Smart Infrastructure Investment: Evaluating Demand Trends & Weighing Risks

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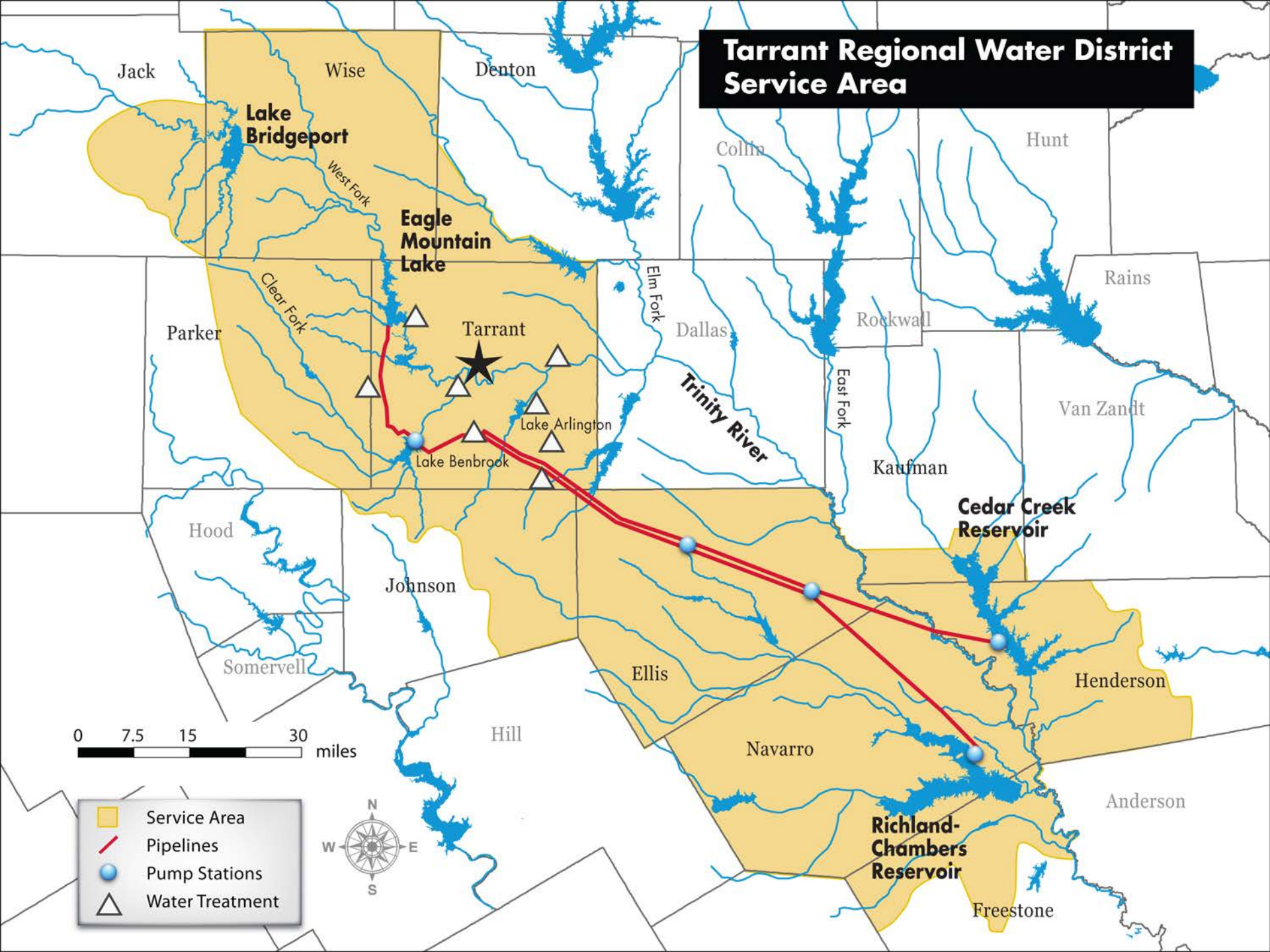
1/23/14


Tarrant Regional Water District
Service Area
Jack
Wise
Denton
Collin
Hunt
Lake
Bridgeport
West Fork
Eagle
Mountain
Lake
Clear Fork
Parker
Tarrant
Elm Fork
Dallas
Rockwall
Rains
Trinity River
East Fork
Van Zandt
Lake Arlington
Lake Benbrook
Kaufman
Cedar Creek
Reservoir
Hood
Johnson
Somervell
Ellis
Henderson
Hill
Navarro
Anderson
Richland-
Chambers
Reservoir
Freestone
0 7.5 15 30
miles
N
W
E
S
Service Area
Pipelines
Pump Stations
Water Treatment

TRWD Overview

•Formed in 1924 from an act of the Texas Legislature and Governed by a 5 member Board of Directors

• Guidance provided by four primary wholesale customers: Arlington, Fort Worth, Mansfield and the Trinity River Authority.

• Main functions are flood control ($21 MM annual budget) and water supply ($116 MM annual budget)

• Ultimately serves 70 cities in an eleven county service area.

•Current service population is 1.8 million; projected to increase to 4.3 million by 2060

•District should deliver about 370,000 acre feet of untreated water this year

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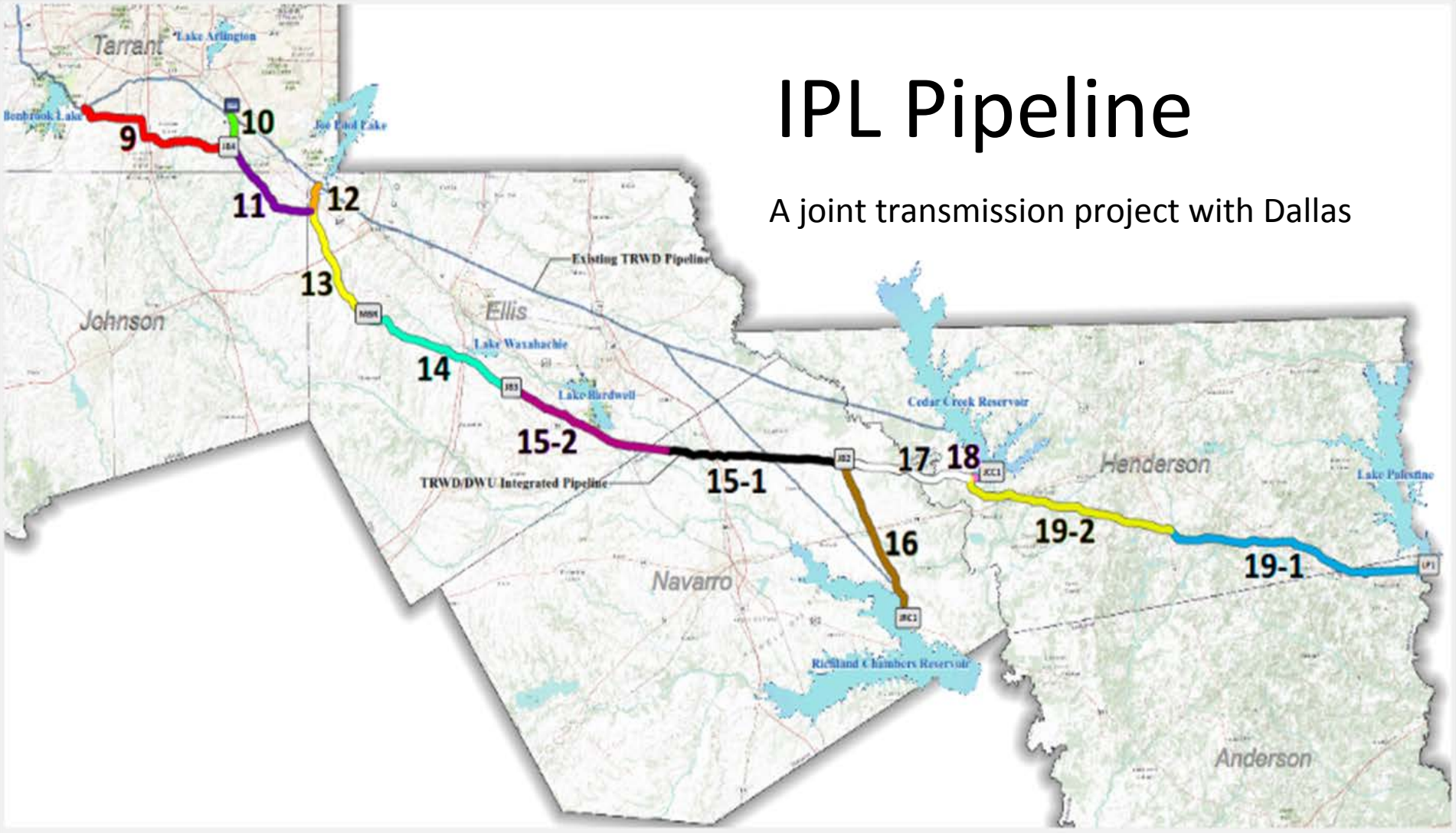
IPL Pipeline

