Interim Report
State Wildlife Grants
T-1-7
F13AF01086

Endangered, Threatened and Rare Wildlife Conservation Projects

Interim Report for Project Year
September 1, 2015 – August 31, 2016

NJ Department of Environmental Protection

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

Conserve Wildlife
New Jersey Division of Fish & Wildlife
Endangered & Nongame Species Program

SPORT FISH & WILDLIFE RESTORATION

Performance Report

Project: **1. SGCN Research, Monitoring and Management**
Federal Aid Project: T-1-7 (State Wildlife Grants)
Segment dates: September 1, 2015 to August 31, 2016

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:

- Staff surveyed 35 locations and coordinated with NJ Audubon to survey an additional 28 locations for golden-winged warblers in potential habitats (utility ROW, shrub swamp, successional forest, old field). We also report on 73 surveys conducted to evaluate Working Lands for Wildlife (see Project 2, Job B1, in this document). Therefore, a total of 136 surveys were conducted to aid in the identification of priority areas for golden-winged warbler management in spring 2016.
  - 113 of the points were in NJ, 23 were in NY.
  - Eight points were part of the Golden-winged Warbler Atlas Project (GOWAP), a regional effort to monitor GWWA population trends and changes in distribution.
  - Twenty-eight points had never been surveyed for GWWA prior to 2016.
- Twenty-five golden-winged warblers (in 26 locations), four hybrids, and 74 blue-winged warblers were observed during the survey period. Seventeen golden-winged, 62 blue-winged, and all four hybrid (3 Brewster's, 1 Lawrence's) observations were in NJ (Fig. 1). One GWWA male was observed at two different survey locations.
  - Two GWWA locations not surveyed in 2015 were surveyed in 2016 (1 had GWWA in 2014), and two GWWA surveyed in in 2015 were not surveyed in 2016 (1 had GWWA in 2015). Three (16%) of the 19 NJ locations occupied by golden-winged warblers in 2015/14 were not occupied in 2016, one (11%) of the previous nine golden-winged warbler locations missing golden-winged warbler observations in 2015 were recolonized in 2016. Three (3%) of the 89 locations without any previous golden-winged warbler observations were colonized in 2016, but one location was a single male with two territories.
- One of the golden-winged warbler males banded in 2014 was recaptured in 2016 along a utility ROW a few hundred meters from 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, 2017.
- Staff attended the first Northeast Appalachian Mountain Joint Venture Technical Meeting in Bear Mountain, NY, March 22-23, 2016, and the regional Appalachian Mountain Joint Venture Technical Meeting, August 1-4, 2016.
- 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.

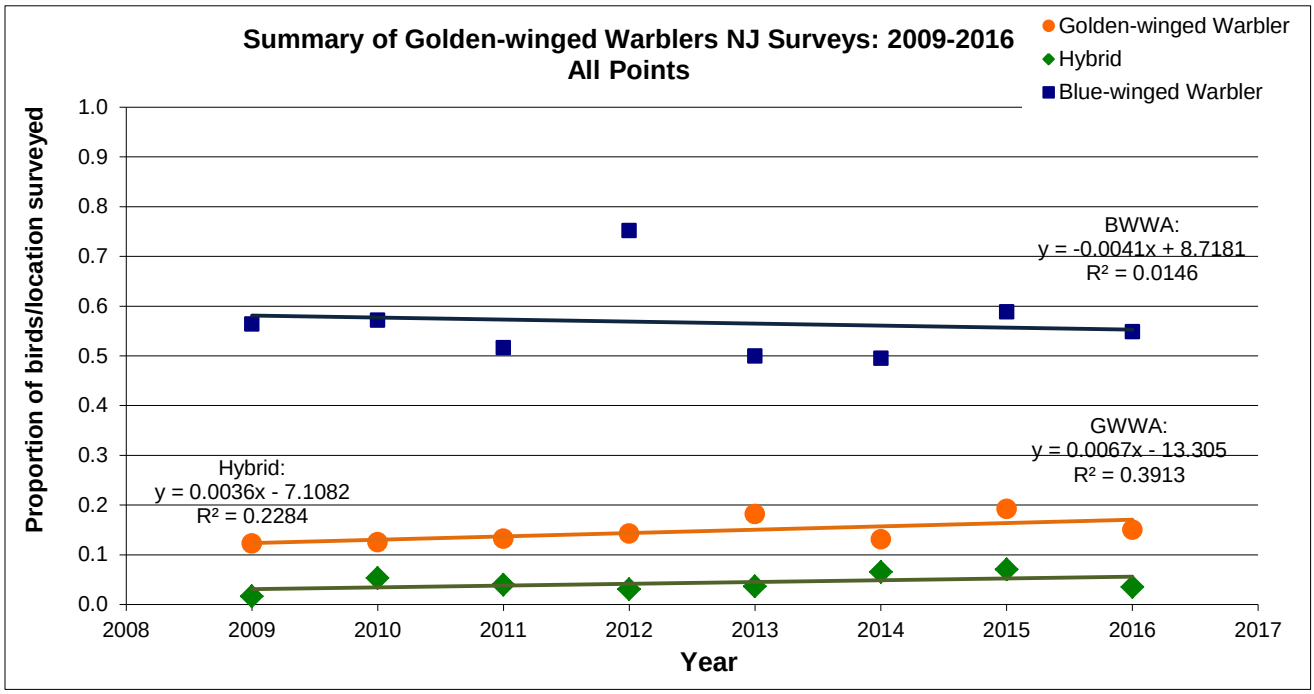

Figure 1. Proportion of golden-winged warblers, blue-winged warblers, and hybrids observed per survey location during the 2009 (n=179), 2010 (n=117), 2011 (n=151), 2012 (n=161), 2013 (n=110), 2014 (n=107), 2015 (n=99), and 2016 (n=113) surveys.

Conclusions:

- The number of breeding golden-winged warblers observed in NJ dropped by two individuals in 2016 even though there was a net gain of one breeding GWWA site. Overall, the population has been fairly stable with slight fluctuations since 2012 and the proportion of survey locations occupied has been slightly increasing at a rate of 0.7%/year since 2009 (Fig. 1). Blue-winged warblers are slightly decreasing while hybrids are slightly increasing overall.
- Similar to 2014 and 2015, 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.
- When looking at only repeated GWWA survey points, the proportion of GWWAs observed per survey location increased since 2014, BWWA increased after a decrease in 2015, and hybrid observations decreased (Fig. 2). Many of the same sites recolonized multiple times by GWWAs could be a result of high site fidelity coupled with limited optimal breeding sites in NJ.
- There are 14 "optimal sites" in NJ: Nine where GWWAs have been observed every year since 2013 and five where GWWAs have been observed in three of the last four years. All of the sites are on conserved lands. Half of the sites are along the ROW managed by PSEG within conserved lands, three are on lands managed by Passaic County, two are on lands managed by the City of Newark, one on lands managed by The Nature Conservancy, and one on lands managed by the NJ DEP.

