs)	N/A	0.5 (12 nesting pairs, 9 broods)
Duxbury Beach, Duxbury (Duxbury Beach Reservation)	Use of Roads and Parking Lots in the Vicinity of Unfledged Piping Plover Chicks	The covered area included the full length of Gurnet Road, which provides access to private residences at the south end of the barrier beach and recreational access to the beachfront. Multiple broods crossed between the beachfront	8	12; 50% of pairs	01A	4	3	6/1	6/28	28	0	1.0 (24 nesting pairs, 17 broods)
					02A	4	3	6/7	7/15	39	2	
					03A	1	2	7/3	7/3	1	31	
					04A	3	3	6/25	6/29	5	20	
					06A	4	3	6/10	6/10	1	4	
					07A	3	0	6/12	6/12	1	2	
					10A	1	1	6/18	7/8	21	8	
					11A	3 (1 road-related mortality)	1	6/18	6/26	9	9	

Location	Covered Activity	Description of Covered Activity Implementation	# Permitted Take Exposures	# Take Exposures Used; % of Total Pairs Exposed	Pair Identifier	# Chicks Exposed	# Fledged from Exposed Pairs	Start of Imple-menta-tion	End of Imple-menta-tion	# Days Pair/Brood Exposed to Covered Activity	Age of Chicks When First Exposed (Days)	Produc-tivity (Fledges/ pair)
Duxbury Beach continued		and bayside of the road. IAMP included intensive brood monitoring and traffic restriction when chicks were on or near the road.			13A	1	1	6/22	6/22	1	14	
					18A	1	1	7/12	8/2	22	16	
					19A	4	4	6/6	7/6	31	1	
					22A	2 (1 road-related mortality)	1	7/14	8/15	33	2	
Horseneck Beach Reservation, Westport (Department of Conservation and Recreation)	Reduced Proactive Symbolic Fencing of Habitat, Reduced Symbolic Fencing Around Nests, Use of Roads and Parking Lots in the Vicinity of Unfledged Chicks	One pair of Piping Plovers nested in a parking lot, where they were subject to reduced symbolic fencing around the nest. When the nest hatched, the parking lot remained open, but all 3 chicks relocated to the beach within 24 h. IAMP included intensive monitoring (continuous when chicks were in the parking lot) and straw wattles to prevent chicks from moving further into the lot. The main beach area, a 0.5-mi (9.55 acre) stretch was raked from April 2 to August 10, potentially displacing Least Terns but not Piping Plovers.	3	1; 7% of pairs	12B	3	1	6/11 (date nest was found with 2 eggs)			0	0.6 (15 nesting pairs, 9 broods)

Location	Covered Activity	Description of Covered Activity Implementation	# Permitted Take Exposures	# Take Exposures Used; % of Total Pairs Exposed	Pair Identifier	# Chicks Exposed	# Fledged from Exposed Pairs	Start of Imple-menta-tion	End of Imple-menta-tion	# Days Pair/Brood Exposed to Covered Activity	Age of Chicks When First Exposed (Days)	Produc-tivity (Fledges/ pair)
Statewide	See above	See above	25	19; 2.8% of pairs	N/A	47	39 (includes fledglings from pair exposed to Reduced Proactive Symbolic Fencing at Sandy Neck)	N/A	N/A	N/A	N/A	1.30 (688 pairs, adjusted total count)

II.2 Summary of annual take exposure.

The total allowable take exposure for a given year is based on a three-year rolling average of the statewide Piping Plover breeding population (HCP, Table 3-1). The average breeding population size for 2015-2017 was 662 breeding pairs, based on Adjusted Total Count, resulting in an allowable exposure to covered activities of 7%, or a maximum of 46 broods, nests, and/or territories that could be exposed to covered activities statewide (MassWildlife 2015, 2016, 2017, Table 2). During 2018, 19 broods/nests/territories were exposed to covered activities, and exposure at each site was <15% of the breeding population size at that site, with the exception of Duxbury Beach (Table 1).

