Assateague Island National Seashore

MANAGEMENT AND MONITORING OF THE PIPING PLOVER, *Charadrius melodus* 2009 BREEDING SEASON

NPS 2009

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MANAGEMENT AND MONITORING OF THE PIPING PLOVER (*Charadrius melodus*) AT ASSATEAGUE ISLAND NATIONAL SEASHORE, MD 2009 REPORT

ABSTRACT

An estimated 45 pairs of piping plovers, *Charadrius melodus*, nested on the Maryland portion of Assateague Island National Seashore during 2009. A total of 105 adults were counted during the annual census conducted 4 June through 6 June. Ninety-eight percent of nesting pair and 98% of the censused population were located along northern Assateague with the remainder observed adjacent to the over-sand vehicle zone. Egg-laying was initiated on 28 April and a total of 51 nest attempts were documented. Predator exclosures were installed around 43 nests. Nine nests failed prior to hatching, due primarily to depredation. Forty-two successful nests hatched 151 chicks, of which 64 survived to fledging age, for a productivity of 1.42 chicks fledged per pair.

INTRODUCTION

Congress authorized Assateague Island National Seashore (ASIS) as a unit of the National Park Service (NPS) in 1965. NPS Management Policies (2006) directs parks to 'proactively conserve Federally listed species and prevent detrimental effects on these species (4.4.2.3). The General Management Plan for ASIS reflects a systematic approach to park management by which recreational use and development is balanced with the need to ensure long term preservation of natural resources, processes and values.

Sections of ASIS provide suitable nesting habitat for beach-nesting birds, including piping plovers, *Charadrius melodus*. Since 1985, all known piping plover nesting activity within the state of Maryland has been on Assateague Island. Monitoring of piping plover breeding success on ASIS has been conducted since the species was federally listed as Threatened in 1986. The purpose of this report is to present the results of the 2009 piping plover management and monitoring program conducted by the NPS on the Maryland portion of ASIS.

PROGRAM OBJECTIVES

The Atlantic Coast Piping Plover Recovery Plan (USFWS 1995) provides specific information on the species and recommends monitoring goals and management actions. A comprehensive review of program goals for ASIS is presented in the park's Piping Plover Management Plan (NPS 2001). Primary management objectives include limiting human disturbance and providing protection from predators. Monitoring efforts include surveys to document the breeding population and observations to estimate reproductive productivity.

SITE DESCRIPTION

Assateague Island is situated along the Maryland and Virginia Atlantic coastline. The 35 kilometer (km) Maryland portion of Assateague (Figure 1) is under ownership of the NPS, with the exception of a 3.2 km section that lies primarily south of Maryland state road 611 that comprises Assateague State Park (ASP). The Virginia portion of Assateague Island is owned and managed by the U.S. Fish and Wildlife Service (FWS) as the Chincoteague National Wildlife Refuge (CNWR).

The 3.2-km section of the island immediately south of ASP is managed by ASIS as a developed recreational area, and includes campgrounds, day-use facilities and interpretive trails. The 19-km section south of the developed area to the MD/VA state line is managed as a primitive and traditional recreation area, which permits regulated over-sand vehicle (OSV) use, backcountry camping, and hunting. Over-sand vehicle use is restricted to the ocean beach and on designated trails west of the ocean beach.

The northern 10 km of Assateague is managed as a primitive area where public access is limited to foot and boat-in traffic, and vehicular traffic is restricted to official government business and authorized research activities.

BEACH MANAGEMENT

With the exception of the combined 6.4-km developed areas, the Maryland portion of Assateague Island is managed to facilitate natural coastal processes. Northern Assateague Island has, however, been subject to unnatural erosion and shore migration since 1934 when the jetty system constructed to stabilize Ocean City inlet disrupted natural longshore sand transport to the Island. To address both historic and ongoing sediment supply impacts, the NPS, in cooperation with the U.S. Army Corps of Engineers (COE), implemented a restoration program in 2002. The goal of the project is to insure the geologic integrity of northern Assateague Island and re-establish a sediment supply equivalent to that present before the inlet was stabilized. The restoration project was planned and designed in consideration of the habitat values for piping plover and other beach dwelling species.

An initial phase of restoration included a robust storm berm that was constructed along the section of beach experiencing the highest rates of sediment loss. As a topographic feature designed to reduce or negate hydrological processes, the storm berm could influence terrestrial processes and habitats immediately adjacent to the structure. In order to provide insight into any relationship between the storm berm and habitat change or other influence on plover breeding, the plover monitoring and management program was adjusted to document those impacts. A section of this report provides an assessment of the relationship the storm berm, habitat condition, and plover reproductive success.

MANAGEMENT PROGRAM

DISTURBANCE MANAGEMENT OBJECTIVES

Piping plovers are susceptible to displacement from preferred breeding habitat and also experience high levels of mortality from a wide range of causes. They are particularly susceptible to direct and indirect egg losses during nesting activities, with some individuals responding to disturbance up to 200 meters from the nest.

The plover management program addresses disturbance on two fronts: wildlife management, including pest and predator species, and visitor management covering visitor and employee activities. Wildlife management utilizes integrated pest management practices including both non-lethal and lethal actions on target species or individual animals, dependent on the circumstances. Visitor management is accomplished through education and training for individuals needing to work in close proximity to the birds, and through area closures for public use in general.

WILDLIFE MANAGEMENT ACTIVITIES

The primary management effort to reduce wildlife impacts to nesting plovers was through the use of nest site predator exclosures, an effective non-lethal method of protection. There are two limiting factors for exclosure use and efficacy. It necessitates that staffing is adequate to find plover nests in a timely manner. It also requires personnel time to construct exclosures at the nest sites. There are not effective management options to address wildlife impacts on plovers during the courtship or brood rearing phases of the breeding cycle under the current program.

The secondary management tool used to reduce wildlife impacts was predator control. Compliance and permitting for predator control was established to address north end predator issues documented in 2008.

