BRACKISH GROUNDWATER IN THE WOODBINE AQUIFER

TWDB Report 392 Snapshot | October 2025

BACKGROUND on BRACKISH GROUNDWATER STUDIES

The Texas Water Development Board (TWDB) Brackish Resources Aquifer Characterization System (BRACS) Program was established in 2009 to map and characterize the brackish portions of Texas aquifers to provide useful information and data to regional water planning groups and other entities interested in using brackish groundwater as a water supply. Both Texas industry and public water supply planners are looking at brackish groundwater to supplement stressed freshwater resources.

Brackish groundwater is a significant water supply component that can be used to meet future water demands. Groundwater desalination strategies in the 2022 State Water Plan (TWDB, 2023) represent additional new groundwater supply for nine of the regional planning groups. Development of these strategies would create an additional supply volume of approximately 97,000 acre-feet per year estimated to be online by 2030, with an additional 157,000 acre-feet per year of brackish groundwater recommended to be in service by 2070.

What is brackish groundwater?

Brackish groundwater contains dissolved minerals with a concentration between 1,000 and 9,999 milligrams per liter of total dissolved solids.

WOODBINE AQUIFER STUDY AREA

The Woodbine Aquifer study area encompasses approximately 15,000 square miles in northeast Texas, including all or parts of 29 counties (Sutton and others, 2025). The study area extends downdip to the south and east from the outcrop area, up to approximately 50 miles beyond the extent of the official TWDB-designated aquifer boundary (George and others, 2011).

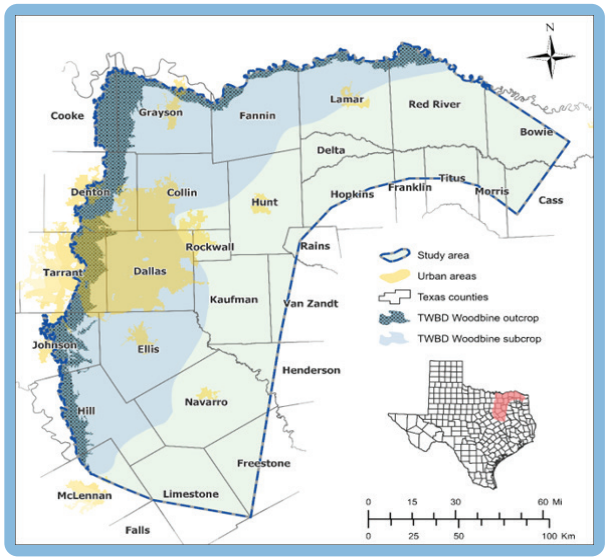

Figure 1. Woodbine Aquifer BRACS study area.

Portions of regional water planning areas C, D, and G are included in the study area. Groundwater Management Area 8 occupies most of the study area, but limited portions of groundwater management areas 11 and 12 are included. There are six groundwater conservation districts within the study area. Groundwater from the Woodbine Aquifer is primarily used for municipal and irrigation purposes.

The 2022 State Water Plan indicates that annual groundwater supplies for the Woodbine Aquifer are projected to decrease 2.5 percent by 2070. However, there are fourteen water user groups that list the development of groundwater from the Woodbine Aquifer as a recommended strategy in the plan.

BRACKISH GROUNDWATER VOLUMES in WOODBINE AQUIFER

SLIGHTLY SALINE **72.7** million acre-feet

MODERATELY SALINE **47.7** million acre-feet

TOTAL BRACKISH **120.4** million acre-feet

The in-place aquifer storage volumes calculated in this study are estimates to provide insight into the magnitude and distribution of this important resource. Not all brackish groundwater can be produced or economically developed. We recommend that site-specific studies be conducted to support projects and efforts that will incorporate brackish groundwater resources into water resources planning.

These volume estimates are not the same as the TWDB-calculated total estimated recoverable storage volumes, which are confined to the aquifer boundaries used by TWDB groundwater availability models. Furthermore, the area, saturated thickness, and storage parameters used in the calculations for this study are different from those used in total estimated recoverable storage reports (Wade and others, 2014).

The TWDB uses the information produced from this study to identify potential brackish groundwater production zones, which are areas that can produce brackish groundwater over 30- and 50-year periods without causing significant impacts to water availability or quality for existing users.

In designating brackish groundwater production zones, the TWDB is guided by exclusionary criteria in Texas Water Code § 16.060 that is designed to prevent significant adverse impacts to existing water wells and water quality. These criteria limit production so that long-term pumping is unlikely to interfere with fresh groundwater availability or degrade water quality.

As a result, the volumes that can be produced from designated brackish groundwater production zones are reduced by orders of magnitude compared to the total in-place storage volumes, underscoring the importance of careful planning and site-specific evaluation for projects within designated zones or in brackish portions of aquifer outside of designated zones.

