



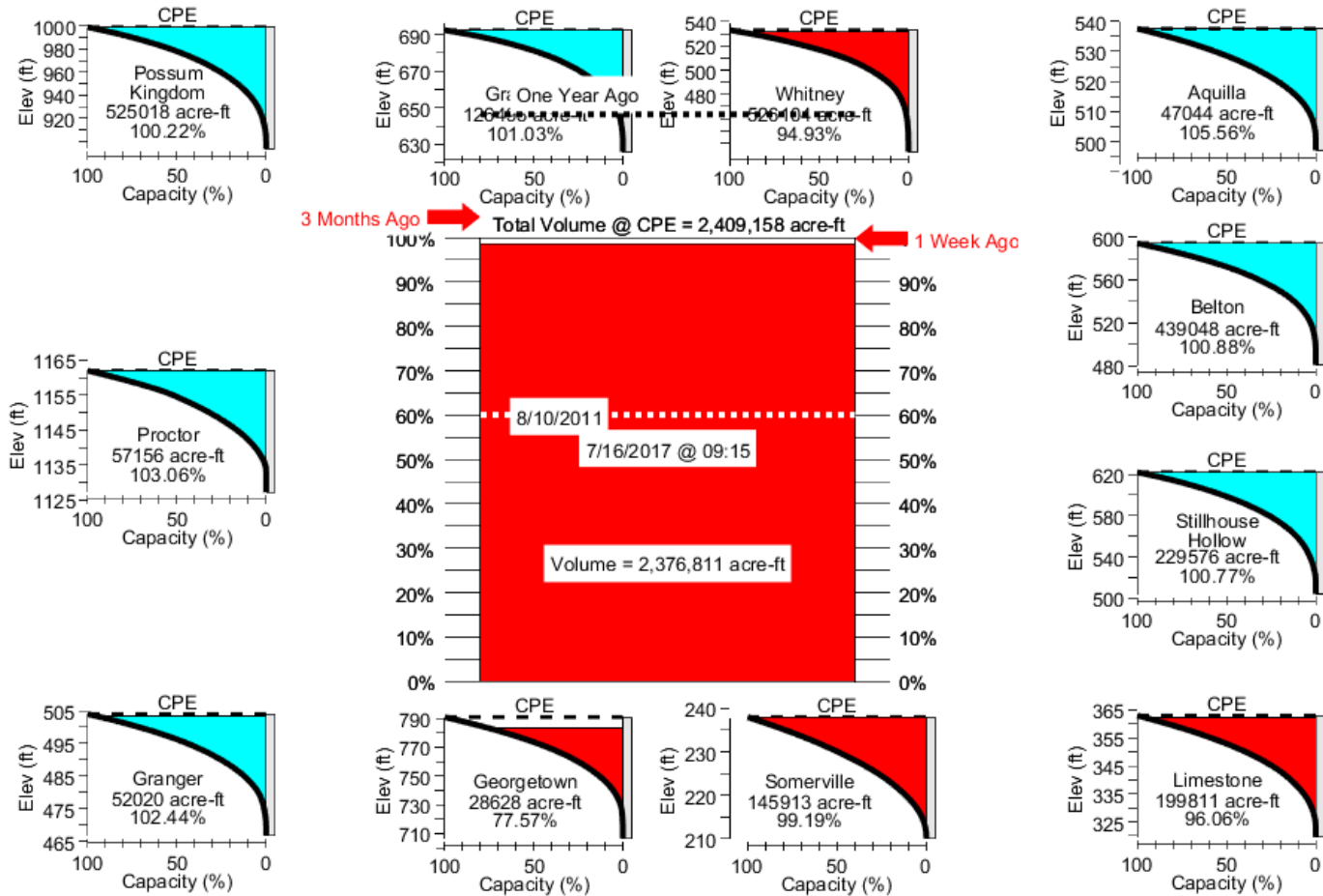
Gulf Coast Water Authority

Drought Contingency Plan Update  
US BoR WaterSMART Grant  
Drought Task Force Meeting #3

07/17/2017



# Current Conditions in the Lower Brazos Basin



## Streamflow Records (cfs):

7/15/2017

Current Flow Average Flow

Whitney	=	87	3120
Bryan	=	2070	2250
Hempstead	=	3220	3120
San Felipe	=	3040	3020
Richmond	=	2700	2740
Rosharon	=	3330	3010

\*\*All Demands Met w/  
Q = 700-1000 cfs

# US BoR WaterSMART Program

- Proposal Submitted 4/11/16
- Notice of Award 6/23/2016
- Contract Initiated 10/2016
  
- Financial Part:
  - 2 Year Contract (Oct '16-Oct '18)
  - 50-50 Cost Share with GCWA
  
- Purpose:
  - Pro-Active Drought Management
  - Build Long-Term Drought Resiliency
  - Study potential mitigation strategies
  
- Potential Benefits for future Title 16 Funds
  - Strategy Implementation



Gulf Coast Water Authority

## Drought Contingency Plan Update

Response to Funding Announcement: R16-FOA-DO-005

*Applicant:*

Gulf Coast Water Authority  
Ivan Langford, General Manager  
3630 FM 1765  
Texas City, TX 77591

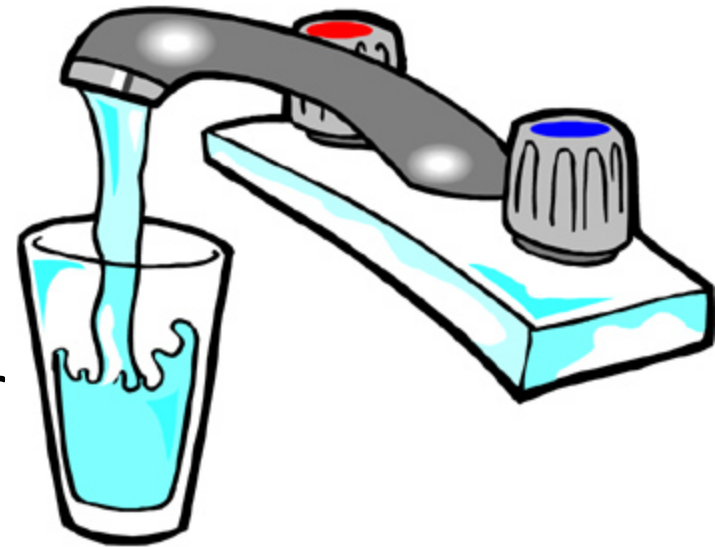
*Project Manager:*

Jordan Fumans, PhD, PE, PG, CFM  
1000 Heritage Center Circle, Suite 141  
Round Rock, TX 78664  
Email: [Jordan.Fumans@lrewater.com](mailto:Jordan.Fumans@lrewater.com)  
Phone: 512-736-6485

April 11, 2016

# GCWA's Drought Contingency Planning Goal

- Ensure GCWA Customers have water needed during future droughts
- Not: Curtailment
- Not: Rationing
- Not: Relying only on Watermaster
- Is: Maintaining Customer's Expectations
- Is: Smart Planning to maintain & grow Texas economy



# Today's Agenda

- Welcome & Purpose of DCP Update Process
  - Gather Comments, incorporate
- Discuss Comments Received since April, 2017
- TCEQ Rules for water curtailment under DCPs
- Project Status & Website
- Water Loss Monitoring & Dashboard
- Climate Change Analysis for the Lower Brazos River
- Set Next Meeting
  - October 17?

