Interim Report
Federal Aid in Wildlife Restoration
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"Species of Greatest Conservation Need (SGCN) - Birds Research and Management"

Interim Report
January 1, 2020 – December 31, 2020

NJ Department of Environmental Protection

DIVISION OF FISH AND WILDLIFE
ENDANGERED AND NONGAME SPECIES PROGRAM
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NEW JERSEY DIVISION OF
Fish and Wildlife

SPORT FISH & WILDLIFE RESTORATION

Project 1. SGCN Birds Conservation and Management

The objectives of this grant are to:

1. Conduct surveys of beach and marsh birds to determine species occurrence, abundance, population trend, productivity, and habitat use. Conduct research as necessary to determine threats, habitat use, population status, and to obtain information necessary to prepare and implement recovery plans. Manage breeding and migrating sites to enhance populations.
2. Conduct surveys of migrating shorebirds to determine species abundance, population trend, and habitat use. Conduct research as necessary to determine threats, habitat use, population status, and to obtain information necessary to prepare and implement recovery plans. Manage migration stopover sites to improve conditions to support population recovery.
3. Conduct surveys of secretive and coastal marsh nesting birds to determine species occurrence, abundance, population trend, and habitat use. Conduct research as necessary to determine threats, habitat use/preferences, and for information needed to prepare and implement recovery plans. Manage breeding sites to enhance populations.
4. Conduct surveys of raptors to determine species occurrence, abundance, population trend, productivity, and habitat use. Conduct research as necessary to determine threats, habitat use, population status, and to obtain information necessary to prepare and implement recovery plans. Implement management to enhance populations.
5. Conduct surveys of non-raptor land birds to determine species occurrence, abundance, population trend, productivity, and habitat use. Conduct research as necessary to determine threats, habitat use, population status, and to obtain information necessary to prepare and implement recovery plans. Implement management to enhance populations and progress toward recovery.

Objective 1 – Beach & Marsh Birds

Beach nesters

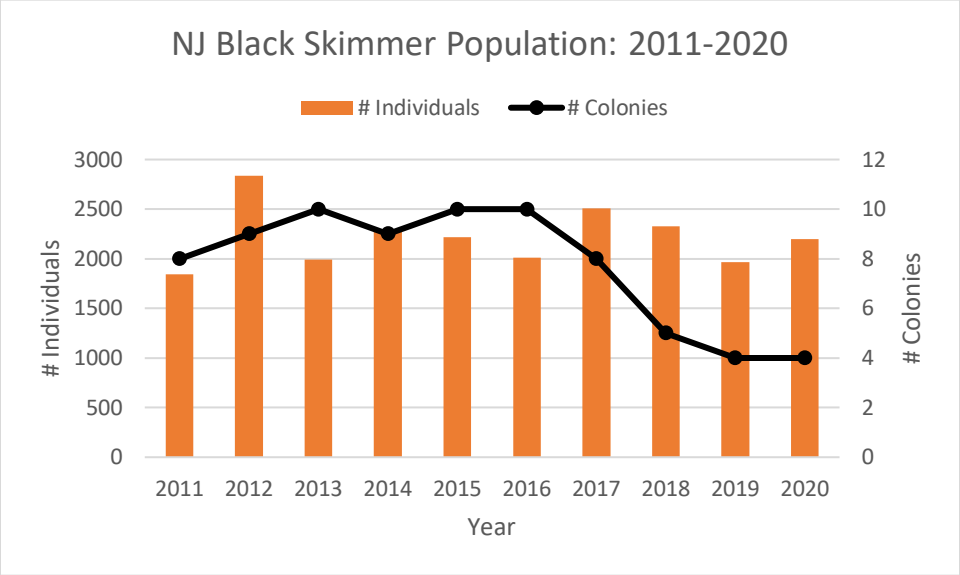
Prepared by: Christina Davis, Environmental Specialist II

Project Leader: Christina Davis

The portions of this job applying to Piping Plover are also supported by ESA Section Six funding and state funds.

Key Findings:

Black Skimmer

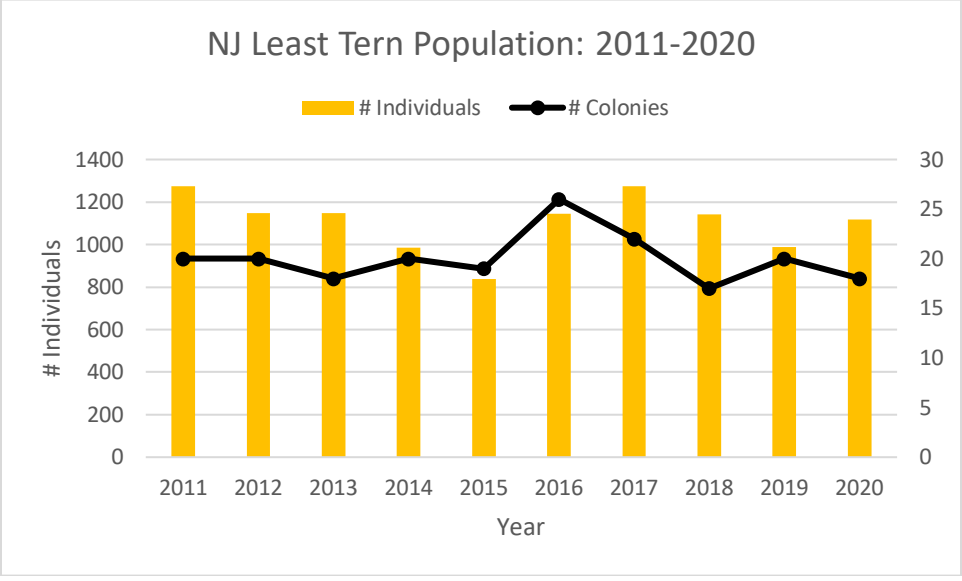


- Black skimmer breeding bird counts were conducted approximately every week at active sites from arrival (mid-May) until nesting ceased (September-October) on beaches along the entire Atlantic coast. Marsh islands

were not surveyed, due to lack of resources and COVID restrictions. Ground surveys took place at ten sites and active nesting (at least one nest with eggs) was observed at four sites. These four sites were visited 3-7x/week for management and outreach for the duration of the nesting season.

