Tracking Salinity Sources to Texas Streams: Examples from West Texas and the Texas Gulf Coastal Plain

H. S. Nance

Bureau of Economic Geology, Jackson School of Geosciences, The University of Texas at Austin, University Station, Box X, Austin, TX 78713-8924

ABSTRACT

Upper Colorado River (West Texas) and Petronila Creek (Texas Coastal Plain) salinities exceed state regulatory standards. For a recent study, airborne conductivity surveys located points of saline influx. Hydrochemical analyses defined salinity trends and potential sources. Both streams comprise Na-Cl hydrochemical facies and are near hydrocarbon production operations.

Upper Colorado River salinity decreases downstream overall (8,430-1,540 mg/L total dissolved solids [TDS], during this study) with local trend reversals. Stream-proximal shallow Permian groundwaters are sulfate enriched from evaporite dissolution. Stream-water chloride predominance is mitigated downstream by sulfate-enriched base flow. Anomalous chloride increases along the stream path correlate with proximity to anomalously saline water wells and oilfields. Conservative (Br/Cl) mixing models suggest hydraulic connection between saline wells, deep-basin brines, and saline streams.

Petronila Creek salinity increases downstream (233-15,180 mg/L TDS). The highest salinity (28,100 mg/L) in the study area is observed in a tributary ditch that previously was used for oilfield brine discharge. Conservative mixing models suggest that either Tertiary-age oilfield brine or seawater might constitute the source of salinity. However, boron and chloride data suggest that oilfield brine is probably the source. Sulfate (relative to chloride) is more concentrated in surface water than is expected from evaporation of oilfield brine or seawater and probably reflects soil-gypsum dissolution.