Quantifying the Impacts of Climate Change to the Department of the Interior

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Quantifying the Impacts of Climate Change to the Department of the Interior

Jonathan Steele & Christian Crowley
DOI, Office of Policy Analysis
May 18, 2016
DOI Climate Change Climate Preparedness Overview

• Overview of DOI Mission

• Initial Bureau Activities
  • National Park Service (NPS)
  • U.S. Fish and Wildlife Service (FWS)
  • U.S. Geological Survey

• Secretary Order 3289
  • Landscape Conservation Cooperatives
  • Climate Science Centers

• DOI Climate Change Adaptation Policies and Guidance
  • Departmental Manual Chapter (2012)
  • Guidance Documents (Health and Safety, Training, Facilities)
DOI Climate Change Climate Preparedness Overview

- DOI Bureau Adaptation Activity highlights
  - NPS – Climate Change Response Program
  - FWS – LCCs, Comprehensive Conservation Management Plans
  - USGS – CSCs, National Climate Change and Wildlife Science Center, Climate Change and Land Use Mission Area
  - Bureau of Land Management – Rapid Ecoregional Assessments
  - Bureau of Reclamation – WaterSMART
  - Bureau of Indian Affairs – Tribal Adaptation Planning
DOI Sites in Hampton Roads Region

- Plum Tree Island National Wildlife Refuge
- Back Bay National Wildlife Refuge
- Great Dismal Swamp National Wildlife Refuge
- Fort Monroe National Monument
- Colonial National Historic Park (Jamestown and Yorktown)
Purpose and Goals of DOI’s Work to Quantify Impacts of Climate Change

• DOI’s work is primarily in response to Executive Orders 13653 (Section 5) and 13693 (Section 13)
• DOI Leadership interest in quantifying climate change impacts on DOI’s water management responsibilities
• Goals include:
  • Develop a framework that could be adapted and applied to other DOI regions and mission areas
  • Develop a better understanding of DOI’s financial exposure to climate change
  • Develop a better understanding of costs for management options to manage climate change risk
Estimating DOI’s Financial Exposure to Climate Change in the Southeast U.S.

• Focused on 54 DOI sites in VA, NC, SC, and GA

• Why we choose the southeast U.S.
  • Many DOI sites, but more limited management responsibilities
  • Clear climate threats, such as sea-level rise
  • NPS and FWS are active in climate adaptation planning; have available underlying information
Estimating DOI’s Financial Exposure to Climate Change in the Southeast U.S.

### Resource Types
- Infrastructure
- Ecosystems and Habitats
- Recreation

### Climate Impact Categories
- Road Service Level
- Bridge Service Level
- Wetland Type Conversion and Loss
- Invasive Species Range Expansion
- Visitation Changes
- Recreational Freshwater Fishing Opportunity Changes
- Built Asset Inundation and Loss
- Wildland Fire Frequency, Size and Severity
- Economic Benefit of Recreation Changes
- Recreational Trail Use Opportunity Changes
- Visitor Fee Collection Changes
Estimating DOI’s Financial Exposure to Climate Change in the Southeast U.S.

- Climate scenarios from EPA’s Climate Impacts and Risk Analysis (CIRA)
- Reference scenario is “no climate policy” for GHGs
- High future precipitation scenario (IGSM-CAM)
- Dry future (MIROC)
- Cumulative costs for 2015-2100 are $9-$10 million (2015-$)

<table>
<thead>
<tr>
<th>Category</th>
<th>Cost (2015-$)</th>
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</thead>
<tbody>
<tr>
<td>Infrastructure</td>
<td>$4 billion</td>
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<tr>
<td>Ecosystems and Habitats</td>
<td>$5 billion</td>
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<tr>
<td>Recreation (benefits)</td>
<td>-$0.1 billion</td>
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<tr>
<td>Coastal Assets</td>
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</tr>
<tr>
<td>Invasive Species</td>
<td></td>
</tr>
<tr>
<td>Visitor Revenue</td>
<td></td>
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</tbody>
</table>
Analyzing Bureau of Reclamation Basin Studies

- Basin studies apply water supply/demand modeling to Reclamation’s service areas in the West, e.g. Henry’s Fork of the Snake River (ID)
- Sectors: agriculture, consumption, groundwater, fisheries
- We developed a simple valuation of the no-adaptation scenario (no crop-switching, irrigation upgrades, etc.)
- Applied economic values of water to basin study projections of future water shortfalls in the years 2030-2059
- Market value of crops harvested in the Basin ($212.8/a-f/yr)
- Shortage 83,000-132,000 acre feet per year, depending on droughts
- Agriculture market impacts: $18-$28 million (normal/drought)
NPS Coastal Assets and SLR

• Identify NPS assets threatened by 1 m SLR
• 40 coastal units
• 10,000 assets categorized:
  high/intermediate/limited exposure
• High exposure assets (about 3,700):
  current replacement value over $41 billion
• Over 80% of replacement value is for fortifications
• Study not intended for unit-level decision-making
• Study does not account for resource condition, priority to the unit, current level of storm threat
• Future work: 30 additional coastal units; case studies of current strategies
• www.nature.nps.gov/geology/coastal/coastal_assets_report.cfm
SLAMM: Sea Level Affecting Marshes Model

- Accounts for the dominant processes in wetland conversion and shoreline modifications during long-term sea level rise
- Inundation, erosion, accretion, salinity, island overwash, soil saturation
- Integrates SLR with infrastructure information
- Open source; GIS-based; publicly available inputs
- Stochastic treatment of uncertainty
- Not hydrodynamic; simple erosion model; no feedback into ecological systems; no socioeconomic (cost) information
- Applied to more than 100 FWS Refuges