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# **Water Scarcity: Who's the Gorilla in the Room?**

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**James W. Richardson**

**Regents Professor**

**AgriLife Senior Faculty Fellow**

**Co-Director of Agricultural & Food Policy Center**

**USDA Outlook**

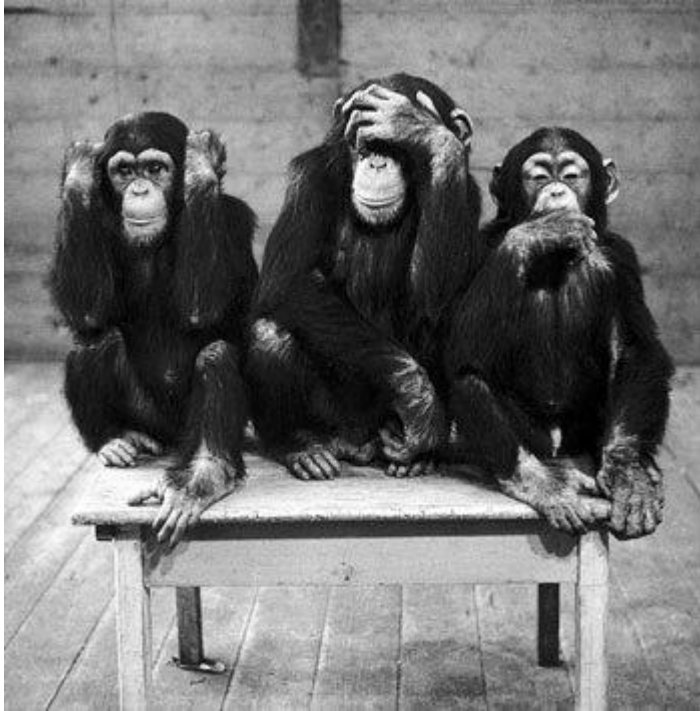
**February 19, 2015**

**TEXAS A&M**  
UNIVERSITY

**AFPC**

# A Gorilla or Three Big Monkeys?

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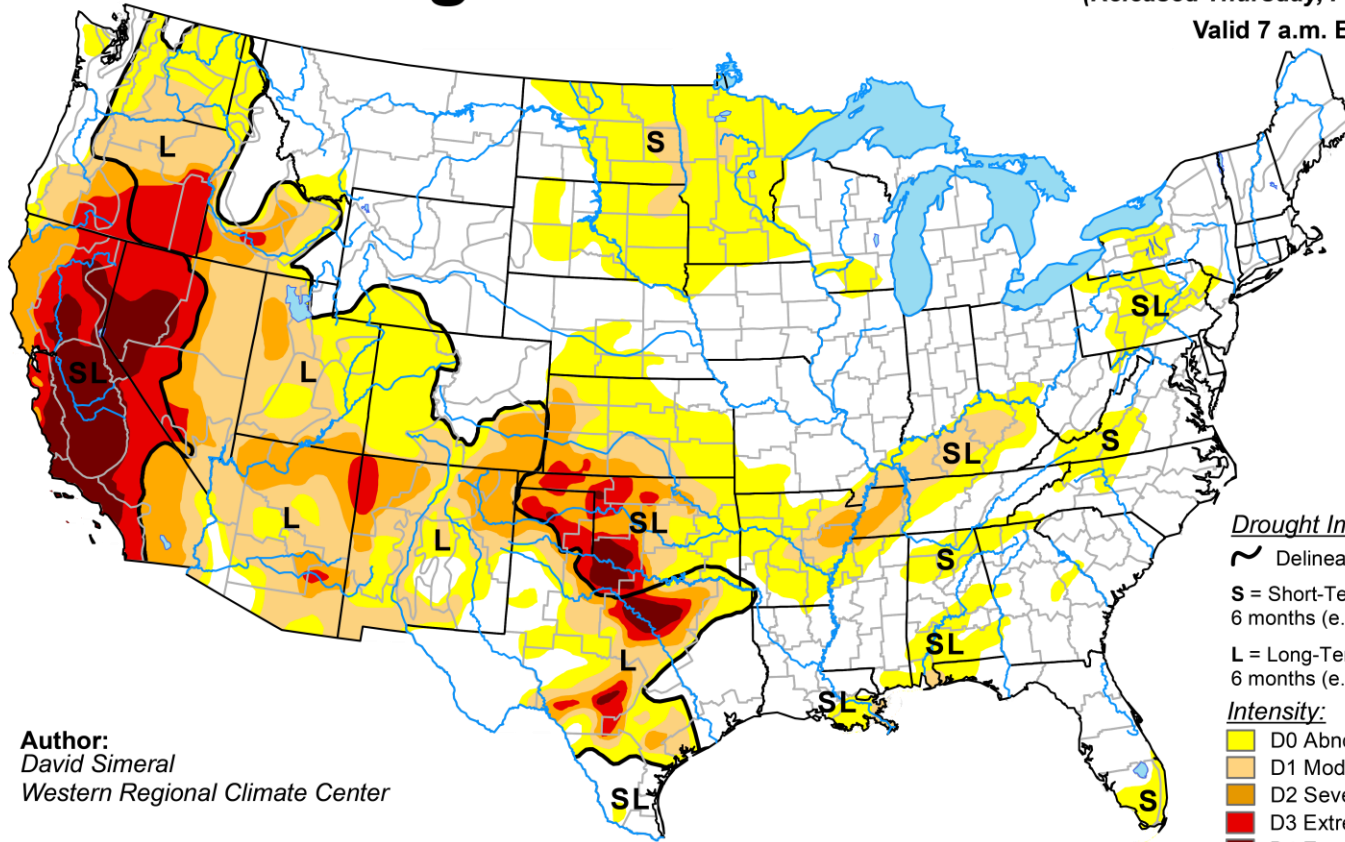
- Drought
- Population Growth
- Agricultural and Industrial Uses

# US Drought: Current Conditions

## U.S. Drought Monitor

February 10, 2015  
(Released Thursday, Feb. 12, 2015)

Valid 7 a.m. EST



Author:  
David Simeral  
Western Regional Climate Center

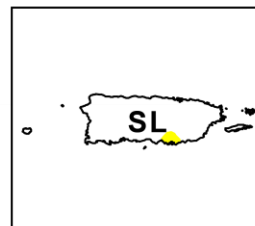
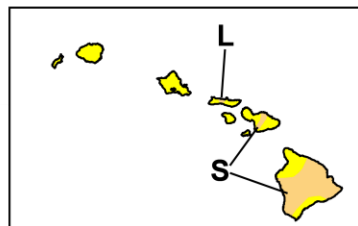
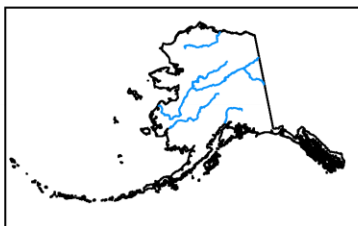
### Drought Impact Types:

- ~ Delineates dominant impacts
- S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)
- L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

### Intensity:

- Yellow D0 Abnormally Dry
- Orange D1 Moderate Drought
- Red D2 Severe Drought
- Dark Red D3 Extreme Drought
- Black D4 Exceptional Drought

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



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

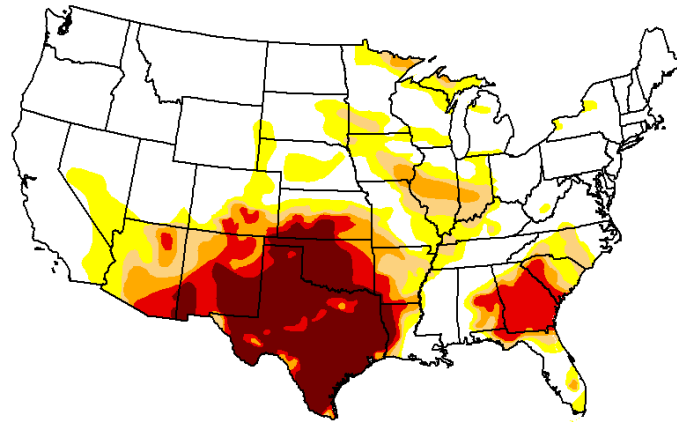
# Texas is actually looking pretty good relative to 2011 ...

