Interim Report
State Wildlife Grants
T-1-7
F13AF01086

Endangered, Threatened and Rare Wildlife Conservation Projects

Interim Report for Project Year
September 1, 2017 – September 30, 2018

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 Conservation and Management

Job A. Birds

Subjob A.1. Raptors (Activated in Grant W-70-R eff. 9/1/15)

Subjob A.2. Landbirds (non-raptors)

Subjob A.3. Shore and Marsh Birds (Activated in Grant W-70-R eff. 9/1/15)

Job B. Mammals (Inactive job, presently covered by Grant W-71-R)

Job C. Reptiles and Amphibians

Subjob C.1. Turtles

Subjob C.2. Snakes

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Job D. Invertebrates

Subjob D.1. Mollusks

Subjob D.2. Macroinvertebrates

Subjob D.3. Effects of Dam Removals

Job E. Marine Wildlife: Identify and Mitigate Threats to Sea Turtles in NJ Waters

Job F. Threat assessment: Emerging Diseases

Project 2. Habitat Management and Planning

A. Strategic Habitat Conservation

B. Habitat Management

B.1. Forest Habitat Management

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Performance Report

Project: **1. SGCN Research, Monitoring and Management**
Federal Aid Project: T-1-7 (State Wildlife Grants)
Segment dates: September 1, 2017 to September 30, 2018

JOB A. BIRDS

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

Subjob A.2. LAND BIRDS (non-raptors)

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 Project 2, Job B.1. herein), ENSP staff surveyed 15 locations and coordinated with NJ Audubon to survey an additional 35 locations for golden-winged warblers (GWWA) in potential habitats (utility ROW, shrub swamp, successional forest, old field). NJ Audubon also provided GWWA observations on utility ROWs from 2018 which were used in the analyses.
- Fifteen GWWA, nine hybrids, and 79 blue-winged warblers were observed during the 2018 survey period in NJ. Three of the GWWA were located through eBird.
    - Eight (40%) of the 20 NJ locations occupied by GWWA in 2017 were not occupied in 2018.
    - Four (27%) of the 15 GWWA locations were without GWWA observations in 2017 and were recolonized in 2018. Two (13%) of the 15 locations had no prior GWWA observations but were colonized in 2018.
- Data will be submitted for entry into the NJ DEP's Biotics database by mid-January.
- The area of forest and shrubs around each GWWA survey point has been calculated to inform the GWWA status assessment and recovery.
    - Golden-winged warblers observed in 2018 were in locations with an average 79% (range 34-92%) forest cover and 4.7% (range 1-9.4%) shrub cover within a 1.5-mi radius of the survey location. Total habitat (forest + shrub) averaged 84% (range 50-95%) cover within 1.5-mi, and all locations had <20% agriculture and <15% development within a 1.5-mi radius of the survey location. The average elevation for these locations was 870 feet (range 410-1111 ft).
    - Blue-winged warblers observed in 2018 were in locations with an average 76% (range 45-93%) forest cover and 5.3% (range 1.1-16.5%) shrub cover within a 1.5-mi radius of the survey location. Total habitat (forest + shrub) averaged 81% (range 76-86%) cover within 1.5-mi, and all locations had <20% agriculture and <15% development within a 1.5-mi radius of the survey location. The average elevation for these locations was 970 feet (range 417-1264 ft).
    - Brewster's warblers observed in 2018 were in locations with an average 77% (range 73-84%) forest cover and 3.9% (range 2-8.6%) shrub cover within a 1.5-mi radius of the survey location. Total habitat (forest + shrub) averaged 81% (range 52-96%) cover within 1.5-mi, and all locations had <5% agriculture and <30% development within a 1.5-mi radius of the survey location. The average elevation for these locations was 980 feet (range 835-1230 ft).

- Staff attended the regional Appalachian Mountain Joint Venture Technical Meeting in Chief Logan, WV, August 7-8, 2018. Staff also attended the Atlantic Flyway Council and Atlantic Coast Joint Venture meetings in Plymouth, MA, September 23-26, 2018.

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% per year since 2012 (Fig. A.2-1). In 2018 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 2018 about 66% (14/21) of the known NJ GWWA breeding population was observed in utility ROWs.

