Section 6 Federal Aid to Endangered Species
E-1-38
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Endangered & Threatened Wildlife Conservation

Interim Report, Project Year
September 1, 2015 – August 31, 2016

NJ Department of Environmental Protection

DIVISION OF FISH AND WILDLIFE
ENDANGERED AND NONGAME SPECIES PROGRAM
P.O. BOX 420
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INTERIM PERFORMANCE REPORT

STATE: New Jersey PROJECT NO.: E-1-38

PROJECT TITLE: Endangered & Threatened Wildlife Conservation

STUDY TITLE: IV. Vertebrate Wildlife Conservation

JOB NUMBER AND TITLE: 2-B Piping Plover Threat Assessment and Management

PERIOD COVERED: September 1, 2015 to August 31, 2016

PREPARED BY: Christina Davis and Todd Pover

JOB OBJECTIVE: To determine statewide and site specific piping plover populations, nesting success, and productivity.

SUMMARY: The New Jersey Division of Fish and Wildlife (NJDFW)-Endangered and Nongame Species Program (ENSP) monitored 40% (8) of the state's 20 active piping plover nesting sites. NJDFW-monitored sites accounted for nearly a quarter (23%) of the state's overall nesting pairs (115). NJDFW also regularly monitored 12 additional sites and several others less regularly, although no nests were found at those sites. Other sites in the state were monitored by cooperators including the National Park Service (Gateway National Recreation Area-Sandy Hook Unit); The Wetlands Institute (Stone Harbor Point); Cape May National Wildlife Refuge (Two-Mile Beach and Coast Guard LSU); the U.S Coast Guard (Coast Guard LSU and Cape May Training Center); The Nature Conservancy (Cape May Migratory Bird Refuge), and the Conserve Wildlife Foundation of New Jersey (Holgate and Little Beach Units of the Edwin B. Forsythe National Wildlife Refuge, as well as various sites throughout the state in conjunction with ENSP). NJDFW worked closely with those cooperators to implement standardized monitoring and data collection protocols. The cooperators provided data on population and reproductive success from their sites to NJDFW so that we could compile and analyze nesting data for the entire state. A statewide cooperators meeting was held before the breeding season to review recent statewide trends, ongoing research, predator management initiatives, and other relevant management needs to better coordinate recovery efforts.

A total of 115 pairs of piping plovers nested in New Jersey in 2016, a slight increase (6%) from 2015 (108 pairs), but a significant jump (25%) from 2014 when the lowest number of pairs since federal listing was recorded (92 pairs). Despite the increase in statewide abundance the past two years, breeding pair totals continued to be slightly below the long-term state average since federal listing (118 pairs). Sandy Hook continued to host the highest number of pairs in the state (51 pairs or 44% of the statewide total). Sites immediately south of Sandy Hook saw a notable increase in pairs, up to 12 pairs after recording just 2 pairs in each of the previous two year; as a result, in 2016 the Monmouth County region recorded an even larger percentage of the state's overall breeding population (63 pairs or 55%). The region consisting of Holgate, Little Beach (both part of Edwin B. Forsythe NWR), and North Brigantine Natural Area accounted for 42 pairs (37% of the state total). Holgate, alone, accounted for 25 pairs (22% of the statewide total),

the most of any single site in the state. The number of pairs nesting in Cape May County in the southern end of the state fell again, to just 6 pairs (5% of statewide population), a continuation of a long-term drop from 43 pairs in 2004.

The number of active nesting sites statewide was about on par with last year (20 sites in 2016 versus 19 in 2015). It was well below the peak number of sites recorded in the state (30 sites in 2004 and 2005).

Statewide pair nest success (pairs that hatch at least one chick) was extremely high in 2016 at 90%, well above the average for the years since federal listing (68%).

Statewide productivity remained near record statewide levels for the third year in a row (1.35 fledglings/pair in 2016, 1.29 in 2015 and 1.36 in 2014), well above the statewide average since federal listing (1.00 fledglings/pair) and above the range-wide level (1.245 fledglings/pair) believed necessary to maintain a stationary population (USFWS, 1996).

SIGNIFICANT DEVIATIONS: None.

RECOMMENDATIONS: Continue intensive monitoring of populations and reproductive success.

BACKGROUND

The piping plover (*Charadrius melodus)* was listed as endangered by the New Jersey Department of Environmental Protection in 1979. In January 1986, the U.S. Fish and Wildlife Service (USFWS) included the piping plover on the Federal Endangered Species list and classified the Atlantic coast population as "Threatened". ENSP has directed local and statewide assessment of population trends since 1976. Statewide surveys were conducted in 1980 and 1984-2016, with limited surveys in 1976 and 1983.