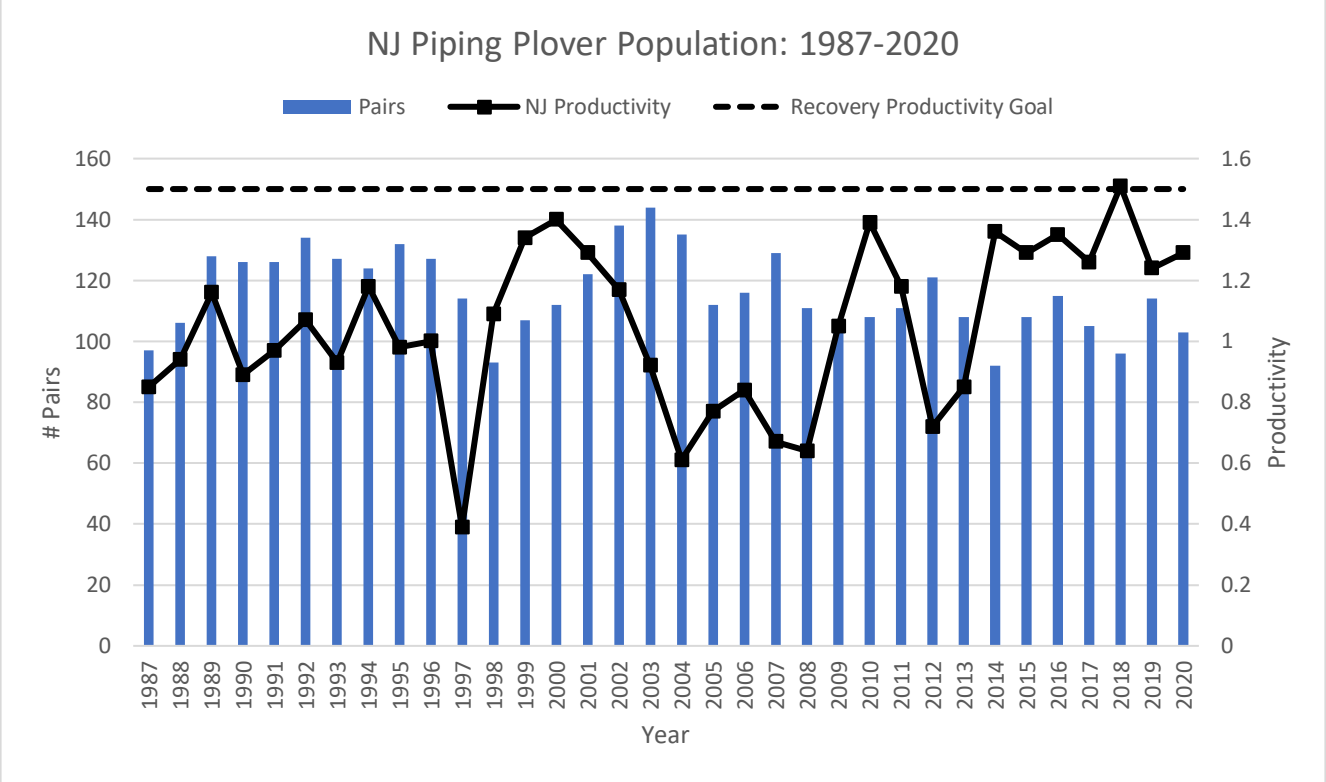
- A total of 2,197 adults were present at the active sites. This figure is the cumulative total of site counts that occurred in the peak survey period, which took place 7-13 August. The sum of the peak adult number from each site was 2,554. The larger the difference between these two numbers, the more likely it is there was failure at any given colony and then relocation/renesting to another colony; it appears this happened this year.
- As has now been the case since 2010, the majority (61%) of the state's known population was present at Seaview Harbor Marina (SHM) in Longport (1,340 peak adult count). However, this proportion continued its downward trend, which peaked at 89% of the state's population in 2012. Skimmers were documented continuing to visit the sandy restored areas of marsh islands (Ring Island and Mordecai Island), but no nesting was documented this year.
- A peak count of 530 incubating adult black skimmers was tallied in the 3-9 July survey period. The incubation number was lower than might be expected given the number of adults present and was almost certainly lower than number that nested. As is generally the case, the vegetation at SHM blocked observers from garnering an accurate count of these ground nesters but walk through colony counts have not shown to be effective in NJ.
- Black skimmer statewide productivity appeared to be low-moderate with 511 fledglings produced statewide. This translates to 0.96 fledglings/pair if calculated on the peak incubating adult count. If we simply halve the peak period total adult number and use that as pair count, the productivity is 0.40. The true rate is likely somewhere in the middle. Unlike 2019, when fledges were distributed more evenly around the state, SHM produced the bulk of the state's fledges, at 80%. Stone Harbor Point produced 20% and Point Pleasant Beach and Holgate produced zero fledges. Depredation and human disturbance were the primary factors responsible for nest and chick loss at these sites.
- NJDFW and The Wetlands Institute (TWI) worked cooperatively to band 70 Black Skimmer near-fledglings, fledglings and adults on Stone Harbor Point and SHM. COVID greatly reduced the ability for staff to band birds, but this effort did represent the first-time skimmers were banded at SHM. Nocturnal efforts for banding near-fledglings continued to be the preferred technique, but noose mats were used to good effect diurnally for fledglings and adults. Long-term goals of banding include better understanding of site fidelity and inter-state movements (particularly with New York breeding birds).
- During the reporting period, 98 individuals banded in NJ from 2016-2020 were observed either on migration or wintering grounds. Banded skimmers from MA (3), NY (25), Virginia (1), and North Carolina (1) were observed in NJ as migrants.

<u>Least Tern</u>



- Least tern breeding bird surveys were conducted every week from mid-May until the end of August at beaches along the entire Atlantic coast. Active colonies (those where ≥ 1 pair was observed with eggs) were located at 18 sites and observations were made at these locations for the duration of the season. Sites were visited 3-7x/week for management and outreach for the duration of the nesting season. Due to COVID, monitoring of some sites with terns was not possible, so the population and colony numbers are likely underestimates.
- A total of 1,118 adults were present at these sites (based on a cumulative total of peak site counts that occurred in the 12-18 June survey period). The summed peak adult number from each site was 1,515. A large difference between these two numbers can suggest failure at a given colony and then relocation/renesting to another colony, which given the data and on-the-ground observations appears to have happened in 2020.
- A peak (census period of 19-25 June) of 586 adult least terns were observed incubating. Productivity was low for least terns with 124 fledglings produced statewide (0.21 fledglings/pair), based on the peak number of incubating adults).
- The population was distributed fairly evenly throughout the state and six colonies had >100 adults. The largest colony was at Holgate - South, with 293 adults on its peak count, followed by Holgate - North with 220 adults at its peak. These two colonies very likely had a fair bit of exchange. The next largest colony was at Point Pleasant Beach with 205 adults at its peak.

Piping Plover (*Full Piping Plover reporting can be found in NJ E-1-42*)



- One hundred three (103) pairs of piping plovers nested in New Jersey in 2020, an 10% decrease from 2019 (114) and a 7% increase from 2018 (96). This tally continued the highly unstable nature of the NJ population, despite higher than average productivity, over the last five-plus years.
- The total number of adults recorded for the entire nesting season (228) was higher than during the date-restricted survey conducted June 1-9 (210). The number of pairs tallied during the entire nesting season (103) was also higher than the pairs recorded during the date-restricted census (95). There were 20 unpaired adults observed during the census and 23 in the final tally. This figure was quite high and suggests there were, as there has been in recent years, bachelor birds that could not find a mate or mated birds that never laid a nest (it

due to intense monitoring, it is unlikely many nests were missed). This raises concerns about the number of available breeding birds in the population.

- Pairs nested at 20 sites statewide, a sharp decrease from 27 in 2019 and back to the lower rates observed over the last 5+ years. The distribution continues to heavily favor the northern part of the state, but the only two new sites added were in Cape May County. Those two sites were Ocean City – North (last active in 2005) and Coast Guard - TRACEN (last active in 2013).
- Statewide pair-nest success (the percentage of pairs that successfully hatch at least one nest) decreased in 2020 compared to 2019 (69% vs. 83%, respectively), but was on par for the period since federal listing (70%). Looking at just NJDFW-monitored sites, 2020 pair-nest success (83%) was higher than the state-wide tally and the period since federal listing (66%).
- The statewide productivity rate was 1.29 fledglings/pair, similar to 2019 (1.24 fledglings/pair). Productivity at NJDFW-monitored sites (1.54 fledglings/pair for 24 pairs) was above the 2019 metric (1.09 fledglings/pair for 33 pairs).
- NJDFW continued to use predator exclosures in 2020 with 44% of nesting attempts exclosed (statewide was 19%). The exclosed hatch rate for NJDFW nests was 93% (statewide was 77%). The NJDFW unexclosed hatch rate was 39% (statewide was 57%) and of the NJDFW nests not exclosed, 64% were lost to depredation (statewide was 31% to predators and 18% to undetermined, likely many were depredated). The abandonment rate for NJDFW exclosed nests was 7%, compared to 3% statewide.
- NJDFW purchased GPS data loggers in support of the State University of New York (SUNY)–Syracuse's piping plover research project in 2018. By 2020, there was one Piping Plover that still carried a logger. She was not trapped in 2019 but biologists were able to trap her in 2020. As with previous logger removals, no problems were detected with this attachment method and no injuries reported related to the unit itself (abrasion, cuts, etc.), despite her carrying the logger for two years rather than the expected one year.
- COVID heavily influenced the mechanics of the field season and reduced our ability to carry out management, monitoring, and to conduct outreach.

