

WATER LEVELS IN OKLAHOMA

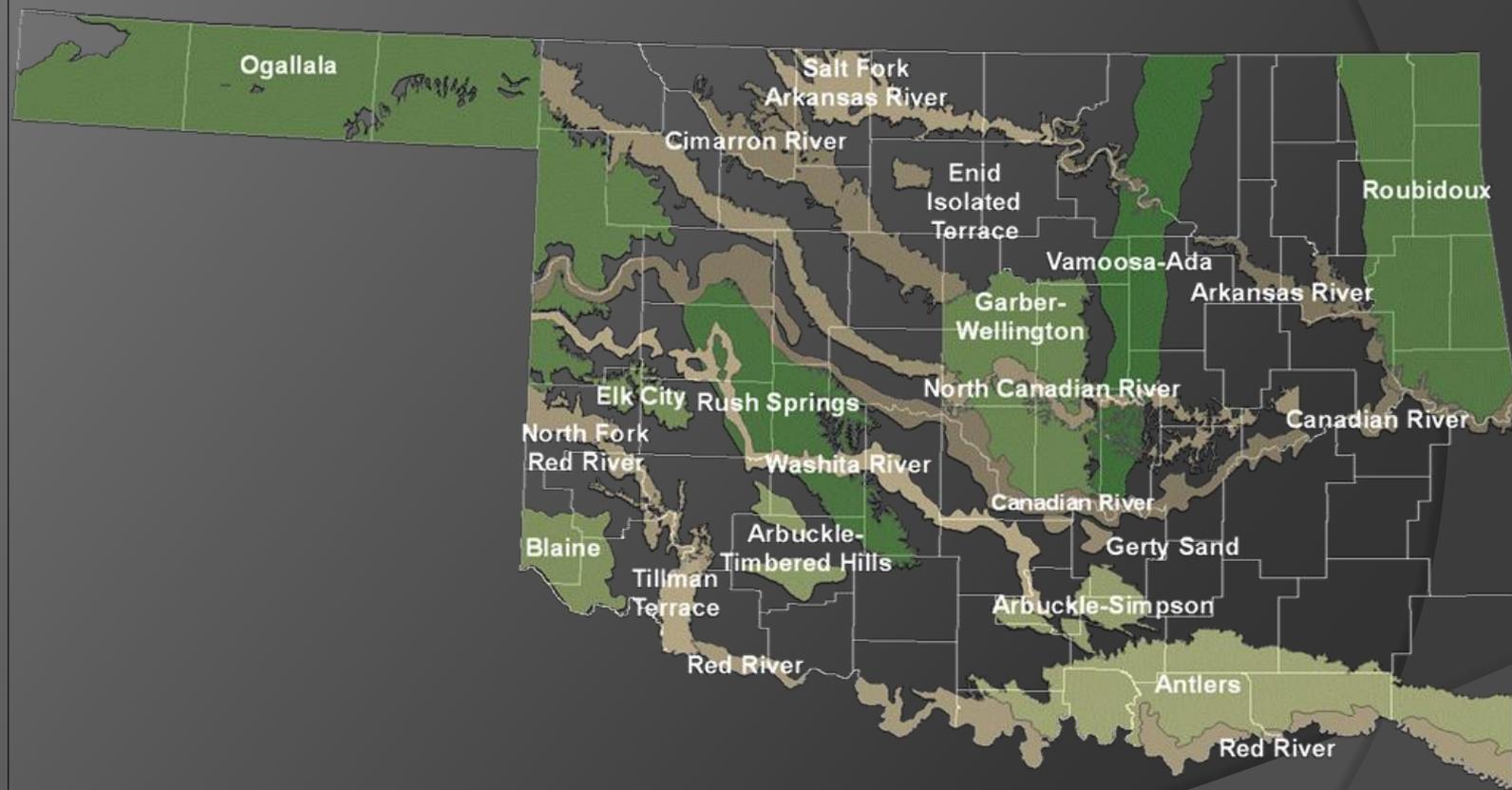


Oklahoma Governor's Water Conference
October 18, 2011
Norman, Oklahoma

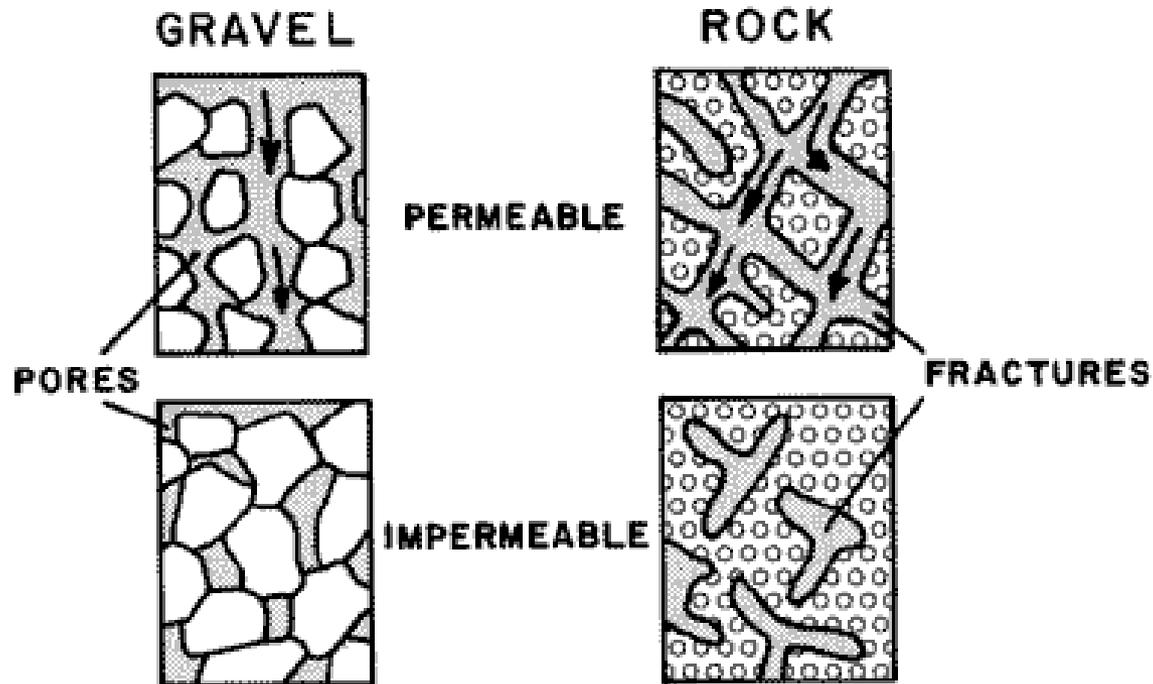
Christopher R. Neel
Hydrologist

OWRB
the water agency

OKLAHOMA'S MAJOR AQUIFERS



AQUIFER TYPES



AQUIFER TYPES

Aquifer Storage

North Canadian Alluvial aquifer
Arbuckle-Simpson aquifer
Rush Springs aquifer

~0.2
0.008
~0.25



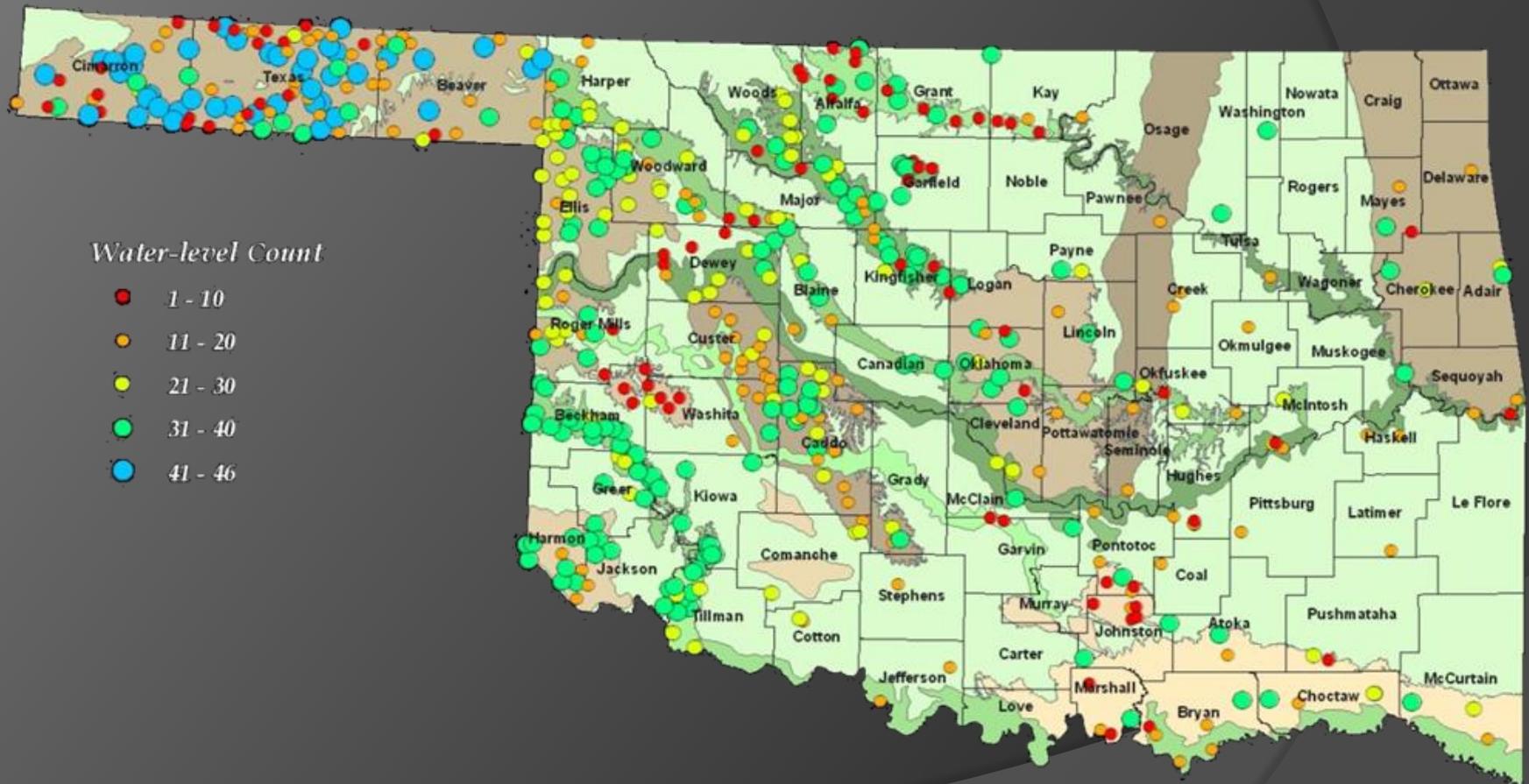
Alluvial aquifer
1.5 gallons



Arbuckle-Simpson aquifer
1 cup

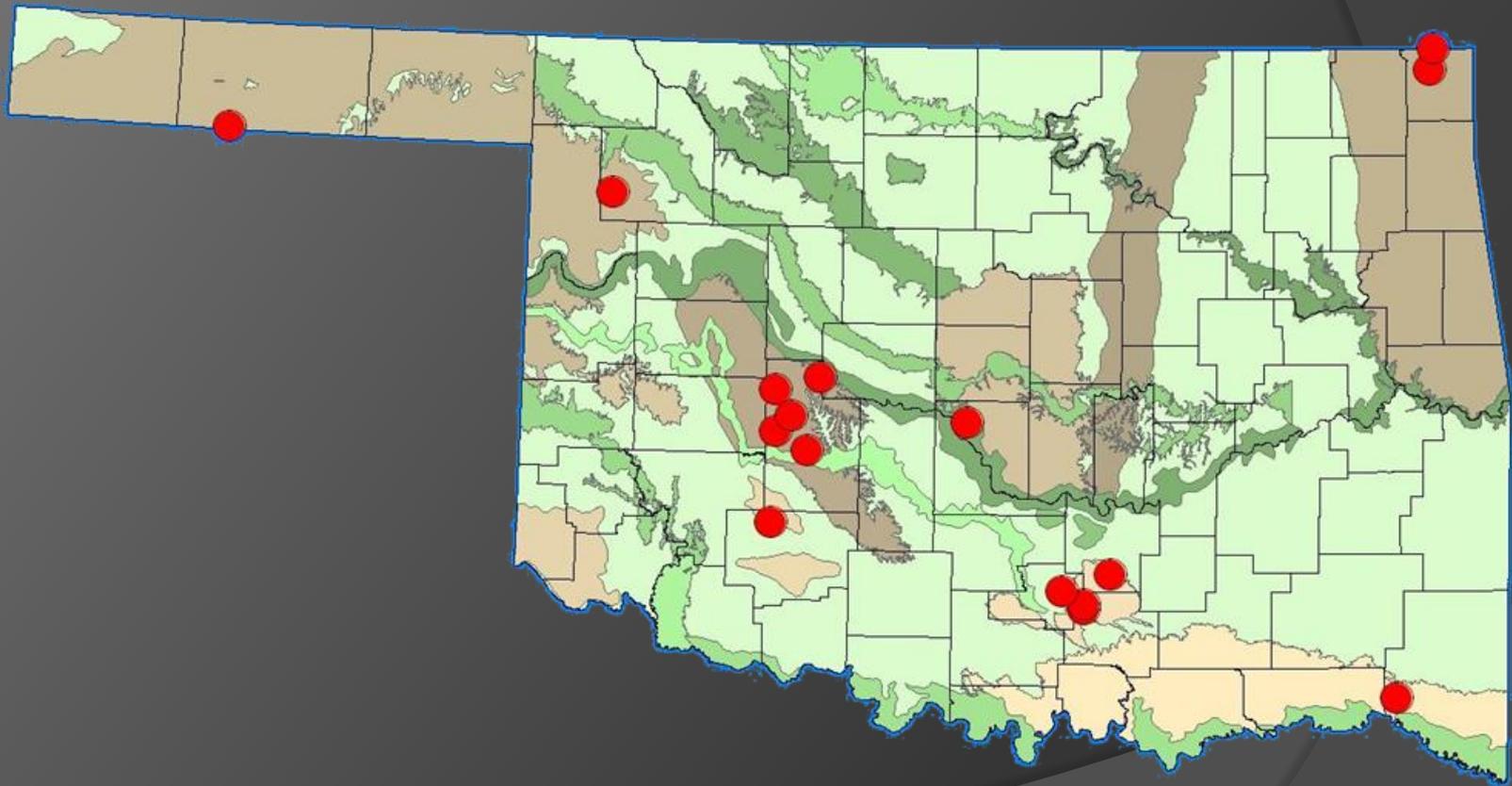
GROUNDWATER LEVELS

Mass Measurement Program



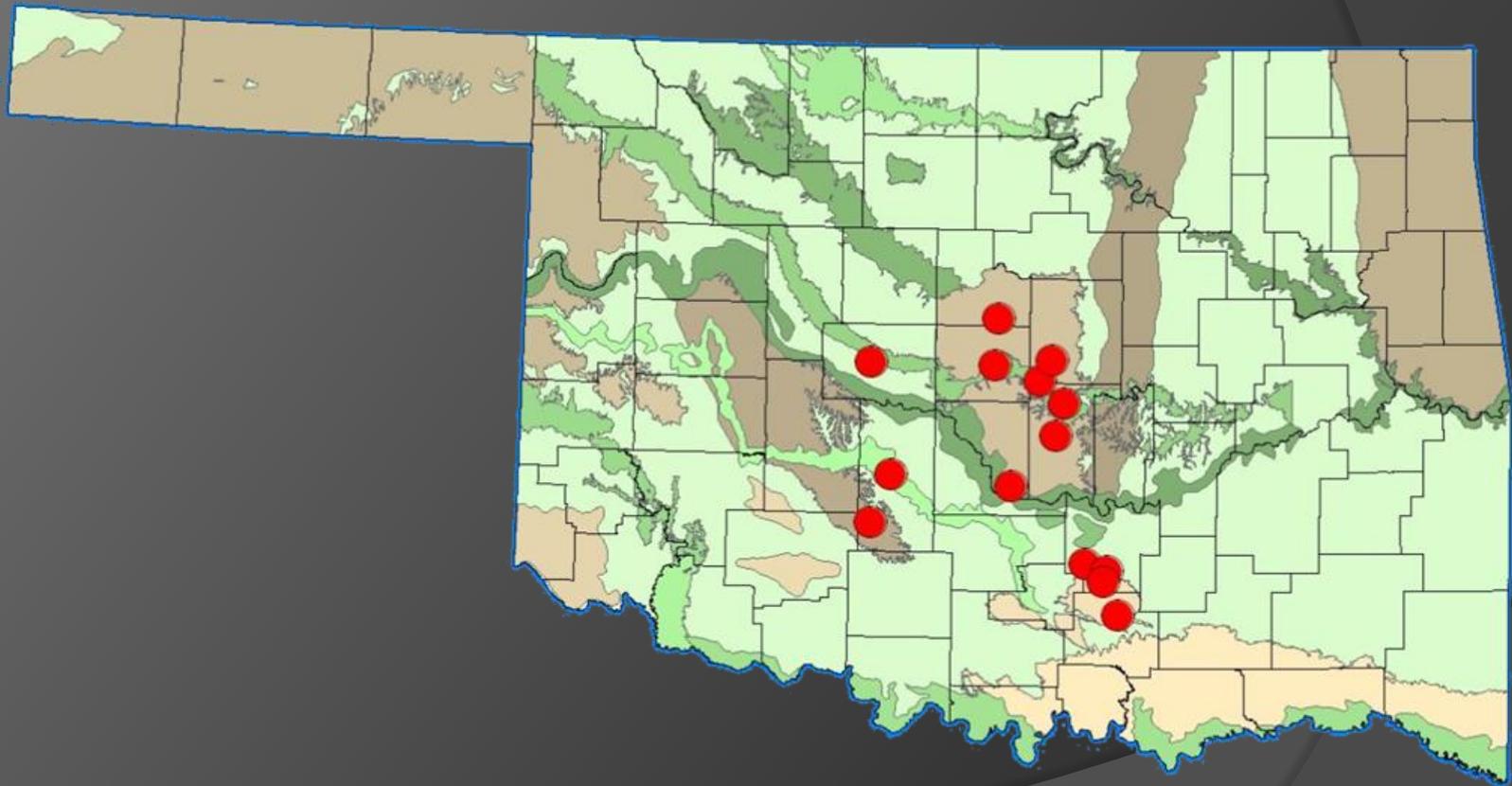
GROUNDWATER LEVELS

