The Department of the Interior Metrics Expert Group Report

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Recommendations for assessing the effects of the DOI Hurricane Sandy Mitigation and Resilience Program on ecological system and infrastructure resilience in the Northeast coastal region

https://www.doi.gov/hurricanesandy/news/hurricane-sandy-project-metrics-report

The DOI Hurricane Sandy Program

- DOI funded over 140 projects, about $342 million for projects aimed at improving resilience
- Need for a resilience assessment, to see how effective projects were
- July 2014, DOI convened a team of scientists and socio-economists charged by DOI to identify measurements to assess changes in coastal resilience resulting from DOI-sponsored projects.

Key Definitions

Resilience:

- ***The ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions (Executive Order 13653).***

Performance Metric:

- ***A qualitative or quantitative measurement or suite of measurements (index) that can be used to detect and assess a change in DOI coastal resilience objectives.***

Core Performance Metrics:

- ***A subset of performance metrics that are applied to multiple projects and at the full range of temporal and spatial scales to detect a change in resilience in one or more coastal features.***

Metrics Organized by Natural and Artificial Coastal Features

- *Beach System: Beach, Barrier Island, and Dunes*
- *Nearshore Shallow and Nearshore Deep*
- *Riverine and Riparian Zone*
- *Marshes and Wetlands*
- *Uplands and Watersheds*
- *Maritime Forests and Shrublands*
- *Estuaries and Ponds*
- *Built Environment: Grey infrastructure*
- *Green Infrastructure: Living shorelines*
- *Green Infrastructure: Other methods*

Ecological Performance Metrics

- *Organized by Natural and Artificial Coastal Features*
- *Provides Objectives and Ecosystem Services*
- *Identifies Performance Metrics, and*
- *Recommends Core Performance Metrics*

Protocols for measuring potential performance metrics

Provides protocol name, associated performance metrics, and citation/source

Organized by:

Biotic
- Fish and Wildlife Species
- Habitat
- Landscape Context Metrics

Abiotic
- Hydrology/Wave Energy
- Water/Air Quality
- Soils/Sediment

Structural/Engineering
- Shoreline Position
- Coastal Topography/Elevation


SET Installation


Subbottom profiles in nearshore

Natural and Artificial Coastal Features
Marshes and Wetlands

Objectives and Ecosystem Services

1. Mitigate coastal flooding by restoring or improving marsh hydrology and tidal dynamics
2. Improve water quality and reduce contaminant levels
3. Provide high quality habitat for salt marsh biota
4. Decrease erosion and enhance marsh accretion and resilience to sea level rise
5. Maintain and enhance shoreline integrity; preserve marsh area and distribution to support migration corridors, e.g., maintaining marsh and wetland habitat in flyways
6. Dissipate wave energy from storm surges associated with future coastal storms to, protecting habitat and communities
7. Increase infiltration and decrease erosion by reducing impervious surface effects on resilience
8. Use information and modeling to help articulate community risk reduction benefits of marshes and wetlands

Recommended Core Performance Metrics

Biotic

- Salt marsh plant community monitoring (e.g., species composition, percent cover, areal coverage of the high and low marsh community type)
- Nekton abundance, species richness
- Species – based on accepted community of practice

Abiotic

- Marsh accretion and erosion
- Groundwater dynamics
- Water quality: salinity, conductivity, temperature, dissolved oxygen, pH

