

Groundwater and Aquifers

The Groundwater Resources of Lost Pines GCD



Andrew Donnelly
Senior Hydrogeologist
Daniel B. Stephens & Associates

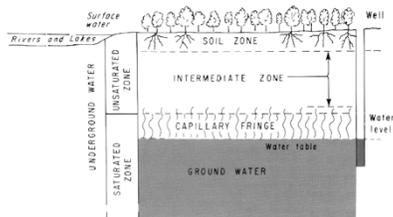
Where do Texans get their water?



- More than half Texans depend on groundwater for their drinking water.
- Over 2 million Texans are served by privately owned individual wells. 20% of public water supply is directly from groundwater.
- Groundwater flows into rivers, such as the Colorado River, providing baseflow.

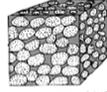
Groundwater: What is it?

- Groundwater is water located beneath the ground surface in soils and geologic formations



Groundwater: Where is it?

Primary Openings

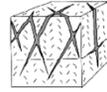


WELL-SORTED SAND



POORLY-SORTED SAND

Secondary Openings



FRACTURES IN GRANITE



CAVERNS IN LIMESTONE

Where can we find groundwater?



Where does groundwater come from?



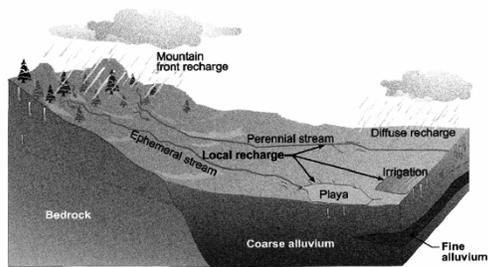
Recharge



Recharge



Other Sources of Recharge



How do we get groundwater?

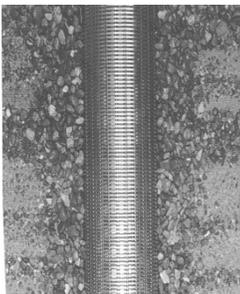


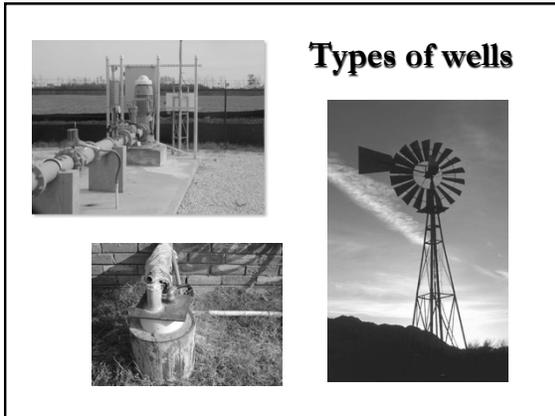
Springs



How do we get groundwater?