Conclusions:

- Although NJDFW continues to be concerned that the majority of **black skimmers** were at one site, that proportion continues to decline, and other substantial colonies continue to take shape. If vegetation is not modified at SHM, this colony will continue to decrease in size in future years.
- Due to COVID restrictions, no marsh island surveys (by ground or air) were performed in 2020. Therefore, it is not possible to comment on the status of any marsh nesting sites, but no reports from partners or the public revealed any sites that were not already known. Four active colonies with just two producing young continues to be a cause for concern over long term stability of the state's population, especially in light of reduced habitat conditions at SHM.
- Although COVID reduced the ability of project partners to band Black Skimmers, notable progress was still made. 2020 was the first year banding occurred at SHM, achieving a long-time goal of banding at the most important site in the state. Project partner expanded the use of noose mats to capture more adults and fledges than years past. The resight rate continued to be high and partners are looking forward to beginning data analysis from the past four years.
- The statewide **least tern** breeding population continued to be relatively stable, but the low productivity in 2020 was a concern. Predators continue to be the overwhelming limiting factor for higher productivity. Although predation management is occurring at many locations in the state, the colonial nature of this species means it only takes a few individual predators keyed into a nesting area to cause untold damage.
- The number of active least tern colonies (18) decreased in 2020, but not by a significant amount. The species continues to be distributed rather fairly across sites and the state, in terms of location and number of individuals in colonies, and this is a positive note for this species. However, only 50% of sites produced fledglings, and even at those sites the fledge rates was extremely low.
- The state recorded its seventh consecutive year of strong productivity for **piping plover** at 1.29 fledglings/pair, above the long-term average in New Jersey (1.05 fledglings/pair) and well above the levels believed necessary to maintain a recovery unit-wide stationary population (~1.00 fledglings/pair). The fluctuations in the pair numbers are unsettling, as it is near impossible to make predictions of population based

off productivity. The high number of bachelor birds mimics recent year's trends of lower pair number but more unpaired adults. It is unclear what this means for the long-term stability of the population, but it does not appear to be a positive development.

- The majority of plovers (77%) are still nesting at two federal sites (Gateway NWA – Sandy Hook and EB Forsythe NWR). The loss of so many pairs this year at presumably less desirable sites highlighted this trend even more than in the past. Monmouth County non-federal properties lost both sites (no birds present) and pairs from sites (fewer pairs present at an active site). Cape May County continued its slow upward trend with seven pairs at four sites. Although still far from its peak of 43 pairs in 2002, it is up from 2018 when there were three pairs at just one site.
- Predators were a major factor again this year, in terms of hatch success and fledge rates. Where possible, managers increased the amount of predation management that took place, with mixed results. Even at a given site, one species might have had a fairly successful year while another failed entirely. Although it is known that predation management can increase productivity, drilling down the specific "hows" and "whys" continues to be a challenge.
- COVID-related limitations had a major impact on beach-nesting birds management in NJ in 2020. Of note, no exclosures were deployed at Sandy Hook this year and they were not able to complete tern surveys. Statewide, once the beaches were opened after widespread closures, they were busier than average and the pressure on the habitat did appear to be a problem for some birds (for example, the colony at Point Pleasant Beach).

Recommendations:

- Resume periodic monitoring of back bay island complexes within the coastal region of the state (aerially, if possible) to ensure that large numbers of skimmers are not nesting in these areas. When sites are identified, include them in the ground surveys.
- Continue intensive monitoring of piping plover populations and reproductive success, and continue monitoring to ascertain causes of nest failure and brood loss. Encourage research projects focusing on improving reproductive success for all three species by reaching out to potential collaborators, supporting their proposals and providing technical guidance as needed.
- Continue to incorporate management strategies for piping plovers, black skimmers and least terns into comprehensive beach management plans for municipalities and state parks in the coastal zone.
- Continue to refine a comprehensive predation management plan (including components such as removal, aversion and reducing site attractiveness) as it is a primary means forward to recover these species. Work within and among DEP Divisions to obtain permission and create action plans for state lands, continue to encourage federal partners to do the same, and work on initiatives to complete more aggressive and/or focused predator management on municipal lands.
- Lead and/or coordinate large-scale restoration efforts to improve beach nesting bird habitat. Targeted sites include Malibu Beach WMA, Stone Harbor Point and Cape May Point State Park and carefully selected marsh islands. Conduct smaller efforts to manage vegetation as needed (for example, at Seven Presidents Oceanfront County Park, Belmar – Shark River Inlet, and Barnegat Light).
- Continue to work with regional partners to ensure that NJ is making the best decisions possible when it comes to predator exclosures.
- Continue to follow the piping plovers that were banded in 2012-13 and 2015-20. Use this date to better understand survivorship and make progress towards understanding the population instability in recent years.
- Continue to band plovers and skimmers, where possible, and investigate banding least terns.
- Engage and seek out data and research on the impacts of sea-level rise, subsidence, and man-made efforts to stabilize the coastal zone in an effort to ensure habitat persists in the coming decades for these highly vulnerable species.
- Continue to coordinate management with municipalities and county, state and federal landowners.
- Continue to incorporate breeding data into NJ DEP's Landscape Project and Biotics database.

Colonial Waterbirds

Prepared by: Christina Davis, Environmental Specialist II

Job inactive during report period due to COVID-19 restrictions reducing close contact work.

Objective 2 – Migrating Shorebirds

Prepared by: Amanda Dey, Principal Zoologist

- Delaware Bay Peak Count - Peak stopover abundance of red knots in Delaware Bay (aerial/ground counts) had been low and stable for much of the last decade, 2009 to 2016 (Figure 1). Peak abundance declined in 2017 (17,969); and in 2018 and 2019, peak numbers of red knots were higher (32,930 and 30,880, respectively) as more birds took advantage of higher egg densities that were distributed over more sites. In 2020, a tropical storm in early May brought high winds and a prolonged period of cool water temperature that curtailed crab spawning. As a result, peak counts on May 24 of red knots (19,397) and ruddy turnstones (23,822) were close to poor 2017 counts, and approximately 69% of knots and 40% of turnstones left the bay early, by May 26. In terms of food resources: prior to May 24, surface egg density was <400 eggs/m^2, and 6,000+ red knots were observed feeding on the NJ Atlantic coast (behind Stone Harbor), but few were observed in Delaware Bay. With the onset of spawning (May 24-30), surface egg density increased to 9,193 eggs/m^2 and peaked in mid-June (11,814 eggs/m^2) after the peak of shorebird migration (~May 18-May 28). COVID-19 precluded an aerial survey. We performed a full ground and boat survey typically conducted concurrent with aerial survey. The aerial survey does not account for turnover; (the total number of knots moving through Delaware Bay stopover, May 1 to June 7).

