Interim Report
Federal Aid in Wildlife Restoration
W-70-R-1
F11AF00901

"Species of Greatest Conservation Need (SGCN) Research and Management"

Interim Report for Project Year
September 1, 2014 – August 31, 2015

NJ Department of Environmental Protection

DIVISION OF FISH AND WILDLIFE
ENDANGERED AND NONGAME SPECIES PROGRAM
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The jobs presented herein have some degree of overlap with jobs State Wildlife Grants T-1-7, but the approaches proposed below will not be conducted nor funded through State Wildlife Grants.

PROJECT 1: SGCN BIRDS

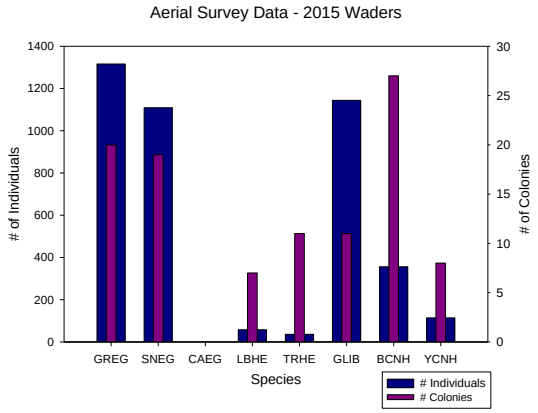
Job Number and Title: I-1. Colonial Waterbirds

Prepared by: Christina Davis, Environmental Specialist II

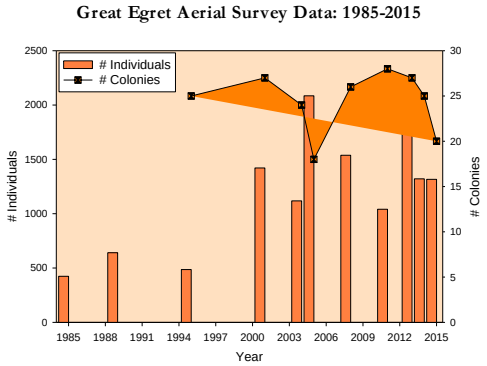
Job Objective: Census long-legged wading birds nesting on Atlantic coastal marsh islands, via aerial survey.

Key Findings:

- 4,133 individual wading birds were counted on the aerial survey in 35 colonies. Of the 4,133, 1,316 (32%) were great egrets, 1,109 (27%) were snowy egrets, 1,144 (28%) were glossy ibis, 356 (8%) were black-crowned night-herons, 114 (3%) yellow-crowned night-herons, 58 (1%) little blue herons, 36 (1%) tricolored herons and 0 (0%) cattle egrets.

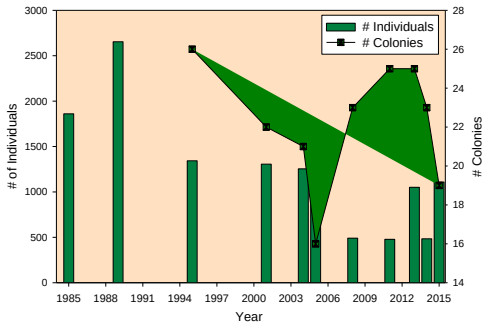


- There were 1,316 individual great egrets observed in 20 colonies. Due to changes in methodology, please note that colony data is not available prior to 1995.



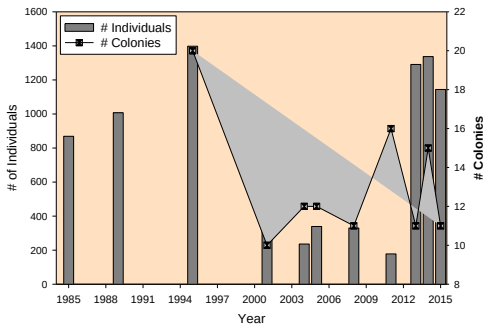
- There were 1,109 individual snowy egrets observed in 19 colonies. Due to changes in methodology, please note that colony data is not available prior to 1995.

