

Massachusetts Habitat Conservation Plan for Piping Plover

2017 Annual Report



Bill Byrne/MassWildlife



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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 could expose Piping Plovers (*Charadrius melodus*) to “take” that are authorized by the Incidental Take Permit (ITP). Incidental Take coverage can be extended by MassWildlife to approved landowners and beach managers through Certificates of Inclusion (COI’s). During the 2017 beach season, six beach operators held valid COI’s and covered activities were carried out at four beaches (Sandy Neck, Winthrop Shores, Plymouth Long Beach and Nauset Beach), exposing a statewide total of three broods to reduced proactive symbolic fencing, one brood to the operation of a road, and one brood to escorted recreational oversand vehicle use. Intensive impact avoidance and minimization measures were implemented by the COI holders, and required HCP compliance and effectiveness monitoring was carried out by both MassWildlife and the COI holders.

Three out of 3 pairs of Piping Plover pairs exposed to reduced proactive symbolic fencing of habitat nested successfully and six of six chicks exposed to vehicles fledged, suggesting that implementation of the covered activities, had little, if any effect on nesting success and productivity. Participation in the HCP enabled the Town of Barnstable to keep most of the recreation zone open all season. Winthrop Shores reported experiencing increased favorable interactions with beach visitors as a result of increased space for recreational use. Participation by the town of Plymouth allowed the Town to open the Day Use parking area and Roadside Parking areas 43 days earlier than would otherwise have been permitted; the OSV crossover was able to remain open for an additional 32 days. Additionally, night fishing access was opened when unfledged Least Terns, but not Piping Plovers, were present and allowed 23 vehicles to access night fishing areas that would have otherwise remained closed. Participation in the HCP also reduced costs associated with management of essential vehicles. Participation by the Town of Orleans enabled the Town to open sections of beach to recreational OSV use approximately 18 days earlier than would otherwise be allowed. 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. 114.1 breeding pairs of Piping Plover benefited from selective predator management, substantially more than the minimum benefit of 13 pairs required pursuant to the HCP. This report documents compliance with the HCP and provides information about other state-listed species exposed to potential take by the covered activities, Least Tern and Diamondback Terrapin.

II. Annual Report Requirements

This annual report summarizes HCP implementation activities during 2017, 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 the MassWildlife to demonstrate to the FWS 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 problem.
- 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 provided in the Appendices as referenced throughout the text.

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

At Sandy Neck Beach Park, Barnstable, one Piping Plover pair was exposed to the covered activity *Reduced Proactive Fencing of Habitat*, for which the pair moved to another portion of the beach and nested successfully and fledged two chicks. At Winthrop Beach, two Piping Plover pairs were exposed to the covered activity *Reduced Proactive Fencing of Habitat*, for which both pairs nested successfully fledged one chick (See Section II.22 for Least Tern information). At Plymouth Long Beach, Plymouth, one Piping Plover brood of three chicks was exposed to the covered activity, *Use of Roads and Parking Lots in Vicinity of Unfledged Chicks*, for twenty-five days at which time all three chicks fledged (sustained flight >15 m) (See Section II.22 for Least Tern information). At Nauset Beach, Orleans, one Piping Plover brood of three chicks was exposed to the covered activity, *Oversand Vehicle Use in Vicinity of Unfledged Chicks*, for eighteen days fledging all three chicks (Table 1). No direct evidence of chick injury or mortality was observed. Additional information, including figures showing the specific locations of the covered activities at each site can be found in Appendices A - D.

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Table 1. Covered Activities Implemented in 2016