PROCEDURES

Starting in March, NJDFW began visiting coastal beaches to assess the suitability of nesting habitat. Nesting activity was then monitored at all identified nesting sites (with emphasis on areas where nesting had occurred in recent years) following nesting survey guidelines published in the Atlantic Coast Piping Plover Recovery Plan (USFWS, 1996). Starting in mid-April, NJDFW visited nesting areas at least 3 times a week, and typically more frequently, to search for active nests and pairs on territories. Once located, nests, and then broods, were checked 3 to 5 times a week to monitor breeding progress and outcome. Cooperators throughout the state followed a similar protocol, although the Monmouth County sites (outside Sandy Hook) and Stone Harbor Point were monitored near daily and Holgate and Little Beach six times a week in 2016. In addition to regular monitoring, a statewide, date-restricted count was conducted between June 1 and 9. All sites where piping plovers had nested the past 10 years (if suitable habitat still existed), as well as any newly created habitat that could potentially support nesting plovers were checked using methodology established by the USFWS (1996) for the Atlantic coast breeding population. NJDFW-ENSP adjusted the date-restricted count to include pairs

discovered after the survey window that, based on nesting phrenology, were present during the survey period. Additionally, because NJDFW-ENSP surveyed individual sites more than once during the census period, identification of pairs at NJDFW surveyed sites was based on breeding and territorial behavior noted during the entire survey period (rather than from one specific visit).

FINDINGS

One hundred fifteen (115) pairs of piping plovers nested in New Jersey in 2016, a 6% increase from 2015 (108 pairs) and a strong 25% increase from 2014 when pairs were at their lowest since federal list (92 pairs). Despite the increase, the current number of nesting pairs remains slightly below the long-term average since federal listing (118 pairs) and significantly below the peak count of 144 pairs in 2003. (Figure 1).

The total number of adults recorded for the entire nesting season (232) was slightly higher than the adults present during the date-restricted survey conducted June 1-9 (226). Likewise, the number of pairs tallied during the entire nesting season (115) was somewhat higher than the pairs present during the date-restricted census (109). This is consistent with the long-term pattern in New Jersey, the date-restricted pair and total adult counts are typically below the final season counts, although the degree has varied from year to year.

Northern Monmouth County, as a region, accounted for the largest percentage of pairs in the state, with just over half of the statewide population (63 pairs or 55% of the statewide total). Most of those pairs nested at Sandy Hook (51 pairs or 44% of the statewide total). However, the other sites in Northern Monmouth County (Sea Bright, Monmouth Beach, and Seven Presidents Oceanfront Park) saw a notable jump in pairs, from 2 pairs the previous two seasons to 12 pairs in 2016. That bump largely accounted for the overall statewide increase this year. The region comprised of Holgate, Little Beach, and North Brigantine Natural Area accounted for the other significant proportion of the statewide population (42 pairs or 37% of the statewide total). Although a modest increase in terms of pairs, the area around Barnegat Inlet increased to 4 pairs, compared to just 1 pair in 2015. Cape May County, the southernmost region of the state, consisting of Ocean City to Cape May Point, accounted for just 6 pairs in 2016, part of a continuing downward trend from 43 pairs in 2004 at its peak.

Looking at the individual sites, there were only modest changes in pairs in 2016 versus 2015, with the most significant sites largely remaining the same. However, Sea Bright and Monmouth Beach saw notable increases, up to 6 and 5 pairs, respectively, compared to 1 at each site the previous year. Of special note, a pair nested at Island Beach State Park, the first nesting at that site since 2005 and the first time on oceanfront habitat in the Park in 25 years.

Pairs nested at 20 sites statewide, up one site from 2015 (19), but still well below the peak count of 30 sites recorded in both 2004 and 2005. NJDFW-monitored 8 of the active nesting sites (40% of the sites statewide). NJDFW also regularly monitored 12 other potential breeding sites with historic nesting records and/or highly suitable habitat, as well as several other sites on a less frequent basis; however none of those sites yielded nests. NJDFW-monitored sites accounted for 27 nesting pairs (23% of the nesting pairs statewide), up from just 17 pairs (16%) in 2015, which had been the lowest recorded since federal listing. This increase reverses a decade long

downward trend of active pairs at NJDFW sites, however, the number of sites is still well below previous levels. In 2006, for instance, pairs (116) were about the same as in 2016 (115 pairs), but NJDFW-monitored sites accounted for 62 pairs or 53% of the statewide population.

Statewide pair-nest success (the percentage of pairs that successfully hatch at least one nest) was extremely high this year (90%), well above the average for the period since federal listing (68%). Pair nest success was largely high across all the sites; of the sites with a significant number of pairs only Little Beach was notably lower (67% for 12 pairs), although even at that it was on par with long-term statewide averages and an increase for the site from the previous year (36% for 14 pairs). Looking at just NJDFW-monitored sites, pair-nest success was significantly higher than last year (93% versus 65% in 2015) and also well above average for NJDFW-monitored sites for the period since federal listing (66%).

The statewide fledgling rate, which includes data collected and provided by all the state cooperators, was 1.35 fledglings per pair, up slightly from 2015 (1.29 fledglings/pair) and on par with 2014 (1.36 fledglings/pair). Although the 2016 productivity level was still below the 1.50 fledglings per pair federal recovery goal, it was above the 1.245 fledglings per pair range-wide threshold for population maintenance established in the USFWS Recovery Plan for the Atlantic Coast population of piping plovers (USFWS, 1996). Furthermore, it was well above the long-term statewide average in New Jersey since federal listing (1.00 fledglings/pair). Productivity at NJDFW-monitored sites (1.89 fledglings/pair for 27 pairs) was above 2015 levels (1.41 fledglings/pair for 17 pairs), although both years were well above the long-term average for NJDFW sites (0.88 fledglings/pair since federal listing). NJDFW-monitored sites also, atypically, ran higher than the statewide average in 2016.

