



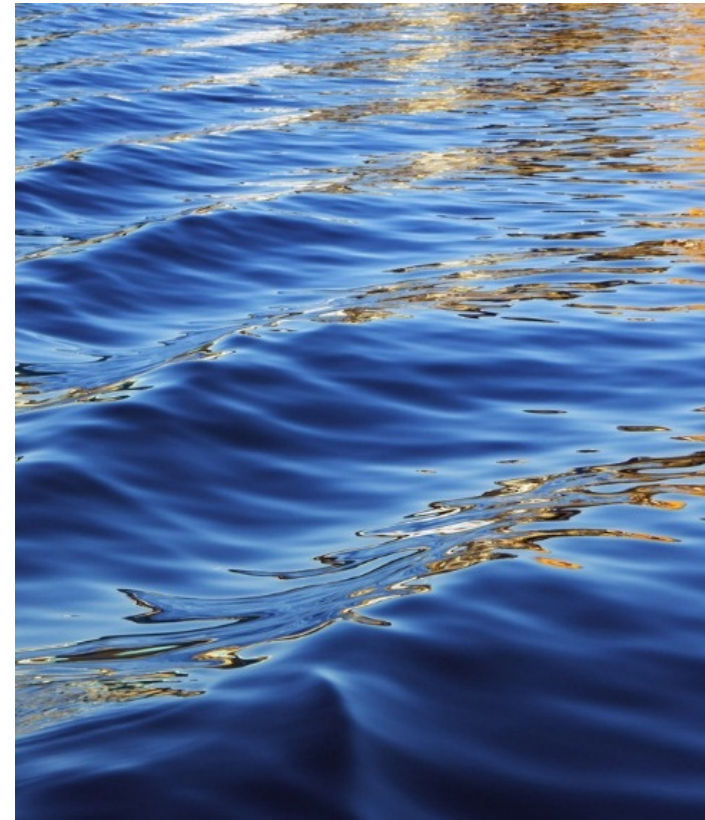
Houston Post Harvey: The need for an Urban Water Management Resiliency Approach

Gulf Coast Water Efficiency Network Meeting
January 25, 2018



GALVESTON BAY
FOUNDATION

Paula Paciorek
Water Resources Manager



“Water, water, every where,
Nor any drop to drink”



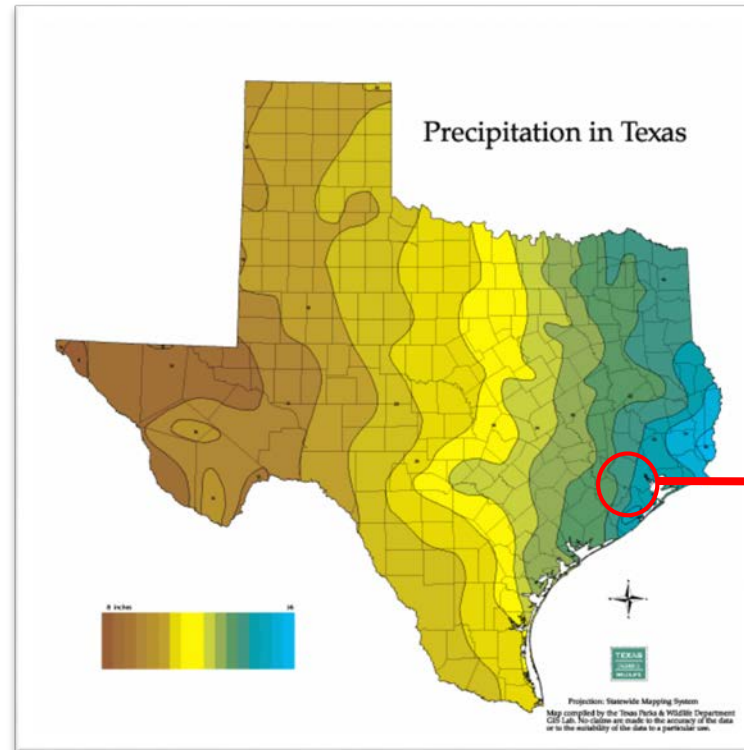


Houston's Climate: Extreme Weather Events

The role of Climate Change:
Even more extreme!



No precipitation

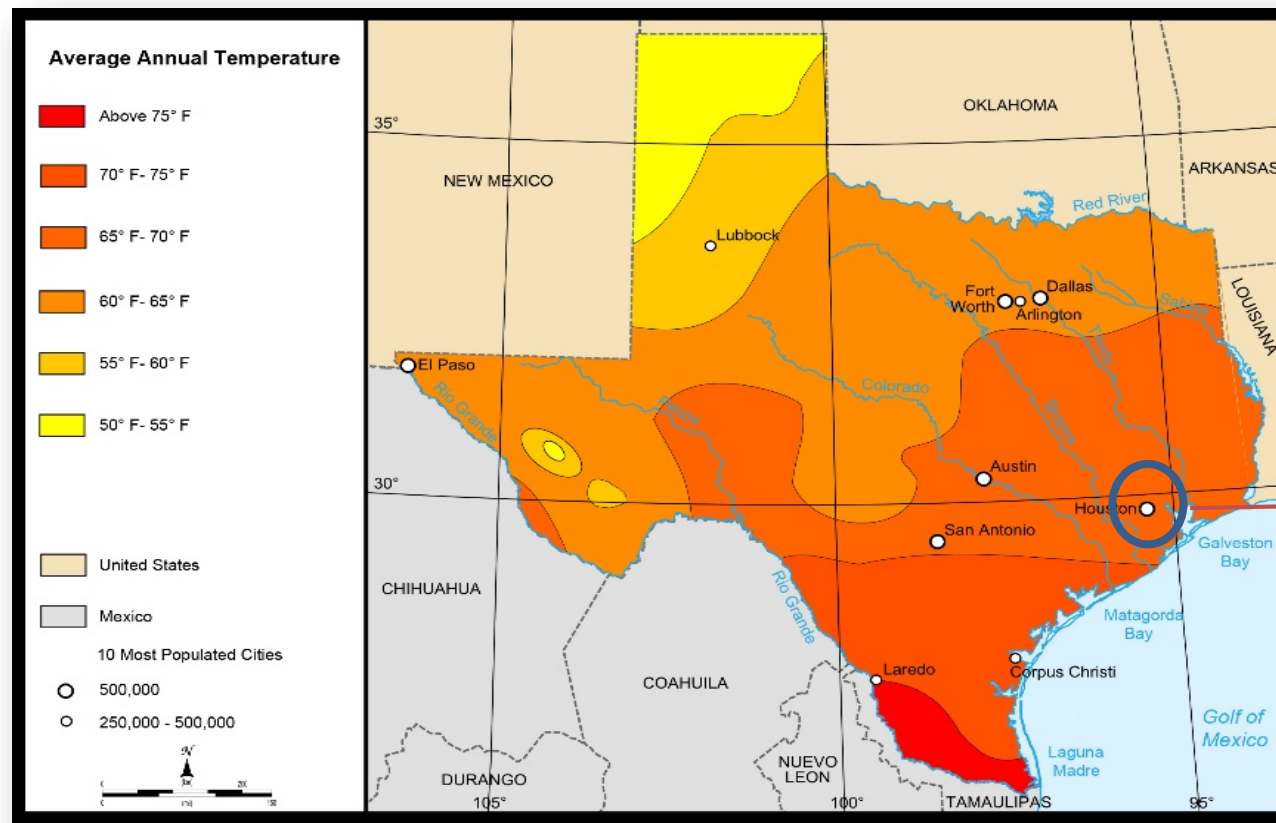


Average: 53.34 in/yr.