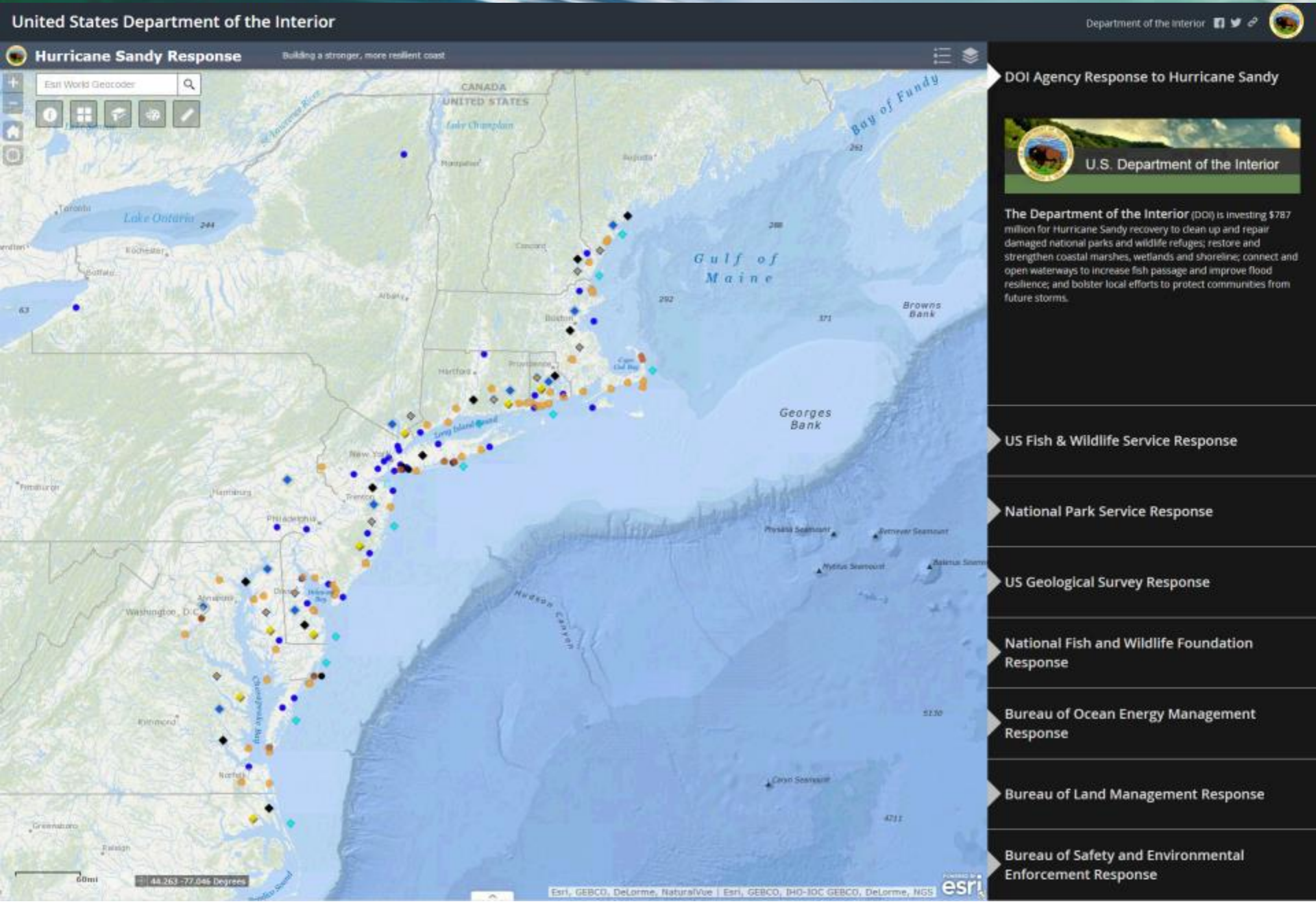
Structural/Engineering

- Marsh surface elevation change trend - long-term 3+ years and short term

Note: Longer list of potential performance metrics in report

Next Steps

- Develop Socio-economic Metrics
- Implement Ecological and Socio-economic Metrics – Targeted Geographies
- Conduct Independent Resilience Assessment of DOI Projects



http://fws.maps.arcgis.com/apps/MapSeries/index.html?appid=17a3ad1b05884d369c0b24fbcd57b6b9

Natural Infrastructure Metrics Workgroup

Rick Bennett

December 4, 2015

A Systems Approach to Geomorphic Engineering (SAGE) Workgroup

U.S. Fish and Wildlife Service and National Wildlife Federation, co-chairs

NIMW Goals:

Develop core metrics that cut across agency missions, supporting efficiencies and knowledge base that demonstrate that natural infrastructure is:

- **Effective**
- **Resilient**
- **Cost Effective**

NIMW Approach:

1) **Convene** multi-agency/organization team

2) **Compile** a list of intermediate and final services per organization

3) **Compile** list of metrics per organization

4) **Identify and fill** knowledge gaps

5) **Select** a common core set of metrics

Ecosystem Good or Service:

ECOLOGICAL: Provide Habitat; Maintain Biodiversity; Protect TES; Buffer Ocean Acidification

SOCIOLOGICAL: Provide Recreation; Provide & Support Navigation; Produce-Provide Food, Feed, etc.; Provide & Improve Aesthetics; Promote Environmental Justice; Protect Property Value; Protect Cultural Heritage; Provide & Support Education; Provide-Support Scientific Research

