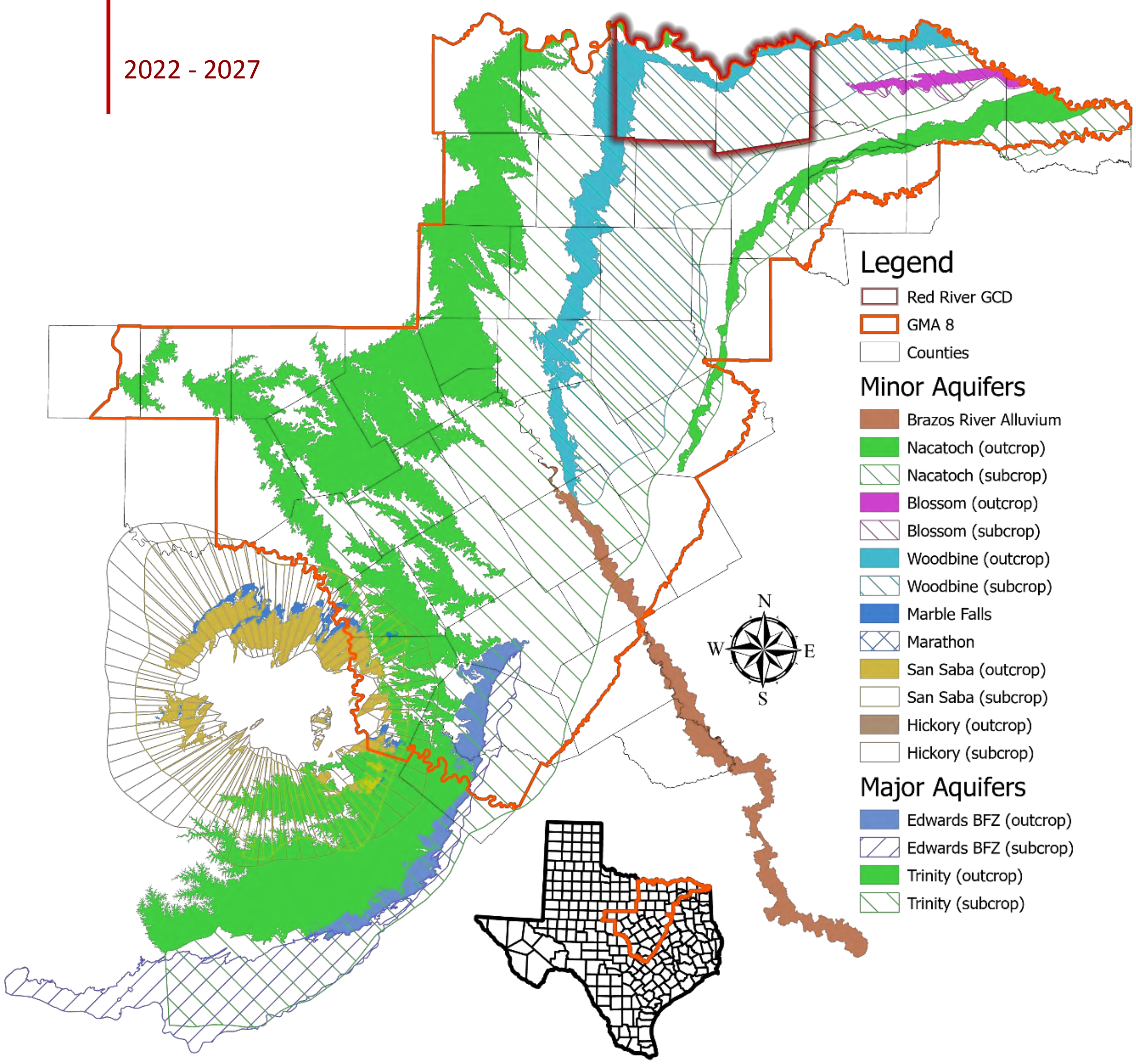
RED RIVER
GROUNDWATER CONSERVATION DISTRICT

2022 Management Plan

2022 - 2027



Adopted June 23, 2022

RED RIVER
GROUNDWATER CONSERVATION DISTRICT

P.O. Box 1214
Sherman, TX 75091-1214
(800) 256-0935
rrgcd@redrivergcd.org
www.redrivergcd.org

Table of Contents

INTRODUCTION

The Red River Groundwater Conservation District (the District), after notice and hearing, adopts this Management Plan according to the requirements of Texas Water Code §36.1071. The Red River Groundwater Conservation District Management Plan represents the management goals of the District for the next five years, including the desired future conditions of the aquifers within the jurisdictional boundaries of the District. These desired future conditions were adopted through the joint planning process in Groundwater Management Area 8 as prescribed in Chapter 36, Texas Water Code.

DISTRICT MISSION

The mission of the District is to develop and adopt a management plan and develop and enforce rules to provide protection to protect existing wells and the rights of landowners, prevent waste, promote conservation, provide a framework that will allow availability and accessibility of groundwater for future generations, protect the quality of the groundwater in the recharge zone of the aquifers, ensure that the residents of Fannin and Grayson counties maintain local control over their groundwater, and operate the District in a fair and equitable manner for all residents.

STATEMENT OF GUIDING PRINCIPLES

The District is committed to manage and protect the groundwater resources within its jurisdiction and to work with others to ensure a sustainable, adequate, high quality and cost-effective supply of water, now and in the future. The District will strive to develop, promote, and implement water conservation, augmentation, and management strategies to protect water resources for the benefit of the citizens, economy, and environment of the District. The preservation of this most valuable resource can be managed in a prudent and cost-effective manner through conservation, education, and management. Any action taken by the District shall only be after full consideration and respect has been afforded to the individual property rights of all citizens of the District.

HISTORY AND PURPOSE OF THE MANAGEMENT PLAN

The purpose of the management plan is to identify the goals of the District and to document the management objectives and performance standards that will be used to accomplish those goals.

The 75th Texas Legislature in 1997 enacted Senate Bill 1 (SB 1) to establish a comprehensive statewide water planning process. In particular, SB 1 contained provisions that require each groundwater conservation district (GCD) to prepare a management plan to identify the water supply resources and water demands that will shape the decisions of the GCD. SB 1 designed the management plans to include management goals for each GCD to manage and conserve the groundwater resources within their boundaries. In 2001, the Texas Legislature enacted Senate Bill 2 (SB 2) to build on the planning requirements of SB 1 and to further clarify the actions necessary for GCDs to manage and conserve the groundwater resources of the state of Texas.

The Texas Legislature enacted significant changes to the management of groundwater resources in Texas with the passage of House Bill 1763 (HB 1763) in 2005. HB 1763 created a long-term planning process in which GCDs in each Groundwater Management Area (GMA) were required to meet and determine the Desired Future Conditions (DFCs) for the groundwater resources within their boundaries by September 1, 2010. In 2011, Senate Bills 660 and 737 further modified these groundwater laws and GCD management requirements in Texas.

Texas groundwater law is clear in establishing the sequence that a GCD is to follow in accomplishing statutory responsibilities related to the conservation and management of groundwater resources. The three primary steps, each of which must occur at least once every five years, are the following: (1) to adopt desired future conditions (Texas Water Code Section 36.108(c)), (2) to develop and adopt a management plan that includes goals designed to achieve the desired future conditions (Texas Water Code Section 36.1071(a)(8)), (3) to amend and adopt rules necessary to achieve goals included in the management plan (Texas Water Code Section 36.101(a)(5)).

Senate Bill 660 required that GMA representatives must participate within each applicable regional water planning group (RWPG). It also required the Regional Water Plans (RWP) be consistent with the DFCs in place when the regional plans are initially developed. TWDB technical guidelines indicate that the MAG volume (within each county and basin) is the maximum amount of groundwater that can be used for existing uses and new strategies in the Regional Water Plans. In other words, the MAG volumes are a cap on groundwater production for TWDB planning purposes.

"Managed available groundwater" was redefined as "modeled available groundwater" in Senate Bill 737 by the 82nd Legislature. Modeled available groundwater is "the amount of water that can be produced on an average annual basis" to achieve a desired future condition.

CRITERIA FOR PLAN APPROVAL

PLANNING HORIZON

This management plan becomes effective upon adoption by the District Board of Directors and subsequent approval by the Executive Administrator of the Texas Water Development Board (TWDB). This management plan incorporates a planning period of five years in accordance with 31 Texas Administrative Code (TAC) §356.5(a).

BOARD RESOLUTION

A certified copy of the Red River Groundwater Conservation District resolution adopting the plan is located in Appendix A: Resolution Adopting the Management Plan.

PLAN ADOPTION

Public notices documenting that the plan was adopted following appropriate public meetings and hearings are located in Appendix B: Evidence that the Management Plan was Adopted.

COORDINATION WITH SURFACE MANAGEMENT ENTITIES

A template letter transmitting copies of this plan to the surface water management entities in the District along with a list of the surface water management entities to which the plan was sent are located in Appendix C: Evidence that the District Coordinated Development of the Management Plan with the Surface Entities.

DISTRICT INFORMATION

CREATION

The District was created by the 81st Texas Legislature under the authority of Section 59, Article XVI, of the Texas Constitution, and in accordance with Chapter 36 of the Texas Water Code (Water Code), by the Act of May 25, 2009, 81st Leg., R.S., Ch. 248, 2009 Tex. Gen. Laws 686, codified at Tex. Spec. Dist. Loc. Laws Code Ch. 8859 ("the District Act").

The District is a governmental agency and a body politic and corporate. The District was created to serve a public use and benefit and is essential to accomplish the objectives set forth in Section 59, Article XVI, of the Texas Constitution. The District's boundaries are coextensive with the boundaries of Fannin and Grayson Counties, Texas, and lands and other property within these boundaries will benefit from the works and projects that will be accomplished by the District.

LOCATION AND EXTENT

The District's boundaries are coextensive with the boundaries of Grayson and Fannin Counties, Texas. The District covers an area of approximately 1,878 square miles. Figure 1 is a map of the District's jurisdiction.

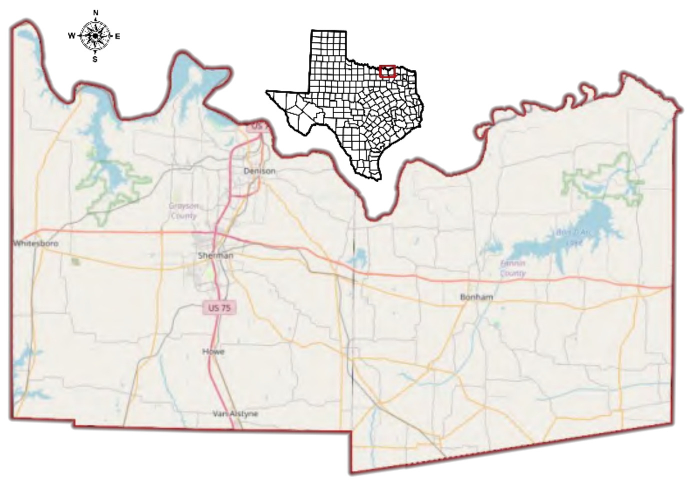


Figure 1: Map of the District's Jurisdiction.

DIRECTORS

The District is governed by a board of seven appointed directors. Directors serve staggered four-year terms, with the terms of three or four directors from each appointing county expiring on August 31 of each odd-numbered year. A director serves until the director's successor has qualified to serve.

AUTHORITY AND FRAMEWORK

The District has the rights and responsibilities provided for in Chapter 36 of the Texas Water Code and Chapter 356, Title 31 of the Texas Administrative Code. The District is charged with conducting hydrogeological studies, adopting a management plan, providing for the permitting of certain water wells, and implementing programs to achieve statutory mandates. The District has rulemaking authority to implement the policies and procedures needed to manage the groundwater resources of Grayson and Fannin Counties.

TOPOGRAPHY AND DRAINAGE

The District is located within the Red, Trinity and Sulphur River Basins. The northern two-thirds of Grayson and Fannin Counties drain north and east to the Red River, the southern portion of

Grayson County drains toward the south to the Trinity River, the southeastern one-third of Fannin County drains east to the Sulphur River. Elevations in the District range from approximately 500 to 900 ft. above mean sea level (AMSL) and the physiography consists primarily of gently rolling prairieland, blacklands, woodlands and wooded bottomlands in the river valleys. Average annual rainfall is about 43 inches.

POPULATION

Primary activities involved in the development of a water resources management plan include the analysis and development of projections of population, historical and current water use, and water demands in the future (for a defined period of time). In order to develop projections for how much water supply we will need in the future, three questions must be answered: (1) how many people are there now and how much water has been used in the recent past, (2) how many people will there be in the future (population projections), and (3) how much water will be required to meet the needs of the projected population and other water use sectors in the future. These analyses to develop water demand projections are primarily conducted in Texas as part of the regional water supply planning process (created by the 75th Texas Legislature through the passage of Senate Bill 1 in 1997). Water demand projections are developed for the following water user categories; municipal, rural (county-other), irrigation, livestock, manufacturing, mining, and steam-electric power generation.

Based on the 2021 Region C Water Plan, the population projection for the District for 2020 was 173,611 increasing 173.5% to 474,852 in 2070 (Figure 2).

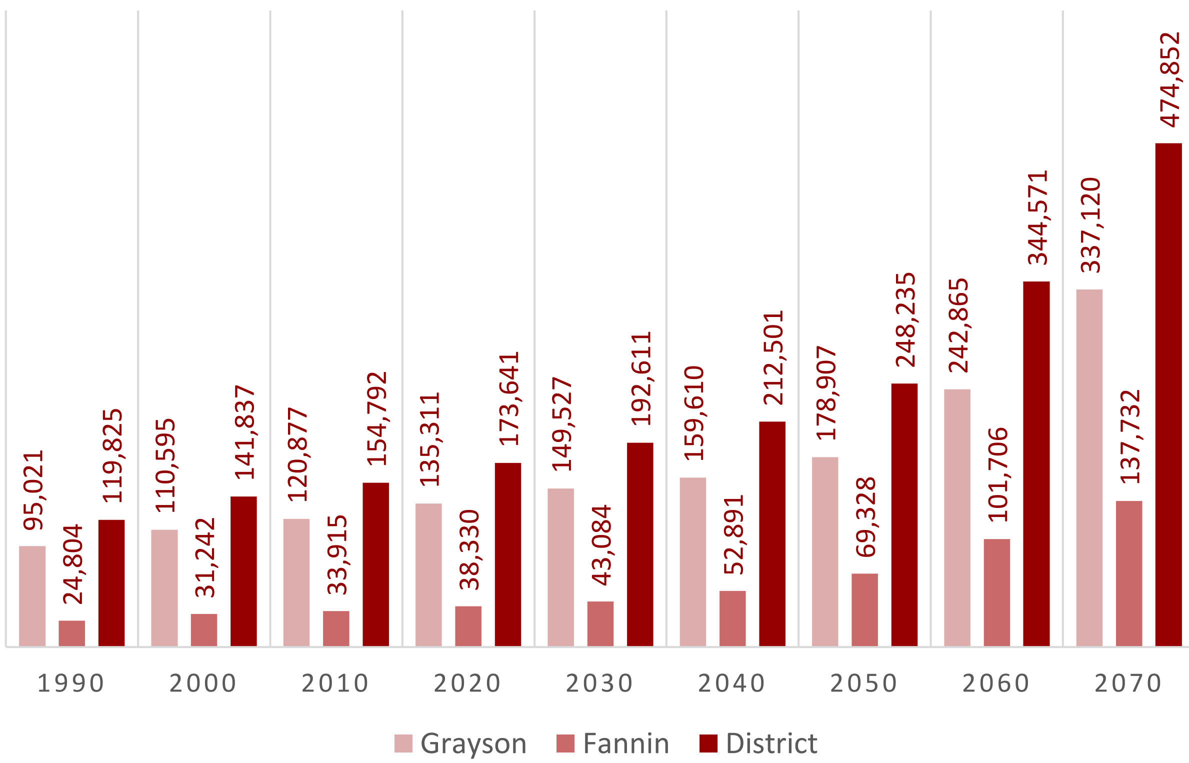


Figure 2: Population Trends

DISTRICT RULES AND MANAGEMENT OF GROUNDWATER

With substantial input and feedback from stakeholders, the District's Board of Directors established the District's Rules in accordance with state law to successfully implement the management plan. The Rules are strictly and fairly enforced. The District may amend the Rules as necessary to comply with changes to Texas law and to ensure the best management of the groundwater within the District. The Rules govern the management strategies of the District, including, but not limited to, well registration, permitting, well spacing, production limitations, water production reporting and fees, waste of groundwater, and achieving DFCs. The District executes its responsibilities with transparency and places stakeholder involvement as a priority. All District documents are made available to the public pursuant to the Texas Public Information Act. In addition to the District's management plan, the District's Rules can be obtained online from the District's website: www.redrivergcd.org and from the District's office.

GENERAL GEOLOGY AND HYDROLOGY

The Trinity Aquifer consists of early Cretaceous Period formations of the Trinity Group where they occur in a band extending through the central part of the state in all or parts of 55 counties, from the Red River in North Texas to the Hill Country of South-Central Texas. Trinity Group deposits also occur in the Panhandle and Edwards Plateau regions where they are included as part of the Edwards-Trinity (High Plains and Plateau) aquifers.

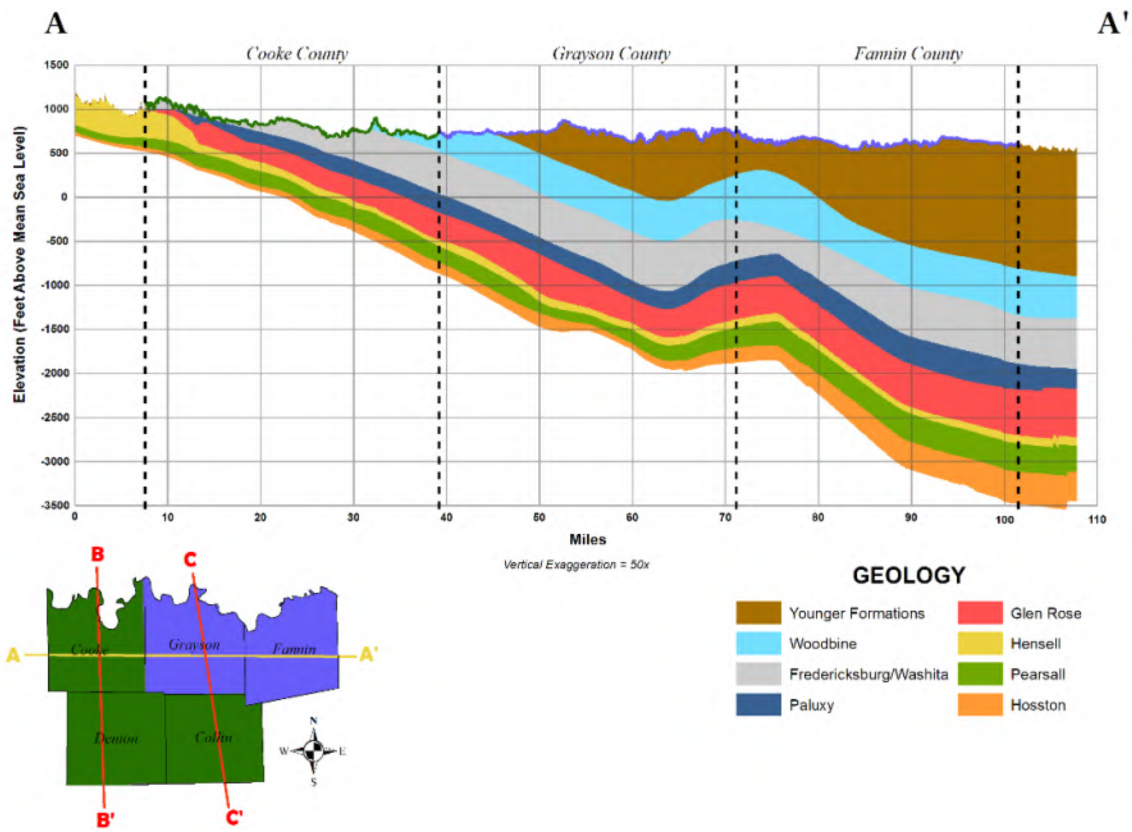


Figure 3: Cross Section of the Woodbine and Trinity Aquifer from A to A'.

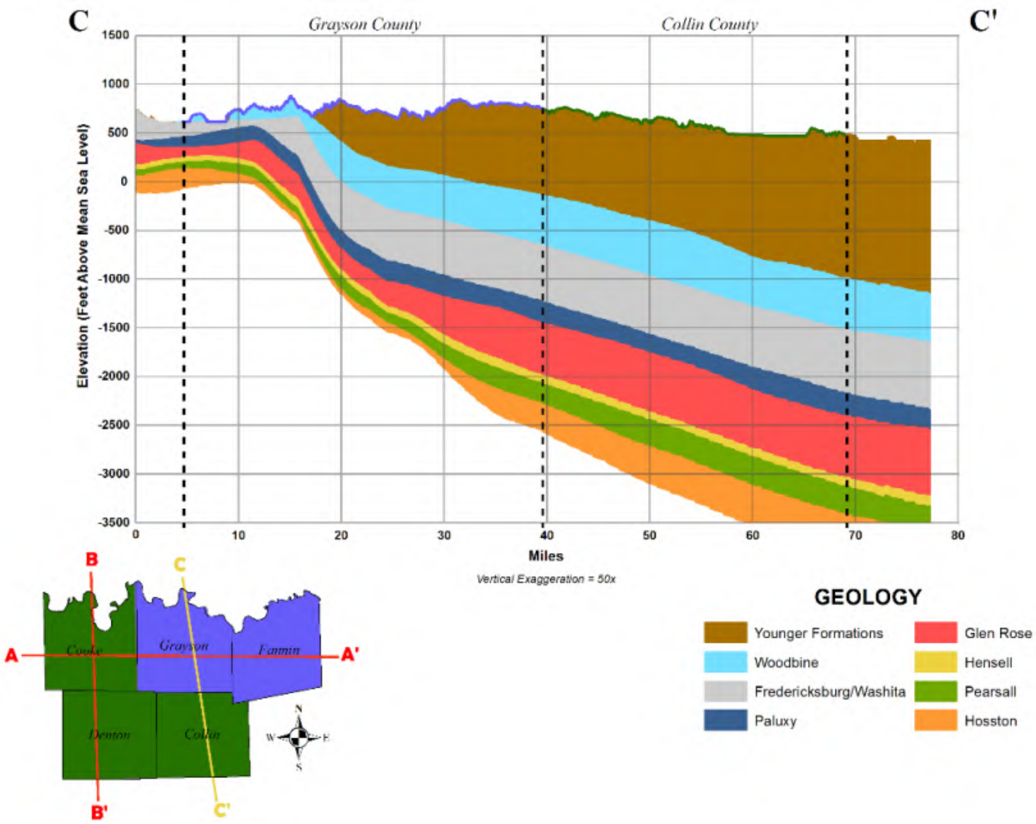


Figure 4: Cross Section of the Woodbine and Trinity Aquifer from C to C'.

Formations comprising the Trinity Group are (from youngest to oldest) the Paluxy, Glen Rose, and Twin Mountains-Travis Peak. Up-dip, where the Glen Rose thins or is missing, the Paluxy and Twin Mountains coalesce to form the Antlers Formation. The Antlers consists of up to 900 feet of sand and gravel, with clay beds in the middle section. Water from the Antlers is mainly used for irrigation in the outcrop area of North and Central Texas. Forming the upper unit of the Trinity Group, the Paluxy Formation consists of up to 400 feet of predominantly fine-to-coarse-grained sand interbedded with clay and shale. The formation pinches out downdip and does not occur south of the Colorado River.

Underlying the Paluxy, the Glen Rose Formation forms a gulf-ward-thickening wedge of marine carbonates consisting primarily of limestone. South of the Colorado River, the Glen Rose is the upper unit of the Trinity Group and is divisible into an upper and lower member.

