Coastal Impoundment Restoration on Edwin B. Forsythe National Wildlife Refuge

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U.S. Fish and Wildlife Service
The Mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.
Biological Integrity: Biotic composition, structure, and functioning at genetic, organism, and community levels comparable with historic conditions, including the natural biological processes that shape genomes, organisms, and communities.

Biological Diversity: The variety of life and its processes, including the variety of living organisms, the genetic differences between them, and the communities and ecosystems in which they occur.

Environmental Health: Composition, structure, and functioning of soil, water, air, and other abiotic features comparable with historic conditions, including the natural abiotic processes that shape the environment.
Refuge Establishment:
- Brigantine NWR 1939
- Barnegat NWR 1967

Renamed in 1984 in memory of the late Congressman, Edwin B. Forsythe

Current ownership is 47,067 acres along a 48 mile span of coast

70% is salt marsh
National Assessment of Coastal Vulnerability to Sea-Level Rise

National Assessment of Coastal Vulnerability to Sea-Level Rise:
U.S. Atlantic, Pacific, and Gulf of Mexico Coasts

RISK RANKING
- Low
- High
- Moderate
- Very High

8534720 Atlantic City, New Jersey

Linear Mean Sea Level Trend
Upper 95% Confidence Interval
Lower 95% Confidence Interval
Monthly mean sea level with the average seasonal cycle removed

300
0
300
600 Kilometers

Atlantic Ocean
GOAL STATEMENT

*Maintain and restore, where possible, the biological integrity, diversity, and environmental health* of Refuge Habitats to sustain native plants and wildlife, federal trust resources, and species of conservation concern.
Coastal Impoundments

- Began in the 1940’s and continued into the 1970’s
- Impound freshwater with levees for wildlife habitat, mosquito control or hunting
- Water control structures allow water level management for increasing carrying capacity of habitat (seeds & inverts)
- Require active management ($).
HQ Impoundment System

- Doughty Creek (fresh water feeder creek)
- Northwest Pool (fresh water)
- Southwest Pool (fresh water)
- East Pool (salt water)
• Manage Refuge Wetland Impoundments to sustain native plants and wildlife and federal trust resources with emphasis on migrating and wintering birds and species of conservation concern.

• Consider other options to current management when conservation targets cannot be achieved or when it may be no longer viable to maintain impoundments due to sea level rise or other factors.
Hurricane Sandy’s Path

Hurricane Sandy’s path, courtesy of USGS
The Hurricane Sandy Disaster Relief Supplemental Appropriation Act of 2013, Public Law 113-2.
To Manage or Restore?

- Refuge has 14 impoundments
  - In 4 systems
  - Only 1 actively managed

- Evaluated:
  - Refuge’s ability to manage
  - Resilience to climate change
  - Benefits to wildlife
    - Natural system
    - Impoundment
- HQ Impoundment System chosen for continued management
- Three other systems chosen for restoration of tidal flow
Headquarters Impoundment Restoration
Project Goals and Objectives

• Determine freshwater availability for management goals.
  – Water Balance Study

• Repair and enhance vulnerable sections
  – Repair Turtle Cove and Dogleg
  – Elevate and reseed outer dike

• Restore independent management of Northwest and Southwest Pools
  – Rebuild Long Dike
  – Dike protection and water control

• Restore management capability of East Pool
  – Replace WCS #3

• Prepare new management plans
West Pools

• Managed as one unit since the Long Dike breached in 2007.
• Independent management will allow for varied habitat.
• A freshwater living shoreline will provide extra protection and additional foraging and refuge habitat.
**East Pool**

- Managed as a tidal impoundment since 2004.
  - Not enough rainfall to manage as a freshwater system.
- Muted tide offset from surrounding marsh.
- Repairing WCS #3 will allow the Refuge to gradually adjust flow into East Pool.

<table>
<thead>
<tr>
<th>Tide Range</th>
<th>Outside Waters</th>
<th>East Pool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Tide Height (Feet NAVD88)</td>
<td>3.05</td>
<td>1.24</td>
</tr>
<tr>
<td>Minimum Tide Height (Feet NAVD88)</td>
<td>-1.58</td>
<td>0.38</td>
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</tbody>
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Tidal Flow Restoration of 10 Coastal Impoundments

• The Refuge is partnering with the Ocean County Mosquito Commission to restore tidal flow to Stouts Creek, Forked river and Barnegat Impoundments
  • Work will start early January 2017

• All breaches will be 3-4ft wide and 3ft deep

• The material that is excavated will be kept nearby so that at any point the breach can be filled back in if deemed necessary

• The Commission will use an amphibious excavator or a low-ground pressure excavator during construction

• The Refuge has installed water loggers at all three impoundments to monitor the tidal cycles pre and post breaching
Barnegat Impoundment Proposed Breaches

Legend
- Proposed Breaches = 11
- Functioning Water Control Structures
  - no = 2
  - yes = 4
- Project Boundary
Monitoring Before and After on Impoundments and Adjacent Salt Marsh

- SHARP and SMI
  - Bird Populations
  - Vegetation
  - Nekton
  - SET’s

- Expanded water logger use

- Physical attributes
  - Elevation
  - Sediment Supply
  - Soil characteristics
Use Adaptive Management Principles

- Treat impoundment restoration actions as experiments
- Uses outcome of actions to inform and improve future actions
- Develop alternate hypotheses
THANK YOU!

Any Questions?

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