Climate Change and Hampton Roads

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Today's Program

- Eric Walberg and Ben McFarlane, HRPDC – Introduction and Overview of HRPDC Climate Change Project
- Harry Wang, VIMS – Sea-level Rise and Storm Surge in Hampton Roads
- Barry Stamey, Noblis – Storm-surge modeling
- Duane Apling, Northrop Grumman – Climate Change Modeling
- Eric Walberg – Formation of Climate Change Working Group and Goals for the Next Year

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Hampton Roads Climate Change Initiative

- 3-year grant project with the Virginia Coastal Zone Management Program
- Year 1: Begin stakeholder process and identify broad impacts of climate change on Hampton Roads
- Year 2: Assessment of impacts and development of policy recommendations through stakeholder process
- Year 3: Analysis of infrastructure and economic impacts and completion of the regional framework for mitigation and adaptation to climate change

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What is Climate Change?

- "Any change in climate over time, whether due to natural variability or as a result of human activity." (IPCC 2007)
- "There is *very high confidence* that the global average net effect of human activities since 1750 has been one of warming." (IPCC 2007)
- "Most of the observed increase in global average tempearture since the mid-20th century is *very likely* due to the observed increase in anthropogenic GHG concentrations."
- Primary driver of climate change is increased emissions of greenhouse gases: current CO2 concentration around 385ppm
- Rising GHG concentrations lead to increased radiative forcing, which causes global average temperatures to increase

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Observed and Projected Global Changes

- Temperature rise: 1.5° F increase in global average temperature since 1900 (USGCRP 2009)
- Sea-level rise: Increase from 1.8mm/year (1961 to 2003) to 3.1mm/year (1993 to 2003) (IPCC 2007)
- Decrease in snow and ice extent
- Changes in precipitation patterns
- Changes in extreme weather events

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Observed and Projected Impacts: Temperature Rise

- Higher average temperatures
- Higher high temperatures
- Increased frequency of heat waves
- Species shifts
- Potential for reduced biodiversity of ecosystems
- Changes in crop production capability

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Projected Mid-Atlantic Climate Change Impacts: Precipitation

- Potential for more precipitation
- Seasonal shift in rainfall
- Increased concentration of precipitation
  - More intense storms
  - Longer periods of drought
- Impacts on water quality, water resources, agriculture, and infrastructure

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Projected Mid-Atlantic Climate Change Impacts: Sea-Level Rise

- Inundation of coastal areas
- Increased erosion of vulnerable landforms
  - Potential for crossing thresholds where massive changes occurs in a short period of time
- Magnification of storm surge impacts

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Projected Extent of Climate Change in Hampton Roads

- Governor's Commission on Climate Change:
  - 3.1° C average warming for Virginia by 2100
  - 11% precipitation increase
  - Sea-level rise between 2.3 and 5.2 ft by 2100
- Major Challenges for Hampton Roads
  - Infrastructure impacts due to sea level rise and associated increase in storm surge
  - Flooding and loss of wetlands due to sea level rise
  - Potential economic disruption due to sea level rise

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Impacts: Built Environment

- Sea level rise
  - Inundation of infrastructure (transportation, water, sewer, etc.)
  - Inundation/erosion of public and private property
- Storms
  - Erosion
  - Flooding

