

**U. S. FISH AND WILDLIFE SERVICE
CHINCOTEAGUE NATIONAL WILDLIFE REFUGE**

PIPING PLOVER MONITORING AND MANAGEMENT

SUMMER 1999



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ASSATEAGUE ISLAND, VIRGINIA**

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PIPING PLOVER MONITORING AND MANAGEMENT SUMMER 1999

I. INTRODUCTION

The piping plover monitoring and management program for the 1999 breeding season continues to followed the recommendations developed as a result of a three-year study that concluded in 1991 and experiences gained during the 1992 through 1998 field seasons. This report represents data collected in the 1999 season (February through August) and presents the results of this year's nesting success and offers recommendations that will promote nesting success and increased productivity in the 2000 nesting season.

II. MANAGEMENT AREAS

Chincoteague National Wildlife Refuge (CNWR) is a 5,691 ha (14,014 acres) wildlife refuge located almost entirely on Assateague Island in Accomack County, Virginia. Assateague Island is a barrier island that extends approximately 59 km (37 miles) along the Maryland/Virginia Coast. Assateague Island portion of the refuge includes beach, dune, saltmarshes, freshwater impoundments, and maritime forest/shrub habitats. Adjacent islands that are a part of the refuge complex and support piping plovers include Assawoman, the northern end of Metompkin, and parts of Cedar Islands. Wallops Island, just south of Assateague, is administered by the National Aeronautics and Space Administration (NASA) and is included as part of the Wallops Island NWR under a Use Agreement (UA) with NASA.

The four principle monitoring areas within the Assateague Island portion of the refuge include the Overwash, Hook Beach, Wild Beach, and North Wash Flats (Figures 1). In previous years, the Overwash area was considered to be part of the Hook management area. The Overwash consists of the area between parking lot 5 of the public beach and the Hook. The nesting area is located adjacent to the Off-Road Vehicle Zone on the Tom's Cove side of the Overwash. It is approximately 1.8 km (1.1 miles) in length. The nesting area was closed this year to all public use from March 15 to August 16, which coincides with the piping plover's breeding season.

The Hook is the southernmost portion of Assateague Island and extends for approximately 4.5 km (2.8 miles). The Hook is

Figure 1 Chincoteague National Wildlife Refuge, Assateague Island, Virginia (Base Map).

approximately 316 ha (780 acres) of multiple tidal flats and pools, small vegetated dunes, blowouts, and relatively wide beach areas. Since 1988, the Hook has been closed to all public use from March 15 through August 31.

The Wild Beach nesting area extends from D Dike north to the North Wash Flats crossover for approximately 5.9 km (3.7 miles). The Maryland/Virginia state line is located approximately 4.8 km (3 miles) north of North Wash Flats crossover. The Wild Beach is also typified by small vegetated dunes, occasional tidal pools, and varying widths of beach. This area tends to be highly vulnerable to adverse weather conditions, i.e. flooding, wind gusts, and blowing sand. Areas behind the high tide line are posted and closed to public access during the nesting season. However, the intertidal zone is accessible to pedestrian traffic throughout the year.

The North Wash Flats is a 324 ha (800 acres) impoundment between the bay and the ocean. It is a brackish water impoundment that is managed according to the refuge's Marsh and Water Management Plan to allow nesting and feeding by piping plovers and other migrant shorebirds. Waterfowl use the impoundment extensively during the fall and winter months. In past years, the low elevation of this area has rendered it highly subject to flooding. All public access is prohibited year round.

The barrier islands of Assawoman, Cedar, Metompkin, and Wallops are composed of narrow sandy beaches with intermittent dunes and extensive saltmarshes. Public access is restricted during the breeding period (March through August) on most of the islands.

III. METHODS

The techniques employed to monitor plovers have evolved over the past twelve years as more information became available and monitoring techniques improved. Procedures used are those that have proven to be the most cost-effective to date and yet provide the types of data needed to determine the effectiveness of the refuge's piping plover management program.