Other species that affect plovers, possibly to a significant level, are migratory falcons (Peregrine and Merlin) and feral horses. Migrant falcons are observed each spring preying on breeding plovers. The feral horse population causes constant disturbances throughout the plover breeding season resulting in an unmeasured level of direct and indirect mortality. The current management program lacks infrastructure, staffing and authority to counter impacts by these species.

WILDLIFE MANAGEMENT RESULTS AND DISCUSSION

A team of Maryland Conservation Corp volunteers, on staff at ASP, were trained to assist in deploying exclosures for the season. There assistance was vital in ensuring the timely installation of the nest protection devices. With their assistance, 43 nests (84%) were protected by predator exclosures. Predator exclosures were installed between 6 May and 2 July in 2009. Two plover pairs rejected the exclosure, one near km 4.75, and the other near km 6.75, on the west side of the storm berm.

ASIS entered into an interagency agreement with USDA APHIS – Wildlife Services for lethal predator management prior to the 2009 plover breeding season. A trapper was active in the early spring and was able to remove several fox from the north end and ASP.

USDA trappers under contract with Maryland DNR also removed a herring gull colony from a bay island outside of the NPS boundary several weeks after nesting season began. This coincided with the arrival of a large group of herring gulls on the north end. The group of gulls primarily loafed along the northern two kilometers, and remained there for most of the summer. Two herring gull nests, one of which contained one egg, were found several weeks after the gulls arrived.

Goose management in April and early May resulted in a survey of 31 geese, from which 36 eggs were addled from 8 nests. Adults with goslings were seen at several locations within the developed zone of the island. Observations indicate that some of these geese are coming from mainland nesting sites. Continued resident goose management is recommended for 2010.

Ghost crabs have been associated with incidental egg and nest losses during past breeding seasons. In 2009, no eggs or nests were lost due to ghost crabs, though in at least one instance an unhatched egg disappeared from an exclosed nest that contained a ghost crab hole.

Fewer horses made the summer migration to northern Assateague in 2009. During the July survey, 31 horses from six bands were recorded on the north end (25% of the herd). The number of horses and their constant social interactions can be a source of regular disturbance to plovers. Unlike 2008, when approximately 33% of all exclosures were used for scratching at some point during the breeding season, exclosures in 2009 were rarely visited by horses. The reduced extent of horse migrations to the north end and the reduction in horse interactions with exclosures may have been related to an apparent decline of island biting fly hatches in 2009.

VISITOR MANAGEMENT ACTIVITIES

Attempts are made to eliminate or reduce human disturbance to plovers during all phases of breeding. Plover habitat utilization and human use patterns are well established, facilitating installation of appropriate area closures. A 200 meter disturbance buffer is used to protect most breeding habitats. In areas where plover breeding activity occurs in close proximity to human use areas, and if staffing levels are adequate, an assessment is made of the sensitivity of the birds on site. When possible, an attempt is made to maintain some level of recreational opportunities. When in doubt, visitor use is curtailed to ensure that breeding activities are protected.

Park staff and researchers with a legitimate need to work in or travel through plover breeding areas receive training to reduce the potential risk to the plovers. Staff and cooperators with irregular needs to access sensitive areas are provided escorts. Law enforcement officers are offered training to accommodate the need to patrol the beach and inlet areas.

Northern Assateague supports plover activity along most of its length and width, requiring a near area-wide signed closure to control visitor use. Remote bay beaches allow boat landing. A corridor is maintained along the high ocean beach to accommodate administrative vehicular

traffic and pedestrian foot traffic. In the event that nests are established along the beach in areas of high visitor use, the intertidal and high beach may be closed to public use until the nests at risk have hatched.

In the OSV zone, there are a few discrete breeding locations and occasional breeding season sightings of adults elsewhere. Nesting distance from the beach, breeding bird behaviors and reaction to humans or vehicles vary from year to year. Dependent on foraging habitat condition at the time of brood rearing, chicks may or may not use the ocean intertidal zone for foraging. Unpredictable behavior and habitat use has resulted in a stepped progression of visitor management actions. Normally, observations are made of birds in courtship to identify management areas. As soon as nests are initiated, an assessment is made to determine the sensitivity of both breeding adults to human use. When birds react negatively to human disturbance, the normal travel corridor is reduced in width in an attempt to accommodate passage of vehicles and pedestrians. If traffic or pedestrian use can not be accommodated, a full area closure is placed in effect. A similar assessment and closure progression is made for brood habitat needs if the nest successfully hatches. On the non-beach sides surrounding OSV area nests the standard 200 meter buffer distance is used to protect plover breeding activity.

VISITOR MANAGEMENT RESULTS

Information related to area closures were e-mailed to park staff and cooperators at the onset of the season and whenever changes were made. Training was available to ensure that park staff was aware of and worked conscientiously around plover habitat. Several law enforcement seasonal staff as well as new permanent park staff were given a brief overview.

The north end interior and bay shoreline, from km 0.5 to km 9.0, was closed by signing for the entire breeding season from 24 April to 5 August. On 5 August, a majority of the north end was re-opened, with a small portion from km 8.0 to km 9.0 remaining closed until 21 August. As in 2008, nest placement by the birds in 2009 allowed public access of the ocean intertidal zone for the entire breeding season.

Public use closure signing around northern Assateague was effective in minimizing disturbance by humans. A few violations of ocean-side signs occurred, but incursions appeared to be limited in duration. Since time is the important factor for nest disturbances, the beach closure was effective in managing visitor disturbance.

After concerns over ineffective sign placement and readability along the bay shoreline, law enforcement officials assisted with the 2009 public closure sign installation. This coordination between the piping plover monitoring crew and law enforcement allowed for better communication of the needs of both divisions. The plover management program would benefit from any assistance from other park staff with boat access in future years, particularly during the summer season when bayside visitor use is highest.