Snowy Egret Aerial Survey Data: 1985-2015



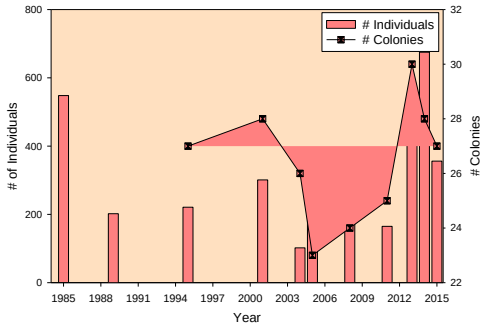
- There were 1,144 individual glossy ibis observed in 11 colonies. Due to changes in methodology, please note that colony data is not available prior to 1995.

Glossy Ibis Aerial Survey Data: 1985-2015



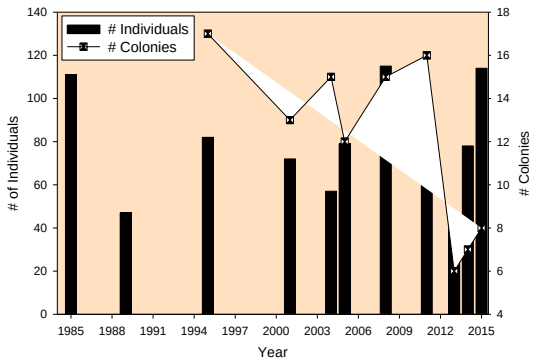
- There were 356 individual black-crowned night-herons observed in 27 colonies. Due to changes in methodology, please note that colony data is not available prior to 1995.

Black-crowned Night Heron Aerial Survey Data: 1985-2015



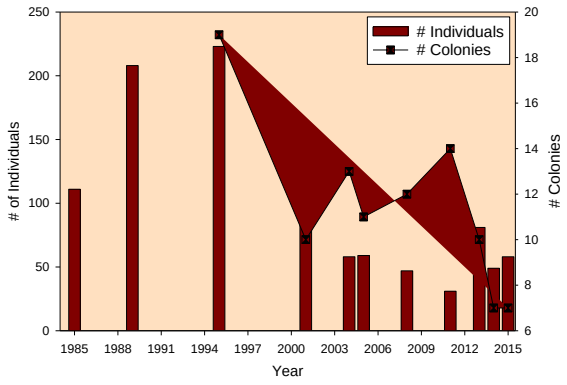
- There were 114 individual yellow-crowned night-herons observed in 8 colonies. Due to changes in methodology, please note that colony data is not available prior to 1995.

Yellow-crowned Night Heron Aerial Survey Data: 1985-2015



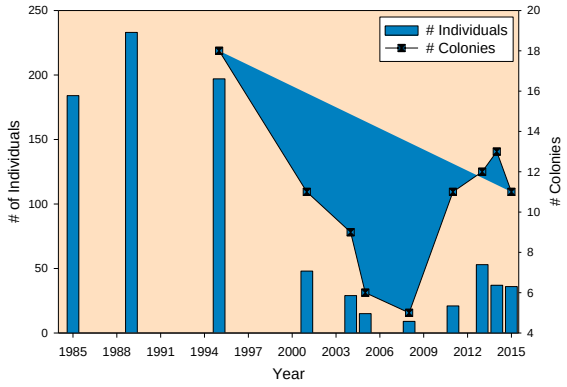
- There were 58 individual little blue herons observed in 7 colonies. Due to changes in methodology, please note that colony data is not available prior to 1995.

Little Blue Heron Aerial Survey Data: 1985-2015



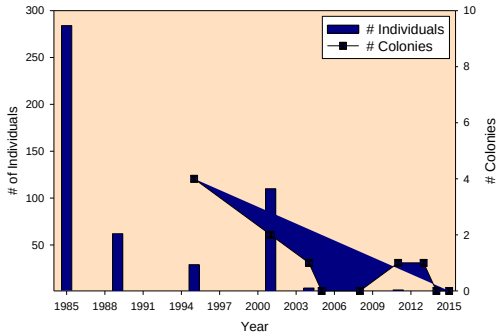
- There were 36 individual tricolored herons observed in 11 colonies. Due to changes in methodology, please note that colony data is not available prior to 1995.

