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

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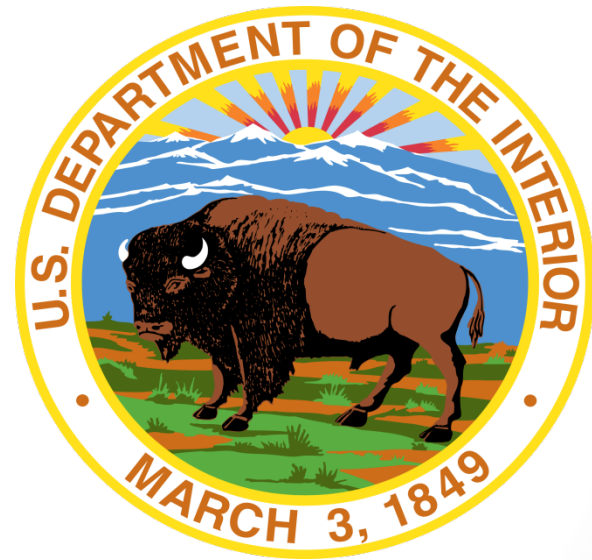
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# Quantifying the Impacts of Climate Change to the Department of the Interior

Jonathan Steele & Christian Crowley

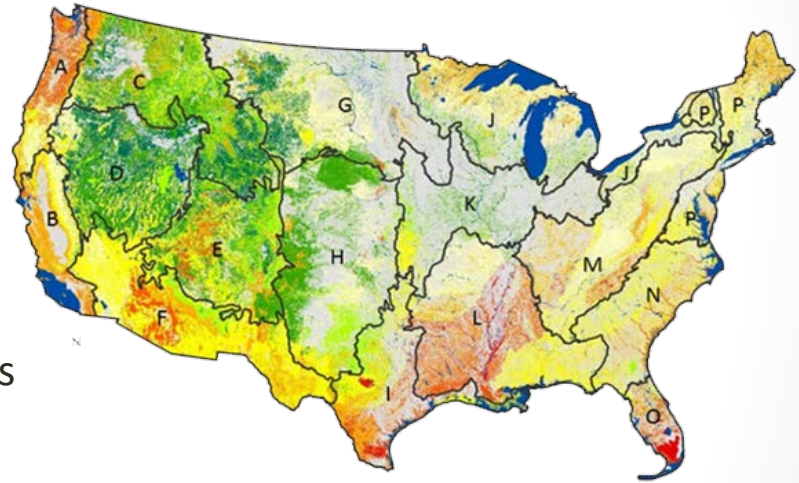
DOI, Office of Policy Analysis

May 18, 2016



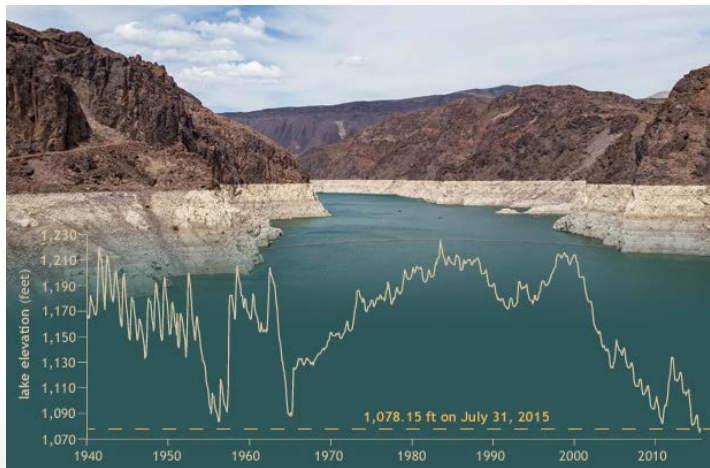
# DOI Climate Change Climate Preparedness Overview

