Using Sea-level Rise Modeling and Habitat Priority Planner to Prioritize Future Land Protection in a Tidal Freshwater System

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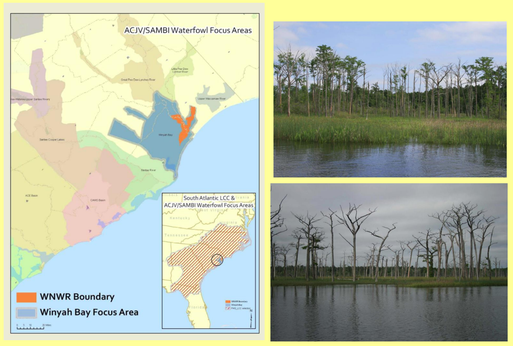
Abstract

We used a locally-adapted sea-level rise model, SLAMM 5.0 and NOAA's Habitat Priority Planner (HPP) to examine 25-year and 50-year projected loss and conversion of tidal freshwater wetlands along the Waccamaw and Pee Dee Rivers in Georgetown County, South Carolina. Using HPP, we examined the extent to which salt water intrusion would impact Swallow-tailed Kites, a flagship species for the bottomland hardwood forest system, as well as private, state, and federally protected lands in the study area. We found that over 14,000 acres of protected tidal freshwater wetlands in Georgetown County could be lost to conversion to salt marsh and brackish marsh by 2050. We identified the upper Waccamaw River in Horry County and Black River-Mingo Creek watershed in Georgetown and Williamsburg Counties as possible areas to focus future private, state, and federal land protection efforts.

Threat to tidal freshwater wetlands

Winyah Bay's river system, the third largest on the Atlantic Coast, has one of the most extensive and intact wetland complexes in the Southeast. As sea-level rises and land surface subside, salt water inundation will progress upslope and inland leading to: (1) loss of wetland habitat to open water, (2)conversion of freshwater habitats to salt and brackish, (3)conversion of upland habitats to wetland habitats.

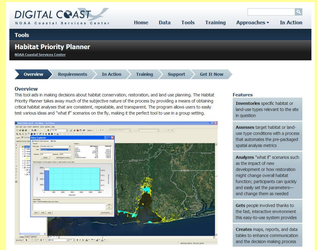


"This successional sequence implies that tidal freshwater forest are more vulnerable to retreat and loss from sea-level rise than other coastal habitats."
Dolye et al 2010

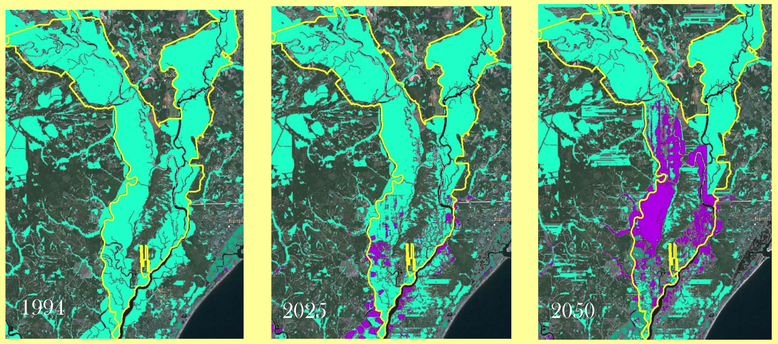
Data Resources and Analysis Methodology

We used many resources including SLAMM version 5.0 (locally adapted), High resolution LiDAR, National Wetlands Inventory data, Habitat Priority Planner, local data on erosion and accretion rates, protected lands data layer, and local data generated by Citizen-science for Swallow-tailed Kite online database to develop sea-level rise scenarios and analyze potential impacts on tidal freshwater wetlands including protected wetlands and habitat for the focal species, Swallow-tailed Kites. We applied predicted sea level rise habitat impacts (SLAMM outputs) with NOAA's Habitat Priority Planner to identify freshwater wetlands that are threatened by conversion to saltwater or brackish habitat due sea level rise by year 2050. NOAA's Habitat Priority Planner allowed us to layer Citizen-Science data points and identify those areas used by Swallow-tailed Kite during the breeding season. Further, we could use the HHP tool to looks at breeding areas that were currently protected and areas without protection.