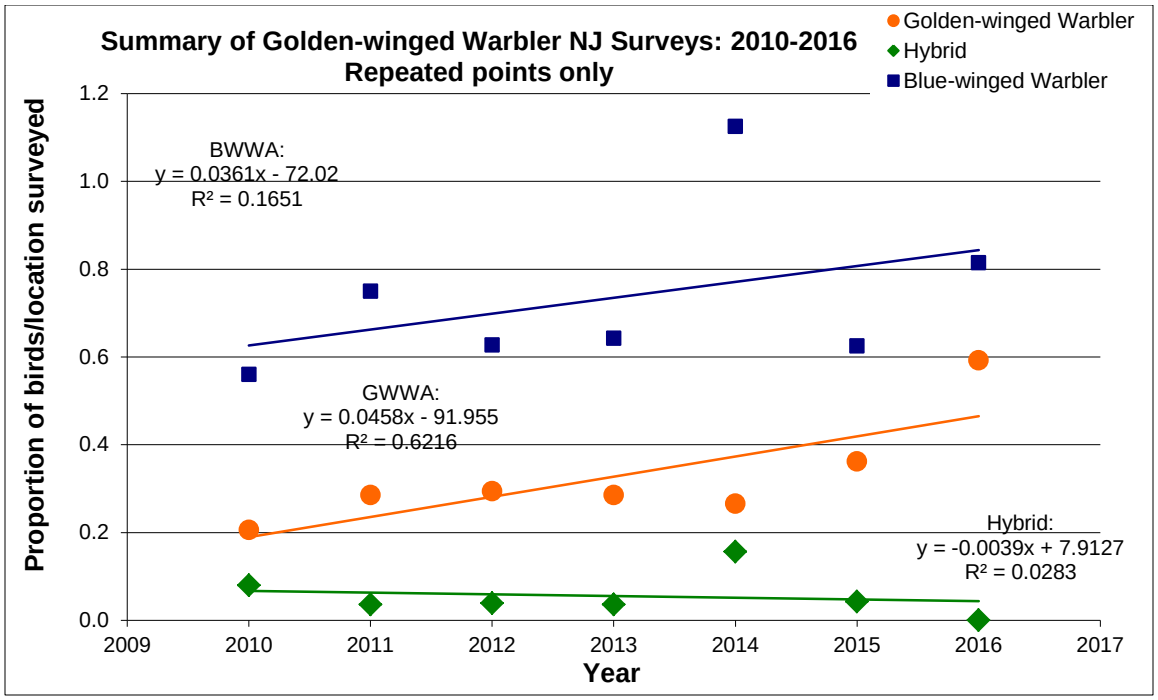

Figure 2. Proportion of golden-winged warblers, blue-winged warblers, and hybrids observed per repeated survey locations in 2009-10 (n=25), 2010-11 (n=28), 2011-12 (n=51), 2012-13 (n=56), 2013-14 (n=64), 2014-15 (n=47), 2015-16 (n=27).

Recommendations:

- Continue to coordinate surveys with NJ Audubon and GOWAP.
- Continue to collaborate with PSEG to retain the breeding GWWAs on their power line spans.
- Without the maintenance of existing and/or creation of new breeding habitat in NJ specifically for golden-winged warblers, the population will once again begin 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. Expand efforts to work with City of Newark and Passaic County.
    - Investigate the 14 optimal sites in NJ to determine why those areas consistently retain breeding GWWAs.
- 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 create plans to enhance habitat around 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. Per ENSP input, the restoration will include an upland dike to protect ~100 ac of freshwater wetlands from saltwater tidal inundation during restoration of the inlet and flow to Pond Creek. Non-federal funding was secured and engineering was completed. Staff met throughout the year to review ground surveys on projected vegetation and water depth targets for the marsh plain to benefit marsh birds and shorebirds, and other migrating birds.
- Plans and projected marsh elevations, made by engineering contractor, will be ready for review in late 2016. In calendar 2017, plans will be finalized in preparation for going to bid.

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. ENSP should continue to leverage outside and non-federal funding to accomplish our objective of maintaining important habitats for migrating birds. Pre- and 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:

The scope of work covered by this Subjob was conducted (in this year) under other grants:

1. NJ E-1-38 (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 Non-game Species Program and Division of Land Use Regulation, and the U.S. Fish and Wildlife Service, New Jersey Field Office

Subjob C.2. SNAKES

Project Leader: Kris Schantz

Key Findings:

- ENSP continued to manage the Venomous Snake Response Team (VSRT) and respond to telephone inquiries regarding potential venomous snake presence on private lands and public recreation areas.
  - No trainings were held in 2016 due to time constraints on ENSP personnel.
  - In 2016, the additional paperwork required from team members as a result of the 2014 restructuring of the response team (i.e., identifying those that are considered "volunteers" that receive no compensation for their effort versus those that are compensated [e.g., State workers, town-contracted animal control officers, police]) resulted in increased difficulty for ENSP to gather the necessary information from and consequently, provide the necessary authorization to team members.
    - This resulted in only 44 of the potential 119 members receiving official authorization to act as venomous snake responders. The limited available personnel increased ENSP's difficulty to provide responders to residents in need of assistance in a timely manner resulting in the need for ENSP to frequently request assistance from local qualified permit holders (consultants and researchers; i.e., not official response team members).
    - ENSP's attempts to locate available responders took as long as two hours, with most requests taking almost 45 minutes. ENSP has, in the past, dispatched responders within 15 minutes of receiving a request for assistance and verification of a venomous snake, with responders reaching the target location within 30 minutes after being dispatched.
  - Of the forty-four official team members, 35 submitted information regarding their responses and time and mileage incurred; excluding personnel from key areas that annually receive the most or second most number of response requests. Six out of those 35 responded to 16 venomous snake calls, confirming 14 Timber Rattlesnakes, no 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 two observations.
  - ENSP made no progress of developing a structure to maintain and expand the team while decreasing ENSP responsibilities and time required.
- ENSP reviewed rare species observations for potential entry into Biotics.
  - During this reporting period, the following sightings were entered into Biotics:
    - 7 Timber Rattlesnake sightings
    - 0 Northern Copperhead sightings
    - 6 Eastern King Snake sightings
    - 0 Northern Pine Snake sightings