September 13, 2011

February 3, 2015

U.S. Drought Monitor  
CONUS

September 13, 2011  
(Released Thursday, Sep. 15, 2011)  
Valid 7 a.m. EST



Author:  
Mark Svoboda  
National Drought Mitigation Center

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

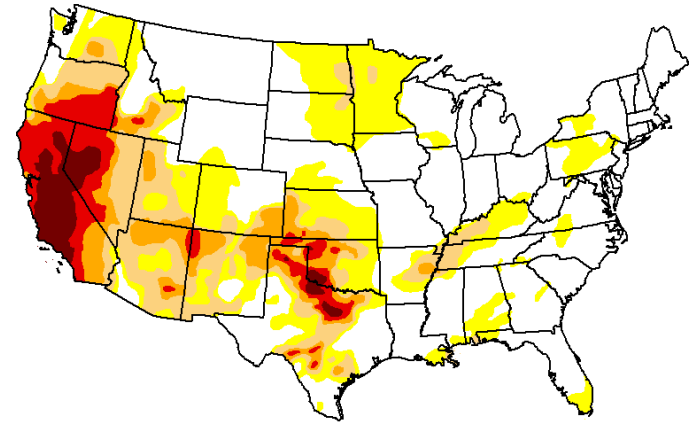
Intensity

D0 Abnormally Dry  
D1 Moderate Drought  
D2 Severe Drought  
D3 Extreme Drought  
D4 Exceptional Drought

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

U.S. Drought Monitor  
CONUS

February 3, 2015  
(Released Thursday, Feb. 5, 2015)  
Valid 7 a.m. EST



Author:  
Brian Fuchs  
National Drought Mitigation Center

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

Intensity

D0 Abnormally Dry  
D1 Moderate Drought  
D2 Severe Drought  
D3 Extreme Drought  
D4 Exceptional Drought

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

## ... but parts of Texas are still in an exceptional, multi-year drought ...

# Will Drought Be More Commonplace?

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**A ‘megadrought’ will grip U.S. in the coming decades, NASA researchers say**

Fading El Niño could extend Texas drought

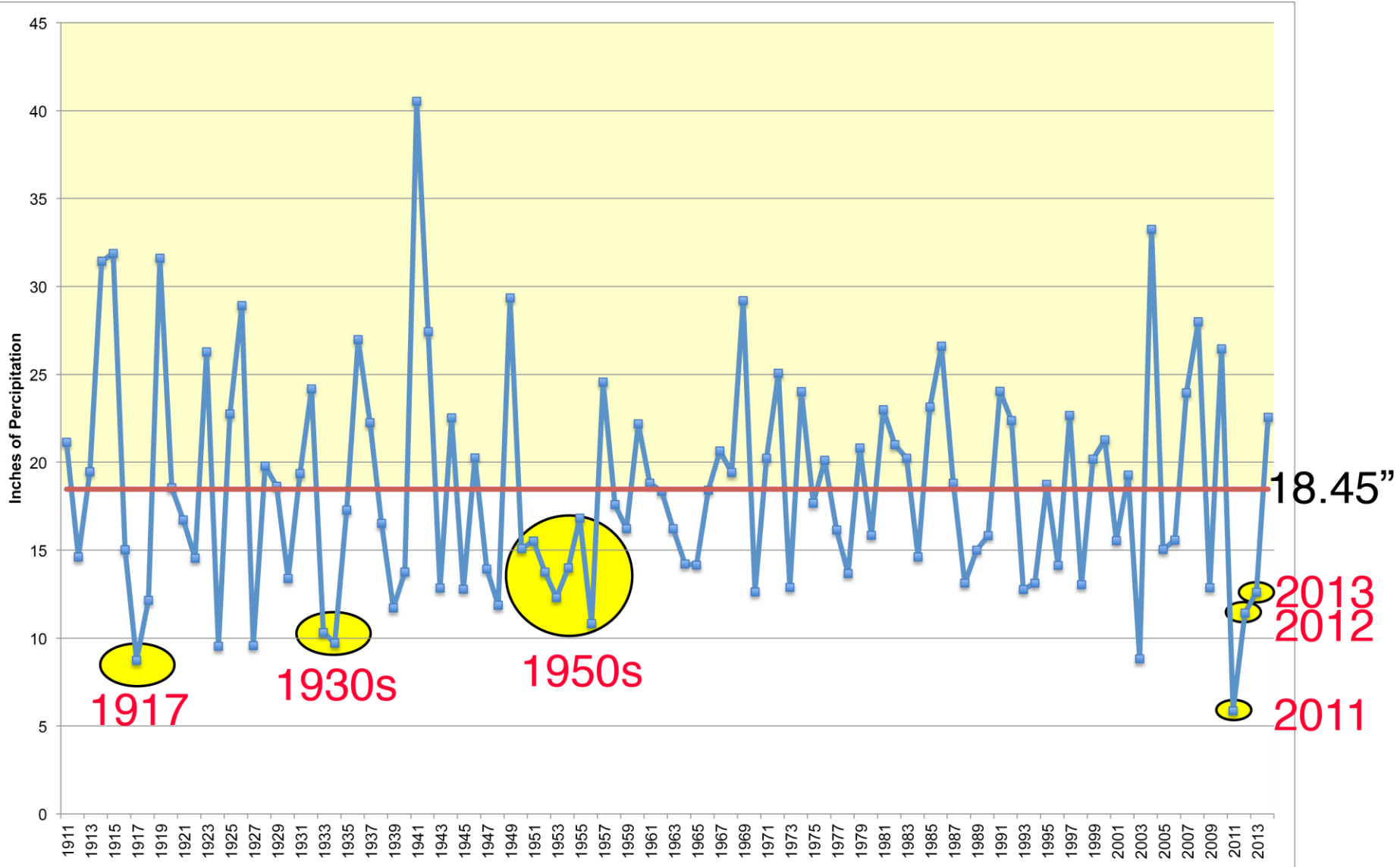
**Southwest, Central Plains Face ‘Unprecedented’ Drought**

**Climate Forecast: More Southwest Droughts and Australian Floods**

*Global warming will drive La Niña to greater extremes, a new study says—and El Niño too.*

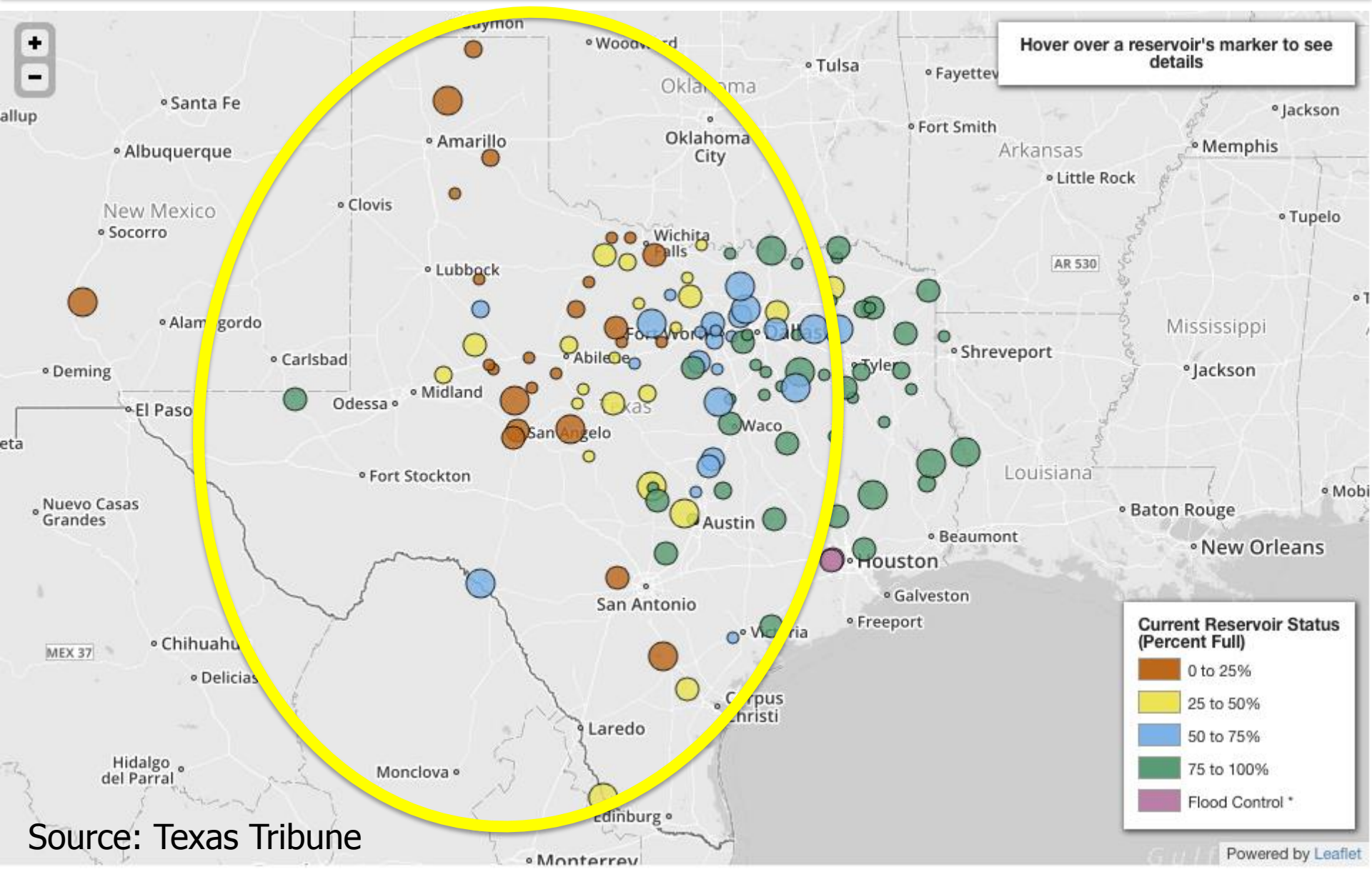
**Drought among the worst in Texas  
in past 500 years**