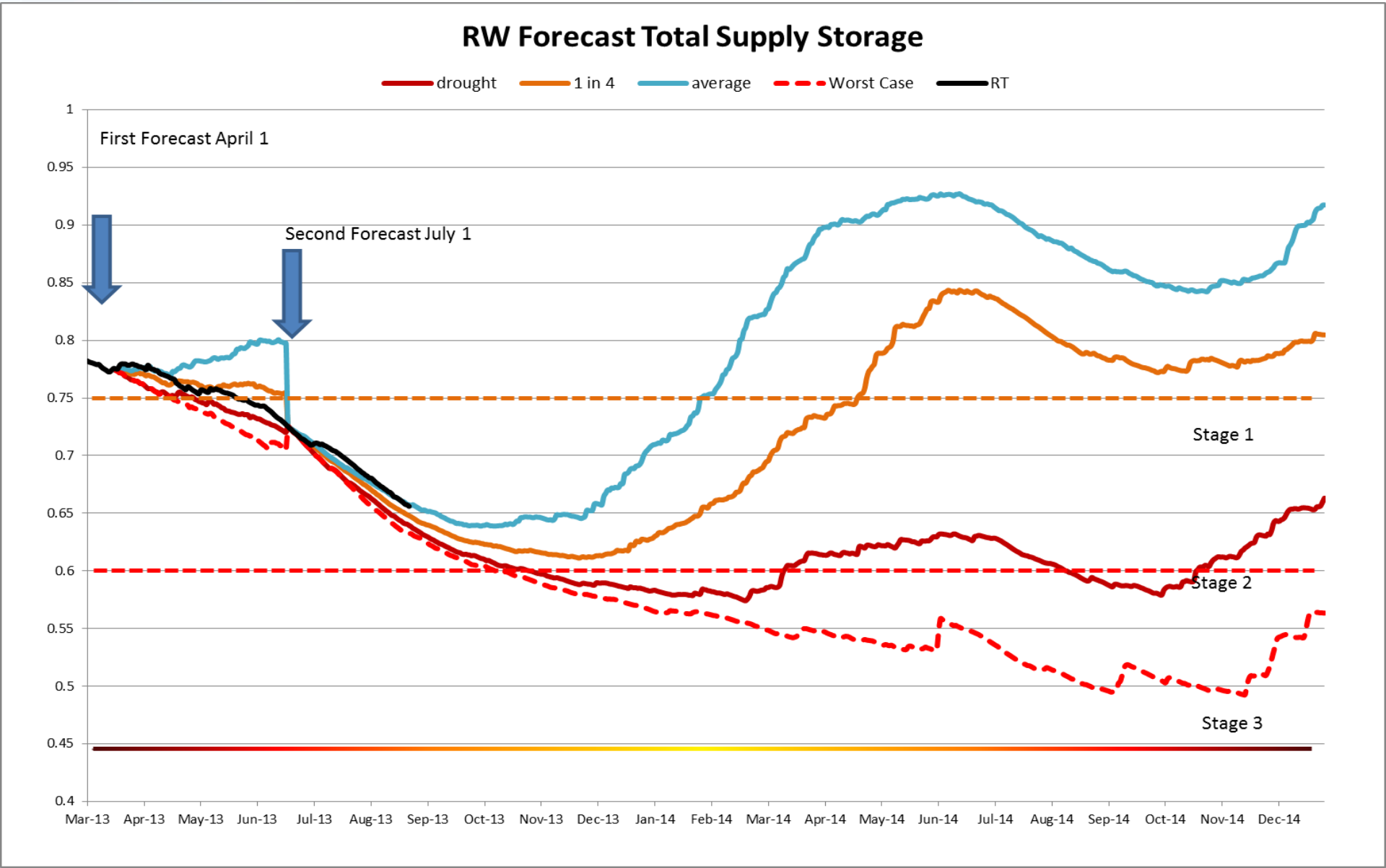
A joint transmission project with Dallas



TRWD System Optimization and Risk

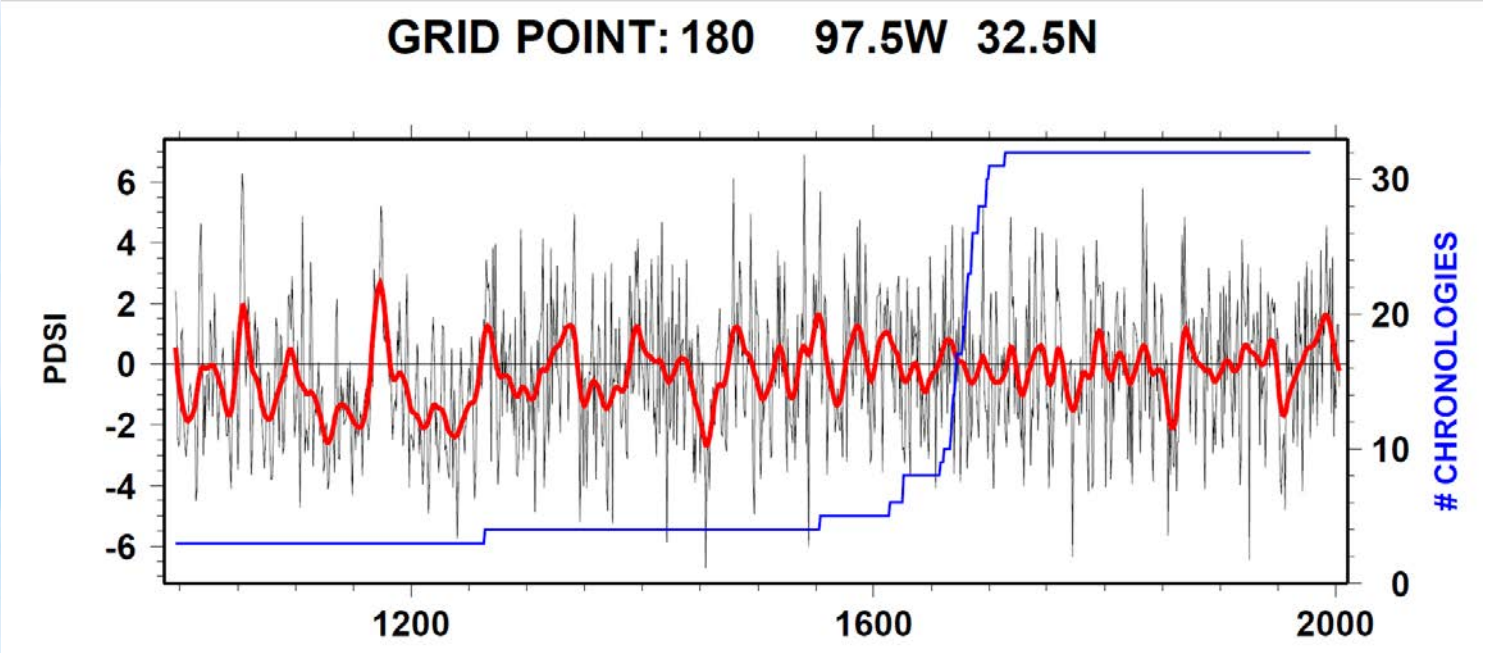
- TRWD balances operating costs and reliability in our optimization using a daily time step
- Our operating policies are flexible: policy sets are developed using the short term climate patterns (6 months) to adapt to conditions
- These dynamic policy sets are then used to simulate the system to determine system reliability for daily operations
- Demands are based on responses to the climate but demand responses to drought measures are not estimated
- We also simulate the system on a monthly time step to see frequencies of shortages, pumping, lake levels and other operating parameters to guide is in planning.