Groundwater management area
Brackish groundwater storage volume in acre-feet

	Slightly saline	Moderately saline
8	72,692,600	47,260,900
11	0	426,000
12	0	0

Regional water planning area
Brackish groundwater storage volume in acre-feet

	Slightly saline	Moderately saline
C	63,876,600	30,677,700
D	6,794,500	15,782,000
G	2,021,600	1,227,200

Table 1. Brackish groundwater storage volumes by groundwater management area (left) and regional water planning area (right). Values are in acre-feet. Volumes from additional salinity classes in these areas can be found in Sutton and others (2025).

SALINITY SPATIAL DISTRIBUTION

A total of 329 wells were used for total dissolved solids concentration calculations and incorporated into the salinity distribution analysis along with 628 measured water quality samples. The salinity zones are delineated at 1,000, 3,000, 10,000, and 35,000 milligrams per liter of total dissolved solids concentration.

The brackish portion of the Woodbine Aquifer is comprised of both slightly saline (yellow area in Figure 2) and moderately saline (orange area in Figure 2) groundwater. The distribution of slightly saline groundwater encompasses parts of 14 counties and covers the largest lateral extent of the five salinity classes within the study area. Localized pockets of slightly saline groundwater are present within the outcrop region where freshwater would generally be expected. The increased salinity in the outcrop area is likely due to elevated sulfate concentrations associated with the presence of lignite beds within the Woodbine Group (Baker, 1960). Structural complexities in the northwestern portion of the study area may also impact the distribution of slightly saline groundwater in this area.

Moderately saline groundwater occupies a relatively narrow band west and north of the Mexia-Talco Fault Zone across parts of 13 counties in the study area. Moving down-dip, approaching the fault zone, salinity increases rapidly from very saline to brine. Due to the limited sand content present in the far southern portion of the study area, salinity characterization was not performed, as denoted by a cutoff line.

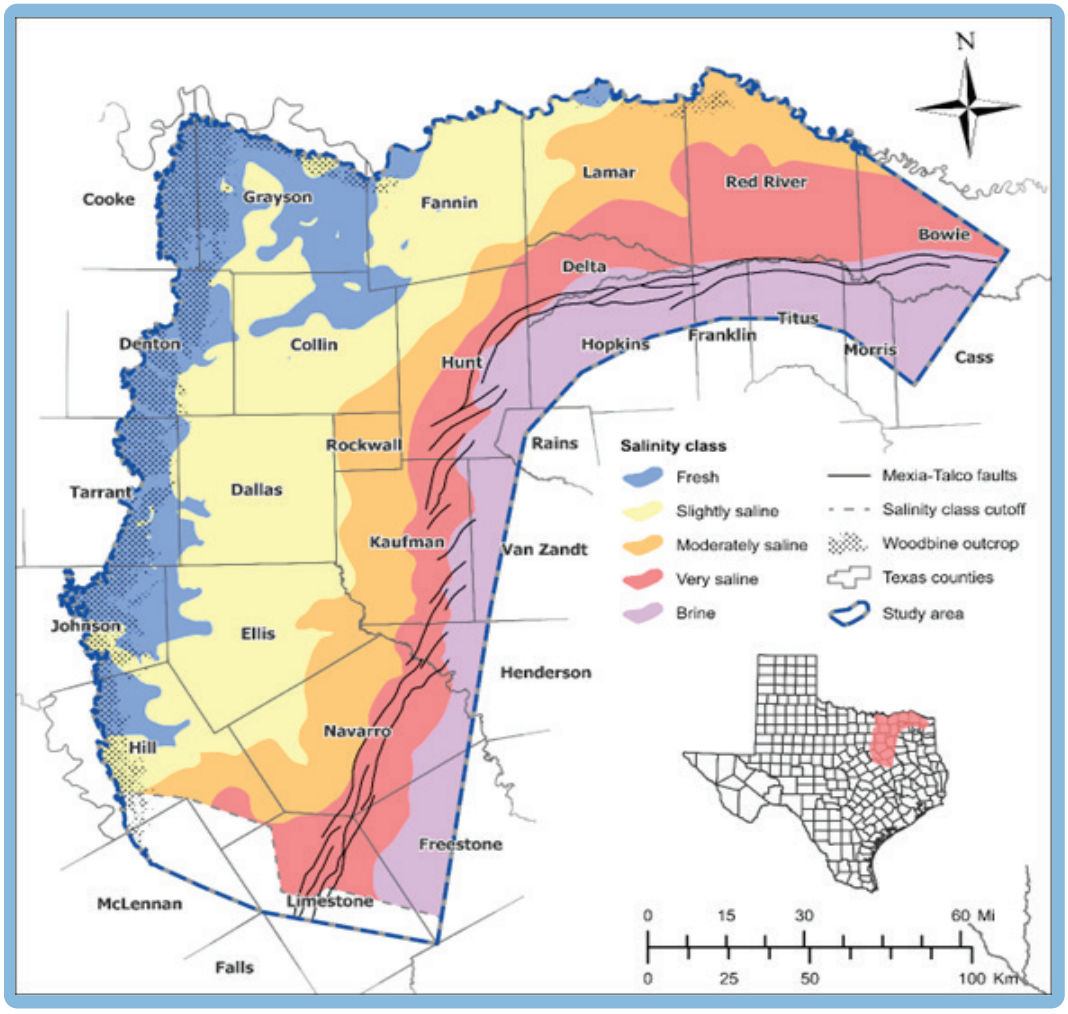

Figure 2. Woodbine Aquifer salinity map.

