

**Interim Report
State Wildlife Grants
T-1-7
F13AF01086**

Endangered, Threatened and Rare Wildlife Conservation Projects

**Interim Report for Project Year
September 1, 2016 – September 30, 2017**

NJ Department of Environmental Protection

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



Performance Report

Project: 1. SGCN Research, Monitoring and Management
Federal Aid Project: T-1-7 (State Wildlife Grants)
Segment dates: September 1, 2016 to September 30, 2017

JOB A. Bird Conservation

Subjob A.1. RAPTORS – *This Subjob was inactive here, but active under grant NJ W-70-R*

Subjob A.2. LAND BIRDS

Golden-winged Warbler

Project Leader: Sharon Petzinger

Objective: To conserve and manage the New Jersey golden-winged warbler (*Vermivora chrysoptera*) population and gather and analyze data to inform conservation status and recovery plan actions of this species.

Key Findings:

- In addition to the locations surveyed to evaluate Working Lands for Wildlife (see Job B1 in Project 2), ENSP staff surveyed 11 locations and coordinated with NJ Audubon to survey an additional 33 locations for golden-winged warblers in potential habitats (utility ROW, shrub swamp, successional forest, old field). NJ Audubon also provided golden-winged warbler observations on utility ROWs from 2012 through 2017 which were used in the analyses.
- Twenty-one golden-winged warblers, three hybrids, and 50 blue-winged warblers were observed during the 2017 survey period in NJ.
 - Ten (48%) of 21 NJ locations occupied by golden-winged warblers in 2016 were not occupied in 2017, two (13%) of the previous 16 golden-winged warbler locations missing golden-winged warbler observations in 2016 were recolonized in 2017. Six (38%) of the 16 locations without any previous golden-winged warbler observations in 2016 were colonized in 2017.
- One of the golden-winged warbler males banded in 2015 was re-sighted in 2017 along a utility ROW at the original capture site. This ROW was part of a GWWA-specific maintenance prescription to allow for GWWA habitat while maintaining vegetation in compliance with regulations (see Job B1 in Project 2).
- Data will be submitted for entry into the NJ DEP's Biotics database by mid-January.
- Staff attended the first Northeast Appalachian Mountain Joint Venture Technical Meeting in Ithaca, NY, March 21-22, 2017, and the regional Appalachian Mountain Joint Venture Technical Meeting in Lake Hope, OH during July 31- August 2, 2017.
- The area of forest and shrubs around each golden-winged warbler survey point are being calculated to inform the golden-winged warbler status assessment and recovery.

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 5%/year since 2012 (Fig. 1). In 2017 we observed a net loss of breeding GWWA sites (based on: previously vacant sites recolonized + new occupied sites discovered - previously occupied sites lost). Similar to previous years, about half 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. However, in 2017 about 66% (14/21) of the known NJ GWWA breeding population was observed in utility ROWs.

- Based on repeated *Vermivora* breeding surveys, blue-winged warblers are fluctuating but experienced an overall increase in northern NJ since 2012. Golden-winged warblers, however, have shown a consistent decline of 6.3% per year since 2012 (Fig. 2). If nothing is done to increase GWWA recruitment or productivity in NJ and this rate of decline continues, it is likely that NJ's breeding population of GWWAs will be extirpated in about 10 years.

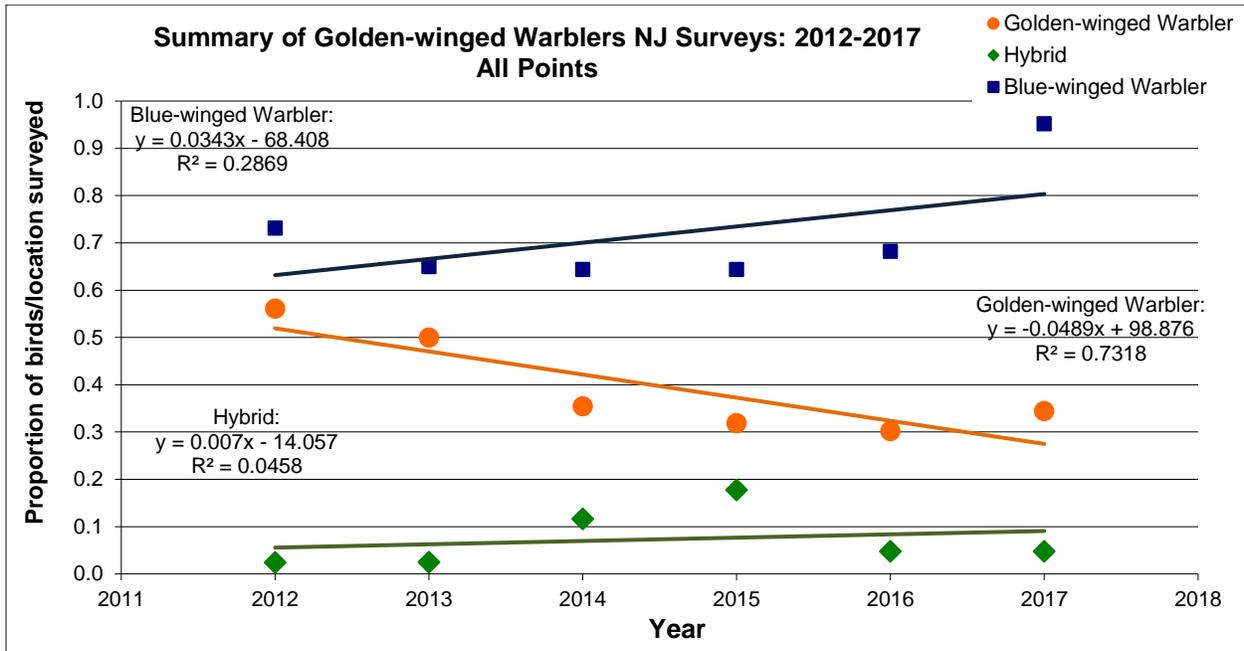


Figure 1. Proportion of golden-winged warblers, blue-winged warblers, and hybrids observed per survey location during the 2012 (n=57), 2013 (n=56), 2014 (n=62), 2015 (n=69), 2016 (n=76), and 2017 (n=58) surveys.