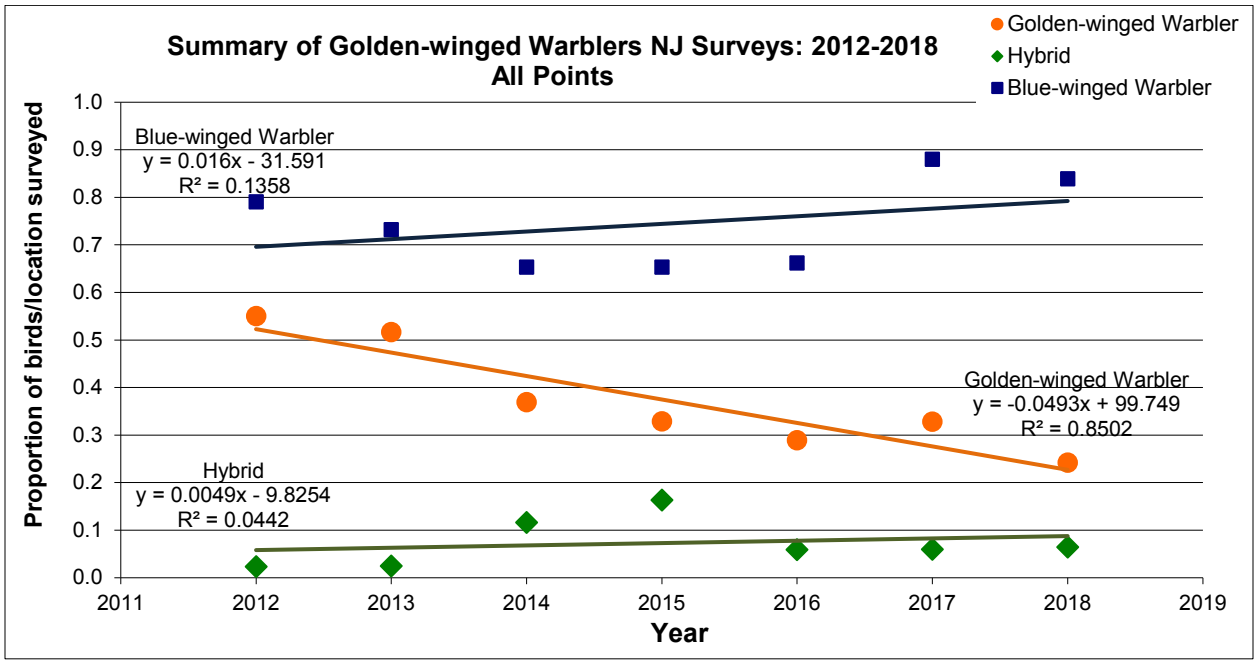

Figure A.2-1. Proportion of golden-winged, blue-winged, and hybrid *Vermivora* warblers observed per survey location during the 2012 (n=60), 2013 (n=60), 2014 (n=65), 2015 (n=76), 2016 (n=83), 2017 (n=67), and 2018 (n=62) surveys.

- Based on repeated *Vermivora* breeding surveys, the blue-winged warbler population fluctuated in 2012-2014 but has experienced an overall increase in northern NJ since 2015. The golden-winged warbler population, however, has declined at a rate of about 5% per year since 2012 (Fig. A.2-2). 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.

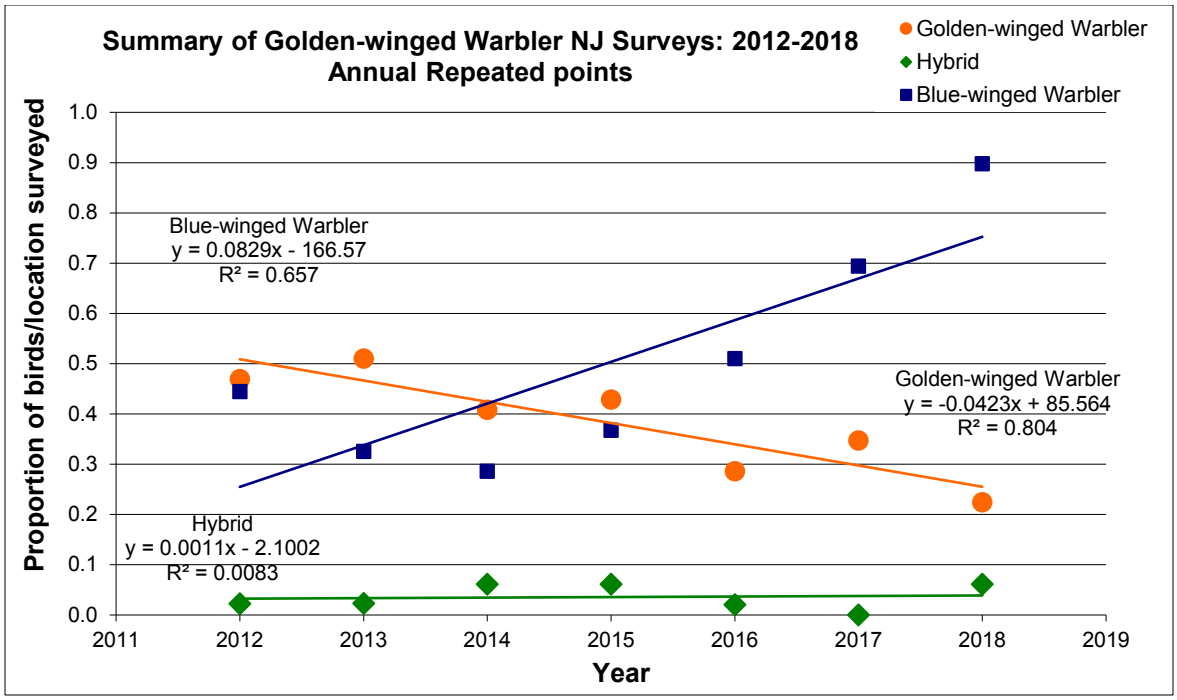

Figure A.2-2. Change in golden-winged, blue-winged, and hybrid *Vermivora* warblers observed in NJ locations surveyed annually since 2012 (n=49).

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.
- 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 Working Lands For Wildlife.
    - 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.

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

Bog Turtle Key Findings:

- Additional bog turtle activities during this reporting period were completed under funding through Comp-SWG ("Multistate Recovery Actions for Bog Turtle and Associated Headwater Wetland Species of Greatest Conservation Need") and Section 6.
- 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.
- Staff coordinated and lead monitoring efforts of a site in central NJ where construction is ongoing of an under-road tunnel system to safely pass turtles and other wildlife between two bisected areas. Visual monitoring is supplementing additional monitoring efforts along the roadway and of telemetered animals to later assess the effectiveness of the completed wildlife passage system at reducing roadkill.
- Together with partners from NJAS, 30 acres of uplands were mowed, tilled, and seeded with native warm season grasses and forbs, while an additional 4 acres were mowed, flagged, and hand seeded with a native wetland pollinator mix of seeds on a Wildlife Management area in southern NJ. The 30 acres of upland planting was maintenance mowed once more in August. Two turtles were outfitted with transmitters in 2018, and movements in the southern wetland were monitored throughout the season. No additional new turtles were observed in 2018. NJAS plans to have phragmites mowed and treated in the winter of 2019.
- A new observation of a bog turtle in the Outer Coastal Plain Recovery Unit was reported in June of 2018. This particular area in Southern NJ has historic occurrences in the neighboring habitat, but no new sightings in decades. ENSP, USFWS, and a group of consultants surveyed the site with no additional findings within a week of the initial observation, but suitable habitat was encountered, and further survey efforts are planned for the 2019 field season.