GEOLOGICAL CROSS-SECTION of WOODBINE AQUIFER

BRACS staff digitized geophysical logs to create cross sections for the Woodbine Aquifer report. Figure 3 shows a strike-oriented cross section from northeast to southwest that characterizes stratigraphy across the study area. The logs in this cross section are hung on the top of the Eagle Ford Group.

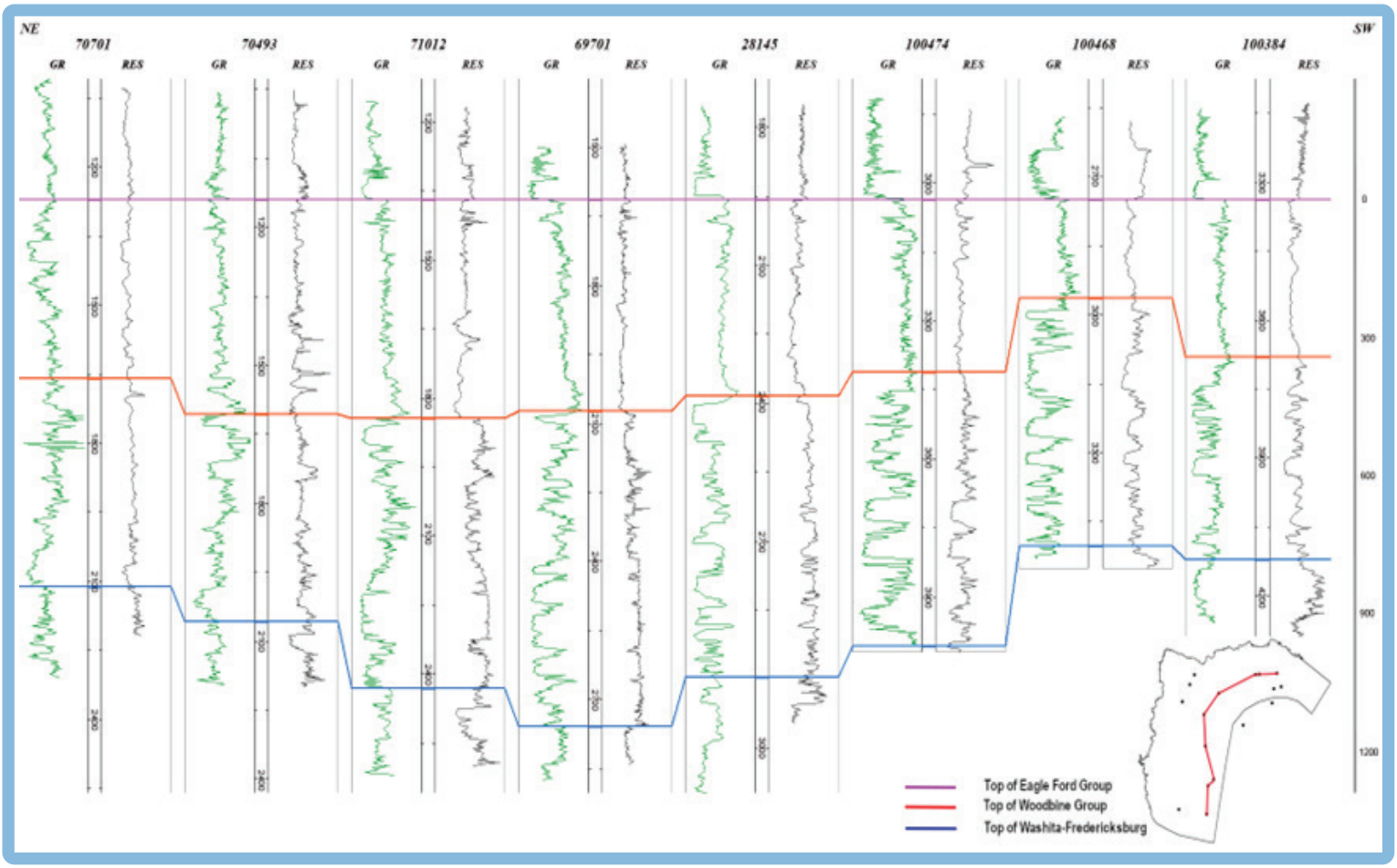

Figure 3. Geological cross section through study area logs.

REFERENCES

Baker, E.T., Jr., 1960, Geology and ground-water resources of Grayson County, Texas: TWDB, Bulletin 6013, p. 3-152.

George, P.G., Mace, R.E., and Petrossian, R., 2011, Aquifers of Texas: Texas Water Development Board Report 380, 172 p.

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Wade, S., Ph.D., Shi, J., Ph.D., and Selter-Weatherford, C., 2014, Total estimated recoverable storage for aquifers in groundwater management area 11: Texas Water Development Board 13–034, 30 p.