Location	Covered Activity	Description of Covered Activity	# Allowable Take Exposures	# Take Exposures Used	Start of Implementation	End of Implementation	# Days Brood(s)/Pairs Exposed to Covered Activity	Age of Chicks When First Exposed	% Pairs Exposed	% Broods Exposed
Sandy Neck Beach Park	Reduced Proactive Fencing of Habitat	The area exposed consisted of 1.2 acres of unfenced habitat within the Recreation Zone. Beach habitat above the high tide line would not be fenced, but a narrow buffer extending from the toe of the dune would be retained to help protect the dune. Beach raking was used as a deterrent and was conducted a total of five times. For additional information see Appendix A for Sandy Neck Beach Park Report	1	1	4/12/2017	5/12/2017	31	N/A	3.7%	N/A
Winthrop Beach	Reduced Proactive Fencing of Habitat	The area exposed consisted of 0.63 acres of unfenced habitat that was ultimately reduced to 0.16 acres as a result of the exposed pairs nesting. Beach raking was used as a deterrent and was conducted from 4/19/2017 to 7/9/2017. For additional information see Appendix B for Winthrop Beach Report.	4	2	4/19/2017	7/9/2017	Pairs: 2 Brood 1: 25 Brood 2: 0	N/A	25%	28.5% (of nests that hatched chicks) 25% (of total nesting pairs)
Plymouth Long Beach, Plymouth	Use of Roads and Parking lots in the vicinity of Unfledged Piping Plover Chicks	The area exposed consisted of the Day Use Parking Area and Ryder Way between the Day Use Parking Area and the OSV Crossover. Under the covered activity, the Town allowed unrestricted access for essential vehicles and access for recreation vehicles when recreational areas beyond the road were free of unfledged chicks subject to the IAMP. For additional information see	2	1	6/23/2017	7/18/2017	26	0 days old	N/A	4.5% (of nests that hatched chicks) 4.2% (of total nesting pairs)

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		Appendix C for Plymouth Long Beach Report.								
Nauset Beach, Orleans	Oversand Vehicle (OSV) Use in the Vicinity of Unfledged Chicks and Reduced Symbolic fence buffer and/or nest moving:	The covered activities allowed the exposure of two broods OR 1 nest and 1 brood total across the site as a whole. The area for continued OSV use consists of the Pochet Wash on Nauset Beach South. Although not carried out in 2017, the area for reduced symbolic fencing or nest moving was located on Nauset Spit at the base of Callanan's Pass, a primary beach access point. This exposure would allow Callanan's pass to remain open if a piping plover nested close to the Pass. For additional information see Appendix D for Nauset Beach Report.	2	1	7/15/2017	8/1/2017	18	9 days old	N/A	11% (of total nesting pairs and total nest that hatched chicks)
Nauset Beach (North Beach), Chatham	Reduced Proactive Fencing of Habitat, Reduced Fencing Around Nests and Oversand (OSV) use in the Vicinity of Unfledged Chicks.	No covered activities were implemented in 2017. For additional information see Appendix E for Nauset Beach (North Beach) Report.	1	0	N/A	N/A	N/A	N/A	N/A	N/A
East Beach and Leland Beach, Edgartown, MA	Use of Oversand (OSV) Vehicles in the Vicinity of Unfledged Chicks	No covered activities were implemented in 2017. For additional information see Appendix F for East Beach and Leland Beach Report,	2	0	N/A	N/A	N/A	N/A	N/A	N/A

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Coskata-Coatue, Nantucket, MA	Use of Oversand (OSV) Vehicles in the Vicinity of Unfledged Chicks	No covered activities were implemented in 2017. For additional information see Appendix G for Coskata-Coatue Report.	1	0	N/A	N/A	N/A	N/A	N/A	N/A
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II.2 Summary of annual take exposure.

The total allowable take exposure for a given year is based on a 3 year rolling average of the statewide Piping Plover breeding population (HCP, Table 3-1). The average breeding population size for 2014-2016 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 2014, 2015, 2016, Table 2). During 2017, five broods/nests/territories (three pairs and two broods) were exposed to covered activities, and exposure at each site was <15% of the breeding population size at that site with the exception of Winthrop Beach per DFW approval (Table 1; HCP, Section 3.2).

Based on information provided by USFWS, during 2016 Cape Cod National Seashore was authorized to expose up to three pairs of Piping Plover to flexible management that result in take exposure through 2020. Flexible management was not implemented, resulting in no additional Massachusetts take exposure. Although take exposure for recreational activities on federal properties is not associated with the 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. Statewide Piping Plover Breeding Population, 2014-2016, Actual and Allowable Take Exposure, 2016.

