Mapping and Monitoring of Wetland Dynamics for Improved Resilience and Delivery of Ecosystem Services in the Mid-Atlantic Region

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Introduction

Study objectives

1. Develop ***improved wetland mapping and change detection*** using remote-sensing data from multiple, complementary sensors at various temporal and spatial scales;
2. Study ***the socioeconomic and physical drivers of wetland change*** affecting wetland extent and function at regional scales;
3. Assess ***the impacts of multiple environmental stressors,*** particularly the anthropogenic ones;
4. Quantify ***vulnerability of wetlands and wetland ecosystem services*** under multiple climate and land use change scenarios.

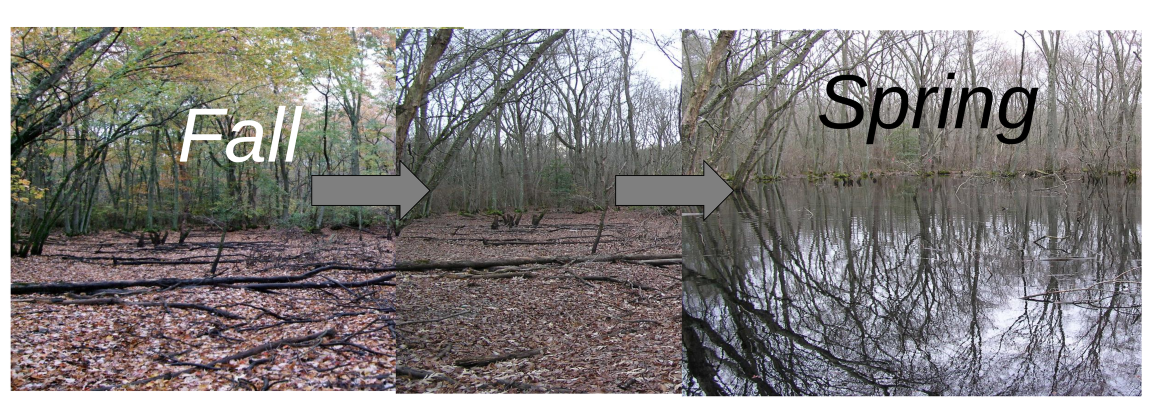
Study Area

The Chesapeake Bay Watershed (the most productive estuary in US with a coverage of 165,758 km^2) with focus on the Atlantic Coastal Plain Physiographic Region.

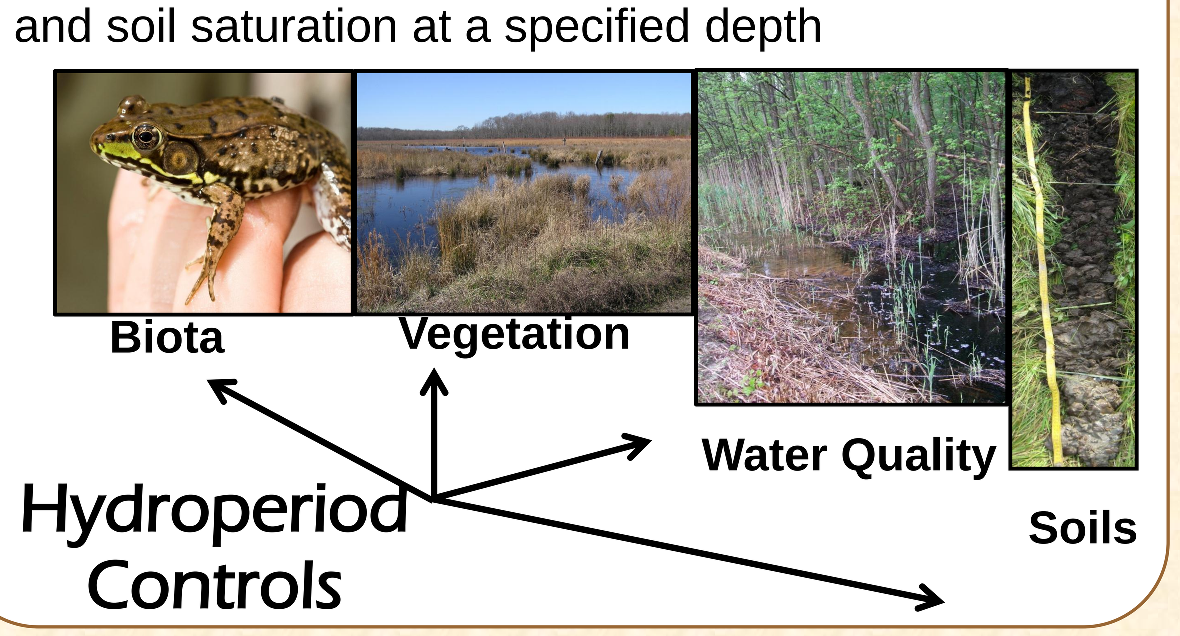
Figure 1. Chesapeake Bay watershed and surrounding area.

