

Strengthening Resiliency in Coastal Watersheds: An Ecosystem Services and Ecological Integrity Decision Support System



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Coastal watersheds and communities are vulnerable to the converging impacts of development and extreme weather events



Image credit: US FWS and NOAA

How can we strengthen the resiliency of coastal watersheds and communities?

Challenges

- Coastal watersheds are under chronic stress with increasing development, extreme weather events and sea level rise
- U.S. coastal population projected to increase from 123 million in 2010 to 134 million by 2020 (NOAA, *U.S. Census Bureau*)
- Coastal communities need to minimize risk and incorporate adaptation planning
- Resiliency requires a watershed perspective for local prioritization and action

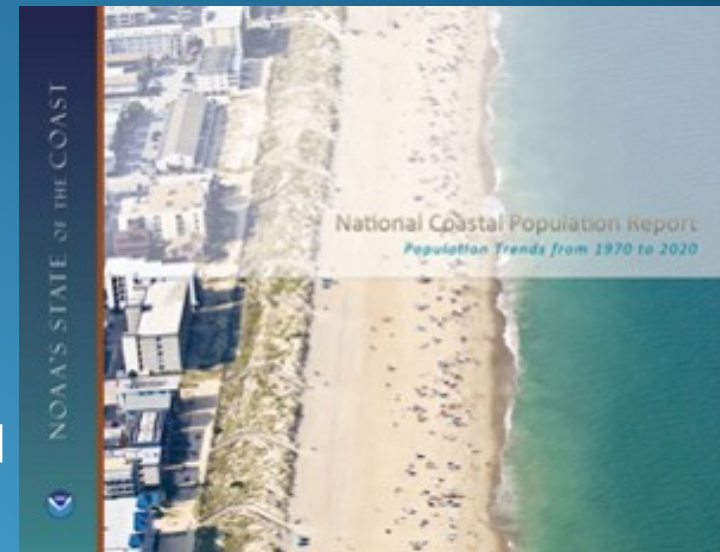


Image credit: NOAA

Approach

- Develop decision support system (DSS) and tools to inform sustainable decision making with a watershed perspective
- Inform science-based decision making for *modifiable factors* that increase coastal resiliency
- Integrate measures of Ecosystem Services (ES) and ecological integrity to inform decision making