In 2009, two courting pairs of plovers were observed in the OSV zone, one near km 24 and the near km 34. However, only the pair near km 24 established a nest. A variety of modified public closures were implemented depending on the requirements of the piping plovers. For the area

from km 34 to km 35, a public use closure of the area west of the OSV driving boundary was instituted on 7 May to protect the courtship and possible nest site, while on the same day, a reduction in the width of the OSV corridor from km 23.5 to km 24 was established. The lane reduction was later expanded to km 24.2 after a pair of piping plovers established a nest at km 23.8. A full closure from km 23.5 to km 24.2 went into effect on 18 June after the nest hatched and observations indicated that the brood was regularly foraging in the ocean inter-tidal zone. This closure allowed backcountry campers to hike from Chincoteague National Wildlife Refuge up to km 24.2, but did not allow them to travel further north. Similarly, the closure allowed backcountry campers to hike from the North Beach Ranger Station to km 23.5, but did not allow them to travel further south. The pair courting from km 34 to km 35 eventually left the area and the closure was removed in this area on 18 June. The closure from km 23.5 to Km 24.2 ended on 20 July, after the chicks were able to achieve and maintain flight.

MONITORING PROGRAM

The monitoring program splits the plover reproductive activities into two phases: nest and incubation activities, from which breeding population size is estimated, and hatching and fledging activities from which reproductive success is estimated. A set of habitat maps support this report which illustrate the location of nests and the outcome of each breeding attempt.

The monitoring program also attempts to discern ongoing influences by the storm berm. As a recognizable landscape feature, the monitoring staff is able to document the relationship between plover breeding observations and the storm berm. For ease of communication, instead of using coordinates to describe nesting and broodings observations, a general location is occasionally used to communicate where critical occurrences were observed. These areas include: “east of and on the storm berm,” “west of the berm,” “north of the berm,” “south of the berm,” and the “OSV” beach .

POPULATION, NEST, AND INCUBATION MONITORING METHODS

The size of the breeding piping plover population is estimated from data collected on nesting activity. The population is much easier to track if re-nesting events are kept to a minimum, so an attempt is made to locate nests as they are established, and to protect nests with a predator exclosure after egg lying is completed. Exclosed nests are safe from most predators and easier to relocate, so losses are easier to monitor. Assuming that staffing levels permit adequate monitoring efforts, it is possible to identify re-nesting events and assign them to the appropriate pair of a known lost nest.

The monitoring program also completes a single annual census, standardized on the East Coast to occur during the first 10 days in June. The census numbers gathered during the designated window permits a count for the entire population on site, including non-breeding individuals. Results are compared to the nesting population to address any anomalies.

Nest searches are conducted utilizing three general techniques, dependent on habitat type. Sparsely vegetated areas are surveyed by walking transects. Vegetated communities, dune fields and other sight-limited areas add audible surveys for courtship vocalizations and by flushing

plovers (or watching predators flush plovers) away from the nest, and then attempting to watch the tending bird as it returns to the nest. Lastly, for pairs that may utilize the high beach for nesting, it is possible to locate incubating birds from a vehicle.

When nests are located, they are either inconspicuously marked or surveyed with GPS to facilitate relocation for monitoring and predator exclosure installation. Nests that are found with a complete clutch are floated when an exclosure is installed in order to establish an estimated hatch date.

POPULATION, NEST, AND INCUBATION MONITORING RESULTS

Population Monitoring Results

Based on documented breeding activity, it was estimated that 45 nesting pairs utilized the Maryland portion of Assateague Island during the 2009 breeding season. The FWS-designated census was conducted from 2 June to 4 June by 10 observers, and a total of 105 adult birds were counted: 103 on the north end and two in the OSV zone.

Nest Search Results

Methodical nest surveys along the northern 9.5 km of the island were conducted between 27 April and 26 June, followed by spot checks in areas where adults were still in courtship. The earliest nest initiation was believed to have been on 28 April, and the latest nest initiation was on 26 June.

Of the 45 breeding pairs, 6 with lost nests are believed to have re-nested for a total of 51 nests. On the north end, 50 nest attempts were located between km 1.4 and km 8.7. In the OSV zone, one nest was documented at km 23.8. All nest locations were recorded with a Global Positioning System (GPS) and electronically mapped (Appendix A).

Five nests were lost prior to clutch completion, and another four were lost after completion, for a total of 9 known nest losses (18% of all nests). Two nests were abandoned or lost due to disturbance, six were depredated, and one nest was lost to unknown causes. Only one exclosed nest failed in 2009, and that was due to abandonment which occurred eighteen days after the exclosure was installed. Appendix B presents a summary of relevant data for each nest.

In 2009, 26 nests (51%) were located on the storm berm, 1 (2%) was located west of the berm, 20 (39%) were located north of the berm, and 3 (6%) were located south of the berm. Two nests (4%) were associated with an herbaceous vegetation community, while forty-nine nests (96%) were associated with a sparse vegetation community.

Incubation Monitoring Results

The incubation period for 38 nests found during the egg laying period ranged from 24 to 29 days, with a mean of 26 days. Six nests had two or more eggs floated to estimate the onset of incubation. Of 42 nests that hatched, 3 (7%) had one or more eggs that did not hatch. Of the 155

total eggs in these successful nests, 4 (3%) eggs failed to hatch. A total of 151 chicks were documented hatching.

POPULATION, NEST, AND INCUBATION MONITORING DISCUSSION

Population Monitoring Discussion

The census count and documented nesting population differed, but within the range of past counts (Table1). The census yielded 16 adult birds (14% of the population) that were not tied to known breeding pairs. Although there were more volunteers participating on the census than in past years, the fact that many plovers observed during the census were located in vegetated habitats and not easily observed could have resulted in an undercount during the census.

Nest Search Discussion

Nesting plovers demonstrated a selective utilization of the storm berm's course sediments since shortly after its creation (Table 1). Use of the berm for nesting in 2009 was sustained, supporting 51% of both nesting pairs and nesting attempts. Anecdotal observations of the area west of the storm berm describe the area as primarily vegetated; though it is still a low-lying wet area. A decade ago the area under and west of the storm berm supported half of the state's breeding population, and now appears to have been effectively abandoned due to vegetation succession. This change has been attributed to the storm berm, and exacerbated by a reduction in coastal storms.

