



Gulf Coast Water Authority

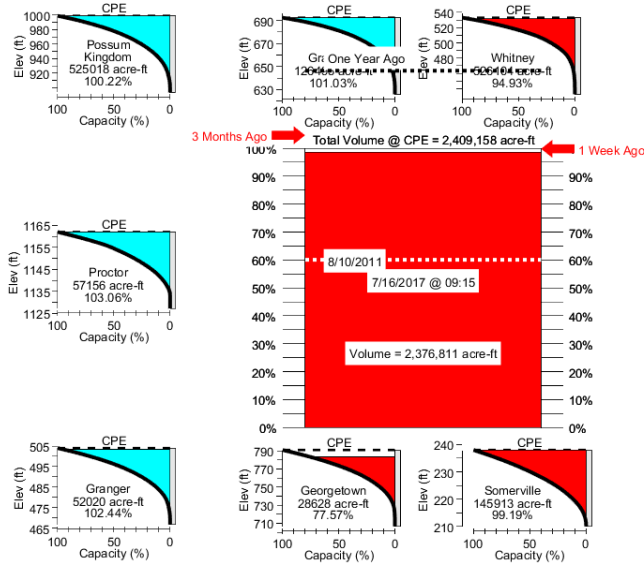
Drought Contingency Plan Update
US BoR WaterSMART Grant
Drought Task Force Meeting #5

01/16/2018 – ReScheduled 2/26/2018

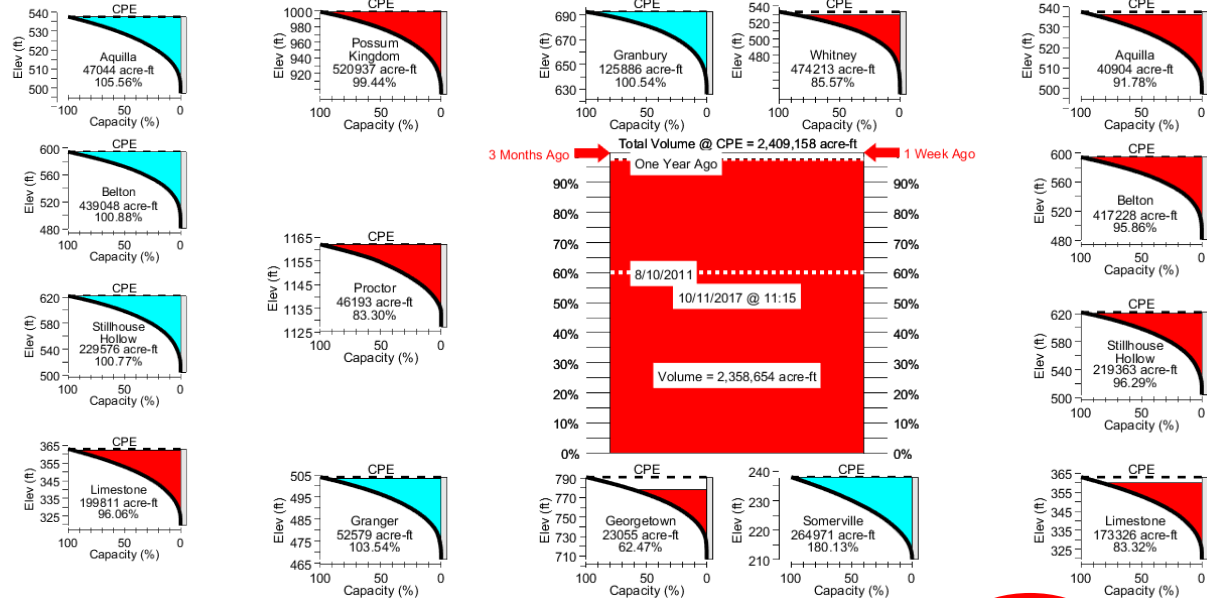


From Previous Meeting – Error Found

7/17/17



10/17/17



Streamflow Records (cfs):

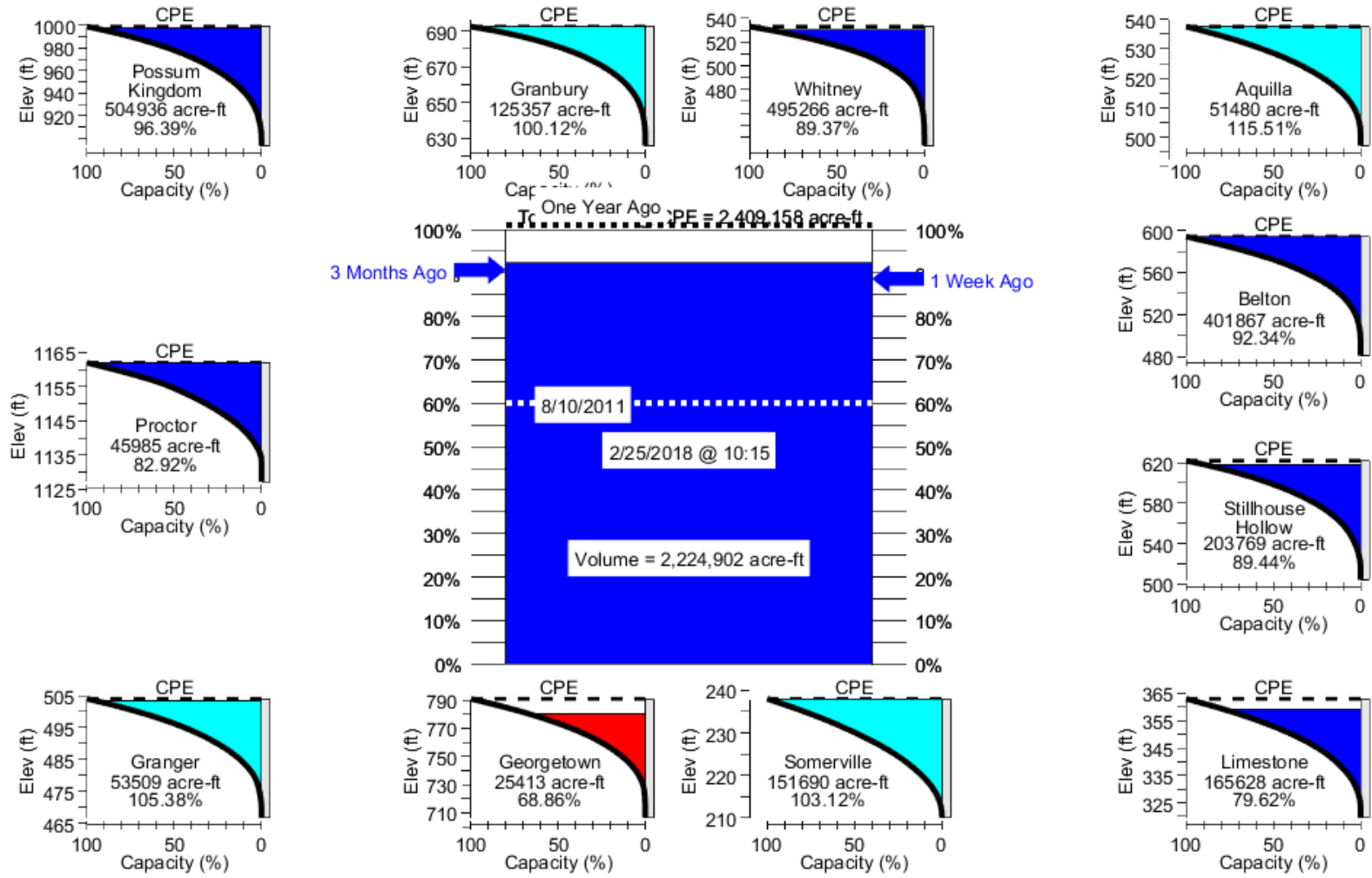
	Current Flow	Average Flow	Current Flow	Average Flow
Whitney	= 87	3120	= 49	3470
Bryan	= 2070	2250	= 637	691
Hempstead	= 3220	3120	= 3380	3470
San Felipe	= 3040	3020	= 3930	4010
Richmond	= 2700	2740	= 3880	4060
Rosharon	= 3330	3010	= 6330	6400

Incorrect in Code

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

Impact of Harvey

Current Conditions in the Lower Brazos Basin

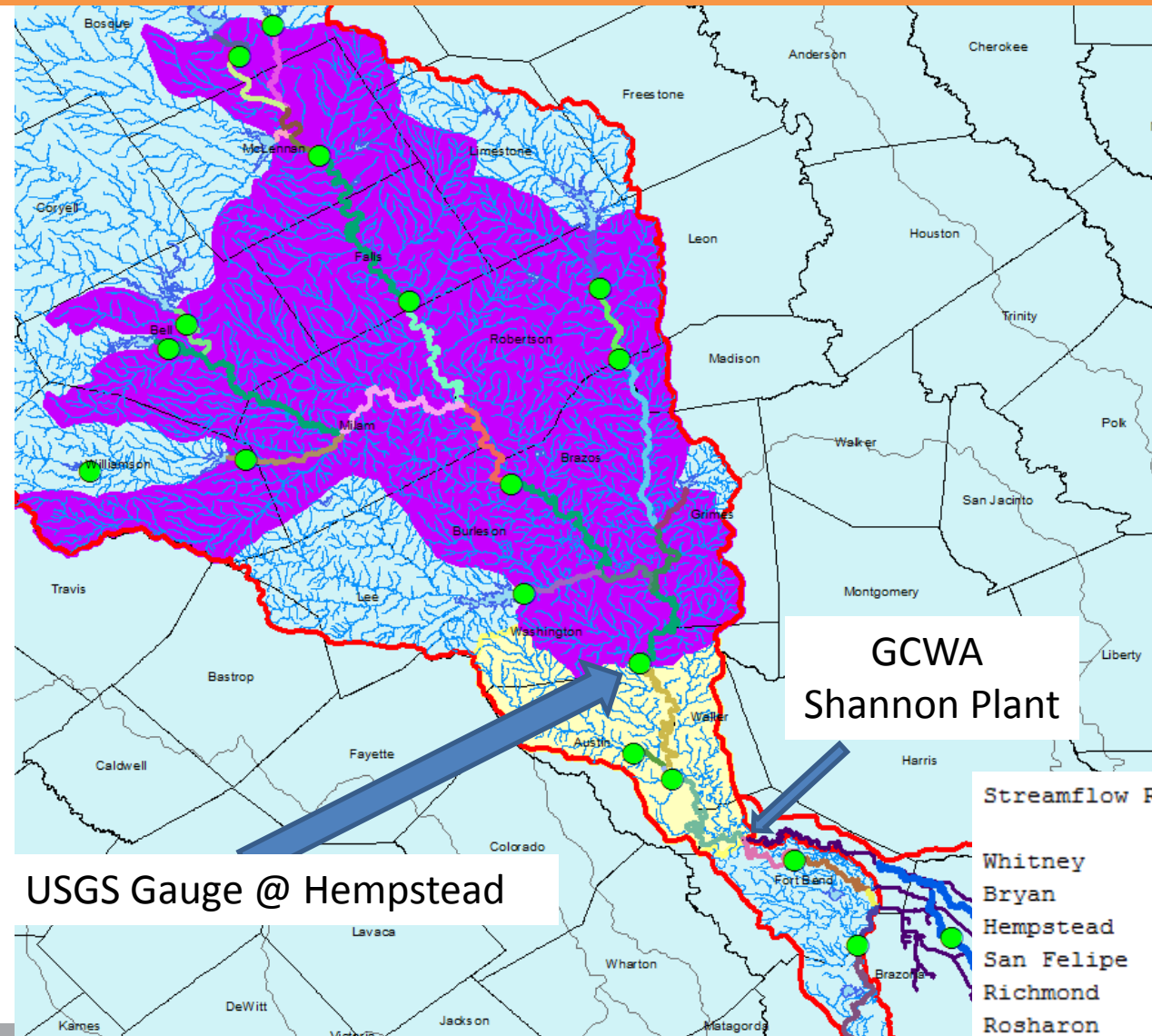


Streamflow Records (cfs):

		2/24/2018	
		Current Flow	Average Flow
Whitney	=	62	80
Bryan	=	2090	2100
Hempstead	=	2790	2450
San Felipe	=	3200	3660
Richmond	=	4230	4920
Rosharon	=	5220	3180

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

Watershed - Lower Brazos Basin



Watershed Downstream From BRA System Reservoirs:
4.72 Million Acres

Watershed between Hempstead & GCWA:
650,000 Acres
12% of contributing GCWA watershed