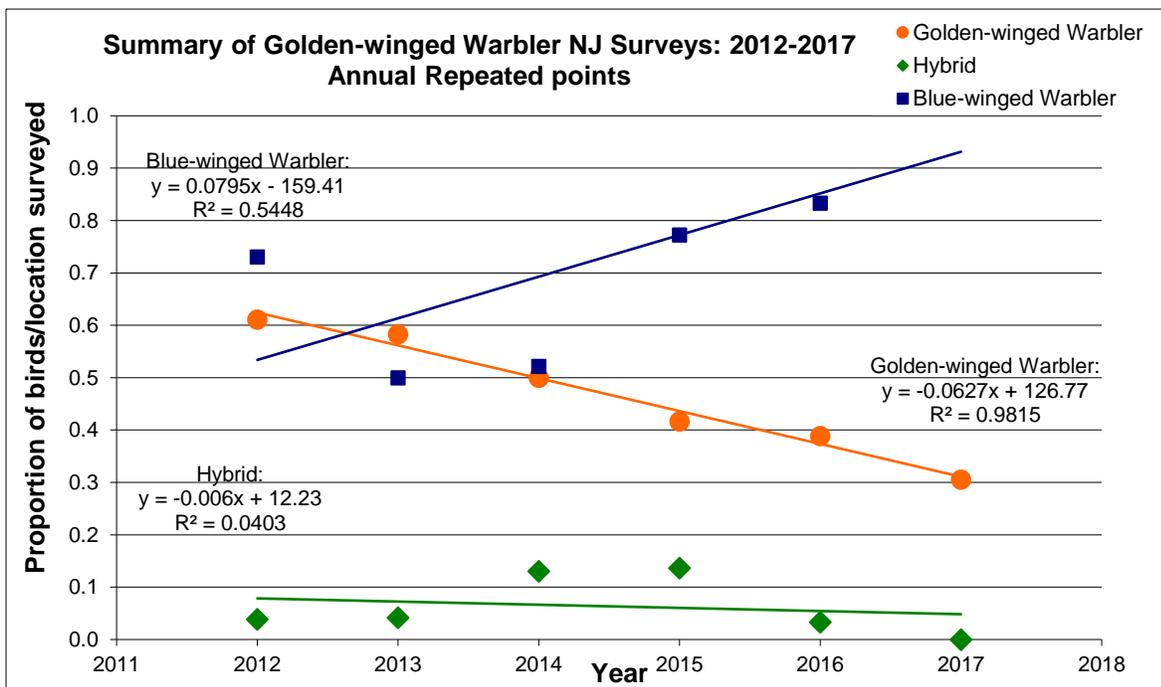


Figure 2. Change in number of golden-winged warblers from NJ locations surveyed annually since 2012 (n=36).

Recommendations:

- Continue to coordinate surveys with NJ Audubon and GOWAP.
- Continue to collaborate with PSEG to retain the breeding GWWAs on their spans.
- Without the maintenance of existing and/or creation of new breeding habitat in NJ specifically for golden-winged warblers, the population will continue to decrease as NJ runs out of new potential breeding sites to survey, and occupancy or recolonization of previously-occupied sites continues to decline.
 - Continue to provide technical assistance pertaining to forest management for golden-winged warblers on private and public lands, including WLFW.
 - Continue to work with utility companies, NJ Division of Parks and Forestry, NJ Division of Fish and Wildlife's Bureau of Land Management, Morris County Park Commission, and The Nature Conservancy-New Jersey Chapter to manage the last remaining active golden-winged warbler breeding areas.
- Complete the status assessment and draft species recovery plan for golden-winged warblers in NJ.

Grassland LIP Evaluation

Project Leader: Sharon Petzinger

Objective: To conserve and manage the New Jersey grassland bird population and analyze data to inform conservation status and recovery plan actions of these species.

Key Findings:

- Due to staff departures, predictive models, habitat management guidelines, and a status assessment for grassland bird species were not completed.

Conclusions and Recommendations:

- Further data analyses should be done that will help develop habitat management guidelines and models to prioritize parcels and management activities for specific grassland bird species.

Conservation of Migrants

Project Leader: Kathleen Clark

Objective: Identify and enhance critical habitat necessary to maintain the concentrations of migrating birds that rely on NJ's coast and peninsula for successful migration.

Key findings:

- ENSP biologists continued to work with other DFW biologists and others in DEP to plan habitat restoration near Cape May Point on Higbee Beach Wildlife Management Area. The restoration of Pond Creek marsh will result in converting >170 ac of Phragmites-dominated brackish marsh into a tidally-flowed marsh and mudflat system. As recommended by ENSP biologists, the restoration will include an upland dike to protect ~100 ac of freshwater wetlands from saltwater tidal inundation during and after restoration of flow to Pond Creek. Non-federal funding was secured and engineering was completed. Staff met several times during the year. ENSP biologists provided guidance for pre- and post-construction surveys of habitat and birds during breeding season and fall migration season. In 2017 a second year of pre-construction surveys were completed in both upland and wetland habitats. ENSP also commented on the final draft of plans for projected vegetation and water depth targets to benefit marsh birds, shorebirds, and land birds.
- During calendar 2017, engineering plans were finalized in preparation for bidding by the State.

Conclusions/Recommendations:

- Outside funding for habitat restoration in the Cape May peninsula has provided a unique opportunity for ENSP to help improve conditions for migratory birds that rely on this peninsula stopover. Habitat enhancement is a critical need given the continuing loss of habitat to residential and commercial development, and significant levels of invasive vegetation. ENSP should continue to leverage outside and non-federal funding to accomplish our objective of maintaining important habitats for migrating birds. Post-construction monitoring should be built into this site work.

Subjob A.3. SHORE AND MARSH BIRDS – *This Subjob was inactive here, but active under NJ W-70-R*

JOB C. REPTILE AND AMPHIBIAN CONSERVATION

Subjob C.1. TURTLES

Project Leader: Brian Zarate

Key Findings:

1. NJ E-1-38 and E-1-39 (Section 6 Federal Aid to Endangered Species) for bog turtle conservation.
2. Comp-SWG (“Multistate Recovery Actions for bog turtle and Associated Headwater Wetland Species of Greatest Conservation Need”)
3. NJ Dept. of Transportation grant (“Memorandum of Agreement to Complete Endangered Species Act Section 7 Formal Programmatic Consultation for the Bog Turtle,” Interagency Agreement among the Federal Highway Administration, the New Jersey Department of Transportation, the New Jersey Department of Environmental Protection’s Endangered and Nongame Species Program and Division of Land Use Regulation, and the U.S. Fish and Wildlife Service, New Jersey Field Office.

Wood turtle:

Key Findings:

- Staff and volunteers performed stream transect surveys for wood turtles following standardized approaches (survey effort = 1-km/hour) developed under a Regional Conservation Need grant (2014) and further implemented under a Competitive SWG (current – NJ participation ended spring 2016) at four different streams. Two of the four streams were monitored in spring 2017 and four in fall 2017. Three of the streams are part of a long-term monitoring network, while one was new to the study. Two streams were in Sussex County, one in Warren County, and one in Hunterdon County.
 - Sussex County – Six wood turtles were captured in nine surveys. Three surveys were conducted at one stream spring 2017 and three surveys each at two streams fall 2017.
 - Warren County – Three wood turtles were captured in six surveys. Three surveys were conducted at one stream in spring 2017 and three surveys at the same stream in fall 2017.
 - Hunterdon County – No wood turtles were captured in four surveys. All four surveys were at one stream.
 - This study site was monitored post-impact of a siltation event from a local quarry, a violation ongoing investigation by DEP. Stream cleanup was ongoing during the surveys. Extant wood turtle observations pre-silt event occur along the transect monitored.

Recommendations:

- Continue to coordinate with volunteers to monitor long-term network of wood turtle stream transects.
- Enlist additional, trained volunteers to assist with wood turtle stream transect monitoring.

- Conduct additional monitoring for wood turtles at Hunterdon County stream in spring 2018 to determine occupancy after stream mitigation work is completed.