Table 1. Number of Pairs Nesting on the Storm Berm and the Area West of Storm Berm

Year	Total Nesting Population (in pairs)	Storm Berm		West of Berm	
		Number of Pairs	Percent	Number of Pairs	Percent
1999	58	2	3%	30	52%
2000	60	2	3%	36	60%
2001	61	6	10%	31	51%
2002	60	12	20%	21	35%
2003	59	16	27%	24	41%
2004	66	27	41%	16	24%
2005	63	29	46%	12	19%
2006	64	25	39%	14	22%
2007	64	18	28%	17	27%
2008	49	21	43%	7	14%
2009	45	23	51%	1	2%

Incubation Monitoring Discussion

Plover nest hatching and subsequent exclosure removal occurred early in 2009. The timing appears to have significantly reduced the incidents of interrupted incubation due to horses scratching on exclosures, which has been an issue in recent years. Although targeted efforts are not made to specifically document the effect of horses on breeding plovers, interactions are obvious and ongoing. Observed impacts are recorded, and in 2009 include a nest without an exclosure that was crushed by walking horses. Horses continued to be an ongoing harassment issue to foraging broods.

Only three percent of eggs failed to hatch in 2009, which tied for the lowest percentage of hatch failure with 2004. After analyzing the eighteen years of data, the unhatched egg failure averages about nine percent a year, with a standard deviation of five percent. However, the data is positively skewed, indicating that more often than not egg failure is higher than the historic average.

BROOD MONITORING AND PRODUCTIVITY ESTIMATION

Brood Monitoring Methods

Broods were monitored most intensely following the hatch and as the chicks reached fledging age. Isolated broods were searched and documented individually, while broods with overlapping ranges were located by area surveys, counted and aged, and then given probable identification.

Vegetation and topography helped conceal plover broods. In circumstances when adult behavior suggested that they were brooding but the terrain prohibited the observation of chicks, locations were recorded and subsequent searches were made based on those adult observations. More thorough observations were attempted to count individual chicks as these broods approached fledging age.

Productivity Methods

Attempts were made to monitor each brood through the 25th day, or until the chicks were observed flying or not seen for a minimum of five searches. Productivity was based on the number of observed fledged chicks and presented as number of chicks fledged per nesting pair.

BROOD MONITORING AND PRODUCTIVITY RESULTS

Brood Monitoring Results

Piping plover brood hatching dates at ASIS ranged from 1 June to 27 July, with a total of 42 nests and 151 chicks hatched during this period. Brood monitoring continued through 21 August. Of the estimated 45 pairs, 36 pairs (80% of all pairs) were successful in fledging chicks, including five pairs that fledged all chicks.

Productivity Results

Of 151 chicks hatched, 64 fledged, for a fledgling success of 42%. With an estimated nesting population of 45 pairs, the 2009 piping plover breeding productivity for Maryland was 1.42 chicks per pair.

Twelve pairs of piping plovers fledged a total of 22 chicks after spending their brood rearing period foraging east of or on the berm (Table 2). This was the highest number of successful broods and fledged chicks that resided around the storm berm.

Table 2. Broods that Foraged on Storm Berm

Year	Number of Broods Fledged	Number of Chicks Fledged
2002	1	3
2003	0	0
2004	1	2
2005	7	14
2006	6	8
2007	0	0
2008	0	0
2009	12	22

BROOD MONITORING AND PRODUCTIVITY DISCUSSION

Weather, staff dedication, predator control and good luck appear to be factors which led to the productivity rate in 2009, especially in the storm berm area. As shown in Figure 2, nesting and brood activity periods were both well ahead of the 24 year historic average (represented by the dashed and solid lines). Monitoring staff and the Maryland Conservation Corp volunteer exclosure crew were able to locate and protect early nest attempts, minimizing overall nest losses. This effort in turn resulted in a majority of broods hatching in June.

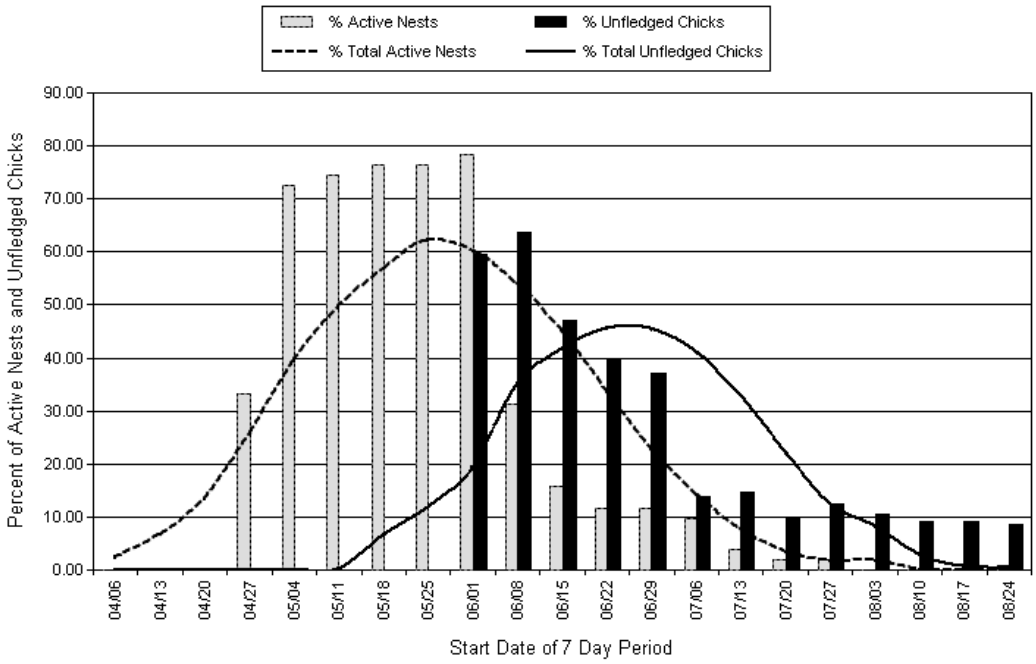
This is important because historically, weather in July tends to be hot with less frequent rainfall, both factors having an influence on prey availability within the primary foraging habitats. Because most nests hatched in early June, 2009, chicks experienced less environmental stress and foraging areas were better able to sustain chicks throughout their critical early development.

