SLIDES: Deep Trouble on the Plains: Conflicts Over Aquifer Mining, Management and Marketing

Ronald Kaiser

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Deep Trouble on the Plains: Conflicts over Aquifer Mining, Management and Marketing

Ronald Kaiser
Texas A&M University
Website: http://texaswater.tamu.edu
Presented at Natural Resources Law Conference
Boulder, Colorado
June, 2004
I. Water factoids
   State Water Use (High Plains)
   Ogallala Aquifer
   Texas Aquifers

II. Mining Aquifers

III. Judicial and Legislative Responses
   Edwards Aquifer
   Bolson Aquifers
   Ogallala Aquifer

IV. Marketing

VI. POINTS TO PONDER
<table>
<thead>
<tr>
<th>STATE</th>
<th>Surface</th>
<th>Groundwater</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorado</td>
<td>13 MAF</td>
<td>2.5 MAF</td>
</tr>
<tr>
<td>Kansas</td>
<td>2 MAF</td>
<td>4.0 MAF</td>
</tr>
<tr>
<td>Nebraska</td>
<td>5 MAF</td>
<td>7.0 MAF</td>
</tr>
<tr>
<td>New Mexico</td>
<td>2 MAF</td>
<td>2.0 MAF</td>
</tr>
<tr>
<td>Texas</td>
<td>7 MAF</td>
<td>9.5 MAF</td>
</tr>
</tbody>
</table>

MAF=million acre-feet

*USGS Circular 1200(1998)*
OGALLALA USE BY STATE*

<table>
<thead>
<tr>
<th>State</th>
<th>Irrigated acres</th>
<th>Pumpage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorado</td>
<td>1 million</td>
<td>1.5 MAF</td>
</tr>
<tr>
<td>Kansas</td>
<td>2.5 million</td>
<td>4.0 MAF</td>
</tr>
<tr>
<td>Nebraska</td>
<td>6.5 million</td>
<td>6.5 MAF</td>
</tr>
<tr>
<td>Texas</td>
<td>3.5 million</td>
<td>6.2 MAF</td>
</tr>
<tr>
<td>Others</td>
<td>.5 million</td>
<td>1.8 MAF</td>
</tr>
<tr>
<td></td>
<td>14 million</td>
<td>19 MAF</td>
</tr>
</tbody>
</table>

*USGS Circular 1243(2003)
Ogallala Aquifer

- 173,000 sq miles/8 states
- 14 million acres in irrigation
- 19 million acre feet/yr pumping
- 95% of water used for irrigation

Limited Recharge in Colorado, Kansas, Oklahoma, New Mexico and Texas

Extensive mining in Colorado, Kansas and Texas

Economic depletion
- 25 years in Kansas
- 50 years in Texas

Northeastern Colorado depletion is 1.5x recharge
Ogallala Aquifer

**Water in Storage**
- 2,980 million acre-feet
- Low of 40 million in New Mexico
- High of 2,000 million in Nebraska
- 350 million in Texas
- 300 million in Kansas

**Saturated Thickness**
- Greatest in Nebraska
- Least in Kansas, and Texas
- 100-200 feet in most parts of state
## GROUNDWATER USE BY STATE*

<table>
<thead>
<tr>
<th>STATE</th>
<th>Irrig.</th>
<th>Pub. Supply</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorado</td>
<td>89%</td>
<td>5%</td>
<td>6%</td>
</tr>
<tr>
<td>Kansas</td>
<td>90%</td>
<td>4%</td>
<td>6%</td>
</tr>
<tr>
<td>Nebraska</td>
<td>93%</td>
<td>4%</td>
<td>3%</td>
</tr>
<tr>
<td>New Mexico</td>
<td>75%</td>
<td>16%</td>
<td>9%</td>
</tr>
<tr>
<td>Texas</td>
<td>80%</td>
<td>14%</td>
<td>6%</td>
</tr>
</tbody>
</table>