# Lubbock, TX, Rainfall (1911 – 2014)





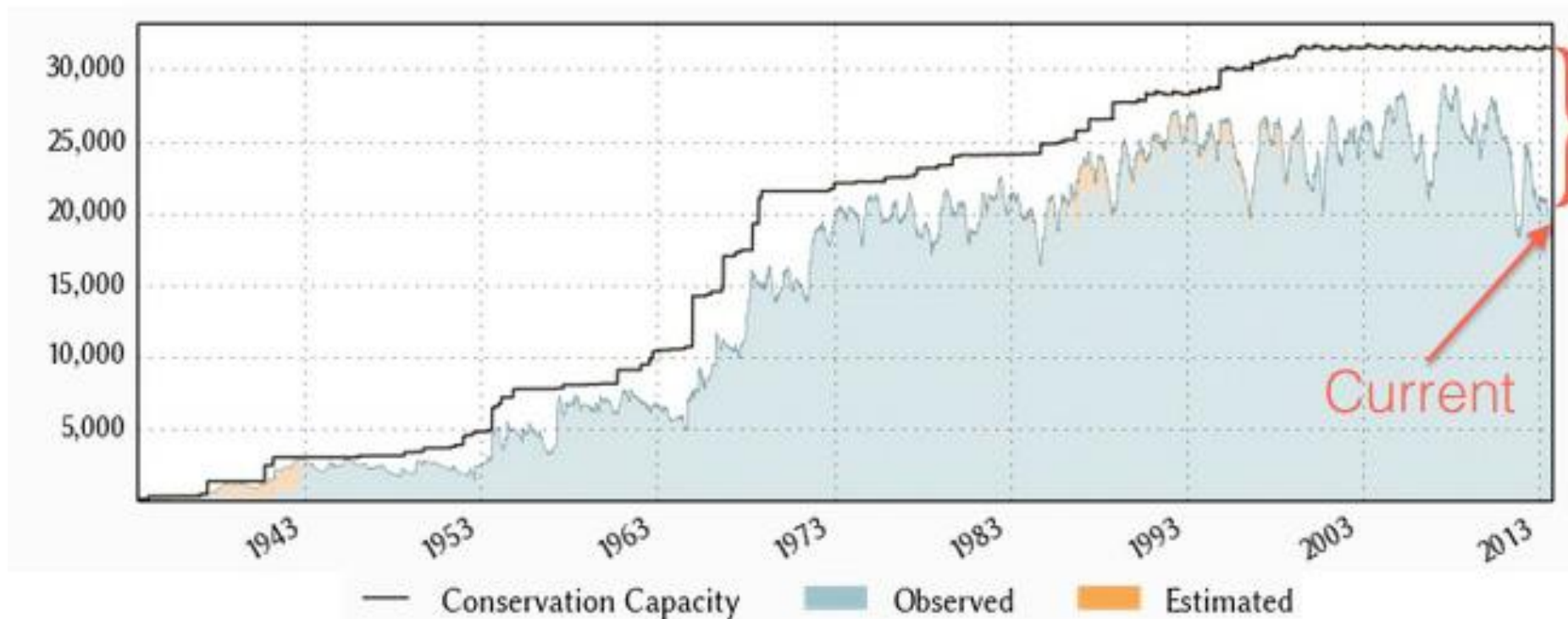
# Texas Reservoir Levels (2015)





# Reservoir Levels vs. Capacity

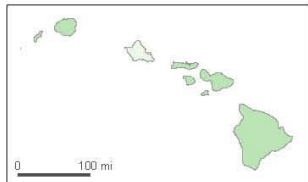
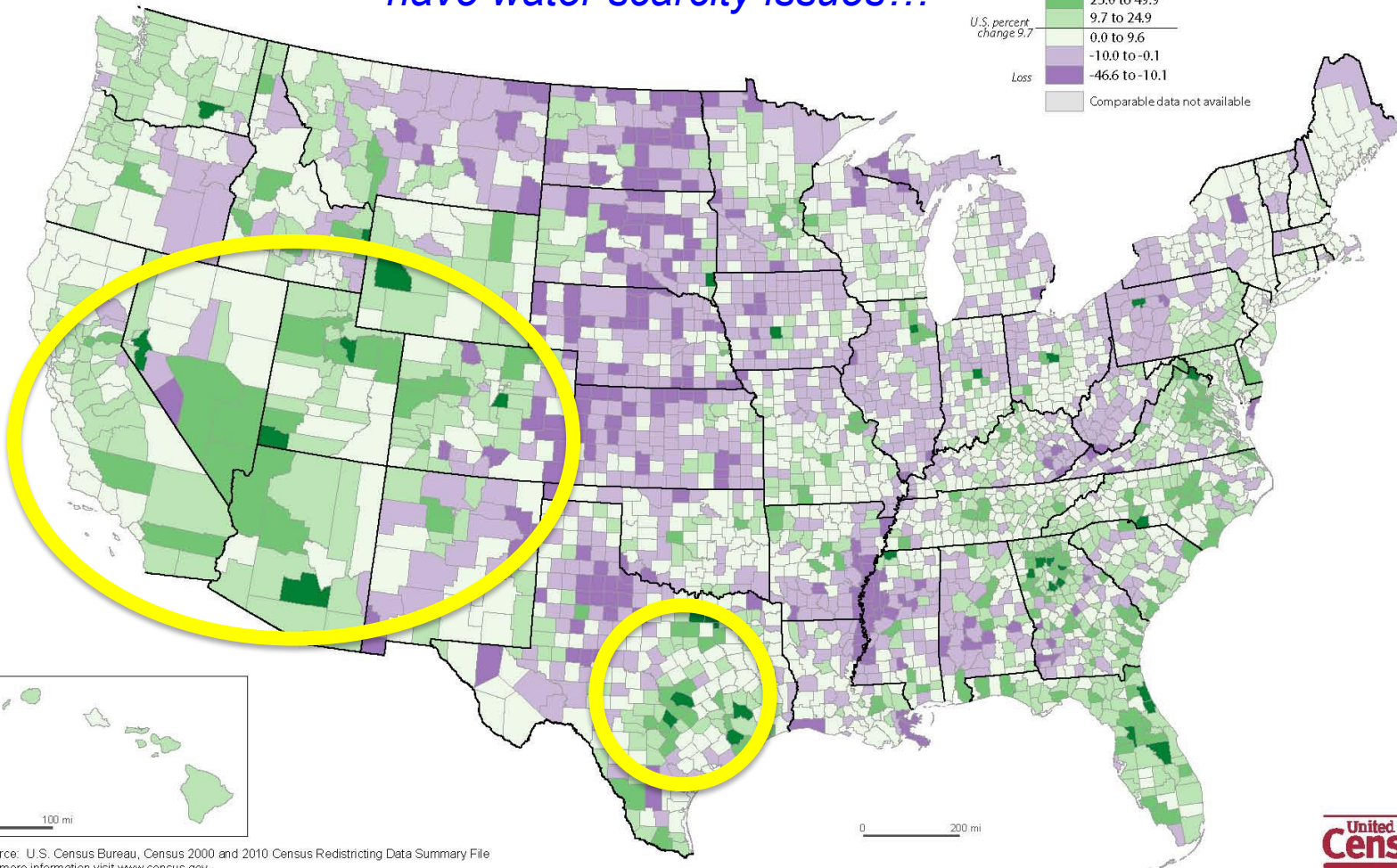
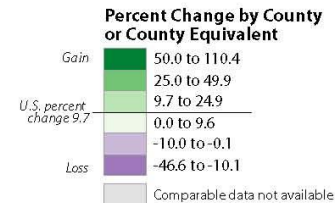
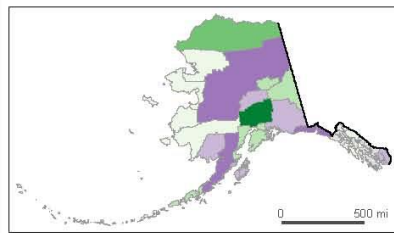
Texas water supply reservoirs are at 64.9%