USFWS directly authorized Cape Cod National Seashore through 2020 to expose up to three pairs of Piping Plover to flexible management that could result in take exposure. Flexible management was not implemented, resulting in no additional Massachusetts take exposure (Tim Watkins personal communication). Although take exposure for recreational activities on federal properties is not associated with the Massachusetts Piping Plover HCP, MassWildlife is required to subtract these authorizations from the total allowable statewide take exposure available to HCP participants in a given year.

Table 2. Massachusetts Piping Plover Breeding Population, 2015-2017, and Actual and Allowable Take Exposure for 2018 under the Massachusetts Piping Plover HCP.

	YEAR		
	2015	**2016**	**2017**
MA Breeding Pairs (Adjusted Total Count)	683	641.5	650.5
Three-year average (2015 – 2017):	658		
Maximum Allowable 2018 Exposure (7%):	46 broods/nests/territories		
Actual 2018 Exposure:	19 broods/nests/territories		

II.3 Summary of the annual mitigation implemented, and any mitigation credits or deficits outstanding from previous years.

In 2018, MassWildlife provided $7,315 to two organizations for HCP mitigation activities (selective predator management) at two sites. The New England Field Office of the USFWS approved all plans for the purpose of HCP mitigation. MassWildlife provided $6,815 to Crane Beach (The Trustees of Reservations), which contracted with USDA APHIS Wildlife Services at a total cost of $8,450. This work benefited 42 Piping Plover pairs, with the state portion of the funding (80.7%) benefiting 33.9 of those pairs (Table 3). MassWildlife awarded an additional $10,500 to Monomoy National Wildlife Refuge, but the Refuge did not implement a comprehensive predator management plan in 2018. MassWildlife therefore expended $500 for coyote removal at Monomoy NWR (Appendix K) but retained the remaining $10,000 to be put towards future mitigation.

In addition, Duxbury Beach Reservation (DBR), the Town of Plymouth, and the Department of Conservation and Recreation (DCR) used their own resources to implement selective predator management at five sites (Duxbury Beach, Plymouth Long Beach, Sandy Point State Reservation, Horseneck Beach Reservation, and Demarest Lloyd State Park) to mitigate for impacts associated with the covered activities included in their COIs (Appendices L-Q). In all cases, USDA APHIS Wildlife Services

carried out the work in accordance with their plans, which were approved by the New England Field Office of the USFWS for the purpose of HCP mitigation. This work was not cost-shared with MassWildlife. Duxbury Beach onsite selective predator management benefited 24 pairs of breeding Piping Plovers, and Plymouth Long Beach onsite selective predator management benefited 26 breeding pairs. DCR implemented three selective predator management programs to mitigate for covered activities at two sites: a program at Sandy Point State Reservation mitigated for impacts at Revere Beach and Winthrop Shore Reservation, and programs at Horseneck Beach and Demarest Lloyd State Park mitigated for impacts at Horseneck Beach. Sandy Point selective predator management benefited 10 breeding pairs of Piping Plovers, while Horseneck Beach and Demarest Lloyd State Park selective predator management benefitted 19 breeding pairs.

MassWildlife and the COI holders implemented more than enough selective predator management to meet 2018 mitigation requirements. Therefore, there is a mitigation credit that carries forward (Table 3). At the mitigation ratios of 2.5:1 (OSV Use and Reduced Fencing) and 3:1 (Roads and Parking Lots), selective predator management was required to benefit 55.5 pairs in order to mitigate for exposures that occurred during 2018. In fact, selective predator management associated with the HCP benefitted 122 pairs (33.9 by state mitigation funds provided by COI holders and 88.1 directly by COI holders). Including credits carried forward from 2016 and 2017, there are 83.6 credits available statewide and an additional 97.8 credits allocated to individual sites (*i.e.*, because the COI holder directly funded mitigation activities). Of those credits, 2.5 (allocated to Orleans) expired at the end of the 2018 season. Table 3 provides additional detail.