Monitoring Key Drivers

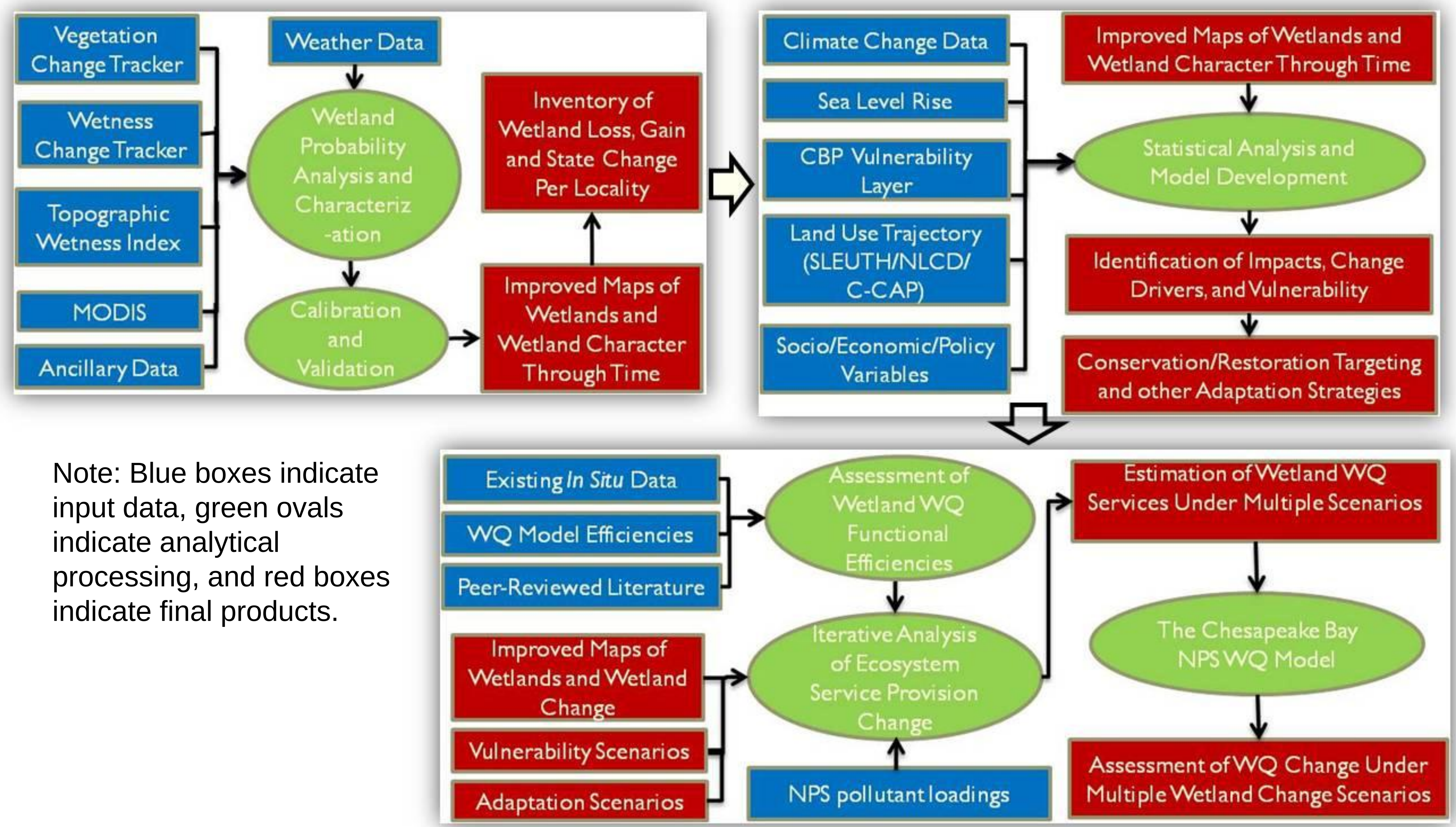
- Accurate, dynamic wetland maps can improve society's resilience to increasing urbanization, population growth, and climate change through
  - early detection and improved understanding of climate change effects
  - enhanced management of wetlands to target desired ecosystem services
- Wetland hydroperiod is the most important abiotic factor controlling wetland extent and function.



