



Orca Pod



## Challenges Facing Improved Coastal Resiliency

*Holly Bamford, Ph.D., Chief Conservation Officer, National Fish & Wildlife Foundation*  
March 2020

## About Us

### Who We Are

- Chartered by Congress in 1984
- 30 member Board appointed by Secretary of the Interior
  - Includes FWS Director and NOAA Administrator

### What We Do

- Protect and restore nation's fish, wildlife and habitats
- Bring collaboration among federal agencies and private sector
- Create common conservation goals

### How We Do It

- Leverage public funding with private money
- On-the-ground conservation projects through competitive grant making



### NFWF is

- A leader in conservation strategies and outcomes
- A grant-maker that funds experts in the field to get results

### NFWF is not

- An advocacy organization that engages in lobbying or litigation

## Foundation for Partnerships

### Non-Federal Partners

- Corporations
- Foundations
- Private Donors
- States
- NGOs

\$



# NFWF

*Leader in fish, wildlife and habitat conservation through collaborative public-private partnerships that implement science-based strategies to achieve measurable outcomes.*

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### Federal Partners

- Appropriations
- Cooperative Agreements



### Effective competitive grant programs



California Coho salmon



Black duck



Student corps expanding trails



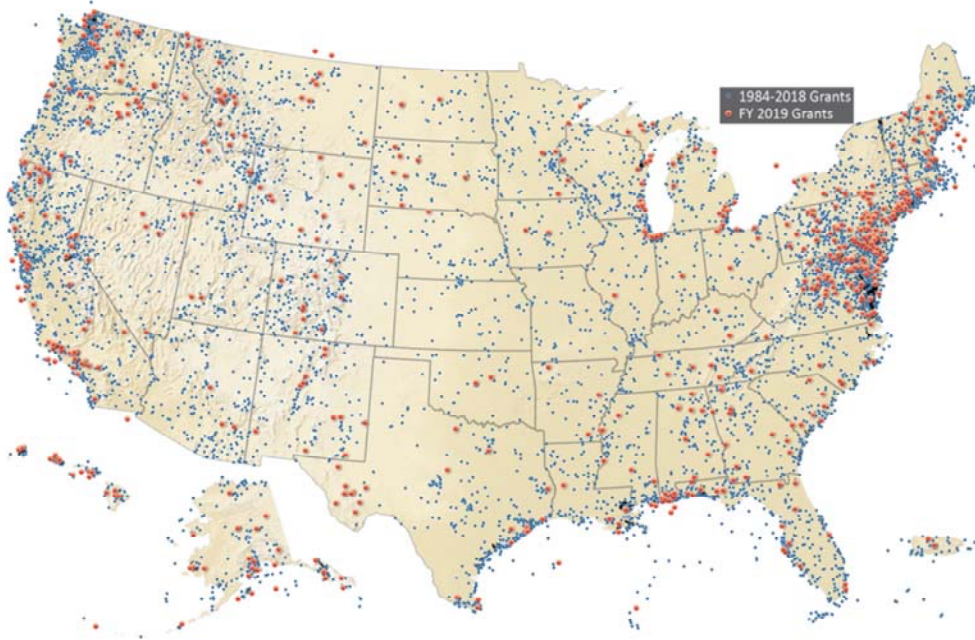
Mule deer buck

**Projects guided by science-based business plans to deliver outcomes**

# NFWF Federal, Corporate, & Foundation Partners



## NFWF Conservation Investments (1984 – 2019)

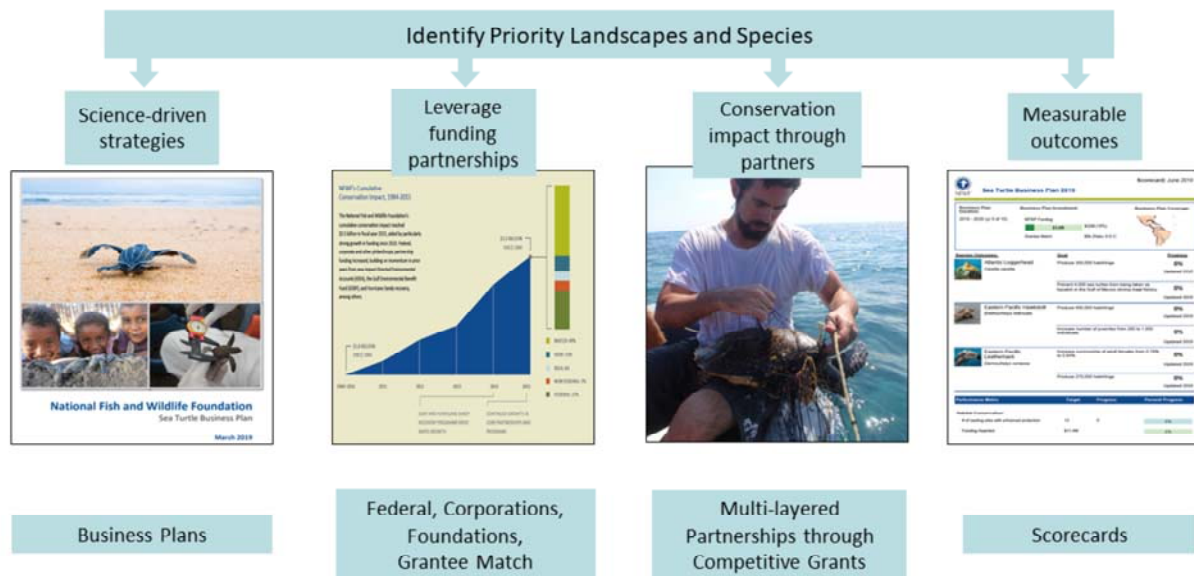


- **Funded 18,670 investments.**
- **Works with over 5,000 grantee organizations to achieve results.**
- **Manages more than 2,800 grants at any given time, and collects data for thousands more.**

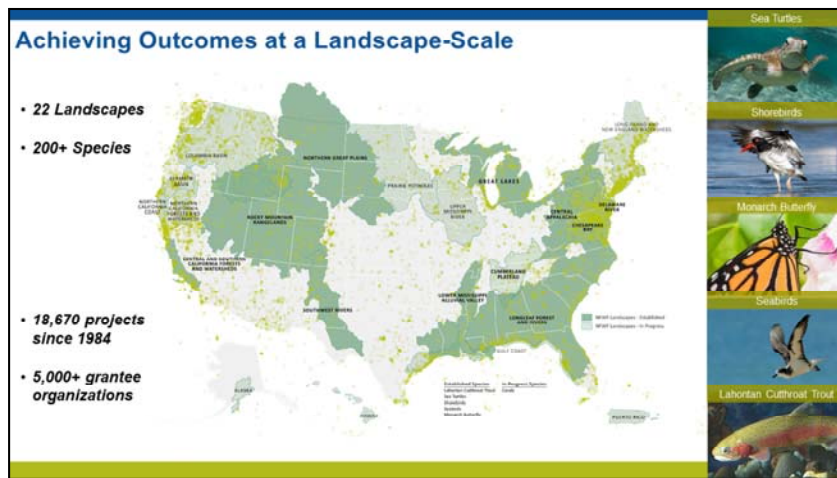