A. POPULATION MONITORING

Population monitoring included both the pre-nesting and nesting periods throughout the spring and summer months. Monitoring activities were confined to specific periods, with the Overwash as an exception, to lessen disturbance to territorial pairs, incubating adults, and adults with young.

1. PRE-NESTING

Prior to the nesting season, refuge staff and volunteers began surveys to document the arrival of piping plovers. Beginning in late February all beach areas were periodically surveyed for plover arrival, establishment of territories, courtship display, and preliminary nest scrapes. From one to two surveys were conducted each week to obtain an idea of population density and dispersal. More intense monitoring began in mid-April when territorial pairs were firmly documented.

2. NEST SEARCHES AND MONITORING

Locating nests was accomplished by observing territorial individuals or pairs from a distance until their behavior revealed the nest or approximate location. In vegetative areas, tracks were followed to locate the nest once the general area was known. The time frame for searches was established between late April and the second week of July, with the second week of May set aside for intense nest searches. Search time was limited to less than 10 minutes when nest searches were held after 1000 hours or in extreme weather conditions such as mid-day heat, rain, wind, etc. The time restraint was adhered to even at the expense of not finding a new nest. During the rest of the season, nests were found only by observing territorial adults. Intense nest searches were defined as walking through potential nesting areas at a slow pace, looking for nests, scrapes, or plover tracks. Once a nest was located, the observer marked the nest approximately 10 meters north and south and recorded it in the nest records. Throughout the season, visits to the areas, with the of the Overwash area as an exception, were limited too once a day to minimize disturbance. Disturbance to incubating or territorial adults was limited to a maximum of 20 minutes on any given day, with most nests monitored with a spotting scope.

3. INTENSIFIED MONITORING IN THE OVERWASH

During the 1999 breeding season, methods of intense monitoring were implemented in the Overwash nesting area due to the close proximity of the nesting area to the Off-Road Vehicle (ORV) Zone. In compliance with a Section 7 (see Appendix) the following protocol was established. When unfledged broods were present in the Overwash area, a monitor was present from 0430 hrs. to 2200 hrs. Prior to the ORV zone opening at 0500 hrs., the area within the ORV zone and 100 meters into the nesting area was checked for

plover chicks. If clear, or if the chicks were between 50 and 100 meters of the rope closure, the ORV zone was opened. If between 50 and 100 meters, the chicks were kept under constant observation and their activities recorded. If within the 50-meter zone, the ORV zone was closed from a point that extended 200 meters north of the chicks location to the Hook closure. Brood locations were recorded three times daily (0500-1100 hrs., 1100-1600 hrs., 1600-2200 hrs.). Detailed record keeping noted the exact location on a map, with the date and time, along with any significant or unusual behavior that was observed. Selective shooting of problem, avian predators occurred in the early morning, but also later in the day if needed. Monitors also harassed avian species using sling-shots, sticks, and their presence, in an effort to discourage predators.

B. MANAGEMENT TECHNIQUES

Predator management for increased piping plover productivity has been performed on the refuge since 1988 and follows protocol as directed by the Piping Plover Recovery Plan and the refuge's annual Predator Control Program. The refuge incorporates refuge specific techniques fashioned by the piping plover recovery team for the refuge's individual predator problems. Several direct and indirect management techniques are currently in use to increase plover productivity. Direct predator management techniques include den gassing, shooting, soft leg-hold traps, snares, and live trapping. Indirect techniques used are predator-proof exclosures and predator fencing around North Wash Flats nesting area. Predator exclosures were utilized within all nesting areas in 1999 on Assateague Island.

1. PREDATOR MANAGEMENT

Predator management techniques utilized this year included den gassing, soft leg-hold traps, snares, live traps, and shooting of select avian species (grackles, crows, gulls). The gull carcasses were displayed as a deterrent to other gulls. Fox den searches were performed several times throughout the spring and summer within plover nesting areas. This year, staff located two dens on Assawoman and no dens on Assateague Islands. Dens were gassed using carbon monoxide cartridges. Although the number of animals taken by den gassing cannot be accurately determined, this method has proven to be a quick and humane way to control the fox population.

