The Status of Brackish Aquifer Studies in Texas

2021 Annual Report to the 87th Texas Legislature on Brackish Groundwater Production Zone Designation

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Texas Water Development Board

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Introduction

The Texas Water Development Board (TWDB) Innovative Water Technologies Department was created in 2005 to advance innovative water supply and storage strategies, including aquifer storage and recovery, brackish groundwater, desalination, and water reuse. In 2009, the 81st Texas Legislature appropriated funding to the TWDB to establish the Brackish Resources Aquifer Characterization System (BRACS) Program. The goal of the program is to map and characterize the brackish portions of the aquifers in Texas and provide useful data to regional water planning groups and other entities interested in developing and desalinating brackish groundwater as a new water supply.

In 2015, the 84th Texas Legislature passed House Bill 30, directing the TWDB to (1) identify and designate brackish groundwater production zones in the state, (2) determine the volumes of groundwater that a brackish groundwater production zone can produce over 30- and 50-year periods without causing significant impact to water availability or water quality, (3) make recommendations on reasonable monitoring to observe the effects of brackish groundwater production within that zone, (4) work with groundwater conservation districts and stakeholders, and (5) provide a summary of brackish groundwater production zone designations in the biennial report due December 1 of each even-number year.

In 2019, the 86th Texas Legislature restored funding for the BRACS Program with the passage of Rider 24 in House Bill 1, which appropriated $2 million to the TWDB for contract and administrative costs to support designation of brackish groundwater production zones in aquifers of the state, excluding the Dockum Aquifer. The 86th Texas Legislature also passed Senate Bill 1041 that extended the deadline from December 1, 2022, to December 1, 2032, to complete zone designations. That same year, House Bill 722 established a permitting framework for developing water supplies from TWDB-designated brackish groundwater production zones. In January 2021, the TWDB adopted rules to implement the requirements of House Bill 722.

In 2021, the 87th Texas Legislature again appropriated $2 million to the TWDB for contracted technical services and administrative costs to support designation of brackish groundwater production zones in aquifers of the state, excluding the Dockum Aquifer. To facilitate program coordination with the TWDB's Groundwater Availability Modeling Program, the BRACS Program moved from the Innovative Water Technologies Department to become a separate department in the Groundwater Division.

Studies on brackish aquifers

In total, legislative appropriations to the TWDB have provided funding to complete studies internally and 18 contracts for additional studies in the BRACS Program. In 2010, the TWDB contracted three research projects totaling $449,500 to support the initiation of the BRACS Program. In 2015, the TWDB funded seven contracts totaling nearly $1.7 million for studies covering eight aquifers or portions of an aquifer. In 2020–2021, the TWDB funded eight contracts totaling nearly $1.7 million for a variety of BRACS research projects (Table 1).

Overall, the TWDB has completed 13 brackish aquifer studies and has three ongoing studies (Figure 1)**.** Of the completed brackish aquifer studies, the TWDB completed six internally and contractors completed seven. The TWDB is working on three brackish aquifer studies (Table 2) and will need to evaluate three additional aquifers (Pecos Valley; Carrizo-Wilcox; and the Carrizo-Wilcox, Queen City, Sparta, and Yegua aquifers) for zone designation. The TWDB has planned for future studies, which will include nine aquifers that meet statutory criteria and are eligible for zone designation (Figure 2). The remaining 12 aquifers that do not meet statutory criteria will be mapped and characterized after meeting the December 1, 2032, legislative deadline for completing the zone designations for qualifying aquifers.

Designation of brackish groundwater production zones

To date, the TWDB has designated a total of 31 brackish groundwater production zones (Figure 3). In October 2016, the TWDB designated eight brackish groundwater production zones: one zone in the Carrizo-Wilcox Aquifer south of the Colorado River, four zones in the Gulf Coast Aquifer and bordering sediments, and three zones in the Rustler Aquifer. No zones were identified in the Blaine Aquifer. Summaries of each aquifer study were included in the 2016 Biennial Report on Seawater and Brackish Groundwater Desalination submitted to the Texas Legislature by December 1, 2016.

