THE SALTMARSH HABITAT & AVIAN RESEARCH PROGRAM

2014 Compiled Annual Report

A collaborative project of

The Maine Dept. of Inland Fisheries and Wildlife, University of Maine, University of Connecticut, University of Delaware, University of New Hampshire, and State University of New York – College of Environmental Science and Forestry

In cooperation with

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THE SALTMARSH HABITAT & AVIAN RESEARCH PROGRAM

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Other Partnerships

This project is entirely dependent on a large network of stakeholders and collaborators who have provided access to historical data, logistic support for field work, and permission to access land. Numerous field assistants also helped with data collection, both past and present. Successful completion of the study would not be possible without their cooperation.
BACKGROUND

Tidal marshes are ecotonal systems that dominate the transition zone between terrestrial and marine communities in eastern North America (Reinold 1977, Mitsch and Gosselink 1993). Where they occur, tidal marshes perform many key services for humans. Tidal marsh is critical for absorbing the energy of ocean storms and protecting shorelines (Daiber 1986), improving water quality in bays and estuaries (Heinle and Flemer 1976, Valiela and Teal 1979, Dame et al. 1986, Valiela et al. 2000, Koch and Gobler 2009), providing nutrients to marine foodwebs (Odum 1969), and supplying critical habitat for both the reproduction of a suite of ocean species (Boesch and Turner 1984) and for non-breeding use by an entire community of migratory birds appreciated by birders and sportsmen alike (Master 1992, Erwin 1996, Brown et al. 2002). Furthermore, the shoreline of eastern North America possesses the highest level of vertebrate biodiversity and endemism of any tidal marsh region worldwide (Greenberg and Maldonado 2006).

The global importance of, and local services provided by, tidal marshes justify conservationists’ attention, but it is their high risk of degradation and loss that necessitates detailed information to prioritize and coordinate conservation actions. Climate change may impact the unique bird assemblage found in tidal marshes by increasing the frequency (Resio and Hayden 1975, Hayden 1981) and intensity (Emanuel 1987, Bacon and Carter 1991, Knutson et al. 1998) of storm surges. Tidal flooding is a well-documented determinant of successful reproduction in tidal marsh birds (Gjerdrum et al. 2005, Greenberg et al. 2006, Shriver et al. 2007, Gjerdrum et al. 2008, Bayard and Elphick 2011); climate change and especially sea-level rise are likely to increase this threat to many tidal marsh endemics, most of which nest on the marsh surface.

In the face of the habitat loss and degradation that is expected to affect tidal marshes given climate change predictions, a group of academic, government, and non-profit ecologists formed the Saltmarsh Habitat and Avian Research Program (SHARP) in 2010 to gather information to aid the conservation of this ecosystem. The project is determining each state’s responsibility for the conservation of tidal marsh bird species and providing a platform for long-term monitoring of the tidal marsh bird community within the non-barrier-island Atlantic coastline (corresponding to Bird Conservation Region 30 plus the Maine coast from Cape Elizabeth to Lubec; hereafter BCR30+). Using a multi-tiered approach, we are collecting detailed population and demographic data for bird species using tidal marsh habitat in BCR30+ and using these data to prioritize the importance of tidal marshes at state and regional scales.
This report describes in detail the work conducted during SHARP’s fourth field season regardless of funding source and compiles information already reported to supporting agencies and organizations during calendar year 2014. Additional field work at our demographic study sites as well as additional surveys at over 2200 points between Virginia and Maine continues with support from the U.S. Fish and Wildlife Service (USFWS). Analyses are underway on many components of the research. We anticipate completing many of these analyses and preparing publications in the coming year.

RESEARCH SUMMARIES

Contemporary Surveys of Bird Use of High Marsh Communities

In 2014, the primary goal of our surveys was to assess the effects of Hurricane Sandy on saltmarsh resilience as part of a project funded by the USFWS. To give a more complete assessment of tidal marsh birds along the northeast coast and to facilitate comparisons with historical data sets, we extended survey effort geographically beyond BCR30 to encompass marshes from Casco Bay in Maine (the northern limit of BCR 30) to the Canadian border, hereafter BCR30+ (Figure 1). We conducted bird surveys using both passive point count and broadcast/response methods along the coast of BCR30+ to map the abundance and distribution of all bird species using high tidal marsh habitat of BCR30+ during the breeding season. We divided the entire study area into 9 subregions (Figure 1).

Figure 1. Distribution of survey effort within nine subregions of BCR30+ for the Saltmarsh Habitat and Avian Research Program (SHARP).
Point-count surveys consisted of a five-minute passive period followed by a series of broadcast calls for secretive marsh birds. The total time to complete a point count ranged from 8 to 13 min, depending on the number of species included in broadcast calls for a given subregion. During this time, we recorded all bird species detected by sight or sound that were using tidal marsh habitat. Surveys were completed between one half hour before sunrise and 1100 h.

