New Insights into the Brazos River Alluvium Aquifer

A CLOSER LOOK AT STUDIES IN THE NORTHERN SEGMENT

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From research by Jacob Jarvis, Erin Noonan, and other B.U. students.

Brazos River Alluvium Aquifer Background introduction



The only floodplain alluvium aquifer in Texas

A major minor aquifer

A long, thin, linear aquifer

Alluvial Sediments and Aquifers

MINOR AQUIFERS



MAJOR AQUIFERS





An Important Aquifer

I-35 corridor

Northern Segment



Segments

Northern (1) Central (2) Southern (3)

- 1. Underlying aquitards
- 2. Carrizo, Queen City, Sparta aquifers
- 3. Gulf Coast aquifer



Alluvium Aquifer Framework

> Fining Upward Sediments Lower Saturated Unconfined / Water Table

Brazos River





Crevasse

More complex

Elevated Salinity River vs Aquifer Erin Noonan. M.S., G.I.T.

Salt Fork of the Brazos R.



Areas of high salinity in the aquifer:

A.The river?B. Contamination? (spills etc.)C.Irrigation/Evap.?



Areas of high salinity in the aquifer:

> The aquifer salinity increased from McLennan to Falls county

Erin Noonan, M.S. GIT

2018 Data:

river vs aquifer and counties





Ionic Chemistry



TWDB Data:

river vs aquifer and counties



Groundwater vs Surface Water Irrigation

MCLENNAN COUNTY

FALLS COUNTY







Landuse





ISOTOPES O¹⁸ and H² Local Meteoric Water Line Rain Water

Groundwater - wells

Groundwater – springs

Brazos River



Groundwater fluctuations rain vs river

Groundwater elevation and precipitation for well HDB.

Rain, River, and Groundwater

HDB WELL VS RAIN

HDB WELL VS RIVER





Cross section w/ piezometers and Brazos R. water levels showing influences by 37-day reversal (10/1/18, 10/24/18, and 12/24/18).



Stream Connections and Compartments

Jacob Jarvis, M.S.



River/Aquifer Connections

Poorly connected

Well Connected

Nearly Connected

Disconnected



Boundaries and Compartments

1. Bedrock physical

2. Brazos River hydrologic



Compartments and Flow

River is the drain (low point)

Flow toward the river

Nearly perpendicular flow lines





GeoProbe Cores



Crosssection wells



Vertical Heterogeneity



A' S

410

- Groundwater flow is essentially toward the river.
- River/aquifer connections vary in effectiveness and are not connected everywhere.
- The aquifer is compartmentalized.
- Flow reversals are usually short lived and affect small portions of the aquifer.

Summary

- The river is not the likely source of elevated aquifer salinity
 - The aquifer is recharged by rain and isotopically distinct from the river
 - During 37-day gradient reversal, water traveled ~88 feet into aquifer
- Irrigation could potentially be a source of elevated salinity
- These characteristics suggest the aquifer is not a sandbox but must be managed more locally.

Summary