TRWD Reliability Modeling

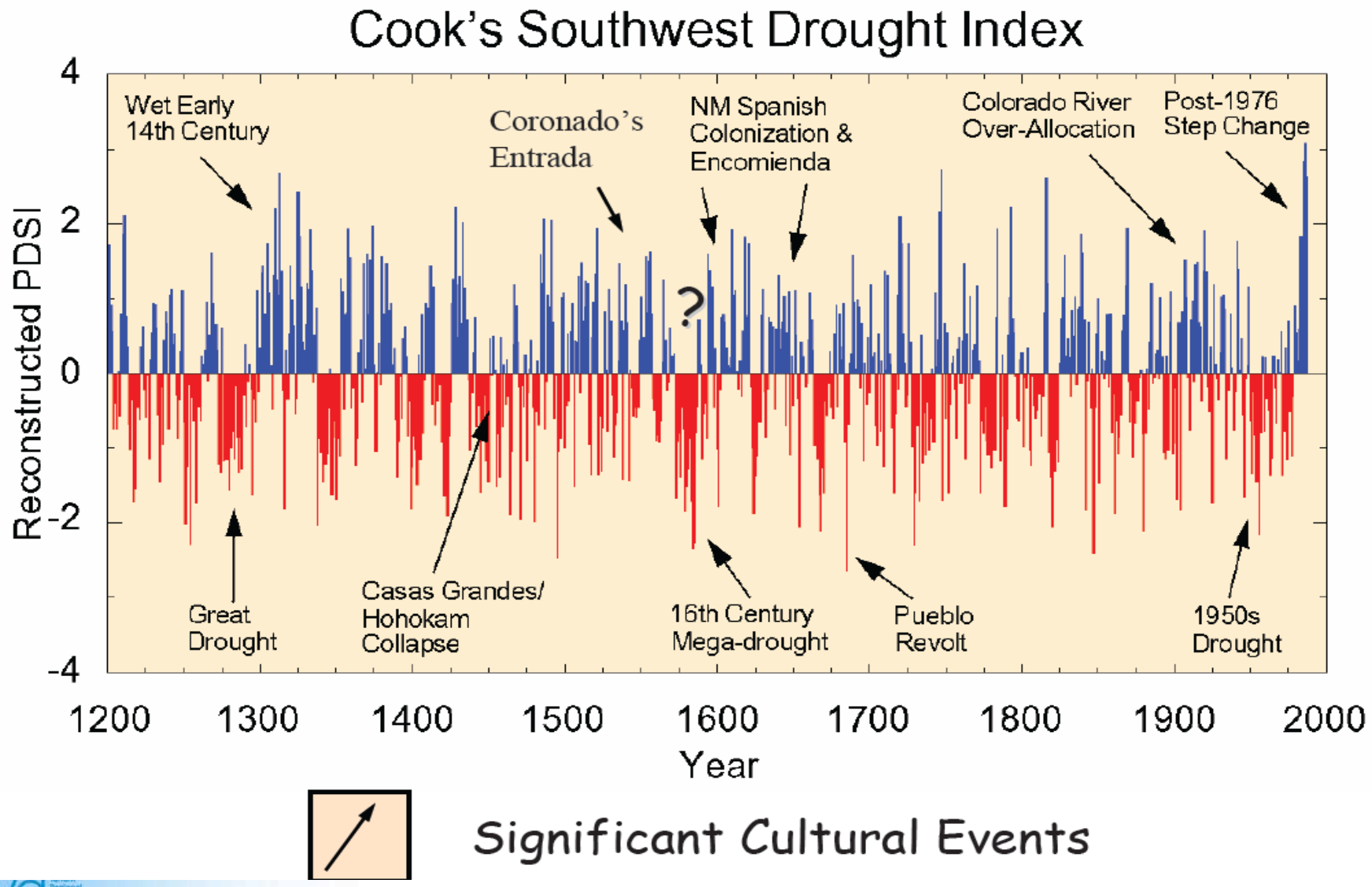


Risk of Climate Variability

- Tree ring records show extreme droughts in the past
- Climatic pattern changes add another uncertainty in supply planning



Climate Variability - Palmer Index History



Demand Forecasting

- Region C's methodology
  - Each Water User Group (WUG) projects population and demand based on a number of categories
  - This is done for each decade for 5 forward decades
  - The process accounts for conservation in the plumbing code in the demands through lower per capita demands