# Comments Received since April, 2017

- “The documents are mostly the work process absent of a lot of details yet. We presume the details will be populated over the next several months.”
  - *Answer: Yes & No – The USBoR requirements for the Detailed Work Plan are not really that it require details. We will be filling in details as the work progresses, but not updating the now-approved document.*
- “The work process includes ways to forecast droughts and their severity. The one thing that seems to be missing is the documentation of the impact of a Watch/Warning/Emergency/Curtailment forecast. For example, if an Emergency level is reached, this means a reduction of XXX amount of water consumption. The impact of that is XYZ municipalities will have a ban on irrigation water usage. This will then enable the financial/social/health, etc. impact to be measured.”
  - *Answer: The dashboard will track water usage and any water usage reductions caused by a Watch/Warning/Emergency/Curtailment forecast. It will not track financial/social/health impacts.*  
*Should it – Let’s discuss further.*

# TCEQ Rules for Curtailment under DCPs

- “Pro-rata reduction in demand to affected customers – No prioritization”. Please explain what this means.
  - *Answer: TAC Title 30, Part 1 §288.22 – requires pro-rata curtailment per TWC §11.039*
  - *TWC §11.039 – Distribution of Water During Shortage*
    - (a) If a shortage of water in a water supply not covered by a water conservation plan prepared in compliance with Texas Natural Resource Conservation Commission or Texas Water Development Board rules results from drought, accident, or other cause, the water to be distributed shall be divided among **all customers pro rata**, according to the amount each may be entitled to, so that **preference is given to no one and everyone suffers alike**.
    - (b) If a shortage of water in a water supply covered by a water conservation plan prepared in compliance with Texas Natural Resource Conservation Commission or Texas Water Development Board rules results from drought, accident, or other cause, the person, association of persons, or corporation owning or controlling the water shall divide the water to be distributed among **all customers pro rata**, according to:
      - (1) the amount of water to which each customer may be entitled; or
      - (2) the amount of water to which each customer may be entitled, less the amount of water the customer would have saved if the customer had operated its water system in compliance with the water conservation plan.
    - (c) Nothing in Subsection (a) or (b) precludes the person, association of persons, or corporation owning or controlling the water from supplying water to a person who **has a prior vested right** to the water under the laws of this state.

Applicable to GCWA

# Project Status & Website

Since the April DTF Meeting:

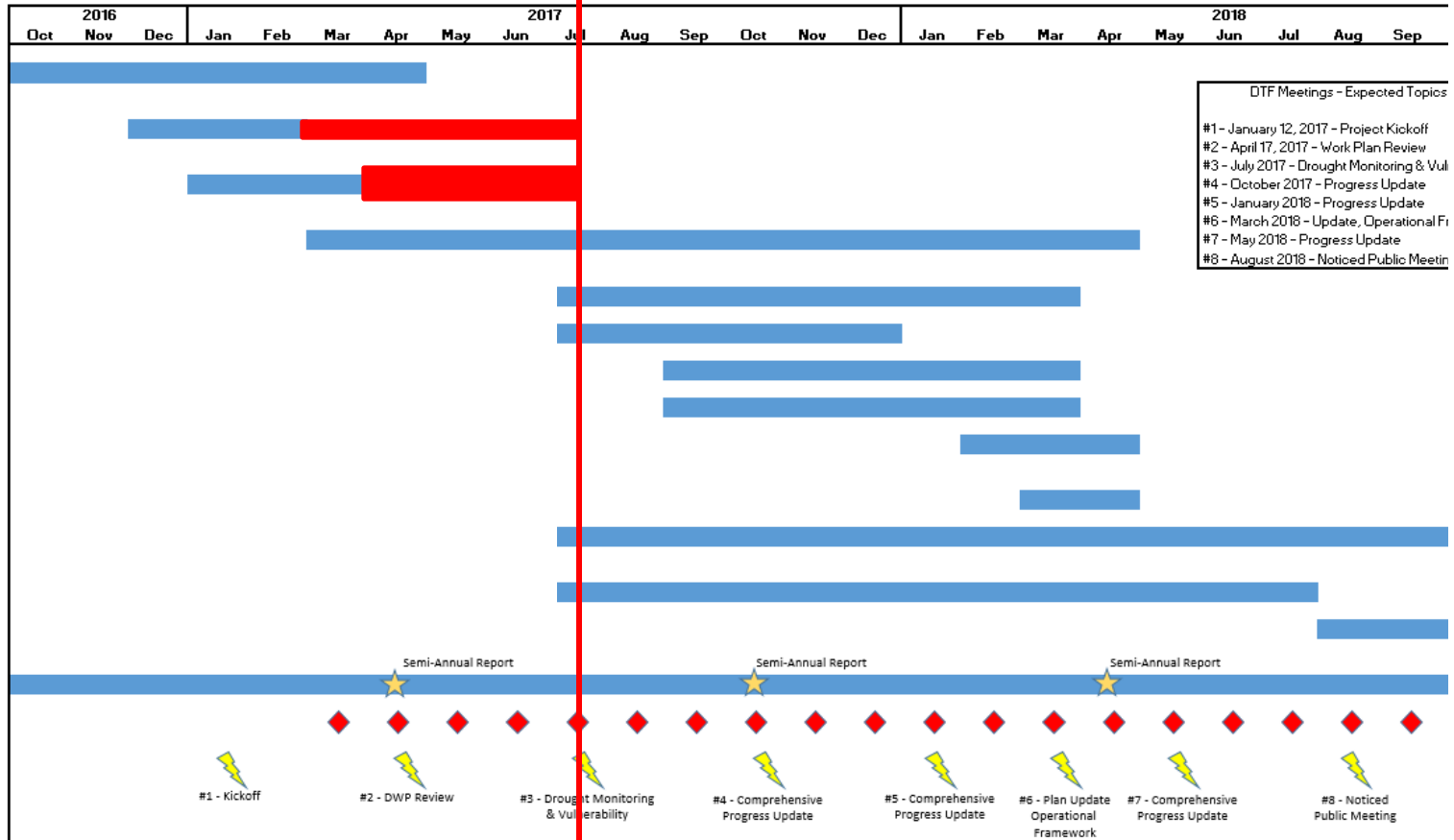
- Revised the Detailed Work Plan
  - Included Climate Change Analysis Requirements (per US BoR)
  - Clarified Tasks & Timelines
  - Added description of incentivization means for groundwater usage
- Revised the Communications & Outreach Plan