Tricolored Heron Aerial Survey Data: 1985-2015

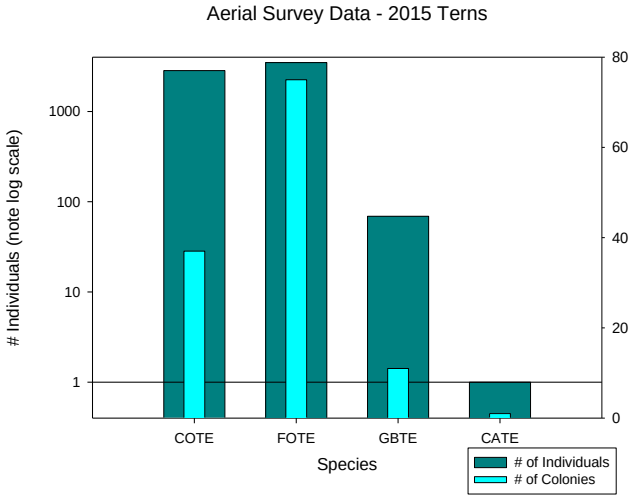


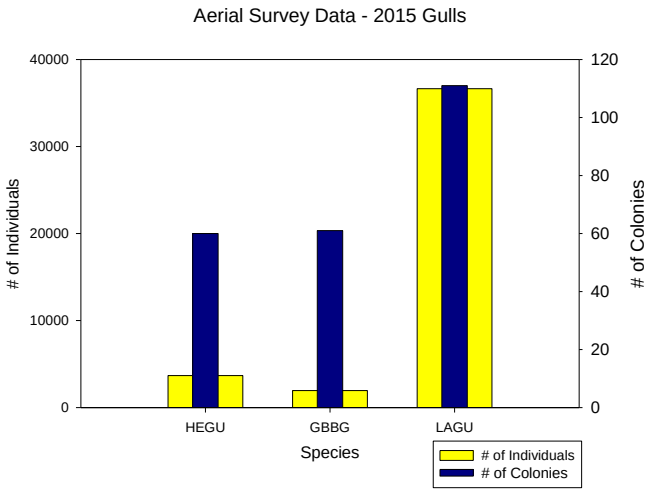
- There were zero cattle egrets observed in zero colonies. Due to changes in methodology, please note that colony data is not available prior to 1995.

Cattle Egret Aerial Survey Data: 1985-2015



- Although the focus of this objective is long-legged colonial waterbirds, surveyors also took the opportunity to census terns and gull species. Surveyors counted 2,841 common terns in 37 colonies, 3,481 Forster's terns in 75 colonies, 69 gull-billed terns in 11 colonies and 1 Caspian tern in 1 colony. 36,645 laughing gulls in 111 colonies, 3,677 herring gulls in 60 colonies and 1,952 great-black backed gulls in 61 colonies were also tallied. The high survey number of gull-billed and Caspian terns in 2014 was not repeated and numbers for those species returned to normal averages. There is still no explanation for the 2014 "bump" or the subsequent return to "normal" this year. For the first time, rooftop nesting by gulls was recorded, on a strip mall in Ventnor.





Conclusions:

- The aerial survey of the Atlantic coastal marshes by helicopter continues to be the most efficient way to survey the large area in a short period of time. Downsides include that it represents a snapshot of the season (rather than the results that would come from continuous monitoring over the course of one) and that dark-plumaged bird numbers are likely underestimated since they blend into the surrounding vegetation so well.
- 2015 continued the recent trend (since 2013) of surveying wading birds in late May and gulls and terns at the end of the first week in June, which helps address getting the correct timing for nesting phenology (peak incubation, when many individuals are present, is ideal). Although not a primary focus of the survey, timing for the large gulls (great-blacked and herring) continues to be difficult. In 2014, late May seemed slightly early for these species, so the decision was made to move them to be counted with small gulls and terns in early June. No count of large gulls was made on the May survey but the numbers "seemed" to be lower on the June survey, judging strictly by observer assessment.
- Cool spring conditions prevailed in 2015, as with 2014, but surveyors felt the timing was a bit better, as many birds were on eggs (noted when birds flushed off nests).
- The unprecedented luxury of doing three surveys in a row (and likely a fourth in 2016) helps emphasize the difficulties in getting an accurate count associated with the snapshot aerial survey technique. The "declines" and "increases" noted in 2015, especially the large ones, are unlikely to be due to actual population changes related to mortality and/or newly matured adults. Increases from 2014 were observed in snowy egret, little blue heron (very slight) and yellow-crowned night-heron. Decreases from 2014 were observed in glossy ibis and black-crowned night-heron (dark plumaged birds that are notoriously difficult to count on aerial surveys). Great egrets and tricolored herons were comparable to 2014 numbers. Cattle egret, a species that has not been tallied on aerial counts in any substantial way since 2001, remained at "0". Changes in habitat (loss of agriculture) are suspected to play a role in this decline.
- Variables like poor productivity in 2013 (productivity data does not exist but the conclusion can be made since many of these species are long-lived and population changes on a short time scale are not generally associated with yearly productivity but rather long-term rates) or habitat loss (there was no large-scale evidence of this noted by the observers as they flew the coast) probably don't explain the unevenness in the numbers year to year and are more likely a consequence of this survey method. Variables like timing of nesting, tide cycles, and individual activity on any given day were likely bigger factors than actual population changes. Nonetheless, the data does provide an index of populations, which shows that many species, while currently stable, continue to be depressed from historic highs.
- Although no major habitat changes were observed from 2014 to 2015, a long term trend of eroding and disappearing islands is noticeable, especially in the Barnegat Bay and around Atlantic City. Some islands that are on maps have disappeared entirely; others exist as shrinking versions of themselves. As ground nesters, the terns and gull habitat is more noticeably affected at this stage, but the wading bird habitat is likely soon to follow. A complete analysis of this trend has not yet been undertaken, but in looking at aerial photos from years past, the change is evident.

