Section 6 Federal Aid to Endangered Species
E-1-39
F15AP00438

Endangered & Threatened Wildlife Conservation

Interim Report, Project Year
September 1, 2016 – August 31, 2017

NJ Department of Environmental Protection

DIVISION OF FISH AND WILDLIFE
ENDANGERED AND NONGAME SPECIES PROGRAM
P.O. BOX 420
TRENTON, NJ 08625

NEW JERSEY DIVISION OF
Fish and Wildlife

INTERIM PERFORMANCE REPORT

STATE: New Jersey PROJECT NO.: E-1-39

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, 2016 to August 31, 2017

PREPARED BY: Christina Davis

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 monitored 45% (nine) of the state's 20 active piping plover nesting sites. NJDFW-monitored sites accounted for just over a quarter (28%) of the state's overall nesting pairs (29 of 105[1] pairs). NJDFW also regularly monitored 14 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 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 NJDFW); New Jersey Audubon Society (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). 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 it could be compiled and analyzed 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 105 pairs of piping plovers nested in New Jersey in 2017, an unexpected decrease (9%) from 2016 (115 pairs), but still greater than 2014 when the lowest number of pairs since federal listing was recorded (92 pairs). Sandy Hook continued to host the highest number of pairs in the state (40 pairs or 38% of the statewide total). Sites immediately south of Sandy Hook saw another notable increase in pairs, up to 14 pairs after recording just two pairs in 2014-2015; as a result, in 2017 the Monmouth County region recorded roughly half of the state's overall breeding population (54 pairs or 51%). The region consisting of Holgate, Little Beach (both part of Edwin B. Forsythe NWR), and North Brigantine Natural Area (state owned) accounted for 41 pairs (39% of the state total). Holgate, alone, accounted for 22 pairs (21% 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 four pairs (4% of statewide population), a continuing and alarming long-term drop from 43 pairs in 2002.

The number of active nesting sites statewide was about on par with recent years (20 sites in 2017 versus 20 in 2016 and 19 in 2015). It was well below the peak number of sites recorded in the state (30 sites in 2004 and 2005). Much of this drop can be explained by the loss of sites in Cape May County.

Statewide pair nest success (pairs that hatch at least one chick) at 78% remained above the long-term average since state listing (69%) but below the near record high of 90% in 2017.

Statewide productivity remained very high for the fourth year in a row (1.29 fledges/pair in 2017 versus 1.35 in 2016, 1.29 in 2015 and 1.36 in 2014), well above the statewide average since federal listing (1.01 fledges/pair) and above the range-wide level (1.245 fledges/pair) believed necessary to maintain a stationary population (USFWS, 1996).

[1] One pair nested at two sites. One a federal site and one a NJDFW monitored site. In this instance, the pair was counted in the NJDFW total since its successful nesting attempt was from the NJDFW site. The pair is not double counted in the total state pair number.

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 1984. 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". NJDFW has directed local and statewide assessment of population trends since 1976. Statewide surveys were conducted in 1980 and 1984-2017, 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 per week to monitor breeding progress and outcome. Some sites, such as the Monmouth County sites (outside Sandy Hook), Holgate, Little Beach and Stone Harbor Point were monitored daily or near daily. 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 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 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

A total of 105 pairs (defined as two adults with at least one confirmed nesting attempt) of piping plovers nested in New Jersey in 2017, an unexpected decrease (9%) from 2016 (115 pairs), but still greater than 2014 when the lowest number of pairs since federal listing was recorded (92 pairs). The current number of nesting pairs remains slightly below the long-term average since federal listing (117 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 (227) was slightly higher than the adults present during the date-restricted survey conducted June 1-9 (222). The number of pairs tallied during the entire nesting season (105) was similar to the pairs present during the date-restricted census (104). Often in New Jersey, the date-restricted pair and total adult counts are lower than the final season counts, but this year the differences were nominal.