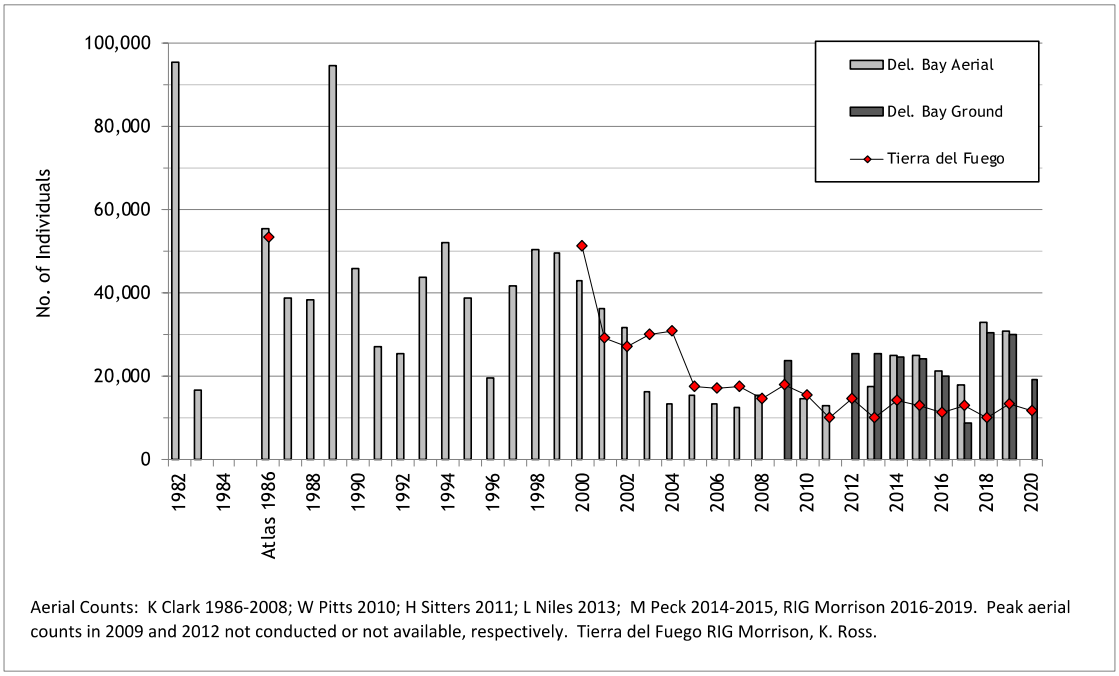


Figure 1. Peak aerial count of Red Knots in Delaware Bay during spring stopover, 1982-2020; aerial count of Red Knots in Tierra del Fuego (major wintering area) 1986-2019. Source: Delaware Bay aerial survey, NJ Division of Fish and Wildlife, DE Division of Fish and Wildlife, New Jersey Audubon; Tierra del Fuego Aerial Survey-Atlas 1986, Morrison, R. I. G. and R. K. Ross; 2000-2020.

- Red Knot Weight Gain – Red knot weights are statistically linked to horseshoe crab surface egg density (eggs/m^2 in top 5 cm of sand). Sufficient red knot weight gain (≥180 grams) on Delaware Bay is statistically linked to adult survival (Baker et al. 1994) and Arctic productivity (Duijns et al. 2017). The proportion of red

knots reaching 180 grams (P180) at time of normal departure (May 26-28) is useful as an index of shorebird foraging conditions (Figure 2). In 2020, the proportion of red knots reaching ≥180 grams was 0.35, below 2018 and 2019 when feeding conditions were better. Since 2005, P180 has varied widely and has not shown substantive or sustained improvement.

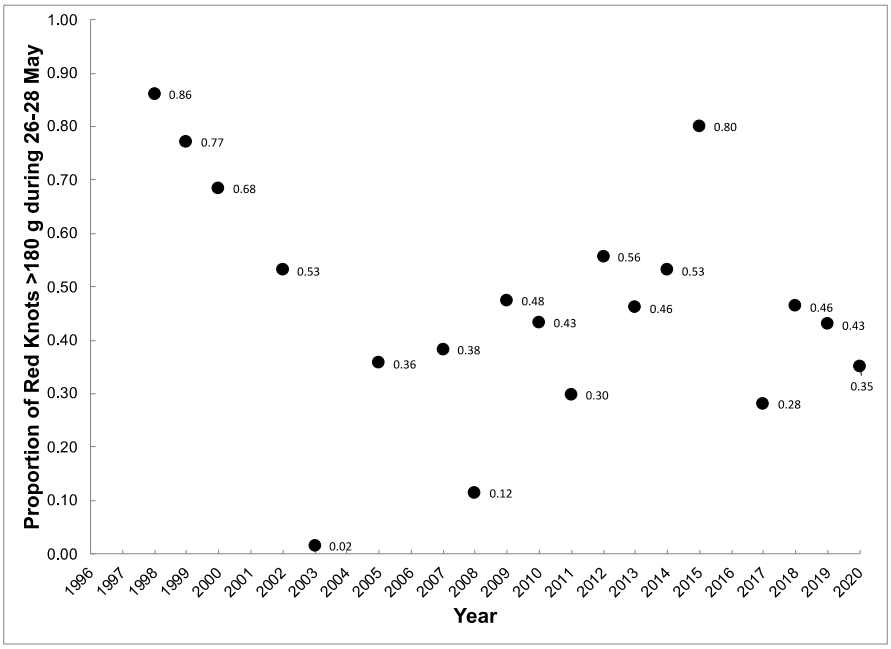


Figure 2. The proportion of red knots reaching ≥180 grams (P180) at time of departure from Delaware Bay (May 26-28) excluding capture data from Mispillion Harbor, DE. Source: NJ and DE Divisions of Fish and Wildlife.

- Superpopulation Estimate for Red Knot – In 2020, the superpopulation estimate for red knots in the Delaware Bay stopover was 40,444 (95% CI: 33,627 - 49,966), similar to estimates of previous years (Table 1). The estimate is derived from bay-wide resightings of individually-marked red knots using a Jolly-Seber mark-recapture model. This method accounts for turnover of birds and is considered a stopover population estimate (Lyons et al. 2015).

Table 1. Superpopulation estimate (mark-resighting method). Source: Lyons 2019, Table 4. Memorandum to the Delaware Bay Adaptive Resource Model (ARM) Working Group. September 30, 2020.

Table 4. Stopover (passage) population estimate using mark-resight methods compared to peak-count index using aerial- or ground-survey methods. The mark-resight estimate of stopover (passage) population accounts for population turnover during migration; peak-count index, a single count on a single day, does not account for turnover.

Year	Stopover population[a] (mark-resight *N**)	95% CI Stopover population *N**	Peak-count index [aerial (A) or ground (G)]
2011	43,570	(40,880 – 46,570)	12,804 (A)[b]
2012	44,100	(41,860 – 46,790)	25,458 (G)[c]
2013	48,955	(39,119 – 63,130)	25,596 (A)[d]
2014	44,010	(41,900 – 46,310)	24,980 (A)[c]
2015	60,727	(55,568 – 68,732)	24,890 (A)[c]
2016	47,254	(44,873 – 50,574)	21,128 (A)[b]
2017	49,405[e]	(46,368 – 53,109)	17,969 (A)[f]
2018	45,221	(42,568 – 49,508)	32,930 (A)[b]
2019	45,133	(42,269 – 48,393)	30,880 (A)[g]
2020	40,444	(33,627 – 49,966)	19,397 (G)[c]

[a] passage population estimate for entire season, including population turnover
[b] 23 May
[c] 24 May
[d] 28 May
[e] Data management procedures to reduce bias from recording errors in the field; data from observers with greater than average misread rate were not included in the analysis
[f] 26 May
[g] 22 May

- Index of Food Availability – Surface horseshoe crab egg density (eggs/m^2 in top 5 cm of sand) in 2020 were lower than the last two years, related to prolonged cool water temperature that lasted until late May. Surface egg density has not shown any sustained increase since the mid-1990s. They remain below historic densities observed prior to crab overharvest in the 1990s (~44,000 eggs/m^2 in 1991; Botton et al. 1994; Figure 3).