Subjob C.2. SNAKES

Project Leader: Kris Schantz

Key Findings:

- Due to personnel constraints, ENSP did not actively manage the Venomous Snake Response Team (VSRT) in 2017. However, a number of team members continued to respond to requests for assistance either directly or through ENSP.
 - Due to limited ENSP-personnel availability, only four trainings were held in 2017; all for the National Park Service – Delaware Water Gap National Recreation Area personnel.
 - Of the potential 118 team members (including those that have been trained but were not considered official team members in 2016 due to missing registration forms), 21 submitted information regarding their responses and time and mileage incurred; excluding some personnel from key areas that annually receive the most or second most number of response requests. Four out of those 21 responded to 18 venomous snake calls, confirming 15 timber rattlesnakes and two northern copperheads. ENSP has received most of the official sighting report forms for submission and entry into NJ DEP’s Biotics database (Biotics), but is awaiting additional details for three observations.
 - ENSP made no progress towards developing a structure to maintain and expand the team while decreasing ENSP responsibilities and time required.
 - A change in personnel in 2016 led to less experienced personnel inputting observations into ENSP’s tracking database and Biotics and exacerbated an already significant backlog of submitted observations. While a significant backlog of data remains, data-managing personnel are making progress.
- ENSP personnel are in possession of hundreds of rare snake observations that have yet to be submitted for entry into the Biotics tracking database. Due to continued responsibilities regarding the State Wildlife Action Plan review and environmental permit reviews requiring an inordinate amount of time, personnel have not been able to compile and review the data in preparation for submittal to the data management team.
- ENSP met with the ENSP Pinelands Snake Research Team to provide clarification on their objectives and identify targeted survey areas.
 - Volunteers were tasked with surveying target areas on State lands in search of:
 - Reptile and amphibian observations.
 - Existing critical habitats (i.e., summer and winter dens, nesting areas/gestation and birthing areas, shedding stations), and were asked to assess their need for management.
 - Areas where minimal habitat management can create suitable basking, nesting and/or gestation and birthing areas.
 - Questionable shelter arrays (i.e., multiple cover boards, carpet fragments, debris, etc. set within a localized area) indicating potential snake collection sites.
 - Volunteer data submittal is incomplete; not all volunteers have submitted their data and ENSP continues to review and seek clarification on data that were submitted.
 - Volunteers were assigned square mile sections to survey where ENSP are lacking data. Since not all volunteers have submitted their data, ENSP cannot determine if the volunteers remained within their assigned areas.
- ENSP biologist was unable to commit additional time to the development of the timber rattlesnake status assessment and recovery plan due to responsibilities regarding the State Wildlife Action Plan review and environmental permit reviews requiring an inordinate amount of time. However, additional revisions were made to the Pinelands Rare Snakes’ Status Assessments (*formerly the Northern Pine Snake recovery plan*) and a small team with varying taxonomic expertise has begun a review to determine the information to be

included in this and future species status assessments and recovery plans based on the USFWS' "3-Rs;" representation, redundancy, and resiliency.

- No den surveys were conducted in search of undocumented dens.
- No opportunistic radio-telemetry research to identify rare snake critical habitats was conducted due to limited resources.

Conclusions:

- The VSRT is lacking participation and in need of additional training and guidance:
 - The 2014 VSRT transition has continued to cause confusion, many team members failed to submit the necessary information/documentation to continue to participate, and some team members failed to submit documentation of their responses and time and mileage incurred.
- There is a significant backlog of rare snake observation data both within the data entry process and awaiting official submittal for data entry.
- Pinelands Snake Research Team requires additional instruction to encourage, if not ensure, they survey ENSP's target areas in 2018.
- Law enforcement has continued to patrol and target the 2016-identified snake collection hot spots for illegal activities. ENSP has not been privy to their findings.

Recommendations:

- The VSRT will continue in 2018 as ENSP continues to attempt to develop a structure to maintain and expand the team while decreasing ENSP responsibilities and time required.
 - ENSP must continue to work with the team members so they understand (and fulfill) what is required of them as official volunteers and as team members not covered under DFW insurance.
 - ENSP needs to recruit and train new personnel statewide to build the VSRT to ensure adequate coverage for NJ residents.
- Continue work on the Pinelands Rare Snakes' Status Assessments and Recovery Plan (*formerly the Northern Pine Snake recovery plan*).
- Continue to gather information for the timber rattlesnake status assessment and recovery plan as time and resources permit.
- Using a non-federal funding source, ENSP should continue to participate on the snake fungal disease project's monthly conference calls to determine the next steps; i.e., research focus.

Subjob C.3. AMPHIBIANS

Project Leader: Brian Zarate

Key findings

- ENSP staff and volunteers have been recording salinity readings at several eastern tiger salamander breeding pools to collect base-line data and monitor for potential impacts from saltwater intrusion.
- Eastern tiger salamander surveys were conducted at known or potential breeding pools throughout the species range. Specific emphasis was placed on surveying potential new breeding pools.
- *Lizard Tail Swamp WMA*: No significant advancements were made during the reporting period regarding plans to re-grade certain man-made breeding pools at this location.
- *Mechanic Street*: ENSP volunteers and CWF staff continued surveying pools on and adjacent to USFWS Refuge land, including an annual survey conducted with USFWS staff. Illegal use of the site by off-road vehicles (motorcycles and all-terrain vehicles//quads) has been identified as a threat.

Conclusions

- ENSP's survey efforts during the reporting period emphasized continued viability of previously documented eastern tiger salamander breeding populations.

- Due to overriding ENSP staff obligations, survey efforts were largely conducted by ENSP volunteers or CWF staff.
- ENSP's management efforts for tiger salamanders continue to focus on known breeding pools on protected land within the species range.
- As validated by the recently completed SWAP, identification and remediation of additional threats to eastern tiger salamander populations remains important, especially regarding issues related to disease and habitat destruction due to off-road vehicles.

Recommendations

- Continue working with the Bureau of Lands Management and the NJ CWF on vernal pool construction on Division of Fish and Wildlife lands.
- Develop a strategy to protect breeding pools from off-road vehicles, particularly on public lands.
- Continue to work with partners and trusted volunteers to monitor pools and encourage amateur herpetologists to submit sightings, with a focus on the identification of new breeding populations.

JOB D. INVERTEBRATE CONSERVATION AND MANAGEMENT

Subjob D.1. Mollusks

Project Leader: Jeanette Bowers-Altman

Objective:

- To document occurrences, monitor populations, and create conservation strategies to aid in the recovery of listed freshwater mussel species throughout New Jersey. Listed species include the dwarf wedgemussel, brook floater, green floater, yellow lampmussel, eastern lampmussel, eastern pondmussel, tidewater mucket and triangle floater.

Key Findings:

- We conducted timed searches at 11 stream sites in seven counties for listed freshwater mussels. Surveys were performed at historic locations, monitoring areas, and/or in previously unsurveyed suitable habitats. Two of the sites, Lamington and Pequest rivers, were surveyed on multiples days, resulting in 15 total in-water field days. Commitments to the State Wildlife Action Plan update and other projects, combined with high water/high flows in June, limited time available for survey work.
- We completed habitat assessments and/or preliminary searches at 21 additional sites in two counties to determine if larger surveys were warranted.
- EPA Habitat Assessment Field Data Sheet scores (high and low gradient combined) ranged from 126 (Stony Brook, Mercer County) to 169 (Musconetcong River, Warren/Hunterdon counties), out of a possible 200. Previous ENSP studies have shown that mussels occur in a habitat score range of 68-173. All sites surveyed scored within the preferred habitat range.
- Water quality values at sites surveyed were as follows: pH ranged from 6.5-8.8, water temperatures ranged from 19.1 to 28.6 C, dissolved oxygen ranged from 6.5 to 11.9 ppm.
- Catch per unit effort (CPUE) for all freshwater mussel species combined during timed searches was highest in the Lamington River with 2.05 live mussels/minute.
- The ENSP and volunteers found seven species of freshwater mussels (live or shells) during field activities, including the dwarf wedgemussel, brook floater (possible), creeper, alewife floater, eastern floater, eastern elliptio, and paper pondshell. The eastern elliptio was the most prevalent and widespread mussel species documented. Species richness was highest in Stony Brook, Mercer County and Lamington River, Somerset County, with three species recorded at each location. Significant findings included two fresh dwarf wedgemussel shells in the Pequest River and 10 dwarf wedgemussel shells at a previously unknown location in Sussex County (Lake Aeroflex). In addition, we recorded a fresh creeper in Bear Creek, along with creeper shells in the Stony Brook and Lamington River. A possible brook floater valve (relict) was

recovered in Lamington River; species identification will be confirmed pending examination by an outside expert.