Purple Gain: 1,522 cfs
Yellow Gain: 1,990 cfs

GCWA
Shannon Plant

USGS Gauge @ Hempstead

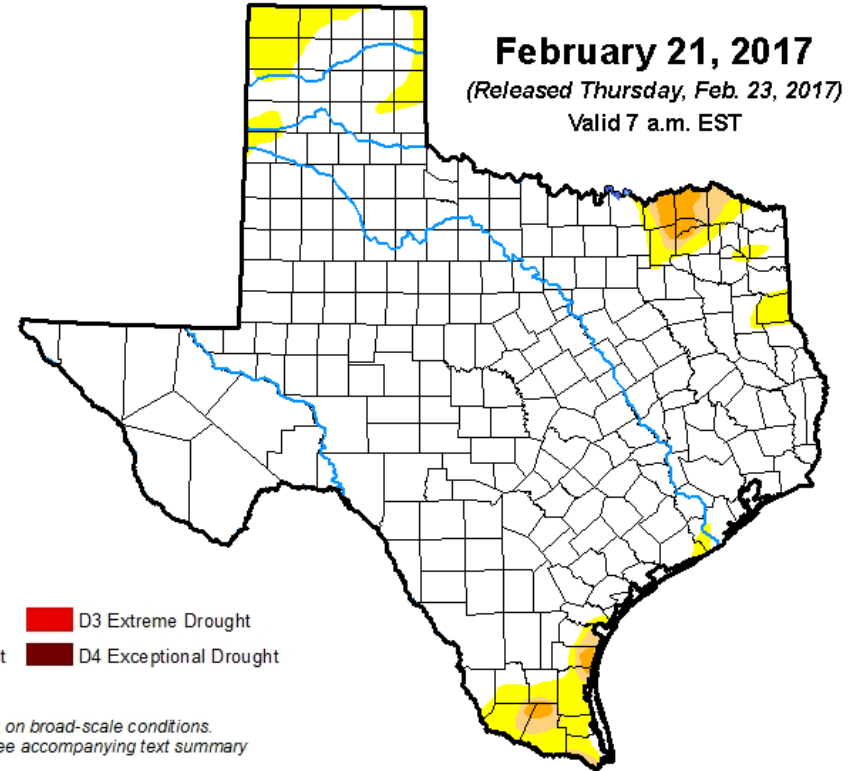
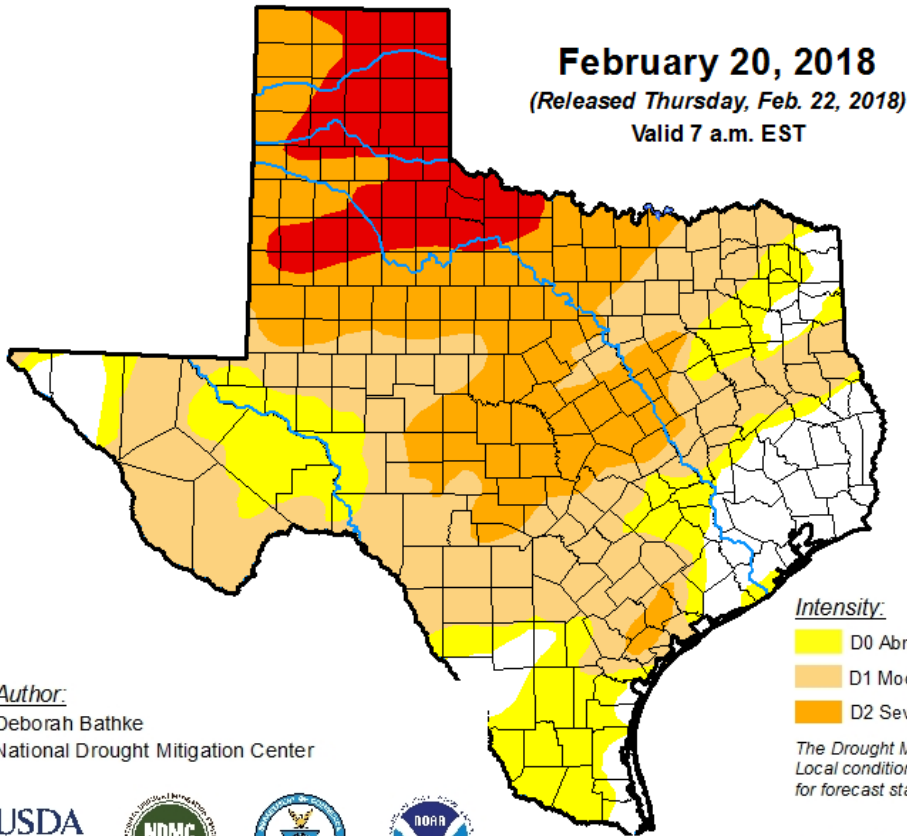
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Rosharon	=	5220	3180

2/24/2018

Dow & GCWA both model conservatively – using Hempstead Gauge

Texas Drought Map – February 2017 vs 2018



The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
Deborah Bathke
National Drought Mitigation Center

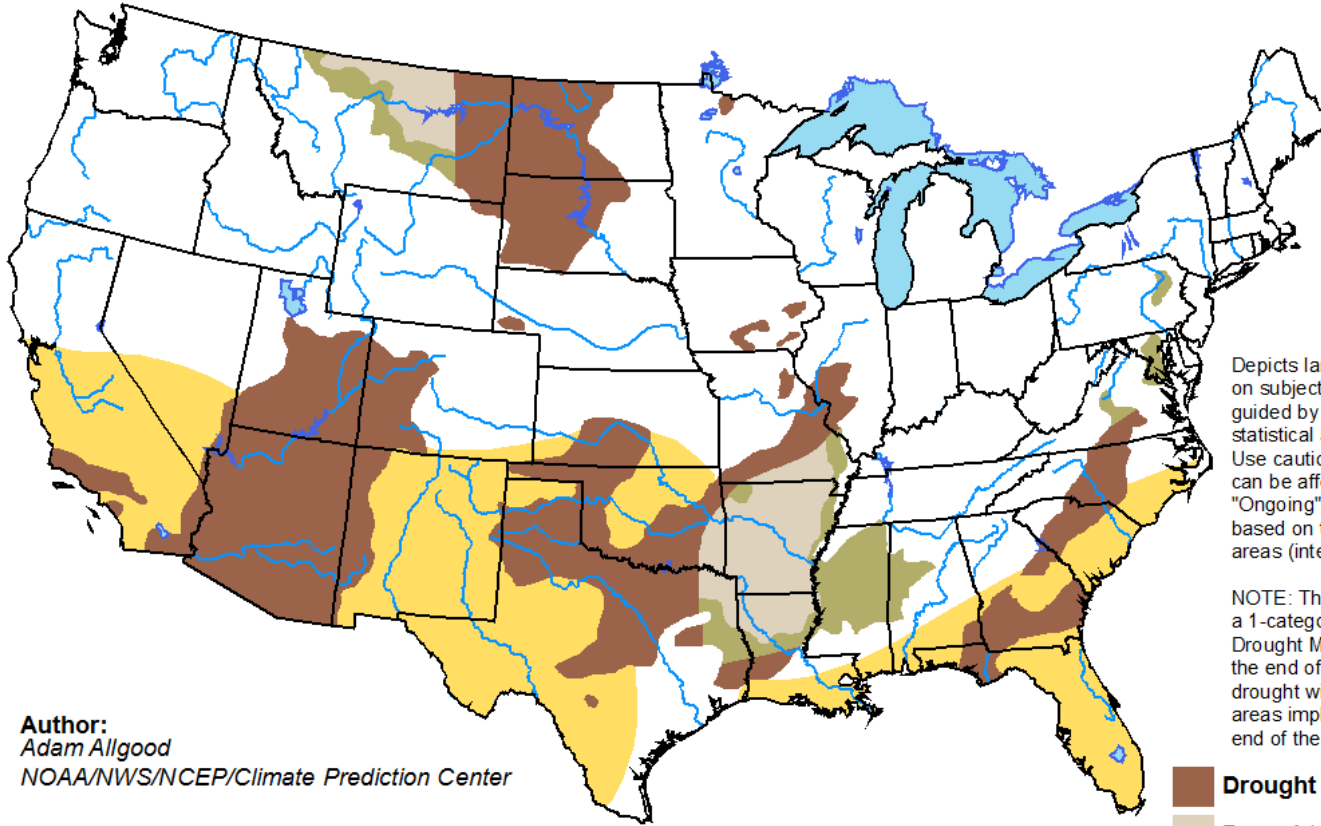


<http://droughtmonitor.unl.edu/>

Seasonal Drought Outlook

U.S. Seasonal Drought Outlook Drought Tendency During the Valid Period

Valid for December 21 - March 31, 2018
Released December 21, 2017







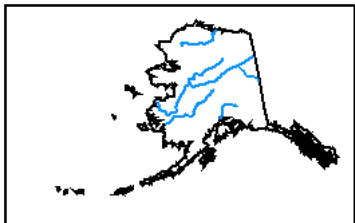
April-June Outlook
To be released
1/18/18

Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Use caution for applications that can be affected by short lived events. "Ongoing" drought areas are based on the U.S. Drought Monitor areas (intensities of D1 to D4).

NOTE: The tan areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period, although drought will remain. The green areas imply drought removal by the end of the period (D0 or none).

Author:
Adam Allgood
NOAA/NWS/NCEP/Climate Prediction Center

-  Drought persists
-  Drought remains but improves
-  Drought removal likely
-  Drought development likely

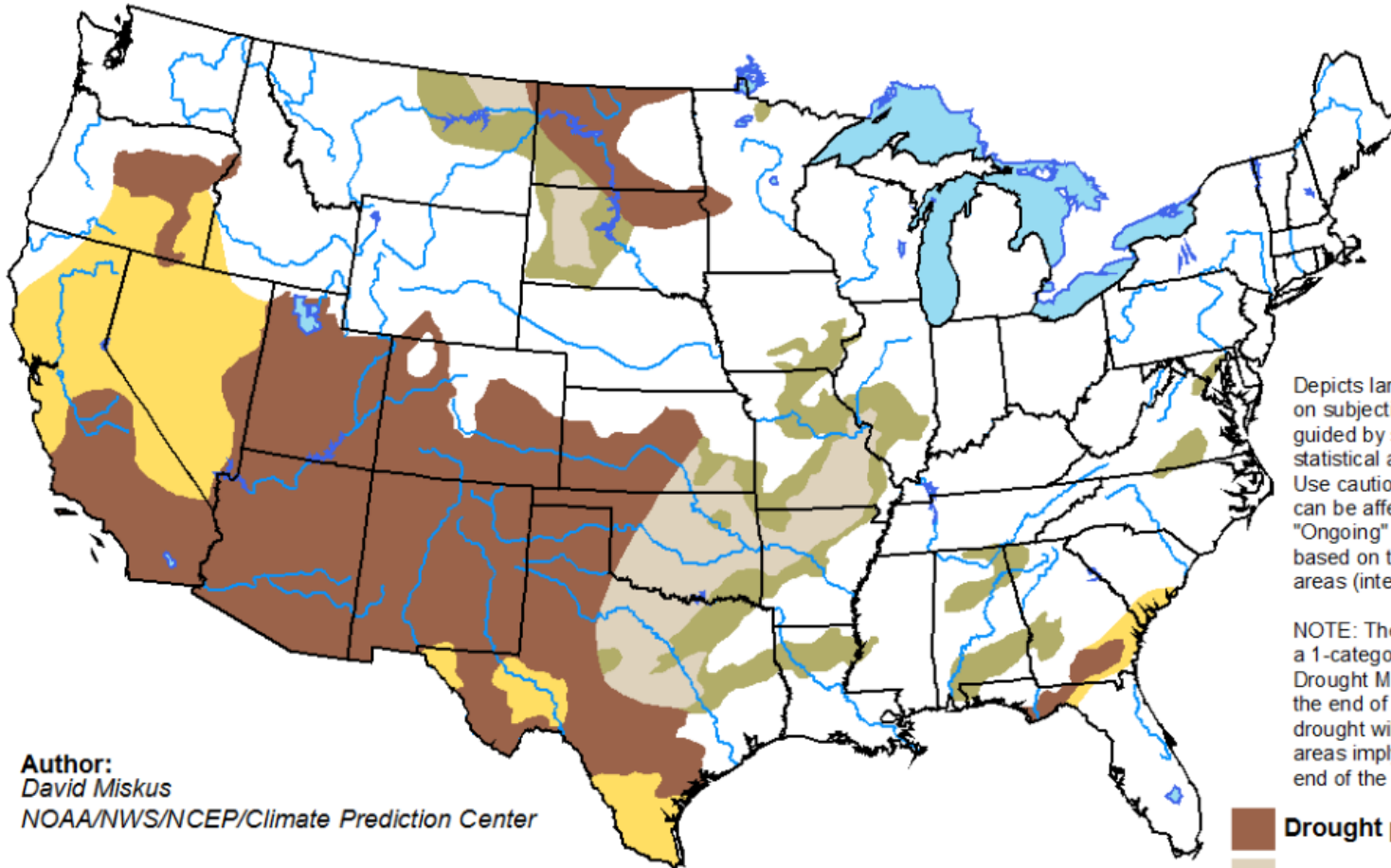


<http://go.usa.gov/3eZ73>

Seasonal Drought Outlook

U.S. Seasonal Drought Outlook Drought Tendency During the Valid Period





Valid for February 15 - May 31, 2018
Released February 15, 2018

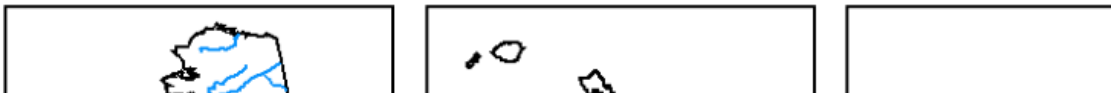


Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Use caution for applications that can be affected by short lived events. "Ongoing" drought areas are based on the U.S. Drought Monitor areas (intensities of D1 to D4).

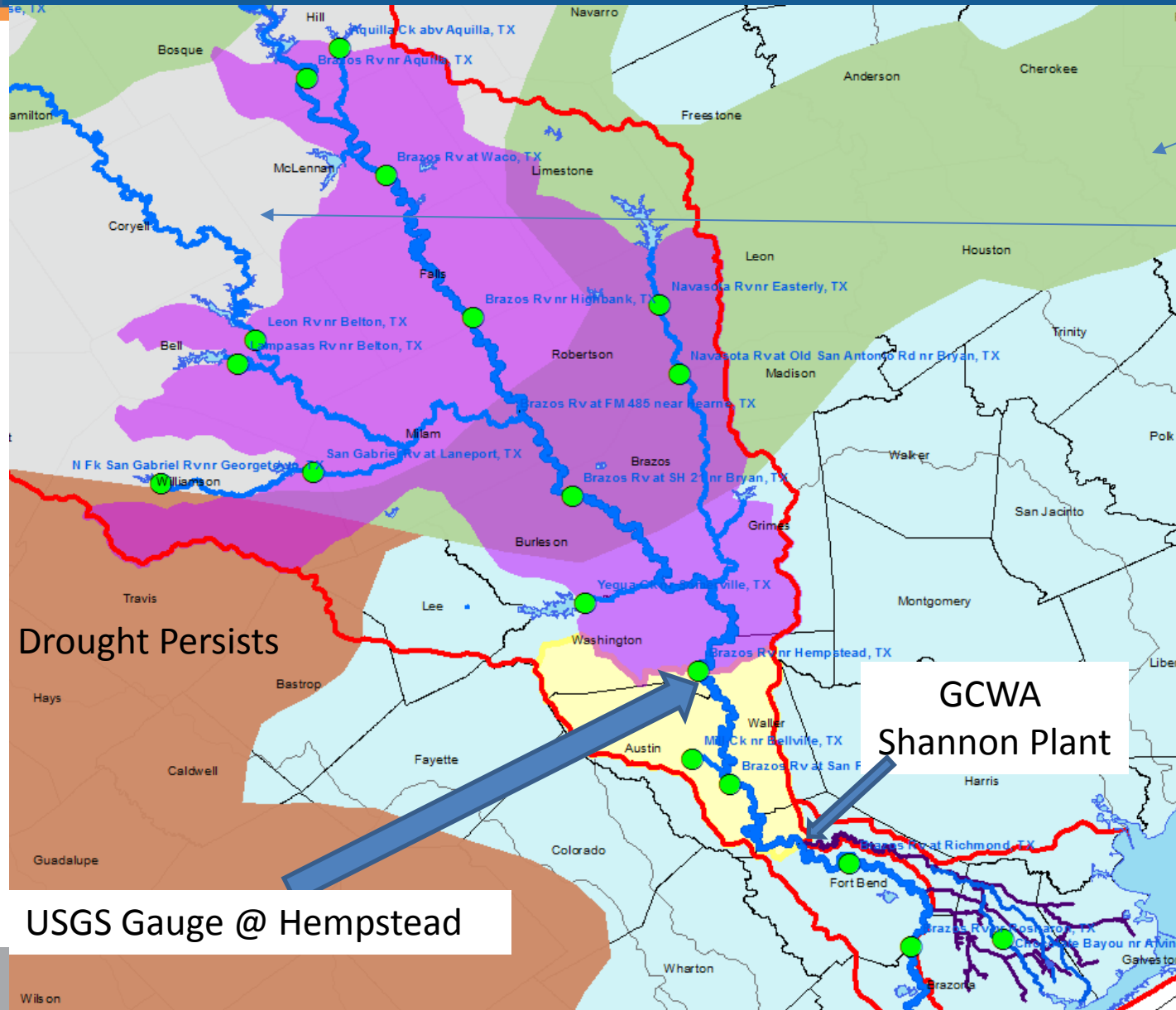
NOTE: The tan areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period, although drought will remain. The green areas imply drought removal by the end of the period (D0 or none).