USGS Real-time Wells



GROUNDWATER LEVELS

OWRB Continuous Sites



GROUNDWATER LEVELS

Ogallala (High Plains) Bedrock Aquifer

Active Mass Measurement Wells - 134

Wells measured in 1967 & 2011 - 38

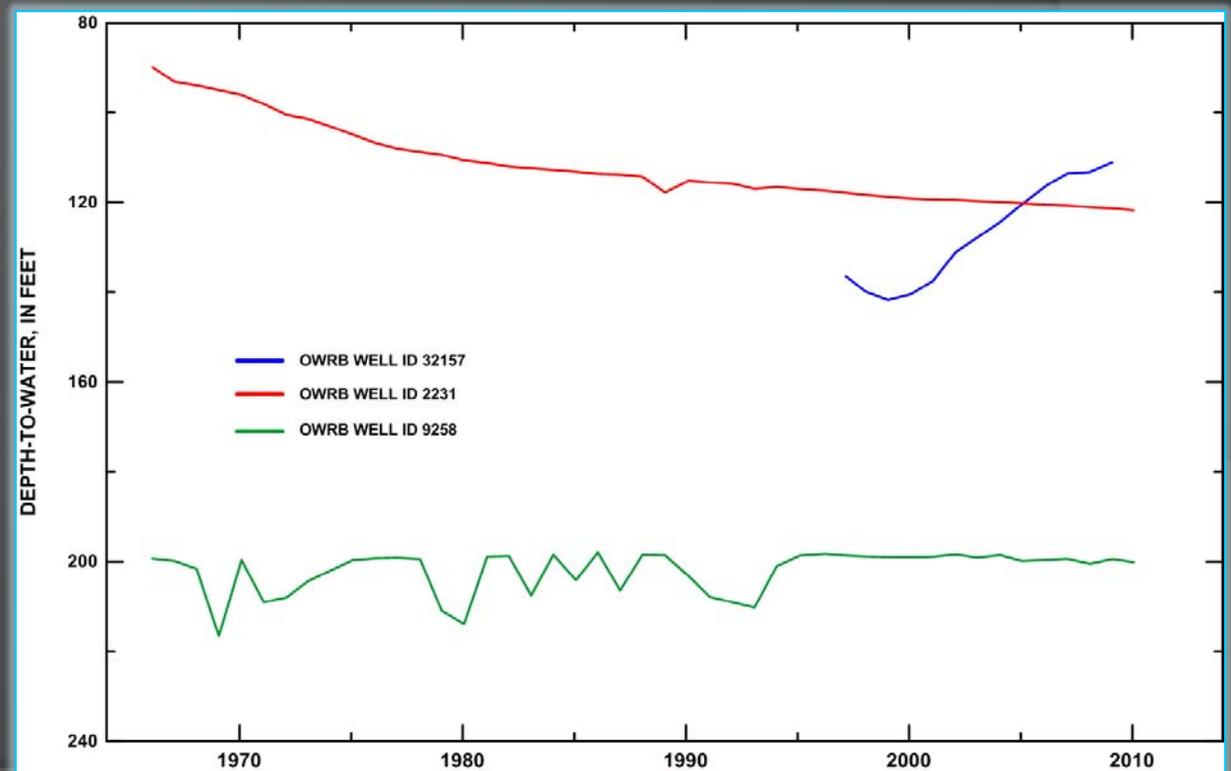
Continuous Sites - 2



GROUNDWATER LEVELS

Ogallala (High Plains) Bedrock Aquifer

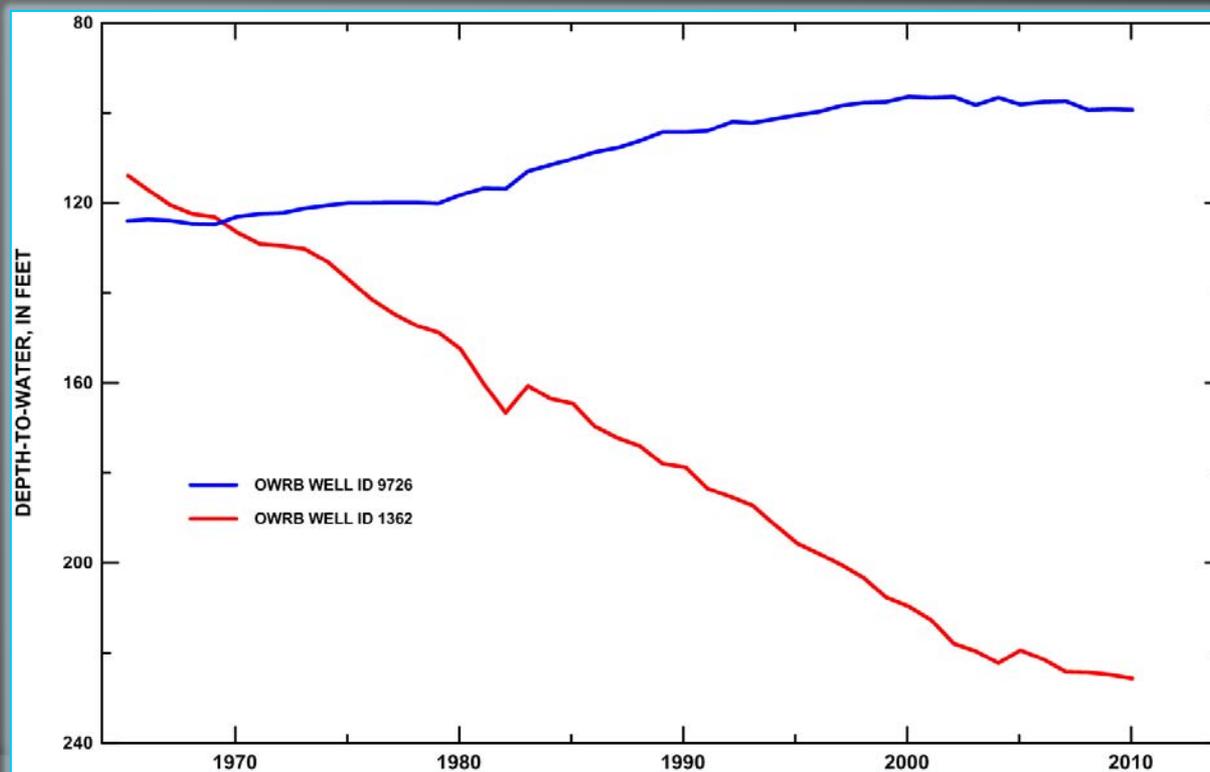
Mass Measurement Wells



GROUNDWATER LEVELS

Ogallala (High Plains) Bedrock Aquifer

Mass Measurement Wells – Extreme



24.32 ft. increase

108.51 ft. decline

GROUNDWATER LEVELS

Ogallala (High Plains) Bedrock Aquifer

Active Mass Measurement Wells – 134

Wells measured in 1967 & 2011 - 38