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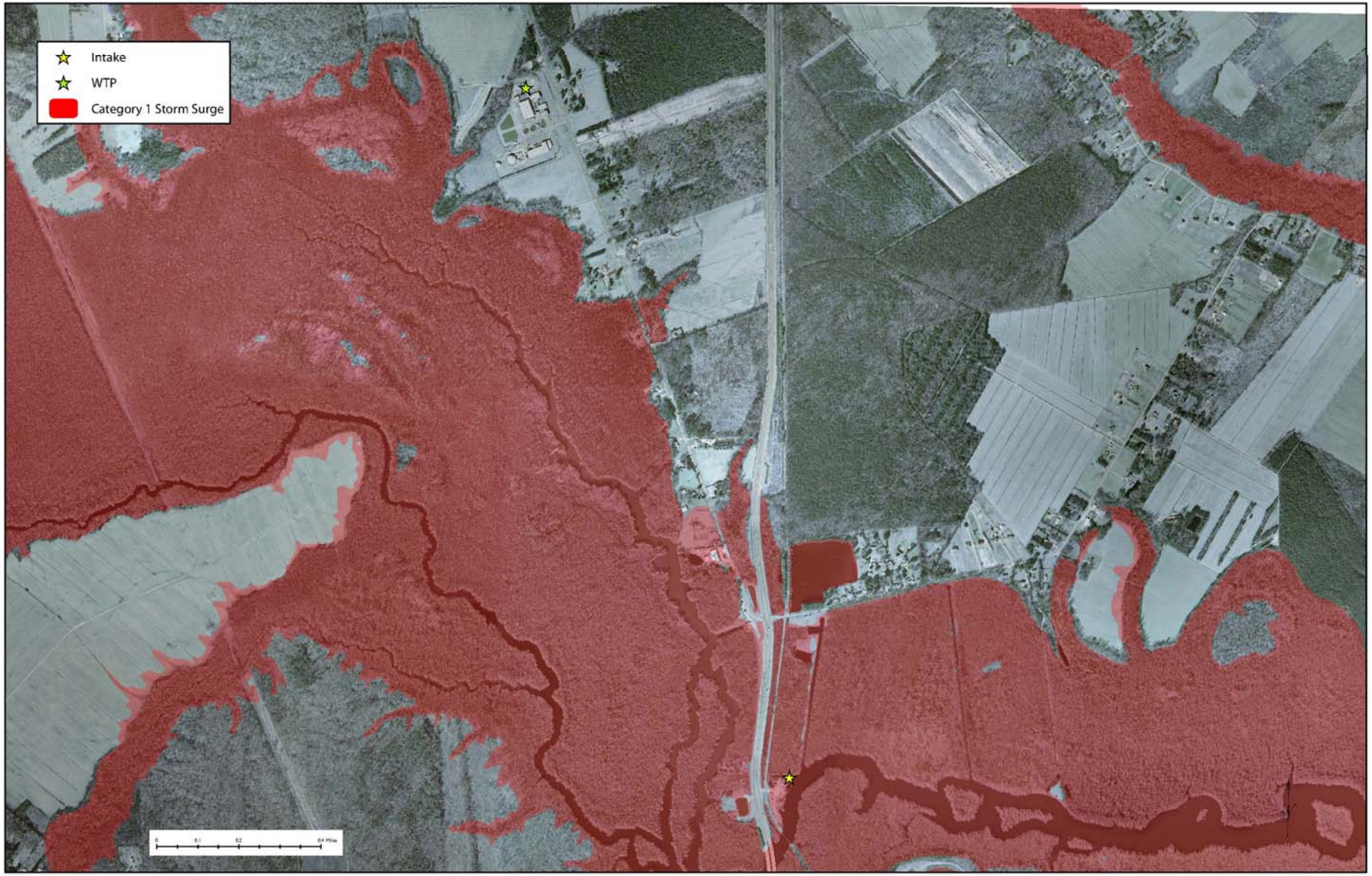

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Natural Environment

- Sea level rise
  - Inundation of wetlands and other ecologically significant areas
  - Increased salinity of tidal waters
- Storms
  - Erosion of coastal areas
  - Destruction of green infrastructure
- Temperature rise
  - Decline in some species
  - Potential for increase in invasive species

