

Developing engineering guidance for Natural and Nature-based features

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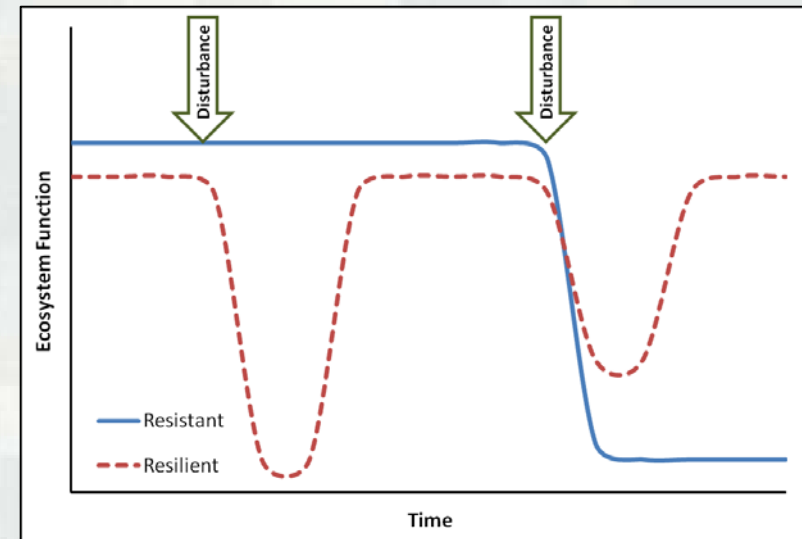


US Army Corps
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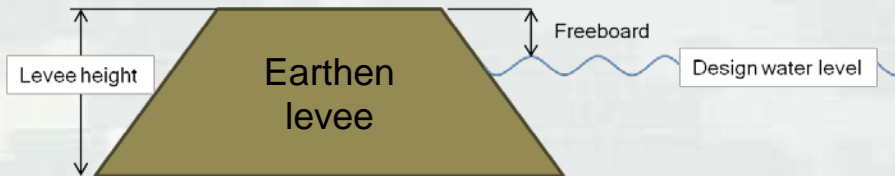
Natural and Nature-based Features

- Natural structures are resilient, adapting to changes in physical, biological, geologic, and chemical processes
- Nature-based features created by humans to provide specific services, such as coastal risk reduction. Intersection of engineering and ecology.



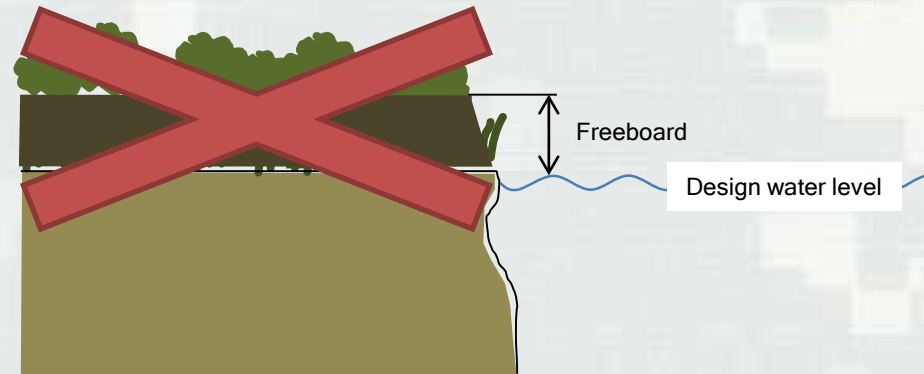
Engineering design must account for ecosystem function

Structural engineering approach



Traditional engineering deals with uncertainty by employing a margin of safety such as extra freeboard in levee design

Ecological engineering approach



Increasing the height of a constructed marsh to add freeboard will convert the site to an upland that will not function as a marsh



Cross-cutting project: developing NNBF engineering guidance

Dunes



Sea Grant
NJ Sea Grant Consortium

Research Projects
2014-2016

Facilitating Natural Dune Building R/6410-0013

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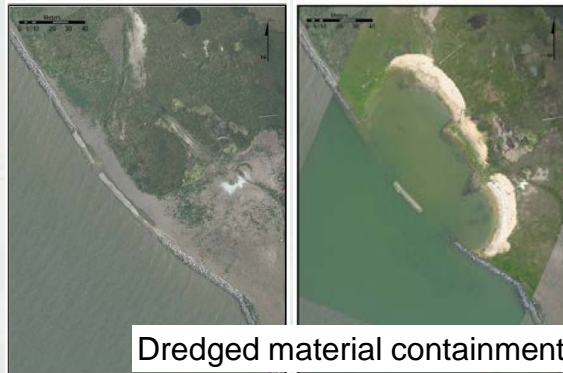
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Assessments of damage along the New Jersey shores after Tropical Storm Sandy indicate that the condition of the dunes had a pronounced effect on susceptibility to flood and wave damage. Not all dunes were alike, with dunes eroded by natural processes, some were created by direct deposit of fill, water were