Productivity varied considerably by individual site and region. The Northern Monmouth County region fledged 1.25 chicks per pair (63 pairs), about on par with last year (1.22 fledglings/pair). Sandy Hook's productivity was down slightly from last year (1.12 fledglings/pair in 2016 versus 1.19 fledglings/pair in 2015), but was notably down from 2014 (1.40 fledglings/pair). The other Northern Monmouth County sites (Sea Bright, Monmouth Beach, and Seven Presidents Oceanfront Park) collectively recorded an especially high productivity rate (1.83 fledglings/pair for 12 pairs). Productivity for the Holgate, Little Beach, and North Brigantine Natural Area region was down slightly from the previous year (1.41 fledglings/pair in 2016 versus 1.49 in 2015), however, it was still a very robust level. Holgate fledged 1.71 chicks per pair, continuing a trend of particularly high productivity since Hurricane Sandy created highly suitable (overwash) habitat at the site (1.54 fledgling/pair in 2015 and 2.33 in 2014). Little Beach was one of the poorer sites statewide in terms of productivity in 2016 (0.92 fledglings/pair), but the combined Edwin B. Forsythe NWR sites of Holgate and Little Beach still performed well, producing 1.27 fledglings per pair (37 pairs). Although only five pairs nested at North Brigantine Natural Area, it recorded a high rate of 2.60 fledglings per pair, the second consecutive year of extremely high productivity. Pairs clustered around the Barnegat Inlet (1 pair at Island Beach State Park and 3 pairs Barnegat Light) were productive fledging 2.25 chicks per pair (4 pairs). Cape May County recorded productivity of 1.17 fledglings per pair (6 pairs), up from recent years when productivity was extremely low in this region, but still lower compared to the statewide average this year.

DISCUSSION AND CONCLUSIONS

New Jersey's statewide piping plover breeding population has increased for two consecutive years, now standing at 115 pairs, after reaching a historic low (since federal listing) of just 92 pairs in 2014. Even with this uptick, the population still remains slightly below long-term averages and well below the peak of 144 pairs. It will take several more years of increases to demonstrate sustained growth and movement towards recovery.

The state's breeding pairs of piping plovers produced the third consecutive year of strong productivity, well above the long term average in New Jersey and above the levels believed necessary to maintain a range-wide stationary population. Collectively the past three years are one of only two times New Jersey has recorded a sustained period of productivity, the other coming from 1999-2001, which preceded a notable population growth leading to the state's peak population since federal listing. High productivity has historically been difficult to achieve for piping plovers in New Jersey. Even as statewide hatch rates are consistent with levels recorded in other regions across the breeding range, chick survival has been low here. Given that population levels typically increase within a year or two on the heels of high productivity, the recent success is especially promising and suggests New Jersey may be able to continue its population growth in the short term.

Last year saw a troubling concentration of breeding pairs of piping plovers in New Jersey to fewer sites and primarily federally protected/owned lands (Davis, Pover, 2015). For the first time in a decade, pairs were up on municipal and state properties in 2016, reversing that trend and distributing the pairs slightly away from just the federal lands. This is, of course, a "double-edged sword", as reproductive success has typically not been as strong on the municipal sites, which receive the highest levels of recreational use and disturbance. However, in 2016 pairs on municipal, county, and state sites (those monitored and managed by NJDFW), which accounted for about a quarter of the state's pairs, recorded particularly high productivity (1.89 fledglings/pair), helping to spur the high productivity recorded statewide. NJDFW continues to maintain that the while the federally (and state) protected sites are core to piping plover recovery in New Jersey, full recovery cannot be achieved without a wider distribution of breeding along the state's coast. Increased success at sites outside the federal lands in 2016, in particular the Northern Monmouth County sites, which saw a big increase in pairs and managed high fledge rates, demonstrates this is possible under the best case scenario. On the downside, considerable suitable habitat still remains unoccupied (or at a very low density of breeding pairs) in New Jersey, including at some former breeding strongholds. This is most evident in the Cape May County region, which represents most of the southern portion of the state. NJDFW remains hopeful that the recent productivity success statewide will lead to colonization of some of those sites, but in the meantime it is imperative that a strong monitoring and management regimen continues at these sites to ensure they remain viable options once piping plovers are present again.

FAIRS ACTIVITY CODES: 1450, 1460.