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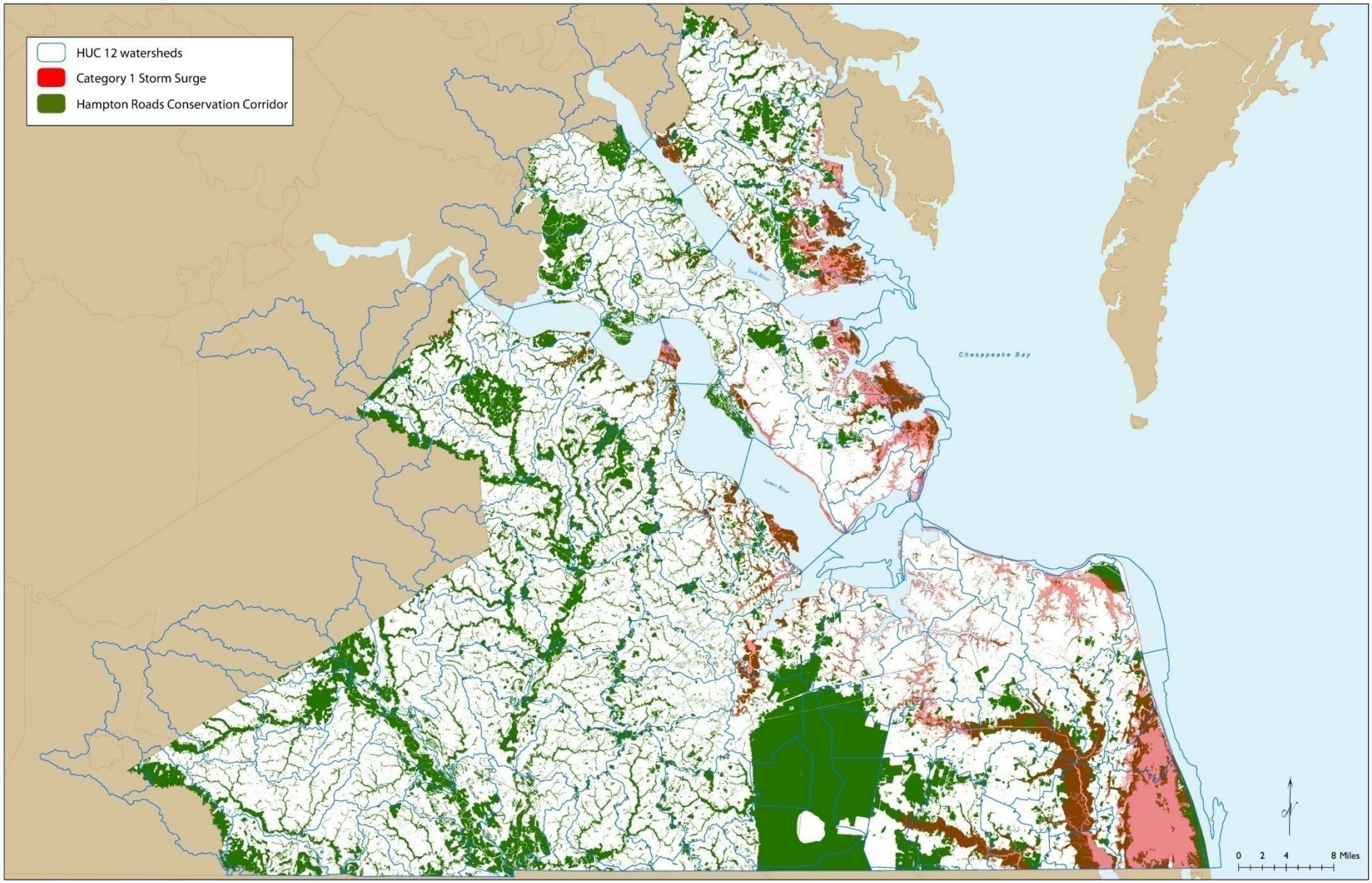

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Development of a Framework for Response to Climate Change in Hampton Roads

- Adaptive Management Approach
  - Assessing risk
    - Probability
    - Consequence
    - Vulnerability
  - Reducing risk
    - Prevent
    - Prepare
    - Respond
    - Recover

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Related Regional Planning Efforts

- Hazard Mitigation Plan Update: Combined effort for Peninsula and Southside
- Critical Infrastructure Project: Focus on resiliency, will include climate change in the range of issues considered
- Regional Green Infrastructure Project

Example Climate Change Planning Documents

- Living with a Rising Bay: Vulnerability and Adaptation in San Francisco Bay and on its Shoreline (April 7, 2009)
- Thames Estuary 2100 (April 2009)
- Sea Level Response Strategy for the State of Maryland (October 2000)
- PlanNYC: Climate Risk Information (February 2009)

Year Two Project Goals

- Initial Assessment of Economic Impacts
- Tool Development: Sea Level Rise Impacts
- Initial Policy Recommendations: Built Environment
- Initial Policy Recommendations: Natural Environment
- Draft Framework for the Response to Climate Change in Hampton Roads

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Formation of Working Group

- Formation of regional working group to discuss options for mitigation and adaptation to climate change (15-20 members)
  - Local government staff
  - NGOs
  - Researchers
  - Military
  - Business
  - State/federal agencies
- Will meet approximately six times over the next year to provide input to the HRPDC effort and develop consensus recommendations on options

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