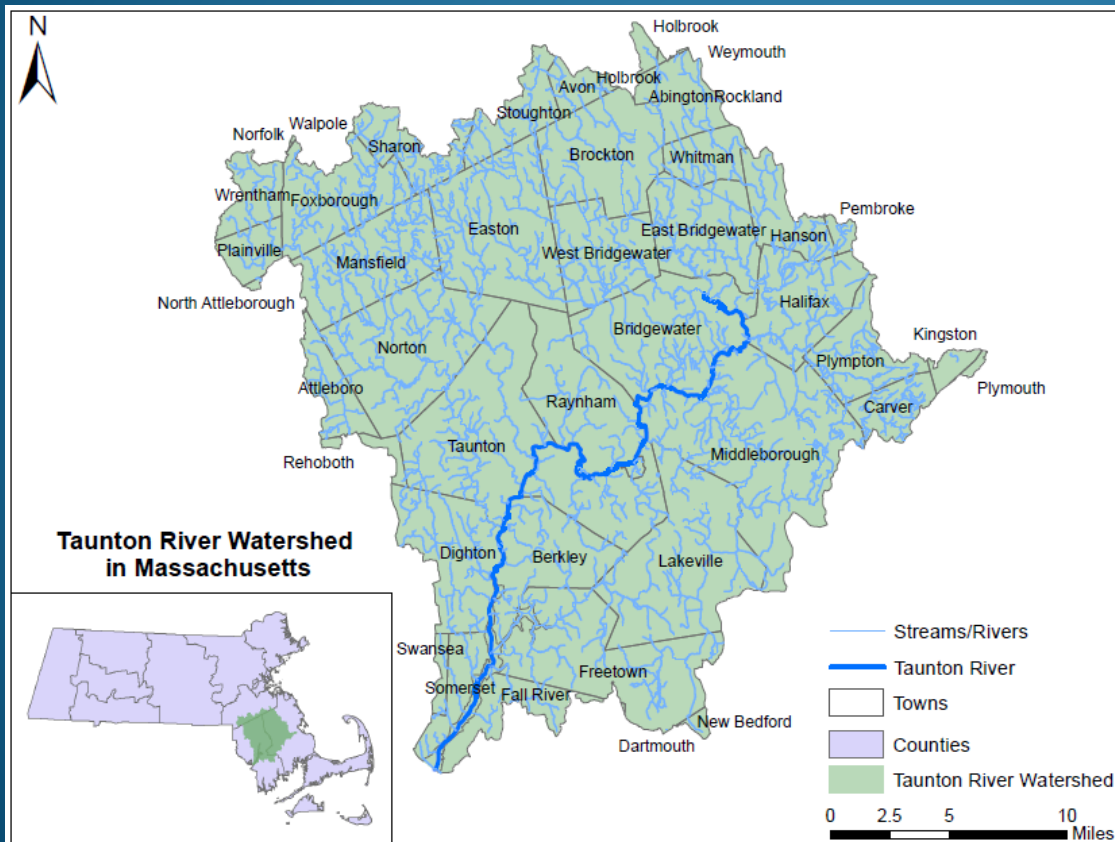


Image credit: Rutgers University

Approach

Strengthening the Resilience of the Taunton Watershed

The Resilient Taunton Watershed Network (RTWN) is a collaboration of local, non-profit, regional organizations, state and federal government representatives working together to leverage and share information, resources, and tools to protect existing natural resources, reduce flooding, promote restoration, and develop sustainably.



Linking Watershed Condition to Ecosystem Services

Focus on Key Ecosystem Services (ES):

- protection from extreme events/floods
