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, 2019 – December 31, 2019

NJ Department of Environmental Protection

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

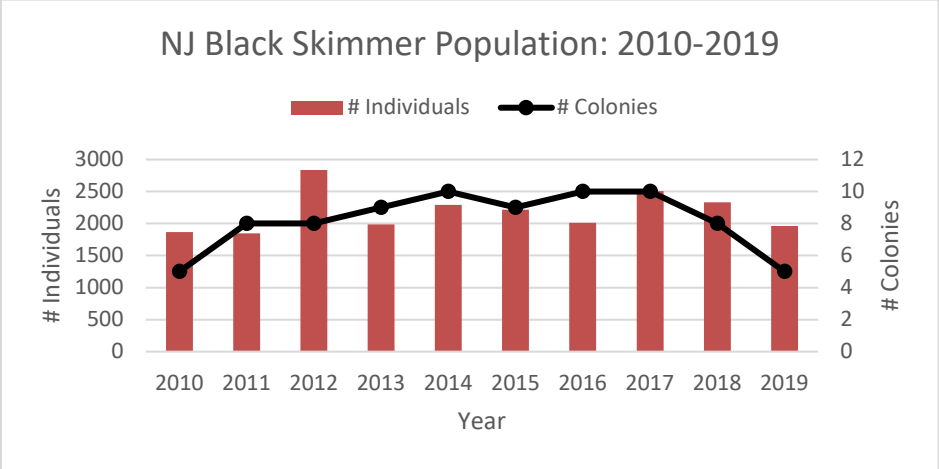
Prepared by: Christina Davis, Environmental Specialist II

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:

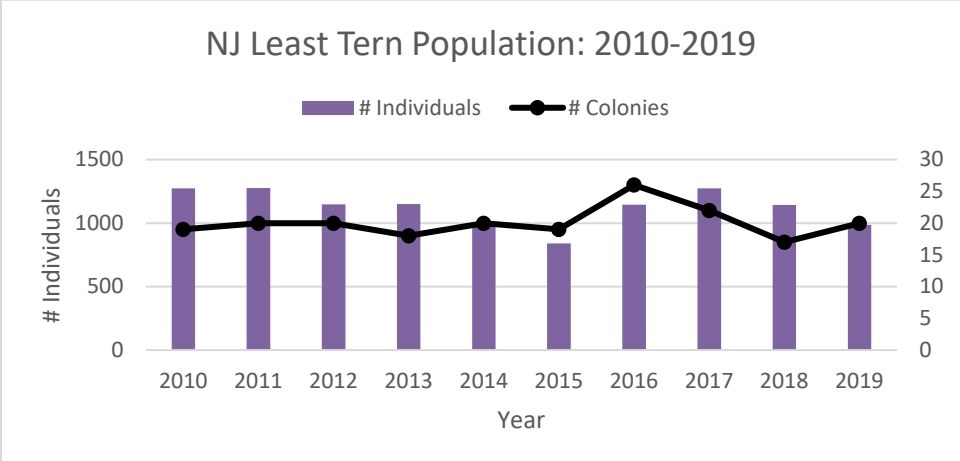
Black Skimmer



- 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 comprehensively surveyed, due to lack of resources, but some sites were visited as time and staff allowed. Ground surveys took place at eight 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.

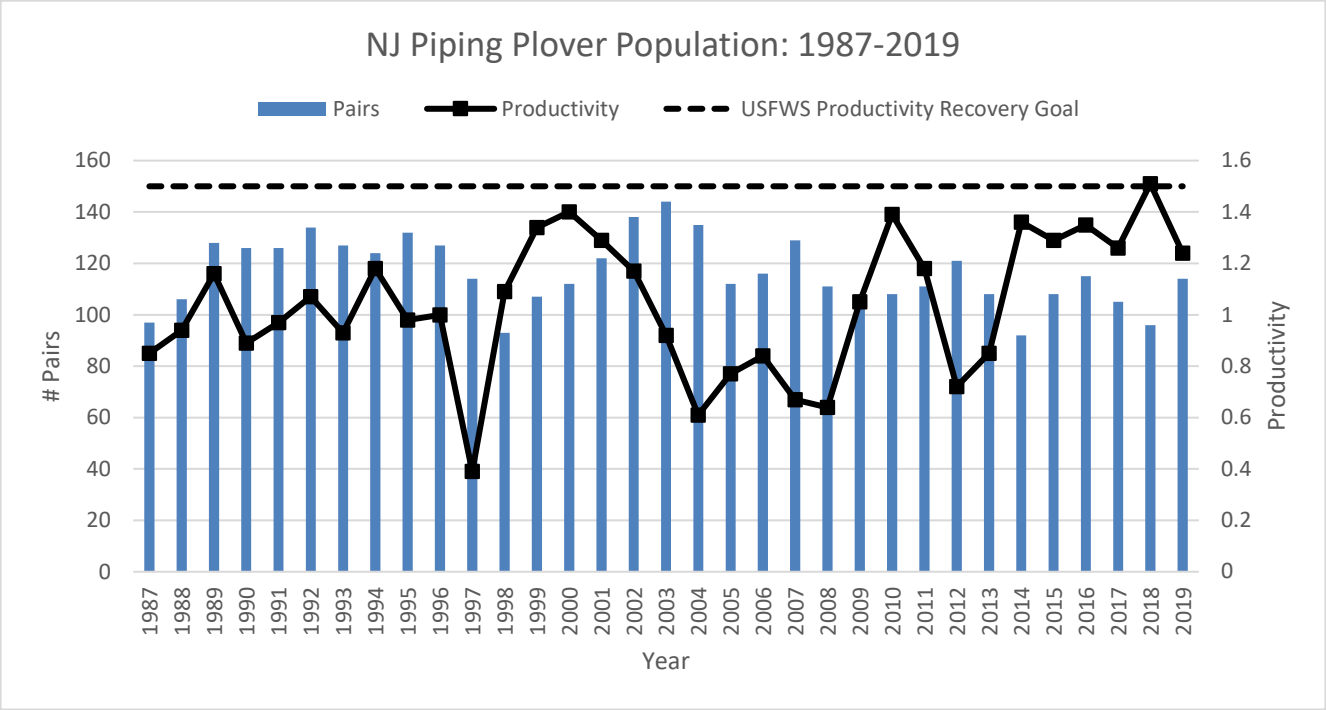
- A total of 1,963 adults were present at the active sites. This figure is the cumulative total of site counts that occurred in the peak survey period, which took place 24 July – 30 July. The sum of the peak adult number from each site was 2,114. A large the difference between these two numbers can suggest failure at any given colony and then relocation/renesting to another colony but this year it appears that most birds stayed settled in their initial nest sites. As has now been the case since 2010, the majority (67%) of the state's known population was present at just one site, which continued to be Seaview Harbor Marina (SHM) in Longport (1,425 peak adult count). However, the percent majority is at its lowest rate since SHM became a major site in 2008. It peaked at 89% of state's population in 2012 and this is the first time it has dipped below 70% since that time. Skimmers were documented continuing to visit the sandy restored areas of marsh islands (Ring Island, Mordecai Island and Great Flat), although no nesting was documented this year (likely because of predators).
- A peak count of 717 incubating adult black skimmers was tallied in the 10-16 July survey period. The incubation number was lower than might be expected given the number of adults present and was likely lower than what actually 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 on the lower side of moderate and a marked decline from 2018, with 403 fledglings produced statewide. This translates to 0.56 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 0.41. The true rate is likely somewhere in the middle. Three sites (Point Pleasant Beach, SHM and Stone Harbor Point) fledged young, in a much more evenly distributed pattern than in recent years. Rather than SHM producing the bulk of the state's fledges, it produced just 36%. Stone Harbor Point produced 44% and Point Pleasant Beach 20%. The fledge rate further highlights what may be the beginning of a departure from SHM as the major nesting area in the state. Depredation was the primary factor responsible for nest and chick loss on beach strand sites.
- NJDFW, The Wetlands Institute (TWI) and the Conserve Wildlife Foundation of NJ worked cooperatively to band 111 Black Skimmer near-fledglings on Stone Harbor Point, the highest season total yet. This effort was the most fruitful yet, since banding began in 2016, owing largely to the success of the colony at Stone Harbor Point. Nocturnal efforts for banding continued to be the preferred technique. Additional band sizes were utilized in 2019 to accommodate a variety of leg sizes and shapes and allowing banders to mark more birds than in season's past. Long-term goals of banding include better understanding of site fidelity and inter-state movements (particularly with New York breeding birds).
- Over the course of fall 2018-fall 2019, 27 individuals banded in NJ from 2016-2019 were observed either on migration or wintering grounds. Many NY and MA-banded birds were observed in NJ as migrants. One adult banded as a fledge in 2016 was observed breeding in NJ this year, marking the first confirmed breeding of a study bird.