The storm berm and fronting beach is an elevated area that has extremely low prey densities and traditionally results in a very low chick survival rate. Broods that hatched on the storm berm from 1999, the first breeding season with the storm berm, until 2004 actually migrated west to utilize high quality foraging habitat. As vegetation converted that forage habitat, fewer broods from storm berm nests survived when forced to forage on the berm and beach.

Modifications to the storm berm (Figure 3) in 2007 and 2008 were designed to facilitate winter overwash, but also effectively pooled water after moderate rains, resulting in small but attractive foraging areas. These modified ‘notches’ and the edge of vegetation along the western edge of the storm berm were both used for foraging by broods hatching from nests on the storm berm in

2009. Prey density on these wet berm edges was apparently adequate during the cooler, wet June period. In fact, considerable aggressive behaviors between adjacent pairs with broods including documented displacement were recorded at all of the existing notches.

Figure 2. Weekly Distribution of Active Nests and Unfledged Chicks



One remarkable weather event that impacts broods was a thunder storm on 1 July that dropped 0.93 inches of rainfall in a two hour period. The rainfall pooled in large mid-island puddles. The next day in the OSV zone one chick was found dead in a large puddle and another was observed being brooded while still in a large puddle. No obvious explanation could be given as to why the adults did not move the chicks to nearby higher areas.

MISCELLANEOUS INFORMATION

North End Beach Restoration

Northern Assateague Island has been subjected to unnatural erosive forces and counteractive beach restoration activities. Annual descriptions of recent restoration efforts including influences on plover breeding habitat can be reviewed at: http://www.nps.gov/asis/naturescience/resource-management-documents.htm.

One facet of the restoration effort involves a constructed ‘storm berm’ that outperformed its intended functional period and eventually resulted in negative impacts to habitat condition, breeding behaviors and reproductive success. This impact was exacerbated by a drop in recent storm frequency and intensity.

Beginning in 2007, a series of small experimental modifications were made to the storm berm in an effort to create sections that mimic the island's natural beach topography and in theory would be more susceptible to the influences of storm tides (image of a nest stake near a notch is on the report cover). While observations suggested that significant tidal action may begin to restore the habitat's functionality for plover breeding, the island was not subjected to sufficient storm tides prior to the 2009 season. By October 2009, a total of 16 modified notches had been graded across the storm berm.

Tidal action from tropical storm Ida in November 2009 had limited influence along the entire island beach, but a full evaluation of elevation changes, particularly along the storm berm, could not be made by the time this report was finalized. Limited overwash deposition occurred through all existing notches, extending an average 50 meters west of the storm berm proper. Cross-island overwash habitat was created in a few other localized areas of the north end.

Least Tern Breeding Activity

Least terns, *Sterna antillarum*, are a state Threatened species. They nest in open, sandy habitat on Assateague Island, and typically prefer to nest in tight colonies. Due to the high frequency of (fox) disturbance at ASIS they usually disburse to widely scattered sub-colonies following any initial disturbance.

In 2009**,** the first least terns were observed on the north end on 16 April, with the first nest found on 21 May. The annual least tern census took place on 18 June 2009. 105 individuals/pairs were counted on the north end of Assateague, from the inlet to km 9.5, while 12 individuals/pairs were counted in the OSV zone, from km 16 to the state line. Least tern nests were depredated by both avian and mammalian predators, though depredation was not as intense as in previous years. Anecdotal observations put least tern productivity near one chick fledged per breeding pair in 2009.

American Oystercatcher Breeding Activity

The American oystercatcher, *Haematopus palliatus*, is a species of concern in Maryland. It nests along both ocean and bay shorelines on Assateague Island. Casual observations were made on oystercatcher nests that were observed along the ocean shoreline only. A presence/absence colonial waterbird survey was conducted on 15 June, and additional oystercatchers were observed on bay islands. During the piping plover census, a total of twenty-three adult American oystercatchers were counted on the north end of Assateague Island.

There were a total of twenty-three breeding pairs, with fifteen of those associated with a documented nesting attempt. Three breeding pairs were observed on the bay islands, one had a nest, while another had two chicks. On the north end, there were thirteen nest attempts from twelve nesting pairs. Of those, there were five hatched nests, but only three chicks were confirmed to fledge. Of the eight breeding pairs observed in the OSV zone, only one was associated with a nesting attempt at km 23.9, which was within an area closed to public use for plover breeding. The nest failed before hatching, and there were no other observations of chicks in the OSV zone.

Several banded American Oystercatchers were observed this year, both in the OSV zone as well as on the north end (Table 3).

Table 3. Banded American Oystercatcher Sightings

Date(s)	Location	Right Leg (Upper)/(Lower)	Left Leg (Upper)/(Lower)	Banded Location
6/8, 6/9	OSV	Black 4P/FWS	Black 4P	Virginia
6/8	OSV	Red 4?	Red 4?	Georgia
6/10	North End	Black 7W/FWS	Black 7W	Virginia
6/12	North End	? AF	? AF/FWS	?
6/17	OSV	Red E1	Red E1/FWS	Georgia
6/17	North End	Black MF/FWS	Black MF	Virginia
8/12	OSV	Red N7	Red N7/FWS	Georgia
9/2	OSV	Black 7W/FWS	Black 7W	Virginia

Staff Acknowledgements

The 2008 field staff consisted of Tami Pearl, avian program technician, Allison Turner, predator exclosure team leader, Brianna Smrekar and Sally Schultz, seasonal biological science technicians, Nat Donkin, seasonal OSV technician, and Matt Dickinson, NPS intern. Jack Kumer, resource specialist, provided training, supervision, field and logistical support.