US BoR Comments: **APPROVED**

(so now we get seriously busy)



# Project Status & Website



# Project Status & Website

<http://gcwa.lrewater.com/>

To Add:  
Comment Submission  
Function

Link from GCWA Website

**LREWater, LLC**  
A Leonard Rice Engineers Company

**LRPR**  
LEONARD RICE PUBLIC RELATIONS  
SIMPLICITY WORKS

[Home](#) [Documents](#) [Meetings](#) [Contact Us](#)

# DROUGHT TASK FORCE

**GCWA**  
Gulf Coast Water Authority

**GCWA DROUGHT CONTINGENCY PLAN:**  
Update Process

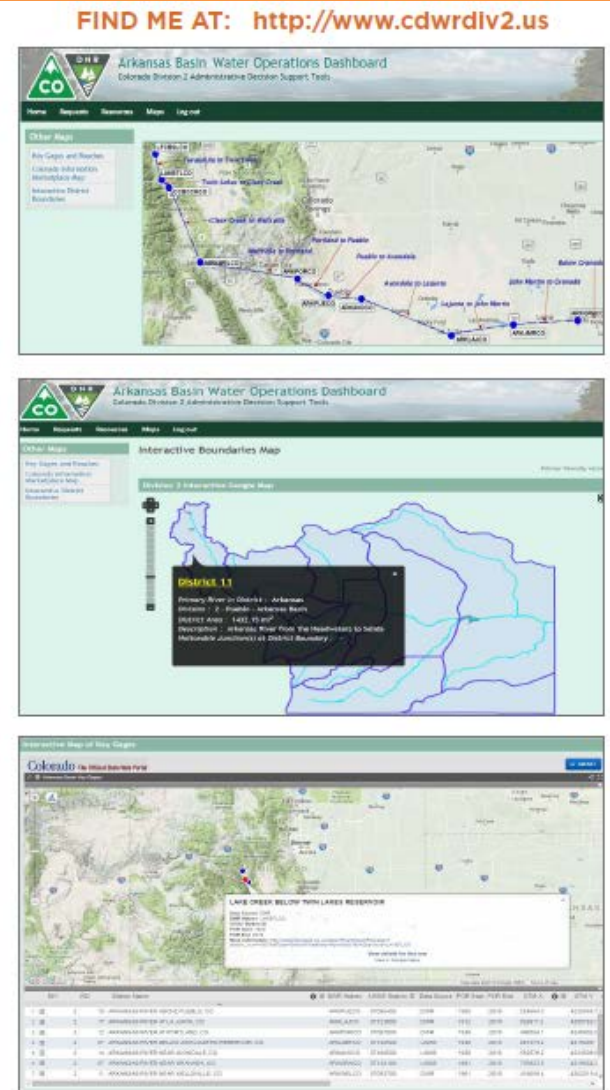
The Gulf Coast Water Authority has embarked on a comprehensive

**NEXT GCWA DROUGHT TASK FORCE MEETING**

**July 17, 2017**

# Dashboard Creation Update

- Dashboard Functionality—
  - Data Tracking & Analysis
  - Drought Prediction
  - Climate Change & Preparedness
- Likely Location
  - Cloud-hosted – accessible via login
  - Website name/URL TBD
- Current Content
  - Downloading of Brazos Streamflow
  - Computation & Routing of Flow Downstream
  - Static Predictions – No weather influence
  - Developing Database of Basin Water Usage
  - Finalizing database of GCWA customer usage
    - 2006-Present



# Dashboard Scope

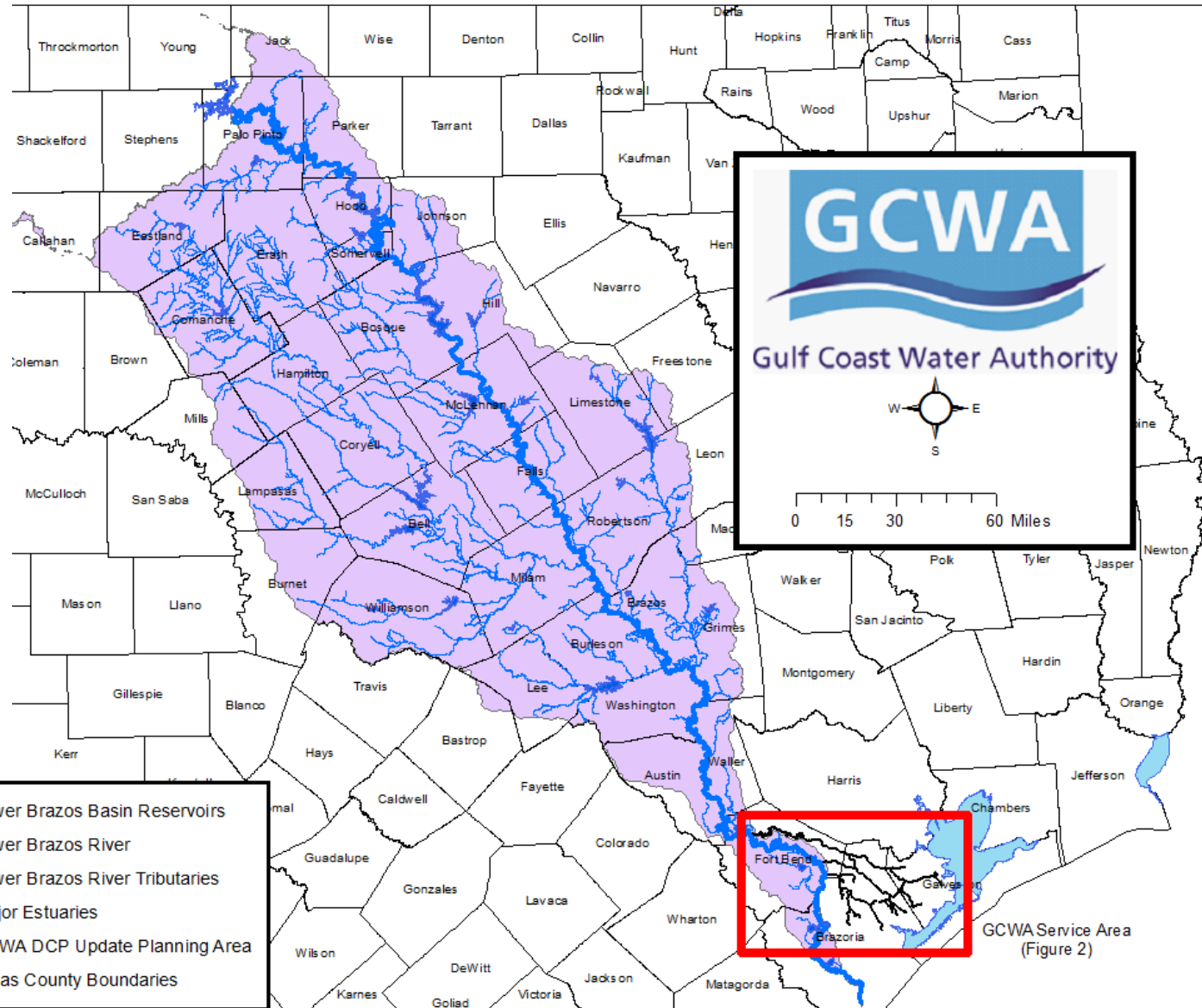
USGS Gauges  
Streamflow  
Reservoir Levels  
NOAA Predictions  
Other?