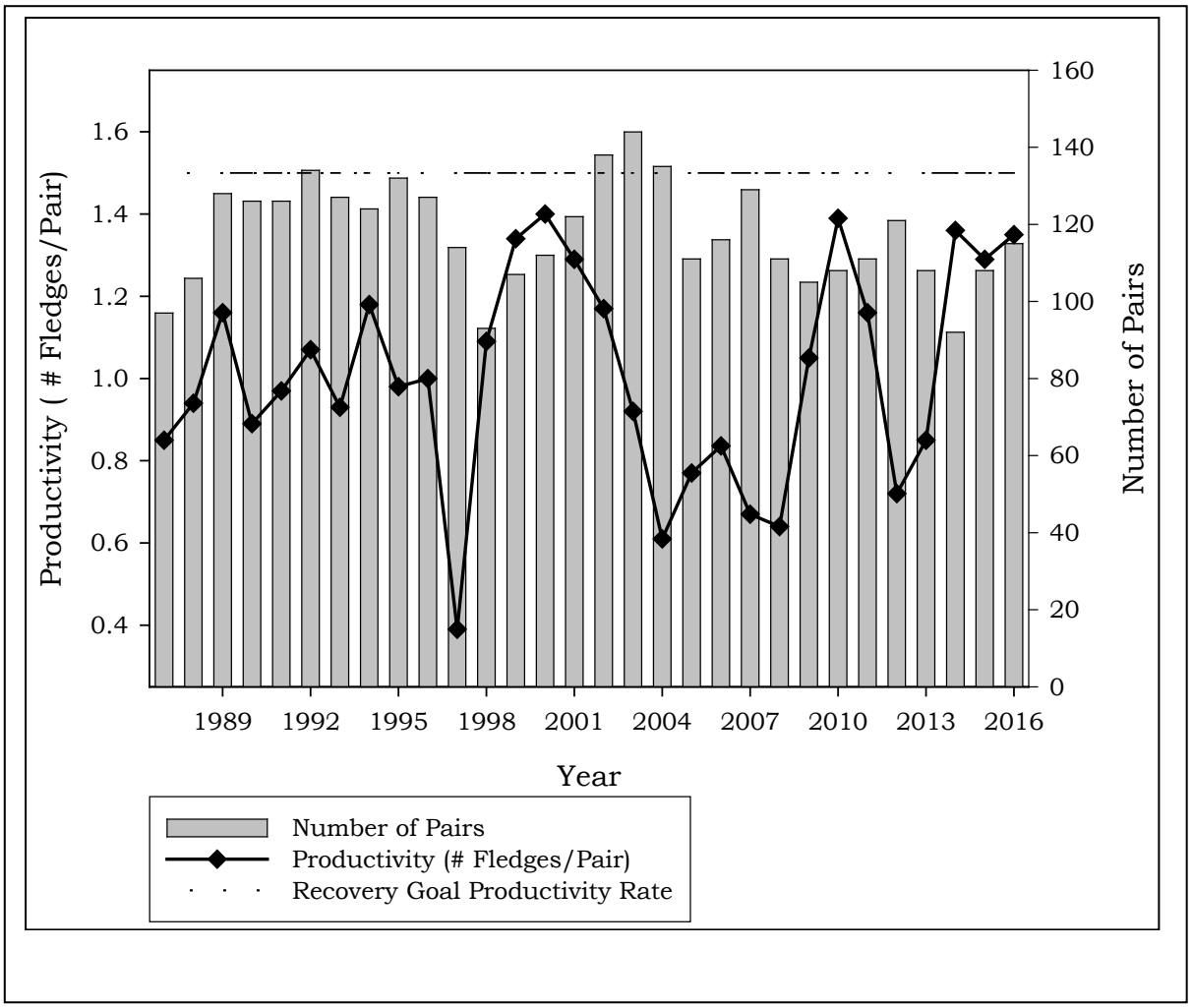
LITERATURE CITED

Davis, Christina, T. Pover 2015. Federal Aid Performance Report: Project E-1-37, Study IV.

Job 2-B. Piping Plover Population Survey.

U.S. Fish & Wildlife Service. 1996. Piping Plover *(Charadrius melodus),* Atlantic Coast Population, Revised Recovery Plan. Hadley, MA. 258 pp.

Figure 1. New Jersey piping plover population: 1987-2016.



INTERIM PERFORMANCE REPORT

STATE: New Jersey PROJECT NO.: E-1-38

PROJECT TITLE: Endangered & Threatened Wildlife Conservation

STUDY TITLE: IV. Vertebrate Wildlife Conservation

JOB NUMBER AND TITLE: 2-C Piping Plover Threat Assessment and Management

PERIOD COVERED: September 1, 2015 to August 31, 2016

PREPARED BY: Christina Davis and Todd Pover

JOB OBJECTIVES: To determine the nature and level of threats to piping plover populations and reproductive success and to reduce threats through management.

SUMMARY: The New Jersey Division of Fish and Wildlife (NJDFW)-Endangered and Nongame Species Program (ENSP) tracked the nest outcome and causes of nest failure, as well as brood loss (where possible), for 27 pairs of piping plovers nesting at 8 active breeding sites. This accounted for about a quarter (23%) of the state's nesting population at 40% of the active nesting sites.

NJDFW staff was able to determine nest outcome for all (100%) of the known nests (32) at the sites it monitored. Just over three-quarters (78%) of the nests hatched and just under a quarter (22%) failed. NJDFW was able to determine the cause of failure for all (100%) of the failed nests it monitored. Nest failure was relatively low in 2016, but predation was the leading cause among those nests that did fail at NJDFW-monitored sites, accounting for 72% of the failed nests. Abandonment and flooding each accounted for 14% of the failed nests. Causes of chick loss remained difficult to determine, so no detailed assessment can be provided.

Fencing and signage were erected at all NJDFW-monitored nesting sites to minimize human disturbance. As chicks hatched, foraging areas were posted with signage alerting beachgoers that chicks were present, in order to limit disturbance, and, where possible, totally restrict human access into preferred foraging areas (i.e., Barnegat Light, North Brigantine Natural Area, and Stone Harbor Point). Limitations on municipal/landowner vehicle use were in place at all active sites and recreational vehicle closures were implemented during the chick rearing stage at active state-owned sites (Island Beach State Park and North Brigantine Natural Area). Nesting areas were patrolled on a regular basis, most intensively on weekends and holidays.