High Precipitation



Houston's Temperatures Play a Big Role



Cold

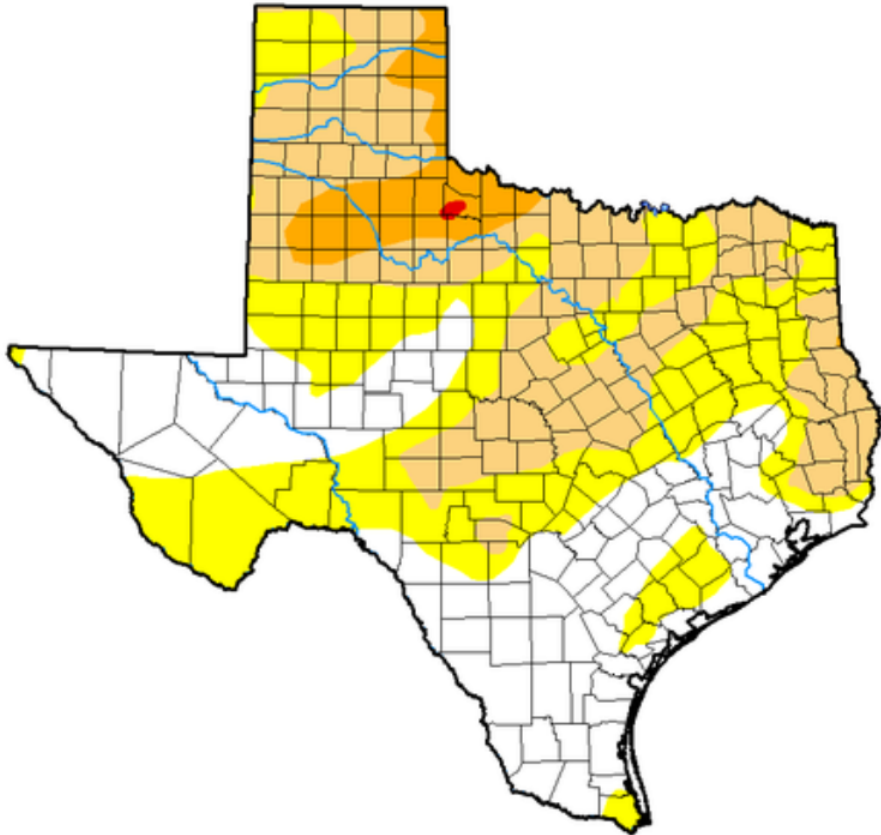
High evapotranspiration rates

Hot

Drought Monitor = Precipitation + Temperature

As of January 2, 2018

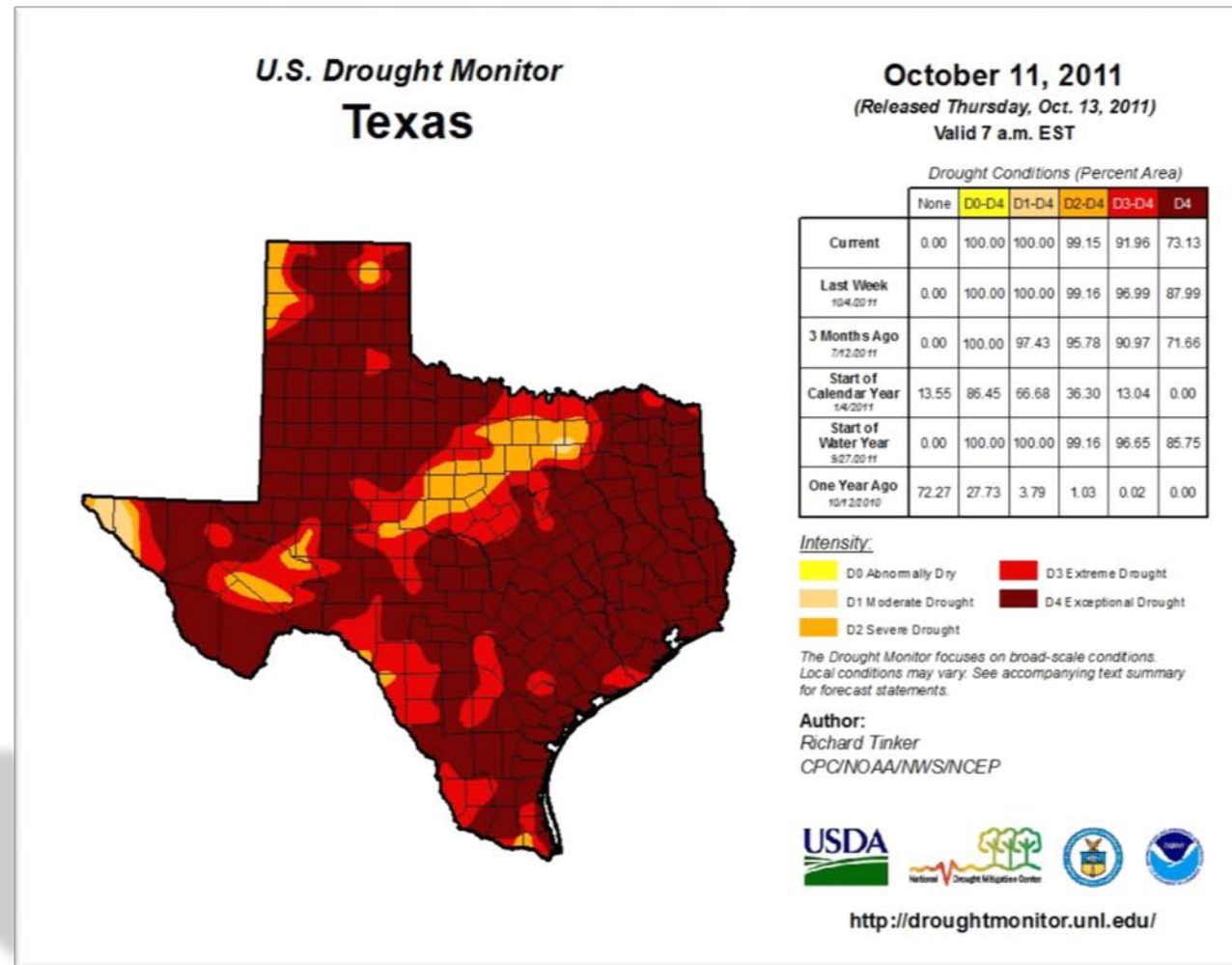
Author: Eric Luebehusen, U.S. Department of Agriculture



Drought Conditions (Percent Area)

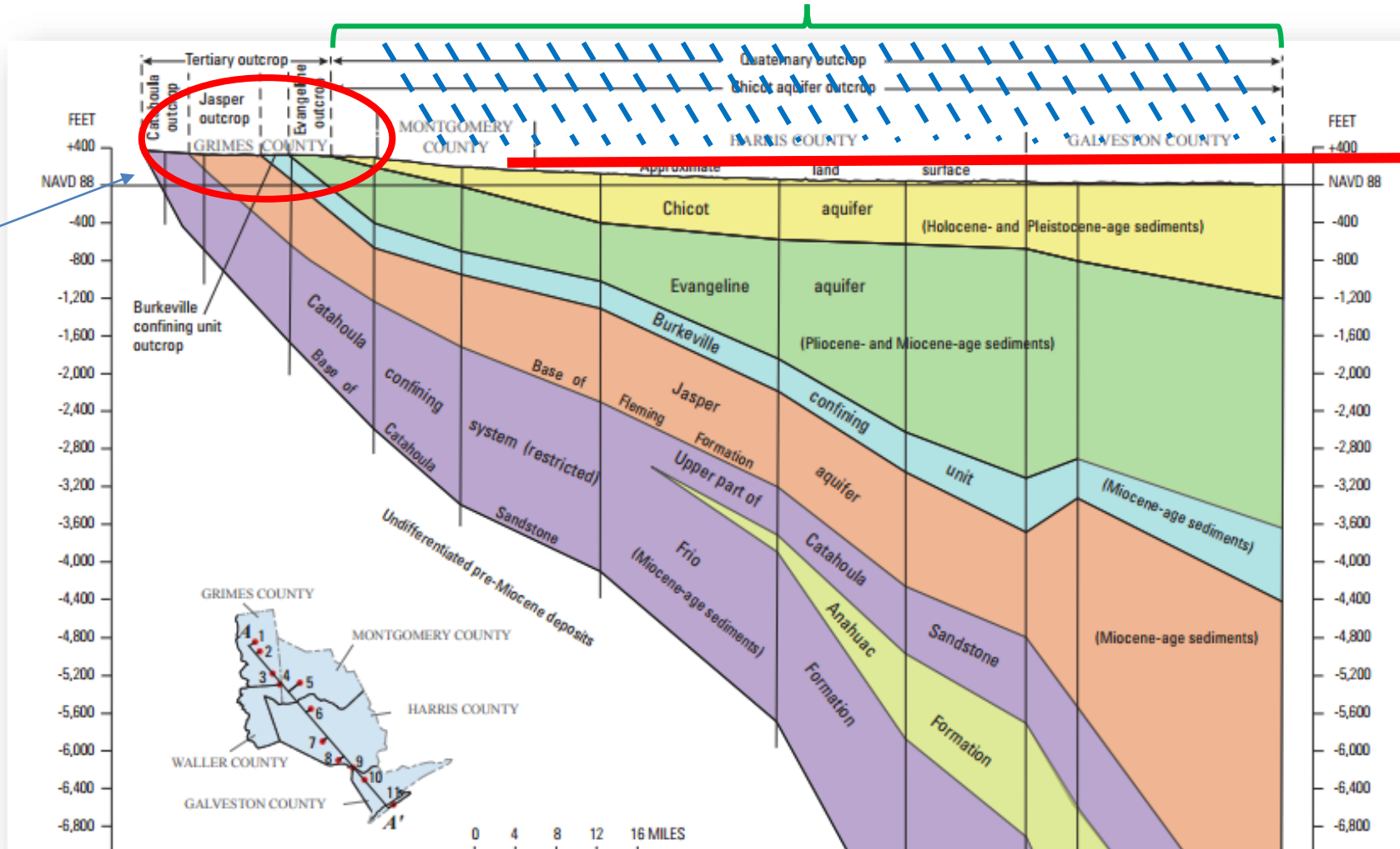
Week	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current 1/02/2018	33.37%	66.63%	33.56%	5.94%	0.11%	0.00%
Last Week 12/26/2017	37.16%	62.84%	32.93%	2.90%	0.11%	0.00%
Three Months Ago 10/03/2017	86.76%	13.24%	2.20%	0.00%	0.00%	0.00%
Start of Calendar Year 1/02/2018	33.37%	66.63%	33.56%	5.94%	0.11%	0.00%
One Year Ago 1/03/2017	81.50%	18.50%	6.29%	1.97%	0.04%	0.00%

