Protected Areas
And
Disaster Resilience

World Parks Congress
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US National Park Service
Clemson University
Yala National Park, Sri Lanka
Rio Plantano Reserve, Honduras
Kuwait
Davos Protection Forest, Switzerland
Strategic Sciences Group Mission

• To provide science-based assessments and interdisciplinary scenarios of environmental crises affecting Departmental resources,

• to rapidly assemble trained teams of scientists during a crisis, and

• deliver results to leadership in support of decision-making.
Office of Strategic Services (OSS) 1942-45

- Focus on mission, not process
- Expertise not representation
- Access to leaders
- “PhDs who can win a bar fight”
Deepwater Horizon Oil Spill, 2010
Methods: Scenario Building

- Evacuations
  - Disruption of daily behavioral patterns
    - Mental and physical stress
      - Heightened stress in socially vulnerable populations
    - Heightened stress to local service providers
      - Continued physical and mental health impacts
Methods: Scenario Building

Levels of Scientific Uncertainty

5  Certain
4  Reasonably Certain
3  Probable
2  Plausible
1  Unlikely
0  Not Possible
NK Not Known

after Weiss, 2003
Early sketches, DWH recovery scenario framework
In May 2010, the U.S. Department of the Interior (DOI) established a Strategic Sciences Working Group (SSWG) to assess how the Deepwater Horizon (DH) oil spill may impact the ecology, economy, and people of the Gulf of Mexico (GOM). It included scientists from diverse disciplines and federal, academic, and nongovernmental organizations. The SSWG was not to conduct a scientific investigation, but to provide rapid scientific assessment of potential consequences of the spill that could provide usable knowledge to decision-makers.

Such teams are not common to formal government response efforts. Most scientific activity at early stages of the spill was tactical, e.g., documenting preimpact conditions, monitoring oil transport, assessing resource damage, and supporting technical decisions associated with oil containment. Interdisciplinary and comprehensive analyses of consequences were not integral to these tactical efforts. The SSWG was a strategic and experimental response initiated by DOI, novel to the DH spill for its combination of (i) independence from standard response structures [e.g., the Incident Command System (ICS) and Natural Resource Damage Assessment (NRDA)]; (ii) collaborative engagement of federal and nonfederal scientists; (iii) rapid their requisite data may be unavailable, and many key factors are unknown. Scenario-building, originally developed for the military (2) and adapted by large-scale firms and others, offers several advantages, particularly its capacity to systematically examine possible zones through recovery. Baseline stress in the GOM was treated as increasing before the DH oil spill, due to nutrient loading, expansion of the seasonal hypoxic area, wetland loss, land subsidence, invasive species, climate change, fishing pressures, effects of past hurricane
Coastal Communities & Ecosystems: First Tier Consequences
Coastal Communities & Ecosystems: First Tier Consequences

- Changes in coastal geomorphology
- Ecological impacts
- Atypical freshwater/saltwater mixing
- Flood damage to the built environment and property
- Wind damage to the built environment and property
- Loss of electricity
- Disruption of recreational and commercial fishing
- Closure of outdoor recreation resources
- Storm preparedness and response activity - especially flood related (flood fighting, fortification and planning)
- Injury, stress and loss of human life
- Altered perception of risk in the affected region (citizens, private sector, government officials)
- Increased voluntary individual and organizational activity
- Altered beliefs and values related to sense of place

Hurricane Sandy

Hurricane 2018
Hurricane Sandy

- Changes in coastal geomorphology
- Overwash and breaches of barrier islands and beaches
- Changes to coastal submerged areas
- Shoreline and profile change
- Damage to iconic cultural resources
Hurricane 2018

Changes to coastal submerged areas
- Changes in navigational hazards
  - Increase in risk (recreational boating injury)
  - Changes in navigation routes
- Changes in habitat (eel grass)
- Changes in wave impact
- Changes in availability and accessibility of dredge materials
  - Depleted accessibility and availability of dredge materials
  - Higher cost of dredge materials
Interventions

• **Interventions**: institutional actions that increase resilience of the coupled human-natural system to future major storms.

• **Intervention Value**: a subjective assessment (H/M/L) of the return on investment and pervasive positive impact on the system.
**Intervention:** Prioritize and implement ecosystem-based and engineered risk-reduction projects on a regional basis to maximize multiple benefits.

- Ecological Change
- Changes in Coastal Geomorphology
- Atypical Fresh/Saltwater Mixing
- Flood Damage to the Built Environment
- Wind Damage to the Built Environment
- Loss of Electricity
- Disruption of Commercial and Recreational Fishing
- Closure of Outdoor Resources
- Altered Storm Preparedness and Response Activity
- Injury, Stress, and Loss of Human Life
- Altered Perception of Risk
- Increased Voluntary Activity
- Altered Beliefs and Values
Key Sandy Insights

• As the region is a complex coupled human/natural system, so too are the consequences of Hurricane Sandy.

• These consequences are not fully understood, and responses should account for uncertainty.

• Resilience is best understood and achieved when applied at the full system level.

• Neither “gray” nor “green” infrastructure rebuilds or restorations are individually sufficient to prepare future storms.

• The speed and effectiveness in rebuilding from Sandy will have major consequences for the impact of future storms.
Sandy Supplemental Funds
Project Evaluation Criteria

- **Policy:** Contribute to funding objectives, youth/veteran engagement, collaboration and partnerships, significance

- **Resilience:** Leverage, risk, return on investment, speed to functionality, sustained benefits, pervasiveness

- **Project Management:** Project plan and objectives, project team
Hurricanes
Wildfires
Dam failures
Drought
Arctic oil spills

Earthquakes

Megastorms

Bioterrorist attacks