HYDROPERIOD: Duration and frequency of flooding and soil saturation at a specified depth



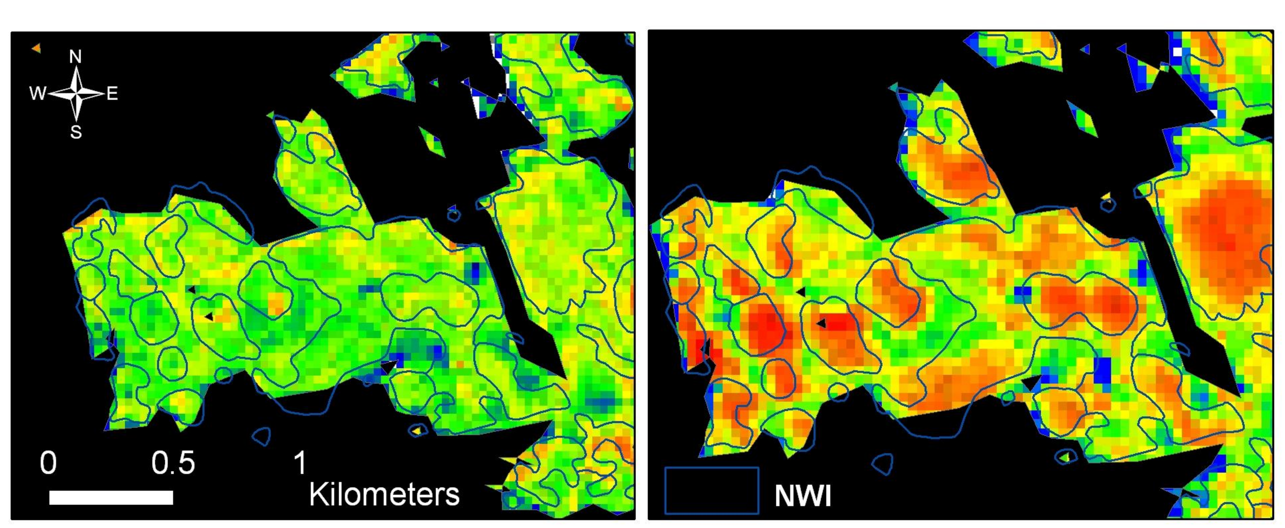
The Overall Design of the Proposed Study



Note: Blue boxes indicate input data, green ovals indicate analytical processing, and red boxes indicate final products.