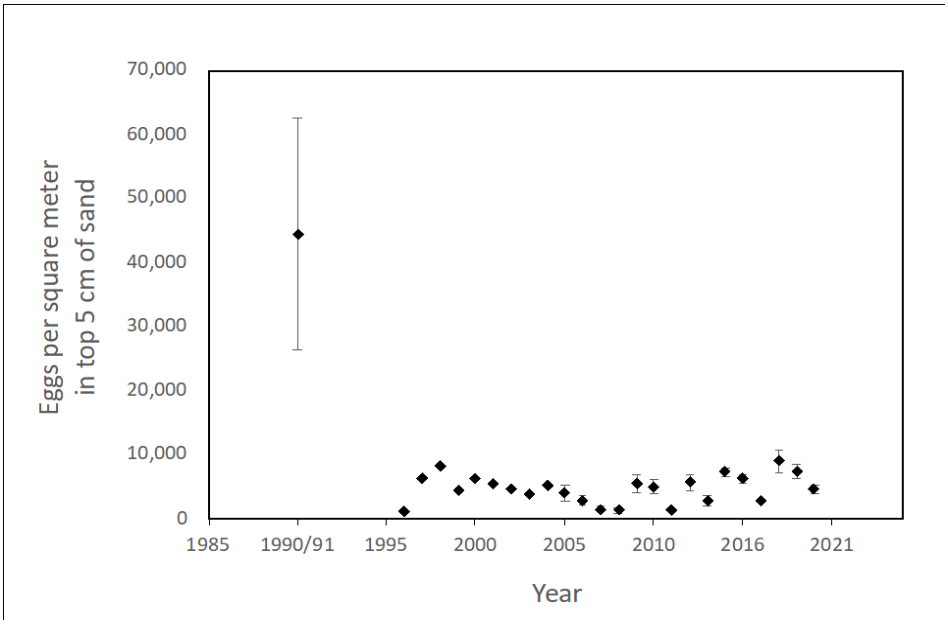


Figure 3. Surface egg densities on NJ beaches: Historic 1990-1991 (Botton et al. 1994), unpublished report to NJDEP 1996-1999 (Botton and Loveland), NJDFW unpublished data 2000-2020 (NJ Division of Fish and Wildlife).

- Beach Protection – Shorebird stewards were recruited, trained, and fielded at 13 beaches during the peak stopover period to help prevent human disturbances to foraging shorebirds. The Shorebird Steward project was funded in 2020 under NJ E-1-42 Section 6 federal aid to endangered species.

- There were no habitat enhancement or restoration projects carried out in 2020 under this grant.

Conclusions:

- The red knot peak stopover population (aerial survey) is apparently stable but remains approximately 65% below historic peak abundance in 1989. The red knot population estimate (using mark-recapture) has varied around 45,000 individuals since 2011.
- Management of human disturbance is an important component of red knot recovery work. Long-distance red knot migrants (coming from South America) are most time constrained and most reliant on abundant eggs at the end of May to make large, rapid weight gain prior to Arctic breeding.
- Horseshoe crab spawning habitat restoration (by other organizations), and shorebird steward site management to reduce disturbance to shorebirds, appear to have improved foraging conditions for red knots/shorebirds despite lack of increase in female crab abundance and egg resources. New Jersey's volunteer Shorebird Steward Program, supported by NJ Conservation Police, enjoys widespread support and cooperation from Bayshore communities and visitors.

Recommendations:

- Continue NJ and DE long-term collaboration on red knot/horseshoe crab research and conservation efforts; ensure annual red knot data are provided to the ASFMC such that shorebird biologists continue to have a cooperative role in horseshoe crab management and restoration, and USFWS has annual recovery metrics necessary for annual status assessment and recovery planning.
- Continue protection of important shorebird beaches to give red knots and other shorebirds maximum foraging time on all resource beaches. Continue to support this volunteer program of Shorebird Stewards.
- Support initiation of bay-wide voluntary community efforts, aimed at reducing shorebird disturbance, could help provide greater access to available surface eggs, increase the number of red knots reaching 180 grams, and support red knot recovery.

- Support restoration of beach habitats to improve spawning and shorebird foraging opportunities, by removing of rip-rap and buried rubble, and placement of intertidal shell bag reefs that attenuate wave energy, reduce beach erosion, and create spawning habitat.
- Support a shift in horseshoe crab management by the ASFMC -- from maximum bait harvest to rapid restoration of horseshoe crabs and including horseshoe crab eggs (clusters, surface eggs) as indices of female carrying capacity.

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Objective 3 – Secretive Marsh Birds

Prepared by: Christina Davis, Environmental Specialist II

Job inactive during report period due to COVID-19 restrictions on close contact work.

Objective 4 – Raptors

Prepared by: Kathleen Clark, Supervising Zoologist, William Pitts, Senior Zoologist

Habitat protection and planning:

- Maps of bald eagle nests were updated, and new information was entered into the Biotics database. Ten bald eagle roost locations that had been verified with quarterly ground surveys were also entered into the Biotics database. Broad-scale habitat assessments were not yet attempted.
- Staff met with other DEP staff to incorporate management guidelines for raptors into management plans drafted by the DFW and Division of Parks and Forestry, including the DEP's plan to restore Atlantic white cedar in NJ.

Population monitoring of bald eagles:

The Division of Fish and Wildlife's Endangered and Nongame Species Program (ENSP) biologists, Conserve Wildlife Foundation (CWF) staff, and volunteer observers located and monitored bald eagle nests and territories. Two hundred and forty-eight nest sites were monitored during the nesting season, of which 220 were documented to be active (with eggs) and 28 were territorial or housekeeping pairs. Thirty-six new eagle pairs were found this season, 22 in the south, seven in central and seven in the north. One hundred-seventy-nine nests (85%) of the 210 known-outcome nests produced 307 young, for a productivity rate of 1.46 young per active/known-outcome nest. Thirty-one nests (14%) failed to produce. The Delaware Bay region remained the

state's eagle stronghold, with roughly half of all nests located in Cumberland and Salem counties and the bayside of Cape May County.
Nest sites that were deemed vulnerable to human disturbance were posted and checked regularly. The brochure describing bald eagle nest protections and recommended practices for conservation was distributed to landowners and to interested citizens by staff and nest watchers. Two Eagle Project volunteer orientation meetings were held in northern and southern NJ in February (before COVID-19 restrictions on gatherings). About 80 Eagle Project nest monitors recorded nest observations using NestStory program that facilitated data compilation by the project leader; the program also enabled tracking of time and mileage that documented 3,138 hours and 31,152 miles in the course of their work. Weekly email communications were sent to all cooperators with project updates. All new nest sites were entered into the NJ Biotics database, and were provided real-time to NJ DEP regulatory staff.

Population monitoring of other raptors:

- **Continue to monitor the nesting by peregrine falcons statewide, and collect/report data to the USFWS per the Peregrine Falcon Post-Delisting Monitoring Plan.** Record the location of all nests, and record their active status and nest outcome. Identify threats to falcons and nest success, including weather, predators, parasites, and contaminants. Band nestling peregrine falcons following national and regional protocols. Coordinate with other states in the mid-Atlantic and Northeast to report and track marked birds.

