Ecological Adaptation Framework

Nature-based Project Prioritization for Coastal Resilience in New Jersey

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2018 New Jersey Coastal Resilience Summit
Charting a Course for the Future
October 9, 2018

Why Ecological Adaptation?

- High-Density Coastal Population and Development interspersed with Critical Natural Resources
- Natural Resources support:
  - Maritime Industries
  - Travel & Tourism Economy
  - Ecotourism
  - Flood Risk Reduction
  - Human Health & Wellbeing

Value of Ecological Adaptations

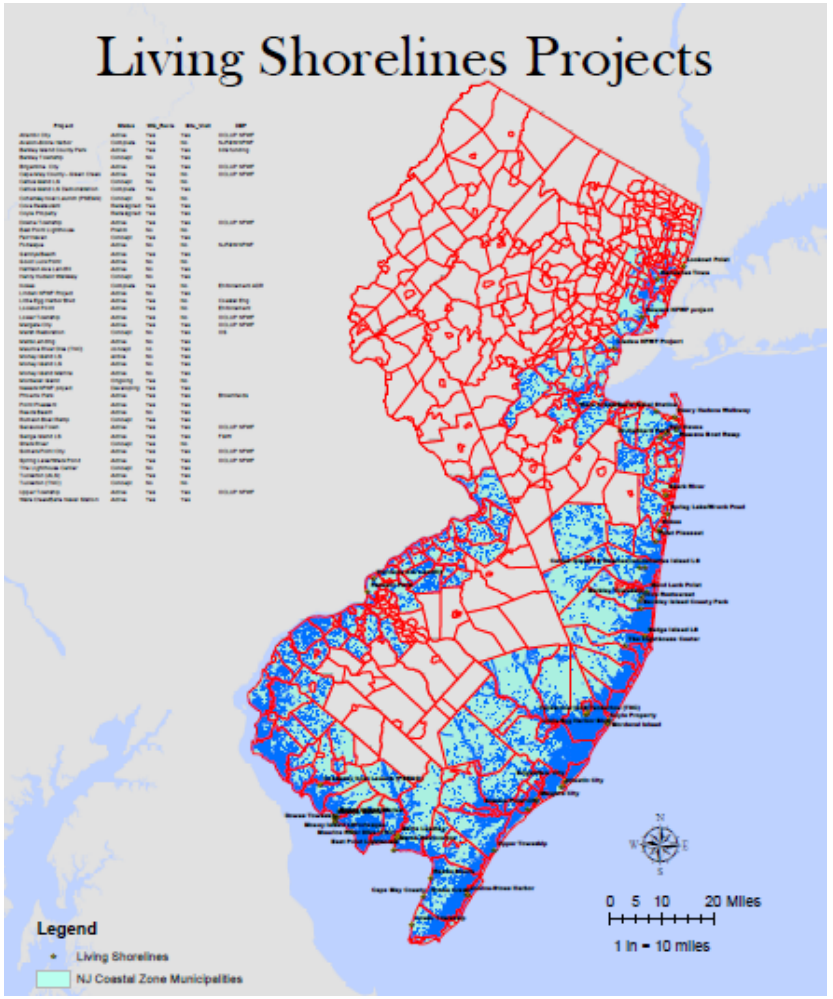
- *Reduce Community Vulnerability to Sea Level Rise*
- *Maintain healthy coastal ecosystems*
- *Reduce costs of disasters*
- *Protect critical infrastructure*
- *Minimize economic impacts of climate change*
- *Reduce the impact of climate stressors on natural systems*
- *Preserve Habitat and Migration Corridors*

Elements of Effective Ecological Adaptation

- *Function over Short-, Mid-, and Long-term Scales*
- *Adaptable over time*
- *Vary in Scope*
- *Flood Risk Reduction*
- *Continuity of Habitat & Habitat Corridors*
- *Carbon Sequestration*
- *Coordination Vehicle for Federal, State and Local Planning and Management Initiatives*

Ecological Adaptation Requirements

- Socially acceptable
- Scientifically sound
- Minimal cumulative and secondary impacts
- Capability and funding required to implement & maintain
- Politically acceptable
- Legal authority to implement and enforce
- Benefits outweigh the costs
- Sustainable
- Adaptively Manage and Maintain



Adaptation Planning Process

- Review of existing and planned projects
- Assessment of Stressors
- Identification of Issues of Concern (IOC)
- Screening of Adaptation Measures based on their ability to address IOCs
- Gap Analysis and Identification of New Projects
- Technical Analysis including C:B and EIS
- Prioritization of Projects through Tiered Rankings

Environmental Stressors:

- *Sea Level Rise*
- *Storm Frequency and Intensity*
- *Nuisance Flooding; Coastal*
- *Development*
- *Shoreline Erosion*

Potential Issues/Concerns:

- *Degradation and Habitat Loss*
- *Beach and Dune Erosion*
- *Storm Surge Damage*
- *Water Quality Impacts*
- *Nuisance Flooding*