Water Rights

- Locations
- Historical diversions
- Trend Analysis

GCWA Demands

- Locations
- Historical diversions
- Trend Analysis



# Water Loss Monitoring

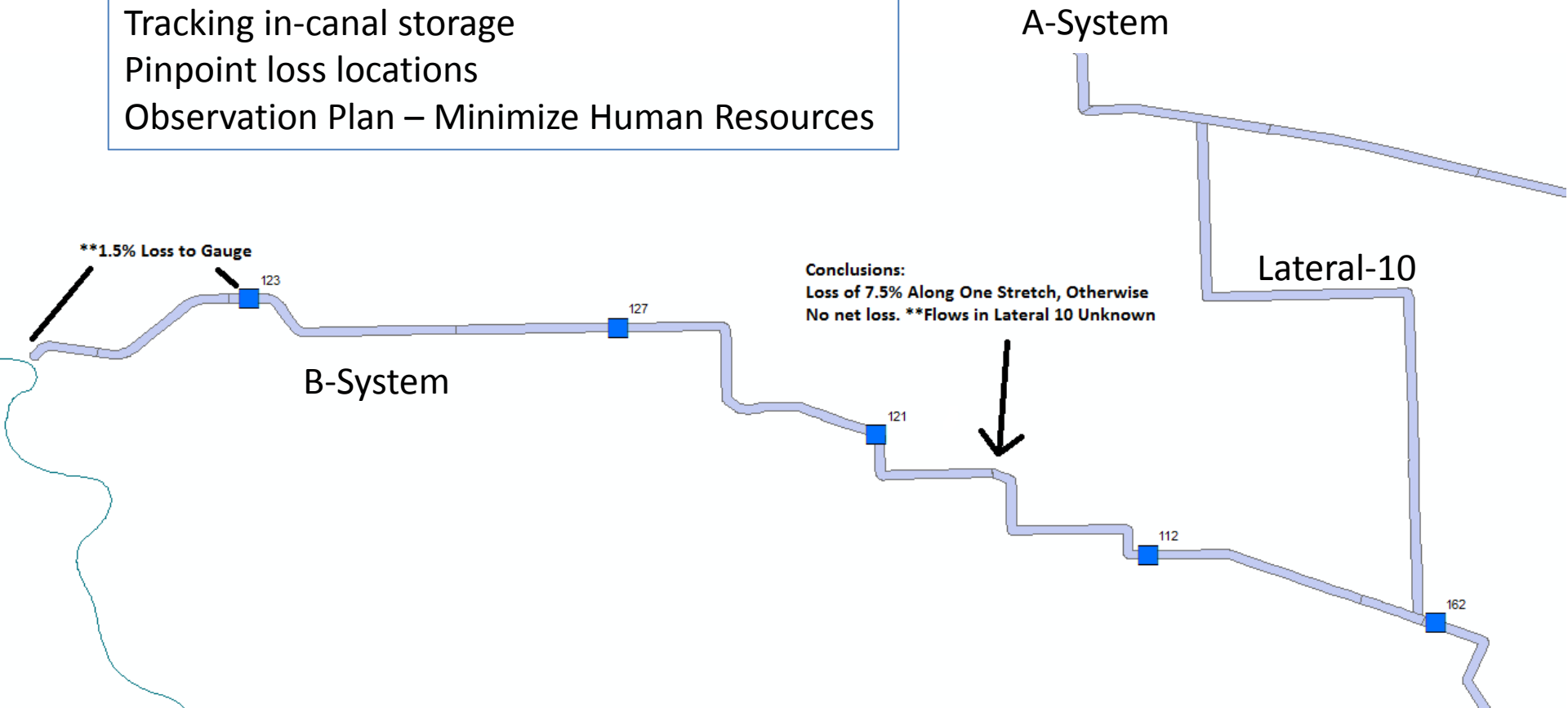
- Gain Loss Studies:
  - **GCWA loses 12-25% of Brazos River Water**
- Water distribution to customers:
  - 2016 Data: 5.74% Losses (2,025 acre-ft) From Mackey Plant
  - 2015 Data: 4.34% Losses (1,487 acre-ft) From Mackey Plant
- Develop & Implement Monitoring Program
  - Locate & Quantify Losses
  - GCWA will fix them – Prioritized List
  - Monitor for illegal diversions
  - Measure/Model/Estimate Stormwater Inflow
- Recommend additional gauges/monitoring locations
  - Water Level Trackers
  - In-canal storage & Optimization

# Canal Losses – Monitoring & Reduction

## 2014 Gain-Loss Study of GCWA System

### Determine:

- Locations for water level/flow measurements
- Tracking in-canal storage
- Pinpoint loss locations
- Observation Plan – Minimize Human Resources



# Climate Change Analysis – US BoR Requirement

- TCEQ Planning Requirements – Only for the “Drought of Record”
- US BoR Requirement – more “all-encompassing”

Appendix B  
Guidance for Incorporating Climate Change Information into Drought Contingency Plans

## Appendix B: Guidance for Incorporating Climate Change Information into Drought Contingency Plans

A critical component in conducting the vulnerability assessment for a Drought Contingency Plan is an understanding of the potential for and characteristics of future droughts. Such information is used to not only inform the risk to critical resources in a plan’s vulnerability assessment, but the development of mitigation and response actions, and the selection of action triggers in the drought monitoring process. An understanding of future droughts can be informed by the observed past, but in the incorporation of paleo-climate and projected future climate will provide a broader set of possibilities, contributing to a more robust and effective plan overall.