We partnered with several agencies and conservation organizations to accomplish these surveys. Luanne Johnson (BiodiversityWorks) collected data at 10 points on Martha’s Vineyard that were otherwise inaccessible to SHARP staff due to their island location. Michael Farina and Tara Schneider (Town of Hempstead, Long Island, NY) surveyed 11 points. Lindsey Reis and Jordan Raphael (National Park Service, Fire Island) assisted with survey coordination and provided housing. Vincent Bio (Town of Babylon, Long Island, NY) and Thomas Halavik (Narragansett Bay, Rhode Island) provided boat access to points. In New Jersey, Paul Castelli (USFWS) conducted point counts at 26 points in the E.B. Forsythe National Wildlife Refuge (NWR). In Delaware, Susan Guiteras and Annie Larson (USFWS) collected data at 25 points in the Coastal Delaware NWR Complex (Bombay Hook and Prime Hook NWRs). These various collaborations resulted in an additional 193 points visited 2-3 times over the 2014 field season. Many other collaborators supported SHARP efforts through field and logistic support, including USFWS, NPS, the University of New England, New Hampshire Fish and Game Department, Marine Biological Laboratory, Massachusetts Audubon, New York City Audubon, Maryland Ornithological Society, and the Smithsonian Migratory Bird Center.

In 2014, we conducted surveys at a total of 2235 points (Table 1), 528 more (+24%) than in 2013. Each point was surveyed on at least two occasions and most were visited three times throughout the survey period. At least 10 days elapsed between consecutive surveys at individual points.

Raw occurrence data are summarized in Table 1, illustrating the frequency with which each focal species was detected in each state. Of the six target species, Clapper Rail, Nelson’s Sparrow and Seaside Sparrow were not found across our entire 10 state study area. Among the three species with project-wide distributions, American Black Duck was the least frequently encountered species (9.9% occurrence) and Willet was the most frequently encountered at 56.2% occurrence.
Table 1. Number of survey points visited in 2014 and proportion of those points where each of the focal high marsh species was detected, for each of the ten states in the SHARP sampling scheme.

<table>
<thead>
<tr>
<th>State</th>
<th>Survey Points</th>
<th>American Black Duck</th>
<th>Clapper Rail</th>
<th>Willet</th>
<th>Nelson’s Sparrow</th>
<th>Saltmarsh Sparrow</th>
<th>Seaside Sparrow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maine</td>
<td>364</td>
<td>24.7</td>
<td>0.2</td>
<td>26.9</td>
<td>36.5</td>
<td>12.4</td>
<td>0</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>62</td>
<td>9.7</td>
<td>0</td>
<td>33.9</td>
<td>9.7</td>
<td>27.4</td>
<td>0</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>402</td>
<td>19.4</td>
<td>0</td>
<td>68.9</td>
<td>7.7</td>
<td>44.0</td>
<td>6.2</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>108</td>
<td>10.2</td>
<td>3.7</td>
<td>54.7</td>
<td>0</td>
<td>59.2</td>
<td>9.2</td>
</tr>
<tr>
<td>Connecticut</td>
<td>113</td>
<td>3.5</td>
<td>17.7</td>
<td>58.4</td>
<td>0</td>
<td>32.7</td>
<td>16.8</td>
</tr>
<tr>
<td>New York</td>
<td>184</td>
<td>9.2</td>
<td>21.7</td>
<td>67.4</td>
<td>0</td>
<td>49.5</td>
<td>39.7</td>
</tr>
<tr>
<td>New Jersey</td>
<td>426</td>
<td>1.2</td>
<td>54.0</td>
<td>51.6</td>
<td>0</td>
<td>30.0</td>
<td>49.3</td>
</tr>
<tr>
<td>Delaware</td>
<td>188</td>
<td>12.8</td>
<td>65.4</td>
<td>64.4</td>
<td>0</td>
<td>30.9</td>
<td>68.1</td>
</tr>
<tr>
<td>Maryland</td>
<td>170</td>
<td>2.4</td>
<td>50.6</td>
<td>45.3</td>
<td>0</td>
<td>12.9</td>
<td>69.4</td>
</tr>
<tr>
<td>Virginia</td>
<td>218</td>
<td>5.5</td>
<td>78.4</td>
<td>90.4</td>
<td>0</td>
<td>22.0</td>
<td>36.2</td>
</tr>
<tr>
<td><strong>Total/mean</strong></td>
<td><strong>2235</strong></td>
<td><strong>9.9%</strong></td>
<td><strong>41.6%</strong></td>
<td><strong>56.2%</strong></td>
<td><strong>18.0%</strong></td>
<td><strong>32.1%</strong></td>
<td><strong>36.9%</strong></td>
</tr>
</tbody>
</table>

1Mean occurrence (%) calculated only across states within species geographic range.

Changes in Marsh Bird Abundance and Distribution Based on Comparisons with Historical Data

The goal of this research is to repeat surveys in the area studied extensively by Hodgman et al. (2002) and Shriver et al. (2004) to estimate changes in bird distribution and abundance over time across sites where historical data exist. Our approach here uses the same sampling frame as our contemporary surveys. However, our analyses differ in that we will use historical data as reference points for the dynamics of the saltmarsh bird community.

For our entire BCR30+ study area, we have assembled historical saltmarsh bird data from 14 sources, spanning 10 states, and totaling 3,006 points (Figure 2). Analyses including historical data are underway and we anticipate completing all analyses by mid-2015.
Table 2. Summary of historical point count data available for analysis and number of historical points resurveyed by SHARP during the 2011-2013 field seasons.