Screening of Alternatives

- Meets the Coastal Resilience Plan Goals
- Urgency of implementation
- Ease of implementation
- Maximizes benefits
- Maximizes System-wide approach
- Mitigates climate change impacts
- Reliability of projected project benefits
- Flexibility under a range of climate change scenarios

Approach

- Regional Framework
  - System Framework
    - Developed Coastal Areas
    - Beach, Headland and Dune Complexes
    - Coastal Forest and Shrublands
    - Tidal Marshes
  - Economic Framework
    - Travel & Tourism
    - Ecotourism
    - Fisheries
    - Ecosystem Services
    - Carbon Sequestration

Ecological Projects to Address…

- Marsh & Wetland Loss
- Shoreline Erosion
- Maritime Forests and Shrubland Loss
- Coastal Flooding
- Water Quality

…for Future Resilience

Marsh & Wetland Adaptations

- Preservation
- Thin Layer Spreading
- Marsh Platform Construction
- Migration/Conservation Easements
- Ecosystem Continuity
- Edge Stabilization
- Restore Hydrologic & Sediment Connectivity
- Planting/Vegetation Enhancement
- Removal of Upland Retaining Structures & Infrastructure

Shoreline Erosion Adaptations

- Beach and Dune Nourishment
- Regional Sediment Management
- Migration/Overwash Easements
- Nature-based Sills/Reefs
- Soften Armored Shorelines
- Restore and Protect Native Vegetation

Maritime Forest Adaptations

- Preserve, Protect and Restore
- Migration/Conservation Easements
- Ecosystem Continuity
- Restoration/use of Native Plants
- Groundwater Recharge

Coastal Flooding Adaptations

- Living Shoreline Berms, Slopes & Levies
- Maritime Shrubland and Forest
- Restoration/Creation of Natural Floodways
- Nature-based Flood Retention
- Development Set-backs
- Property Acquisition

Water Quality Adaptations

- Green Infrastructure
- Groundwater Infiltration
- Restoration/use of Native Plants
- Groundwater Conservation

