Appendix A

American Littoral Society
Proposal for Hurricane Sandy Coastal Resilience Competitive Grants
Creating a Resilient Delaware Bay Shoreline in Cape May and Cumberland Counties (NJ)
submitted to National Fish and Wildlife Foundation
Federal Financial Assistance Grant Number: 43429
Grant Information

Title of Project
Creating Resilient Habitats and Communities on Delaware Bay

Total Amount Requested $4,750,000.00
Matching Contributions Proposed $254,468.00
Proposed Grant Period 06/02/2014 - 05/30/2016

Project Description
We will restore 6 Delaware Bayshore sites, making habitats and towns more resilient to future storms and impacts of climate change. Our innovative techniques will promote long-term sustainability.

Project Abstract
We propose to restore six interrelated Delaware Bayshore sites in Cape May and Cumberland Counties, New Jersey. Each site is an integral unit of the Western Hemisphere Shorebird Reserve Network, a known spawning beach for horseshoe crabs, and a major stopover point for northbound migrant shorebirds. These natural areas and small, rural communities adjacent to them are experiencing the impacts of climate change and sea level rise. Sites include both the natural and built communities at Gandy’s/Money Island Beach, Roadway Beach between Fortescue and Oyster Creek, East Point Lighthouse Beach, and Moores/Thompsons Beach in Cumberland Cty, and South Reeds, Cooks, and North Pierces Point Beaches in Cape May Cty.

Activities: Restore 5.73 miles of beach, some with locally dredged sand
Restore 50 acres of coastal wetlands using locally dredged silt
Employ 6 local earth moving companies and 5 oystermen
Provide employment and valuable training to 10 local veterans
Educate at least 1,000 students about project impacts and engage 250 in gathering data
Complete 8 supportive studies to be used by our partners and others
Develop 2 plans that will inform future action

Outcomes: This work will improve horseshoe crab spawning in the Delaware Bay and annual stopovers of northbound migrant shorebirds (especially the red knot); ecological and economic resilience of Delaware Bayshore communities; and sustainability of this work by innovative methods.

Organization and Primary Contact Information
Organization American Littoral Society
Organization Type Non-profit Corporation 501(c)(3)
Organization Web Address www.littoralsociety.org/
Organization Phone 732-291-0055
Street Line 1 Building 18, Sandy Hook
Street Line 2 18 Hartshorne Dr Ste 1
Title: Creating Resilient Habitats and Communities on Delaware Bay
Organization: American Littoral Society

City, State, Country, Postal Code: Highlands, New Jersey, North America - United States 07732
Region (if international):
Organization Congressional District: District 2 (NJ)
Primary Contact: Mr. Alek Modjeski
Position/Title: Habitat Restoration Program Director
Street Line 1: 18 Hartshorne Drive, Suite #1
City, State, Country, Postal Code: Highlands, New Jersey, North America - United States 07732
Region (if international):
Phone and E-mail: 732-291-0055 x; alek@littoralsociety.org

Keywords: Conservation Threat; Major Habitat Type; Other; Species
Sub-keywords: Bird - Shorebird - Calidris canutus (Red Knot); Bird - Shorebird - Haematopus palliatus (American Oystercatcher); Coastal - Coastal beaches, dunes and shoreline; Coastal - Estuaries and Bays; Other; Species - Bird; Species - Invertebrate

Other Keyword(s): Invertebrate-Horseshoe Crab - Limulus polyphemus
Project Location Information

Project Location Description: Gandy’s/Money Island Beach, Roadway Beach, East Point Lighthouse Beach, Moores/Thompsons Beach (Cumberland Cty); Reeds Beach/Pierces Point, South Reeds/Cooks/North Pierces Point Beaches (Cape May Cty)

Project Country(ies): North America - United States

Project State(s): New Jersey

Project Congressional District(s): District 2 (NJ)

Permits and Approvals

Permits/Approvals Description: Bidwells Creek Marsh and reed beach restoration from dredging: Thin Layer application of silt on damaged marsh and sand to damaged beach both from the dredging of Bidwells Creeks by NJ Department of Transportation. Estimated volume of silt=20k cubic yard Estimated Sand=30k cubic yards

NJDEP Individual Permit for Waterfront Development including a Water Quality Certificate (WQC)& Sediment Mgmt Plan

Permits/Approvals Status: Intend to Apply

Permits/Approvals Agency-Contact Person: NJDEP - Mark Davis

Permits/Approvals Submittal-Approval Date: 9/15/2014 12:00:00 AM

Permits/Approvals Description: Site: Bidwells Creek Marsh and reed beach restoration from dredging

Need: ACOE Individual Permit for Wetland Restoration Activities

Thin Layer application of silt on damaged marsh and sand to damaged beach both from the dredging of Bidwells Creeks by NJ Department of Transportation. Estimated volume of silt=20k cubic yard Estimated Sand=30k cubic yards

Permits/Approvals Status: Intend to Apply

Permits/Approvals Agency-Contact Person: USACE - Sam Reynolds

Permits/Approvals Submittal-Approval Date: 9/15/2014 12:00:00 AM
Permits/Approvals Description: Pierces to Reeds Beach Restoration
NJDEP Need Modification to existing Permit for emergency restoration
Complete the restoration of beaches started in spring 2013. We will add 20k cubic yards of sand to South Reeds, Cooks, Kimbles and Pierce Point Beach to complete profiles establish though beach surveys

Permits/Approvals Status: Application Submitted

Permits/Approvals Agency-Contact Person: NJDEP: Christopher Dolphin/Colleen Keller

Permits/Approvals Submittal-Approval Date: 3/15/2014 12:00:00 AM

Permits/Approvals Description: Pierces to Reeds Beach Restoration
USACE - extension to existing NWP 27 for enhancement of aquatic resources
Complete the restoration of beaches started in spring 2013. We will add 20k cubic yards of sand to South Reeds, Cooks, Kimbles and Pierce Point Beach to complete profiles establish though beach surveys

Permits/Approvals Status: Application Submitted

Permits/Approvals Agency-Contact Person: USACE - Sam Reynolds

Permits/Approvals Submittal-Approval Date: 3/15/2014 12:00:00 AM

Permits/Approvals Description: EXPERIMENTAL SAND HARVESTING ON DELAWARE BAY CAPE SHORE BAY BEACHES
Permit: Individual Permit NJDEP
Experiment with harvesting sand from the intertidal flat off the lower Cape May Peninsula beaches. We have two potential sites in Middle Township and will partner with both Middle township and Cape May county mosquito commission and the county government. We expect to harvest about 30k but the cost will be calculated based on time.

Permits/Approvals Status: Intend to Apply

Permits/Approvals Agency-Contact Person: Christopher Dolphin or Colleen Keller

Permits/Approvals Submittal-Approval Date: 8/1/2014 12:00:00 AM
Permits/Approvals Description: Moores Beach NJDEP - Modification to existing Permit for emergency restoration Complete the beach profile developed in the spring 13 project which will extend the recovered beach by another 1000ft. The total sand will be approx. 15,000
Permits/Approvals Status: Application Submitted
Permits/Approvals Agency-Contact Person: NJDEP - Coleen Keller
Permits/Approvals Submittal-Approval Date: 3/15/2014 12:00:00 AM

Permits/Approvals Description: Moores Beach USACE - extension to existing NWP 27 for enhancement of aquatic resources Complete the beach profile developed in the spring 13 project which will extend the recovered beach by another 1000ft. The total sand will be approx. 15,000
Permits/Approvals Status: Intend to Apply
Permits/Approvals Agency-Contact Person: USACE - Sam Reynolds
Permits/Approvals Submittal-Approval Date: 3/15/2014 12:00:00 AM

Permits/Approvals Description: Thompsons Beach njdep - Modification to existing INDIVIDUAL Permit for road and beach improvements Design and Restore Beaches for Shorebirds, Horseshoe Crabs and Coastal Resiliency / Storm Protection with 45k. The beach has already been cleaned of most rubble by the NJDEP. Road work will be necessary.
Permits/Approvals Status: Intend to Apply
Permits/Approvals Agency-Contact Person: NJDEP - Colleen Kellery
Permits/Approvals Submittal-Approval Date: 7/1/2014 12:00:00 AM

Permits/Approvals Description: Thompsons Beach usace - extension to existing NWP 27 for enhancement of aquatic resources Design and Restore Beaches for Shorebirds, Horseshoe Crabs and Coastal Resiliency / Storm Protection with 45k. The beach has already been cleaned of most rubble by the NJDEP. Road work will be necessary.
Permits/Approvals Status: Intend to Apply
Permits/Approvals Agency-Contact Person: Sam Reynolds
Permits/Approvals Submittal-Approval Date: 7/1/2014 12:00:00 AM

Permits/Approvals Description: Gandy’s and Money Island: Restore Beach / Marsh Using Dredge Material
NJDEP: Individual Permit for Waterfront Development including a Water Quality Certificate (WQC)& Sediment Mgmt Plan

Permits/Approvals Status: Intend to Apply
Permits/Approvals Agency-Contact Person: Mark Davis/Colleen Keller
Permits/Approvals Submittal-Approval Date: 3/15/2015 12:00:00 AM

Permits/Approvals Description: Gandy’s and Money Island: Restore Beach / Marsh Using Dredge Material
NJDEP: Individual Permit for Waterfront Development including a Water Quality Certificate (WQC)& Sediment Mgmt Plan

Permits/Approvals Status: Intend to Apply
Permits/Approvals Agency-Contact Person: USACE: Sam Reynolds
Permits/Approvals Submittal-Approval Date: 3/15/2015 12:00:00 AM

Permits/Approvals Description: Reeds Community Beach This project will be included in the permitting for Bidwells (above) so they are the same req.
Permits/Approvals Status: Application Submitted
Permits/Approvals Agency-Contact Person: NJDEP: Colleen Keller  USACE: Sam Henderson
Permits/Approvals Submittal-Approval Date: 9/15/2014 12:00:00 AM

Permits/Approvals Description: Eastpoint Lighthouse Beach NJDEP - Individual Permit for Waterfront Development, incl. WQC USACE - Individual Permit for beach restoration & shoreline protection activities
Permits/Approvals Status: Intend to Apply
Permits/Approvals Agency-Contact Person: usace - j. smith and sam reynolds  njdep - mark davis and colleen keller
Permits/Approvals Submittal-Approval Date: 3/15/2015 12:00:00 AM

Permits/Approvals Description: Fortescue  NJDEP: Individual Permit for Waterfront Development including a Water Quality Certificate (WQC) & Sediment Mgmt Plan  ACOE: Individual Permit for Wetland Restoration Activities  We already have the dredging permit from NJDEP
Permits/Approvals Status: Intend to Apply

Permits/Approvals Agency-Contact Person: usace - sam reynolds  njdep / njdot - mark davis
Permits/Approvals Submittal-Approval Date: 6/1/2014 12:00:00 AM
## Salaries and Benefits

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<thead>
<tr>
<th>Position</th>
<th>Units</th>
<th>Cost Per Unit</th>
<th>Total</th>
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<tbody>
<tr>
<td>Habitat Restoration Program Director</td>
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<td>$45,000.00</td>
<td>$90,000.00</td>
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<tr>
<td>Habitat Restoration Coordinator</td>
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<td>Communications Coordinator</td>
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<td>Part-time Restoration Assistant</td>
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<td>$50,000.00</td>
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<tr>
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<td>Executive Director</td>
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<tr>
<td>Outreach Coordinator</td>
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**Total Salaries and Benefits** $403,690.00

Salary costs shown include 20% fringe comprising employee health insurance, payroll taxes, FICA, workers’ comp., and other statutory taxes and insurance. 1) Restoration Prog. Dir.: 60% over 2 years @ 75K per year + 20% Fringe. Serve as overall project manager, partner/contractor coordination/management; scientific and logistical expertise and support; permit development and management; fiscal oversight, document review. Restoration/Education Coord.: 87% over 2 years @ $50K per year + fringe. Provide local logistical support and task mgmt; prepare documentation; GIS support; support educational outreach and volunteer coordination. Communications Coord.: 25% over 2 years @ $50K + fringe; Handle print media, web site, public relations; social networking; and production of printed materials and signage. Part-time Assistant: 100% over 2 years @ $20,125/yr. Assist on onsite tasks, education program, data entry and other general project tasks. Vet. Interns: 5 Interns per project year @ $5K each + 0% fringe; Assist with pre and post project monitoring, data gathering, work on oyster reefs and restoration tasks. Dep. Director-QA/QC Officer: 20% over 2 years @ 75K per year + 20% fringe. Serve as QA/QC officer, review project documentation. Exec. Director: 10% over 2 years @ 94K per year + fringe. Core PM Team/Press events. Finance Mgr: 20% per year at $56K + fringe. Budget QA/QC, Actuals/Budget Outreach Coord.: 20% over 2 years at $45k + fringe. Manage/create Outreach Programs/events.

## Equipment
### Contractual Services

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<th>Units</th>
<th>Cost Per Unit</th>
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<tr>
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<td><strong>Total Contractual Services</strong> $4,020,576.40</td>
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<tr>
<td>Larry Niles and Associates, LLC</td>
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<td>$851,944.00</td>
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<tr>
<td>Richard Stockton College Coastal Research Center</td>
<td>1</td>
<td>$435,431.00</td>
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<tr>
<td>Partnership for Delaware Estuary</td>
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<td>$30,502.00</td>
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<tr>
<td>Delaware Bayshore Oystermen</td>
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<td>Earthwork Restoration Companies TBD</td>
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<td>Conserve Wildlife Foundation</td>
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<td>Litwin and Provence</td>
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<td>Bus Contractor</td>
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<tr>
<td>Graphic Subcontractor TBD</td>
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<td>Interpretive Signage Contractor TBD</td>
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**Total Equipment** $0.00
Larry Niles & Associates LLC: project design, local field oversight, permit and compliance support, engineering design review, adaptive management monitoring and public engagement; Richard Stockton College, CRC: beach engineering and design, materials assessment; beach profile, overview mapping and other material necessary for permits. Conduct baywide survey of sand movement and major influences that carry sand from one beach to another; repeated beach profiles for the monitoring of restored beaches; bathymetry surveys for amounts of sand and silt in thin layer and sand harvesting projects. Partnership for the Del. Estuary: Provide historical assessment data for specific marsh areas; assist in design and implementation of Wetland Monitoring Programs. Earthwork Restoration Companies: 6 companies to transport habitat grade sand to restoration sites from upland sources and grade according to specs., spread sand to engineered profiles; harvest sand in lower Cape Shore project. Oyster Reef Contractors: contract with local oystermen with shellfish leases to create protective oyster reefs. CWF: local project management at 4 state-owned sites including public outreach. Haskins Shellfish Research Lab: Assist with oyster education/outreach. Litwin & Provence: legal document review incl. subcontracts/regulations. Bus Contractor: student transportation to horseshoe crab field sites and shell transport. Graphic Sub- Provide quality grade design Interpretive sign - create site specific educ. signs

### Supplies and Materials

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<tr>
<th>Item</th>
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<tr>
<td>laptops</td>
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<tr>
<td>Educational Consummables</td>
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<td>Folding Hand Carts</td>
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<tr>
<td>Office Supplies</td>
<td>2</td>
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<td>$2,000.00</td>
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<tr>
<td>Thin spray nozzle</td>
<td>2</td>
<td>$4,500.00</td>
<td>$9,000.00</td>
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<tr>
<td>Anchors and straps for barge</td>
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<td>$400.00</td>
<td>$800.00</td>
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<tr>
<td>12ft 10” Divers Pipe</td>
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<td>Pipe Diffuser</td>
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### Supplies and Materials

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<tr>
<td>rope</td>
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<tr>
<td>Geotube material per yard</td>
<td>3524.42</td>
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**Total Supplies and Materials** $175,993.00

1) 2 laptops for field use by interns, volunteers, staff
2) Educational Consummables - supplies for horseshoe crab education/monitoring program including portable touch tanks, paper, photocopying, small stopper bottles, test tubes, rulers, calipers, clipboards, food coloring, test kits
3) folding hand carts for moving equipment and supplies from vehicles into schools and onto field sites
4) Office Supplies - project related including printer ink, paper, binders, postage, pens, staples, memos, file holder stands
5) Nozzle - design/fabricate for spreading silt on salt marsh
6) Anchors/Straps - secure barge to project sites
7) Divers Pipe for underwater restoration operations
8) Coir logs, straw wattles, geotube material, stakes, rope, flags etc. to protect marsh restoration sites from losing recently applied silt
9) chest waders for 10 veteran interns and /or volunteers

### Printing

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<tr>
<th>Units</th>
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<tbody>
<tr>
<td>Education and Outreach Materials</td>
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<tr>
<td>Public Outreach Fact Sheets</td>
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**Total Printing** $10,510.00

Fact Sheets about horseshoe crabs, red knots, and habitat; link between resilience and habitat restoration
Fact sheets/cards about each of the 6 projects

### Travel

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<tr>
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<th>Cost Per Unit</th>
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<tr>
<td>Habitat Restoration Program Director</td>
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<td>Restoration/Education Coordinator</td>
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<td>Units</td>
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<tr>
<td>-------</td>
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<tr>
<td>Veteran Interns</td>
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<td>$4,045.00</td>
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</table>

**Total Travel**

$24,930.60

1) Habitat Restoration Director - Mileage reimbursement for use of personal auto – Sandy Hook to Cape May = 125 miles  RT = 250 miles
   X .56 = $140  Tolls = $3.75 RT = $7.5 = 1 RT = $147.50 @ 2 per month = $295 x 24 = $7,080
   Lodging – For overnight stays at local area hotel during times of heavy local project activity (Less expensive to stay over 1 night per month than to reimburse for mileage) Winter averages 100/night @ 1 per month X 6 months = $600 Summer averages $275 @ 1/month x 6 months = 1,650
   $2,250 per year x 2 = $4,500
   Total lodging $4,500 + Mileage/tolls $7,080 = $11,580 for 2 years

2) Restoration/Education Coordinator
   Reimbursement for use of personal auto
   Millville to Cape May = 40 miles  RT = 80 Miles x .56 - $44.80 @ 3 per month = $134.40 X 24 $ 3,225.60

3) Part-time Restoration Assistant - Mileage reimbursement for use of personal Auto – Sandy Hook to Cape May = 125 miles  RT = 250 miles X .56 = $140  Tolls = $3.75 RT = $7.5 = 1 RT = $147.50 @ 2 per month (for 20 1/2 months) = $295 x 20 trips = $6,080 (includes approx. 320 miles for local trips needed for supply pick up, and project associated errands.