All NJDFW-monitored sites where active breeding occurred were managed to some degree to reduce predation of nests, including through predator removal, where necessary. Predator exclosures were used on just over two-thirds (69%) of the nests that NJDFW monitored/managed, significantly more than it deployed in the previous two seasons. Hatched

success was extremely high for exclosed nests, nearly all (96%) of the nests exclosed by NJDFW this year hatched. In contrast, only 40% of the unexclosed nests hatched. Nest abandonment, which has been closely scrutinized by NJDFW in recent years, especially with regards to predator exclosure use, was an insignificant factor at NJDFW-monitored sites in 2016; just one nest was abandoned overall and it was not an exclosed nest.

NJDFW continued to work with the U.S. Fish and Wildlife Service (USFWS)-New Jersey Field Office (NJFO) to assist municipalities and other landowners in developing comprehensive management plans for the protection of federally and state-listed beach dependent species, in particular piping plovers. NJDFW continues to take the lead role in implementation of those plans as part of its routine management activities on municipal, county, and state lands.

SIGNIFICANT DEVIATIONS: None.

RECOMMENDATIONS: Maintain current monitoring frequency to ascertain causes of nest failure and brood loss. Continue use of predator exclosures (and electric fence) where they are likely to reduce predation without leading to adult mortality. Continue to monitor the effectiveness of predator exclosures, especially as it relates to the rate of nest abandonment and possible adult mortality. Continue increased levels of targeted mammalian predator removal measures where needed. Continue to closely coordinate management efforts with municipalities, as well as county, state, and federal landowners. Continue working with the USFWS-NJFO to develop, revise, and implement beach management plans.

BACKGROUND: ENSP has actively managed nesting piping plovers in the state for 31 years using the basic techniques described in "Procedures" below. Funding provided through the B. T. Nautilus oil spill natural resource damage settlement from 1995-2000 and the M.T. Anitra oil spill settlement from 2006-2011, as well as ongoing funding provided by the U.S. Army Corps of Engineers and/or the NJDEP Office of Engineering and Construction has resulted in increased monitoring and management intensity throughout the state since 1995. An intern project initiated with Monmouth University in 2001 has provided students to assist NJDFW with stewardship and management programs in the Monmouth County region. Through a partnership with the Conserve Wildlife Foundation of New Jersey, in part through funding provided by the National Fish and Wildlife Foundation since 2007 and other funding sources, monitoring and stewardship was increased at sites all along the coast, especially within Hereford Inlet.

PROCEDURES:

Nest/brood checks: Through regular (3-5 times/week) monitoring, NJDFW attempted to examine the relationship between adverse factors and nest outcome (i.e. nest success and fledging rates). Observers attempted to determine the cause of all nest failures (destruction and abandonment), including evidence of predator activity, weather factors, and human disturbance. Brood monitoring, included assessing factors that might be involved in chick loss, was also undertaken, but rarely resulted in direct observations of chick mortality.

Field management techniques: Specific methods NJDFW applied to protect nesting piping plovers and increase breeding success vary from site to site, although certain basic measures are used at most locations. Signs and fencing, most commonly string-and-post "symbolic" fencing,

restrict public access to nesting areas. Site managers erect fencing either prior to the nesting season in areas with a well-established nesting history ("pre-fencing") or as nesting activity is discovered. NJDFW staff regularly patrols all major sites on weekends and holidays to monitor human and predator activities, to help reduce human disturbance and to perform on-site education and outreach. Predator exclosures are the primary field technique used to reduce nest predation by large avian and mammalian predators. Exclosures are constructed and erected as outlined in the USFWS recovery plan (USFWS, 1996). Due to the higher rate of nest abandonment associated with predator exclosures and the elevated risk of human vandalism and predator harassment at "identified" nests, as a general practice NJDFW historically used exclosures on a selective basis, only at sites with a recent history of nest losses due to predation or where managers have observed ongoing predator activity. In the past decade or so, predator activity has been identified at nearly all active nesting sites, and as a result NJDFW started using predator exclosures more routinely at most sites (vs. a more selective approach). However, because of persistently higher rates of nest abandonment with exclosed nests and more recent concerns over the potential of adult mortality in association with exclosure use, NJDFW scaled back exclosure use in 2014 and 2015. NJDFW increased their use again in 2016. Other management techniques used on a more limited basis include: the use of electric fence where exclosures alone are not an effective means of deterring mammalian predation; erection of fenced and/or posted "feeding corridors" to protect foraging areas at beaches with high levels of human activity and/or where human activity is not already seasonally restricted; implementation of seasonal public ORV closures (i.e., Island Beach State Park, North Brigantine Natural Area, Corson's Inlet State Park). In addition, although not funded through this or any other federal grant, NJDFW conducted targeted predator removal at some sites with acute predator problems. Intensity of predator removal was increased in 2015 and 2016, especially in Southern New Jersey through a cooperative effort with the USFWS-NJFO and other partners.