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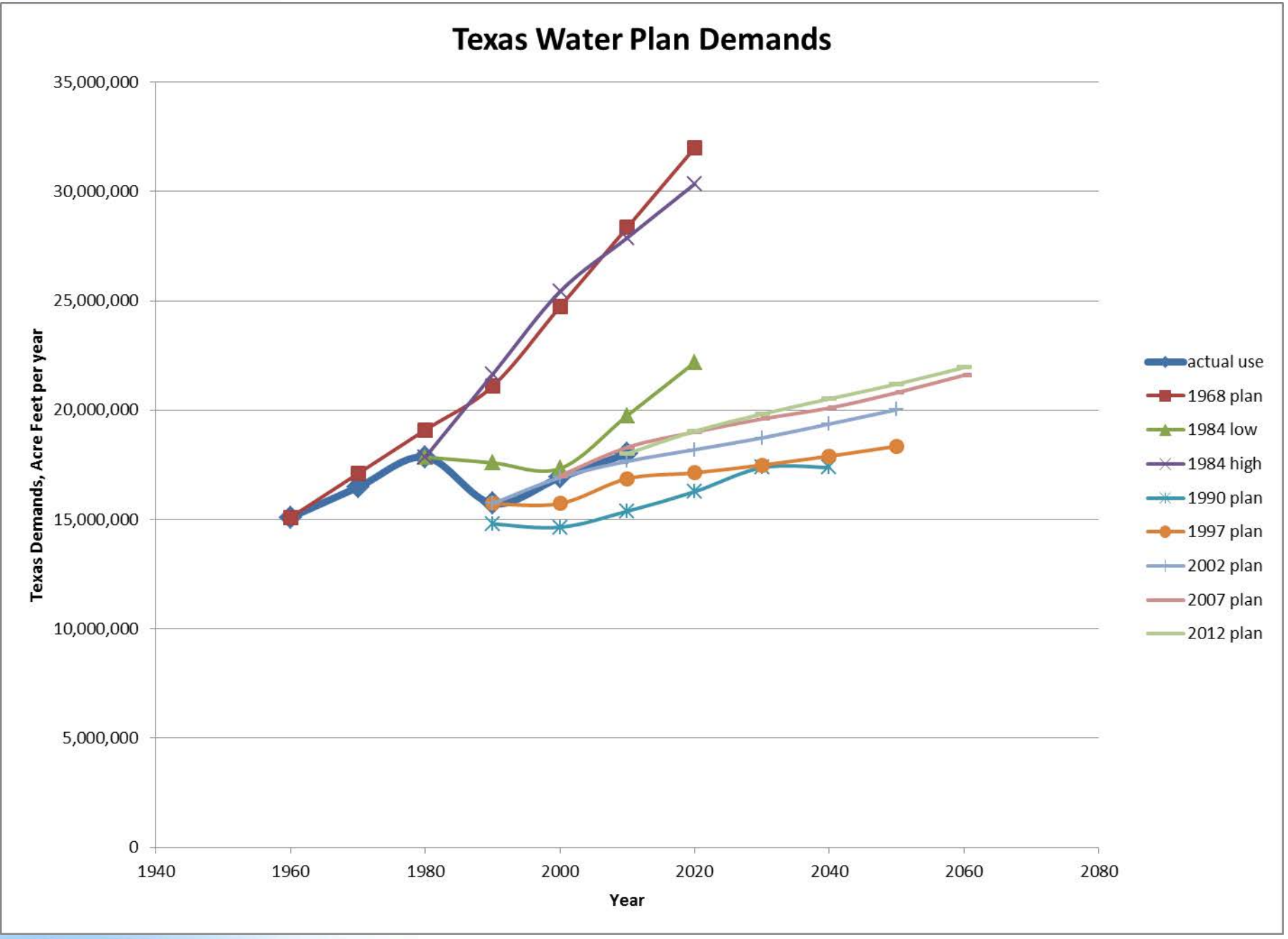
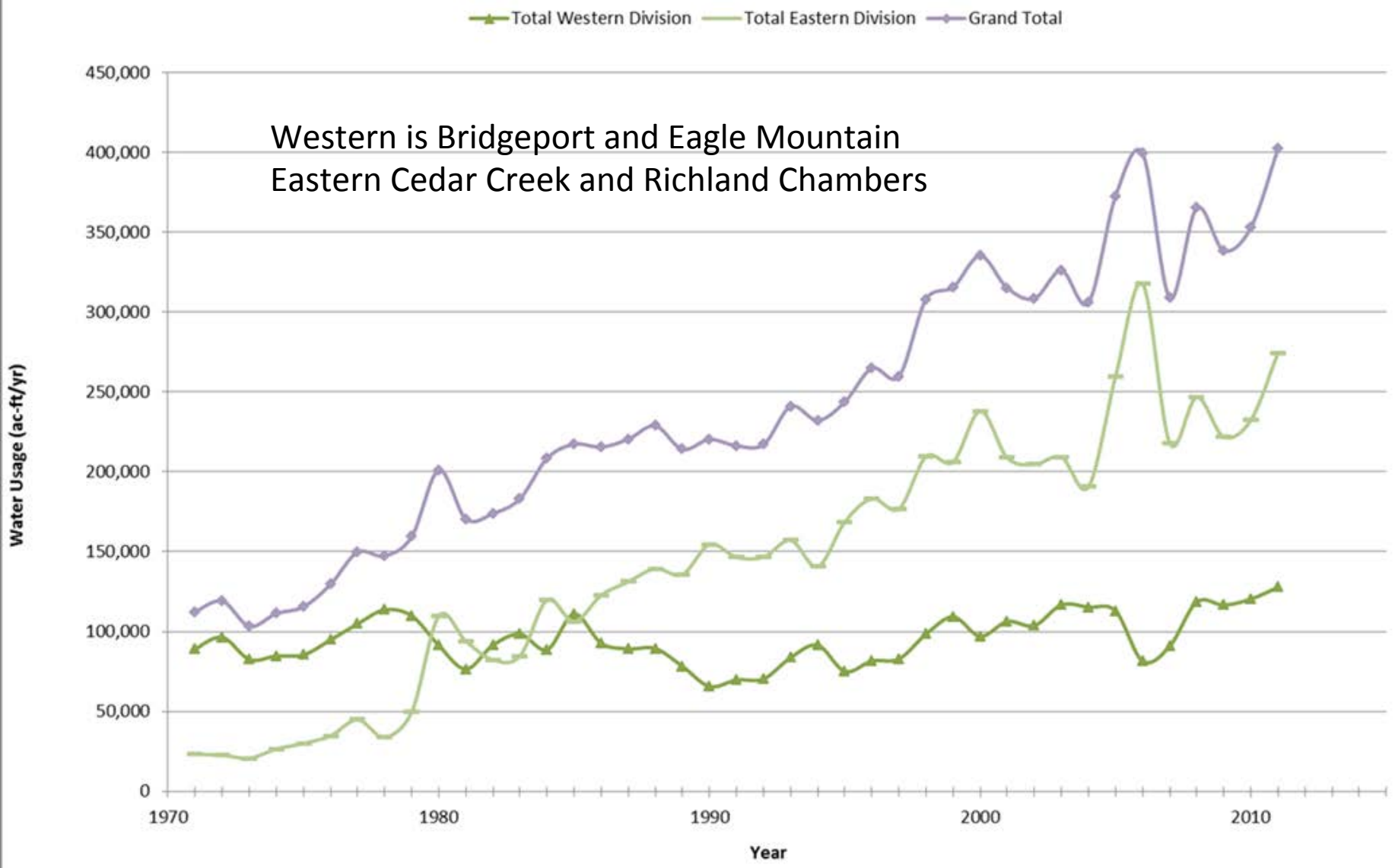
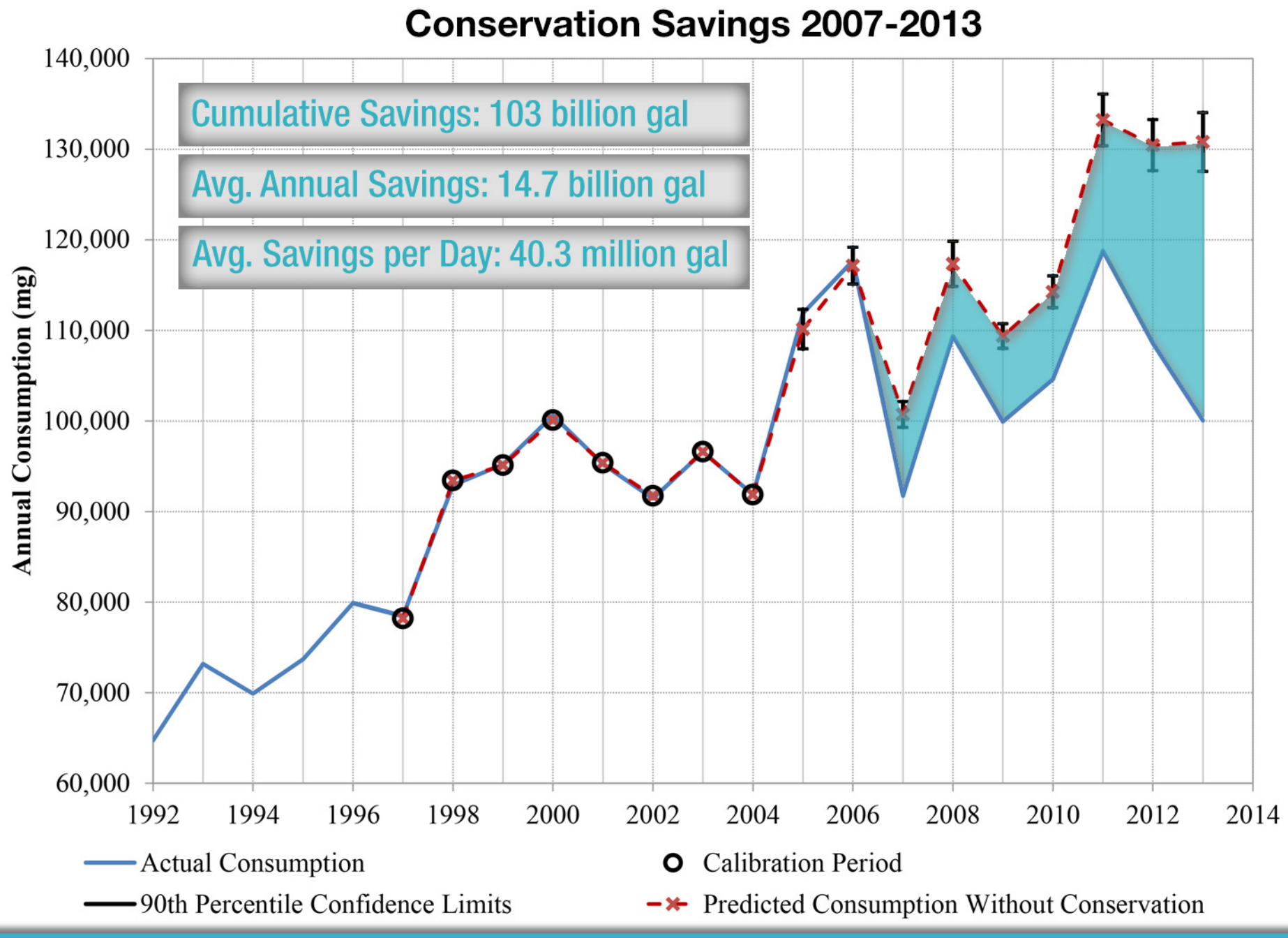
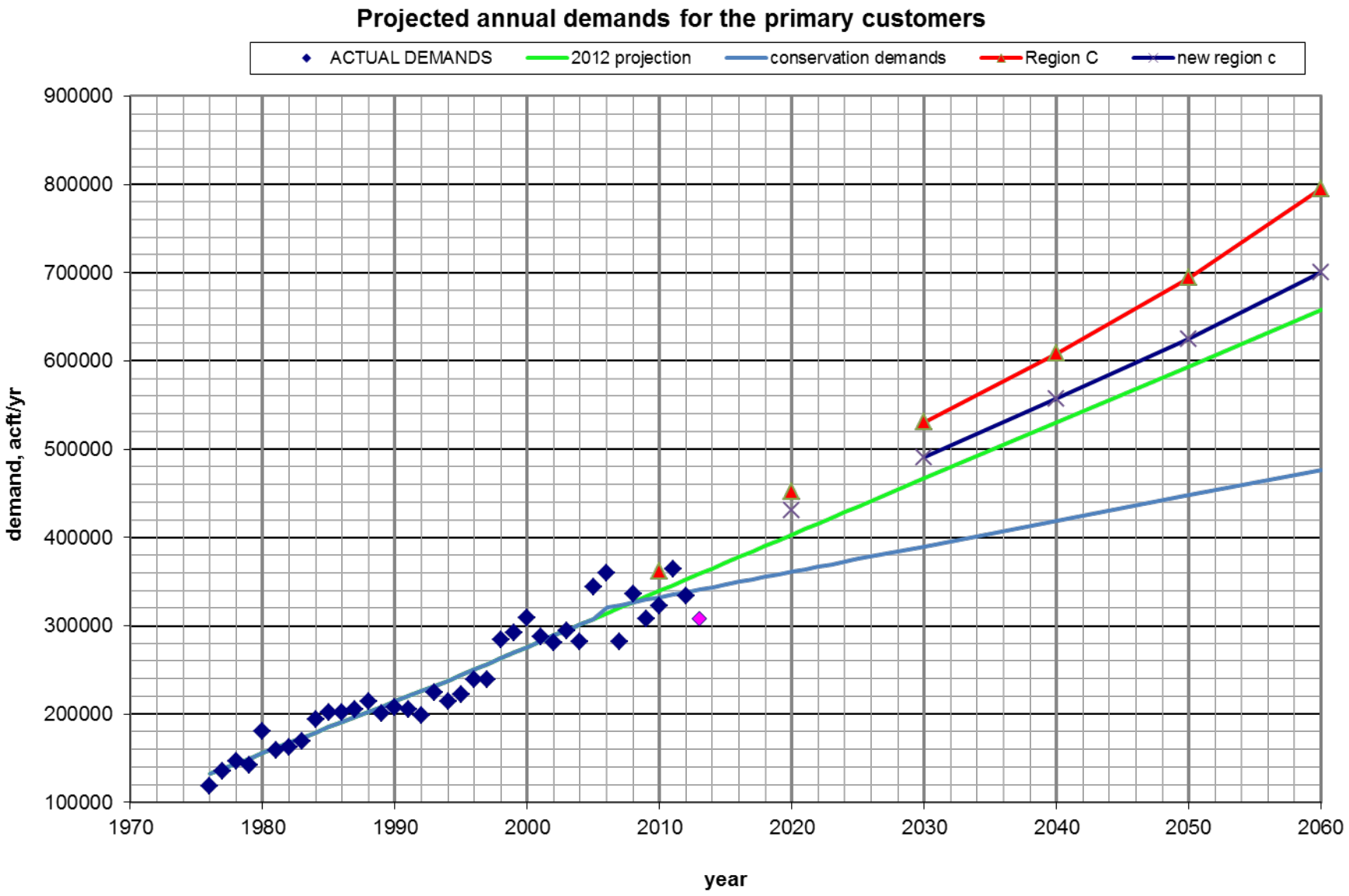