2. NEST EXCLOSURES

Nest exclosures are comprised of a 10.9 m (36 ft) piece of 122 cm (48 in) wide 5.1 cm by 10.2 cm (2 X 4 in) welded wire mesh. The wire mesh is placed around the nest forming a 3.7 m (12 ft) diameter circle surrounding the nest. Six 1.8 m (6 ft) pieces of 15.9 mm (five-eighths inch) rebar are evenly spaced around the perimeter and are driven into the ground to secure the wire mesh in place. The nest exclosure is then covered by 3.8 cm (1.5 in) mesh nylon netting to deter avian predation. Each exclosure requires approximately ten to fifteen minutes to construct and set up time is recorded for each nest to determine if abandonment could be caused due to excessive set up time.

A predator-proof exclosure is placed around each nest after the second egg is laid, or on smaller clutches, if no additional eggs are laid after three days. After exclosure placement, the nest is observed at a distance to allow the adult to return to the nest. The exclosure is removed if the adults fail to resume incubation within 60 minutes.

The 3.7 m (12-ft) diameter predator-proof exclosure used in past seasons was continued this year to provide a greater distance between the nest and the exclosure. In addition, the single piece of 3.8 X 3.8 cm (1.5 X 1.5 in) mesh bird netting was also continued this season. The netting has proven to be effective in keeping out avian predators and facilitated a quicker and easier placement and handling during exclosure construction. All nests found on the Overwash, Hook, Wild Beach, and Wash Flats were protected by predator-proof nest exclosure during the 1999 piping plover nesting season.

IV. MANAGEMENT RESULTS

Results presented in this report were compiled from data collected throughout the 1999 nesting season. These data are from 24 weeks of monitoring: February 24th through August 8th. Tables are presented that depict data for the past seven years of plover monitoring to better facilitate comparisons between years.

In an effort to provide a more comprehensive report of piping plover productivity within the refuge complex, data from the refuge's Lower Island units of Assawoman, Cedar, Metompkin, and NASA's Wallops Island are also presented. Data on nesting pairs and productivity for Cedar, and Metompkin Island were obtained through Terwilliger Consultants on contact to the Virginia Department of Game and Inland Fisheries Division of

Non-game to survey and monitor islands for plover nesting activity.

A. POPULATION MONITORING

Plover surveys on Assateague Island began on February 26 with one bird sighted on the Hook on March 5. The first plovers on the Wild Beach were sighted on March 30. Plovers were first observed on the Wash Flats on March 29. The first plovers on the Overwash were seen on March 16. Surveys continued throughout the summer, with the last nest of the season found on June 25 on the Hook.

Plovers nested in all four of the major nesting areas, with the most nests (16) being located on the Hook. The Wild Beach had four nests, the Overwash area had six nests, and the Wash Flats had two nests. The first nest initiation date for 1999 was approximately April 26 on the Wild Beach and Hook, which was similar to nest initiation in 1998.

Nesting plovers decreased by seven pairs (25) on the Refuge portion of Assateague Island this year. Assawoman Island had an increase of four nesting pairs, for a total of twelve pairs. One pair of plovers was sighted near the northern end of Wallops Island; however, after observations and a brief nest search, it was decided the pair were using the area for feeding. Metompkin Island decreased by two pairs, for a total of five nesting pairs.

Data for Cedar Island are for the entire island which has many privately owned areas. However, the Service has several beach easements scattered throughout the island and fee title to several portions of the island. A total of 13 nesting pairs with 13 nests were recorded this year.

Surveys and monitoring activities were conducted throughout the spring and summer in all potential plover nesting areas with emphasis on the four known nesting areas on Assateague Island. Most nesting activity occurred in traditional breeding areas with the exception of one nest between Old Fields crossover and the MD/VA line.