<table>
<thead>
<tr>
<th>State</th>
<th>Historical Points Contributed</th>
<th>Historical points resurveyed</th>
<th>Overall Percent Resurveyed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2011</td>
<td>2012</td>
</tr>
<tr>
<td>Maine</td>
<td>698</td>
<td>123</td>
<td>122</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>22</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>296</td>
<td>47</td>
<td>48</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>64</td>
<td>18</td>
<td>19</td>
</tr>
<tr>
<td>Connecticut</td>
<td>287</td>
<td>56</td>
<td>57</td>
</tr>
<tr>
<td>New York</td>
<td>32</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>New Jersey</td>
<td>481</td>
<td>25</td>
<td>32</td>
</tr>
<tr>
<td>Delaware</td>
<td>181</td>
<td>57</td>
<td>53</td>
</tr>
<tr>
<td>Maryland</td>
<td>617</td>
<td>73</td>
<td>86</td>
</tr>
<tr>
<td>Virginia</td>
<td>328</td>
<td>14</td>
<td>13</td>
</tr>
<tr>
<td>Total/mean</td>
<td>3006</td>
<td>440</td>
<td>457</td>
</tr>
</tbody>
</table>
Assessing Geographic Trends in Demography

Our goal is to understand how demographic rates for Species of Greatest Conservation Need vary across BCR30. The data requirements for determining such rates prevent us from sampling as extensively as for our survey efforts. Instead, we have centered our work in several focal areas spanning BCR30 for intensive study of demographic parameters.

In 2011, we established sites for intensive demographic studies in Maine, Connecticut, and New Jersey, supplemented by collaborators’ sites in New Hampshire, Massachusetts, and Rhode Island. In 2012, we added sites in New York. This geographic scope has provided insight into the biology of saltmarsh breeding birds, given variation in climate, vegetation, predators, and other aspects of the saltmarsh ecosystem across BCR30. Sampling for Saltmarsh Sparrow is especially comprehensive as our study sites span the species’ entire breeding range.

Each study site consists of one to five plots where field crews regularly searched for nests and conducted systematic mist-netting using a standardized protocol at regular intervals throughout the breeding season. Plots varied in size depending on access constraints and marsh size, but most were 10-25 ha in size. We monitored nesting within each study plot from May through August, 2014. Across all sites, we found a total of 832 nests of the six focal species (Table 3), a 10% increase from 2013. Since 2011, our project has found and monitored 2,738 nests to determine nest fates and fledgling production.

Table 3. Number of nests found for each focal tidal marsh species during the 2014 field season.

<table>
<thead>
<tr>
<th>Study Area</th>
<th>American Black Duck</th>
<th>Clapper Rail</th>
<th>Willet</th>
<th>Nelson’s Sparrow</th>
<th>Saltmarsh Sparrow</th>
<th>“Sharp-tailed” sparrow¹</th>
<th>Seaside Sparrow</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME²</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>9</td>
<td>77</td>
<td>89</td>
<td>0</td>
<td>184</td>
</tr>
<tr>
<td>NH</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>41</td>
<td>17</td>
<td>0</td>
<td>58</td>
</tr>
<tr>
<td>MA</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>34</td>
<td>13</td>
<td>0</td>
<td>48</td>
</tr>
<tr>
<td>RI</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>11</td>
<td>-</td>
<td>0</td>
<td>14</td>
</tr>
<tr>
<td>CT</td>
<td>0</td>
<td>13</td>
<td>10</td>
<td>0</td>
<td>52</td>
<td>-</td>
<td>6</td>
<td>81</td>
</tr>
<tr>
<td>NY</td>
<td>0</td>
<td>17</td>
<td>6</td>
<td>0</td>
<td>94</td>
<td>-</td>
<td>54</td>
<td>171</td>
</tr>
<tr>
<td>NJ</td>
<td>0</td>
<td>12</td>
<td>22</td>
<td>0</td>
<td>77</td>
<td>-</td>
<td>165</td>
<td>276</td>
</tr>
<tr>
<td>Total</td>
<td>0</td>
<td>42</td>
<td>51</td>
<td>9</td>
<td>386</td>
<td>119</td>
<td>225</td>
<td>832</td>
</tr>
</tbody>
</table>

¹At northern study sites, Nelson’s and Saltmarsh Sparrows hybridize; consequently, not all “sharp-tailed” sparrow nests can be assigned to species.

²Includes data from plots studied by both UNH and U. Maine crews.
In addition, we conducted opportunistic netting to capture adults as they arrived on the breeding grounds and targeted females that were associated with nests discovered during nest searches. We monitored all nests following a standardized protocol to track nest success and to gather information on the causes of nest failure. Upon capture, all birds were banded, measured, and released to gather information on survival rates and potential factors that might affect survival. From 2011 to 2013, in Connecticut and New Hampshire, we also captured sparrows in mist nets during the breeding season away from our demographic plots, and during spring and fall migration at our demographic plots in Connecticut, and at a number of sites on the wintering grounds. This supplemental banding, conducted as part of two graduate student studies, resulted in many additional birds being banded and in recaptures of birds that also were caught during the breeding season and has contributed important information for our survival analyses. In 2014, we continued to receive reports of birds banded by SHARP crews and recaptured elsewhere in Atlantic Coast marshes.