## 2010 Census Results - United States

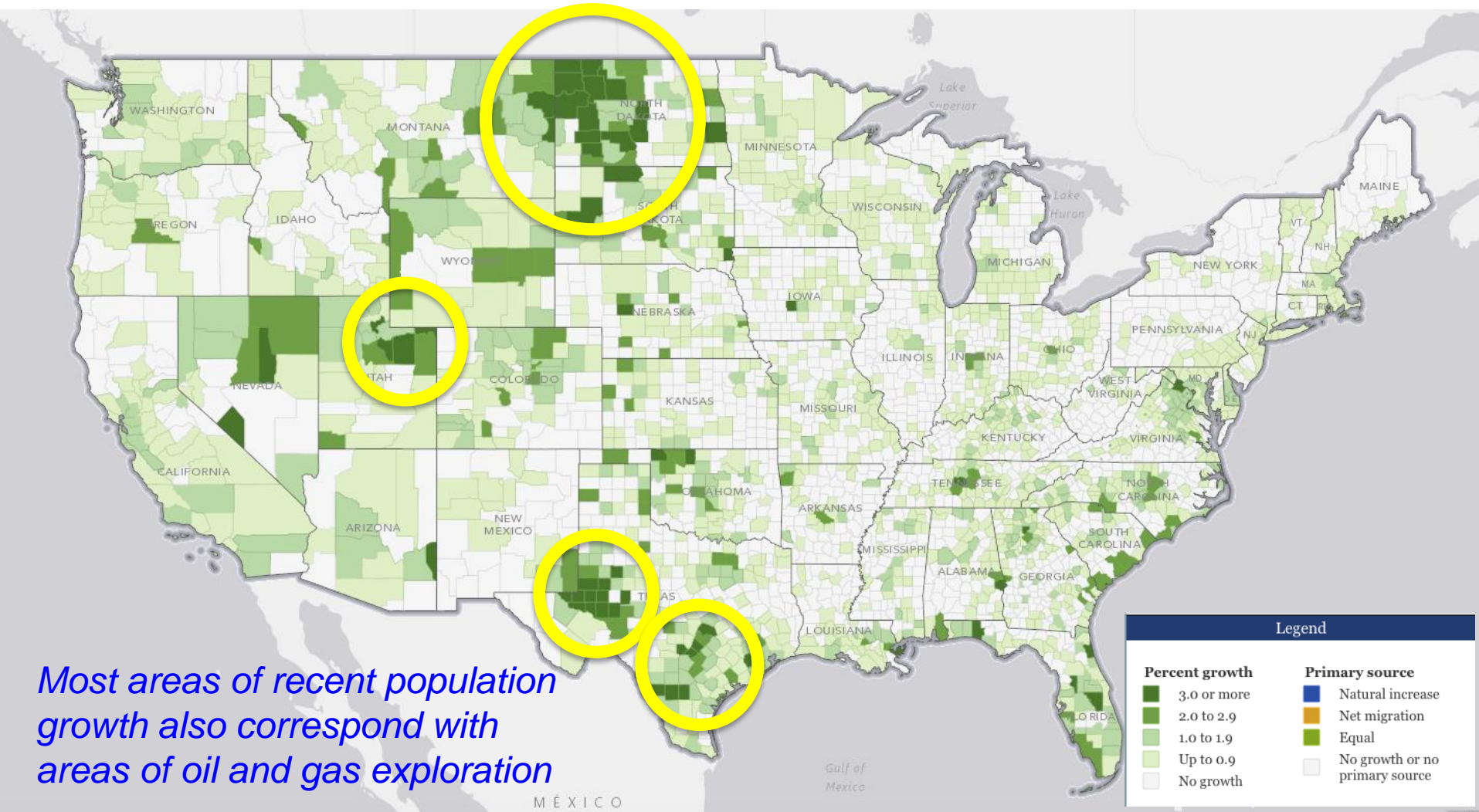
Percent Change in Population: 2000 to 2010

*US population growth areas  
have water scarcity issues...*



Source: U.S. Census Bureau, Census 2000 and 2010 Census Redistricting Data Summary File  
For more information visit [www.census.gov](http://www.census.gov).