- A troubling development in 2015 was the presence of an active colony of double-crested cormorants at one of the largest, and longest running, colonies in the state, Gull Island (near Stone Harbor). Thirty-six (36) adults were counted in May and 61 in June. This site has hosted many hundreds of wading birds for decades and is one of the state's most critical nesting areas. The cormorants are an issue because the caustic defecation causes the nesting trees and shrubs to die, rendering them unusable by all species in a matter of years. The loss of this colony would be devastating to the state's nesting wading bird population, as there is not another site nearby that would likely handle the emigration. The Stone Harbor Bird Sanctuary is in the same vicinity, but wading birds abandoned that site decades ago and have not yet responded to the measures some organizations are taking to entice them back.
- Tweaking the timing of the survey continues to be a challenging task. The primary difficulty in fine-tuning the timing further is reserving the helicopter. The pilot and helicopter must be reserved in early winter (both because of contractual paperwork on the state's end and to accommodate the scheduling needs of the contractor) and this is not compatible with honing any given year's "perfect" date. For example, the cycle of the moon (which can influence the risk of flooding) can be predicted in advance but a "late spring" (as was the case in 2014) cannot.
- The helicopter flushed four great-horned owls from three islands (Wellington Island, Flat Thorofare and High Island) on the May survey and there was evidence from a separate survey that indicates an owl on Fish Factory (and likely other locations that were not detected). These were all islands that previously hosted wading bird colonies and there is some degree of concern that a stable/increasing owl population could be partially to blame for site abandonment. This theory has also been postulated for sites like the Stone Harbor Bird Sanctuary and Armacost Park.

Recommendations:

- Continue this multi-year survey effort using the earlier survey dates (late May) for long-legged waders and large gulls (that is, revert to large gulls paired with waders) and later dates (early June) for terns and laughing gulls.
- Continue to investigate alternative survey methods to the aerial survey. Although it remains the best of the tested options, its high cost makes it prohibitive for yearly counts. In 2015, some steps were taken to explore the practicality of using drones. At this point, nebulous regulations for flying aircraft and concerns for the safety of the birds are leading ENSP to believe this may not be a viable option for the near future but certainly something worth keeping on the radar.
- Examine the variables that may be impacting the future status of wading birds, namely: 1) investigate the role eroded marshes are having in site selection and function, 2) investigate the role owls may be having in site avoidance and/or direct mortality and 3) investigate options in controlling the cormorant colony to ensure it does not permanently alter the nesting habitat.
- Attend regional waterbird meetings to create partnerships with other states to find solutions to declining populations. These meetings are critical to establishing and maintaining cooperative efforts and to the continued exchange of information.