4) Veteran Interns = 107 miles r/t from various locations not to exceed a 54 mile radius from project site x 10 interns x 6 trips over two years each = $3,595.20 + tolls r/t $7.50 x 10 x 6 = $450 for a total of 4,045.00

**Other**

<table>
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<tr>
<th>Units</th>
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<tbody>
<tr>
<td>Permit Fees</td>
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<tr>
<td>Lab Analysis</td>
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<tr>
<td>19’ skiff rental</td>
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<tr>
<td>GPS Base Station and Rover Rental</td>
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<tr>
<td>20X10 Barge Rental</td>
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</table>

**Total Other**

$114,300.00
1) Permit fees for up to 2 sites that may not receive federal consistency based on applicant; all other include State of NJ as a partner and thus permit fees will be waived
2) Lab analysis of sediments for contaminants as per condition of permits to use sediment for restoration
3) 19' skiff rental for monitoring and oyster reef/marsh restoration for 4 months per year for 2 years
4) GPS base station and rover rental to monitor thin layer application for 4 months per year over 2 years
5) 20 X 10 barge rental for reef restoration and monitoring

| Budget Grand Total |               | $4,750,000.00 |
Matching Contributions

Matching Contribution Amount: $1,000,000.00
Type: Cash
Status: Pledged
Source: US Fish and Wildlife Service
Source Type: Federal
Description: We are currently working with FWS to develop a cooperative agreement through which FWS will invest 1,000,000 in expanding the restoration of horseshoe crab habitat and other important habitats in New Jersey’s Delaware Bayshore.

Matching Contribution Amount: $129,468.00
Type: In-kind
Status: Pledged
Source: Volunteer Labor
Source Type: Non-Federal
Description: ALS Horseshoe Crab Census - 250 volunteers X 4 hours @ 25.91 X 2 years = $51,820
ALS Oyster Reef Project - 50 volunteers X 6 hours @ 25.91 x 2 years = 15,460
CWF Shorebird Stewards - 100 volunteers @ 24 hours X 25.91 = 62,184

Matching Contribution Amount: $75,000.00
Type: Cash
Status: Pledged
Source: NJ Recovery Fund
Source Type: Non-Federal
Description: Via CWF for habitat restoration

Matching Contribution Amount: $26,000.00
Type: Cash
Status: Pledged
Source: US Fish and Wildlife Service
Source Type: Federal
Description: Pledged to CWF for Delaware Bayshore habitat restoration

Matching Contribution Amount: $50,000.00
Type: In-kind
Status: Pledged
Source: Larry Niles & Associates, LLC
Source Type: Non-Federal
Description: Value of scientists and field workers banding and assessing shorebird populations in Delaware Bay during Spring 2014 and 2015

Total Amount of Matching Contributions: $1,280,468.00
Activities and Outcomes

Funding Strategy: Capacity, Outreach, Incentives
Activity / Outcome: Sandy - Economic benefits - # jobs created
Description: Enter the number of jobs created
Required: Recommended
# jobs created - Current: 0
# jobs created - Grant Completion: 20
Notes: To our knowledge, this project will not create permanent, long-term jobs. During the course of the project, however, it will provide significant work for local earth moving firms and oystermen, who will be employed over a two-year period. In addition, our proposed veterans internship program will provide short-term employment and training in such skills as surveying, monitoring, and restoring habitats including using GPS equipment and interpreting data. Finally, the implementation of a dredge recycling program in which sand and silt from rivers and streams can be re-used locally, will make more regular dredging possible due to reduced costs, thus creating additional local work and improved navigation and cost savings for oyster fishermen.

Funding Strategy: Habitat Restoration
Activity / Outcome: Sandy - Beach habitat quality improvements - Miles restored
Description: Enter the number of miles restored
Required: Recommended
Miles restored - Current: 0
Miles restored - Grant Completion: 5.73
Notes: We will restore 5.73 miles of beach habitat destroyed by Hurricane Sandy at multiple sites in Cape May and Cumberland County. This will result in improved spawning habitat for horseshoe crabs, higher egg densities and, consequently, improved stopovers for migrating shorebirds, especially the red knot. In addition, the wider beaches will result in improved resilience of the coastal landscape and increased protection of nearby communities. Resilience of the built and natural landscape will be increased.

Funding Strategy: Capacity, Outreach, Incentives
Activity / Outcome: Sandy - Outreach/ Education/ Technical Assistance - # people reached
Description: Enter the number of people reached by outreach, training, or technical assistance activities
Required: Recommended
# people reached - Current: 0.00
# people reached - Grant Completion: 2000.00
Notes: During the course of the project, we anticipate reaching the following people 1,500 middle school and high school students through horseshoe crab education program
500 middle school students through our partnership with Rutgers Haskins Shellfish Research Lab's oyster education program

Funding Strategy: Capacity, Outreach, Incentives
Activity / Outcome: Sandy - Volunteer participation - # volunteers participating
Description: Enter the number of volunteers participating in projects
Required: Recommended
# volunteers participating - Current: 0.00
# volunteers participating - Grant Completion: 700.00
Notes: Horseshoe Crab Surveys: 500 We anticipate that 500 students and their teachers and parents will volunteer in 2 annual horseshoe crab surveys/data collection -- 250 per year -- after receiving training in our horseshoe crab education program.
Oyster Reef Construction: 100 volunteers working approximately 6 hours each

Funding Strategy: Planning, Research, Monitoring
Activity / Outcome: Sandy - Management or Governance Planning - # plans developed
Description: Enter the number of plans developed that had input from multiple stakeholders
Required: Recommended
# plans developed - Current: 0
# plans developed - Grant Completion: 2
Notes: During the course of the project, we will develop 2 management plans:

- Cox’s Meadow Beach and Marsh Restoration
- Bidwell’s Creek Marsh Restoration

Funding Strategy: Planning, Research, Monitoring
Activity / Outcome: Sandy - Research - # research studies completed
Description: Enter the number of research studies completed
Required: Recommended
# research studies completed - Current: 0
# research studies completed - Grant Completion: 1
Notes: We will complete a comprehensive scientific evaluation of sediment behavior along the Bayshore that will support the restoration work.

Funding Strategy: Habitat Restoration
Activity / Outcome: Sandy - Wetland restoration - Acres restored
Description: Enter the number of acres restored
Required: Recommended
Acres restored - Current: 0.00
Acres restored - Grant Completion: 50.00
Notes:

Funding Strategy: Habitat Restoration
Activity / Outcome: Sandy - Erosion control - # structures installed
Description: Enter the number of structures installed, replaced, upgraded or repaired to reduce erosion or wetland/marsh lost.
Required: Recommended
# structures installed - Current: 0
# structures installed - Grant Completion: 2
Notes:
Hurricane Sandy destroyed nearly 70% of horseshoe crab habitat on the New Jersey side of Delaware Bay. This imperiled not only the horseshoe crabs that spawn on the storm-ravaged beaches, but also the shorebirds that stop there each spring to refuel before making the final leg of their journey from Tierra del Fuego to their nesting grounds in the Canadian Arctic. Immediately after the hurricane, a team led by the American Littoral Society and the Conserve Wildlife Foundation of New Jersey successfully restored just over a mile of damaged horseshoe crab habitat, avoiding a natural catastrophe for northbound migrant shorebirds that depend on building weight from horseshoe crab eggs. Herein, we propose to expand that work to six other, interrelated Bayshore sites and restore the beaches and marshes most important to the survival of the horseshoe crab and migrant shorebirds. This work will also increase the resilience of nearby communities and demonstrate the value of adopting a nature-based response as we move forward from the storm.

A. Geographic Context:

We propose to restore beach and wetland habitats of six interrelated Delaware Bayshore sites in Cape May and Cumberland Counties, New Jersey. While not all contiguous, each site is an integral unit of the Western Hemisphere Shorebird Reserve Network, a known spawning beach for horseshoe crabs, and a major stopover point for northbound migrant shorebirds. In addition, both the natural areas and small, rural communities adjacent to them are experiencing the impacts of climate change and sea level rise. The Delaware Estuary is also recognized as an Estuary of International Importance by the Ramsar Convention on Wetlands of International Importance. The sites include both the natural and built communities at 1) Gandy’s/Money Island Beach (Cumberland County), 2) Roadway Beach between Fortescue and Oyster Creek (Cumberland County); 3) East Point Lighthouse Beach (Cumberland County); 4) Moores/Thompsons Beach (Cumberland County); 5) Reeds Beach Beach and Pierces Point (Cape May County); and 6) South Reeds, Cooks, and North Pierces Point Beaches (Cape May County). Detailed spatial information and aerial photographs of each site is provided in the attachments submitted with this proposal.

B. Project Narrative:

Project Goals: Our overarching goals are to increase the success of horseshoe crab spawning in the Delaware Bay and the annual Bayshore stopovers of northbound migrant shorebirds (especially the red knot) and resilience of Delaware Bayshore communities. We wish to strengthen an irreplaceable natural system and reduce the vulnerability of rural Bayshore communities that was so clearly exposed by the impacts of Sandy. To advance these goals, we propose to restore and enhance the most important beaches which comprise critical habitat for shorebirds and horseshoe crabs. Restored beaches have been demonstrated to contribute to mitigating storm hazards. We will also restore adjacent saltmarshes for their value as habitat for other wildlife, and their potential role in hazard mitigation. The restoration of these areas will increase resilience of the rural Delaware Bayshore communities situated close to them through the addition of demonstrated, nature-based approaches to storm hazard reduction in communities which don’t currently have them. We will design and implement a sustainable program of using Bay sediments to restore and maintain these natural features. As we create local
and environmentally beneficial opportunities for the disposal of channel dredge materials, we will resolve long standing impediments to the economic well-being and resiliency of Bayshore communities. This work will be supported by comprehensive scientific evaluation of sediment behavior along the Bayshore. We will also create oyster reefs and compatible aquaculture operations as critical parts of the storm mitigation work and strengthening the conditions related to recovered beaches. This will also expand the economic resiliency of the communities by supporting local, bay related industry. We will engage members of the community in various elements of our work to promote understanding of the link between habitat restoration and coastal resilience and increase public support for these and future coastal habitat restoration efforts.

Success will be measured by increased numbers of shorebirds on the designated project beaches in the 2014, 2015, and subsequent stopovers; by increased numbers of crabs and egg densities on the designated horseshoe crab beaches during the 2014, 2015, and subsequent spawning seasons; reduced wave action and resulting erosion at designated beaches; successful engagement of youth, veterans, and other community members in learning about and volunteering in project elements in their communities. Specific metrics and targets are provided in our activities and outcomes document submitted as an attachment to this proposal.

Specific outputs and outcomes are:
Site 1: Gandy’s Beach Money Island Beach –
**Outputs:** Barrier island beach and eroded salt marsh restored using dredged material from Nantuxent Creek; creation of storm protection through wave-attenuating oyster reefs
**Outcomes:** Improved habitat for horseshoe crabs and increased egg densities to better support more shorebirds; more regular dredging (due to nearby use for dredge material) improves conditions for local oystermen and access to regional offloading facility

Site 2: Roadway Beach between Fortescue and Oyster Creek
**Outputs:** Rubble removed from beach, sand replenished and protected with geotubes and dredged sand.
**Outcomes:** Increased use by horseshoe crabs; increased egg densities to better support shorebirds; road protected, public access to recreational beach enhanced increasing local economic activity

Site 3: East Point Lighthouse Beach- use
**Outputs:** Beaches restored with dredge material from Maurice River
**Outcomes:** Improved horseshoe crab habitat, historic lighthouse protected

Site 4: Moores Beach/Thompson’s Beach
**Outputs:** 8000 cubic yards disbursed onto beach, completing restoration begun in 2013 and halted due to arrival of horseshoe crabs
**Outcomes:** Earlier project finalized and 1500 feet of additional horseshoe crab spawning habitat provided, shorebirds better supported

Site 5: Reeds Beach and Pierces Point
**Outputs:** Horseshoe crab beaches restored using dredge sand from nearby Bidwell Creek; damaged bulkhead material removed; optimal sources of sand identified
**Outcomes:** Crab impingement eliminated; crab spawning habitat improved and expanded; more shorebirds supported; cost of Bidwell Creek dredge reduced due to local use for sand and silt; resiliency increased by continuous re-use of sand
Site 6: South Reeds, Cooks, and North Pierces Point Beaches

**Outputs:** Horseshoe Crab beaches fully restored; creek mouths restored

**Outcomes:** Improved habitat for horseshoe crabs and increased egg densities to better support more shorebirds

In addition to the “on the ground” benefits at each of these critical sites, our project will create and establish processes and programs which will contribute to the management of the Bayshore region in a way that will support long-term community and economic resiliency. We will advance a sub-regional sediment management system, informed by science about sediment transport within this section of the Bay, and pilot a process to sustainably maintain navigational channels and create an ongoing dredged materials beneficial reuse program for benefit of shorebirds, beach nourishment and marsh restoration. It will directly speak to the issue of maintaining navigational channels important to commercial and recreational fishing operations.

**Output:** Scientific investigations supporting a subregional sediment management plan related to navigational maintenance and beneficial reuse

**Outcome:** Long-stalled maintenance of navigable channels resolved; access to bay related marine industry facilities restored and businesses supported

**Priority:**

We have selected the project areas based on the ecological value of each section to horseshoe crabs and shorebirds, and opportunities to enhance community resiliency. The beaches’ importance for shorebirds is based on shorebird and horseshoe crab usage and occurrence data collected over the last three years. The communities selected reflect local recovery planning prioritization by the communities themselves.

Further, the value of our strategy of beach nourishment for horseshoe crab and shorebird habitat restoration is a proven approach. Our proposal will build upon investments made by USFWS, NFWF and private foundations in the immediate aftermath of Hurricane Sandy which produced outstanding results in both utilization by horseshoe crabs for spawning and by shorebirds during the spring migratory stopover.

National and state plans prioritizing the restoration and protection of Delaware Bay beaches for shorebird conservation include: NJ State Wildlife Action Plan, USFWS Atlantic Flyway Shorebird Plan, Red Knot Status Assessment, Red Knot Conservation Plan (Manomet Center for Conservation Sciences). Within the *Atlantic Flyway Shorebird Business Strategy,* seven key strategies were developed to characterize core conservation activities necessary to address threats that reduce shorebird populations. Given limited resources, the key strategies focus on actions that will have concrete and measurable outcomes on population growth and sustainability: In that plan, Strategy 2 “Manage and Protect Habitat” recognized the need to protect shorebird habitat from threats such as development, and to effectively manage habitat to meet shorebird needs, as well as the need to create more habitat to recover shorebird populations.

Botton, et al. (1988) conducted beach surveys on approximately 80 kilometers of beach along the New Jersey side of the Delaware Bay and categorized approximately 10.6 percent (8.5 kilometers) as providing optimal spawning habitat and 21.1 percent (17.0 kilometers) as suitable spawning habitat. The Atlantic States Marine Fisheries Commission (1998) concluded that optimal spawning beaches may be a limiting reproductive factor for the horseshoe crab population.

While the status of Delaware Bay’s intertidal beaches are critical to both shorebirds and horseshoe crabs, it should be noted that Burger et al. (1997) documented that migrating shorebirds, including the red knot, move actively between Delaware Bay’s various habitats with changes in tidal cycle. The shorebirds use all these
various habitats for foraging, resting and other behaviors depending on location, seasonal date, time of day, tide and species. Though the beaches are of critical importance; during high tide, the beaches are often too narrow for foraging, and the birds go elsewhere. Burger et al. (1997) suggest that in addition to the massive food resource provided by spawning horseshoe crabs, Delaware Bay’s complex mosaic of coastal habitat types of mudflats, beaches, tidal creeks and salt marshes is essential to maintain the large migrant shorebird population.

Only 41% of the optimal beach habitat in Delaware and 37% in New Jersey (or 39.5% combined) are in some form of conservation protection (i.e., federal, state, public utility or non-governmental organization). While significant stretches of the optimal beach habitat is protected in some form of conservation ownership, there are key sections of optimal habitat that remain unprotected.

The high-quality central portion of the Cape May peninsula on the New Jersey side has been the focus of land conservation acquisition as part of the Cape May National Wildlife Refuge, though the map shows that there are significant gaps in the existing refuge boundaries. Likewise, there are small pockets of optimal/suitable habitat along the northern Delaware Bayshore of the New Jersey side (e.g., Fortescue and Gandy’s Beaches) that are largely unprotected.

The unprotected status of these areas minimizes the likelihood that the habitats there will be actively managed for their resource values, and necessitates a greater focus of conservation and restoration efforts to maintain those values. These “conservation gaps” are included in our proposal.

The selected beach restoration sites were all identified and evaluated in a 2008 study done for the American Littoral Society by Rutgers University.

From a perspective of increasing community resilience, the restoration sites are adjacent to hard-hit communities along the Bayshore. Each was identified as a priority area for measures to increase protection from future storms through a FEMA sponsored Long Term Recovery Team program. Significant damages were incurred, highlighting the need for measures and approaches to ameliorate the vulnerability of the communities, and encourage approaches to adapt to increased future stressors, particularly from sea level rise.

