Feasibility of Evaluating the Impacts of Sea Level Rise on Foraging Habitats of the Little Blue Heron in the Great White Heron National Wildlife Refuge

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Conservation Problem
- Habitats in the Refuge sustain local avian diversity and support regional or statewide populations of wading birds.
- 7 (100%) of Florida’s impounded wading bird species occur in the Refuge and 5 (71%) species breed there (U.S. Fish and Wildlife Service 1994).
- Wading birds are very sensitive to small changes in water depth because their leg length constrains them to feeding in shallow water.
- A major threat to these species in the Refuge comes from likely changes in habitat as a result of sea level rise.
- Quantifying climate-driven habitat change for sensitive wading bird species is a precursor to long-term conservation planning, but fraught with difficulties:
  - Need to identify specific habitats in the intertidal zone used for foraging
  - Need to couple predicted sea level changes with predicted changes in ground surface elevation, which is dynamic and also affected by sea level.

Little Blue Heron as the Target Species
- Florida Species of Special Concern and species of High Concern in the North American Waterbird Conservation Plan (Kushlan et al. 2002).
- Species occurs in both saltwater and freshwater habitats so it is possible to compare historic population trends in both habitats and identify relative changes.
- Good indicator for other wading birds in the Refuge because it may have a narrower range of habitat tolerance than other herons and egrets in the Refuge.

Great White Heron National Wildlife Refuge
- Dominant vegetation types include 3100 ha of mangrove islands surrounded by, and interspersed with, vast mud, sand, and grass flats.
- Mangrove islands are nesting colony sites.
- Intertidal flat provides the majority of feeding habitat.

Objectives
1) Predict changes in Little Blue Heron foraging habitat as a function of sea level rise in a test areas.
2) Evaluate predictions of habitat model by comparing to field surveys of Little Blue Herons.
3) Determine whether the Little Blue Heron has exhibited differential population trends in coastal and interior areas of Florida.

Habitat Model and Impact Assessment
- A Digital Elevation Model, created using LIDAR data, will be used to drive a predictive model, Sea Level Affecting Marshes Model (SLAMM), for a test area inside the Refuge.
- SLAMM predicts wetland conversions and shoreline modifications during long-term sea level rise by simulating 5 dominant processes (inundation, erosion, overwash, saturation, and accretion).
- Most required input datasets are readily available from public sources (e.g. NOAA, U.S. Fish & Wildlife Service, U.S. Geological Survey).

Model Evaluation
- The distribution and abundance of Little Blue Herons in a test area will be determined from bird surveys conducted by boat quarterly from December to August.
- Model predictions based on current water levels and habitat distributions will be compared to the observed distribution of Little Blue Herons in the 30 m x 30 m SLAMM grid cells using confusion matrices, which utilize information on whether predicted values were false positive, false negative, or correctly classified (Deleo 1993).

Coastal and Interior Population Trends
- Because the nesting data sets were not designed to provide unbiased population estimates, trends will be compared using nonparametric rank-based regression techniques and confidence intervals on the slopes.

References

Figure 1. Photograph of a Little Blue Heron

Figure 2. Map of the Refuge. Air Photo Source: Google Earth

Figure 3. 2-D and 3-D landscape visualizations in SLAMM. Each cell has an elevation, slope and aspect.

Figure 4. Conceptual model of habitat availability

Figure 5. Presence (Green) and absence (White) of Little Blue Heron. Results grid shows correctly classified (CC), false positive (FP), and false negative (FN) cells in the 30 m x 30 m SLAMM grid.