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 three different streams. Two of the streams are part of a long-term monitoring network, while one is being monitored short-term in relation to a silt impact a year ago.
    - Sussex County – The primary focus was on a stream transect in an area slated for forestry activity in future years. Volunteers affiliated with Montclair State University have begun monitoring the transect using visual surveys and through radio-telemetry on any captured wood turtles of appropriate size and health.
    - Warren County –Three surveys were conducted at one stream in fall 2017 and three surveys at the same stream in spring 2018. Volunteers have not submitted capture data to date for these surveys.

    - Hunterdon County – No wood turtles were captured in two surveys in the spring. Both 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 completed by the end of 2017. Extant wood turtle observations pre-silt event occur along the transect monitored.
- Staff continued to participate in regional Competitive SWG monthly conference calls to stay engaged on efforts and to review and provide feedback on state-specific deliverables and the overall Conservation Plan, which is currently in draft form.

Recommendations:

- Continue to apply standardized monitoring approaches for bog and wood turtle beyond the end of regional funding cycles.
- Continue to coordinate with volunteers to monitor priority bog and wood turtle areas.
- Enlist additional, trained volunteers to assist with wood turtle stream transect monitoring.

Subjob C.2. SNAKES

Project Leader: Kris Schantz

Key Findings:

- ENSP personnel continued to recruit, train and manage the Venomous Snake Response Team (VSRT) in 2018.
    - Eight trainings were held in 2018 including State Parks and Forestry personnel, town-/county-contracted animal control officers, staff from a wildlife rehabilitation center, and personnel from two outdoor education/camping organizations.
    - Of the potential 82 team members (including 13 that have been trained but were not considered active team members in 2018 due to lacking "registration" information), 56 submitted information regarding their snake responses and time and mileage incurred at the time this report was prepared. Thirteen responders had responded to 38 venomous snake calls including 24 Timber Rattlesnakes and five Northern Copperheads; the remainder were confirmed as non-venomous snakes. ENSP has received most of the official sighting report forms for submission and entry into NJ DEP's Biotics database (Biotics) and continues to work to obtain the remainder from team members.
    - ENSP made no progress towards developing a structure to maintain and expand the team while decreasing ENSP responsibilities and time required.
    - ENSP personnel attempted to recruit two local police departments (one in northern New Jersey, one in central New Jersey) to venomous snake response training. Contacts expressed interest but did not pursue training.
- ENSP personnel worked to submit hundreds of rare snake observation data for entry into the Biotics tracking database. This included compiling, formatting, reviewing data obtained by the ENSP personnel, consultants, academics and private researchers, and when necessary, seeking clarification and/or corrections regarding the data from the original observers. A backlog of data remains.
- ENSP continued working with the ENSP Pinelands Snake Research Team to conduct surveys within the Pine Barrens.
    - In 2017 and 2018, 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.

- Data collected during the 2017 field season and submitted in the fall, 2017, included:
  - 45 snake observations that included two State-endangered species, one State-threatened species, one State-special concern, one species that is a candidate for State-threatened, one species that is a candidate for State-special concern, one species that is a SWAP-SGCN, and one common species.
  - Findings included previously undocumented critical habitat features including 13 nest sites/gestation areas and seven hibernacula (or observations proximate to hibernacula). The remaining observations included two "on road" and 23 observations within general summer habitat.
- Data collected during the 2018 field season and submitted in the fall, 2018, included:
  - Three volunteer surveyors submitted their data (two of which also submitted their timesheets) prior to this report.
  - Snakes were observed at 27 locations. The observations included two State-endangered species, one State-threatened species, one State-special concern, one species that is a candidate for State-threatened, two species that are candidate for State-special concern, one regional priority/NJ SWAP SGCN species, and one common species.
  - Findings included previously undocumented critical habitat features including five nest sites/gestation areas and five hibernacula (or observations proximate to hibernacula). The remaining observations included five "on road" and 12 observations within general summer habitat.
- In 2018, volunteers were permitted to survey any areas they chose but were provided with a few targeted areas where the ENSP is lacking data.

- Northern region den survey volunteers targeted one area in northern New Jersey for spring emergence surveys where timber rattlesnake and northern copperhead dens were suspected but never confirmed. The surveyors confirmed both species present and identified a larger den complex.
- ENSP personnel abandoned the idea of multiple species status assessment and recovery plan (in 2017 report, presented as the Pinelands Rare Snakes' Species Status Assessments) after reviewing literature regarding an assessment of the complications and pitfalls of focusing recovery plans on multiple species (Clark and Harvey 2002). Instead, the ENSP biologist focused on revising the 2009 Northern Pine Snake Status Assessment using more current literature and data and focusing on the USFWS' "3-Rs;" representation, redundancy, and resiliency.
- No opportunistic radio-telemetry research to identify rare snake critical habitats was conducted.
- No progress was made on the Timber Rattlesnakes' Species Status Assessment.
- Using a non-federal funding source, in early 2018 the ENSP continued to participate on the snake fungal disease project's monthly conference calls to determine the next steps; i.e., research focus.

<u>Conclusions:</u>

- The VSRT is continues to lack participation and require additional recruitment, training and guidance:
  - VSRT transition (who qualifies as an official volunteer versus those performing the service as part of their job responsibilities) has continued to cause some confusion. Some [trained] people (10-15) continue to fail to submit the necessary information/documentation to continue to participate regardless of ENSP's prompting.
  - Obtaining VSRT members time/mileage and response reports continues to be difficult. However, the volunteers provide a much-needed service to New Jersey residents and added protection for the snakes and as such, the ENSP is hesitant to remove trained personnel from the team due to a lack of reporting.
- A rare snake observation data backlog continues to exist, although it has been significantly decreased.
- Pinelands Snake Research Team requires additional instruction to encourage, if not ensure, they survey ENSP's target areas in 2019.
- Law enforcement has continued to patrol and target the 2016-identified snake collection hot spots for illegal activities. Unknown persons (or evidence of their presence) have been observed at sites and are suspected by researchers to have collected a gravid northern pine snake; no evidence exists.