Even with large flooding events, the trend is drought



What happens with all that flood water?

Highly urbanized areas



Grimes County: Recharge Area

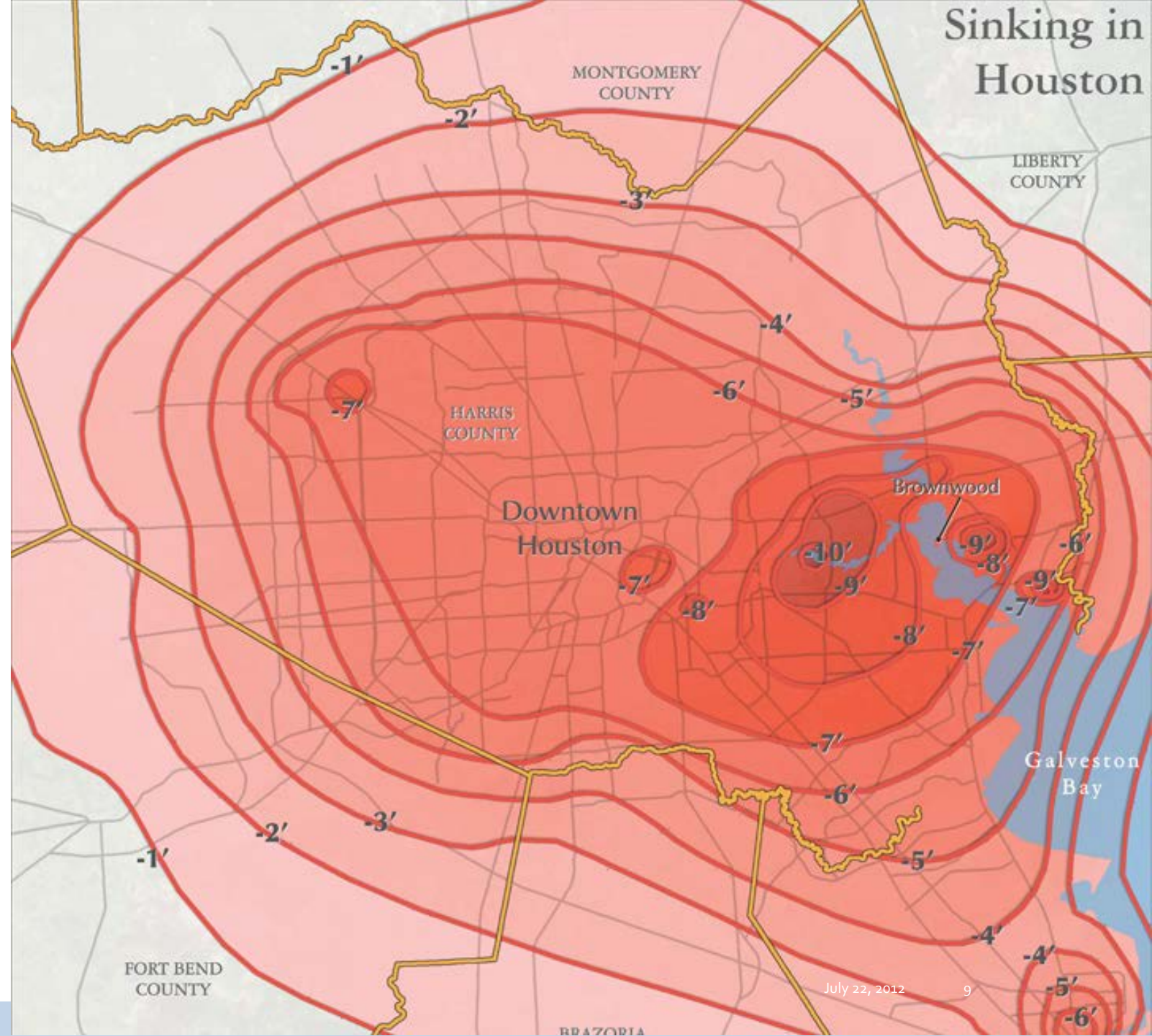
Very low recharge rates

RUNOFF

Ocean

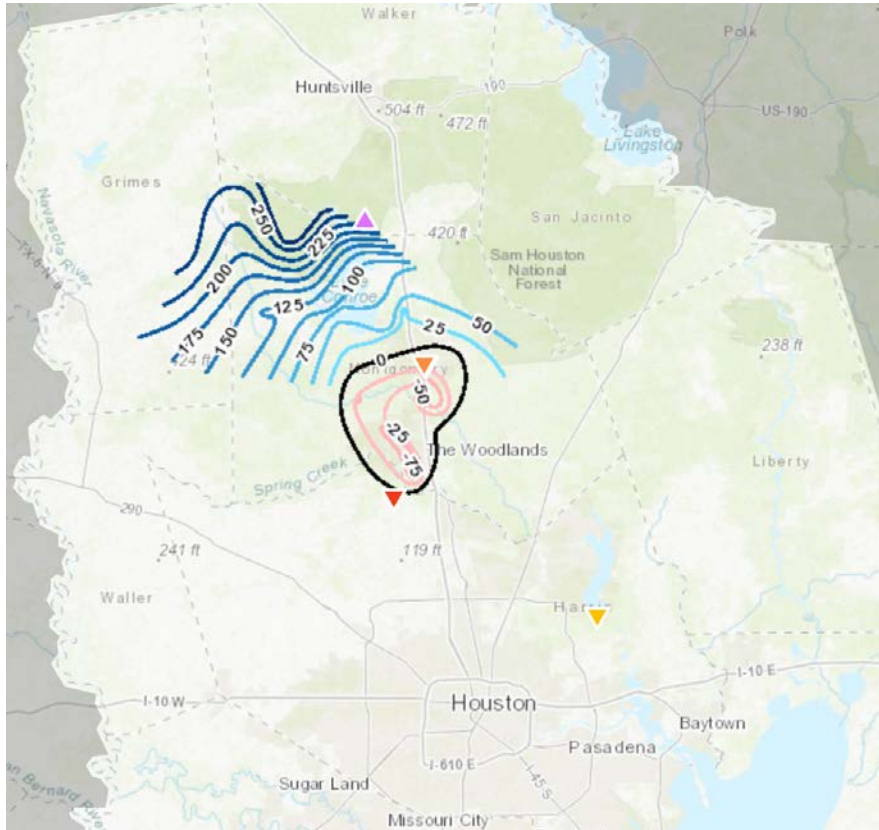
MYTH: High rainfall events = instantly recharge aquifers

- Recharge rates do not vary. Any excess water ends up as runoff
- In fact, we have been withdrawing water at a higher rate than the recharge rate (unsustainably).
- This has led to subsidence in the Houston/Greater Houston area.
- Groundwater districts now help protect groundwater.