- We continued surveying known brook floater locations and historic sites to determine 1) current habitat condition/suitability and 2) species presence/absence. Results of these surveys will provide updated information to the ENSP's status review/recovery planning process, and help fill in data gaps as identified in the RCN-funded Brook Floater Regional Assessment, which was completed in part to inform the federal listing process.
- Of the five stream sites (out of 11) surveyed for brook floaters, we found evidence of the species (possible relict shell) at only one location. The area is situated well upstream of a known brook floater site, and just downstream of a golf course. We observed few live mussels in the area, and there was apparent damage/erosion to shells of the living specimens. In addition, we observed a white powdery substance of unknown origin on many of the rocks along the shoreline, and recorded a pH of 8.8 at the site.
- Impacts from severe flooding were observed at two historic brook floater locations. We observed flooding impacts in the Stony Brook, near the Carter Road crossing, where we photographed severe bank erosion/instability. There was little suitable substrate present in many spots, with evidence of scouring/flooding along riparian areas. In addition, flooding impacts were apparent in the Stony Brook off Old Mill Road, where we detected numerous changes to instream habitat since our visit just prior to tropical storms Lee and Irene (2011).
- We conducted surveys in Mantua Creek, within the Tall Pines State Preserve, Gloucester County, upstream of a known triangle floater occurrence. The Tall Pines State Preserve is situated on land that was used as a golf course between 1950-2006. The land was purchased by NJDEP in 2015 and is now a state park. Although suitable habitat was present, and some small fish were observed, no freshwater mussels or shells were found.
- Working with staff of the Rutgers Marine Field Station (RUMFS), we began surveys in the Mullica River system to investigate the role of pH on local bivalve fauna. We documented the first Pinelands occurrence of the nonnative paper pondshell in Shamong Township, Burlington County, and identified suitable habitats where pH is elevated due to agricultural activities.
- Wildlife Conservation Corp (WCC) volunteers continued surveys in the Stony Brook, Mercer County.
- All locations of federal and/or state listed freshwater mussels from surveys covered in this report and others (e.g. private consultants, USGS, nonprofit organizations, etc.) have been/ are in the process of being incorporated into the Biotics database. These locations, along with sightings from previous surveys, will be used in the next version of the Landscape Project mapping to identify critical areas for listed mussel populations.

Conclusions:

- Based on habitat suitability assessments and preliminary searches, 11 out of 21 sites warrant further survey work to determine freshwater mussel species composition and abundance.
- Suitable substrate in critical dwarf wedgemussel areas appears to be returning at the Pequest River at the Division's fish hatchery. We observed more sand and sand/cobble in areas that had been impacted by tropical storms Lee and Irene than in previous seasons. The discovery of two very fresh dwarf wedgemussel shells, along with numerous fragments at the site, warrants additional surveys (including quadrat sampling) in the recovering upstream habitat.
- Brook floater populations appear to be declining in the state. Habitat conditions at several historic brook floater sites underscore the need for stream and riparian area resiliency/protection due to projected increases in flooding and extreme weather events. Brook floater declines in NJ may very well be attributed, in part, to loss of stable habitat via transport downstream due to flooding and extreme events such as tropical storms Lee and Irene in 2011. Other threats include water quality degradation, habitat loss, dam construction, and the prevalence of invasive species. The apparent lack of juvenile mussels at most occupied sites indicates that little reproduction is occurring within populations. We are encouraged with the recent discovery of a reproducing brook floater population downstream of our southern Lamington River survey location (E. Nadeau, 2017. Biodrawiversity, pers. comm.).

- Mantua Creek within the Tall Pines Preserve may be devoid of mussels due to the many years it was exposed to liming and other golf course-related land use practices. Freshwater mussels may eventually colonize the area via host fish movement. If water quality is shown to be suitable, the location may serve as a good test site for restoration and potential transplantation of common species.
- Impacts to freshwater mussel populations in areas adjacent to and downstream of golf courses need to be explored further. In addition to potential water quality degradation in the Lamington River and Mantua Creek, in 2014 we observed numerous dead, still in the shell eastern elliptio directly downstream of a large golf course situated along the Rancocas Creek, Burlington County.
- The discovery of the paper pondshell in the Mullica River system warrants further Pinelands-based surveys. It may be that listed or rare species are present in areas where pH has been elevated due to agricultural practices. In addition, there have been triangle floaters (T) reported in peripheral, higher-pH areas, along with common species such as eastern elliptio.

Recommendations:

- Continue surveys for listed species in previously unsurveyed suitable habitats to document distribution; monitor populations in known locations.
- Continued surveys for brook floaters at historic locations and occupied sites in the northern half of the state. Draft the brook floater species assessment and state recovery plan, and coordinate with RCN Regional Assessment leader to fill in data gaps and develop protective measures for critical areas.
- Continue surveys for dwarf wedgemussels in the Pequest River and vicinity of Lake Aeroflex to document occurrences and establish population boundaries.
- Field truth 2016 model results to determine efficacy and publish results. Develop protocol that will apply findings to stream restoration techniques to help manage for listed mussels and prepare for extreme weather impacts.
- Identify and survey areas below and adjacent to golf courses, and determine whether the development of BMP's specific to freshwater mussel protection is warranted. Investigate potential opportunities for habitat/mussel restoration within Tall Pines Preserve and other applicable areas.
- Continue surveys in previously unsurveyed stream and lake sites within the Mullica River system where pH is suitable (>5.5) for mussels.
- Continue working with the NJISST to monitor Chinese pond mussel spread and assist with eradicating known pond populations.
- Solicit assistance from additional WCC volunteers; train volunteers to identify and survey for mussels; assign specific areas for survey work where data are lacking. Provide volunteers with printable sections of the mussel story map to be used in the field.

Subjob D.2. Macroinvertebrates

Lepidoptera

Project Leader: Robert Somes

Objective: To identify, survey, protect, and manage for listed Lepidoptera populations and habitats in New Jersey. Species include but are not limited to arogos skipper, Mitchell's satyr, bronze copper, Appalachian grizzled skipper, checkered white, silver-bordered fritillary, hoary elfin, Harris' checkerspot, Hessel's hairstreak, and frosted elfin.

Key Findings:

- The 2017 butterfly season was a highly challenging one marked by a cool late spring and wet June, leading to very depressed butterfly numbers for the early part of the season. Staff shortages and commitments to the State Wildlife Action Plan update and other projects limited time available for survey and management activities. Surveys were conducted for a wide range of listed species

throughout NJ and in a wide variety of habitats by staff and with help from the North American Butterfly Club-North Jersey Chapter and the South Jersey Butterfly Blog contributors.

