

***Challenges in Texas Water  
Management: Climate Change and the  
Policy-Science Nexus***

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# Overview

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- Texas as a Microcosm
- Water Impacts
- Climate Change
- Climate Variation
- Science and Policy



# Why Texas?

- Important Coast Resources
- Significant Coastal Challenges
- Major Water Competition
- Important Other Water Activities
- Advanced Water Supply Planning



# Water Impacts – Coastal Connection

- Inflows to Estuaries
- Human Activities
  - Water Supply
  - Industrial
  - O&G Production
  - Fishing
  - Coastal Construction
- Storm Events
- Droughts



# Interactions of Water and Other Factors on Coast Ecosystems

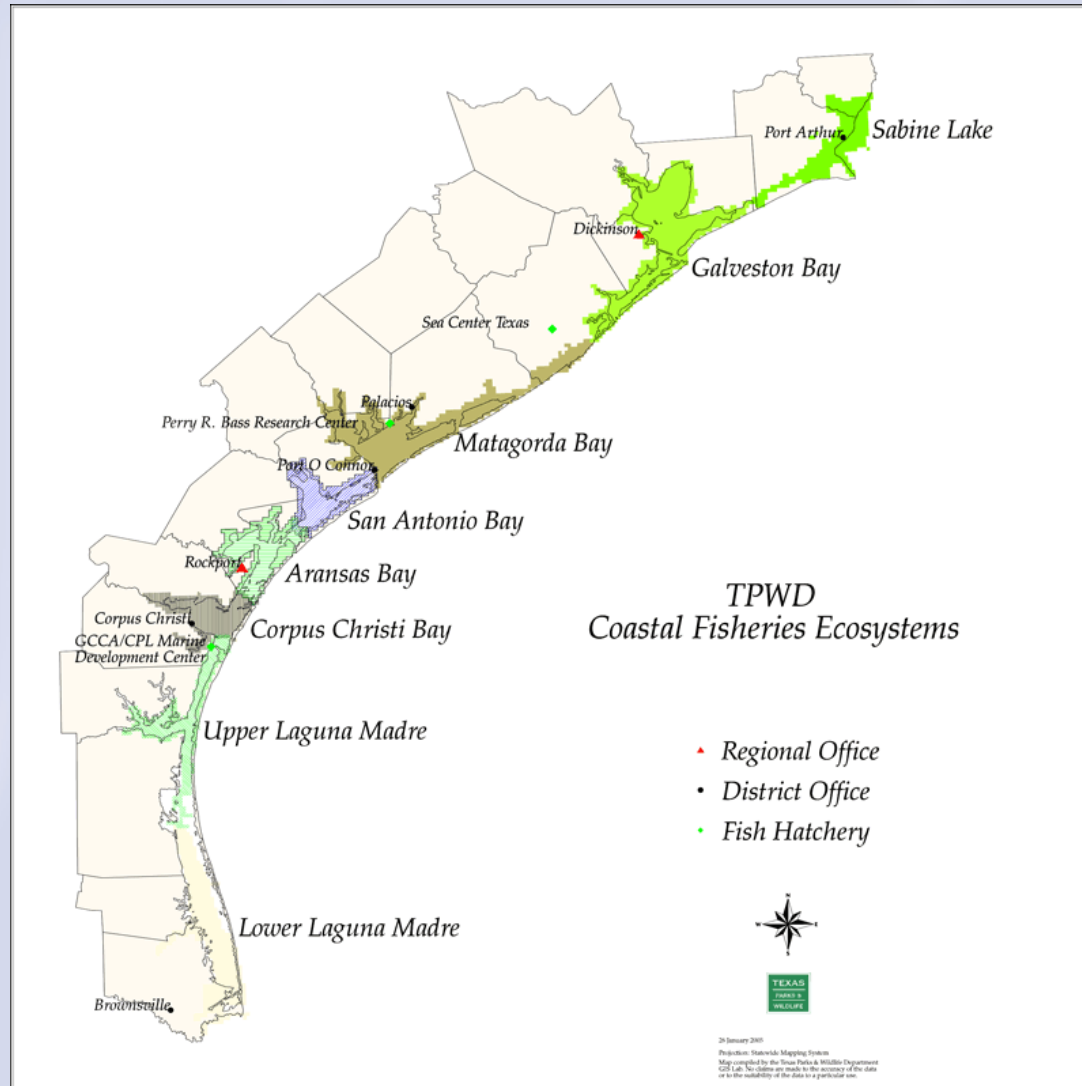
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- Water Inflows
- Temperature
- Land Development
- Sea Level Rise
- Subsidence
- Storm Impacts