# Measuring Impact: NFWF Conservation Framework



- NFWF Conservation Framework is a national approach to framing our conservation efforts around a common set of priorities collectively.
- The Conservation framework provides criteria around conservation need; investments and measures
- Funnels down to rank and prioritize landscapes and species.
- The Framework is dynamic, allowing for adjustment as conservation needs and partner opportunities change.



- The Conservation framework Funnels down to rank and prioritize landscapes and species.
- A priority are those places that scored highest in the three categories and should be those places we continue to invest, drive partners to and get outcomes.
- The Framework is dynamic, allowing for adjustment as conservation needs and partner opportunities change.
- Finally framework highlights conservation approaches across landscapes to address cross cutting issues effecting fish and wildlife; disease, full lifecycle needs, responding to CC, invasive. Cross-cutting approaches represents species needs across multiple habitats/ full lifecycle needs, systemic threats like disease and alien species, resilience to SLR...

The Conservation Framework represents

- species that are identified as a priority at a landscape scale – either single or more than one landscape
- species that are wide-ranging – or have a species specific plan
- **Landscapes:**
  - Longleaf Forests and Rivers
  - Northern Great Plains
  - Central and Southern CA Forests and Watersheds
  - Central Appalachia
  - Cumberland Plateau Delaware River Watershed
  - Chesapeake Bay Watershed
  - Great Lakes
  - Southwest Rivers
  - Northern CA Coast
  - Gulf Coast
  - Northern Rockies
  - Hawai’l
  - Northern CA Forests and Watersheds
  - Sagebrush
  - Prairie Potholes
  - Alaska
  - Klamath Basin
  - Columbia Basin
  - Lower MS Alluvial Valley
  - New England Forests and Rivers
  - Puerto Rico
  - Central MS River/Tributaries

## Resilience

Capacity of nature and communities to prepare for, withstand, and recover from a disruption or adapt to change.