Job Number and Title: I-2. Red Knot Conservation

Prepared by: Amanda Dey, Principal Zoologist, and A.S. Gates, volunteer

Job 2: Migratory Shorebirds - Red Knot Survival

Project leader: Amanda Dey, Principal Zoologist & Albert Gates

OBJECTIVE: Monitor recovery of red knot and other shorebird species: monitor mass gain and adult survival through resightings of marked individuals; develop survival estimates for red knots originating from different wintering populations; monitor stopover population size through two methods: baywide aerial and ground survey and mark-and-recapture/resighting methods.

Key Findings:

Red knot Monitoring (weight gain, resightings, air/ground counts)

- ENSP staff coordinates and participates in annual surveys to quantify peak abundance of red knots. The red knot population has remained near 25,000 individuals since 2009. In 2015, peak red knot stopover abundances, from concurrent aerial and ground counts, were comparable: 24,890 and 24,321, respectively. Coupled with an increased proportion of knots (85%) reaching adequate weight, we anticipate the red knot population may remain stable. However, the current population is much reduced from its former size of >90,000 individuals in 1989.

Index of Food Availability

- New Jersey horseshoe crab egg densities improved slightly in 2015 (7,528 eggs/m^2) over 2014 (2,340 eggs/m^2). However, surface egg density (i.e., in top 5 cm of sand) is still far below historic levels of >100,000 eggs/m^2 observed in the early 1990s (Botton 1994; Figure 1). We estimate that 50,000 eggs/m^2 are necessary to being recovery of red knots and improve conditions for other migrant shorebirds that rely on this terminal stopover prior to Arctic breeding (Niles et al 2009). In 2015 this task was funded by matching, non-federal funds provided by the NJ Natural Lands Trust.

Beach protection

- In 2015, this task was funded by (and is reported under) Section 6 Aid to Endangered Species, New Jersey E-1-37. Thirteen bayshore and two Atlantic Coast sites had seasonal access restrictions to protect shorebird foraging. Beach closures, staffed by shorebird steward volunteers, allowed a greater proportion of red knots to reach adequate weight (≥180 grams) despite continued low egg densities. In three of the last four years, ≥50% of red knots departing the bay reached adequate weight. We estimate that 80% of birds must consistently reach 180 grams each year to begin population recovery.

Habitat enhancement and restoration

- ENSP staff collaborated on restoration specifications and monitoring methods for beach restoration. In 2015, 0.94 mile of bayshore beach in northern Delaware Bay (Thompsons Beach and Fortescue) was restored to improve horseshoe crab spawning habitat. Some restored beaches have been found to support higher developed egg cluster abundance (more eggs reaching larval stage) and higher shallow egg abundance that is available to foraging shorebirds (J. Smith, unpublished data).

Adaptive Resource Management (ARM) Model

- ENSP staff continued to deploy observers to resight marked red knots and conduct ratio surveys (marked:unmarked birds) that are necessary to estimate red knot population size and adult survival. The red knot mark-resight database for 2015 contained a total of 4,353 individuals that were seen in Delaware Bay at least once, more than any previous year since 2005. The total number of resightings, including all resightings of all birds, was 12,555 resights. The earliest resighting in 2015 was 6 May and the latest was on 3 June. Dr. J. Lyons, USFWS-Patuxent, used the data to produce a population estimate for the ASMFC's ARM Model Subcommittee of 60,727 (95% confidence range, 55,568-68,732) (Lyons 2015).

- Resight metrics and the resulting estimates of red knot population size are referenced in the horseshoe crab harvest model. In 2015, the horseshoe crab harvest quota remained the same as in 2013 and 2014, which is a male-only harvest of 500,000 of Delaware Bay origin. In 2016, the ARM Model will be revisited and updated to incorporate new information (e.g., female crab mortality related to lysate production). In addition, ENSP staff will collaborate in an independent validation of the Mark-resighting population estimate for red knots (Lyons 2012).

Recommendations and Conclusions:

- In addition to trapping and banding efforts on the Delaware Bay, the above activities underpin recovery, and recovery monitoring, for red knots, and should be continued.
- A major threat to the continued use of the ARM Model to set harvest quotas is lack of dependable funding of the Atlantic Coast Benthic Trawl Survey performed by Virginia Tech (Hata and Hallerman 2012). This survey, geared specifically to sample horseshoe crabs, provides reliable population estimates used to develop harvest quotas, and is critical to monitor the horseshoe crab population. This is particularly important in the face of the likely increased global demand for Limulus Amebocyte Lysate (derived from horseshoe crab blood) in the U.S. due to the collapse of horseshoe crabs in China.
- In the face of red knot federal listing, the management goal should be refocused to hasten recovery of red knot via rapid increase in the crab population (i.e., management and reduction of bait harvest, lysate production, and other sources of breeding-age crab mortality).

