WATER LEVELS IN OKLAHOMA

Oklahoma Governor’s Water Conference
October 18, 2011
Norman, Oklahoma

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OWRB
the water agency
AQUIFER TYPES

GRAVEL

PORES

PERMEABLE

IMPERMEABLE

ROCK

FRACTURES
AQUIFER TYPES

Aquifer Storage

1 CUBIC FOOT

North Canadian Alluvial aquifer
Arbuckle-Simpson aquifer
Rush Springs aquifer

~0.2
0.008
~0.25

Alluvial aquifer
1.5 gallons

Arbuckle-Simpson aquifer
1 cup
GROUNDWATER LEVELS

Mass Measurement Program

Water-level Count
- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 46
GROUNDWATER LEVELS

USGS Real-time Wells
GROUNDWATER LEVELS

OWRB Continuous Sites
OGALLALA (HIGH PLAINS) BEDROCK AQUIFER

Active Mass Measurement Wells - 134
Wells measured in 1967 & 2011 - 38
Continuous Sites - 2
GROUNDWATER LEVELS

Ogallala (High Plains) Bedrock Aquifer

Mass Measurement Wells
GROUNDWATER LEVELS

Ogallala (High Plains) Bedrock Aquifer

Mass Measurement Wells – Extreme

24.32 ft. increase

108.51 ft. decline
Ogallala (High Plains) Bedrock Aquifer

Active Mass Measurement Wells - 134
Wells measured in 1967 & 2011 - 38

Wells increased - 3
Wells decreased - 35

<table>
<thead>
<tr>
<th>Highest Positive</th>
<th>Highest Negative</th>
<th>Average</th>
<th>Median</th>
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<tbody>
<tr>
<td>24.32</td>
<td>-108.51</td>
<td>-35.6829</td>
<td>-30.85</td>
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GROUNDWATER LEVELS

Ogallala (High Plains) Bedrock Aquifer

USGS Sharon Well
Ogallala (High Plains) Bedrock Aquifer

USGS Texhoma Well
OGALLALA (HIGH PLAINS) BEDROCK AQUIFER

USGS Texhoma Well - 2011 Drought
Rush Springs Bedrock Aquifer

Active Mass Measurement Wells – 68
POR ranges from 11 to 37 years
Continuous Sites - 5
Rush Springs Bedrock Aquifer

Dewey County
Mass Measurement Wells

Increasing water levels
Rush Springs Bedrock Aquifer
Caddo County area
Mass Measurement Wells

Increasing water levels
Rush Springs Bedrock Aquifer

Mass Measurement Wells
Wells Measured in 1979 and 2011

- Wells increased: 10
- Wells decreased: 2

<table>
<thead>
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<th>Highest Positive</th>
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<tr>
<td>32.74</td>
<td>-8.05</td>
<td>13.14</td>
<td>7.46</td>
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Rush Springs Aquifer Drought

USGS Caddo County
Gracemont
Rush Springs Aquifer Drought

USGS Caddo County
Hinton
Rush Springs Aquifer Drought

USGS Caddo County Eakly
Rush Springs Aquifer Drought

USGS Caddo County
Alfalfa
Rush Springs Aquifer Drought

USGS Caddo County
Core2
Groundwater Levels

USGS Caddo County
Alfalfa

Long-term Record
Since 1948

Water levels have decreased
GROUNDWATER LEVELS

Elk City Bedrock Aquifer

Active Mass Measurement Wells – 8
Longest Period of Record – 23 years
Most < 5 years
Blaine Bedrock Aquifer

Active Mass Measurement Wells - 16
Period of Record of 31-40 years - 12

No Continuous Recorders
Used mostly for irrigation
GROUNDWATER LEVELS

Blaine Bedrock Aquifer

1990’s – High
2000’s - Lower

Precipitation pattern?
Groundwater Levels

Garber-Wellington (Central Oklahoma) Bedrock Aquifer

Active Mass Measurement Wells - 17
Longest Period of Record - 35 years
7 wells with POR of 31-35 years
Shallower wells may respond to precipitation.
GROUNDWATER LEVELS

Garber-Wellington (Central Oklahoma) Bedrock Aquifer
GROUNDWATER LEVELS

Garber-Wellington (Central Oklahoma) Bedrock Aquifer

[Graph showing depth-to-water and precipitation over time]
GROUNDWATER LEVELS

Arbuckle-Simpson Bedrock Aquifer

Active Mass Measurement Wells - 12
POR < 17 years

Several Continuous Sites
GROUNDWATER LEVELS

Arbuckle-Simpson Bedrock Aquifer
USGS Fittstown Site
GROUNDWATER LEVELS

Arbuckle-Simpson Bedrock Aquifer

OWRB Ferris Site
Antlers Bedrock Aquifer

Active Mass Measurement Wells – 23
6 wells with a POR between 31-40 years
GROUNDWATER LEVELS

Antlers Bedrock Aquifer

Active Mass Measurement Wells – 23
6 wells with a POR between 31-40 years

Wet Period?
GROUNDWATER LEVELS

No long-term monitoring established
• Arbuckle-Timbered Hills Aquifer
• Roubidoux Aquifer

Insufficient long-term monitoring
• Vamoosa-Ada Aquifer (only 4 mass measurement wells)
• Elk City Aquifer
Ogallala (High Plains) – Water levels have decreased
Rush Springs – Water levels have increased
Elk City – Short Period of record
Blaine – High variation; seems to correlate to precip patterns
Antlers – Variable spatially – wet period visible?
Arbuckle-Simpson – Correlates to precipitation patterns
Garber-Wellington – Some precip correlation; deep wells ‘unconnected’

2011 Drought – Apparent in some continuous water levels
Cause:
1) Nearby pumping
2) Low Precipitation
Groundwater Levels

Water-level Responses:
1) Precipitation?
2) Groundwater Use?

Precipitation – Dewey County

1959-2009 Average 27.81 inches
DROUGHT 2011