In 2014, across all sites, we banded a total of 53 Nelson’s Sparrows, 1108 Saltmarsh Sparrows, 100 unidentified “sharp-tailed” sparrows, and 408 Seaside Sparrows (Table 4). Across all three sparrow species, we recaptured 747 birds that had been banded earlier in the field season or during previous banding efforts. In 2015, we will use these recapture data in mark-recapture models to estimate survival rates.

Table 4. Summary of sparrow banding data from demographic plots during the 2014 field season.

<table>
<thead>
<tr>
<th>Study Area</th>
<th>Nelson’s Sparrow</th>
<th>Saltmarsh Sparrow</th>
<th>“Sharp-tailed” Sparrow</th>
<th>Seaside Sparrow</th>
<th>Percent of Females Attending Nests</th>
<th>Total No. of Sparrow Recaptures</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME²</td>
<td>44</td>
<td>175</td>
<td>89</td>
<td>0</td>
<td>61%</td>
<td>243</td>
</tr>
<tr>
<td>NH</td>
<td>6</td>
<td>102</td>
<td>8</td>
<td>0</td>
<td>71%</td>
<td>61</td>
</tr>
<tr>
<td>MA</td>
<td>1</td>
<td>124</td>
<td>3</td>
<td>0</td>
<td>61%</td>
<td>33</td>
</tr>
<tr>
<td>RI</td>
<td>0</td>
<td>60</td>
<td>0</td>
<td>0</td>
<td>45%</td>
<td>14</td>
</tr>
<tr>
<td>CT</td>
<td>2</td>
<td>335</td>
<td>0</td>
<td>0</td>
<td>26%</td>
<td>182</td>
</tr>
<tr>
<td>NY</td>
<td>0</td>
<td>129</td>
<td>-</td>
<td>183</td>
<td>55%</td>
<td>75</td>
</tr>
<tr>
<td>NJ</td>
<td>0</td>
<td>183</td>
<td>-</td>
<td>161</td>
<td>69%</td>
<td>130</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>53</strong></td>
<td><strong>1,108</strong></td>
<td><strong>100</strong></td>
<td><strong>408</strong></td>
<td></td>
<td><strong>747</strong></td>
</tr>
</tbody>
</table>

¹At northern study sites, Nelson’s and Saltmarsh Sparrows hybridize; consequently, not all birds can be reliably assigned to species.
²Includes data from plots studied by UNH and U. Maine crews.
Tracking Sparrow Movements Using Nanotags

In 2014, we assisted USFWS refuge biologists with a pilot project to track Saltmarsh Sparrows during fall migration using nanotags. We attached nanotags to five sparrows (3 hatch year and 2 adults) at Rachel Carson National Wildlife Refuge in Maine in early September, and to six individuals (4 hatch year and 2 adults) at Parker River National Wildlife Refuge in Massachusetts between mid-August and mid-September. At the Rhode Island Refuge Complex, biologists tagged an additional 14 sparrows. The effort was highly successful; no sparrows are known to have lost their tag, or to have experienced adverse effects from being tagged. All individuals were detected at least once (either on the sampled marsh or another marsh) by either radiotracking with a handheld antenna or by detection via an antenna tower. This pilot project revealed a few interesting findings about sparrow movements after the breeding season. Sparrows remained on the marshes where initially captured and tagged through late October. Also, some sparrows made short local movements between marshes within Rachel Carson Refuge (i.e., between Furbish and Eldridge Marshes) and stopped at Parker River Refuge presumably during their southward migration. One individual Seaside Sparrow moved from Rachel Carson Refuge southward to Parker River Refuge then returned to Rachel Carson Refuge shortly thereafter. Sparrows from Rachel Carson were detected by tower-mounted antennae as far south as Rhode Island and New Jersey, and as late as November 7. Batteries within the nanotags from Rachel Carson exceeded their expected lifetime by at least 2 weeks. These preliminary findings provide useful information to plan further trials for the 2015 season.

Use of PIT Tags to Improve Monitoring of Nest Attendance

Researchers from SUNY College of Environmental Science and Forestry and the University of Maine piloted a study in 2014 involving the application of PIT (Passive Integrative Transponder) tags to tidal-marsh sparrows within New York City and southern Maine. During previous field seasons, multiple recaptures of sparrows (systematically and at nests) throughout the field season led to trap avoidance and was thought to possibly increase the risk of nest abandonment. To reduce both of these potential problems, we chose to attach a PIT tag to a nesting birds’ color band as a novel way to allow researchers to passively identify birds attending a nest. Additionally, these tags do not require a power source, are light weight (0.1 g), and should remain with the bird for its lifespan, reducing inconvenience to the bird while increasing efficacy for researchers.