	YEAR		
	2014	2015	2016
MA Breeding Pairs (Adjusted Total Count)	662	683	642
Three-year average:		662	
Maximum Allowable 2016 Exposure to Covered Activities		46 broods/nests/territories	
Actual 2016 Exposure		5 broods/nests/territories	

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

During 2017, MassWildlife provided \$29,000 in funding for selective predator management at Monomoy National Wildlife Refuge and Crane Beach to be considered off-site mitigation for the HCP. Work was carried out in accordance with three work plans contracting USDA APHIS Wildlife Services approved for the purpose of HCP mitigation by the New England Field Office of the USFWS for a total cost of \$29,000 (December 29, 2016 Crane Beach and February 14, 2017 Monomoy NWR,) (Appendix H and I). Monomoy selective predator management benefited 46 Piping Plover breeding pairs, with 38.1 pairs benefiting from HCP funding, based on a 82.7% HCP cost share (Table 3). Crane Beach selective predator management benefited 39 Piping Plover Pairs, with 39 pairs benefiting from HCP funding, based on 100% HCP cost share (Table 3). Results of the predator management by both contractors on both sites are provided in Appendix H and I.

In addition, the Town of Plymouth implemented selective predator management at Plymouth Long Beach to mitigate for on-site impacts associated with the covered activities included in the Certificate of Inclusion (COI). Work was carried out in accordance with a work plan provided by USDA APHIS Wildlife

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Services approved for the purpose of HCP mitigation by the New England Field Office of the USFWS at a total cost of \$11,000 (No approval letter received)(Appendix J). Plymouth Long Beach selective predator management benefited 24 Piping Plover breeding pairs, with 24 pairs benefiting from HCP funding, based on a 100% HCP cost share (Table 3). Results of the predator management are provided in Appendix J. Lastly, the Department of Conservation and Recreation (DCR) implemented selective predator management at Sandy Point State Reservation to mitigate for off-site impacts associated with the covered activities included in the Certificate of Inclusion (COI) for Revere Beach and Winthrop Shores State Reservations. Work was carried out in accordance with a work plan provided by USDA APHIS Wildlife Services approved for the purposes of HCP mitigation by the New England Field Office of the USFWS at a total cost of \$8,300 (February 23, 2017) (Appendix K). Sandy Point State Reservation selective predator management benefited 13 Piping Plover breeding pairs, with 13 pairs benefiting from HCP funding, based on 100% HCP cost share (Table 3). Results of the predator management are provided in Appendix K.

The HCP required mitigation to be completed in advance of covered activities for 2017 implementation. MassWildlife and the COI holders implemented more than enough selective predator management to meet 2017 mitigation requirements, and are carrying forward a mitigation credit (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 benefiting 33 breeding pairs of Piping Plover was required to meet 2017 mitigation requirements. In fact, selective predator management benefiting 114.1 breeding pairs was carried out, resulting in a mitigation credit of 101.1 carrying over into 2017. Of these 101.1 credits, 45.2 are allocated to the Towns of Plymouth and Orleans, The Trustees of Reservations and DCR. The remaining 55.9 credits are available statewide. See Table 3 for additional detail.

There is a mitigation credit of 16.3 pairs carrying forward from 2017 making a total mitigation credit of 72.2 pairs available statewide.

Table 3. Statewide Predator Management Mitigation Accounting.

DEBITS						
COI Site	No. authorized exposures	No. Actual Exposures	Predator Control Mitigation Required (#plover pairs benefiting)	Site Specific Credits	Credits expire	Notes
Orleans	2	1	2.5	2.5	2018	See table 3 in 2016 Annual Report
Plymouth LB	2	1	3	21.4	2018	See table 3 in 2016 Annual Report
Barnstable	1	1	2.5	0		
Chatham	1	0	0	2.5	2019	See table 3 in 2016 Annual Report
Edgartown	2	0	0	10.8	2019	See table 3 in 2016 Annual Report
Nantucket	1	0	0	*same as Edgartown	2019	See table 3 in 2016 Annual Report
Revere/Winthrop	4	2	5	8	2019	See table 3 in 2016 Annual Report
TOTAL	13	5	13	45.2		