### NFWF and Resilience

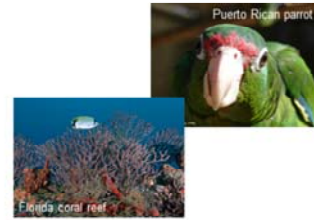
#### Long-term Planning



#### Building Back BETTER



#### Immediate Response



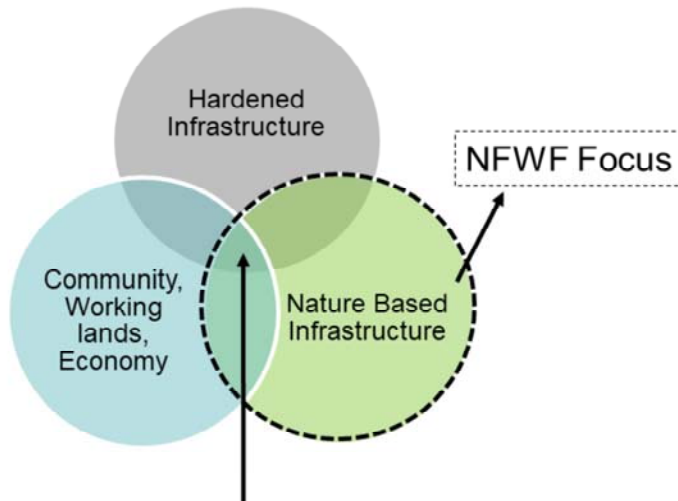
- As an organization, NFWF uses science-based approaches to measure the benefits of conservation.
- We know our conservation actions bring multiple benefits to species and habitats. More recently, through our coastal resilient efforts, we know our work can benefit human communities.
- So as we think about resilience, we think about it in building the capacity of nature and communities to prepare for, withstand, and recover from a disruption or adapt to change.

NFWF performs in three main areas:

- Long-term Conservation – Business plans are built out with resilience in mind
- In our implementation efforts to build back better – that is when we put funds on the ground.
- And in emergency response – working with federal agencies and other partners to step in when species and communities are needed after unexpected events.
- In all of these cases, NFWF considers resilience.
- What we mean by improving resilience is improving the health of natural systems (think ecosystems) so they can absorb disruptive forces (storms, floods, drought, wildfire).



## Resilience Strategy



Hybrid of nature based and hardened infrastructure directed by comprehensive community planning.

### Community Resilience Goal for All Three Activities

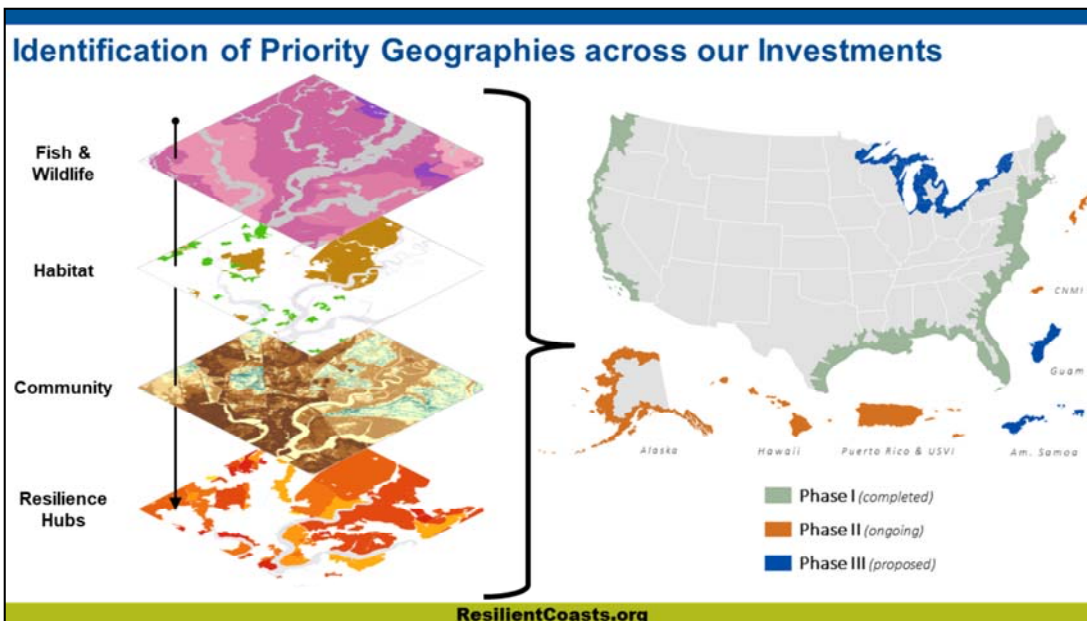
- Human Safety
- Critical Asset Protection
- Jobs Retained