HYDROLOGICAL: Reduce Storm Surge & Flooding; Provide Flood Storage; Attenuate Waves; Provide and Store Groundwater; Reduce Overtopping; Reduce Current - Wave Velocity; Restore Functional Hydrology

GEOLOGICAL: Reduce & Control Erosion; Protect & Enhance Healthy Soils

BIOGEOCHEMICAL: Improve Water Quality; Sequester & Convert Nutrients; Reduce Hazardous-Toxic Materials

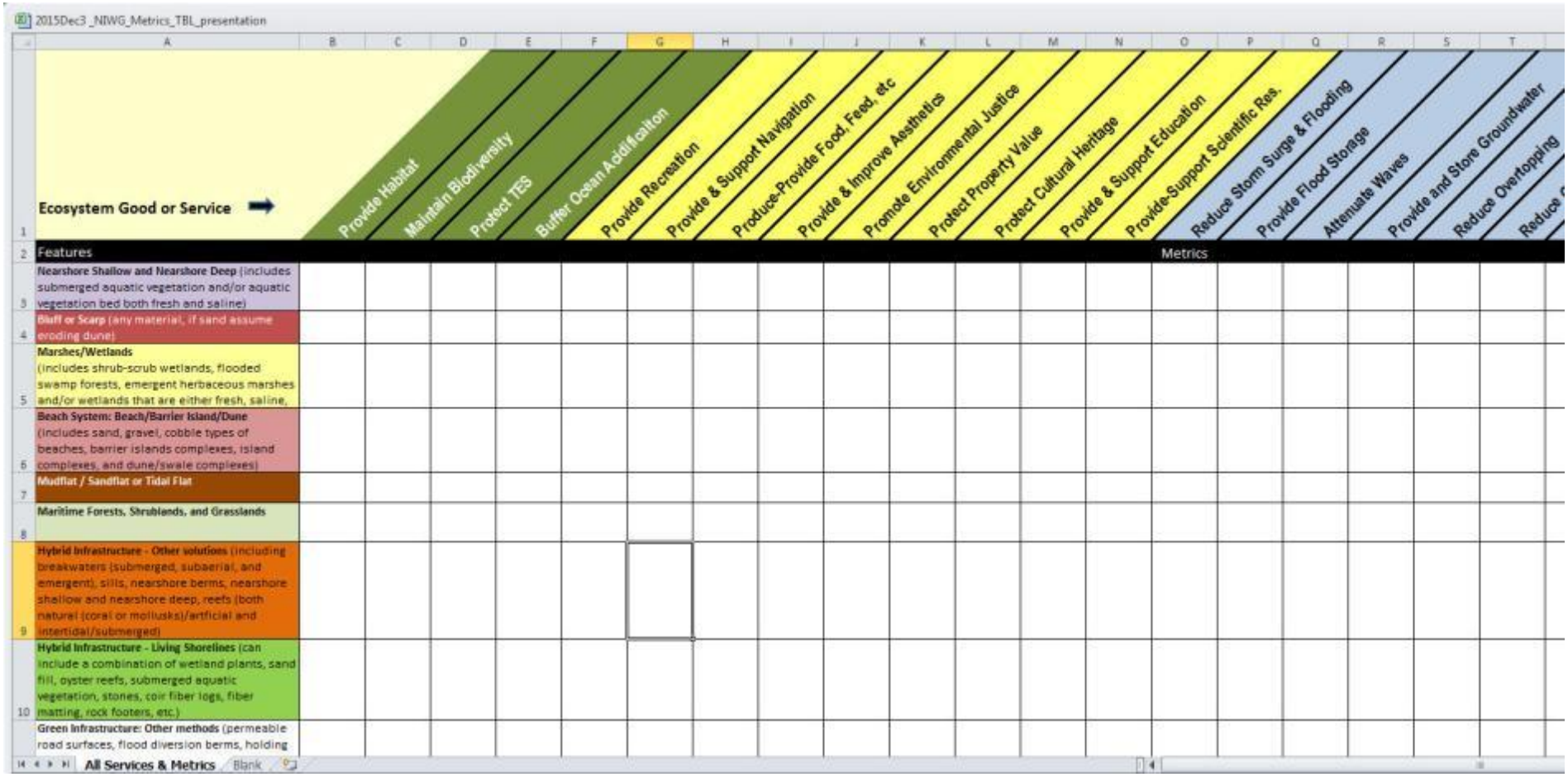
CLIMATOLOGICAL: Regulate Microclimate; Sequester Carbon

