The U.S. Geological Survey’s National Perspective on Restoration

Strategies, Priorities, Accomplishments, and Challenges

Matthew Andersen
mandersen@usgs.gov
<table>
<thead>
<tr>
<th>Fundamental Human Needs</th>
<th>Ecosystems provide</th>
<th>Related Ecosystems Mission Area Programs</th>
<th>Research Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Subsistence</strong></td>
<td>Food, water, atmosphere, raw materials</td>
<td>Fisheries, Wildlife, Invasive Species CRU</td>
<td>Energy and wildlife interactions; population, species &amp; habitat assessments; pollinators; fish and aquatic systems; Biofuels; carbon sequestration; new tools and techniques</td>
</tr>
<tr>
<td><strong>Protection</strong></td>
<td>Protect us from the elements, fiber, shelter, social security, health systems</td>
<td>Environments, Invasive Species</td>
<td>Coastal processes, restoration, fire, early detection, priority ecosystems, new tools and techniques, disease emergence and spread</td>
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<tr>
<td><strong>Affection &amp; Understanding</strong></td>
<td>Connections-Understanding our life within the planet</td>
<td>Fisheries, Wildlife, Environments, Status and Trends, Invasive Species CRU</td>
<td>New tools and techniques; data collection, monitoring, modeling, analysis; basic biology</td>
</tr>
<tr>
<td><strong>Participation</strong></td>
<td>We participate in it, being “in” the landscape</td>
<td>Fisheries, Wildlife, Environments CRU</td>
<td>Population assessments; adaptive management; fire ecology; water quality; landscape conservation</td>
</tr>
<tr>
<td><strong>Leisure &amp; Creativity</strong></td>
<td>Provide opportunity</td>
<td>Fisheries, Wildlife, Environments CRU</td>
<td>Population assessment; adaptive management; landscape conservation</td>
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<tr>
<td><strong>Identity &amp; Freedom</strong></td>
<td>Part of our identity, sense of place, laced with culture</td>
<td>Fisheries, Wildlife, Environments, Invasive Species</td>
<td>Endangered species; priority ecosystems</td>
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Ecosystems Strategic Science
Plan Priorities

• Understand how drivers influence ecosystem change
• Understand the services that ecosystems provide to society
USGS Science Priorities

1. Recovery and Management
   - T&E Species

2. Detection and Control
   - Invasive Species
   - Pathogens
   - Wildlife Disease

3. Decision Support
   - Ecological and Economic Uses of Land and Water

4. Ecological Adaptation and Mitigation
   - Climate Change
   - Sea-Level Rise
   - Nitrogen Deposition
   - Acidification

5. Strategies for Resilience
   - Sustaining and Restoring Ecosystem Function and Services
USGS Integrated Research Areas

- Integrated Assessment of Coastal Risk and Resiliency
- Combined Environmental and Socioeconomic Impacts of Natural Hazards
- Environmental Impacts of Alternative Energy Development
- Documenting and Assessing Environmental Flows
- Innovative Technologies for Environmental Assessment
Volume and extent of release

<table>
<thead>
<tr>
<th>Extent of Release</th>
<th>Volume</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.9 M barrels</td>
<td>Oil slick: 68,000 mi² = 180,000 km²</td>
<td>April 20-July 15, 2010</td>
</tr>
</tbody>
</table>

- 184.8 M gallons = 699.6 M ℓ = 700,000 m³
  (1 barrel of oil = 42 gallons)
- 25% captured, 25% dissolved, 24% dispersed, 26% in environment (National Incident Command 2010)
- 1.84 M gallons Corexit dispersant
  (= 6.966 M ℓ = 7,000 m³)
- Approx. 500 km of shoreline oiled, 100 km heavily
Multi-disciplinary emergency response to *Deepwater Horizon (DWH)*

- Federal flow estimation: helps determine impacts and penalties
- Oil provenance: *DWH* origin confirmed
- Water monitoring: freshwater releases into GOM
- Wetland monitoring: on site and remote
- Microbial and chemical monitoring
- Coastal Marine Geology: sand berm monitoring
More impacts on *Spartina* than *Phragmites*
Compare: June 17, 2009 and June 23, 2010

*Photos: Oct, 2010 by Harmon Brown
LA Dept. of Natural Resources
Hurricane Sandy
Multi-disciplinary emergency response to Sandy

- Developed a Sandy Response Science Plan
- Measure changes in elevation in the near shore and on shore
- Measure changes in sand: how did beaches, dunes, and berms respond?
- How did storm hydrology change flows? Where do we need gages for next storm?
- What toxic materials remain?
- How were natural environments and species affected?
Challenges

• Shared definitions of
  • Landscapes and Hydroscapes
  • Ecosystem Services
    • Monetary
    • Non-monetary
Support and restore natural assets

Good science for good decisions

Investments now to yield tomorrow’s returns

Ecosystems Science at USGS
Partnering for Science