        - 26 Corn Snake sightings
    - Additional sightings were entered into ENSP's tracking database (preliminary database used prior to entry into the Biotics database) and will be reviewed by ENSP staff over the next year for entry into the Biotics database including:
        - 62 Timber Rattlesnake sightings
        - 5 Northern Copperhead sightings
        - 5 Northern Pine Snake sightings
        - 4 Eastern King Snake sightings
        - 6 Corn Snake sightings
    - A change in personnel inputting observations into ENSP's tracking database and Biotics (i.e., experienced personnel no longer conducting the work; ENSP must rely on less experienced personnel) has exacerbated an already significant backlog of submitted observations.
- ENSP personnel are in possession of ≥275 timber rattlesnake and/or northern copperhead observation data; the number of other rare snake observations has not been determined. Due to continued responsibilities regarding the State Wildlife Action Plan review and environmental reviews requiring an inordinate amount of time, personnel have not been able to compile and review data to submit to the data management team.
- ENSP recruited volunteers to participate as members of the Pinelands Snake Research Team.
    - 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; volunteers continue to gather their data and clarify information on data already submitted.
    - Volunteers were assigned square mile sections to survey where ENSP is lacking data. However, it appears that many failed to cover their assigned areas and instead focused on areas they were familiar with or were confident they had located snakes.
- ENSP, with assistance from private and academic researchers and volunteers, identified twelve "hot spots" for snake collection within the Pinelands (11) and southern New Jersey (1). ENSP provided to DFW's Bureau of Law Enforcement information on snake life history, behavior and critical periods when collection is likely to occur, and maps with target patrolling periods.
- ENSP personnel reviewed and edited the NJ chapter of the Timber Rattlesnake Conservation Action Plan (TRCAP), a document that was started more than 20 years ago; led by William H. Martin and Alvin Breisch.
- ENSP biologist was unable to commit additional time to the following due to responsibilities regarding the State Wildlife Action Plan review and environmental permit reviews requiring an inordinate amount of time.
    - Timber Rattlesnake status assessment and recovery plan development.
    - Pinelands Rare Snakes' Status Assessments and Recovery Plan (formerly the Northern Pine Snake recovery plan).
- No den surveys were conducted in search of undocumented dens. ENSP's focus during spring emergence was revisiting known dens in search of potentially infected snakes (snake fungal disease); funded through Competitive SWG and mitigation funds.
- 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 to continue to participate, and some team members failed to submit documentation of their responses and time and mileage incurred.
- The lack of active participants has made 2016 a difficult season for ENSP personnel seeking field assistance in a timely manner.

- There is a significant backlog of rare snake observation data both in the data entry process and awaiting review prior to data entry. ENSP is planning to obtain a contractor to help solve this problem.
- Pinelands Snake Research Team requires additional instruction to encourage, if not ensure, they survey ENSP's target areas in 2017.
- Law enforcement began patrolling and targeting the snake collection hot spots for illegal activities shortly after meeting with ENSP. ENSP had not been privy to their findings.
- ENSP contribution to TRCAP's NJ chapter was significant as the original draft failed to describe the various conservation efforts and regulatory measures in place that benefit New Jersey's timber rattlesnakes. In addition, the map of their current distribution and population status (i.e., extant, extirpated) was inaccurate. This was ENSP's first opportunity to provide significant input on this document; in the early 2000's, ENSP requested the developers avoid showing specific den location data.

Recommendations:

- The VSRT will continue in 2017 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 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.
- 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.

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 27 known or potential breeding pools throughout the species range. Specific emphasis was placed on surveying potential new breeding pools, and as a result, one new breeding population was identified.
- *Head Starting*: The Department did not pursue any head-starting projects, as prior experiences with partners proved to have little value.
- *Lizard Tail Swamp WMA*: Plans to re-grade certain man-made breeding pools at this location were initiated, and water level monitoring is ongoing to establish the most desirable water levels needed to preclude the retention of a permanently breeding fish population.
- *Mechanic Street*: ENSP 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.

- *Beaver Swamp WMA*: A consultant has completed and submitted a rare plant survey for a potential "alternate" breeding pool construction project, following the need to abandon a prior location due to potential impacts to rare plant species. Water level monitoring in this existing wetland is ongoing to determine potential desirable water depths and the potential need to excavate.
- Submissions to ENSP on vernal pool data were cataloged but no entry into the database was completed until the database undergoes revision.

Conclusions

- ENSP's survey efforts have emphasized the potential identification of previously undocumented eastern tiger salamander breeding populations. One new active pool (and population) was discovered.
- ENSP's management efforts for tiger salamanders continue to focus on known breeding pools on protected land within the species range. Efforts have specifically been made to maximize the suitability of existing pools, improve habitat connectivity, and to potentially create new pools which would help connect regional metapopulations and/or potentially draw species populations away from areas at risk to sea-level rise. This focus may hold the most value to maintain the long term persistence of tiger salamanders in New Jersey in the face of habitat threats, most notably climate change and sea-level rise.
- 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 15 stream sites in nine counties for listed freshwater mussels. Surveys were performed at historic locations, monitoring areas, and/or previously unsurveyed suitable habitats
- We completed habitat assessments and/or preliminary searches at eight 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 119 (Maurice River, Cumberland County) to 163 (Musconetcong River, Warren 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.
- In 2015, we completed an analysis of freshwater mussel data collected between 2000-2014 by comparing individual habitat characteristic scores from EPA Habitat Assessment Field Data sheets (including but not limited to epifaunal substrate/available cover, sediment deposition, bank stability, and riparian width) with freshwater mussel abundance and diversity. We tested our previous findings using habitat data collected during this season's mussel surveys. The model adequately accounted for maximum abundance and diversity, using eight discrete scores and one continuous variable (Table 1). Coefficients of variation were generally low, usually less than 0.30 (range 0.11 – 0.67); thus, there is much variability of freshwater mussel populations in NJ waters.
- Water quality values were as follows: pH ranged from 5.7 to 8.2, water temperatures ranged from 16.5 to 28.8 Celsius, dissolved oxygen ranged from 4.4 to 10.0 ppm.
- Catch per unit effort (CPUE) for all species combined during timed searches was highest in the Stony Brook, with 0.35 live mussels/minute.
- The ENSP and volunteers found ten species of freshwater mussels (live or shells) during field activities, including the Brook floater, Eastern lampmussel, Eastern pondmussel, Tidewater mucket, Triangle floater, Creeper, Alewife floater, Eastern elliptio, Eastern floater, and Paper pondshell. The Eastern elliptio was the most prevalent and widespread mussel species documented. Species richness was highest in Haynes Creek, Burlington County, and the Stony Brook, Mercer County, with four species recorded at each location. Significant findings included two live Tidewater muckets and two shells, and one live Eastern pondmussel in Union Lake, Cumberland County; two fresh Brook floater (juvenile) shells and four fresh Creeper (one juvenile) shells in the Stony Brook, Mercer County (different locations); one live Eastern lampmussel and several shells in Lake Aeroflex, Sussex County; and one fresh Triangle floater shell in Salem Creek, Salem County.
- In 2015, we trained representatives from the NJ Invasive Species Strike Team (NJISST) and NJ Conservation Foundation (NJCF) to identify the highly invasive Chinese pond mussel and other freshwater mussel species. Since this time, NJISST volunteers have been conducting searches in Wickecheoke Creek to assist in determining if the mussels are spreading downstream from the source ponds (formerly part of a fish farm) towards the Delaware River. The Conservation Foundation and NJISST, in coordination with FWS and ENSP biologists, are determining the best chemical-based method for eradicating all life stages of Chinese pond mussels from occupied pond sites. The fish pond site represents the first documented occurrence of Chinese pond mussels in the United States (and North America) (Bogan *et al.* 2011).
- To date, NJISST volunteers have identified one privately owned pond adjacent to the NJCF preserve that contains live Chinese pond mussels. Despite 11.6 stream miles searched in Wickecheoke Creek and