Coastal Ecosystem  
Impacts

Water Policy Intersects with all of these Issues

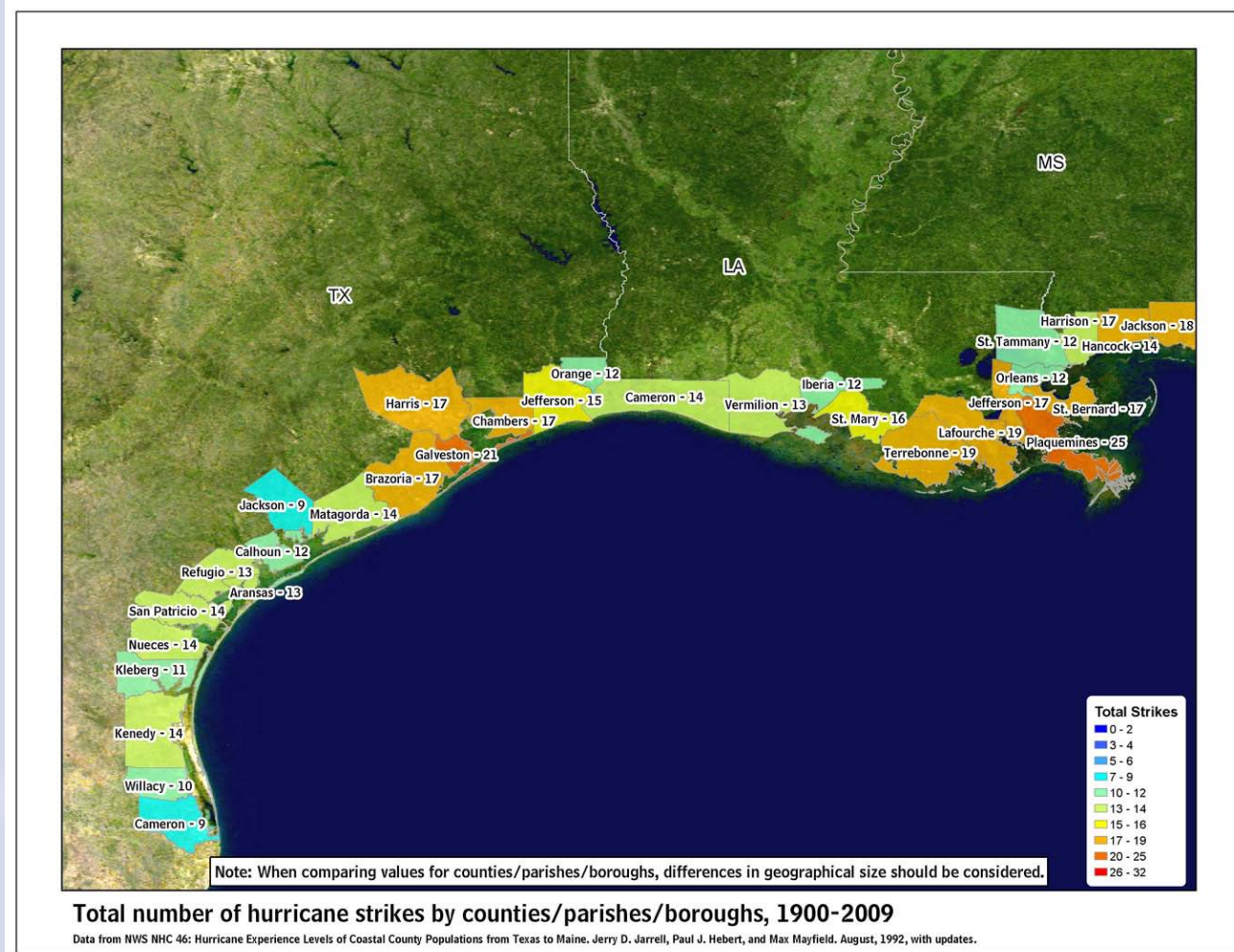
# Texas Coastal Ecosystems



# Population and Economic Impacts -- Selected

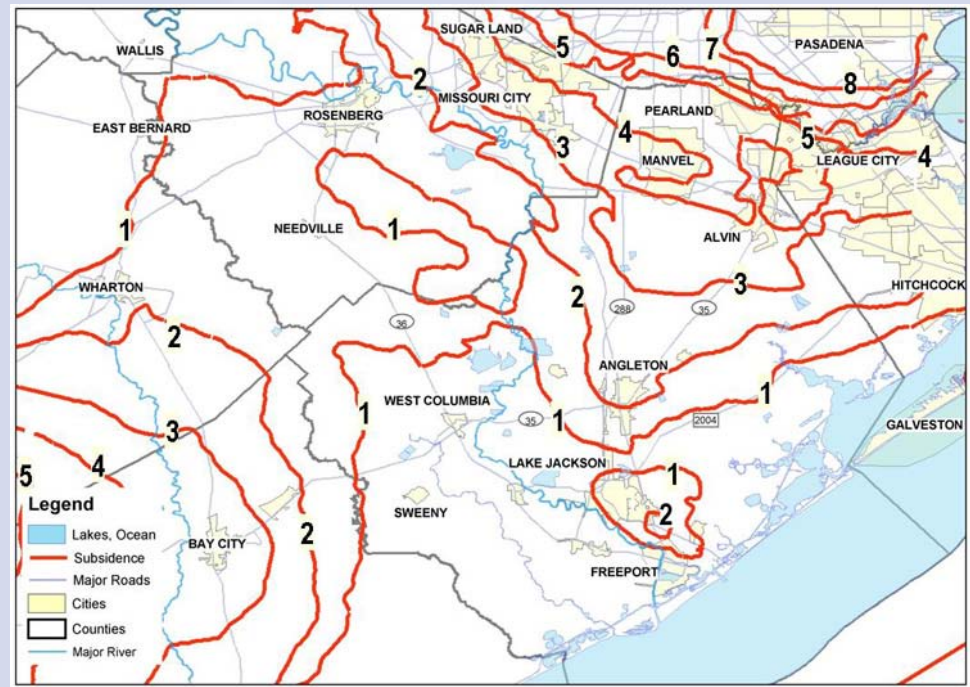
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# Hurricane Strikes By County 1900-2009



# Water Impacts – Coastal Ecosystem Health

- Reduced Surface Water Inflows to Estuaries
- Increased Subsidence Due to Groundwater Withdrawals
- Sea Level Rises
- Storm Event Damage
- Droughts



# Climate Change – Water System Stresses

- Temperature Changes
- Precipitation Changes
- Hurricane and Other Storm Intensity
- Drought Duration and Intensity
- Evapotranspiration
- Heat induced Water Quality Impacts
- Increased Sediment



# Climate Change – Water System Stresses

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## Climate Change

“It is important to make a distinction between the *processes* of climate change and the *impacts* on water suppliers resulting from these changes. Although global warming is fairly straightforward, the impacts on water suppliers may involve many additional cause-and-effect relationships.”

AWMA Research Study

“*Implications of Climate Change for Urban Water Utilities*”

# Climate Variation

“There is nothing new in the world except the history you do not know.”