- The partnership that was developed between the NJ State Forestry Service, NJ State Park Service, and the Endangered and Nongame Species Program to create a statewide program of butterfly/pollinator gardens and meadows and to create management and maintenance guidelines beneficial to pollinators on State property continued and was expanded during its second year. This year was another successful year for the program.
 - Staff from the Division of Fish and Wildlife collected common milkweed seed throughout the State of New Jersey. The State Forestry Service's NJ Forest Nursery provided staff and resources to propagate 400 common milkweed plants. These seedlings were distributed to a subset of parks and used in the creation or enhancement of thirteen butterfly/pollinator gardens.
- Surveys for Leonard's skipper were conducted at three known sites and two potential sites in northern New Jersey. The species was present at all known locations with numbers ranging from one to 20 individuals. During these surveys, two new locations were documented in Sussex County.
- Surveys for silver bordered-fritillary were conducted at three known locations and two potential locations over the course of three days. There were no silver-bordered fritillaries observed at any of these sites. There has not been a silver-bordered fritillary observed in NJ since 2012.
- Extensive surveys for the Baltimore checkerspot were conducted this year. Seventeen sites were surveyed, with the species found at only two sites. Three individuals were observed at one site and 10 were observed at the other.
- Population monitoring was conducted at four known frosted elfin sites with a maximum number of 22 elfins observed.
- Surveys for northern metalmark were conducted over the course of two days at four different known sites. Fifty-six metalmarks were observed at one location and 12 were observed at a second site. There were no metalmarks observed at the other two sites.
- Surveys for arogos skipper in southern New Jersey were conducted on the Penn State Forest sites (two separate historic locations) over two days, with no arogos skippers observed. Surveys of two known sites in Morris County and at several potential locations in Hunterdon County over the course of three days failed to locate any arogos skippers.
- Surveys for Georgia satyr were conducted at two potential locations in southern New Jersey over the course of three days. A new large Georgia satyr colony was discovered with 56 individuals counted in one day. During these surveys, a new two-spotted skipper colony was also discovered in southern New Jersey with two skippers observed.
- Surveys for checkered white were conducted at four potential new locations over the course of three days. One new site was documented with 21 checkered whites observed.
- Volunteers conducted moth inventory surveys at one site in the Palisades and at a second site on Island Beach State Park. Staff have continued meeting with local moth experts to develop general range maps for SGCN species that occur in NJ and plan surveys for 2018.
- The Division of Fish and Wildlife's Bureau of Land Management continues to use a pollinator seed mix for field plantings in southern New Jersey and successfully planted approximately 20 acres this year.

Conclusions:

- The SWAP update has allowed us to greatly improve the representation of other insect species groups on our SGCN list. This will allow us to better target future research and conservation activities.
- The partnership with the State Park Service and the State Forest Service to propagate milkweed and to create butterfly gardens and meadows continues to be a huge success and has the potential to be expanded further. This year we were able to get plantings at a larger number of parks than last year.
- The Bureau of Land Management actively manages hundreds of acres of land each year including extensive mowing and seeding. By working together, we will greatly enhance large sections of

Wildlife Management Areas for the benefit of rare butterflies and pollinators through improved mowing regimes and through changing the seed mixes that we use for planting to include more plants suitable as foodplants and as nectar sources for our native butterflies and pollinators.

- Surveys of potential rare butterfly species habitat continue to yield discoveries of new colonies for many species; large areas of unsurveyed but suitable habitat exists within NJ for many species.
- We discovered another new colony of checkered white in northern New Jersey this season; there is the potential for other undiscovered sites in the vicinity of this location.
- Surveys of the northern metalmark habitat management site yielded some of the highest counts seen at this location. It is hoped that management efforts have improved the site for the species.
- Surveys of potential habitat in the New Jersey Pinelands yielded new colonies for several species and show that many potential new sites for rare species exist in this region.

Recommendations:

- An extensive survey effort needs to target the butterfly species that were recently added to New Jersey's rare species list. Many of these species have very limited data for New Jersey, therefore it is critical that we develop a better understanding of their distribution, life history requirements, and threats.
- The milkweed propagation and butterfly garden/meadow creation project should be expanded within the State Park and Forest Service and we should strive to expand the number of seedlings that we distribute throughout the State.
- The partnership with Lands Management should be expanded to create larger areas of habitat suitable to our rare butterflies and native pollinators.
- Habitat management for northern metalmark should be expanded to insure the persistence of our current colonies and allow them to expand into former sites that have become overgrown and unsuitable. Continue working with land managers to maintain existing northern metalmark habitats. Work to increase connectivity between sites by maintaining natural corridors and creating suitable habitat by thinning invasive shrubs and trees. Work together with the NJ Park Service to develop a maintenance plan for northern metalmark sites found on KVSP.
- Surveys for silver bordered-fritillary should continue to be a priority during 2018. Surveys for potential new or undiscovered colonies should be conducted to determine whether the species is truly extirpated or if it is shifting from site to site as conditions change.
- Surveys for Leonard's skipper, frosted elfin, and dotted skipper should be a high priority in southern New Jersey. The frosted elfin is being petitioned for Federal listing and better baseline data for NJ would be beneficial to the effort.
- Surveys of potential habitat for Georgia satyr and two-spotted skipper should be expanded in the New Jersey Pinelands to better understand the distribution of these species.
- Continue working with land managers to maintain existing frosted elfin habitats. Work together with land managers to create suitable habitat adjacent to existing to Right of Ways (ROW) to insure there is refugia for the species independent of ROW maintenance activities.
- Arogos skipper should be surveyed during 2018 to determine if the known colonies are still in existence. Areas of suitable/potential habitat should be surveyed as well. Follow-up surveys should be conducted to assess the impacts of the fire on the Penn State Forest habitat. Expanded surveys need to be conducted for arogos skipper in both northern and southern New Jersey during 2018 and determine if the species still occurs in northern New Jersey and to better survey potential habitat in southern New Jersey.
- The updated State Wildlife Action Plan will have an extensive Species of Greatest Conservation Need moth list for New Jersey. Moth and tiger beetle surveys and research should target the newly listed species so that we can greater incorporate their conservation into our lands management planning and better understand life history requirements.
- Staff should work to create an insect conservation working group to help better steer conservation activities for the expanded SGCN list in the NJ State Wildlife Action Plan.

Odonata

Project Leader: Robert Somes

Objective: To monitor populations and create conservation plans and strategies to aid in the recovery of state-listed species found throughout New Jersey, including but not limited to the gray petaltail, superb jewelwing, brook snaketail, robust baskettail, banner clubtail, harpoon clubtail, and Kennedy's emerald. To locate new populations of these species in areas not yet surveyed. To periodically re-visit known population to assess status and update the element occurrence.

Key Findings:

- Surveys this year focused on resurveying existing rare Odonata sites and colonies that have not been surveyed during the course of the last several years. Surveys were also conducted in new and potential habitat that might be suitable for rare species.
- Surveys for brook snaketail were conducted at three sites along the Musconetcong River, with one new colony documented.
- Surveys for New England bluet in northern New Jersey documented five different colonies.
- Surveys for rapid's clubtail and Septima's clubtail documented two sites for each species.
- Surveys during this field season documented single occurrences for the following species: tiger spiketail, arrowhead spiketail, brush-tipped emerald, cobra clubtail, golden-winged skimmer, Hudsonian whiteface, Maine snaketail, sable clubtail, spatterdock darner, banner clubtail, harpoon clubtail, and Kennedy's emerald.

Conclusions/Recommendations:

- Surveys of historic sites and potential new sites were very successful for a variety of species. Follow-up surveys should be conducted at historic locations where listed species were absent during 2017 to determine whether the sites are occupied or not or if the species were just missed during the surveys.
- Follow-up surveys should continue along the Musconetcong River restoration site to monitor whether suitable habitat is created and if it is colonized by brook snaketails. Several other dam removals have also recently occurred along the river and near brook snaketail sites where the habitat should be monitored to determine if any new stretches are occupied by the dragonfly in the future. Surveys this year showed that there is the potential to find new occurrences for this species along the Musconetcong River.
- Surveys should be conducted for harpoon clubtail along the Delaware River to determine the distribution of the species in this watershed.
- Survey potential tiger spiketail habitat in central and southern New Jersey to locate new colonies and fill in the range gap between Hunterdon and Camden counties.
- Surveys for Pine Barrens bluet, scarlet bluet, and New England bluet should be a high priority because these species are a high regional priority, with New Jersey considered a stronghold.
- Surveys for other listed Odonata species should continue and be expanded during 2018 to fill in knowledge gaps and gain a better understanding of their distribution in New Jersey. Efforts should be made to revisit known sites that have not been recently surveyed to determine if previously documented species are extant.