Northern Monmouth County, as a region, accounted for the largest percentage of pairs in the state, with just over half of the statewide population (54 pairs or 51% of the statewide total). Most of those pairs nested at Sandy Hook (40 pairs or 38% of the statewide total) although this area did undergo an 11 pair drop from 2016. However, the other sites in Northern Monmouth County continued to play an important role in the region, particularly Sea Bright, with an astounding 10 pairs (one pair in 2015, six in 2016). Some of Sandy Hook's decrease may have been related to Sea Bright's increase but this increase as not enough to offset the overall regional decline. The region comprised of Holgate, Little Beach, and North Brigantine Natural Area accounted for the other significant proportion of the statewide population (41 pairs or 39% of the statewide total). Also of note was the continued use of Island Beach State Park (one pair plus a fair amount of fall prospecting), an increase of pairs at Barnegat Light (five pairs) and the utilization of habitat north of the Holgate border in Long Beach Township (one pair ultimately nested but at least two territorial males were observed using the area). Cape May County, the southernmost region of the state, consisting of Ocean City to Cape May Point, accounted for just four pairs in 2017, part of a distressing downward trend from 43 pairs in 2004 at its peak.

Eleven male adults were outfitted with GPS tags (in a novel attachment method for this species via leg harness) through a project partially supported by this funding source and led by State University New York (SUNY). Five adults received temporary tags during the nesting season to test the method of application, conduct behavioral observations to make sure there were no injuries, and to gather information on home range during incubation periods. The temporary tags were removed, charged and redeployed on 10 adults to carry with them for one year, until they return to breeding grounds. Results are not yet available from this portion of the project, except

to say that the short-term findings were that the tags did not appear to have a negative effect on the bird's behavior.

Pairs nested at 20 sites statewide, same as 2016 and well below the peak count of 30 sites recorded in both 2004 and 2005. NJDFW-monitored 9 of the active nesting sites (45% of the sites statewide). NJDFW also regularly monitored 14 other potential breeding sites with historic nesting records and/or 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 29[1] nesting pairs (28% of the pairs statewide). This represents a continued increase in percentage of active pairs at NJDFW sites (23% in 2016, 16% in 2015); however, the number of sites is still well below previous levels. In 2009, for instance, pairs (105) were about the same as in 2017, but NJDFW-monitored sites accounted for 46 pairs or 44% of the statewide population. The longer-term decline appears to be explained by the desertion of many NJDFW monitored sites in Cape May County. The recent increase may be a combination of recruitment of young birds fledged from federal sites to NJDFW areas and the emigration of adults from federal sites (which may be at carrying capacity).

Statewide pair-nest success (the percentage of pairs that successfully hatch at least one nest) was 78%, well above the average for the period since federal listing (69%). Pair nest success was variable this year, with some sites extremely high (100% at Sea Bright) and others dismally low (0% at Stone Harbor Point). Traditionally, fledge rate in NJ has appeared to be more of a limiting factor to reproductive success than hatch rate, but that pattern was not apparent at all sites this year. One example was Holgate, which posted a 50% pair-nest success rate but still rallied to a 1.05 fledges/pair. Looking at just NJDFW-monitored sites, pair-nest success was lower than last year (86% versus 93% in 2016) but well above average for NJDFW-monitored sites for the period since federal listing (67%).

The statewide fledge rate, which includes data collected and provided by all the state cooperators, was 1.29 fledges/pair, down slightly from 2016 (1.35 fledges/pair) and the same as 2015 (1.29 fledges/pair). Although the 2017 productivity level was still below the 1.50 fledges/pair federal recovery goal, it was above the 1.245 fledges/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 (1.01 fledges/pair). Productivity at NJDFW-monitored sites (1.79 fledges/pair for 29 pairs) was below 2016 levels (1.89 fledges/pair for 27 pairs) but both years were well above the long-term average for NJDFW sites (0.89 fledges/pair since federal listing). NJDFW-monitored sites also continued the atypical trend from 2016 where hatch and fledge rates ran higher than the statewide totals.