Texas Water Plan Demands
35,000,000
30,000,000
25,000,000
20,000,000
15,000,000
10,000,000
5,000,000
0
Texas Demands, Acre Feet per year
1940
1960
1980
2000
2020
2040
2060
2080
Year
actual use
1968 plan
1984 low
1984 high
1990 plan
1997 plan
2002 plan
2007 plan
2012 plan

Total Historic Water Demands Within The District Service Area



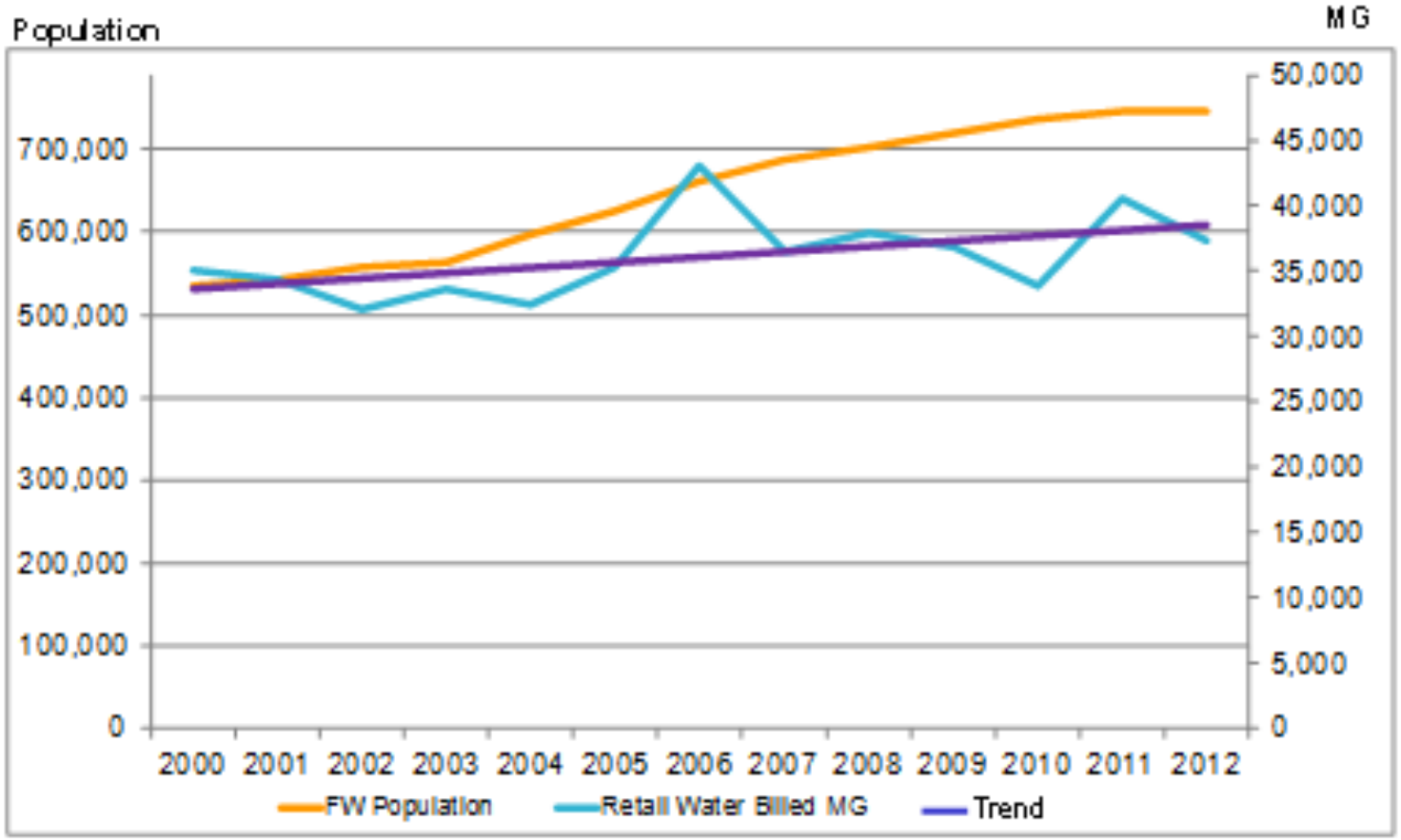

Conservation Savings 2007-2013
Cumulative Savings: 103 billion gal
Avg. Annual Savings: 14.7 billion gal
Avg. Savings per Day: 40.3 million gal
Annual Consumption (mg)
140,000
130,000
120,000
110,000
100,000
90,000
80,000
70,000
60,000
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
Actual Consumption
Calibration Period
90th Percentile Confidence Limits
Predicted Consumption Without Conservation