Subjob D.3. Impact of Dam Removals on Macroinvertebrates

Project Leader: Jeanette Bowers-Altman

Objective:

Identify and monitor rare freshwater mussels and Odonata that occur up and downstream of dams in the Musconetcong and Raritan rivers, and potentially other watersheds throughout New Jersey to 1) document short and long-term impacts of dam removal to populations 2) determine whether there are safe alternatives to current dam removal methods and 3) develop strategies to mitigate short-term impacts of dam removal to minimize injury and/or mortality to individuals. Stream segments adjacent to dams planned for removal within the next two years will be emphasized.

Key Findings: This job was inactive during 2014-2017 period due to funding and staff constraints.

JOB E. MARINE WILDLIFE

Subjob E.1. Identify and Mitigate Threats to Sea Turtles in NJ Waters

Project Leader: Jeanette Bowers-Altman

Objective:

- To identify and address major threats to sea turtles associated with power plant impingements.

Key Findings:

- ENSP staff continued entering sea turtle impingement/sightings data from the Oyster Creek Nuclear Generating Station (OCNGS) into the Biotics database. The ENSP receives copies of all incidental “takes” reported to the National Marine Fisheries Service (NMFS) by Exelon Corporation. Data included date and time of impingement/take, species, carapace length, weight, condition (live vs. dead), intake area of impingement (circulation water system vs. dilution water system), number of pumps running (CWS vs. DWS) and water temperature. Conserve Wildlife Foundation/ENSP staff have now compiled and/or entered data for three sea turtle species (Atlantic green, Atlantic loggerhead, and Kemp’s ridley) impinged at the OCNGS between 1992 and 2017.
- In 2015, we completed the preliminary analysis of sea turtle impingements recorded at the OCNGS versus weather/meteorological factors during the last project period with the goal of developing a predictive model that would determine when captures are most likely to occur at the power plant. Data from late 2015 to 2016 were compared to the existing 1992 – 2015 dataset to determine whether the model was able to effectively predict sea turtle takes at the plant. We used Microsoft Excel graphing and regression software to analyze data and identify trends. Methods and results of the model test were reported in the ENSP’s SWG 2016 report.
- Three sea turtles were reported at OCNGS during the project period; one live Atlantic loggerhead (13 June 2017), one Kemp’s ridley (4 September 2017), and one live Atlantic green turtle (28 September 2017).
- Information was gleaned for the period (day of, and both days prior to each take), tabulated, and examined by placing certain weather parameters (as recorded by www.wunderground.com) in a matrix for each take. The following parameters were used: 1) nor’easter storm 2) wind direction 3) minimum air temp for day of take 4) Delta-T (max-min) air temp for day of take 5) 2 day Delta-T air temp (max two days prior, and min day of take) 6) max wind gusts for day of take 7) event notations (e.g., rain, fog, etc.) 8) hurricane (not applicable for this period) and 9) max air temp (not applicable for this period).
- It appears as though the live Atlantic loggerhead observed on 13 June 2017 may have suffered heat shock, with daytime air temperatures reaching 97F (Fig. 1). Conversely, the take of a live Kemp’s ridley on 4 September 2017 was associated with a rapidly rising Delta T (23 F drop, from 82F to 52F), possibly

indicating cold shock. The green turtle take of 28 September 2017 may have also been associated with cold shock.

Conclusions:

- Quantitative modeling of takes is found to be problematic due to the low numbers of sea turtles reported. In addition, distribution of turtles in local waters is unknown. Thus, there are many instances wherein no turtles are taken despite them being predicted at the plant.
- We have identified possible parameters affecting sea turtle occurrence at OCNGS; however, it should be noted that catch at the plant is primarily affected by local abundance and distribution. Sea turtles must be in the waters adjacent to the facility in order to be impinged on the racks. There are many times when one or all of the parameters are met, yet no takes are reported. It would be valuable to obtain multi-year information regarding the presence/absence of sea turtles near Barnegat Inlet during June through October, yet these data do not exist or are not available. Gusty east winds, especially during storms, may drive turtles into the intake canal, but there are many more instances where despite such winds, no turtles are captured, presumably because they are not the area at that time.
- According to Tatham et al. (1977), northeast winds (particularly storm conditions) coincided with greater impingement at the plant. These findings, specific to finfish and macroinvertebrates, concur with the findings of this project; whether turtles are pushed along with wind-blown currents, or whether they are following prey items into the intake canal (or a combination of the two) has yet to be determined. Another possibility is that it may be extremely difficult for plant personnel to actually spot turtles during certain conditions (e.g. during increased turbidity and/or high influxes of detritus such as eelgrass or sea lettuce that can be blown in from the bay during storms and/or east winds).
- The OCNGS will remain in operation until at least 2019. Given the remaining life of the plant, combined with increased catches of sea turtles, strategies to help further reduce take could potentially prevent injury/mortality to many individuals. In addition, application of our methods at the Salem plant and other coastal energy facilities with water intakes may be feasible and worth further investigation.

Recommendations:

- Set up an informal information sharing system with OCNGS Environmental Controls to facilitate transfer of information on sea turtle takes on a “next day” notification.
- Strongly suggest OCNGS personnel to be extra vigilant for a day after the first turtle is observed, and that they take time to examine the intake canal closely for more turtles.
- Encourage meteorologist to take an active role in forecasting NE/E winds and communicate with operations personnel the likelihood of sea turtle presence. This includes during storms, fog, and large (>20F) air temperature changes.
- Additional protocols that operations staff may employ during times of likely sea turtle presence may include: a) increased inspection and cleaning of the trash racks at dilution water and circulatory water intakes b) increased inspection of canals by boat c) inspection of intake and discharge canals from bridges along Route 9 and d) video camera surveillance of the intake canal.

Literature Cited

Tatham, T.R., Danila, D.J., and D.L. Thomas and Associates. 1977. Ecological Studies for the Oyster Creek Generating Station: Progress Report for the Period September 1975 – August 1976. Volume One, Fin and Shellfish. Report for Jersey Central Power and Light Company. Ichthyological Associates, Inc. 354 pp.

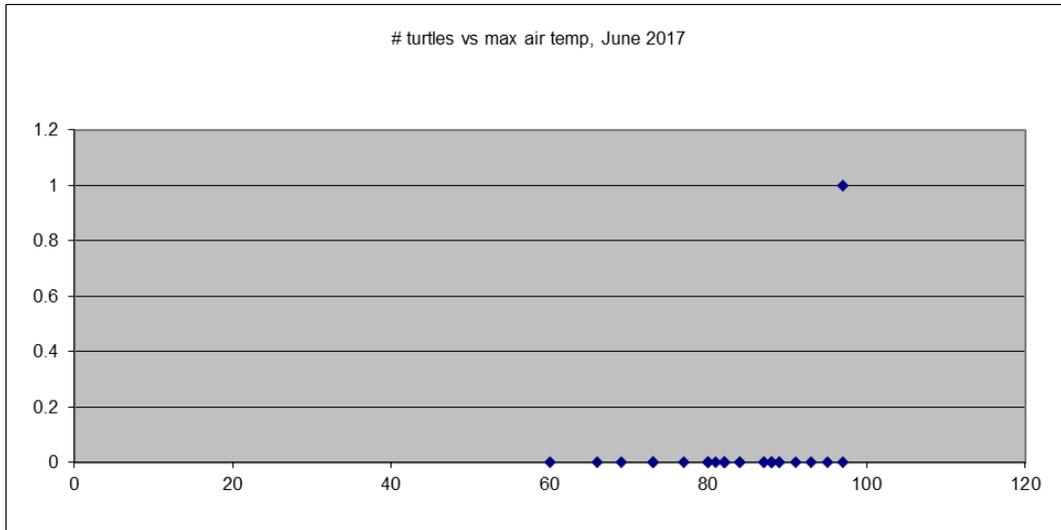


Fig. 1. Number of sea turtles observed at OCNCS vs. maximum air temperature during June 2017.