Productivity varied by individual site and region. The Northern Monmouth County region fledged 1.37 fledges/ pair (54 pairs), higher than last year (1.25 fledges/pair). Sandy Hook's productivity (1.13 fledges/pair) was on par with the last two years (1.12 fledges/pair in 2016, 1.19 fledges/pair in 2015), but still down from 2014 (1.40 fledges/pair). The other Northern Monmouth County sites (Sea Bright, Monmouth Beach, and Seven Presidents Oceanfront Park) collectively recorded a record high productivity rate (2.07 fledges/pair for 14 pairs) driven primarily by Sea Bright (2.6 fledges/pair for 10 pairs). Productivity for the Holgate, Little

Beach, and North Brigantine Natural Area region was down from the previous two years at 1.24 fledges/pair in 2017 versus 1.43 in 2016 and 1.49 in 2015. Holgate productivity (1.05 fledges/pair) was down from the record level post-Hurricane Sandy highs (1.44 in 2016, 1.54 in 2015 and 2.33 in 2014). Some of the decline was attributed to a bourgeoning issue with mink depredation. Little Beach was on par with last year (1.00 fledges/pair in 2017 and 0.92 on 2016) so the combined Edwin B. Forsythe NWR sites of Holgate and Little Beach were down compared to last year, producing 1.03 fledges/pair (37 pairs) compared to 1.27 (37 pairs) in 2016. Although only four pairs nested at North Brigantine Natural Area, it recorded a high rate of 2.25 fledges per pair, the third consecutive year of extremely high productivity. Pairs clustered around the Barnegat Inlet (one pair at Island Beach State Park and five pairs Barnegat Light) were productive fledging 1.50 fledges/ pair. Cape May County recorded productivity of 0.25 fledges/pair (four pairs), a return to extremely low rates in this region.

[1] One pair nested at two sites. One a federal site and one a NJDFW monitored site. In this instance, the pair was counted in the NJDFW total since its successful nesting attempt was from the NJDFW site. The pair is not double counted in the total state pair number.

DISCUSSION AND CONCLUSIONS

New Jersey's statewide piping plover breeding population declined (105 pairs) after two consecutive years of increase which followed a historic low (since federal listing) of just 92 pairs in 2014. Given the strong reproductive success of the previous three years (which continued in 2017), it was disconcerting to observe, for the first time since federal listing, that strong reproductive success was not correlated with an increase in pairs. The change in this relationship may have long term repercussions for managing NJ's population. In the past, the goal has been high reproductive success because it translated into an increase in pairs. If this year's trend is an indication to what is to come, it will be even more difficult to recover this species than was previously thought. Concern must be tempered, however, as this is the first year this trend was noted and may be an aberration.

The normal productivity/pair number relationship was on display at certain locations, such as Sea Bright and Barnegat Light, whose previously high reproductive rates did seem to translate into more pairs. But other sites, like North Brigantine Natural Area, are losing pairs even with strong reproductive rates. Another factor complicating this trend was that the total number of adults in the state was not as low compared to previous years as was the confirmed breeding pair number. For a variety of reasons that are not fully understood, there were a number of "bachelor" adults as well as pairs where a nest was never confirmed (and thus cannot be counted as a breeding pair) tallied in the state this year. In 2016, there were 115 pairs and 232 total adults. But in 2017, there were 105 breeding pairs and 227 total adults. It is possible some nests were missed, but all the non-breeding pairs were in areas that received a high degree of monitoring and this is not likely to explain the discrepancy. There were also a number of bachelor males who appeared unable to attract a mate. The reason for this is unclear, but concern about the number of birds in the system available for pairing and mating was heightened this year.

The number of pairs at non-federal sites continued to increase in 2017, helping to alleviate concerns about a concentration of breeding pairs in New Jersey to fewer sites and primarily federally protected/owned lands (Davis and Pover, 2016). This trend comes with its own brand of apprehension, as traditionally the birds have not fared as well on municipal and state sites.

However, the previous two years have shown that success is possible at these sites, which is reassuring news as the habitat created by Hurricane Sandy in 2012 has likely reached its apex and it is unknown how much longer the federal sites will hold the most suitable habitat.