Providing increased resiliency to the habitats and enhancing the role of beach and tidal wetland environments in contributing to reducing community vulnerability relies on a sustainable approach to nourishing the beaches and marshes. Each of the proposed restoration sites was identified, in part, due to its proximity to a sediment source in the form of navigation channels or other watercourses, as is discussed further in the next section.

**Sustained Benefits**

The restoration of critical habitat utilized by migratory shorebirds has been identified by the leading resource agencies and researchers as a key part of the recovery strategy for threatened species such as the red knot. Our work on the stopover beaches of Delaware Bay last spring established the value of this strategy, as beaches destroyed by the storm that we restored were heavily used by spawning horseshoe crabs and migrating shorebirds. The value of this work was directly measured by shorebird biologists from, among others, the USFWS last spring. As this work contributes to the overall recovery and stabilization of both the horseshoe crab and shorebird populations, it provides a clearly measurable and sustainable benefit to priority species.

The vulnerability of Bayshore communities has been a known issue for many years, one which has been brought into stark relief by the impact of Hurricane Sandy. One of the lessons throughout the storm-impacted region was that the presence of robust beach berms and dune systems helped to minimize damage to adjacent communities. Despite the long-standing vulnerability of these rural communities, historically there have been no federally supported beach nourishment projects, as seen along New Jersey’s Atlantic Coast. A measurable
benefit of our proposal is that in addition to its habitat restoration benefits it will also make hazard reduction available to the Bayshore towns where it has been never been provided before.

The communities of the Delaware Bayshore are tied to the Bay, both culturally and economically. Significant businesses still ply the waters in traditional pursuits of fishing and commercial shellfisheries. These businesses are dependent upon navigable waterways providing access to and from their home ports to the Bay: Fortescue, Bivalve, and Money Island. As in the case of beach nourishment priorities, the rural and far away location of the bay’s rivers and communities often leaves them at the end of the funding priorities when it comes to maintaining non-federal channels, despite the importance of these to the economic resiliency of the towns. This is further compounded by the traditional complexity and difficulty of siting disposal facilities or opportunities for the dredged material. By effectively providing for beneficial reuse opportunities, our proposal will directly strengthen the economic recovery and resiliency of the Bayshore communities and businesses by facilitating necessary maintenance of the navigation channels. The New Jersey Department of Transportation, which manages the dredging of state navigation channels, has expressed support for our proposal. Their active participation provides a tremendous opportunity for the development of a lasting program.

The tidal salt marshes of the Delaware Bay provide critical habitat for multiple estuarine species, improve water quality, and as demonstrated by Hurricane Sandy provide additional storm hazard reduction benefits to coastal communities. However, these valuable resources are threatened by inundation due to sea level rise and subsidence, and erosion from coastal storm damage and the loss of fronting beach berms and dune systems. Our project, through the beneficial reuse of dredge materials, will help to offset these stressors on the tidal marshes at the project sites. Restoring the marshes will provide a substantial benefit, both ecologically and by advancing the use of nature-based approaches to community resiliency.

Each of our restoration projects will include a feasible method to sustain the restoration projects, requiring minimal future investment and thus create a more resilient shoreline, capable of responding to increasing environmental stresses being currently observed and felt. As introduced above, the proposed project will advance two new approaches to enhancing both natural and community resiliency. By linking restoration projects to dredging activities on the Bay’s five navigable waterways, these projects will create a regular input of sand and silt to maintain restoration achievements. The approach will also support a key economic need: the maintenance of navigable channels in support of the Bayshore’s recreational and commercial fishing industries and communities. A current impediment to maintenance of navigation channels is that locations to place dredged materials must lie within a cost-effective distance from the dredging site. Under a traditional model in which this part of dredging is considered “disposal,” this becomes an often insurmountable hurdle particularly when coupled with the environmental issues associated with traditional disposal practices. We include in our proposal a new method of beneficial use of silts to facilitate dredging projects, often stalled by the lack of safe disposal sites. With thin layer application of silts we can restore marshes damaged by the effects of sea level rise and abandonment of salt hay impoundments, as well as facilitate the restoration and maintenance of navigable channels which provide critical infrastructure for local industries.

A second practice to promote resiliency will be created through the use of oyster beds and cultivated oyster structures to reduce wave impacts on the horseshoe crab beaches and communities. Oyster reefs can serve as nature-based breakwaters that reduce erosion of both sandy and peat shorelines along the Delaware Bay and can help protect restoration investments. By utilizing oyster aquaculture structures in concert with restored reefs, the project will produce marketable oysters and will be maintained by oysterman to ensure long-term sustainability of structures, as well as leverage their interest to maintain the ecological and resiliency benefits of the project. The engagement of the local oysterman will directly aid in the economic resiliency of the region, as the cultivation of oysters for ecological and community resiliency benefits open new markets to an industry suffering from the impacts of disease, historic overharvest and environmental degradation of the Bay.
In the immediate aftermath of Hurricane Sandy, the National Fish and Wildlife Foundation, the US Fish and Wildlife Service, and private foundations from New Jersey, Philadelphia and elsewhere, as well as national conservation organizations invested in the emergency restoration of the horseshoe crab and shorebird beaches, to great success; the American Littoral Society and Conserve Wildlife Foundation managed those efforts. That investment restored fully destroyed beaches to amazing habitat quality and productivity. However, the restoration was not comprehensive, due in part to limited funding and in part due the short time frame prior to the arrival of the horseshoe crabs and the red knots: it was truly a race against nature’s clock. This proposal, if successful, will allow us to build on the investments to date, and extend the successes of last spring to a more comprehensive reach of critical habitats and vulnerable communities.

**Leveraging:** Through its internal DOT Mitigation Funding, the USFWS has committed resources to the restoration of migratory shorebird beaches on the Delaware Bay. We have been working in close consultation with the Service to coordinate that project with those included in this proposal. The coordination of the work will extend the area of habitat restored significantly. Further, our proposal to establish an ongoing program of utilizing dredged material to re-nourish the horseshoe crab beaches will support the federal investment in the beach habitats beyond the period of this grant.

The impacted communities are aggressively seeking measures to both help them recover, physically and economically, from Hurricane Sandy. Our proposal has been developed in conversation with them, and will provide added elements of resiliency to future strategies and approaches.

Establishing a beneficial reuse of dredged materials will support the efforts to restore economic vitality to the bay industries in the impacted ports. Projects proposed for the near future will benefit from short-term opportunities to integrate the end use of their materials into the habitat restoration projects.

**Speed to Functionality:**

Our successful restoration of the Reeds Beach-Pierce’s Point section of the Bayshore last spring demonstrated that we are able to bring these projects on-line quickly, backed by the support of the relevant resource and regulatory agencies. Dependent on the availability of funding, we are prepared to begin work rebuilding and expanding these sections this spring.

The New Jersey Department of Transportation, which manages the dredging of the state’s navigational channels, estimates that should this proposal be successful, and appropriate beneficial use site characterization completed, projects in several locations could start in the fall of 2014.

**C. Youth and/or Veteran Engagement**

To ensure that people of the Delaware Bayshore understand how this project will increase community resiliency, we propose an education and outreach program focused on three key bayshore species: horseshoe crabs, shorebirds and oysters. To accomplish this, we proposed to expand and adapt our existing education programs to engage Delaware Bayshore youth and veterans.

For the past 5 years, the American Littoral Society has partnered with Rutgers University’s Haskins Shellfish Lab on this project that provides education about oysters and their importance to the environment, economy, and history of the Delaware Bayshore. We propose to update the existing curriculum with information about the proposed wave attenuation reef at Moore’s Beach and to provide opportunities to help build the reef.
We will deliver a complementary program focused on horseshoe crabs that combines hands-on, classroom based and field-based activities. The new “trainees” will then participate in the horseshoe crab spawning surveys.

The Delaware Bayshore region has a very strong Veteran culture. In fact, the Littoral Society’s own Bayshore conservation coordinator served with the U.S. Army Rangers prior to joining our staff. We propose to offer part-time internships to local veterans, assisting with the surveying and monitoring components of the project. Prior to beginning the program, each intern will attend a workshop about the benefits of the projects in which they will work to the community, habitats, and wildlife of the Delaware Bayshore.

Through our project partner, the Conserve Wildlife Foundation, we propose to expand the state's Shorebird Stewards program – which recruits, trains, and coordinates seasonal volunteers for Delaware Bayshore shorebird banding and public restrictions from sensitive beaches. CWF has managed the State’s Shorebird Stewards program for the past decade. We would design the expansion to enlist students in active and hands-on roles within the project and in community interaction.

We will undertake a Community Engagement campaign that educates, informs, and engages local Delaware Bayshore residents in support of our team's restoration initiatives. This will include hosting a public event, inviting key audiences within the Delaware Bay communities and educating residents on issues like beach restoration, ecological resiliency, and long-term challenges to the Bayshore.

D. Collaboration and Partnerships

Stakeholders have been extensively involved in discussions which supported this proposal. We have met directly with, and gained support from a wide range of resource agencies, local community leaders and leading academic institutions. Of note is the direct involvement of the New Jersey Department of Environmental Protection, the NJ Department of Transportation and the US Fish and Wildlife Service. Project partners include Larry Niles & Associates, LLC; Conserve Wildlife Foundation; Partnership for the Delaware Estuary, Richard Stockton College; New Jersey Institute of Technology (NJIT); Rutgers University, Manomet Center for Conservation Sciences, many of whom are providing significant in-kind support and cash match.

E. Work Plan & Logistics

The project team includes the same biologists, coastal geologists and contractors responsible for the restoration of five beaches funded by NFWF in 2013. American Littoral Society staff (Tim Dillingham, Renee Brecht, Al Modjeski), will provide overall supervision of the project, including management of expenses, contractors, permitting and educational and community outreach programs. LJ Niles Associates (Lawrence Niles PhD, Dianne Daly and Joseph Smith PhD) will develop the justification and materials for permits, develop project designs, execute each project in the field and conduct the follow up assessment of each project. This work will be supported by Stephen Hafner and Stew Farrell PhD from Stockton College’s Coastal Research Center providing coastal engineering, survey and designs. Conserve Wildlife Foundation of New Jersey (David Wheeler, Ben Wurst, Larissa Smith) will provide restoration and management support on select beaches within the project, as well as developing the Shorebird Steward Expansion program and the Community Engagement initiative. Biologists from the NJ Division of Fish and Wildlife (Amanda Dey in the Endangered and Nongame Species Program and Jason Herrin in the Bureau of Shellfisheries) will integrate the project into existing state efforts. The NJDOT will manage the operational aspects of the dredging projects and beneficial use of silt and sand, and remove rubble from the beach in Fortescue. Staff from Partnership for Delaware Estuary (Jen Atkins and Danielle Kreeger) will assist in assessing the thin layer application of silts to damaged marshes. Bart Wilson, working on the restoration of damaged marshes in Delaware will supervise the thin layer application of silt. Scientists from NJ Institute of Technology (Nancy Jackson PhD), USGS (David Smith PhD), Stockton
University (Dan Barone PhD) and Rutgers University (Dave Bushek PhD, Joanna Burger PhD) will conduct projects on the movement of sand, construction of oyster reefs, evaluate progress and outcomes. Barney Hollinger, oysterman and a member of the Shellfisheries Council of NJ, will undertake the aquaculture construction.

b. Work Plan
Once awarded, the project will begin on or about May 1, 2014. All restoration work will be completed on or about April 30, 2016.

Beach/Marsh Restoration Projects work plan

The comprehensive nature of this project makes the interrelationships between work plans for each of the interrelated sites complex. However, each restoration site will follow a similar work plan, modified as appropriate for the specific site conditions and goals (responsible party in parentheses):

Property surveys, engineering designs and permit applications (ALS): Each restoration site will be assessed to determine property ownership and boundaries in relationship to the work area. Land owners will be contacted and permission secured to work on the site. We have already developed optimal beach profiles for the majority of the sites, working with Stockton College. The beach profile designs account for our knowledge of optimal conditions for horseshoe crab spawning. Additionally, we have post construction surveys from our work last spring which will inform both the design and the permitting. Engineering designs will be prepared in consultation with our state and federal partners and, to the extent necessary, permit applications developed and reviewed jointly.

Site demolition and preparation (rubble removal) (ALS, State of NJ)

The Fortescue Beach site has extensive rubble on the beach. The NJ Department of Transportation has agreed to remove this in conjunction with post storm rebuilding of an adjacent roadway. To the extent there are structures or materials that would interfere with the restoration or utilization by the crabs, we will remove with partners: either volunteers or municipal/county authorities.

Sand placement and grading (ALS)

Regional sand and gravel contractors will deliver the sand to the restoration sites, and mechanically spread in accordance with the beach profile designs. The onsite spreading will be supervised by Stockton College staff to insure the design elevations and profile are achieved.

Dredge mobilization and channel dredging; placement on beach and marsh (NJ Department of Transportation)

Dredging of the identified channels, and the placement of the materials either on the beach restoration sites (sand) or on marsh restoration sites (silts) will be provided by the NJDOT, in accordance with design plans developed by our partnership.

Post construction monitoring (Partnership for the Delaware Estuary/Stockton College/NJIT)

The physical aspects, as well as biological metrics, will be monitored by the Partnership for the Delaware Estuary (marsh restoration sites) and Stockton College/NJIT (beach restoration and sediment movement). Monitoring reports will be developed at regular intervals following data collection, and used to assess the
success of the projects.

**Oysters:**

**Oyster reef site survey, permit applications (ALS)**

The reef restoration site is located on an existing oyster harvest lease area, and we are working directly with the lease holder. We will work within the boundaries of his existing permits to the extent possible, and develop designs for the placement, elevation and distribution of added shell collaboratively.

**Shell purchase/collection/placement on reef site (ALS)**

Shell for the reef will be acquired through a variety of approaches including commercial purchase and donation. It will be placed on the reef through a combination of commercial operator and volunteer efforts.

**Aquaculture structure placement: permitting (if any), construction (ALS)**

The proposed aquaculture structures will be placed adjacent to already permitted structures, and should be accommodated within those permitted sites.

**Proposed Schedule**

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<th>KEY PROJECT ELEMENTS/MILESTONES</th>
<th>Year 1</th>
<th>Year 2</th>
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<tr>
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<td>May 2014– April 2015</td>
<td>May 15 – April 16</td>
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<td>Q1</td>
<td>Q2</td>
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<tr>
<td><em>South Reeds - Pierses Point Site</em></td>
<td>20,000 cubic yards sand applied</td>
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<td><em>Moores Beach – 15,000 cubic yards sand applied</em></td>
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<td><em>Thompsons Beach – 45,000 cubic yards sand applied</em></td>
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<td><em>East Point Lighthouse – 32,000 cubic yards sand applied</em></td>
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<tr>
<td><em>Fortescue Beach Rubble Removal</em></td>
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<td><em>Fortescue Beach Restoration – 55,000 cubic yards sand applied</em></td>
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<td><em>Reeds Community Beach – 10,000 cubic yards sand applied</em></td>
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<tr>
<td><strong>Bidwells Creek (Beach &amp; Marsh Restoration) 25k cu yds sand/20 cu yds silt</strong></td>
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<tr>
<td><em><strong>Lower Cape Shore 30,000 cubic yards sand applied</strong></em></td>
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<tr>
<td><strong>Gandy Beach/Money Island – 20K cu yds sand/20K cu yds silt</strong></td>
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<tr>
<td>Cox Meadow Restoration Plan and Design</td>
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<tr>
<td>Egg Island Restoration Plan and Design</td>
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**c. Monitoring and Measuring Performance:**

In addition to measuring outcomes of beach restoration mileage and acreage of salt marsh and oyster restoration, we will incorporate a suite of measures within each restoration project that will allow for robust assessment of project achievements (see table). These measures will also provide a basis for adaptive management that can improve the performance of in-progress and future restoration projects. All monitoring will incorporate before-after control-impact experimental design which maximizes the insights gained by incorporating time and treatment controls into project monitoring. For beach restoration, these measures include monitoring beach profiles to examine sand gains and losses before and at several intervals after restoration. We will measure shorebird activity, horseshoe crab spawning activity, egg abundance and egg development at each beach. We will develop quality assurance protection plans (QAPPs) for monitoring components as required. Because we are working at numerous beaches and we are examining bay-wide sand movement patterns, the insights gained from our monitoring will be the basis for strategic beach habitat management well into the future. In addition to the above metrics, experimental sand harvesting will incorporate careful assessment of the impact of intertidal harvesting on benthic invertebrates. Salt marsh restoration projects will have a similar suite of metrics. We will measure elevations before and at several intervals after thin-
spread application of dredge material. Biological response to restoration will be measured by examining plant species composition, plant density, above and below ground biomass, and invertebrate monitoring. All monitoring results will be summarized quarterly and will be reported to the project steering committee in order to make adaptive management decisions for ongoing and future projects. The results of the monitoring regime will inform the methodological approach of the two restoration planning projects in our proposal (Cox Meadow and Egg Island).

d. Return on Investment: The return on investment for this project will affect every community along the Delaware Bayshore from Gandy’s Beach in Cumberland County to Villas in Cape May County both economically and ecologically. The restoration of horseshoe crab habitat will speed the restoration of crabs thus providing a long term economic gain for the ecotourism economy ($35,000,000 with multipliers) and the lysate industry ($200,000,000 estimated). The restoration of community beaches will help reduce the risks to millions of dollars of potential damage. Facilitating the dredging of creeks will create a firmer footing for the oyster industry and recreational and commercial fishing fleets. Finally, the beach restored in this project will add a new economic gain because they will be available for resident and tourist use outside the period necessary for shorebird sand horseshoe crab use. The most immediate economic impact of our work will come from the nearly $4 million in contracts to local companies creating many local machine operator and trucking jobs, not a small influence in the poorest county in NJ.