1. EGG AND CHICK LOSS

Egg and chick losses were attributed to a variety of factors with many unknowns associated with chick losses. In all instances, direct and indirect evidence was used to attribute loss to a particular cause.

a. **ASSATEAGUE ISLAND EGG LOSSES**

A total of 94 eggs were produced in 28 nests on the refuge portion of Assateague Island this year. The eggs lost (19) were due mostly to abandonment (Table 1). The one weather related nest loss was due to high tides. Six eggs were documented as infertile and two eggs were lost to predation. One nest with one egg on the Wash Flats was assumed lost to an avian predator before it was exclosed.

The one nest that was a weather related loss on the Hook initially contained two eggs. After high tides, one egg was lost and one egg remained in the exclosure. The remaining egg was relocated by the tide within inches of the edge of the exclosure. The adult plovers constructed a new scrape around the egg and continued incubation. After an additional eight days of incubation, the egg was lost to predation.

b. **EXCLOSED NEST/EGG LOSSES**

A total of 23 nests was exclosed this year compared to 32 last season. All nests that were found on the refuge were exclosed after the second or third egg was laid.

Of the exclosed nests, 86% were successful in hatching at least one chick and 75% fledged at least one chick. Of the five unexclosed nests, 80% (4 found as broods) were successful in hatching at least one chick. The fifth nest (one egg) was lost to predation on the Wash Flats.

TABLE 1
Causes of Piping Plover Egg Loss on Assateague Island, 1999

AREA	Number of Eggs (Complete nests) Lost To:					Total
	Predation	Weather	Infertile	Abandon	Unk	
Hook Beach	1(0)	1(0)	4(0)	6(2)	0(0)	12(2)
Overwash	0(0)	0(0)	1(0)	0(0)	0(0)	1(0)
Wild Beach	0(0)	0(0)	0(0)	4(1)	0(0)	4(1)
Wash Flats	1(1)	0(0)	1(0)	0(0)	0(0)	2(1)
Total	2(1)	1(0)	6(0)	10(3)	0(0)	19(4)

C. ASSATEAGUE ISLAND CHICK LOSSES

Chick losses decreased from last year, with 32 chicks lost in the 1999 nesting season and 61 chicks lost in 1998. The Hook and Overwash area accounted for 81% of all losses with 26 chicks lost. The Wild Beach accounted for 16% (5 chicks) of the chick losses and the Wash Flats 3% (1 chick). Avian predation is suspected in most cases. For the first time on Assateague island, a Herring gull was observed taking a piping plover chick in the Overwash area.

2. HATCHING AND FLEDGLING SUCCESS

The Wild Beach had substandard hatching success again this year, of the 12 eggs from four nests, eight chicks hatched for an average of 2.00 chicks hatched/nest; that was down from 2.09 chicks hatched/nest in 1998. Hatching success increased on the Hook from 2.58 chicks hatched/nest in 1998 to 2.75 in the 1999 nesting season.

Fledgling success on Assateague Island in 1999 was the second highest ever recorded, with 1.72 chicks fledged/pair for a total of 43 chicks fledged (Table 2). The Hook and Overwash area were the most productive areas with 76% of all the plovers nesting on the island found in these two areas. A total of 14 pairs of piping plovers nested on the Hook and produced 28 fledglings for an average of 2.00 fledglings/nesting pair. The Overwash area had a total of six pairs of nesting plovers, and produced eleven fledged chicks for an average of 1.83 fledglings/pair. The success rate on the Wild Beach was 0.75 (3 chicks) fledglings/nesting pair. That was a decrease from the 1998 nesting season when five chicks fledged from this area. Only 38% of the chicks hatched on the Wild Beach survived to fledging age. The number of plover pairs on the Wild Beach decreased in 1999 to four pairs from nine pairs in 1998. In 1998 there were three pairs of plovers nesting on the Wash Flats, compared to one pair this year with two nest attempts. The one pair on the Wash Flats produced one fledgling for an average of 1.0 fledgling/nesting pair.