The basal unit of the Trinity Group consists of the Twin Mountains and Travis Peak formations, which are laterally separated by facies change. To the north, the Twin Mountains formation consists mainly of medium- to coarse-grained sands, silty clays, and conglomerates. The Twin Mountains is the most prolific of the Trinity Aquifer in North-Central Texas; however, the quality of the water is generally not as good as that from the Paluxy or Antlers Formations. To the south, the Travis Peak Formation contains calcareous sands and silts, conglomerates, and limestones. The formation is subdivided into the following members in descending order: Hensell, Pearsall, Cow Creek, Hammett, Sligo, Hosston, and Sycamore.

The depth to the top of the Trinity Group Antlers and Paluxy formations ranges between approximately 500 feet in northwest Grayson County to over 3,500 feet in southeast Fannin County. The depth to the base of Cretaceous ranges between 900 ft and 4,500 feet from northwest to southeast across Grayson and Fannin counties. The total thickness of the Trinity Formations ranges from 400 and 1,000 feet across the District.

The Woodbine Aquifer extends from McLennan County in North-Central Texas northward to Cooke County and eastward to Red River County, paralleling the Red River. Groundwater produced from the aquifer furnishes municipal, industrial, domestic, livestock, and small irrigation supplies throughout its North Texas extent. The Woodbine Formation is composed of water-bearing sandstone beds interbedded with shale and clay. Within the District, the Woodbine Formation dips eastward into the subsurface where the top of the formation reaches a maximum depth of approximately 1,200 feet below land surface and a maximum thickness of approximately 600 feet near the eastern Fannin County line.

The Woodbine Aquifer is divided into three water-bearing zones that differ considerably in productivity and quality. Only the lower two zones of the aquifer are developed to supply water for domestic and municipal uses. Chemical quality deteriorates rapidly in well depths below 1,500 feet. In areas between the outcrop and this depth, quality is considered good overall as long as ground water from the upper Woodbine is sealed off. The upper Woodbine contains water of extremely poor quality in downdip locales and contains excessive iron concentrations along the outcrop. Cross sections through the aquifers are included as *Figure* 3 and Figure 4.

RED RIVER ALLUVIUM WITHIN THE DISTRICT

A review of state well reports in both northern Fannin County and the northeast corner of Grayson County indicates that significant water-bearing alluvial deposits have accumulated along the Red River Basin. The depth from land surface to the base of the river alluvium occurs up to a maximum depth of about 95 feet, with an average alluvium thickness of 50 feet. The thick deposits that parallel the sides of the river channel are a result of the river downcutting through existing fluvial deposits, which are typically composed of clay, sand, and gravel. Gravel is usually identified at the base of the alluvial sequences. The extent of the alluvial aquifer in the District is shown on Figure 5.

There are 66 wells registered within the District that have been completed in the alluvium that have not been plugged or drilled as dry holes. Ten of those wells are non-exempt. These numbers are based on District well registry data collected through October 2015.

Sand pit operations that are located in the alluvium aquifer discharge a significant amount of groundwater for dewatering operations. Other uses include irrigation and domestic use. Well yields range from one gallon per minute (GPM) to 150 GPM, with an average yield of approximately 25 GPM.

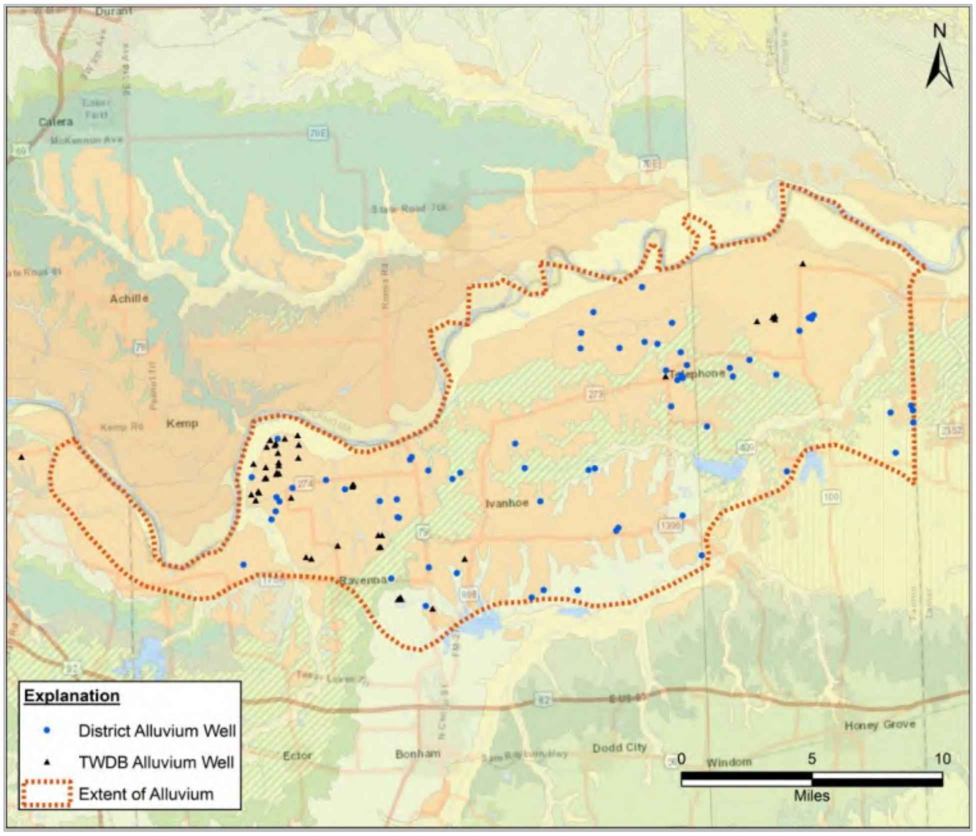


Figure 5: Extent of Red River Alluvium within the District.

MODELED AVAILABLE GROUNDWATER BASED ON THE DESIRED FUTURE CONDITIONS

Texas Water Code § 36.001 defines modeled available groundwater as "the amount of water that the executive administrator determines may be produced on an average annual basis to achieve a desired future condition established under Section 36.108."

The amount of water that may be permitted from an aquifer is not the same amount as the total amount that can be pumped from an aquifer. Total pumping includes uses of water both subject to permitting and exempt from permitting ("exempt use"). Examples of exempt use include domestic, livestock, and some types of water use associated with oil and gas exploration.

To determine the DFCs, a series of simulations using the TWDB's Groundwater Availability Model ("GAM") for the Northern Trinity and Woodbine aquifers were completed. Each GAM simulation was done by iteratively applying various amounts of simulated groundwater pumping from the aquifer over a predictive period that included a simulated repeat of the drought of record. Pumping was increased until the amount of pumping that could be sustained by the aquifer without impairing the aquifer conditions selected for consideration as the indicator of the aquifer desired future condition was identified.

The desired future conditions of the Northern Trinity and Woodbine aquifers in GMA 8 are documented in GAM Run 17-029 MAG, which is included as Appendix D. The DFCs are based on average drawdown in feet after 50 years for each Trinity and Woodbine aquifers.

In the District, the geologic units comprising the Trinity are the Antlers (which includes all of the Trinity Group formations), the Paluxy Sand, the Glen Rose Limestone, and the Twin Mountain (which includes the Hensell and the Hosston formations that are differentiated further to the south).

The joint planning process set forth in Texas Water Code § 36.108 must be collectively conducted by all groundwater conservation districts within the same GMA. The District is a member of GMA 8. During the second round of joint planning, GMA-8 passed and adopted a resolution proposing DFCs for all relevant aquifers by letter dated April 1, 2016. The adopted DFCs were then forwarded to the TWDB for development of the MAG calculations. At the time of the adoption of this management plan, GMA 8 is in the process of adopting new DFCs. The new MAG will replace the GAM Run 17-029 MAG and the new MAG is expected to be available later in 2022. The new MAG will be posted on the District's website with this management plan. A summary the modeled available groundwater is presented in Table 1 below.

Table 1: Estimates of Modeled Available Groundwater for pumping within the District (GAM Run 17-029 MAG).

County	Aquifer	2020	2030	2040	2050	2060	2070
Fannin	Trinity (Antlers)	2,092	2,087	2,092	2,087	2,092	2,087
	Woodbine	4,934	4,920	4,934	4,920	4,934	4,920
	Total	7,026	7,007	7,026	7,007	7,026	7,007
Grayson	Trinity (Antlers)	10,738	10,708	10,738	10,708	10,738	10,708
	Woodbine	7,541	7,521	7,541	7,521	7,541	7,521
	Total	18,279	18,229	18,279	18,229	18,279	18,229
District	Trinity (Antlers)	12,830	12,795	12,830	12,795	12,830	12,795
	Woodbine	12,475	12,441	12,475	12,441	12,475	12,441
	Total	25,305	25,236	25,305	25,236	25,305	25,236

Note: Production is in acre-feet.

AMOUNT OF GROUNDWATER BEING USED WITHIN THE DISTRICT

Each year the TWDB conducts an annual survey of ground and surface water use by municipal and industrial entities within the state of Texas. The information obtained is then utilized by the TWDB for water resources planning. The historical water use estimates are subject to revision as additional data and corrections are made available to the TWDB.

Estimates of historical water use in Grayson and Fannin counties in the years 2004 through 2019 is presented in Appendix E. TWDB data included in Appendix E do not differentiate between exempt and non-exempt use.

Estimated groundwater use in the District was approximately 70 percent for municipal use, 16 percent for irrigation use, 8 percent for livestock use, 5 percent for manufacturing use, less than one percent for mining use, and steam-electric power use. In the TWDB Water Use Survey, the municipal use category includes small water providers and rural domestic pumping in addition to municipalities.

Historic water uses from 2004 to 2019 is taken from the 2022 State Water Plan. Table 2 present the historic water usage for Fannin and Grayson counties. Refer to Appendix E for the data table.

Table 2: TWDB's Estimated Historical Water Use by Water Source

County	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
Fannin	Groundwater	3,083	0	2	122	994	1,258	5,459
	Surface Water	1,549	2	912	59	6,908	228	9,657
	Total	4,633	2	914	180	7,902	1,486	15,116
Grayson	Groundwater	9,804	999	30	0	2,028	294	13,155
	Surface Water	8,858	1,064	14	640	491	945	12,012
	Total	18,662	2,063	44	640	2,519	1,238	25,167
District	Groundwater	12,887	999	33	122	3,022	1,552	18,614
	Surface Water	10,407	1,066	926	699	7,399	1,172	21,669
	Total	23,294	2,065	958	820	10,421	2,724	40,283

Note: The data was averaged from 2004 through 2019. For more information on this data, see Appendix E. Production is in acre-feet.

Annual Amount of Recharge of Precipitation

Recharge from precipitation falling on the outcrop of the aquifer (where the aquifer is exposed to the surface) within the Red River GCD was estimated by the TWDB in the GAM Run 21-002 dated January 11, 2022. Water budget values of recharge extracted for the transient model period indicate that precipitation accounts for 2,873 acre-feet per year of recharge to the Trinity Aquifer and 63,673 acre-feet per year of recharge to the Woodbine aquifer within the boundaries of the Red River GCD (Appendix D).

Annual Volume of Discharge from the Aquifer to Springs and Surface Water Bodies

The total water discharged from the aquifer to surface water features such as streams, reservoirs and springs is defined as the surface water outflow. Water budget values of surface water outflow within the Red River GCD were estimated by the TWDB in the GAM Run 21-002 (Appendix D). Modeled values are 1,486 acre-feet per year of discharge from the Trinity Aquifer and 45,461 acre-feet per year of discharge from the Woodbine Aquifer to surface water bodies that are located within the Red River GCD.

Annual Volume of Flow into and out of the District and between Aquifers in the District

Flow into and out of the District is defined as the lateral flow within an aquifer between the District and adjacent counties. Flow between aquifers is defined as the vertical flow between aquifers or confining units that occurs within the boundaries of the District. The flow is controlled by hydrologic properties as well as relative water levels in the aquifers and confining units. Table 3 is a summary of the flows into and out of the District and between aquifers. Water budget values of flow for the Red River GCD were estimated by the TWDB in the GAM Run 21-002 (Appendix D).

Table 3: Summary of Annual Volume of Flow into and out of the District and Between Aquifers

Categories	*Aquifer or Confining Unit*	*Results (ac-ft)*
Estimated annual volume of flow into the District within each aquifer in the District	Trinity Aquifer	4,995
	Woodbine Aquifer	2,151
Estimated annual volume of flow out of the District within each aquifer in the District	Trinity Aquifer	2,999
	Woodbine Aquifer	1,138
Estimated net annual volume of flow between each aquifer in the District	To the Trinity Aquifer from the Washita Group of the Cretaceous System	1,451
	To the Trinity Aquifer from equivalent hydrogeologic units in Oklahoma	3,702
	From the Woodbine Aquifer to equivalent units outside the official Woodbine Aquifer extent	173
	To the Woodbine Aquifer from younger units	6,383
	From the Woodbine Aquifer to Washita and Fredericksburg confining units	5,091
	From the Woodbine Aquifer to equivalent hydrogeologic units in Oklahoma	8,954

PROJECTED WATER SUPPLY NEEDS

PROJECTED SURFACE WATER SUPPLY IN THE DISTRICT

The 2022 Texas State Water Plan, the most recent plan available, provides an estimate of projected surface water supplies in Grayson and Fannin Counties. These estimates are included in Appendix E.

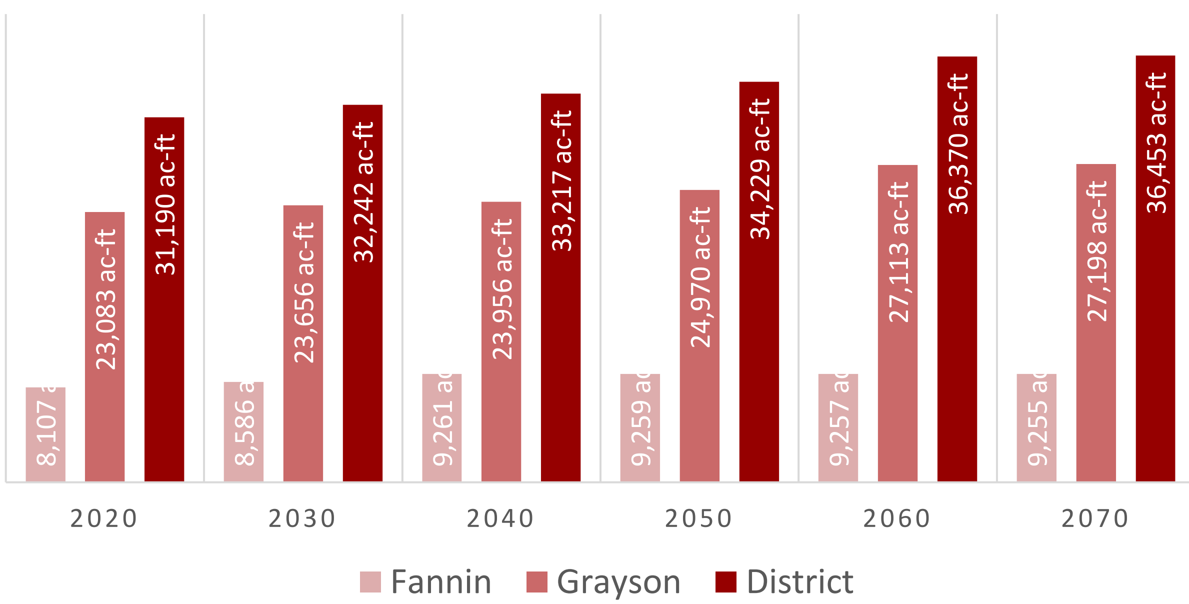


Figure 6: Projected surface water supply within the District by county

Total projected surface water supplies by county are illustrated in Figure 6. The estimated projections range from a maximum of 9,261 acre-feet in 2040 to a minimum of 8,107 acre-feet in 2020 for Fannin County, from a maximum of 27,198 acre-feet in 2070 to a minimum of 23,083 acre-feet in 2020 for Grayson County. They also indicate that projected surface water supplies for the District, which are about 33,950 acre-feet per year, are about double the historical groundwater use in the District, which is about 18,614 acre-feet per year for 2004 through 2019.

PROJECTED TOTAL DEMAND FOR WATER IN THE DISTRICT

Appendix E contains an estimate of projected net water demand in Fannin and Grayson Counties based on the 2022 Texas State Water Plan.

The analyses to develop water demand projections are primarily conducted in Texas as part of the regional water supply planning process (created by the 75th Texas Legislature through the passage of Senate Bill 1 in 1997). Water demand projections are developed for the following water user categories; municipal, rural (county-other), irrigation, livestock, manufacturing, mining, and steam-electric power generation.

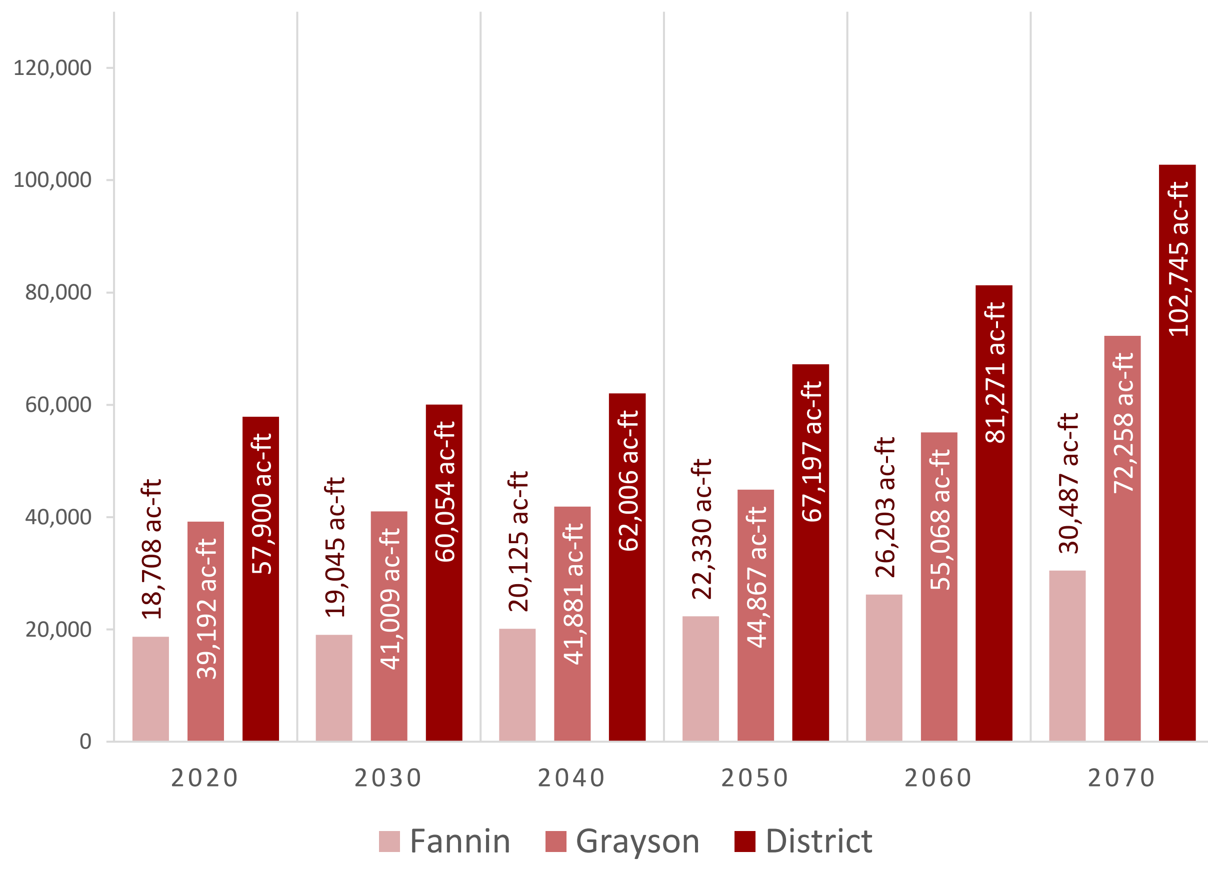


Figure 7: Water demand projections within the District by county

Texas Water Code § 36.1071(e)(3)(G) requires that a management plan include projections of the total demand for water (surface water and groundwater) from the most recently adopted state water plan. The projected total demand for the District increases significantly from 57,900 acre-feet per year in 2020 to 102,745 acre-feet per year in 2070. Projected demands are significantly higher in Grayson than in Fannin County (Figure 7).

PROJECTED WATER SUPPLY NEEDS

Projected water needs for the counties in the District were developed for the 2022 State Water Plan. Those needs reflect conditions when projected water demands exceed projected water supplies in the event of a drought of record. Projected water needs were estimated on the county-basin level for all water user group categories for every decade from 2020 through 2070. Appendix E lists the total water supply needs for Grayson and Fannin Counties as adopted in the TWDB 2022 State Water Plan.

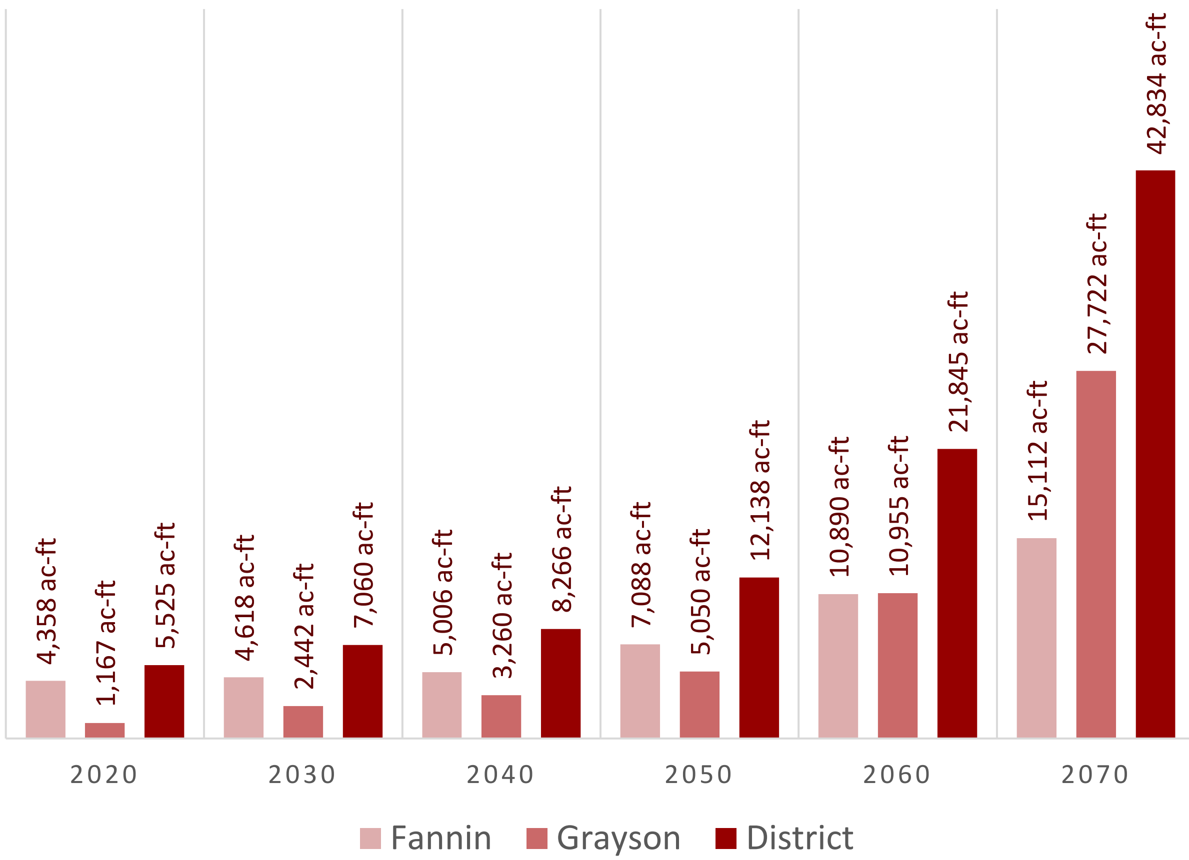


Figure 8: Total projected water supply needs within the District by county

Data for the 2017 State Water Plan projects future water needs for both counties in the District. For the District, the total projected water need increases from 5,525 acre-feet per year in 2020 to 42,834 acre-feet per year in 2070. Figure 8 shows the total projected water needs for the District through 2070.