TRWD Demands Over Time



FORT WORTH

Growth Outpaces Water Demand



- Population has grown 40% since 2000
- Retail billed MG has grown 6.2%

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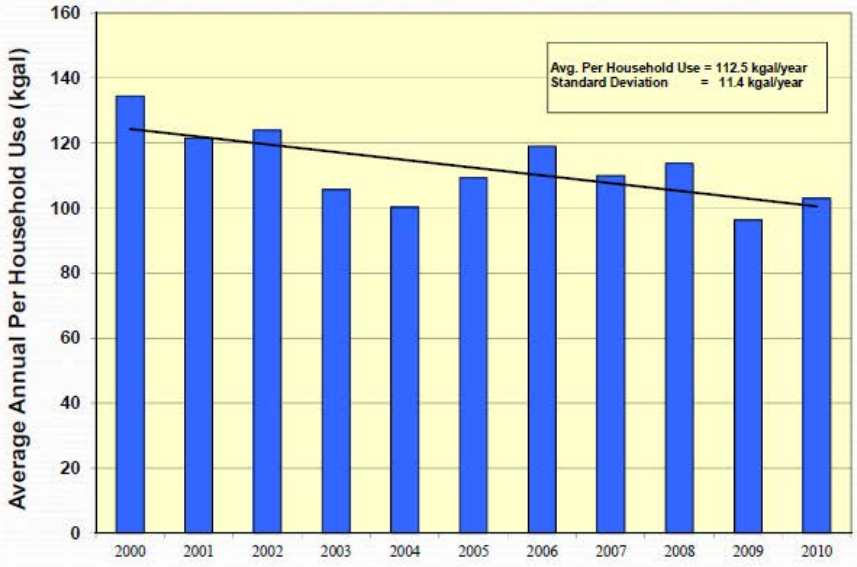
Where did the demand go?

- Residential water use has declined across the country.
- In 2008 a typical household used ~ 12,000 gallons *less* than in 1978 (Coomes, P. et. al. 2010).
- Significant demand reductions were observed prior to the current recession.

City of Westminster, CO average annual household water use, 2000 – 2010, with trend line



From Water Research Foundation Webcast "Foundation Knowledge Webcast: Assessing Changes in Single Family Water Use 12/6/2011

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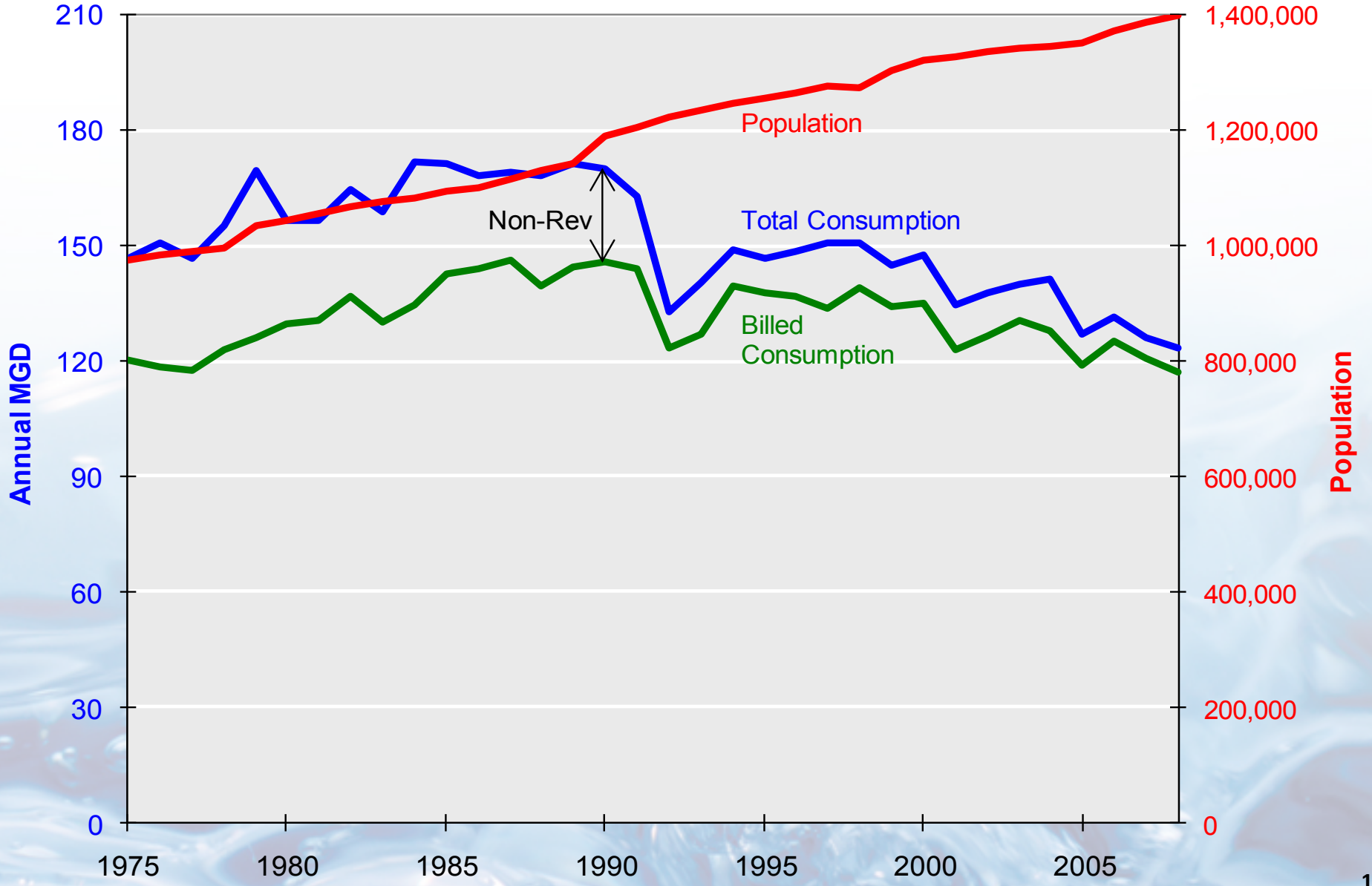
CASCADE WATER ALLIANCE

Growth in Population & Water Consumption



So, what are our demands?

- Reflecting back to the methodology used in the 1984 and 1990 State Water Plan, we have to bracket them
- We still may not capture the future
  - Continued conservation activities
  - Escalating price impact
  - Uncertainty in population gain
- Future demands are one of the major sources of uncertainty in the process