Monitoring of the Lower Island units continued this year as in past years with data provided by the Virginia Department of Inland Game and Fisheries or their representative.

TABLE 2
Piping Plover Hatching and Fledgling Success, 1994 - 1999

AREA	YEAR	NESTS	NESTING PAIRS	TOTAL ¹ EGGS	HATCHED/ NEST	CHICKS FLEDGED	FLEDGLINGS/ NESTING PAIR
HOOK	1994	17	15	64	2.65	41	2.73
	1995	22	21	73	2.45	21	1.00
	1996	20	16	60	2.15	28	1.75
	1997	26	15	96	1.80	23	1.53
	1998	26	20	89	2.50	25	1.25
	1999	16	14	56	2.75	28	2.00
WILD BEACH	1994	10	7	35	2.20	2	0.29
	1995	5	5	19	3.80	0	0.00
	1996	9	8	32	2.89	7	0.88
	1997	11	7	39	2.36	2	0.29
	1998	11	9	41	2.09	5	0.56
	1999	4	4	13	2.25	3	0.75
WASH FLATS	1994	4	3	15	2.75	10	3.33
	1995	6	5	17	2.50	4	0.80
	1996	0	0	0	0.00	0	0.00
	1997	4	2	11	2.50	3	1.50
	1998	5	3	15	2.00	9	3.00
	1999	2	1	4	1.00	1	1.00
OVERWASH	1999	6	6	22	3.50	11	1.83
T O T A L	1994	31	25	114	2.52	53	2.12
	1995	33	31	109	2.67	25	0.81
	1996	29	24	92	2.38	35	1.46
	1997	41	24	145	3.52	28	1.12
	1998	42	32	145	2.43	39	1.22
	1999	28	25	95	2.38	43	1.72

1. Includes chicks from broods found after hatching.

B. MANAGEMENT TECHNIQUES

Management techniques employed to enhance the success of nesting plovers included the continued placement of predator-proof exclosures and extensive predator trapping within and adjacent to known plover nesting areas. The use of carbon monoxide cartridges to gas fox dens was continued. Plover exclosures were placed around all nests found on the Hook, Overwash, North Wash Flats and Wild Beach after the second egg was laid.

1. PREDATOR EXCLOSURES

Of the 23 nests found prior to hatching, 22 received predator exclosures. One nest with one egg was predated on the Wash Flats. Of the 22 exclosed nests, 86% (19 nests) successfully hatched at least one egg. Of the four exclosed nests that were unsuccessful, one loss was to weather and predation and three were abandoned. All exclosures were accepted under 60 minutes of placement.

2. PREDATOR MANAGEMENT

The predator program this year continued to emphasize red fox and raccoon control within and adjacent to plover nesting areas. Night shoots proved to be the most effective control method this year since no fox dens were located on Assateague.

With the emphasis on den gassing and having only a brief trapping period, trapping results for 1999 was only one fox captured on Assawoman Island using leg-hold traps during the trapping period.

Raccoon control was heavily emphasized on the refuge this year during the early nesting season. Night shoots were conducted for six nights, resulting in the take of 18 raccoons (11 female, 7 male). Live traps, soft-catch leg holds and snares were set on the refuge in an attempt to catch fox and raccoon. Refuge staff ran traps for a total of 629 traps/nights from February to April. One fox and 23 raccoons were removed from the Hook, overwash area and the Wild Beach. A female coyote, the first ever documented on the refuge, was captured on the Wild Beach.

In an effort to reduce predation on plover chicks selective shooting was conducted on the Wild Beach, Overwash area, and on the Hook. A total of 55 herring gulls, eight great black-backed, 57 laughing, five ring-billed, and seven grackles, were removed from the nesting areas. A majority of these birds were removed from the Hook and Overwash area. Staff documented for the first time on the refuge the taking of a piping plover chick by

a herring gull. Numerous gull/plover confrontations were observed and documented.