Wells increased – 3

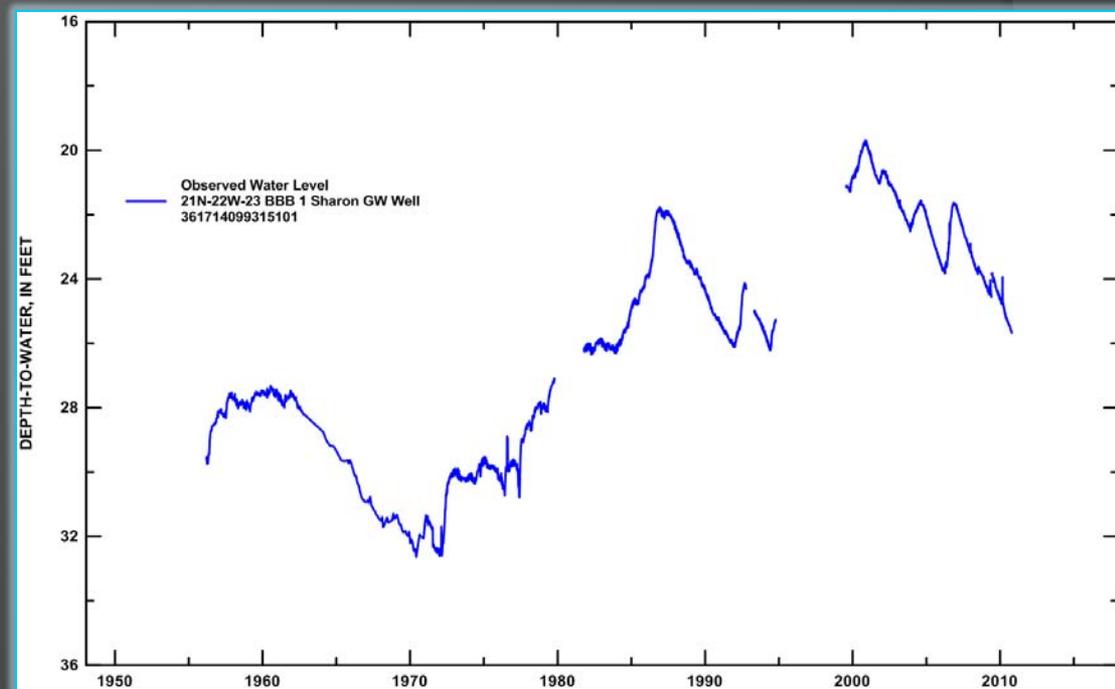
Wells decreased - 35

Highest Positive	Highest Negative	Average	Median
24.32	-108.51	-35.6829	-30.85

GROUNDWATER LEVELS

Ogallala (High Plains) Bedrock Aquifer

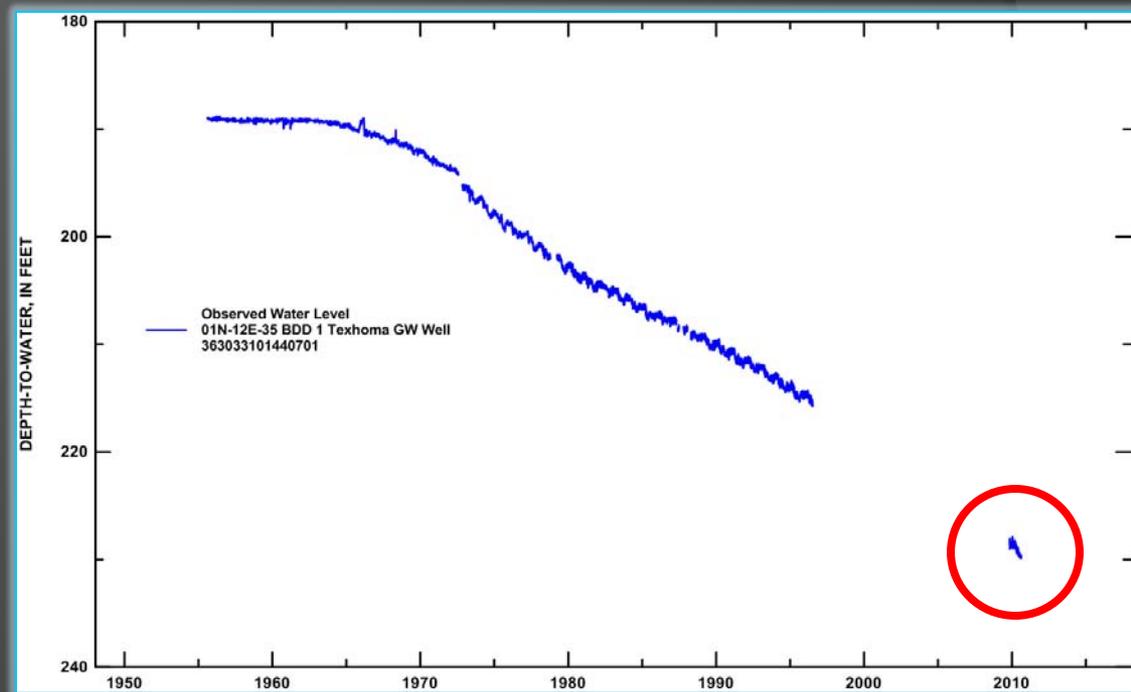
USGS Sharon Well



GROUNDWATER LEVELS

Ogallala (High Plains) Bedrock Aquifer

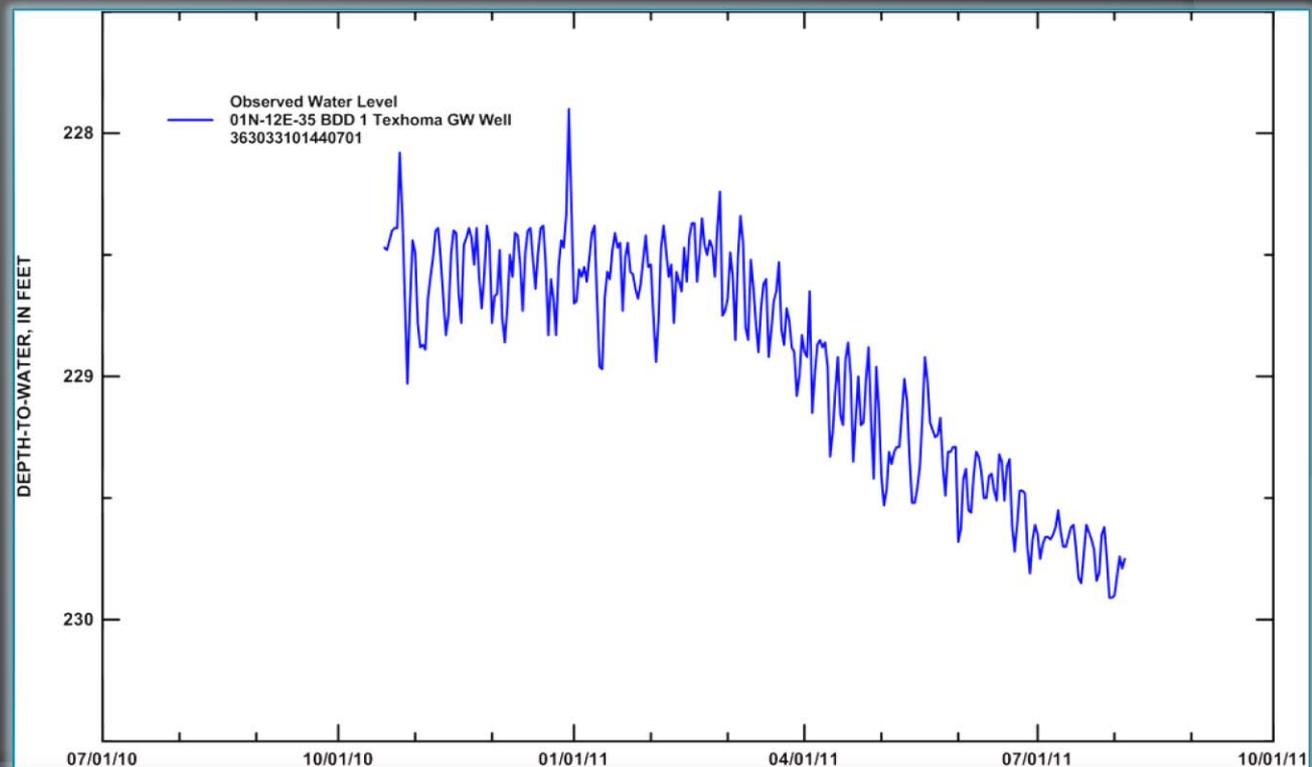
USGS Texhoma Well



GROUNDWATER LEVELS

Ogallala (High Plains) Bedrock Aquifer

USGS Texhoma Well - 2011 Drought



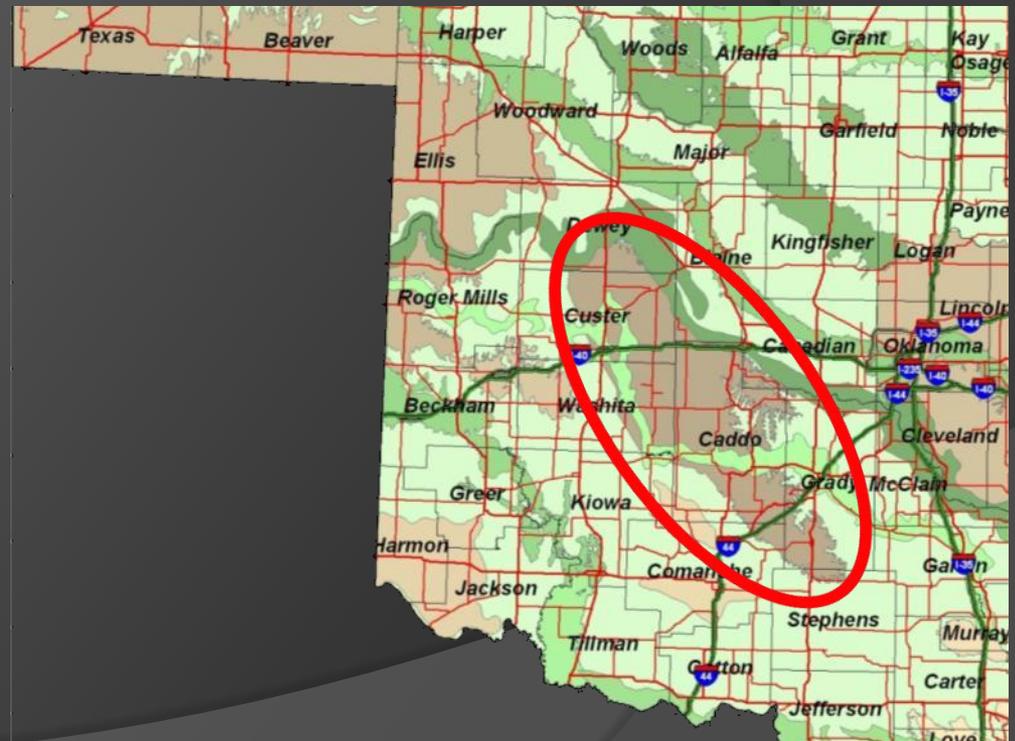
GROUNDWATER LEVELS

Rush Springs Bedrock Aquifer

Active Mass Measurement Wells – 68

POR ranges from 11 to 37 years