tributaries, Plum Brook and the D & R Canal, live Chinese pond mussels have not been found outside the NJCF preserve or in the adjacent, privately owned pond. One partial Chinese pond mussel shell was located in the creek at a culvert south of Allen's Corner Road, but this was most likely washed downstream from the occupied fish farm ponds.

- We focused efforts on 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 eight stream sites (out of 15) surveyed for Brook floaters, we found the species at only one location. Two fresh, young Brook floater shells were discovered in the Stony Brook, Mercer County, just downstream of a known occurrence. Interestingly, the site also had the highest CPUE value of the season. Consultants surveying at the actual occurrence site in anticipation of a major bridge replacement project found no Brook floaters present.
- Impacts from severe flooding were observed at one location (SB Raritan River), where we photographed vegetation and debris dangling from beneath a bridge (Fig. 1). There was little suitable substrate present; mud/muck bottom was prevalent, with only a few Eastern elliptio observed. Evidence of scouring/flooding was also observed at other locations (Musconetcong and NB Raritan rivers), whereas a strong petroleum odor and sharp drop off in mussel abundance was detected at a third site (Stony Brook above Lewis Brook). The odor was so strong that members of the field crew became nauseous and were forced to stop surveying for the day. The incident was reported to the DEP emergency response team.
- Wildlife Conservation Corp (WCC) volunteers continued surveys in Salem Creek and surrounding waterways, Cumberland 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.
- The Conserve Wildlife Foundation's "Freshwater Mussels of New Jersey" story map is now online and available through the CWF and NJDFW websites. We provided text, images, dichotomous key specific for NJ, and video clips to be used in the story map, which includes the following sections: Introduction, Ecology and Life History, Status and Threats, Conservation and Management, Survey Methods, Identification, Dichotomous Key to NJ Species, Species Profiles (with images of species and habitats), Zebra Mussels, Health Advisories and Regulations, and Data Sheet. The story map contains printable sections that can be used by ENSP volunteers during mussel surveys.

Conclusions:

- Based on habitat suitability assessments and preliminary searches, five out of eight sites warrant further survey work to determine freshwater mussel species composition and abundance.
- In general, our model effectively predicts freshwater mussel abundance and diversity in most small to mid-sized streams for eight key habitat parameters that are ranked by EPA Habitat Assessment Field Data sheets and pH. The model does not account for other factors that can affect mussel distribution, such as water quality, presence of host fish, surrounding land use practices, etc.
- 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.

- Despite surveys by NJISST volunteers, it may be too soon to determine whether or not the species is living in Wickecheoke Creek, and/or has been washed down (or carried via hosts fishes) to the Delaware River or D & R Canal. The creek is intermittent and fairly unsuitable to support freshwater mussel populations, but it contains pockets of deeper, stagnant pools, a preferred Chinese pond mussel habitat type. It is critical that all Chinese pond mussels are eliminated from the former fish farm and adjacent property ponds.

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 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.
- Field truth 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. Also, use model results as a tool to help identify previously occupied, suitable areas where appropriate listed/rare species may be reintroduced.
- 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.

Literature Cited

Bogan, A.E., Bowers-Altman, J. and M.E. Raley. 2011. The first confirmed record of the Chinese pond mussel (*Sinanodonta woodiana*) (Bivalvia: Unionidae) in the United States. The Nautilus 125(1):41-43.

Table 1. Tabulation of model analysis for 2000-2014 vs. 2016 test maxima.

parameter	Maximum abundance - all species (L+S)		Maximum diversity - # species	
	Predicted value	Measured value	Predicted value	Measured value
pH	6.75 +/- 0.25	6.7	8.75 +/- 0.25	7
total habitat score	125 +/- 5	125	145 +/- 5	162
bank stability score	15.5 +/- 0.5	12	15.5 +/- 0.5	16
riparian zone width score	17.5 +/- 0.5	16	15.5 +/- 0.5	18
vegetative cover score	16.6 +/- 0.5	16	16.5 +/- 0.5	18
sum of veg and rip zone score	31.5 +/- 0.5	32	32.5 +/- 0.5	29
channel alteration score	15.5 +/- 0.5	15	14.5 +/- 0.5	16
embeddedness score	12.5 +/- 0.5	13	14.5 +/- 0.5	16
sediment deposition score	11.5 +/- 0.5	15	12.5 +/- 0.5	13
	good fit (<1) 5%			
	close fit (<2) 10%			

Figure 1. South Branch Raritan River, Somerset County, evidence of major flooding event.

Subjob D.2. Macroinvertebrates

Lepidoptera

Project Leader: Robert Somes, Senior Zoologist

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, Hessell's Hairstreak, and Frosted Elfin.