Author:
David Miskus
NOAA/NWS/NCEP/Climate Prediction Center

-  Drought persists
-  Drought remains but improves
-  Drought removal likely
-  Drought development likely



Watershed - Lower Brazos Basin



Drought Removal Likely

Drought Improves

Conclusion:

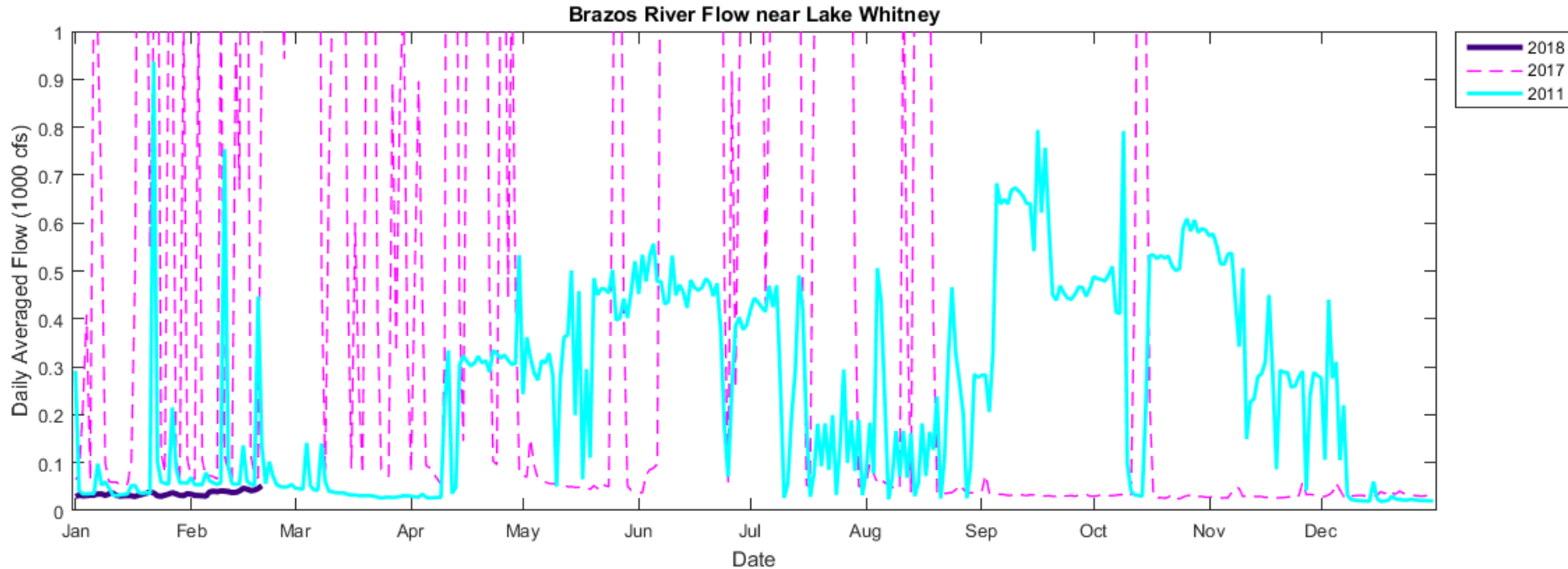
Drought Persists in
Some of GCWA
Source area

No new drought areas
Developing through
May

Check 3/15/18
Forecast

USGS Gauge @ Hempstead

Releases from Lake Whitney



Hydropower Releases – Generate Electricity – Water Moves Downstream
Per BRA – Whitney Electricity is costly and not needed – Wind Power on Grid
Possibly less releases from Whitney in Summer 2018?

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
Phone: 512-736-6485

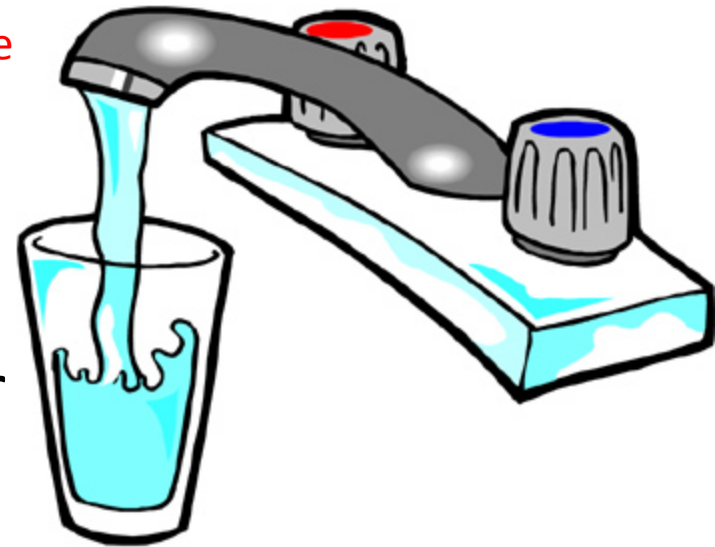
April 11, 2016

GCWA's Drought Contingency Planning Goal

- Ensure GCWA Customers have water needed during future droughts

****Curtailment Rules will be Included in DCP Update ****

- Not: Curtailment
- Not: Rationing
- Not: Relying only on Watermaster

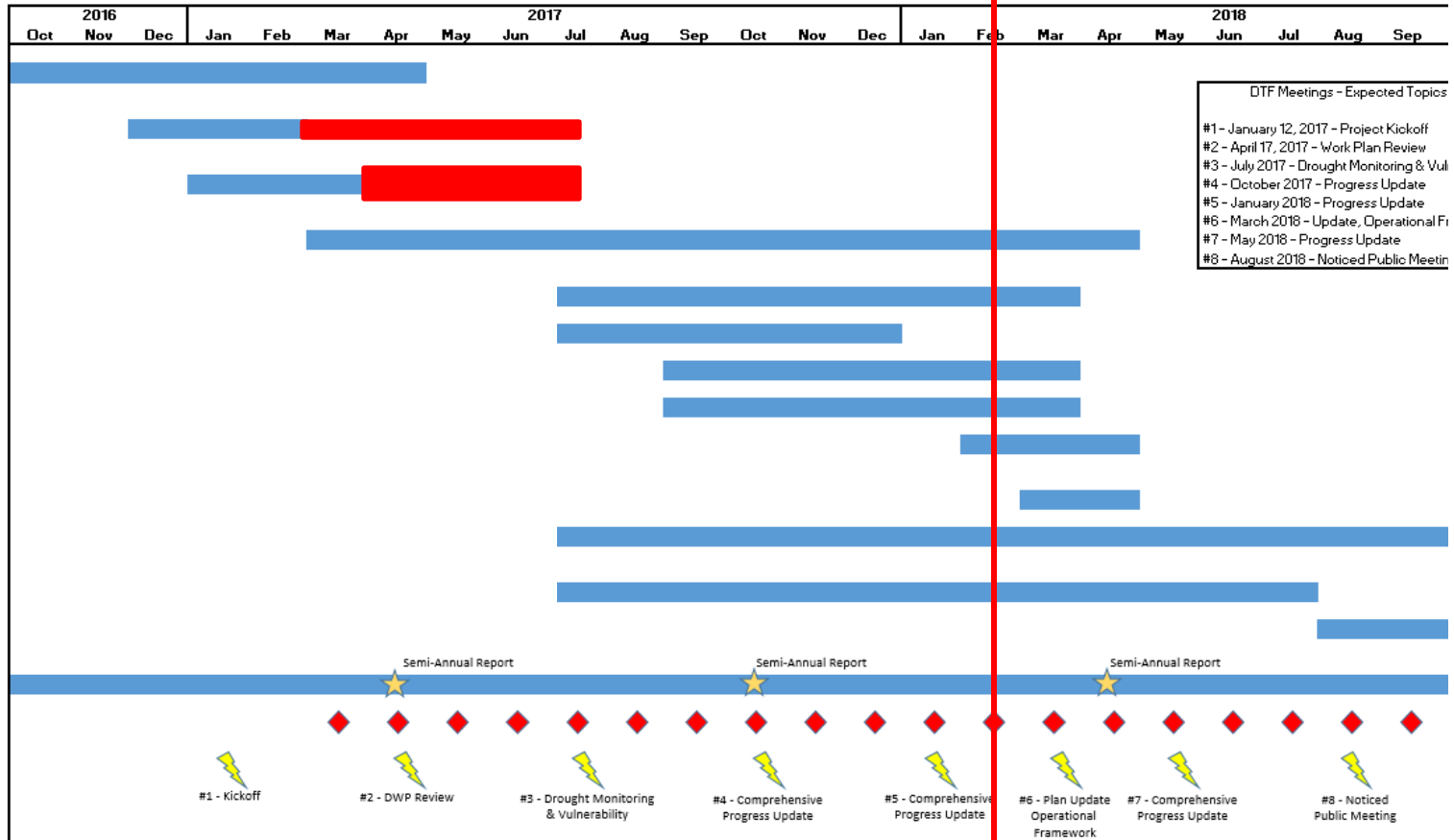


- Is: Maintaining Customer's Expectations
- Is: Smart Planning to maintain & grow Texas economy

Today's Agenda

- Curtailment Survey Results & Curtailment Modeling
- Groundwater as supplement to surface water supply
- Canal Loss Mitigation Efforts
- Next Meeting topics and discussion
- Set Next Meeting
 - Tuesday, April 17, 2018?

Project Status & Website



Project Status & Website

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

Added:
Past Presentations
Survey Results

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

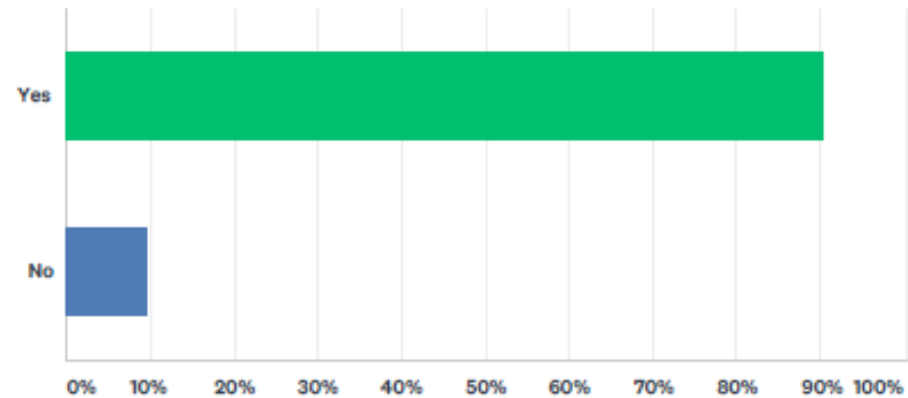
NEXT GCWA DROUGHT TASK FORCE MEETING

July 17, 2017

Water Usage Survey Results

Q1 Can you tolerate a 5% reduction in your water supply from GCWA?

Answered: 21 Skipped: 0



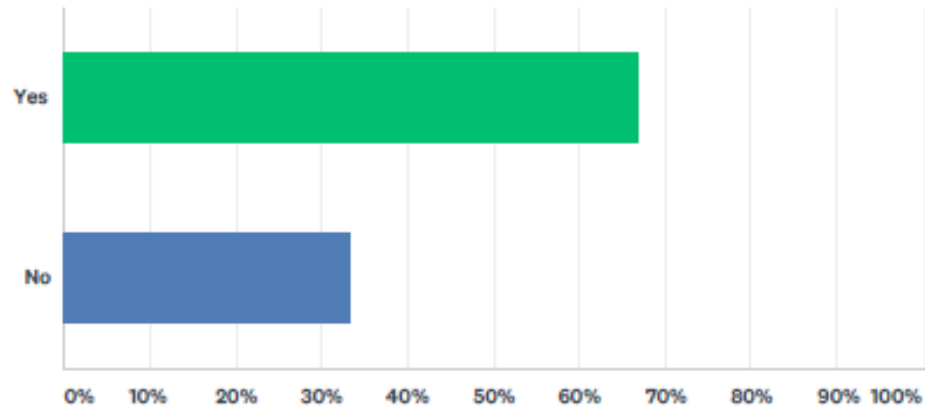
ANSWER CHOICES	RESPONSES
Yes	90.48% 19
No	9.52% 2
TOTAL	21

Currently Stage #1 – GCWA’s Existing DCP

Water Usage Survey Results

Q3 Can you tolerate a 10% reduction in your water supply from GCWA?

Answered: 21 Skipped: 0



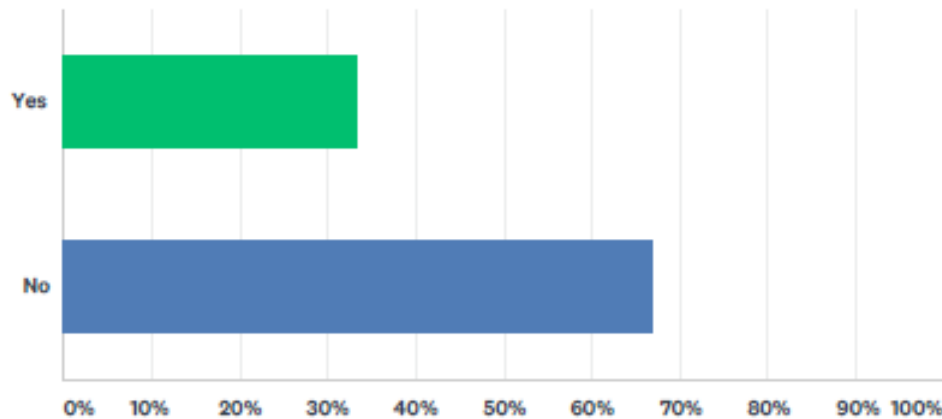
ANSWER CHOICES	RESPONSES	
Yes	66.67%	14
No	33.33%	7
TOTAL		21

Currently Stage #2 – GCWA’s Existing DCP

Water Usage Survey Results

Q5 Can you tolerate a 20% reduction in your water supply from GCWA?