Long-term and field-support management: NJDFW, in conjunction with USFWS-NJFO, has developed or is developing comprehensive management agreements with municipalities and other landowners as a means to minimize the detrimental effects of their activities (e.g., beach maintenance, vehicle use, etc.) on nesting success. During the nesting season, NJDFW issued regular management updates or emails - communications to municipalities and other appropriate agencies outlining current nesting activity and applicable management restrictions. NJDFW also met directly with individuals or departments (including public works, beach patrol, administrative staff, law enforcement, etc.) within municipalities or other agencies to review management issues, as needed. More generalized public outreach has included the distribution of informational brochures, placement of interpretive signs at nesting sites, informal on-site contact with the public, formal group presentations, social media, and informational booths at festivals and local events.

FINDINGS

NJDFW monitored nest outcomes and cause of nest failure, as well as brood loss, where possible, at 8 active sites, 40% of the active piping plover nesting sites in the state. Data were collected for 27 nesting pairs, representing 23% of the state's pairs.

NJDFW was able to determine nest outcome for all (100%) of the known nesting attempts at the sites it monitored. Of the 32 known nesting attempts, 25 (78%) hatched and 7 (22%) failed. NJDFW determined the likely cause of all (100%) of the failed nests (7). Predation was the leading cause of nest failure at NJDFW-monitored sites, accounting for 5 nests (16% of nesting attempts, 72% of failures). Of the 5 nests lost to predators, 2 (40%) were believed to be destroyed by mammalian species and 1 (20%) by avian species, and for 2 (40%) the exact species could not be determined. Abandonment and flooding was the cause of failure for 1 nest each (3% of nesting attempts, 14% of failures).

The degree of the causes of nest failure at NJDFW-monitored sites varied over the past five years, as is typical. Nest success was especially high at NJDFW-monitored sites this year, but of the nests that failed, predation was the leading cause of nest failure again in 2016, the fourth year in a row of that result. Flooding played a very minor role in nest failure over the past four years after being the leading cause of nest failure in 2012. Nest abandonment rates have varied over the past five years, but was at its lowest level in 2016. Human disturbance has not been the direct cause of any known nest failures over the past five years.

Causes of brood loss were difficult to determine, as is typical. Given the exceeding high pair hatch rate at NJDFW-monitored sites this year, brood loss played a greater role in reducing overall reproductive potential (compared to egg loss). However, ultimately fledgling rates were relatively high this year, so brood loss was not an overly significant factor.

NJDFW employed predator exclosures on about two-thirds (22 or 69%) of the 32 nests it managed in 2016, up notably from 2015 (46%) and nearly double the amount in 2014 (35%). Nearly all the exclosed nests successfully hatched (96%) compared to just 40% of the unexclosed nests (10). The fledgling rate from successfully hatched exclosed nests was substantially higher than from successfully hatched unexclosed nests (2.19 fledglings/pair vs. 1.25, respectively). Abandonment was not a factor in nest failure for NJDFW-exclosed nests in 2016, just 1 (3%) of the total nesting attempts failed due to abandonment, none associated with exclosures.

DISCUSSION AND CONCLUSIONS:

2016 marked the third consecutive year that productivity for New Jersey's breeding piping plovers was well above the long-term statewide average. This, in turn, has resulted in statewide population increases in each of the past two years. Despite the population increases, abundance still remains slightly below the long-term average since federal listing, but the relatively high productivity over the past three years is expected to continue the upwards population trend within the state for the short-term, assuming typical correlative patterns hold (Davis, Pover, 2016).

NJDFW, in partnership with USFWS-NJFO and other partners, implemented a more intensive predator control (removal) effort at many of the state's breeding sites for the second consecutive year. Although it remains difficult to absolutely correlate these efforts to breeding success, (given the extent of other limiting factors as well), NJDFW believes this increased predator control effort was an important factor in recent gains in abundance and productivity. Securing funding and resources to sustain predator control is difficult, but remains a high priority. Even

with increased breeding success, predators have been the greatest cause of nest (and likely chick) loss the past several years. For the foreseeable future, intensive targeted predator control programs should be viewed as central to and a baseline requirement for any (successful) recovery effort.

Predator exclosures continue to be a key tool used by NJDFW (and other statewide partners) to minimize the impact of predators. In recent years, NJDFW has experimented with reducing their use with varying results, in response to shared concerns across the breeding range about adult mortality, nest abandonment, and waning effectiveness. In 2016, NJDFW significantly increased use of predator exclosures at sites they managed, resulting in extremely high pair hatch rates. NJDFW believes the exclosure use (in concert with elevated predator control efforts) accounted for the spike in hatch success and ultimately higher productivity. It should be noted, however, that the increased use of exclosures by NJDFW was a result of the sites where pairs/nests were distributed, not a pre-determined strategy to increase usage. NJDFW remains cautious about their deployment; increased use in 2016 largely resulted from a significant jump in pairs in Northern Monmouth County, a region where exclosures have remained highly effective without any significant abandonment or adult mortality issue associated with their use. NJDFW will continue to carefully evaluate use of exclosures on a situational basis, site by site and year by year. It is hoped that a two-year range-wide assessment of predator exclosure use, which was completed this year, will provide us with additional guidance on when best to use predator exclosures.

Even with a strong investment in predator management as a means to increase breeding success, NJDFW will continue to address all factors impacting piping plovers within the state. Some impacts have proved to be cyclic, flooding losses, for instance, have been very low the past several years, but in other periods have accounted for a high degree of nest loss. NJDFW believes an adaptive comprehensive management strategy remains the best hope for recovery of piping plovers in New Jersey.

FAIRS ACTIVITY CODES: 1450, 1460.