PROJECTED WATER MANAGEMENT STRATEGIES

The 2022 State Water Plan assessed and recommended water management strategies to meet the identified needs for every decade from 2020 through 2070. Potential strategies include water conservation, developing additional groundwater and surface water supplies, expanding, and improving management of existing water supplies, and water reuse. The projected water management strategies for the counties in the District from the 2022 State Water Plan are shown in Appendix E by water user group (WUG). Table 4 includes all the water management strategies involving the groundwater resources within the District. The water management strategies involving groundwater resources consist of new wells for public water systems, irrigation, and mining. These strategies where consider during the joint groundwater planning process.

Table 4: Groundwater Management Strategies for the District.

Water Management Strategy	***Source Name [Origin]***	***2020***	***2030***	***2040***	***2050***	***2060***	***2070***
ARLEDGE RIDGE WSC - NEW WELL(S) IN WOODBINE AQUIFER	WOODBINE AQUIFER [FANNIN]	0	0	251	252	251	251
BELLS - NEW WELL(S) IN WOODBINE AQUIFER	WOODBINE AQUIFER [GRAYSON]	0	55	55	55	55	55
DESERT WSC - NEW WELL(S) IN WOODBINE AQUIFER	WOODBINE AQUIFER [FANNIN]	0	0	0	0	0	0
DORCHESTER - NEW WELL(S) IN TRINITY AQUIFER	TRINITY AQUIFER [GRAYSON]	0	90	90	90	90	90
GUNTER - NEW WELL(S) IN TRINITY AQUIFER	TRINITY AQUIFER [GRAYSON]	50	50	50	50	50	50
IRRIGATION, FANNIN - NEW WELL(S) IN TRINITY AQUIFER	TRINITY AQUIFER [FANNIN]	1,592	1,592	1,592	1,592	1,592	1,592
MINING, GRAYSON - NEW WELL(S) IN TRINITY AQUIFER	TRINITY AQUIFER [GRAYSON]	100	100	100	100	100	100
NORTHWEST GRAYSON COUNTY WCID 1 - NEW WELL(S) IN TRINITY AQUIFER	TRINITY AQUIFER [GRAYSON]	29	29	34	55	130	247
PINK HILL WSC - NEW WELL(S) IN TRINITY AND WOODBINE AQUIFER	TRINITY AQUIFER [GRAYSON]	0	6	3	16	61	124
PINK HILL WSC - NEW WELL(S) IN TRINITY AND WOODBINE AQUIFER	WOODBINE AQUIFER [GRAYSON]	0	6	3	16	61	124
SOUTHWEST FANNIN COUNTY SUD - NEW WELL(S) IN WOODBINE AQUIFER	WOODBINE AQUIFER [FANNIN]	0	66	19	53	53	51
TRENTON - NEW WELL(S) IN WOODBINE AQUIFER	WOODBINE AQUIFER [FANNIN]	0	25	25	25	25	25
WHITE SHED WSC - NEW WELL(S) IN WOODBINE AQUIFER	WOODBINE AQUIFER [FANNIN]	0	22	81	193	422	676
Total (ac-ft)		*1,771*	*2,041*	*2,303*	*2,497*	*2,890*	*3,385*

ACTIONS, PROCEDURES, PERFORMANCE, AND AVOIDANCE FOR PLAN IMPLEMENTATION, AND MANAGEMENT OF GROUNDWATER SUPPLIES

The District is currently operating pursuant to a set of rules that became effective January 1, 2019. The District's Rules are housed on the District's website http://www.redrivergcd.org/district-information.html. The rules were adopted under the authority of Sections 36.101 and 36.1071(f), Texas Water Code, and the District Act for the purpose of conserving, preserving, protecting, and recharging groundwater in the District in order to prevent subsidence, prevent degradation of water quality, prevent waste of groundwater, and to carry out the powers and duties of Chapter 36, Texas Water Code, and the District Act.

These rules are used by the District in the exercise of the powers conferred on the District by law and in the accomplishment of the purposes of the law creating the District. These rules may be used as guides in the exercise of discretion, where discretion is warranted. However, under no circumstances and in no particular case will they or any part therein, be construed as a limitation or restriction upon the District to exercise powers, duties and jurisdiction conferred by law. These rules create no rights or privileges in any person or water well and shall not be construed to bind the Board in any manner in its promulgation of the District Management Plan or amendments to these Rules.

The District may amend the District rules as necessary to comply with changes to Chapter 36 of the Texas Water Code and to insure the best management of the groundwater within the District. The development and enforcement of the rules of the District has been and will continue to be based on the best scientific and technical evidence available to the District.

The District has encouraged and will continue to encourage public cooperation and coordination in the implementation of the management plan for the District, as it is amended. All operations and activities of the District have been and will be performed in a manner that best encourages cooperation with the appropriate state, regional or local water entity. The meetings of the Board of the District are noticed and conducted at all times in accordance with the Texas Open Meetings Law. The District has also made available for public inspection all official documents, reports, records, and minutes of the District pursuant to the Texas Public Information Act and will continue to do so in the future.

METHODOLOGY FOR TRACKING DISTRICT PROGRESS IN ACHIEVING MANAGEMENT GOALS

An annual report ("Annual Report") will be created by the general manager and staff of the District and provided to the members of the Board of Directors. The Annual Report will cover the activities of the District including information on the District's performance in regard to achieving the District's management goals and objectives. The Annual Report will be delivered to the Board following the completion of the District's fiscal year, beginning with the fiscal year that started on January 1, 2012. A hard copy of the Annual Report will be kept on file and will be available for public inspection at the District's offices upon adoption. Annual reports will also be available via the District's website.

GOALS, MANAGEMENT OBJECTIVES AND PERFORMANCE STANDARDS

The following goals, management objectives, and performance standards have been developed and adopted to ensure the management and conservation of groundwater resources within the District's jurisdiction.

For purposes of this management plan, an exempt well means wells that meet any one of the following, unless a different meaning is set forth in the District rules, or the context clearly provides otherwise: (1) any well that was applied for or existed prior to January 1, 2019 that is used solely for domestic use, livestock use, or poultry use; (2) any well that was applied for or existed prior to January 1, 2019 that does not have the capacity, as equipped, to produce more than 27.7 gallons per minute and is used in whole or in part for commercial, industrial, municipal, manufacturing, or public water supply use, use for oil or gas or other hydrocarbon exploration or production, or any other purpose of use other than solely for domestic, livestock, or poultry use, except that if the total sum of the capacities of wells that operate as part of a well system is greater than 27.7 gallons per minute, the well system and individual wells that are part of it are not considered to be exempt; (3) any new well applied for after January 1, 2019 that does not have the capacity, as equipped, to produce more than 17.36 gallons per minute; or (4) leachate wells, monitoring wells, and piezometers. All wells that do not meet one of these criteria are considered to be non-exempt for purposes of this management plan. The characterization of exempt and non-exempt wells is intended to apply only to wells described in this management plan and shall not be interpreted to mean that the wells will be considered exempt or not exempt from permitting under any rules adopted by the District in the future.

GOAL 1: PROVIDING FOR THE MOST EFFICIENT USE OF GROUNDWATER

The District, through strategies and programs adopted in this management plan and rules, strives to ensure the most efficient use of groundwater in order to sustain available resources for the future while maintaining the vibrant economic growth of the District.

1. WELL REGISTRATIONS

Management Objective:

a. The District will require that all wells be registered in accordance with its current rules.
b. It is the goal of the District that all wells be registered. In order to ensure that all wells required by the District's Rules to be registered, the District will have a Field Inspections Program, with the objective of conducting field inspections of at least 60 wells per year. These inspections will confirm that a well has been registered, and comply with the District's Rules.

Performance Standard:

a. The Board of Directors will receive quarterly briefings by the General Manager regarding the District's well registration program. These quarterly reports will be included in the Annual Report to the Board of Directors. In addition, a handout will be made available to local realtor associations detailing the benefits of new property owners registering their existing well.

b. Quarterly briefings by the General Manager will be provided to the Board of Directors regarding the number of well sites inspected each month to confirm well registration requirements have been met. This information will also be included in the Annual Report to the Board of Directors.

2. Permitting

Management Objective:

a. Each year, the District will require permits for all non-exempt wells in the District in accordance with the District's Rules.
b. The District will continue developing methods for determining or evaluating permit requested annual amounts.
c. Any permit that exceeds their maximum amount authorized by the permit or rule will be subjected to penalties as outlined in Rule 9.8 of the District Rules.

Performance Standard:

a. The District will provide information on the approved permits in the Annual Report to the Board of Directors.
b. The District will work with industry experts to develop and evaluate the District's methods for determining or evaluating permit requested annual amounts. The District staff will report the progress in evaluating and developing the methods as needed to the Board of Directors.
c. The General Manager will report to the Board of Directors any violations of the permitted maximum amount as needed and the District will report on any violations in the Annual Report.

3. Groundwater Monitoring

Management Objective:

a. In order to evaluate continually the effectiveness of the District's rules in meeting the goal of ensuring the efficient use of groundwater, the District will operate a groundwater monitoring program to collect information on the quantity and quality of groundwater resources throughout the District. This monitoring program is based on the establishment of a network of monitoring wells. In addition, one additional well will be added in each county, for a total of three new wells to the system in accordance with the District's well monitoring plan. For the purpose of water quality sampling, samples collected for water quality taken by Texas Commission on Environmental Quality staff every five years will be used for monitoring purposes initially and may be supplemented in the future as determined by the Board. All information collected in the monitoring program will be entered into the District's geodatabase. The results of the monitoring program will be included in the Annual Report presented by the General Manager.
b. In order to ensure the efficient use of groundwater, adequate data must be collected to facilitate groundwater availability modeling activities necessary to understand current groundwater resources and the projected availability of those resources in the future. Monitoring wells will be established by the District on a schedule determined by the Board

of Directors as funds are available.

Performance Standard:

a. Track the number of wells in Fannin and Grayson counties for which water levels were measured per year as reported in the Annual Report presented by the General Manager to the Board of Directors.
b. Track the number of wells in Fannin and Grayson Counties for which water samples were collected for the testing of water quality: The Texas Commission on Environmental Quality provides a Consumer Confidence Report that provides consumers with information about the quality of drinking water.
c. The wells for which water level data is available will be accessible online to the well owner.

This data may be reviewed at: www.tceq.texas.gov/drinkingwater/ccr/ for water systems.

4. METER REQUIREMENTS

Management Objective:

c. A critical component of the District's goal of ensuring the efficient use of groundwater is the collection of accurate water use information. The District's Rules require that all non-exempt wells be equipped with meters to measure the use of groundwater. The well owner/operator is responsible for maintaining a meter log with at least monthly records of water use. Cumulative water use is to be reported to the District by the well owner/operator quarterly. All water use information will be entered and maintained in the District's geodatabase. It is the objective of the District that 95 percent of all registered non-exempt wells will report water use by the reporting deadlines established in the District's rules.
d. In order to ensure that registered non-exempt wells have been equipped with District-approved meters and that water use is being accurately reported, the District Field Technician facilitates a meter inspection program to ensure that all registered non-exempt wells will be inspected on at least a five-year cycle by District personnel. These inspections will, at a minimum, verify proper installation and operational status of meters and record the meter reading at the time of inspection. This meter reading will be compared to the most recent water use report for the inspected well. Any potential violations of District rules regarding meter installation and reporting requirements will be reported to the Board of Directors at the next practicable meeting for consideration of possible enforcement actions. Annual water use will be included in the Annual Report presented by the General Manager to the Board of Directors.

Performance Standard:

a. Percent of registered non-exempt wells meeting reporting requirements of water use will be provided in the Annual Report to the Board of Directors.
b. Percentage of registered non-exempt wells inspected by District personnel annually is provided in the Annual Report presented by the General Manager.

5. ESTIMATING EXEMPT PRODUCTION

Management Objective: The District will quantify current and projected annual groundwater production from exempt wells.

Performance Standard: The District will provide the TWDB with its methodology and estimates of current and projected annual groundwater production from exempt wells. The District will also utilize the information in the future in developing and achieving desired future conditions and in developing and implementing its production allocation and permitting system and rules. Information related to implementation of this objective will be included in the Annual Report to the Board of Directors.

GOAL 2: CONTROLLING AND PREVENTING WASTE OF GROUNDWATER

Another important goal of the District is to implement strategies that will control and prevent the waste of groundwater.

1. OUTREACH

Management Objective: The District will annually provide information to the public on eliminating and reducing wasteful practices in the use of groundwater by publishing information on groundwater waste reduction on the District's website.

Performance Standard: Information on groundwater waste reduction will be provided on the District's website and the information published on the website will be included in the District's Annual Report to be provided to the Board of Directors.

2. WATER USE FEES

Management Objective: The District will encourage the elimination and reduction of groundwater waste through a collection of water-use fees for non-exempt production wells within the District.

Performance Standard: Annual reporting of the total fees paid, and total groundwater used by non-exempt wells will be included in the Annual Report provided to the Board of Directors.

3. RULE ENFORCEMENT

Management Objective:

a. The District will identify well owners that are not in compliance with District well registration, reporting, and fee payment requirements and bring them into compliance.
b. The District will investigate instances of potential waste of groundwater.

Performance Standard:

a. The District will compare existing state records and field staff observations with well registration database to identify noncompliant well owners.
b. District staff will report to Board of Directors as needed regarding potential waste of groundwater and include number of investigations in Annual Report.

GOAL 3: CONTROLLING AND PREVENTING SUBSIDENCE

The District has reviewed the TWDB report on Identification of the Vulnerability of the Major and Minor Aquifers of Texas to Subsidence with Regard to Groundwater Pumping (Furnans, et al., 2017) and used the provided Subsidence Prediction Tool located at http://www.twdb.texas.gov/groundwater/models/research/subsidence/subsidence.asp to evaluate the risk of subsidence within the District. The Woodbine Aquifer has a subsidence risk score of

4.5. For the Trinity Aquifer, two public supply wells were used to evaluate the subsidence risk of the aquifer, and the evaluation determine a subsidence risk score between 5.63 and 6.41. The results of the evaluation can be found in Table 5. Based on the subsidence risk score, the District has a medium subsidence risk.

Table 5: Subsidence Prediction Tool Results for Trinity Aquifer Wells in the Red River GCD

Well Owner	*State Well ID*	*Aquifer Thickness (feet)*	*Clay Thickness (feet)*	*Subsidence Risk Score*	*Minimum Subsidence (feet)*	*Maximum Subsidence (feet)*
City of Honey Grove	17-25-302	410	254	5.63	0.17	0.31
City of Randolph	18-38-302	510	216	6.41	0.65	1.17

According to Water-Level Declines in the Woodbine, Paluxy, and Trinity Aquifers of North-Central Texas (Mace, Dutton, & Nance, 1994), historical data collected south of the Dallas-Fort Worth area in Ellis County indicates that there has been no detectable land subsidence greater than measurement error between 1957 and 1991. Due to the medium subsidence risk and no detectable land subsidence in areas of large water decline in the Woodbine and Trinity aquifers, problems resulting from water level declines and any resulting subsidence are considered insignificant and as such, a goal addressing subsidence is not applicable. Any reported cases of subsidence will be investigated by the District and reported to the Board of Directors.

Goal 4: Addressing Conjunctive Surface Water Management Issues

Surface water resources represent a vital component in meeting current and future water demands in all water use sectors within the District. The District coordinates with surface water management entities within the region by designating a board member or the general manager to attend and coordinate on water supply and management issues with the Region C Water Planning Group.

1. Region C Water Planning Group

Management Objective: Each year, a representative of the District will participate in the regional water planning process by attending at least one of the Region C Water Planning Group meetings to encourage the development of surface water supplies to meet the needs of water user groups within the District.

Performance Standard: The attendance of the District representative at the Region C Water Planning Group meetings will be noted in the Annual Report provided to the Board of Directors.

2. Outreach

Management Objective: The General Manager of the District will monitor and participate in relevant stakeholder meetings concerning groundwater resources relevant to the District such as Groundwater Management Area 8, Texas Water Development Board, and Texas Commission of Environment Quality stakeholder meetings.

Performance Standard: The General Manager of the District will monitor and participate in relevant stakeholder meetings that concern groundwater resources relevant to the District. The meetings that are attended will be presented in the District's Annual Report.

Goal 5: Addressing Natural Resource Issues that Impact the Use and Availability of Groundwater and Which are Impacted by the Use of Groundwater

The District understands the important nexus between water resources and natural resources. The exploration and production of natural resources such as oil and gas along with mining efforts for road aggregate materials such as sand and gravel clearly represent potential management issues for the District. For example, improperly plugged oil and gas wells may provide a conduit for various hydrocarbon and drilling fluids to potentially migrate and contaminate groundwater resources in the District.

1. Injection Well Monitoring

Management Objective: The District has engaged a firm to monitor all injection well applications within the District and notify the General Manager of any potential impacts.

Performance Standard: General Manager will report to the Board of Directors any information provided by the consultant engaged to monitor injection well applications within the District to the Board of Directors and document the information in the Annual Report to the Board of Directors.

2. Oil and Gas Wells

Management Objective: The District will monitor compliance by oil and gas companies including water well registration, metering, production reporting, and fee payment requirements of the District's rules.

Performance Standard: As with other types of wells, instances of non-compliance by owners and operators of water wells for oil and gas activities will be reported to the Board of Directors as appropriate for enforcement action. A summary of such enforcement activities will be included in the Annual Report to the Board of Directors.

Goal 6: Addressing Drought Conditions

1. Outreach

Management Objective: The District will make available through the District's website easily accessible drought information.

Performance Standard: Current drought conditions information from multiple resources including the Palmer Drought Severity Index (PDSI) map for the region is available to the public through the District's website at redrivergcd.org/drought-information.html.

2. *Drought Contingency Plan*

Management Objective: The District will update as necessary the Drought Contingency Plan for the purpose to conserve, preserve, protect, and recharge the groundwater resources of Fannin and Grayson Counties, and to prevent waste and degradation of quality of those groundwater resources. The plan will include initiation and determination of drought stages and water reduction goals for each stage.

Performance Standard: The District Staff will update the Board on the current drought stage and the Board will acted as necessary to initiate or terminate the various drought stages. A summary of such initiated and terminated drought stages will be included in the Annual Report to the Board of Directors.

Goal 7: Addressing Conservation, Recharge Enhancement, Rainwater Harvesting, Precipitation Enhancement, and Brush Control

Texas Water Code §36.1071(a)(7) requires that a management plan include a goal that addresses conservation, recharge enhancement, rainwater harvesting, precipitation enhancement, or brush control, where appropriate and cost-effective. The District has determined that a goal addressing recharge enhancement and precipitation enhancement is not appropriate or cost-effective, and therefore is not applicable to the District.

1. *Conservation*

Management Objective:

a. The primary goal, perhaps viewed as the "umbrella goal" of the District is to provide for and facilitate the conservation of groundwater resources within the District. The District will include a link on the District's website to the electronic library of water conservation resources supported by the Water Conservation Advisory Council. For example, one important resource available through this internet-based resource library is the Water Conservation Best Management Practices Guide developed by the Texas Water Conservation Implementation Task Force. This Guide contains over 60 Best Management Practices for municipalities, industry, and agriculture that will be beneficial to water users in the District.
b. The District will provide educational curriculum regarding water conservation offered by the Texas Water Development Board (Major Rivers) to at least one elementary school in each county of the District.

Performance Standard:

a. Link to the electronic library of water conservation resources supported by the Water Conservation Advisory Council is available on the District's website.
b. Each year the District will seek to provide water conservation curriculum to at least one elementary school in each county within the District. The elementary schools for which the curriculum is provided will be listed in the Annual Report to the Board of Directors.

2. *Rainwater Harvesting*

Management Objective: Rainwater harvesting is assuming a viable role either as a supplemental water supply or as the primary water supply in both urban and rural areas of

Texas. As a result, Texas has become internationally recognized for the widespread use and innovative technologies that have been developed, primarily through efforts at the TWDB. To ensure these educational materials are readily available to citizens in the District, a link to rainwater harvesting materials including system design specifications and water quality requirements will be maintained on the District's website at redrivergcd.org/water-conservation.html.

Performance Standard: Link to rainwater harvesting resources at the TWDB is available on the District's website at redrivergcd.org/water-conservation.html.

3. Brush Control

Management Objective: Educate public on importance of brush control as it relates to water table consumption.

Performance Standard: Link to information concerning brush control is available on the District's website at redrivergcd.org/water-conservation.html.

Goal 8: Addressing the Desired Future Conditions

The desired future conditions of the aquifers in Groundwater Management Area 8 represent average water levels in the various aquifers at the end of 50-years based on meeting current and projected groundwater supply needs. The Board of Directors has adopted a strategic approach that includes the adoption of this management plan and rules necessary to achieve the desired future conditions. This management plan and the companion rules have been designed as an integrated program that will systematically collect and review water data on water quantity, water quality, and water use, while at the same time, implementing public awareness and public education activities that will result in a better-informed constituency.

Management Objective: Statute requires GCDs to review, amend as necessary, and readopt management plans at least every five years. The General Manager will annually present a summary report on the status of achieving the adopted desired future conditions. Prior to the adoption date of the next management plan, the General Manager will work with the Board of Directors to conduct a focused review to determine if any elements of this management plan or rules need to be amended in order to achieve the adopted desired future conditions, or if the adopted desired future conditions need to be revised to better reflect the needs of the District.

Performance Standard:

a. The General Manager will include a summary report on the status of achieving the adopted desired future conditions in the Annual Report. This summary report will primarily be based on data collected from the District's groundwater monitoring program.
b. Comparison of annual water use versus estimates of modeled available groundwater established as a result of the adopted Desired Future Conditions shall be included in the Annual Report presented by the General Manager.

REFERENCES

Furnans, J., Keester, M., Colvin, D., Bauer, J., Gin, G., Danielson, V., . . . Snyder, G. (2017). Final Report: Identification of the Vulnerability of the Major and Minor Aquifers of Texas to Subsidence with Regard to Groundwater Pumping. *Texas Water Development Board*, 4-71 thru 4-79 & 4-222 thru 4-228.

Mace, R. E., Dutton, A. R., & Nance, H. S. (1994). Water-Level Declines in the Woodbine, Paluxy, and Trinity Aquifers of North-Central Texas. *Transactions Of The Gulf Coast Association of Geological Societies, v. 44*, 413-420.

Appendix A: Resolution Adopting the Management Plan

Resolution Place Holder

APPENDIX B: EVIDENCE THAT THE MANAGEMENT PLAN WAS ADOPTED

Proof of Publication

Meeting Agenda

Meeting Minutes

APPENDIX C: EVIDENCE THAT THE DISTRICT COORDINATED DEVELOPMENT OF THE MANAGEMENT PLAN WITH THE SURFACE ENTITIES

Surface Water Management Entities Letter

Proof Letter Email/Mail

APPENDIX D: GAM RUNS

GAM Run 17-029 MAG: Modeled Available Groundwater for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory aquifers in Groundwater Management Area 8

Jerry Shi, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Availability Modeling Department
(512) 463-5076
January 19, 2018

STATE OF TEXAS
JIANYOU SHI
GEOLOGY
11113
LICENSED
PROFESSIONAL GEOSCIENTIST

1/19/2018

This page is intentionally left blank.