Answered: 21 Skipped: 0



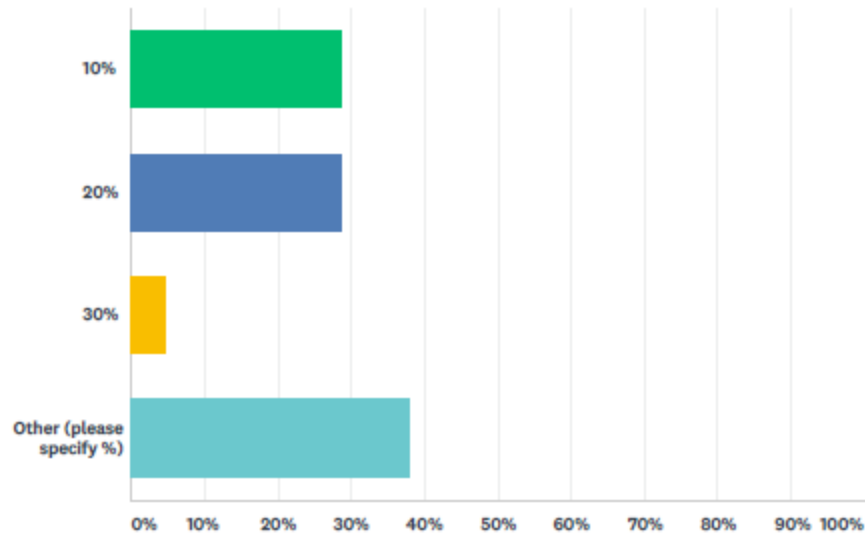
ANSWER CHOICES	RESPONSES	
Yes	33.33%	7
No	66.67%	14
TOTAL		21

Currently Stage #3 – GCWA’s Existing DCP

Water Usage Survey Results

Q7 What is the maximum amount that your water supply can be reduced and still allow your operations to continue?

Answered: 21 Skipped: 0



ANSWER CHOICES	RESPONSES	
10%	28.57%	6
20%	28.57%	6
30%	4.76%	1
Other (please specify %)	38.10%	8
TOTAL		21

**Other Responses: 5%, unknown, “subsidence district limits”

Water Usage Survey – Summary & Limitations

Value:

Understanding of GCWA
Customer constraints

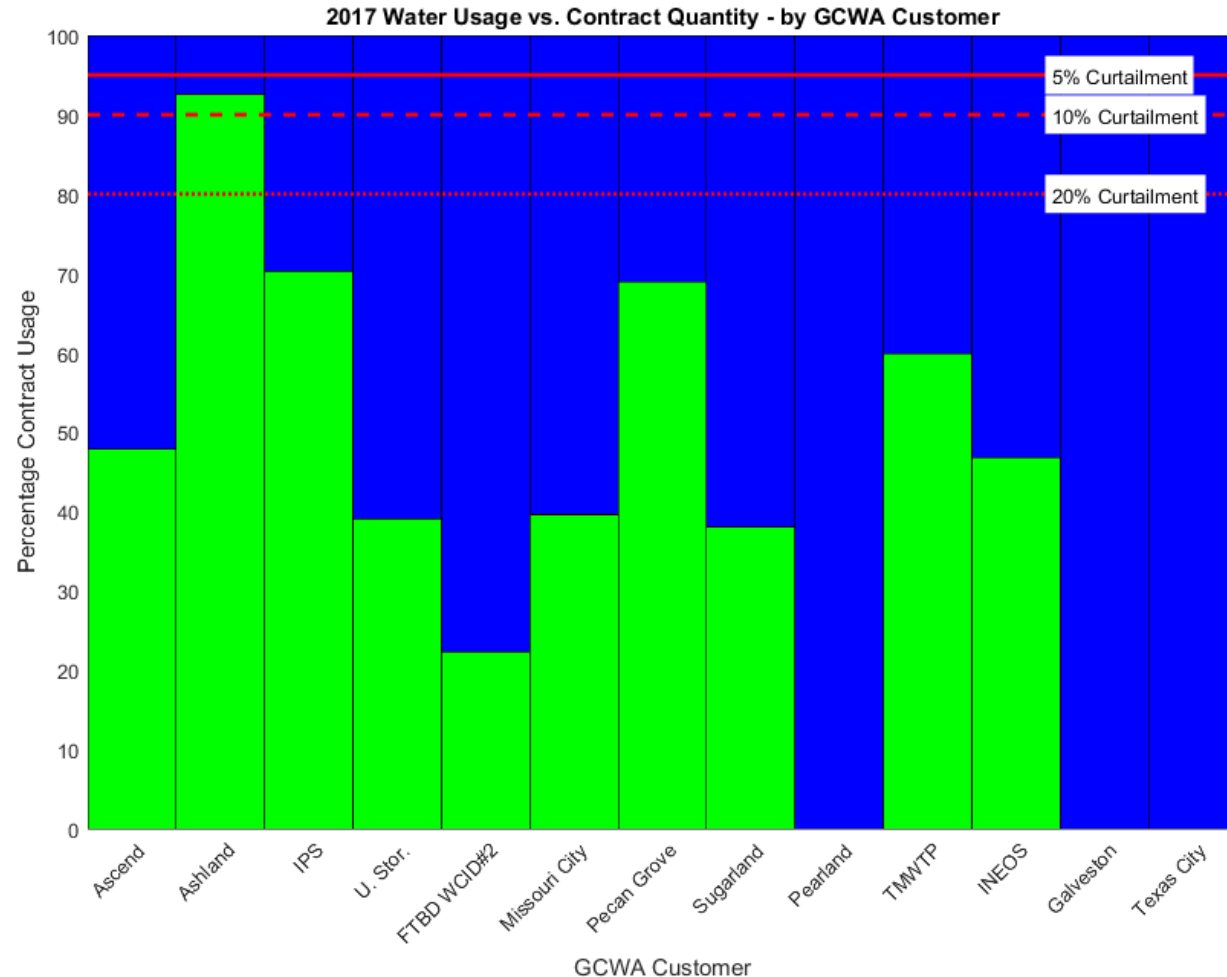
Need for Max Time of Notice
Prior to curtailment

Detractors:

Survey was anonymous
Wasn't clear whether reduction
Was from contract or recent
Usage amounts

GCWA Needs: 301 MGD
(Full Contracts & Losses)

2017 Usage: 138 MGD



Curtailment Modeling – GCWA Daily Hydro (V7)

- Daily Water Availability Model
 - Developed for GCWA in 2011
 - Continuous refinements
 - Simulates through 2017
 - Uses *Gauged Streamflow @ Hempstead*
 - Models 2011 – “Worst Single Year on Record”
- Models Contractual GCWA Demands
 - Can Model Current/Future Usage
- Applies Prior-Appropriation Doctrine
- Includes GCWA, NRG, Dow, Brazosport WA

Use Daily-Hydro (V7)
to model impact of
proposed/potential
Curtailment rules

Curtailment Modeling – GCWA Daily Hydro (V7)

- Water Allocation Methods:
 - Strict Priority – Senior First
 - With Monthly Limits – is in Texas WAM
 - Senior First during drought, otherwise junior first
 - §297.58(b) – Senior first within individual water rights
 - GCWA can use 1939-*5171* before using 1926-*5168*
 - GCWA cannot use 1950-*5171* before exhausting 1939-*5171*
 - ★ • *Watermaster can accept or deny GCWA usage requests*
 - Pro-Rata Allocation among GCWA, Dow, NRG, BWA
 - At all times, or
 - Only during shortage, otherwise use §297.58(b)

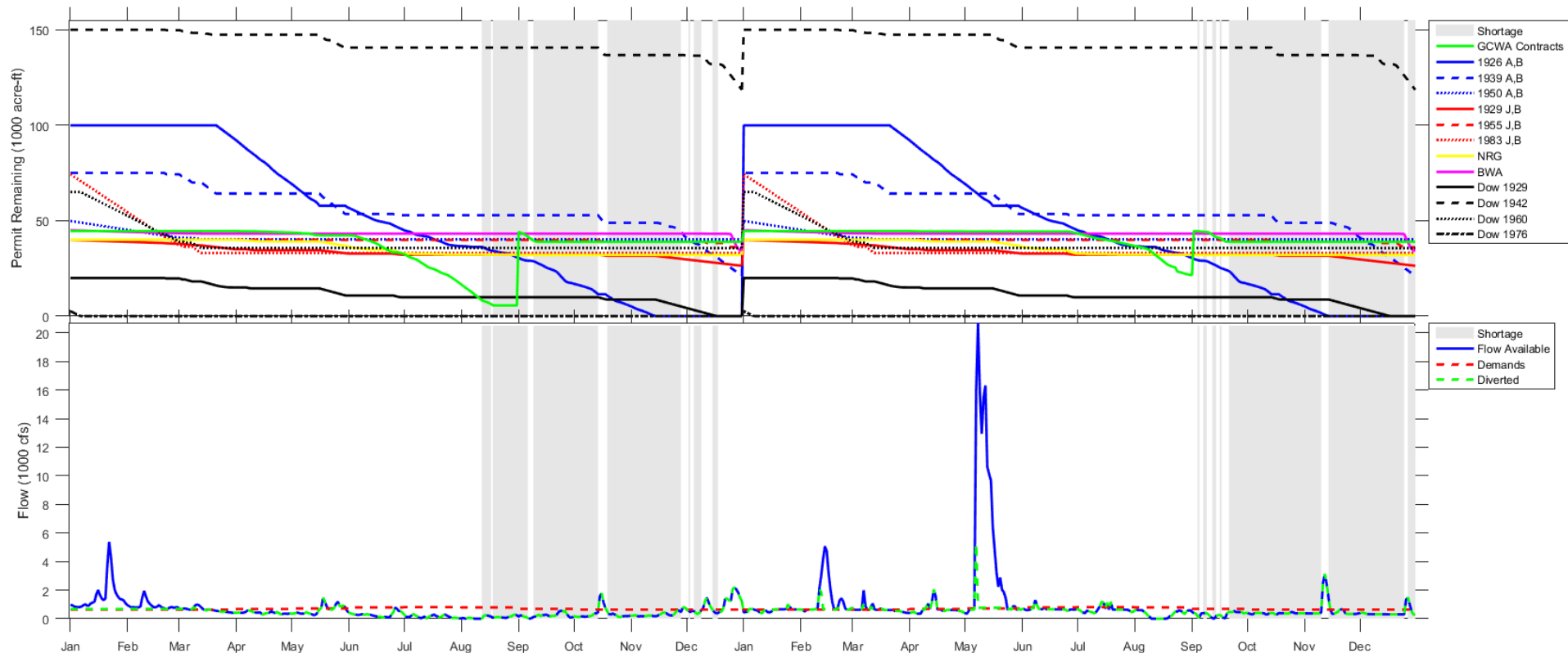
Different Methods yield different GCWA Shortages

GCWA's Defense Against RoR Shortages

- Long-Term Contracts for BRA Stored Water
 - 3 Fiscal-Year Contracts
 - 31,820 acre-ft, 9,335 acre-ft, & 3,100 acre-ft
 - Renew on September 1
 - 12% Losses in Brazos River between release & GCWA diversion
 - 1 Calendar Year Contract
 - 5,625 acre-ft
 - Renews on January 1
 - No Brazos River losses
- Other contracts
 - BRA Interruptible Contracts (Short-Term)
 - 13,666 AF (ex. 2020), 1,834 AF (ex. 2021)
Ag 12,500 AF (ex. 2018)

In GCWA Daily-Hydro
Long-Term Contracts
Used to back-up RoR
Diversions

Curtailment Modeling – Revised Methods



Modeling 2011 Followed by 1956 – 2 years of bad drought

Shortages:

Y1 = **32,147 acre-ft**

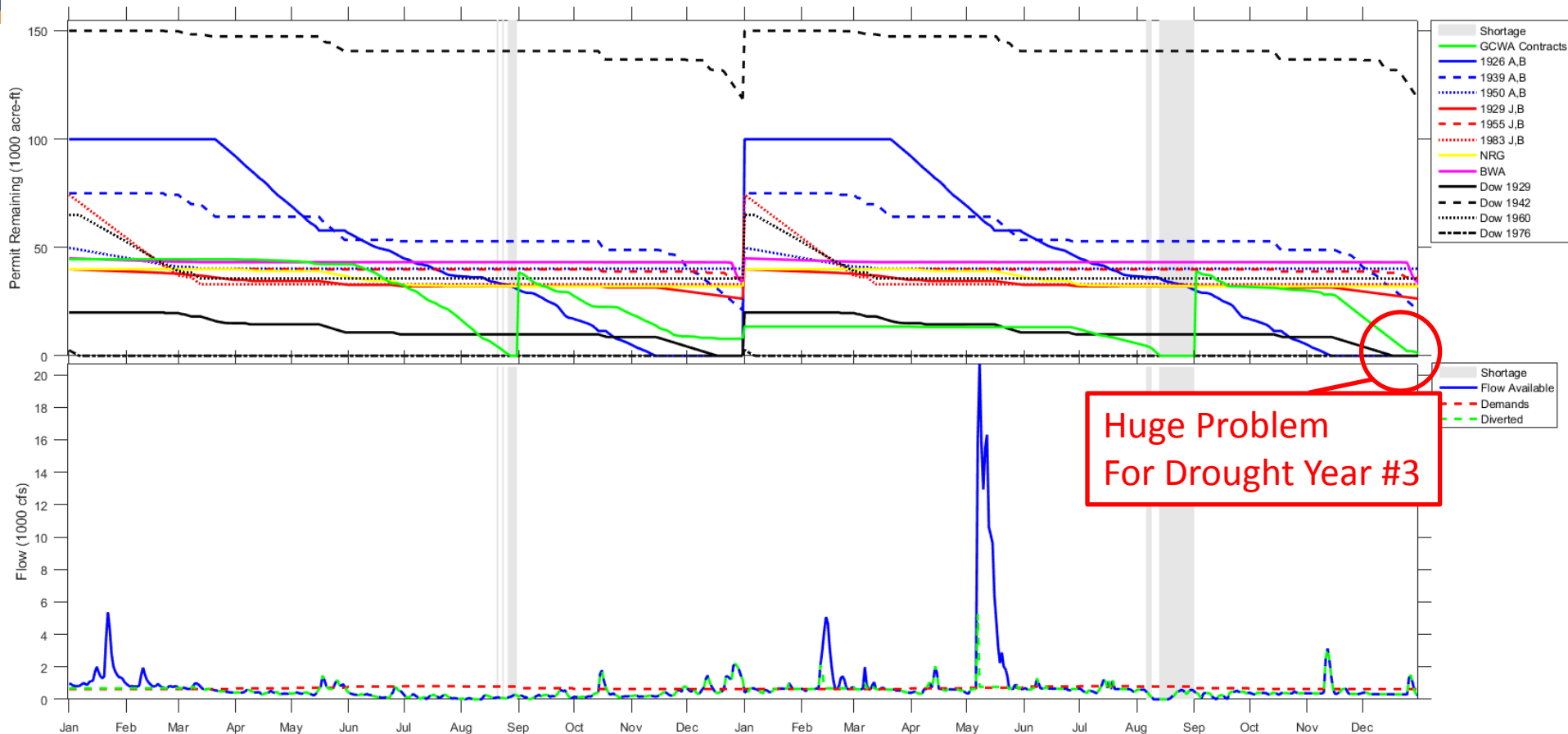
Y2 = **30,734 acre-ft**

Up to **350 cfs** short per day

Shortages occur late in year:

- Not Enough RoR Water
- Contract Water Used Up or Limited

Curtailment Modeling – Revised BRA Water Usage



Huge Problem
For Drought Year #3

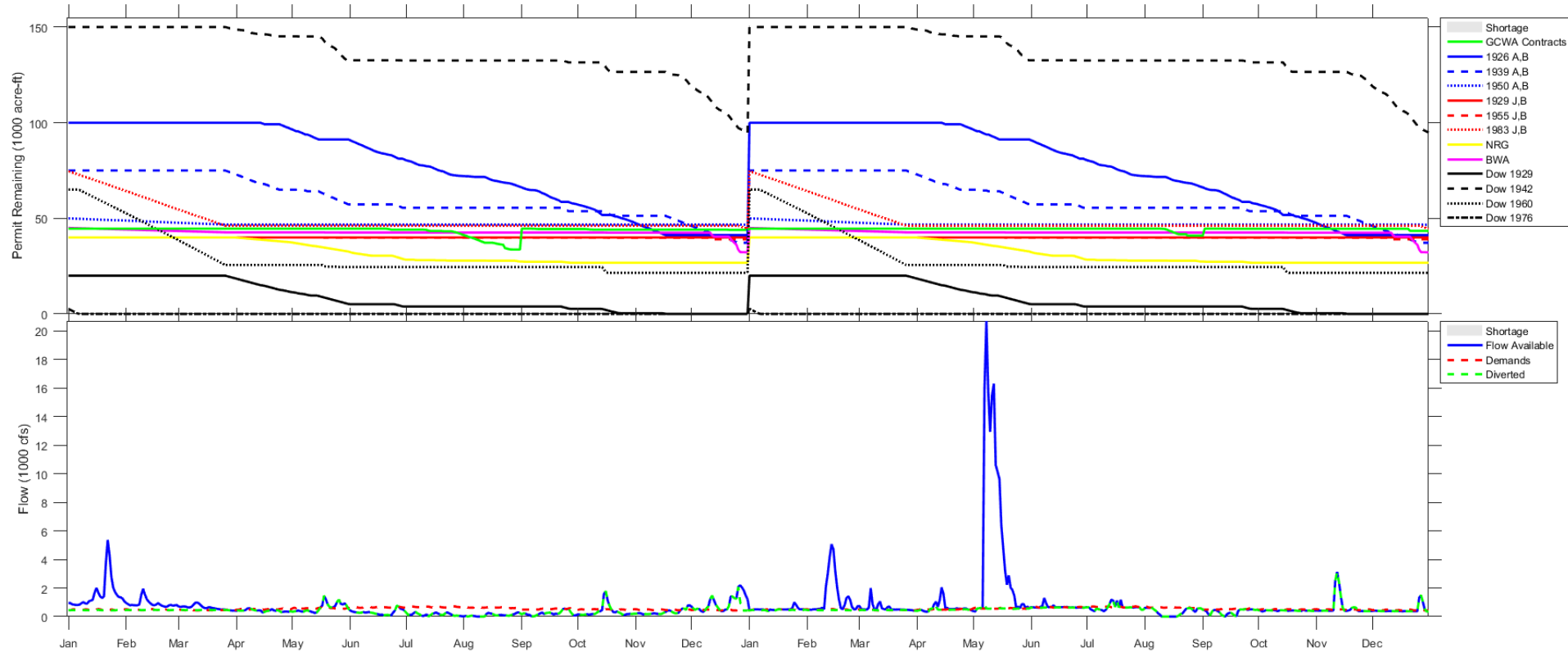
Removing Limitations on BRA Contract Water Usage

Shortages occur only in August:

- Not Enough RoR Water
- Contract Water Used Up

Shortages:
 Y1 = 1,048 acre-ft
 Y2 = 7,549 acre-ft
 Up to 400 cfs short per day

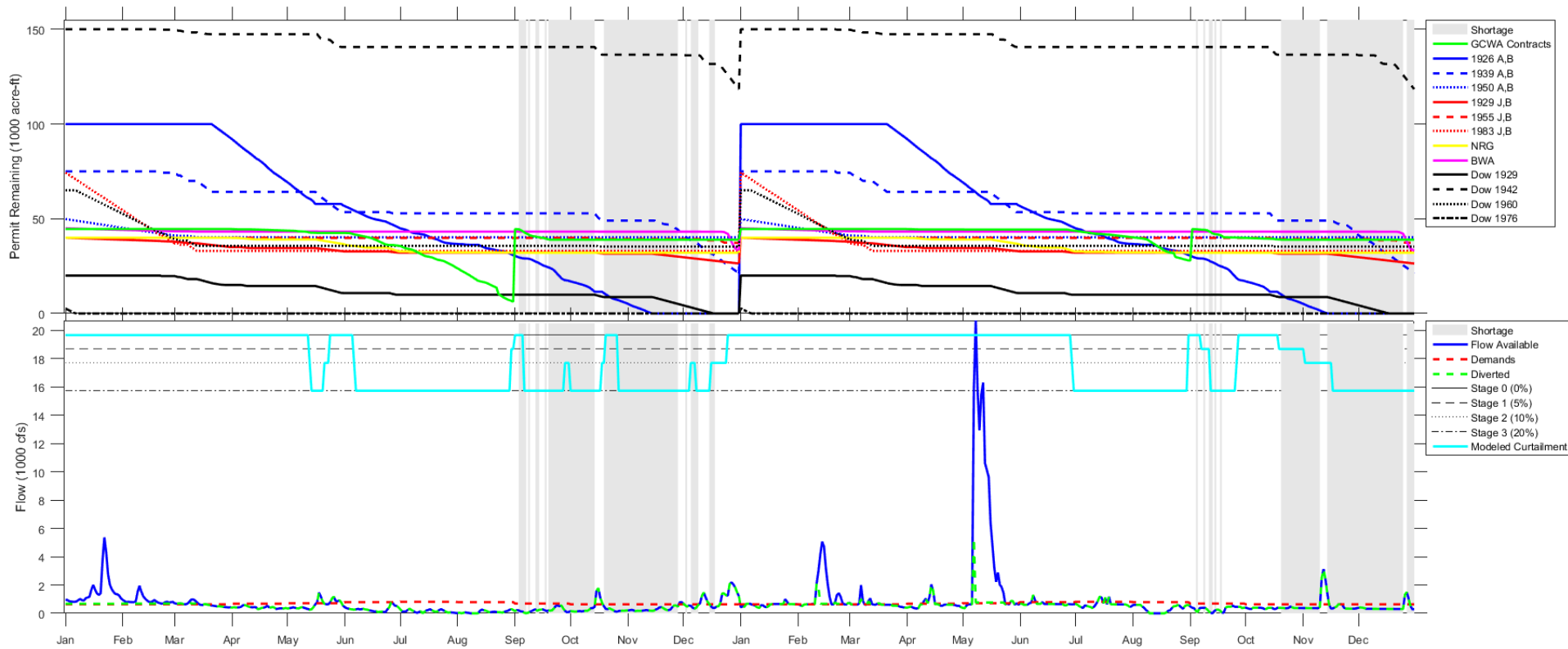
Curtailment Modeling – Using 2017 Demands



Modeling Assumes GCWA Ag
 Cut-off on Jan 1 – Revising Per GCWA Operations

Shortages:
 Zero Acre-ft

Curtailment Modeling – Current DCP



Current GCWA Policy on BRA Contract Water Usage

Shortages occur :

- Not Enough RoR Water
- After September 1

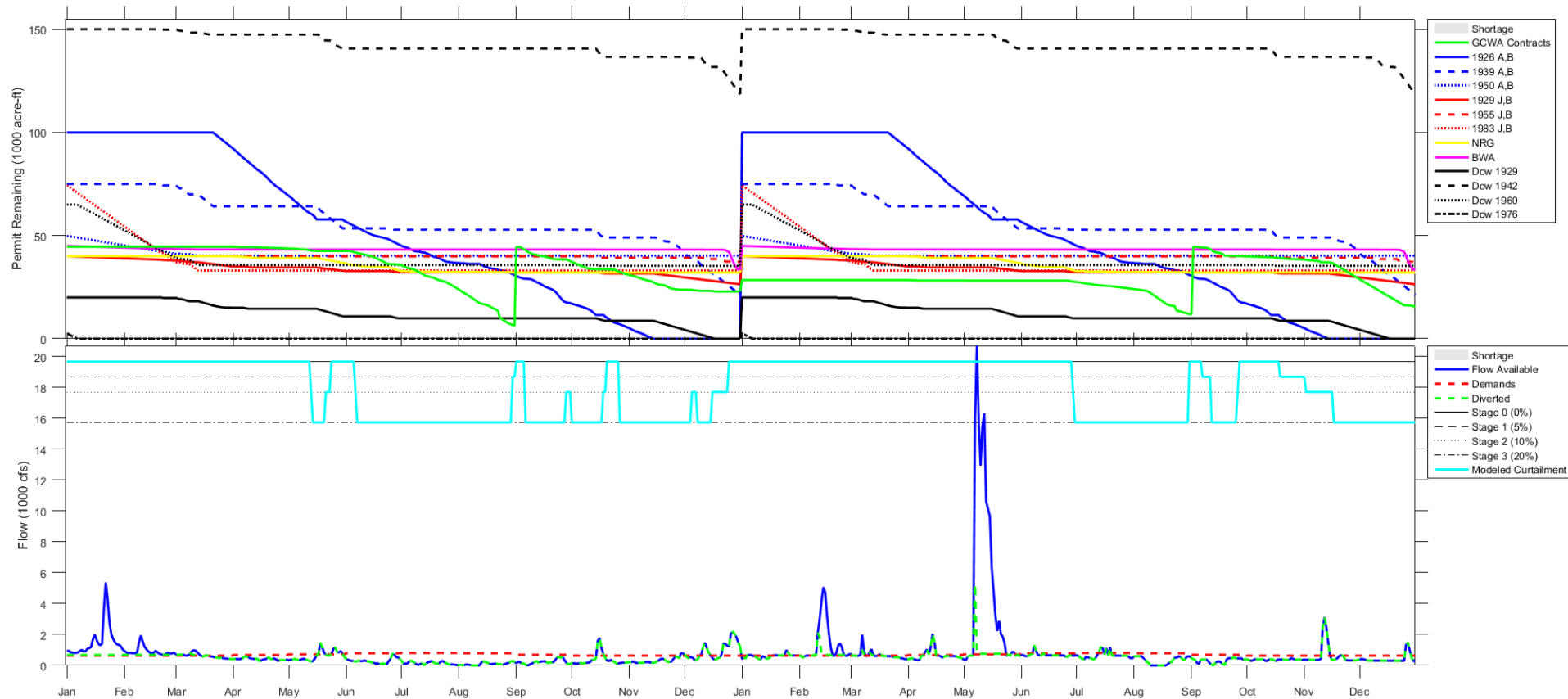
Shortages:

Y1 = 16,125 acre-ft

Y2 = 23,650 acre-ft

Up to 300 cfs short per day

Curtailment Modeling – Current DCP & Free Use



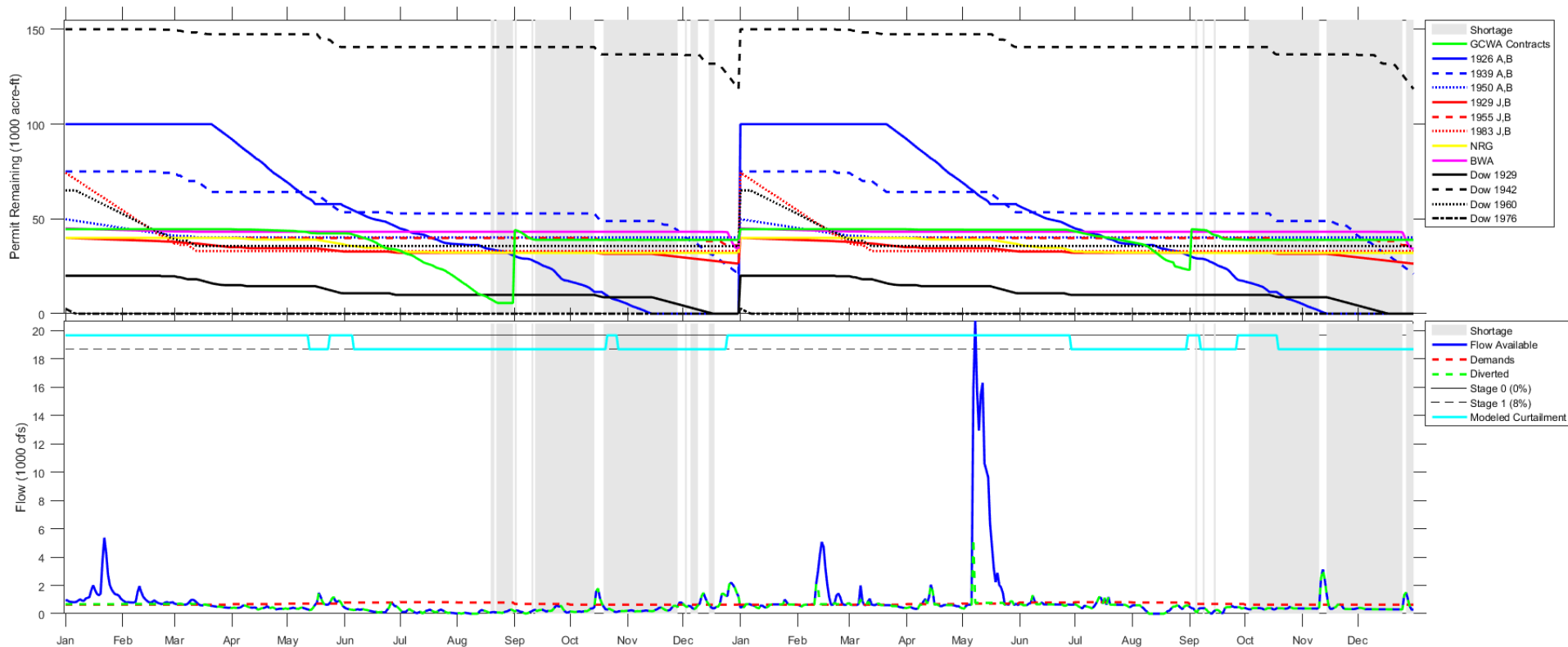
Modified GCWA Policy on BRA Contract Water Usage