- Paleo-Climate = Tree Ring Analysis
- Projected Future = Global Climate Modeling

# Tree-Ring Analysis of Paleo-Climature & Streamflow

## Common Analyses

Concept: Thickness of annual tree rings indicate drought conditions

“Ring-width and streamflow - an indirect but robust relationship” - <http://www.treeflow.info/>



No Data Yet for TX



# Tree-Ring Analysis of Paleo-Climature & Streamflow

GBRA – Published Study in 2011

Texas Water Resources Institute  
**Texas Water Journal**

Volume 2, Number 1, Pages 54–96, December 2011

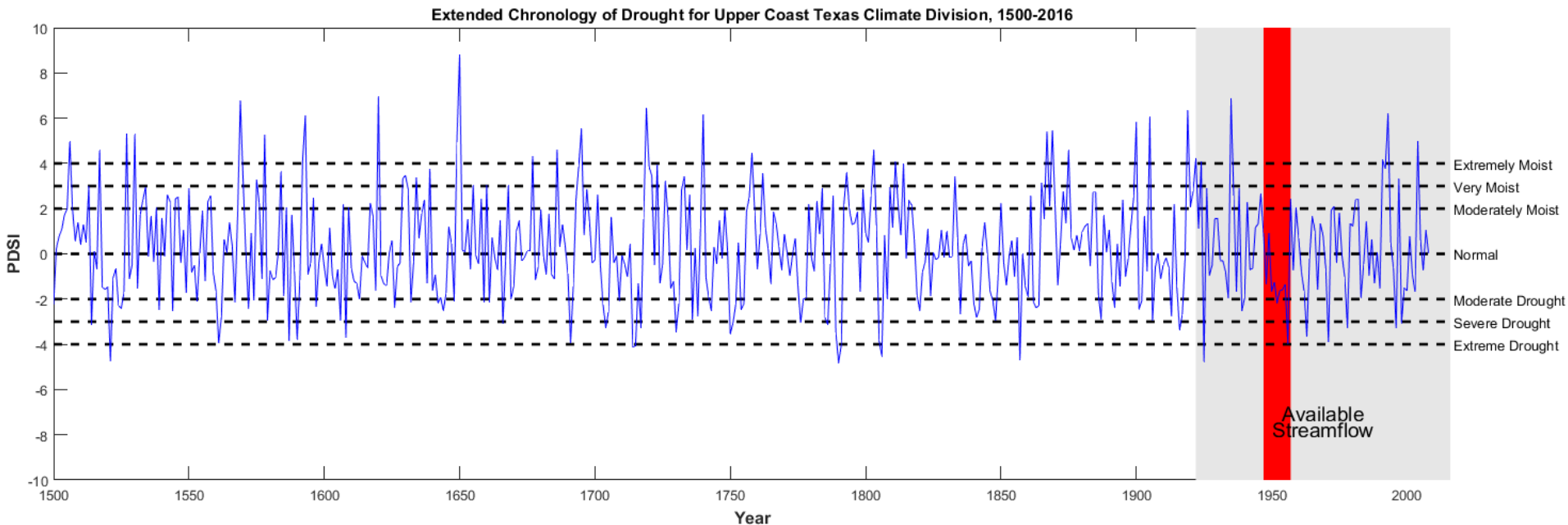
## Extended Chronology of Drought in South Central, Southeastern and West Texas

Malcolm K. Cleaveland<sup>1</sup>, Todd H. Votteler<sup>2</sup>, Daniel K. Stahle<sup>1</sup>, Richard C.  
Casteel<sup>3</sup>, Jay L. Banner<sup>3</sup>



\*\*Used Bald Cypress Rings  
Recreated Palmer Drought Severity Indices (PDSI)  
1500-2008, LRE Extended Data through 2017

