

Basic Water Science Seminar

May 14, 2009

Water Quality and Groundwater
Data Collection

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**Antelope Hills, Ogallala Formation
Roger Mills County, Oklahoma**

Why Care About Groundwater?

- Untreated drinking water source for an estimated 200,000 Oklahomans.
- Meets 90% of the State's Agriculture Crop Irrigation Needs with 2.5 Million A.F. Appropriated Annually (815 Billion Gallons)
- Raw water source for an estimated 625,00 Oklahomans (Source ODEQ, 2007 Annual Report)

What is Currently in Place to Protect Groundwater?

- Water Quality Standards
- Source Water Protection Program
- Compliance Monitoring Protection

OAC785, CHAPTER 45

Water Quality Standards

SUBCHAPTER 7

Groundwater Quality Standards

Fresh From the Grinder!

No Clean Water Act authority

State Authority Only

Sub-Chapter 7 Rules

Scope and Applicability

- Fresh Water (< 10,00 mg/L TDS)
- Protection of Beneficial Uses and Classes
- Non-Degradation
- Provisions for Remediation (WQSIP)

Groundwater Classification

Four (4) Classes of Groundwater Range From
Special Source.....Highly Mineralized

“Distinguishes the Wheat from the Chaff”

Examples of Special Source (Class I)

- Arbuckle-Simpson/Chickasaw Ntl Rec Area
- Scenic Rivers/Wellhead Protection Areas

Groundwater Classes II-IV

- Class II General Use (TDS < 3,000 mg/L) – Requires Minimal Treatment to be Usable for Drinking Water (Most Major Aquifers in this Category)
- Class III Limited Use ($3,000 \leq \text{TDS} < 5,000$ mg/L)
- Class IV Highly Mineralized Treatable Water ($5,000 \leq \text{TDS} < 10,000$ mg/L)



Groundwater Beneficial Uses Recognized and Protected by OWQS

- Public and Private Water Supply
- Agriculture
- M/I Process and Cooling Water

Beneficial Use Designations

- Class I and Class II
 - Public and Private Water Supply,
 - Agriculture
 - Industrial & Municipal Process & Cooling Water.
- Class III and Class IV
 - Agriculture and
 - Industrial & Municipal Process & Cooling Water.
- Appendix H
 - as designated