In March 2019, the TWDB designated a total of 23 brackish groundwater production zones: 3 zones in the Blossom Aquifer, 5 zones in the Nacatoch Aquifer, and 15 zones in the Northern Trinity Aquifer. No zones were identified in the Lipan Aquifer. Summaries of each aquifer study were included in the 2020 Biennial Report on Seawater and Brackish Groundwater Desalination submitted to the Texas Legislature on December 1, 2020.

Status of legislative implementation

The $2 million appropriated in 2019 from the 86th Session General Appropriations Act, Article VI, TWDB Rider 24, was divided into two funds: (1) $318,554 for two additional full-time

employees in the BRACS Program and (2) $1,681,446 for contract costs to support studies related to designating zones in aquifers of the state, excluding the Dockum Aquifer. The funding was from General Revenue and lapsed on August 31, 2021.

In November 2019, the TWDB hired two full-time employees to fill the additional positions. Contracts were executed with consulting firms qualified to perform specific tasks (Table 1) for aquifer studies such as data entry, water quality sampling, and core testing. A contract was also executed with a consulting firm to complete an injection well buffer study to model the distance injected fluids may have migrated both laterally and vertically from Class II salt-water disposal and flag enhanced oil recovery injection wells. Based on the study results, the TWDB will assemble guidance determining the appropriate buffer distance needed to prevent production of injected fluids by groundwater wells in designated brackish groundwater production zones. The TWDB has also met with state agencies to discuss technical and regulatory research topics related to brackish groundwater development. The additional $2 million appropriated in 2021 from the 87th Session General Appropriations Act, Article VI, TWDB Rider 4, will be used to continue this work.

Table 1. BRACS studies contracted in FY 2020 and FY 2021

Study	Description	Contracted budget
Brackish Groundwater Comingling	Studied the comingling of groundwaters with different salinities with the Texas Department of Licensing and Regulation as a stakeholder	$137,700
Seismic Interpretation	Prepared a resource document detailing the availability, limitations, and usefulness of seismic data in mapping brackish aquifers (1,000- to 5,000-feet depth)	$150,000
Data Entry for Upper Coastal Plain System Aquifers in East Texas	Entered well information into the BRACS Database from nearly 20,000 unprocessed logs in 55 counties within the study area	$226,000
Core Testing for Hill Country Trinity Aquifer	Tested and analyzed cores of brackish aquifers for mineralogy, porosity, permeability, and cementation properties	$219,710
Drilling and Logging an Ideal Exploratory Well	Prepared a resource document that details how to drill and log the ideal exploratory brackish groundwater wells	$135,000
Develop Procedures and Tools to Delineate Areas Designated or Used for Class II Well Wastewater Injected Fluids	Developed technically defensible procedures and tools to map injected fluid migration from Class II injection wells over 30- and 50-year horizons	$500,000

Study	Description	Contracted budget
Sampling of Higher Salinity Groundwater	Collected and analyzed samples of high salinity (3,000 to 35,000 mg/L total dissolved solids) water from water wells	$222,300
Core Testing and Numerical Well Simulations for Edwards-Trinity (Plateau) Aquifer	Tested and analyzed cores to obtain brackish aquifer properties and simulated well logs to perform sensitivity analysis of salinity estimations	$90,736
TOTAL		$1,681,446

Table 2. Brackish aquifer studies conducted by the TWDB in FY 2021 and FY 2022

Aquifer	Estimated completion	Scope of work
Hill Country Trinity Aquifer	Fall 2021	Evaluate publicly available water well records, geophysical well logs, and geologic reports. Enter information into the BRACS Database. Map brackish aquifers and their hydraulic properties. Estimate salinity of groundwater from water well records and geophysical well logs. Estimate volumes of brackish groundwater. Prepare GIS files and report document(s).
Sparta Aquifer, East Texas	Fall 2022	
Edwards-Trinity (Plateau) Aquifer	Winter 2023	

Note: Refer to www.twdb.texas.gov/groundwater/bracs/studies.asp for status of brackish aquifer studies.

