

# **Survey of Springs Issuing from the Trinity Aquifer in the Vicinity of Northern Bexar County, Texas**

## **INTRODUCTION**

The karstic Trinity aquifer is a major source of water for central Texas. In the vicinity of northern Bexar County the Trinity aquifer supplies water for domestic, stock and public supply wells. Springs issuing from the Trinity aquifer ultimately supply recharge to either deeper portions of the Trinity aquifer and/or the Edwards aquifer which lies down gradient from the outcrops of the Trinity aquifer. In addition, spring flow sustains numerous aquatic and terrestrial species. In recent years, urban growth has occurred at a rapid rate in the vicinity of northern Bexar County. Along with the population growth, there has been an increased demand for water from the Trinity aquifer. The effects of possible increased pumping on springs issuing from the Trinity aquifer have not been documented. In most cases, the precise location and amount of discharge from the springs issuing from the Trinity aquifer is not known. Many of the springs in the vicinity of northern Bexar County issuing from the Trinity aquifer may support habitat for various wildlife species. Continued withdrawals from the Trinity aquifer could affect perennially flowing springs which might lead to cessation of flow. It is also possible that some of the springs issuing from the Trinity aquifer have robust flow characteristics that are resistant to the effects of increased pumping. It is important to gain knowledge of the hydrogeologic characteristics of each spring to differentiate between which springs can sustain flow despite increasing water use and those that will not sustain flow with increased withdrawals.

## **PROBLEM**

More information is needed to develop a better understanding of the hydrologic properties of the Trinity aquifer in order to determine the effects on groundwater movement and storage in Bexar County. The lack of data in this region severely limits the ability of water managers to effectively manage the resources of the aquifer.

## **OBJECTIVES AND SCOPE**

The objectives of this study are 1) to review available data on location of Trinity aquifer springs in northern Bexar County and develop a database of springs, 2) to conduct a field reconnaissance of springs and to collect discharge and physiochemical properties from selected springs, and 3) publish a USGS report, including Geographical Information System (GIS) database, documenting location and characteristics of springs.

The scope of the study is the recharge zone of the Trinity aquifer in the vicinity of northern Bexar County, Texas. The study area boundary coincides with the Bexar County line and with the outcrops of the Edwards aquifer.

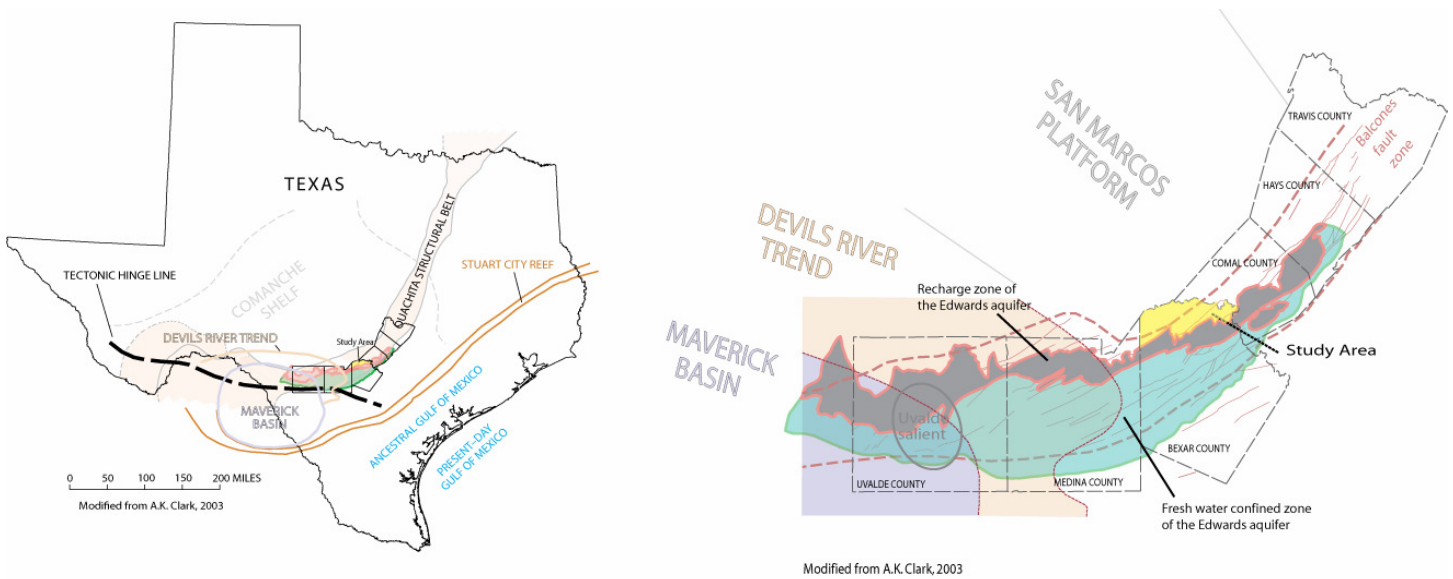


Figure 1. Location of study area and major depositional provinces (middle Cretaceous), structural features and hydrogeologic zones of the Edwards aquifer.

## RELEVANCE AND BENEFITS

Results of this study will provide valuable information on the location and water quality characteristics of springs within the Trinity aquifer in the vicinity of northern Bexar County, Texas, and aid in establishing a connection between groundwater circulation within the Trinity aquifer. It will also aid in identifying springs that may provide habitat for various wildlife species.