Monitoring of the Lower Island units continued this year with a cooperative agreement between the Virginia Department of Game and Inland Fisheries and the U.S. Fish and Wildlife Service. During the summer months, Commonwealth consultants and refuge biologists conducted periodic surveys on breeding success of plovers on the barrier islands of Assawoman, the northern end of Metompkin, Cedar, and Wallops. Table 3 provides a summary of this year's data. The fledgling success on these islands combined with the Assateague Island portion of the refuge resulted in an overall total of 55 chicks fledged, or 1.35 chicks fledged/nesting pair.

TABLE 3
Piping Plover Productivity on Islands Owned/Managed by the
Chincoteague National Wildlife Refuge, Summer 1999¹.

ISLAND	NO PAIRS	% OF ISLAND POPULATION ²	CHICKS FLEDGED	CHICKS FLEDGED/ NESTING PAIR
Assateague	25	31	43	1.72
Wallops	0	100	0	0.00
Assawoman	12	100	20	1.67
Metompkin	5	20	3	0.95
Cedar	13	100	8	0.62 ³
TOTAL	55	--	74	1.35

V. DISCUSSION

Plover productivity on Assateague Island was the second highest ever recorded in the 1999 season after a fair season in 1998. Twenty-five pairs of plovers, down seven pair from 1998, fledged 43 chicks compared to 39 chicks in 1998. Although pair number decreased in all areas except the Overwash, productivity increased. The increase in productivity is believed to be the result of the intensified predator and

¹ Data provided by Terwilliger Consultants on contract to the Virginia Department of Game and Inland Fisheries, Non-Game Division for the islands of Metompkin and Cedar.

² These percentages represent the portion of the island's population on Service owned or managed lands. On Assateague Island, the Assateague Island National Seashore accounted for 71% (60 pair) of Assateague's total population, and on Metompkin Island, The Nature Conservancy portion represented 90% of the island's population.

³ Data for Cedar represents the entire island. The Refuge retains fee title and easements scattered throughout the island.

monitoring programs conducted this year. Weather had very little affect on the plover season this year.

Nests on the Overwash area were extensively monitored this year. A staff of three biological technicians and five interns conducted the monitoring. Other staff members filled in often when needed.

In contrast to past nesting seasons, raccoons were not a problem this year. No adult mortality or nest loss was attributed to raccoons.

This season marked the 12th year of intense monitoring and management to protect this threatened species on Assateague Island. During this 12 year period, the adult breeding population has fluctuated from year to year as has the number of young produced to fledgling stage. In 1990 the population was at its highest with 42 nesting pairs. During the last four years, the refuge population has been at its lowest with a low of 24 pairs recorded during the 1996 season. The best production year was 1994 when 25 pairs produced a record 53 fledglings (2.12/nesting pair). The worst year was 1992, when 36 pairs produced only 19 fledglings (0.53/nesting pair).

VI. RECOMMENDATIONS

When implemented, these recommendations will provide protection to nesting birds and their habitat, minimize disturbance to plovers during the early spring migration, nest site selection, incubation, and chick rearing stages, and to secure additional potential nesting areas. Deviations from any established procedure or protocol will be implemented only to provide more protection or less disturbance to nesting birds.

1. Continue the predator control program through use of soft catch leg-hold, live traps, and den gassing, with emphasis on night shoots and raccoon live trapping. Red fox and raccoon will continue to be the target species. Attempt to improve red fox trapping techniques. Initiate the raccoon trapping and fox den gassing program in early February to reduce the potential of predation on nest during the early nesting period.

Only experienced trappers familiar with island trapping techniques will be used. All trappers will be required to have pre-exposure rabies inoculation prior to any trapping activity. Trapping and fox den gassing will be confined to areas adjacent to known piping plover nesting areas.

Continue selective shooting of avian predators. Increase effort (shooting and trapping) on Wild Beach.

Continue to develop plans and techniques to control gulls in the Overwash area of the ORV zone. Use student interns

and volunteers to harass gulls and staff to conduct lethal control. Enforce regulations in the heavily used beach area adjacent to the Overwash to enforce regulations prohibiting feeding gulls and other wildlife.