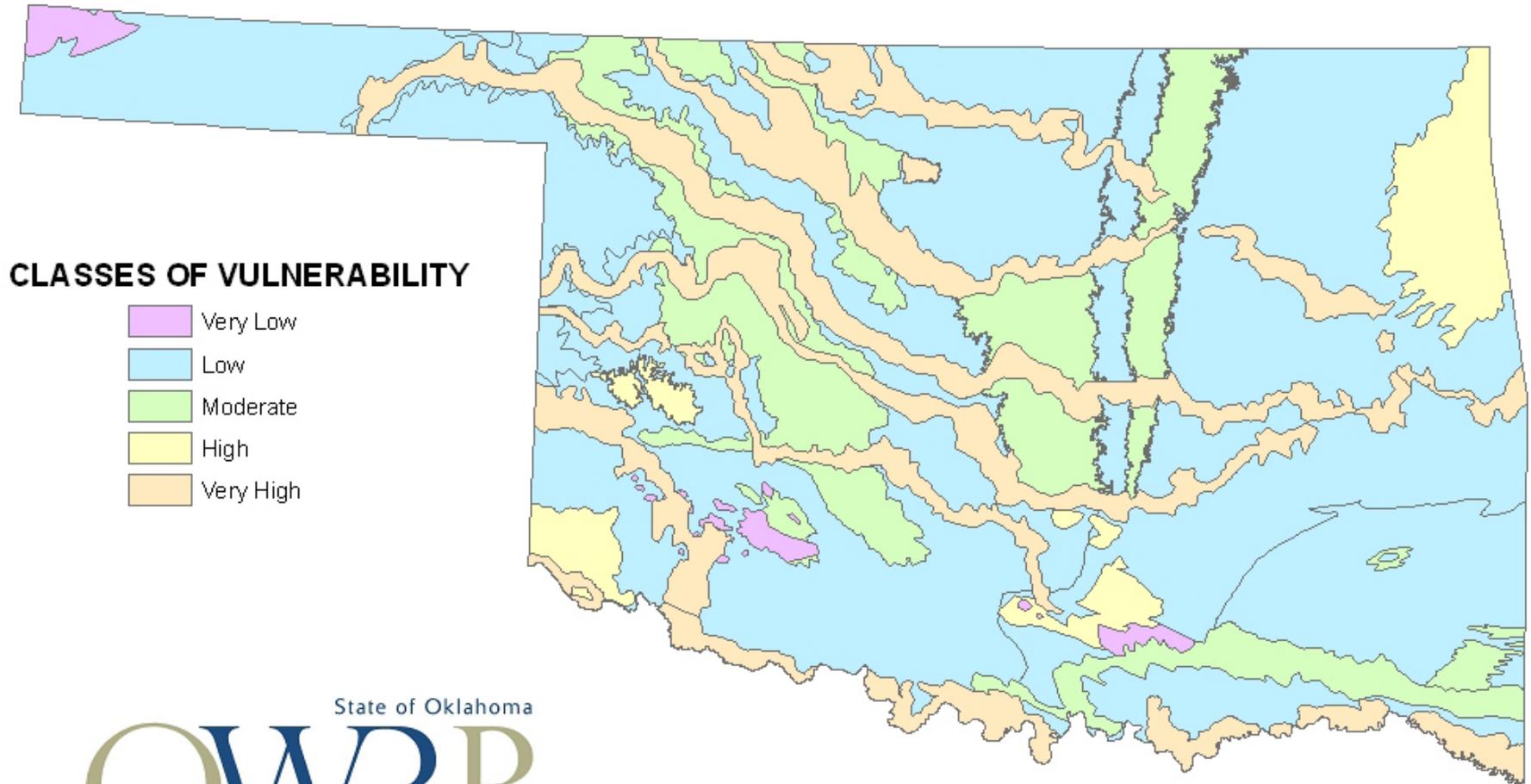
Criteria for Groundwater Protection and Corrective Actions

- Ground waters shall be maintained to prevent alteration
- Ground waters with substances not naturally occurring or other substances greater than background are deemed to be polluted
- Polluted groundwater shall be restored to support the beneficial use
- Responsibility of each state environmental agency within their statutory authority

Aquifer Vulnerability

- Assesses the relative risk to contamination from surface introduced pollutants (based on intrinsic aquifer properties).
- Augments Groundwater Classification Scheme
- Aids decision makers/planners (not to be used in lieu of site specific assessments)
- Map does not indicate what the water quality is, only that certain types of aquifers are more susceptible to contamination from surface activities

STATE OF OKLAHOMA AQUIFER VULNERABILITY MAP



CLASSES OF VULNERABILITY

-  Very Low
-  Low
-  Moderate
-  High
-  Very High

Source Water Protection Program

- Delineation of the source water protection area (WHPA-Groundwater, Drainage Basin-Stream Water)
- Inventory of the contaminant source within the area
- Determination of the susceptibility of the public water supply to contamination from the inventoried sources
- Release of the results of the assessments to the public