Table 3a. Predator Management Mitigation Requirements and Credits for COI holders under the Massachusetts Piping Plover HCP in 2018.

2018 COI Sites							
COI Site	**No. Authorized Exposures**	**No. Actual Exposures in 2018**	**Predator Control Mitigation Required**	**Site Credits Gained in 2018**	**2017 Site Credit Balance**	**2018 Total Site Credit Balance**	**Credits Expire**
Orleans	2	1	2.5	2.5 (escrow)	2.5 (escrow)	2.5	2018
Plymouth	3	3	9	26	24.4	41.4	2019
Barnstable	1	1	2.5	2.5 (escrow)	0	0	2019
Chatham	1	0	0	0	2.5 (escrow)	2.5	2019
Edgartown	2	0	0	8.1	10.8	18.9	2019
Nantucket	1	0	0	*same as Edgartown	*same as Edgartown	*same as Edgartown	2019
Revere/Winthrop	4	1	2.5	10	8	15.5	2019
Duxbury	8	12	36	24	N/A	-12 (covered by state credits in 2018)	2020
Horseneck	3	1	3	19	N/A	16	2020
TOTAL	**25**	**19**	**55.5**	**92.1 (includes escrow credits)**	**48.2**	**96.8 (Duxbury deficit is subtracted from state credits)**	**N/A**

Table 3b. Predator Management Mitigation Programs and Credits under the Massachusetts Piping Plover HCP in 2018

2018 Mitigation Sites									
Mitigation Site	**Total Cost**	**HCP Cost (Applicant)**	**HCP Cost (DFW)**	**HCP Cost Share (Applicant)**	**Actual Pairs Benefiting**	**Site Credits Gained**	**State Credits Gained**	**Site Credits Used**	**Location(s) of Credit Use**
Crane Beach	$8,450	$1,635	$6,815	19.3%	42	8.1	33.9	0	Edgartown, Nantucket
Plymouth	$11,285	$11,285	$0	100%	26	26	0	9	Plymouth
Sandy Point	$5,467	$5,467	$0	100%	10	10	0	2.5	Revere/ Winthrop
Duxbury	$18,500	$18,500	$0	100%	24	24	0	36	Duxbury
Horseneck/ Demarest Lloyd	$9,785	$9,785	$0	100%	19	19	0	3	Horseneck
Monomoy NWR	**N/A**	N/A	$500	N/A	N/A	N/A	0	0	N/A
DFW Subtotal	**N/A**	**N/A**	**$7,315**	**N/A**	**N/A**	**5 (escrow)**	**28.9 (excludes 5 escrow credits)**	**5 (escrow)**	**Orleans, Barnstable**
TOTAL	**$53,987**	**$46,672**	**$7,315**	**N/A**	**121**	**92.1**	**28.9**	**55.5**	**N/A**

Table 3c. Statewide Predator Management Net Mitigation Credits under the Massachusetts Piping Plover HCP in 2018.

2018 Net Credits						
Credit Type	**Credits at End of 2017**	**Credits Gained 2018**	**Credits Used 2018**	**Net Credits at End of 2018**	**Credits Expiring 2018**	**Credits Carrying Forward to 2019**
Credits Allocated to Individual Sites (includes escrow credits)	48.2	92.1	43.5	96.8	2.5 (Orleans)	94.3
Credits Available Statewide	69.2	28.9	12 (Duxbury deficit)	86.1	0	86.1
TOTAL NET CREDITS	**117.4**	**121**	**55.5**	**182.9**	**2.5**	**180.4**

II.4 Summary of exceptions to the restrictions on the number or territories/nests/broods affected (15% vs. 30%) and habitat impacts (2 acres/10% vs. 4 acres/20%) employed for the covered activities (as provided for in the Plan).