# County Population Growth (2012 – 2013)



Source: US Census Bureau

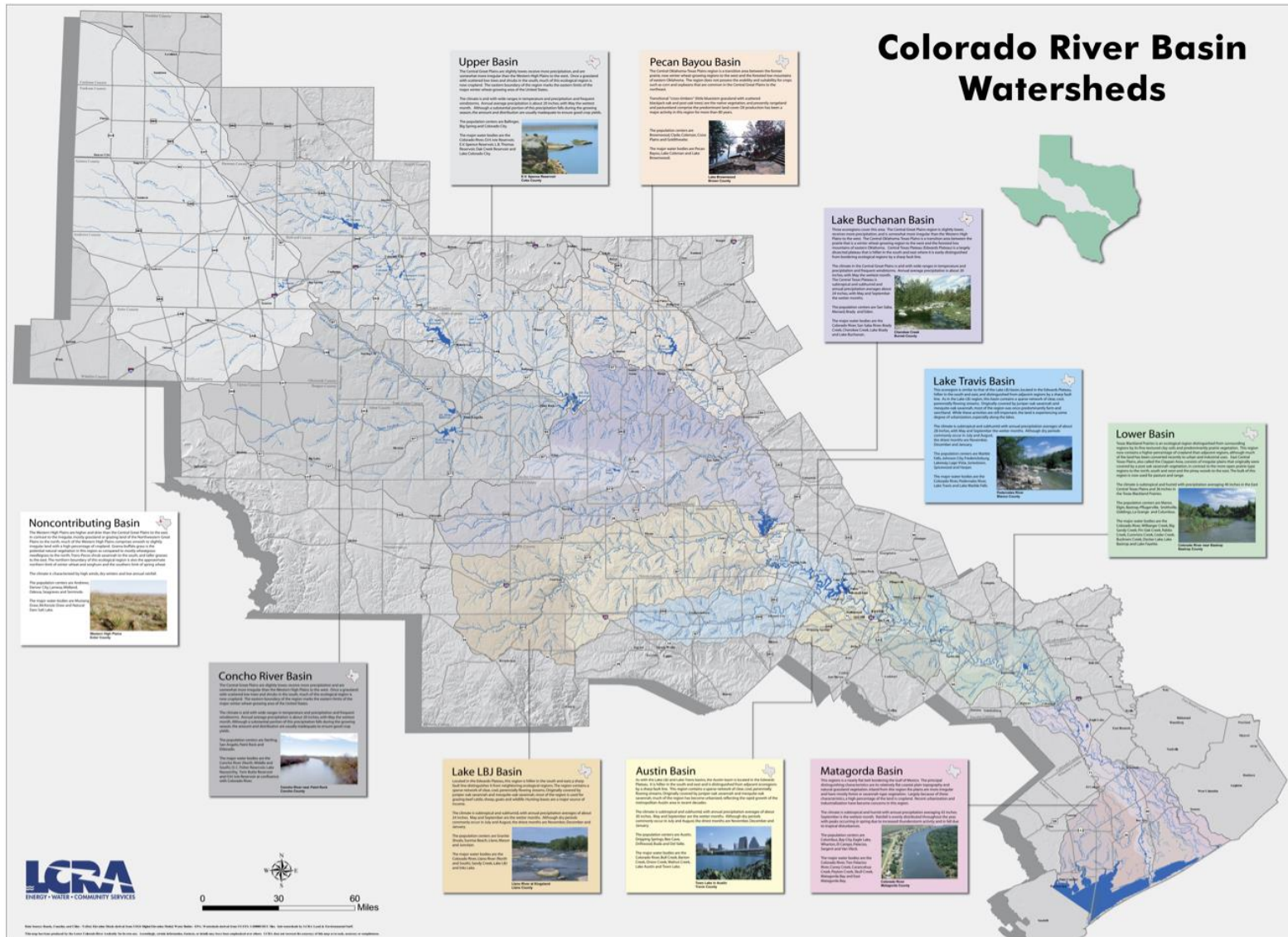
# Situation

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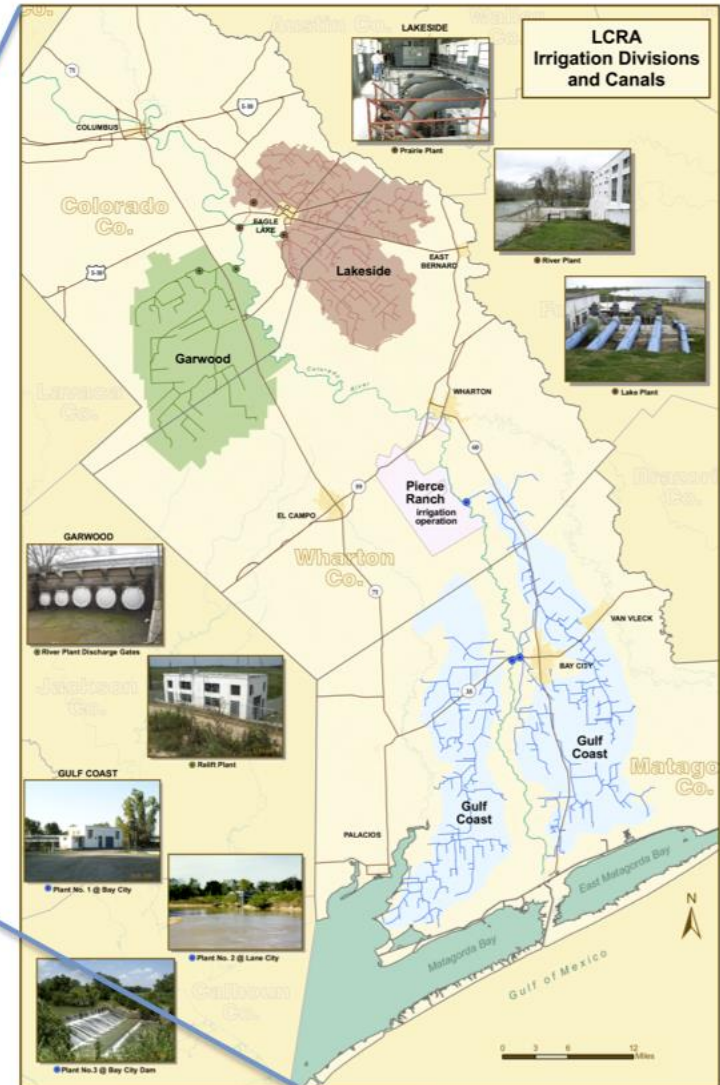
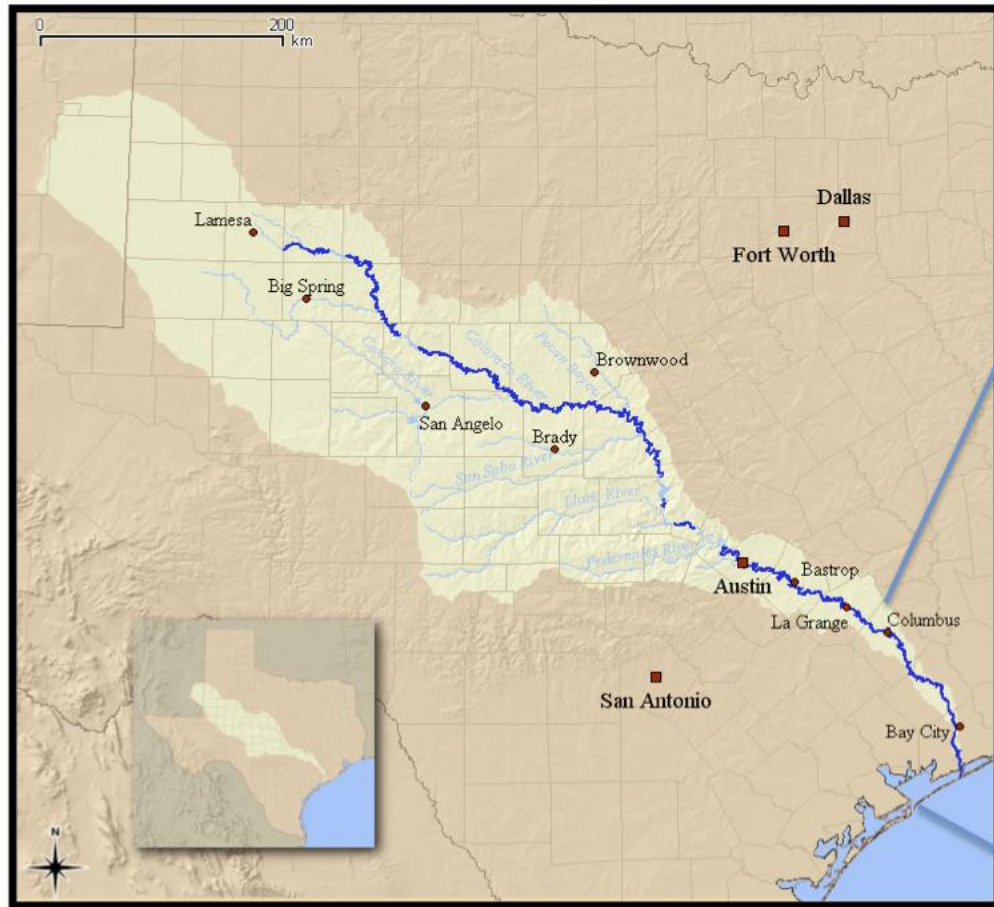
- Gorilla 1: A big drought in the Southwest
- Gorilla 2: Increased rate of population growth in the aid regions
- What does this mean for water consumers other than people?
  - Gorilla 3: Agriculture and Industry