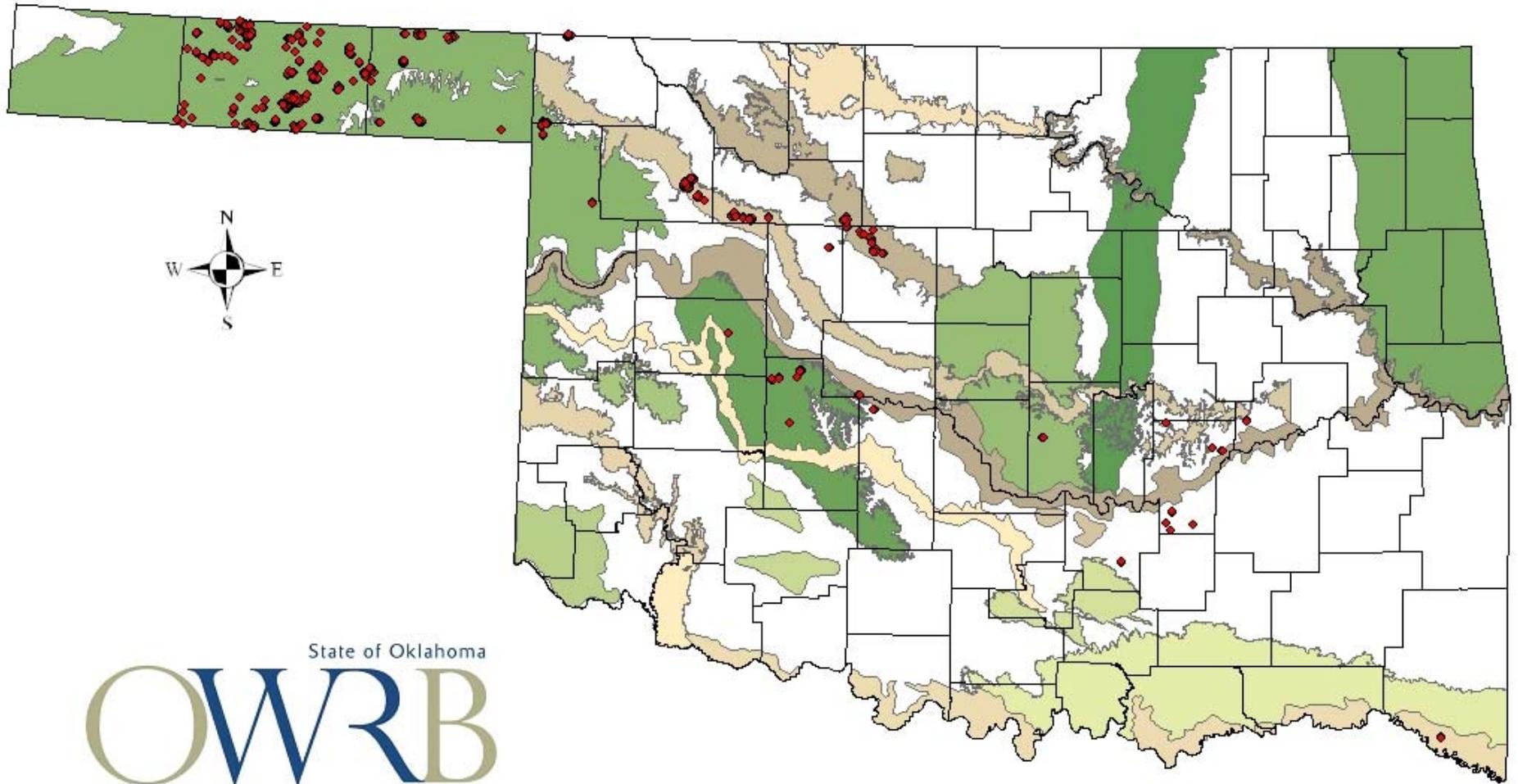
Compliance Monitoring

- Public Water Supply Systems are rigorously and continuously monitored to insure safe drinking water for consumers
- Annually, nutrient and bacteria monitoring occur at Swine CAFOs to assess environmental impacts