Least Tern



- Least tern breeding bird surveys were conducted every week from mid-May until the end of August at beaches along the entire Atlantic coast. Colonies were located at 20 sites and observations were made at these locations for the duration of the season. These 20 sites were visited 3-7x/week for management and outreach for the duration of the nesting season.
- A total of 987 adults were present at these sites (based on a cumulative total of peak site counts that occurred in the 17-23 July survey period). The summed peak adult number from each site was 1,825. 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 2019.
- The population was distributed fairly evenly throughout the state and seven colonies had >100 adults with one colony 300+ adults. The largest colony was at Holgate, with 395 adults on its peak count followed by Sea Bright – North with 249 adults at its peak. The statewide adult number was lower than in recent years.
- A peak (census period of 12-18 June) of 624 adult least terns were observed incubating. Productivity was moderate for least terns with 384 fledglings produced statewide (0.62 chicks per pair, based on the peak number of incubating adults). The peak incubating adult count suggests a higher number of adults than was tallied for the total adult count. This is likely because not all adults associated with a colony were present during a count.

Piping Plover (*Full Piping Plover reporting can be found in NJ E-1-41*)



- One hundred and fourteen (114) pairs of piping plovers nested in New Jersey in 2019, a 19% increase from 2018 (96) and a 7% increase from 2017 (105). This increase represents one of the biggest single year jumps since records began and quelled serious concerns stemming from two years of declines.
- The total number of adults recorded for the entire nesting season (238) was somewhat higher than during the date-restricted survey conducted June 1-9 (233). The number of pairs tallied during the entire nesting season (114) was similar to the pairs recorded during the date-restricted census (111). There were 11 unpaired adults observed during the census, compared to 10 that remain unpaired by season's end. This figure is on the higher side for NJ and suggests there were, as there has been in recent years, bachelor birds that could not find a mate. This raises concerns about the number of available breeding birds in the population.
- Pairs nested at 27 sites statewide, a sharp increase from 19 in 2018 more in line with the peak counts of 30 sites recorded in both 2004 and 2005. However, the distribution remains heavily in the northern part of the

state, with only one site being added to Cape May and Atlantic Counties. However, that site, Corson's Inlet State Park, was an exciting development for a part of the state that has only suffered site losses as of late and bodes well for the future.

- Statewide pair-nest success (the percentage of pairs that successfully hatch at least one nest) decreased in 2019 compared to 2018 (83% vs. 91%, respectively), but was still above-average for the period since federal listing (69%). Looking at just NJDFW-monitored sites, 2019 pair-nest success (73%) was lower than the state-wide tally and in 2018 (96%) but higher than the period since federal listing (66%).
- The statewide productivity rate was 1.24 fledglings/pair, a decrease from 2018 (1.51 fledglings/pair). Productivity at NJDFW - ENSP-monitored sites (1.09 fledglings/pair for 33 pairs) was below the 2018 metric (1.59 fledglings/pair).
- NJDFW continued to use predator exclosures in 2019 with 49% of nesting attempts exclosed (statewide was 52%). The exclosed hatch rate for NJDFW nests was 74% (statewide was 83%). The NJDFW unexclosed hatch rate was 18% (statewide was 34%) and of the NJDFW nests not exclosed, 61% were lost to depredation (statewide was 37%). The abandonment rate for NJDFW exclosed nests was 15%, compared to 10% statewide.
- NJDFW purchased GPS data loggers in support of the State University of New York (SUNY)–Syracuse's piping plover research project in 2018. In 2018, 15 adults (13 females, 2 males) were outfitted for the long-term (one-year deployment) using a leg harness attachment technique. In 2019, nine of the 15 birds returned with their GPS units attached. No problems were detected with this attachment method and no injuries reported related to the units themselves (abrasion, cuts, etc). Eight adults were recaptured but only one retrieved unit functioned properly and provided data (the issue was related to manufacturing and the state will be compensated). The ninth bird was not able to be trapped.