# Historical Droughts in the Lower Brazos

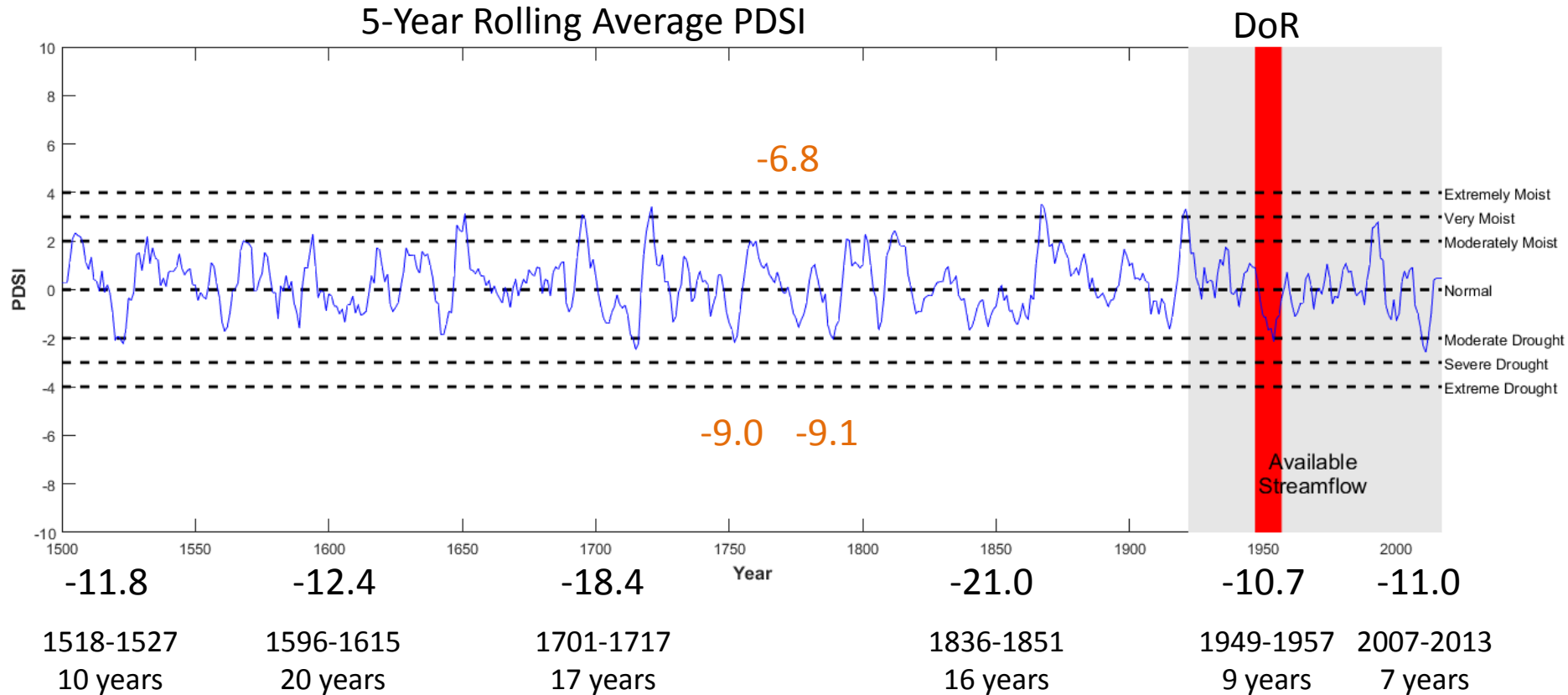


Large year-to-year variations

More extremely moist years than extreme drought years

Trends there – yet difficult to discern

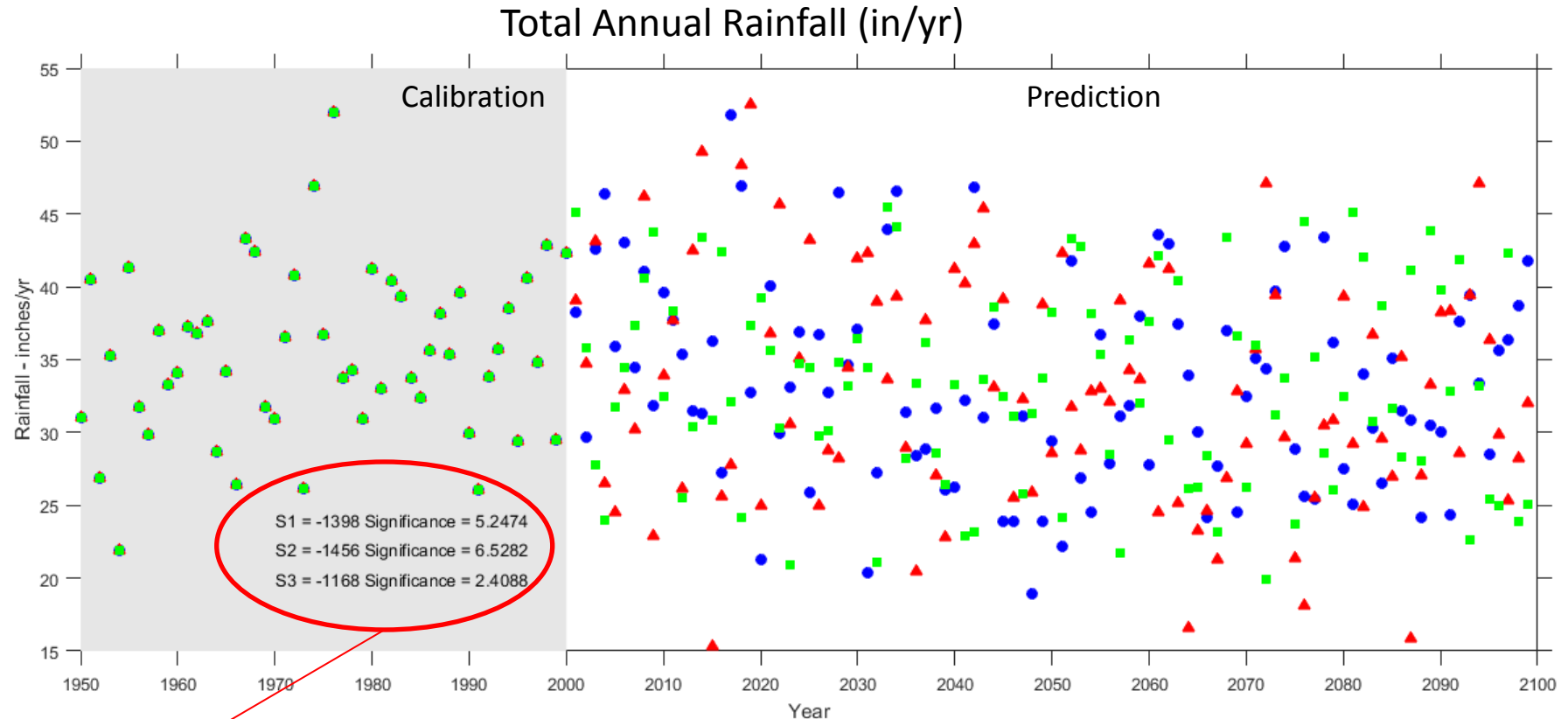
# Historical Droughts in the Lower Brazos



*Conclusion – Droughts worse than the DoR occur 1x per 100 years*

# Future Droughts in the Brazos – Through 2099

## Future Droughts – Implicit within Global Climate Model Results



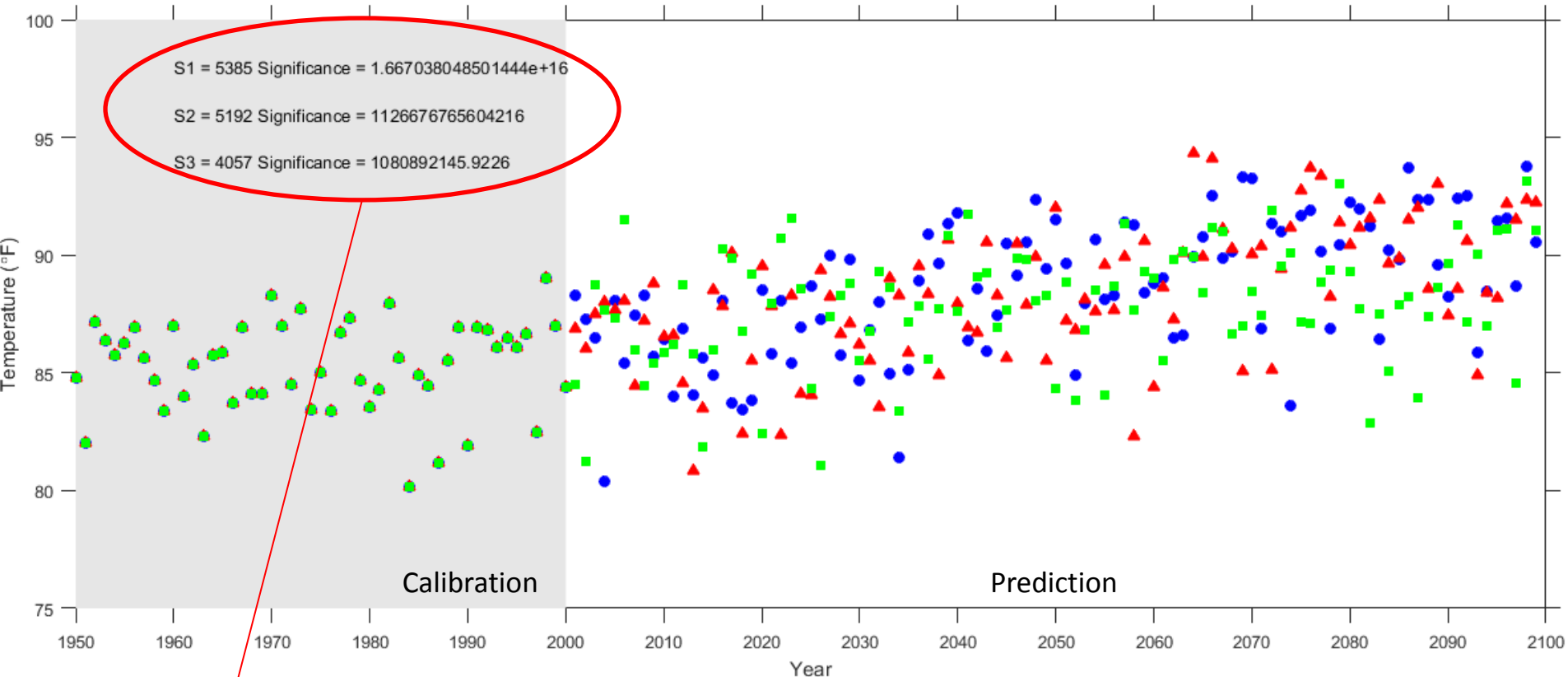
*Indicate Decreasing Rainfall  
With significance*