# Agriculture Example Will Focus on One River Basin in Texas



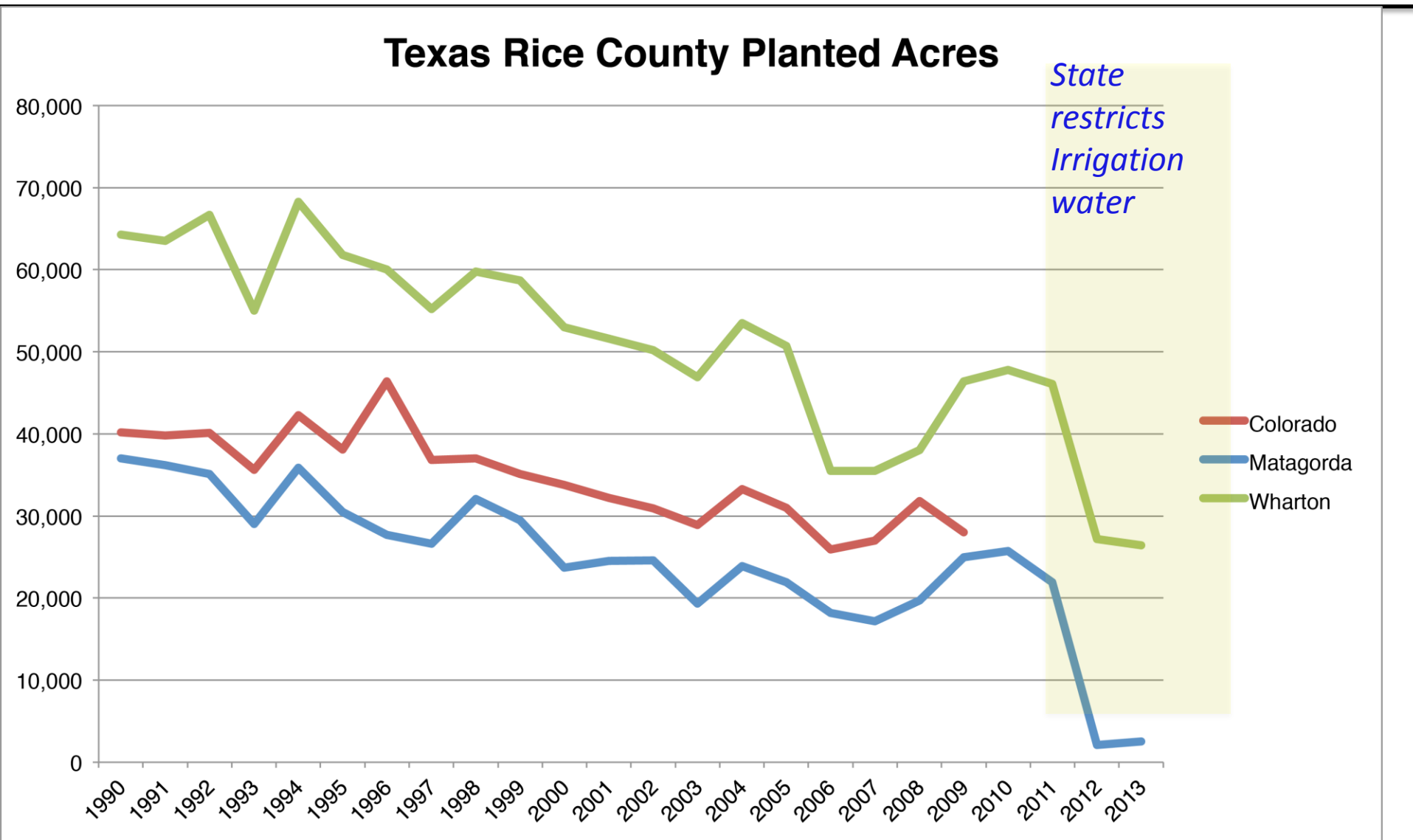
# LCRA Rice Irrigation Areas in Texas





# People vs. Agriculture?

## Texas Rice Farmers Take the Hit; No Water in 2011-15; Likely Cause a Loss of Infrastructure & Community

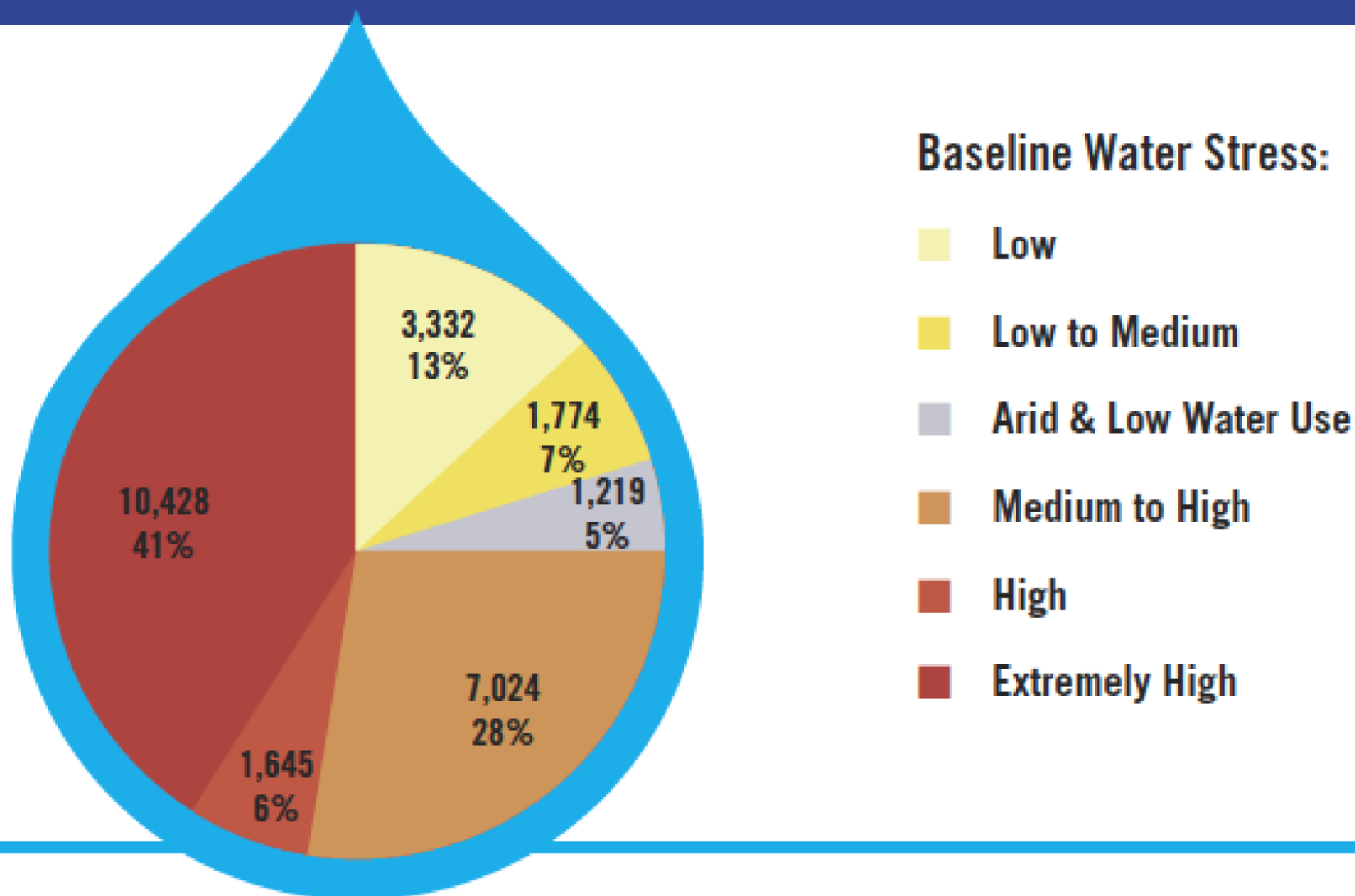


# Energy Industry is a Growing Water User

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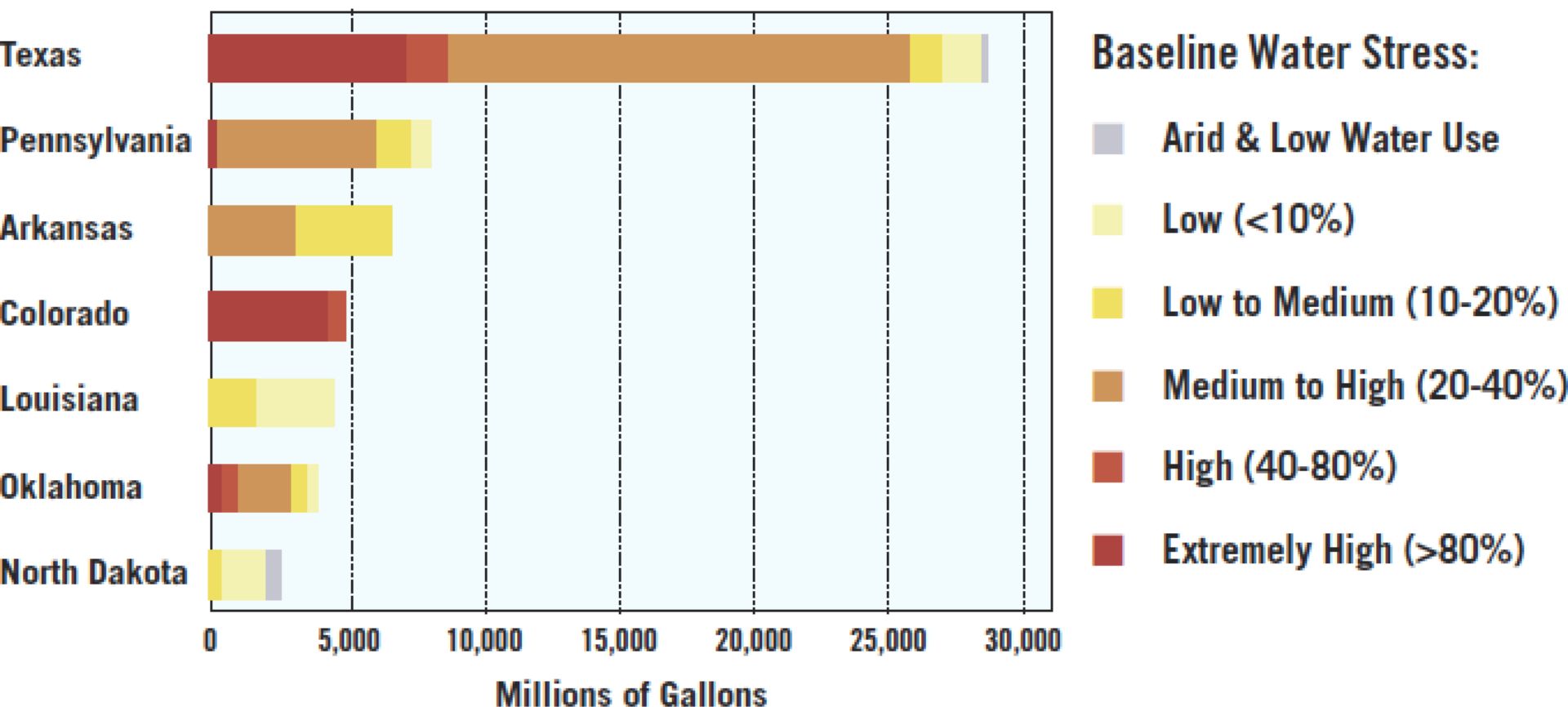
- Water used for fracking is small, usually about 1% of the state's water usage
- But, locally water usage could be quite large
  - 2 to 10 million gallons per well
  - Globally 38% of shale oil & gas in water stressed regions
  - In the Texas Eagle Ford Shale water use could amount to 89% of total water use in peak production
  - In the Texas Barnett Shale about 50% of water usage in 2006 was for fracking
- Jan 2001-Sept 2012, 25,450 wells reported using 65.8 billion gallons; the annual water needs for 2.5 million Americans