While the northern Monmouth County sites continue to flourish, the opposite is true for Cape May County. In what can only be classified as a population crash, the breeding pairs there have plummeted from a high of 43 pairs in 2002 to four pairs in 2017. The reasons for this decline are partially linked to the poor productivity the region has suffered. However, it is not well understood why there is so little recruitment into the region, given the recent high productivity elsewhere in the state which should ostensibly translate into new adults looking for territories to occupy. Possible hypothesis include that source populations are too far away, that the elevation of the habitat is not correct (with examples of both too high and too low), the increase of American Oystercatchers nesting on the beaches in this part of the state (competition for nesting habitat) and factors relating to the quality of foraging habitat. What is understood is that the trend must be reversed if the state is to meaningfully contribute to regional recovery.

Although there were many positive outcomes of this year's nesting season, the pair decrease in light of the reproductive rates of previous years as well as the continual decline of Cape May County as viable nesting habitat is cause for concern for the long-term viability of this population.

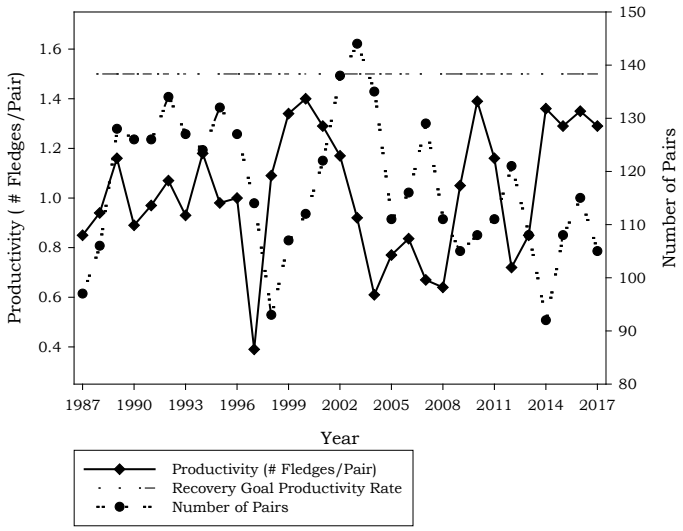
FAIRS ACTIVITY CODES: 1450, 1460.

LITERATURE CITED

Davis, Christina, T. Pover 2016. Federal Aid Performance Report: Project E-1-38, 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.


Productivity (# Fledges/Pair)
Number of Pairs
Year
1987
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
0.4
0.6
0.8
1.0
1.2
1.4
1.6
80
90
100
110
120
130
140
150
Productivity (# Fledges/Pair)
Recovery Goal Productivity Rate
Number of Pairs

INTERIM PERFORMANCE REPORT

STATE: New Jersey PROJECT NO.: E-1-39

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, 2016 to August 31, 2017

PREPARED BY: Christina Davis

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 tracked the nest outcome and causes of nest failure, as well as brood loss (where possible), for 29 pairs of piping plovers nesting at nine active breeding sites. This accounted for 28% of the state's nesting population and 45% of the active nesting sites.

NJDFW staff was able to determine nest outcome for all (100%) of the known nests (40) at the sites it monitored. Sixty-three (63%) of the nests hatched and 37% failed. NJDFW was able to determine the cause of failure for almost all (93%) of the failed nests it monitored. Nest failure increased in 2017 compared to 2016 partially because weather played a greater role than last year. Flooding and eggs blown over from strong winds were the leading cause of nest failure at NJDFW-monitored sites, accounting for 60% of failed nests. Abandonment accounted for 13%, depredation for 20% and 7% were undetermined cause

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 (although there is still room for improvement) 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. Additional signage related to dog walking restrictions and ethical wildlife observing and photography were also posted.

All NJDFW-monitored sites where active breeding occurred were managed to some degree to reduce depredation of nests, including through predator removal, where necessary. Predator exclosures were used on 60% of the nests that NJDFW monitored/managed. Hatching success

was high for exclosed nests, as 88% hatched. In contrast, only 25% of the unexclosed nests hatched. Nest abandonment, which has been closely scrutinized by NJDFW in recent years in relation to predator exclosure use, was not a significant factor at NJDFW-monitored sites in 2017; just two nests (5% of nesting attempts were abandoned and only one of those was exclosed.