*USGS Circular 1200(1998)
Drawdown

Red > 150 feet
Orange = 100+ feet
## GROUNDWATER MANAGEMENT OVERVIEW

<table>
<thead>
<tr>
<th>State</th>
<th>Law</th>
<th>Local Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorado</td>
<td>PriorAppr.</td>
<td>Yes (advisory?)</td>
</tr>
<tr>
<td>Kansas</td>
<td>Prior Appr.</td>
<td>Yes (advisory)</td>
</tr>
<tr>
<td>Nebraska</td>
<td>CR + Statutes</td>
<td>Yes (NRD’s—Regulatory)</td>
</tr>
<tr>
<td>New Mexico</td>
<td>Prior Appr.</td>
<td>No</td>
</tr>
<tr>
<td>Oklahoma</td>
<td>State permit</td>
<td>No</td>
</tr>
<tr>
<td>Texas</td>
<td>Capture</td>
<td>Yes (Regulatory)</td>
</tr>
</tbody>
</table>
A Focus on Groundwater Management in Texas
2002 Texas Water Uses and Sources

Users by Source

• Groundwater (9.5 maf—57%) capture rule
  • Agriculture 80%
  • Municipal 15%
  • Other 5%

• Surface Water (7.1 maf—43%) state permits
  • Agriculture 35%
  • Municipal/Industrial 65%
Texas Water Issues

• Cities & Drought
  • 10% shortage today
  • 43% shortage 2050 (900 cities)
• Drought Options for Cities
  • Conserve/Reuse Treated Effluent
  • New Sources—Groundwater
• Interbasin Transfers—junior rights
• New Reservoirs: cost & consequences
• Environmental Water Needs
• Desalinization: where, cost & who pays
• Funding Needed ($17 Billion)
• Groundwater Issues & Fate of Rural Texas
Groundwater Issues

• Aquifer over-pumping
  • Well interference
  • Mining
• Aquifer sustainability
• Sales & Exporting—rural to urban
• Aquifers as drought hedge
• Private Property Rights & Capture
• Impact on Rural Texas
• State Land Leasing—GLO
MAJOR AQUIFERS OF TEXAS

EXPLANATION
- Ogallala
- Gulf Coast
- Edwards (BFZ)
- Carrizo-Wilcox
- Trinity
- Edwards-Trinity (Plateau)
- Seymour
- Hueco-Mesilla Bolson
- Cenozoic Pecos Alluvium

OUTCROP (That part of a water-bearing rock layer which appears at the land surface.)

* DOWNDIP (That part of a water-bearing rock layer which dips below other rock layers.)
# WATER USE BY AQUIFER

<table>
<thead>
<tr>
<th>AQUIFER</th>
<th>Estimated Pumping</th>
<th>Estimated Recharge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ogallala</td>
<td>6,200,000 AF</td>
<td>300,000 AF</td>
</tr>
<tr>
<td>Edwards</td>
<td>730,000 AF</td>
<td>1,200,000 AF</td>
</tr>
<tr>
<td>Carrizo</td>
<td>500,000 AF</td>
<td>645,000 AF</td>
</tr>
<tr>
<td>Trinity</td>
<td>200,000 AF</td>
<td>100,000 AF</td>
</tr>
<tr>
<td>Gulf Coast</td>
<td>1,150,000 AF</td>
<td>1,230,000 AF</td>
</tr>
<tr>
<td>Bolson</td>
<td>400,000 AF</td>
<td>430,000 AF</td>
</tr>
<tr>
<td>All Others</td>
<td>220,000 AF</td>
<td>200,000 AF</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>9,400,000 AF</strong></td>
<td><strong>4,100,000 AF</strong></td>
</tr>
</tbody>
</table>
Groundwater as a Source of Water Supply
Judicial Response

Keep Capture Rule
Groundwater Law

CAPTURE RULE: Texas landowners can pump unlimited quantities of water from beneath their land, without liability for harm to surrounding landowner wells.