**Monitoring Well & Hog Barns
Kingfisher County, Oklahoma**

Monitoring Well Locations at Swine Licensed Managed Feeding Operations



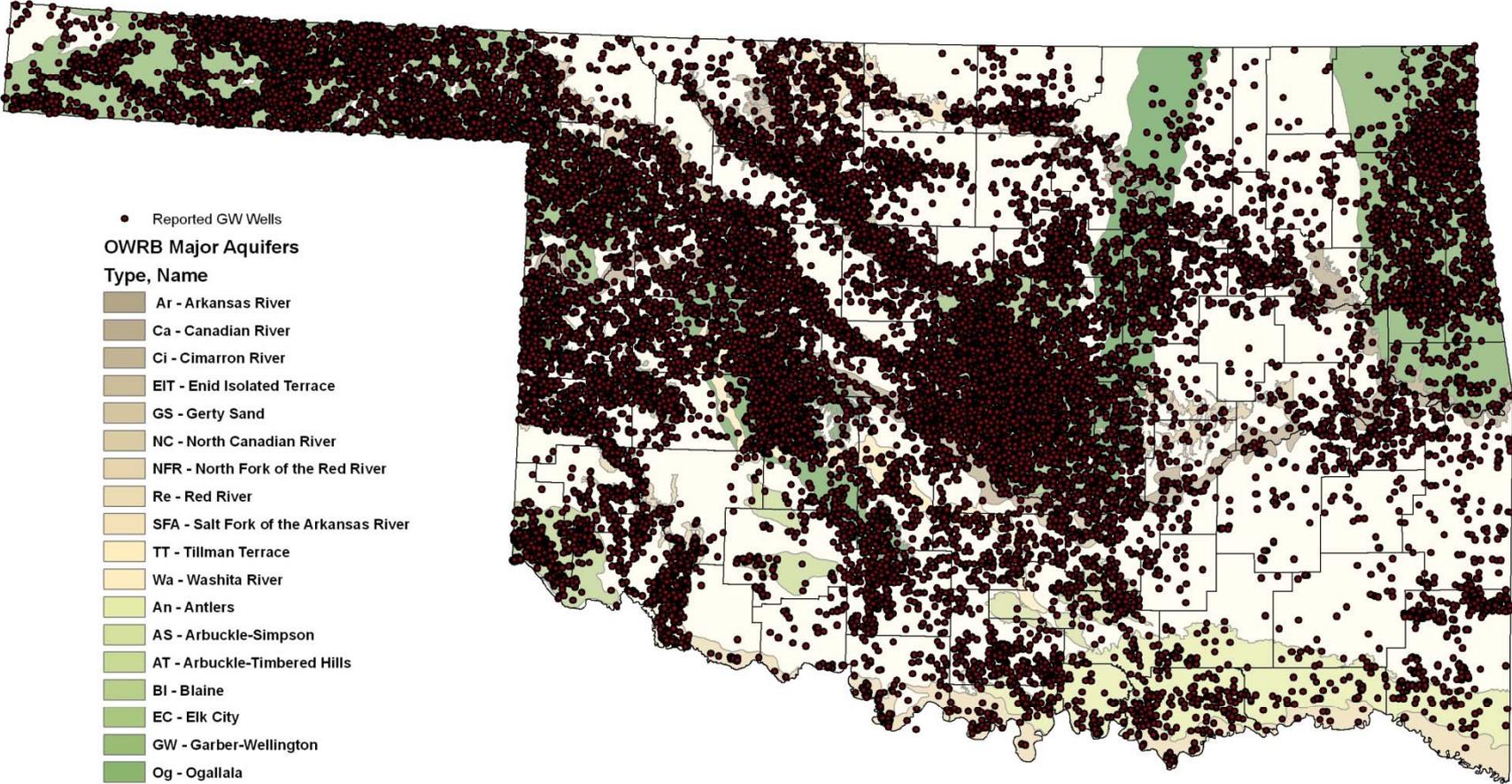
State of Oklahoma
OWRB
WATER RESOURCES BOARD
the water agency

What Do We Currently Know About Groundwater Quantity (in brief)?