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 depredation 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. Continue to support research projects that elucidate factors leading to adult and chick mortality.

BACKGROUND: NJDFW has actively managed nesting piping plovers in the state for 32 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.

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. However, a chick mortality study in 2017 (partially supported by these funds) conducted by SUNY outfitted 21 chicks (statewide) with transmitters (glued to back) to track them from hatching to mortality or fledge (25 days old).

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 depredation 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 depredation or where managers have observed ongoing predator activity. By 2004 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 exclosures beginning in 2014. NJDFW increased their use again in 2016 and continued this in 2017 but employed them judiciously and the abandonment rate has remained low. An exclosure decision support tool is now available to help mangers make determinations of when to use exclosures but the numbers of pairs at most NJDFW sites do not meet the minimum needed to provide robust results. 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 (bottom line of electric) or avian depredation (top line of electric, new technique debuted this year); 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; and implementation of seasonal public ORV closures (i.e., Island Beach State Park, North Brigantine Natural Area). 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 has been elevated since 2015, especially in Southern New Jersey through a cooperative effort with the USFWS-NJFO.

Long-term and field-support management: NJDFW, in conjunction with USFWS-NJFO, has developed, updated/revised 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 weekly (and in some cases daily) updates via email municipalities and county landowners and interested state and federal 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 and brood loss, where possible, at nine active sites (45% of the active piping plover nesting sites in the state). Data were collected for 29 nesting pairs, representing 28% 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 40 known nesting attempts, 25 (63%) hatched and 15 (37%) failed. NJDFW determined the likely cause of nearly all (93%) of the failed nests (14). Weather related factors (flooding and eggs blown over by strong winds) were the leading cause of nest failure at NJDFW-monitored sites, accounting for nine nests (23% of nesting attempts, 60% of failures). Abandonment accounted for 5% of nesting attempts, 13% of failures. Depredation accounted for 7% of attempts, 20% of failures and one nest was lost to an undetermined reason (2% of attempts, 7% of failures). The species could not be determined for any of the three nests lost to predators.

Causes of brood loss were difficult to determine, as is typical. The data from the transmitter tagged chicks from the SUNY study did provide some information on this type of loss. Of the 21 chicks outfitted with transmitters, 13 chicks fledged, two were lost and the fate could not be determined, one tag fell off the chick before it perished, and one tagged chick was taken to rehab with a broken leg (possibly from ghost crab attack) and later expired. Four fates were determined using this method – two from ghost crabs, one from great horned owl and one from mink.

NJDFW employed predator exclosures on 60% of the 40 nests it managed in 2017. Nearly all the exclosed nests successfully hatched (88%) compared to just 25% of the unexclosed nests (4 of 16). The fledge rate from successfully hatched exclosed nests was similar to that from successfully hatched unexclosed nests (1.77 fledges/pair vs. 1.86, respectively). Abandonment was not a major factor in nest failure for NJDFW-exclosed nests in 2017, as just 5% of the total nesting attempts failed due to abandonment. Of the two nests affected, one was exclosed, one was not.

DISCUSSION AND CONCLUSIONS:

2017 marked the fourth consecutive year that productivity for New Jersey's breeding piping plovers was well above the long-term statewide average. Previous strong years resulted in statewide population increases in 2015 and 2016. In a troubling turn, that was not the case in 2017, which has implications for long term recovery of the species. Concern must be tempered, however, as this is the first year this trend was noted and may be an aberration.

NJDFW, through support from USFWS-NJFO, implemented a more intensive predator management effort at many of the state's breeding sites for the third consecutive year. Although it remains difficult to absolutely correlate this work to breeding success and given the extent of other limiting factors, NJDFW does believes this increased effort was an important factor in reduced nest loss from predators at some sites. However, the nature of predator management

efforts is that they must be on-going as their impact is effective but short-lived as other individuals fill in vacant niches. Securing funding and resources to sustain predator management is difficult, but remains a high priority. For the foreseeable future, intensive targeted predator management programs should be viewed as central to and a baseline requirement for this 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. NJDFW believes, and the data shows, that prudent deployment of exclosures (in concert with elevated predator management efforts) has led to an increase in hatch success and ultimately higher productivity. NJDFW remains cautious about their use; 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, and this pattern continued in 2017. NJDFW will continue to carefully evaluate use of exclosures on a situational basis, site by site and year by year.