We applied tags (using epoxy and electrical tape) to the color bands of female Saltmarsh Sparrows (ME and NY), Nelson’s Sparrows (ME) and hybrids (ME), and male
and female Seaside Sparrows (NY) captured throughout the 2014 field season. We banded male Seaside Sparrows with PIT tags because they are known to occasionally aid in feeding young and are notoriously difficult to capture during targeted netting at nests. We applied tags to 88 individuals in New York and 84 in Maine. Once an abundance of individuals were tagged at a study site, researchers began placing RFID (Radio Frequency Identification) reader antennae next to active nests for 15-minute intervals to determine which individuals were attending nests. To confirm that RFID readers were only capturing the IDs of the attending adults and not other birds passing by, a subset of these same nests were later targeted for netting. In all instances where targeted netting resulted in a capture, individuals captured in nets were the same individuals whose PIT tag ID was recorded by the RFID reader at the nest. Also, in every instance that an RFID reader was unable to obtain the PIT tag ID of an individual, targeted netting determined that the attending individual was not marked with a PIT tag, demonstrating 100% PIT tag readability during the 2014 field season in both New York and Maine.

We were unsuccessful at capturing PIT tag IDs of male Seaside Sparrows during the 2014 field season. This likely resulted from the short timespan that RFID readers were placed at nests, and because the majority of placements occurred during the incubation stage, when males were spending little time at nests. During the 2015 season, we intend to place RFID readers at nests when chicks are older and when males are more likely to be assisting with feeding young. Also, on a subset of individuals in both New York and Maine, electrical tape affixing PIT tags to bands began unravelling. Consequently, we need to monitor retention of PIT tags during future field seasons to determine if this is a viable long-term strategy for monitoring nest attendance.

Hurricane Sandy and Coastal Marsh Resiliency

In 2014, we continued to use the SHARP sampling framework to investigate the effects of Hurricane Sandy on coastal marsh birds. With funding from the US Fish and Wildlife Service, we conducted a second season of post-Sandy bird and vegetation surveys to augment data collected in 2013 with funding from the National Science Foundation. Our data set includes ~1500 sites where we have sampled vegetation and bird populations immediately before and after the storm to describe the ability of marshes to resist hurricane disturbance. Sampling across the entire survey region – which was only possible due to the baseline data collection, made possible by our State Wildlife Grant – has allowed us to use a before-after control-impact design to assess changes at
sites that experienced very different storm conditions and were subject to diverse anthropogenic stressors.

We are also using the SHARP survey platform as a basis for evaluating post-Hurricane Sandy restoration efforts. Millions of dollars are being spent on coastal resilience and recovery. We are using pre-storm data to describe reference conditions and extending our current sampling to quantify baseline conditions where restoration work is being done. Before- and after-restoration sampling at sites throughout the mid-Atlantic and New England states is being used to investigate the efficacy of different recovery actions. By pooling information from multiple restoration sites using a standardized set of survey protocols, our sampling will allow rigorous quantification of whether methods work, how they compare, and what they contribute to coastal resilience. Our work on Hurricane Sandy is also leading to new collaborations with a variety of other research groups focused on the effects of the storm. As a result, all SHARP PIs and many SHARP graduate students participated in a December 2014 workshop organized by the North Atlantic Landscape Conservation Cooperative at Hadley, MA.

**Indicators of Climate Change in Long Island Sound**

Members of the SHARP Team (specifically C. Field, C. Elphick, M. Correll, M. Huang, and B. Olsen) investigated potential indicators of climate change effects on key wildlife and ecosystem resources in coastal Long Island Sound (LIS). Our focus was on biological indicators with high potential to show climate responses, available historical data, ease of cost-effective future data collection, and the ability to inform real-world management decisions. For wildlife measures with long enough time series, we investigated whether variation was explained by a set of core parameters: measures of temperature, precipitation, and sea level. We found that beach-nesting and colonial waterbirds, which represent some of the longest time series for wildlife in LIS, are not strongly influenced by the core parameters. In contrast, several saltmarsh bird and plant measures are strong indicators of sea level and tidal flooding. Additionally, we conducted pilot investigations and collected baseline data for other potential indicators in an attempt to address topics that lacked an historical record, in particular rates of ecosystem change in areas thought to be experiencing marine transgression. Overall, our results suggest that (1) several components of saltmarsh ecosystems are already being affected by increased coastal flooding and (2) coastal forest ecosystems appear to be relatively resilient to change in the face of increased coastal flooding (i.e., over time scales of several decades). This temporal mismatch in responses to coastal flooding will likely create challenges for management aimed at saltmarsh conservation in LIS. Additional research
and monitoring is needed to understand rates of marine transgression and the factors influencing them.

We offered a series of recommendations to facilitate a rapid and improved understanding of sea level rise and marsh transgression in Long Island Sound.

**Top priority action items:**

- Conduct regular monitoring of specialist saltmarsh bird (clapper rail, willet, saltmarsh sparrow, seaside sparrow) abundance and nest success at existing georeferenced points and using protocols now in use throughout the Northeast and Mid-Atlantic states.
- Conduct regular resurveys of the coastal margin transects created to quantify baseline conditions during this study.
- Conduct regular resurveys of tidal marsh vegetation at existing georeferenced sites.
- Deploy a network of “PlantCam” photo stations to quantify phenology of coastal vegetation change.

**High priority action items:**

- Expand tree core sampling of oaks to describe spatial variation in the resilience of coastal forests to marsh encroachment and climate-related growth patterns.
- Compile historic data sets describing tidal marsh vegetation and organize them in a consistent format.