Assateague State Park's Maryland Conservation Corp once again assisted the National Park's Piping Plover Program in the installation of predator exclosures at plover nest sites. The crew was supervised by Sarah Knipe, and members included: Ruth Pumroy, Jeanette Bitzel, Christina Bell, Holly Hager, Allison Wilke, Jen Elmer, and Erin Fox.

This year, staff from the Chincoteague National Wildlife Refuge assisted in the Maryland piping plover census on 4 June 2008. Observers included: Amanda Daisey, Nicole Bartlett, and Krista Koehn.

Thanks to all NPS personnel and other volunteers who assisted with aspects of the avian program, including: Dana Condron, Ian Morton, Neil Winn, Kim Pincin, John Bruning and Carl Zimmerman.

Data Storage

Breeding data from 2008 was added to the Piping Plover database created in 2005 on a Windows XP platform utilizing MS Access 2003. All documentation and products associated with the Piping Plover Management and Monitoring Program are filed under the Resource Identification Number (RIN) 03.03.107. Hard copy field data, management notes, and annual summary reports since 1991 are stored in fireproof cabinets in the Resource Management library. Photographic slides are labeled and stored separately in the Resource Management library slide cabinet. An

electronic version of this report, all project data, and GIS files will be filed in the ASIS-NRM Electronic Library with accompanying NRBIB and Dataset Catalog entries.

GLOSSARY

Active Nest	A nest with at least one egg, during egg laying or incubation.
Breeding pair	A pair of birds that has demonstrated breeding behaviors.
Fledge success	Number of chicks fledged per number hatched.
Hatch success	Number of chicks hatched per number of eggs laid.
Nest attempt	Nest where egg laying was recorded.
Nest success	Number hatched nests per number of total nests.
Nesting pair	Pair of birds that has produced at least one egg.
Productive pairs	Number of pairs that fledge at least one chick per number of breeding pairs.
Productivity	Number of chicks fledged per pair.
Successful nest	Nest that hatched at least one chick.

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Table 4. Historic success of piping plover breeding activity at ASIS, 1986-2008.

Year	*Adults Counted on Census*	*Breeding pairs*	*Nest attempts*	*Nests hatched (% success)*[a]	*Chicks hatched (% success)*[b]	*Chicks fledged (% success)*[c]	*Chicks fledged per pair*[d]
1986	--	17	23	14 (61%)	38 (≈44%)	18 (47%)	1.1
1987	--	23	33	16 (48%)	46 (≈37%)	27 (59%)	1.2
1988	--	25	34	13 (38%)	37 (32%)	13 (35%)	0.5
1989	--	20	27	11 (41%)	36 (39%)	18 (50%)	0.9
1990	--	14	20	8 (40%)	25 (33%)	11 (44%)	0.8
1991	--	18	20	14 (70%)	47 (61%)	7 (15%)	0.4
1992	--	24	30	14 (47%)	43 (41%)	24 (56%)	1.0
1993	--	20	30	11 (37%)	39 (38%)	34 (87%)	1.7
1994	--	32	42	31 (74%)	104 (67%)	77 (74%)	2.4
1995	84	44	45	41 (91%)	148 (88%)	76 (51%)	1.7
1996	91	61	72	50 (69%)	173 (66%)	91 (53%)	1.5
1997	122	60	100	54 (54%)	177 (50%)	60 (34%)	1.0
1998	110	56	71	46 (65%)	147 (60%)	73 (50%)	1.3
1999	111	58	74	50 (68%)	147 (60%)	63 (43%)	1.1
2000	104	60	96	46 (48%)	150 (44%)	48 (32%)	0.8
2001	112	60	100	41 (41%)	142 (40%)	55 (39%)	0.9
2002	135	60	63	57 (90%)	206 (85%)	111(54%)	1.9
2003	132	59	72	48 (67%)	161 (64%)	92 (57%)	1.6
2004	161	66	77	62 (81%)	229 (82%)	123(54%)	1.9
2005	126	63	79	57 (72%)	173 (63%)	79 (46%)	1.3
2006	167	64	75	60 (80%)	196 (71%)	68 (35%)	1.1
2007	143	64	75	52 (69%)	179 (65%)	50 (28%)	0.8
2008	114	49	72	29 (40%)	77 (31%)	20 (26%)	0.4
2009	105	45	51	42 (83%)	151 (83%)	64 (42%)	1.4

[a] % Nest Success is the number of nests hatched ≥ one egg ÷ total nests laid
[b] % Hatching Success is the number eggs hatched ÷ number eggs laid
[c] % Fledging Success is the number chicks fledged ÷ number hatched
[d] % Productive pairs is the number of pairs that fledge ≥ one chick ÷ number of breeding pairs