SLAMM Inputs	Regional	Local
Habitat data	**NWI – National Classification**	**NWI: site-specific reclassification**
Elevation	**National Elevation Dataset (30m)**	**High resolution lidar**
Tide Erosion Accretion	**Regional (Southeast)**	**Local**

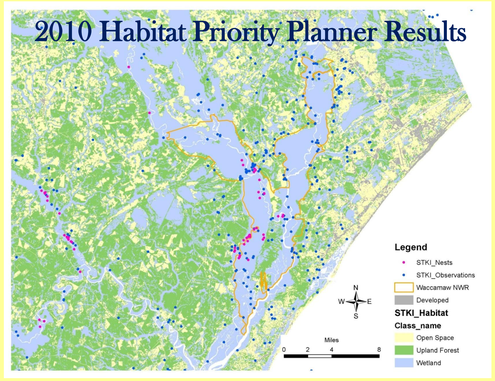


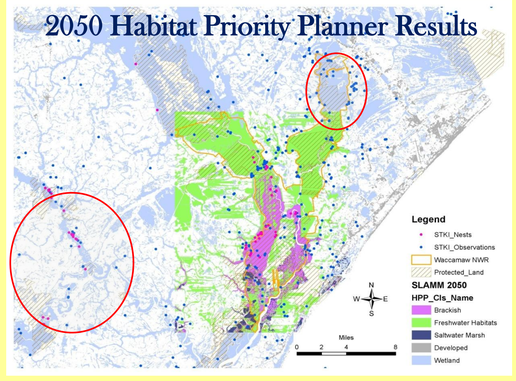
Sea Level Affecting Marshes Model



The predicted 2050 conversion of freshwater tidal wetlands to salt and brackish marsh was extensive. The model predicted that over 14,000 acres of currently protected tidal freshwater wetlands could be impacted by habitat conversion due to salt-water intrusion.

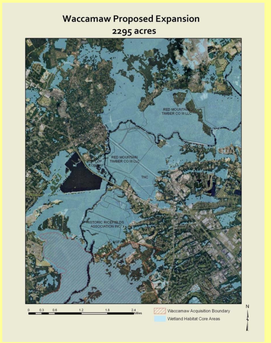
Brackish Marsh
Freshwater Habitats
Waccamaw NWR

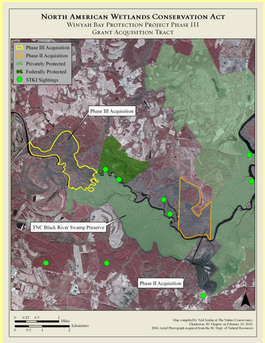




Prioritizing Future Land Protection

We feel the most appropriate scale at which to apply our current model is landscape-scale conservation planning. The conservation planning information has already been used to leverage federal and private funds for land protection including Land and Water Conservation funding (LWCF) for Waccamaw Refuge acquisition tracts and USFW North American Wetland Conservation Act (NAWCA) Grants for private protection outside of the Refuge boundary. The information will continue to be used to direct land protection activities and support a proposed major expansion of the Waccamaw NWR. We know that this effort will aid in wetland migration inland and upslope. Increasing the extent of forested wetland protection in the watershed will also provide a buffering effect during climate-related weather events such as drought and extreme rain events.





Conclusions

In the future, we hope to increase the resolution and scope of the model so that it may inform restoration activities in the watershed as well such as restoration of altered hydrology, invasive species control, and oyster reef restoration. As we move forward, we want to make informed decisions about how and where to direct our conservation efforts. We are most interested in directing those efforts toward climate adaptation strategies that build resilience and help buffer the effects of a changing climate. We strive to better understand and demonstrate how these efforts can benefit both natural systems and people.