The ecological return on investment for this bay-wide restoration program will be incalculable. Directly we will hasten the restoration of the critically endangered red knot and damaged population of horseshoe crabs. In a draft business plan done for NFWF by red knot biologist from the entire flyway, the restoration of the Delaware Bay was seen as the most important of all actions that could occur in the birds 10000 mile long migratory journey. Our project will restore stable ecological function to over 10 miles of bayshore habitat including repairing damaged beaches and marshes that are fundamental to the long term productivity of the bay. Restoring ecological function to the bay will help underpin all resource related economic activities.

e. Risk
Because of the nature of the projects (beach nourishment, marsh restoration, oyster reef construction), there is little risk of failure that would create conditions potentially more dangerous than the status quo.

f. Permits and Approvals: Design and Permitting
Designs and engineering documents required for permitting for five sites have already been completed including: South Reeds –Pierce’s Point, Moore’s Beach, Thompsons’s Beach, East Point Light House Beach and Fortescue Beach.

Design and engineering documents for Reeds’s Community, Bidwells Creek Dredging, Gandy’s - Money Island Beach and Marsh Restoration and South Cape Shore Sand Harvesting project will begin in June –August 2014 and be completed within 6 months.

Design and permitting requirements for Cox Meadow and Egg Island will be in June 2015.

Safety: Staff, youth, veterans, and volunteers will follow local, State and Federal (including DOI) safety standards and will be equipped with standard safety equipment and personal protective equipment; Additionally Job Hazard Analysis will guide on-the job training needs, and needed training will be provided (OSHA, CPR, First AID, etc.).
GANDY’S BEACH AND MONEY ISLAND
Downe Township
Cumberland County, New Jersey

Beach and salt marsh restoration area
ROADWAY BEACH FORTESCUE PROJECT
Downe Township
Cumberland County, New Jersey

Beach restoration area
EGG ISLAND PROJECT
Downe Township
Cumberland County, New Jersey

- 1930 shoreline
- 1970 shoreline
- 1995 shoreline
THOMPSON BEACH, MOORES BEACH
AND COX CREEK PROJECT
Maurice River Township
Cumberland County, New Jersey

Salt marsh restoration area
Beach restoration area
REEDS BEACH PROJECT
Middle Township
Cape May County, New Jersey

- Salt marsh restoration area
- Beach restoration area
S. REEDS BEACH, COOKS BEACH, KIMBLES BEACH
AND PIERCES POINT
PROJECT AREA
Middle Township
Cape May County, New Jersey

- Salt marsh restoration area
- Beach restoration area
Letters of Support
Creating Resilient Habitats and Communities on Delaware Bay

Senator Robert Menendez
Congressman Frank LoBiondo
NJ Senator Jeff Van Drew
Assemblyman Sam Fiocchi

Director Joseph Derella, Cumberland County Board of Chosen Freeholders
Robert G. Brewer, Cumberland County Planning Department
Elizabeth Semple, Manager, Division of Coastal & Land Use Planning, NJ DEP
Russell J. Fumari, Chair, NJ Corporate Wetlands Restoration Partnership
Jennifer A. Adkins, Executive Director, Partnership for the Delaware Estuary
Robert Campbell, Mayor, Downe Township
Resolution 29-2014 Enacted by Maurice River Township
Middle Township
Elder Point Oyster Company
Citizens United to Protect the Maurice River and Its Tributaries
Eric Schrading, Field Supervisor, US Fish and Wildlife Service
January 29, 2014

David O’Neill  
Vice President, Conservation Programs  
National Fish & Wildlife Foundation  
1133 15th Street NW #1100  
Washington, D.C. 20005  

Dear Mr. O’Neill:  

The American Littoral Society and the Conserve Wildlife Foundation of New Jersey are submitting an application for funding from the National Fish & Wildlife Foundation’s Hurricane Sandy Coastal Resiliency Competitive Grant Program. I write to you to offer my strong support for their proposal and respectfully request that you give due consideration to their application.  

If funded, the American Littoral Society and the Conserve Wildlife Foundation of New Jersey plan to conduct a Delaware Bayshore Beach Restoration Project. This project would focus on the beach and wetland habitats of six interrelated Delaware Bayshore sites in both Cape May County and Cumberland County. The proposed project is an expansion of emergency beach restoration that was undertaken in 2013 along New Jersey’s battered Delaware Bayshore. The proposed funding would be critical for not only restoring the vitality of the region’s natural habitat for shore birds and breeding horseshoe crabs, but it would also help to reinforce a unique natural system which helps to protect New Jersey’s rural Bayshore communities.  

Hurricane Sandy hit New Jersey’s coastline and natural habitats hard. The previous project was able to restore over a mile of beaches which had been stripped of sand and littered with debris and waste. The proposed funding from the Hurricane Sandy Coastal Resiliency Competitive Grants Program would allow the Delaware Bayshore Beach Restoration Project to refurbish even more of New Jersey’s natural habitat that is so critical to wildlife. The funding would also help protect rural communities, as the beaches act as a natural barrier against future storms. Without the proposed funding, the New Jersey Delaware Bayshore would be at an increased risk from storms and suffer both short and long-term ecological detriment. It is therefore of serious importance that the restoration process continues as the future of the Delaware Bayshore region is tied to the health and ecological diversity of the Delaware Bay and its Coast.
For these reasons, I strongly support the Delaware Bayshore Beach Restoration Project’s proposal for funding from the Hurricane Sandy Coastal Resiliency Competitive Grant Program. I thank you in advance for giving the American Littoral Society and the Conserve Wildlife Foundation’s application its due consideration.

Sincerely,

[Signature]

ROBERT MENENDEZ
United States Senator
Mr. David O’Neill, Vice President
Conservation Programs
National Fish & Wildlife Foundation
Attn: Hurricane Sandy Coastal Resilience Competitive Grants Program
1133 15th Street, NW #1100
Washington, D.C. 20005

Dear Mr. O’Neill:

I am pleased to write this letter of support on behalf of the American Littoral Society and the Conserve Wildlife Foundation of New Jersey’s application for funding under the Hurricane Sandy Coastal Resilience Competency Grants Program.

It is my understanding the restoration project will focus on the beach and wetland habitats of six interrelated Delaware Bayshore sites in Cape May and Cumberland Counties. The timely and successful implementation of this project will reestablish the vitality of critical habitats used by horseshoe crabs and shore birds while also strengthening an irreplaceable natural system which helps protect rural Bayshore communities.

The proposed project expands on earlier efforts from 2013 when emergency beach restoration was undertaken along New Jersey’s Delaware Bayshore in an effort to repair the devastation left by Hurricane Sandy. This project prepared the beaches for the arrival of breeding horseshoe crabs and the many shorebirds which stopover in the Bayshore region to feed on the horseshoe crab eggs. Because of the tremendous support, both financially and participatory, from many partners, over a mile of beaches which had been stripped of sand and littered with debris were successfully restored just in time for the horseshoe crab’s breeding season.

It is important this restoration process continues as the future of the Delaware Bayshore region is tied to the health and ecological diversity of the Delaware Bay and its coast. Without a consistent and focused effort at restoration the shoreline will suffer long term ecological detriment, Bayshore communities will be at increased risk from storms, and local industries will suffer financially.

Sincerely,

Frank A. LoBiondo
Member of Congress

FAL:cm:ml
Date 1/30/2014

David O’Neill, Vice President, Conservation Programs
National Fish & Wildlife Foundation
Attn: Hurricane Sandy Coastal Resiliency Competitive Grants Program
1133 15th St NW #1100
Washington, DC 20005

Re: Letter of Support Regarding the Delaware Bayshore Beach Restoration Project

Dear Mr. O’Neill,

The First Legislative District supports the Bayshore beach and marsh restoration project being proposed by the American Littoral Society and the Conserve Wildlife Foundation of New Jersey for funding through the Hurricane Sandy Coastal Resiliency Competitive Grant Program. This restoration project will focus on the beach and wetland habitats of six interrelated Delaware Bayshore sites in Cape May County and Cumberland County. The timely and successful implementation of this project will reestablish the vitality of critical habitats used by horseshoe crabs and shore birds while also strengthening an irreplaceable natural system which helps protect rural Bayshore communities.

This proposed project expands on earlier efforts from 2013 when emergency beach restoration was undertaken along New Jersey’s Delaware Bayshore in an effort to repair the devastation left by Hurricane Sandy. This project prepared the beaches for the arrival of breeding horseshoe crabs and the many shorebirds which stopover in the Bayshore region to feed on the horseshoe crab eggs. Because of the tremendous support, both financially and participatory, from many partners, over a mile of beaches which had been stripped of sand and littered with debris were successfully restored just in time for the horseshoe crab’s breeding season.
It is of paramount importance that this restoration process continues as the future of the Delaware Bayshore region is tied to the health and ecological diversity of the Delaware Bay and its coast. Without a consistent and focused effort at restoration the shoreline will suffer long term ecological detriment, Bayshore communities will be at increased risk from storms, and local industries will suffer financially.

Sincerely,

Jeff Van Drew
Senator First Legislative District
January 30, 2014

National Wildlife Foundation
Attn: Renee Brecht

Re: Letter of Support Regarding the Delaware Bayshore Beach Restoration Project

To whom it may concern:

Sam Fiocchi supports the bayshore beach and marsh restoration project being proposed by the American Littoral Society and the Conserve Wildlife Foundation of New Jersey. This restoration project will focus on the beach and wetland habitats of six interrelated Delaware Bayshore sites in Cape May County and Cumberland County. The timely and successful implementation of this project will reestablish the vitality of critical habitats used by horseshoe crabs and shore birds while also strengthening an irreplaceable natural system which helps protect rural Bayshore communities.

This proposed project expands on earlier efforts from 2013 when emergency beach restoration was undertaken along New Jersey's Delaware bayshore in an effort to repair the devastation left by Hurricane Sandy. It was a project intended to prepare the beaches for the arrival of breeding horseshoe crabs and the many shorebirds which stopover in the bayshore region to feed on the horseshoe crab eggs. Because of the tremendous support, both financially and participatory, from many partners, over a mile of beaches which had been stripped of sand and littered with debris were successfully restored just in time for the horseshoe crab's breeding season.

It is of paramount importance that this restoration process continues as the future of the Delaware bayshore region is tied to the health and ecological diversity of the Delaware Bay and its coast. Without a consistent and focused effort at recovery and restoration of the bayshore coastline the bay will suffer long term detriments ecologically, bayshore communities will be at increased risk from storms, and local industries will suffer financially.

Sincerely,

Assemblyman Sam Fiocchi
First Legislative District
Dear Ms. Chesnutt:

On behalf of the Cumberland County Board of Chosen Freeholders I am pleased to support the bayshore beach and marsh restoration project being proposed by the American Littoral Society and the Conserve Wildlife Foundation of New Jersey.

This proposed project expands on earlier efforts from 2013 when an emergency beach restoration project was undertaken along New Jersey’s Delaware bayshore. The project was implemented in an effort to repair the devastation left by Hurricane Sandy. This project was intended to prepare the beaches for the arrival of breeding horseshoe crabs and the many shorebirds which stopover in the bayshore region to feed on the horseshoe crab eggs. Due to the tremendous support, both financially and participatory, from many partners, over a mile of beaches which had been stripped of sand and littered with debris were successfully restored just in time for the horseshoe crab’s breeding season.

It is very important that this restoration process continues. Without a consistent and focused effort to restore the bayshore coastline, the bay will suffer long term detriments ecologically, and the bayshore communities will be at risk from storms which will ultimately impact the local businesses and industry located in the area.

As a result of the above mentioned information, the County of Cumberland wholeheartedly supports this application and would greatly appreciate any and all consideration you may provide.

Sincerely,

Joseph Derella,
Director

The Board of Chosen Freeholders
County of Cumberland
State of New Jersey
790 East Commerce Street
Administration Building
Bridgeton, New Jersey 08302

Phone: (856) 453-2125
Fax: (856) 451-8243

Ken Mecouch, Co. Administrator,
Clerk to the Board
Kimberly E. Wood, Deputy Co. Administrator

www.co.cumberland.nj.us
Mandy Chesnutt  
National Fish and Wildlife Foundation  
1133 Fifteenth St., N.W., Suite 1100  
Washington, D.C. 20005  

January 29, 2014

Re: Letter of Support Regarding the Delaware Bayshore Beach Restoration Project

Dear Ms. Chesnutt:

I am writing to support the bayshore beach and marsh restoration project being proposed by the American Littoral Society and the Conserve Wildlife Foundation of New Jersey. This restoration project will focus on the beach and wetland habitats of six interrelated Delaware Bayshore sites in Cape May County and Cumberland County - East Point, Gandys Beach, Money Island, Moores Beach, Reeds Beach and Pierces Point. The timely and successful implementation of this project will reestablish the vitality of critical habitats used by horseshoe crabs and shore birds while also strengthening an irreplaceable natural system which helps protect rural Bayshore communities.

This proposed project expands on earlier efforts from 2013 when emergency beach restoration was undertaken along New Jersey’s Delaware bayshore to repair the devastation left by Hurricane Sandy. That project prepared the beaches for the arrival of breeding horseshoe crabs and the many shorebirds which stopover in the bayshore region to feed on the horseshoe crab eggs. Because of the tremendous support, both financially and participatory from many partners, over a mile of beaches which had been stripped of sand and littered with debris were successfully restored just in time for the horseshoe crab’s breeding season.

It is of paramount importance that this restoration process continues as the future of the Delaware bayshore region is tied to the health and ecological diversity of the Delaware Bay and its coast. Without a consistent effort focused on recovery and restoration of the bayshore coastline, the bay will suffer long term ecological damage; bayshore communities will be at increased risk from storms; and local industries will suffer financially.

It is my hope that the National Fish & Wildlife Foundation will respond favorably to the American Littoral Society’s proposal.

Respectfully,

Robert G. Brewer
Dear Mr. O'Neill:

New Jersey Department of Environmental Protection, Office of Coastal and Land Use Planning supports the Bayshore beach and marsh restoration project being proposed by the American Littoral Society and the Conserve Wildlife Foundation of New Jersey for funding through the Hurricane Sandy Coastal Resiliency Competitive Grant Program. This restoration project will focus on the beach and wetland habitats of six interrelated Delaware Bayshore sites in Cape May County and Cumberland County. The timely and successful implementation of this project will reestablish the vitality of critical habitats used by horseshoe crabs and shore birds while also strengthening an irreplaceable natural system which helps protect rural Bayshore communities.

This proposed project expands on earlier efforts from 2013 when emergency beach restoration was undertaken along New Jersey's Delaware Bayshore in an effort to repair the devastation left by Hurricane Sandy. This project prepared the beaches for the arrival of breeding horseshoe crabs and the many shorebirds which stopover in the Bayshore region to feed on the horseshoe crab eggs. Because of the tremendous support, both financially and participatory, from many partners, over a mile of beaches which had been stripped of sand and littered with debris were successfully restored just in time for the horseshoe crab's breeding season.

It is of paramount importance that this restoration process continues as the future of the Delaware Bayshore region is tied to the health and ecological diversity of the Delaware
Bay and its coast. Without a consistent and focused effort at restoration the shoreline will suffer long term ecological detriment, Bayshore communities will be at increased risk from storms, and local industries will suffer financially.

Sincerely,

Elizabeth Semple, Manager
Division of Coastal & Land Use Planning
January 31, 2014

David O’Neill, Vice President, Conservation Programs
National Fish & Wildlife Foundation
Attn: Hurricane Sandy Coastal Resiliency Competitive Grants Program
1133 15th St NW #1100
Washington, DC 20005

Re: Letter of Support Regarding the Delaware Bayshore Beach Restoration Project

Dear Mr. O’Neill,

The New Jersey Corporate Wetlands Restoration Partnership (NJ CWRP) supports the Bayshore beach and marsh restoration project being proposed by the American Littoral Society and the Conserve Wildlife Foundation of New Jersey for funding through the Hurricane Sandy Coastal Resiliency Competitive Grant Program. NJ CWRP is part of the Coastal America Foundation and the National Coastal America Partnership.

This restoration project will focus on the beach and wetland habitats of six interrelated Delaware Bayshore sites in Cape May County and Cumberland County. The timely and successful implementation of this project will reestablish the vitality of critical habitats used by horseshoe crabs and shore birds while also strengthening an irreplaceable natural system which helps protect rural Bayshore communities.

This proposed project expands on earlier efforts from 2013 when emergency beach restoration was undertaken along New Jersey’s Delaware Bayshore in an effort to repair the devastation left by Hurricane Sandy. This project prepared the beaches for the arrival of breeding horseshoe crabs and the many shorebirds which stopover in the Bayshore region to feed on the horseshoe crab eggs. Because of the tremendous support, both financially and participatory, from many partners, over a mile of beaches which had been stripped of sand and littered with debris were successfully restored just in time for the horseshoe crab’s breeding season. NJ CWRP has been involved with several projects in this area over the years and was proud to be one of these partners.

It is of paramount importance that this restoration process continues as the future of the Delaware Bayshore region is tied to the health and ecological diversity of the Delaware Bay and its coast. Without a consistent and focused effort at restoration; the shoreline will suffer long term ecological detriment, Bayshore communities will be at increased risk from storms, and local industries will suffer financially.

Sincerely,

Russell J. Furnari
Chair, NJ CWRP

C: NJCWRP Membership
Mandy Chesnutt  
National Fish and Wildlife Foundation  
1133 Fifteenth St., N.W., Suite 1100  
Washington, D.C. 20005  

Subject: Hurricane Sandy Coastal Resiliency Competitive Grants Program – Creating Resilient Beach and Marsh on Delaware Bay for Shorebirds and Horseshoe Crabs  

Dear Ms. Chesnutt:  

On behalf of the Partnership for the Delaware Estuary (PDE), I’m pleased to provide this letter of support for the proposal “Creating Resilient Beach and Marsh on Delaware Bay for Shorebirds and Horseshoe Crabs” that is being submitted by American Littoral Society. As a regional non-profit organization leading science-based and collaborative efforts to improve the tidal Delaware River and Bay, we are extremely supportive of restoration projects that enhance the ecological integrity of coastal wetlands and Bayshore beaches while also building resilience. If this project is supported, we agree to provide a supportive role in characterizing baseline characteristics of the sites and then helping to monitor environmental responses to the project relative to baseline. Successful completion of this project will help advance our goals for clean water goals, healthy habitats, and resilient communities in and around the Delaware River and Bay.  