Shortages:

Y1 = 0 acre-ft

Y2 = 0 acre-ft

Modeling – “New” DCP – 5% Curtailment



Current GCWA Policy on BRA Contract Water Usage

Shortages occur only in August:

- Not Enough RoR Water
- After August 1

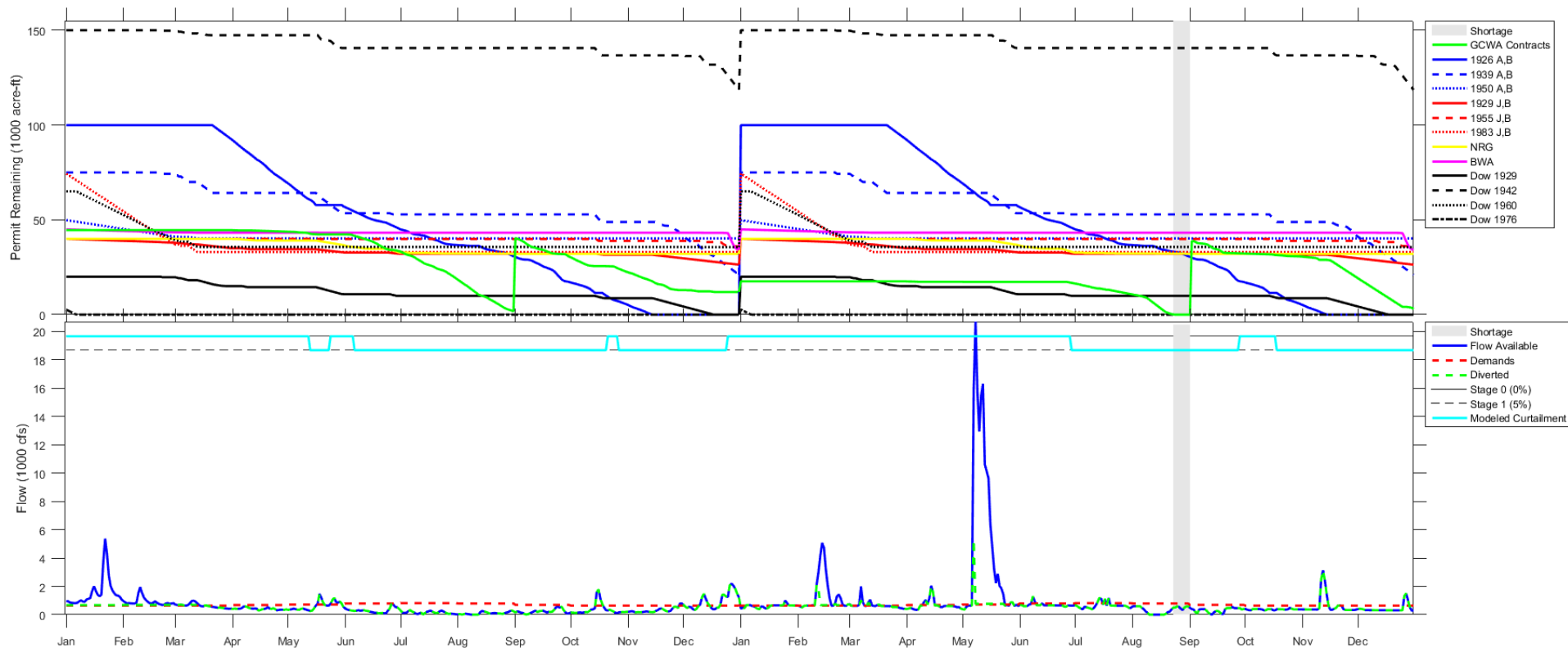
Shortages:

Y1 = 27,020 acre-ft

Y2 = 28,800 acre-ft

Up to **350 cfs** short per day

Modeling – “New” DCP – 5% Curtailment & Free Use



Modified GCWA Policy on BRA Contract Water Usage

Potential Shortages in Year #3 – Due to lack of BRA Contract Water

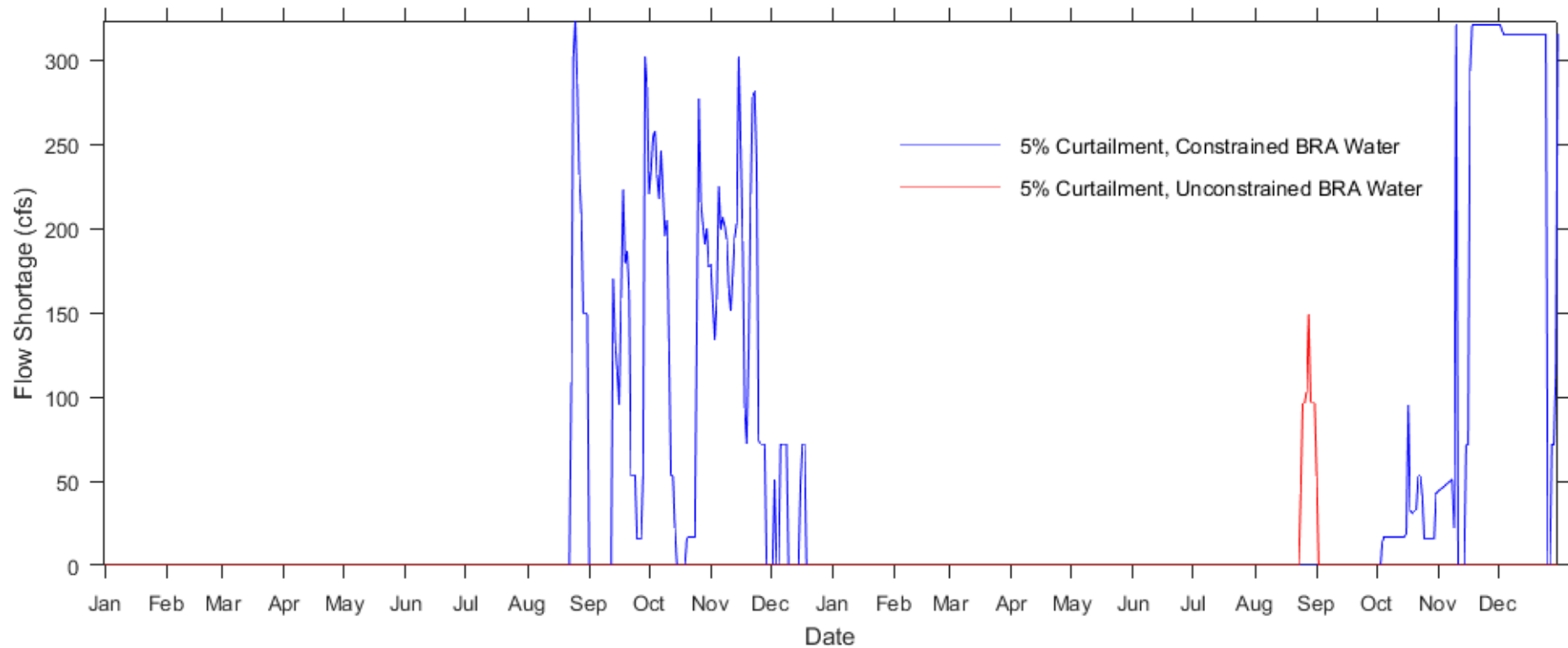
Shortages:

Y1 = 0 acre-ft

Y2 = 1,645 acre-ft

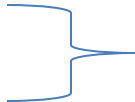
Max shortage = 160 cfs

Flow Shortage – “New” DCP



Approx. 350 cfs shortages vs. 150 cfs shortage – depending upon BRA water usage

Final Modeling Scenarios (?)

- Include 2017 Ag Diversions & May Plant
 - Cutoff Ag 100% when Needed
 - Include Ag's 12,500 acre-ft BRA INT Contract
 - Simulate up to 10% Curtailment, with 1-2 weeks notice
 - 1-2 Week Notice for transition from 0%-5% curtailment
 - 1-2 Week Notice for transition from 5%-10% curtailment
 - Require Minimum 50% of BRA Contract Water Remaining at End of December (?)
 - Modification of TX City Reservoir Operating Rules
 - Currently min storage = 85% (1096 acre-ft useable, 6212 acre-ft reserved)
 - Reduction of canal losses
 - Inclusion of Supplemental groundwater
-  Preview

Groundwater Usage for Shortage Mitigation

- Only considered potentially large capacity wells
 - Public Supply
 - Irrigation
 - Industrial
 - Multiple datasets compiled and analyzed for duplicates
 - TWDB Groundwater Database
 - TWDB Submitted Driller’s Report Database
 - TCEQ Public Water Supply Well Database
 - FBSD and BCGCD datasets for potentially large capacity wells were duplicates of the larger state databases
 - Limited dataset to within 5 miles of GCWA canals
- Example: “Smallville” can curtail usage by 20%, “Acme Inc.” can curtail 5%
DCP says 10% curtailment. Smallville curtails extra, receives payment from Acme, Inc.

GCWA Asks Customers to
use own wells

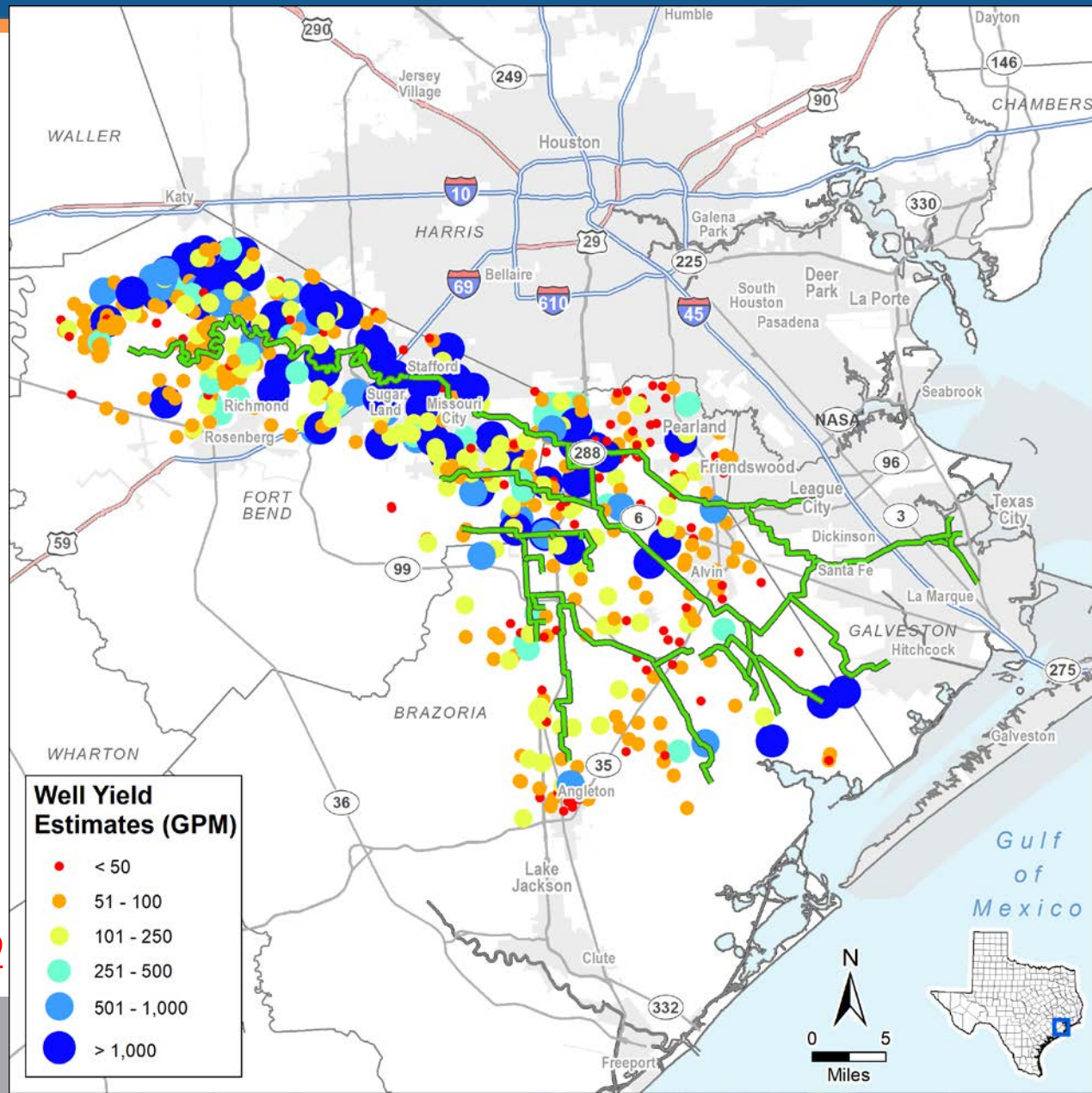
Groundwater Usage for Shortage Mitigation