A full report may be obtained at: http://www.tidalmarshbirds.org/?page_id=1605.

**GRADUATE STUDENT PROFILES**

With five academic institutions working together in SHARP, education is an important component of our work. Our research objectives are accomplished by an outstanding group of graduate students, each of whom has identified a key question in saltmarsh bird ecology and conservation as the focus of their graduate program. Currently, SHARP supports 13 graduate students (5 Masters, 8 Ph.D.).

**Bri Benvenuti**

Bri is in the first year of her Master’s Program at the University of New Hampshire, under the guidance of Adrienne Kovach. Her research is focused on the ecology of female Saltmarsh Sparrows, specifically adaptations in nesting behavior and to tidal flooding. She is also conducting experimental trials of floating habitat islands as a potential management option to increase the reproductive success of the species by creating nesting habitat that is free of tidal flooding. Additional funding for Bri’s thesis research is provided by the New Hampshire Agricultural Experiment Station.
Alyssa Borowske

Alyssa is completing her Ph.D. in Chris Elphick’s lab at the University of Connecticut. Her research interests center on considering organisms within the context of their full annual cycles, including interactions between seasons. For her dissertation, Alyssa compared male and female Saltmarsh and Seaside Sparrows during the breeding and non-breeding seasons to investigate the impact of their differing reproductive strategies on key components in their annual cycles: 1) the timing of migration and molt events, 2) feather quality and condition, 3) within-season survival and body condition, and 4) migration patterns to the non-breeding grounds. After finishing graduate school in 2015, she intends to stay involved with avian research and conservation. Additional support for Alyssa’s doctoral work was provided through a University of Connecticut Outstanding Scholar Fellowship and a National Science Foundation Graduate Research Fellowship.

Meaghan Conway

Meaghan is in her first year as a Ph.D. student at the University of Maine, advised by Brian Olsen (U. Maine) and Tom Hodgman (Maine Dept. of Inland Fisheries and Wildlife). Her Ph.D. research will focus on the evolutionary ecology of sparrows found in salt marshes of the northeast. Meaghan is generally interested in evolution and species’ ability to adapt to environmental change. She is currently developing a research proposal designed to elucidate the causes and consequences of ecological specialization. She will measure niche volume along an upriver ecological gradient among species of tidal marsh sparrows with varying degrees of specialization to investigate how niches change through evolutionary time.

Mo Correll

Mo is a fifth year Ph.D. candidate at the University of Maine advised by Brian Olsen (U. Maine) and Tom Hodgman (Maine Dept. of Inland Fisheries and Wildlife). Her research is focused on the biogeography of marsh birds found in salt marshes of the northeast, specifically between Maine and Virginia. In her dissertation, she explores population trends in tidal marsh specialists such as the saltmarsh sparrow over the past 15 years using a combination of historical datasets and the SHARP survey data from 2011-2012. She will compare these trends to those of several tidal marsh generalists to explore patterns in population change related to habitat specialization within this suite of species. Additionally, Mo is working to develop
a remote sensing tool to quantify high marsh habitat within northeastern tidal marshes using a combination of satellite imagery and elevation data. She expects to complete her dissertation and graduate in fall 2015. Additional support for Mo’s doctoral work was provided by an NSF IGERT Adaptation to Abrupt Climate Change Fellowship.

Chris Field

Chris is a fourth year Ph.D. student at UConn in Chris Elphick’s lab. His research is focused on the demographics of tidal marsh sparrows, the ecology and human dimensions of marsh transgression in Long Island Sound, and conservation planning in the face of sea-level rise. Chris is currently conducting population viability analyses for SHARP focal species: Saltmarsh Sparrow, Nelson’s Sparrow, and Seaside Sparrow and expects to complete his dissertation in May 2016. Chris hopes to continue conducting research on tidal marsh ecology and conservation for his post-doctoral research. Additional support for Chris’s doctoral work was provided by the Switzer Foundation and the University of Connecticut’s College of Liberal Arts and Sciences.

Tim Freiday

Tim is entering his second year as a Master’s Student in the Wildlife Ecology Program at the University of Delaware under the guidance of Greg Shriver. Tim’s research is focused on improving sampling techniques for secretive marsh birds with a focus on King Rails in the Delmarva Peninsula of Delaware and Maryland. He is developing a sampling framework based on the National Marsh Bird Monitoring protocol. Upon detection of King Rails, Tim also uses adaptive neighborhood transects and subsequent intensification of sampling effort to increase detections of this elusive species. Additionally, he will use remote acoustic recordings to quantify the effect of observer presence on secretive marsh bird call rates during surveys. Tim anticipates collecting data for two more field seasons with graduation in fall 2016.

Laura Garey

Laura is in her first year as an M.S. student at the University of Maine. Her advisers are Brian Olsen (U. Maine) and Tom Hodgman (Maine Dept. of Inland Fisheries and Wildlife). Laura’s research is focused on tidal marsh community structure and food web dynamics. Specifically, she will examine diet of tidal marsh sparrows, document variation in invertebrate communities in northeast tidal marshes, and explore changes to invertebrate communities after excluding avian predators. Laura completed
her first field season in 2014 and expects to graduate in fall 2016.