In addition to 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 stochastic; weather related losses, for instance, were very low the past several years, but in 2017 were a more dominant factor. 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

Davis, C., and T. Pover. 2015. Federal Aid Performance Report: Project E-1-38, 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

INTERIM PERFORMANCE REPORT

JOB DESCRIPTION

STATE: New Jersey **PROJECT NO:** E-1-39

PROJECT TITLE: Endangered and Threatened Wildlife Conservation

STUDY TITLE: Vertebrate Wildlife Conservation **STUDY NUMBER:** V

JOB TITLE: Bog Turtle Habitat Assessment & Survey and Habitat Restoration

PERIOD COVERED: September 1, 2016 - August 31, 2017 **JOB NUMBER:** 14A

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-1-39 extends until August 31, 2018. The Division has been using these funds, in combination with funds granted in segment E-1-38, to contract pre-construction turtle monitoring during the spring-summer of 2017 in advance of a bog turtle road crossing project planned for construction during the winter of 2017-18.

SIGNIFICANT DEVIATIONS: A no-cost time extension was granted, taking this job through August 31, 2018.

COST: $56,685.56 ($51,017.00 federal and $5,668.56 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 the owners of both the bog turtle wetlands and the roadway itself. Working with the Division's Bureau of Land Management, we planned 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 in the wetland area, among other amphibians and mammals. In the last four years alone, four bog turtles have been found on the roadway. The construction of a turtle passage system, including tunnels and "funnel" fencing, will minimize or prevent target species from entering 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: Funding under E-1-39 supported a portion of the pre-construction monitoring at the WMA. We will report on pre-construction procedures through the grant period, acknowledging that some monitoring activities will continue through October 2017. Pre-

construction monitoring included standardized visual surveys and radio telemetry. Techniques followed recommendations consistent with FWS-Region 5 and FWS-NJFO guidance and with procedures being implemented in the concurrent grant, "Competitive SWG Multistate Recovery Actions for the Bog Turtle and Associated Headwater Wetland Species of Greatest Conservation Need."

An existing WMA road bisects wetland habitat occupied by bog turtles into two core activity areas. Field procedures and findings were designated by which side of the road they occurred, in this case WMA North or WMA South. Baseline information on bog turtle and other turtle species presence and habitat use was collected both for WMA North and WMA South.

Following regional population monitoring protocols developed under the Competitive SWG project, we first delineated the core bog turtle habitat of WMA North at 2.25 acres and WMA South at 4.25 acres to determine the appropriate minimum survey effort required for each core habitat (Regional Population Monitoring for the Bog Turtle 2015). We planned for each core area to be sampled at least three times, and appropriately sized turtles would be affixed with radio-transmitters to track habitat use. Between April 15 and June 15, 2017, WMA North was visually surveyed five times and WMA South was visually surveyed five times. The goals of the visual surveys were to contribute to regional population monitoring and to detect turtles for radio-transmitters.

Upon capture, each bog turtle, spotted turtle (state special concern), or eastern box turtle (state special concern) was measured, weighed, and given a unique marginal scute notch code, unless already marked in which case the existing code was recorded. Turtles weighing approximately 100g or greater were affixed with a Wildlife Materials SOPR radio-transmitter on site using a two-part quick-set epoxy and released at the point of capture. Relocations using radio-telemetry occurred twice per week, with each relocation event separated by at least two days.

FINDINGS: Funding under E-1-39 supported a portion of the pre-construction monitoring at the WMA. We will report on additional pre-construction findings through the grant period, acknowledging that some monitoring activities will continue through October 2017.