Conclusions:

- Although NJDFW continues to be concerned that the majority of **black skimmers** were at just one site, that number is declining, and other substantial colonies are beginning to take shape. As SHM continues to vegetate (a primary theory as to the reason for fewer birds this year) and the other sites post success, it is expected that this trend will continue as birds seek other nesting habitat. If habitat conditions persist, is suspected that colonies will form/grow at Ocean City-North, Corson's Inlet State Park and Stone Harbor Point in 2020.
- The impact of sea-level rise in the marsh islands may be affecting occupied nesting areas. The largest colonies continue to be located either on the beach strand or on large, relatively stable marsh islands with a sandy substrate and 2019 saw almost no activity in traditional marsh colony areas (ENSP was not able to conduct large scale surveys in this habitat, but substantial colonies will often be reported by partners). This appears to represent a true move away from wrack nesting marsh colonies, which NJDFW will be closely tracking it in future years. The sandy restoration areas did not have success this year, but that seemed to be largely driven by predator activity. NJDFW remains committed to continuing to experiment with restoring habitats.
- The effort to band black skimmers took another significant leap forward this year, where project partners banded their largest number of chicks yet (111, up from 48, in 2018 and 35 in 2016), gained more experience and honed techniques that will serve the project well (such as nocturnal banding). Relatively speaking, the resight rate has been quite high which is already helping to answer basic questions about post-breeding dispersal and wintering locations. The confirmation of a breeding bird that was banded in NJ as a juvenile is the first step towards understanding natal site dispersal.
- The statewide **least tern** breeding population continued to be relatively stable, although total peak adult number was smaller than in recent years (but if double the peak incubating adult number, it is more in line with recent tallies). Higher productivity was achieved in 2019, which was a major goal this year. However, depredation is still a driving factor for nest and chick loss and a commitment to predation management must continue if high productivity is to be achieved. Management is occurring at many locations in the state, but there are key places where it is not tenable, and the result is outcomes like low productivity.
- The number of active least tern colonies (20) increased in 2019 and is back in line with the 10-year trend. The species is distributed rather fairly across sites and the state, in terms of location and number of individuals in colonies, so this was a positive outcome.
- The state recorded its sixth consecutive year of strong productivity for **piping plover** at 1.24 fledglings/pair, above the long-term average in New Jersey (1.03 fledglings/pair) and well above the levels believed necessary

to maintain a recovery unit-wide stationary population (~1.00 fledglings/pair). The sharp jump in pair number in 2019 is evidence of this sustained productivity and the trend that was lacking in 2017 and 2018, when population declines were observed. This lends some evidence to support a hypothesis that a higher than normal mortality may have been occurring on the migratory and wintering grounds in those years.

- The majority of plovers (71%) are still nesting at two federal sites (Gateway NWA – Sandy Hook and EB Forsythe NWR). Cape May County continues to be severely lacking in active nesting areas and pairs, but some progress was made in 2019. There were 43 pairs in this county in 2002, compared to just five in 2018. However, that was an increase from three in compared to 2018, and at two sites instead of one. Notably, the "new" site was Corson's Inlet State Park, which has historically been a stronghold for plovers.
- Predators were a major factor this year, in terms of hatch success and abandonment rates. As often happens, some individual predators (notably, red fox) were able to home in to all the nests at a site (multiple species) and inflict major damage in short periods of time. Biologist's decision-making regarding the use of exclosures and other predator management tools were tested this year, with mixed results. Hatch success was down and abandonments sharply up from 2018, especially at NJDFW sites, underlining the complex decision-making that is involved with predator-related decisions on a year-to-year basis, even at the same sites.
- This chick mortality research project for which transmitters/loggers were deployed on plover adults and juveniles is on-going and final results are not yet available. The leg harness GPS logger deployment appeared to be a success in terms of safety, but the overall results mixed with such a high degree of transmitter failure.
- Although the distribution of plovers is currently strongly tied to federal properties, least terns and black skimmers are distributed throughout the state and have started using areas that can be surprising. To wit, the tern/skimmer colony at Point Pleasant Beach was extremely successful, despite being located on a highly recreated and groomed beach. This trend is even more apparent with American oystercatchers (not reported here, but a cohort of the beach-nesting bird group). As the pressure on the coast grows (by human recreation, sea level rise and development), biologists expect more of this type of response to the solutions that humans create (such as stabilization and beach replenishments), which may have short-term attractiveness to some beach-nesting bird species.

Recommendations:

- Continue to periodically monitor 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 in the coastal zone. Develop similar plans for state managed parks and natural areas.
- 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 Barnegat Light, Malibu Beach WMA, Stone Harbor Point and Cape May Point State Park and carefully selected marsh islands. Conduct smaller efforts to control vegetation as needed (for example, at Seven Presidents Oceanfront County Park and Belmar – Shark River Inlet).
- Continue to work with regional partners, through in-person meetings and conference calls, 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 2015-19 (though the aforementioned SUNY research project). Monitor arrival and departure dates and local movements of all banded birds. Peruse records of observations of birds on their migratory stopover and wintering grounds through birding listservs,

eBird, social media and other online documentation tools. Enlist volunteers to help with survey efforts. Work towards analyzing and publishing piping plover migration data. Use this date to better understand survivorship and make progress towards understanding the population decline in recent years.

- Continue to band plovers (in conjunction with SUNY or independently) and skimmers, and investigate banding least terns.
- Continue to work with partners in regional coordination, research and protection efforts for black skimmers. Formalize research questions to be answered by banding and participate in the creation of a database where band resights can be entered, accessed, and stored. Consider doing the same for 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 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.

Marsh species

Colonial Waterbirds

Prepared by: Christina Davis, Environmental Specialist II

This job was inactive during the 2019 reporting period.

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); resightings of marked red knots indicated some birds left Delaware Bay early. 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. The aerial survey does not account for turnover; (the total number of knots moving through Delaware Bay stopover, May 1 to June 7).