Recommendations:

- The VSRT will continue in 2019 as ENSP continues to consider possible methods to maintain and expand the team while decreasing ENSP responsibilities and time required.
    - ENSP must pursue the two local police departments that expressed interest in training for recruitment as their communities are within venomous snake territories.
    - ENSP needs to recruit and train new personnel statewide to build the VSRT to ensure adequate coverage for NJ residents.
    - 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.
- Continue revisions on the 2009 Northern Pine Snake Species Status Assessment and share the document with appropriate professionals for their review and input. Upon revisions and finalization, continue work on the Northern Pine Snake's draft recovery plan which had begun in 2014.
- The ENSP will determine potential rare snake projects to be contracted through a non-federal funding source.

Literature cited:

Clark, J.A., and E. Harvey. 2002. Multi-species recovery plans under the Endangered Species Act. *Ecological Applications* 12(3): 655-662.

Subjob C.3. AMPHIBIANS

Project Leader: William Pitts

Key findings

- 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.
- ENSP volunteers have been recording salinity readings at several eastern tiger salamander breeding pools to collect baseline data and monitor for potential impacts from saltwater intrusion.
- *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.

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, breeding-pond surveys were conducted by ENSP volunteers and Conserve Wildlife Foundation of NJ (CWF) staff.
- ENSP's management efforts for tiger salamanders focus on known breeding pools on protected land within the species range, and managing those sites as needed.
- Identification and remediation of additional threats to eastern tiger salamander populations remains important, especially regarding potential disease, habitat destruction due to off-road vehicles, and potential salt water intrusion.

Recommendations

- Continue working with the Bureau of Lands Management and the CWF on vernal pool construction on Division of Fish and Wildlife lands to create and manage safe habitats.
- Develop a strategy to protect breeding pools from off-road vehicles, particularly on public lands. Work with Bureau of Law Enforcement on use of surveillance equipment to protect known breeding pools from illegal ATV activity.
- Follow up with GIS staff to ensure all new locations are represented in Biotics. Prioritize ponds with last observation dates from the 1980s for follow up surveys.

- 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 10 stream sites in six counties for listed freshwater mussels. Surveys were performed at historic locations, monitoring areas, and/or in previously unsurveyed suitable habitats. High water and high flow velocities due to unprecedented rain and flooding severely limited our ability to complete scheduled surveys throughout the season.
- We conducted habitat assessments and/or preliminary searches at 20 additional sites in three counties to determine if larger surveys were warranted.
- EPA Habitat Assessment Field Data Sheet scores (high and low gradient combined) ranged from 127 (Stony Brook, Mercer County) to 172 (Raritan River, Somerset County), 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 7.1-8.4, water temperatures ranged from 20.5 to 25.7 C, dissolved oxygen ranged from 6.5 to 9.3 ppm.
- Catch per unit effort (CPUE) for all freshwater mussel species combined during timed searches was highest in the Lamington River with 0.411 live mussels/minute. We estimate that the CPUE would have been higher in Lake Aeroflex than in the Lamington River, but survey efforts were curtailed to minimize harm/stress to live individuals in high density areas.
- The ENSP and volunteers found nine species of freshwater mussels (live and/or shells) during field activities, including the dwarf wedgemussel, brook floater, creeper, alewife floater, eastern floater, eastern elliptio, paper pondshell, eastern pondmussel and tidewater mucket. The eastern elliptio was the most prevalent and widespread mussel species documented. Species richness was highest in the Stony Brook (Mercer County), Lamington River (Somerset County), and Indian Mills Brook (Burlington County), with three species recorded at each location. Significant findings included one very fresh dwarf wedgemussel shell in the Pequest River, along with two live brook floaters in the Lamington River, downstream of a known occurrence. In addition, we recorded a fresh creeper shell in the Lamington River, along with a relict brook floater shell in the Stony Brook. Volunteers continued to document live eastern pondmussels and tidewater muckets within Union Lake, Cumberland County.
- 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. Results will also assist efforts by the Brook Floater Working Group (BFWG), whose primary objective is to develop a strategic conservation and restoration plan for the species across its range. New Jersey is now a member of the BFWG.
- Of the five stream sites (out of 10) surveyed for brook floaters, we found evidence of the species at two locations. We observed two live adult brook floaters in the Lamington River, Bedminster Township,

downstream of an extant occurrence, and just upstream of the Raritan River confluence. In addition, we found a relict brook floater shell in the Stony Brook, Mercer County, at a once occupied site (downstream of Carter Road).

- Impacts from severe flooding were observed at two historic brook floater locations. We observed flooding impacts in the Stony Brook, downstream of the Carter Road crossing, where we recorded 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 within Rosedale Park, where we observed and photographed debris hanging from trees directly above where live brook floaters were recorded in 2011. Despite much effort, we were unable to locate brook floaters in the stream stretch.
- We continued searches for the Chinese pond mussel in Wickecheoke Creek, Hunterdon County. In 2010, we documented the first North American occurrence of the highly invasive Chinese pond mussel (*Sinanodonta woodiana*) from ponds owned by the NJ Conservation Foundation (NJCF). The ponds had formerly been used as part of a fish farm operation for holding bighead carp and other fish species. Despite a rotenone treatment and lowering of all the ponds on site over one winter, there are Chinese pond mussels still living in the ponds.
- No live Chinese pond mussels or shells were found downstream of the ponds at monitoring locations that extended from the source to just above the mouth of the Delaware River. The number of shells along the ponds' banks appear to be declining.
- As requested by the DEP's Division of Water Monitoring and Standards, we compiled a list of stream sites that qualified for DEP's Category One antidegradation status via surface water quality rules based on the presence of select listed freshwater mussel species. Category One waters are protected from any measurable change in water quality because of their exceptional ecological, recreational, water supply, or fisheries resource significance.
- Working with staff of the Rutgers Marine Field Station (RUMFS), we continued surveys in the Mullica River system to investigate the role of pH on local bivalve fauna. We documented the first Pinelands occurrence of eastern elliptio, eastern floater, alewife floater, and the nonnative paper pondshell in Shamong Township, Burlington County, and identified suitable habitats where pH is elevated due to agricultural activities and other factors.
- Wildlife Conservation Corp (WCC) volunteers continued surveys in Cumberland and Monmouth counties.
- Listed and Special Concern 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, 13 out of 20 sites warrant further survey work to determine freshwater mussel species composition and abundance.
- Lake Aeroflex, Sussex County, appears to harbor a freshwater mussel species that we could not positively identify. Based on photographs and expert opinion, it is possible that the freshwater pearl mussel, *Margaritifera margaritifera,* may be present in the lake. This species was thought to be extirpated in NJ. If the identification is confirmed, the role of salmon stocking on the species' presence in the lake should be examined.
- 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.