Results shown for BC3 Model – On Lower Brazos Watershed

# Future Droughts in the Brazos – Through 2099

## Future Droughts – Implicit within Global Climate Model Results

Average Temperature in July



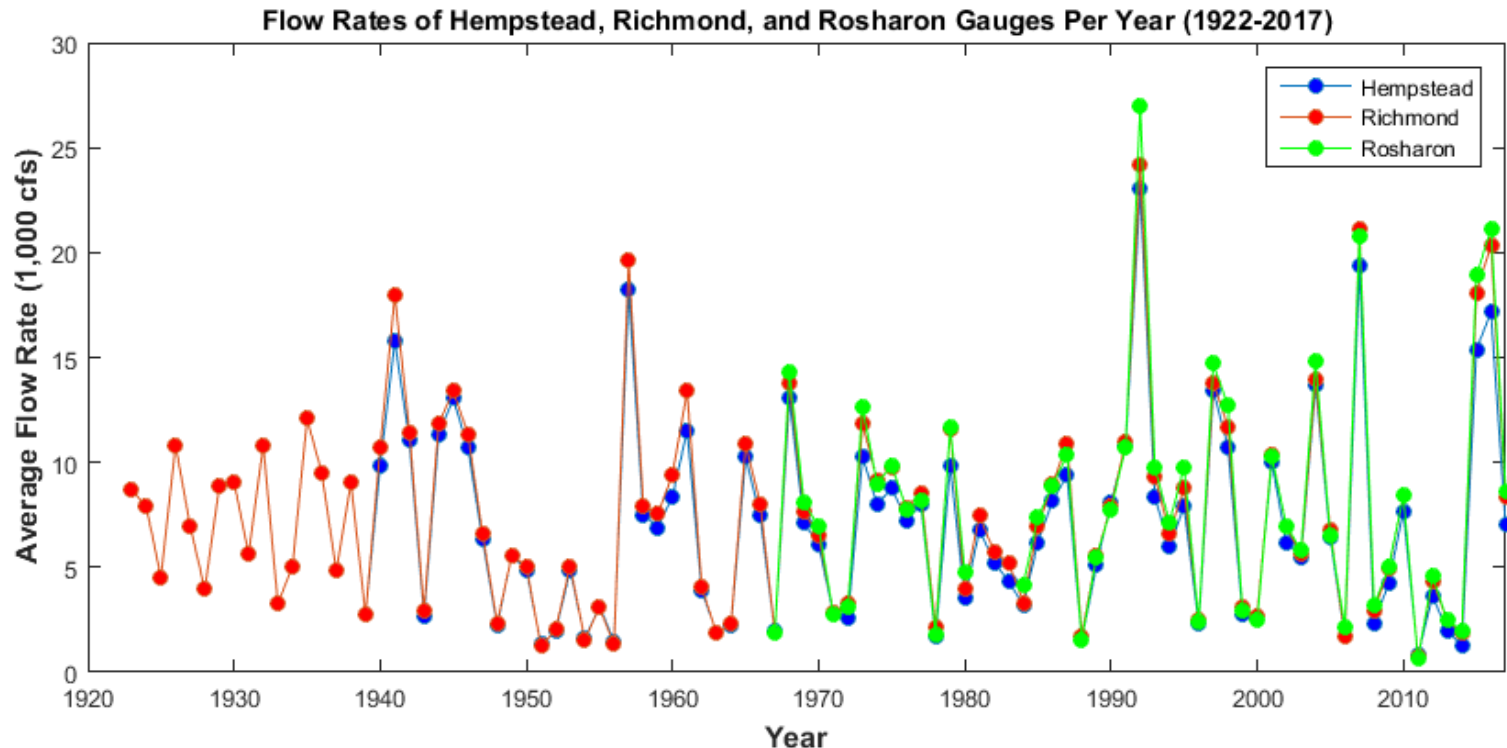
*Indicate Increasing Temperature  
With significance*

Results shown for RGRD3 Model – On Lower Brazos Watershed

# Combining Temperature & Rainfall Data

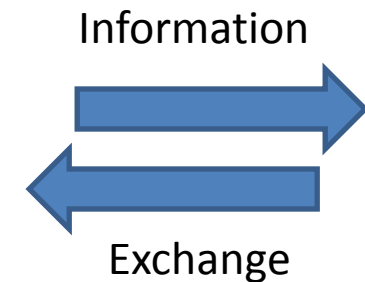
- VIC Watershed Modeling
  - Translates Temperature & Rainfall into Runoff
  - Compute Future Streamflow in the Lower Brazos
  - Model Future Water Availability/Reliability
- Correlation Method with Measured Streamflow

Outside of  
Project  
Scope



# Drought Task Force – Future Meetings

- **Working Meetings** = No lunch, but snacks likely → At GCWA facility or [online](#)
  - October 2017: Date & Time TBD
    - Discuss Drought Monitoring & Vulnerability – **Dashboard**
    - Update on Water Loss Calculations, Groundwater Assessment
  - Future meetings will be limited to 90 minutes
    - We do a “show & tell”
    - We listen to **YOU**
  - Task Force Roles:
    - Guide the engineering/planning process
    - Evaluate proposed solutions & provide feedback
    - Provide local knowledge & data to support project