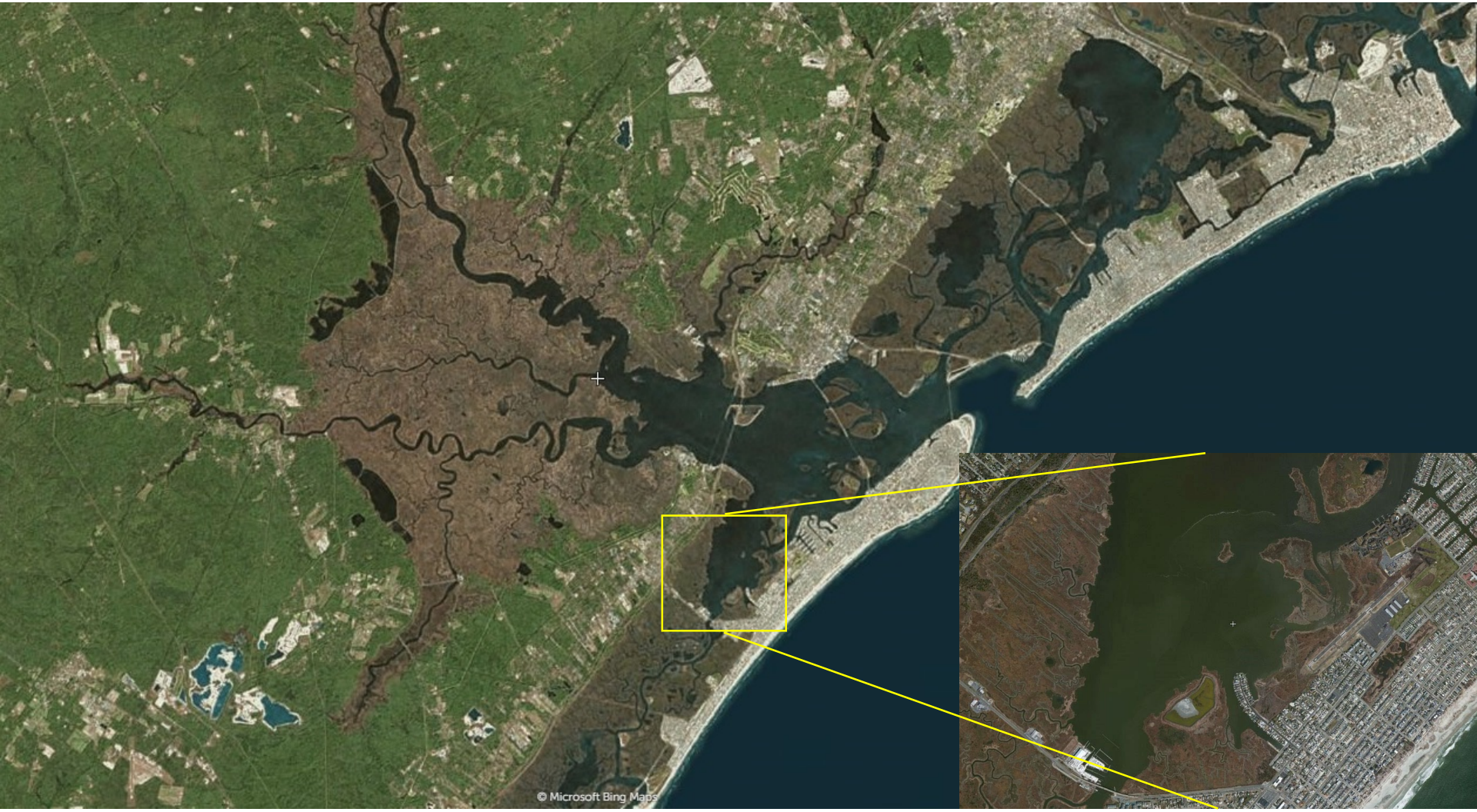
Southwest Park, Hoboken, NJ

Adaptation Prioritization Framework

- Tiered Screening Approach
  - Sustainability under climate change stressors
  - Ecosystem/Habitat continuity and preservation
  - Coastal storm surge and flood risk reduction benefits
  - Long-term adaptability & financing
  - Regulatory authority
  - Funding availability

- Weighting Based on Coastal Resilience Plan

Local Adaptation Example



Tiered Priority Ranking

Effectiveness of Adaptation Measure under Present and Future Environmental Conditions

Adaptation Measure	Sea Level Rise			Tidal Range			Current			Waves			Wakes			Storm Surge		
	Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High
	< 4 mm/yr	4 -8 mm/yr	> 8 mm/yr	< 1.5 ft	1.5 - 4 ft	> 4ft	< 3 kts	3-6 kts	> 6 kts	< 1 ft	1 - 3 ft	> 3 ft	< 1 ft	1 - 3 ft	> 3 ft	< 1 ft	1 - 3 ft	> 3 ft
Preservation	High	Medium	Low	High	High	Low	High	Medium	Low	High	Medium	Low	High	Medium	Low	High	Low	Low
Thin Layer Spreading	High	Medium	Low	High	Medium	Low	High	Medium	Low	High	Medium	Low	High	Medium	Low	High	Low	Low
Conservation Easements	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	Medium	Low
Ecosystem Continuity	High	Medium	Low	High	High	High	High	High	High	High	High	High	High	High	High	High	Medium	Low
Edge Stabilization	High	Medium	Low	High	Medium	Low	High	High	High	High	High	Medium	High	High	Medium	High	Medium	Low
Hydrologic & Sediment Connectivity	High	Medium	Low	Medium	High	High	High	High	Medium	High	High	Medium	High	High	Medium	High	Medium	Low
Vegetation Enhancement	High	Medium	Low	High	High	Medium	High	High	Medium	High	High	Medium	High	High	Medium	High	Medium	Low
Migration Corridors	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	Medium	Low

Effectiveness of Adaptation Measure in Reducing Storm Impacts

Adaptation Measure	Strom Surge Reduction			Local Flood Risk Reduction			Regional Flood Risk Reduction			Storm Wave Attenuation			Erosion Reduction		
	Minor	Moderate	Severe	Minor	Moderate	Severe	Minor	Moderate	Severe	Low	Medium	High	Minor	Moderate	Severe
Preservation	High	Low	Low	High	Low	Low	High	High	High	High	Low	Low	High	Medium	Low
Thin Layer Spreading	High	Low	Low	High	Low	Low	High	High	High	High	Low	Low	High	High	Medium
Conservation Easements	High	Medium	Low	High	Medium	Low	High	High	High	High	High	High	High	Medium	Low
Ecosystem Continuity	High	Medium	Low	High	Medium	Low	High	High	High	High	High	High	High	Medium	Low
Edge Stabilization	High	Medium	Low	High	Low	Low	High	Low	Low	High	Medium	Low	High	High	High
Hydrologic & Sediment Connectivity	High	Medium	Low	High	Medium	Low	High	Low	Low	High	Medium	Low	High	Medium	Low
Vegetation Enhancement	High	Medium	Low	High	Medium	Low	High	High	High	High	Medium	Low	High	Medium	Low
Migration Corridors	High	Medium	Low	High	Medium	Low	High	High	High	High	High	High	High	Medium	Low

Appropriate Development and Land Use Conditions for Adaptation Measure

Adaptation Measure	Shoreline Type			Development Density			Stormwater Runoff			Adjacent Land Ownership			Existing Maritime Use			
	Hard	Hybrid	Soft	Low	Medium	High	Low	Medium	High	Conserved	Public	Private	Farming/ Fishing	Industry/ Marina	Recreation	Conservation
Preservation	Low	Medium	High	High	High	Medium	High	Medium	Low	High	High	Medium	High	Medium	High	High
Thin Layer Spreading	Low	Low	High	High	High	Medium	High	Medium	Low	High	High	Medium	Medium	Low	High	High
Conservation Easements	Low	Low	High	High	Medium	Low	High	High	High	High	High	Medium	High	Low	High	High
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Vegetation Enhancement	Low	High	High	High	Medium	Low	High	Medium	Low	High	High	Medium	High	Medium	High	High
Migration Corridors	Low	Low	High	High	Low	Low	High	Medium	Low	High	High	Low	High	Low	High	High

Possible Prioritized Adaptations


Thank You