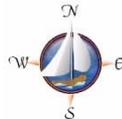
- Hydrologic Surveys/MAY Determinations provide the framework for the orderly withdrawal and permitting of groundwater (Also quantify aquifer characteristics)
- Groundwater use accounts for 56% of beneficially used water in the State of Oklahoma.
- GW-SW interaction affects (recently highlighted by Arbuckle-Simpson Study) demonstrate the need for integrated, holistic solutions for water resource management
- The Number of groundwater wells reported have doubled in Last 15+ years (next two slides)

Locations of Reported Groundwater Wells

1900 - 1990 (29,789 Wells)

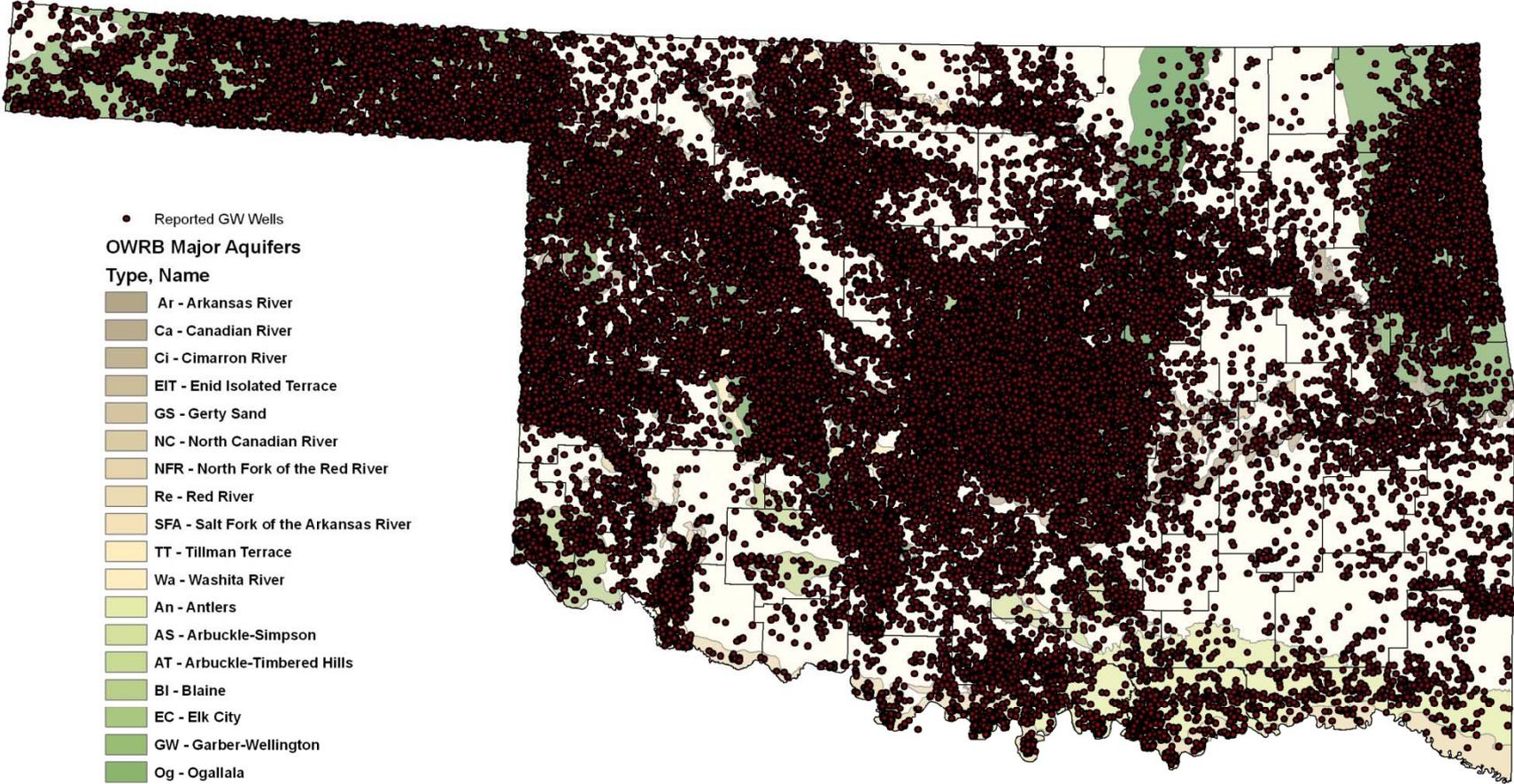


- Reported GW Wells
- OWRB Major Aquifers**
- Type, Name**