### Additional Benefits of Nature Based Infrastructure Component

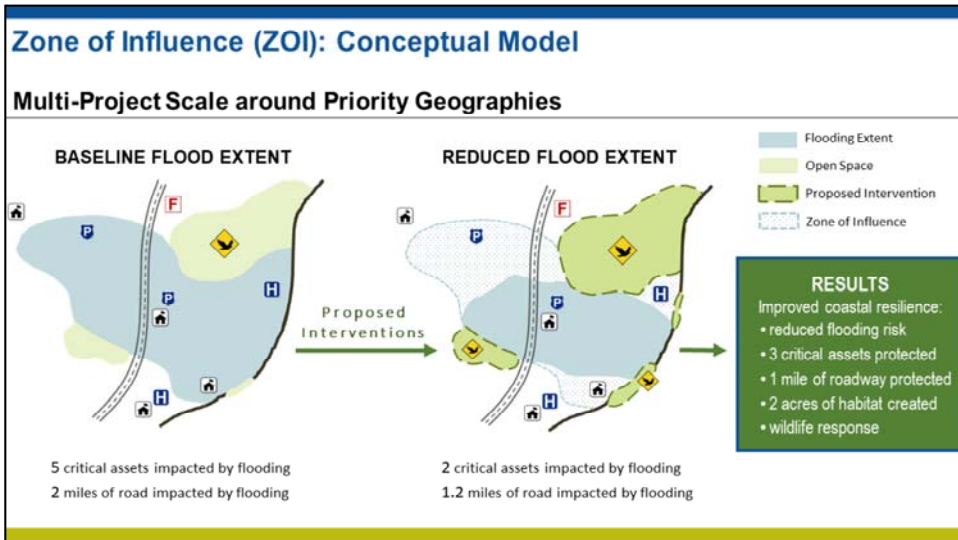
- Fish & Wildlife Habitat
- Outdoor Recreation & Tourism
- Community Engagement & Volunteering
- Additional Jobs/Economic Activity
- Cost Effectiveness/Enhanced Duration
- Water Quality
- Open Space
- Quality of Life
- Carbon Sequestration
- Industry Impacts (Commercial Fisheries)



- Our strategy is to bring nature or nature-based infrastructure to the table when planning, developing and implementing solutions.
- We want to promote the use of nature in the solution of community and wildlife residence.
- This not only can it offer community protection in many places (coastal storms, forest fires, flooding) but increase the health of habitats so species can also benefit.
- We do this in many settings from our coastal efforts to fuels management and grassland restoration and protection.
- I will focus on XXX.....



- **Identify areas where conservation projects may have the greatest potential to protect and enhance human community resilience.**
- Which areas are most important for fish and wildlife?
- Where are significant open space and protected areas?
- Where are people and assets exposed to coastal flood risk?
- We conduct formal evaluation and assessments to identify areas on the landscape where implementation of conservation actions will have maximum benefit for human community resilience and fish and wildlife habitat.
- NFWF’s Resilience assessment tool (CREST) is used to identify areas on the landscape where implementation of conservation actions will have maximum benefit for fish and wildlife habitat and human community resilience.
- And if we invest in the right place, we get huge “win-win” outcomes. – we can gain “community resilience” and “ecosystem resilience”.
- Studies show that communities with green infra fared better than others during natural events, indicating significant value to spp, hab and communities.
- Data shows that communities were better protected by natural infrastructure, and had cost savings in the long run.
- Thinking about how natural systems can protect coastal habitat, species, communities led us to build our resilience portfolio and better understand how to build resilience capacity.
- We have been in the resilience space for almost a decade; however, our resilience work is mostly about coastal right now (Sandy, GEBF, NCRF), but it shows up and arises in other areas like wildfire and drought.
- This is where we are trying to move and measure with all our work.
- For instance, while we are incorporating resilience in an obvious manner with “resilience” programs like NCRF and ECRF, we are branching beyond those into other landscapes.
- One major thing we learned with Sandy is that a successful way to build back better is by investing in nature-based solutions to make species, the habitats they rely on, and now communities more resilient across ALL our landscapes – grasslands, forests, etc.



### Conceptual models of the zone of impact model

- In partnership with NOAA, the preliminary ZOI model will be used to generate a pilot geospatial tool that will allow us to explore the likelihood of flooding events in a given area of interest and be able to use the tool to run basic scenarios to understand how the likelihood and extent of flooding may change through salt marsh habitat enhancements, such as restoring or elevating marsh habitat.
- By restoring or otherwise enhancing habitat, the flood extent will be reduced, which in turn will reduce socio-economic impacts to surrounding communities.
- In this hypothetical example, restoring coastal habitat (dark green shading) will decrease flood extent (light blue shading) leaving fewer community assets at risk of flooding.

All figures provided are hypothetical and for explanatory purposes only.

### Approach.

Determine the spatial footprint of inundation based on water height and land elevation data

Take into account elevation changes associated with specific project

Pre-project elevation

Add in change in height from project (e.g., dune or habitat heights)

Compare inundation footprints between pre- and post-project to determine area of influence

Overlay inundation footprint with infrastructure and/or habitat to estimate impacts

Analysis is project-specific, depending on availability of data and local geomorphology and infrastructure. Impact to habitats may be estimated from other metrics such as change in marsh area, fragmentation, etc.