GAM RUN 17-029 MAG: MODELED AVAILABLE GROUNDWATER FOR THE TRINITY, WOODBINE, EDWARDS (BALCONES FAULT ZONE), MARBLE FALLS, ELLENBURGER-SAN SABA, AND HICKORY AQUIFERS IN GROUNDWATER MANAGEMENT AREA 8

Jerry Shi, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Availability Modeling Department
(512) 463-5076
January 19, 2018

EXECUTIVE SUMMARY:

The Texas Water Development Board (TWDB) has calculated the modeled available groundwater estimates for the Trinity, Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory aquifers in Groundwater Management Area 8. The modeled available groundwater estimates are based on the desired future conditions for these aquifers adopted by groundwater conservation district representatives in Groundwater Management Area 8 on January 31, 2017. The district representatives declared the Nacatoch, Blossom, and Brazos River Alluvium aquifers to be non-relevant for purposes of joint planning. The TWDB determined that the explanatory report and other materials submitted by the district representatives were administratively complete on November 2, 2017.

The modeled available groundwater values for the following relevant aquifers in Groundwater Management Area 8 are summarized below:

- Trinity Aquifer (Paluxy) – The modeled available groundwater ranges from approximately 24,500 to 24,600 acre-feet per year between 2010 and 2070, and is

summarized by groundwater conservation districts and counties in Table 1, and by river basins, regional planning areas, and counties in Table 13.

- Trinity Aquifer (Glen Rose) – The modeled available groundwater is approximately 12,700 acre-feet per year between 2010 and 2070, and is summarized by groundwater conservation districts and counties in Table 2, and by river basins, regional planning areas, and counties in Table 14.
- Trinity Aquifer (Twin Mountains) – The modeled available groundwater ranges from approximately 40,800 to 40,900 acre-feet per year between 2010 and 2070, and is summarized by groundwater conservation districts and counties in Table 3, and by river basins, regional planning areas, and counties in Table 15.
- Trinity Aquifer (Travis Peak) – The modeled available groundwater ranges from approximately 93,800 to 94,000 acre-feet per year between 2010 and 2070, and is summarized by groundwater conservation districts and counties in in Table 4, and by river basins, regional planning areas, and counties in Table 16.
- Trinity Aquifer (Hensell) – The modeled available groundwater is approximately 27,300 acre-feet per year from 2010 to 2070, and is summarized by groundwater conservation districts and counties in Table 5, and by river basins, regional planning areas, and counties in Table 17.
- Trinity Aquifer (Hosston) – The modeled available groundwater ranges from approximately 64,900 to 65,100 acre-feet per year from 2010 to 2070, and is summarized by groundwater conservation districts and counties in Table 6, and by river basins, regional planning areas, and counties in Table 18.
- Trinity Aquifer (Antlers) – The modeled available groundwater ranges from approximately 74,500 to 74,700 acre-feet per year between 2010 and 2070, and is summarized by groundwater conservation districts and counties in Table 7, and by river basins, regional planning areas, and counties in Table 19.
- Woodbine Aquifer – The modeled available groundwater is approximately 30,600 acre-feet per year from 2010 to 2070, and is summarized by groundwater conservation districts and counties in Table 8, and by river basins, regional planning areas, and counties in Table 20.
- Edwards (Balcones Fault Zone) Aquifer – The modeled available groundwater is 15,168 acre-feet per year from 2010 to 2060, and is summarized by groundwater conservation districts and counties in Table 9, and by river basins, regional planning areas, and counties in Table 21.

- Marble Falls Aquifer – The modeled available groundwater is approximately 5,600 acre-feet per year from 2010 to 2070, and is summarized by groundwater conservation districts and counties in Table 10, and by river basins, regional planning areas, and counties in Table 22.
- Ellenburger-San Saba Aquifer – The modeled available groundwater is approximately 14,100 acre-feet per year between 2010 and 2070, and is summarized by groundwater conservation districts and counties in Table 11, and by river basins, regional planning areas, and counties in Table 23.
- Hickory Aquifer – The modeled available groundwater is approximately 3,600 acre-feet per year from 2010 to 2070, and is summarized by groundwater conservation districts and counties in Table 12, and by river basins, regional planning areas, and counties in Table 24.

The modeled available groundwater values for the Trinity Aquifer (Paluxy, Glen Rose, Twin Mountains, Travis Peak, Hensell, Hosston, and Antlers subunits), Woodbine Aquifer, and Edwards (Balcones Fault Zone) Aquifer are based on the official aquifer boundaries defined by the TWDB. The modeled available groundwater values for the Marble Falls, Ellenburger-San Saba, and Hickory aquifers are based on the modeled extent, as clarified by Groundwater Management Area 8 on October 9, 2017.

The modeled available groundwater values estimated for counties may be slightly different from those estimated for groundwater conservation districts because of the process for rounding the values. The modeled available groundwater values for the longer leap years (2020, 2040, and 2060) are slightly higher than shorter non-leap years (2010, 2030, 2050, and 2070).

REQUESTOR:

Mr. Drew Satterwhite, General Manager of North Texas Groundwater Conservation District and Groundwater Management Area 8 Coordinator.

DESCRIPTION OF REQUEST:

In a letter dated February 17, 2017, Mr. Drew Satterwhite provided the TWDB with the desired future conditions of the Trinity (Paluxy), Trinity (Glen Rose), Trinity (Twin Mountains), Trinity (Travis Peak), Trinity (Hensell), Trinity (Hosston), Trinity (Antlers), Woodbine, Edwards (Balcones Fault Zone), Marble Falls, Ellenburger-San Saba, and Hickory aquifers. The desired future conditions were adopted as Resolution No. 2017-01 on January 31, 2017 by the groundwater conservation district representatives in

Groundwater Management Area 8. The following sections present the adopted desired future conditions for these aquifers:

Trinity and Woodbine Aquifers

The desired future conditions for the Trinity and Woodbine aquifers are expressed as water level decline or drawdown in feet over the planning period 2010 to 2070 relative to the baseline year 2009, based on a predictive simulation by Beach and others (2016).

The county-based desired future conditions for the Trinity Aquifer subunits, excluding counties in the Upper Trinity Groundwater Conservation District, are listed below (dashes indicate areas where the subunits do not exist and therefore no desired future condition was proposed):

County	Adopted Desired Future Condition (feet of drawdown below 2009 levels)							
	Woodbine	Paluxy	Glen Rose	Twin Mountains	Travis Peak	Hensell	Hosston	Antlers
Bell	—	19	83	—	300	137	330	—
Bosque	—	6	49	—	167	129	201	—
Brown	—	—	2	—	1	1	1	2
Burnet	—	—	2	—	16	7	20	—
Callahan	—	—	—	—	—	—	—	1
Collin	459	705	339	526	—	—	—	570
Comanche	—	—	1	—	2	2	3	9
Cooke	2		—	—	—		—	176
Coryell	—	7	14	—	99	66	130	—
Dallas	123	324	263	463	348	332	351	—
Delta	—	264	181	—	186	—	—	—
Denton	22	552	349	716	—	—	—	395
Eastland	—	—	—	—	—	—	—	3
Ellis	61	107	194	333	301	263	310	—
Erath	—	1	5	6	19	11	31	12
Falls	—	144	215	—	462	271	465	—
Fannin	247	688	280	372	269	—	—	251
Grayson	160	922	337	417	—	—	—	348
Hamilton	—	2	4	—	24	13	35	—
Hill	20	38	133	—	298	186	337	—
Hunt	598	586	299	370	324	—	—	—

County	Adopted Desired Future Condition (feet of drawdown below 2009 levels)							
	Woodbine	Paluxy	Glen Rose	Twin Mountains	Travis Peak	Hensell	Hosston	Antlers
Johnson	2	-61	58	156	179	126	235	—
Kaufman	208	276	269	381	323	309	295	—
Lamar	38	93	97	—	114	—	—	122
Lampasas	—	—	1	—	6	1	11	—
Limestone	—	178	271	—	392	183	404	—
McLennan	6	35	133	—	471	220	542	—
Milam	—	—	212	—	345	229	345	—
Mills	—	1	1	—	7	2	13	—
Navarro	92	119	232	—	290	254	291	—
Red River	2	21	36	—	51	—	—	13
Rockwall	243	401	311	426	—	—	—	—
Somervell	—	1	4	31	51	26	83	—
Tarrant	7	101	148	315	—	—	—	148
Taylor	—	—	—	—	—	—	—	0
Travis	—	—	85	—	141	50	146	—
Williamson	—	—	77	—	173	74	177	—

The desired future conditions for the counties in the Upper Trinity Groundwater Conservation District are further divided into outcrop and downdip areas, and are listed below (dashes indicate areas where the subunits do not exist):

Upper Trinity GCD County (crop)	Adopted Desired Future Conditions (feet of drawdown below 2009 levels)			
	Antlers	Paluxy	Glen Rose	Twin Mountains
Hood (outcrop)	—	5	7	4
Hood (downdip)	—	—	28	46
Montague (outcrop)	18	—	—	—
Montague (downdip)	—	—	—	—
Parker (outcrop)	11	5	10	1
Parker (downdip)	—	1	28	46
Wise (outcrop)	34	—	—	—
Wise (downdip)	142	—	—	—

Edwards (Balcones Fault Zone) Aquifer

The desired future conditions adopted by Groundwater Management Area 8 for the Edwards (Balcones Fault Zone) Aquifer are intended to maintain minimum stream and spring flows under the drought of record in Bell, Travis, and Williamson counties over the planning period 2010 to 2070. The desired future conditions are listed below:

County	Adopted Desired Future Condition
Bell	Maintain at least 100 acre-feet per month of stream/spring flow in Salado Creek during a repeat of the drought of record
Travis	Maintain at least 42 acre-feet per month of aggregated stream/spring flow during a repeat of the drought of record
Williamson	Maintain at least 60 acre-feet per month of aggregated stream/spring flow during a repeat of the drought of record

Marble Falls, Ellenburger-San Saba, and Hickory Aquifers

The desired future conditions for the Marble Falls, Ellenburger-San Saba, and Hickory aquifers in Brown, Burnet, Lampasas, and Mills counties are intended to maintain 90 percent of the aquifer saturated thickness over the planning period 2010 to 2070 relative to the baseline year 2009.

Supplemental Information from Groundwater Management Area 8

After review of the explanatory report and model files, the TWDB emailed a request for clarifications to Mr. Drew Satterwhite on August 7, 2017. On September 8, 2017, Mr. Satterwhite provided the TWDB with a technical memorandum from James Beach, Jeff Davis, and Brant Konetchy of LBG-Guyton Associates. On October 9, 2017, Mr. Satterwhite sent the TWDB two emails with additional information and clarifications. The information and clarifications are summarized below:

a. For the Trinity and Woodbine aquifers, an additional error tolerance defined as five feet of drawdown between the adopted desired future condition and the simulated drawdown is included with the original error tolerance of five percent. Thus, if the drawdown from the predictive simulation is within five feet or five percent from the desired future condition, then the predictive simulation is considered to meet the desired future condition.

   Groundwater Management Area 8 provided a new MODFLOW-NWT well package, simulated head file, and simulated budget file on October 9, 2017. The TWDB determined that the distribution of pumping in the new model files was consistent with the explanatory report.

The TWDB evaluates if the simulated drawdown from the predictive simulation meets the desired future condition by county. However, Groundwater Management Area 8 also provided desired future conditions based on groundwater conservation district and the whole groundwater management area.

b. For the Edwards (Balcones Fault Zone) Aquifer in Bell, Travis, and Williamson counties, the coordinator for Groundwater Management Area 8 clarified that TWDB uses GAM Run 08-010 MAG by Anaya (2008) from the last cycle of desired future conditions with all associated assumptions including a baseline year of 2000.

c. For the Marble Falls, Ellenburger-San Saba, and Hickory aquifers in Brown, Burnet, Lampasas, and Mills counties, Groundwater Management Area 8 adjusted the desired future condition from "maintain 90 percent of the saturated thickness" to "maintain *at least* 90 percent of the saturated thickness". Groundwater Management Area 8 also provided estimated pumping to use for the predictive simulation by TWDB.

d. The Trinity, Woodbine, and Edwards (Balcones Fault Zone) aquifers are based on the official aquifer boundary while the Marble Falls, Ellenburger-San Saba, and Hickory aquifers include the portions both inside and outside the official aquifer boundaries (modeled extent).

e. The sliver of the Edwards-Trinity (Plateau) Aquifer was declared to be non-relevant by Groundwater Management Area 8.

METHODS:

The desired future conditions for Groundwater Management Area 8 are based on multiple criteria. For the Trinity and Woodbine aquifers, the desired future conditions are defined as water-level declines or drawdowns over the course of the planning period 2010 through 2070 relative to the baseline year 2009. The desired future conditions for the Edwards (Balcones Fault Zone) Aquifer are based on stream and spring flows under the drought of record over the planning period 2010 to 2070. For the Marble Falls, Ellenburger-San Saba, and Hickory aquifers, the desired future conditions are to maintain aquifer saturated thickness between 2010 and 2070 relative to the baseline year 2009. The methods to calculate the desired future conditions are discussed below.

Trinity and Woodbine Aquifers

The desired future conditions for the Trinity and Woodbine aquifers in Groundwater Management Area 8 are based on a predictive simulation by Beach and others (2016), which used the groundwater availability model for the northern portion of the Trinity and Woodbine aquifers (Kelley and others, 2014). The predictive simulation contained 61 annual stress periods corresponding to 2010 through 2070, with an initial head equal to 2009 of the calibrated groundwater availability model. The desired future conditions are the drawdowns between 2009 and 2070.

Because the baseline year 2009 for the desired future conditions falls within the calibration period 1890 to 2012 of the groundwater availability model, the water levels for the baseline year have been calibrated to observed data and, thus, they were directly used as the initial water level (head) condition of the predictive simulation.

The drawdowns between 2009 and 2070 are calculated from composite heads. Appendix A presents additional details on methods used to calculate composite head and associated average drawdown values for the Trinity and Woodbine aquifers.

Edwards (Balcones Fault Zone) Aquifer

Per Groundwater Management Area 8 (clarification dated September 1, 2017), the results from GAM Run 08-010 MAG by Anaya (2008) are used for the current round of joint planning. The following summarizes the approach used:

- Ran the model for 141 years, starting with a 100-year initial stress period (pre-1980) followed by 21 years of historical monthly stress periods (1980 to 2000), then 10 years of predictive annual stress periods (2001 to 2010), and ending with 10 years of predictive monthly stress periods (2011 to 2020) to represent a simulated repeat of the 1950s' drought of record.

- Used pumpage and recharge distributions provided to TWDB by the Groundwater Management Area 8 consultant.

- Adjusted pumpage in Williamson County to meet the desired future conditions.

- Extracted projected discharge for drain cells representing Salado Creek in Bell County and drain cells representing aggregated springs and streams in Williamson and Travis counties, respectively, for each of the stress periods from 2011 through 2020 to verify that the desired future conditions were met.

- Determined which stress period reflected the worst case monthly scenario for Salado Springs during a repeat of the 1950s' drought of record.
- Generated modeled available groundwater for all three desired future conditions based on the lowest monthly springflow volume for Salado Springs during a simulated repeat of the 1950s' drought of record.

Marble Falls, Ellenburger-San Saba, and Hickory Aquifers

The TWDB constructed a predictive simulation to analyze the desired future conditions for the Marble Falls, Ellenburger-San Saba, and Hickory aquifers in Brown, Burnet, Lampasas, and Mills counties within Groundwater Management Area 8. This simulation used the groundwater availability model for the minor aquifers in the Llano Uplift region by Shi and others (2016). The predictive simulation contains 61 annual stress periods corresponding to the planning period 2010 through 2070 with an initial head condition from 2009.

Because the baseline year 2009 for the desired future conditions falls within the model calibration period 1980 to 2010, and the water levels for the baseline year have been calibrated to observed data, the simulated head from 2009 of the calibrated groundwater availability model was directly used as the initial water level (head) condition of the predictive simulation.

Additional details on the predictive simulation and methods to estimate the drawdowns between 2009 and 2070 are described in Appendix B.

Modeled Available Groundwater

Once the predictive simulations met the desired future conditions, the modeled available groundwater values were extracted from the MODFLOW cell-by-cell budget files. Annual pumping rates were then divided by county, river basin, regional water planning area, and groundwater conservation district within Groundwater Management Area 8 (Figures 1 through 13 and Tables 1 through 24).

Modeled Available Groundwater and Permitting

As defined in Chapter 36 of the Texas Water Code, "modeled available groundwater" is the estimated average amount of water that may be produced annually to achieve a desired future condition. Groundwater conservation districts are required to consider modeled available groundwater, along with several other factors, when issuing permits in order to manage groundwater production to achieve the desired future condition(s). The other factors districts must consider include annual precipitation and production patterns, the estimated amount of pumping exempt from permitting, existing permits, and a reasonable estimate of actual groundwater production under existing permits.

PARAMETERS AND ASSUMPTIONS:

The parameters and assumptions for the groundwater availability simulations are described below:

Trinity and Woodbine Aquifers

- Version 2.01 of the updated groundwater availability model for the northern Trinity and Woodbine aquifers by Kelley and others (2014) was used to construct the predictive model simulation for this analysis (Beach and others, 2016).
- The predictive model was run with MODFLOW-NWT (Niswonger and others, 2011).
- The model has eight layers that represent units younger than the Woodbine Aquifer and the shallow outcrop of all aquifers (Layer 1), the Woodbine Aquifer (Layer 2), the Fredericksburg and Washita units (Layer 3), and various combinations of the subunits that comprise the Trinity Aquifer (Layers 4 to 8).
- Multiple model layers could represent an aquifer where it outcrops. For example, the Woodbine Aquifer could span Layers 1 to 2 and the Trinity Aquifer (Hosston) could contain Layers 1 through 8. The aquifer designation in model layers was defined in the model grid files produced by TWDB.
- The predictive model simulation contains 61 transient annual stress periods with an initial head equal to 2009 of the calibrated groundwater availability model.
- The predictive simulation had the same hydrogeological properties and hydraulic boundary conditions as the calibrated groundwater availability model except groundwater recharge and pumping.
- The groundwater recharge for the predictive model simulation was the same as stress period 1 of the calibrated groundwater availability model (steady state period) except stress periods representing 2058 through 2060, which contained lower recharge representing severe drought conditions.
- In the predictive simulation, additional pumping was added to certain counties and some pumping in Layer 1 was moved to lower layer(s) to avoid the automatic pumping reduction enacted by the MODFLOW-NWT code (Beach and others, 2016).

- During the predictive simulation model run, some model cells went dry (Appendix C). Dry cells occur during a model run when the simulated water level in a cell falls below the bottom of the cell.
- Estimates of modeled drawdown and available groundwater from the model simulation were rounded to whole numbers.

Edwards (Balcones Fault Zone) Aquifer

- Version 1.01 of the groundwater availability model for the northern segment of the Edwards (Balcones Fault Zone) Aquifer (Jones, 2003) was used to construct the predictive model simulation for the analysis by Anaya (2008).
- The model has one layer that represents the Edwards (Balcones Fault Zone) Aquifer.
- The model was run with MODFLOW-96 (Harbaugh and McDonald, 1996).
- The predictive model simulation contains the calibrated groundwater availability model (253 monthly stress periods), stabilization (10 annual stress periods), and drought conditions (120 monthly stress periods).
- The boundary conditions for the stabilization and drought periods (except recharge and pumping) were the same in the predictive simulation as the last stress period (stress period 253) of the calibrated groundwater availability model.
- The groundwater recharge for the stabilization and drought periods and pumping information were from Groundwater Management Area 8 consultant.
- The groundwater pumping in Williamson County was adjusted as needed during the predictive model run simulation to match the desired future conditions.
- Estimates of modeled spring and stream flows from the model simulation were rounded to whole numbers.

Marble Falls, Ellenburger-San Saba, and Hickory Aquifers

- Version 1.01 of the groundwater availability model for the minor aquifers in Llano Uplift region by Shi and others (2016) was used to develop the predictive model simulation used for this analysis.
- The model has eight layers: Layer 1 (the Trinity Aquifer, Edwards-Trinity (Plateau) Aquifer, and younger alluvium deposits), Layer 2 (confining units), Layer 3 (the Marble Falls Aquifer and equivalent unit), Layer 4 (confining units), Layer 5 (Ellenburger-San Saba Aquifer and equivalent unit), Layer 6 (confining units), Layer 7 (the Hickory Aquifer and equivalent unit), and Layer 8 (Precambrian units).

- The model was run with MODFLOW-USG beta (development) version (Panday and others, 2013).
- The predictive model simulation contains 61 annual stress periods (2010 to 2070) with the initial head equal to 2009 of the calibrated groundwater availability model.
- The boundary conditions for the predictive model except recharge and pumping were the same in the predictive simulation of the last stress period of the calibrated groundwater availability model.
- The groundwater recharge for the predictive model simulation was set equal to the average of all stress periods (1982 to 2010) of the calibrated model except the first stress period.
- The groundwater pumping was initially set to the last stress period of the calibrated groundwater availability model. Additional pumping per county was then added to the model cells of the three aquifers based on the modeled extent to match the total pumping data for each aquifer provided by Groundwater Management area 8.
- During the predictive model run, some active model cells went dry (Appendix D). Dry cells occur during a model run when the simulated water level in a cell falls below the bottom of the cell.
- Estimates of modeled saturated aquifer thickness values were rounded to one decimal point.

RESULTS:

The modeled available groundwater for the Trinity Aquifer (Paluxy) that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 24,499 acre-feet per year for the non-leap (shorter) years (2010, 2030, 2050, and 2070) to 24,565 acre-feet per year for the leap (longer) years (2020, 2040, and 2060). The modeled available groundwater is summarized by groundwater conservation district and county in Table 1. Table 13 summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Trinity Aquifer (Glen Rose) that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 12,701 acre-feet per year for the non-leap years (2010, 2030, 2050, and 2070) to 12,736 acre-feet per year for the leap years (2020, 2040, and 2060). The modeled available groundwater is summarized by groundwater conservation district and county in Table 2. Table 14 summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Trinity Aquifer (Twin Mountains) that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 40,827 acre-feet per year for the non-leap years (2010, 2030, 2050, and 2070) to 40,939 acre-feet per year for the leap years (2020, 2040, and 2060). The modeled available groundwater is summarized by groundwater conservation district and county in Table 3. Table 15 summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Trinity Aquifer (Travis Peak) that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 93,757 acre-feet per year for the non-leap years (2010, 2030, 2050, and 2070) to 94,016 acre-feet per year for the leap years (2020, 2040, and 2060). The modeled available groundwater is summarized by groundwater conservation district and county in Table 4. Table 16 summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Trinity Aquifer (Hensell) that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 27,257 acre-feet per year for the non-leap years (2010, 2030, 2050, and 2070) to 27,331 acre-feet per year for the leap years (2020, 2040, and 2060). The modeled available groundwater is summarized by groundwater conservation district and county in Table 5. Table 17 summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Trinity Aquifer (Hosston) that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 64,922 acre-feet per year for the non-leap years (2010, 2030, 2050, and 2070) to 65,098 acre-feet per year for the leap years (2020, 2040, and 2060). The modeled available groundwater is summarized by groundwater conservation district and county in Table 6. Table 18 summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Trinity Aquifer (Antlers) that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 74,471 acre-feet per year for the non-leap years (2010, 2030, 2050, and 2070) to 74,677 acre-feet per year for the leap years (2020, 2040, and 2060). The modeled available groundwater is summarized by groundwater conservation district and county in Table 7. Table 19 summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Woodbine Aquifer that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 30,554 acre-feet per year for the non-leap years (2010, 2030, 2050, and 2070) to 30,636 acre-feet per year for the leap years (2020, 2040, and 2060). The modeled available groundwater is summarized by groundwater conservation district and county in Table 8. Table 20 summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Edwards (Balcones Fault Zone) Aquifer that achieves the desired future condition adopted by Groundwater Management Area 8 remains at 15,168 acre-feet per year from 2010 to 2060. The modeled available groundwater is summarized by groundwater conservation district and county in Table 9. Table 21 summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Marble Falls Aquifer that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 5,623 acre-feet per year for the non-leap years (2010, 2030, 2050, and 2070) to 5,639 acre-feet per year for the leap years (2020, 2040, and 2060). The modeled available groundwater is summarized by groundwater conservation district and county in Table 10. Table 22 summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Ellenburger-San Saba Aquifer that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 14,050 acre-feet per year for the non-leap years (2010, 2030, 2050, and 2070) to 14,089 acre-feet per year for the leap years (2020, 2040, and 2060). The modeled available groundwater is summarized by groundwater conservation district and county in Table 11. Table 23 summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater for the Hickory Aquifer that achieves the desired future condition adopted by Groundwater Management Area 8 ranges from 3,574 acre-feet per year for the non-leap years (2010, 2030, 2050, and 2070) to 3,585 acre-feet per year for the leap years (2020, 2040, and 2060). The modeled available groundwater is summarized by groundwater conservation district and county in Table 12. Table 24 summarizes the modeled available groundwater by county, river basin, and regional water planning area for use in the regional water planning process.