- Although no live Chinese pond mussels have been recorded at the Wickecheoke Creek monitoring sites for several years, it is critical that all remaining individuals in the NJCF ponds are destroyed. The impacts of a Chinese pond mussel invasion in the Delaware River to native freshwater mussel populations in NJ and PA could be catastrophic.
- The discovery of freshwater mussels 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.
- Continue 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 BFWG to fill in data gaps and develop protective measures for critical areas. Begin using standardized monitoring techniques developed by the BFWG where applicable.
- Continue surveys for dwarf wedgemussels in the Pequest River to document occurrences and establish population boundaries.
- Continue to monitor Chinese pond mussel spread and assist NJCF with eradicating known pond populations.
- 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. Field truthing was postponed in 2017-2018 due to prevalence of high water and strong flows.
- 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 applicable areas. Continue discussions with NRCS regarding possible creation of brook floater habitat in the upper Lamington River.
- Continue surveys in previously unsurveyed stream and lake sites within the Mullica River system where pH is suitable (>5.5) for mussels.
- Solicit assistance from additional WCC volunteers; train volunteers to identify and survey for mussels; assign specific areas for survey work where data are lacking.

Subjob D.2. Macroinvertebrates

Lepidoptera

Project Leader: Robert Somes

Key Findings:
- Staff conducted surveys for Hoary Elfin at two known sites and three potential sites. Large emergences were observed at both known locations. New populations were also documented at three new sites. Two of these sites are adjacent to an area where habitat management is being conducted to benefit this and a variety of other species.
- Frosted Elfin surveys were conducted by staff at four historic locations (two metapopulations) to monitor their populations. More than 50 Frosted Elfins were observed at each location.
- Extensive surveys were conducted for Georgia Satyr (*Helicta satyr*) in the New Jersey Pinelands. There are large areas of potential habitat that had never been surveyed for this species and NJ is considered a regional stronghold. Due to these efforts, 12 new populations were discovered within the Pinelands region. Surveys for Georgia Satyr also documented six new Two-spotted Skipper populations within the Pinelands region.

- Northern Metalmark surveys were conducted at two known locations. The one known site had a count of over 50 individuals and continues to persist, although invasive plants are becoming an issue again. One of these sites had not been surveyed in several years and was never surveyed during the peak flight, so only low numbers had been observed until this season. Over 100 metalmarks were observed during this year. The Division of Fish and Wildlife is partnering with the landowner of this site to implement management that will help support the colony. A management plan is also being developed to improve habitat for this species on State property adjacent to the colony.
- A survey for Arogos Skipper was conducted on Ft. Dix and we observed six skippers at a historic site. This is likely to be the last extant population for the species in New Jersey.
- Habitat management for pollinators in general continued with the planting of pollinator seed-mix plots at various locations throughout NJ. Six hundred common milkweed, swamp milkweed, and orange butterfly weed plants were distributed for planting throughout the State in 20 state parks. This is up about one-third from 2017, when 400 plants were planted in 12 state parks. These plants were used to create and expand pollinator gardens.

Conclusions:

- The partnership with the State Park Service and the State Forest Service to propagate milkweed and to create butterfly gardens and meadows continued to be a success and could be expanded. This year we were able to get plantings at 20 state parks, up from 12 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 are improving large sections of Wildlife Management Areas for the benefit of rare butterflies and pollinators by delaying mowing until after September 30, and by changing the seed mixes used for planting to include more plants suitable as foodplants and as nectar sources for native butterflies and pollinators.
- Surveys of potential rare butterfly species habitat continued to yield discoveries of new colonies for many species; large areas of unsurveyed but suitable habitat exist within NJ for many species.
- Surveys of potential habitat in the New Jersey Pinelands yielded new colonies for several species and showed that many potential new sites for rare species exist in this unique 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 Arogos Skipper and Frosted Elfin should be a high priority in NJ. Frosted Elfin and Arogos Skipper are both being petitioned for Federal listing and better baseline data for NJ would be beneficial to the effort. Both of these species have regional strongholds in NJ and Arogos Skipper is probably one of our most imperiled species.

Odonata

Project Leader: Robert Somes

Key Findings:

- Staff conducted surveys for Scarlet Bluet, Pine Barrens Bluet, and New England Bluet as part of a regional effort to address the conservation of these species because they are endemic to the Northeastern United States. Five populations of New England Bluet, 14 populations of Scarlet Bluet, and five populations of Pine Barrens Bluet were surveyed and documented. Habitat characteristics were also surveyed at these sites to better understand their life history requirements and management needs.
- Surveys for other listed Odonata species documented occurrences for the following species: Superb Jewelwing - 1 site, Golden-winged Skimmer – 4 sites, Brook Snaketail – 1 site, Maine Snaketail – 2 sites, Septima's Clubtail – 1 site, and Spatterdock Darner – 3 sites.
- A variety of other SGCN Odonata species were also observed during these surveys and documented.