The 2020 New Jersey peregrine falcon population remained the same at 38 known pairs with 37 active (known to lay eggs), similar to the 2018 and 2019 levels. The same number of pairs (28) were successful in producing 77 young, for a productivity rate of 2.08 young per active nest and a success rate of 80%. A brief summary of data collected during the 2020 nesting season follows:

- 19 pairs nested on towers (12) and buildings (7), representing 50% of the population and 64% of the production. Towers and buildings fledged 49 young for an overall productivity rate of 2.53 young per active nest. This is close to the long term average. Parasitic flies caused some mortality of hatchlings at two sites, with the only effective treatment to date being bird-lice spray within the first 5 days after hatching. Older nestlings seem to survive; Carnus flies were found in nearly all coastal nests.
- Eight pairs occupied territories in natural cliff habitat, seven of which were known active. Four nests were successful in producing six chicks for a productivity rate of 0.86 young per active nest; this figure excludes one nest where chicks were lost by 3 weeks of age. These mediocre results were similar to what was seen in 2019.
- Eleven pairs of falcons were known to nest on bridges this year, an increase of two pairs. Seven of those bridges lie completely within the boundaries of NJ, while four span the Delaware River between NJ and PA and were monitored by NJ. NJ bridge pairs produced 21 known young that fledged, for a productivity rate of 1.91 young per active nest. The new bridge nests were discovered well into the nesting season in northern NJ; another bridge was confirmed only after a fledgling was rescued next to it. Bridges can be difficult to monitor and confirm nest results, as the nest sites are often located out of sight or on inaccessible sections of the bridge. Two fledglings were rescued from the water and were fostered back to family groups. Other urban bridges may have been occupied, but the project lacked monitors in urban locations to document all possible sites.

ENSP staff banded 53 of the 77 young produced following national protocols. The 24 young we were unable to band fledged from sites that could not be accessed at the appropriate time.

In 2017-19 we documented nestling mortalities that resulted from lead-poisoned prey. They prompted us to take blood samples at four nests in 2018, eight nests in 2019, and 11 nests in 2020. The results had Pb ranging from <0.01 to 0.95 ppm. Two nestlings at Burlington-Bristol Bridge died shortly after banding, likely due to lead in their food. Other nests with high lead exposure were all urban sites. This warrants continued study.

In 2020 we continued to use *NestStory* to document nest activity, band identities, photos and resightings, enabling us to connect our many databases on individual birds, their populations, and movements.

We continued to use remote, motion-activated cameras to photograph peregrines at nests, which allowed us to read the leg bands on 13 breeding adults at eight nest sites. An additional 23 adults were identified using optics. A minimum of 12 adults were unbanded and therefore unidentifiable to origin and age. The median age of both males and females was 7.0. The information that these identifications provide is valuable for relating peregrine origin and age to nest success, site fidelity and turnover rate in the population.

- **Ospreys: accommodate citizen science by providing for a public platform (www.osprey-watch.org)** where all nests in NJ are listed and data (occupancy, success) can be entered. Oversee licensed bird banders (subpermittees under NJ Station permit #22803) who check osprey nests for nest success and banding nestlings.

ENSP partner, Conserve Wildlife Foundation of NJ (CWF), helped coordinate data collection. CWF, staff, and volunteers recorded 647 occupied nests, about 3% lower than the high in 2019. Eighty-three percent were located along the Atlantic Coast, 12% along Delaware Bay, and the remainder were active in the northern region from the Meadowlands to the Delaware River. Productivity averaged 1.61 young per active-known-outcome nests, below the five-year average but well above the 1.0 minimum needed to sustain the population.

The Delaware Bay nesting colony continued to have better productivity as compared to the Atlantic Coastal colony at 1.65 vs. 1.58, a smaller margin of difference than most years. Thirty-five known-outcome nests in inland/Delaware River/northern NJ regions good success with 2.06 young/active nest. Staff and volunteers recorded production of 812 young from 503 active/known-outcome nests; 209 osprey nestlings were banded during nest checks.

- **American kestrels: Using staff and trained volunteers and cooperators, maintain a nest box program that serves as a study platform for monitoring nest occupancy and success, marking adults and nestlings, and providing birds for telemetry studies.**

ENSP staff oversaw their 15th nest box season in 2020. A total of 92 nesting attempts occurred in boxes monitored by ENSP and partners. Approximately 235 nest boxes were monitored as frequently as possible due to COVID-19 restrictions from April – August. Of the total nesting attempts (n=92), 77 (81%) were successful, as defined by nestlings that reached the bandable age of 14-22 days. 15 nesting attempts (19%) failed. 2020 nest success was 84% and productivity was 3.06 young/ active nest, with 3.86 young per successful box. NestStory was used by a limited number of volunteers due to COVID-related travel restrictions. More training will be provided in 2021 if COVID restrictions allow.

- **Woodland raptors: Develop revised survey strategies for this guild of raptors, one which will help ENSP assess population trends, and help identify best forest management approaches.**

This job was mainly inactive in 2020. In addition to contributing to the NJDEP Forest Service's NJ Forestry Plan, we also recommended barred owl management for forests targeted for Atlantic White Cedar restoration. Several barred owl nest boxes were installed adjacent to existing cedar swamps to test for occupancy.

- **Migrating raptors: Seek data collected by others on important bird migration areas, including Cape May and the raptor banding station (Cape May Raptor Banding Project), and owl banding station (K. Duffy), and add information to the NJ Biotics database for species of conservation concern.**

ENSP compiled data on E&T raptors recorded at Cape May in the course of raptor and owl banding, and those data will be entered into the Biotics database following database protocols.

Objective 5 – Non-Raptor Land Birds

Prepared by: Sharon Petzinger, Senior Zoologist

Key Findings:

- A total 135 locations suitable for breeding golden-winged warblers (GWWA) in NJ were surveyed in 2020. Due to issues related to COVID-19, ENSP staff was unable to survey locations full-time but coordinated with NJ Audubon to survey 88 of those locations for GWWAs. An additional 5 locations were surveyed in southern NY as part of Cornell's GOWAP.
    - 102 of those locations contained forest cover >70% when measured within a 1.5-mile radius from the location

- Fourteen GWWAs were observed in the 135 locations surveyed in NJ in 2020 (naïve occupancy = 0.104).
  - Seven (50%) locations were recolonized by GWWAs in 2020 after being vacant in 2019.
  - Two (14%) locations were new and had no prior GWWA observations. Both of these locations were in sites that received active forest management with the goal of creating golden-winged warbler breeding habitat.
  - Ten (62.5%) of the previous 16 NJ locations occupied by GWWA in 2019 were not occupied in 2020.
- All GWWAs observed were in locations with >70% forest cover (naïve occupancy = 0.137), while 85% of the GWWAs observed (12/14) were in locations with > 75% forest cover.
  - Naïve occupancy of GWWAs on powerlines was 0.18, naïve occupancy on powerlines non-managed wetland sites was 0.08, and naïve occupancy on active forest management sites was 0.20
- Only 104 of the 135 locations recorded blue-winged warblers (BWWAs) and hybrids. Of those four hybrids (naïve occupancy = 0.039) and 57 BWWAs (naïve occupancy = 0.548) were observed during the 2020 survey period.
- Data will be submitted for entry into the NJ DEP's Biotics database by mid-February 2021.
- The GWWA status assessment has been updated with new literature and data.
- Staff attended a series of monthly webinars for the Northeast Appalachian Mountain Joint Venture meeting running from May through October 2020.
  - As a result of these meetings, staff helped organize a series of NJ-specific virtual meetings to discuss unified messaging to promote and implement habitat management for golden-winged warblers and other species.
- Staff virtually attended the regional Appalachian Mountain Joint Venture Technical Meeting July 28-29, 2020.
- ENSP staff continued to collaborate with NJ Audubon and PSEG to revise and implement management prescriptions for each span on the utility ROW maintained by PSEG that is part of the 1.5-mile stretch containing about half of NJ's GWWA population. Selective herbicide was used outside the breeding season the end of 2019/early 2020 on non-compatible vegetation within some of these spans.
- In 2020, six GWWAs used the GM spans during the breeding season, which is an increase from the five GWWAs breeding in these spans from 2019. For comparison, only three GWWAs were observed breeding in the non-ROW locations that contained known GWWA males in 2012 or 2013 (Fig. 5-1).
  - Overall, although not statistically significant, the declining trend of GWWAs on the 19 GM spans continues to be less than the decline of GWWAs on the 18 non-ROW locations. In 2020, these GM spans contained six of the 14 GWWA males observed in NJ, six were not on ROWs, and one was on non-GM spans along the same transmission line.