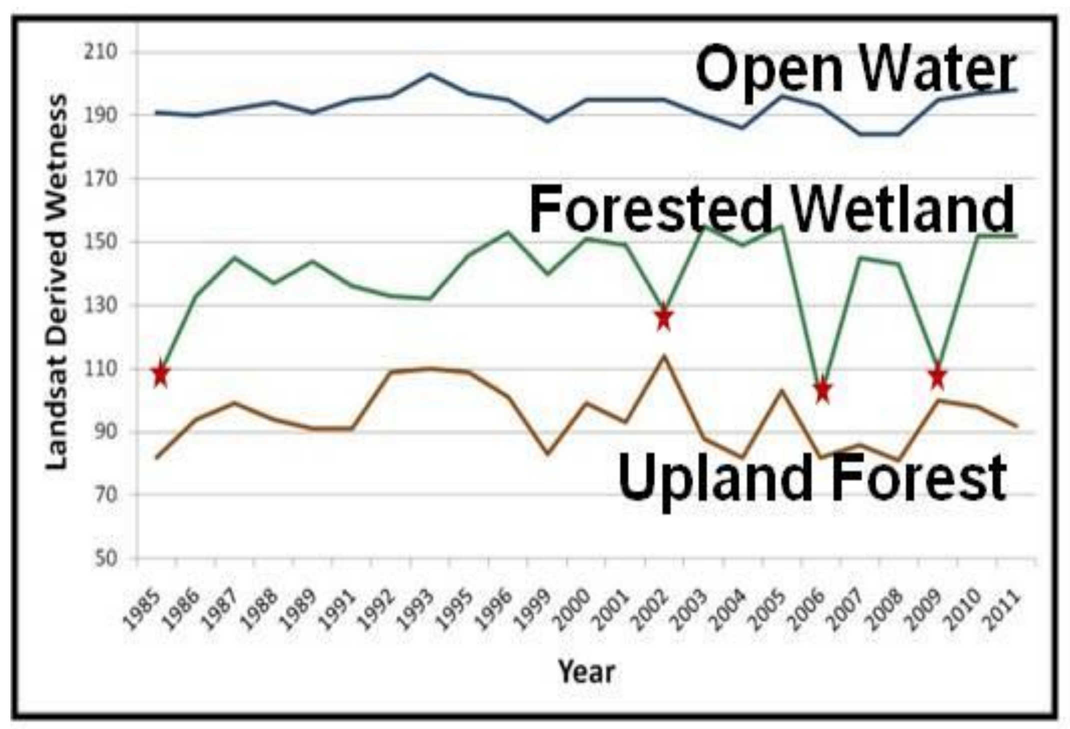
Preliminary Results

Monitoring the Connection between Weather and Hydroperiod with Landsat Based Wetness Trends through Time (1)