LITERATURE CITED

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U.S. Fish & Wildlife Service, 1996. Piping Plover (*Charadrius melodus*), Atlantic Coast Population, Revised Recovery Plan. Hadley, MA. 258 pp.

PERFORMANCE REPORT

STATE: New Jersey PROJECT NO.: E-1-38

PROJECT TITLE: Endangered & Threatened Wildlife Conservation

STUDY TITLE: IV. Vertebrate Wildlife Conservation

JOB NUMBER AND TITLE: 10A. Red Knot Conservation on Delaware Bay

PERIOD COVERED: September 1, 2015 to August 31, 2016

PREPARED BY: Amanda Dey, Principal Zoologist

OBJECTIVE 1: Protect critical habitats and resources on the Delaware Bay stopover for migratory shorebirds: continue regional collaboration with state and federal agencies to recover horseshoe crab and shorebird populations, reduce anthropogenic disturbance to shorebirds enhance/create coastal habitat and impoundments for crab spawning/shorebird foraging and roosting.

OBJECTIVE 2: Assess recovery of red knot and other shorebird species: monitor mass gain, population size and adult survival through resightings of marked individuals; monitor trend in peak stopover abundance through baywide aerial survey. ***(Covered in grant NJ W-70-R-1).***

OBJECTIVE 3: Assess recovery of the horseshoe crab egg resource: monitor horseshoe crab egg densities on Delaware Bay beaches. (***Not funded here in 2016.)***

SUMMARY: In 2016, NJ continued seasonal restricted access (i.e., beach closures) on Delaware Bay (13 sites) and the Atlantic coast (1 site) to protect shorebird foraging and roosting areas from disturbance during the May migration stopover. Beach closures, staffed by Shorebird Steward Volunteers and backed by NJDFW Conservation Officers, have played a critical role in aiding a larger proportion of red knots to gain adequate weight (≥180 grams) prior to Arctic breeding. While horseshoe crab spawning and surface egg resources have not significantly increased, restricted human access provides widely distributed foraging beaches, allows shorebirds to spread out and take advantage of limited resources over full tidal range, reduces interspecific and gull competition and risk from aerial predators. Since 2013, eight important bayshore beaches were restored (approximately 2.57 miles) by non-profit partners to create crab spawning habitat that has improved shorebird foraging conditions. The proportion of red knots reaching weights of ≥180 grams, by the time of normal departure from Delaware Bay (May 26-28), is statistically related to horseshoe crab egg densities in the top 5 cm of sand. In 2016, the proportion of knots reaching ≥180 grams was 56%, a decline from 2015 (77%), but still promising because in four of the last five years more than 50% of knots departed the bay with adequate weight – an improvement over the previous ten years (2002 to 2011).

The long-term improvement in the number of knots reaching 180g is hopeful but should be tempered by the fact that the red knot stopover population is roughly a quarter of its former size

(>94,000 in 1989; 21,128 in 2016), and the horseshoe crab population has shown no significant trend despite 15 years of harvest management.

SIGNIFICANT DEVIATIONS: Section 6 funding was insufficient to include the 2016 horseshoe crab egg survey.

RECOMMENDATIONS: The volunteer Shorebird Steward program, with conservation officer support, is one of our most effective conservation actions which, we believe, has helped stabilize the red knot stopover population. Continued funding will help maintain existing protection efforts and community engagement.

The horseshoe crab egg survey is critical to assessing foraging conditions on Delaware Bay. The addition of egg cluster surveys by nonprofit partners has provided the potential to link deep egg clusters (an index of spawning activity) to surface eggs (index of foraging conditions). In absence of surface egg density information, it is impossible to assess the conditions that affect red knots weight gains on the bay.

The Virginia Tech Atlantic Coast Benthic Trawl Survey, the only trawl geared to sample horseshoe crabs, should be fully funded so that it may continue to provide accurate population estimates and trend, which underpin the setting of annual horseshoe crab harvests, including harvest of female crabs which ceased in the Mid-Atlantic states in 2013. Female harvest is now being considered by the ASMFC, despite a lack of population increase to support this action.

COSTS: $16,667 (15,000 Federal, $1,667 state/in-kind)

BACKGROUND: NJ Endangered and Nongame Species Program has carried out intensive shorebirds studies on Delaware Bay since 1997, when unregulated harvests of horseshoe crabs peaked and the Delaware Bay states (NJ and DE) began to quantify the impact of crab harvest on shorebird migrants.

The work centers on capture and individually marking shorebirds (survival and population estimation using mark-and-resightings methods), measuring weight gain through the stopover period (assess number of birds reaching adequate departure weight), aerial survey (trend in shorebird abundance and distribution), and egg density survey (assess foraging conditions for red knots and other shorebird migrants). This work, and the work of others in Canada and South America, led to the red knot status assessment in 2007, and helped underpin red knot listing in 2016. Now with 19 years of data, the above metrics are useful for annual recovery assessment of red knots and horseshoe crab egg resources in Delaware Bay.

Over the 13 years of the Shorebird Steward volunteer program, the incidence of disturbance has been greatly reduced, shorebirds optimize foraging free from human disturbance, and the program enjoys overwhelming community support.