## Test ZOI: Improving Shinnecock Reservation's Shoreline (NY)



### Improving Shinnecock Reservation's Shoreline Habitats (NY)

EZG# 44225

Award Amount: \$3,750,000

- Roughly 500 members of the Shinnecock Nation, a maritime people who once spanned a large swath of the eastern Long Island shoreline, reside in a 1.5-square-mile patch on their traditional land, encircled by the summer homes and yacht clubs of the Hamptons.
- Across the water, sea walls try to hold back the water from the shoreline homes of Southampton, but they ultimately cause the beach to be washed away, which is why officials are trying to dissuade residents from building new sea walls.
- On the Shinnecock's beach, facing Shinnecock Bay and the barrier island out in front, the sands have shifted over the years, and hurricane Sandy experienced drastic landscape alterations and loss of habitat. In its current state, the shoreline is extremely degraded and highly susceptible to sea level rise and future storm impacts.
- In 2016, we funded a project that put several measures in place to decrease erosion and increase habitat such as new marsh habitat, oyster reef planting, and eelgrass meadow restoration where it historically occurred.
- Also, the beach and upland plant community will be revived through the planting of diverse native species.
- Through these steps, the local waters will have increased carrying capacity and a stronger ability to protect the reservation and wildlife habitats. Additionally, the tidal flushing between two wetland systems will be increased, thereby increasing species diversity and acting as a mosquito vector control.
- Poured 30,000 cubic yards of sand, filled biodegradable bags with oyster shells and then laid them in rows to calm the waves and propagated local grass seeds to hold down the sand. A row of rocks were placed near the high tide line to protect the cord grasses from the southwestern winds that blow across the bay in summer.
- The project used wind and water to sculpt the sand into gently rising dunes. It has taken nearly four years to restore a modest 3,250-foot stretch of beach and buffer the burial grounds that lie just beyond.
- To what extent these natural defenses will succeed remains uncertain.

## Test ZOI: Improving Shinnecock Reservation's Shoreline (NY)

### Wave Attenuation Analysis

- Two wave models
- Analysis is approximation of ZOI
  - Not a 3D Hydrodynamic model
  - “Back of the envelope” method to determine potential zone of influence based on estimated decay coefficient
- Scenario is based on a 4 ft. storm surge (1.21m) and 6 ft. waves (1.8m)
- Analysis based on project elevations interpolated from digitized contours
- Does not take into account impact of other features (e.g., wave attenuation from marsh to lee of project)
- Likely most beneficial for marsh restoration projects



Analysis utilized two wave models:

1. USGS 2012 Wave Model (Rohweder, et. al., 2012\*)
  - Wave heights based on fetch length (unobstructed open water distance) and wind speed
  - Obstruction only (does not take into account depth)
  - No wave attenuation over inundated surface
2. GIS Wave Attenuation Model
  - Based on incoming wave heights (does not model incoming wave heights)
  - Attenuates waves over different substrates (e.g., marsh, sand spit)
  - Limited to project itself due to level of effort
  - Assumes incoming wave perpendicular to restoration line (e.g., coast)

\*Reference: Rohweder, J., Rogala, J. T., Johnson, B. L., Anderson, D., Clark, S., Chamberlin, F., Potter, D., and Runyon, K., 2012, Application of Wind Fetch and Wave Models for Habitat Rehabilitation and Enhancement Projects



## Test ZOI: Improving Shinnecock Reservation's Shoreline (NY)



**Results of living shoreline:**  
 0.2 acres of oyster reef restored  
 4 acres of beach and dune habitat restored  
 5 acres of salt marsh restored

**Accomplishments:** The beach nourishment portion of the project has remained fairly intact through two winters, including some intense winter storm activity. The beach grass is flourishing at many points along the dunes, and there is no indication, that it will not continue to propagate. However, the marsh grasses planted among the boulders have not survived nor proliferated, as expected. Future work will entail additional plantings of the spartina in the tidal zone. Additionally, one of the tidal ponds closed and had been re-opened, but will require additional stabilization of the natural curvature. Part of the long term shoreline management will include maintenance work on the opening.

### Metrics:

successfully created one "Living Shoreline"

4.00 acres with restored hydrology

4.75 acres of wetlands restored

0.2 acres of oyster reef restored

3.73 acres of beach, bluff, or dune habitat restored

0.57 miles of lower beach habitat restored

481 erosion control structures installed (snow fence, boulders, etc)