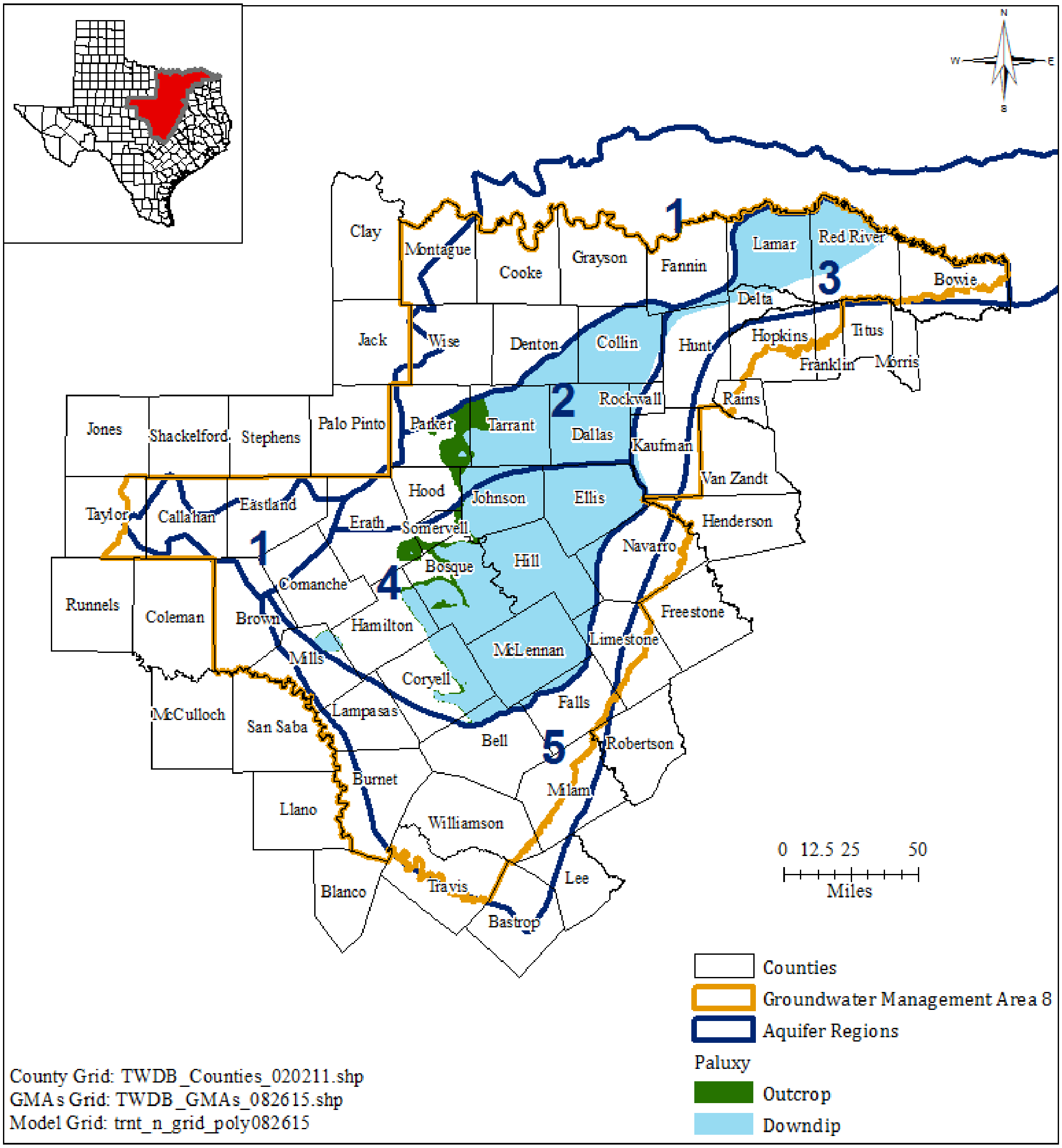


FIGURE 1. MAP SHOWING THE TRINITY AQUIFER (PALUXY) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS.

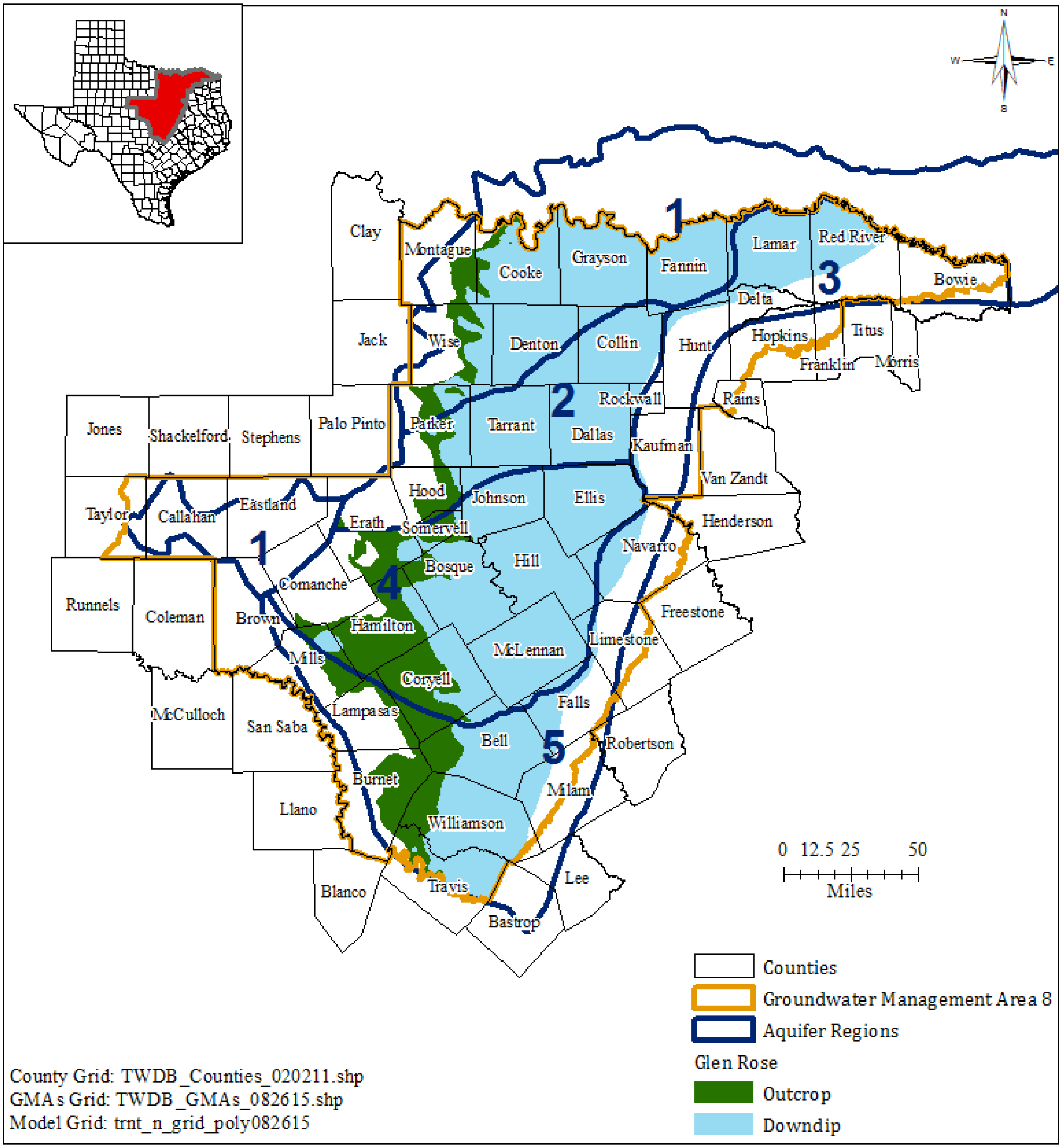


FIGURE 2. **MAP SHOWING THE TRINITY AQUIFER (GLEN ROSE) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS.**

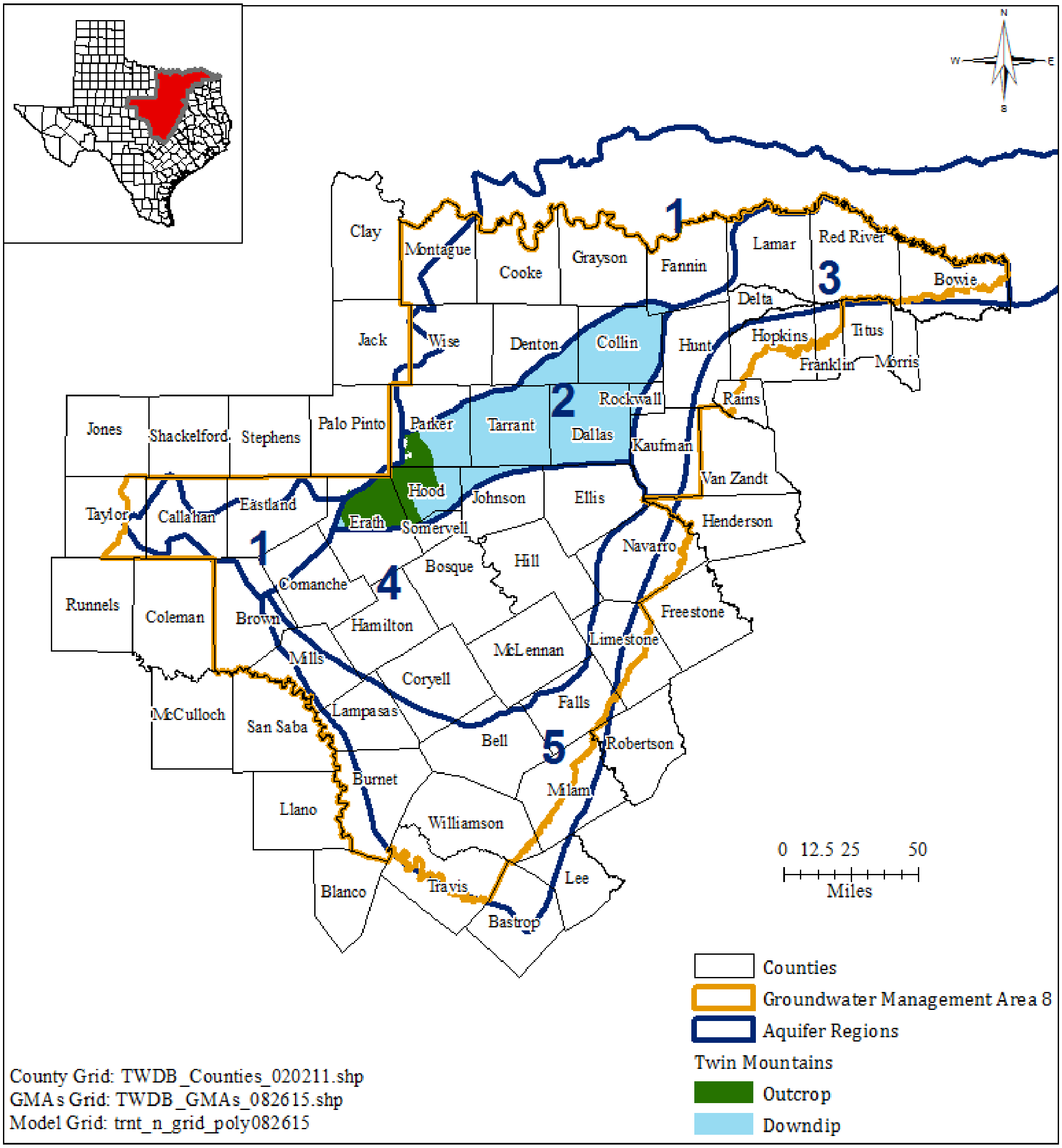


FIGURE 3. MAP SHOWING THE TRINITY AQUIFER (TWIN MOUNTAINS) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS.

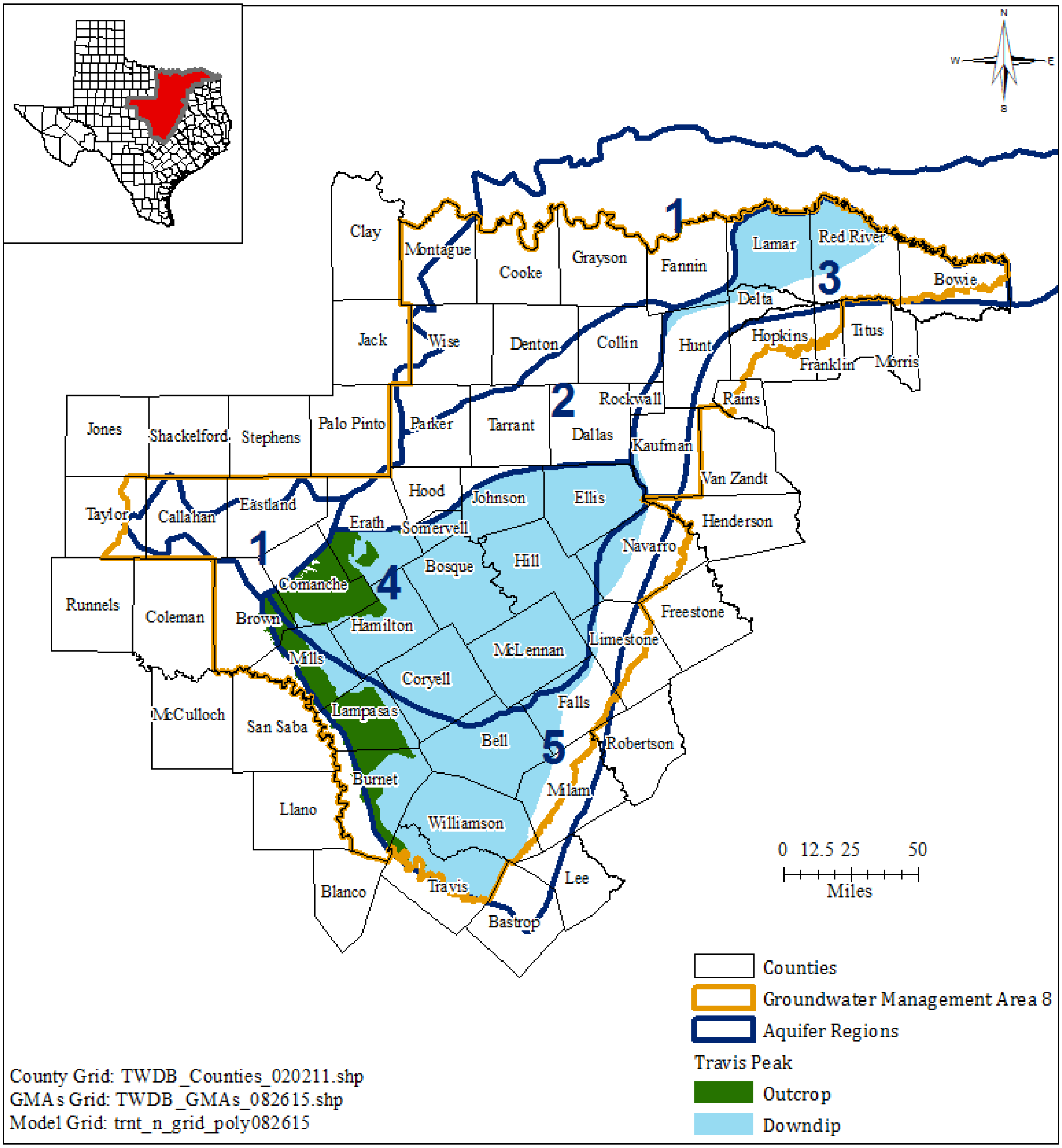


FIGURE 4. MAP SHOWING THE TRINITY AQUIFER (TRAVIS PEAK) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS.

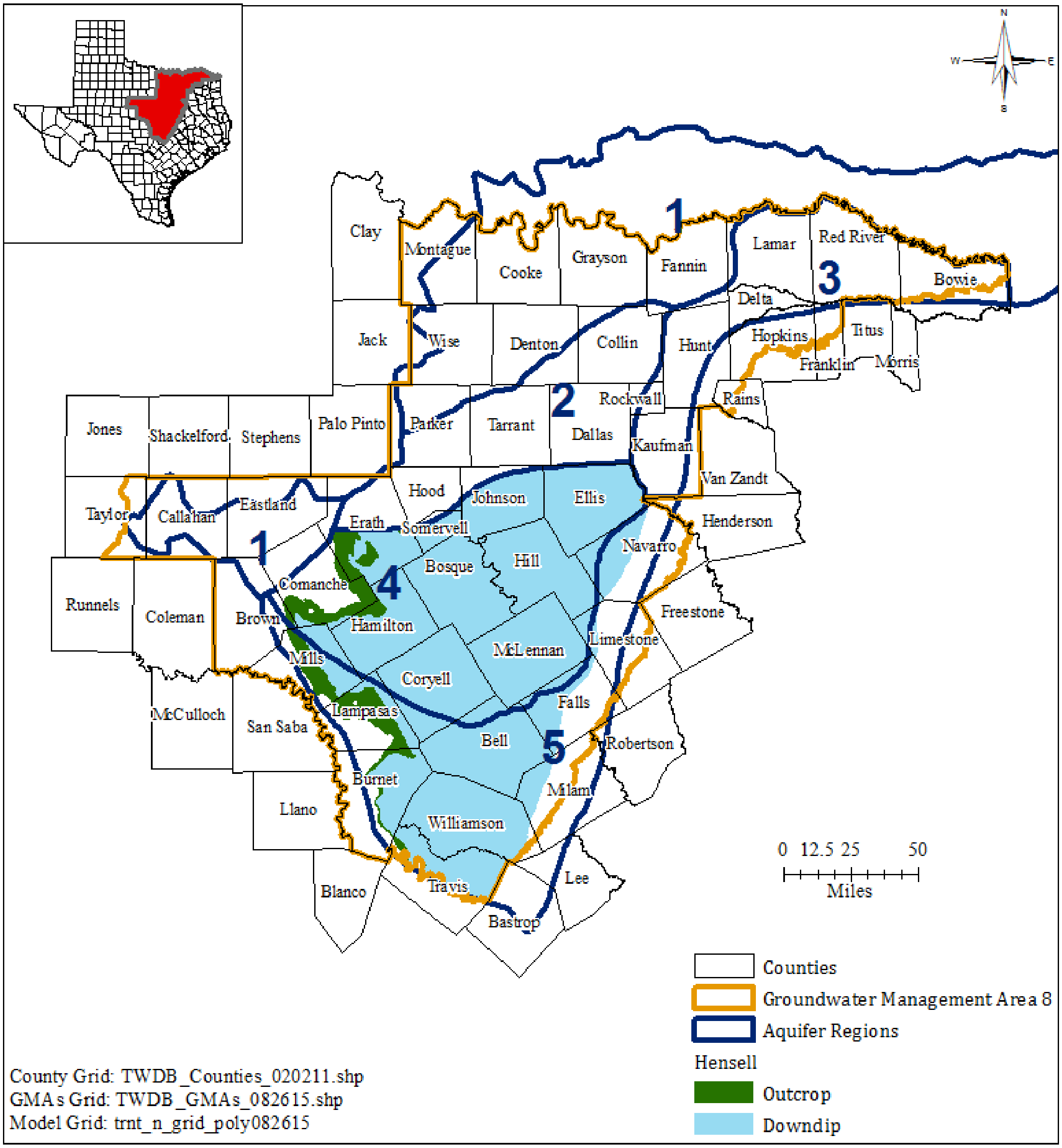


FIGURE 5. MAP SHOWING THE TRINITY AQUIFER (HENSELL) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS.

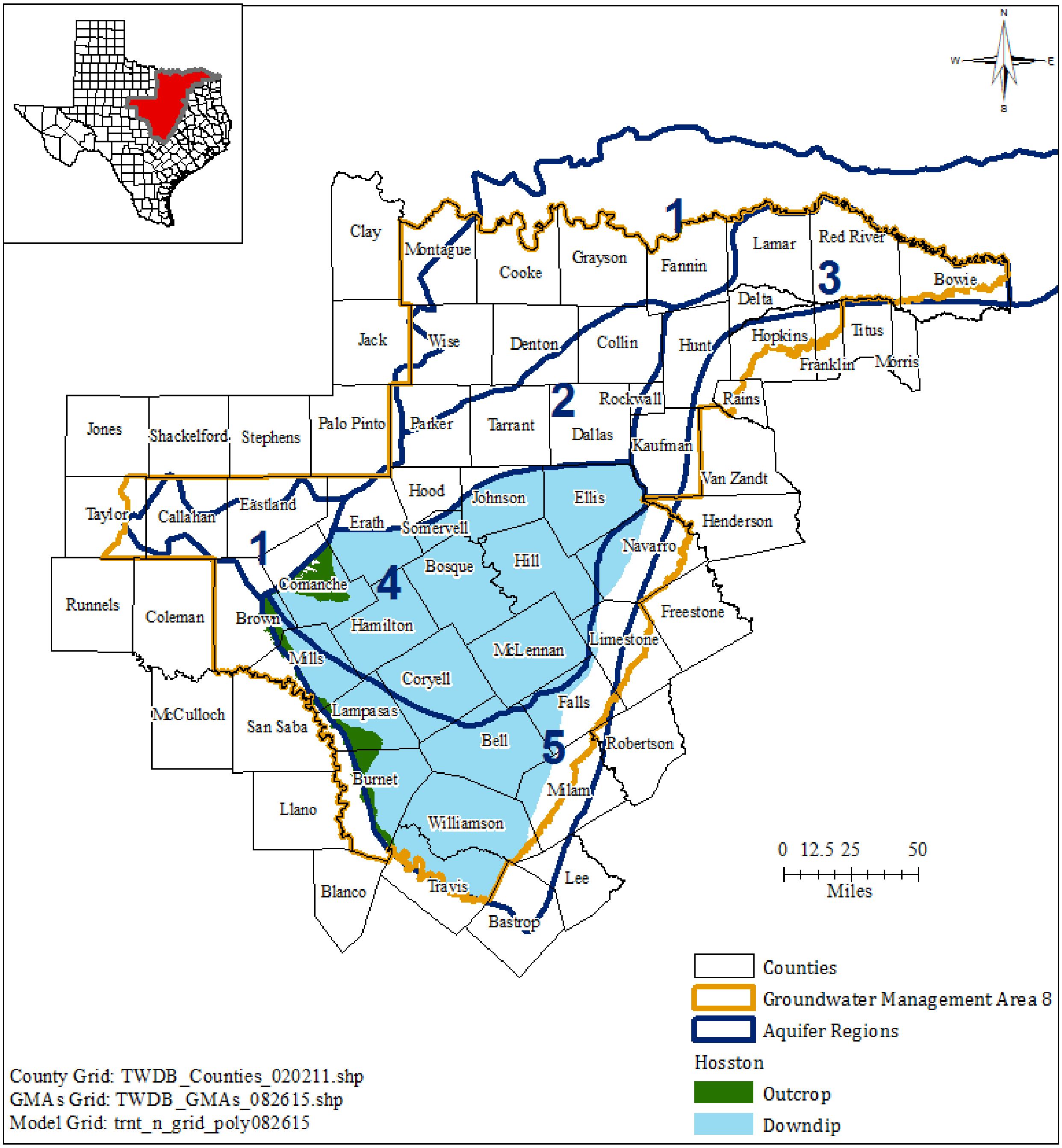


FIGURE 6. MAP SHOWING THE TRINITY AQUIFER (HOSSTON) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS.