Results from this study will benefit the U.S. Geological Survey Strategic Directions Program by conducting an assessment in an area where there are critical ground-water issues by adding to the scientific body of knowledge about the complex geology and hydrology of the Trinity aquifer.

## APPROACH

The project will be conducted in three phases. Phase 1 will be conducted in FY10 and will involve a literature review of available data on locations of Trinity aquifer springs in Bexar County. Phase 2 will be conducted in FY11 and will involve field reconnaissance of locations and data collection of selected springs. In phase 3 of the study a USGS report will be reviewed and published during FY12.

### **Phase 1---Review of locations of historical springs issuing from the Trinity aquifer**

Phase 1 of the project will begin with a review of available data which will include, but not be limited to maps, reports, and electronic databases. In some cases, springs are represented on topology maps but they are not in USGS or State of Texas databases listing spring locations. There are also springs in databases that have not been field verified. Additional springs that might not listed in available databases or shown on existing maps are also likely in the study area, and could possibly represent the majority of springs in the study area. Additional relevant historical information on springs will be noted which will include names of land owners and written historical accounts of the history of the springs. Locations of recorded springs will be entered into a Geographic Information System (GIS) and a draft map of the springs will be created. The review of historical information (draft database and map) will be presented to the Trinity Glen Rose Groundwater Conservation District (GCD) prior to proceeding to Phases 2 and 3.

#### Tasks

1. Review historical information of springs
2. Create a geodatabase and map of spring location
3. Present data to the Trinity Glen Rose GCD

### **Phase 2---Reconnaissance, data collection, and report**

After completion of the review of available literature and development of a spring geodatabase in Phase 1, Phase 2 will include a field reconnaissance of selected springs to verify location and to collect discharge and water-quality data. Spring discharge will be measured, as near as possible to the spring orifice. If measurement conditions are such that an accurate measurement cannot be made, discharge will be estimated. Water quality field parameters will also be recorded including pH, temperature, and conductivity. The exact spring locations will be obtained utilizing a GPS (Global Positioning System). The springs will be photographed and documented with a site descriptions and location maps. In addition historical information from the land owners will be recorded, if possible. Relevant hydrologic information will be noted such as exact geologic unit the spring is issuing from, distance till water re-enters the groundwater system, etc. These data will be entered into the USGS GWSI database.

After completion of the spring reconnaissance, the spring geodatabase will be updated, as necessary, according to information obtained through the field reconnaissance. A draft USGS report (open-file report) will be produced. The report will include a map and tables documenting location of springs and discharge and physiochemical properties associated with selected springs.

#### Tasks

1. Complete field reconnaissance to precisely locate springs

2. Obtain discharge measurements and physiochemical properties (pH, specific conductance, temperature) of selected springs
3. Produce draft report

### **Phase 3---Report review and publishing**

During phase 3 the USGS draft report will undergo technical/peer review and will be published as an open-file report.

### **QUALITY ASSURANCE**

The Texas Water Science Center's Quality Assurance Plan (QAP) for collection of groundwater and water quality data will be followed to ensure the quality, precision, accuracy, and completeness of the data generated during the study. The QAP describes the methods and the procedures used by the USGS in Texas to collect hydrologic and water quality data.

### **REPORT AND DELIVERABLES**

Results from the study will be provided to the cooperator and incorporated into an interpretive report, to be produced in FY11. The report will be an Open File Report (OFR) that describes the methods and the results of all phases of the project, including the data collected. These data will also be provided to the cooperator in a digital and/or paper format. Geographic information system (GIS) layers and associated meta-data will be developed using GIS software and provided to the cooperator in appropriate format.

### **PERSONNEL**

Allan Clark, hydrologist with the USGS South Texas Program Office in San Antonio, will serve as project chief for this study. Additional technical assistance will be provided as needed from the USGS San Antonio and Austin offices, including GIS support. Research personnel of the USGS are available as a technical resource to ensure the successful completion of the project.

## TIMELINE

A project timeline is shown below. The timeline is based on the project beginning in Oct 2009. Phase 1 tasks are expected to be completed in Q1 of FY10. Phase 2 tasks, including completion of a USGS report will be completed by the end of FY11 (September 2011).

TASK	FY10	FY11	FY12
Phase 1 – Research and compile locations of historical springs, including development of a GIS database of spring locations (Q1 FY10)			
Phase 2 – Verify and document location of springs, including collection of discharge measurements and water-quality measurements at selected springs. Develop a draft USGS open-file report (Q1-Q4 FY11)			
Phase 3 – Review and publish USGS report (Q1-Q3 FY12)			

## BUDGET

Category	FY10	FY11	FY12	Total
Phase 1 – Review of historical data	\$ 28,000			\$ 28,000
Phase 2 – Documentation, data collection and draft report		\$ 32,000		\$ 32,000
Phase 3 – Report review and publishing			\$ 32,000	\$ 32,000
Total	\$ 28,000	\$ 32,000	\$ 32,000	\$ 92,000

## AGENCY CONTRIBUTIONS

Depending on fund availability and authorization, the U.S. Geological Survey will contribute matching funds according to the table below in FY10. Availability of matching funds for FY11 and FY12 are not yet known.

Agency	FY10	FY11	FY12	TOTAL
Trinity Glen Rose Groundwater Conservation District	\$18,000	--	--	--
U.S. Geological Survey	\$10,000	--	--	--
<b>Total</b>	<b>\$28,000</b>	<b>\$32,000</b>	<b>\$32,000</b>	<b>\$92,000</b>