## Resilience Funding at Scale

**Hurricane Sandy Resilience Fund:** \$103M + \$55M in match = **\$158M impact**

**Emergency Coastal Resilience Fund (ECRF):** \$49M + \$60M in match = **\$109M impact**

**National Coastal Resilience Fund (NCRF):** \$59M + \$98M in match = **\$157M impact**



### EPA Geographies

- Great Lakes
- Chesapeake Bay
- Long Island Sound
- Gulf of Mexico



### Gulf Environmental Benefit Fund

- Gulf States
- Coastal Restoration
- State Plan Priorities

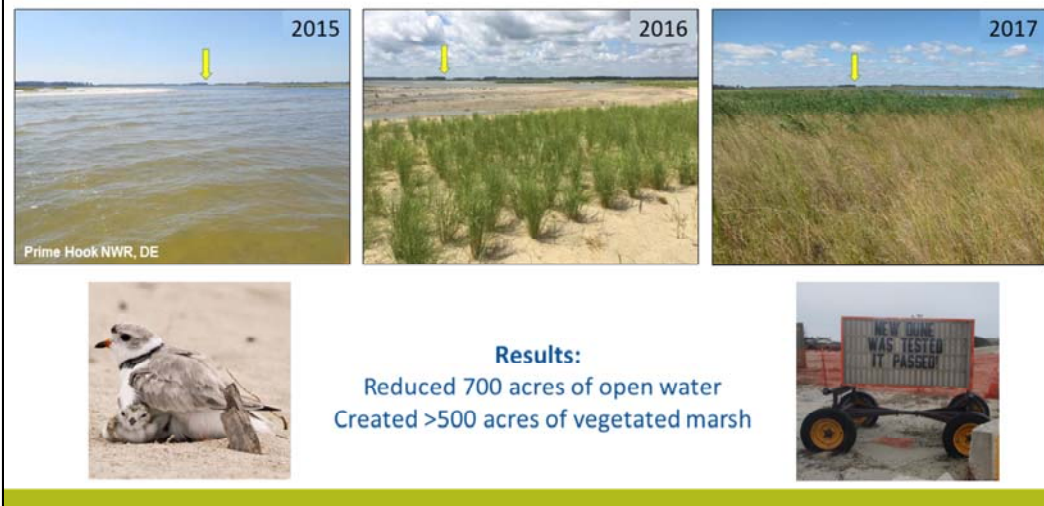


### Wildland Fires

- Fuels Management
- Forest Service Lands
- CalFire Partnership

- Able to go from reactive to proactive. Thank you congress.
- Funding is new as it relates to conservation and community resilience and being able to promote, implement, and measure nature based.
- Growing at right rate
  - Demand higher than funding but capacity is limited.
  - Building the pipeline and awareness of NBI
  - Scale up – thank you congress!
  - Metrics development

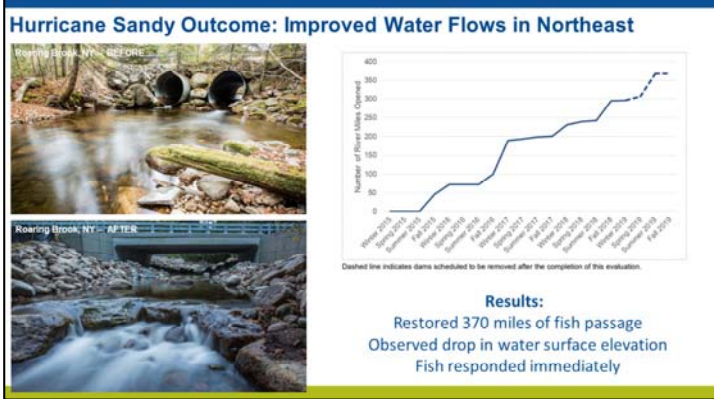
## Hurricane Sandy Outcome: Marsh Restoration in Delaware



### Prime Hook National Wildlife Refuge coastal tidal marsh/barrier beach restoration (DE)

Award Amount: \$19,805,00

- *The project restored a highly damaged tidal marsh/barrier beach ecosystem on Prime Hook Wildlife Refuge in Delaware covering about 4,000 acres within the former freshwater impoundment system on the refuge.*
- *This coastal wetland restoration improved the ability of the refuge marshes to withstand future storms and sea level rise and improves habitat for migratory birds and other wildlife.*
- *September 2016 work completed.*
- dune, beach, and back-barrier beach platform has been restored along nearly 8,000 feet of shoreline, including closure of four large breaches, using more than 1 million cubic yards of dredged from the Delaware Bay.
  - The restored dune is 9 feet high with a 100- to 600-foot-wide back barrier platform extending into the marsh.
- Refuge staff and partners conducted continued monitoring of the restoration project. Water levels, salinity, nutrients, and flow and enables the refuge to track how the restored tidal hydrology in refuge wetlands translates into new patterns of water levels, sediment concentration, and salinity.
- Prime Hook has rebounded ecologically; acres of mudflats are thriving with marsh grasses. Nesting shorebirds, including piping plovers, as well as other wildlife and fish are returning to the refuge.
- Hydrologic reconnection: A small channel dug on Prime Hook National Wildlife Refuge to reconnect the flow of water.
- Placed approximately 640,000 cubic yards of dredged material to restore the marsh tidal channels.
- Marsh vegetation has recolonized approximately 25% of the damaged wetlands.
- Observed reduced water levels post-restoration in much of the marsh interior.
- Tidal wetland grasses and other vegetation had begun to recolonize many of the exposed mud flat areas.
- Based on remote sensing, there has been an observed reduction of 700 acres of open water and an increase of over 500 acres of vegetated marsh in the 2 years post-project.



## Ausable Watershed Flood Mitigation and Fish Passage Restoration (NY)

EZG# 42874

- We examined 19 projects in the Hurricane Sandy Program portfolio that were primarily focused on removing dams, improving fish passage, replacing or removing culverts, replacing low-head bridges, and/or improving instream habitat.
- These activities were designed to reconnect rivers and streams for fish and wildlife use and mitigate storm-related flooding and safety risks.