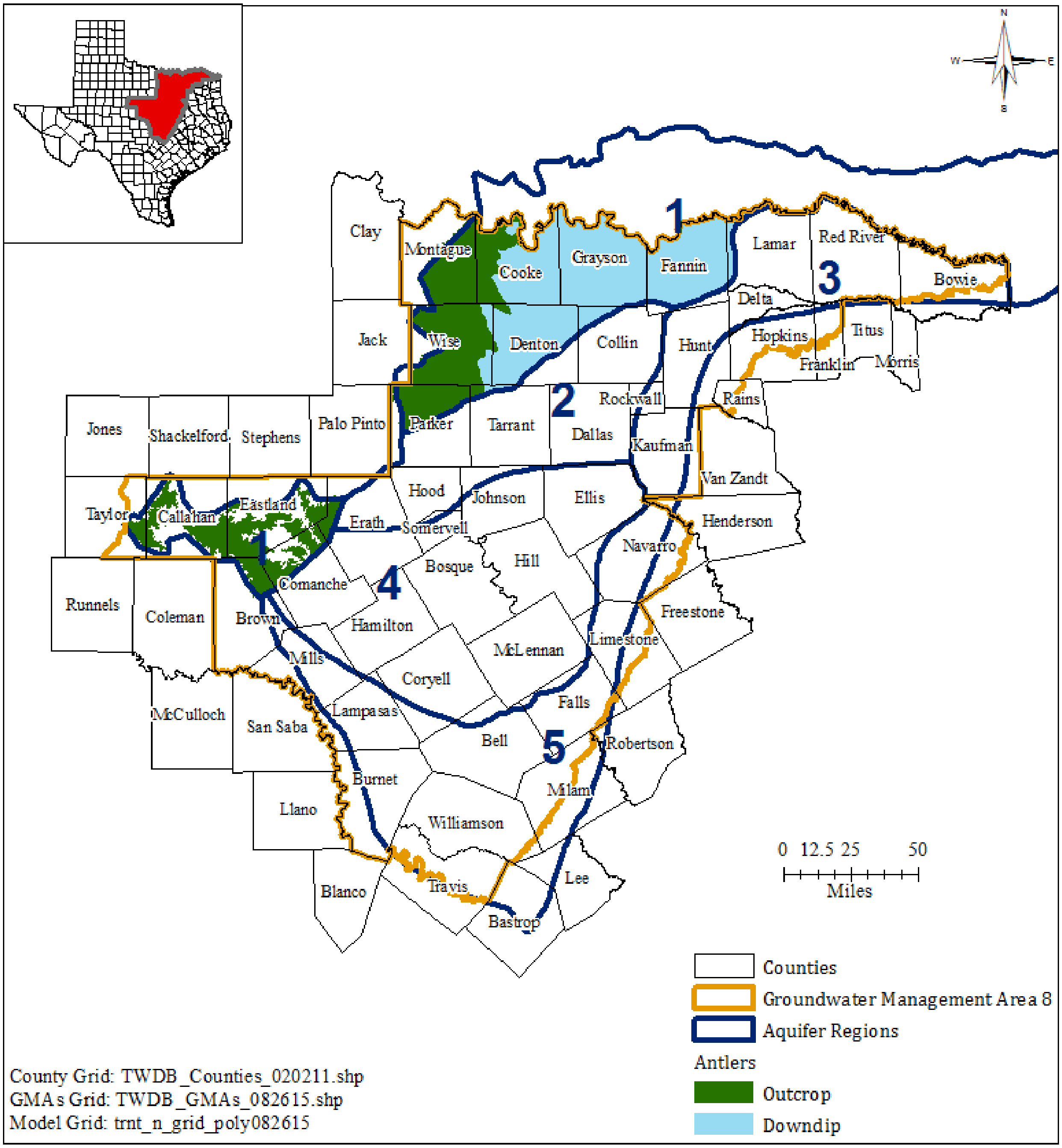


FIGURE 7. MAP SHOWING THE TRINITY AQUIFER (ANTLERS) WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS.

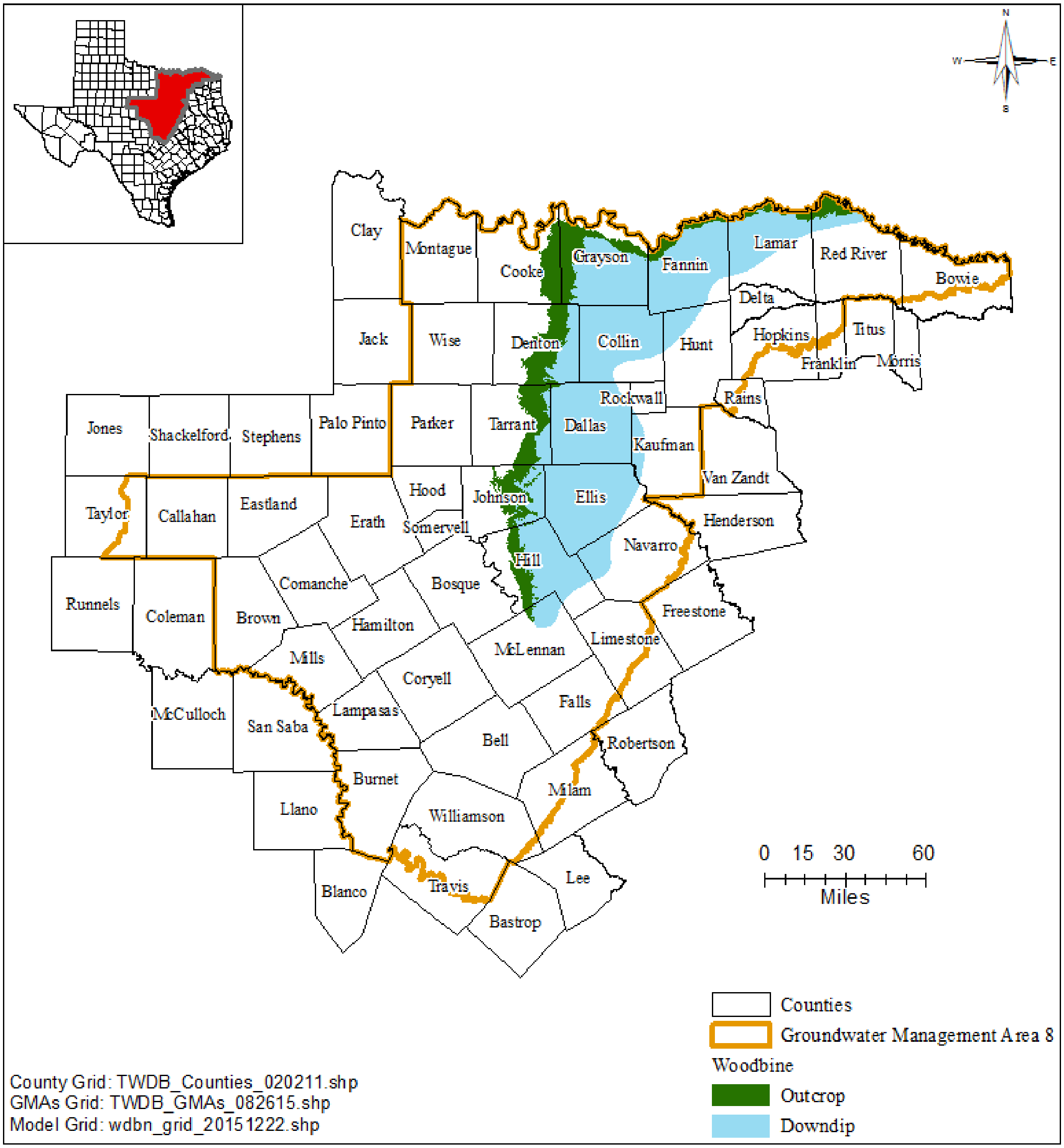


FIGURE 8. MAP SHOWING THE WOODBINE AQUIFER WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AND WOODBINE AQUIFERS.

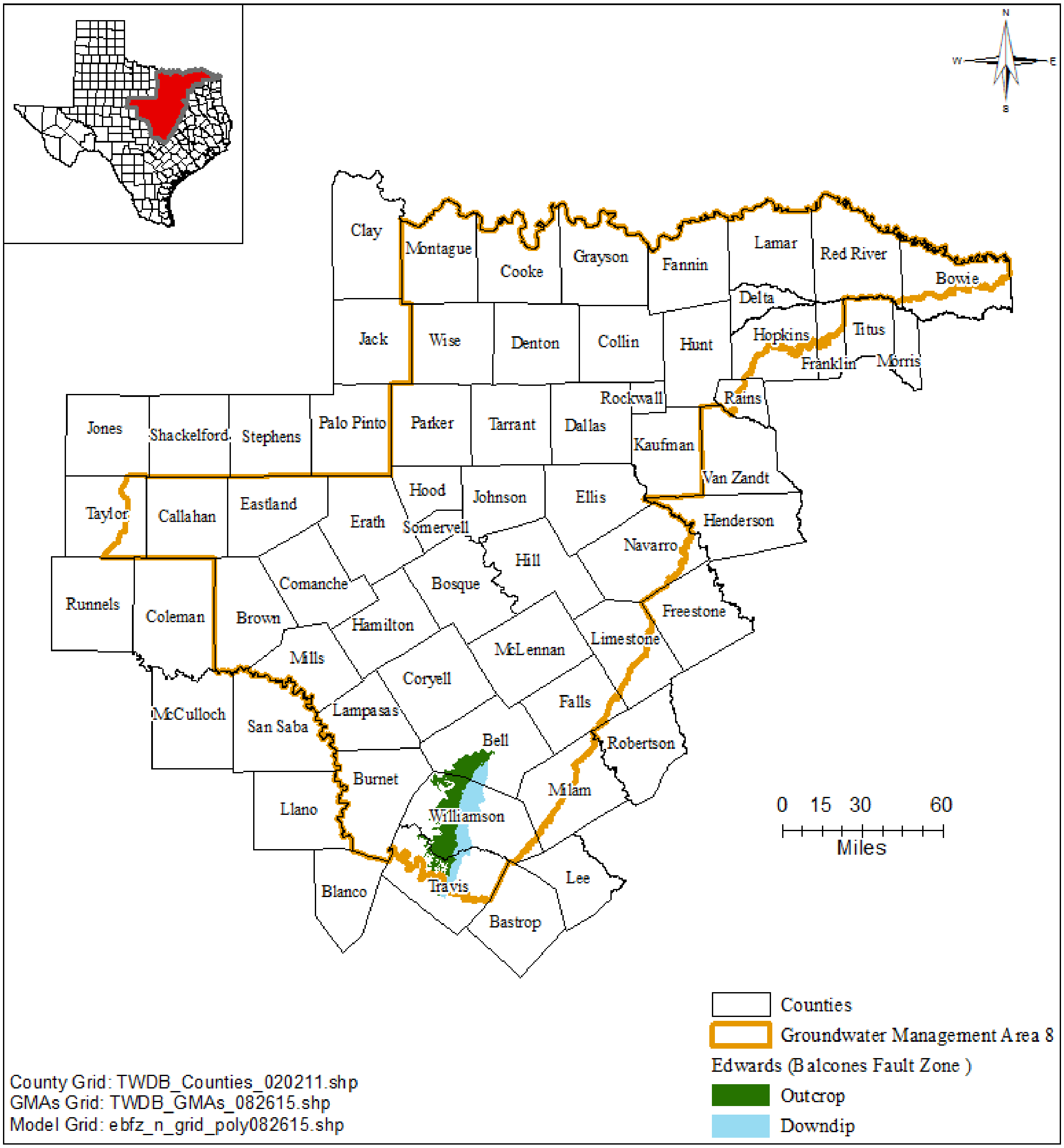


FIGURE 9. MAP SHOWING THE EDWARDS (BALCONES FAULT ZONE) AQUIFER WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN SEGMENT OF THE EDWARDS (BALCONES FAULT ZONE) AQUIFER.

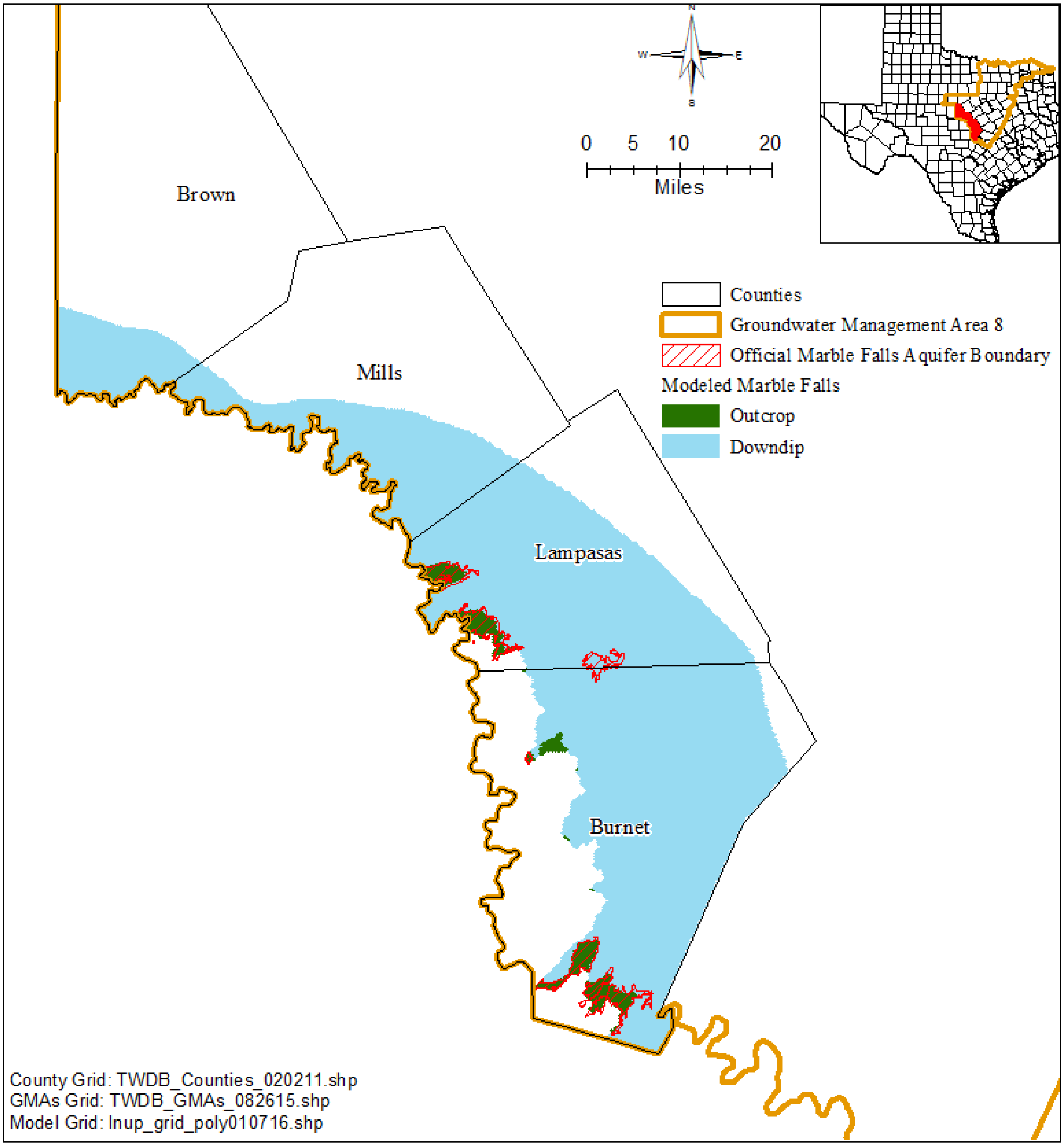


FIGURE 10. MAP SHOWING THE MARBLE FALLS AQUIFER WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE MINOR AQUIFERS IN LLANO UPLIFT REGION.

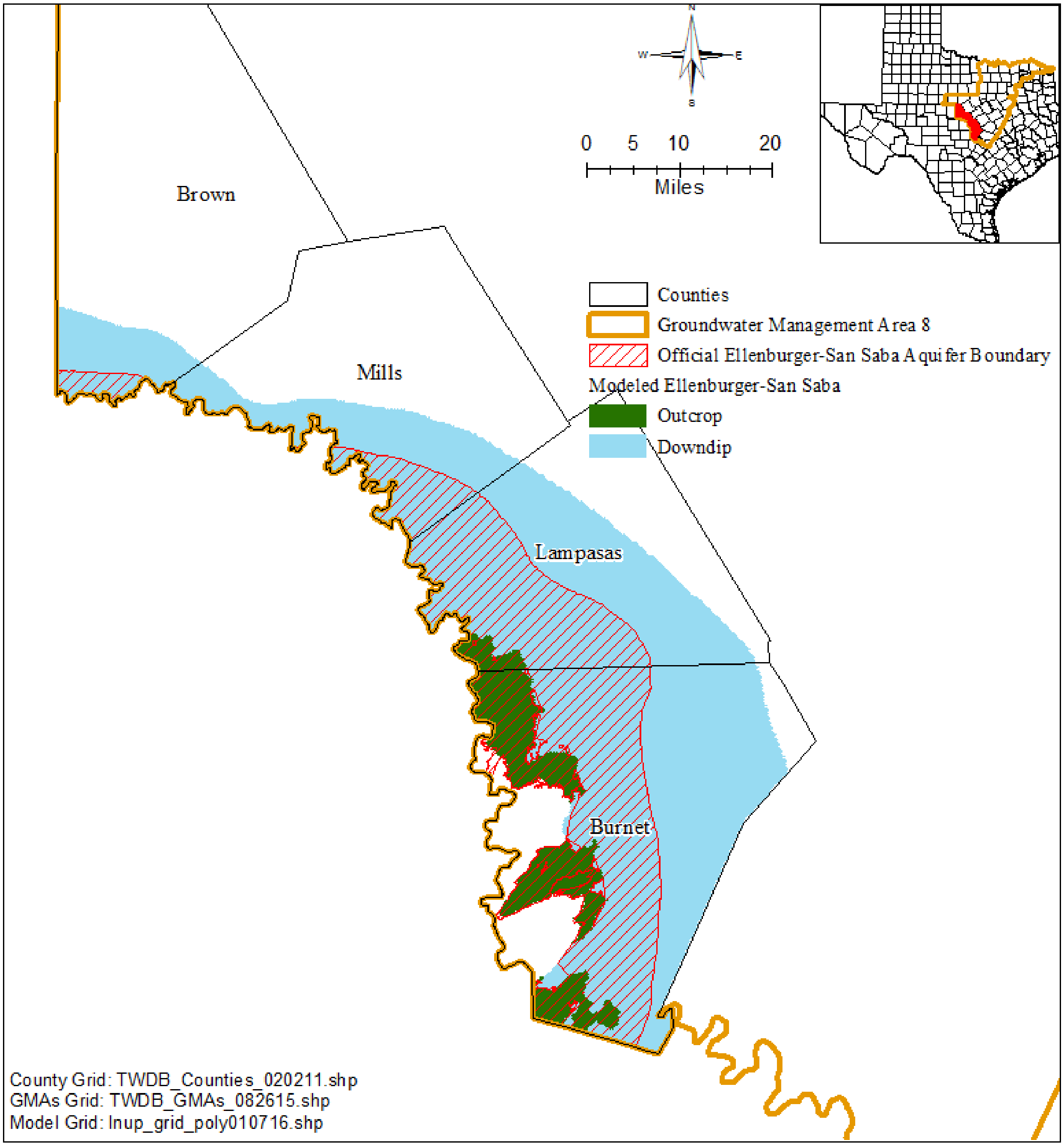


FIGURE 11. MAP SHOWING THE ELLENBURGER-SAN SABA AQUIFER WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE MINOR AQUIFERS IN LLANO UPLIFT REGION.

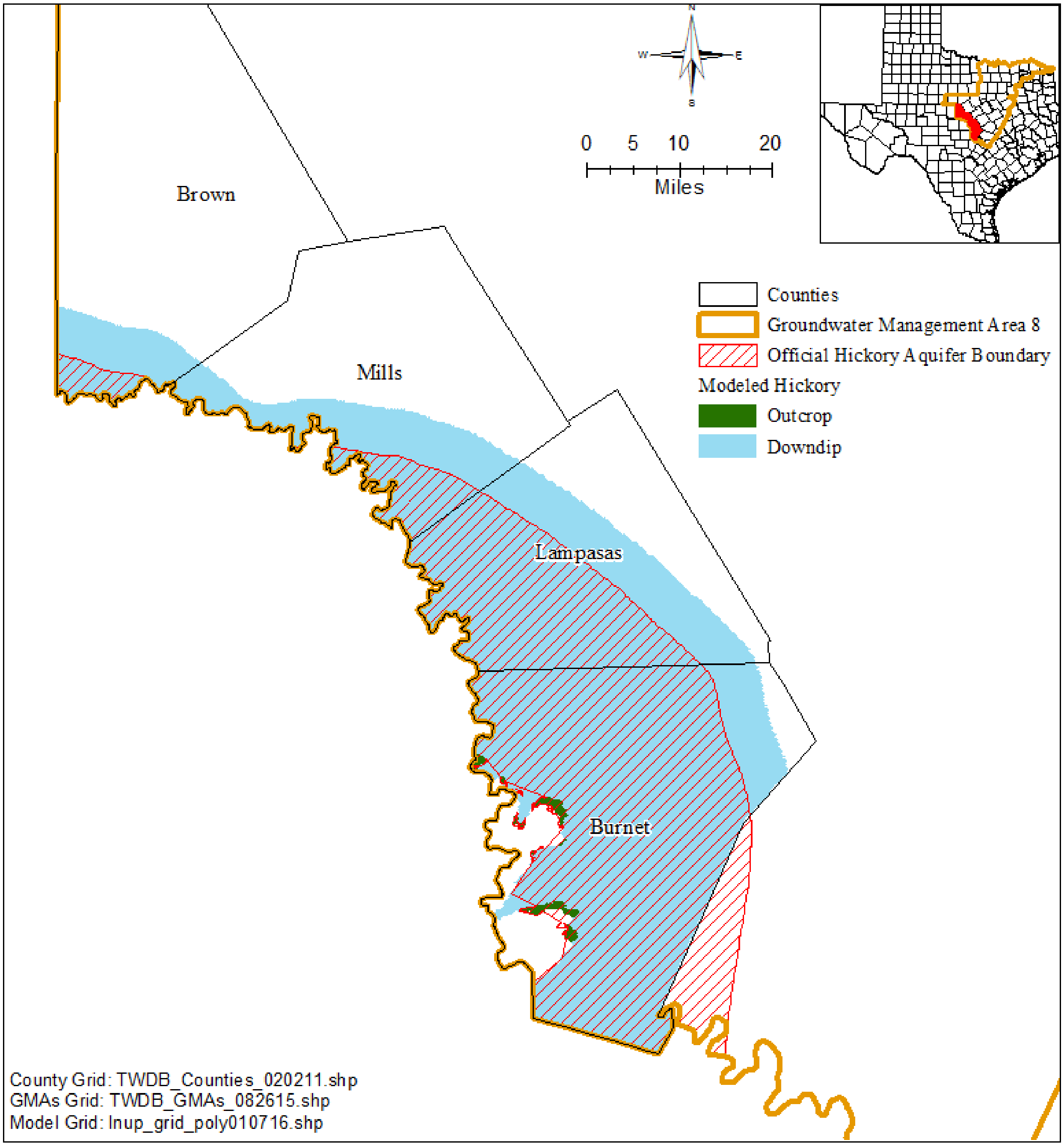


FIGURE 12. MAP SHOWING THE HICKORY AQUIFER WITHIN GROUNDWATER MANAGEMENT AREA 8 FROM THE GROUNDWATER AVAILABILITY MODEL FOR THE MINOR AQUIFERS IN LLANO UPLIFT REGION.