Judicial & Legislative Exceptions
- No Malice & Waste
- Land Subsidence from Negligent Pumping
- No Slant Wells
- No Underflow of a River
- Groundwater Conservation Districts
Capture Rules & Its Consequences

- No protection from well interference: biggest pump wins
- Encourages aquifer mining
- Encourages rural to urban transfers
- Limited public input into transfers
- Threat to rural Texas
- No incentives to conserve water
- Private property rights: myth & reality
- Provides $$$ for landowners
- No consideration for community impacts
- Fosters political discord & balkanization
VI. Legislative Response

Create groundwater districts
- Let local’s figure it out

- State action as last resort
  - Priority groundwater study areas
  - Edwards Aquifer
Groundwater Conservation Districts—80+

Mandated Duties
- Plan – Adopt a Management Plan
- Keep Records of Wells & Water Use
- Register certain wells (25gpd exempt)
- Adopt Governance Rules

Optional Duties
- Can Exempt all Wells from Registration
- Well Spacing & Pumping Limits
- Buy and sell water
- Require permits for transfers
Advantages of Groundwater Conservation Districts

- Local control & regulation
- Can modify capture rule
- Can opt for minimum regulations
- Regulations vary from GCD to GCD
- Local influence on decisions
- Encourages citizens to work together
- Avoids dreaded state regulation
- Legislative preference
- Widespread coverage in state by 80+ GCD
Disadvantages: Groundwater Conservation Districts

- Little management and regulatory uniformity
- Many districts over same aquifer: unified management difficult
- Limited political will to make hard choices—don’t regulate me, do it to others.
- Can divide communities and groups
- Limited funding
- Locals pay regulatory costs/state problem
- Locals pay litigation expenses
- Aquifer mining continues
- Cannot prevent water exportation
Focus on 2 Texas Aquifers

★ Edwards Aquifer
  - EAA created in response to ESA
  - Extensive Regulatory Mandate
  - Aquifer Sustainability Standard
  - Urban/Rural Aquifer

★ Ogallala Aquifer
  - Biggest in Texas
  - 1st GCD created in 1949
  - 13 different GCD’s in Aquifer
  - Intensive irrigation, some urban uses
The Edwards Aquifer
Edwards Aquifer Regulatory Authority

🌟 Permit Required
- Exemptions: 25,000gpd domestic
- 2 acre-feet/acre for agriculture
- Historical use: 1972–1993
- Marketing OK: 50% limit

🌟 Statutory Sustainability Standard
- Ensure ESA protection by 2012
- 400,000 AF withdrawal limit by 2008
- Water plan including conservation
Edwards Aquifer Authority Permitting Status

Request
• 1,094 Requests for 836,774 AF
  • Of the 836,774 AF
    • Agric.=46%, Mun.=37%, Indus. 17%

Approvals
• 844 permits for 557,490 AF
• (over limit by 157,490 AF)
• 400,000 AF withdraw limit by 2008
Edwards Aquifer Authority
Permitting Status

Options for Dealing with 157,490 AF overage
• Ignore it
• Ask for statutory increase
• Purchase excess permitted amount
• Proportional reduction
Ogallala Aquifer in Texas

- Major water source in the Panhandle, providing water to all or parts of 46 Texas counties
- Supplies two thirds of all the groundwater and 38% of all the water used in Texas
- Sole source of drinking water for many Panhandle communities
- Approximately 95 percent used for irrigation
- Limited Recharge
- Water mining extensive
- 12 GCD’s established to manage Aquifer
# District Composition