- water quantity protection
- water quality protection
- habitat protection
- air quality protection
- open space preservation



Some ES benefits can be measured in terms of avoided future costs, such as for water treatment and flood damage repair.

Watershed Landscape divided into Focus Areas

Landscape Focus Areas (FA):

- Freshwater Riparian Wetlands
- Saltwater Riparian Wetlands
- Freshwater Upland Wetlands
- Riparian Forests
- Upland Forests
- Streams



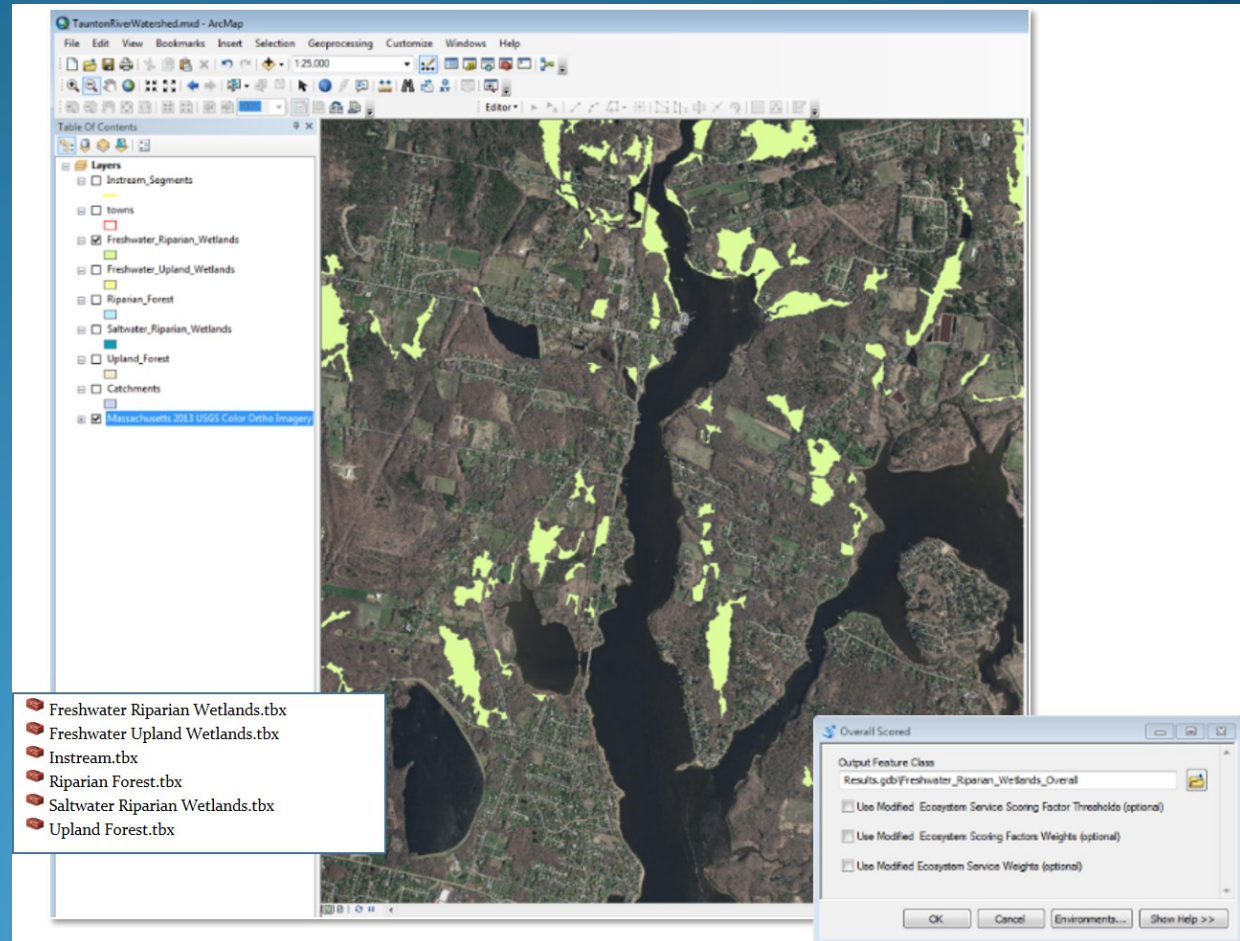
Each FA is evaluated for ES using GIS to quantify indicators or scoring factors.