- Ar - Arkansas River
- Ca - Canadian River
- Ci - Cimarron River
- EIT - Enid Isolated Terrace
- GS - Gerty Sand
- NC - North Canadian River
- NFR - North Fork of the Red River
- Re - Red River
- SFA - Salt Fork of the Arkansas River
- TT - Tillman Terrace
- Wa - Washita River
- An - Antlers
- AS - Arbuckle-Simpson
- AT - Arbuckle-Timbered Hills
- Bl - Blaine
- EC - Elk City
- GW - Garber-Wellington
- Og - Ogallala
- Rb - Roubidoux
- RS - Rush Springs
- VA - Vamoosa-Ada

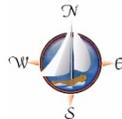


Locations of Reported Groundwater Wells

1900 - 2006 (68,788 Wells)



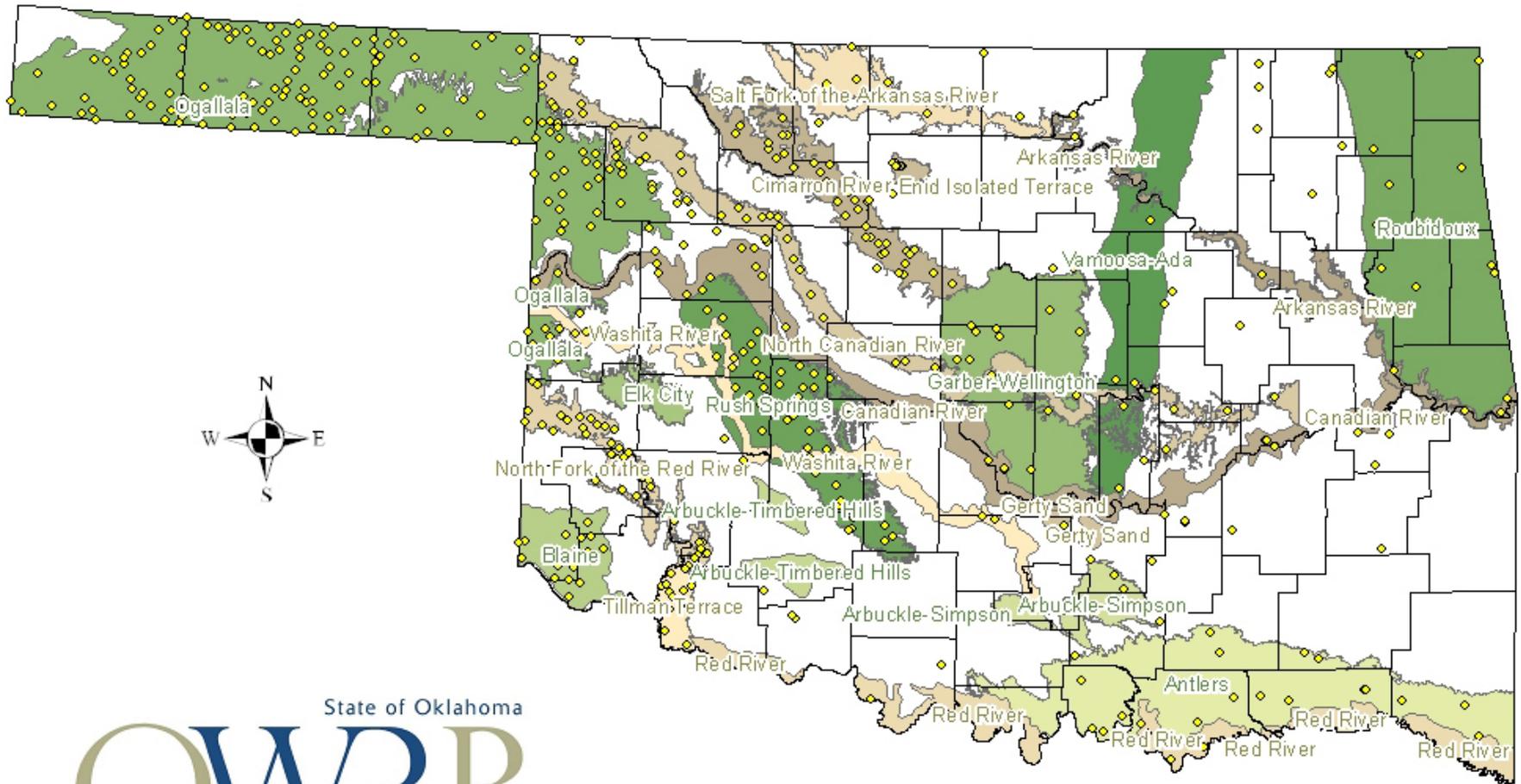
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Groundwater Level Monitoring