Estimated Yield for Existing Wells

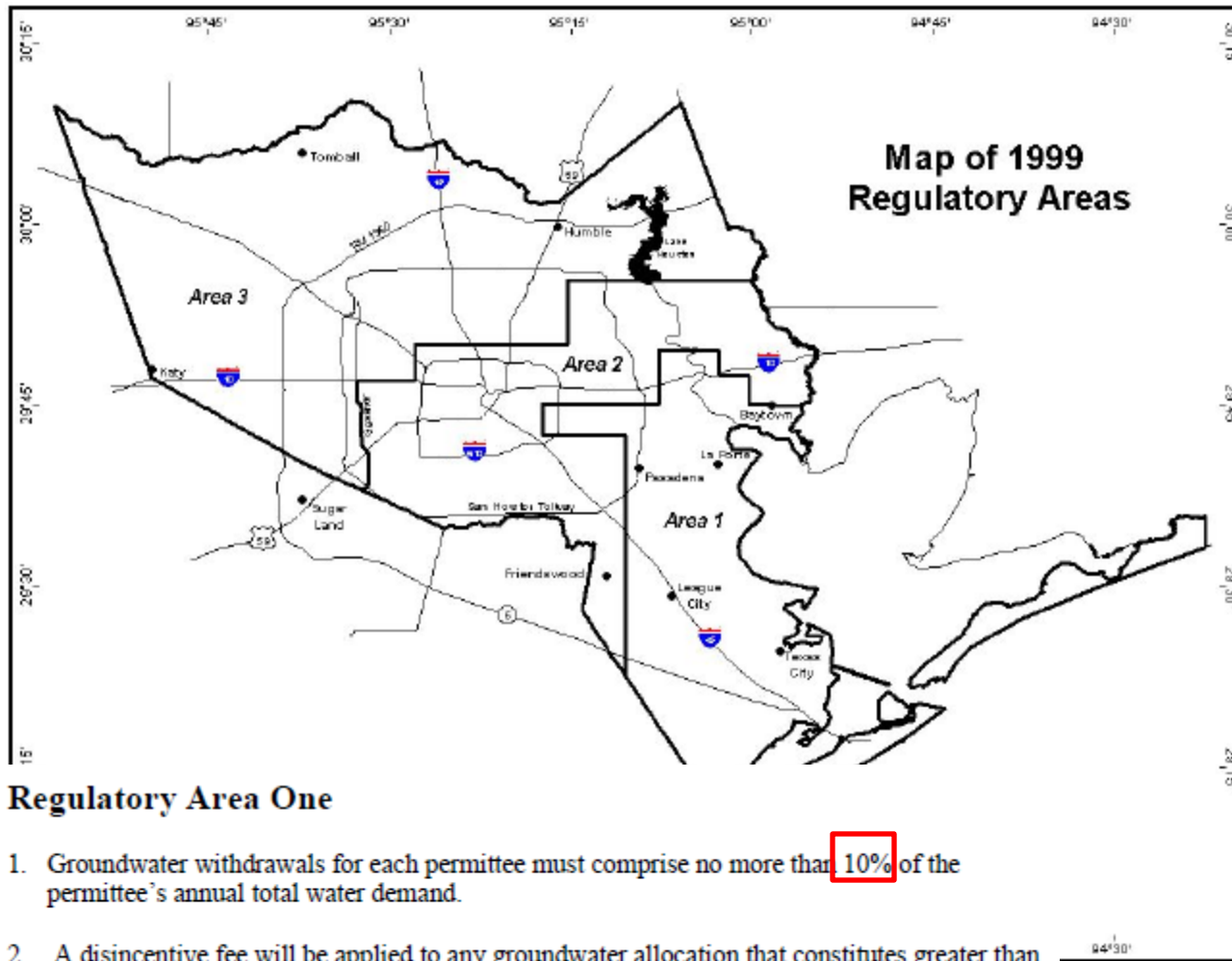
- Yields are estimated from driller reports
- Values are more reflective of well design than aquifer conditions
- Most high yield estimates are for public supply wells

1000 GPM = 2.2 cfs = 1.44 MGD

Many Wells Needed



GCWA & Harris-Galveston Subsidence District



Regulatory Area One

1. Groundwater withdrawals for each permittee must comprise no more than **10%** of the permittee's annual total water demand.
2. A disincentive fee will be applied to any groundwater allocation that constitutes greater than 10% of the permittee's total water demand.

GCWA Galveston County Demand

	acre-ft/yr	Ave CFS	Ave MGD
2008	81,271.6	112.0	72.4
2009	85,108.0	117.6	76.0
2010	85,160.3	117.6	76.0
2011	88,503.8	122.2	79.0
2012	87,152.2	120.1	77.6
2013	83,815.0	115.8	74.8
2014	81,763.7	112.9	73.0
2015	82,509.6	114.0	73.7
2016	84,541.2	116.5	75.3
2017	81,627.8	112.8	72.9

**GCWA Could Get:

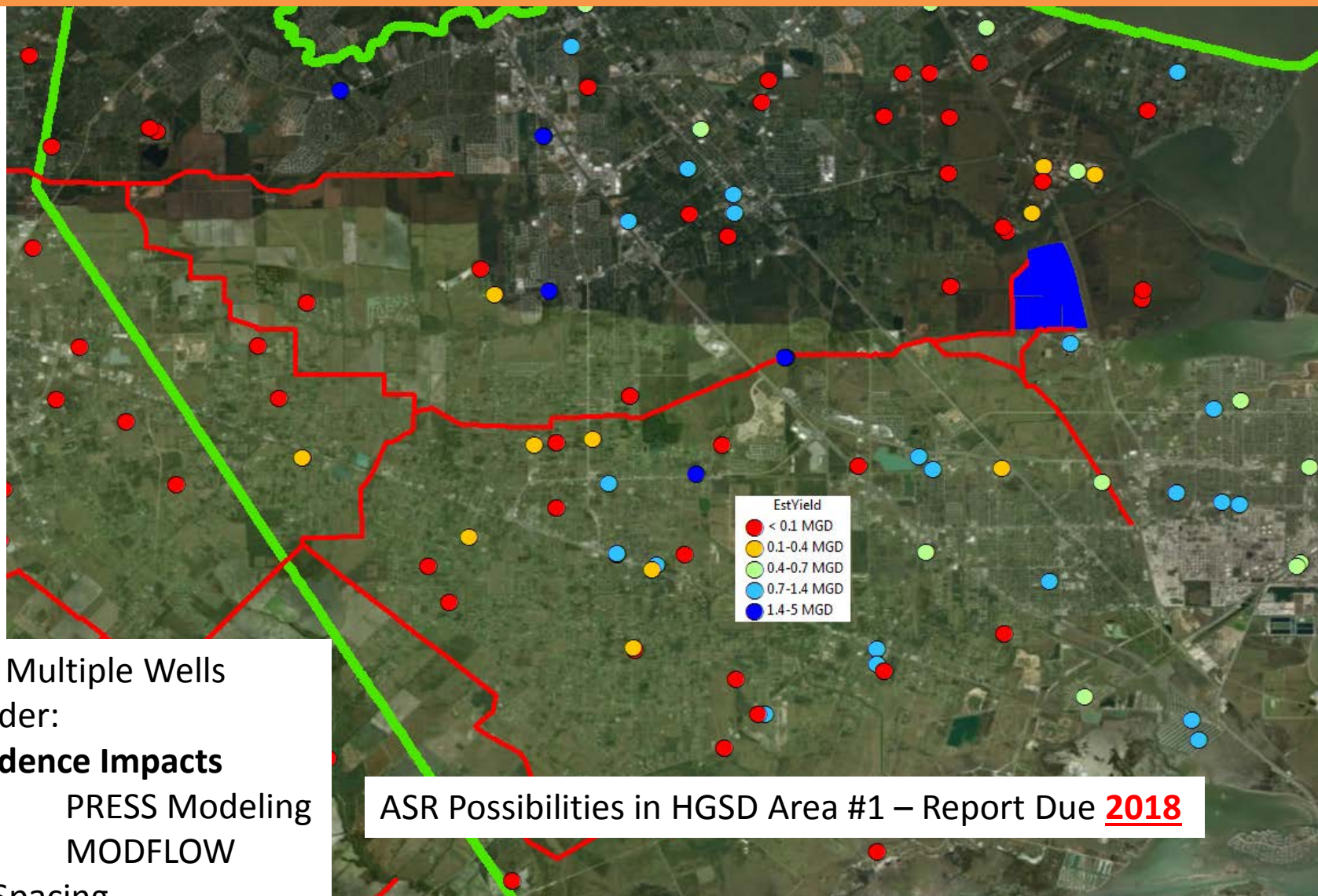
8 MGD

Every day

Or

32 MGD for 3 Months

Existing Wells – Galveston County



Need Multiple Wells

Consider:

Subsidence Impacts

PRESS Modeling

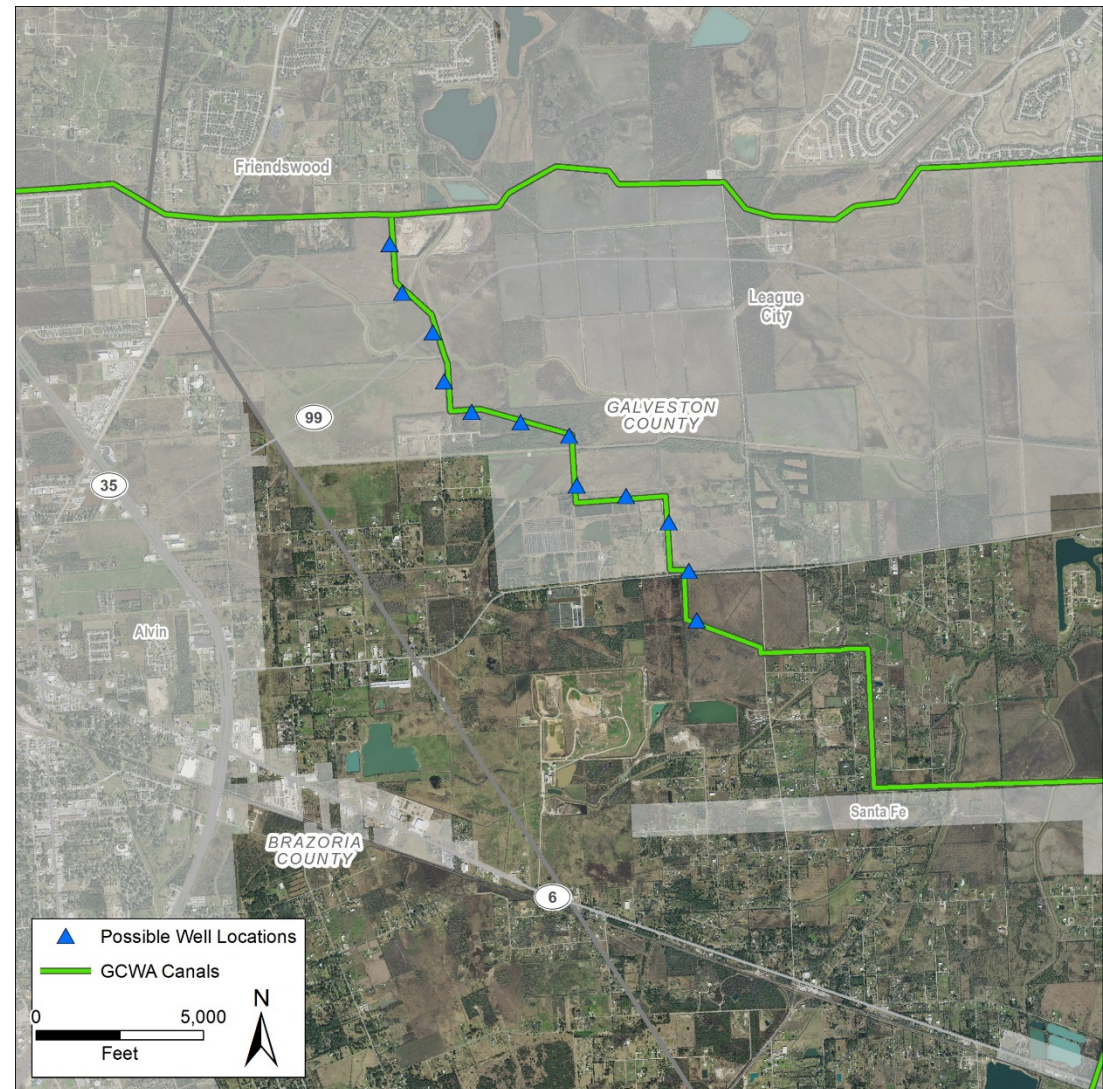
MODFLOW

Well Spacing

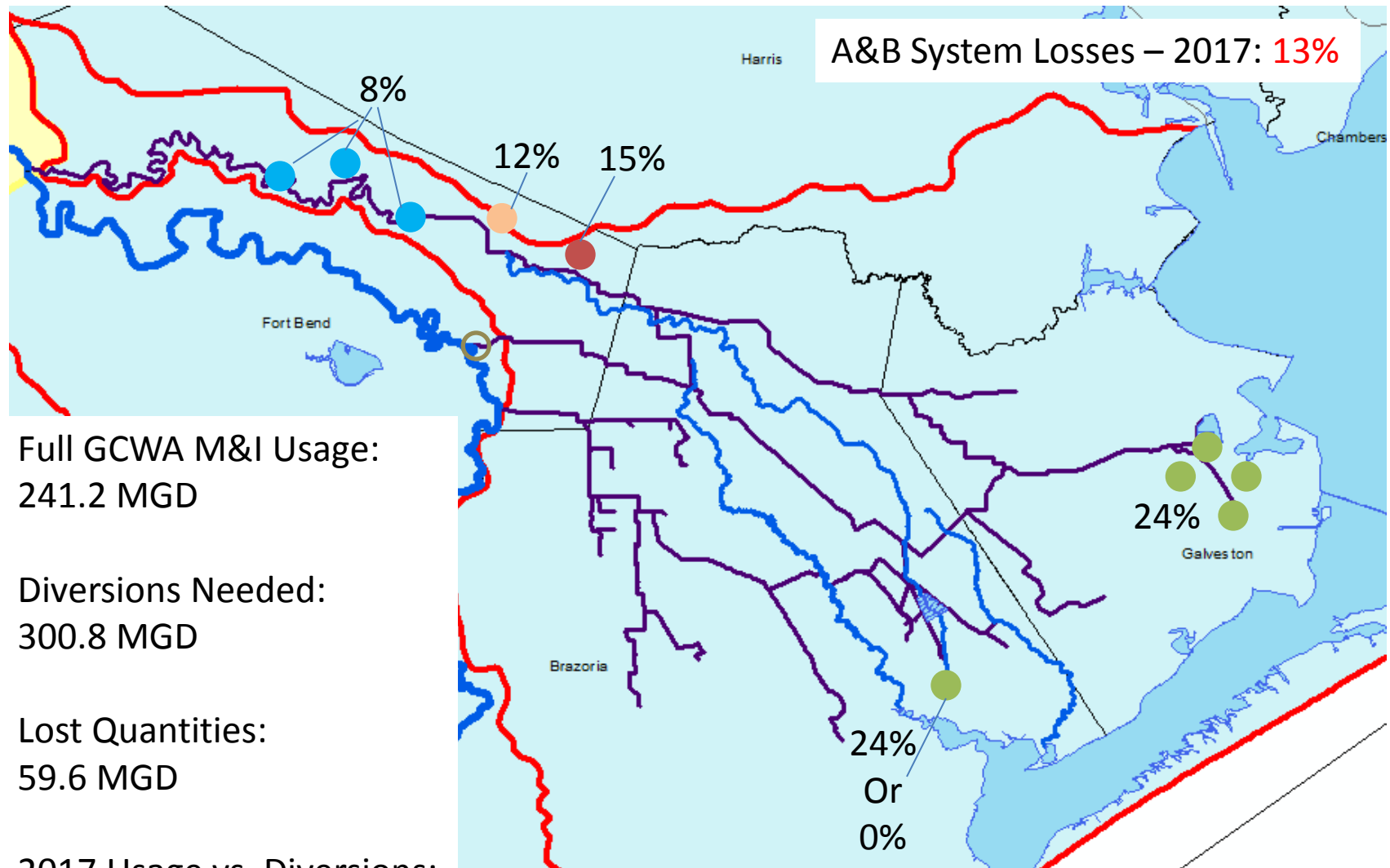
Canal & Utility Proximity

New Potential GCWA Wells – Galveston County

- 12 wells along upper portion of G canal in Galveston County
- Production of 8 MGD annual average for 50 years
- Used HAGM for simulation
- Maximum additional water level decline of 190 feet
- Subsidence Effects Pending
- HGSD Considering multi-year, rolling permitting
- Discuss Next Meeting
 - Modeling & Subsidence Results
 - Estimated Well Costs
 - Annual Costs
(ballpark \$0.20/ 1000 gal)



Controlling GCWA Canal Losses – Better Source?