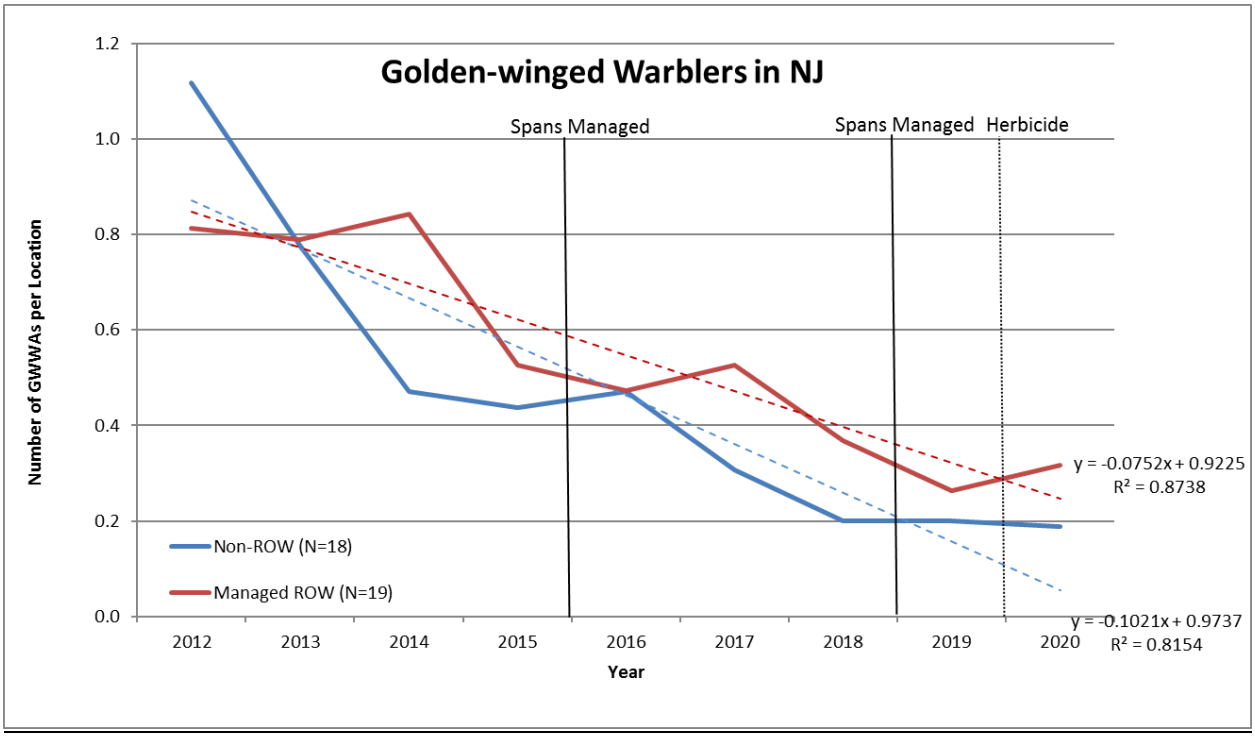

Figure 5-1. Number of golden-winged warblers observed per survey location from 2012 – 2020 (data from ENSP and NJ Audubon). The managed ROW (red) represents the 19 spans chosen for GWWA management, where the span-specific prescriptions were implemented winter of 2015/16 and early 2019, and selective herbicide on non-compatible vegetation was used end of 2019/early 2020. The Non-ROW (blue) represents known GWWA locations in 2012/13 that are not within a powerline. The dotted lines are linear trends.

Conclusions:

- Overall the proportion of suitable GWWA breeding habitat occupied by at least one GWWA during the breeding season has been decreasing at a rate around 5% per year since 2012 (Fig. 5-2). In 2020 we observed a loss of two breeding GWWA sites, which was 12.5% of the population observed in 2019.

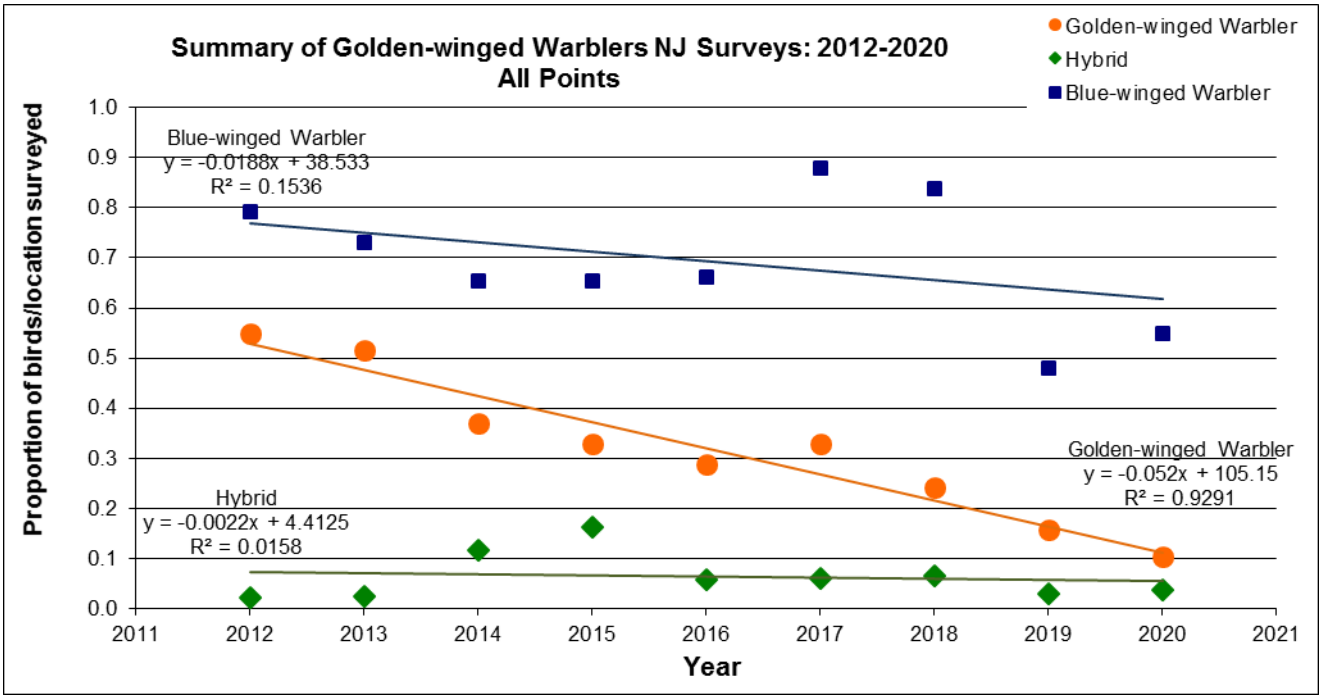

Figure 5-2. Proportion of golden-winged, blue-winged, and hybrid *Vermivora* warblers observed per survey location in suitable habitat during the 2012 (n=60), 2013 (n=60), 2014 (n=65), 2015 (n=76), 2016 (n=83), 2017 (n=67), 2018 (n=62), 2019 (n=102), and 2020 (n=135) surveys.