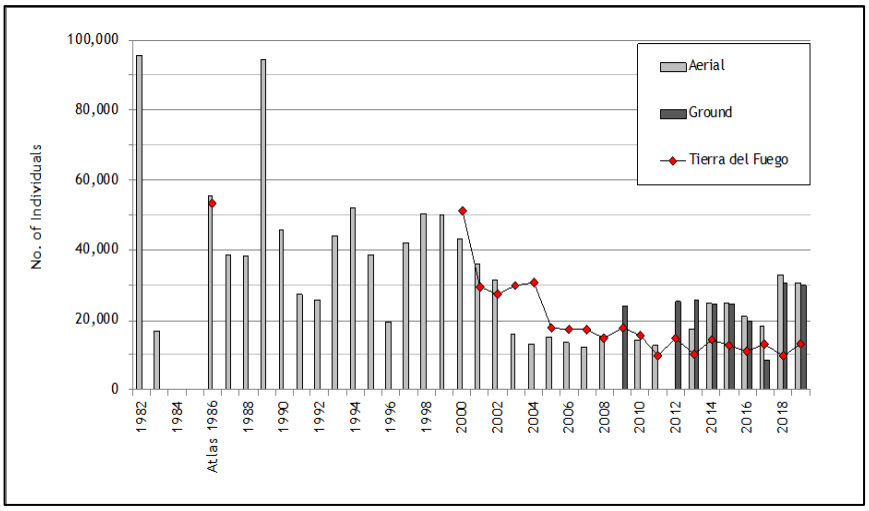


Figure 1. Peak aerial count of Red Knots in Delaware Bay during spring stopover, 1982-2019; aerial count of Red Knots in Tierra del Fuego (major wintering area) 1986-2019. Source: Delaware Bay aerial survey, NJ Division of Fish and Wildlife, DE Division of Fish and Wildlife, New Jersey Audubon; Tierra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

- Red Knot Distribution from Aerial Survey - Since 2009, there has been an apparent shift in red knot distribution toward use of NJ's bayshore beaches, with an average of 80% using the NJ shoreline. This is

due, in part, to the change from weekly aerial counts that captured shifts in bay-wide distribution, to fewer counts conducted during the peak stopover (~May 18 - 28). Given equal or greater egg resources on DE beaches historically (2005-2013) and in 2019 (21,613 eggs/m^2, n=4 sites), food availability does not readily explain the observed shift. Likewise, proximity of high-tide roosts (day, night, and spring tides) are not an apparent influence on red knot distribution in aerial surveys. Based on surveys around Memorial Day weekend when red knot number peak, we suspect human disturbance plays an important role in red knot distribution. Factors that likely influence red knot distribution include: NJ restricted beach access, staffed by volunteers to reduce human disturbance; and beach restoration that created numerous, large intertidal shoals that support spawning crabs.

- 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 2019, the proportion of red knots reaching ≥180 grams was 0.43, similar to 2018 and higher than 2017. Since 2005, P180 has varied widely and has not shown substantive or sustained improvement.

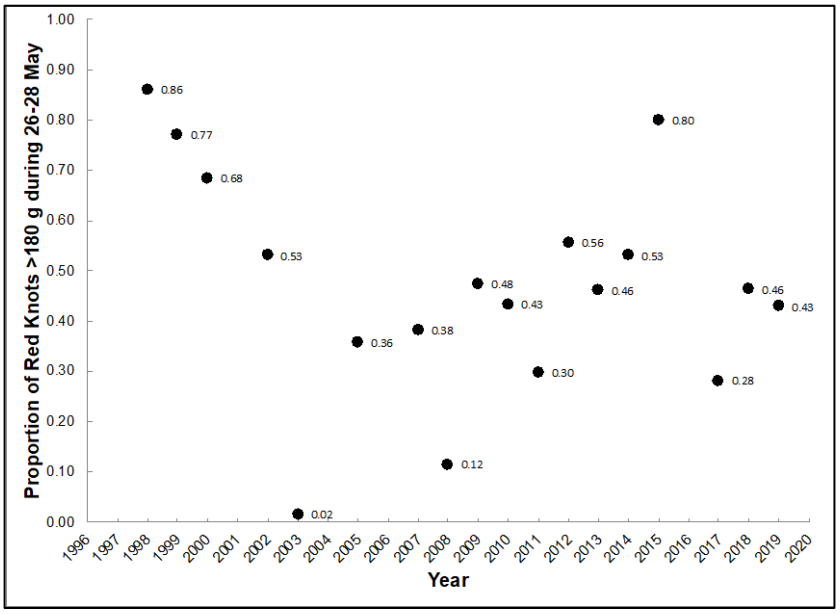


Figure 2. The proportion of red knots reaching ≥180 grams (P180) at time of departure from Delaware Bay (May 26-28) excluding capture data from Mispillion Harbor, DE. Source: NJ and DE Divisions of Fish and Wildlife.

- Superpopulation Estimate for Red Knot – The superpopulation estimate for red knots in the Delaware Bay stopover was 45,113 in 2019 (95% CI: 42,269-48,393), 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 estimate 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.

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]

[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 2019 were similar to 2018 and have not shown substantial increase over the last ten years. 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).

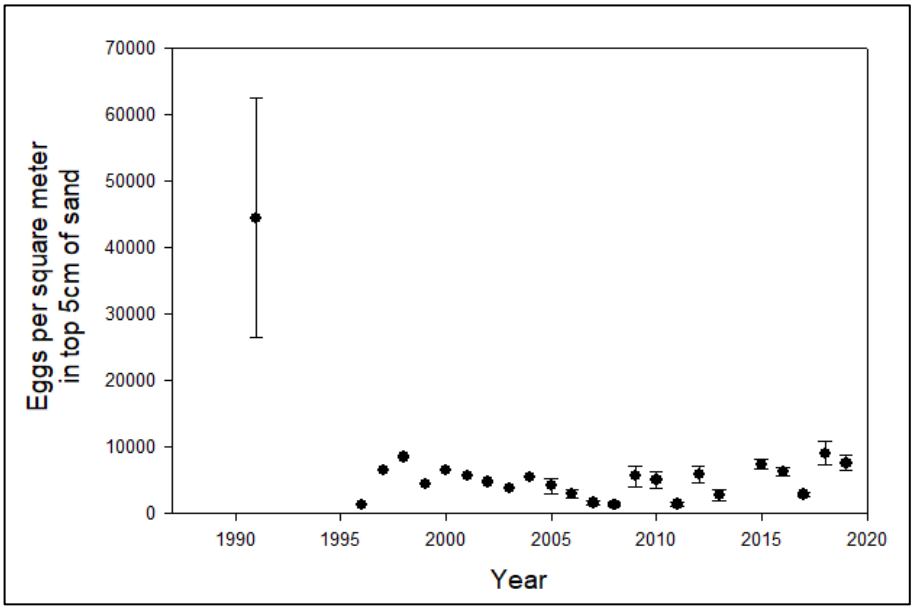


Figure 3. Surface egg densities on NJ beaches: Historic 1990-1991 (Botton et al. 1994), unpublished report to NJDEP 1996-1999 (Botton and Loveland), NJDFW unpublished data 2000-2019 (NJ Division of Fish and Wildlife).