- Annual Network Comprised of 500 Wells (1/2 of the original size) Network used to track water level changes over time in relation to climate and usage patterns.
- 19/21 Major Aquifers Monitored
- Typical Period of Record, 35-40 Years
- Groundwater Levels Oscillate w/Respect to “Normal Variable Precipitation (Mining of groundwater in Ogallala, Panhandle, is exception)

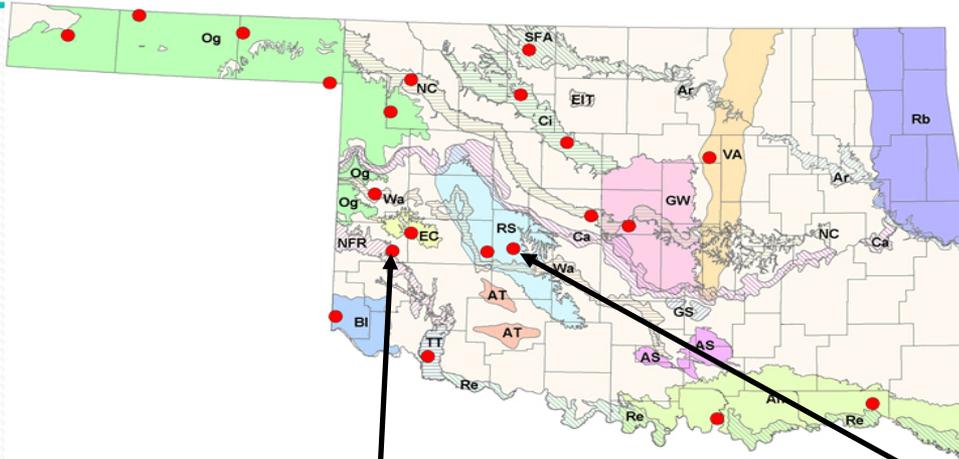
OKLAHOMA WATER RESOURCES BOARD ANNUAL WATER LEVEL MEASUREMENT SITES



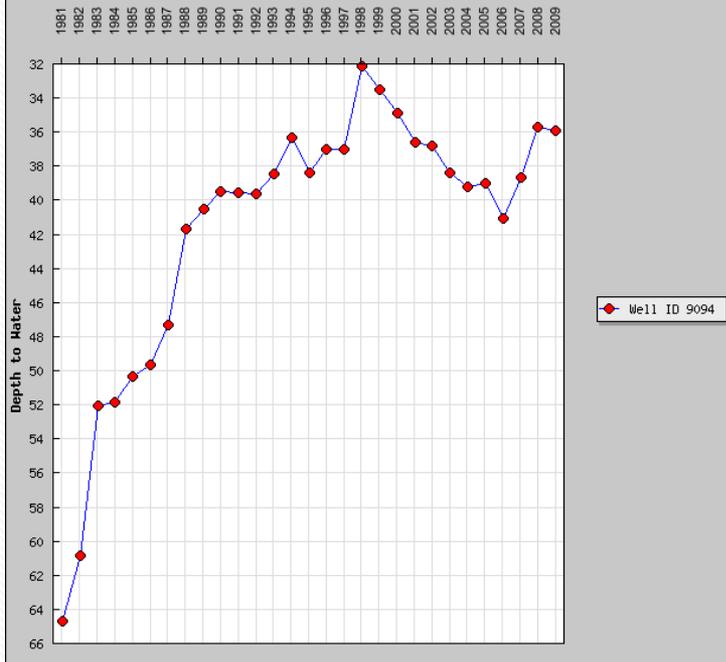
Selected Well Hydrographs OWRB Well Measurement Program

- >500 wells in network
- Data available at www.owrb.ok.gov

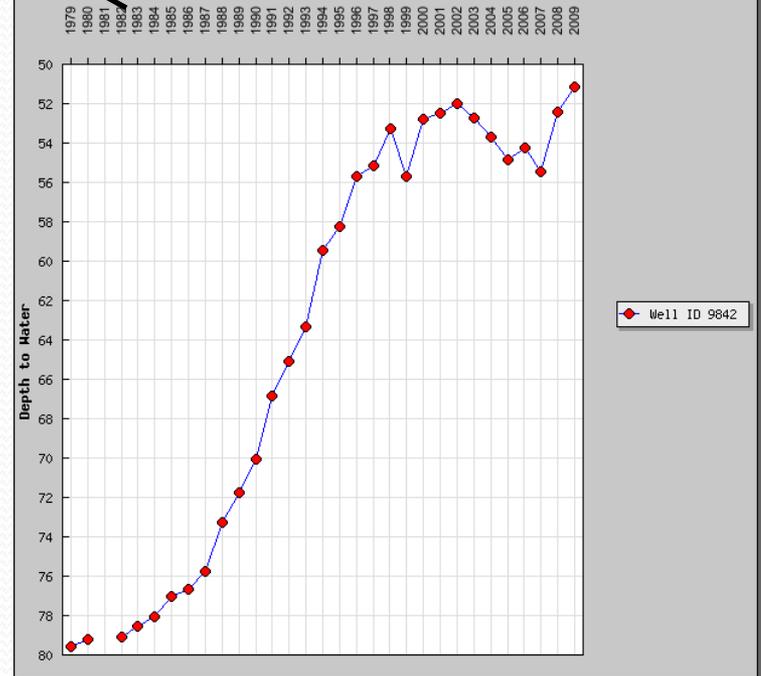
Major Aquifers of Oklahoma



North Fork Red River Well (1981-2009)



Rush Spring Sandstone Well (1981-2009)



What Do We Currently Know About Groundwater Quality (in brief)?

- Safety net exists for PWS because of continuous, rigorous monitoring
- For private well use, water “fitness” uncertain
- Ambient GW Monitoring > NO!
- Monitoring at Swine CAFOs indicating impacts
- Groundwater environments are diverse and dynamic and are technically and economically challenging to monitor and assess

Conclusion

What's Important From This?

- Groundwater accounts for > than 50% of all water consumed in the State (super majority of agriculture water, ~ 25% of drinking water)
- Even though groundwater is a private property right, still deserves (requires) protection and assessment
- Limited GW Quantity Monitoring, Very limited GW Quality Monitoring
- WQS and SWP(s) provide some protection, but still young and evolving



Contact Information

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OWRB HOME PAGE <http://www.owrb.ok.gov/>