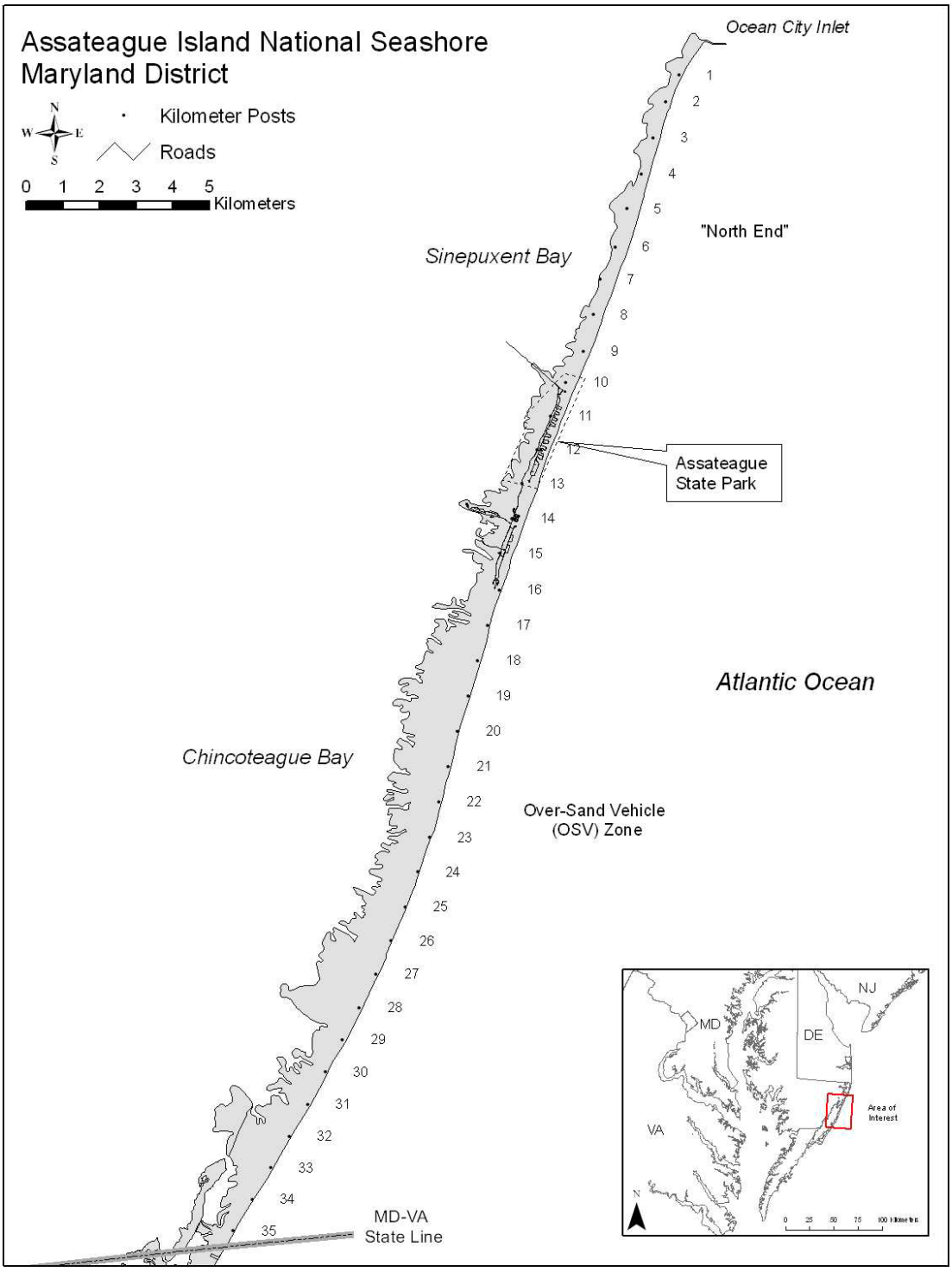

Figure 1. Regional map and Maryland district of Assateague Island National Seashore

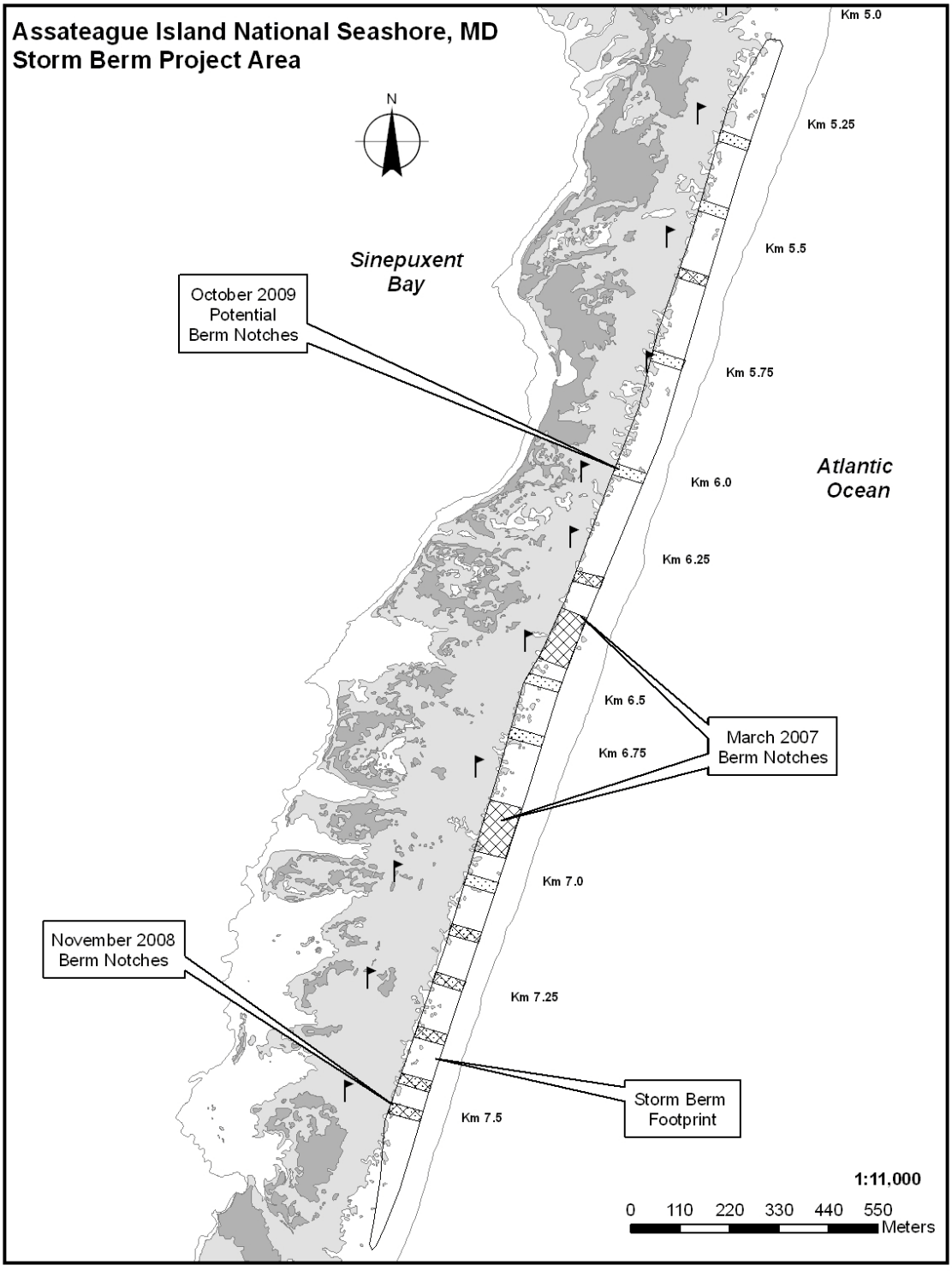

Figure 3. Storm Berm Project Area on North End of Assateague Island National Seashore