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 2018 to determine whether the sites are occupied or not or if the species were just missed during the surveys.
- Surveys should be conducted for Harpoon Clubtail along the Delaware River to determine the distribution in the 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 2019 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 2014-2018 period due to funding and staff constraints. The segment final report will address next steps.

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 collecting 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. The 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 2018. All sightings will be included in the next versions of the SOA (Species Occurrence Area) file and Landscape Project.
- Three sea turtles were reported at OCNGS during the project period; one live Loggerhead (13 June 2017), one live Kemp's Ridley (4 September 2017), and one live Green Turtle (28 September 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.
- After 49 years of operation, OCNGS shut down operation in September 2018.

Conclusions/Recommendations:

- 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).
- After 49 years of operation, OCNGS shut down permanently in September 2018. Given the uncertainty in the modeling, along with the imminent plant closure, no further actions were taken during the project period.
- Applications of our methods (with modifications) at Salem Nuclear Generating Station, where sea turtles are taken with some regularity, may be feasible and worth further investigation.

Literature Cited

Tathem, 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.

JOB F. THREAT ASSESSMENT: Emerging Diseases

Subjob F.1. Emerging Diseases

Project Leader: Kris Schantz and Brian Zarate

Key Findings:

- ENSP is not pursuing testing symptomatic snakes because we determined, as a result of findings under the Comp-SWG project (WSFR-NJ F14AP00036, 2014-2017), it is likely Snake Fungal Disease can be found statewide and among various species. However, the ENSP continued to provide assistance to other researchers interested in assessing and testing symptomatic snakes.
- Staff contracted with the Wildlife Conservation Society – Bronx Zoo to continue conducting health assessments at priority bog turtle sites. One site was visited this year and 12 turtles were sampled and assessed. Some results are still pending, but all turtles tested negative for Ranavirus and Mycoplasma. One eastern box turtle was removed from the site for care by WCS staff and later returned healthy after treatment for an ear infection and nasal discharge.

Conclusions:

- ENSP can provide assistance to other researchers at low cost while obtaining information regarding suspected infections.

Recommendations:

- Provide guidance to research and conservation partners interested in assessing SFD prevalence as needed.
- ENSP will maintain a record of reported symptomatic snakes for future reference should New Jersey snake populations demonstrate severe declines.
- ENSP begin to assess the need for further bog turtle health screenings at new site and consider beginning to re-sample sites last sampled 5+ years ago.

Performance Report

Project: **2. Habitat Management and Planning**
Federal Aid Project: T-1-7 (State Wildlife Grants)
Segment dates: September 1, 2017 to September 30, 2018

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 met occasionally during the year with biologists, foresters and planners from within DEP to discuss management priorities and management challenges on state lands. The primary focus was in the Skylands region because outside funding was available in that region to conduct forest inventories within the majority of state lands (WMAs, parks, and forests).
- ENSP staff continued overseeing forestry activities and habitat planning on Sparta Mountain and Weldon Brook WMAs after the retirement of the Division's northern region habitat planner.
    - ENSP staff contracted with a forester to create the 2018 practice plans for Year 1 of the Sparta Mountain WMA Forest Stewardship Plan, and to implement the practice plans by March 31, 2018. The day prior to the announced implementation, public outcry convinced the Commissioner to put a temporary hold on the project.
- ENSP staff observed 55 different bird species (21 of which are SGCN) during the 2018 post-treatment bird surveys on Sparta Mountain and Weldon Brook WMAs.
    - A total 53 species (20 of which are SGCN) were observed in at least one of the six managed sites on Sparta Mountain WMA. A total 26 species (12 of which are SGCN) were observed in the one managed site on Weldon Brook WMA.
- An acoustic monitoring unit was deployed on Sparta Mountain in one of the management sites to determine what, if any, bird species present at the site were not detected during the surveys.
    - On the same day, the acoustic monitoring unit detected seven species that were not detected during the surveys: American robin, black-billed cuckoo, great crested flycatcher, indigo bunting, northern cardinal, northern flicker, and scarlet tanager.
    - Three species were detected during the survey that were not detected on the acoustic monitoring unit: common yellowthroat, least flycatcher, and white-breasted nuthatch.
- Preparations to hire a forester to create a practice plan for this winter's activities on Weldon Brook WMA were made, but the meeting with technical stakeholders was delayed in order to address the circumstances surrounding Sparta Mountain WMA.
- 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:

- Forest management conducted on state lands to allow the regeneration of oak/hickory forests (i.e. Modified Seed Tree with Wildlife Reserves) within a mature forested landscape creates breeding habitat for many bird species of conservation need (Fig. 2A-1) and is also used by mature forest bird species, including the endangered red-shouldered hawk.
- Continue to manage forests on state lands to allow the regeneration of oak/hickory forests (i.e. Modified Seed Tree with Wildlife Reserves) within a mature forested landscape, provided the amount of forest in

the young forest stage (<20 years post-harvest) does not exceed 20% of the forested landscape at a given time.
    - Conduct management on Sparta Mountain WMA during the winter of 2018/19 as outlined in Year 1 of the approved forest stewardship plan.
    - Convene meetings with technical stakeholders to discuss areas to be managed the winter of 2018/19 on Weldon Brook WMA and create a practice plan to manage forested areas the winter of 2018/19.
    - Determine the feasibility of using drones and acoustic monitoring units to record bird species in areas difficult to access.
- 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.*