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CREDITS								
Mitigation Site	Total Cost	HCP Cost (Applicant)	HCP Cost (DFW)	HCP cost share	Actual Pairs Benefiting	Actual HCP Pairs Benefiting (Credits)	2017 Credits Used	2017 Credits to be Used at:
Plymouth LB	\$11,000	\$11,000		100.0%	24	24	3.0	Plymouth LB
Plymouth LB 2016 Credits						3.4		
Monomoy NWR	\$27,800		\$23,000	82.7%	46.0	38.1	5	Miscellaneous sites with offsite mitigation requirements
Crane Beach	\$8,300	\$2,300	\$6,000	100.0%	39.0	39.0	0.0	Nantucket and Edgartown; Miscellaneous sites with offsite mitigation requirements
Sandy Point	\$8,300	\$8,300		100.0%	13.0	13.0	5.0	Revere/Winthrop
MADFW 2016 Credits						12.9		
TOTAL	\$55,400	\$21,600	\$29,000		122.0	130.4	13	
Actual 2017 TOTAL NET CREDITS (breeding Pairs):					117.4			
CREDITS accruing to individual sites:					45.2			
TOTAL AVAILABLE CREDITS:					72.2			

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 territories/nests/broods affected (15% v. 30%). This exception was employed under the Revere Beach and Winthrop Shores State Reservation COI under the covered activity *Reduced Proactive Fencing of Habitat* and allowed up to four Piping Plover pairs to be exposed between both Revere Beach and Winthrop Shores. The covered activity was only implemented on Winthrop Shores and two broods were exposed consisting of 25% of pairs on Winthrop Shores only (2 of 8 pairs) and 8.7% of pairs on both Winthrop Shores and Revere Beach combined (2 of 23 pairs).

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 piping plover habitat. On Winthrop Shores, 0.63 acres habitat was not fenced and exposed to recreational activity and beach raking. The area of impacted habitat was ultimately reduced to 0.16 acres as a result of both exposed pairs nesting within the area of reduced fencing. The reduced fencing and beach raking was conducted from 4/19/2017 to 7/9/2017. On Sandy Neck Beach Park, 1.2 acres of

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habitat was not fenced and exposed to OSV use for the entire beach season with beach raking from 4/12/2017 to 5/12/2017. Consistent with management in accordance with state and federal guidelines that was in place prior to implementation of the HCP, the width of the Orleans OSV corridor was minimized (<5 yards wide), and located so as to minimize impacts to beach wrack and vegetation. The covered activities did, however, increase the risk of take by allowing the road and OSV corridor to be used when unfledged chicks were present, subject to the Impact Avoidance and Minimization protocols implemented by the COI holders (Appendices L - O).

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 demonstrating compliance with the authorized level of take on the ITP.

Table 4. Cumulative Quantification of Exposure

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%

Three Piping Plover broods in 2016 and 5 piping plover broods/nests/territories in 2017 were exposed to covered activities, or 6.4% (2016) and 10.9% (2017) of the statewide allowable exposure. The cumulative total equates to the exposure of 8 broods/nests/territories to covered activities for the first two 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.

Two experimental habitat management projects were carried out on Duxbury Beach Reservation, Duxbury, MA and Winthrop Shores State Reservation in 2017. On Duxbury Beach, three existing replicated habitats (created in 2016) and two new areas were enhanced through the scraping and burying of vegetation to resemble a wash over area. All five enhancement areas occurred in the west side (bayside) between High Pines and the third crossover (Table 5). For additional information, see Duxbury Beach Piping Plover Nesting Habitat Enhancement 2017 Final Report (Appendix P). On Winthrop Shores State Reservation, cobble larger than 1.5 inches were removed from the southern shorebird nesting area. Two pairs of piping plovers and 20-25 pairs of Least Terns used this restored area. For additional information, please see Appendix B.

Table 5. Summary of size and location of replicated habitat areas restored in 2017 (constructed in 2016) and constructed in 2017 (Retrieved from Duxbury Beach Piping Plover Nesting Habitat Enhancement 2017 Final Report).

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,	458	4,930	2017	No activity	No activity

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	-70.622584					
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

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

Assessments of vegetation management actions are provided in Appendices B and P. Experimental management at both sites successfully enhanced breeding habitat for Piping Plovers and management at Winthrop also benefited Least Terns.

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

See Table 1 on page 3.

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	
Income	
\$11,600.00	Unspent 2016 Funds
\$ 11,600.00	Orleans Escrow
\$ 5,800.00	Barnstable Escrow
\$ 5,800.00	Chatham Escrow
\$ 15,000.00	Other Beach Mitigation Funds (Least tern)
Expenses	
\$22,500.00	USDA APHIS, Monomoy Predator Management
\$500.00	Beals, Monomoy Predator Management
\$6,000.00	USDA APHIS, Crane Beach Predator Management
\$10,000.00	Duxbury Beach Nesting Habitat Creation
\$6,000.00	Sandwich Community Liaison, MassAudubon

II.11 If appropriate, any updates to the mitigation fee as described under the adjustment process at Section 5.2.2.1 and an updated annual budget for DFW’ 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.