2. Continue plover population monitoring using the same procedures employed during the 1993 through 1999 seasons. No more than two surveys per week will be conducted beginning no later than the last week of February.
3. Maintain closures and area posting consistent with previous years (March 15 through August 31). Delay reopening of the Hook at the end of the nesting season if conditions warrant. Continue the closed area on the Hook to include the overwash area adjacent to the ORV zone, north of the old Coast Guard station, on the bay side north to the entrance to the ORV zone. Sign and rope off the north, south, and east sides of the closed area to keep pedestrians from entering the area. This would provide protected nesting habitat for plovers, least terns, common terns and black skimmers.
4. Close the ORV zone adjacent to the overwash plover nesting area during brood rearing period to reduce the possibility of chick losses to ORV traffic.
5. Confine intense nest searches to a one to two week period from mid May to mid June. The time table for the intensive nest searches will be based on the number of potential nesting pairs observed on the surveys. During this time, staff will conduct walk-throughs in all three refuge nesting areas. During the rest of the season, nests should be found only by observing territorial adults. Limit disturbance to incubating or territorial adult(s) to a maximum of 20 minutes on any given day. Search time will be limited to less than ten minutes when nest searches are held after 1000 hours or in extreme weather conditions such as mid-day heat, rain, wind, etc. This time limit should be adhered to even at the expense of not finding any new nests.
5. Nest monitoring will be limited to direct observations at a distance that does not disturb the incubating bird. The incubating adult will not be flushed from the nest until approximately two to three days prior to the estimated hatching date. At nests that contained complete clutches when found, nest checks will be made six to seven days prior to the estimated hatch date.
6. Limit vehicle activity (nest monitoring, trapping, etc.) within nesting areas to survey routes established at the beginning of the nesting season and to no more than one trip each day. Limit visits to the Hook by law enforcement personnel to only those requiring direct contact. Patrols for trespassing violations should be conducted by boat

whenever possible. Any person who may be required to enter the nesting area during the season should be accompanied by a plover monitor to determine the safest route to be followed.

7. Continue predator-proof exclosures of all plover nests, with the exception of the Wild Beach nesting area adjacent to the North and South Wash Flats impoundments (Fig 1). Consider exclosures on the Wild Beach on a year to year basis, based on hydrological conditions within the North Wash Flats impoundment and predation problems on the Wild Beach. Continue to carry exclosures in the trucks at all times and exclose a new nest immediately if found with 2 or more eggs.
8. Trap and remove all predators detected within the enclosed section of the North Wash Flats nesting area.
9. Expand the nesting areas of the North Wash Flats area by placement of additional lines of shells (located further east) to encourage more birds to move from the Wild Beach to the Flats.
10. Monitor nests on the Wild Beach intensively for at least three days immediately after the first chick hatches, as this appears to be the most critical time period in determining whether or not a chick will survive to fledge. Initiate a more extensive study of the Wild Beach plover population to determine the reason(s) for low survival rates. Use additional interns as plover wardens to observe and or help reduce plover interactions with potential predators. Explore funding options available through Challenge Grants or Fish and Wildlife Coop Units of nearby Universities.
12. Continue to prohibit kite flying on the Overwash area during the plover nesting season due to the disturbance to nesting birds.
13. Initiate an experimental nest protection procedure by placing a protective boom or sand bags around nests that are in danger of being washed over during a high tide event. Booms or bags will be covered with sand to prevent birds from abandoning nest. Protection device will be removed once danger has passed (Sec. 7 to be completed).
14. Continue to remove or reduce, by disking, vegetative areas to enhance and increase plover nesting habitat on the southern tip of the Hook. The disking should be completed in the fall following the nesting season to allow the sand in the area to settle. Disking needs to be more frequent to reduce re-vegetation. Allow horses access to the North Wash Flats during the fall and winter to graze. All horses

will be removed from the compartment by February 15 to insure no disturbance to nesting plovers.

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