Appendix B 2009 Piping Plover Nest and Brood Data for Assateague Island National Seashore

Nest ID	Renest of	Date Found	# Eggs Found	# Eggs Laid	Date Failed	Cause of Failure	Date Exclosed	Date Hatched	# Chicks Hatched	# Chicks Fledged	Comments
2009001		5/1/2009	2	4			5/6/2009	6/1/2009	4		
2009002		5/4/2009	1	4			5/11/2009	6/6/2009	4		
2009003		5/5/2009	2	4			5/8/2009	6/5/2009	4	1	
2009004		5/5/2009	1	1	5/6/2009	Depredated					Avian depredation
2009005		5/5/2009	2	4			5/11/2009	6/4/2009	4	2	
2009006		5/5/2009	2	2	5/6/2009	Depredated					Avian depredation
2009007		5/5/2009	1	4			5/14/2009	6/4/2009	4	1	
2009008		5/5/2009	1	4			5/14/2009	6/7/2009	3	1	
2009009		5/5/2009	2	4			5/8/2009	6/4/2009	4	1	
2009010		5/5/2009	3	4			5/6/2009	6/5/2009	2	1	
2009011		5/5/2009	2	4			5/8/2009	6/3/2009	4	1	
2009012		5/5/2009	2	4			5/8/2009	6/3/2009	4	3	
2009013		5/5/2009	1	4			5/14/2009	6/7/2009	4	2	
2009014		5/5/2009	1	4			5/14/2009	6/6/2009	4	1	
2009015		5/5/2009	1	4			5/14/2009	6/6/2009	4	2	
2009016		5/5/2009	1	4			5/14/2009	6/7/2009	3	2	Missing egg had no evidence of cause, exclosure was intact
2009017		5/5/2009	2	4			5/11/2009	6/5/2009	3	1	1 egg missing 5/19/09 with no cause determined
2009018		5/5/2009	3	4			5/6/2009	6/3/2009	4	1	
2009019		5/5/2009	1	2	5/11/2009	Unknown					
2009020		5/5/2009	1	4			5/14/2009	6/7/2009	4	2	
2009021		5/5/2009	3	4			5/6/2009	6/2/2009	4	1	
2009022		5/6/2009	1	4			5/14/2009	6/10/2009	4		
2009023		5/6/2009	2	4			5/11/2009	6/5/2009	4	3	
2009024		5/6/2009	3	3	5/11/2009	Depredated					Exclosure installed 5/6/09 and removed 5/7/09 when no adults returned to nest area. Avian depredation
2009025		5/6/2009	1	3	6/1/2009	Abandon	5/14/2009				
2009026		5/8/2009	3	4			5/11/2009	6/4/2009	4	2	
2009027		5/8/2009	3	4			5/11/2009	6/4/2009	4	4	
2009028		5/12/2009	2	4			5/20/2009	6/9/2009	4	3	
2009029		5/12/2009	2	3			5/20/2009	6/8/2009	3	1	Noted that on day of hatch HEGU had an item in its bill, possibly a chick, just outside of exclosure. HEGU tracks were all around the exclosure and appeared to have been in that area for some time.
2009030		5/12/2009	2	4			5/20/2009	6/12/2009	4	2	
2009031		5/12/2009	1	4			5/20/2009	6/11/2009	4		
2009032	2009004	5/13/2009	1	2			5/20/2009	6/10/2009	2	2	
2009033		5/13/2009	3	3			5/14/2009	6/5/2009	3	3	
2009034		5/13/2009	3	3	5/16/2009	Abandon					
2009035		5/13/2009	3	4			5/15/2009	6/10/2009	4	2	On hatch day chicks harassed by crow, one chick missing from nest.
2009036		5/13/2009	4	4			5/14/2009	6/5/2009	4		

Appendix B 2009 Piping Plover Nest and Brood Data for Assateague Island National Seashore

Nest ID	Renest of	Date Found	# Eggs Found	# Eggs Laid	Date Failed	Cause of Failure	Date Exclosed	Date Hatched	# Chicks Hatched	# Chicks Fledged	Comments
2009037		5/13/2009	4	4	5/14/2009	Depredated					Avian depredation
2009038		5/13/2009	3	4			5/15/2009	6/10/2009	4	3	
2009039		5/13/2009	4	4			5/14/2009	6/3/2009	4	1	
2009040		5/13/2009	2	3			5/20/2009	6/9/2009	3	2	
2009041		5/18/2009	1	4			5/26/2009	6/19/2009	4	2	6/16/09 fox dug around exclosure, holes were filled in
2009042		5/20/2009	1	4	5/29/2009	Depredated					Exclosure installed 5/27/09 and removed 5/28/09 when no adults returned to nest area. Avian depredation
2009043	2009037	5/21/2009	1	4			5/27/2009	6/20/2009	3	2	
2009044		5/21/2009	1	3			5/27/2009	6/21/2009	3	3	
2009045	2009024	5/27/2009	2	3	6/1/2009	Depredated					Horses stepped on nest while passing through area; destroyed all the eggs.
2009046	2009019	6/10/2009	4	4			6/11/2009	7/4/2009	4		
2009047	2009034	6/10/2009	2	3			6/19/2009	7/7/2009	3	2	
2009048		6/16/2009	1	3			6/19/2009	7/14/2009	3	1	
2009049		6/25/2009	4	4			6/25/2009	7/12/2009	4	1	
2009050		7/1/2009	3	4			7/2/2009	7/27/2009	4	1	
2009051	2009045	7/2/2009	1	1				7/7/2009	1	1	