- 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

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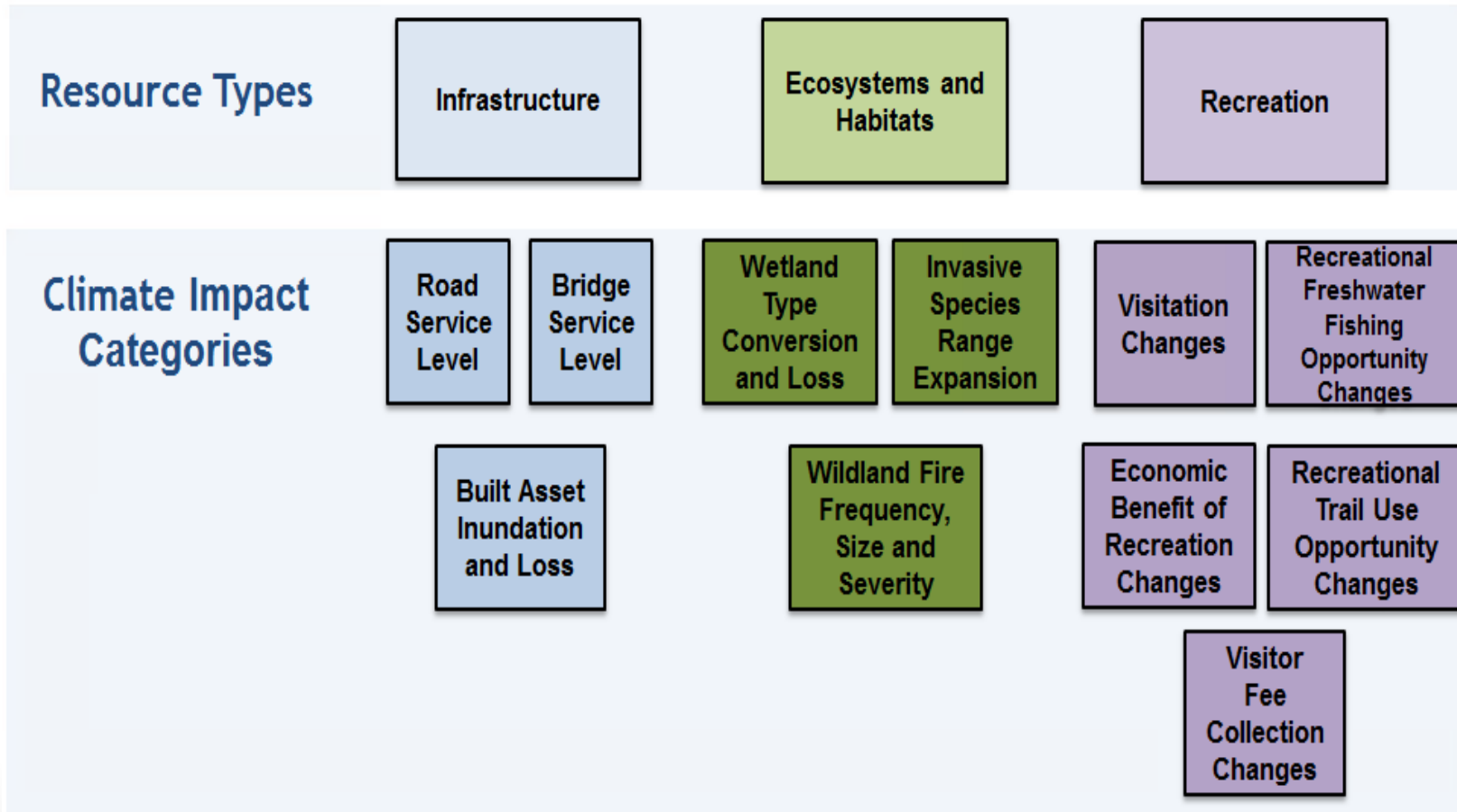
- DOI's work is primarily in response to Executive Orders 13653 (Section 5) and 13693 (Section 13)
- DOI Leadership interest in quantifying climate change impacts on DOI's water management responsibilities
- Goals include:
  - Develop a framework that could be adapted and applied to other DOI regions 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.





# 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-\$)

**Infrastructure**

\$4 billion

**Ecosystems and  
Habitats**

\$5 billion

**Recreation  
(benefits)**

-\$0.1 billion

Coastal Assets

Invasive Species

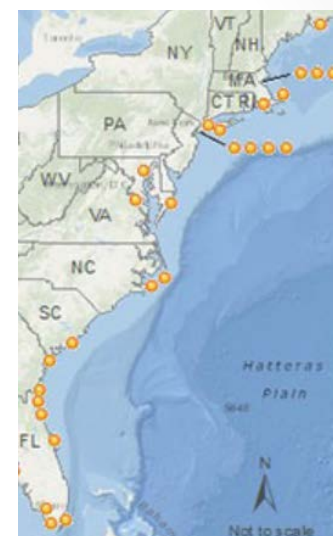
Visitor Revenue

# 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](http://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