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Looking for the Next Source

Finding New Sources

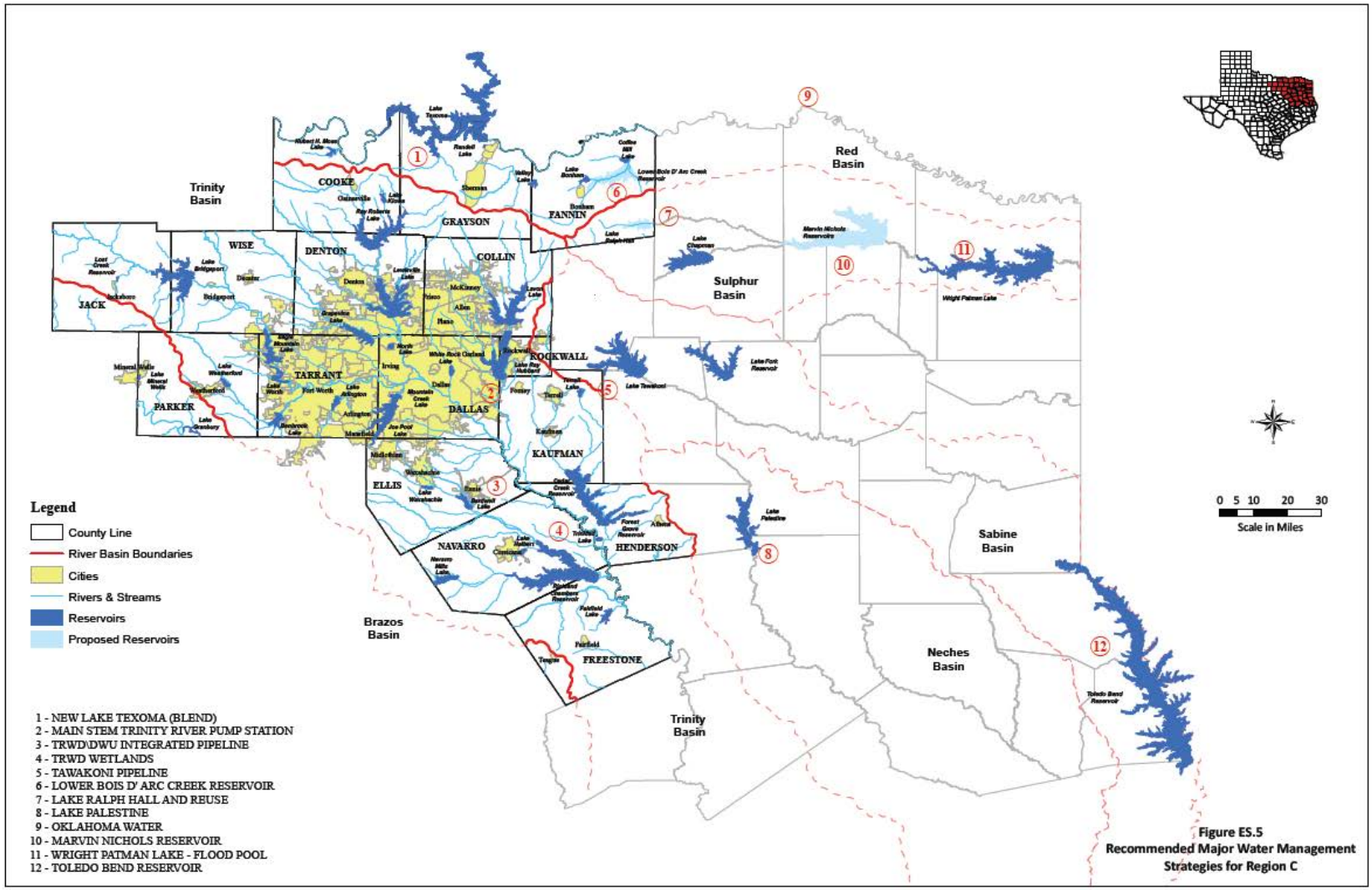

Figure ES.5
Recommended Major Water Management Strategies for Region C

Exploring alternative new sources

- Expanded conservation
- Reuse
  - Dual systems (Cape Coral , FL)
  - Direct reuse (Big Spring)
  - Indirect reuse (TWRD, NTMWD Wetlands)
- Rainwater harvesting
  - Tucson rebate program
  - Simple landscape terracing
- Water sharing with adjacent agencies (Dallas, NTMWD)
- Reservoir augmentation/off channel storage capturing flood flows
- ASR for drought contingency

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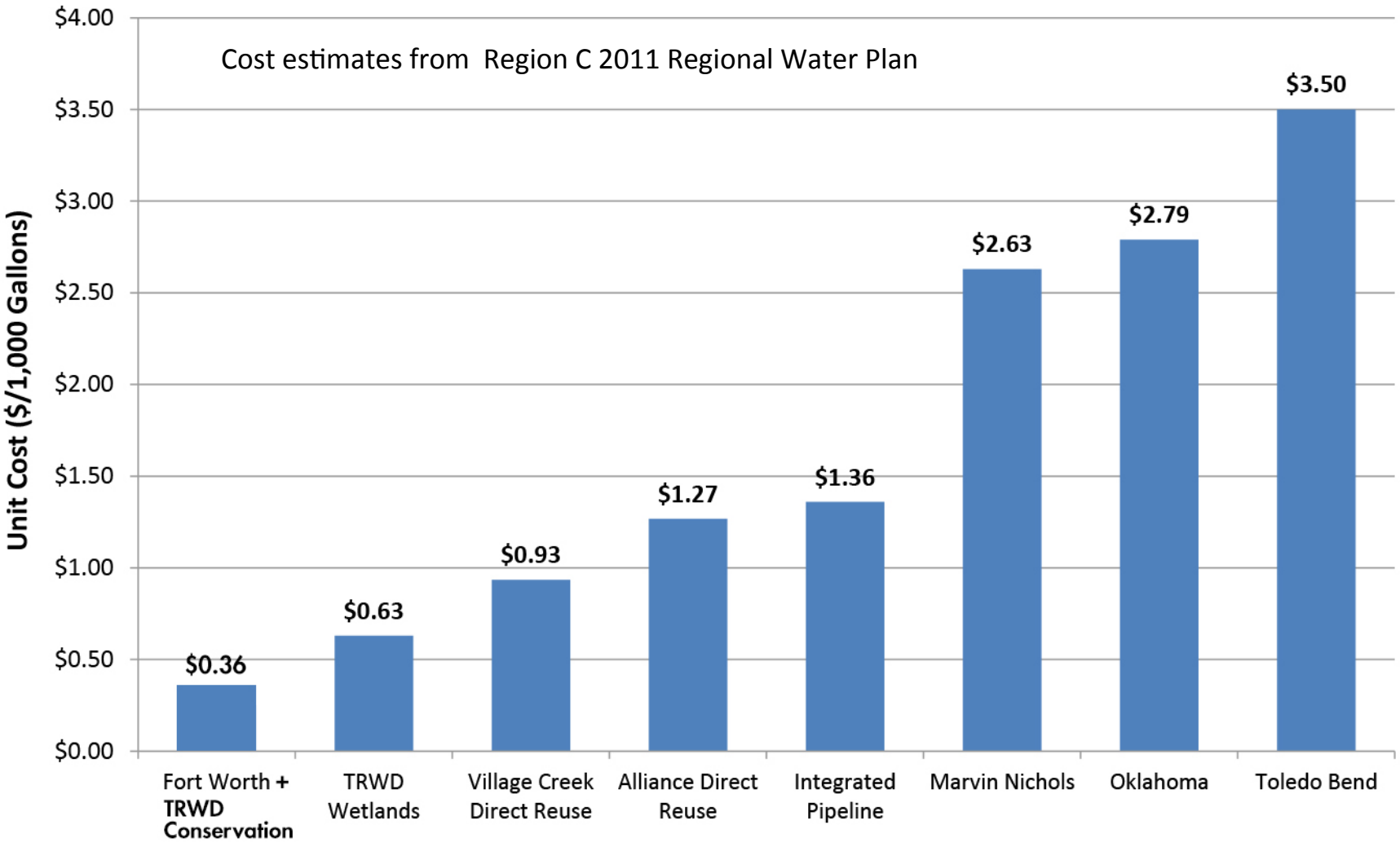
Cost of Future Supply Alternatives

Save water. Nothing can replace it.



Evaluating the Best Strategy

- A number of factors need to be considered in developing the plan:
  - Future population and demands
  - Risk tolerance of our customers
  - Legal risks for a new source
  - Cost to develop the source
  - Cost to deliver the water
  - Environmental considerations
  - Social considerations
  - Partnering options
  - Time to develop the resource