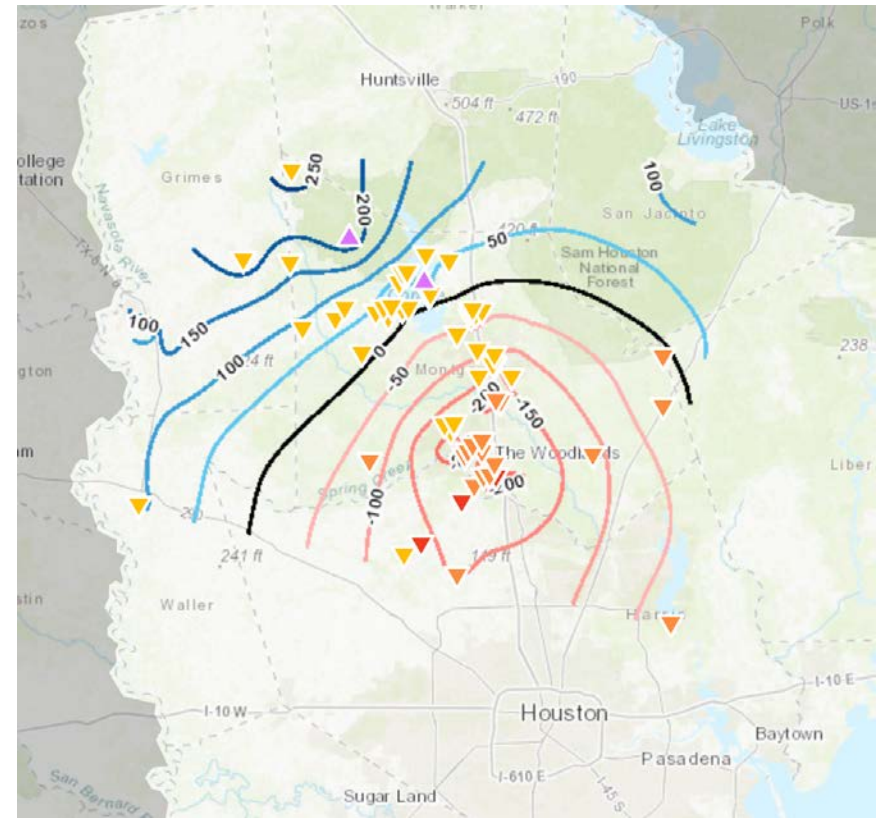


Trend: Still using groundwater unsustainably

Jasper Aquifer @ Montgomery County



1-year change (1999-2000)

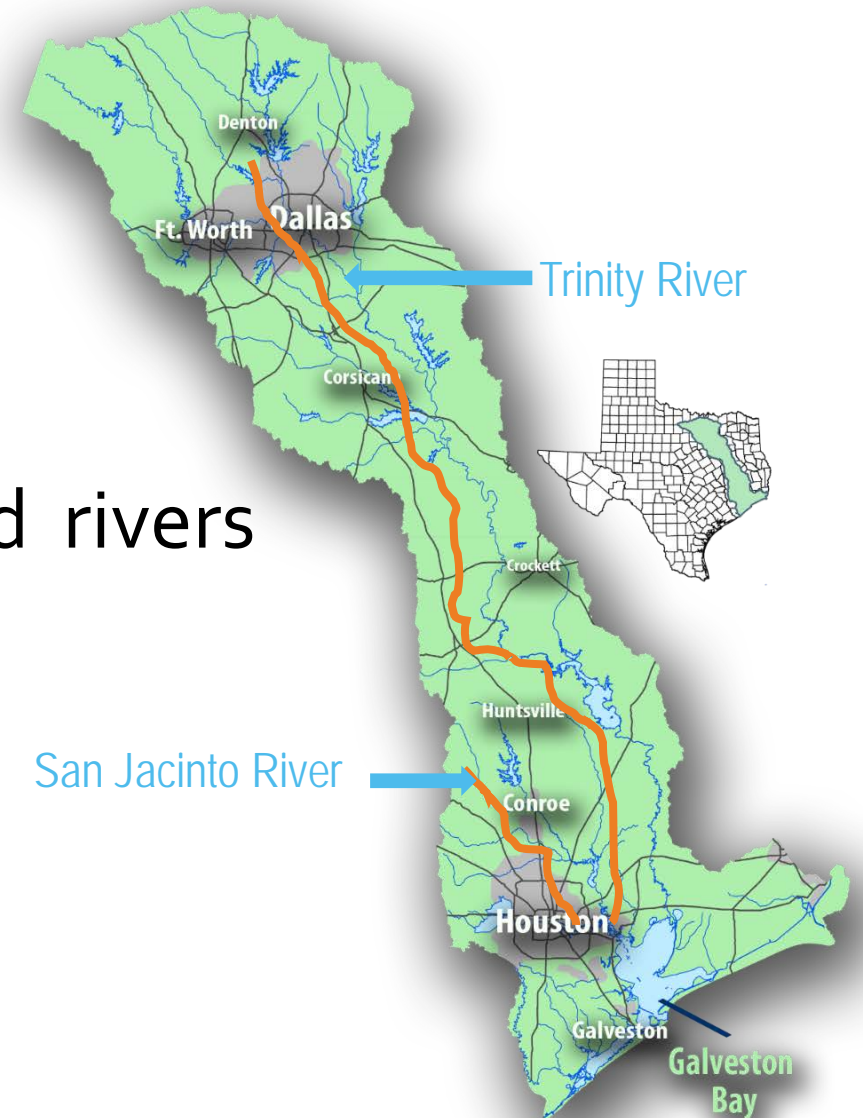


10-year change (2007-2017)

USGS Water Level Contours

Shifting from groundwater to surface water use

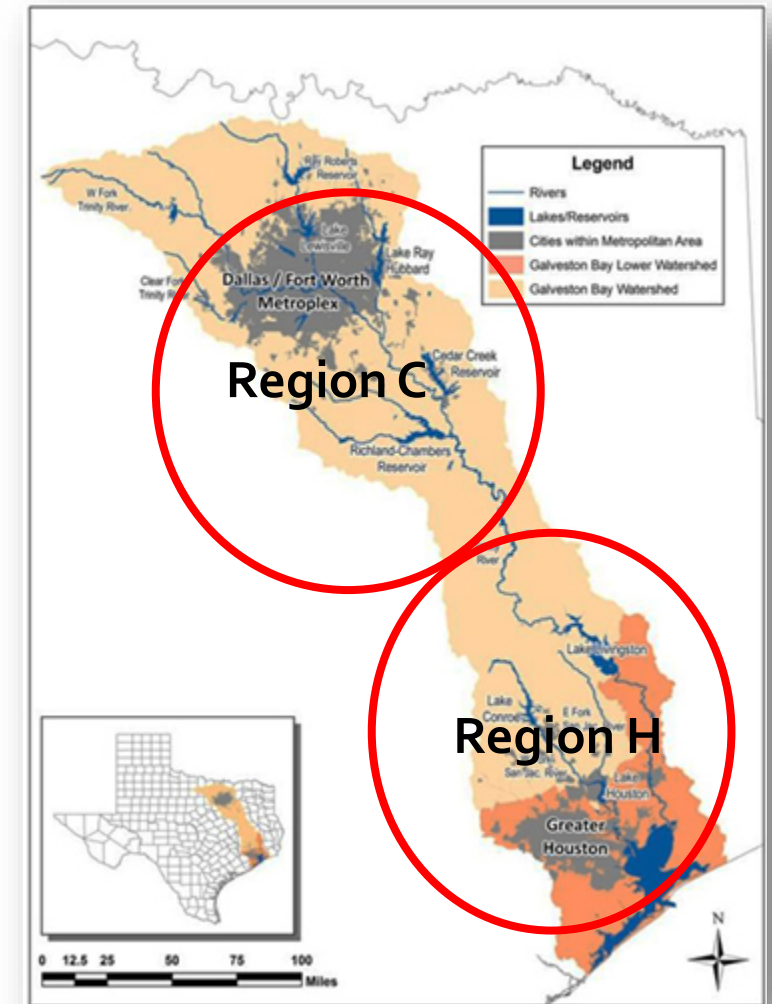
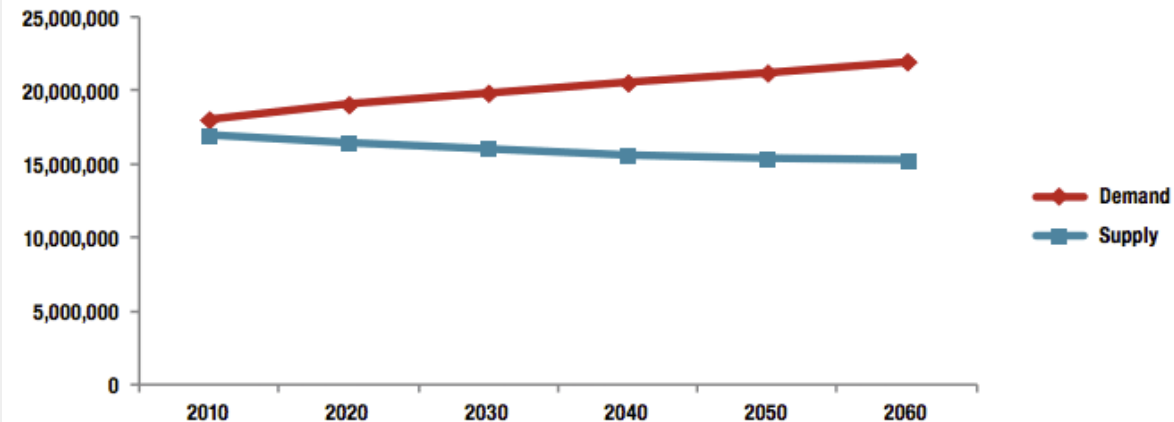
- To relieve subsidence and unsustainable groundwater use
- Puts a strain on already overallocated rivers



Adding to the Mix: High Population Growth

- **Projected high water demand**
 - Texas' population to double by 2070
 - Galveston Bay watershed only: 12 million people
 - Projected water shortages for both regions in the watershed

FIGURE ES.2. PROJECTED WATER DEMAND AND EXISTING SUPPLIES (ACRE-FEET PER YEAR).