### Findings :

- Dam removal and culvert replacement resulted in improved fish access to nearly 370 miles of upstream river habitat, supporting key species in the region.
- Early improvements in fish passage, water quality, and instream habitat have already been achieved by some projects.
- Dam removal lowered water elevations in project areas, reducing flood risk in nearby areas.
- For a subset of projects, dam removal improved human safety by removing risks associated with recreational activities and catastrophic dam failure.
- The observed ecological benefits of aquatic connectivity projects to date are consistent with expected time lags between restoration and ecological outcomes.
- Conclusion Taken together, these findings suggest that Hurricane Sandy Program investments in improving aquatic connectivity have increased the resilience of natural and human communities close to restored areas. The program enhanced fish access to a substantial amount of previously inaccessible freshwater habitat, which can improve fish productivity and survival, making those populations more resilient to disturbances. Similarly, people who live, work, or recreate near dams are less likely to be harmed by storms, through either reduced flood risk or improved safety

### Accomplishments:

- We replaced four high priority undersized culverts with climate-resilient and fish-friendly structures resulting in close to 24 miles of newly accessible habitat in New York's Ausable River watershed.
- The new culverts were designed to restore fish passage, mitigate future flooding, and reduce communities' maintenance costs.
- We developed a replicable model for improving roadstream crossings that includes a framework for site selection, a multi-stakeholder task force, and a costshare model to fund local climate-adapted infrastructure improvements.
- We created and disseminated two major outreach products to inspire and train key audiences – a video that highlights the multiple benefits of right-sizing culverts and an online training module that contains the nuts and bolts of our approach, including building partnerships, assessing fish passage, assessing vulnerability, prioritizing projects, securing funding, planning and implementing projects, sharing success stories, implementing codes and standards, and training road personnel.
- Finally, we developed educational materials to teach students a basic understanding about stream health and the co-benefits that culverts provide to meet ecological, social, and economic objectives.

Project lead-reported data show that dam removal and culvert replacement/ improvement have resulted in fish gaining access to just over 368 miles of habitat that had been inaccessible to diadromous fish for decades to centuries (Figures 2 and 4; Tables A.1 and A.2 in Appendix A). This tally represents a minimum estimate of improved habitat access, as most project leads reported only mainstem river miles opened and did not include tributaries (see Tables A.1 and A.2).



## ECRF Outcome: Living Shoreline in Florida

### Results:

- Improved 12 miles of shoreline habitat
- Created 30 acres of intertidal marsh
- Created 20 acres of estuarine nearshore reef



## Living shoreline development after impacts of H. Michael

EZG #67013

Organization: Apalachee Regional Planning Council

- This \$7.5M project is funded in part by GEBF. And is Location: Highway 98, Franklin County, Florida
- The shoreline suffers from erosion during every major storm event. The shoulder of the roadway frequently becomes undermined by wave activity where no reef or marsh currently exists. The same area has also been damaged by Hurricane Michael.
- Over the years, costly efforts to control erosion with vertical seawalls, concrete rubble, and rock riprap at the site have only provided temporary shoreline protection. These structures have a limited useful life and require expensive maintenance/replacement. Armoring structures such as these also displace natural coastal habitats.
- We will install nearshore reefs to reduce wave energy and allow the creation of expansive intertidal salt marshes.
- This will help stabilize sediment, reduce wave action, and strengthen the coastal resilience for nearby communities by protecting public infrastructure, including the Highway 98 roadway.
- The project will increase the resilience of communities around St. George Sound by restoring lost habitats for fishery resources and protecting existing public infrastructure with the addition of protective.
- The anticipated ecological and socioeconomic benefits of this project include 12 miles of shoreline habitat improved and roadway protected, 30 acres of intertidal marsh created, 20 acres of estuarine reef created, and almost 3,000 community residents benefited.
- This will be a large-scale habitat enhancement project along Highway 98 between Carrabelle and Eastpoint, FL.