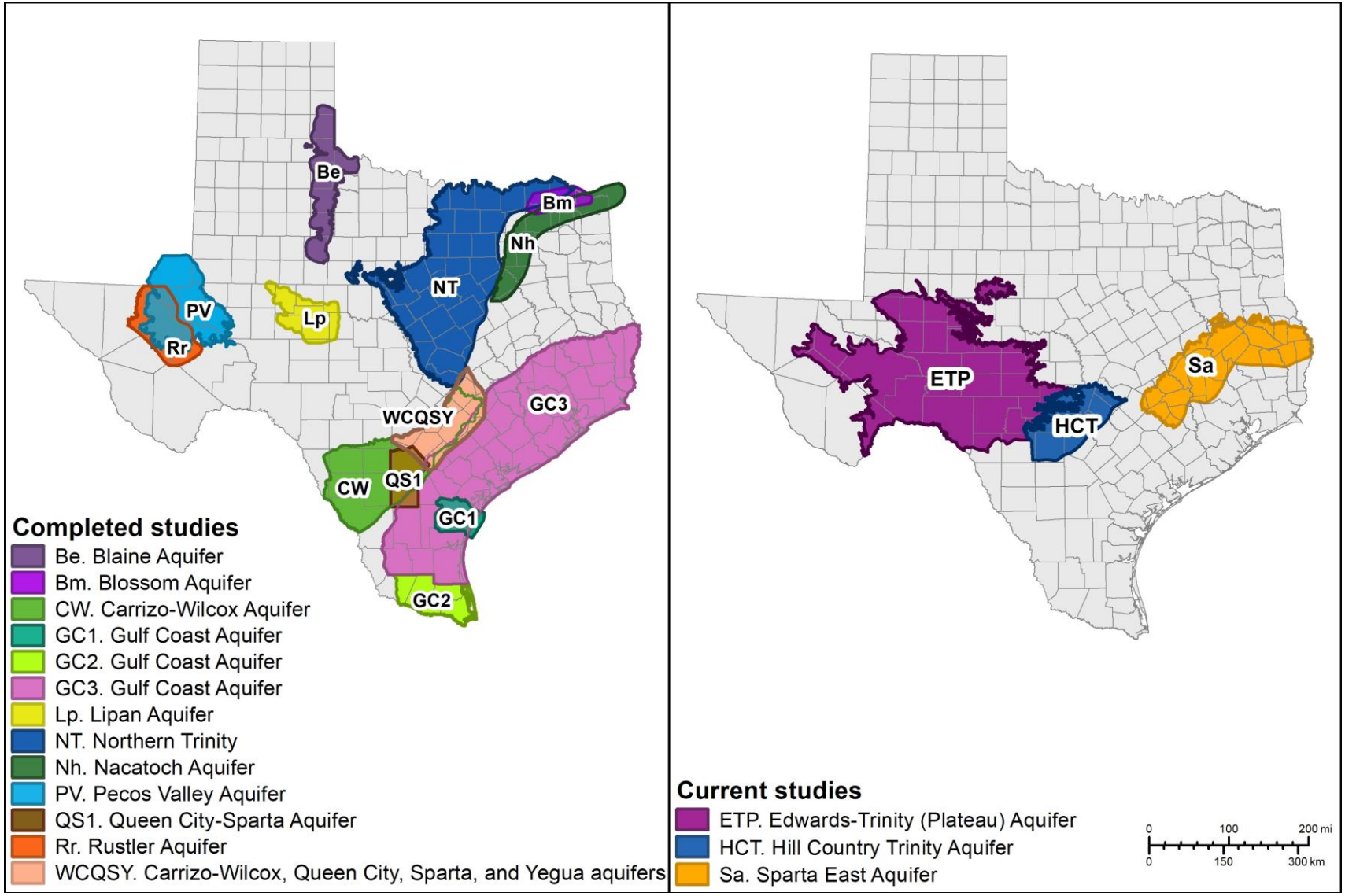

Figure 1. Completed and current aquifer studies of the Brackish Resources Aquifer Characterization System Program.