Recommended strategies to meet future “human water needs”

Region H (Houston and 14 surrounding counties)

• 2020:

- Shortages : 347,034 ac-ft
- Strategies: 715,982 ac-ft

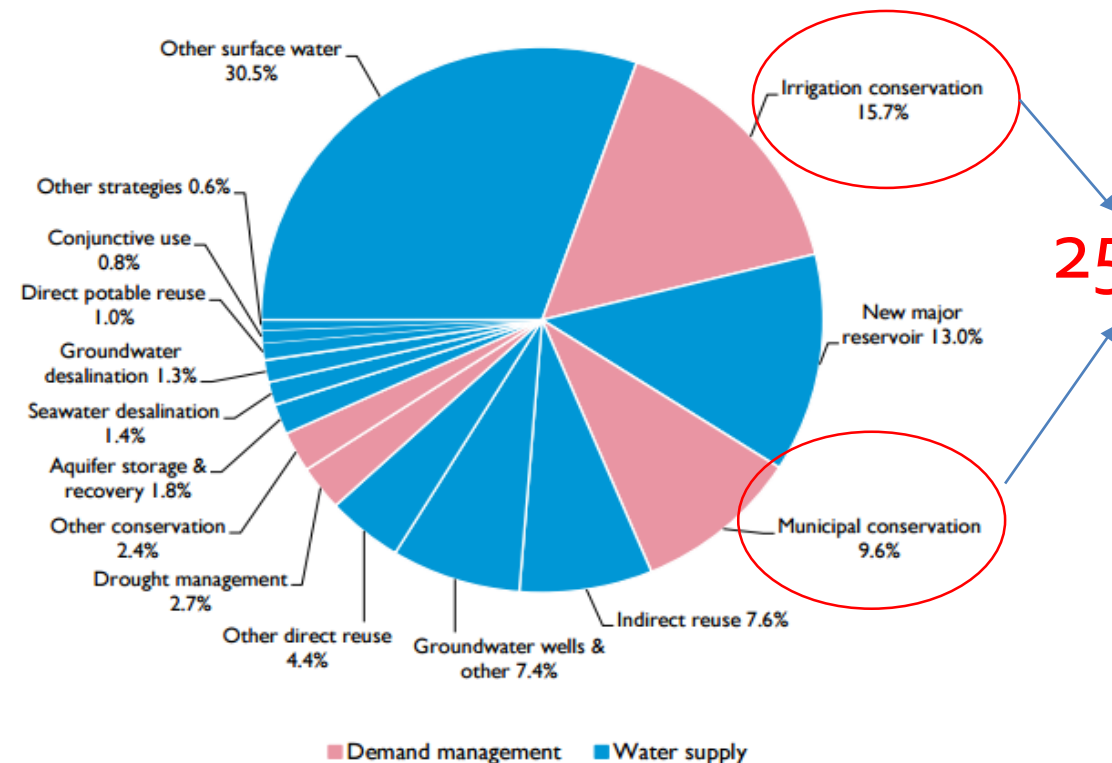
• 2070:

- **Shortages: 1.1 M ac-ft**
- Strategies: 1.7 M ac-ft

• Cost: \$10.8 Billion

Strategies DO NOT address
“environmental needs”

Figure ES.7 - Share of recommended water management strategies by strategy type in 2070

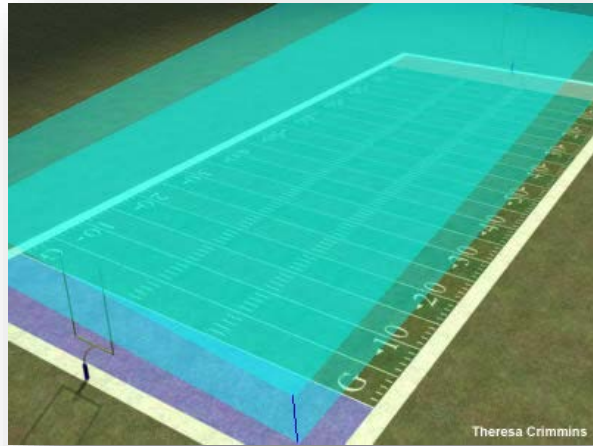


25% WC

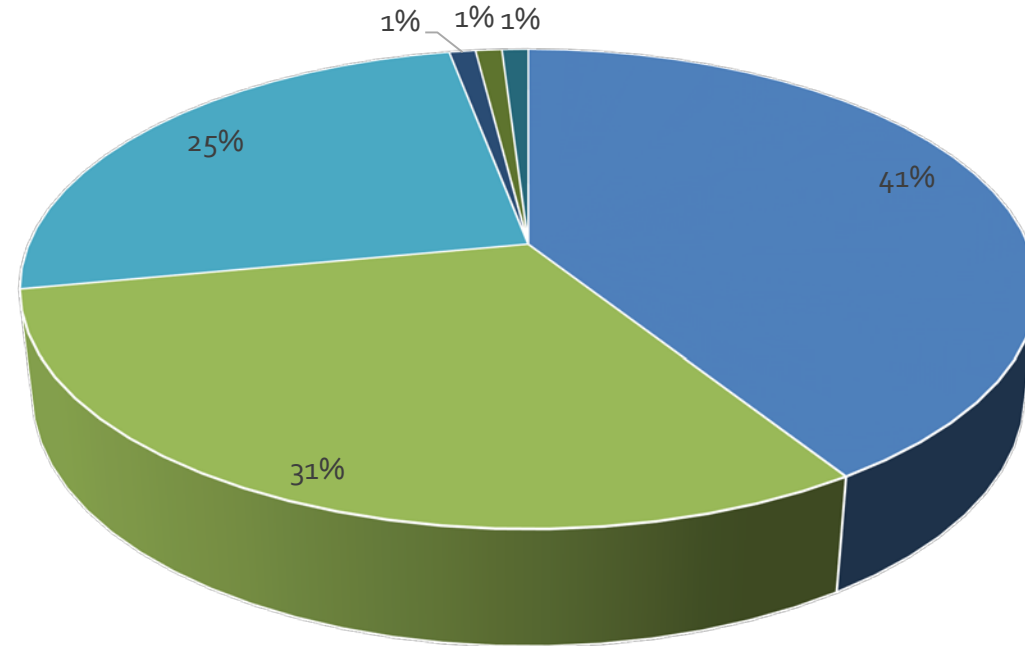
One of the main strategies:
Water Conservation