Key Findings:

- The 2016 butterfly season was a highly challenging one marked by a cool late spring and very wet June leading to depressed butterfly numbers for the early part of the season. The late spring caused the emergence of many insects to be delayed by several weeks. 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.
- As part of the State Wildlife Action Plan (SWAP) update, a concerted effort was made to incorporate other insect species groups into the plan, which involved collaborating with a variety of private insect enthusiasts and staff from several universities. Through this effort, we were able to create preliminary Species of Greatest Conservation Need (SGCN) lists for bees, tiger beetles, and moths for New Jersey. This will allow us to better target future research and conservation efforts for these other often neglected species.
- The partnership that was developed between the NJ State Forestry Service, NJ State Park Service, and the ENSP to create a statewide program of butterfly/pollinator gardens and meadows, and to create management and maintenance guidelines beneficial to pollinators on State property, was continued and expanded during its second year.
    - Staff from the Division of Fish and Wildlife collected common and swamp milkweed seed and purchased orange butterflyweed for the program. The State Forestry Service's NJ Forest

Nursery provided staff and resources to propagate 500 common milkweed, swamp milkweed, and orange butterfly milkweed plants. These seedlings were distributed to a subset of parks and used in the creation or enhancement of eight butterfly/pollinator gardens and two large (~2 acre) butterfly meadows.

- Surveys for Leonard's Skipper were conducted at three known sites and three potential sites in northern New Jersey. The species was present at all known locations with numbers ranging from three to five individuals. During the course of these surveys a new location was documented in Sussex County.
- Surveys for Silver Bordered-Fritillary were conducted at seven known locations over the course of six days. There were no Silver-bordered Fritillaries observed for the fourth consecutive year. There has not been a Silver-bordered Fritillary observed in NJ since 2012.
- Extensive surveys for the Baltimore Checkerspot were conducted this year. Seventeen total sites were surveyed for the species with the butterfly found at only five sites. Low numbers were observed at all locations: one individual observed at two sites, two observed at one site, and three observed at two sites.
- Population monitoring was conducted at two known Frosted Elfin sites with a maximum number of 24 elfins observed.
- Surveys for Northern Metalmark were conducted over the course of three days at five known sites with very low numbers observed at all locations. Single individuals were observed at two sites and a maximum of five individuals were observed at one site.
- Habitat management for Northern Metalmark continued at the White Lake Wildlife Management Area and at Kittatinny Valley State Park. Approximately a quarter of an acre of invasive shrubs were removed at each location.
- Surveys for Arogos Skipper in southern New Jersey were conducted on the Penn State Forest sites (two separate historic locations) over the course of two days with no Arogos Skippers observed. The New Jersey Forest Fire Service conducted a large prescribed burn covering approximately 2,000 acres during January 2016 that included three historic Arogos Skipper sites in Penn State Forest that were becoming overgrown due to fire exclusion. The prescribed fire appeared to improve large areas of habitat at the sites.
- No survey work was conducted for moths during the 2015-2016 field season due to insufficient staff time and resources. Staff began meeting with local moth experts to develop general range maps for SGCN species that occur in NJ and plan surveys for 2017.

Conclusions:

- The SWAP revision process 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 continued to be a success and has the potential to be expanded.
- The DFW Bureau of Land Management actively manages hundreds of acres of land each year including extensive mowing and seeding. By working together, we will enhance large sections of state wildlife lands for the benefit of rare butterflies and pollinators through improved mowing regimes, and by changing the seed mixes to include pollinator food plants and nectar sources.
- Surveys of potential rare butterfly species habitat continued to yield discoveries of new colonies for many species and large areas of unsurveyed but suitable habitat exists within NJ for many species.
- Arogos Skipper appears to have been extirpated from the historic Penn State Forest sites, though many areas are inaccessible and further surveying effort needs to be conducted. The prescribed burning conducted by the state appear to have greatly improved the habitat and access for several areas of Arogos Skipper habitat.

- We discovered another new colony of Leonard's Skipper in northern New Jersey this season. This species appears to be relatively stable in the northern half of the state, but appears to have declined in the south. There is the potential to find additional colonies.

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 are distributed 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 2017. Surveys for potential new or undiscovered colonies need to 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 and Dotted Skipper should be a high priority in southern New Jersey.
- Continue working with land managers to maintain existing Frosted Elfin habitats. Work together with land managers to create suitable habitat adjacent to existing Right of Ways (ROW) to insure there is refugia for the species independent of ROW maintenance activities.
- Arogos Skipper should be surveyed during 2017 in order 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.

Odonata

Project Leader: Robert Somes, Senior Zoologist

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.
- We surveyed four known sites over the course of three days for Gray Petaltail, with one individual observed. A survey that was conducted in potential habitat in Morris County successfully located a new Gray Petaltail site. Previously, the current range for Gray Petaltail was largely restricted to Bergen County. This new site expanded the current range for this species in New Jersey and shows that the species is still present in counties where it historically occurred.
- Surveys for Brook Snaketail were conducted at two sites along the Big Flat Brook and two new colonies were documented.

- Surveys for Rapids Clubtail documented this species at three new locations and one known location along the Musconetcong River and the Delaware River.
- Surveys for Williamson's Emerald were conducted at one known site and three individuals were observed.
- Surveys for Cobra Clubtail were conducted at four sites along the upper Delaware River over the course of five different days. Numbers ranged from 6 to 20+ at all locations.
- During the Cobra Clubtail surveys along the upper Delaware River a single Harpoon Clubtail was observed at one site. This species is currently only found in the Paulinskill River drainage in New Jersey and greatly expands the documented range of this species in NJ.

Conclusions/Recommendations:

- Surveys of potential Gray Petaltail habitat should continue to search for further undiscovered colonies. There is a large push for forest management in northern New Jersey that could impact Odonata of small interior forest streams. A greater effort should be made to better document colonies and suitable habitat to better influence management decisions for these forest species.
- Follow-up surveys should continue to be conducted 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 also be monitored to see if any new stretches are occupied by the species in the future.
- Surveys should be conducted for Harpoon Clubtail along the Delaware River in order to determine the distribution of the species in this watershed.
- Surveys should be conducted in potential Tiger Spiketail habitat in central and southern New Jersey in order to locate new colonies to fill in the range gap between Hunterdon and Camden counties.
- Surveys for other listed Odonata species should continue and be expanded during 2017 to fill in knowledge gaps for many species and to gain a better understanding of the distribution of these species within New Jersey. Efforts should be made to revisit known sites that have not been surveyed recently in order to determine if they are still 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 2014-2016 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:

- Conserve Wildlife Foundation (CWF) and ENSP staff continued entering sea turtle impingement/sightings data from the Oyster Creek Nuclear Generating Station (OCNGS) into the ENSP's 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 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 2016.
- 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.
- The following factors were used during the 1992-2013 analyses in comparison to available capture data from the OCNGS: 1) wind speed and direction 2) air temperature parameters, including mean daily temperature, maximum daily temperature, minimum daily temperature, daily Delta T (max minus min), daily Delta T from two days prior to capture 3) thermal minima and maxima effects (i.e. cold shock, heat shock) 4) hurricanes 5) nor'easter storms 6) intervals of vulnerability (i.e. periods of abundance) 7) direct human interaction (i.e. boating effects) and 8) moon phase (2012-2013 only). Parameters used to compare sea turtle captures reported in 2015 and 2016 with captures in the dataset included 1) maximum air temperature 2) maximum wind gusts, weighted means by 5 mph increments 3) wind direction 4) average air temperature and 5) wind direction and speed by month of take.
- Sea turtle takes reported at OCNGS from 1992 to 2016 were collated in several Excel files. Each sea turtle capture was compared to weather parameters as recorded by www.wunderground.com at the Atlantic City airport, the only consistent, available source of weather information in the area. Air temperature was used in the analysis because sea surface temperature was not available. It is presumed that air temperature is indicative either of sea surface temperature, or an indirect measure of surface coastal water temperature through Barnegat Inlet, or bay water temperature toward the Forked River intake canal through which cooling waters are channeled.
- Four sea turtles (1 Kemp's, 3 Green) were taken at OCNGS in October 2015, one sea turtle (Green) was taken in November 2015 and two sea turtles (1 Kemp's, 1 Loggerhead) were taken in August 2016. We did not find information to indicate that sea turtles were taken May through July 2016.
- Information was gleaned for the period (day of, and both days prior to each take), tabulated, and examined by placing certain weather parameters 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)
- The matrix derived for three months of reported sea turtle takes at OCNGS are shown in Tables 1. The shaded areas have been somewhat arbitrarily chosen: minimum air temperature below 50ºF, Delta-T and two day Delta-T > 20ºF, max gusts >20 mph, rain events. Entries used are not of equal value, NE storms and very high wind gusts are associated with turtle takes more consistently than Delta-T or two day Delta-T. Minimum air temperature becomes significant at lower temperatures.

- The 2015 matrix for October shows all 4 takes were expected. November, 2015 take was unexpected.
- Three of the seven takes were associated with NE storms (NE wind and rain). One take is associated with E winds and minimum air temperature of 36ºF. The three remaining takes only have a 2 day Delta-T >20ºF in common.
- The 2016 matrix shows take of 1 August was expected, take of 25 August not expected.

Conclusions:

- Quantitative modeling of takes was 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.
- There were several differences between 2015 and 2016 takes and the previous takes from 1996-2014. The first is the total number of takes for 2015 and 2016 is much lower than previous years. There were no June takes in 2015 and 2016. There were no 4th of July takes in 2015 and 2016, and no takes reported for July. There were no takes attributable to maximum air temperatures in 2015 and 2016. Undoubtedly, some of this rather impressive reduction in turtle takes was due to reduced abundance of those turtles in this near coastal areas surrounding Barnegat Inlet (although reduced turtle takes from September 19-October 14, 2016 may be attributable to a refueling outage). Since NJ had some of its highest temperatures ever recorded during the summer of 2016, sea turtle abundances may have been reduced due to instances of low DO, which could affect prey availability and lead to lower numbers of sea turtles in the area. Also, sea turtles in the mid-Atlantic are known to forage in colder water below the thermocline. Due to the shallow nature of Barnegat Bay, higher temperatures may have forced at least some sea turtles to forage in deeper waters, farther away from the OCNGS.
- A problem can be seen when one looks deeply into air temperature values, either the measurements or the derived Delta-T values. During a multi-day storm day and night, temperatures to an extent will become mixed by the storm turbulence. This will result in a minimal Delta-T during a period of expected takes.
- 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 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:

- The OCNGS has a meteorological tower on site, along with two other towers (ocean and inland) which are part of the "ocean breeze monitoring network." In the absence of a full scale model, we recommend that environmental personnel monitor weather information at the met towers and increase inspections for sea turtles May through October during the following conditions: wind gusts of >20 knots, NE wind, and

nor'easter storms. It may also be prudent, given our previous findings, to increase sea turtle inspections during and just after the July 4th holiday.

- Schedule meeting with appropriate OCGNS personnel to present results and discuss protocols that could be easily implemented during predicted times of likely sea turtle occurrence based on on-site met tower readings. Possible protocols aimed at minimizing sea turtle impingements 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.

Table 1. Matrix derived for three months of sea turtle takes, 2015-2016.

Parameter	2-Oct-15	4-Oct-15	22-Oct-15	26-Oct-15	7-Nov-15	01-Aug-16	25-Aug-16
NE	Yes	Yes	No	No	No	Yes	No
Wind direction	45	45	225	90	270	45	180
Min air	52	57	44	36	52	72	63
Delta-T	6	5	32	23	17	7	23
2 day Delta-T	32	1	25	25	22	13	19
Max gusts	43	40	20	25	18	19	25
Recorded events	Rain	Rain	No	No	Rain	Rain	No

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 E.1. Emerging Diseases

Project Leader: Kris Schantz and Brian Zarate

Objective: Emerging threats including wildlife diseases can rapidly deteriorate both local and regional wildlife populations of both SGCN and non-SGCN. Participation in actions to identify causes and vectors of wildlife disease and illness allows resource managers to implement steps to reduce species loss

Key Findings, Snakes:

- ENSP biologist and assistants conducted all work pertaining Snake Fungal Disease (SFD) under the Comp-SWG grant (Conserving Snake Species of Greatest Conservation Need Threatened by an Emerging Fungal Skin Disease).

Conclusions:

- Snakes continue to be identified and confirmed positive for SFD in multiple counties of NJ. All information will be provided in the report for the Comp-SWG job (Conserving Snake Species of Greatest Conservation Need Threatened by an Emerging Fungal Skin Disease).

Recommendations:

- Continue to participate on conference calls for the Comp-SWG grant (Conserving Snake Species of Greatest Conservation Need Threatened by an Emerging Fungal Skin Disease) to work with partnering states and agencies/organizations to determine how this research should proceed.

Performance Report

Project: **2. Habitat Management and Planning**
Federal Aid Project: T-1-7 (State Wildlife Grants)
Segment dates: September 1, 2015 to August 31, 2016

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.
    - Staff met with botanists from the Natural Heritage Program to discuss concerns of potential impacts of forest management on rare plants in Sparta Mountain WMA.
    - Staff revised the Sparta Mountain WMA Forest Stewardship Plan and sent it out for stakeholder and public comment period, which was extended through March 2016. Staff also made presentations to many stakeholders about the plan and the need for forest stewardship.
        - 2,529 comments were submitted from 2,077 individuals or organizations. Overall, comments were 16% in support and 81% in opposition.
        - The majority of NJ state-wide organizations (79%), national organizations (100%), and natural resource professionals (85%) submitted comments in support of the plan.
        - The majority of local organizations (64%), local residents (89%), NJ residents (82%) and non-residents (86%) submitted comments in opposition of the plan.
    - Staff worked with foresters from NJ Audubon and the Ruffed Grouse Society to have volunteers conduct forestry activities on Sparta Mountain WMA this fall/winter. The project was put on hold prior to completion in January 2016 due to public resistance and harassment of RGS individuals and may be completed in 2017.
- Staff conducted post-treatment bird surveys on Sparta Mountain and Weldon Brook WMAs.