- Beach Protection – Shorebird stewards were recruited, trained, and fielded at seven beaches during the peak stopover period to help prevent human disturbances to foraging shorebirds. Seventeen stewards logged 391 hours, and provided brochures to assist as they interacted with the public.

- There were no habitat enhancement or restoration projects carried out in 2019 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 remained stable since 2011.
- 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.

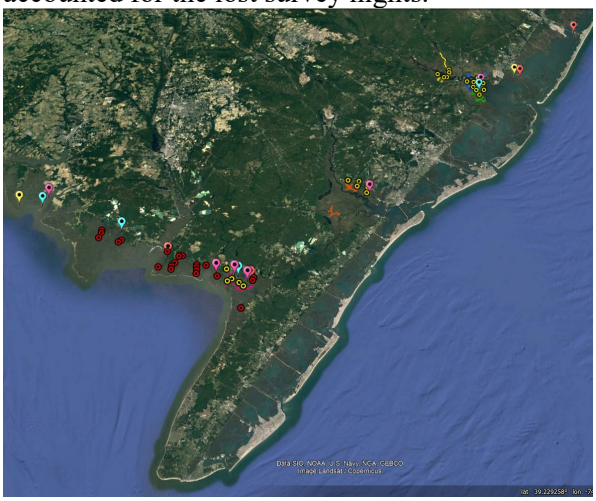
Recommendations:
- Continue NJ and DE long-term collaboration on red knot/horseshoe crab research and conservation efforts; ensure annual red knot data are provided to the ASFMC such that shorebird biologists continue to have a cooperative role in horseshoe crab management and restoration, and USFWS has annual recovery metrics necessary for annual status assessment.
- 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.
- 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.
- Increase 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 sheltered spawning habitat.

Objective 3 – Secretive Marsh Birds

Prepared by: Christina Davis, Environmental Specialist II

Key Findings:
- A focused black rail survey was initiated in 2015 and continued 2019 as concerns over the security of the black rail population along the eastern seaboard, and particularly the mid-Atlantic, heighten.
- ENSP biologists continued to use the GIS-based Marsh Zone Map (publicly available from the Saltmarsh Habitat & Avian Research Program website) as well as ground truthing areas to select points and troll routes.
- Each point was located at least 400m from one any other and coded as either "water" or "road." Points were also segregated into their Watershed Management Areas (Mullica, Great Egg Harbor, Cape May and Maurice-Salem- Cohansey). For example, point GEH-W-208 was point #208 in the Great Egg Harbor Watershed Management Area and was accessible by water. In 2019, both "water" and "road" based points were surveyed.
- New to 2019, observers experimented with "troll" routes. These were water-based routes where the boat engine was either shut off or idled and observers played call and listened as they floated through a pre-selected area. The goal was to cover more overall area than could be completed with points alone.
- Also new in 2019, staff deployed six Wildlife Acoustics SM2 acoustic recording units (ARUs) at 16 locations, rotating them every two weeks from 25 April- 18 July. Locations were selected through ground truthing in suitable habitat (some locations were surveyed for more two-week increments than others, depending on apparent quality of habitat). Data files were reviewed through an automated process using Wildlife Acoustics SongScope software.

- Point survey protocol was compatible with that being used elsewhere along the east coast. Surveys were a call-playback consisting of a combination of passive listening and recordings (of black and Virginia rails). The survey window in 2019 was 5 May– 14 July and three surveys (≥ 7-10 days apart) were taken at each point. The survey period was ten minutes (plus a two-minute settling in period prior) and calls were recorded to the minute they occurred. Surveys took place between 10pm and 3am. Surveys were limited to low wind conditions with little/no precipitation and a rising or high tide (to allow boat access in shallow waterbodies). Black rail data were given the priority, but rail calls of all species were recorded by observers. Site and weather data were recorded for each point as well.
- ENSP staff carried out the surveys with the assistance of one seasonal employee and six contracted freelance biologists at 25 water-based points, 27 troll lines, and 19 road points. Survey points consisted of a combination of those that had "hits" in the past and new locations in suitable habitat. Similar to 2018, there were zero black rail detections at any of the points, even at those with previous black rail detections.
- Twenty of the water-based survey points were surveyed the prescribed three times. Two points were surveyed two times and three points were surveyed just once. Poor weather and mechanical boat failure accounted for the lost survey nights.



Location of 2019 survey points and trolls

- Although no black rails were detected, many other species were heard. This list includes six species of ducks/geese/swan, seven species of shorebirds, three species of gulls, four species of wading birds, four species of owl/raptor, and 13 species of passerine. Least bittern, clapper rail and Virginia rail were also heard.

Conclusions:

- Nocturnal surveys continue to be the best time to survey this species in New Jersey, but this comes with many logistical challenges. Important components for successful boat-based surveys are an understanding of the waterways (accomplished through daylight recon trips), appropriate lighting system and spotlight on the boat, reliable GPS or electronic mapping system (such as Google Earth on smartphone) to follow in real time, and ability to track weather through radar during the survey. Challenges included having only one boat operator and being limited to nights with good weather *and* the correct tides. Road-based points are much easier, logistically, but don't provide comparable access to habitat.
- Troll routes were not as successful as hoped for. When the boat's engine was cut, it did not float as well with the tide as anticipated and when it was idling at low speed, surveyors reported it was louder than ideal listening conditions would dictate. There were also concerns that the sound was discouraging birds from calling, as they may have perceived it as disturbance.
- ARUs continue to hold promise to enlarge the area that can be surveyed (and the amount of time each area can be surveyed) during a busy survey season when only a handful of nights provide suitable conditions for water-based surveys. The downside is that there is an immense amount of data collected (in 2019, ~1,900 hours) so manual review of the files is not practical. Automated review was the method used in 2019, but there are concerns that this may not detect hits if the software is not successful at "finding" the black rail calls. The units themselves functioned well, were easy to operate, and were dependable in the marsh

environment. This was the first year there was a dedicated seasonal employee on this project and that allowed the ARU component to be more fully utilized than in the past.