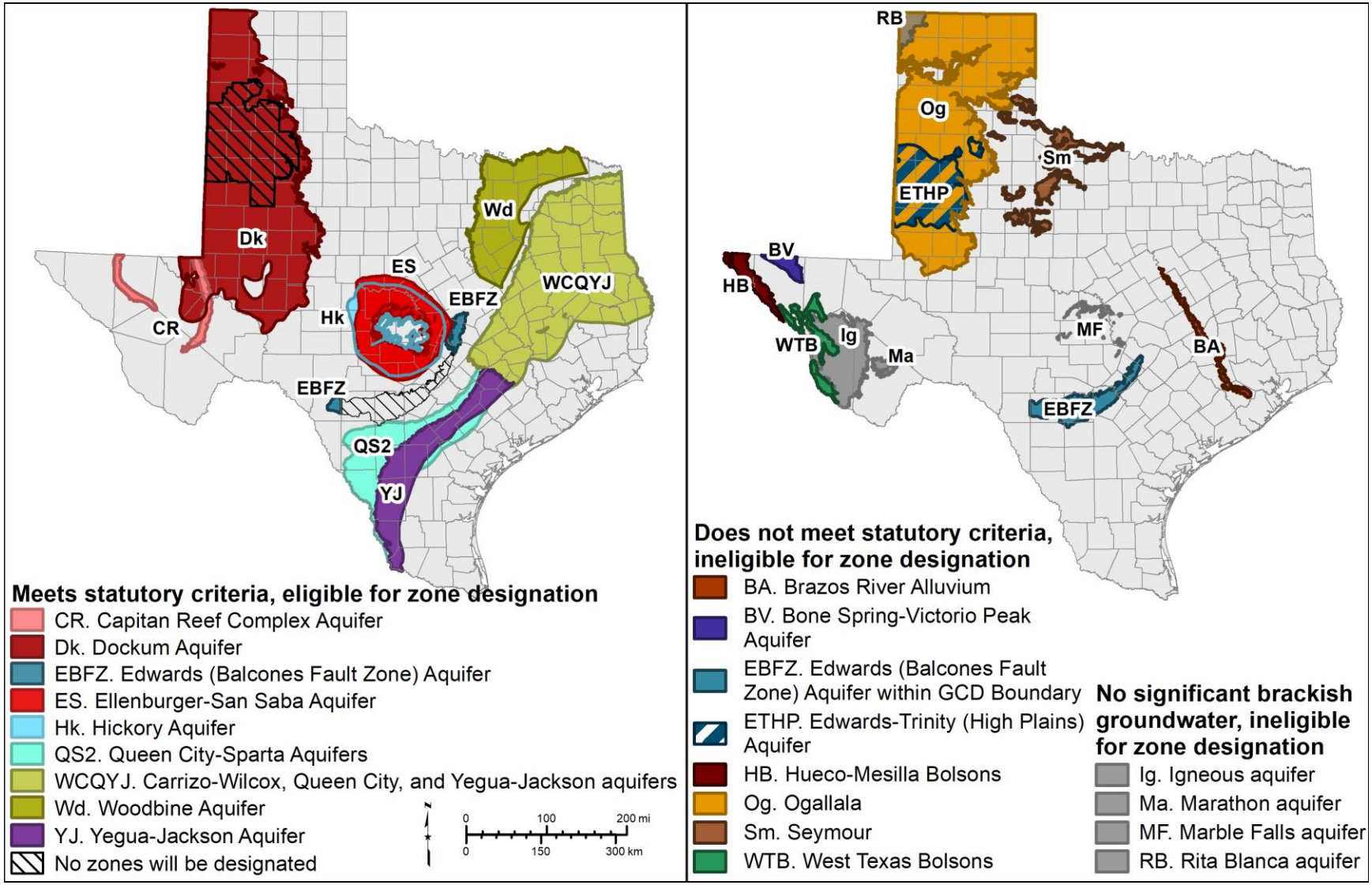

Figure 2. Future aquifer studies that will be evaluated for zone designation in eligible aquifers (left side) and the remaining aquifers to be characterized after the legislative deadline (right side).