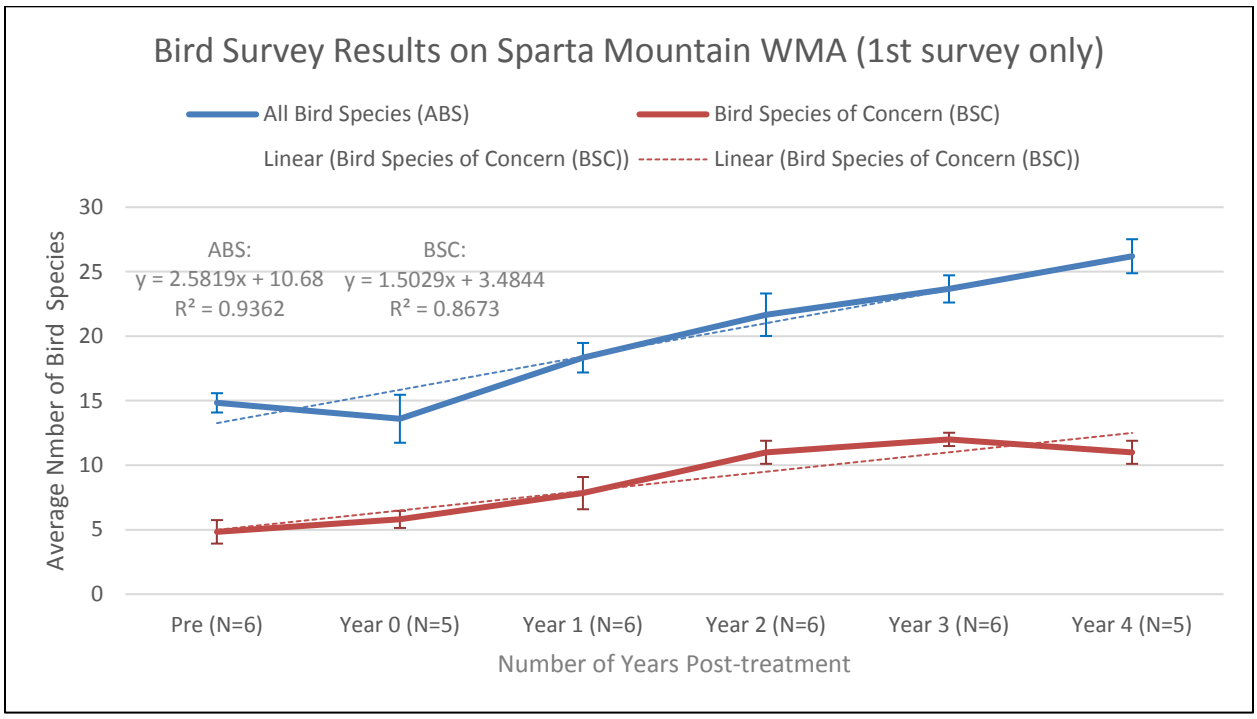

Figure 2A-1. Average (± SE) number of bird species (ABS, blue) and bird species of concern (BSC, red) observed during breeding bird surveys on Sparta Mountain WMA. Pre-treatment surveys were conducted in 2004 and/or 2008 and selected based on proximity to treatment sites (conducted 2012-2018) within the same forest stand.

JOB B.1. Forest Habitat Management

Key Findings:

- In 2018, 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 eight private landowners interested in Working Lands for Wildlife (WLFW).

- A total 55 sites were surveyed for all bird species in 2018: 24 WLFW, 17 Management (MGMT), 11 Natural (NAT), and three pre-management (PRE). NAT sites represented naturally-occurring "young forest" habitat within wetlands and were considered the control sites. 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.

  - From 2014 – 2018, species richness (SPP) in NAT sites had a trend of 0.08 per year while bird species of concern (BSC) had a trend of -0.03 per year. Species richness in MGMT+WLFW sites had a trend of 1.68 per year while BSC had a trend of 0.78 per year (Fig. 2B1-1).
  - A paired T-test was used to analyze differences of SPP and BSC between NAT sites and WLFW+MGMT sites from 2014 - 2018. As expected with an increasing trend, WLFW+MGMT sites had significantly greater SPP and BSC compared to the NAT sites (P=0.001; P=0.003)
  - GWWAs were detected on three MGMT sites in 2018 but not on WLFW or NAT sites. Blue-winged warblers (*Vermivora cyanoptera*; BWWAs) were observed at 26 sites; 15 individuals at ten WLFW sites, 13 individuals at ten MGMT sites, and six individuals at six NAT sites. One Brewster's warbler hybrid (*Vermivora* spp.) was observed at one MGMT site.