Conclusions and Recommendations:

- 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 below.

JOB B1. Forest Habitat Management

Key Findings:

- In 2016, 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 golden-winged warblers.
    - In conjunction with separate funding (NFWF and NJ Audubon), staff conducted six visits to private landowners interested in Working Lands for Wildlife (WLFW): Two new landowners signed contracts and three existing contracted landowners implemented management prescriptions.

All landowners under contract with WLFW allow property access to conduct bird surveys, which was done using both SWG and NFWF funds.

- A total 78 paired sites were surveyed for all bird species: 26 WLFW, 26 Management (MGMT), 26 Natural (NAT). 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. Both the WLFW and MGMT sites were highly variable due to differences in treatment type and number of years since treatment.

- In 2016, a paired T-test was used to analyze differences of species richness (SPP) and bird species of concern (BSC) among the three treatments. Five of the 26 WLFW sites monitored were prior to treatment (pre-WLFW) and analyzed separately. WLFW sites again had a greater SPP and BSC compared to paired NAT and MGMT sites, but neither difference was statistically significant. The proportion of BSC per SPP was lowest in NAT sites, but this also was not statistically significant (Fig. 1). The pre-WLFW sites, which consisted of closed-canopy upland forest, had the lowest SPP and BSC, but the highest proportion of BSC per SPP (Fig. 2). Although it the sample size for the pre-WLFW sites was small (N=5) for the paired analyses, NAT had a significantly higher SPP than pre-WLFW (P=0.002).
- Twenty-nine of the 63 sites contained at least one *Vermivora* spp.: 12 MGMT sites, 12 NAT sites, and five WLFW sites. Four GWWAs were observed in four MGMT sites, thirty-one blue-winged warblers (*Vermivora cyanoptera*; BWWAs) were observed at 27 sites (10 MGMT, 12 NAT, and 5 WLFW) and one Brewster's hybrid (*Vermivora* spp.; BRWA) was observed at one MGMT site. Only two sites (MGMT) contained GWWAs without a BWWA or hybrid.
- When comparing the12 sites that were also surveyed in 2015, all sites had a decline in BSC, WLFW and MGMT sites had a decline in SPP, and NAT had an increase in SPP between 2015 and 2016 (Fig. 3).

- Staff collaborated with NJ Audubon and PSEG to create 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 March 2016, the span prescriptions to maintain powerline reliability while not decimating GWWA breeding habitat was completed. GWWAs continued to use those spans during the breeding season, including one male who was banded in 2014 in that same span.

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.

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.

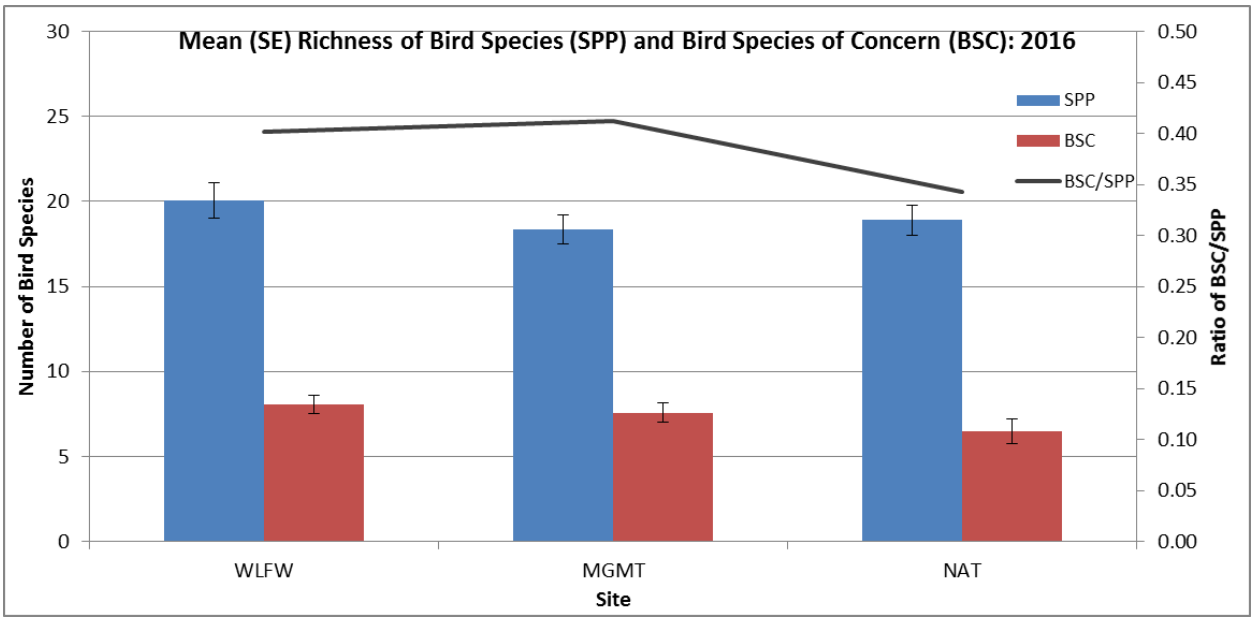

Figure 1. Mean species richness with SE from the 2016 surveys to evaluate WLFW and their paired sites.