PROCEDURES

Seasonal Beach Closures:

- Seasonal closures have been in place since 2003. All or part of 13 bayshore beaches and one Atlantic coast site were closed from May 7 to June 7 annually. A map of these locations was provided on the NJDFW website: http://www.njfishandwildlife.com/ensp/beachclozmap.htm
- Public viewing areas were present at each site; three viewing areas were established in the southern, middle and northern Delaware Bay (at Norbury's Landing, Reeds Beach, and Fortescue) for up-close public viewing of shorebirds and horseshoe crabs.
- Shorebird Steward volunteers staffed closed beaches; they educated the public on the importance of beach habitat for crabs and shorebirds and preventing disturbance to foraging shorebirds.
- Conservation officers assisted with closure efforts. Weekend shifts of two officers, on two shifts per day, covered Cape May and Cumberland counties when visitation and recreational use is greatest. Officers educated the public and assisted Stewards in dealing with disturbance problems. Annual cost for officer support is $10,000 from *non-federal funds* provided by the NJ Natural Lands Trust.

FINDINGS

- Eighteen Shorebird Stewards worked a combined 494 hours at nine Delaware Bayshore sites during May. They spoke with beach-goers, provided brochures to those interested, helped maintain symbolic fencing and signs, and keep beaches free from disturbance.
- We suggest that temporary beach closures, staffed by volunteers during the peak of shorebird migration, have helped a greater proportion of red knots to reach adequate departure weights.
- The proportion of red knots achieving adequate weight has exceeded 50% in four of the last 5 years. We estimate that 80% of the red knot stopover population must consistently reach 180 grams to support recovery.

DISCUSSION AND CONCLUSIONS

- Delaware Bay is a critical stopover for Arctic-nesting shorebirds because it is a terminal stopover before Arctic breeding. Fat reserves from Delaware Bay help birds survive and successfully reproduce in years when Arctic conditions are favorable.
- Continued seasonal beach closures and other collaborative methods that protect shorebirds from disturbance and improve foraging conditions, is a critical conservation job that should take place equally on both sides of Delaware Bay in spring, and on Atlantic Coast stopovers (MA to FL) in summer and fall. Beach protection efforts would benefit both Arctic- and temperate-breeding shorebirds which rely on beach and intertidal habitats for 6 to 8 months of the year.
- While it appears declines of red knots and horseshoe crabs may have been stemmed, their populations are now lower, which could leave red knots and other declining shorebirds vulnerable. A more rapid increase of Delaware Bay spawning horseshoe crabs could jump-start red knot recovery. However, despite red knot listing, horseshoe crab management remains tied to multiple objectives, including managing bait harvest as well as providing crabs for the benefit of red knots.

FAIRS ACTIVITY CODES:

INTERIM PERFORMANCE REPORT

STATE: New Jersey PROJECT NO: E-1-38

PROJECT TITLE: Endangered and Threatened Wildlife Conservation

STUDY TITLE: IV. Vertebrate Wildlife Conservation

JOB NUMBER AND TITLE: 14A. Bog Turtle Habitat Assessment & Survey and Habitat Restoration

PERIOD COVERED: September 1, 2015 - August 30, 2016

PREPARED BY: Brian Zarate, Senior Zoologist

OBJECTIVE: To monitor and conserve populations of the federally threatened and state endangered bog turtle *(Glyptemys muhlenbergii)* on public and private lands.

SUMMARY: Bog turtle funding under E-1-38 has been extended for a period of one year. The Division will use these funds to contract pre-construction turtle monitoring during the spring and summer of 2017 in advance of a bog turtle road crossing project planned for construction during the winter of 2017/18.

SIGNIFICANT DEVIATIONS: This segment was extended until August 30, 2017, and the funding from segments 38 and 39 will support the road crossing and monitoring job.

RECOMMENDATIONS: Develop turtle population monitoring scope of work and bid contract for monitoring in winter 2016.

COST: $11,111.11 ($10,000.00 federal, and $1,111.11 state)

BACKGROUND: Encompassed entirely on NJ wildlife management area (WMA) property, a priority bog turtle colony located in Upper Freehold Twp., Monmouth County is bisected by a two-lane WMA road. The Division of Fish and Wildlife are both the owners of the bog turtle wetlands and the roadway itself. Working with the Division's Bureau of Land Management, we are in the planning phase of designing an under-road passage system to allow bog turtles to safely move between the wetland areas that the road has split. Division staff, volunteers, and members of the public have reported bog turtles, spotted turtles (state special concern), and eastern box turtles (state special concern) on the road within the wetland area, among other amphibians and mammals. The construction of a turtle passage system, including tunnels and "funnel" fencing, will minimize or eliminate target species from being able to enter the roadway and allow for movement under the roadway to access different parts of the larger wetland complex. Both pre- and post-construction monitoring will be employed to establish habitat usage by the turtles before and after the tunnels are in place.

PROCEDURES: Pre-construction monitoring may include visual surveys, live trapping, and/or radio telemetry. Techniques will follow recommendations consistent with USFWS-Region 5 and USFWS-NJFO guidance.

FINDINGS: There are no findings to report at this time.

DISCUSSION AND CONCLUSIONS: There is nothing to report at this time.

FAIRS ACTIVITY CODES:

LITERATURE CITED

U.S. Fish and Wildlife Service (USFWS). 2001. Bog Turtle (*Clemmys muhlenbergii*), Northern population recovery plan. USFWS, Hadley, Massachusetts.