Region H: Water Shortages by 2020

by Category of Use



1 Acre-Foot = 325,851 gallons



■ Municipal

■ Irrigation

■ Manufacturing

■ Mining

■ Livestock

■ Steam Electric

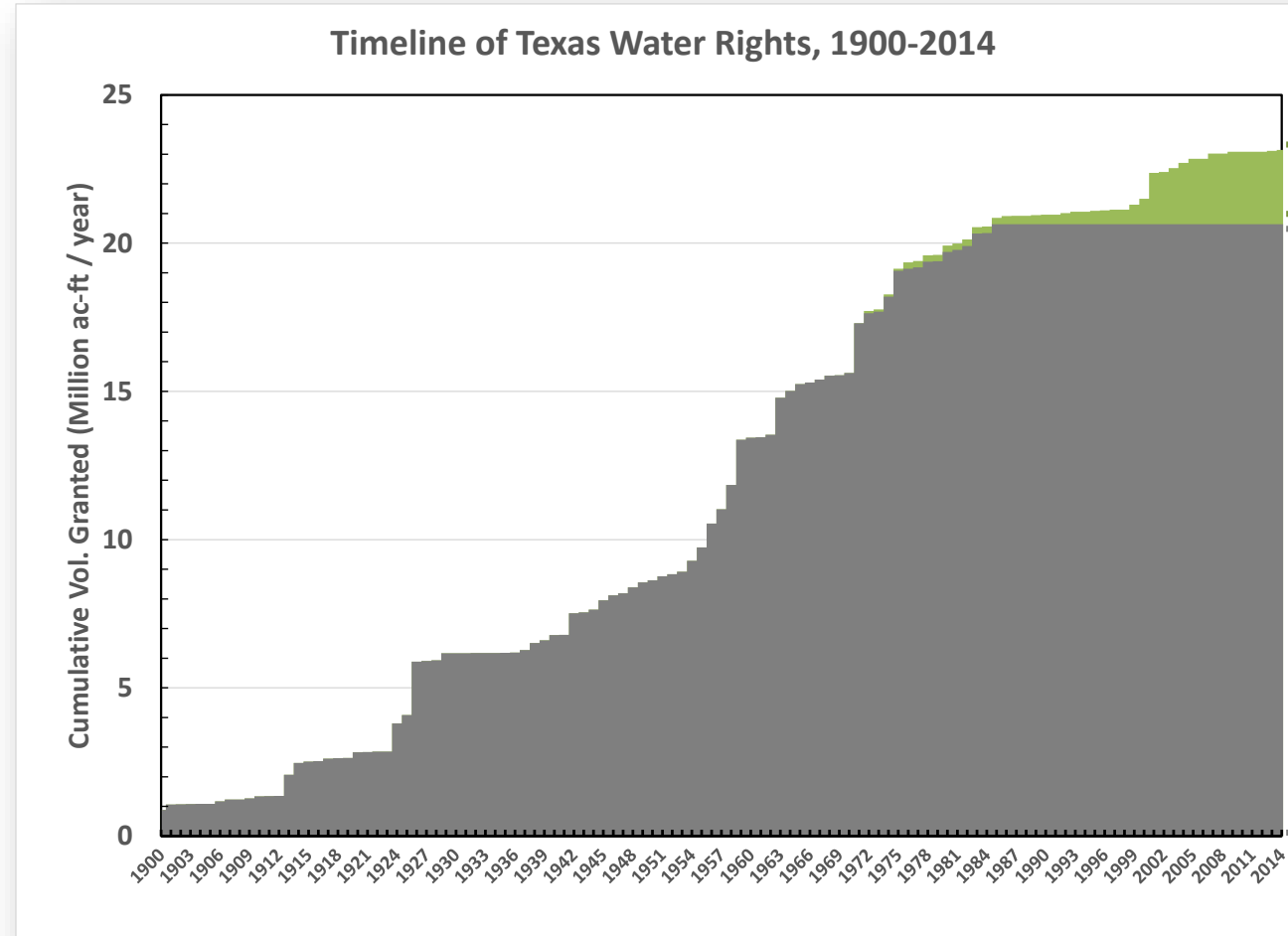
Texas Surface Water Rights

Granted without environmental conditions

60% of SJ-T rivers are composed of wastewater return flows

During times of drought: 60% becomes 100%

Rivers are dependent on wastewater return flows



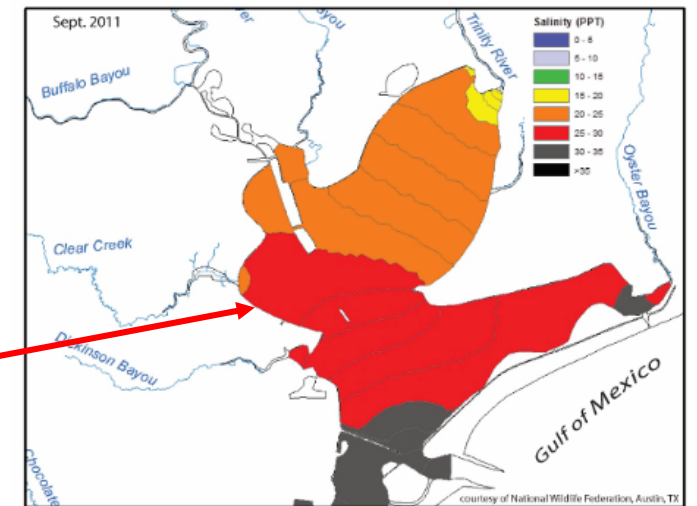
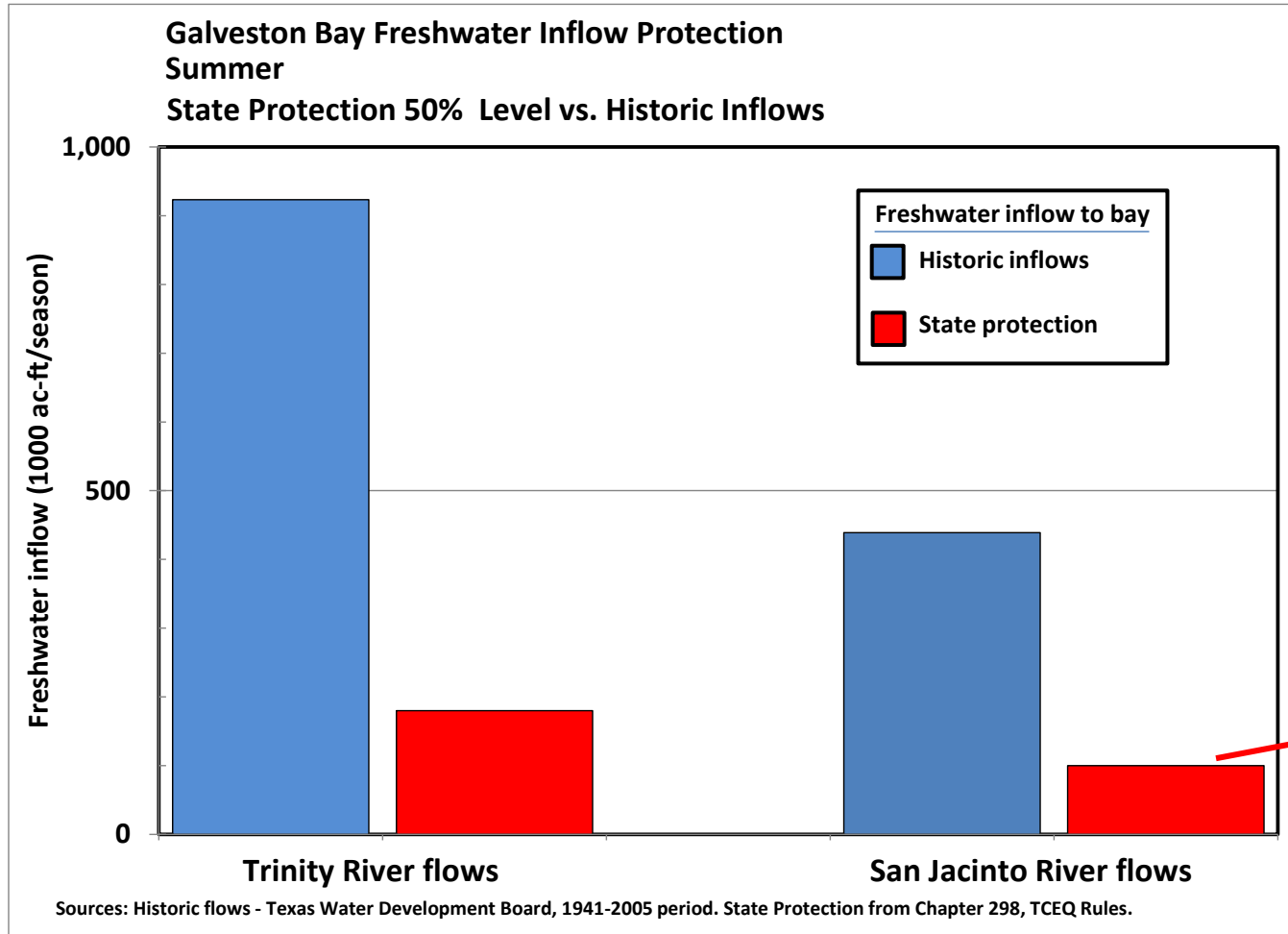
w/ Env. conditions