Literature Cited:

Botton, M. L., R. E. Loveland, and T. R. Jacobsen. 1994. Site selection by migratory shorebirds in Delaware Bay, and its relationship to beach characteristics and abundance of horseshoe crab *Limulus Polyphemus* eggs. Auk 111:605-616.

Hata, D. & E. Hallerman. 2013. Results of the 2012 Horseshoe Crab Trawl Survey: Report to the Atlantic States Marine Fisheries Commission Horseshoe Crab and Delaware Bay Ecosystem Technical Committees. VA Tech., Blacksburg, VA. 29 pp.

Lyons, J. E. 2015. Red Knot Stopover Population Size and Stopover Ecology at Delaware Bay in 2015. Report to the Delaware Bay ARM Workgroup. August 29, 2015; 12 pages.

Lyons, J. E. 2012. Estimating stopover population size using mark-resight methods for red knots at Delaware Bay. Submitted to Delaware Bay Adaptive Resource Management Working Group. July 23, 2012.

Niles LJ, J. Bart, H. P. Sitters, A. Dey, K. E. Clark, P. W. Atkinson, A. J. Baker, K. A. Bennett, K. S. Kalasz, N. A. Clark, J. Clark, S. Gillings, A. S. Gates, P. M. Gonzalez, D. E. Hernandez, C. D. T. Minton, R. I. G. Morrison, R. R. Porter, R. K. Ross, C. R. Veitch. 2009. Effects of Horseshoe Crab Harvest in Delaware Bay on Red Knots: Are Harvest Restrictions Working? Bioscience 59:153-164.

Job Number and Title: I-3. Barred Owl Home Range Study

Prepared by: Kathleen Clark, Supervising Zoologist

Job Objective: Use radio-telemetry and the most current available land use data cover to determine the home range and broader habitat selection use by barred owls within NJ, specifically targeting the differences between northern and southern residents, in order to inform land use decisions and reviews, and develop forest management practice guidelines and informational vehicles that help reverse the declines of the state-threatened barred owl (*Strix varia)*.

Key Findings:

- In 2013 we took delivery of a GPS telemetry system made by Telemetry Solutions, consisting of Mini-bird GPS data loggers with remote download option and VHF transmitter, a Quantum Remote Download Base Station and 420-MHz antenna for remote downloads, along with Telemetry Solutions' proprietary software. We tested all of the units using different programmed schedules (number of GPS fixes per hour, per day, etc.), and tested the remote download capabilities.
- In the 2014-2015 work period we were completing field work begun in summer, 2014. We recaptured Belleplain owl #401 on September 23, 2014, and removed the transmitter.
- The battery life of these transmitters is limited by the transmitter units' size and weight. Battery life was influenced by the programming (number of fixes scheduled per day) and the time-to-fix (how much time the unit tried to get a GPS location before it obtained a fix or reached a programmed maximum). During testing, units usually obtained a location fix in less than 60 seconds. For the field, we programmed units to allow 90 seconds for a fix, and to take fixes five times per night and (once per week) one time during the day, at 2100, 2300, 0100, 0300, 0500 and 0700.
- As we reported in this grant's 2013-14 report, the unit deployed in August-September, 2014, had a slightly better fix rate than the units used in 2013, about 30% compared to last year's 6%–20% (Table 2). The unit generally used the maximum time-to-fix (90 sec), causing higher battery drain and contributing to the limited working life of five weeks.
- We did not continue this study due to the limitations of the transmitters.

Table 1. Data on one barred owl captured for telemetry.

BDOW ID	Band #	Sex	Capture Date	Owl mass at capture (g)	GPS Unit No. / Mass	Comments
Belleplain	1957-05401	F	8/18/2014	967	04 / 23g	Body condition excellent; weight was within 3 g of her April 2013 weight.
"	"		9/23/2014 (recap)	940	none	Condition good. No wear marks visible from harness.

Table 2. Results recorded by unit fielded on a barred owl in the Belleplain study area, 2014.