As a National Estuary Program (NEP), PDE is charged with coordinating implementing of the 1996 “Comprehensive Conservation and Management Plan” (CCMP) for the Delaware Estuary”. This is a guiding document that includes 77 actions, with a variety of subactions, for improving conservation and management of the Estuary. This project particularly relates to CCMP objectives surrounding land management and habitat and living resources goals. Additionally, PDE also recently completed a five-year strategic plan, which includes a set of goals for our organization over the next five years. One of our new priorities, Objective 1.1b, is to “facilitate or directly implement projects to protect and rebuild tidal wetlands and build coastal resilience in the face of climate change”. Hence, this project would help PDE to implement shared goals.  

PDE is uniquely positioned to provide expertise for this project, having worked to devise and implement relevant science-based programs such as the Delaware Estuary Living Shoreline Initiative (DELSI) and the Mid-Atlantic Coastal Wetland Assessment (MACWA). For these programs, which are described on our website (delawareestuary.org), PDE has worked with numerous partners to develop just the type of monitoring protocols needed to assess performance of living shoreline and sediment application projects. We also have baseline data and existing fixed stations for salt marsh monitoring that can serve as reference locations for the proposed marsh work.  

We appreciated the opportunity to express our support for this proposal for funding by the Hurricane Sandy Coastal Resiliency Competitive Grants Program.  

Sincerely,  

[Signature]  
Jennifer A. Adkins  
Executive Director
Re: Letter of Support Regarding the Delaware Bayshore Beach Restoration Project

To whom it may concern:

The Township of Downe, Cumberland County supports the Bayshore beach and marsh restoration project being proposed by the American Littoral Society and the Conserve Wildlife Foundation of New Jersey. This restoration project will focus on the beach and wetland habitats of six interrelated Delaware Bayshore sites in Cape May County and Cumberland County. The timely and successful implementation of this project will reestablish the vitality of critical habitats used by horseshoe crabs and shore birds while also strengthening an irreplaceable natural system, which helps protect rural Bayshore communities.

This proposed project expands on earlier efforts from 2013 when emergency beach restoration was undertaken along New Jersey's Delaware Bayshore in an effort to repair the devastation left by Hurricane Sandy. This project prepared the beaches for the arrival of breeding horseshoe crabs and the many shorebirds which stopover in the Bayshore region to feed on the horseshoe crab eggs. Because of the tremendous support, both financially and participatory, from many partners, over a mile of beaches which had been stripped of sand and littered with debris were successfully restored just in time for the horseshoe crabs breeding season.

It is of paramount importance that this restoration process continues as the future of the Delaware Bayshore region is tied to the health and ecological diversity of the Delaware Bay and its coast. Without a consistent and focused effort at restoration, the shoreline will suffer long-term ecological detriment. Bayshore communities will be at increased risk from storms, and local industries will suffer financially.

Sincerely,

Robert Campbell, Mayor, Downe Township
January 17, 2014

Lawrence Niles PhD
LJ Niles Associates LLC
109 Market Lane
Greenwich, NJ 08323

RE: Resolution 29-2014 – Support of Creating Resilient beach and Marsh on the Delaware Bay for Shorebirds and Horseshoe Crabs

Dear Mr. Niles:

Please find enclosed a sealed copy of Resolution 29-2014 In Support of Creating Resilient Beach and Marsh on the Delaware Bay for Shorebirds and Horseshoe Crabs which was adopted by the Township Committee of Maurice River on January 16, 2014.

Sincerely,

Linda L. Costello
Acting Municipal Clerk

LLC/dlp

cc: Township Committee
MAURICE RIVER TOWNSHIP

RESOLUTION NO. 29-2014

A RESOLUTION IN SUPPORT OF CREATING RESILIENT BEACH AND MARSH ON THE DELAWARE BAY FOR SHOREBIRDS AND HORSESHOE CRABS.

WHEREAS, shoreline restoration has been initiated along the Delaware Bay for the purpose of creating resilient beach and marsh for environmental habitats including shorebirds and horseshoe crabs, and

WHEREAS, the Township of Maurice River realizes salt marshes are a crucial part of our natural infrastructure, shielding communities from the effects of storms and providing vital ecological services, and

WHEREAS, on-going studies and replenishment projects are necessary to restore all of the important horseshoe crab and shorebird beaches in New Jersey and make them resilient to the natural forces of change, and

WHEREAS, recent cooperative efforts of multiple agencies including Conserve Habitat Management and Restoration LLC, American Littoral Society, Conserve Wildlife Foundation of New Jersey, NJ Division of Fish and Wildlife, and Richard Stockton University, Center for Coastal Research have successfully restored beaches damaged by Hurricane Sandy and said agencies propose to expand the project to six Bayshore sites over a four-year period, and

WHEREAS, proposed collaborative efforts include the long-term goal to restore the most important beach and marsh habitat by determining beaches that feed and receive sand, link restoration projects to dredging activities, creation of oyster beds and cultivated oyster structures, and create a more resilient Delaware Bay shoreline to combat the impacts of rising sea levels, and

WHEREAS, proposed projects include restoring sandy beach on Thompson’s Beach and a feasibility study to restore Cox Creek mud flat in Maurice River Township to achieve goals of restoration, protection of communities and support for vital economic concerns.

NOW, THEREFORE, BE IT RESOLVED, THAT THE TOWNSHIP COMMITTEE OF MAURICE RIVER TOWNSHIP hereby acknowledges and supports the proposed study and restoration of the Delaware Bay shoreline including Thompson’s Beach and Cox Creek mud flat, through collaborative efforts, cooperative studies and multi-level funding sources.

CERTIFICATION

I, Linda L. Costello, Deputy Municipal Clerk of Maurice River Township, a Municipal Corporation of the State of New Jersey, located in the County of Cumberland, do hereby certify that the foregoing is a true and accurate copy of a Resolution adopted by the Township Committee of Maurice River Township at a regular meeting held in the Municipal Building, Lower Township, New Jersey, on January 16, 2014 at 7:30 P.M.

SIGNED: Linda L. Costello, Acting Municipal Clerk
January 27, 2013

David O’Neill, Vice President, Conservation Programs
National Fish & Wildlife Foundation
Attn: Hurricane Sandy Coastal Resiliency Competitive Grants Program
1133 15th St NW #1100
Washington, DC 20005

Re: Letter of Support Regarding the Delaware Bayshore Beach Restoration Project

Dear Mr. O’Neill,

The Township of Middle supports the Bayshore beach and marsh restoration project being proposed by the American Littoral Society and the Conserve Wildlife Foundation of New Jersey for funding through the Hurricane Sandy Coastal Resiliency Competitive Grant Program. This restoration project will focus on the beach and wetland habitats of six interrelated Delaware Bayshore sites in Cape May County and Cumberland County. The timely and successful implementation of this project will reestablish the vitality of critical habitats used by horseshoe crabs and shore birds while also strengthening an irreplaceable natural system which helps protect rural Bayshore communities.

This proposed project expands on earlier efforts from 2013 when emergency beach restoration was undertaken along New Jersey’s Delaware Bayshore in an effort to repair the devastation left by Hurricane Sandy. This project prepared the beaches for the arrival of breeding horseshoe crabs and the many shorebirds which stopover in the Bayshore region to feed on the horseshoe crab eggs. Because of the tremendous support, both financially and participatory, from many partners, over a mile of beaches which had been stripped of sand and littered with debris were successfully restored just in time for the horseshoecrab’s breeding season.

It is of paramount importance that this restoration process continues as the future of the Delaware Bayshore region is tied to the health and ecological diversity of the Delaware Bay and its coast. Without a consistent and focused effort at restoration the shoreline will suffer long term
ecological detriment, Bayshore communities will be at increased risk from storms, and local industries will suffer financially.

Sincerely,

Constance A. Mahon
Business Administrator
David O’Neill, Vice President, Conservation Programs
National Fish & Wildlife Foundation
Attn: Hurricane Sandy Coastal Resiliency Competitive Grants Program
1133 15th St NW #1100
Washington, DC 20005

Re: Letter of Support Regarding the Delaware Bayshore Beach Restoration Project

Dear Mr. O’Neill,

Elder Point Oyster Co. supports the Bayshore beach and marsh restoration project being proposed by the American Littoral Society and the Conserve Wildlife Foundation of New Jersey for funding through the Hurricane Sandy Coastal Resiliency Competitive Grant Program. This restoration project will focus on the beach and wetland habitats of six interrelated Delaware Bayshore sites in Cape May County and Cumberland County. The timely and successful implementation of this project will reestablish the vitality of critical habitats used by horseshoe crabs and shore birds while also strengthening an irreplaceable natural system which helps protect rural Bayshore communities.

This proposed project expands on earlier efforts from 2013 when emergency beach restoration was undertaken along New Jersey’s Delaware Bayshore in an effort to repair the devastation left by Hurricane Sandy. This project prepared the beaches for the arrival of breeding horseshoe crabs and the many shorebirds which stopover in the Bayshore region to feed on the horseshoe crab eggs. Because of the tremendous support, both financially and participatory, from many partners, over a mile of beaches which had been stripped of sand and littered with debris were successfully restored just in time for the horseshoecrab’s breeding season.

It is of paramount importance that this restoration process continues as the future of the Delaware Bayshore region is tied to the health and ecological diversity of the Delaware Bay and its coast. Without a consistent and focused effort at restoration the shoreline will suffer long term ecological detriment, Bayshore communities will be at increased risk from storms, and local industries will suffer financially.

Sincerely,

Barney Hollinger
Mandy Chestnutt  
National Fish and Wildlife Foundation  
1133 Fifteenth St., N.W., Suite 1100  
Washington, D.C. 20005  

Re: Letter of Support Regarding the Delaware Bayshore Beach Restoration Project

To whom it may concern:

Citizens United to Protect the Maurice River and Its Tributaries, Inc. supports the bayshore beach and marsh restoration project being proposed by the American Littoral Society and the Conserve Wildlife Foundation of New Jersey. This restoration project will focus on the beach and wetland habitats of six interrelated Delaware Bayshore sites in Cape May County and Cumberland County. The timely and successful implementation of this project will reestablish the vitality of critical habitats used by horseshoe crabs and shorebirds while also strengthening an irreplaceable natural system that helps protect rural Bayshore communities.

This proposed project expands on earlier efforts from 2013 when emergency beach restoration was undertaken along New Jersey’s Delaware bayshore in an effort to repair the devastation left by Hurricane Sandy. It was a project intended to prepare the beaches for the arrival of breeding horseshoe crabs and the many shorebirds that stopover in the bayshore region to feed on the horseshoe crab eggs. Because of the tremendous support, both financially and participatory, from many partners, over a mile of beaches, which had been stripped of sand and littered with debris, were successfully restored just in time for the horseshoe crab’s spawning season and the return of the migratory shorebirds.

It is of paramount importance that this restoration process continue, as the future of the Delaware bayshore region is tied to the health and ecological diversity of the Delaware Bay and its coast. Without a consistent and focused effort at recovery and restoration of the bayshore coastline, the bay will suffer long-term detriments ecologically, and local industries that rely on its natural resources will suffer financially.

Sincerely,

Lillian B. Armstrong  
Executive Director

Jane Morton Galetto  
Board President

P.O. Box 474  •  Millville, New Jersey 08332  
www.cumauriceriver.org  

Founded for the Preservation of the Maurice River Valley in 1979.  
Dedicated to the Wild and Scenic River System of the National Park Service, 1993.

Printed on Recycled Paper
Dear Mr. O'Neill:

The U.S. Fish and Wildlife Service (Service) is writing in support of the Bayshore beach and marsh restoration project being proposed by the American Littoral Society and the Conserve Wildlife Foundation of New Jersey for funding through the Hurricane Sandy Coastal Resiliency Competitive Grant Program. These comments are provided pursuant to the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) and the Migratory Bird Treaty Act (16 U.S.C. 703-712, as amended; 40 Stat. 755).

The proposed restoration project will focus on the beach and wetland habitats of six interrelated Delaware Bayshore sites in Cape May County and Cumberland County, New Jersey. The timely and successful implementation of this project will reestablish the vitality of important habitats used by horseshoe crabs (Limulus polyphemus) and shorebirds while also strengthening an irreplaceable natural system that helps protect rural Bayshore communities.

As you may know, the rufa red knot (Calidris canutus rufa), was proposed for federal listing as threatened on September 30, 2013. Delaware Bay is the single largest spring stopover site for rufa red knots migrating to their Arctic breeding grounds, supporting an estimated 50 to 80 percent of red knots between May and early June. The Delaware Bay was recognized for its hemispheric importance to red knots and other shorebirds through designation as the first Western Hemisphere Shorebird Reserve. The importance of Delaware Bay to shorebirds stems from the superabundance of horseshoe crab eggs that the birds use to fuel their migrations. Thus, the persistence of high-quality horseshoe crab spawning beaches is of utmost importance to the red knot and other shorebirds that depend on this food resource to complete their annual migration.

This proposed project expands on earlier efforts from 2013 when emergency beach restoration was undertaken along New Jersey’s Delaware Bayshore in an effort to repair the damage caused

1 http://www.regulations.gov/#!documentDetail;D=FWS-R5-ES-2013-0097-0004
2 http://www.whsrm.org/site-profile/delaware-bay
by Hurricane Sandy. This earlier project prepared the beaches for the arrival of breeding horseshoe crabs and shorebirds. Because of the tremendous support from many partners, over a mile of beaches that had been stripped of sand and littered with debris were successfully restored in time for the horseshoe crab breeding season.

The proposed project is an important continuation of the restoration work that began last year. The proposal includes restoration of key habitats in the context of a proactive and adaptive regional plan that also addresses important needs of the local communities, particularly the need for improved coastal resiliency. The proposed project involves partnerships with all key stakeholders, both non-governmental and at all levels of government. For these reasons, the Bayshore beach and marsh restoration project has the full support of the Service.

The Service looks forward to continuation of our cooperative relationship with the American Littoral Society, the Conserve Wildlife Foundation, and other partners involved in the restoration and management of Delaware Bay habitats. We appreciate your consideration of this proposal to improve and maintain high-quality habitat at this site of hemispheric importance to red knots and other shorebirds. Please contact Wendy Walsh at (609) 383-3938, x 48, or Wendy.Walsh@fws.gov if you have any questions regarding this letter.

Sincerely,

Eric Schrading
Field Supervisor

cc via email:
David O’Neill, david.oneill@nfwf.org
Mandy Dey, amanda.dey@dep.state.nj.us
Larry Niles, larry.niles@gmail.com
Mr. David O’Neill, Vice President
Conservation Programs
National Fish & Wildlife Foundation
Attn: Hurricane Sandy Coastal Resilience Competitive Grants Program
1133 15th Street, NW #1100
Washington, D.C. 20005

Dear Mr. O’Neill:

I am pleased to write this letter of support on behalf of the American Littoral Society and the Conserve Wildlife Foundation of New Jersey’s application for funding under the Hurricane Sandy Coastal Resilience Competency Grants Program.

It is my understanding the restoration project will focus on the beach and wetland habitats of six interrelated Delaware Bayshore sites in Cape May and Cumberland Counties. The timely and successful implementation of this project will reestablish the vitality of critical habitats used by horseshoe crabs and shore birds while also strengthening an irreplaceable natural system which helps protect rural Bayshore communities.

The proposed project expands on earlier efforts from 2013 when emergency beach restoration was undertaken along New Jersey’s Delaware Bayshore in an effort to repair the devastation left by Hurricane Sandy. This project prepared the beaches for the arrival of breeding horseshoe crabs and the many shorebirds which stopover in the Bayshore region to feed on the horseshoe crab eggs. Because of the tremendous support, both financially and participatory, from many partners, over a mile of beaches which had been stripped of sand and littered with debris were successfully restored just in time for the horseshoe crab’s breeding season.

It is important this restoration process continues as the future of the Delaware Bayshore region is tied to the health and ecological diversity of the Delaware Bay and its coast. Without a consistent and focused effort at restoration the shoreline will suffer long term ecological detriment, Bayshore communities will be at increased risk from storms, and local industries will suffer financially.

Sincerely,

Frank A. LoBiondo
Member of Congress
January 29, 2014

David O’Neill
Vice President, Conservation Programs
National Fish & Wildlife Foundation
1133 15th Street NW #1100
Washington, D.C. 20005

Dear Mr. O’Neill:

The American Littoral Society and the Conserve Wildlife Foundation of New Jersey are submitting an application for funding from the National Fish & Wildlife Foundation’s Hurricane Sandy Coastal Resiliency Competitive Grant Program. I write to you to offer my strong support for their proposal and respectfully request that you give due consideration to their application.

If funded, the American Littoral Society and the Conserve Wildlife Foundation of New Jersey plan to conduct a Delaware Bayshore Beach Restoration Project. This project would focus on the beach and wetland habitats of six interrelated Delaware Bayshore sites in both Cape May County and Cumberland County. The proposed project is an expansion of emergency beach restoration that was undertaken in 2013 along New Jersey’s battered Delaware Bayshore. The proposed funding would be critical for not only restoring the vitality of the region’s natural habitat for shore birds and breeding horseshoe crabs, but it would also help to reinforce a unique natural system which helps to protect New Jersey’s rural Bayshore communities.

