Annual Report: Natural Resource Program Center Funded Projects

Due 31 October

Fiscal Year Project First Funded: 2013; the project was first funded in FY2013 and a Cooperative Agreement was established with the University of Rhode Island at the end of FY2013. Work under the agreement did not begin until FY2014.

Project Name*:* Development of Monitoring Protocols for Roseate Terns

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Project Location: Offshore islands throughout New England where Roseate Terns are nesting (or have historically nested) and staging.

Project Goal:

The objectives of this project are to develop standardized monitoring protocols for nesting and staging Roseate Terns.

Nesting parameters: 1) description, quantification, and ranking of occupied nesting habitat; 2) assessment of changes to vegetation structure and composition and substrate structure post-habitat management; 3) assessment of changes in nesting densities and productivity.

Staging area parameters: 1) description, quantification, and ranking of staging habitat; 2) assessment of disturbance at staging areas; and 3) assessment of staging area management on disturbance (e.g. reduction) and effects to Roseate Terns.

Expected Conservation Outcome of the Project:

The Northeast population of Roseate Terns is entirely found within Region 5 and Canada and uses a network of island and beach nesting sites scattered across the landscape. All northeast coastal R5 Refuges (Maine – New York) and numerous partners are managing

lands for staging and/or breeding Roseate Terns, but outcome-based monitoring has not been standardized across sites. A landscape-level standardized monitoring protocol for recovery activities focused on managing nesting and staging habitat would increase the power of our data, and help us improve conservation design and delivery throughout the range to ensure maximum benefits.

There is increasing interest in nesting habitat management at Roseate Tern colonies throughout the region to provide more nesting habitat at more sites across the range. Nesting habitat preferences appear to vary among colonies, as do methods to manage habitat and monitor effects of habitat management. Invasive species appear to be affecting habitat quality on many Roseate Tern nesting sites, thus control of invasive species is a major management issue on many of these nesting islands. There is a need to standardize metrics for quantifying habitat characteristics at nesting sites, as well as assessing changes to nesting habitat and nesting tern density post-management.

Post-breeding Roseate Terns congregate at staging sites before initiating their migratory flights to their wintering grounds. At least 20 sites have been documented around Cape Cod on open beaches or sand flats near the end of barrier beaches. One management concern is anthropogenic disturbance to staging birds, thus managers are interested in minimizing disturbance at these staging sites. However, there is a pressing need to standardize definitions of staging and disturbance, and to develop standardized protocols to quantify site suitability, disturbance, and potential management strategies.

Project Measureable Objectives (Year 1):

Nesting – Develop standardized metrics for evaluating habitat characteristics for Common Terns and Roseate Terns (which only nest in association with large, productive Common Tern colonies) at a variety of spatial scales including the nest site, productivity plot, and colony. Based on pilot data collected during the first field season, draft monitoring protocols will be developed for assessing changes in habitat characteristics that could affect nest densities, and reproductive success in direct response to management actions at tern nesting sites.

Staging – Develop standardized definitions of staging sites and disturbance, for purposes of protocol development. Draft monitoring protocols for staging sites, disturbances, and effectiveness of strategies to minimize disturbance at staging sites.

Project Measureable Objectives (Long-term):

Develop final protocols in the National Inventory and Monitoring Program format and data management spreadsheets.

Assessment of Short-term Performance (Year 1):

- Less than 70% conservation objective achieved
- 70 – 79% conservation objective achieved
- 80 – 89% conservation objective achieved
- 90% or more conservation objective achieved\

Assessment of Long-term Performance this year:

- Less than 70% conservation objective achieved
- 70 – 79% conservation objective achieved
- 80 – 89% conservation objective achieved
- 90% or more conservation objective achieved

Project Status – Nesting:

Data were collected at six Roseate Tern breeding colonies in 2014 at three different scales: nest, productivity plot, and colony (Table 1).

Nest Scale: To assess habitat at nests, we used a 1 m^2 quadrat that was centered at a random sample of nest and non-nest sites. At each 377 nest sites (Table 1), we took a digital photo from a standard height of 1.5m (Fig. 1). In the lab, we used ImageJ software to quantify vegetation coverage within each 1 m^2 plot based on the digital images. Also, we recorded plant cover within each plot using the Braun-Blanquet scale and measured vegetation height (to the nearest cm) at the center and four corners of the quadrat.

Plot Scale: In order to take advantage of the data already being collected in tern productivity plots (currently only collected at Common Tern nests except for Buzzard's Bay colonies), we also quantified vegetation plant cover at the productivity plot scale (Fig. 2). Data were collected at 48 productivity plots (Table 1). Productivity plots typically are surrounded by 0.3 m tall wire fence to prevent tern chicks from leaving the area before fledging, thus researchers are able to quantify the number of chicks produced per pair. The size of productivity plots varied among islands (e.g., ranging from 3-8 m diameter depending on the island). We used a wi-fi enabled GoPro camera mounted on a telescoping pole (up to 4 m height) in order to achieve a camera height capable of capturing the entire plot in a single photo. We then scaled the digital photo and used ImageJ software to assess plant structure and cover at the productivity plot scale. We also measured vegetation height (nearest cm) at each nest and random locations within each plot.

Colony Scale: To analyze vegetation characteristics at the colony scale (i.e., an entire island), we used a radio-controlled quadcopter to take aerial photographs of the colony

(Fig. 3). Steps were taken to insure that we did not disturb birds when taking photos. We collected these data on two islands, Great Gull and Penikese (Table 1). These photos can be processed into an orthophoto mosaic and potentially produce a digit surface model as well as a digital elevation model which can then be converted into a colony level vegetation height map using photogrammetric software. The photos can also be analyzed for vegetation cover and vegetation cover classes. A ground-truthing survey was also conducted at the intersections of a 10m x 10m grid. Data collected in this survey include vegetation height, plant species within 2 meters, and dominant plant species.

Table 1. Total number of Roseate Tern (ROST), Common Tern (COTE), and random 1 m^2 nest plots, productivity plots (Plot) and island-wide (colony) samples collected at 6 tern nesting islands throughout New England during 2014.

	Nest				Plot	Colony	Total
	ROST	COTE	Random	Total			
Falkner Island (CT)	0	38	0	38	14	0	52
Great Gull Island (NY)	54	40	15	109	0	372	481
Penikese Island (MA)	0	11	16	27	0	20	47
Ram Island (MA)	16	20	15	51	0	0	51
Bird Island (MA)	25	25	23	73	0	0	73
Monomoy NWR (MA)	8	35	35	78	34	0	112
Total	103	169	104	376	48	392	816

Project Status - Staging:

Staging: Throughout the staging period, several staging counts were conducted by URI personnel and RINWRC staff at four sites along the southern RI coast. Also, a collaborative site visit at Cape Cod was conducted in September 2014 with graduate students from SUNY ESF and NPS who were investigating Roseate Tern staging disturbance. Many of the metrics for staging disturbance will likely come from the findings of this project.

Fig. 1. Example of $1m^2$ digital image taken at a Common Tern nest to assess vegetation cover.

Fig. 2. Example of tern productivity plot taken with a GoPro camera used to assess vegetation cover. Photo was taken at Monomoy NWR, Common Tern nests were located at pink flags.

Fig. 3. Example of imagery collected for island-wide vegetation survey on Great Gull Island, NY, by using a remote-controlled quadcopter during fall 2014 from 400’ elevation (K. Rogers, URI, unpublished data).