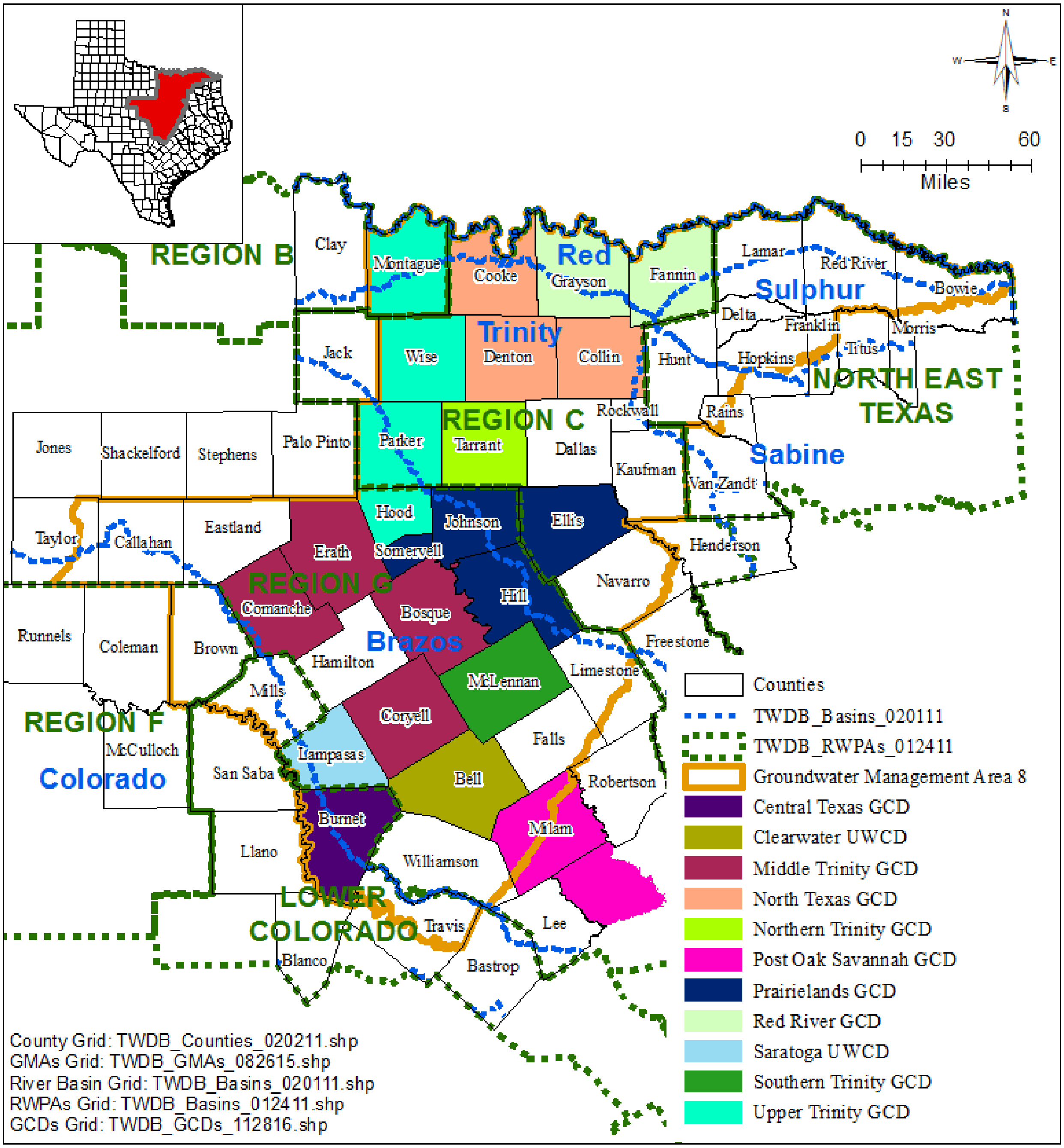


FIGURE 13. MAP SHOWING REGIONAL WATER PLANNING AREAS (RWPAS), GROUNDWATER CONSERVATION DISTRICTS (GCDS), AND RIVER BASINS ASSOCIATED WITH GROUNDWATER MANAGEMENT AREA 8.

TABLE 1. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (PALUXY) IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
Clearwater UWCD	Bell	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Middle Trinity GCD	Bosque	204	356	358	356	358	356	358	356
Middle Trinity GCD	Coryell	0	0	0	0	0	0	0	0
Middle Trinity GCD	Erath	38	61	61	61	61	61	61	61
Middle Trinity GCD Total		**242**	**417**	**419**	**417**	**419**	**417**	**419**	**417**
North Texas GCD	Collin	616	1,547	1,551	1,547	1,551	1,547	1,551	1,547
North Texas GCD	Denton	1,532	4,819	4,832	4,819	4,832	4,819	4,832	4,819
North Texas GCD Total		**2,148**	**6,366**	**6,383**	**6,366**	**6,383**	**6,366**	**6,383**	**6,366**
Northern Trinity GCD	Tarrant	**11,285**	**8,957**	**8,982**	**8,957**	**8,982**	**8,957**	**8,982**	**8,957**
Prairielands GCD	Ellis	510	442	443	442	443	442	443	442
Prairielands GCD	Hill	400	352	353	352	353	352	353	352
Prairielands GCD	Johnson	4,851	2,440	2,447	2,440	2,447	2,440	2,447	2,440
Prairielands GCD	Somervell	3	14	14	14	14	14	14	14
Prairielands GCD Total		**5,764**	**3,248**	**3,257**	**3,248**	**3,257**	**3,248**	**3,257**	**3,248**
Red River GCD	Fannin	389	2,087	2,092	2,087	2,092	2,087	2,092	2,087
Red River GCD	Grayson	0	0	0	0	0	0	0	0
Red River GCD Total		**389**	**2,087**	**2,092**	**2,087**	**2,092**	**2,087**	**2,092**	**2,087**
Southern Trinity GCD	McLennan	**319**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Upper Trinity GCD	Hood (outcrop)	106	159	159	159	159	159	159	159
Upper Trinity GCD	Parker (outcrop)	2,100	2,607	2,614	2,607	2,614	2,607	2,614	2,607
Upper Trinity GCD	Parker (downdip)	221	50	50	50	50	50	50	50
Upper Trinity GCD Total		**2,427**	**2,816**	**2,823**	**2,816**	**2,823**	**2,816**	**2,823**	**2,816**
No District	Dallas	231	358	359	358	359	358	359	358
No District	Delta	56	56	56	56	56	56	56	56
No District	Falls	0	0	0	0	0	0	0	0
No District	Hamilton	0	0	0	0	0	0	0	0
No District	Hunt	3	3	3	3	3	3	3	3
No District	Kaufman	0	0	0	0	0	0	0	0
No District	Lamar	16	8	8	8	8	8	8	8

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
No District	Limestone	0	0	0	0	0	0	0	0
No District	Mills	3	6	6	6	6	6	6	6
No District	Navarro	0	0	0	0	0	0	0	0
No District	Red River	190	177	177	177	177	177	177	177
No District	Rockwall	0	0	0	0	0	0	0	0
No District Total		**499**	**608**	**609**	**608**	**609**	**608**	**609**	**608**
Groundwater Management Area 8		**23,073**	**24,499**	**24,565**	**24,499**	**24,565**	**24,499**	**24,565**	**24,499**

UWCD: Underground Water Conservation District.

TABLE 2. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (GLEN ROSE) IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
Central Texas GCD	Burnet	**35**	**423**	**425**	**423**	**425**	**423**	**425**	**423**
Clearwater UWCD	Bell	**775**	**971**	**974**	**971**	**974**	**971**	**974**	**971**
Middle Trinity GCD	Bosque	576	728	731	728	731	728	731	728
Middle Trinity GCD	Comanche	3	41	41	41	41	41	41	41
Middle Trinity GCD	Coryell	0	120	120	120	120	120	120	120
Middle Trinity GCD	Erath	263	1,078	1,081	1,078	1,081	1,078	1,081	1,078
Middle Trinity GCD Total		**842**	**1,967**	**1,973**	**1,967**	**1,973**	**1,967**	**1,973**	**1,967**
North Texas GCD	Collin	84	83	83	83	83	83	83	83
North Texas GCD	Denton	121	338	339	338	339	338	339	338
North Texas GCD Total		**205**	**421**	**422**	**421**	**422**	**421**	**422**	**421**
Northern Trinity GCD	Tarrant	**1,070**	**793**	**795**	**793**	**795**	**793**	**795**	**793**
Post Oak Savannah GCD	Milam	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Prairielands GCD	Ellis	58	50	50	50	50	50	50	50
Prairielands GCD	Hill	116	115	115	115	115	115	115	115
Prairielands GCD	Johnson	1,780	1,632	1,636	1,632	1,636	1,632	1,636	1,632
Prairielands GCD	Somervell	81	146	146	146	146	146	146	146
Prairielands GCD Total		**2,035**	**1,943**	**1,947**	**1,943**	**1,947**	**1,943**	**1,947**	**1,943**
Red River GCD	Fannin	0	0	0	0	0	0	0	0
Red River GCD	Grayson	0	0	0	0	0	0	0	0
Red River GCD Total		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Saratoga UWCD	Lampasas	**65**	**68**	**68**	**68**	**68**	**68**	**68**	**68**
Southern Trinity GCD	McLennan	**845**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Upper Trinity GCD	Hood (outcrop)	483	653	655	653	655	653	655	653
Upper Trinity GCD	Hood (downdip)	81	103	103	103	103	103	103	103
Upper Trinity GCD	Parker (outcrop)	2,593	2,289	2,295	2,289	2,295	2,289	2,295	2,289
Upper Trinity GCD	Parker (downdip)	1,063	873	876	873	876	873	876	873
Upper Trinity GCD Total		**4,220**	**3,918**	**3,929**	**3,918**	**3,929**	**3,918**	**3,929**	**3,918**

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
No District	Brown	0	0	0	0	0	0	0	0
No District	Dallas	135	131	132	131	132	131	132	131
No District	Delta	0	0	0	0	0	0	0	0
No District	Falls	0	0	0	0	0	0	0	0
No District	Hamilton	168	218	218	218	218	218	218	218
No District	Hunt	0	0	0	0	0	0	0	0
No District	Kaufman	0	0	0	0	0	0	0	0
No District	Lamar	0	0	0	0	0	0	0	0
No District	Limestone	0	0	0	0	0	0	0	0
No District	Mills	12	189	189	189	189	189	189	189
No District	Navarro	0	0	0	0	0	0	0	0
No District	Red River	0	0	0	0	0	0	0	0
No District	Rockwall	0	0	0	0	0	0	0	0
No District	Travis	898	971	974	971	974	971	974	971
No District	Williamson	695	688	690	688	690	688	690	688
No District Total		**1,908**	**2,197**	**2,203**	**2,197**	**2,203**	**2,197**	**2,203**	**2,197**
Groundwater Management Area 8		**12,000**	**12,701**	**12,736**	**12,701**	**12,736**	**12,701**	**12,736**	**12,701**

UWCD: Underground Water Conservation District.

TABLE 3. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (TWIN MOUNTAINS) IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
Middle Trinity GCD	Erath	**3,443**	**5,017**	**5,031**	**5,017**	**5,031**	**5,017**	**5,031**	**5,017**
North Texas GCD	Collin	163	2,201	2,207	2,201	2,207	2,201	2,207	2,201
North Texas GCD	Denton	997	8,366	8,389	8,366	8,389	8,366	8,389	8,366
North Texas GCD Total		**1,160**	**10,567**	**10,596**	**10,567**	**10,596**	**10,567**	**10,596**	**10,567**
Northern Trinity GCD	Tarrant	**7,329**	**6,917**	**6,936**	**6,917**	**6,936**	**6,917**	**6,936**	**6,917**
Prairielands GCD	Ellis	0	0	0	0	0	0	0	0
Prairielands GCD	Johnson	539	384	385	384	385	384	385	384
Prairielands GCD	Somervell	150	174	174	174	174	174	174	174
Prairielands GCD Total		**689**	**558**	**559**	**558**	**559**	**558**	**559**	**558**
Red River GCD	Fannin	0	0	0	0	0	0	0	0
Red River GCD	Grayson	0	0	0	0	0	0	0	0
Red River GCD Total		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Upper Trinity GCD	Hood (outcrop)	3,379	3,662	3,672	3,662	3,672	3,662	3,672	3,662
Upper Trinity GCD	Hood (downdip)	7,143	7,759	7,780	7,759	7,780	7,759	7,780	7,759
Upper Trinity GCD	Parker (outcrop)	1,600	1,066	1,069	1,066	1,069	1,066	1,069	1,066
Upper Trinity GCD	Parker (downdip)	3,459	2,082	2,088	2,082	2,088	2,082	2,088	2,082
Upper Trinity GCD Total		**15,581**	**14,569**	**14,609**	**14,569**	**14,609**	**14,569**	**14,609**	**14,569**
No District	Dallas	2,282	3,199	3,208	3,199	3,208	3,199	3,208	3,199
No District	Hunt	0	0	0	0	0	0	0	0
No District	Kaufman	0	0	0	0	0	0	0	0
No District	Rockwall	0	0	0	0	0	0	0	0
No District Total		**2,282**	**3,199**	**3,208**	**3,199**	**3,208**	**3,199**	**3,208**	**3,199**
Groundwater Management Area 8		**30,484**	**40,827**	**40,939**	**40,827**	**40,939**	**40,827**	**40,939**	**40,827**

TABLE 4. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (TRAVIS PEAK) IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
Central Texas GCD	Burnet	**1,906**	**3,464**	**3,474**	**3,464**	**3,474**	**3,464**	**3,474**	**3,464**
Clearwater UWCD	Bell	**1,957**	**8,270**	**8,293**	**8,270**	**8,293**	**8,270**	**8,293**	**8,270**
Middle Trinity GCD	Bosque	5,255	7,678	7,699	7,678	7,699	7,678	7,699	7,678
Middle Trinity GCD	Comanche	9,793	6,160	6,177	6,160	6,177	6,160	6,177	6,160
Middle Trinity GCD	Coryell	3,350	4,371	4,383	4,371	4,383	4,371	4,383	4,371
Middle Trinity GCD	Erath	8,263	11,815	11,849	11,815	11,849	11,815	11,849	11,815
Middle Trinity GCD Total		**26,661**	**30,024**	**30,108**	**30,024**	**30,108**	**30,024**	**30,108**	**30,024**
Post Oak Savannah GCD	Milam	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Prairielands GCD	Ellis	5,583	5,032	5,046	5,032	5,046	5,032	5,046	5,032
Prairielands GCD	Hill	3,700	3,550	3,559	3,550	3,559	3,550	3,559	3,550
Prairielands GCD	Johnson	5,602	4,941	4,955	4,941	4,955	4,941	4,955	4,941
Prairielands GCD	Somervell	2,560	2,847	2,854	2,847	2,854	2,847	2,854	2,847
Prairielands GCD Total		**17,445**	**16,370**	**16,414**	**16,370**	**16,414**	**16,370**	**16,414**	**16,370**
Red River GCD	Fannin	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Saratoga UWCD	Lampasas	**1,669**	**1,599**	**1,603**	**1,599**	**1,603**	**1,599**	**1,603**	**1,599**
Southern Trinity GCD	McLennan	**13,252**	**20,635**	**20,691**	**20,635**	**20,691**	**20,635**	**20,691**	**20,635**
Upper Trinity GCD	Hood (downdip)	**70**	**89**	**89**	**89**	**89**	**89**	**89**	**89**
No District	Brown	680	394	395	394	395	394	395	394
No District	Dallas	0	0	0	0	0	0	0	0
No District	Delta	0	0	0	0	0	0	0	0
No District	Falls	1,158	1,434	1,438	1,434	1,438	1,434	1,438	1,434
No District	Hamilton	1,685	2,207	2,213	2,207	2,213	2,207	2,213	2,207
No District	Hunt	0	0	0	0	0	0	0	0
No District	Kaufman	0	0	0	0	0	0	0	0
No District	Lamar	0	0	0	0	0	0	0	0
No District	Limestone	0	0	0	0	0	0	0	0
No District	Mills	1,011	2,275	2,282	2,275	2,282	2,275	2,282	2,275
No District	Navarro	0	0	0	0	0	0	0	0
No District	Red River	0	0	0	0	0	0	0	0
No District	Travis	3,442	4,113	4,125	4,113	4,125	4,113	4,125	4,113
No District	Williamson	3,026	2,883	2,891	2,883	2,891	2,883	2,891	2,883

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
No District Total		**11,002**	**13,306**	**13,344**	**13,306**	**13,344**	**13,306**	**13,344**	**13,306**
Groundwater Management Area 8		**73,962**	**93,757**	**94,016**	**93,757**	**94,016**	**93,757**	**94,016**	**93,757**

UWCD: Underground Water Conservation District.

TABLE 5. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (HENSELL) IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
Central Texas GCD	Burnet	**51**	**1,888**	**1,894**	**1,888**	**1,894**	**1,888**	**1,894**	**1,888**
Clearwater UWCD	Bell	**355**	**1,096**	**1,099**	**1,096**	**1,099**	**1,096**	**1,099**	**1,096**
Middle Trinity GCD	Bosque	2,909	3,835	3,845	3,835	3,845	3,835	3,845	3,835
Middle Trinity GCD	Comanche	188	204	204	204	204	204	204	204
Middle Trinity GCD	Coryell	1,679	2,196	2,202	2,196	2,202	2,196	2,202	2,196
Middle Trinity GCD	Erath	3,446	5,137	5,151	5,137	5,151	5,137	5,151	5,137
Middle Trinity GCD Total		**8,222**	**11,372**	**11,402**	**11,372**	**11,402**	**11,372**	**11,402**	**11,372**
Post Oak Savannah GCD	Milam	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Prairielands GCD	Ellis	0	0	0	0	0	0	0	0
Prairielands GCD	Hill	237	225	226	225	226	225	226	225
Prairielands GCD	Johnson	1,530	1,083	1,086	1,083	1,086	1,083	1,086	1,083
Prairielands GCD	Somervell	1,822	1,973	1,978	1,973	1,978	1,973	1,978	1,973
Prairielands GCD Total		**3,589**	**3,281**	**3,290**	**3,281**	**3,290**	**3,281**	**3,290**	**3,281**
Saratoga UWCD	Lampasas	**730**	**712**	**715**	**712**	**715**	**712**	**715**	**712**
Southern Trinity GCD	McLennan	**3,018**	**4,698**	**4,711**	**4,698**	**4,711**	**4,698**	**4,711**	**4,698**
Upper Trinity GCD	Hood (downdip)	**45**	**36**	**36**	**36**	**36**	**36**	**36**	**36**
No District	Brown	6	4	4	4	4	4	4	4
No District	Dallas	0	0	0	0	0	0	0	0
No District	Falls	0	0	0	0	0	0	0	0
No District	Hamilton	1,221	1,671	1,675	1,671	1,675	1,671	1,675	1,671
No District	Kaufman	0	0	0	0	0	0	0	0
No District	Limestone	0	0	0	0	0	0	0	0
No District	Mills	224	607	608	607	608	607	608	607
No District	Navarro	0	0	0	0	0	0	0	0
No District	Travis	919	1,141	1,144	1,141	1,144	1,141	1,144	1,141
No District	Williamson	772	751	753	751	753	751	753	751
No District Total		**3,142**	**4,174**	**4,184**	**4,174**	**4,184**	**4,174**	**4,184**	**4,174**
Groundwater Management Area 8		**19,152**	**27,257**	**27,331**	**27,257**	**27,331**	**27,257**	**27,331**	**27,257**

UWCD: Underground Water Conservation District.

TABLE 6. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (HOSSTON) IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
Central Texas GCD	Burnet	**1,799**	**1,379**	**1,382**	**1,379**	**1,382**	**1,379**	**1,382**	**1,379**
Clearwater UWCD	Bell	**1,375**	**7,174**	**7,193**	**7,174**	**7,193**	**7,174**	**7,193**	**7,174**
Middle Trinity GCD	Bosque	2,289	3,762	3,772	3,762	3,772	3,762	3,772	3,762
Middle Trinity GCD	Comanche	9,504	5,864	5,881	5,864	5,881	5,864	5,881	5,864
Middle Trinity GCD	Coryell	1,661	2,161	2,167	2,161	2,167	2,161	2,167	2,161
Middle Trinity GCD	Erath	4,637	6,383	6,400	6,383	6,400	6,383	6,400	6,383
Middle Trinity GCD Total		**18,091**	**18,170**	**18,220**	**18,170**	**18,220**	**18,170**	**18,220**	**18,170**
Post Oak Savannah GCD	Milam	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Prairielands GCD	Ellis	5,575	5,026	5,040	5,026	5,040	5,026	5,040	5,026
Prairielands GCD	Hill	3,413	3,272	3,281	3,272	3,281	3,272	3,281	3,272
Prairielands GCD	Johnson	4,061	3,853	3,863	3,853	3,863	3,853	3,863	3,853
Prairielands GCD	Somervell	736	843	845	843	845	843	845	843
Prairielands GCD Total		**13,785**	**12,994**	**13,029**	**12,994**	**13,029**	**12,994**	**13,029**	**12,994**
Saratoga UWCD	Lampasas	**907**	**857**	**859**	**857**	**859**	**857**	**859**	**857**
Southern Trinity GCD	McLennan	**10,212**	**15,937**	**15,980**	**15,937**	**15,980**	**15,937**	**15,980**	**15,937**
Upper Trinity GCD	Hood (downdip)	**25**	**53**	**53**	**53**	**53**	**53**	**53**	**53**
No District	Brown	624	356	358	356	358	356	358	356
No District	Dallas	0	0	0	0	0	0	0	0
No District	Falls	1,157	1,434	1,438	1,434	1,438	1,434	1,438	1,434
No District	Hamilton	325	385	386	385	386	385	386	385
No District	Kaufman	0	0	0	0	0	0	0	0
No District	Limestone	0	0	0	0	0	0	0	0
No District	Mills	650	1,467	1,471	1,467	1,471	1,467	1,471	1,467
No District	Navarro	0	0	0	0	0	0	0	0
No District	Travis	2,357	2,783	2,791	2,783	2,791	2,783	2,791	2,783
No District	Williamson	2,050	1,933	1,938	1,933	1,938	1,933	1,938	1,933
No District Total		**7,163**	**8,358**	**8,382**	**8,358**	**8,382**	**8,358**	**8,382**	**8,358**
Groundwater Management Area 8		**53,357**	**64,922**	**65,098**	**64,922**	**65,098**	**64,922**	**65,098**	**64,922**

UWCD: Underground Water Conservation District.