ID	Band #	GPS Unit	Attempted fixes	Successful fixes (%)	Operational days	
Belleplain	1957-05401	04 (912)	279	83 (30%)	41 (8/18-9/23)	

Conclusions:

- The GPS unit attached to a barred owl in Belleplain this season resulted in a minimum convex polygon area of 340 acres over the five weeks of function, with data acquisition rate of about 30% of attempted fixes. This area was roughly half the area found in 10 weeks of data collection during the nesting season in 2013. In this 2014 portion, this adult female should have been completely done with nesting, and while we thought her home range might be larger without having to focus on the nest, perhaps her food requirements were less stringent. It is difficult to make conclusions knowing the transmitter did not collect data during most (70%) of its scheduled time.

- We will be working with Telemetry Solutions, Inc., seeking a better product or restitution for the equipment we purchased. The decision to continue this project will depend on the ability of the manufacturer to provide a better product. Ideally, the function of the units would be improved to at least 80% fix rate and battery life lengthened.
- The limited battery life of the current GPS unit necessitated frequent recapture of individual owls. To accomplish this frequency of recapture, we had to maintain conditioning via frequent food-provisioning to the study birds. Thus one trade-off in this method is the bias in home range that is likely to result from food-provisioning in one location, and having the study bird return to that location more frequently than it might otherwise.
- We may be at the limits of current GPS technology in terms of size of these units and their suitability for a bird the size of a barred owl. However, with continued improvements in technology, we could have a very useful tool to identify home ranges and forest types used by this species that will enable guided forest management to secure the species in NJ.

Literature:

Bierregaard, R. O., E.S. Harrold and M.A. McMillian. 2008. Behavioral conditioning and techniques for trapping barred owls (*Strix varia*). J. Raptor Res. 42(3): 210-214.

Number and Title: I-4. Secretive & Coastal Marsh Birds

Prepared by: Christina Davis, Environmental Specialist II

Job Objectives: 1) To determine the efficacy of the acoustic monitoring of secretive marsh birds in New Jersey (*In progress*) and 2) to determine the relative abundance and distribution of New Jersey's marsh birds, particularly those that are state-listed and of regional and continental concern (black rail, Virginia rail, king rail, sora, common moorhen, least bittern and American bittern).(*Inactive)*

Key Findings:

- A focused black rail survey was initiated in 2015 because this species, in the Northeast, primarily calls nocturnally and was not captured on the 2011 and 2012 call-playback surveys conducted near dawn. There was one black rail recorded on the acoustic unit surveys in those years.
- The last time black rail was the primary focus of a state-wide survey was in 1988. In the time period since, anecdotal and reports on eBird suggest that black rails in NJ have decreased, presumably due to increased rates of flooding and a decline in high marsh. This survey acted as a pilot year to determine if nocturnal surveys in NJ by boat were both valuable and feasible. The conclusion is that they are both.
- Points were generated specifically for this effort as the maps used for the 2011 and 2012 surveys were plotted in both high and low marsh habitats and black rail habitat is dominated by high marsh only. At this time, there is not a reliable high marsh habitat map on either the state, regional or federal levels. There is an effort underway by SHARP personnel but that data is not likely to be available until late 2016. In the interim, ENSP biologists and GIS staff worked together to generate a map that was based off the high marsh LU/LC layers and was then fine-tuned using a variety of automated and hand-digitized methods. 1,059 total points were generated.
- Points were located at least 400m from one another and coded as either "water" or "road." Points were also segregated into their Watershed Management Areas (Mullica, Great Egg Harbor, Cape May and Maurice-Salem-Cohansey). For example, point GEH-W-208 was point #208 in the Great Egg Harbor Watershed Management Area and was accessible by water.
- Since this was a pilot year, only a small number of points (50) were selected (40 around the Tuckahoe River and 10 near Cedar Swamp Creek) for ENSP to survey. It was determined that between the nighttime navigation/boat operation and the components of the survey would prove to be too much for one person so six contractors (one boat captain and five observers) were procured to carry out the work. Therefore, there was one boat captain responsible for boat-focused tasks, and one surveyor responsible for all bird observation data per survey route, which consisted of ten points.
- Survey protocol was compatible with that being used elsewhere along the east coast. Surveys were a call-playback consisting of a combination of passive listening and recordings (of Black and Virginia Rails). The window was May 15-July 15 and three surveys (7-10 days apart) were taken at each point. The survey period was ten minutes (plus a two minute settling in period prior) and calls were recorded by the minute. Timing was between 10pm and 3am. Surveys took place in low wind conditions with little/no precipitation and on rising or high tides (to allow boat access in shallow waterbodies). Black rail data was given the priority, but rail calls of all species were recorded by observers. Site and weather data were recorded for each point as well.
- Forty of the 50 points were surveyed all three times (the other ten were surveyed once but the contractor then had to discontinue surveys due to family medical issues). There were four individual black rails that were heard at three points (6% of points surveyed). All the calls were heard in the first survey period, in mid- late May.
- Six acoustic units were deployed at locations where either a black rail was heard or in a large patch of high marsh that was not surveyed by call playback. Units were programmed to "listen" from midnight-1 am every night from deployment to when brought in from field (varied, but generally late May to mid-July). One unit was stolen. Analysis is a time-consuming process and data is not yet available from these units.
- ENSP coordinated with NJ Audubon Society (NJAS) in a joint effort to survey as many points as possible in 2015. The points were all taken from the map made by ENSP and segregated into routes for observers. While ENSP focused on boat-based points, NJAS volunteer based Citizen Scientists mobilized to survey 214 points by road. They had five total detections (2% of points surveyed), all also in the first survey period. Therefore, the total for NJ was 264 points surveyed at least one time and 9 total detections (3% of all points surveyed).