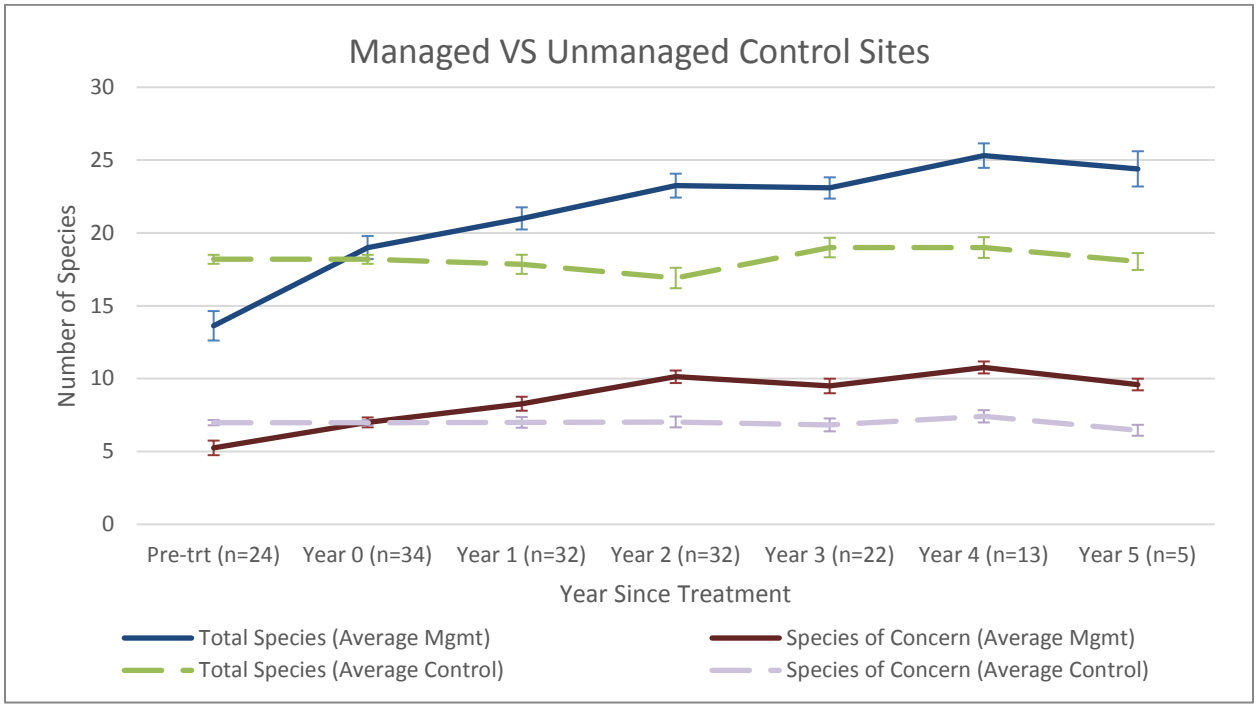

Figure 2B1-1. Average (± SE) number of bird species (blue, green) and bird species of concern (red, violet) observed during breeding bird surveys on Managed (WLFW & public lands treated to create or enhance habitat for GWWAs) and Unmanaged (Natural Control) sites.

- 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 2018, GWWAs continued to use those spans during the breeding season.
  - 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. 2B1-2). In 2018, these GM spans contained seven of the 15 GWWA males observed in NJ, five were not on ROWs, and three were on non-GM spans along the same transmission line.

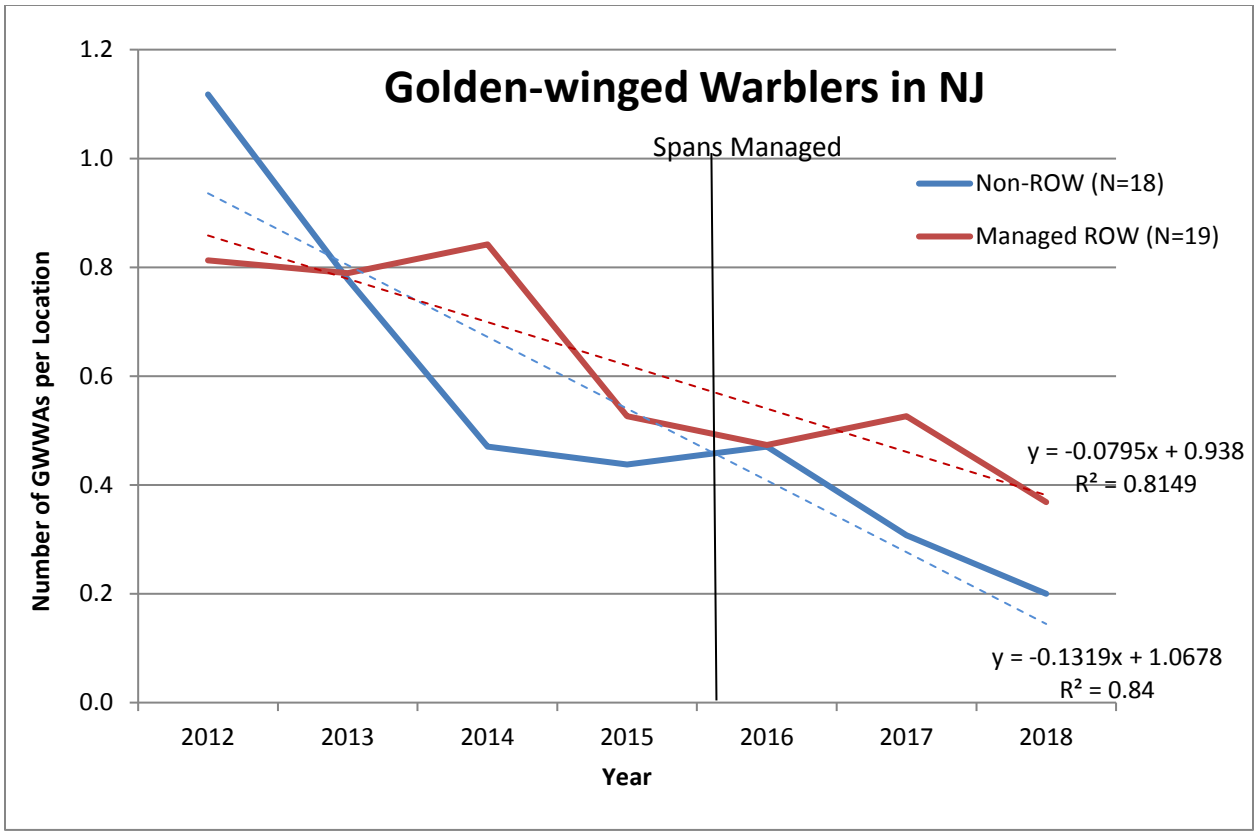

Figure 2B1-2. Number of golden-winged warblers observed per survey location from 2012 – 2018 (data from ENSP and NJ Audubon). The managed ROW (red) represents the 19 spans chosen for GWWA management, where the span-specific prescriptions were implemented winter of 2015/16. The Non-ROW (blue) represents known GWWA locations in 2012/13 that are not within a utility right-of-way. The dotted lines are linear trends.

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. Overall, opening the forest canopy to create GWWA breeding habitat results in a 40% increase in the number of bird species using the site during the breeding season. However, the forest stands are still too young to attract golden-winged warblers.
- Approximately 67% of NJ's breeding GWWA population on the transmission line maintained by PSEG, and about half the population is breeding in the spans specifically managed for GWWAs. 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.

JOB B.2. Habitat Connectivity and Management

This was inactive here, but is covered in NJ W-78-R.