Hurricane Sandy hit New Jersey’s coastline and natural habitats hard. The previous project was able to restore over a mile of beaches which had been stripped of sand and littered with debris and waste. The proposed funding from the Hurricane Sandy Coastal Resiliency Competitive Grants Program would allow the Delaware Bayshore Beach Restoration Project to refurbish even more of New Jersey’s natural habitat that is so critical to wildlife. The funding would also help protect rural communities, as the beaches act as a natural barrier against future storms. Without the proposed funding, the New Jersey Delaware Bayshore would be at an increased risk from storms and suffer both short and long-term ecological detriment. It is therefore of serious importance that the restoration process continues as the future of the Delaware Bayshore region is tied to the health and ecological diversity of the Delaware Bay and its Coast.
For these reasons, I strongly support the Delaware Bayshore Beach Restoration Project’s proposal for funding from the Hurricane Sandy Coastal Resiliency Competitive Grant Program. I thank you in advance for giving the American Littoral Society and the Conserve Wildlife Foundation’s application its due consideration.

Sincerely,

[Signature]

ROBERT MENENDEZ
United States Senator
Preconstruction Surveys
for
Proposed Delaware Bay Restoration Sites
NORTH REEDS BEACH
HABITAT RESTORATION AND SHORELINE PROTECTION,
Middle Township, Cape May County, NJ.

Reeds North
Total Volume = 46,028 cu.yds./ft.

Volume(s) Quantified
136+02 - 134+02 = 2,690.8 cu.yds./ft.
134+02 - 124+02 = 12,378 cu.yds./ft.
124+02 - 112+02 = 21,288 cu.yds./ft.
112+02 - 108+02 = 9,671.2 cu.yds./ft.
Overall Total = 46,028 cu.yds./ft.
Moores Beach - 2013 Restoration Project
3 Month Post-Construction / Survey # 4
Line 03+50 = -7.25 cu.yds./ft.
Shoreline Retreat = -17.83 ft.
THOMPSON'S BEACH
HABITAT RESTORATION AND SHORELINE PROTECTION
MAURICE RIVER TOWNSHIP
CUMBERLAND COUNTY, NJ

Thompsons Beach - Cell 1-4
Volume = 77,951.2 cu.yds./ft.

Cell #4 = 15,796.8 cu.yds./ft.
Cell #3 = 23,695.2 cu.yds./ft.
Cell #2 = 20,708.8 cu.yds./ft.
Cell #1 = 17,750.4 cu.yds./ft.

0 185 370 740 1,110 1,480 Feet
Thompsons Beach - Shoreline Restoration Project
Proposed Beach Template - Maximum Disturbance Limit
Line 32+00 = 14.792 cu.yds./ft.
Shoreline Advance = 47 ft.

30 ft wide berm (4ft NAVD 88 Proposed Elevation)

HTL 4.53

MHW 2.79

MHW 3.29

Existing grade

Angle of Repose

Distance (feet)
## Fortescue Beach Restoration Plan

### Location Map

**Proposed Project Area for Restoration Efforts**

### Table of Areas to be Filled

<table>
<thead>
<tr>
<th>Area to be filled</th>
<th>Square feet</th>
<th>Acres</th>
<th>Volume (cu.yds./ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area to be filled above the Mean High Water Line</td>
<td>9731.13</td>
<td>0.22</td>
<td>608.7</td>
</tr>
<tr>
<td>Area to be filled between the Mean High Water Line and Mean Low Water Line</td>
<td>228330.8</td>
<td>5.24</td>
<td>39,377.90</td>
</tr>
<tr>
<td>Area to be filled below Mean Low Water Line</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total area to be filled</td>
<td>238061.9</td>
<td>5.46</td>
<td>39,986.60</td>
</tr>
</tbody>
</table>
Fortescue Beach - Shoreline Restoration Project
Proposed Beach Template - Maximum Disturbance Limit:
Section 12+00 - 21 cu.yds./ft.

- 30 ft wide berm (4ft NAVD Proposed Elevation)
- HTL 4.53
- MHW 2.79
- 15 to 1 (Proposed Grade)
- existing grade
- MLW -3.29
- Angle of Repose

- Existing Grade
- Proposed Grade
- MLW -3.29
- HTL 4.53
- MHW 2.79
- Angle of Repose

Distance (feet)
East-Point - Cell’s 1 & 2
Total Volume (60ft. berm) = 16,498.814 cu.yds./ft.

Volume with 60 foot berm = 16,498.814 cu.yds./ft.
Addition of dune adds = 5,440.554 cu.yds./ft. (approx.)
Addition of 2 tiered berm adds = 3,715.285 cu.yds./ft. (approx.)
Overall Total = 25,654.653 cu.yds./ft.

Cell # 1 = 7,832.376 cu.yds./ft.
Cell # 2 = 8,666.438 cu.yds./ft.
East-Point - Shoreline Restoration Project
Proposed Beach Template - Maximum Disturbance Limit
Line _05+25 = 5.587 cu.yds./ft.
Shoreline Advance = 16 ft.

Shoreline Advance = 16 ft.

30 ft wide berm (4ft NAVD 88 Proposed Elevation)

East-Point - Shoreline Restoration Project
Proposed Beach Template - Maximum Disturbance Limit
Line _03+35 = 10.024 cu.yds./ft.
Shoreline Advance = 32ft.

30 ft wide berm (4ft NAVD 88 Proposed Elevation)
Establishing Shorebird Restoration Priorities on Delaware Bay
Conserve Wildlife Foundation of NJ
Lawrence Niles, Cristina Frank

Abstract
The process of effectively planning and implementing a restoration project is complex and must withstand many uncertainties inherent in ecosystems while minimizing costs and meeting a variety of goals. The process of adaptive management allows project leaders to develop more successful and predictable plans by integrating lessons from previous restoration projects. This project developed an evaluation framework and a system of scoring for wetland restoration projects in the Delaware Bay Region. The evaluation investigated the sources of complications and successes for 31 beach and/or intertidal restoration projects. In summary, 65% were completed or progressing towards completion and 35% failed or are currently stalled. Funding was the most influential (positive or negative) factor overall. In NJ, the primary cause for failure/stall was related to permitting and stakeholder support. In DE, the causes for failure/stall were more variable ranging from lack of stakeholder support to restoration methodology and funding. Projects in NJ typically experienced a greater frequency of complications than DE. A comparison of partner involvement demonstrated the need for partner coordination and the need to identify a diverse set of partners with the expertise and resources that best fit a particular restoration project. Recommendations for streamlining the process of plan development and implementation are also offered.

Introduction
Restoration projects require effective planning to maximize restoration success while minimizing overall costs (Wyant et al. 1995). These plans must meet a wide array of both ecological and societal goals (Hackney 2000, Thom 2000). They must balance these goals with the need to withstand or adjust to any number of uncertainties inherent in ecological restoration (Thom 1997). For this reason, it is valuable to monitor and evaluate restoration projects during and following implementation and construction in order to revise success criteria and to inform future restoration planning (Hackney 2000, Thom 1997). This process of adaptive management has the potential to increase the probability of restoration success.

In an effort to inform existing and future shorebird restoration projects and planning in the Delaware Bay Region, this project evaluated successful and failed beach and intertidal marsh restoration projects (Figure 1 and 2). Conservation and restoration partners were interviewed using an evaluation framework (Table 1) designed to identify the sources of failure and success experienced during the various stages of planning and implementation. The goal was to identify key pitfalls and to determine the best strategies to implement effective beach and intertidal marsh restoration projects in the Delaware Bay Region. An inventory of beach and intertidal marsh restoration opportunities was also developed for future discussion.
Methods

Beach and intertidal marsh restoration projects were reviewed by interview of conservation and restoration professional using an evaluation framework designed to identify potential sources of failure and success (Table 1). Each project was categorized by its current status as completed (including projects in the post-project assessment stage), ongoing (with a likelihood of completion), stalled (potential for failure) or failed. For some analyses, projects were merged into two groups: completed/ongoing and failed/stalled. This framework evaluated nine stages of each project. For each stage, the leading entity, a status score (4 - completed without complications, 3 - completed despite complications, 2 - ongoing/in progress, 1 - stalled or 0 - failed) and, if applicable, the primary reason for the complication for each status was recorded (Table 2). The subject was also asked to rank up to seven factors that influenced the project’s progress and overall outcome (Table 2). These factors could have positively or negatively influenced the project or may not have had any notable influence on the project at all.

Following the interview process, an evaluation score was determined for each project by summing the status scores across all stages (4 - completed without complications, 3 - completed despite complications, 2 - ongoing/in progress, 1 - stalled or 0 - failed). A perfect score of 36 indicates that a project was completed successfully without any complications. A lower score indicates that some complications were experienced.

Subjects were also asked to provide information about restoration opportunities for shorebirds in the Delaware Bay Region. Evaluation of restoration opportunities employed the same evaluation framework as that used for established projects (Table 2). Subjects indicated the current status of each of the nine stages of potential projects and the probability of success.

Results and Discussion

Overview

Fifteen interviews were conducted across 14 different entities including non-profit organizations, corporations and county, state and federal agencies. Thirty-one established beach and/or intertidal marsh restoration projects were discussed, evaluated and ranked (Figures 1 and 2; Tables 3 and 4). Of these, 9 are currently completed, 11 are ongoing (with a likelihood of success), 7 are stalled (with a potential for failure) and 4 have failed. In summary, 65% are considered completed or progressing towards completion and 35% have failed or are currently stalled with a potential for failure. The highest evaluation score assigned was 36 (Moore’s Beach and Mispillian Harbor/Back Beach) and the lowest was 7 (Thousand Acre Marsh) (Table 3). The average evaluation score overall was 25.

Fifteen potential restoration opportunities were also discussed and evaluated (Figure 3; Table 6). Nine of these are existing or failed projects that require additional resources and/or management/restoration work.
Factors Affecting Restoration Projects

A summary of all factors, having both negative and positive influences, identified funding as the most influential factor affecting beach and/or intertidal restoration projects in the Delaware Bay Region (Table 4). Lack of funding was a source of failure or stall for almost as many projects as it was a source of success for those with secure funding. Funding was also the most influential issue affecting potential restoration opportunities. It is critical to identify the appropriate funding source for wetland projects as they are often very expensive and can take a long time to implement. For larger projects, it is often appropriate to identify a larger number of partners to facilitate funding.

Stakeholder support and permitting had considerable negative influences on project progress and outcome. Complications due to restoration methodology/implementation were also common but were frequently overcome due to the flexibility of the plan and the expertise of the partners. Some of these complications were attributed to corrupt or inexperienced contractors. As was noted by many of the subjects, project design must allow for flexibility and revisions throughout the restoration process to accommodate for unforeseen circumstances. This is also important to allow for the implementation of adaptive management principles (Thom 1997). Factors such as funding and permitting are not as versatile and therefore require considerable planning and coordination among stakeholders and partners. This is especially the case when developing and implementing coastal ecosystem restoration projects as restoration costs are steep and uncertainties are common.

Only a few project leaders mentioned the positive or negative influences of leadership and partner coordination, however, this does not indicate that these factors were in fact less influential. Several project leaders attributed restoration success to the effective and efficient coordination among project partners – a level of cooperation that was achieved by balancing the needs of all those on board. In other cases, leadership and partner coordination were discussed in tandem and can not be teased apart.

A Comparison of New Jersey and Delaware

A comparison of restoration projects across New Jersey and Delaware was conducted to identify potential strengths and/or weaknesses throughout the restoration process within each state (Table 5). Average score for each state was comparable with 25 for NJ and 26 for DE. In NJ, 59% of NJ’s projects were completed or are ongoing with 41% of the state’s 22 projects considered failed or are stalled. In DE, 78% of the state’s 9 projects are completed or ongoing and only 22% have failed or are stalled.

NJ and Delaware were also compared by analyzing the numbers and types of complications or factors lending to a project’s success or failure (Table 4). These seven factors were originally ranked by project leaders as an overall assessment of a particular project (Table 2). In NJ, a total of 61 complications, or approximately 2.8 per project, were noted by project leaders (Table 3). Issues associated with the permitting process were most prevalent, affecting 19 projects or 86% of NJ’s projects. Of those, six
eventually resulted in failure or are currently stalled. In DE, a total of 12 issues, or 0.8 per project, were recorded. Complications associated with restoration methodology/implementation were most prevalent in DE, negatively affecting six projects or 66%. It should be noted, however, that these issues were generally resolved due to the flexibility that was built into the plans. As a result, only one of six projects affected by restoration methodology complications actually led to failure in DE.

In NJ, permitting and lack of stakeholder support appear to be the primary causes of projects that failed or are stalled. In DE, the causes of failure/stall were more evenly distributed across several factors including lack of funding, lack of stakeholder support and restoration methodology.

The types of factors having a positive influence and the most influence on project progress and outcome were also compared. In NJ, funding and stakeholder support had the greatest positive influence. Permitting and stakeholder support were the most influential, positive or negative, across all of NJ’s projects. In contrast, partner coordination and restoration methodology had the greatest influence across all projects in DE. Partner coordination and flexibility of the plan had the greatest positive influence.

A Comparison of Partners

In an effort to identify the most effective partner or combination of partners for a restoration project, additional comparisons were conducted among the five types of partners interviewed (federal, state, county, corporate and non-profit) and the overall progress and outcome of restoration projects under their supervision. Thirteen projects included at least one federal partner, 18 projects at least one state partner, 5 projects at least one county partner, 8 projects at least one corporate partner, and one project with one non-profit partner. Demonstrating minimal variation, the average score of projects with a federal, state, county and/or non-profit partner on board was 24, 26, 27 and 28 respectively. Projects with a corporate partner scored an average of 33 and were all completed or are ongoing. This could be attributed to the essential role that corporations can fulfill as a secure funder and in some cases the source of technical expertise. Projects with corporate funding, however, typically require adherence to a shorter timeline. This should be considered when the appropriate funding resources are being identified for a restoration project.

A comparison of the number of partners involved and project progress and outcome indicated that projects with more than one partner generally scored higher. Ideally, it is beneficial to coordinate a diversity of partners around a restoration project. USFWS, for example, maintains extensive expertise in preparing restoration plans, submitting permit applications and implementing on-the-ground restoration activities. This review demonstrated USFWS’ familiarity with intertidal wetland projects involving the restoration of tidal flow and control of Phragmites (Table 3). USACE specializes in the technical aspects of investigating and developing coastal engineering projects. Most beach restoration projects require USACE as a partner. State agencies/departments offer a broad spectrum of expertise and can be critical in expediting the process of planning and
permitting if a good relationship exists among the departments involved. Partners at the county level can be instrumental in generating local stakeholder support. Non-profit organizations play an important role in restoration partnerships as they are generally not as confined as government agencies and can also provide a diversity of resources from planning, to community outreach, on-the-ground restoration and monitoring. Assembling the best mix of partners depends on a variety of factors including the scope and type of restoration proposed, the cost of the restoration and ownership.

Lessons Learned

Based on the experiences of the project leaders that were interviewed for this research, the following section provides suggestions for streamlining the restoration planning and implementation process.

1. Restoration Methodology: A restoration plan begins with understanding of a project’s scope or vision. With a scope or vision clearly defined, goals and objectives can then be developed. Quite often, the best resources for developing a restoration plan are previously implemented projects. It is useful to review projects that have already been implemented to assess which methodologies have been more effective, more widely-accepted by the community or less costly, for example, in similar restorations. Successful, tested strategies can be adapted to new projects. Employing previously implemented methodologies also has the potential to expedite the permitting process and stakeholder buy in. This is also important to ensure that restoration projects will continue to provide suitable habitat over time and to inform future restoration projects.

Projects leaders also stressed the value of building flexibility into a restoration plan. As suggested by Pastorok et al., planning for potential failure is one of the best strategies for maximizing success. Uncertainties and variability are an inherent part of ecosystems and therefore must be considered early. Flexibility of a plan, including its methodology and the consideration of alternative outcomes, could keep a project from failing altogether. This adaptive management strategy allows for revision of project stages based on the outcome of previous stages (Clewell 2005).

For larger projects, project leaders recommended creating an independent advisory committee composed of knowledgeable scientists that can review project plans and provide recommendations. The EECMP, for example, was integral to the momentum and completion of several intertidal marsh restoration projects implemented under PSEG’s Estuary Enhancement Program.

Throughout the process of initial plan development, it is critical that all partners are in agreement of the plan’s vision, goals and objectives. Stakeholders must also be identified and involved early in the planning process to address any potential issues (Hubbard 2000).
2. **Stakeholder Support**: Stakeholders include those that are impacted by the proposed restoration project such as include landowners, community members, local businesses, independent organizations and investors. Public meetings or forums are typically offered by project partners to increase public awareness of the importance of restoration, communicate a project’s vision and to identify the entities that have a stake in the outcome of a project. Failure to address stakeholder concerns early could undermine a project at a later stage when modifications tend to be very costly (Hubbard 2000). Several projects in the Delaware Bay Region were challenged with opposition from environmental organizations and local communities regarding the application of herbicide for *Phragmites* control. Outreach though public meetings and discussion coupled with modification of the application procedure facilitated resolution and progress early in the process.

3. **Funding**: Restoration partners stressed the importance of identifying the most appropriate funding source for wetland projects. This is particularly important because wetland restoration is often expensive and can take a long time to implement. For larger projects, it has been suggested that identification of a greater number of diverse partners can facilitate funding.

4. **Partner Coordination/Leadership**: The importance of partner coordination can not be understated (Clewell 2005, Jones et al. 2009, Hackney 2000, Hubbard 2000, Thom 1997). Restoration efforts require a team approach, with each partner lending expertise towards goals shared by the group. Coastal habitat restorations, in particular, are complex and require a wide range of disciplines from ecology, hydrology and engineering to planning, communicating and social science. Including a diversity of experienced partners will help ensure the development and implementation of a well-balanced and feasible restoration plan. (Corcoran 2002). As was observed in this evaluation of wetland restoration projects, partner coordination facilitated the success of several projects (Table 3).