There was one exception to the restrictions on the number of territories/nests/broods affected (15% v. 30%). This exception was employed under the Duxbury Beach COI under the covered activity *Use of Roads and Parking Lots in the Vicinity of Unfledged Chicks.* The COI allowed for take of up to 8 broods, although 12 broods (50% of 24 pairs) crossed Gurnet Road in 2018.

II.5 Year-to-date cumulative summary (*i.e.*, from the start of the permit term) of temporary impacts to Piping Plover habitat resulting from covered activities.

Covered activities in 2016 were confined to existing roads, parking lots, and Oversand Vehicle (OSV) corridors, and therefore did not result in any additional impacts to habitat. Covered activities in 2017 included reduced proactive fencing and beach raking at two sites, resulting in temporary impacts to 0.63 acres of Piping Plover habitat at Winthrop Shore and 1.2 acres at Sandy Neck Beach Park. In 2018, covered activities impacted potential habitat at Sandy Neck Beach Park, Revere Beach, Winthrop Shore, and Horseneck Beach. As in 2017, 1.2 acres of habitat at Sandy Neck Beach Park were subject to reduced proactive symbolic fencing, including use of beach raking and coverboards, in order to maintain a groomed "Recreation Zone" for OSV use. Approximately 0.96 acres of habitat at Revere Beach were subject to reduced proactive symbolic fencing and beach raking in front of the Shirley Ave bath house, where one pair of Piping Plovers attempted to nest. At Winthrop Shore, symbolic fencing was reduced by 0.44 acres surrounding a Least Tern nest, but this did not impact Piping Plovers. At Horseneck Beach, beach raking occurred throughout the 0.5-mile "main beach," encompassing approximately 9.54 acres that historically have been raked.

II.6 Year-to-date and cumulative (*i.e.*, from the start of the permit term) quantification of exposure to incidental take of Piping Plover individuals for the purpose of demonstrating compliance with the authorized level of take on the ITP.

Table 4. Cumulative Quantification of Piping Plover Take Exposure under the Massachusetts Piping Plover HCP, 2016 – 2018.

Year	# of Broods/Nests/Territories Exposed	Total Statewide Allowable Take Exposures	% of Statewide Allowable Exposure
2016	3	47	6.4%
2017	5	46	10.9%
2018	19	46	38.8%

Three Piping Plover broods in 2016, five Piping Plover broods/nests/territories in 2017, and 19 broods/nests/territories in 2018 were exposed to covered activities; these equate to 6.4% (2016), 10.9% (2017), and 38.8% (2018) of the statewide allowable exposure. The cumulative total equates to the exposure of 27 broods/nests/territories to covered activities over the first three years of the permit term.

II.7 Description of all experimental vegetation management actions implemented during the reporting period including a year-to-date and cumulative summary of the extent and location of land cover types enhanced through vegetation management.

Experimental habitat management was not implemented during the reporting period. To date, two experimental habitat management projects have been implemented, both in 2017. At Duxbury Beach, vegetation in five experimental plots was scraped or buried, creating and maintaining five areas of potential nesting habitat totaling approximately 0.77 acres. Two pairs nested in the replicated habitats in both 2017 and 2018. At Winthrop Shore Reservation, cobble was removed from the southern portion of the shorebird nesting area, where two pairs of Piping Plovers and 20-25 pairs of Least Terns nested in 2017. Plovers and terns continued to nest in this area in 2018.

II.8 Assessment of the efficacy of vegetation management actions in achieving performance objectives and recommended changes to improve the efficacy of the methods.

No new experimental habitat management occurred in 2018. However, Piping Plovers continued to nest in the experimental habitat areas at both Duxbury Beach and Winthrop Shore in 2018.

II.9 List of all plan participants and activities authorized for take coverage.

See Table 1.

II.10 Accounting of all mitigation funds collected from plan participants during the previous year, and any unspent funds from previous years.