Becky Kern

Becky plans to complete her Ph.D. at the University of Delaware in May 2015, under the guidance of Greg Shriver. Her Ph.D. research focused on the breeding ecology and population viability of Saltmarsh and Seaside Sparrows in New Jersey. Becky explored how nest-site selection may have evolved as an adaptation to the tidal marsh environment and quantified how sparrow population viability is influenced by management scenarios and sea-level rise. Lastly, she measured the resilience of tidal marsh vegetation, small mammals, bird abundance, and bird reproductive success to Hurricane Sandy. Following graduation, Becky will be employed as a wildlife biologist by the U.S. Fish and Wildlife Service in Hadley, MA.

Alison Kocek

Alison is a concurrent M.S. and Ph.D. student studying under Dr. Jonathan Cohen at the State University of New York College of Environmental Science and Forestry. She is wrapping up her M.S. thesis in which she looked at the effects of disturbance, prey abundance and habitat variables on the presence of tidal-marsh nesting sparrows in New York City and the consequences of these variables on nest survival. Her study uncovered surprising differences in the nesting ecology of Saltmarsh Sparrows in New York City and at other field sites throughout their range, indicating that these sparrows may be more capable of adapting to varying landscape level marsh characteristics than previously thought. Alison’s Ph.D. research will look into the proximate cause of this change in sparrow nesting strategy in New York City; test how novel techniques, such as use of PIT Tags, may reduce researcher-caused abandonment of nesting sparrows; and use spatial modeling to determine home range sizes and density estimates for tidal-marsh sparrows throughout their breeding range. Additional support for Alison’s research has been provided by the New York Department of Environmental Conservation (NYSDEC); a Gateway Research Learning Center Fellowship provided by the Gateway National Recreation Area in Jamaica Bay, NY; and the Edna Bailey Sussman Foundation Graduate Fund provided by SUNY-ESF.
Sam Roberts

Sam is a first year Master’s student in Greg Shriver’s lab at the University of Delaware. His research is focused on the demographics of saltmarsh breeding birds in Forsythe National Wildlife Refuge in coastal New Jersey. Sam will use five years of nest monitoring and banding data to estimate the nesting success, fecundity, population size, site fidelity, and annual adult and juvenile survival of Saltmarsh and Seaside Sparrows. With these estimates, he will calculate population growth for these species in New Jersey. Sam also plans to measure the nesting success of Willets and Clapper Rails. Because of the location of his study site, he will use Hurricane Sandy as a case study for evaluating the effects of major storms on the demographics of saltmarsh breeding birds.

Kate Ruskin

Kate is entering the fifth year of her Ph.D. studies at the University of Maine, under the guidance of Brian Olsen (U. Maine) and Tom Hodgman (Maine Dept. of Inland Fisheries and Wildlife). Kate’s Ph.D. research focuses on the breeding ecology, evolutionary biology, and life history strategies of sparrows in salt marshes of the northeast, primarily Saltmarsh and Nelson’s Sparrows in southern Maine. Currently, she is quantifying the reproductive success of four SHARP focal species (Saltmarsh, Nelson’s, and Seaside Sparrows, Willets) from Maine to Virginia. Kate expects to complete her dissertation and graduate in August, 2015. She will remain in SHARP after graduation having recently accepted a postdoctoral research position with Chris Elphick at UConn. Additional support for Kate’s doctoral work was provided by the Chase Distinguished Research Fellowship and the Janet Waldron Doctoral Research Fellowship, both from the University of Maine.

Emma Shelly

Emma is a second year graduate student in Chris Elphick’s lab at the University of Connecticut. Her research interests focus on the reproductive strategies of female Saltmarsh Sparrows, especially why they engage in multiple mating. She also has a strong interest in outreach and science curriculum development. Additional support for Emma’s work was provided through a Crandall-Cordero Fellowship from the University of Connecticut and a Graduate Research Fellowship from the National Science Foundation.
Jen Walsh

Jen is entering the fifth year of her Ph.D. program at the University of New Hampshire, advised by Adrienne Kovach. Her Ph.D. research is focused on understanding spatial and temporal dynamics of the Nelson’s and Saltmarsh Sparrow hybrid zone. Jen combines molecular techniques with traditional field data to answer questions relating to hybrid zone maintenance, including: hybrid fitness, patterns of selection, morphological variation, and the influence of habitat on hybrid distribution. Field work for her dissertation has spanned from Lubec, Maine to Connecticut, but she spent a majority of the season on the UNH demographic sites in Great Bay, New Hampshire and southern Maine. Jen expects to complete her dissertation and graduate in the summer of 2015. Additional funding for Jen’s doctoral work was provided by the New Hampshire Agricultural Experiment Station, the American Ornithologists’ Union Research Award, the American Museum of Natural History, and the University of New Hampshire Dissertation Year Fellowship.

Whitney Wiest

Whitney is entering the fifth year of her Ph.D. program at the University of Delaware, under the guidance of Greg Shriver. Her Ph.D. research is focused on establishing a regional monitoring survey to assess the tidal marsh bird community in the northeast (Maine to Virginia). Whitney currently is quantifying the distribution and abundance of the SHARP focal species (Clapper Rail, Willet, and Nelson’s, Saltmarsh, and Seaside sparrows). She also is evaluating conservation strategies for tidal marsh birds in the face of sea level rise using optimization algorithms. Whitney expects to complete her dissertation and graduate in May 2015. Following graduation, she will be working as a regulatory biologist in U.S. Fish and Wildlife Service’s South Carolina Ecological Services Field Office in Charleston, SC.