5. **Permitting**: Attaining the necessary permits for restoration projects can often be daunting, time consuming and costly, especially for any projects affecting wetland habitats. Suggestions for streamlining the permitting process include clearly demonstrating the habitat or species benefit of a project and establishing a relationship with other projects. Whether building upon existing projects or demonstrating a benefit to ongoing restoration work, familiarity of a restoration project can accelerate the permitting process as well as stakeholder buy in and overall implementation. Hubbard (2000) and Hackney (2000) both suggest a systems approach in which projects are developed in relation to other projects as well as integrated into regional restoration plans.

Revisions to the permitting process have also been suggested. Application review, for example, could incorporate a checklist of priority species and habitats. Assuming a sound restoration plan, approval of projects addressing priority species/habitats should be expedited.
Currently, there is no standard evaluation framework or procedure to evaluate coastal restoration projects. This assessment offers an evaluation framework for wetland restoration projects and should be considered a valuable part of adaptive management. Post-construction assessment, including monitoring, results in the transfer of knowledge and experience from past projects into proposed ones. Merging the lessons of past experiences, including restoration failures, with new scientific technology and information will result in better, more predictable restoration projects (Clewell 2005, Jones et al. 2009, Hackney 2000, Thom 1997).
Bibliography


Appendices
Appendix A: Figures

Figure 1. Map of established beach and/or intertidal restoration projects sites in the northern portion of the Delaware Bay Region that were evaluated.
Figure 2. Map of established beach and/or intertidal restoration projects sites in the southern portion of the Delaware Bay Region that were evaluated.
Figure 3. Map of beach and/or intertidal wetland restoration project opportunities in the Delaware Bay Region.
Appendix B: Tables

**Table 1.** Framework for collecting data on established and potential beach and/or intertidal restoration projects. Each of the nine stages addresses the development, identification and execution of that particular stage. For example, stakeholder support is the stage at which project partners identify, involve and build stakeholder support for the project.

<table>
<thead>
<tr>
<th>PROJECT STAGE</th>
<th>Project Title</th>
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<tbody>
<tr>
<td>Funding</td>
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</tr>
<tr>
<td>Project Design</td>
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<tr>
<td>Project Management</td>
<td></td>
</tr>
<tr>
<td>Permitting</td>
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<tr>
<td>Stakeholder Support</td>
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<tr>
<td>Implementation</td>
<td></td>
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<tr>
<td>Bidding Contractor</td>
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<tr>
<td>Project Construction</td>
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<tr>
<td>Post-project</td>
<td></td>
</tr>
<tr>
<td>Assessment</td>
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</table>

| TOTAL SCORE        | 0                                                                           |

**RANK FACTORS AFFECTING OVERALL PROJECT**
*(Beginning with 1 = most influence; n/a = non-issue)*

<table>
<thead>
<tr>
<th>Leadership</th>
<th>Funding</th>
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<tbody>
<tr>
<td>Restoration Methodology/Implementation</td>
<td></td>
</tr>
<tr>
<td>Flexibility of Plan</td>
<td></td>
</tr>
<tr>
<td>Permitting/Regulatory Issues</td>
<td></td>
</tr>
<tr>
<td>Partner Coordination</td>
<td></td>
</tr>
<tr>
<td>Stakeholder Support</td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Established Restoration Projects</th>
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</thead>
<tbody>
<tr>
<td>Status</td>
</tr>
<tr>
<td>4 Completed w/o complications</td>
</tr>
<tr>
<td>3 Completed despite complications</td>
</tr>
<tr>
<td>2 Ongoing/In progress</td>
</tr>
<tr>
<td>1 Stalled/Unfinished due to complications</td>
</tr>
<tr>
<td>0 Failed</td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
</tr>
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<table>
<thead>
<tr>
<th>Potential Restoration Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
</tr>
<tr>
<td>3 Completed</td>
</tr>
<tr>
<td>2 Ongoing/In progress</td>
</tr>
<tr>
<td>1 Stalled</td>
</tr>
<tr>
<td>0 Failed</td>
</tr>
</tbody>
</table>
Table 2. Definition of terms used in the framework for collecting data.

<table>
<thead>
<tr>
<th>Factors Affecting Overall Project</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leadership</td>
<td>Addresses the ability of project leaders to carry the project to its completion</td>
</tr>
<tr>
<td>Funding</td>
<td>Availability or lack of financial resources to implement a project</td>
</tr>
<tr>
<td>Restoration Methodology/Implementation</td>
<td>Development and implementation (including contract work) of restoration strategies.</td>
</tr>
<tr>
<td>Flexibility of Plan</td>
<td>Ability of a plan to be revised/adjusted in the event of changes to the project site, funding, ineffective methods, etc.</td>
</tr>
<tr>
<td>Permitting/Regulatory Issues</td>
<td>Includes any positive or negative issues associated with permitting and/or regulatory requirements</td>
</tr>
<tr>
<td>Partner Coordination</td>
<td>Identifying and involving project partners. Includes all organizations/agencies working together to design, fund and implement a restoration project</td>
</tr>
<tr>
<td>Stakeholder Support</td>
<td>Identifying, involving and building stakeholder support. May involve conducting outreach through a public forum or meeting. Stakeholders include landowners, local residents, businesses and any agencies/organizations that have a stake in the outcome of the restoration but are not partnering on project design, funding or implementation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Status</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completed w/o Complications</td>
<td>Indicates that the project stage in question was completed without any delays or complications. Score of 4</td>
</tr>
<tr>
<td>Completed Despite Complications</td>
<td>Indicates that the project stage in question was completed regardless of delays or complications. Score of 3</td>
</tr>
<tr>
<td>Ongoing/In Progress</td>
<td>Indicates that the project stage in question has been executed and is moving forward. Score of 2</td>
</tr>
<tr>
<td>Stalled/Unfinished</td>
<td>Indicates that the project stage in question has been executed and is stalled due to a complication or that the project stage was never executed due to a complication. Score of 1</td>
</tr>
<tr>
<td>Failed</td>
<td>Indicates that the project stage was executed but was not completed and has been abandoned. Score of 0</td>
</tr>
</tbody>
</table>
Table 3. Summary of all established beach and/or intertidal restoration projects in the Delaware Bay Region. The evaluation score was determined for each project by summing the status scores across all stages (4 - completed without complications, 3 - completed despite complications, 2 - ongoing/in progress, 1 - stalled or 0 - failed). A perfect score of 36 indicates that a project was completed successfully without any complications.

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Score</th>
<th>Status</th>
<th>Location</th>
<th>State</th>
<th>Acres</th>
<th>Habitat Type</th>
<th>Impairment</th>
<th>Restoration Strategy</th>
<th>Leading Entity</th>
<th>Target Species</th>
<th>Last Completed Stage</th>
<th>Failure/Stall Factors</th>
<th>Success Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thousand Acre Marsh</td>
<td>7</td>
<td>Failed</td>
<td>Delaware City</td>
<td>DE</td>
<td>400</td>
<td>Intertidal Marsh</td>
<td>Tidal Restriction</td>
<td>Restore Flood Regime</td>
<td>DEMC</td>
<td>Shorebirds/ Marsh Birds/ Waterfowl</td>
<td>Project Design Ongoing</td>
<td>Funding/ Stakeholder Support/ Restoration Methodology/ Implementation</td>
<td>n/a</td>
</tr>
<tr>
<td>Eagle Manor Farm</td>
<td>11</td>
<td>Failed</td>
<td>Bridgeton</td>
<td>NJ</td>
<td>12</td>
<td>Freshwater Marsh</td>
<td>Habitat Loss</td>
<td>Freshwater Marsh Creation</td>
<td>USFS</td>
<td>Migratory Birds/ Waterfowl</td>
<td>Project Design Permitting</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>Watson's Dike</td>
<td>11</td>
<td>Stalled</td>
<td>Greenwich TWP</td>
<td>NJ</td>
<td>3</td>
<td>Intertidal Marsh</td>
<td>Flood Control/ Invasive Vegetation</td>
<td>Maintain Flood Regime/ Phragmites Control</td>
<td>USFWS, Cumberland Co</td>
<td>Migratory Birds/ Marsh Birds</td>
<td>Stakeholder Support Funding Stakeholder Support</td>
<td></td>
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<tr>
<td>Cohansay Dike</td>
<td>14</td>
<td>Failed</td>
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<td>NJ</td>
<td></td>
<td>Intertidal Marsh</td>
<td>Tidal Restriction/ Invasive Vegetation</td>
<td>Restore Flood Regime/ Phragmites Control</td>
<td>NJDFW</td>
<td>Waterfowl</td>
<td>Project Design Permitting/ Funding</td>
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<tr>
<td>Mill Creek/ Wheaton Run</td>
<td>14</td>
<td>Failed</td>
<td>Bridgeton</td>
<td>NJ</td>
<td>143</td>
<td>Intertidal Marsh</td>
<td>Tidal Restriction/ Invasive Vegetation</td>
<td>Restore Flood Regime/ Phragmites Control</td>
<td>USFWS</td>
<td>Marsh Birds/ Waterfowl</td>
<td>Project Design Ongoing</td>
<td>Funding Stakeholder Support</td>
<td>n/a</td>
</tr>
<tr>
<td>Pond Creek</td>
<td>15</td>
<td>Stalled</td>
<td>West Cape May</td>
<td>NJ</td>
<td>170</td>
<td>Intertidal Marsh</td>
<td>Tidal Restriction/ Invasive Vegetation</td>
<td>Restore Flood Regime/ Phragmites Control</td>
<td>USACE</td>
<td>Migratory Birds/ Marsh Birds/ Waterfowl</td>
<td>Project Design/ Permitting/ Stakeholder Support</td>
<td>Funding/ Permitting Delays Stakeholder Support</td>
<td>n/a</td>
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<td>Cox Hall Creek</td>
<td>16</td>
<td>Stalled</td>
<td>Town Bank</td>
<td>NJ</td>
<td>2150</td>
<td>Intertidal Marsh</td>
<td>Tidal Restriction/ Invasive Vegetation</td>
<td>Restore Flood Regime/ Phragmites Control</td>
<td>Cape May Co, USFWS</td>
<td>Migratory Birds/ Marsh Birds/ Waterfowl</td>
<td>Project Design/ Permitting Ongoing</td>
<td>Funding/ Permitting Delays Stakeholder Support</td>
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<tr>
<td>Grassdale</td>
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<td>DE</td>
<td>86</td>
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<td>Tidal Restriction/ Invasive Vegetation</td>
<td>Restore Flood Regime/ Phragmites Control</td>
<td>USACE</td>
<td>Marsh Birds/ Waterfowl</td>
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<td>Funding/ Restoration Methodology/ Implementation</td>
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<tr>
<td>Thompson's Beach</td>
<td>16</td>
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<td>NJ</td>
<td>25</td>
<td>Beach</td>
<td>Habitat Degradation</td>
<td>Debris Removal</td>
<td>NJBCE</td>
<td>Shorebirds/ HSC</td>
<td>Project Design Ongoing/ Permits Submitted</td>
<td>Funding/ Stakeholder Support Permitting</td>
<td>n/a</td>
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<tr>
<td>Sea Breeze Beach</td>
<td>17</td>
<td>Stalled</td>
<td>Sea Breeze</td>
<td>NJ</td>
<td>25</td>
<td>Beach</td>
<td>Habitat Degradation</td>
<td>Debris Removal</td>
<td>NJDFW, NJBCE</td>
<td>Shorebirds/ HSC</td>
<td>Permitting Ongoing</td>
<td>Funding/ Stakeholder Support</td>
<td></td>
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<tr>
<td>Mad Horse Creek</td>
<td>20</td>
<td>Stalled</td>
<td>Lower Alloways TWP</td>
<td>NJ</td>
<td>50</td>
<td>Intertidal Marsh</td>
<td>Tidal Restriction</td>
<td>Intertidal Marsh Creation/ Restore Flood Regime</td>
<td>NJDFW, NJNDR</td>
<td>Marsh Birds/ Waterfowl</td>
<td>Project Design Ongoing</td>
<td>Leadership/ Funding/ Partner Coordination Permitting Not Required</td>
<td></td>
</tr>
<tr>
<td>Commercial TWP Salt Hay Farm</td>
<td>26</td>
<td>Ongoing</td>
<td>Commercial TWP</td>
<td>NJ</td>
<td>2894</td>
<td>Intertidal Marsh</td>
<td>Tidal Restriction/ Invasive Vegetation</td>
<td>Restore Flood Regime/ Phragmites Control</td>
<td>NJDFW, PSEG</td>
<td>Shorebirds/ Marsh Birds/ Waterfowl</td>
<td>Project Construction Ongoing</td>
<td>Stakeholder Support/ Restoration Methodology/ Implementation Funding</td>
<td></td>
</tr>
</tbody>
</table>
Table 3. Summary of all established beach and/or intertidal restoration projects in the Delaware Bay Region. The evaluation score was determined for each project by summing the status scores across all stages (4 - completed without complications, 3 - completed despite complications, 2 - ongoing/in progress, 1 - stalled or 0 - failed). A perfect score of 36 indicates that a project was completed successfully without any complications.

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Score</th>
<th>Status</th>
<th>Location</th>
<th>State</th>
<th>Acres</th>
<th>Habitat Type</th>
<th>Impairment</th>
<th>Restoration Strategy</th>
<th>Leading Entity</th>
<th>Target Species</th>
<th>Last Completed Stage</th>
<th>Failure/Stall Factors</th>
<th>Success Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prime Hook NWR</td>
<td>26</td>
<td>Ongoing</td>
<td>Milton</td>
<td>DE</td>
<td>10</td>
<td>Freshwater Marsh/ Dune</td>
<td>Salt Water Intrusion</td>
<td>Dune Enhancement</td>
<td>DNREC, NWR</td>
<td>Shorebirds/ Marsh Birds/ Waterfowl</td>
<td>Permitting/ Stakeholder Support</td>
<td>Restoration Methodology/ Implementation / Partner Coordination</td>
<td>Stakeholder Support</td>
</tr>
<tr>
<td>Russell W. Peterson Wildlife Refuge</td>
<td>26</td>
<td>Ongoing</td>
<td>Willimington</td>
<td>DE</td>
<td>212</td>
<td>Intertidal Marsh</td>
<td>Tidal Restriction/ Invasive Vegetation</td>
<td>Restore Flood Regime/ Phragmites Control</td>
<td>DEMC</td>
<td>Shorebirds/ Marsh Birds/ Waterfowl</td>
<td>Project Construction</td>
<td>Restoration Methodology/ Implementation / Permitting Delays</td>
<td>Partner Coordination/ Leadership/ Flexibility of Plan</td>
</tr>
<tr>
<td>Alloway Creek Watershed</td>
<td>27</td>
<td>Ongoing</td>
<td>Elsinboro, Lower Alloways Creek TWPs</td>
<td>NJ</td>
<td>1601</td>
<td>Intertidal Marsh</td>
<td>Tidal Restriction/ Invasive Vegetation</td>
<td>Restore Flood Regime/ Phragmites Control</td>
<td>NJDFW, PSEG</td>
<td>Shorebirds/ Marsh Birds/ Waterfowl</td>
<td>Stakeholder Support/ Restoration Methodology/ Implementation</td>
<td>Funding</td>
<td></td>
</tr>
<tr>
<td>Cape May Meadows</td>
<td>28</td>
<td>Ongoing</td>
<td>West Cape May</td>
<td>NJ</td>
<td>180</td>
<td>Freshwater Marsh/ Beach/ Dune</td>
<td>Salt Water Intrusion/ Habitat Loss/ Invasive Vegetation</td>
<td>Beach Nourishment/ Dune &amp; Freshwater Marsh Enhancement/ Phragmites Control</td>
<td>USACE</td>
<td>Shorebirds/ Beach Nesting Birds/ Migratory Birds</td>
<td>Project Construction</td>
<td>Stakeholder Support/ Restoration Methodology/ Implementation</td>
<td>Partner Coordination/ Leadership/ Flexibility of Plan</td>
</tr>
<tr>
<td>Living Shorelines/ Maurice River TWP</td>
<td>28</td>
<td>Ongoing</td>
<td>Maurice River TWP</td>
<td>NJ</td>
<td>20</td>
<td>Intertidal Marsh/ Beach</td>
<td>Habitat Loss</td>
<td>Shoreline Stabilization</td>
<td>PDE</td>
<td>Marsh Species (Birds, Shellfish, Fish)</td>
<td>Implementation Ongoing</td>
<td>Funding/ Permitting Delays/ Restoration Methodology/ Stakeholder Support</td>
<td>Partner Coordination/ Stakeholder Support</td>
</tr>
<tr>
<td>The Rocks</td>
<td>28</td>
<td>Ongoing</td>
<td>Odessa</td>
<td>DE</td>
<td>550</td>
<td>Intertidal Marsh</td>
<td>Tidal Restriction/ Invasive Vegetation</td>
<td>Restore Flood Regime/ Phragmites Control</td>
<td>PSEG</td>
<td>Shorebirds/ Marsh Birds/ Waterfowl</td>
<td>Permitting/ Stakeholder Support</td>
<td>Restoration Methodology/ Implementation</td>
<td>Funding</td>
</tr>
<tr>
<td>James Farm Ecological Preserve</td>
<td>31</td>
<td>Completed</td>
<td>Bethany Beach</td>
<td>DE</td>
<td>150</td>
<td>Intertidal Marsh</td>
<td>Tidal Restriction</td>
<td>Restore Flood Regime</td>
<td>DNREC, DEMC</td>
<td>Shorebirds/ Marsh Birds/ Waterfowl</td>
<td>Post-project Assessment</td>
<td>Stakeholder Support/ Flexibility of Plan/ Partner Coordination</td>
<td>Stakeholder Support/ Flexibility of Plan/ Partner Coordination</td>
</tr>
<tr>
<td>Supawna Meadows NWR</td>
<td>31</td>
<td>Completed</td>
<td>Salem</td>
<td>NJ</td>
<td>7</td>
<td>Intertidal Marsh</td>
<td>Tidal Restriction/ Invasive Vegetation</td>
<td>Restore Flood Regime/ Phragmites Control</td>
<td>USACE</td>
<td>Marsh Birds/ Migratory Birds/ Waterfowl</td>
<td>Post-project Assessment</td>
<td>Restoration Methodology/ Implementation / Permitting Delays</td>
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<tr>
<td>Cedar Swamp</td>
<td>32</td>
<td>Ongoing</td>
<td>Odessa</td>
<td>DE</td>
<td>1863</td>
<td>Intertidal Marsh</td>
<td>Tidal Restriction/ Invasive Vegetation</td>
<td>Restore Flood Regime/ Phragmites Control</td>
<td>PSEG</td>
<td>Shorebirds/ Marsh Birds/ Waterfowl</td>
<td>Project Construction</td>
<td>Restoration Methodology/ Implementation</td>
<td>Funding</td>
</tr>
</tbody>
</table>
Table 3. Summary of all established beach and/or intertidal restoration projects in the Delaware Bay Region. The evaluation score was determined for each project by summing the status scores across all stages (4 - completed without complications, 3 - completed despite complications, 2 - ongoing/in progress, 1 - stalled or 0 - failed). A perfect score of 36 indicates that a project was completed successfully without any complications.