Table 6. Accounting of Offsite Mitigation Funds

Statewide Mitigation Funds Balance	
Balance from Previous Years	
$5,800	Unspent 2017 Funds
Income	
$ 5,800.00	Orleans Escrow
$ 5,800.00	Barnstable Escrow
Expenses	
$ 6,815.00	USDA APHIS, Crane Beach Predator Management
$ 500.00	B. Beals, Monomoy Predator Management
Unspent Funds	
$ 10,085.00	$10,000 were awarded but not used for Monomoy Predator Management through USDA APHIS; funds retained for future mitigation

II.11 If appropriate, any updates to the mitigation fee as described under the adjustment process in Section 5.2.2.1 and an updated annual budget for DFW's plan implementation.

No adjustments to the mitigation fee or MassWildlife implementation budget are required at this time.

II.12 If available at the time of the annual report, evidence that DFW's needed funding has been assured for the coming year by the State legislature, and the funds have been earmarked or segregated for their intended purpose within DFW's accounting system.

Funding for Massachusetts Fiscal Year 2019 (ending June 30, 2019) has been secured (Appendix AA). Funding for Fiscal Year 2020 has not yet been assured. As required by the HCP, MassWildlife will provide a funding assurance letter to USFWS in advance of any 2019 covered activities being implemented.

II.13 Accounting of the cost of all mitigation measures implemented in the previous fiscal year and the expected cost of mitigation measures in the upcoming fiscal year.

An accounting for the costs of all mitigation measures implemented in 2018 ($53,987) is provided in Table 3. Additional information on the $7,315 in off-site mitigation is provided in Table 6. Mitigation is expected to total $78,000 in 2019, of which an anticipated $27,485 will be for off-site mitigation, including selective predator management, experimental habitat management, and education and outreach.

II.14 Record of any grants and Plan implementation contracts awarded to plan participants, other landowners, or implementation partners.

Massachusetts Division of Fisheries and Wildlife (DFW) used off-site mitigation commitments to fund predator management through two contracts in 2018. The first contract of $6,815 funded USDA APHIS Wildlife Services at Crane Beach. The second contract of $500.00 funded Brian Beals Predator Control of Winchendon, MA at Monomoy NWR (Table 6).

II.15 Description of the adaptive management process used during the reporting period, if applicable.

No adaptive management took place during the 2018 reporting period.

II.16 Summary for the reporting period of the monitoring program objectives, techniques, and protocols, including monitoring locations, variables measured, sampling frequency, timing and duration, and analysis methods.

The monitoring program documented implementation of covered activities, compliance with the Guidelines, and mitigation programs. COI holders kept required logs of initiation dates of covered activities; number of broods and chicks exposed; locations of exposed broods and any impacts to the broods associated with the covered activity; and monitoring frequency. MassWildlife was notified at least 24 hours in advance of implementing the covered activities and subsequently conducted COI compliance site visits at each site that implemented covered activities in 2018. Compliance with the impact avoidance and minimization protocols was documented in logs and summarized in the COI holder final reports. Final reports and invoices also document implementation of required mitigation, which was also reported by USDA APHIS.

The monitoring program also aimed to assess the impacts of covered activities and effectiveness of impact minimization measures and mitigation programs. Effectiveness monitoring consisted of documenting pair behavior, chick behavior, crossing frequency, and nesting and fledging success at the covered activity implementation sites. Measures of reproductive success were also collected at the selective predator management implementation sites. Monitoring information was provided to MassWildlife in HCP final reports (Appendices A-I) and through the PIPLODES online database. MassWildlife coordinated the synthesis of 2018 Piping Plover data by cooperators, performed quality control, and finalized the 2018 index count, adjusted total count, and productivity of breeding Piping Plovers.

II.17 Assessment of the efficacy of the monitoring and research program and recommended changes to the program based on interpretation of monitoring results and research findings, if applicable.