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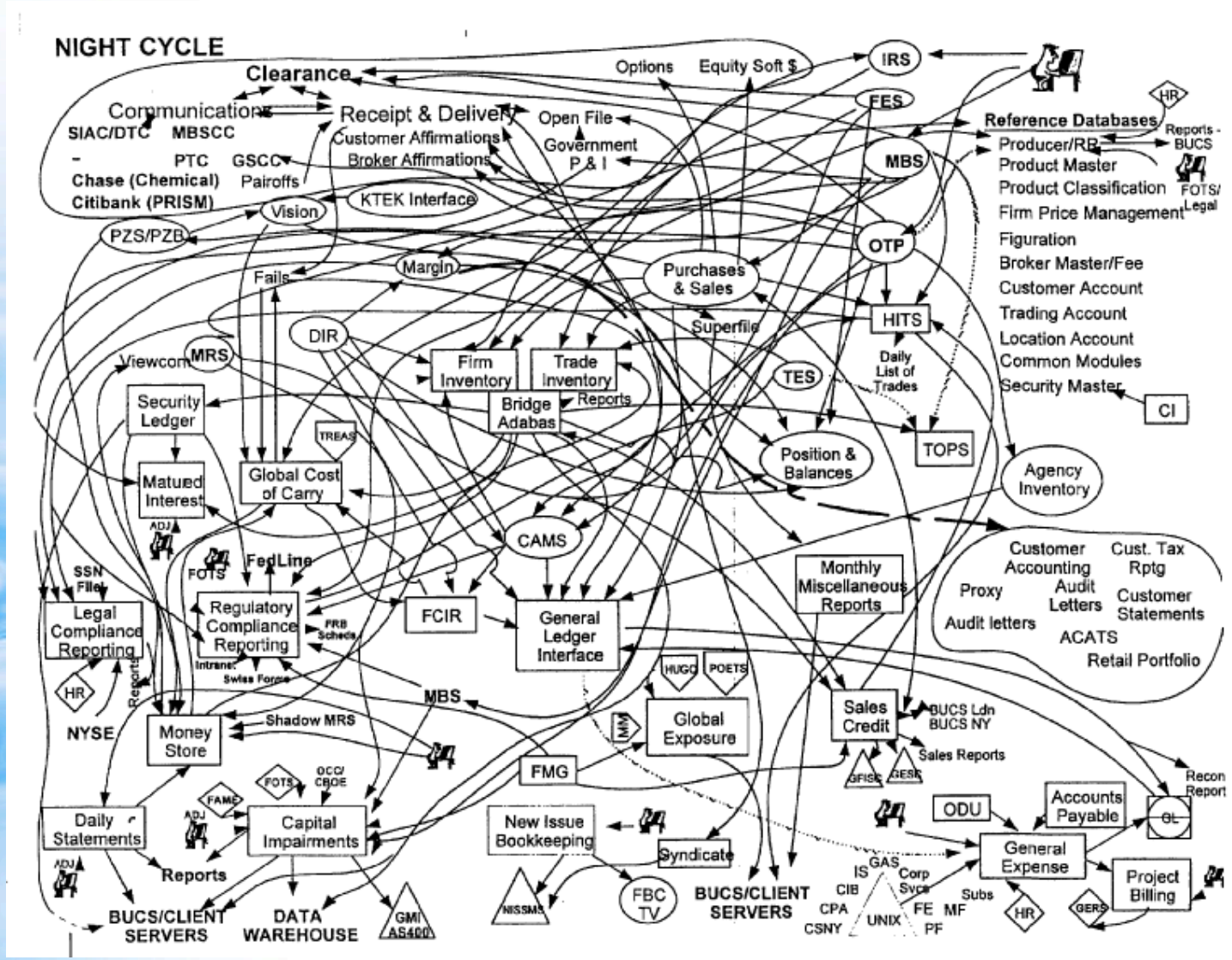
Considering a number of factors complicate the decision process



Charting the Course

- Combining all the information will not lead to a single course of action – there is too much uncertainty in the future
- Risk analysis in system modeling identifies the potential timing water shortages, the volume of those shortages and the frequency of those shortages
- Develop a decision tree that charts the best course based on choices of the driving forces
- As time progresses and uncertainties reduced, the tree will guide the utility to the best path

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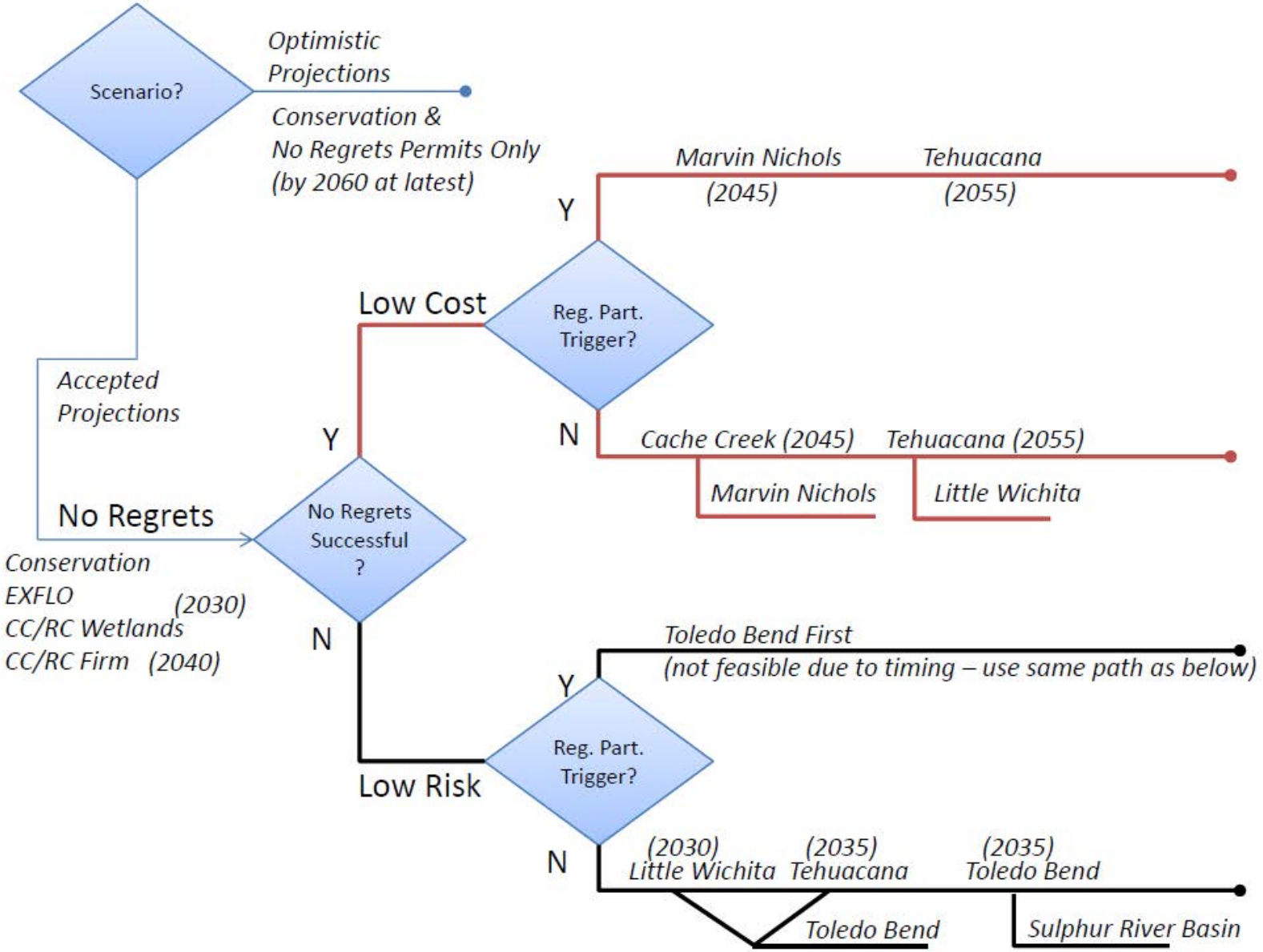
Scenario?
Optimistic Projections
Conservation & No Regrets Permits Only (by 2060 at latest)
Accepted Projections
No Regrets
Conservation
EXFLO (2030)
CC/RC Wetlands
CC/RC Firm (2040)
No Regrets Successful ?
Y
Low Cost
Reg. Part. Trigger?
Y
Marvin Nichols (2045)
Tehuacana (2055)
N
Cache Creek (2045)
Tehuacana (2055)
Marvin Nichols
Little Wichita
N
Low Risk
Reg. Part. Trigger?
Y
Toledo Bend First
(not feasible due to timing – use same path as below)
N
(2030) Little Wichita
(2035) Tehuacana
(2035) Toledo Bend
Toledo Bend
Sulphur River Basin

DO NOT
ENTER
ENTRANCE
ONLY

STOP
PROCEED
WITH
CAUTION

KEEP
RIGHT

TRWD's Future

- The best path may have many forks -a long-term decision process will continue to evolve
- Continue to actively pursue conservation
- Continue to plan with our regional partners
- Further develop our system simulation for risk evaluation to include climate variation and demand response to drought

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THE Lawn Whisperer Says

"It's a drought out there."

Water just twice a week for a healthy lawn.

SaveNorthTexasWater.com

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WATERING ADVICE NOVEMBER 25, 2013

Shared by: Oklahoma State University Outdoor Water Use and Conservation, Save Tarrant Water, Lake Stillhouse Clean Water, North Richland Hills, Mackenzie Meadows HOA, Texas Water Development Board, San Jacinto River Authority, City of Baytown, Dallas Curb Appeal, City of Arlington... and five others.