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Score</th>
<th>Status</th>
<th>Location</th>
<th>State</th>
<th>Acres</th>
<th>Habitat Type</th>
<th>Impairment</th>
<th>Restoration Strategy</th>
<th>Leading Entity</th>
<th>Target Species</th>
<th>Completed Stage</th>
<th>Failure/Stall Factors</th>
<th>Success Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maurice River TWP Salt Hay Farm</td>
<td>32</td>
<td>Ongoing</td>
<td>Maurice River TWP</td>
<td>NJ</td>
<td>1135</td>
<td>Intertidal</td>
<td>Marsh</td>
<td>Tidal Restriction/ Invasive Vegetation</td>
<td>NJDFW, PSEG</td>
<td>Shorebirds/ Marsh Birds/ Waterfowl</td>
<td>Project Construction</td>
<td>Permitting Delays/ Stakeholder Support/ Restoration Methodology/ Implementation</td>
<td>Funding</td>
</tr>
<tr>
<td>Mannington/ Supawna Meadows</td>
<td>33</td>
<td>Ongoing</td>
<td>Mannington on TWP</td>
<td>NJ</td>
<td>475</td>
<td>Intertidal</td>
<td>Marsh</td>
<td>Invasive Vegetation</td>
<td>Phragmites Control</td>
<td>USFWS, NWR</td>
<td>Project Construction</td>
<td>Permitting/ Restoration Methodology/ Implementation</td>
<td>Stakeholder Support</td>
</tr>
<tr>
<td>Dennis TWP Salt Hay Farm</td>
<td>34</td>
<td>Completed</td>
<td>Dennis TWP</td>
<td>NJ</td>
<td>384</td>
<td>Intertidal</td>
<td>Marsh</td>
<td>Tidal Restriction/ Invasive Vegetation</td>
<td>NJDFW, PSEG</td>
<td>Shorebirds/ Marsh Birds/ Waterfowl</td>
<td>Post-project Assessment</td>
<td>Stakeholder Support/ Permitting Delays</td>
<td>Funding</td>
</tr>
<tr>
<td>Newport Marsh</td>
<td>34</td>
<td>Ongoing</td>
<td>Newport Marsh</td>
<td>DE</td>
<td>50</td>
<td>Intertidal</td>
<td>Marsh</td>
<td>Tidal Restriction/ Invasive Vegetation</td>
<td>DEMC, DEDOT, DEDFW, Delmarva Power</td>
<td>Marsh Birds</td>
<td>Project Construction</td>
<td>n/a</td>
<td>Partner Coordination/ Leadership/ Flexibility of Plan</td>
</tr>
<tr>
<td>Cohansey River Watershed</td>
<td>35</td>
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<td>Fairfield, Hopewell TWP</td>
<td>NJ</td>
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<td>Marsh</td>
<td>Tidal Restriction/ Invasive Vegetation</td>
<td>NJDFW, PSEG</td>
<td>Shorebirds/ Marsh Birds/ Waterfowl</td>
<td>Post-project Assessment</td>
<td>Stakeholder Support/ Restoration Methodology/ Implementation</td>
<td>Funding</td>
</tr>
<tr>
<td>Green Creek/ Schellinger's Creek</td>
<td>35</td>
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<td>Green Creek</td>
<td>NJ</td>
<td>292</td>
<td>Intertidal</td>
<td>Marsh</td>
<td>Tidal Restriction/ Invasive Vegetation</td>
<td>USFWS, CMCDM</td>
<td>Marsh Birds/ Migratory Birds/ Waterfowl</td>
<td>Post-project Assessment</td>
<td>Stakeholder Support</td>
<td>Flexibility of Plan/ Restoration Methodology/ Implementation</td>
</tr>
<tr>
<td>Heislerville</td>
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<td>Completed</td>
<td>Heislerville</td>
<td>NJ</td>
<td>50</td>
<td>Intertidal</td>
<td>Marsh</td>
<td>Tidal Restriction/ Invasive Vegetation</td>
<td>NJDFW</td>
<td>Shorebirds/ Marsh Birds/ Waterfowl</td>
<td>Post-project Assessment</td>
<td>Funding</td>
<td>n/a</td>
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<tr>
<td>Market Lane</td>
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<td>Greenwich</td>
<td>NJ</td>
<td>25</td>
<td>Intertidal</td>
<td>Marsh</td>
<td>Tidal Restriction/ Invasive Vegetation</td>
<td>USFWS</td>
<td>Marsh Birds/ Migratory Birds/ Waterfowl</td>
<td>Post-project Assessment</td>
<td>Permitting Delays/ Restoration Methodology/ Implementation</td>
<td>Flexibility of Plan</td>
</tr>
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<td>Mispillian Harbor/ Back Beach</td>
<td>36</td>
<td>Completed</td>
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<td>DE</td>
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<td>Beach</td>
<td>Marsh</td>
<td>Habitat Loss</td>
<td>Beach Nourishment</td>
<td>DNREC, USACE</td>
<td>Post-project Assessment</td>
<td>n/a</td>
<td>Flexibility of Plan/ Partner Coordination</td>
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<tr>
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<td>36</td>
<td>Completed</td>
<td>Delmont</td>
<td>NJ</td>
<td>25</td>
<td>Beach</td>
<td>Marsh</td>
<td>Habitat Degradation</td>
<td>Debris Removal</td>
<td>NJDFW, Maurice River TWP</td>
<td>Post-project Assessment</td>
<td>Stakeholder Support</td>
<td>Partner Coordination</td>
</tr>
</tbody>
</table>
Table 4. Summary of factors affecting beach and/or intertidal restoration projects in the Delaware Bay Region. Negative factors (-) caused delays or failure. Positive (+) factors facilitated the progress and/or success of a project. Note that some projects were influenced by more than one factor. The total # of projects that are influenced either negatively (-) or positively (+) is summed by factor in the last row.

<table>
<thead>
<tr>
<th>Project Status</th>
<th>Leadership</th>
<th>Funding</th>
<th>Restoration Methodology/Implementation</th>
<th>Flexibility of Plan</th>
<th>Permitting/Regulatory</th>
<th>Partner Coordination</th>
<th>Stakeholder Support</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-  +  -  +</td>
<td>-  +  -  +</td>
<td>-  +  -  +</td>
<td>-  +  -  +</td>
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<tr>
<td>Completed</td>
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<td>3 1</td>
<td>0 4</td>
<td>3 0</td>
<td>0 3</td>
<td>4 1</td>
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</tr>
<tr>
<td>Ongoing</td>
<td>0 2 1 5</td>
<td>9 0</td>
<td>0 2</td>
<td>5 0</td>
<td>1 3</td>
<td>4 2</td>
<td></td>
</tr>
<tr>
<td>Stalled</td>
<td>1 0 5 1</td>
<td>1 0</td>
<td>0 0</td>
<td>4 1</td>
<td>1 0</td>
<td>2 2</td>
<td></td>
</tr>
<tr>
<td>Failed</td>
<td>0 0 4 0</td>
<td>1 0</td>
<td>0 0</td>
<td>2 0</td>
<td>0 0</td>
<td>1 1</td>
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</tr>
<tr>
<td>TOTAL # of Projects</td>
<td>1 2 11 8</td>
<td>14 1</td>
<td>0 6</td>
<td>14 1</td>
<td>2 6</td>
<td>11 6</td>
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</tbody>
</table>

Table 5. A comparison of average scores and project status for New Jersey and Delaware.

<table>
<thead>
<tr>
<th></th>
<th>Average Score</th>
<th>Total # Projects</th>
<th>Failed</th>
<th>Stalled</th>
<th>Ongoing</th>
<th>Complete</th>
<th>Failed/Stalled</th>
<th>Complete/Ongoing</th>
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</thead>
<tbody>
<tr>
<td>All Projects</td>
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<td>31</td>
<td>4</td>
<td>13%</td>
<td>7</td>
<td>23%</td>
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<td>35%</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9</td>
<td>29%</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>11</td>
<td>35%</td>
</tr>
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<td></td>
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Table 6. Summary of all potential beach and/or intertidal restoration opportunities in the Delaware Bay Region.

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Need</th>
<th>Location</th>
<th>State</th>
<th>Acres</th>
<th>Habitat Type</th>
<th>Impairment</th>
<th>Restoration</th>
<th>Leading Entity</th>
<th>Target Species</th>
<th>Current Stage</th>
<th>Probability of Success</th>
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<tbody>
<tr>
<td>Cox Hall Creek</td>
<td>Funding</td>
<td>Town Bank</td>
<td>NJ</td>
<td>2150</td>
<td>Intertidal Marsh</td>
<td>Tidal Restriction/ Invasive Vegetation</td>
<td>Restore Flood Regime/ Phragmites Control</td>
<td>USFWS, Cape May Co</td>
<td>Migratory Birds/ Marsh Birds</td>
<td>Project Design</td>
<td>75-100%</td>
</tr>
<tr>
<td>Grassdale</td>
<td>Funding</td>
<td>Delaware City</td>
<td>DE</td>
<td>86</td>
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<td>Tidal Restriction/ Invasive Vegetation</td>
<td>Restore Flood Regime/ Phragmites Control</td>
<td>USACE</td>
<td>Marsh Birds/ Waterfowl</td>
<td>Project Design</td>
<td>75-100%</td>
</tr>
<tr>
<td>Mason's Point</td>
<td>Funding</td>
<td>Elsinboro TWP</td>
<td>NJ</td>
<td>930</td>
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<td>Tidal Restriction/ Invasive Vegetation</td>
<td>Restore Flood Regime/ Phragmites Control</td>
<td>PSEG, NJDFW</td>
<td>Shorebirds/ Marsh Birds/ Waterfowl</td>
<td>n/a</td>
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<td>Milford Neck</td>
<td>Funding</td>
<td>Milford</td>
<td>DE</td>
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<td>Tidal Restriction</td>
<td>Restore Flood Regime</td>
<td>DNREC</td>
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</tr>
<tr>
<td>Mill Creek/ Wheaton Run</td>
<td>Funding</td>
<td>Bridgeton</td>
<td>NJ</td>
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<td>Tidal Restriction/ Invasive Vegetation</td>
<td>Restore Flood Regime/ Phragmites Control</td>
<td>USFWS</td>
<td>Marsh Birds/ Waterfowl</td>
<td>Project Design</td>
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</tr>
<tr>
<td>Mispillian Harbor/ Back Beach</td>
<td>Funding</td>
<td>Milford</td>
<td>DE</td>
<td>50</td>
<td>Beach</td>
<td>Habitat Loss</td>
<td>Beach Renourishment</td>
<td>DNREC, USACE</td>
<td>Shorebirds/ HSC</td>
<td>Project Design</td>
<td>50-75%</td>
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<tr>
<td>Pond Creek</td>
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<td>West Cape May</td>
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<td>170</td>
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<td>Tidal Restriction/ Invasive Vegetation</td>
<td>Restore Flood Regime/ Phragmites Control</td>
<td>USFWS, NJDFW, USACE</td>
<td>Migratory Birds/ Marsh Birds</td>
<td>Project Design/ Permitting</td>
<td>50-75%</td>
</tr>
<tr>
<td>Port Mahon</td>
<td>Funding</td>
<td>Port Mahon</td>
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<td>Intertidal Marsh/ Beach</td>
<td>Tidal Restriction/ Habitat Loss/ Degradation</td>
<td>Restore Flood Regime/ Beach Nourishment</td>
<td>DNREC</td>
<td>Shorebirds/ HSC/ Waterfowl</td>
<td>Project Design</td>
<td>50-75%</td>
</tr>
<tr>
<td>Reeds Beach/ Pierces Point</td>
<td>Funding</td>
<td>Reed's Beach</td>
<td>NJ</td>
<td>25</td>
<td>Beach</td>
<td>Habitat Loss</td>
<td>Beach Nourishment</td>
<td>USACE</td>
<td>Shorebirds/ HSC</td>
<td>Project Design/ Permitting</td>
<td>50-75%</td>
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<tr>
<td>Stone Harbor Point</td>
<td>Funding</td>
<td>Stone Harbor</td>
<td>NJ</td>
<td>116</td>
<td>Beach/ Dune</td>
<td>Habitat Loss</td>
<td>Beach/ Dune Renourishment</td>
<td>USACE</td>
<td>Shorebirds/ Beach Nesting Birds</td>
<td>Project Design</td>
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</tr>
<tr>
<td>Ted Harvey</td>
<td>Funding</td>
<td>Bowers</td>
<td>DE</td>
<td>2700</td>
<td>Beach</td>
<td>Habitat Loss</td>
<td>Beach Nourishment</td>
<td>DNREC</td>
<td>Shorebirds/ HSC</td>
<td>Project Design</td>
<td>50-75%</td>
</tr>
<tr>
<td>Thompson's Beach</td>
<td>Funding/ Local Support/ Permitting</td>
<td>Maurice River TWP</td>
<td>NJ</td>
<td>25</td>
<td>Beach</td>
<td>Habitat Degradation</td>
<td>Debris Removal</td>
<td>TNC, NJDFW</td>
<td>Shorebirds/ HSC</td>
<td>Project Design/ Permits Submitted</td>
<td>75-100%</td>
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<tr>
<td>Thousand Acre Marsh</td>
<td>Funding/ Local Support</td>
<td>Delaware City</td>
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<td>Intertidal Marsh</td>
<td>Tidal Restriction</td>
<td>Restore Flood Regime</td>
<td>DEMC</td>
<td>Shorebirds/ Marsh Birds/ Waterfowl</td>
<td>Project Design</td>
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<tr>
<td>Upper Portions of Delaware Estuary</td>
<td>Funding</td>
<td>Cumberland/ Salem Counties</td>
<td>NJ</td>
<td>1000+</td>
<td>Intertidal Marsh</td>
<td>Invasive Vegetation</td>
<td>Phragmites Control</td>
<td>NJDFW</td>
<td>Shorebirds/ Migratory Birds/ Marsh Birds</td>
<td>Project Design</td>
<td>75-100%</td>
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<td>Watson's Dike</td>
<td>Funding</td>
<td>Greenwich TWP</td>
<td>NJ</td>
<td>3</td>
<td>Intertidal Marsh</td>
<td>Tidal Restriction/ Invasive Vegetation</td>
<td>Restore Flood Regime/ Phragmites Control</td>
<td>USFWS, Cumberland Co</td>
<td>Migratory Birds/ Marsh Birds</td>
<td>Project Construction</td>
<td>25-50%</td>
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</tbody>
</table>
Appendix C: List of Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
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<tr>
<td>CFIB</td>
<td>Delaware Center For the Inland Bays</td>
</tr>
<tr>
<td>CMCDMC</td>
<td>Cape May County Department of Mosquito Control</td>
</tr>
<tr>
<td>DEDFW</td>
<td>Delaware Division of Fish and Wildlife</td>
</tr>
<tr>
<td>DEDOT</td>
<td>Delaware Department of Transportation</td>
</tr>
<tr>
<td>DEMC</td>
<td>Delaware Mosquito Control</td>
</tr>
<tr>
<td>DNREC</td>
<td>Delaware Department of Natural Resources and Environmental Control</td>
</tr>
<tr>
<td>DU</td>
<td>Ducks Unlimited</td>
</tr>
<tr>
<td>EEPAC</td>
<td>Estuary Enhancement Project Committee</td>
</tr>
<tr>
<td>NJBCE</td>
<td>NJ Bureau of Coastal Engineering</td>
</tr>
<tr>
<td>NJDEP</td>
<td>NJ Department of Environmental Protection</td>
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<tr>
<td>NJDFW</td>
<td>NJ Division of Fish and Wildlife</td>
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<td>NJDPF</td>
<td>NJ Division of Parks and Forestry</td>
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<tr>
<td>NJNRD</td>
<td>NJ Natural Resource Damages</td>
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<td>NOAA</td>
<td>National Oceanic and Atmospheric Administration</td>
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<tr>
<td>NWR</td>
<td>National Wildlife Refuge</td>
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<td>PDE</td>
<td>Partnership for Delaware Estuary</td>
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<tr>
<td>PSEG</td>
<td>Power Service Electric &amp; Gas</td>
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<tr>
<td>TNC</td>
<td>The Nature Conservancy</td>
</tr>
<tr>
<td>USACE</td>
<td>US Army Corps of Engineers</td>
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<tr>
<td>USFWS</td>
<td>US Fish and Wildlife Service</td>
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