March 2009 March 2010

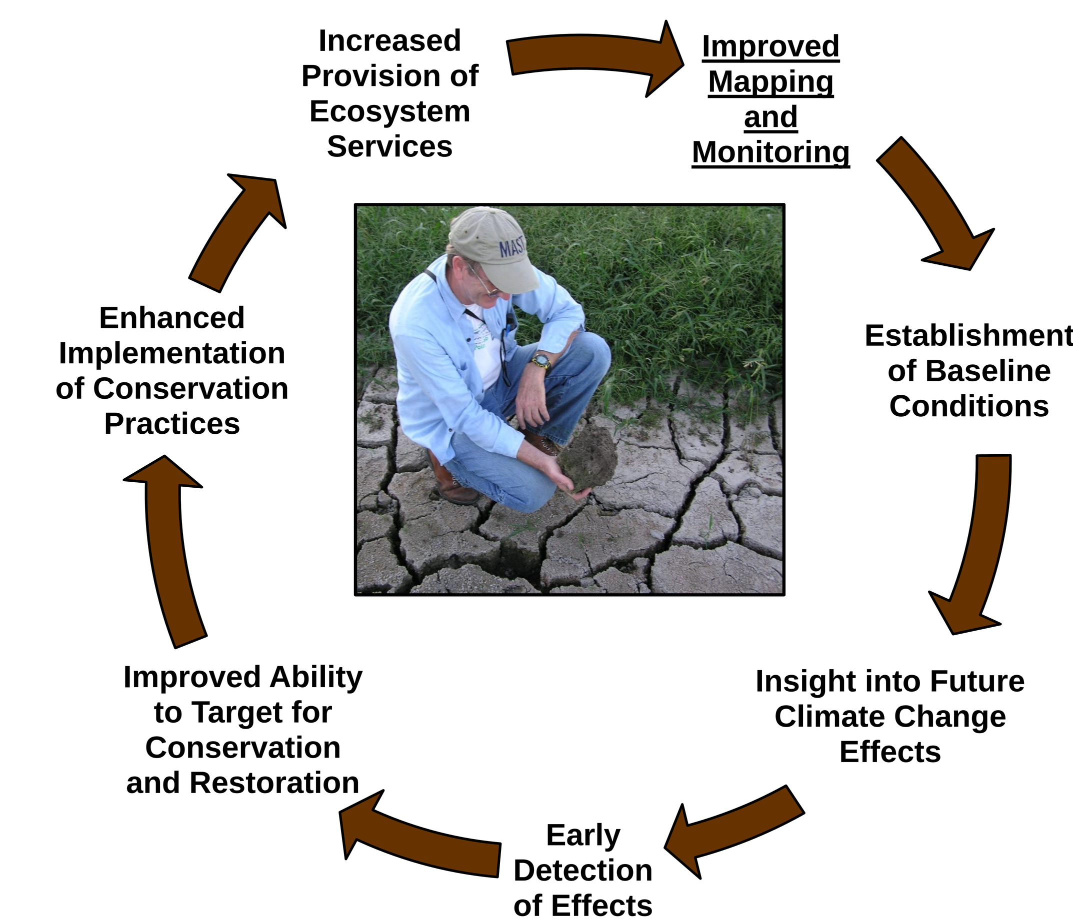
Note that a wetness index, based on Landsat, (above) is markedly different between years (inundated = red / non-inundated = green) and that fluctuations in wetness are well correlated with the Palmer Drought Severity Index (below).



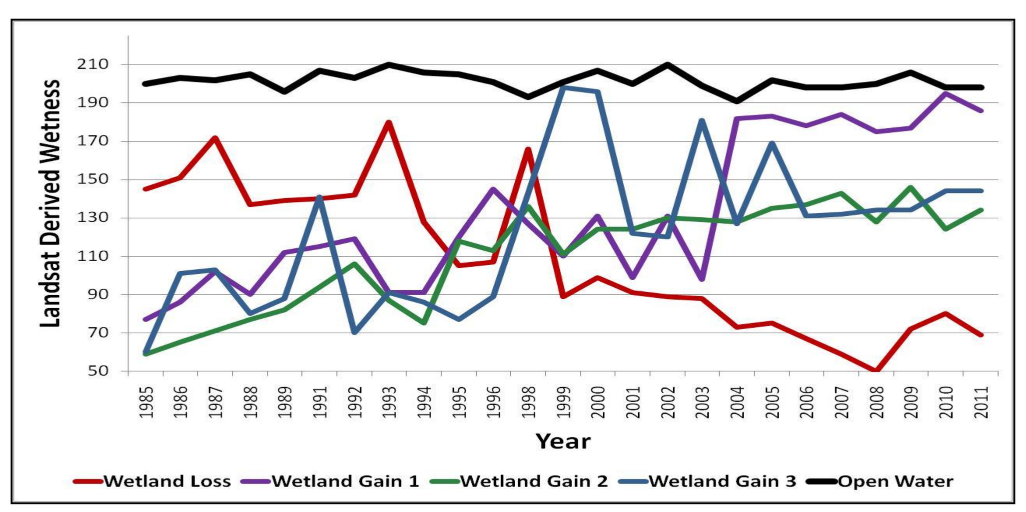
Palmer drought severity index z-score below -1

Outcomes

- Use of remotely-sensed data to produce dynamic maps of wetland extent and assessment of vulnerability impact and adaptation (VIA) to identify key stressors and functional drivers supports the ***adaptive management of wetlands***



Trends in Landsat Wetness index Indicating Wetland Gains and Loss (2)



Note that different trends in wetland gains are probably due to natural versus human based drivers and differences amongst human based restoration implementation practices.

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