**FIGURE 1: NUMBER & PERCENTAGE OF HYDRAULICALLY FRACTURED WELLS BY WATER STRESS**



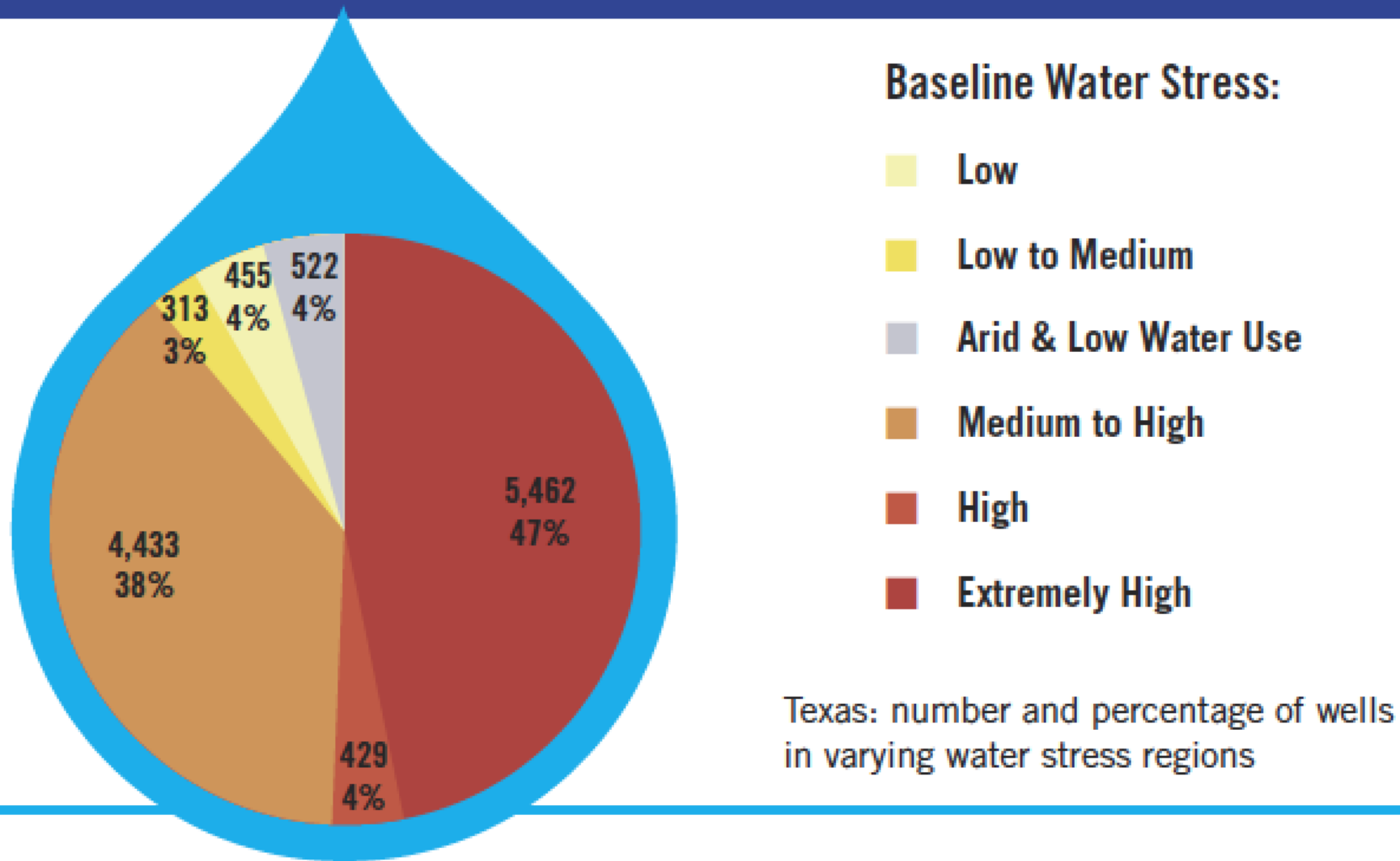
Source: CERES, Hydraulic Fracturing & Water Stress, May 2013

**FIGURE 6: VOLUME OF WATER INJECTED FOR HYDRAULIC FRACTURING BY STATE & WATER STRESS REGIONS**



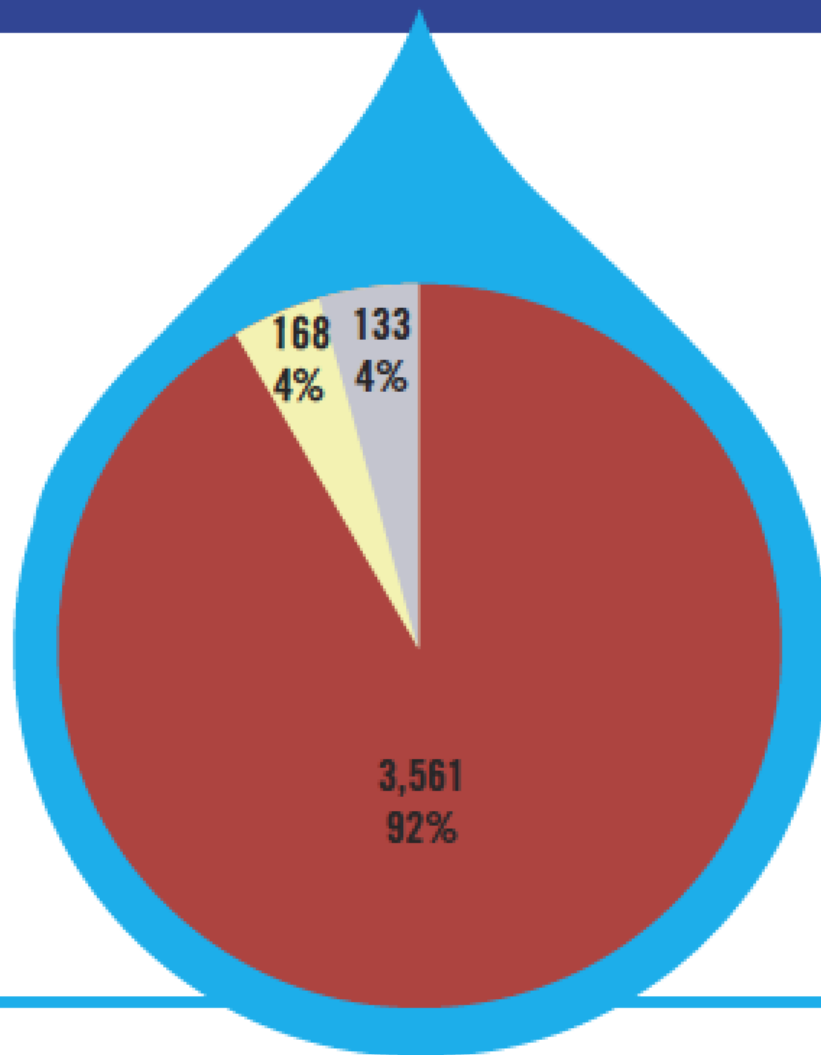
Source: CERES, Hydraulic Fracturing & Water Stress, May 2013

**FIGURE 3: TEXAS—NUMBER OF WELLS BY WATER STRESS**



Source: CERES, Hydraulic Fracturing & Water Stress, May 2013

**FIGURE 4: COLORADO—NUMBER OF WELLS BY WATER STRESS**



**Baseline Water Stress:**

- Low
- Low to Medium
- Arid & Low Water Use
- Medium to High
- High
- Extremely High