Naturally eroding dune at Avonlea 2009



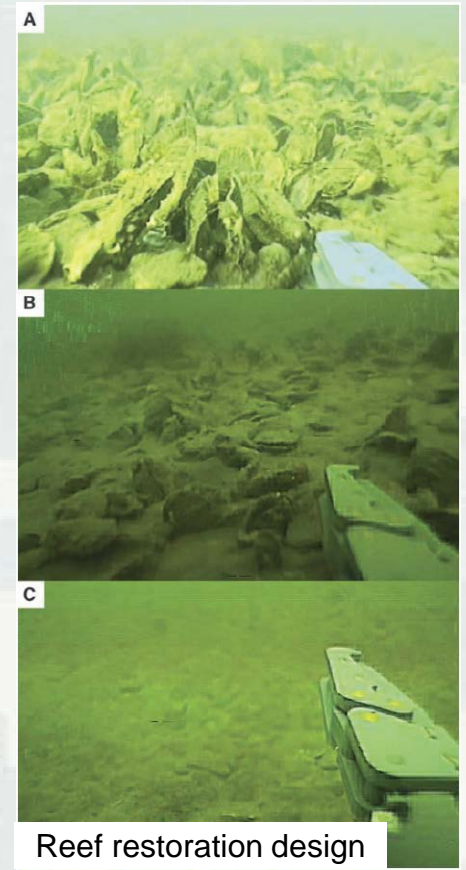
Wetlands



	Florida	The Netherlands
Dispersed	A	C
Clumped	B	D

Planting technique

Oyster Reefs



Engineering Challenges and Opportunities

1. Appropriate design criteria and performance metrics (beyond survivability)
2. Quantifying costs and benefits (engineering, ecosystem, and social)
3. Designing for constructability
4. Communication (successes, failures, and emerging opportunities)
5. Multidisciplinary collaboration
6. Scaling (lab to project to shoreline to coast)
7. Interaction of multiple features within a system
8. Standardized methodologies/metrics for measurement, analysis, and monitoring

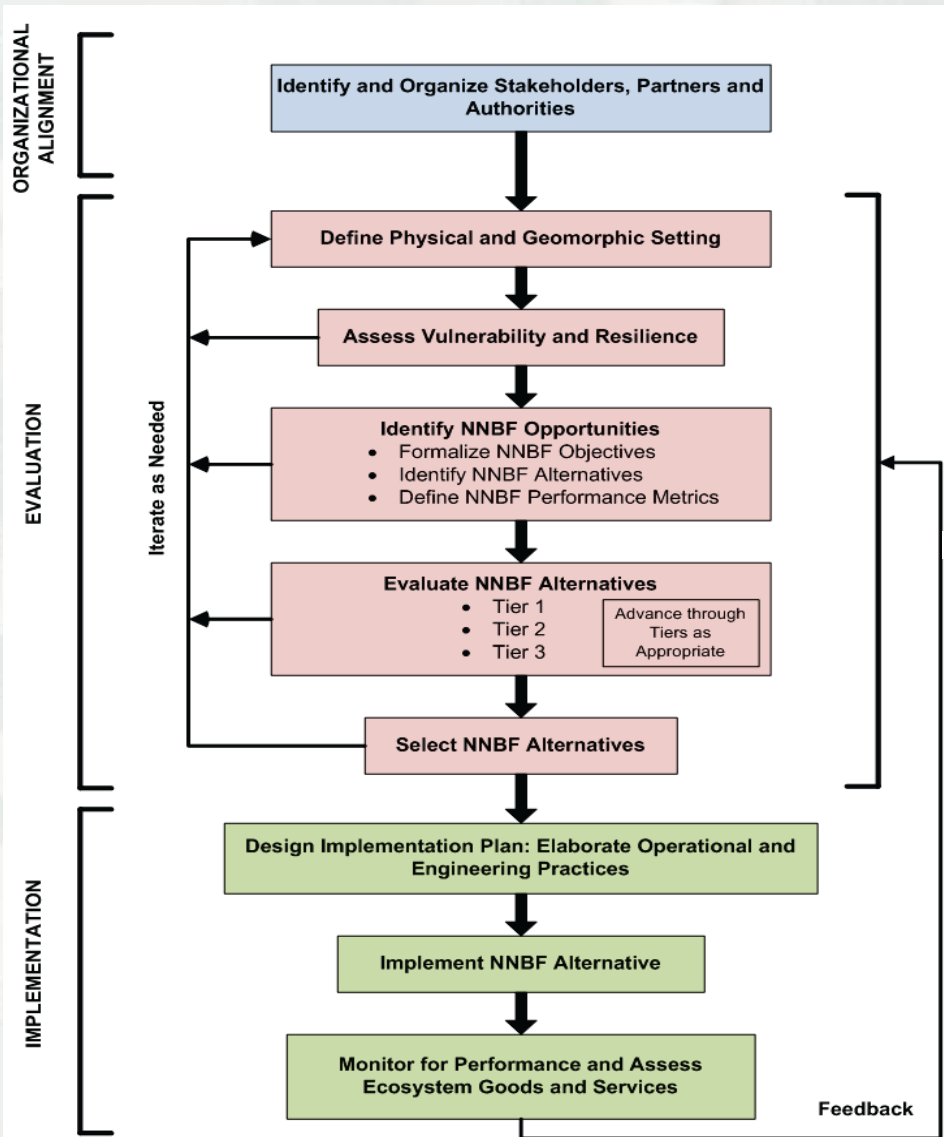


Overall Objectives

- Develop **guidance** to **evaluate, design, construct, monitor, and maintain** NNBFs
- Needed to **design, assess, and implement** successful NNBFs
- Build a community of practice with stakeholders from other agencies (e.g, NOAA)



Process/Path forward



- Developing series of guidance documents for different NNBFs
 - ▶ Islands
 - ▶ Beaches and Dunes
 - ▶ Biogenic Reefs
 - ▶ Wetlands
 - ▶ Combining NNBFs

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