**LRE**Water, LLC

a Leonard Rice Engineers Company

Jordan Furnans, PhD, PE, PG, CFM  
Project Manager – GCWA US BoR DCP Update

**512-736-6485**

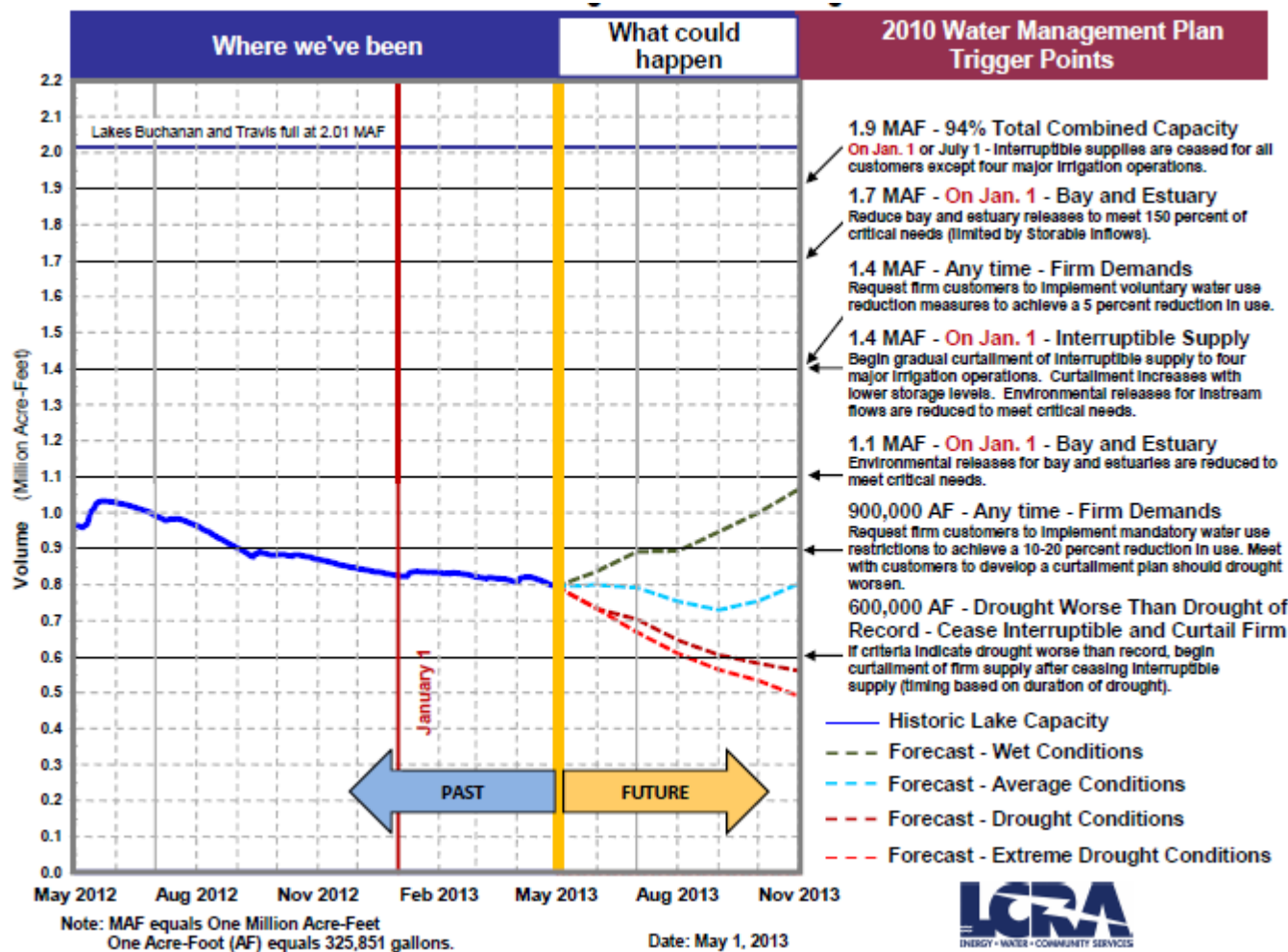
**Jordan.Furnans@LREWater.com**

1101 Satellite View #301 – Round Rock, TX 78665



# Use Established & New Ideas

- LCRA “Look Ahead” Test

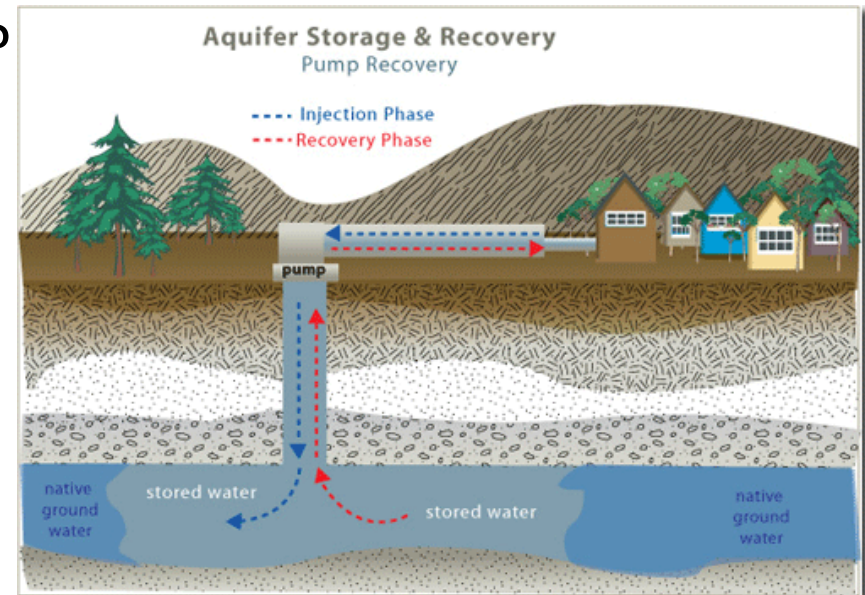


Apply to Brazos  
Streamflow  
Lake Storage

Water Usage Patterns  
Smart Analysis

# Conjunctive Use – SW & GW

- Idea = Use local groundwater when surface water is scarce
  - Use Existing or additional wells
  - Pumping subject to *subsidence district rules*
- Questions to answer:
  - How much pumping could be achieved?
  - Are existing wells operational?
  - Infrastructure Needs?
  - Permit Needs?
  - Other Needs?
  - Is ASR of benefit?



*Potential Investigation of Upstream GW usage  
Building on Ongoing & Completed GCWA Projects*

# Drought Task Force

- Drought Contingency Planning with US BoR
  - Large Stakeholder Component needed
  - Need to form a “Drought Task Force”
    - Will advise on project
    - Will “approve” project components
    - Comprised of GCWA customers, stakeholders, officials
  - Multiple Meetings – Quarterly (8 more)
  - Last Meeting – Public Meeting
  - Proposal Supporters:
    - San Leon MUD
    - Galveston County MUD #12
    - Bayview MUD
    - City of League City

*Stakeholders Identified To Date*

GCWA Drought Contingency Plan Update - Participants							
Entity	Level			Primary Interest			
	Commit	Interest	Expected	MUN	IND	IRR	ENV
San Leon MUD	X			X			
Galveston County Mud #12	X			X			
Bayview MUD	X			X			
City of League City	X			X			
City of Missouri City		X		X			
City of Sugarland		X		X			
Ascend Performance Materials		X			X		
Marathon Petroleum		X			X		
INEOS		X			X		
Dow Chemical		X			X		
NRG Energy		X			X		
Brazos River Authority			X	X	X	X	
Lower Brazos River Coalition		X		X	X	X	X
Harris-Galveston Subsidence District			X	X	X	X	
Texas Farm Bureau			X		X	X	
Texas Parks And Wildlife			X				X
Texas Water Development Board			X	X	X	X	X

# GCWA Customer DCPs

From 1/12/2017 Meeting:

- “New GCWA DCP must be consistent with current customer DCPs”

**What is  
good?  
Bad?**

Customer DCP's I have (and will review)

- Bacliff MUD
- Bayview MUD
- City of Galveston
- City of Hitchcock
- City of La Marque
- City of League City
- City of Texas City
- GC FWD #6 (Tiki Island)
- GC Mud #12 (Bayou Vista)
- GC WCID #1 (Dickinson)
- GC WCID #8 (Santa Fe)
- GC WCID #12 (Kemah)
- San Leon MUD

From City of Galveston DCP:

Stress Public Education Need:

- 1) The water management condition is real
- 2) Reductions in water demand are necessary.
- 3) The adopted measures realistically correspond to the severity of the situation.
- 4) All Customers share the inconvenience during water shortages.
- 5) The City of Galveston is effectively managing the existing water supply.