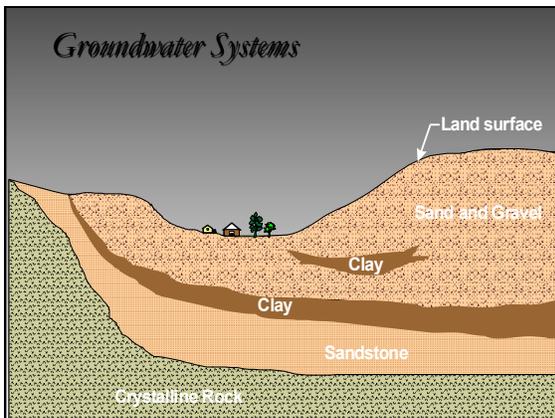


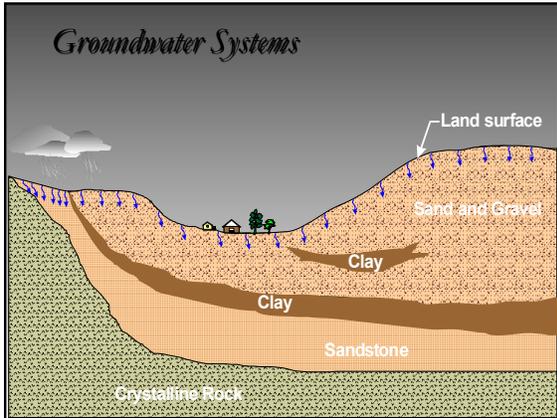


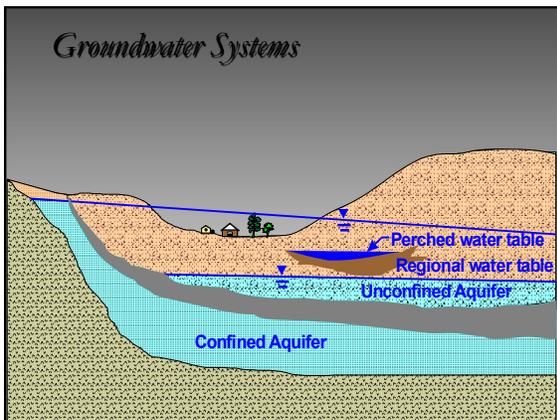


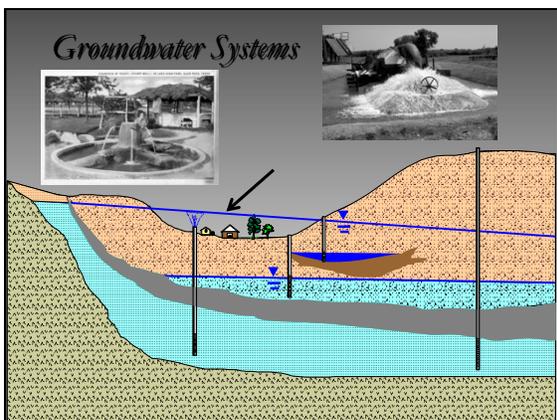
What is an aquifer?

- An aquifer is a saturated permeable geologic unit that can transmit significant quantities of water under ordinary hydraulic gradients.
- Often alternatively defined as permeable enough to yield economic quantities of water to wells.
- Aquifers can be unconsolidated sands and gravels, permeable sedimentary rocks, heavily fractured rocks, and karst.

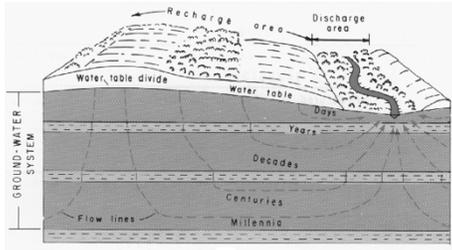








Groundwater Flow Systems



Is An Aquifer An “Underground River”???

“Underground Rivers”

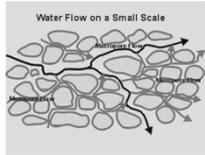
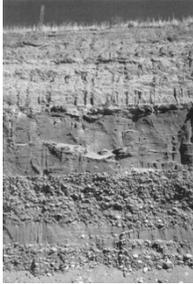


Karst aquifers can have
“underground rivers”



But mostly not!!

(and not in Lost Pines)

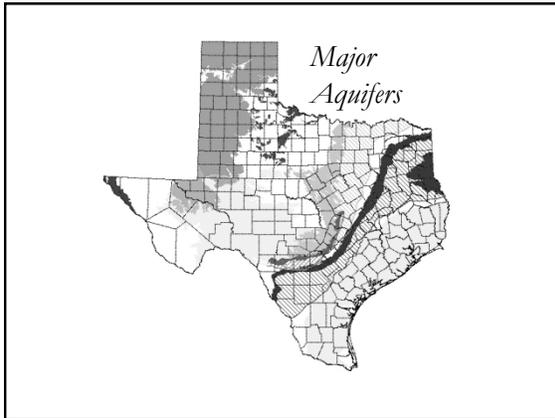


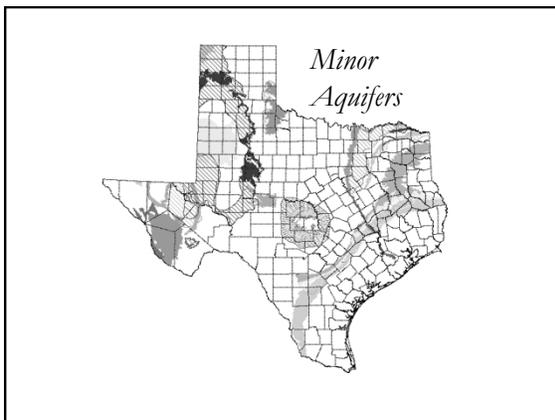
Aquifers in Texas

- Many different types of aquifers
 - Karst- Edwards Aquifer
 - Unconfined- Ogallala Aquifer
 - Confined- Carrizo-Wilcox Aquifer, Gulf Coast Aquifer
 - Alluvial- Brazos River Alluvium
 - Others
- Important to understand differences from a policy and management perspective

Aquifers in Texas

- **Major Aquifers**- Produce large quantities of water over a large area
- **Minor Aquifers**- Produce large quantities of water over a small area, or small quantities of water over a large area