JOB F. THREAT ASSESSMENT: Emerging Diseases

Subjob E.1. Emerging Diseases

Project Leader: Kris Schantz and Brian Zarate

Key Findings:

- ENSP biologist completed all work and reports pertaining to Snake Fungal Disease (SFD) through non—federal funds (i.e., mitigation funds). This study began in 2014 as a Comp-SWG job (Conserving Snake Species of Greatest Conservation Need Threatened by an Emerging Fungal Skin Disease).

Conclusions:

- Snakes continued to be identified and confirmed positive for SFD in multiple counties of NJ.

Recommendations:

- Provide guidance to research and conservation partners interested in assessing SFD prevalence as needed.

Performance Report

Project: 2. **Habitat Management and Planning**
Federal Aid Project: T-1-7 (State Wildlife Grants)
Segment dates: September 1, 2016 to September 30, 2017

JOB A. Strategic Habitat Conservation

Project leader: Sharon Petzinger, Brian Zarate and John Heilferty

Objectives: Enhance, create or restore habitat to support species of greatest conservation need.

Key Findings:

- ENSP continued to work with DFW's Bureau of Land Management to conduct rare snake-specific habitat management within State lands using non-federal funds. Monitoring snake use of these areas was conducted sporadically by an experienced volunteer who confirmed rattlesnake use of the areas for gestation and birthing.

Conclusions and Recommendations:

- Continue identifying, assessing, managing and monitoring habitats to benefit snake conservation within the Pinelands, Highlands and Ridge and Valley Regions. *When possible, use alternate funding sources to accomplish this work.*
- ENSP will take advantage of opportunities to create habitat management plans and improve habitats, but does not have the staff needed to pursue habitat planning as a full-time job. In 2016 ENSP staff worked on specific jobs where non-federal funding was available for habitat improvements, as noted in the jobs B1 and B2 below.

JOB B1. Forest Habitat Management

Project leader: Sharon Petzinger

Key Findings:

- In 2017, surveys for all bird species, including golden-winged warblers (GWWA), were conducted to evaluate the success of Working Lands for Wildlife in terms of the number of bird species and presence of *Vermivora* species.
 - ENSP, NRCS, Conserve Wildlife Foundation, and NJ Audubon jointly conducted two outreach seminars for private forest landowners in northern NJ to provide information about the need for forest manager and available incentive programs.
 - ENSP, NRCS, Conserve Wildlife Foundation, and NJ Audubon jointly conducted visits to twelve private landowners interested in Working Lands for Wildlife (WLFW): Five new landowners signed contracts and seven contracted landowners implemented management prescriptions. All landowners under contract with WLFW allowed property access to conduct bird surveys.
 - A total 75 sites were surveyed for all bird species in 2017: 21 WLFW, 18 Management (MGMT), 32 Natural (NAT), and four pre-management (PRE). NAT sites represented naturally-occurring "young forest" habitat within wetlands. MGMT sites represented other forest management prescriptions to promote young forest habitat that were not enrolled in WLFW. WLFW sites were only considered if they were enrolled in the WLFW program.
 - A paired T-test was used to analyze differences of species richness (SPP) and bird species of concern (BSC) among the three treatments in 2017. WLFW sites again had a greatest SPP and BSC among the NAT and MGMT sites and was statistically significant compare with NAT sites

($P=0.008$; $P=0.021$). The proportion of BSC per SPP was lowest in NAT sites which was statistically significant ($P=0.020$) when compared with the MGMT sites (Fig. 1).

- Thirty-nine of the 75 sites contained at least one *Vermivora* spp.: 11 MGMT sites, 16 NAT sites, and 11 WLFW sites. Four GWWAs were observed in three NAT and one MGMT sites, 42 blue-winged warblers (*Vermivora cyanoptera*; BWWAs) were observed at 36 sites (11 MGMT, 14 NAT, and 11 WLFW) and three hybrids (*Vermivora* spp.) were observed at one MGMT, one NAT site, and one WLFW site. Only two sites (NAT) contained GWWAs without a BWWA or hybrid.
- From 2016 to 2017 there was a significant increase in both SPP ($P=0.004$) and BSC ($P=0.018$) among all three categories (WLFW, NAT, MGMT) combined. When comparing the 20 WLFW sites that were also surveyed in 2016 with the NAT and MGMT pairings (Fig. 2), WLFW sites had the most significant increase in SPP ($P=0.006$).
- 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. In 2017, GWWAs continued to use those spans during the breeding season, including one male who was banded in 2015 in that same span.
 - Although not statistically significant, the declining trend of GWWAs on the 19 spans chosen for GWWA management (GM) is half the decline of the trend of GWWAs on the 18 non-ROW locations that contained known GWWA males in 2012 or 2013 (Fig. 3). In 2017, these GM spans contained 10 of the 21 GWWA males observed in NJ, seven were not on ROWs, and four were on non-GM spans along the same transmission line.

Conclusions

- Even in its early stages, young forest management on private properties has benefited a number of early-successional songbird species and attracted a greater diversity of bird species than other managed and natural sites. However, the forest stands are still too young to attract golden-winged warblers.
- 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.

Recommendations

- Continue to provide technical assistance pertaining to forest management for golden-winged warblers and other wildlife habitat needs on private and public lands, including WLFW.
- Continue to work with utility companies, NJ Division of Parks and Forestry, NJ Division of Fish and Wildlife's Bureau of Land Management, Morris County Park Commission, and The Nature Conservancy-New Jersey Chapter to manage the last remaining active golden-winged warbler breeding areas.

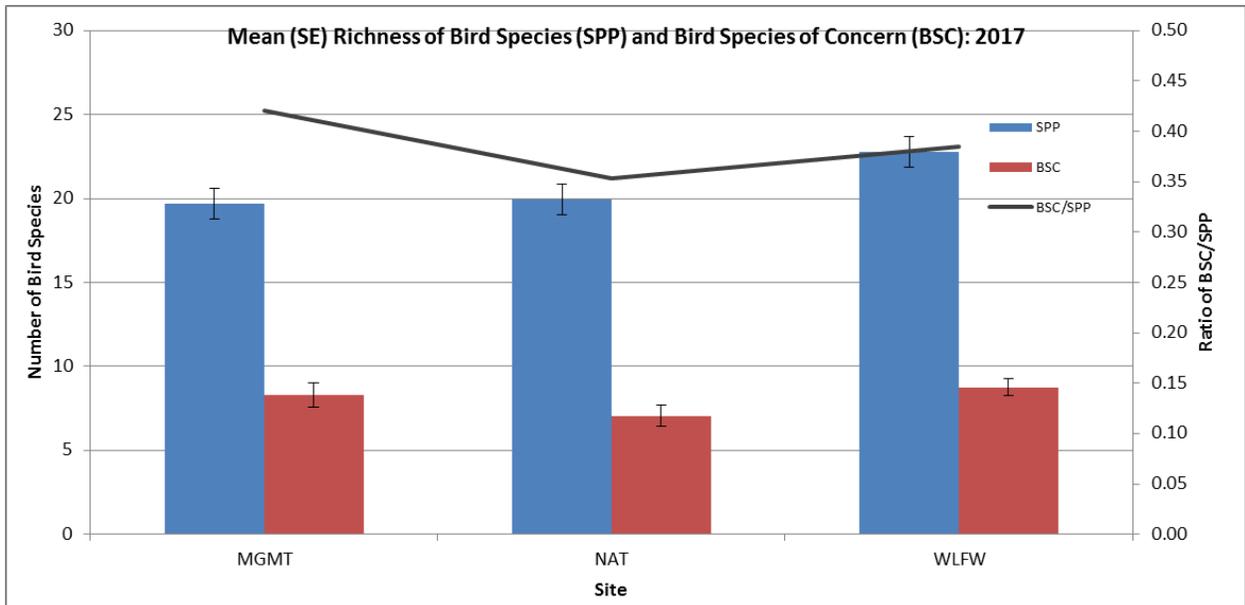


Figure 1. Average (\pm SE) species richness from the 2017 surveys to evaluate WLFW and their paired sites. WLFW and NAT sites were statistically different for SPP ($P=0.008$) and BSC ($P=0.021$). MGMT and NAT sites were statistically different for BSC/SPP ($P=0.020$).