Continuous Sites - 5



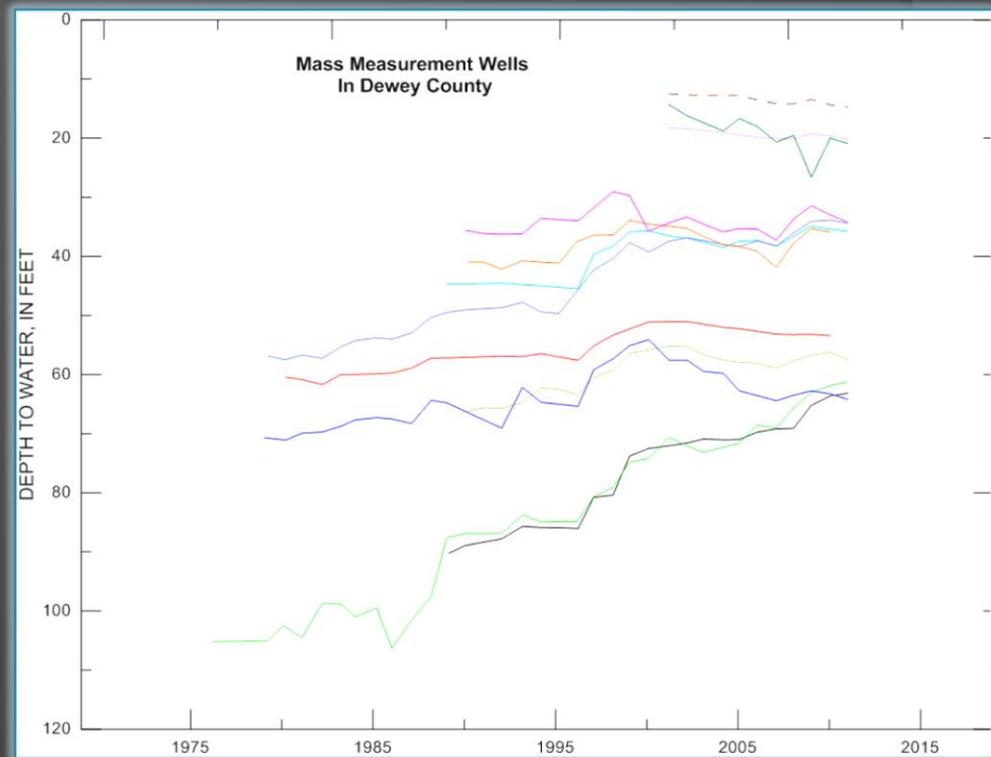
GROUNDWATER LEVELS

Rush Springs Bedrock Aquifer

Dewey County

Mass Measurement Wells

Increasing
water levels



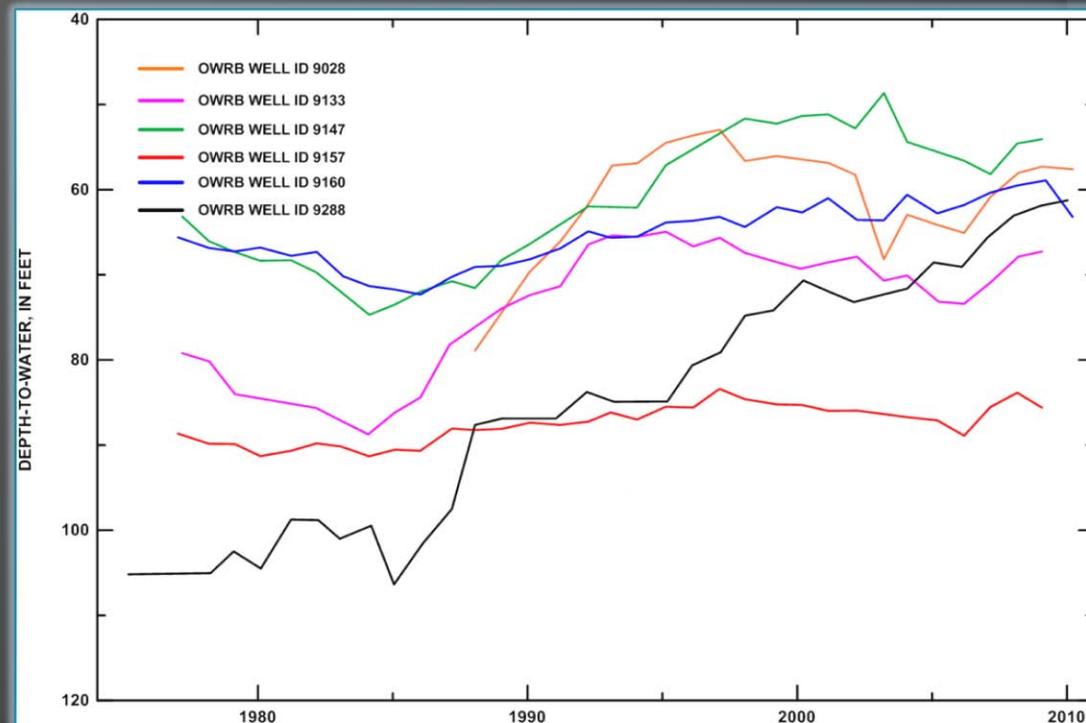
GROUNDWATER LEVELS

Rush Springs Bedrock Aquifer

Caddo County area

Mass Measurement Wells

Increasing
water levels



GROUNDWATER LEVELS

Rush Springs Bedrock Aquifer

Mass Measurement Wells

Wells Measured in 1979 and 2011

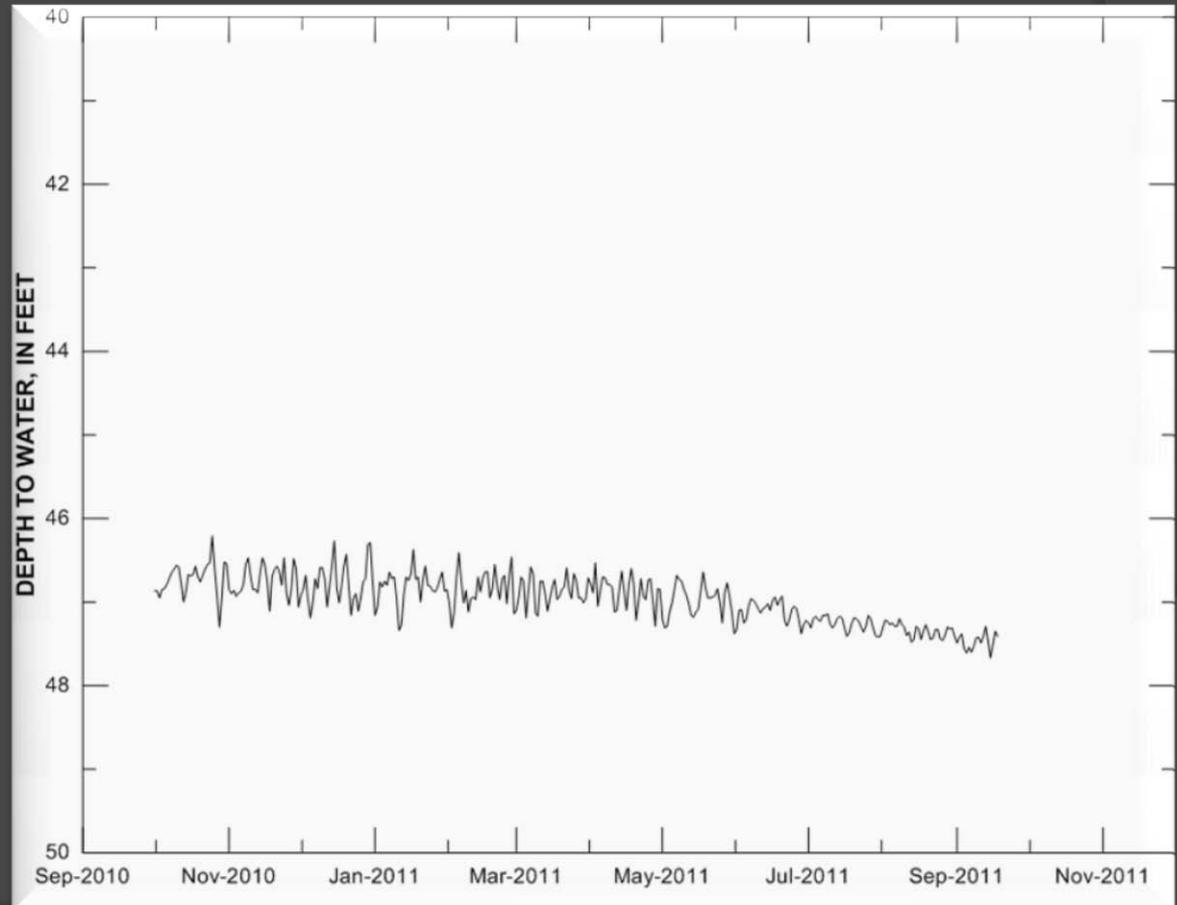
Wells increased - 10

Wells decreased - 2

Highest Positive	Highest Negative	Average	Median
32.74	-8.05	13.14	7.46

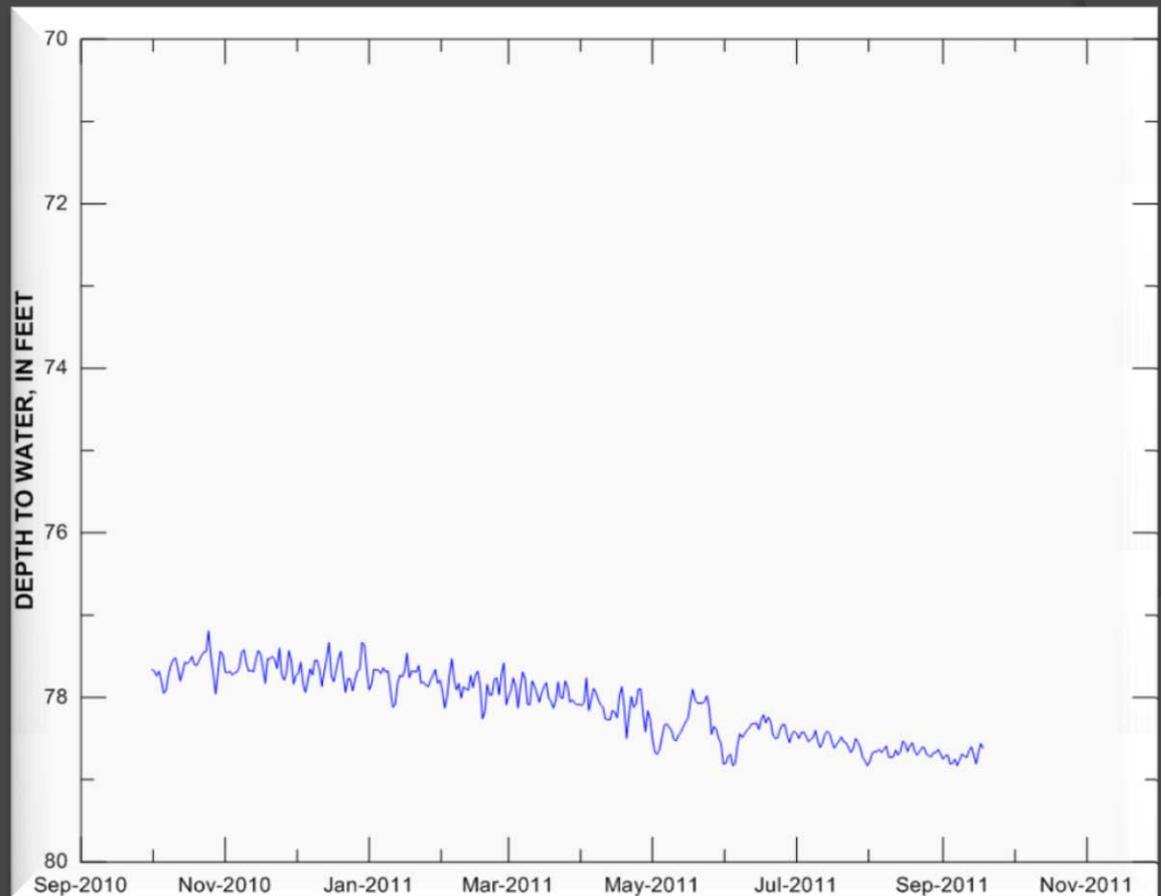
Rush Springs Aquifer Drought