OTHER: Reduce Wildfire Potential; Protect Against Wind Shear; Attenuate Drought

Features:

- Nearshore Shallow and Nearshore Deep
- Bluff or Scarp
- Marshes/Wetlands
- Beach System: Beach/Barrier Island/Dune
- Mudflat/Sandflat or Tidal Flat
- Estuaries/Ponds
- Upland/Watersheds
- Maritime Forests, Shrublands, and Grasslands
- Riverine/Riparian Zone
- Hybrid Infrastructure
- Hybrid Infrastructure - Living Shorelines
- Green Infrastructure

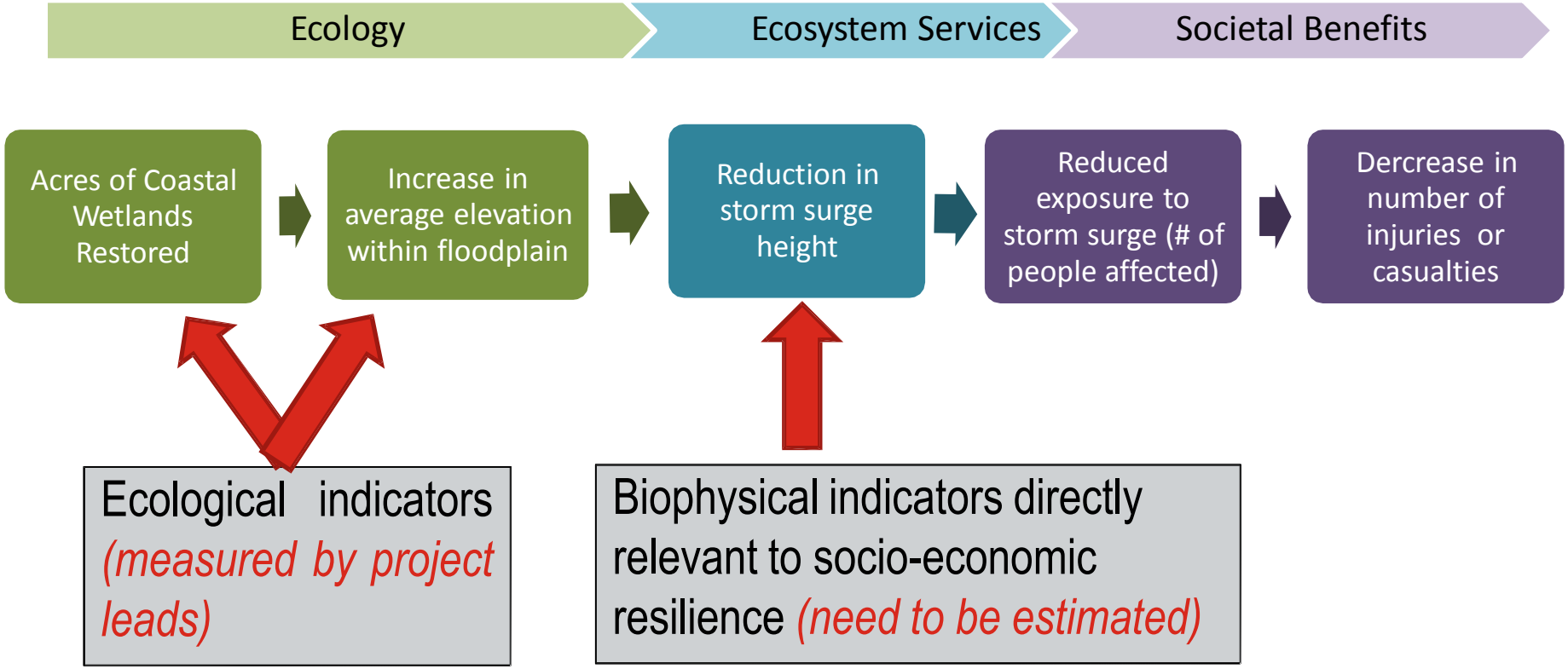
The “Spreadsheet”



Intermediate and Final Services are incorporated in the spreadsheet

Generate Causal Chain

- **For example, Causal Chain for Wetland Restoration**



Final Thought

"If resilience is built through a project, and no perfect resilience metric is around to measure it, does it have an impact?"

Anonymous, National Adaptation Forum, St. Louis, MO 2015