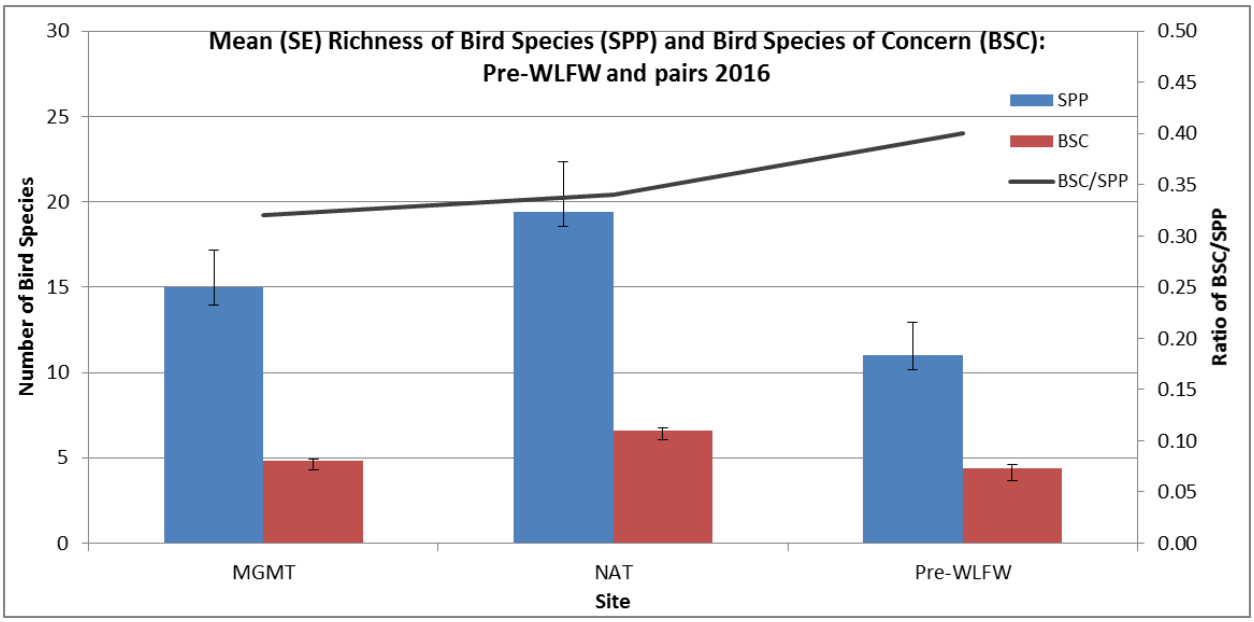

Figure 2. Mean species richness with SE from the 2016 surveys to evaluate pre-WLFW sites and their paired sites.

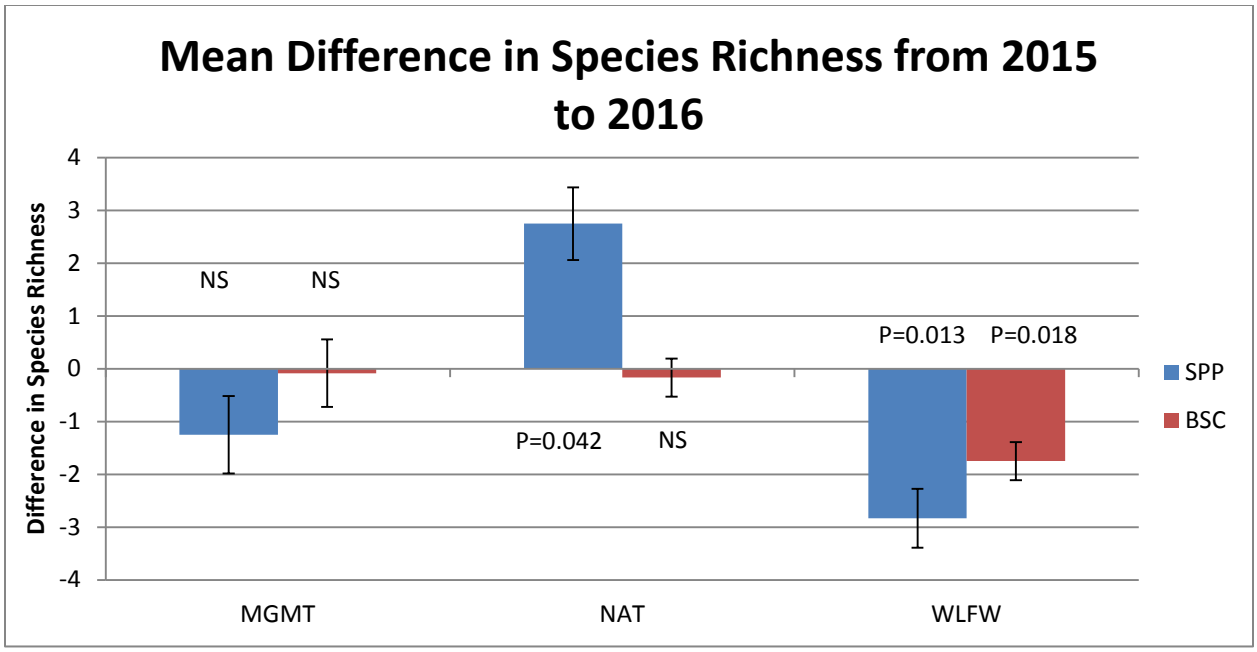

Figure 3. The difference in mean SPP and BSC (with SE) from 2015 to 2016 and results of a paired T-test of the 12 sites per category. Even with the increase in NAT sites and decrease in WLFW sites, WLFW sites still had greater SPP and BSC than NAT sites.

JOB B2. Habitat Connectivity and Management

Key Findings:

Habitat Enhancement and Restoration for Eastern Tiger Salamander

- Enhancement and/or excavation of a new vernal pool on Beaver Swamp WMA is being planned, with groundwater level monitoring and related site assessments underway to determine the site's potential.
- Enhancements and re-profiling of man-made vernal pool breeding areas at the Lizard Tail Swamp WMA are in the planning stage.
- At the Rio Grande ponds, a wetland and habitat mitigation project ("Conifer"), ENSP biologists monitored a 4-acre site for response by eastern tiger salamander and Cope's gray treefrog, and documented site use by both species. There was some concern at this site about a potential anuran tadpole (green or leopard frog) die-off, so this pool will be among the many monitored for potential disease issues as well as for amphibian response to the habitat improvements.

BMPs for in-stream and near stream restoration to benefit Odonates

- The Musconetcong River-Point Mountain Stream restoration project was completed and biologists will be conducting follow-up monitoring for odonates during the 2016 field season.
  - Staff conducted three surveys of the restoration site and the downstream Brook Snaketail colony. Brook Snaketails (3 individuals) were observed ovipositing in the area upstream of the known site on one survey day. It does not appear that the restoration project has had any negative impacts on the Brook Snaketail colony.
- ENSP staff had planned to meet with DEP Division of Land Use Regulation staff to develop regulatory BMPs and guidelines that will ensure protection of rare odonate sites that come through the DEP permitting process. Due to insufficient staff resources no progress was made on this.

Recommendations:

- The jobs under this Habitat project are adaptive in nature, aimed at using best management practices and taking advantage of opportunities to enhance habitat wherever they can be found. Thus this is a project that should continue with all staff ready to participate and fuel projects that will directly benefit SGCN wildlife. Monitoring for results should be built into all projects.