- The lack of black rail detections continues an alarming trend. For the second year, there were no black rail detections on any surveys at any points. In addition, NJDFW is not aware of any black rail detections in the state for 2019 (through eBird, birding networks, etc). In 2018, it was postulated that the lack of calling might have been weather related, as it was particularly cold and wet, or because there were so few points surveyed. However, 2019 did not suffer the same poor weather conditions consistently through the survey period so that did not appear to be the issue. The number of points was increased this year, due to the road-based points and ARUs. While still not comprehensive of all suitable habitat in the state, one would expect that if there was something resembling an intact population, detections would be made. Visually, there did not appear to be any major changes to the habitat that was occupied in 2015 and 2016, but there are many variables that could be at work (such as flooding regime, or water levels, or predators). Considering the downward trend throughout the rest of the range, the lack of detections is especially concerning.

Recommendations:

- Since boat-based surveys are critical in accessing and surveying this species' habitat, consider hiring additional boat operators so that evenings with good conditions (clear and still, high tide) could be maximized by utilizing multiple crews. Without more crews, the number of points that can be surveyed in one season is limited.
- Continue to deploy ARUs and purchase additional units. Upgrade to Kaleidoscope software for automated review of data. Determine a manageable sampling protocol of acoustic data that can be manually reviewed. Conceive and implement an anti-theft deterrent system.
- Continue to focus survey efforts in the southern regions of the state and prioritize boat-based surveys. Use road-based surveys to complement boat-based and to cover as much habitat as possible. Expand survey area in Delaware Bay marshes.
- Continue engagement with the Black Rail Working Group to help determine what management actions can be taken to help recover this species and contribute to the status assessment that is currently being undertaken by the USFWS.
- Continue to incorporate breeding data into the Landscape Project and NJ DEP's Biotics database.

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 eleven nest sites were monitored during the nesting season, of which 190 were documented to be active (with eggs) and 21 were territorial or housekeeping pairs. Twenty-seven new eagle pairs were found this season, 19 in the south, three in central and five in the north. One hundred forty-eight nests (80%) of the 184 known-outcome nests produced 249 young, for a productivity rate of 1.35 young per active/known-outcome nest. Thirty-five nests (18%) failed to produce. The Delaware Bay region remained the state's eagle stronghold, with roughly half of nests located in Cumberland and Salem counties and the bayside of Cape May

County. Eighty nest watchers recorded data on the majority of the 180 tracked nests; 68 nest watchers who used online reporting logged 3,250 hours and 31,282 miles for the project.
Duke Farms donated the cost of a satellite transmitter that ENSP biologists attached to a nestling that successfully fledged in June. Tracking of this eagle, along with past tracking data of other eagles, is on the CWF website, EagleTrax.
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 reprinted and distributed to landowners and to other interested citizens by staff and nest watchers. Eagle Project volunteer orientation meetings were held in both northern and southern NJ in February and March. 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 2019 New Jersey peregrine falcon population decreased slightly to 38 known pairs with 33 active (known to lay eggs), down from 40 and 37 last year. However, the same number of pairs (28) were successful in producing 78 young, for a productivity rate of 2.36 young per active nest and a success rate of 85%. Accounting for known young lost around fledging, the productivity rate dropped to 2.21 young per active nest. A brief summary of data collected during the 2019 nesting season follows:

- 18 pairs nested on towers and buildings and continued to be the core of the nesting population, producing 52 young, for a productivity rate of 2.89 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.
- Nine pairs occupied territories in natural cliff habitat, six of which were known active. Just two nests were successful in producing six chicks for a productivity rate of 1.00 young per active nest; accounting for known mortality (pre-fledging in this case), the rate dropped to 0.50. This was a setback compared to good results last year.
- Nine pairs of falcons were known to nest on bridges this year. Five 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 20 known young that fledged, for a productivity rate of 2.22 young per active nest. 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 recently occupied bridges are low to the water (~20-25 ft), and ENSP removed nestlings from one bridge to avoid fledging mortality (those nestlings fledged from their foster nest); two fledglings were rescued from the water at the other low bridge area, and fostered to a safe nest site.

ENSP staff banded 59 of the 78 young produced (though not all fledged), following national protocol. The 19 young we were unable to band fledged from sites that could not be accessed at the appropriate time.

In 2017 and 2018 we documented two nestling mortalities that resulted from lead-poisoned prey. They prompted us to take blood samples at four nests in 2018 and eight nests in 2019. The results had Pb ranging from <0.01 to 0.13 ppm; the lowest levels were found at coastal nests with one exception, the highest concentration found in a 2019 nestling in Manahawkin. Outside of this single high level, urban nests in Elizabeth, Burlington, and Jersey City were elevated at averages 0.92, 0.70, and 0.63 ppm, respectively. We will keep looking at this issue to understand the risk and possible sources of lead for urban peregrines.

In 2019, we expanded our use of *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 17 breeding adults at ten nest sites. An additional 12 adults were identified using optics. A minimum of eight 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 669 occupied nests, a new high. Eighty-one percent were located along the Atlantic Coast, 14% along Delaware Bay, and the remainder (30 nests) were active in the northern region from the Meadowlands to the Delaware River. Productivity averaged 1.91 young/active-known outcome nest, close to the five-year average and 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 an average productivity rate of 2.09 vs. 1.90. In some parts of Delaware Bay, many previously active nests were reportedly abandoned or not active this year, a situation that will require more attention in 2020. Staff and volunteers recorded production of 932 young from 488 active/known-outcome nests; 286 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 14th nest box season in 2019. A total of 72 nesting attempts occurred in boxes monitored by ENSP and partners. Approximately 250 nest boxes were monitored every 12-15 days April-early August. Of the total nesting attempts (n=72), 51 (71%) were successful, as defined by nestlings that reached the bandable age of 14-22 days; 21 attempts (29%) failed. 2019 was the first year that ENSP staff and volunteers entered nest check data online via program *NestStory*. More training is needed for expanded use in 2020. 2019 nest success was 71% and average productivity was 2.72 young/active nest, with 3.84 young per successful nest.