<table>
<thead>
<tr>
<th>MULTI-COUNTY</th>
<th>SINGLE COUNTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>• North Plains</td>
<td>• Dallam</td>
</tr>
<tr>
<td>• Panhandle</td>
<td>• Garza</td>
</tr>
<tr>
<td>• High Plains</td>
<td>• Hemphill</td>
</tr>
<tr>
<td><strong>TWO COUNTY</strong></td>
<td>• Llano Estacado</td>
</tr>
<tr>
<td>• Permian Basin</td>
<td>• Mesa</td>
</tr>
<tr>
<td>• Glasscock</td>
<td>• Sandy Land</td>
</tr>
<tr>
<td></td>
<td>• South Plains</td>
</tr>
</tbody>
</table>
District Comparison
Well Spacing

• All districts have well spacing requirements except Permian Basin

• Spacing requirements are based on well size or on well production capacity

• Significant variability exists among spacing requirements for all districts reviewed
District Comparison
Pumping & Production Limitations

Volume or Amount/ Acre

- Mesa and South Plains have an annual production limit of four acre feet per acre

- Llano Estacado has an annual production limit of 16.13 acre feet of water per contiguous acre owned
District Comparison
Depletion Limitations

50% of zone of saturation remaining after 50 years

- Two districts have proposed but none have adopted depletion limitations.
Texas Groundwater Marketing and Exporting
Groundwater Marketing

What is it:
★ Transfer of water/rights between willing seller (landowner) and buyer.

Transaction Forms:
★ Lease, sale of right, sale of water, land purchase, cooperative.

Exporting:
★ Transfer of water outside of county, aquifer, or groundwater conservation district.
Drivers for Groundwater Marketing

- Increasing population growth
  - 9 million (1950) 22 million (today) 40 million (2040)

- Limited surface water supplies
  - 12/15 rivers appropriated
  - Fewer reservoirs to be built
  - Junior rights & Inter-basin Transfers

- Drought Shortages – Cities

- Aquifer Availability for Cities

- $$$ for Landowners and Agriculture
Drivers for Groundwater Marketing

- The Capture Rule & Property Rights
- Historical Practice
- Aquifers Drought Resistant
- Inexpensive Water
- Willing Buyers & Sellers
- Few Governmental Controls
Groundwater
Marketing—Texas Style

Long History 1950’s
  • West Texas — Amarillo, Lubbock
  • Corpus Christi

Transactions Types
  • Lease of water
  • Sale of water
  • Purchase of land
  • Cooperative’s/Partnerships

Transaction format
  • Two party but changing
  • GCD Approval for Exporting
More on Marketing

Agriculture (rural) to Urban

Where

• West Texas—El Paso
• Central Texas — San Antonio, Corpus Christi
• Mid sized & smaller cities
• Edwards Aquifer
• Carrizo Wilcox Aquifer

Examples

• Kinney County
• El Paso Water Ranch
• San Antonio/ Alcoa/Edwards Aquifer
• West Texas Groundwater—Boone Pickens
• Lease of state lands—West Texas
Proposed Water Transfers: # 53

Explanation
- Proposed Major Conveyance
- Regional Water Planning Area
- County boundary
Groundwater
Sales/leases
Exporting
Activity — 2003

Data and map by Wendy Patzewitsch
Trends for Groundwater Marketing & Exporting

More pressure on GCD’s to Regulate
Rural to Urban Transactions to Continue

• Reasons
  • Source of water for cities—drought management
  • Inexpensive water for cities
  • Money for landowners
  • Good water quality
  • Groundwater is hedge against drought
  • Junior rights for surface water
  • Surplus in some aquifers—Gulf Coast, Carrizo
Trends for Groundwater Marketing & Exporting

More public involvement
More political controversy
Long range impacts on rural areas
  • Panhandle
  • El Paso
  • Central Texas
  • Gulf coast
Regional or aquifer-wide management??
More legislative involvement
POINTS TO PONDER

- State aquifer wide sustainability standards based on safe yield.
- Depletion rates for non recharging aquifers [i.e. time frame and amount remaining].
- Water exportation based on aquifer safe yield to maintain sustainability.
- Modify capture rule for well interference cases
- Leasing of water on state lands—Require benefit and impact analysis?
- Wisdom of local control with multiple districts over same aquifer