USGS Caddo County
Gracemont



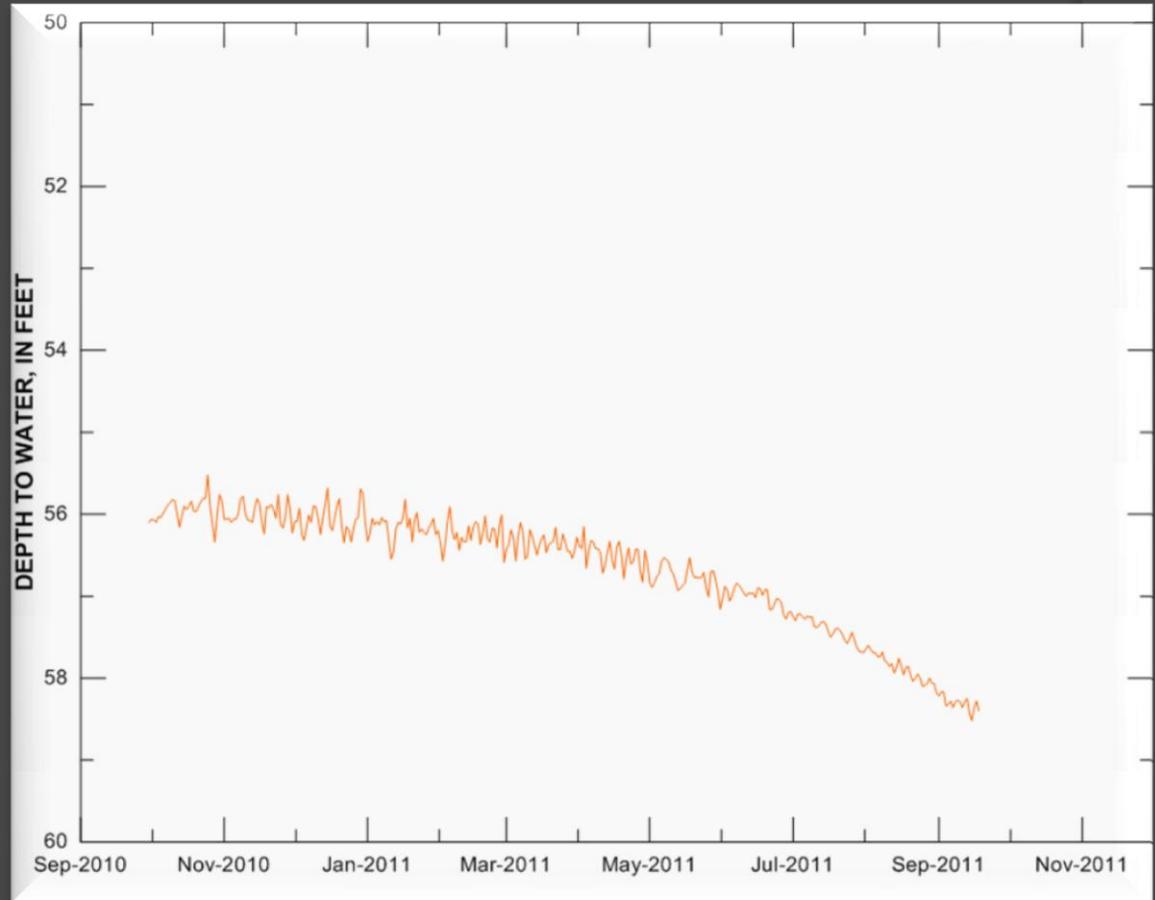
Rush Springs Aquifer Drought

USGS Caddo County
Hinton



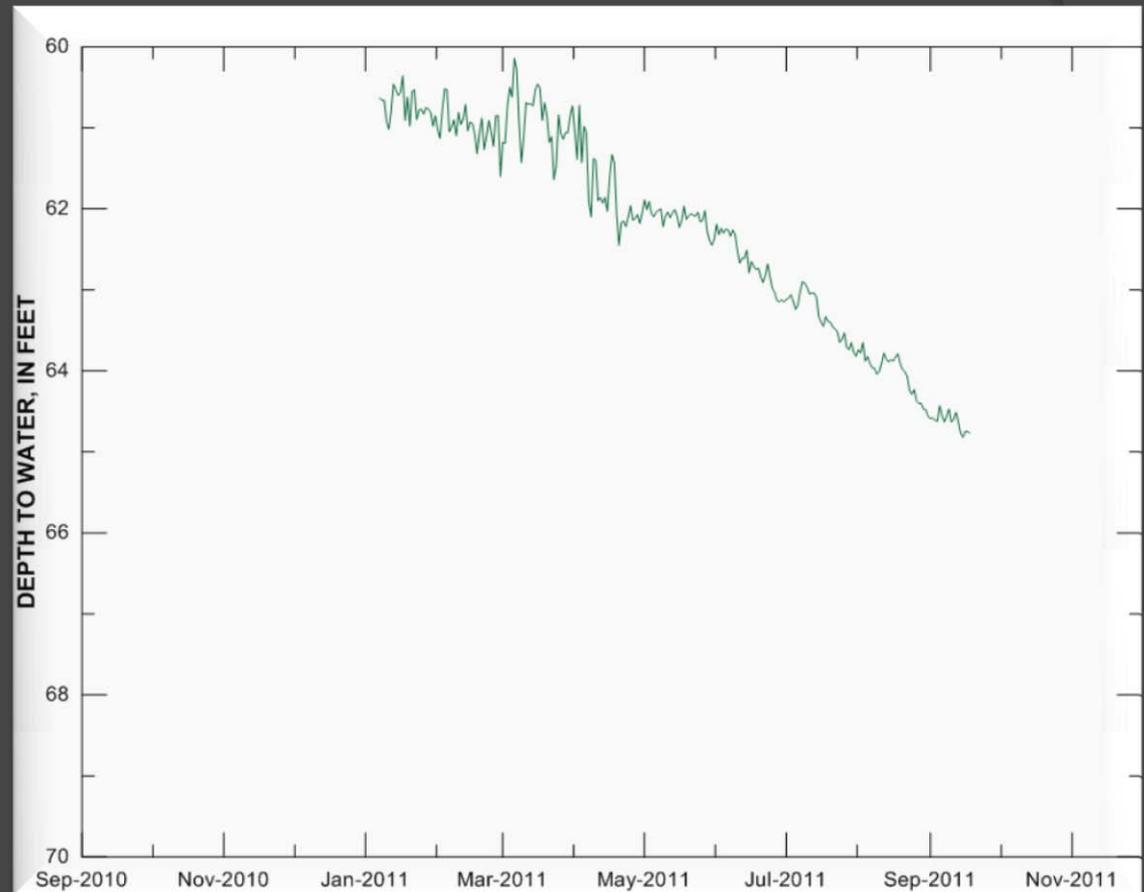
Rush Springs Aquifer Drought

USGS Caddo County Eakly



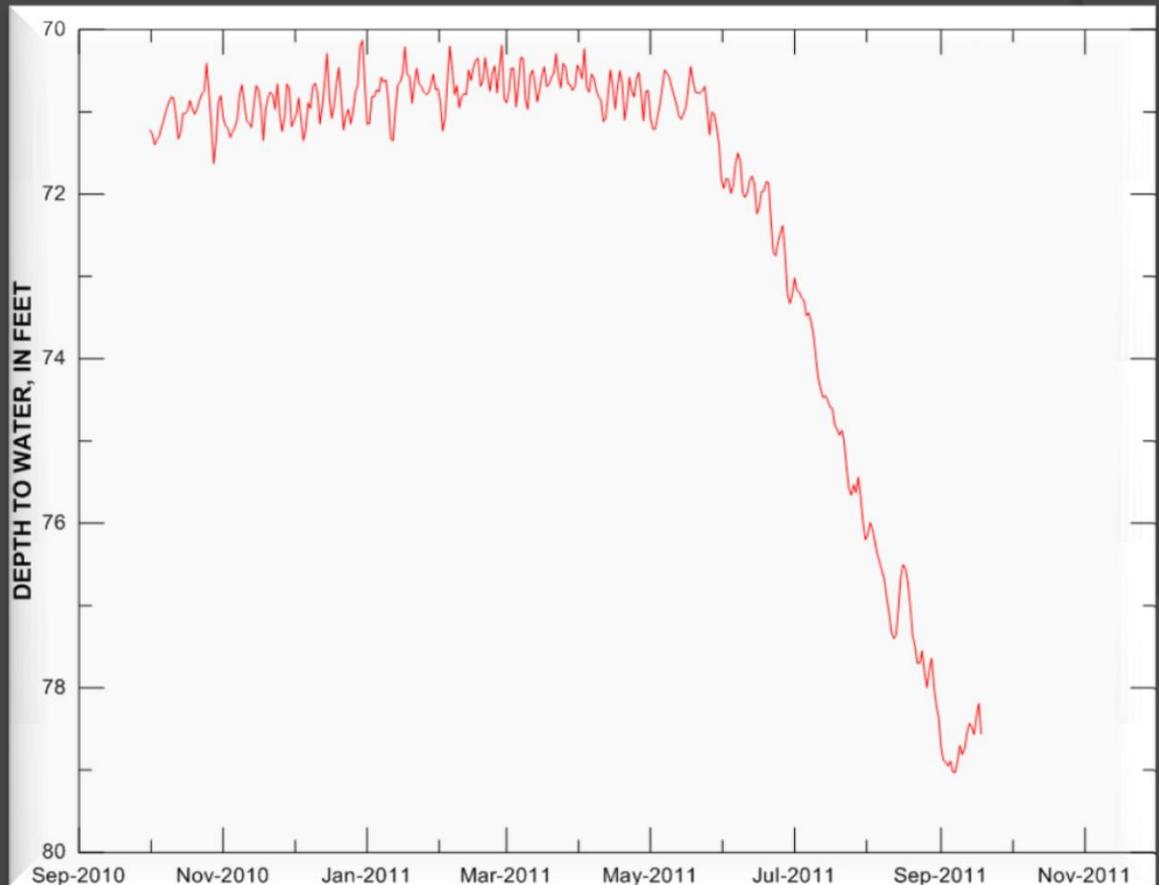
Rush Springs Aquifer Drought

USGS Caddo County
Alfalpa



Rush Springs Aquifer Drought

USGS Caddo County
Core2

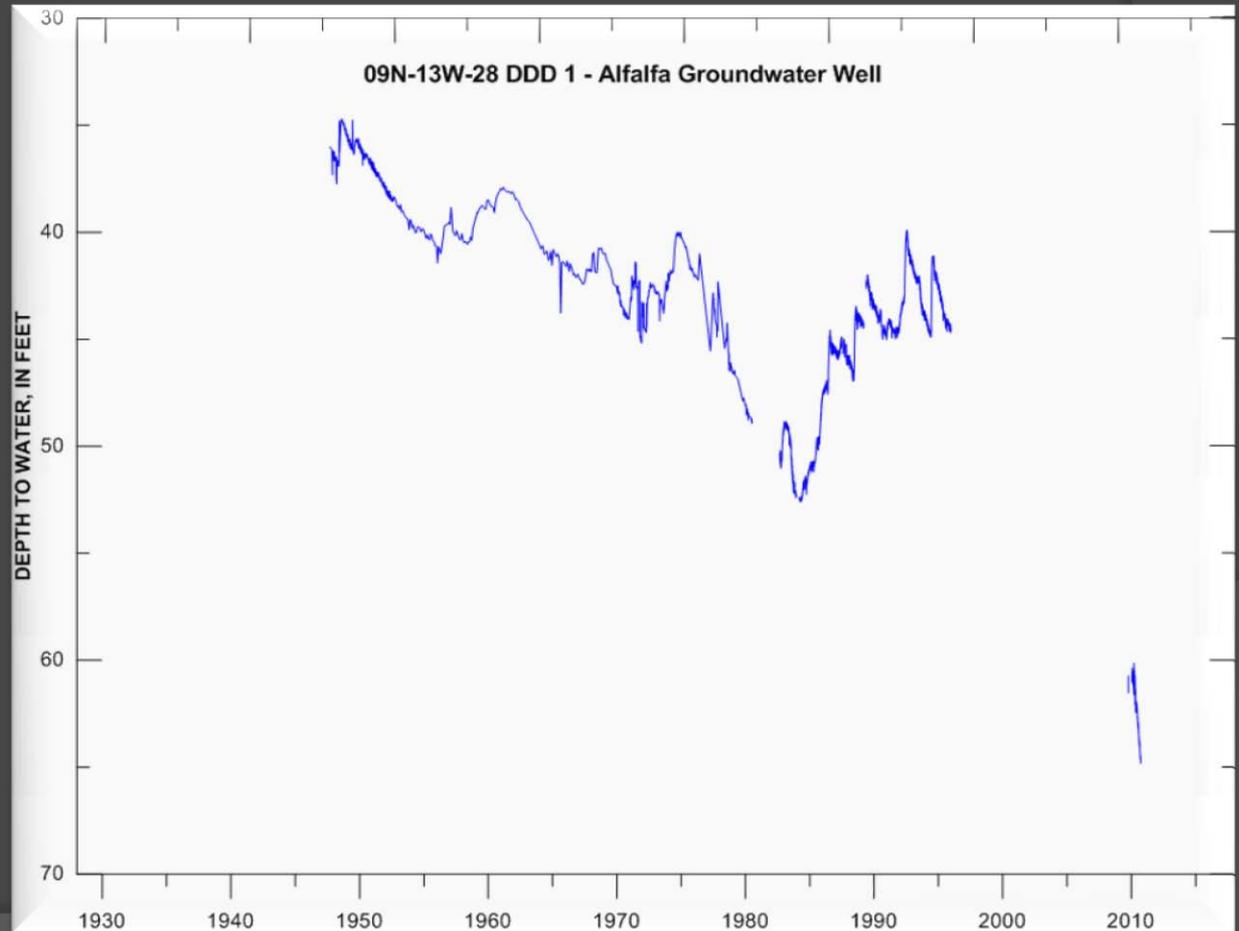


Groundwater Levels

USGS Caddo County
Alfafa

Long-term Record
Since 1948

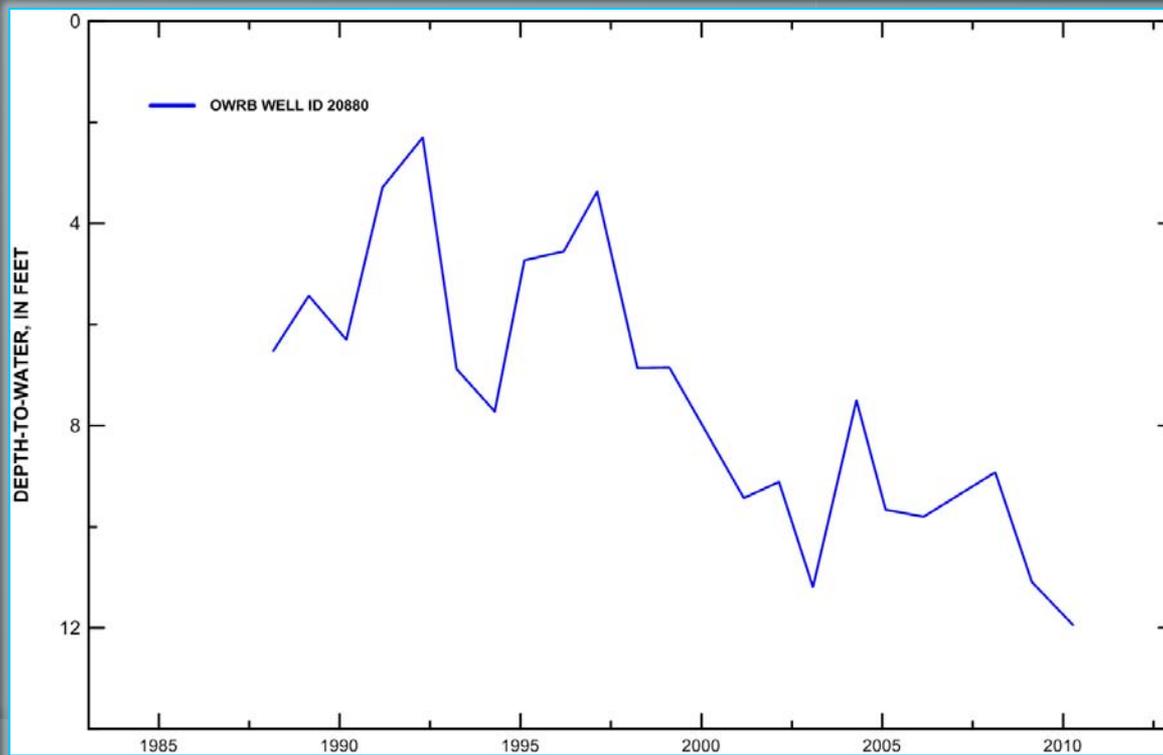
Water levels have
decreased



GROUNDWATER LEVELS

Elk City Bedrock Aquifer

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