*–Harry S. Truman*



**Pictured above:** Drought devastation in eastern Montana, during the 1930s.

**Pictured below:** Drought devastation in Oklahoma, 1998.



# Climate Variation

1950s level droughts—once or twice a century

“When records of drought for the last two millennia are examined, the major 20th century droughts appear to be relatively mild in comparison with other droughts that occurred within this time frame.”



Trees can grow to be hundreds to thousands years old and can contain annually-resolved records of climate for centuries to millenia.

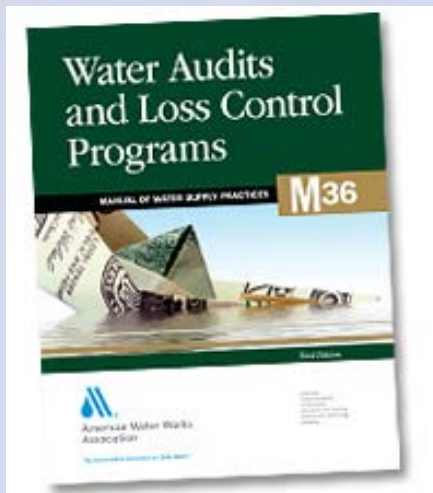
--NOAA

# Interactions—Water Policy Nexus

Water Related Science

Environmental Science

- Legal/Political Process
- Water Use/Demand
- Water Supply Data
- Water Use Policy
- Use Efficiency
- Flood Management
- Sedimentation
- Drought Contingency



# Water Supply Planning

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- Are the data, models, laws, administrative functions, and planning activities sufficient to meet the problems faced?
- For what level of drought/what risk tolerance do we plan?
- How do we plan in the face of uncertainty and new demands?
- What are the impacts on other water users?

# Water Supply Planning

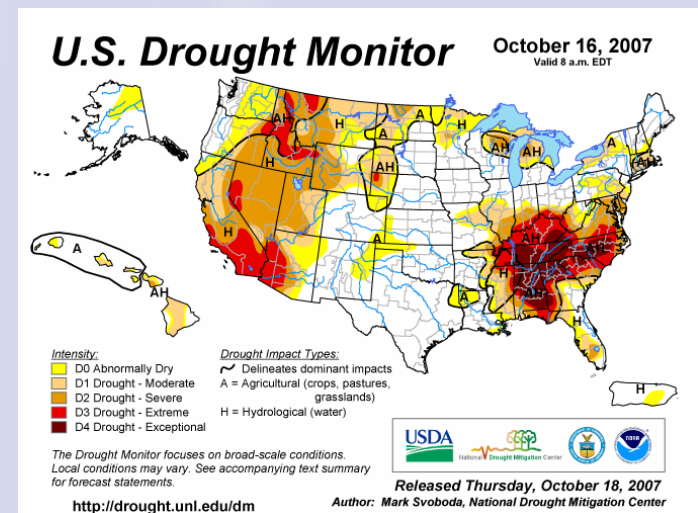
Sound water planning (per AWWA) includes:

- An inventory of available resources
- Consideration of water quantity and water quality management
- Evaluation and projection of existing and future demands and uses (in-stream uses and withdrawals)
- Assessments of structural and nonstructural alternatives
- Evaluation of water resource management alternatives
- Environmental values, as well as human needs
- Sound water allocation decisions are tied to planning

***To these factors, add proper risk/uncertainty consideration, adaptability and financial viability***

# Concluding Thoughts

- Water Policy, Climate Change and Coastal Ecosystems Intersect at Many Points
- Climate Change and Climate Variation Exacerbate Many Existing Challenges
- Current Water Science and Policy Are Insufficiently Robust to Address These Challenges



# Concluding Thoughts

A pessimist is one who makes difficulties of his opportunities and an optimist is one who makes opportunities of his difficulties.

*--Harry S. Truman*



# Concluding Thoughts

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“The dogmas of the quiet past are inadequate to the stormy present.”

—*A. Lincoln*

# Questions?



# Contact Information

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