PROGRESS REPORT

Cooperative Agreement No: F15AC00027

Project Title: **Identifying Resilient Sites for Coastal Conservation,** part of Department of the Interior Project # 24, Decision Support for Hurricane Sandy Restoration and Future Conservation to Increase Resiliency of Tidal Wetland Habitats and Species in the Face of Storms and Sea Level

Reporting Period: July 1, 2015 through Dec 30, 2015

Receipt Organization: The Nature Conservancy

Project Leader: Dr. Mark Anderson

Were planned goals/objectives achieved last quarter? Yes, we developed and tested a method for quantifying and mapping salt marsh migration space, and we developed an approach to compare and rank sites based on that information. We presented the results at the USFW hosted Salt Marsh workshop in December 2015.

NALCC Conservation Need Addressed: Decision Support for Hurricane Sandy Restoration and Future Conservation to Increase Resiliency of Tidal Wetland Habitats and Species in the Face of Storms and Sea Level

Progress Achieved: (For each Goal/Objective, list Planned and Actual Accomplishments)
This quarter we focused on quantifying marsh migration spaces and compiling new region-wide datasets. Specifically we:

Quantified Marsh Migration Space: We focused our research on a pilot area (Massachusetts) while we waited for the creation of a tidal range map for the entire NALCC region based on gauge data. For the study area we implemented the following:

- Compiled data including the Mass DEP datasets for saltmarshes, beaches and tidal flats. Compiled 5 m, 10 m, and 30 m Digital elevation models. Obtained an interpolated grid of tidal range from Brad Compton of UMASS.

- Created a predictive model for current salt marsh extent. In GIS, we created a binary point dataset of salt marsh / non-salt marsh by distributing an equal number of points (10,000) within the salt marsh or on the perimeter but outside of the marsh. We attributed each point with its elevation using 5 m, 10 m, and 30 m DEM, and with its tidal range. We used a logistic regression to predict which points were salt marsh occurrences based on elevation and tidal range, and we then applied regression model to the full dataset to spatially map current salt marsh extent. The method produced excellent results at all scales with the 10 m version giving particularly accurate mapped distribution. When the predicted distribution was compared with the actual distribution it revealed areas where restrictions such as roads or bridges are currently preventing marsh expansion. The latter is being used by the UMASS team for evaluating and ranking tidal restrictions.

- Created scenarios for marsh migration: We created scenarios for marsh migration using the predictive model described above and raising the sea level (lowering the elevation) by 0.5 m, 1 m, and 2 m. The model outputs a spatially explicit map of predicted saltmarsh extending landward from the current extent. We overlaid the NE Terrestrial Habitat Map on the predicted region for each scenario, classified the available habitat as suitable (natural, agriculture) or unsuitable (developed), and quantified the amount of suitable habitat for each marsh

- Summarized migration space by marsh, watershed and coastal shoreline unit. For each salt marsh polygon obtained from Mass DEP we summarized the amount of migration space available directly adjacent to it based on the 1 m sea level rise scenario and attributed the polygon with this information. This provided very useful information where individual salt marshes were distinct and isolated but was difficult to interpret where the marsh was mapped as a complex of many adjacent polygons. Our next step is to create of more useable set of salt marsh units by grouping adjacent polygons together into a single marsh unit, and then to summarize the migration space available to the whole unit. We also summarized the

amount of migration space and types of available habitats within HUC 12 watersheds and within coastal shoreline units. The latter are based on EPA's Coastal and Marine Classification System and allowed us to compare estuaries and marshes of the same basic geomorphic structure type (e.g. embayments, lagoons, fjards) in order to develop ecologically meaningful comparisons between sites.

Compiled Region-wide 10 m DEM. The results of the pilot suggested that the 10 m data gave accurate predictions of salt marsh extent so we compiled a 10 m DEM for the whole NALCC region. We obtained the DEM tiles from the NOAA Sea Level Rise viewer which are based on the best available Lidar-based elevation data and conditioned to include hydrologic features and breaklines (i.e., bridges were removed so water bodies are not separated). We downloaded the 10 and 5 meter DEMs and resampled the 5m grids to 10 m, then merged the resampled 5m grids with the 10m grids and averaged overlapping values. We made the grid available to other researchers working on related projects.

Improved the Soil Texture Dataset:We took advantage of newly released SSURGO data by compiling the dataset and developing soil texture class attributes for the whole NALCC coastal region.

Difficulties Encountered: We received word from USGS that they will not be able to supply the region-wide interpolation of tidal height. We are working with Brad Compton to see if one of our teams can learn and run the VDATUM interpolation. Alternatively we are running quantitative comparisons between results of our pilot scenarios with the NOAA sea level rise dataset to see if it might be possible to adapt their dataset to the needs of this project. A second difficulty was the very recent (Jan 15) retirement of Charles Ferree the modeler who developed the migration space model. We have transferred his responsibilities to Analie Barnett a very capable analyst with prodigious statistical analysis skills. Analie will be on point along with Arlene Olivero and Mark Anderson through the end of the project.

Activities Anticipated Next Quarter:
Goals for the upcoming Quarter include:

1) Run the salt marsh model at 10 meters for the whole region. This step depends on the availability of a tidal range dataset, and if our strategy to obtain an off-the-shelf version doesn't work, a major goal will be to produce the interpolation ourselves using the VDATUM software.
2) Compare the results of our pilot to the NOAA SLR model to identify its potential utility.
3) Create Marsh Units: assemble aggregate salt marsh, or whole estuary units from existing polygons, and estimate migration space for other habitats
4) Begin to incorporate geophysical and biodiversity data into the site characterizations

Expected End Date: October 30, 2016
Employment Information:
As required by the terms of this Agreement, we are reporting that no Veteran or Youth have been hired during the period of this report.

Signature:

Mark Anderson
Director of Conservation Science
The Nature Conservancy, Eastern Division

Date: Jan 29, 2016