Compliance monitoring occurred at each of the sites that implemented covered activities in 2018, and all sites appeared to be in compliance with the Guidelines. However, making inferences about the effectiveness of mitigation measures and impacts of covered activities on productivity is

methodologically challenging and will require larger sample sizes and possibly other methods, such as establishment of predator management control sites. There are no recommended changes to the monitoring program at this time; however, DFW will continue to develop formal methods for assessing efficacy of predator management as required in the HCP.

II.18 Description of all Plan-directed studies undertaken during the reporting period; a summary of study results; and a description of integration with monitoring, assessment, and compliance elements.

DFW contracted with the State University of New York College of Environmental Science and Forestry (principal investigator Dr. Jonathan Cohen and investigator Michelle Stantial) to analyze retrospective Piping Plover productivity data and assess the efficacy of predator removal from Piping Plover nesting sites in Massachusetts. Cohen and Stantial participated in a conference call with the Science Advisory Committee, comprised of interested HCP stakeholders, to discuss methods for assessing the efficacy of selective predator management in February, prior to conducting data analysis. Based on ten years of retrospective data from 22 sites, they were unable to detect a statistically significant effect of predator management on nest or chick survival, because predator management had not been implemented according to an experimental design with multiple years of data collection before and after predator removal. Based on simulations, they were able to detect a 20% increase in nest survival with three years of data prior to predator removal and twelve years following predator removal. To increase the ability to detect changes in predation rates and improve nest survival estimates, Cohen and Stantial recommended recording nest status during every nest check and suggested three potential study designs for testing the efficacy of predator removal. See Appendix R for the full report.

II.19 Description of any actions taken or expected regarding adaptive management and/or changed circumstances, including remedial actions resulting from any Plan or permit amendments granted in the prior years, if applicable.

No actions were taken or expected regarding adaptive management and/or changed circumstances in 2018.

II.20 Description of any unforeseen circumstances that arose and responses taken, if applicable.

Two emergency amendments were issued in response to unforeseen circumstances in 2018. At Plymouth Long Beach, three pairs of Piping Plovers nested in close proximity to the beach access road, prompting an emergency request to increase permitted take exposures from two to three, which was granted by DFW on June 22 (Appendix U). While two of the three nests along the road were predated, two broods unexpectedly crossed or moved toward the road, resulting in a total of three broods exposed to take at Plymouth Long Beach. At Horseneck Beach, a pair of Piping Plovers nested in a parking lot, prompting an emergency request to allow the *Use of Roads and Parking Lots in the Vicinity of Unfledged Piping Plover Chicks*, which was granted by DFW on June 22 (Appendix Z). The nest, which was also subject to reduced symbolic fencing, hatched three chicks, and they subsequently moved to the beachfront.

II.21 Summary of any administrative changes, minor modifications, or major amendments proposed or approved during the reporting year (see Section 5.3.3, *Modifications to the Plan*). Any information about mitigation measures other than selective predator management, the

associated funding, and monitoring is being provided for informational purposes only, as the USFWS has indicated that these activities do not count as mitigation to offset take associated with the ITP.

No changes, modifications, or amendments to the Plan were made during 2018. An amendment to the Plan, which was proposed in 2017 and would allow take exposure of up to 75% of pairs at up to eight sites, has yet to be approved. DFW did not fund any mitigation measures other than selective predator management in 2018.

II.22 Other state or federally listed species affected by HCP implementation

Covered activities had the potential to result in take of state-listed Least Terns at Nauset Beach, Orleans; Plymouth Long Beach, Plymouth; Sandy Neck Beach Park, Barnstable; Nauset Beach (North Beach), Chatham; Winthrop Shore, Winthrop; and Horseneck Beach, Westport. As a result, DCR and the towns of Orleans, Plymouth, Barnstable, and Chatham developed impact minimization and mitigation plans for Least Terns and obtained Conservation and Management Permits to ensure Massachusetts Endangered Species Act (MESA) compliance. Least Terns were not exposed to take in either Orleans or Chatham in 2018. The state-funded portion of off-site mitigation for Least Terns at Crane Beach benefitted 121.8 pairs (out of 151 total nesting pairs). The other COI holders conducted on-site mitigation.