- Based on repeated *Vermivora* breeding surveys in suitable GWWA habitat, the golden-winged warbler population has declined at a rate of about 6.3 to 6.6% per year since 2012 (Fig. 5-3). If nothing is done to increase GWWA recruitment or productivity in NJ and this rate of decline continues, there is a 80% chance that NJ's breeding population of GWWAs will be extirpated within the next 10 years and 98% chance of extirpation within 20 years (Vortex 10.2.14.0).
- The collaborative work between ENSP, NJ Audubon, and PSEG to maintain certain spans for GWWA while maintaining compliance with federal regulations is successful, even with a continually declining population of GWWAs. Approximately half of NJ's breeding GWWA population on the transmission line maintained by PSEG, and about 43% of the population is breeding in the spans specifically managed for GWWAs. This is higher than the previous year.

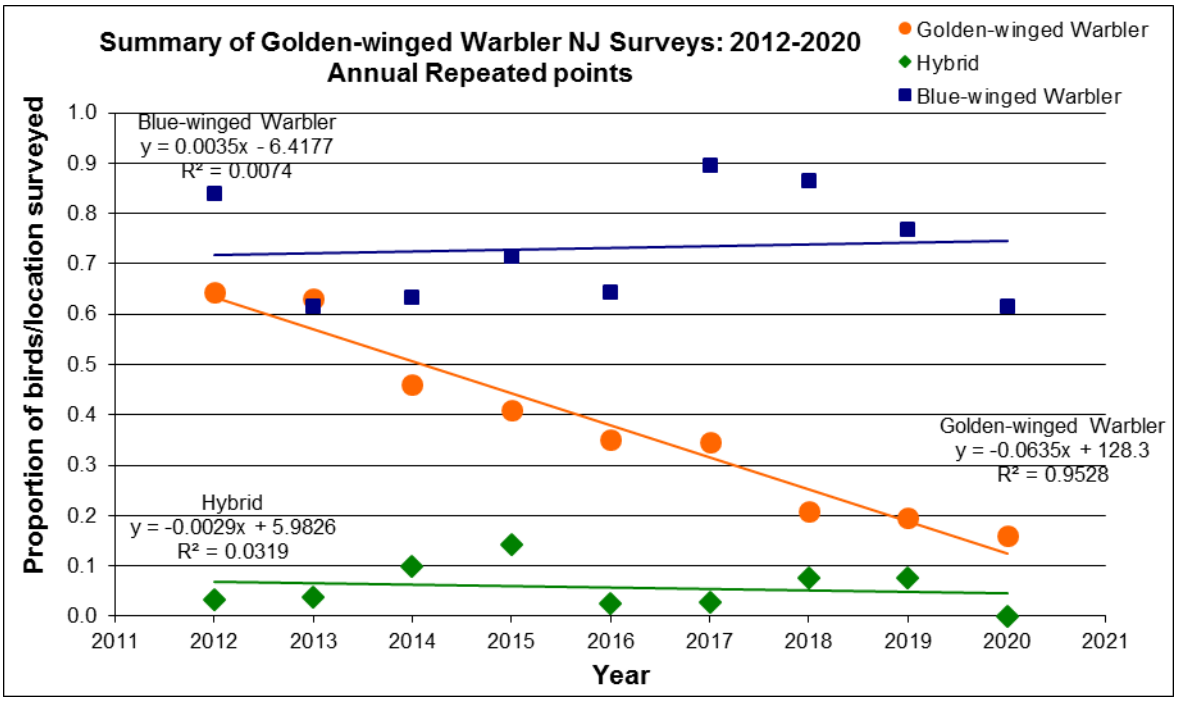

Figure 5-3. Change in golden-winged, blue-winged, and hybrid *Vermivora* warbler population observed in up to 57 NJ locations surveyed at least 7 of the last 9 years in suitable habitat. 2012 (n=45), 2013 (n=46), 2014 (n=50), 2015 (n=56), 2016 (n=57), 2017 (n=55), 2018 (n=53), 2019 (n=56), and 2020 (n=56).

Recommendations:

- Continue to coordinate surveys with NJ Audubon and the Golden-Winged Warbler Atlas Project (GOWAP), specifically targeting areas with >70% forest cover within a 1.5-mile radius.
- Work to create suitable habitat for golden-winged warblers in areas that would reduce nest and/or fledgling mortality and increase recruitment. Based on literature, focus should be on creating GWWA breeding habitat in or near wetlands in areas with > 70% forest cover within a 1.5-mile radius. Efforts should also be made to create or enhance forests near GWWA breeding habitat to increase post-fledging survival.
    - A 10% reduction on mortality in individuals between 0 and 1 year of age will reduce the probability of extirpation in 10 years to 58%.
    - A 10% increase in recruitment will reduce the probability of extirpation in 10 years to 54%

- A combination of a 10% reduction in juvenile mortality and 10% increase in recruitment will reduce the probability of extirpation in 10 years to 34%.

- Continue to collaborate with PSEG to retain the breeding GWWAs on their spans.
- Complete the status assessment and draft species recovery plan for golden-winged warblers in NJ.

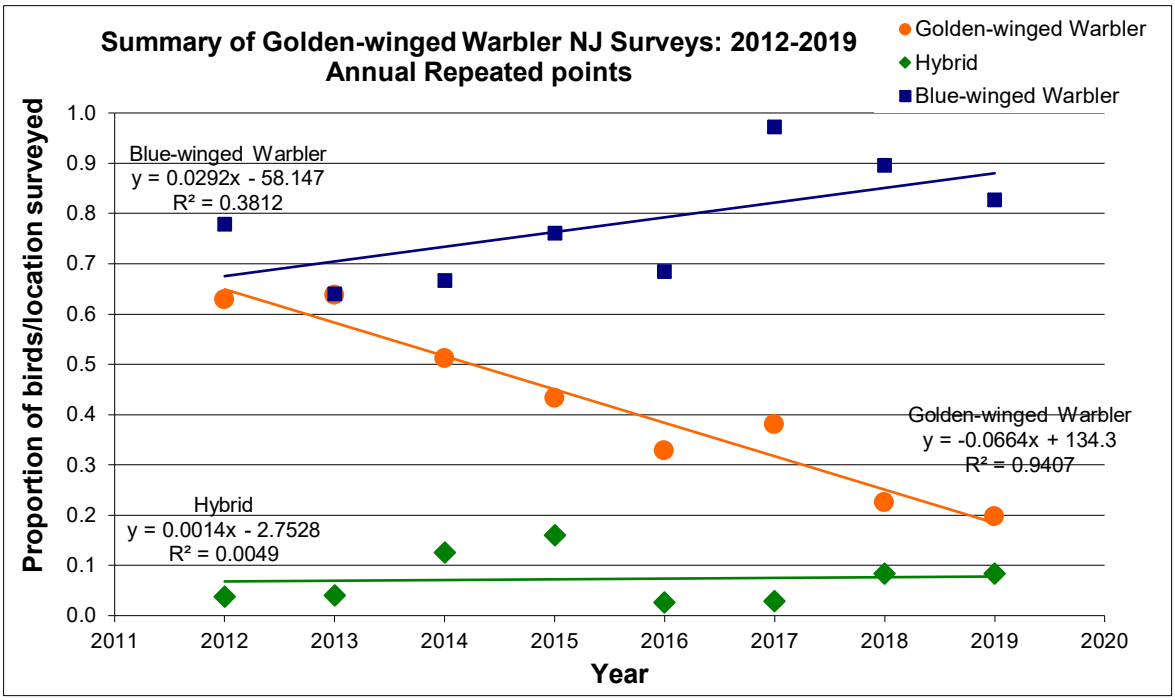

Figure 5-3. Change in golden-winged, blue-winged, and hybrid *Vermivora* warblers observed in NJ locations surveyed at least 6 of the last 8 years (n=51).

Recommendations:

- Continue to coordinate surveys with NJ Audubon and the Golden-Winged Warbler Atlas Project (GOWAP).
- Continue to collaborate with PSEG to retain the breeding GWWAs on their spans.
- Complete the status assessment and draft species recovery plan for golden-winged warblers in NJ.

~ END ~