- **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 2019. ENSP biologists plan to work with NJDEP Forest Service staff to support positive habitat management for forest raptors in the upcoming NJ Forestry Plan.

- **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 102 locations suitable for breeding GWWAs in NJ were surveyed in 2019. ENSP staff also coordinated with NJ Audubon to survey an additional 36 locations for golden-winged warblers (GWWA) within utility ROWs.
- Within those 102 locations of suitable habitat in NJ, sixteen GWWA, three hybrids, and 49 blue-winged warblers were observed during the 2019 survey period. One of the GWWAs was confirmed through eBird.

- Six (37%) of the 16 NJ locations occupied by GWWA in 2018 were not occupied in 2019.
- Three (19%) of the 16 GWWA locations were without GWWA observations in 2018 and were recolonized in 2019. Two (13%) of the 16 locations had no prior GWWA observations but were colonized in 2019.

- Data will be submitted for entry into the NJ DEP's Biotics database by mid-February 2020.
- The GWWA status assessment has been revised and is in final draft form.
- Staff attended the regional Appalachian Mountain Joint Venture Technical Meeting in Frostburg, MD, August 5-7, 2019.
- 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. The second phase of treatment, decided upon by ENSP staff, NJ Audubon, and PSEG, was implemented by PSEG on 17 of the 19 spans chosen for GWWA management (GM) between February and April 2019.
- In 2019, GWWAs continued to use many of the GM spans during the breeding season, but there were fewer birds detected than in 2018; 32% of the GWWAs breeding in these spans in 2012 were detected in 2019. For comparison, less than 18% of the GWWAs breeding in the 18 non-ROW locations that contained known GWWA males in 2012 or 2013 were detected in 2019 (Fig. 5-1).
  - There was more of a decline of GWWAs detected on the GM spans in 2019 than on non-ROW spans. 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 2019, these GM spans contained five of the 16 GWWA males observed in NJ, eight were not on ROWs, and three were on non-GM spans along the same transmission line.

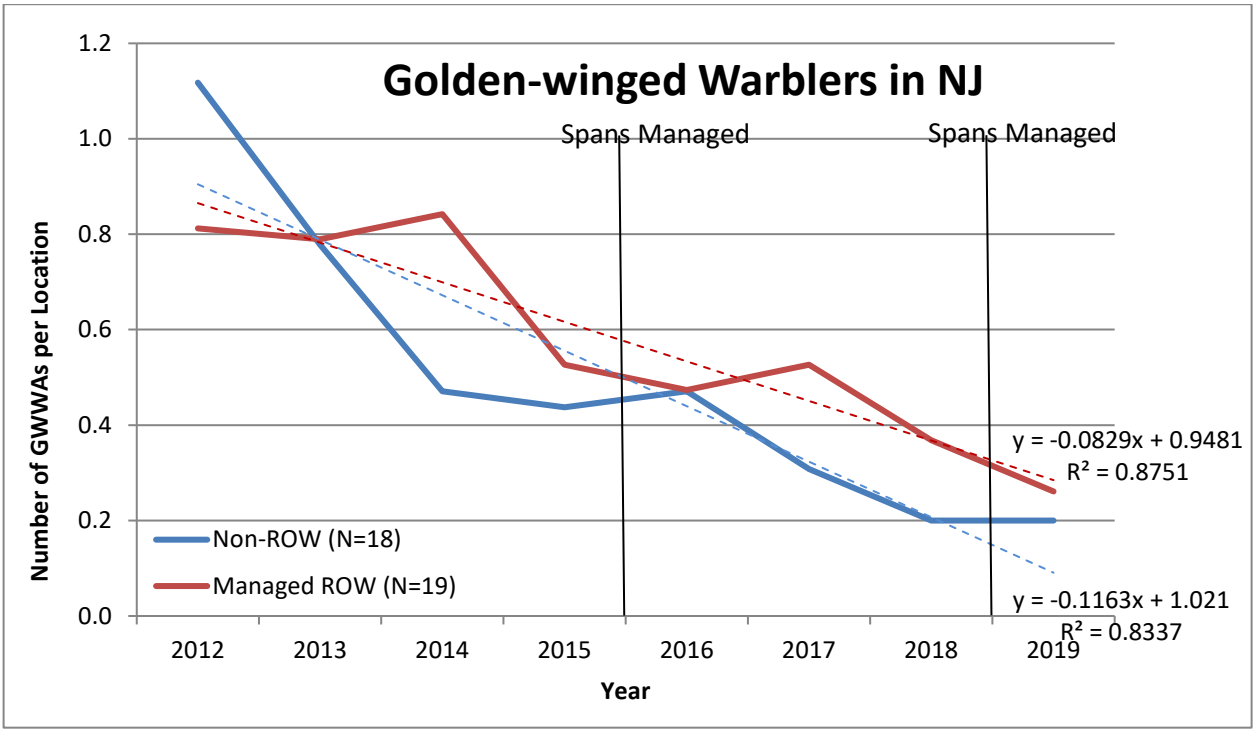


Figure 5-1. Number of golden-winged warblers observed per survey location from 2012 – 2019 (data from ENSP and NJ Audubon). The managed ROW (red) represents the 19 spans chosen for GWWA management, where the span-specific prescriptions were implemented winter of 2015/16 and early 2019. The Non-ROW (blue)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

Conclusions:

- The proportion of suitable GWWA breeding habitat occupied by at least one GWWA during the breeding season has been decreasing at a rate of 6.6% per year since 2012 (Fig. 5-2). In 2019 we observed no net change in breeding GWWA sites (based on: previously vacant sites recolonized + new occupied sites

discovered - previously occupied sites lost). Unlike previous years, in 2019 less than half (31%) of NJ's observed golden-winged warbler breeding population was located on a 1.5-mile stretch of utility right-of-way maintained by PSEG. That said, half (8/16) 2019 of the known NJ GWWA breeding population was observed in utility ROWs.