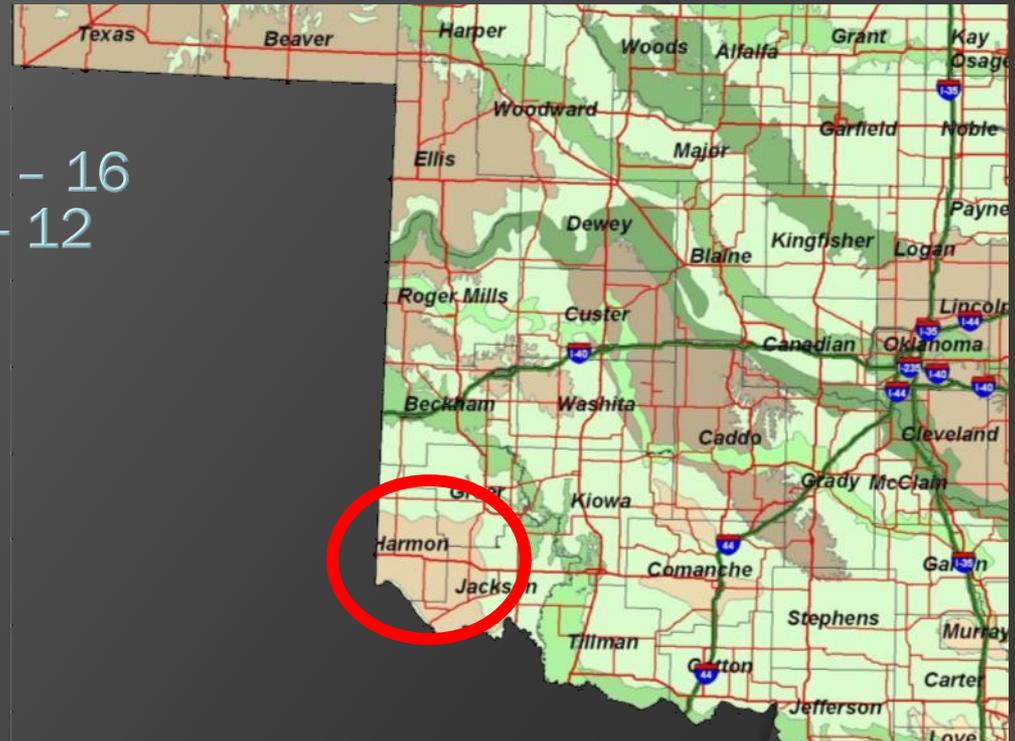


GROUNDWATER LEVELS

Blaine Bedrock Aquifer

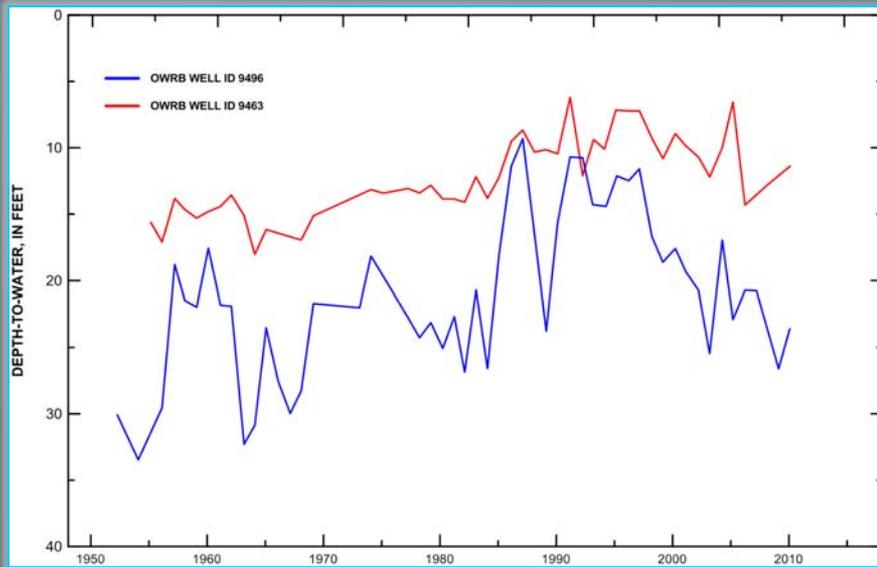
Active Mass Measurement Wells – 16
Period of Record of 31-40 years - 12

No Continuous Recorders
Used mostly for irrigation



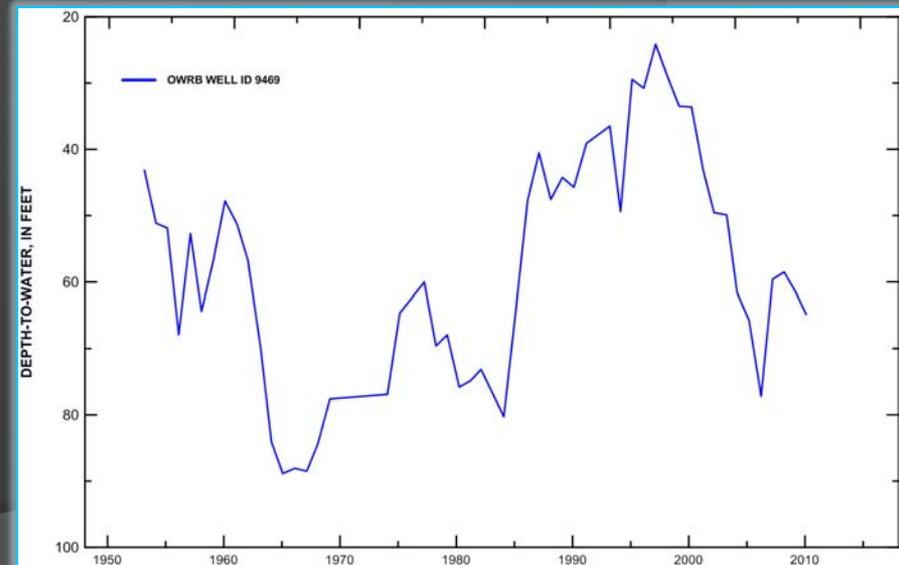
GROUNDWATER LEVELS

Blaine Bedrock Aquifer



1990's - High
2000's - Lower

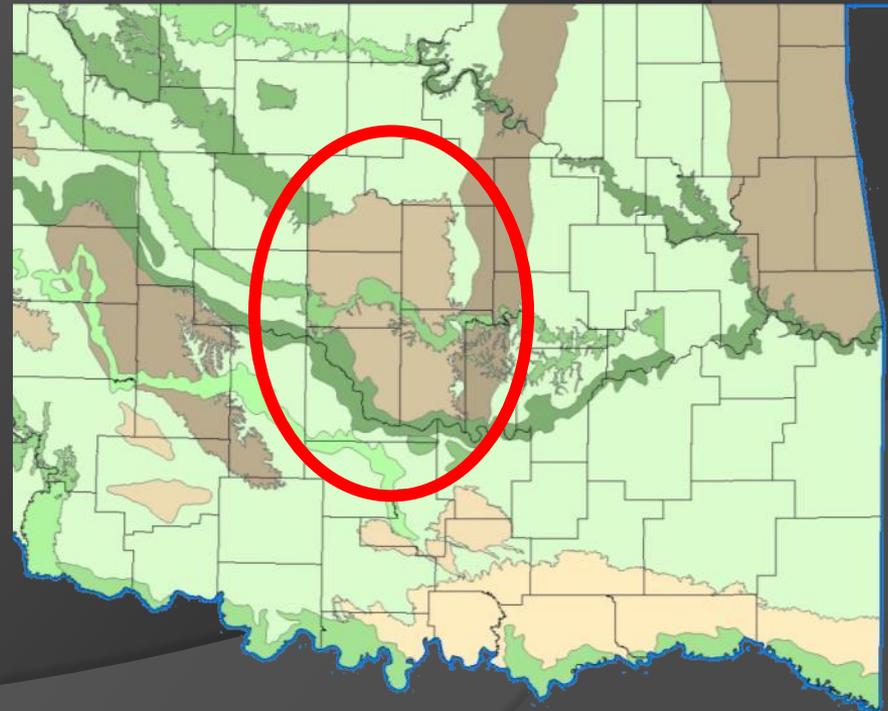
Precipitation
pattern?



GROUNDWATER LEVELS

Garber-Wellington (Central Oklahoma) Bedrock Aquifer

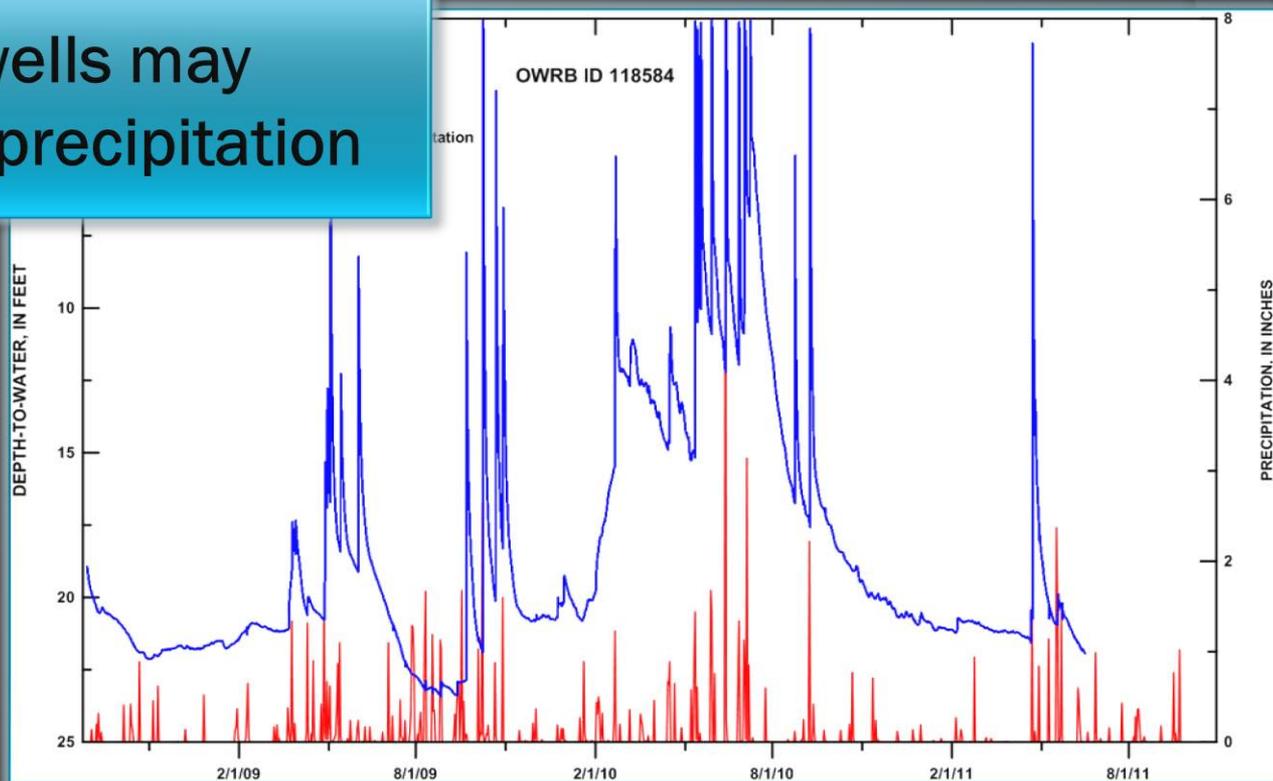
Active Mass Measurement Wells – 17
Longest Period of Record – 35 years
7 wells with POR of 31-35 years



