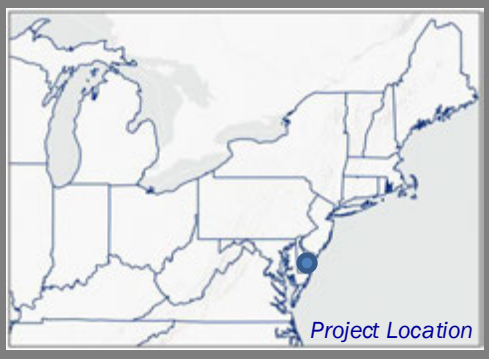
RESTORATION

Tidal Marsh and Dune Restoration on Prime Hook National Wildlife Refuge

Prime Hook National Wildlife Refuge (PHNWR), located along the Atlantic Flyway in Delaware Bay, was established in 1963 to conserve and protect migratory birds. Management of the PHNWR freshwater impoundments was successful until storms and rising sea levels breached the shoreline, resulting in saltwater intrusion into the freshwater ecosystem. These impacts were exacerbated by Hurricane Sandy in 2012, resulting in open water spilling into the impoundments. In 2013, USFWS obtained 38 million dollars in disaster relief funding to bolster coastal resilience. Over six years, the U.S. Fish and Wildlife Service (USFWS) worked closely with the local community and federal and state agencies to restore 4,000 acres of tidal marsh ecosystem utilizing nature-based solutions (NBS).



Prime Hook Beach After Barrier Beach Restoration/USFWS

KEY ISSUES ADDRESSED

Climate change is contributing to more frequent major storm events and sea level rise (EPA, 2024). As a result, around 14,000 ft of beach has eroded (or moved landward by 500 ft) in the last 64 years at PHNWR. Erosion decreases the soil stability of back-barrier dune and tidal marsh ecosystems. Back-barrier dunes provide a buffer between ocean and tidal marsh, as tide and storm surge rarely reaches the back-barrier, except in the case of extreme weather events.

Dune erosion has made PHNWR vulnerable to saltwater intrusion. Saltwater intrusion into freshwater habitat creates unlivable conditions for some freshwater species such as pintails, wood ducks, teal, largemouth bass, and pickerel, leading to ecosystem and species changes as the habitat transitions to saltwater.

PROJECT GOALS

- Restore and reshape dunes that had been leveled by storms and sea level rise to slow and minimize erosion
- Transition freshwater habitat affected by saltwater intrusion to tidal marsh habitat

SEEDING TO STABILIZE

To stabilize the mudflat habitat, refuge staff and partners seeded 1,000 acres of exposed habitat with over 10,000 lbs of seed representing 17 different species.

Dredging Tidal Channels to Reconnect Them to Delaware Bay/USFWS

PROJECT HIGHLIGHTS

Marsh and Barrier Beach Re-Stabilization: PHNWR staff filled in two miles of shoreline with 1.4 million cubic yards of sand directly dredged from Delaware Bay to restore and reshape the eroded dune system. Staff constructed sand fencing and planted plugs of brackish dune and marsh species to stabilize the back-barrier and create high marsh habitat.

Tidal Marsh Hydrologic Restoration: Tidal marsh restoration at PHNWR involved dredging 25 miles of channels across 4,000 acres of former freshwater impoundments. The dredged channels slowed water exchange and distributed flow throughout the marsh, lowering the water level to expose subaqueous soils.

Hydrologic Data and Tools: Delft3d was a critical hydrodynamic modeling tool that assessed the existing conditions of the marsh, including the circulation of tides through the system and salinity data, and potential options for restoration.

Community Engagement: USFWS and its partners used this project as an opportunity for education and outreach with the community and decision makers through public meetings, site visits, articles, and roundtable discussions.

Collaborators

- U.S. Geological Society
- NOAA National Marine Fisheries
- US Army Corps of Engineers Philadelphia
- See online for full list of partners

LESSONS LEARNED

The project design was complex and incorporated a level of detail that was commensurate with the large scale of the project. It was expected that significant modifications would be included during the construction as the varying site conditions were incorporated. This required that staff adapt the management plan throughout the process and adapt to the conditions encountered as they began restoration.

A multidisciplinary team and local expertise were key to project success. Since several employees for the project were hired on a term basis, capacity has been lost in the years following the project. The project would not have been possible without several partner organizations.

A core tenet of using NBS in restoration is the project's benefits to human communities in addition to ecological communities. The success of this project was underscored through its tactical and deliberate community engagement, anchored by the facilitation of several in-person discussions. Community engagement is essential to the success of NBS-related projects and should begin at the onset of project design.

NEXT STEPS

- Continue biological and surface elevation monitoring
- Develop publications about project results
- Maintain climate resilience: storms and sea level rise will continue to test the refuge. By restoring a natural equilibrium to evolve with changing conditions, the site will be more resilient.

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Main Tidal Breach into Freshwater Impoundment/USFWS

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