## Managed Community Retreat and Ecological Restoration of Coastal Wetlands (AK)

EZG# 62282

Award Amount: \$2,731,774

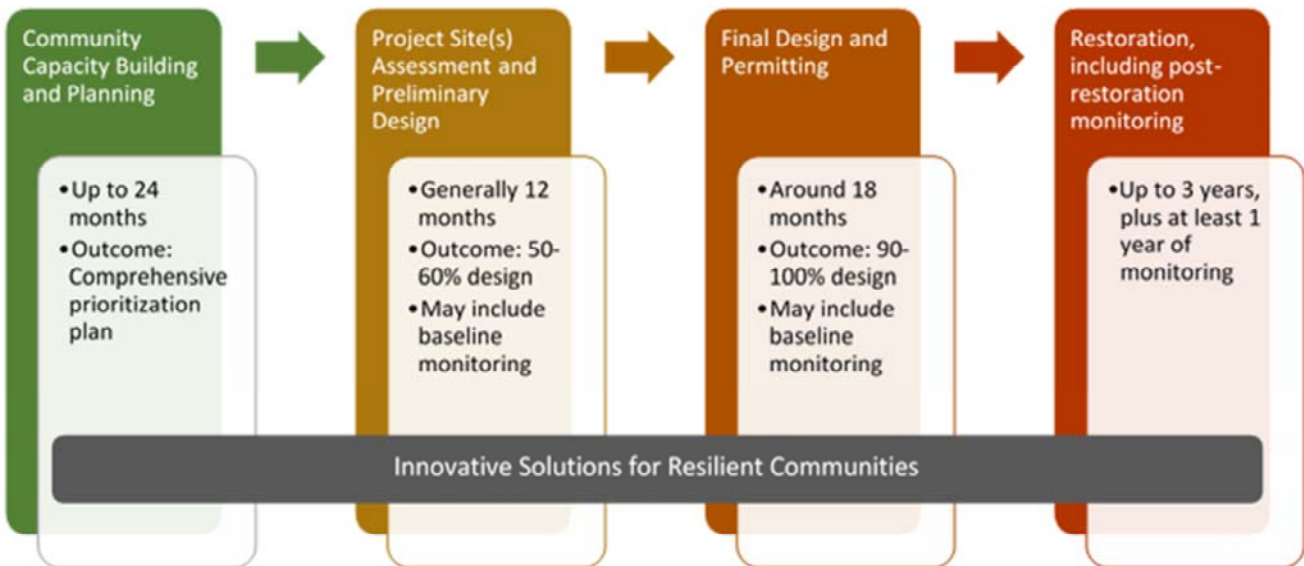
- Newtok, Alaska is a Yup'ik Eskimo village located on an island in the Yukon Delta National Wildlife Refuge, along the western coast of Alaska 12 miles from the Bering Sea.
- The community is built on a low-lying ice-rich permafrost tundra complex that is subsiding. All community infrastructure is imminently threatened by erosion, flooding, and permafrost degradation.
- Newtok is losing an average of 63 feet of shoreline per year, the highest erosion rate in Alaska. With accelerating permafrost melt and decreased sea ice, which previously buffered fall storms, this rate is expected to increase.
- Alaska Native Tribal Health Consortium is helping the community of Newtok retreat to the more resilient location of Mertarvik and restore three acres of wildlife habitat to natural conditions.
- Restore the coastal wetland habitat associated with the relocation of Alaska Native Villages for community protection as well as vital fish and wildlife habitats.
- This project addresses a dire resilience need in Alaska's most threatened coastal community and prevents contamination of invaluable fish and wildlife habitat in the biological heart of the Yukon Delta National Wildlife Refuge.
- Additionally, the project benefits critical habitat for all five species of Pacific salmon, the majority of the global breeding populations of cackler and emperor geese, the highest reported shorebird breeding density in North America, and a species threatened under the Endangered Species Act.
- Decommission 12 houses and all associated infrastructure to restore 3 acres of coastal wetland habitat in Newtok, Alaska.

## National Coastal Resilience Fund: Overview

- Third year under NFWF management
    - 2018: 35 projects for \$29 million in 23 states/U.S. territories
    - 2019: 44 projects for \$30 million in 23 states/U.S. territories
    - **2020: Request for Proposals currently open**
  - Funding available for coastal resilience projects that:
    - Provide communities with enhanced protection and buffering from impacts of sea-level rise, changing flood patterns, coastal erosion, increased frequency, and intensity of storms.
- AND**
- Protect and restore habitat for fish and wildlife.

[www.nfwf.org/coastalresilience](http://www.nfwf.org/coastalresilience)

## National Coastal Resilience Fund: Priorities



The four focus areas in the National Coastal Resilience Fund RFP represent steps in a resilience project pipeline.

Applicants should apply under the focus area that best meets their needs; projects requesting funding under multiple focus areas will not be considered.

Projects that **advance innovative approaches** that seek to re-shape our thinking on how to protect communities in light of projected environmental stressors are encouraged in each focus area.

## National Coastal Resilience Fund: Deadlines

### What is **NOT** a priority:

- Coastal 'community rebuilds' from storms
- Stand alone research projects
- Small scale / isolated projects
- Non-natural structures (hardened shorelines, aquaculture)

### Deadlines:

- Pre-Proposal Due Date – **April 8<sup>th</sup>**
- Invite-only Full Proposal Due Date – **June 25<sup>th</sup>**

[www.nfwf.org/coastalresilience](http://www.nfwf.org/coastalresilience)

These items are not a priority for NFWF, meaning that if you think they are necessary for your project, but we will consider a compelling case for these activities as to how they help advance the goals of the program.

Small scale is not necessarily a priority, HOWEVER – we do acknowledge that in the case of innovative designs, it is likely that a pilot-scale project is a necessary step in the advancement of that design. Project proposals should be clear about how a pilot scale project will advance the innovative design at scale.

Non-natural structures not okay, but a case can be made for hybrid approaches.