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Funding for Massachusetts Fiscal Year 2018 (ending June 30, 2018) has been secured (Appendix Q). Funding for Fiscal Year 19 has not yet been assured. As required by the HCP, MassWildlife will provide a funding assurance letter to USFWS in advance of any 2018 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 2017 (\$50,600) is provided in Table 3. Additional information on the \$29,000 in off-site mitigation is provided in Table 6. Proof of payment is provided in Appendices H - K.

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 three contracts on Monomoy National Wildlife Refuge and Crane Beach in 2017. The first contract of \$500.00 funded Brian Beals Predator Control of Winchendon, MA, the second and third contract of \$22,500.00 and \$6,000.00 funded USDA APHIS Wildlife Services (Table 6; Appendix E). DFW also funded a habitat enhancement project on Duxbury Beach through a contract of \$10,000.00 to Duxbury Beach Reservation and an education and outreach project in the Town on Sandwich through a contract of \$6,000.00 to the Massachusetts Audubon Society Coastal Waterbird Program.

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

No adaptive management took place during the 2017 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.

Compliance and effectiveness monitoring and reporting was carried out in accordance with Table 4-7 and 4-8 in section 4.4.1.1 of the HCP with the exception of Sandy Neck Beach Park, who failed to notify DFW 24 hours in advance of implementing the covered activity. DFW also worked with Sandy neck to clarify the methods of beach raking in the area of reduced fencing, which was included in the COI Request without sufficient detail on impact minimization procedures (DFW bears responsibility for not addressing this during the COI review process). A letter of to address these issues was sent to the beach park manager on August 1, 2017.

An annual limit on statewide exposure was determined through the calculation of the past 3 years of Piping Plover adjusted total counts (Section II.2). The Towns of Barnstable, Plymouth and Orleans as well as the Department of Conservation and Recreation (DCR) on Winthrop Shores 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.

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MassWildlife was notified 24 hours in advance of implementing the covered activities, with the exception of the Town of Barnstable who failed to provide 24 hour advance notice. Monitoring information was provided to MassWildlife in HCP final reports (Appendices A - G), and through the PIPODES online database. Weekly interim reports were also submitted. MassWildlife coordinated the collection of 2017 Piping Plover data by cooperators, performed quality control and finalized the 2017 adjusted total counts of breeding Piping Plovers. Compliance with the impact avoidance and minimization protocols was documented in logs and summarized in the COI holder final reports. MassWildlife conducted COI compliance site visits to each participating site, as required in the HCP. Mitigation implementation final reports and invoices document implementation of required mitigation (Appendices H - K). Effectiveness monitoring consisted of documenting pair behavior (Winthrop and Barnstable), chick behavior, crossing frequency and fledging success (Plymouth and Orleans) at the covered activity implementation sites. Measures of reproductive success were also collected at the selective predator management implementation sites and submitted through PIPODES. The effectiveness of major predator removal was documented in the reports submitted by USDA APHIS (Appendices H - K).

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.

The compliance monitoring program was effective. Effectiveness monitoring was carried out in accordance with the HCP. 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. Nonetheless 3 out of 3 pairs exposed to reduced proactive symbolic fencing nested and successfully hatched chicks and 6 of 6 chicks exposed to OSV use fledged, suggesting that the covered activities had little, if any negative effects on nesting success and productivity. There are no recommended changes to the monitoring program at this time; however DFW will be developing 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.

No Plan-directed studies conducted in 2017

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 2017.

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

No unforeseen circumstances arose in 2017.

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 FWS has indicated that these activities will not be counted as mitigation to offset take associated with the ITP.