GROUNDWATER LEVELS

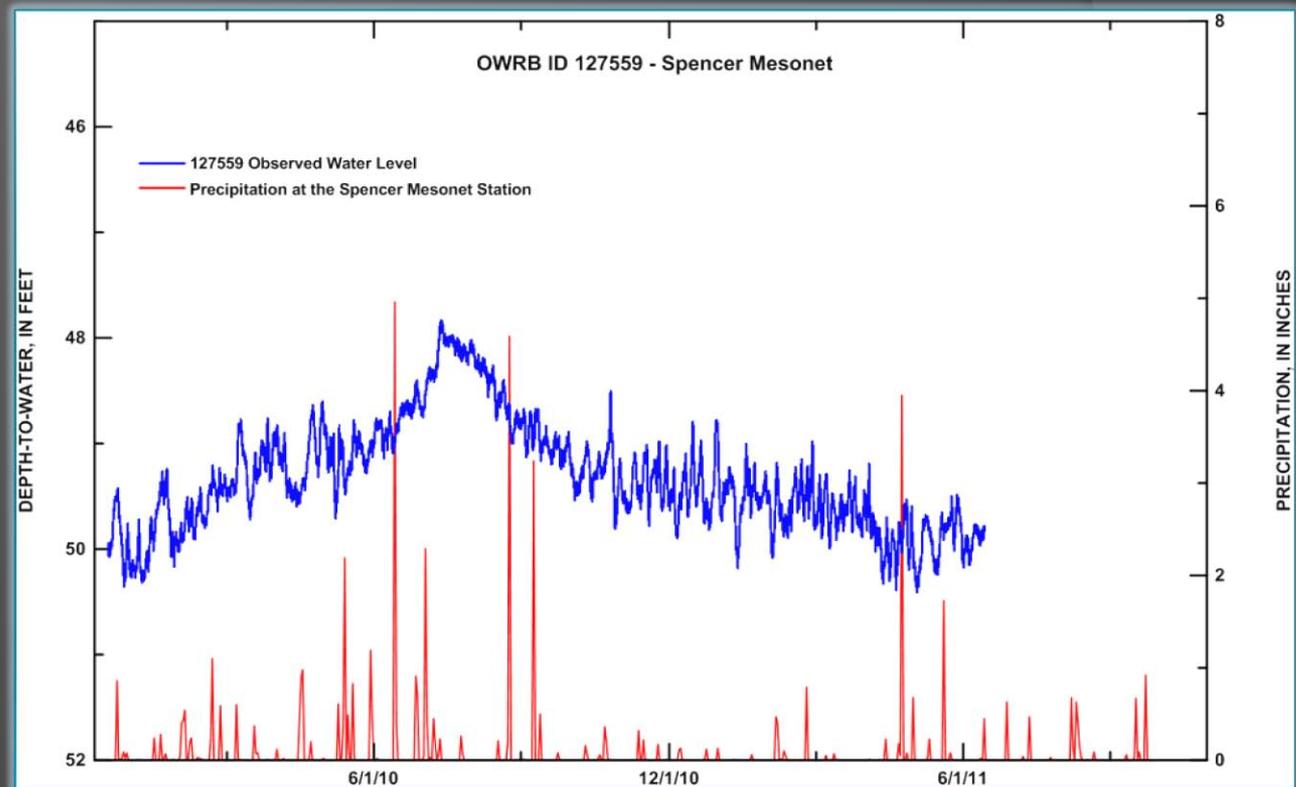
Garber-Wellington (Central Oklahoma) Bedrock Aquifer