- Although not an actual duplication of the Kerlinger effort (which were all road-side points) it bears noting that in the same vicinity as the boat points they tallied three black rails but only had 21 points, for a rate of 14% versus the four rails that ENSP had at 40 points, a rate of 10%. The Tuckahoe region has long been considered a stronghold for this species and it appears that is continuing to some degree.
- In August, ENSP flew over salt marsh habitat near the Mullica River and were able to make general maps of areas with high marsh that might be good candidates for surveys in 2016.

Conclusions:

- Nocturnal surveys are possible. Important tools for its success were an understanding of the waterways (accomplished through daylight recon trips), appropriate lighting system and spotlight on the boat, reliable GPS or electronic mapping system (such as Google Earth on smartphone) to follow in real time and ability to track weather through radar during the survey. One issue was having only one boat operator, who though highly proficient, is just one person and therefore number of points is limited to the work a single person can do. This is further complicated by being limited to nights with good weather and the correct tides.
- All of the detections were heard in only in the first survey period which could be for a few reasons, one of which being that the males were calling and by the subsequent surveys that had found mates and there were no other birds in the vicinity to be territorial with (possible given their depressed numbers) and they stopped calling. Another more distressing theory is that these were birds calling trying to attract a mate and when failed to do so moved to other possible breeding locations. A third theory could be that the calling birds did successfully find a mate but failed (due to flooding or other factors) by the time of the second and third periods so left the site. The second and third theories have slightly higher likelihoods because if birds were present as in the first case, at least some of them should have responded to the call of the recording. Then again, research on telemetered birds in Florida (Legare & Eddleman 2001) has shown that not all birds respond to tape. All of these are strictly hypothetical, though, as there is nothing really known about the fate of these birds during the breeding season.
- The ENSP survey points all seemed to be in the correct high marsh habitat (NJAS volunteers noted that some of theirs did not seem suitable and these will be removed ahead of the 2016 survey) so the lack of birds heard did not seem correlated to unsuitable habitat conditions.

Recommendations:

- Complete the acoustic unit recording analysis to determine if any black rails were captured on those recordings.
- Consider hiring additional boat operators so that evenings with good conditions (clear and still, high tide) could be maximized for many points.
- Deploy acoustic units earlier in the season (have them all out by May 15) to ensure early callers are recorded.
- Continue engagement with the Black Rail Working Group to help determine what management actions can be taken to help recover this species.
- Expand the ENSP and NJAS surveys to cover more territory in 2016.

Literature cited

Legare M.L & Eddleman W. R. 2001. Home Range Size, Nest-Site Selection and Nesting Success of Black Rails in Florida. *Journal of Field Ornithology* Vol. 72, No. 1, pp. 170-177

PROJECT 2: SGCN MAMMALS

Job Number and Title: II-1. Bobcat Conservation

This project was transferred into NJ W-71-R-1 as of 9/1/2014.