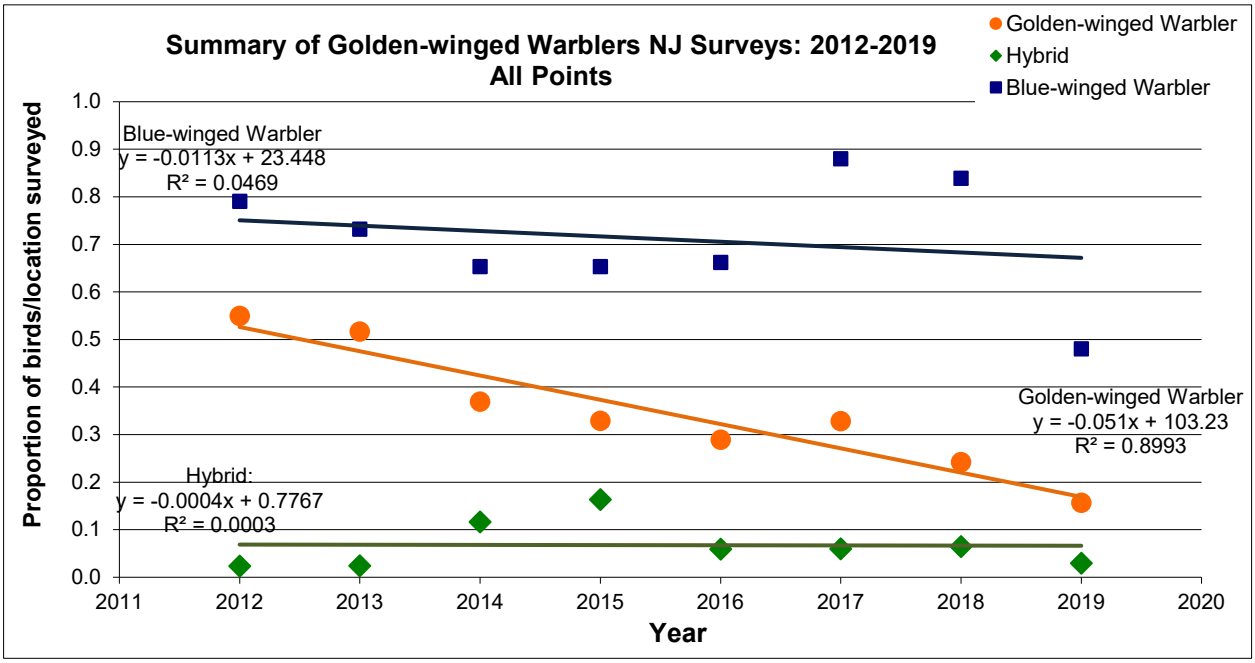


Figure 5-2. Proportion of golden-winged, blue-winged, and hybrid *Vermivora* warblers observed per survey location during the 2012 (n=60), 2013 (n=60), 2014 (n=65), 2015 (n=76), 2016 (n=83), 2017 (n=67), 2018 (n=62), and 2019 (n=102) surveys.

- Based on repeated *Vermivora* breeding surveys, the blue-winged warbler population is fluctuating but has experienced an overall increase in northern NJ. The golden-winged warbler population, however, has declined at a rate of about 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 97% chance (Vortex 10.2.14.0) that NJ's breeding population of GWWAs will be extirpated within the next 20 years.
- Approximately half of NJ's breeding GWWA population on the transmission line maintained by PSEG, and about 31% of the population is breeding in the spans specifically managed for GWWAs. This is lower than previous year, possibly due to a combination of a continued population decline and the recent management done on the spans. 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.

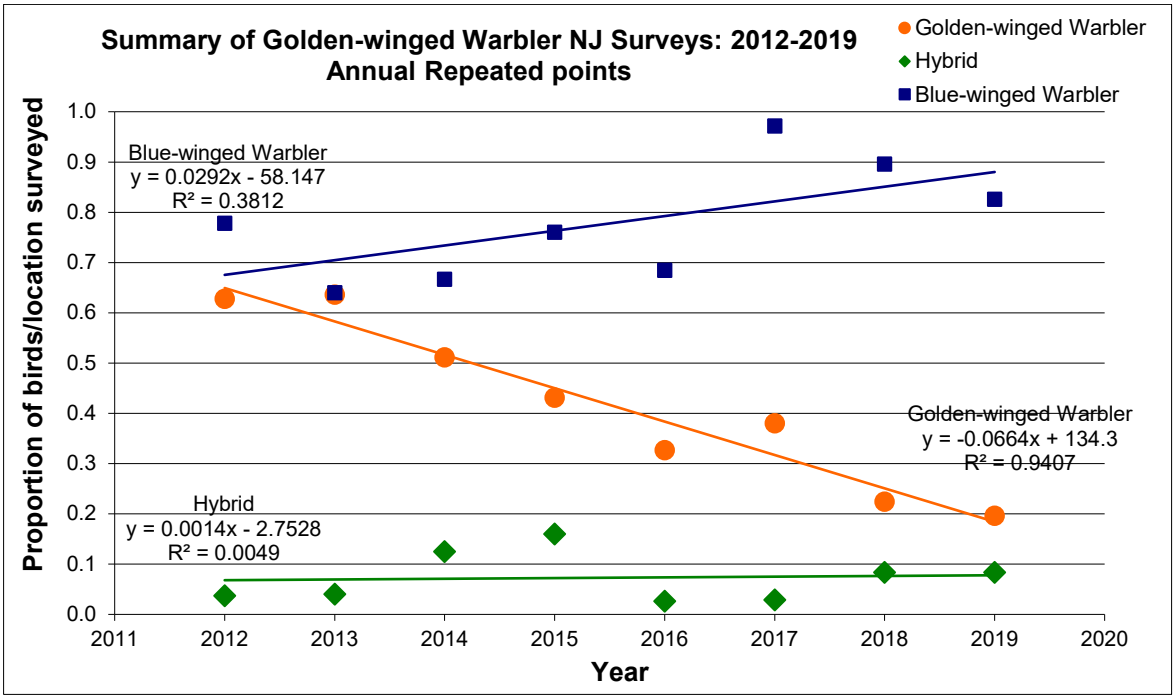


Figure 5-3. Change in golden-winged, blue-winged, and hybrid *Vermivora* warblers observed in NJ locations surveyed at least 6 of the last 8 years (n=51).

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 ~