Shallower wells may
respond to precipitation



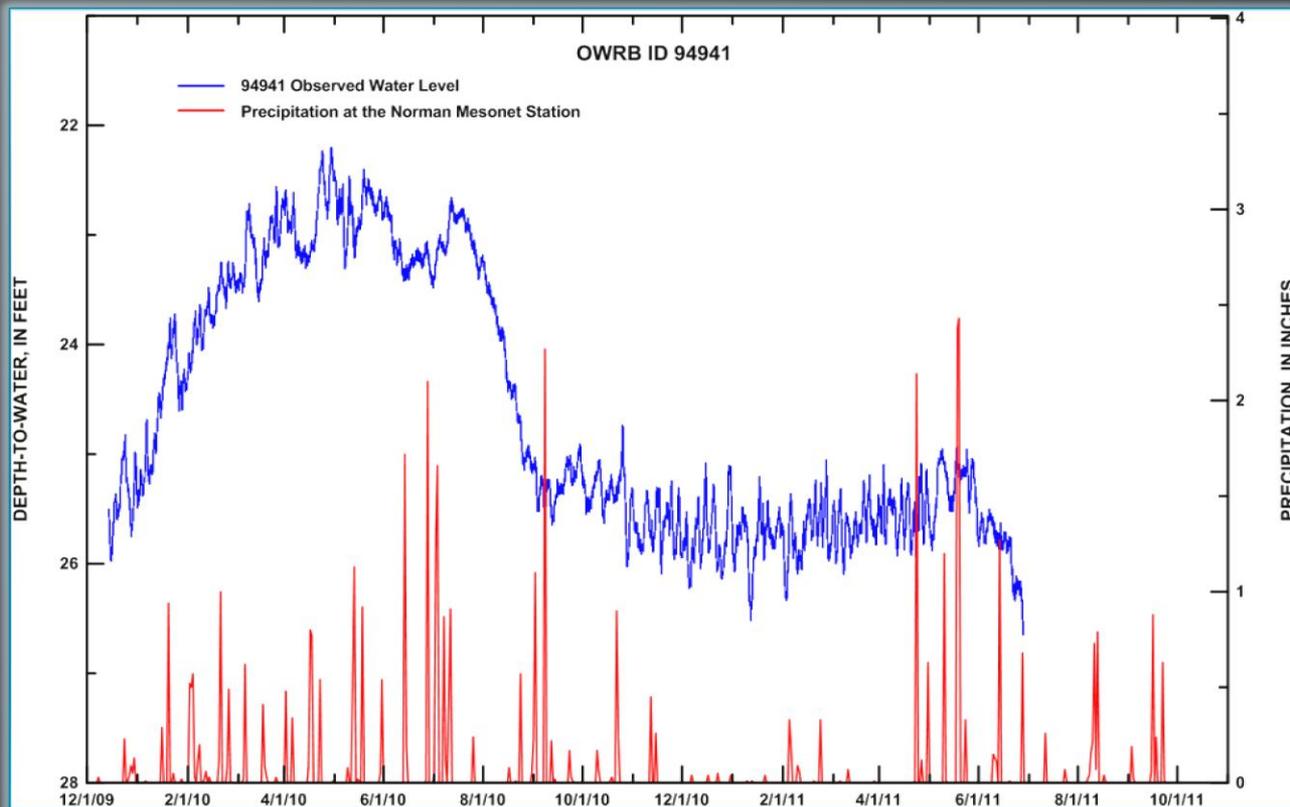
GROUNDWATER LEVELS

Garber-Wellington (Central Oklahoma) Bedrock Aquifer



GROUNDWATER LEVELS

Garber-Wellington (Central Oklahoma) Bedrock Aquifer



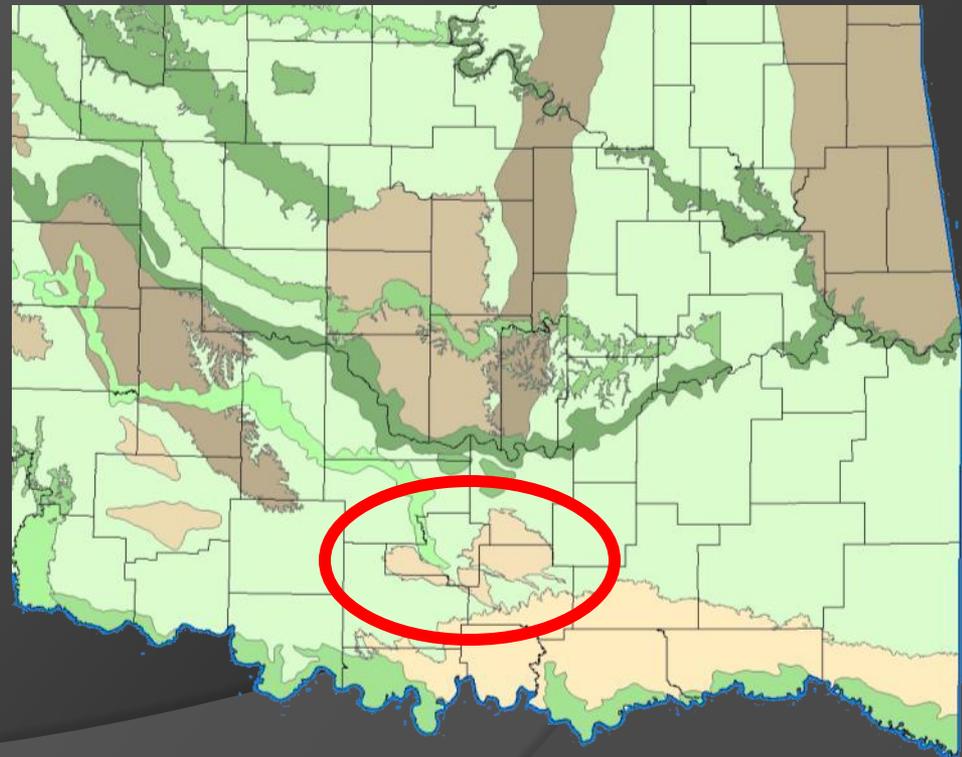
GROUNDWATER LEVELS

Arbuckle-Simpson Bedrock Aquifer

Active Mass Measurement Wells – 12

POR < 17 years

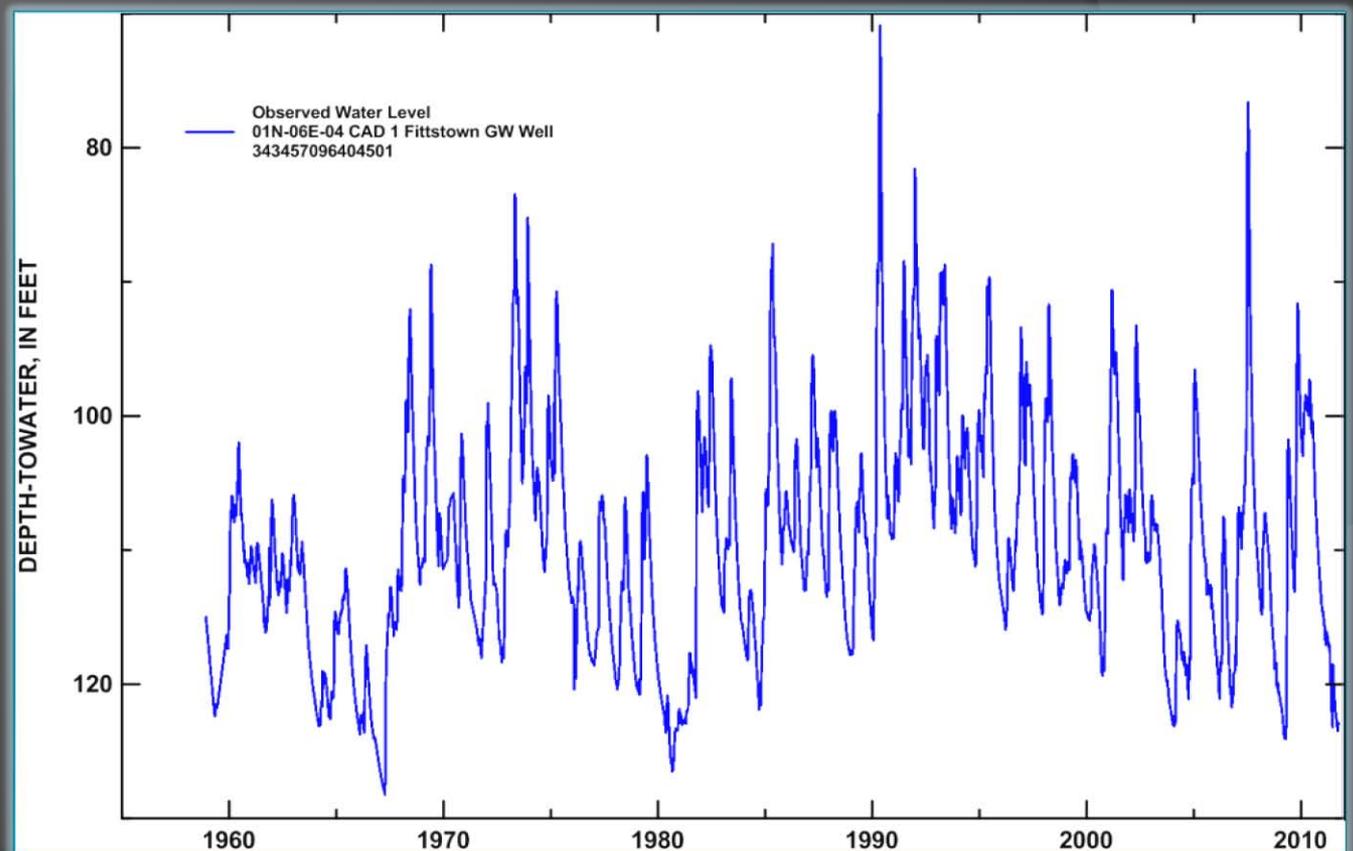
Several Continuous Sites



GROUNDWATER LEVELS

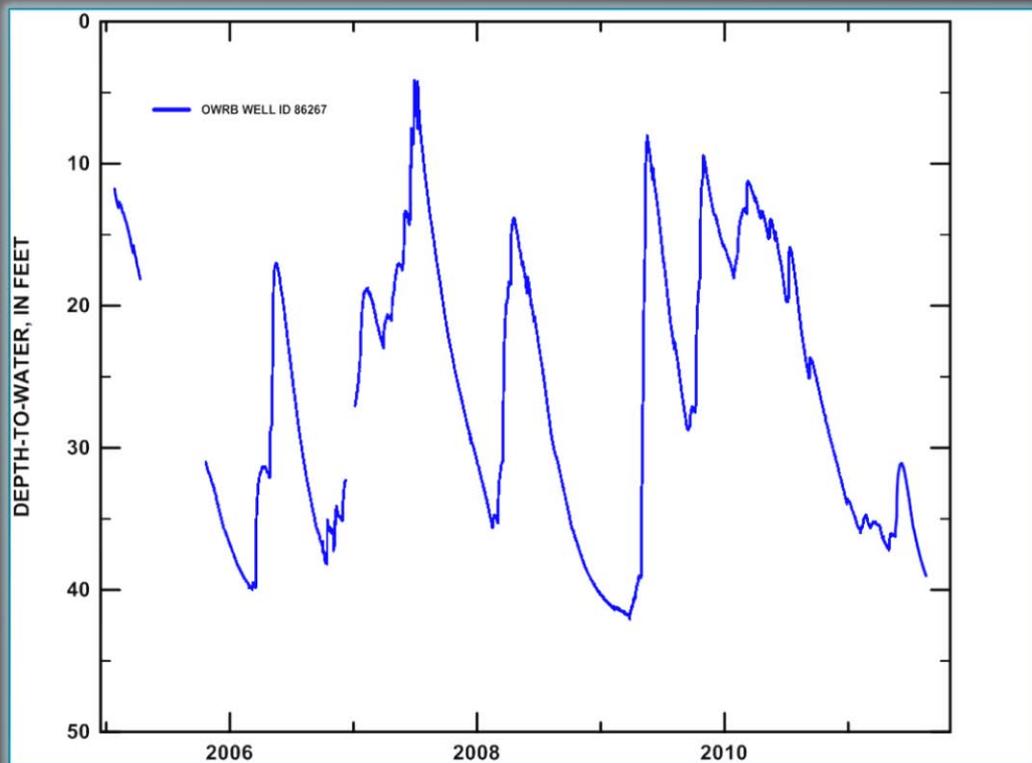
Arbuckle-Simpson Bedrock Aquifer

USGS Fittstown Site



GROUNDWATER LEVELS

Arbuckle-Simpson Bedrock Aquifer



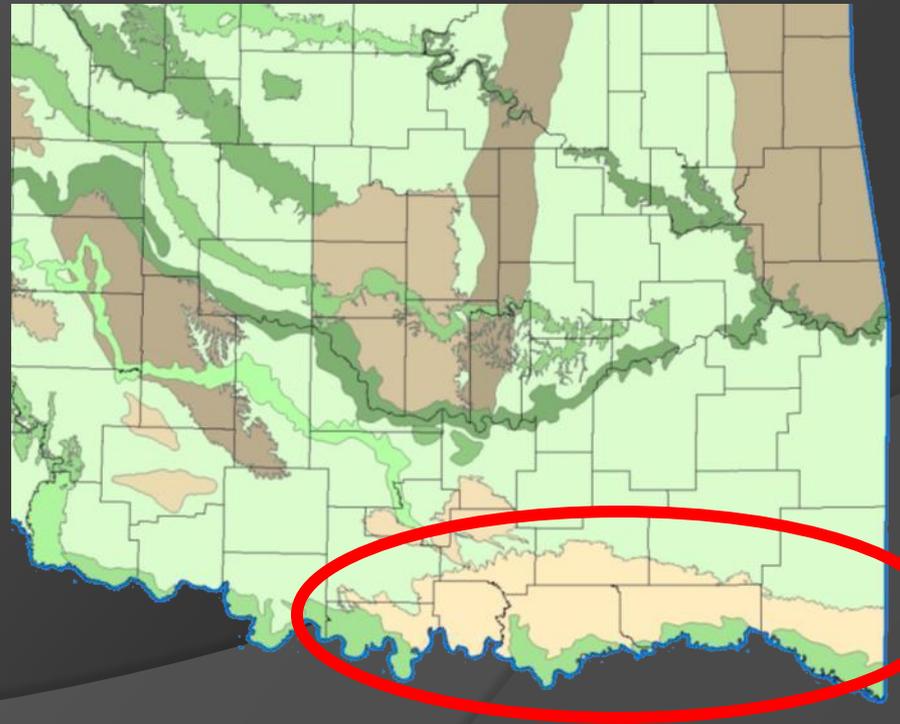
OWRB Ferris Site

GROUNDWATER LEVELS

Antlers Bedrock Aquifer

Active Mass Measurement Wells – 23

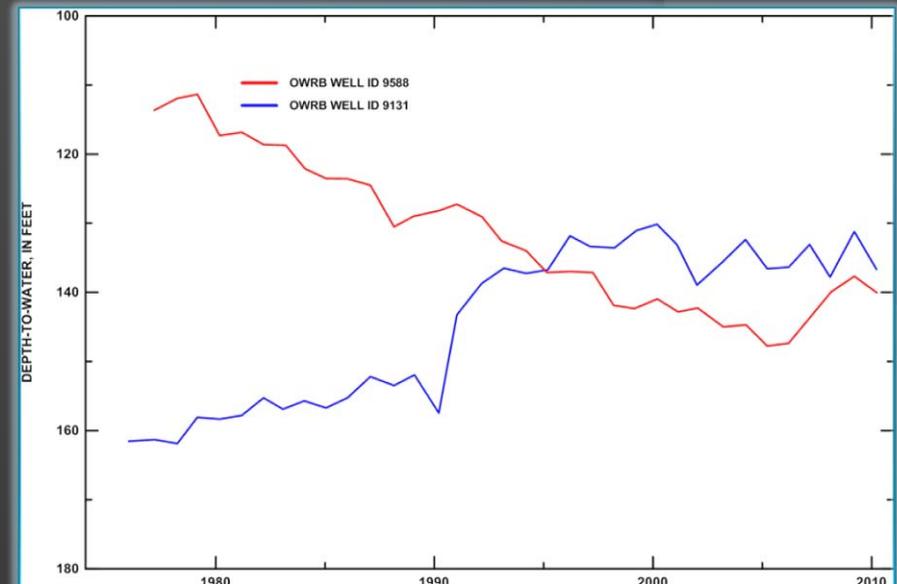
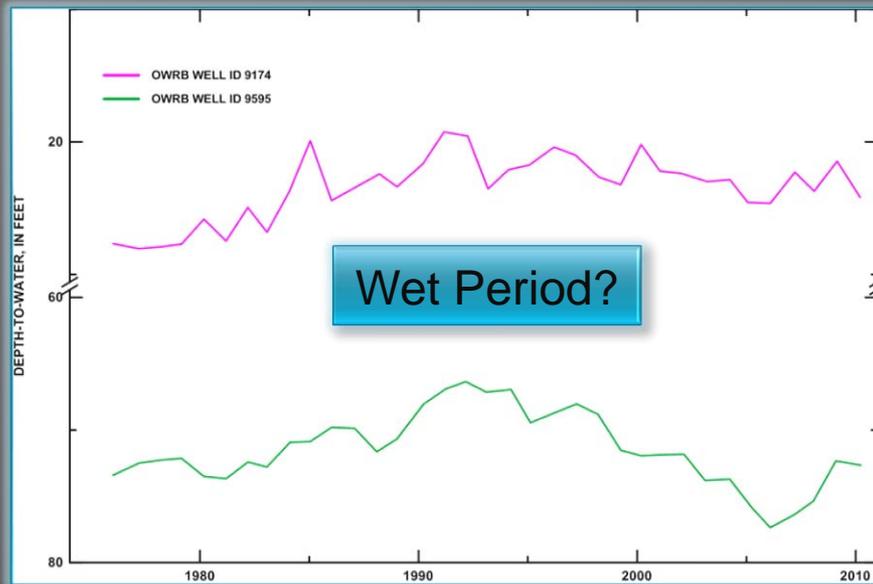
6 wells with a POR between 31-40 years



GROUNDWATER LEVELS

Antlers Bedrock Aquifer

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



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

SUMMARY

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:

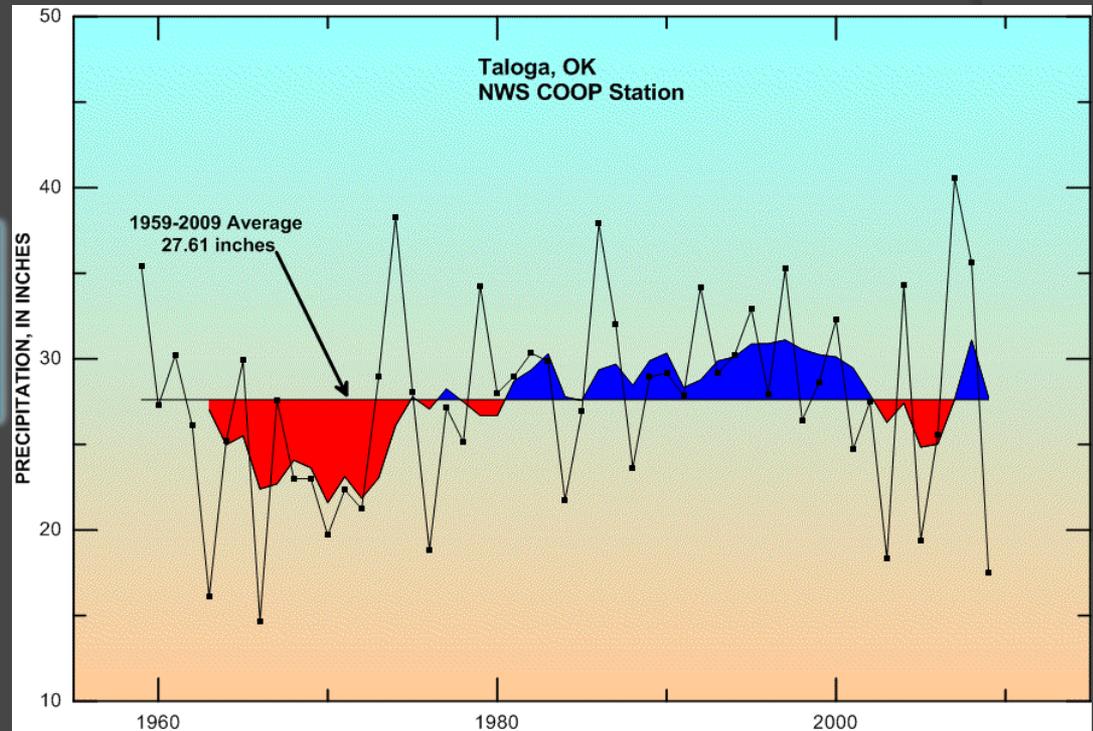
- 1) Nearby pumping
- 2) Low Precipitation

Groundwater Levels

Water-level Responses:

- 1) Precipitation?
- 2) Groundwater Use?

Precipitation – Dewey County



DROUGHT 2011