Colorado: number and percentage of wells in varying water stress regions

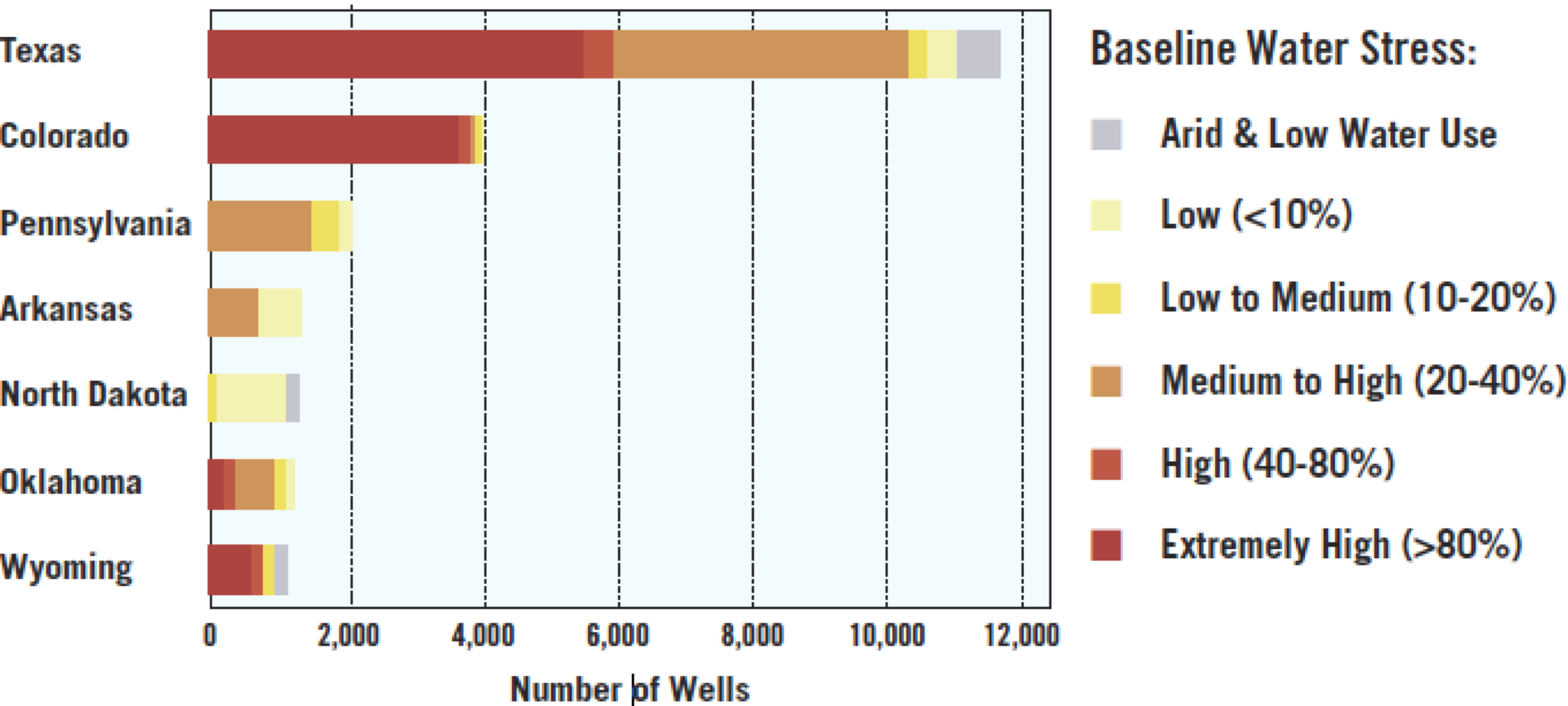


# Summary

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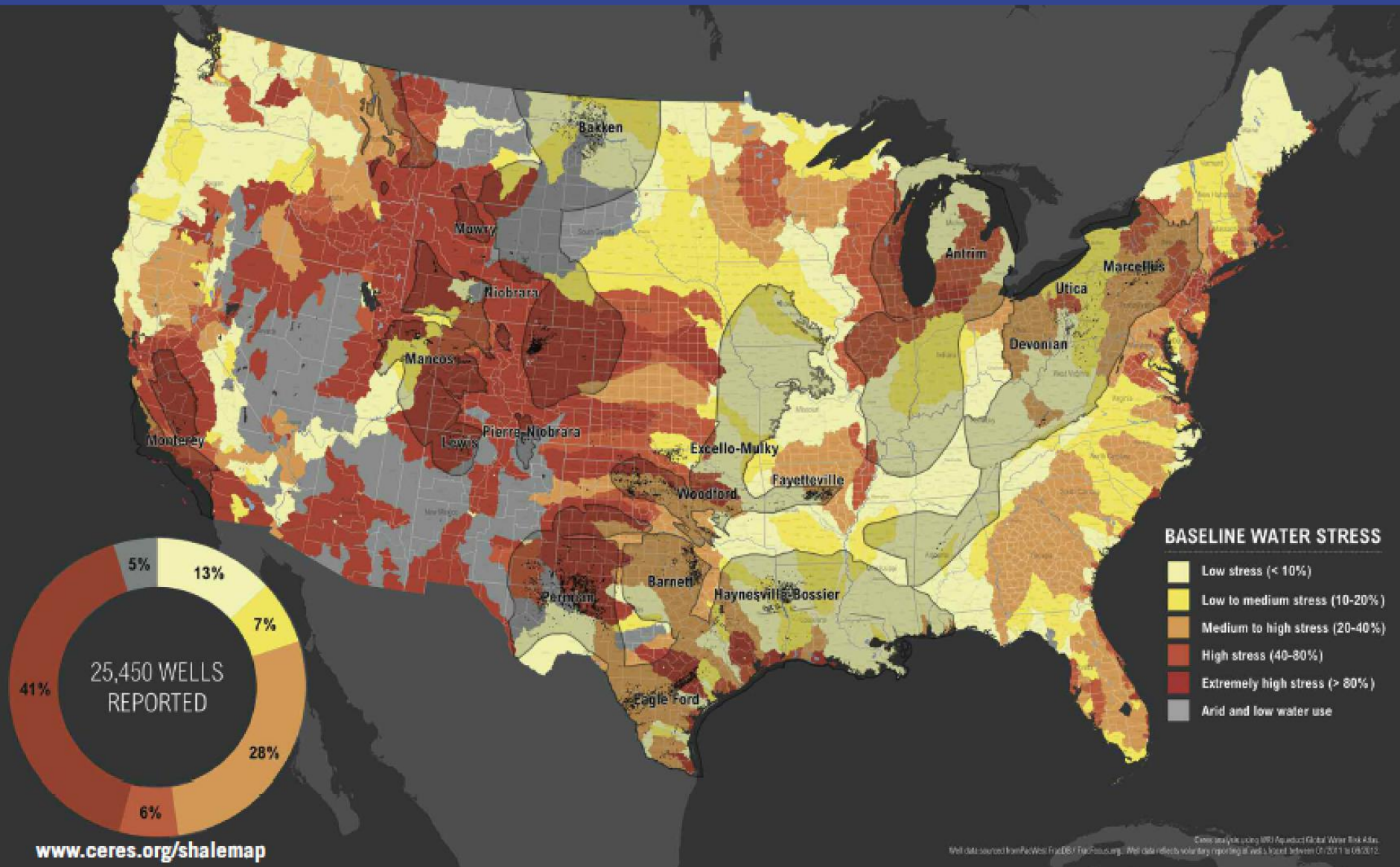
- Drought appears to be with us for many years
  - Continued water scarcity in Southwest and West
- Population continues to grow in water scarce regions
  - Added stress on diminished water supplies
- Agriculture is the first to lose access to water
  - Even if the industry has long standing water rights
  - Puts severe economic pressure on agricultural infrastructure and rural communities
- Energy industry water needs are expanding
  - Water stress regions are using water at increasing rates
  - Majority of water is for energy
  - Where will the trade-off end?

**FIGURE 2: NUMBER OF HYDRAULICALLY FRACTURED WELLS BY STATE & WATER STRESS**



Source: CERES, Hydraulic Fracturing & Water Stress, May 2013

## COMPETITION FOR WATER IN U.S. SHALE ENERGY DEVELOPMENT



Source: CERES, Hydraulic Fracturing & Water Stress, May 2013