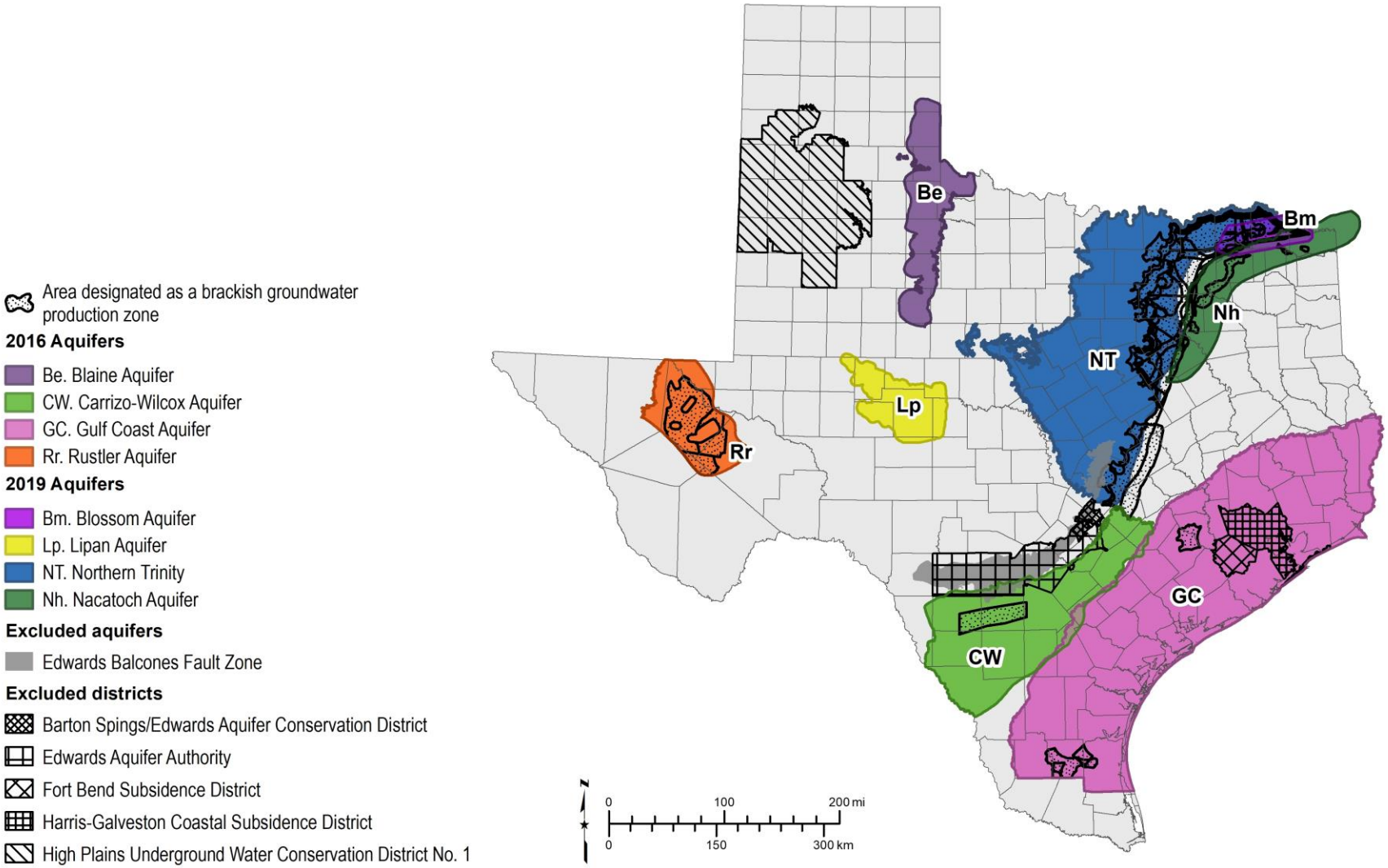

Figure 3. Aquifer studies evaluated for brackish groundwater production zone designation and excluded aquifers and districts per legislation.