No changes, modifications, amendments made during the 2017 season. Two additional mitigation measures other than selective predator management were partially funded by Mass Wildlife in 2017, habitat enhancement and outreach and education. A habitat enhancement project was conducted on Duxbury beach Reservation in Duxbury MA and consisted of constructing three new nesting areas and maintaining three existing constructed nesting areas for Piping Plovers. Each nesting area was created or maintained through the removal and burial of existing vegetation in randomly shaped areas to simulate areas of overwash. Three pairs of Piping Plovers nested within the constructed nesting areas and a total of three chicks fledged. Mass Wildlife funded \$10,000.00 of the \$13,500.00 project. For additional information on this project, please see Appendix P. Mass Audubon Coastal Waterbird Program conducted outreach and education for Piping Plover protection through a Community Liaison in the town of Sandwich, MA. The primary objective of the project was to conduct education and outreach to 100-200 private landowners in the towns of Bourne and Sandwich to benefit 30 pairs of Piping Plovers. Four strategies were implemented in this effort: 1.) Creating an online interactive spatial database 2.) Communication with landowners through mail 3.) Developing and sending a homeowner's guide to coastal bird protection to the landowners and 4.) Conducting educational programs to beachgoers. Mass Wildlife funded \$5,000.00 of the \$9,960.00 project. For additional information on this project, please see Appendix P.

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 Winthrop Shores, Sandy Neck, Plymouth and Nauset Beach, and the Diamondback Terrapin at Sandy Neck and Nauset Beach. As a result, DCR and the Towns of Barnstable, Plymouth and Orleans developed impact minimization and mitigation plans for these species and obtained Conservation and Management Permits, to ensure MESA compliance (Appendices L-O).

The Department of Conservation and Recreation (DCR) developed impact minimization and mitigation measures for Least Terns expected to be impacted by the covered activity *Reduced Proactive Fencing Around Habitat* in their request for COI (Appendix L). DCR was issued a COI and CMP allowing up to 20 Least Tern territories or breeding pairs to reduced proactive symbolic fencing. During implementation of the covered activity, eight (8) Least Tern pairs were exposed and no evidence of mortality or injury was detected (Appendix B). Mitigation consisted of implementation of selected predator management at Sandy Point State Reservation, Ipswich to benefit an estimated 68 Least Tern pairs (estimated from 2016 Least Tern data). However, zero (0) Least Tern pairs nested on Sandy Point State Reservation in 2017 resulting in a mitigation deficit of 16 breeding pairs.

The Town of Plymouth installed a barrier to prevent unfledged Least Tern Chicks from entering the road, and carried out intensive monitoring as described in the IAMP and reported in the Final Report (Appendix C). Although it is challenging to monitor tern chicks, an estimated 28 chicks were exposed to

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the covered activity and no evidence of mortality or injury was detected. Mitigation consisted of implementation of selective predator management on-site to benefit an estimated 98 breeding Least Tern pairs. Sixty Least Tern pairs in addition to the 28.8 pair deficit carried forward from 2016 totaled 88.8 pairs required for mitigation, resulting in a mitigation credit of 9.2 breeding pairs carrying forward in 2018 (Appendix C).

The Towns of Orleans and Barnstable also developed impact minimization and mitigation measures for Least Terns and Diamondback Terrapins (*Malaclemys terrapin*) expected to be impacted by the covered activity (Oversand Vehicle Use in the Vicinity of Unfledged Chicks) in their request for a COI. The Town of Orleans was issued a COI and a CMP allowing up to 20 unfledged Least Tern chicks to be exposed to OSV use. The CMP also covered limited exposure of Terrapins because Terrapins sometimes cross the OSV corridor to nest. During implementation of the covered activity, zero (0) Least Tern chicks were exposed due to the absence of a colony in the exposed area and there were no observed mortality or negative impacts to adult or hatchling Terrapins. A total of three (3) Diamondback Terrapin nests were located and relocated to the Pochet Overwash Turtle Garden by Mass Audubon Wellfleet Bay Sanctuary director Bob Prescott. The relocated nests were protected by Bob Prescott and 27 hatchlings were released (Appendix D). The benefits of nest protection are expected to far outweigh any small risk of mortality associated with the OSV corridor for this species.

The Town of Barnstable was issued a COI and CMP allowing up to 15 unfledged Least Tern chicks to be exposed to OSV use along the Marsh Trail. The CMP also covered limited exposure of Terrapins because Terrapins are sometimes found crossing or nesting within the Marsh Trail, used by essential vehicles and campers. This covered activity was not implemented this year, resulting in zero exposure to Least Tern chicks and Diamondback Terrapins (Appendix A).