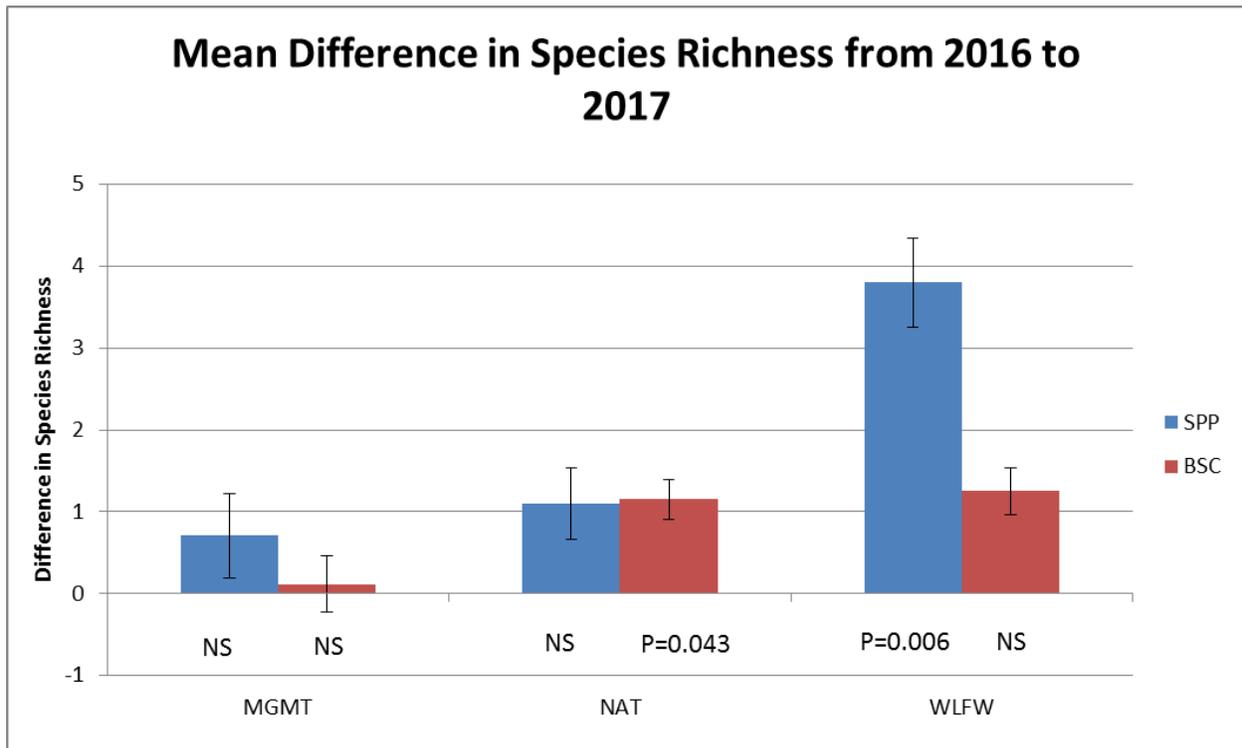


Figure 2. Average (\pm SE) difference in mean number of bird species (SPP) and bird species of concern (BSC) from 2016 to 2017 and results of a paired T-test comparing the two years.

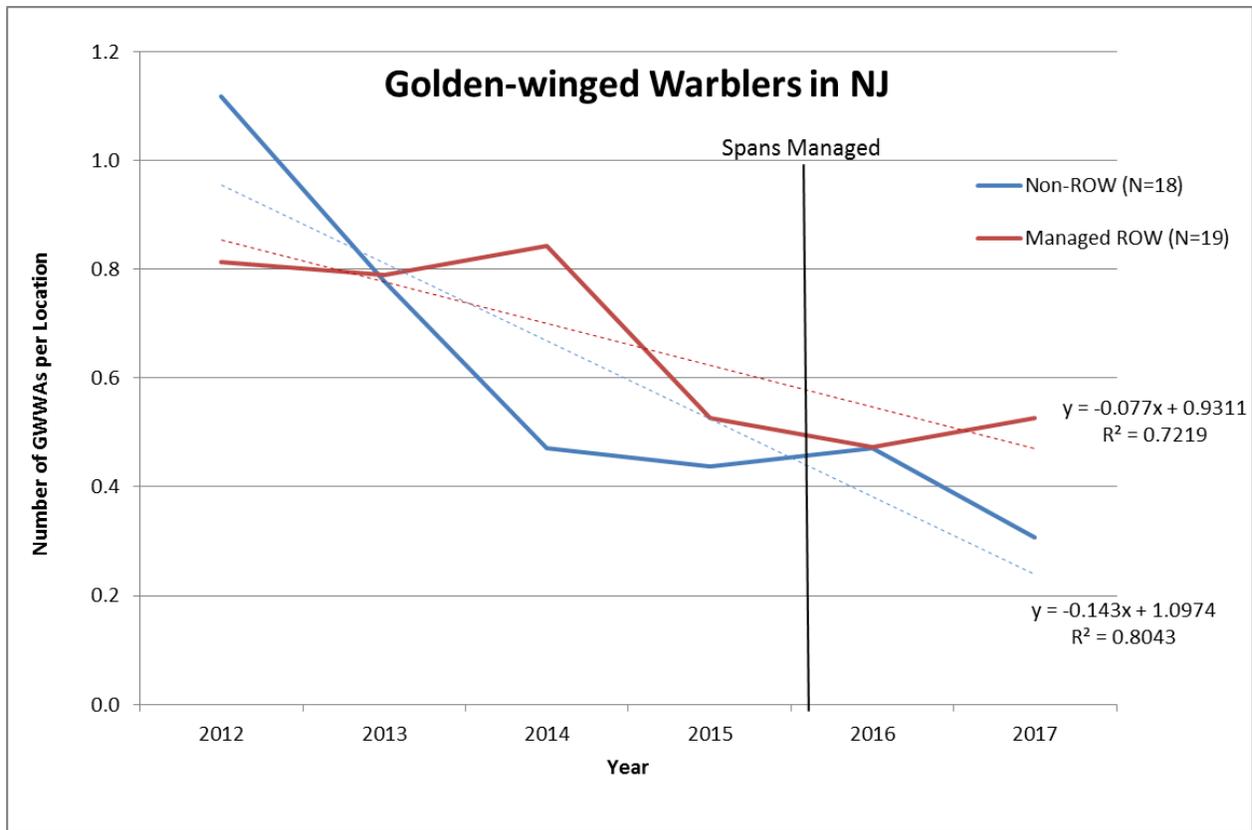


Figure 3. Number of golden-winged warblers observed per survey location from 2012 – 2017 (data from ENSP and NJ Audubon). The managed ROW (red) represents the 19 spans chosen for GWWA management, where the span-specific prescriptions were implemented winter of 2015/16. The Non-ROW (blue) represents known GWWA locations in 2012/13 that are not within a utility right-of-way. The dotted lines are linear trends.