No Env. conditions

Projected a 100% re-use in the future

Inadequate levels of Protection for Galveston Bay

Standards adopted in 2011 are inadequate for Galveston Bay



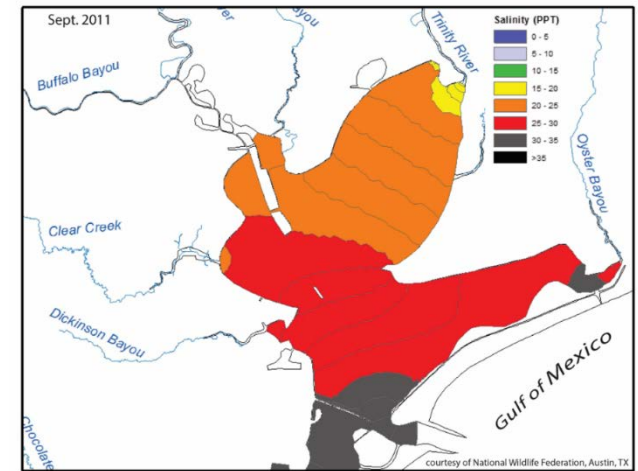
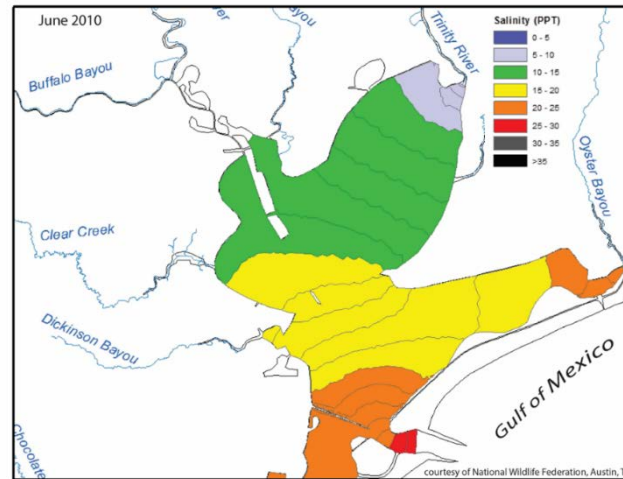
What happens in Galveston Bay during droughts?

Examining the 2011 drought in context

What would happen if we create a man-made drought?

June 2010:
745,000 Ac-ft

September 2011:
160,000 Ac-ft



Eastern Oysters
do not survive in
high salinities



Less Freshwater:

Higher Salinity
Less sediments and
nutrients

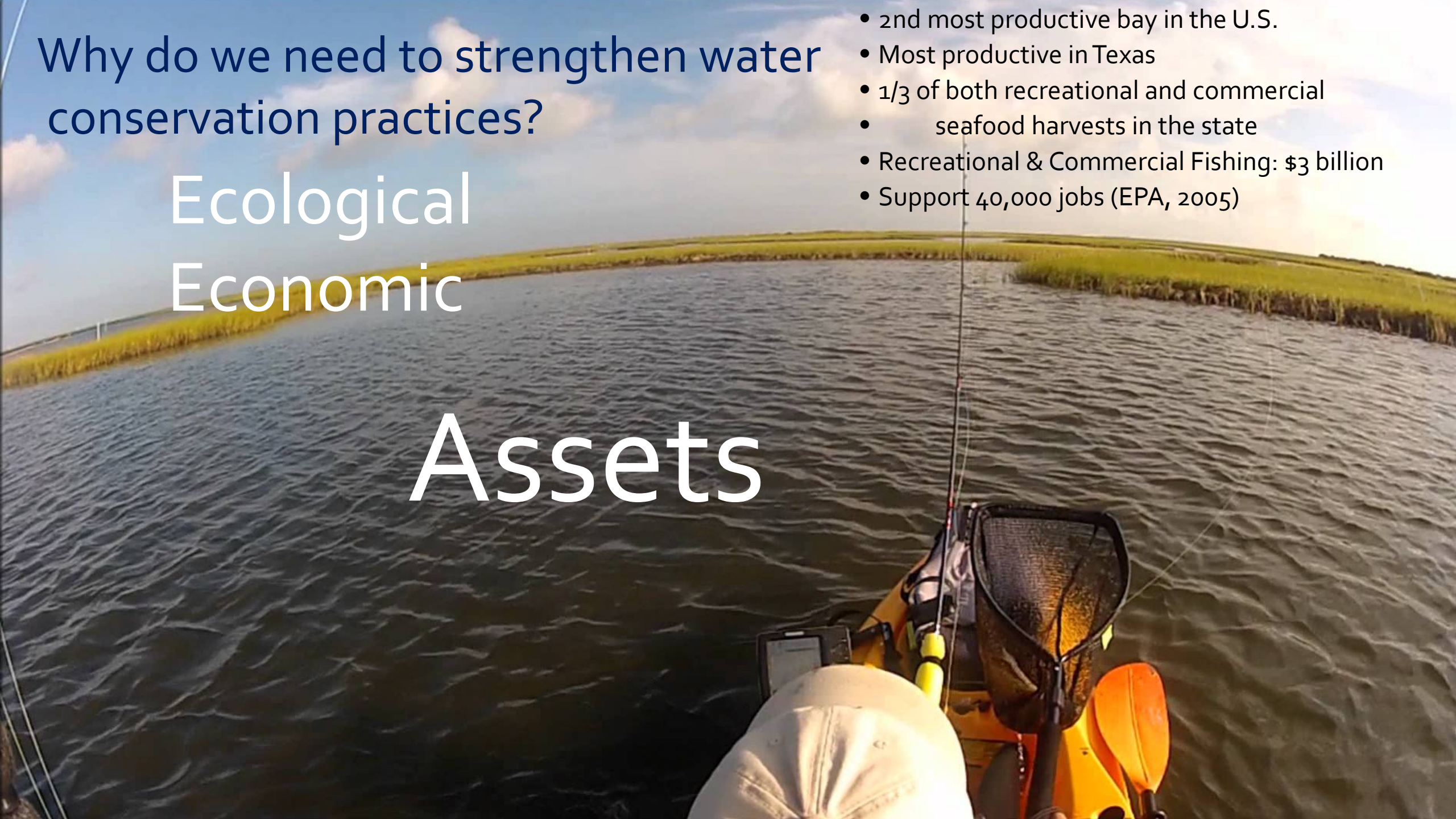


Why do we need to strengthen water conservation practices?

Ecological
Economic

Assets

- 2nd most productive bay in the U.S.
- Most productive in Texas
- 1/3 of both recreational and commercial seafood harvests in the state
- Recreational & Commercial Fishing: \$3 billion
- Support 40,000 jobs (EPA, 2005)



Urban Water Management Resilience is dependent on long-term planning with a holistic vision

Cities face a growing range of adversities and challenges in the 21st century:

- Growing populations
- Inadequate infrastructure
- Aging infrastructure
- Climate Change and “Coastal Change”
- Increasing loss of land to sea level rise and subsidence
- Extreme weather events: floods and drought

Resilience is what helps cities **adapt** and **transform** in the face of these challenges, helping them to prepare for both the **expected** and the **unexpected**

Houston is beginning to move into this direction

Oct. 2017: New Partnership with AccelerateH2O

- Addressing Grand Challenges
- Current and future priorities: "Calls for Proposals" include
 - Biosolids Removal
 - Nutrient Reduction
 - Data and Instrument Integration for Early Water Quality, Leak, Emergency Scenario Detection
 - Oil, Fats, Grease Bioproduct Treatment
- Water Loss and conservation: NOT A PRIORITY...YET

The screenshot shows the AccelerateH2O website. At the top is the logo with the text 'AccelerateH2O innovating water in Texas'. Below the logo is a navigation bar with links: HOME, ABOUT, NEWS, RESILIENCY, COMMUNITIES, KNOWLEDGE NETWORK, CONTACT, and More. The main heading is 'Innovating Texas' Water Assets' with the tagline 'Reduce | Reuse | Recycle | Repurpose |'. A paragraph describes AccelerateH2O as a catalyst for Texas' \$9 billion water technology market. At the bottom, four blue circles are arranged horizontally, each containing one of the following labels: GRAND CHALLENGES, DEMONSTRATION HUBS, INVEST H2O, and WATER CLUSTER.

AccelerateH2O innovating water in Texas

HOME ABOUT NEWS RESILIENCY COMMUNITIES KNOWLEDGE NETWORK CONTACT More

Innovating Texas' Water Assets

Reduce | Reuse | Recycle | Repurpose |

AccelerateH2O is a catalyst for Texas' \$9 billion water technology market by organizing assets, expertise, knowledge, and resources to more efficiently and effectively respond to our current challenges and position us as a competitive global water technology hub.