Pre-construction Visual Surveys:

- WMA North: During five visual surveys of WMA north a total of 11 turtles were captured, including three bog turtles, five spotted turtles, two eastern box turtles, and one painted turtle.
- WMA South: During five visual surveys of WMA north a total of 12 turtles were captured, including five bog turtles, six spotted turtles, and one eastern box turtle.

Pre-construction Radio-telemetry:

- WMA North: Ten individual turtles were monitored twice weekly from initial capture to date. Telemetry relocation will continue through October 2017 and intermittently over the dormant months and regularly during turtle passage system construction this winter. Three bog turtles, five spotted turtles, and two eastern box turtles were tracked. One of the eastern box turtles was found dead during a relocation event and the body was submitted to Wildlife Conservation Society – Bronx Zoo for necropsy and histology. All of the turtles, except two

spotted turtles, remained on the north side of the road. The two spotted turtles that traveled to WMA South likely used a stream tributary to make that movement, as several adult spotted turtles had been observed in this stream earlier in the season.

- WMA South: Six individual turtles were monitored twice weekly from initial capture to date. Telemetry relocation will continue through October 2017 and intermittently over the dormant months, then regularly during turtle passage system construction this winter. Three bog turtles and three spotted turtles were tracked. All of the turtles remained on the north side of the road.

DISCUSSION AND CONCLUSIONS: Procedures reported here, partially funded by E-1-39, are part of the baseline data collection and pre-construction monitoring on bog turtle and SGCN turtle habitat use and occupancy prior to the construction of a turtle passage system planned for winter 2017-2018. During the post-construction monitoring phase of the project beginning in April 2018, visual surveys and radio-telemetry efforts will be replicated to provide a comparison of habitat use after turtle tunnels and funnel fencing are installed. The battery life of the transmitters will allow us to monitor the same individual turtles through November 2018, offering us the secondary benefit of being able to monitor the turtles' response to winter construction activities. We do not anticipate any disturbance to the wetland or the turtles during winter construction.

Although radio-telemetry will continue through October 2017, preliminary data of telemetered turtles have not shown any movements of bog turtles between WMA North and WMA South; two spotted turtles were documented moving between the two areas. It is not entirely uncommon for bog turtles to avoid roads, even when suitable habitat is available on the other side and it may be the road is perceived by the turtles as a barrier to regular movement. The goal of introducing the turtle tunnels to the area is to encourage safe passage of bog turtles and other wildlife from one wetland area to the other, to promote increased breeding, foraging, and nesting opportunities, along with offering a habitat option in the event one side of the road becomes less suitable for the species over time. Over the years, the public and Division staff have documented several bog, spotted, and box turtles on the road, both alive and dead. Since 2013, four bog turtles have been opportunistically found alive on the road by Division staff.

In addition to this segment's work, additional monitoring of the road transect for alive and dead animals has been ongoing from April through October 2017, quantifying the levels of vehicle-wildlife collisions between WMA North and WMA South and at a nearby control transect. By replicating these road transect surveys in 2018 after the turtle tunnels and fencing are in place, we hope to see a decrease in the number of roadkill animals between WMA North and WMA South as a result of our road mitigation efforts. Preliminary data of the road transect monitoring has shown an additional three turtles killed on the road that were not part of radio-tracking: a spotted turtle, eastern box turtle, and snapping turtle. These animals were otherwise not captured during visual surveys or telemetry relocations.

Cumulatively, we believe our pre- and post-construction monitoring efforts (visual surveys, radio-telemetry, road transect surveys) will allow us to objectively assess the effectiveness of the installed turtle tunnels and fencing for 1) allowing for under-road movement of wildlife between

WMA North and WMA South, and 2) reducing the number of vehicle-wildlife collisions along the road transect between WMA North and WMA South.

FAIRS ACTIVITY CODES:

LITERATURE CITED

Competitive State Wildlife Grant: Multistate Recovery Actions for the Bog Turtle and Associated Headwater Wetland Species of Greatest Conservation Need, Regional Population Monitoring Protocol for the Bog Turtle, 2015. Administered by Pennsylvania Fish & Boat Commission