Full GCWA M&I Usage:
241.2 MGD

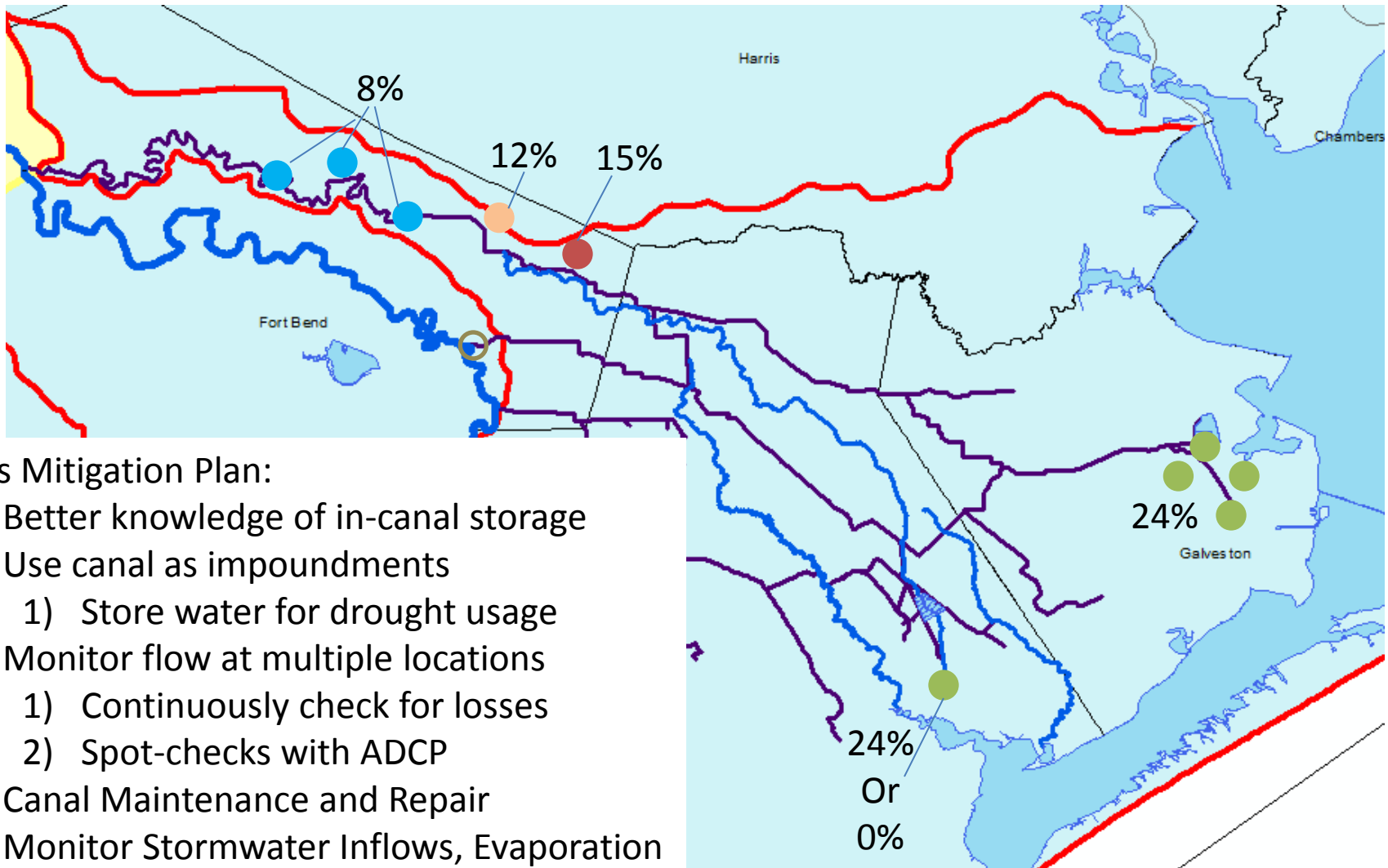
Diversions Needed:
300.8 MGD

Lost Quantities:
59.6 MGD

2017 Usage vs. Diversions:
80% (i.e. 20% "Loss")

** 50% of Losses is on Juliff System

Controlling GCWA Canal Losses – Better Source?



Loss Mitigation Plan:

- 1) Better knowledge of in-canal storage
- 2) Use canal as impoundments
 - 1) Store water for drought usage
- 3) Monitor flow at multiple locations
 - 1) Continuously check for losses
 - 2) Spot-checks with ADCP
- 4) Canal Maintenance and Repair
- 5) Monitor Stormwater Inflows, Evaporation

Canal Losses Due to Evaporation

Net-Evaporative Loss:
 (Evaporation – Precipitation)*Area

TWDB Data from 1954-2016

GCWA Free-Water Surface Areas:

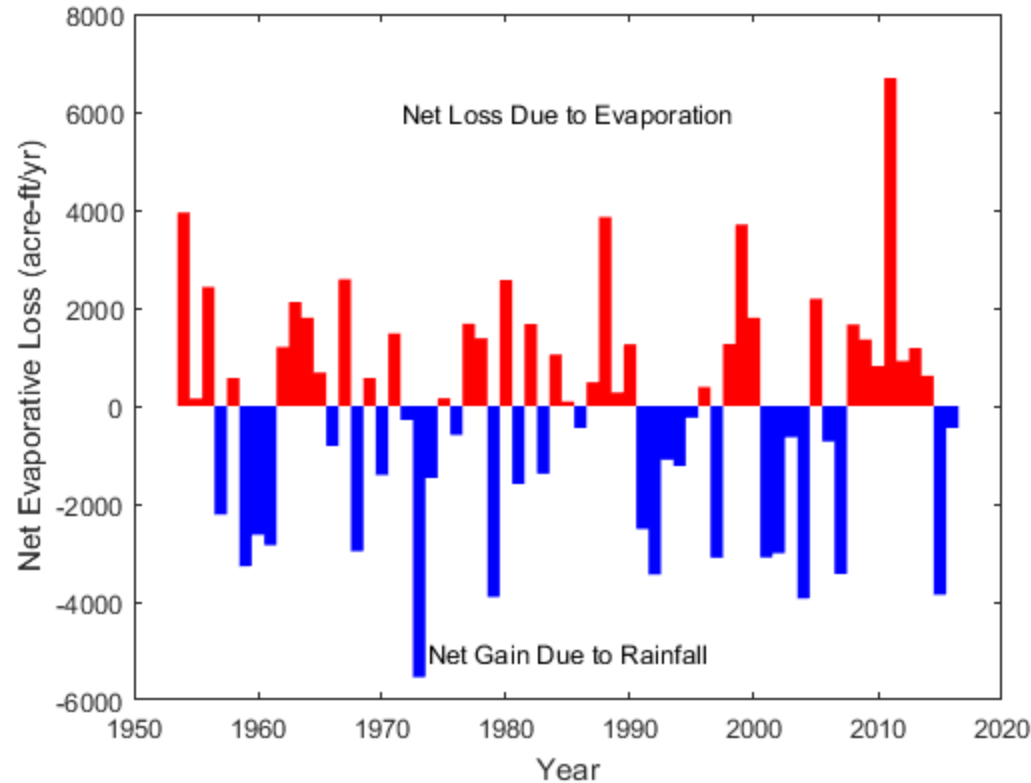
TX City Reservoir: 860 Acres

Mustang Reservoir: 640 Acres

Canal Surfaces: 596 Acres

Max Loss: 6,696 Acre-ft (2011)

Max Gain: 5,537 Acre-ft (1973)



2016 GCWA Diversions: 226,905 Acre-ft

2016 Net Precipitation: 450 Acre-ft

0.2%

2011 GCWA Diversions: 340,495 Acre-ft

2011 Net Evaporation: 6,696 Acre-ft

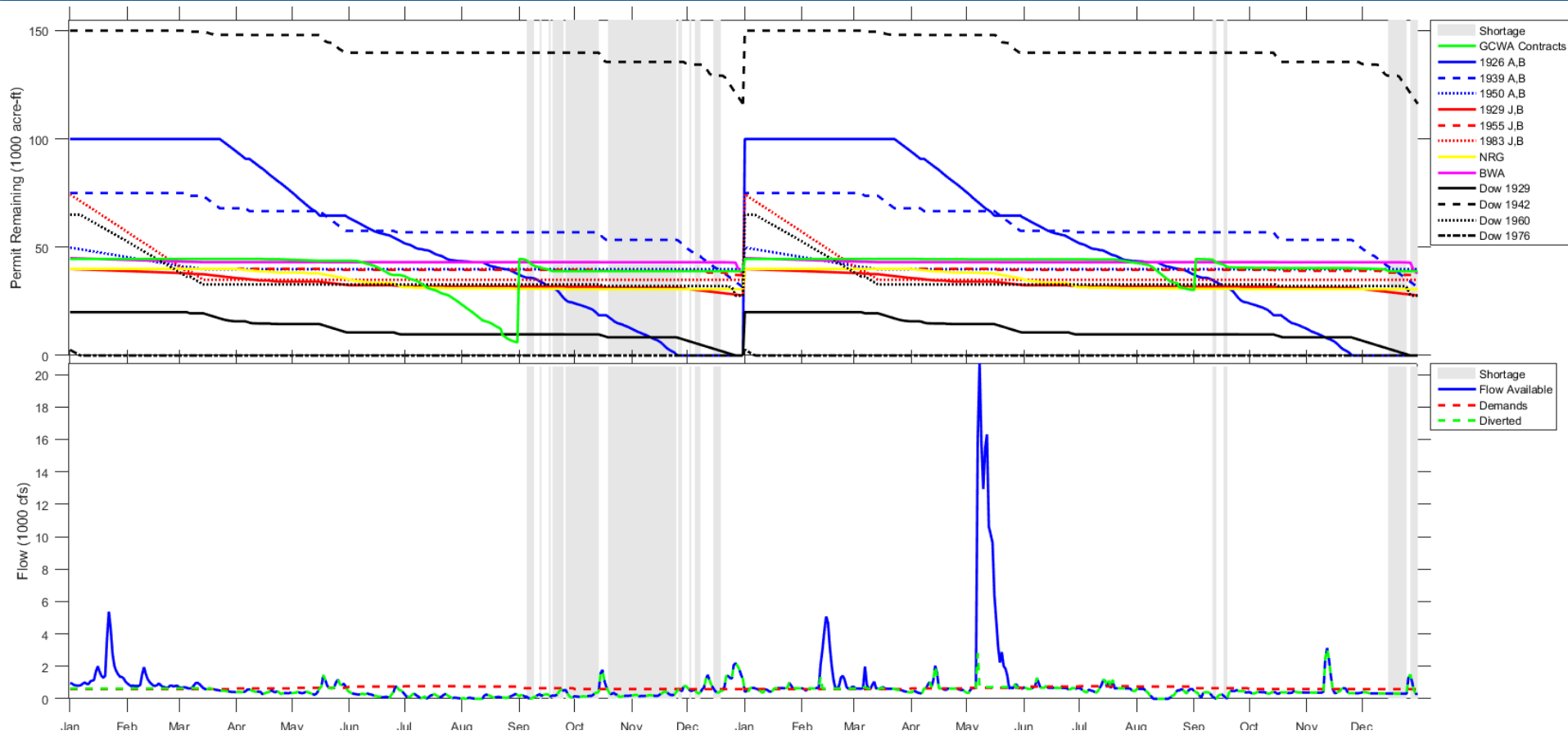
2.0%

2015 GCWA Diversions: 152,806 Acre-ft

2015 Net Precipitation: 3,854 Acre-ft

2.5%

Curtailment Modeling – Losses Reduced by 50%



**Shortages easily mitigated by GCWA
 Easing BRA Contract water restrictions

Shortages:

Y1 = 14,097 acre-ft

Y2 = 6,411 acre-ft

Up to 250 cfs short per day

Today's Take-Away Messages

- **GCWA has worked very hard to ensure your water needs are reliably met**
 - BRA Contract Water = Crucial Insurance
 - Potential Policy Revision on timing of use
 - Risky for multi-year future droughts
- **Curtailment Modeling is based on Full GCWA Contracts**
 - Current Usage is far less than 5%, 10%, and 20% curtailed Full Contracts
 - Curtailment Plan not likely to be “felt” until usage increases
 - Curtailment will be relative to Desired Usage Amount, or Last Year's Usage
- **Modeling of Irrigation for Ag & Potential cutoffs mid-year – Yet to be developed**
- **Groundwater supplementing Surface Water during drought – Viable Approach**
 - Further Investigation for next meeting
- **Reducing canal losses – very effective at reducing shortages & curtailment**
 - Infrastructure Means to reduce canal losses – next meeting topic

Discussion & Next Meeting

- Next Meeting:
 - April 17, 2018 (Tuesday)
 - Topics:
 - Groundwater supplemental Usage
 - Canal loss mitigation
 - Final Curtailment Modeling
 - Dashboard Prediction Progress
 - What Else?



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