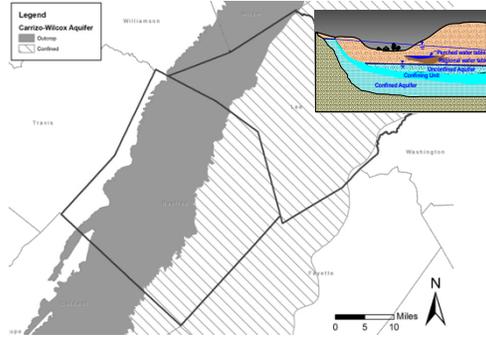
Aquifers in the Lost Pines GCD

- Carrizo-Wilcox Aquifer
- Queen City Aquifer
- Sparta Aquifer
- Yegua-Jackson Aquifer
- Alluvial aquifer(s)

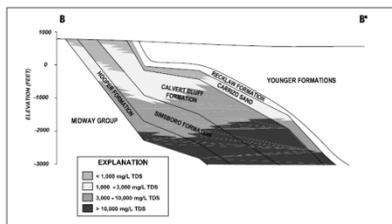
Carrizo-Wilcox Aquifer

- Comprised of the Carrizo Sand and the Wilcox Group
 - Calvert Bluff Formation
 - Simsboro Formation
 - Hooper Formation
- Present throughout most of the Lost Pines GCD

Carrizo-Wilcox Aquifer



Carrizo-Wilcox Aquifer



(from L.B.C. Canyon, 2003)

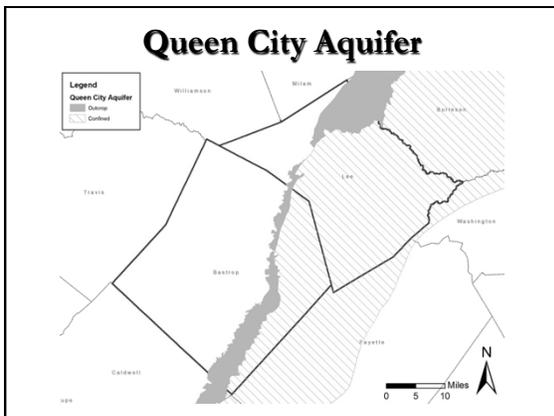
Carrizo-Wilcox Aquifer

- Largest and most extensive aquifer in LPGCD
- The Carrizo and Simsboro are the main aquifer units
- Wells producing thousands of gpm possible
- Significant amount of confined storage
- Vast majority of permits are in this aquifer
 - Carrizo- ~14,500 ac-ft/yr
 - Calvert Bluff- ~5,500 ac-ft/yr
 - Simsboro- ~63,000 ac-ft/yr
 - Hooper- ~2,700 ac-ft/yr

Queen City Aquifer

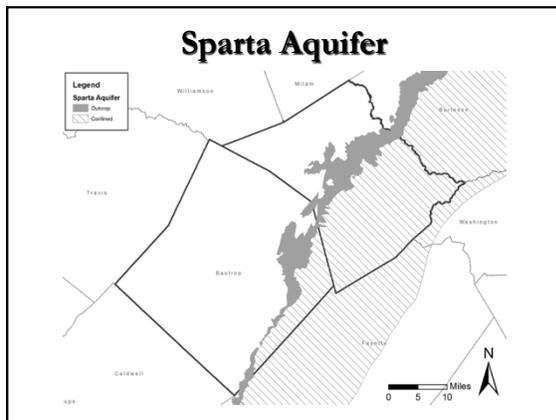
- Minor aquifer present only in about half of the LPGCD
- Several hundred feet thick
- Sand, silt, and clay
- Well capacities of a few hundred gpm
- Limited number of permits- <2,000 ac-ft/yr, only two permitted wells in regular use (Lincoln, Lee County WSC)

Queen City Aquifer



Sparta Aquifer

- Minor aquifer only present in about a third of the LPGCD
- Approximately 100-170 feet thick
- Sand rich unit with massive basal sand, some silt and clay
- Well capacities generally less than 300 gpm
- Limited number of permits- <1,200 ac-ft/yr, only three permitted wells in regular use (Lee County FWSD, Lee County WSC)



Other Aquifers

- Yegua-Jackson
 - Present only in the lower third of Lee County
 - Very little use, primarily domestic and livestock
 - No permits
 - Declared not relevant for planning purposes
- Alluvial Aquifers
 - River and stream alluvium
 - None an "official" major or minor aquifer
 - Shallow wells (less than 100 feet)
 - City of Bastrop has permitted wells in the Colorado River Alluvium

Questions?????