Scoring factors are calculated based on spatial relationships (adjacency, within buffered proximity, upstream/downstream, etc.).

Three levels of Decision Support System (DSS) Applications

ArcMap Application

ArcMap project and a set of toolboxes – one toolbox for each focus area. Users can modify multiple factors and multiple ESs and generate a score for each focus area unit. The units are color coded with red, yellow or green depending on the final score.

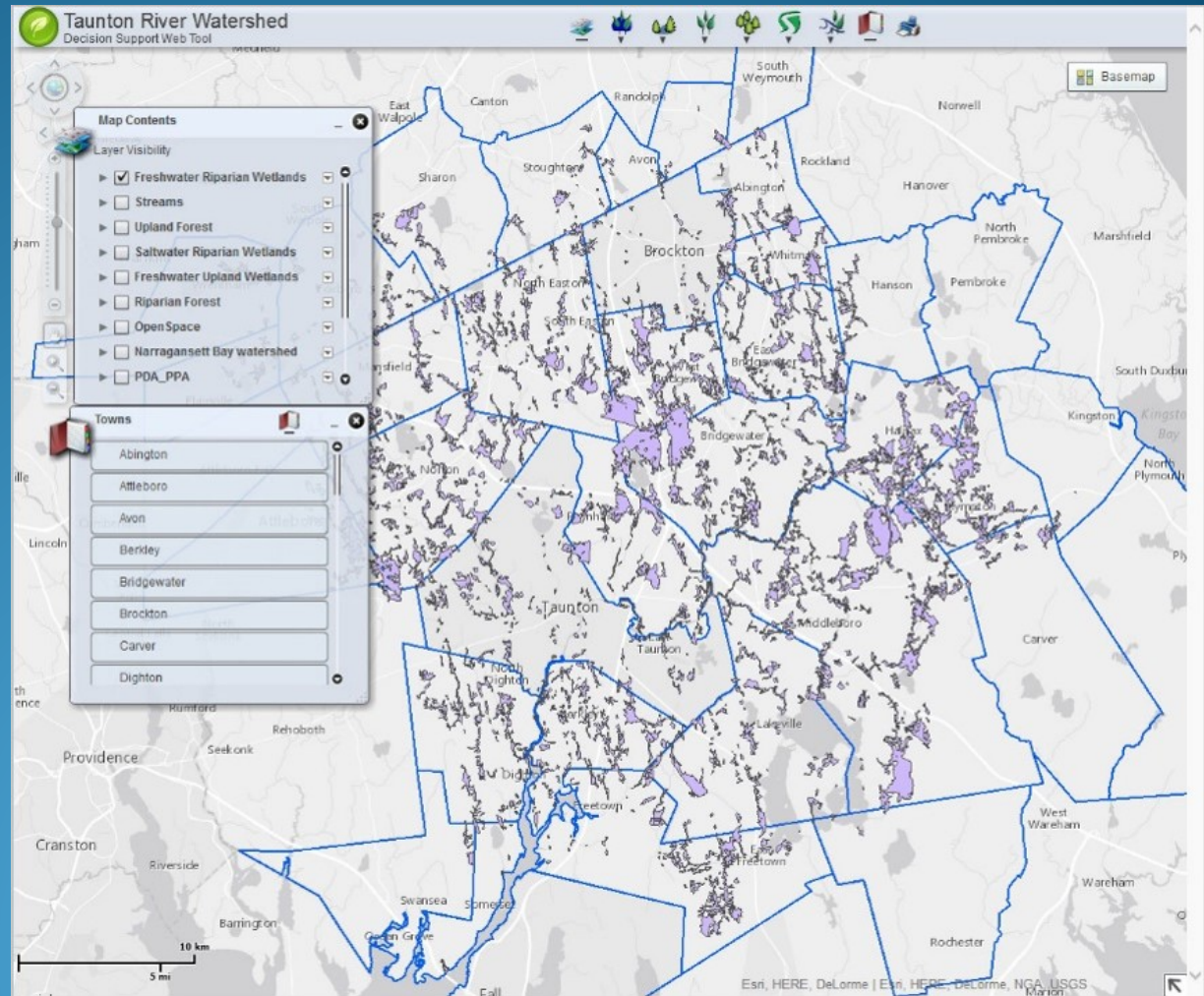


ArcMap Application for technical users with GIS expertise

DSS Web Mapping Application: Only requirement is a web browser

Users create scenarios by modifying factors and ES weights for each focus area

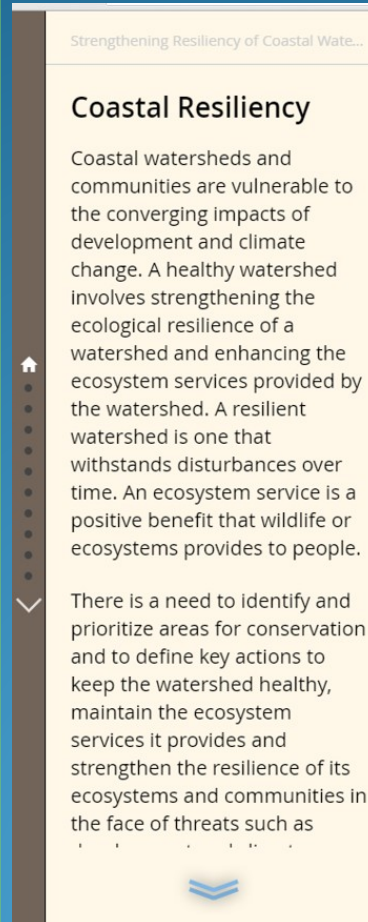
Web-based map application has same technical capabilities as the ArcMap project



Interactive Geographical Communication tool

Story Maps:

- connecting with stakeholders using interactive maps at various scales
- for use in '**Resiliency Roundtables**': facilitated cross community conversations to discuss cost effective solutions to strengthen resiliency



Informing Decisions for Strengthening Coastal Watershed Resiliency



Image credit: Northern Rhode Island Conservation District

- **Prioritize protection and restoration** of habitat for water quality, nutrient management, mitigate non-point stressors
- **Reduce flooding risks**, identify opportunities to restore flood plains and riparian zones
- **Plan for sea level rise adaptation**: marsh migration and marsh hydrology restoration
- Identify optimal locations for **economic development**

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