GRAND CHALLENGES DEMONSTRATION HUBS INVEST H2O WATER CLUSTER

For many years now, we have prepared for droughts as they come...

Drought Contingency Plans ✓ Reactive/ Short-term approach

- Triggers a certain level of water conservation depending on the level of drought/level of water in reservoirs, etc.

Proactive Water Conservation X Proactive/Long-term approach

Water Conservation Needs to be **Ingrained** in our Society

- To Meet **BOTH Future Human and Environmental Needs**
 - Outreach, Public Ads
 - Strategies: BMPs
 - Permanent outdoor watering restrictions

Water Loss Reduction X Currently reactive approach. Can be proactive!

- Houston's reported water loss in 2014 was 11%
- Multiple breaks in the pipelines due to aging infrastructure
- There are new technologies developed to fix aging pipelines robotically

We are getting better.. But we need a radical change to become resilient

AMI: Advanced Metering Infrastructure

- Large number of cities and water utilities are adopting AMI technologies to improve water usage measurement
- It gives “Real Time” data:
- It also monitors water and ambient temperatures, notifies the meter reader of leaks, bursts, tamper and reverse flows, and records this data for 460 days.
- The consumer can be notified right away if they have a leak

Smart water meters



Residential water meter

flowIQ 2100. Ultrasonic water meter, size .015...32 GPM. Composite flow sensor and radio read.



Industrial water meter

flowIQ 3101. Ultrasonic water meter, size .04...160 GPM. Steel flow sensor and radio read.



READY Drive-by

Mobile meter reading via smartphone



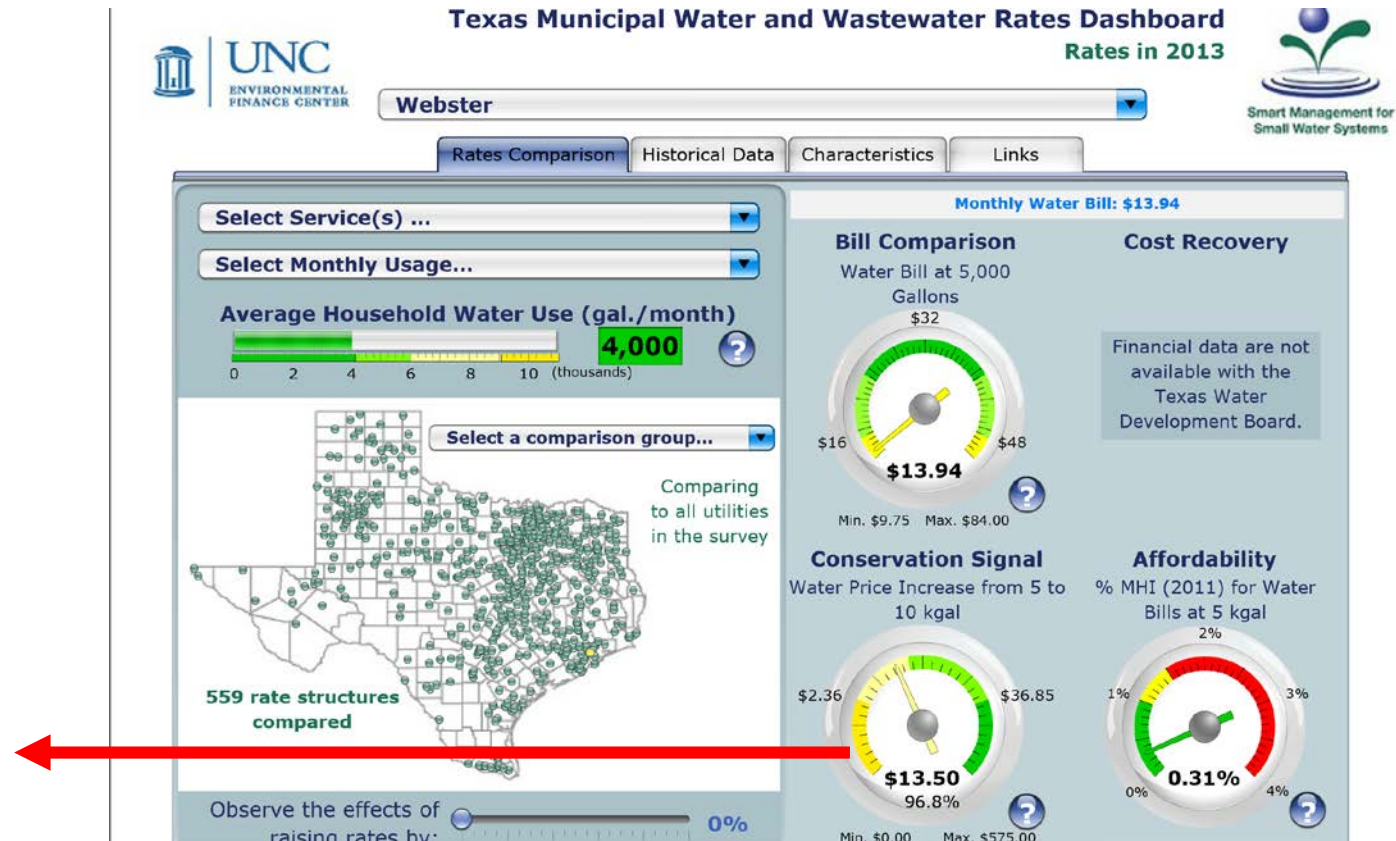
Kamstrup AMI

Kamstrup AMI is a long-range advanced metering infrastructure that makes budget planning more predictable, improves how customers view their water service, and delivers on a promise of simplicity.

The Economic Driver: Water Rate Structure

- This is a tricky one, because every water utility is different.
 - Overhead, infrastructure, taxes, geographical area, number of connections, revenue constraints, others.

City of Webster's
Water Rate Structure
Signals
Moderate
Water Conservation



2016 Texas Water Conservation Scorecard



Houston's
Score:
62



Based on publicly
accessible reports of
2009 and 2014

High water
loss

Low annual
water use
reduction: 0.26%

Only 2 out of 23
BMPs
implemented

WWW.TEXASWATERCONSERVATIONSCORECARD.ORG

Houston: We STILL have a big problem...

Outdoor watering STILL represents a big portion of residential water use

- This **needs to be the center** of the attention of cities' water planning
- Great programs developed and cross-pollination
 - NFBWA Larry's Toolbox
 - HGSD www.WaterMyYard.org and Larry the Talking Sprinkler (partnership)
 - GBF's Galveston Bay Water Brigade www.GBWB.org
 - LSGCD and WJPA outdoor watering recommendations



WATER CONSERVATION BY THE YARD:

Estimating Savings
From Outdoor
Watering
Restrictions



Area of Need:

- Adopting more BMPs
- Need regulatory and code changes
- Need overcome obstacles with developers and HOAs
- Cities' perception of water abundance needs to change
- Broad implementation of permanent outdoor watering restrictions
- Working with Association of Realtors
- Top-down decision from Houston for a unified message
 - Still exists conflicting messaging



WATER CONSERVATION BY THE YARD:

Estimating Savings
From Outdoor
Watering
Restrictions




Need Financing?



- PACE (Property Assessed Clean Energy) Houston
 - Financing for commercial buildings
 - 100% fixed rate
 - increasing cash flow, NOI, marketability and property value.
- SWIFT for Water Conservation (20% of funds available for WC projects):
 - Abridged applications are due February 2nd
 - Who can borrow?
 - Municipalities, counties, river authorities, special law districts, water improvement districts, water control and improvement districts, irrigation districts, groundwater conservation districts



www.texaslivingwaters.org

The background image shows a wetland restoration project. In the foreground, there are several tall, green reeds planted in shallow water. A person is visible in the background, standing in the water and working with the plants. The water is calm and reflects the sky. The overall scene is a natural, outdoor setting.

Not every solution is technologic and/or structural: Working with the Environment

- Living Shorelines Program
- Oyster Shell Recycling Program
- Wetlands Restoration: 16,500 acres of habitat restored
- Land Conservation: Land trusts

In Conclusion

Endless opportunities in the water management front:

- To improve drinking and wastewater systems efficiency
- To reduce water use and loss
- To improve Best Management Practices
- To strengthen Outreach and Public Perception about Water Not Being and Abundant Resource in Houston (and Greater Houston)
- Need to work with the Environment, for more natural/ organic solutions
- Water Reuse: Needs to be examined carefully vis-à-vis environmental needs and dependent rivers

Questions?

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Thank you!