OUTREACH

Public Outreach and Education

In 2014, SHARP PIs and graduate students participated in a wide range of public outreach activities. These included:

- Chris Elphick and Chris Field filmed an episode of the children’s show “AquaKids” at Barn Island Wildlife Management Area in Connecticut, focused on SHARP studies of changing saltmarsh vegetation and saltmarsh migration.
- Brian Olsen was interviewed for an article in The Working Waterfront, a magazine dedicated to life in coastal Maine, regarding SHARP’s work with
Hurricane Sandy restoration. This article was republished in numerous outlets, including: FEMA News Today, Bangor Daily News, GoInfraGreen, Wopular, and Maine Environmental News.

- Chris Field was interviewed for an article in the New London Day that described a public presentation he gave in East Lyme, CT about SHARP’s work on Saltmarsh Sparrows and marsh migration.

- In early January, Chris Elphick visited students in the Advanced Field Studies classes at Connecticut River Academy, an environmental studies-focused magnet school in Hartford, CT. Chris spoke about tidal marshes, Saltmarsh Sparrows, and the effects of Hurricane Sandy.

- The work of SHARP has also been highlighted in web resources and newsletters of our various collaborators and supporting organizations, including:
  

**Symposia Organized**

Elphick, CS, TP Hodgman, BJ Olsen, and WG Shriver (Convenors). 2014. The Saltmarsh Habitat and Avian Research Program (SHARP): progress to date and future expansion south. Northeast and Southeast Partners in Flight Joint meeting, Virginia Beach, VA, USA.

Hodgman, TP (Session Chair). 2014. Saltmarsh Sparrow. 70th Annual Northeast Fish and Wildlife Conference, Portland, ME, USA.

**Presentations (* indicates student author)**


Elphick, CS. 2014. Conservation in an era of climate change: Can we save saltmarsh birds as the oceans rise? *Lederman Lecture in Natural History and Conservation, University of Rhode Island, Kingston, RI, USA*.

Elphick CS. 2014. Extinction risk in tidal marsh birds as sea levels rise: changing habitat and demographic processes. *University of Tsukuba, Tsukuba, Japan*.


Elphick, CS, CR Field*, MD Correll*, WA Wiest*, JB Cohen, TP Hodgman, Al Kovach, BJ Olsen, WG Shriver. 2014. Using the SHARP sampling framework to quantify the effects of Hurricane Sandy on coastal marshes and the efficacy of post-Sandy restoration actions. *Northeast and Southeast Partners in Flight Joint meeting, Virginia Beach, VA, USA*.

Field, C*, and CS Elphick. 2014. Can tidal marsh birds persist in the face of climate change? *The Effects of Sea Level Rise on Rhode Island’s Salt Marshes, Providence, RI, USA*.


Field, C*, C Gjerdrum, and CS Elphick. 2014. Does accounting for imperfect detection during point counts have to be expensive? *Annual meeting, Association of Field Ornithologists and Wilson Ornithological Society, Newport, RI, USA.*


Kovach, Al. 2014. Climate Change and the Conservation of Saltmarsh Birds. *Coastal New Hampshire Climate Summit, Greenland, NH, USA.*


Olsen, BJ, MD Correll, KJ Ruskin, and AI Kovach. 2014. Evolutionary succession. Department of Natural Resources and the Environment, University of New Hampshire, Durham, NH, USA.

Olsen, BJ, MD Correll, KJ Ruskin, and AI Kovach. 2014. Evolutionary succession. Center for Biodiversity, Unity College, Unity, ME, USA.


Ruskin, KJ*, MA Etterson, BJ Olsen, and TP Hodgman. 2014. Differences in Saltmarsh and Nelson’s Sparrow oviposition preference are not adaptive: a case for neutral evolution. GradExpo, University of Maine Orono, ME, USA.


Shriver, WG. 2014. The conservation of tidal marsh birds in the Northeast: adapting to sea level rise. University of Delaware, An international symposium on global issues and trends in agriculture, environment, and bioenergy, Newark, DE, USA.

Shriver, WG. 2014. The conservation of tidal marsh birds in response to sea level rise. University of Georgia, Warnell School of Forestry and Natural Resources, Athens, GA, USA.


Wiest, WA*, WG Shriver, and KD Messer. 2014. Optimizing the suboptimal: finding a pragmatic solution to tidal marsh bird conservation in the face of sea level rise. *Annual meeting, Association of Field Ornithologists and Wilson Ornithological Society, Newport, RI, USA.*
LITERATURE CITED


PHOTO CREDITS

Stone wall, *Juncus gerardii*, Saltmarsh Sparrow by Alyssa Borowske; conducting point count survey by Matt Jones; sparrow nest by Kate Ruskin; Clapper Rail nest by Chris Field; Nanotag on sparrow, PIT tags, PIT tag on Seaside Sparrow, and RFID reader by Alison Kocek.