At Plymouth Long Beach, Least Tern chicks were exposed to *Use of Roads and Parking Lots in the Vicinity of Unfledged Chicks* during June 18–August 16. The Town of Plymouth installed a barrier to prevent unfledged Least Tern Chicks from entering the road. They carried out intensive monitoring as described in the IAMP and presented in their Final Report (Appendix B). Although it is challenging to monitor tern chicks, an estimated 60 chicks were exposed to the covered activity; no evidence of road-related mortality or injury was detected. On-site mitigation consisted of implementation of selective predator management benefitting an estimated 178 breeding pairs of Least Tern. At a mitigation ratio of 2:1 for Least Terns, Plymouth gained 58 credits in addition to the 9.2 credits carrying over from 2017. Entering 2019, Plymouth has a site credit balance of 67.2.

At Sandy Neck Beach Park, two unfledged Least Tern chicks were exposed to *Use of Oversand Vehicles in the Vicinity of Unfledged Chicks* during August 16–August 30 (Appendix C). During that period, ten "camper" vehicles were escorted past the unfledged chicks. Off-site mitigation using state funds at Crane Beach benefitted 121.8 of 151 nesting pairs.

At Winthrop Shore, one pair of Least Terns was exposed to *Reduced Symbolic Fencing Around Nests* (Appendix G). The nest was found and fenced on June 8, and the fencing was reduced to a 5-meter diameter on June 12. Two chicks hatched on June 29, and the parents moved the chicks into a larger fenced area on July 2; both chicks fledged. DCR conducted mitigation off-site at Sandy Point State Reservation, where 12 pairs of Least Terns benefitted. At a mitigation ratio of 2:1, DCR gained 10 credits, which negates the 10-credit deficit carried over from 2017. Entering 2019, DCR has a Least Tern credit balance of zero at Winthrop Shore.

At Horseneck Beach, an estimated nine pairs of Least Terns were exposed to *Reduced Proactive Symbolic Fencing* (Appendix I). While approximately 18 pairs of Least Terns nested at Horseneck Beach in 2018, DCR considered that half of those pairs may have been displaced by reduced symbolic fencing and beach raking in potential habitat. DCR conducted predator management on-site and at Demarest Lloyd,

benefitting 21 pairs of Least Terns. At a mitigation ratio of 2:1, DCR has a Least Tern mitigation balance of three pairs entering 2019.

Covered activities also had the potential to result in take of state-listed Diamond-backed Terrapins (*Malaclemys terrapin*) at Nauset Beach, Orleans and Sandy Neck Beach Park, Barnstable. The towns of Barnstable and Orleans therefore developed impact minimization and mitigation measures, including nest protection, for Diamond-backed Terrapins with potential to be impacted by *Oversand Vehicle Use in the Vicinity of Unfledged Chicks* in their requests for COI. For this species, the benefits of nest protection are expected to outweigh the risk of mortality associated with the OSVs. The Nauset Beach Conservation and Management Permit (CMP) pursuant to MESA covered limited exposure of terrapins in Orleans because terrapins sometimes cross the OSV corridor to nest. One Diamond-backed Terrapin nest was located near the OSV corridor and relocated to the "Pochet Overwash Turtle Garden," where it was exclosed by the Director of Mass Audubon's Wellfleet Bay Sanctuary, Bob Prescott (Appendix A). Prescott then moved the nest to an incubator after 80 days. Eleven of twelve eggs hatched, and the hatchlings were released along Pochet Creek. During implementation of the covered activity, there were no observed mortalities or negative impacts to adult or hatchling terrapins. The Sandy Neck CMP also covered limited exposure of terrapins at Sandy Neck because terrapins are sometimes found crossing or nesting within the Marsh Trail, which is used by essential vehicles and campers. This covered activity was not implemented this year, resulting in zero exposure to Diamond-backed Terrapins (Appendix C).