Texas Water!

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Texas Water Development Board

presented to
The LSSS, RACSS, and LRL Professional Development Seminar

Austin, Texas; October 5, 2015
data

planning

financing
The following presentation is based upon professional research and analysis within the scope of the Texas Water Development Board’s statutory responsibilities and priorities but, unless specifically noted, does not necessarily reflect official Board positions or decisions.
“Water, not oil, is the lifeblood of Texas.”

—James A. Michener
“I wish we water boys were paid like them oil boys.”

—Robert E. Mace
**acre-foot**

= one acre with a foot of water on it

= a football field with a foot of water on it

= about 326,000 gallons

= water for about 10 people for a year
Atlantic Multi-decadal Oscillation

Pacific Decadal Oscillation

Pacific Ocean

Atlantic Ocean

Bermuda High

El Niño Southern Oscillation

Subtropical jet stream

West winds
Average annual precipitation (1981 to 2010)
Average annual evaporation (1981 to 2010)
The West

14th  15th  16th Century Megadroughts
Palmer Drought Severity Index

El Nino

Southern Oscillation

Pacific Decadal Oscillation

Atlantic Multidecadal Oscillation
data from Ward and Valdes (1995)
Rainwater is essentially private property in Texas.
The Water Cycle

- Water storage in ice and snow
- Water storage in the atmosphere
- Condensation
  - Evaporation
- Transpiration
- Surface runoff
  - Streamflow
  - Ground-water discharge
- Spring
  - Freshwater storage
  - Infiltration
- Snowmelt runoff to streams
  - Ground-water storage

U.S. Department of the Interior
U.S. Geological Survey
Average annual runoff (inches)
I think you've confused me

with someone who builds a dam.
Reservoir Levels
as of September 25, 2015
Guadalupe River flowing into San Antonio Bay
Atmosphere

- Precip: 379,000,000
- Evap: 7,200,000

Surface water

- 47,200,000 into lakes and rivers from runoff
- 4,700,000 into lakes and rivers from rainfall

Texas coast: 35,000,000
Other states: 9,300,000

All numbers in acre-feet per year for Texas

Data from Ward and Valdes (1995)

86%
85%
• Amalgam of Spanish, Mexican, and Texan law
• Overland flow: private property
• In a stream course: state property
  • Unless you have a bed and banks permit
• Prior appropriation
  • 1st in time, 1st in right
  • Usufructable
  • Superior rights
• Managed by Texas Commission of Environmental Quality
Your aquifer as a bathtub

- Recharge
- Aquifer
- Pumping
- Spring/base flow
recharge
Hickory Aquifer, sandstone
Edwards-Trinity (Plateau) Aquifer, limestone
Ogallala Aquifer, sand and gravel
Comal Springs
Testing Rice Well, El Campo, Texas

Pub's ed by Our Drug Store
same aquifer: **unconfined and confined**
McDonald Irrigation Well, 1200 Gallons per Minute, Hereford, Texas.
groundwater use in Texas (1937 to 2003)

Total volume pumped:
530,000,000 acre-feet

Texas Water Development Board data

U.S. Geological Survey data
<table>
<thead>
<tr>
<th>Aquifer</th>
<th>Groundwater use (acre-feet per year)</th>
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<tbody>
<tr>
<td>Ogallala</td>
<td>6,300,000</td>
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<tr>
<td>Gulf Coast</td>
<td>1,100,000</td>
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<tr>
<td>Carrizo-Wilcox</td>
<td>450,000</td>
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<tr>
<td>Edwards (Balcones Fault Zone)</td>
<td>390,000</td>
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<tr>
<td>Seymour</td>
<td>190,000</td>
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<tr>
<td>Trinity</td>
<td>170,000</td>
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<tr>
<td>Bone Spring-Victorio Peak</td>
<td>150,000</td>
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<tr>
<td>Edwards-Trinity (Plateau)</td>
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<tr>
<td>Hueco-Mesilla Bolsons</td>
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<td>Other</td>
<td>63,000</td>
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<tr>
<td>Pecos Valley</td>
<td>55,000</td>
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<td>Dockum</td>
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<td>Brazos River Alluvium</td>
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<td>Blaine</td>
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<td>West Texas Bolsons</td>
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<tr>
<td>Lipan</td>
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<tr>
<td>Hickory</td>
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<td>Woodbine</td>
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<td>Queen City</td>
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<td>Sparta</td>
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<td>Igneous</td>
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<tr>
<td>Rita Blanca</td>
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<tr>
<td>Ellenburger-San Saba</td>
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<tr>
<td>Edwards-Trinity (High Plains)</td>
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<td>Nacatoc</td>
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<tr>
<td>Capitan Reef</td>
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<tr>
<td>Marble Falls</td>
<td>1,500</td>
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<td>Blossom</td>
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<tr>
<td>Rustler</td>
<td>800</td>
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<tr>
<td>Marathon</td>
<td>120</td>
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<tr>
<td>Yegua-Jackson</td>
<td>not known</td>
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Total water-level declines in the major aquifers
A road (below right) that provided access to the San Jacinto Monument was closed due to flooding caused by subsidence.

photos from USGS’s Circular 1182
All numbers in acre-feet per year for Texas

- Atmosphere
  - Precip: 379,000,000
  - Evap: 7,200,000
  - ET: 320,000,000

- Surface water
  - 47,200,000 into lakes and rivers from runoff
  - 4,700,000 into lakes and rivers from rainfall
  - Recharge: 5,100,000
  - Baseflow: 1,300,000

- Groundwater
  - Texas coast: 35,000,000
  - Other states: 9,300,000

Data from Ward and Valdes (1995)
• Rule of Capture
• Governed by districts
  • Groundwater conservation
  • Subsidence
  • Edwards Aquifer Authority
• Private property
  • Takings?
  • Oil and gas law apply?
Raw Water Production Facility, Big Spring, Texas

John Grant, Colorado River Municipal Water District

photo by Torin Halsey, Time Record News
Daniel Nix, City of Wichita Falls, partaking of the water from the reuse project

photo by Torin Halsey, Times Record News
aquifer storage and recovery

CONFINING UNIT

CASING

CASING

CONFINING UNIT

AQUIFER

TRANSITION ZONE (ZONE OF MIXING)

FLUSHED ZONE

FLUSHED ZONE

TRANSITION ZONE (ZONE OF MIXING)

UNINVADOED ZONE
Proposed seawater desalination plants in the 2012 State Water Plan

- San Antonio Water System
- Brownsville
- Brazos River Authority
- Laguna Madre
- Proposed seawater desalination plants in the 2012 State Water Plan
- M&G Resins (under construction and not in the plan)
- Corpus Christi
- Guadalupe-Blanco River Authority
- dots show approximate locations of proposed facilities
- Brownsville
- Laguna Madre
46 plants are for municipal use and have a design capacity of more than 0.025 million gallons per day
Overall more than 200 plants in Texas
A tale of two Austin families...

4 people (2 adults, 2 [cute] kids)
111 gallons per person per day

totals:
162,500 gallons
$1,205

$347
$231
$102
$26
15,000

Month:
January
February
March
April
May
June
July
August
September
October
November
December

2013
A tale of two Austin families...

4 people (2 adults, 2 cute kids)
111 gallons per person per day

gallons

$347
$231
$1,205

totals:
162,500 gallons

2013

2 people (2 adults, 3 cute cats)
35 gallons per person per day
14 gallons per mammal per day

gallons

$187
$18
$13

totals:
25,600 gallons

2014
Texas Water!
Texas Water!

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