TABLE 7. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER (ANTLERS) IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
Middle Trinity GCD	Comanche	9,320	5,839	5,855	5,839	5,855	5,839	5,855	5,839
Middle Trinity GCD	Erath	1,663	2,628	2,636	2,628	2,636	2,628	2,636	2,628
Middle Trinity GCD Total		**10,983**	**8,467**	**8,491**	**8,467**	**8,491**	**8,467**	**8,491**	**8,467**
North Texas GCD	Collin	629	1,961	1,966	1,961	1,966	1,961	1,966	1,961
North Texas GCD	Cooke	4,117	10,514	10,544	10,514	10,544	10,514	10,544	10,514
North Texas GCD	Denton	11,427	16,545	16,591	16,545	16,591	16,545	16,591	16,545
North Texas GCD Total		**16,173**	**29,020**	**29,101**	**29,020**	**29,101**	**29,020**	**29,101**	**29,020**
Northern Trinity GCD	Tarrant	**1,908**	**1,248**	**1,251**	**1,248**	**1,251**	**1,248**	**1,251**	**1,248**
Red River GCD	Fannin	0	0	0	0	0	0	0	0
Red River GCD	Grayson	6,872	10,708	10,738	10,708	10,738	10,708	10,738	10,708
Red River GCD Total		**6,872**	**10,708**	**10,738**	**10,708**	**10,738**	**10,708**	**10,738**	**10,708**
Upper Trinity GCD	Montague (outcrop)	1,421	3,875	3,886	3,875	3,886	3,875	3,886	3,875
Upper Trinity GCD	Parker (outcrop)	3,321	2,897	2,905	2,897	2,905	2,897	2,905	2,897
Upper Trinity GCD	Wise (outcrop)	9,080	7,677	7,698	7,677	7,698	7,677	7,698	7,677
Upper Trinity GCD	Wise (downdip)	3,699	2,057	2,062	2,057	2,062	2,057	2,062	2,057
Upper Trinity GCD Total		**17,521**	**16,506**	**16,551**	**16,506**	**16,551**	**16,506**	**16,551**	**16,506**
No District	Brown	1,743	1,052	1,055	1,052	1,055	1,052	1,055	1,052
No District	Callahan	1,804	1,725	1,730	1,725	1,730	1,725	1,730	1,725
No District	Eastland	5,613	5,732	5,747	5,732	5,747	5,732	5,747	5,732
No District	Lamar	0	0	0	0	0	0	0	0
No District	Red River	0	0	0	0	0	0	0	0
No District	Taylor	17	13	13	13	13	13	13	13
No District Total		**9,177**	**8,522**	**8,545**	**8,522**	**8,545**	**8,522**	**8,545**	**8,522**
Groundwater Management Area 8		**62,634**	**74,471**	**74,677**	**74,471**	**74,677**	**74,471**	**74,677**	**74,471**

TABLE 8. MODELED AVAILABLE GROUNDWATER FOR THE WOODBINE AQUIFER IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
North Texas GCD	Collin	2,427	4,251	4,263	4,251	4,263	4,251	4,263	4,251
North Texas GCD	Cooke	1,646	800	802	800	802	800	802	800
North Texas GCD	Denton	3,797	3,607	3,616	3,607	3,616	3,607	3,616	3,607
North Texas GCD Total		**7,870**	**8,658**	**8,681**	**8,658**	**8,681**	**8,658**	**8,681**	**8,658**
Northern Trinity GCD	Tarrant	**2,646**	**1,138**	**1,141**	**1,138**	**1,141**	**1,138**	**1,141**	**1,138**
Prairielands GCD	Ellis	2,471	2,073	2,078	2,073	2,078	2,073	2,078	2,073
Prairielands GCD	Hill	752	586	588	586	588	586	588	586
Prairielands GCD	Johnson	3,880	1,980	1,985	1,980	1,985	1,980	1,985	1,980
Prairielands GCD Total		**7,103**	**4,639**	**4,651**	**4,639**	**4,651**	**4,639**	**4,651**	**4,639**
Red River GCD	Fannin	5,495	4,920	4,934	4,920	4,934	4,920	4,934	4,920
Red River GCD	Grayson	5,056	7,521	7,541	7,521	7,541	7,521	7,541	7,521
Red River GCD Total		**10,551**	**12,441**	**12,475**	**12,441**	**12,475**	**12,441**	**12,475**	**12,441**
Southern Trinity GCD	McLennan	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
No District	Dallas	1,957	2,796	2,804	2,796	2,804	2,796	2,804	2,796
No District	Hunt	463	763	765	763	765	763	765	763
No District	Kaufman	0	0	0	0	0	0	0	0
No District	Lamar	61	49	49	49	49	49	49	49
No District	Navarro	65	68	68	68	68	68	68	68
No District	Red River	3	2	2	2	2	2	2	2
No District	Rockwall	0	0	0	0	0	0	0	0
No District Total		**2,549**	**3,678**	**3,688**	**3,678**	**3,688**	**3,678**	**3,688**	**3,678**
Groundwater Management Area 8		**30,719**	**30,554**	**30,636**	**30,554**	**30,636**	**30,554**	**30,636**	**30,554**

TABLE 9. MODELED AVAILABLE GROUNDWATER FOR THE EDWARDS (BALCONES FAULT ZONE) AQUIFER IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2000	2010	2020	2030	2040	2050	2060	2070
Clearwater UWCD	Bell	**949**	**6,469**	**6,469**	**6,469**	**6,469**	**6,469**	**6,469**	**6,469**
No District	Travis	1,201	5,237	5,237	5,237	5,237	5,237	5,237	5,237
No District	Williamson	13,813	3,462	3,462	3,462	3,462	3,462	3,462	3,462
Groundwater Management Area 8		**15,981**	**15,168**	**15,168**	**15,168**	**15,168**	**15,168**	**15,168**	**15,168**

UWCD: Underground Water Conservation District.

TABLE 10. MODELED AVAILABLE GROUNDWATER FOR THE MARBLE FALLS AQUIFER IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
Central Texas GCD	Burnet	**2,220**	**2,736**	**2,744**	**2,736**	**2,744**	**2,736**	**2,744**	**2,736**
Saratoga UWCD	Lampasas	**363**	**2,837**	**2,845**	**2,837**	**2,845**	**2,837**	**2,845**	**2,837**
No District	Brown	0	25	25	25	25	25	25	25
No District	Mills	20	25	25	25	25	25	25	25
No District Total		**20**	**50**	**50**	**50**	**50**	**50**	**50**	**50**
Groundwater Management Area 8		**2,603**	**5,623**	**5,639**	**5,623**	**5,639**	**5,623**	**5,639**	**5,623**

UWCD: Underground Water Conservation District.

TABLE 11. MODELED AVAILABLE GROUNDWATER FOR THE ELLENBURGER-SAN SABA AQUIFER IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
Central Texas GCD	Burnet	**5,256**	**10,827**	**10,857**	**10,827**	**10,857**	**10,827**	**10,857**	**10,827**
Saratoga UWCD	Lampasas	**351**	**2,593**	**2,601**	**2,593**	**2,601**	**2,593**	**2,601**	**2,593**
No District	Brown	1	131	131	131	131	131	131	131
No District	Mills	0	499	500	499	500	499	500	499
No District Total		**1**	**630**	**631**	**630**	**631**	**630**	**631**	**630**
Groundwater Management Area 8		**5,608**	**14,050**	**14,089**	**14,050**	**14,089**	**14,050**	**14,089**	**14,050**

UWCD: Underground Water Conservation District.

TABLE 12. MODELED AVAILABLE GROUNDWATER FOR THE HICKORY AQUIFER IN GROUNDWATER MANAGEMENT AREA 8 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2070 WITH BASELINE YEAR 2009. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	2009	2010	2020	2030	2040	2050	2060	2070
Central Texas GCD	Burnet	**1,088**	**3,413**	**3,423**	**3,413**	**3,423**	**3,413**	**3,423**	**3,413**
Saratoga UWCD	Lampasas	**0**	**113**	**114**	**113**	**114**	**113**	**114**	**113**
No District	Brown	0	12	12	12	12	12	12	12
No District	Mills	0	36	36	36	36	36	36	36
No District Total		**0**	**48**	**48**	**48**	**48**	**48**	**48**	**48**
Groundwater Management Area 8		**1,088**	**3,574**	**3,585**	**3,574**	**3,585**	**3,574**	**3,585**	**3,574**

UWCD: Underground Water Conservation District.

TABLE 13. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (PALUXY) IN GROUNDWATER MANAGEMENT AREA 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Counties Not in Upper Trinity GCD								
Bell	Region G	Brazos	0	0	0	0	0	0
Bosque	Region G	Brazos	358	356	358	356	358	356
Collin	Region C	Sabine	0	0	0	0	0	0
Collin	Region C	Trinity	1,551	1,547	1,551	1,547	1,551	1,547
Coryell	Region G	Brazos	0	0	0	0	0	0
Dallas	Region C	Trinity	359	358	359	358	359	358
Delta	Northeast Texas	Sulphur	56	56	56	56	56	56
Denton	Region C	Trinity	4,832	4,819	4,832	4,819	4,832	4,819
Ellis	Region C	Trinity	443	442	443	442	443	442
Erath	Region G	Brazos	61	61	61	61	61	61
Falls	Region G	Brazos	0	0	0	0	0	0
Fannin	Region C	Sulphur	2,092	2,087	2,092	2,087	2,092	2,087
Fannin	Region C	Trinity	0	0	0	0	0	0
Grayson	Region C	Trinity	0	0	0	0	0	0
Hamilton	Region G	Brazos	0	0	0	0	0	0
Hill	Region G	Brazos	348	347	348	347	348	347
Hill	Region G	Trinity	5	5	5	5	5	5
Hunt	Northeast Texas	Sabine	0	0	0	0	0	0
Hunt	Northeast Texas	Sulphur	3	3	3	3	3	3
Hunt	Northeast Texas	Trinity	0	0	0	0	0	0
Johnson	Region G	Brazos	880	878	880	878	880	878
Johnson	Region G	Trinity	1,567	1,562	1,567	1,562	1,567	1,562
Kaufman	Region C	Trinity	0	0	0	0	0	0
Lamar	Northeast Texas	Red	0	0	0	0	0	0
Lamar	Northeast Texas	Sulphur	8	8	8	8	8	8
Limestone	Region G	Brazos	0	0	0	0	0	0
Limestone	Region G	Trinity	0	0	0	0	0	0
McLennan	Region G	Brazos	0	0	0	0	0	0
Mills	Lower Colorado	Brazos	6	6	6	6	6	6
Mills	Lower Colorado	Colorado	0	0	0	0	0	0
Navarro	Region C	Trinity	0	0	0	0	0	0
Red River	Northeast Texas	Red	52	52	52	52	52	52
Red River	Northeast Texas	Sulphur	125	125	125	125	125	125

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Rockwall	Region C	Trinity	0	0	0	0	0	0
Somervell	Region G	Brazos	14	14	14	14	14	14
Tarrant	Region C	Trinity	8,982	8,957	8,982	8,957	8,982	8,957
Subtotal			**21,742**	**21,683**	**21,742**	**21,683**	**21,742**	**21,683**
Counties in Upper Trinity GCD								
Hood (outcrop)	Region G	Brazos	159	158	159	158	159	158
Hood (outcrop)	Region G	Trinity	0	0	0	0	0	0
Parker (outcrop)	Region C	Brazos	34	34	34	34	34	34
Parker (outcrop)	Region C	Trinity	2,580	2,573	2,580	2,573	2,580	2,573
Parker (downdip)	Region C	Trinity	50	50	50	50	50	50
Subtotal			**2,823**	**2,815**	**2,823**	**2,815**	**2,823**	**2,815**
Groundwater Management Area 8			**24,565**	**24,498**	**24,565**	**24,498**	**24,565**	**24,498**

TABLE 14. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (GLEN ROSE) IN GROUNDWATER MANAGEMENT AREA 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Counties Not in Upper Trinity GCD								
Bell	Region G	Brazos	974	971	974	971	974	971
Bosque	Region G	Brazos	731	728	731	728	731	728
Brown	Region F	Colorado	0	0	0	0	0	0
Burnet	Lower Colorado	Brazos	188	188	188	188	188	188
Burnet	Lower Colorado	Colorado	236	235	236	235	236	235
Collin	Region C	Sabine	0	0	0	0	0	0
Collin	Region C	Trinity	83	83	83	83	83	83
Comanche	Region G	Brazos	22	22	22	22	22	22
Comanche	Region G	Colorado	18	18	18	18	18	18
Coryell	Region G	Brazos	120	120	120	120	120	120
Dallas	Region C	Trinity	132	131	132	131	132	131
Delta	Northeast Texas	Sulphur	0	0	0	0	0	0
Denton	Region C	Trinity	339	338	339	338	339	338
Ellis	Region C	Trinity	50	50	50	50	50	50
Erath	Region G	Brazos	1,081	1,078	1,081	1,078	1,081	1,078
Falls	Region G	Brazos	0	0	0	0	0	0
Fannin	Region C	Sulphur	0	0	0	0	0	0
Fannin	Region C	Trinity	0	0	0	0	0	0
Grayson	Region C	Trinity	0	0	0	0	0	0
Hamilton	Region G	Brazos	218	218	218	218	218	218
Hill	Region G	Brazos	115	114	115	114	115	114
Hill	Region G	Trinity	1	1	1	1	1	1
Hunt	Northeast Texas	Sabine	0	0	0	0	0	0
Hunt	Northeast Texas	Sulphur	0	0	0	0	0	0
Hunt	Northeast Texas	Trinity	0	0	0	0	0	0
Johnson	Region G	Brazos	953	950	953	950	953	950
Johnson	Region G	Trinity	683	681	683	681	683	681
Kaufman	Region C	Trinity	0	0	0	0	0	0
Lamar	Northeast Texas	Red	0	0	0	0	0	0
Lamar	Northeast Texas	Sulphur	0	0	0	0	0	0
Lampasas	Region G	Brazos	68	68	68	68	68	68
Limestone	Region G	Brazos	0	0	0	0	0	0
Limestone	Region G	Trinity	0	0	0	0	0	0

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
McLennan	Region G	Brazos	0	0	0	0	0	0
Milam	Region G	Brazos	0	0	0	0	0	0
Mills	Lower Colorado	Brazos	96	96	96	96	96	96
Mills	Lower Colorado	Colorado	93	93	93	93	93	93
Navarro	Region C	Trinity	0	0	0	0	0	0
Red River	Northeast Texas	Red	0	0	0	0	0	0
Red River	Northeast Texas	Sulphur	0	0	0	0	0	0
Rockwall	Region C	Trinity	0	0	0	0	0	0
Somervell	Region G	Brazos	146	146	146	146	146	146
Tarrant	Region C	Trinity	795	793	795	793	795	793
Travis	Lower Colorado	Brazos	0	0	0	0	0	0
Travis	Lower Colorado	Colorado	974	971	974	971	974	971
Williamson	Region G	Brazos	623	621	623	621	623	621
Williamson	Region G	Colorado	0	0	0	0	0	0
Williamson	Lower Colorado	Brazos	0	0	0	0	0	0
Williamson	Lower Colorado	Colorado	67	67	67	67	67	67
Subtotal			**8,806**	**8,781**	**8,806**	**8,781**	**8,806**	**8,781**
Counties in Upper Trinity GCD								
Hood (outcrop)	Region G	Brazos	655	653	655	653	655	653
Hood (downdip)	Region G	Brazos	83	83	83	83	83	83
Hood (downdip)	Region G	Trinity	20	20	20	20	20	20
Parker (outcrop)	Region C	Brazos	87	87	87	87	87	87
Parker (downdip)	Region C	Brazos	7	7	7	7	7	7
Parker (outcrop)	Region C	Trinity	2,208	2,202	2,208	2,202	2,208	2,202
Parker (downdip)	Region C	Trinity	869	866	869	866	869	866
Subtotal			**3,929**	**3,918**	**3,929**	**3,918**	**3,929**	**3,918**
Groundwater Management Area 8			**12,735**	**12,699**	**12,735**	**12,699**	**12,735**	**12,699**

TABLE 15. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (TWIN MOUNTAINS) IN GROUNDWATER MANAGEMENT AREA 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Counties Not in Upper Trinity GCD								
Collin	Region C	Sabine	0	0	0	0	0	0
Collin	Region C	Trinity	2,207	2,201	2,207	2,201	2,207	2,201
Dallas	Region C	Trinity	3,208	3,199	3,208	3,199	3,208	3,199
Denton	Region C	Trinity	8,389	8,366	8,389	8,366	8,389	8,366
Ellis	Region C	Trinity	0	0	0	0	0	0
Erath	Region G	Brazos	5,031	5,017	5,031	5,017	5,031	5,017
Fannin	Region C	Sulphur	0	0	0	0	0	0
Fannin	Region C	Trinity	0	0	0	0	0	0
Grayson	Region C	Trinity	0	0	0	0	0	0
Hunt	Northeast Texas	Sabine	0	0	0	0	0	0
Hunt	Northeast Texas	Trinity	0	0	0	0	0	0
Johnson	Region G	Brazos	133	133	133	133	133	133
Johnson	Region G	Trinity	252	251	252	251	252	251
Kaufman	Region C	Trinity	0	0	0	0	0	0
Rockwall	Region C	Trinity	0	0	0	0	0	0
Somervell	Region G	Brazos	174	174	174	174	174	174
Tarrant	Region C	Trinity	6,936	6,917	6,936	6,917	6,936	6,917
Subtotal			**26,330**	**26,258**	**26,330**	**26,258**	**26,330**	**26,258**
Counties in Upper Trinity GCD								
Hood (outcrop)	Region G	Brazos	3,672	3,662	3,672	3,662	3,672	3,662
Hood (downdip)	Region G	Brazos	7,761	7,740	7,761	7,740	7,761	7,740
Hood (downdip)	Region G	Trinity	19	19	19	19	19	19
Parker (outcrop)	Region C	Brazos	1,069	1,066	1,069	1,066	1,069	1,066
Parker (downdip)	Region C	Brazos	778	776	778	776	778	776
Parker (downdip)	Region C	Trinity	1,310	1,306	1,310	1,306	1,310	1,306
Subtotal			**14,609**	**14,569**	**14,609**	**14,569**	**14,609**	**14,569**
Groundwater Management Area 8			**40,939**	**40,827**	**40,939**	**40,827**	**40,939**	**40,827**

TABLE 16. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (TRAVIS PEAK) IN GROUNDWATER MANAGEMENT AREA 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Counties Not in Upper Trinity GCD								
Bell	Region G	Brazos	8,293	8,270	8,293	8,270	8,293	8,270
Bosque	Region G	Brazos	7,699	7,678	7,699	7,678	7,699	7,678
Brown	Region F	Brazos	3	3	3	3	3	3
Brown	Region F	Colorado	392	391	392	391	392	391
Burnet	Lower Colorado	Brazos	2,950	2,943	2,950	2,943	2,950	2,943
Burnet	Lower Colorado	Colorado	523	521	523	521	523	521
Comanche	Region G	Brazos	6,128	6,111	6,128	6,111	6,128	6,111
Comanche	Region G	Colorado	49	49	49	49	49	49
Coryell	Region G	Brazos	4,383	4,371	4,383	4,371	4,383	4,371
Dallas	Region C	Trinity	0	0	0	0	0	0
Delta	Northeast Texas	Sulphur	0	0	0	0	0	0
Ellis	Region C	Trinity	5,046	5,032	5,046	5,032	5,046	5,032
Erath	Region G	Brazos	11,849	11,815	11,849	11,815	11,849	11,815
Falls	Region G	Brazos	1,438	1,434	1,438	1,434	1,438	1,434
Fannin	Region C	Sulphur	0	0	0	0	0	0
Fannin	Region C	Trinity	0	0	0	0	0	0
Hamilton	Region G	Brazos	2,213	2,207	2,213	2,207	2,213	2,207
Hill	Region G	Brazos	3,304	3,295	3,304	3,295	3,304	3,295
Hill	Region G	Trinity	256	255	256	255	256	255
Hunt	Northeast Texas	Sabine	0	0	0	0	0	0
Hunt	Northeast Texas	Sulphur	0	0	0	0	0	0
Hunt	Northeast Texas	Trinity	0	0	0	0	0	0
Johnson	Region G	Brazos	1,932	1,927	1,932	1,927	1,932	1,927
Johnson	Region G	Trinity	3,022	3,014	3,022	3,014	3,022	3,014
Kaufman	Region C	Trinity	0	0	0	0	0	0
Lamar	Northeast Texas	Red	0	0	0	0	0	0
Lamar	Northeast Texas	Sulphur	0	0	0	0	0	0
Lampasas	Region G	Brazos	1,528	1,523	1,528	1,523	1,528	1,523
Lampasas	Region G	Colorado	76	75	76	75	76	75
Limestone	Region G	Brazos	0	0	0	0	0	0
Limestone	Region G	Trinity	0	0	0	0	0	0
McLennan	Region G	Brazos	20,691	20,635	20,691	20,635	20,691	20,635
Milam	Region G	Brazos	0	0	0	0	0	0

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Mills	Lower Colorado	Brazos	706	703	706	703	706	703
Mills	Lower Colorado	Colorado	1,576	1,572	1,576	1,572	1,576	1,572
Navarro	Region C	Trinity	0	0	0	0	0	0
Red River	Northeast Texas	Red	0	0	0	0	0	0
Red River	Northeast Texas	Sulphur	0	0	0	0	0	0
Somervell	Region G	Brazos	2,854	2,847	2,854	2,847	2,854	2,847
Travis	Lower Colorado	Brazos	1	1	1	1	1	1
Travis	Lower Colorado	Colorado	4,124	4,112	4,124	4,112	4,124	4,112
Williamson	Region G	Brazos	2,885	2,877	2,885	2,877	2,885	2,877
Williamson	Region G	Colorado	5	5	5	5	5	5
Williamson	Lower Colorado	Brazos	0	0	0	0	0	0
Williamson	Lower Colorado	Colorado	0	0	0	0	0	0
Subtotal			**93,926**	**93,666**	**93,926**	**93,666**	**93,926**	**93,666**
Counties in Upper Trinity GCD								
Hood (downdip)	Region G	Brazos	89	89	89	89	89	89
Subtotal			**89**	**89**	**89**	**89**	**89**	**89**
Groundwater Management Area 8			**94,015**	**93,755**	**94,015**	**93,755**	**94,015**	**93,755**

TABLE 17. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (HENSELL) IN GROUNDWATER MANAGEMENT AREA 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Counties Not in Upper Trinity GCD								
Bell	Region G	Brazos	1,099	1,096	1,099	1,096	1,099	1,096
Bosque	Region G	Brazos	3,845	3,835	3,845	3,835	3,845	3,835
Brown	Region F	Colorado	4	4	4	4	4	4
Burnet	Lower Colorado	Brazos	1,761	1,757	1,761	1,757	1,761	1,757
Burnet	Lower Colorado	Colorado	133	132	133	132	133	132
Comanche	Region G	Brazos	181	180	181	180	181	180
Comanche	Region G	Colorado	24	24	24	24	24	24
Coryell	Region G	Brazos	2,202	2,196	2,202	2,196	2,202	2,196
Dallas	Region C	Trinity	0	0	0	0	0	0
Ellis	Region C	Trinity	0	0	0	0	0	0
Erath	Region G	Brazos	5,151	5,137	5,151	5,137	5,151	5,137
Falls	Region G	Brazos	0	0	0	0	0	0
Hamilton	Region G	Brazos	1,675	1,671	1,675	1,671	1,675	1,671
Hill	Region G	Brazos	225	224	225	224	225	224
Hill	Region G	Trinity	1	1	1	1	1	1
Johnson	Region G	Brazos	618	616	618	616	618	616
Johnson	Region G	Trinity	468	467	468	467	468	467
Kaufman	Region C	Trinity	0	0	0	0	0	0
Lampasas	Region G	Brazos	713	711	713	711	713	711
Lampasas	Region G	Colorado	1	1	1	1	1	1
Limestone	Region G	Brazos	0	0	0	0	0	0
Limestone	Region G	Trinity	0	0	0	0	0	0
McLennan	Region G	Brazos	4,711	4,698	4,711	4,698	4,711	4,698
Milam	Region G	Brazos	0	0	0	0	0	0
Mills	Lower Colorado	Brazos	172	172	172	172	172	172
Mills	Lower Colorado	Colorado	436	435	436	435	436	435
Navarro	Region C	Trinity	0	0	0	0	0	0
Somervell	Region G	Brazos	1,978	1,973	1,978	1,973	1,978	1,973
Travis	Lower Colorado	Brazos	1	1	1	1	1	1
Travis	Lower Colorado	Colorado	1,144	1,141	1,144	1,141	1,144	1,141
Williamson	Region G	Brazos	753	751	753	751	753	751
Williamson	Region G	Colorado	0	0	0	0	0	0
Williamson	Lower Colorado	Brazos	0	0	0	0	0	0

County	**RWPA**	**River Basin**	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Williamson	Lower Colorado	Colorado	0	0	0	0	0	0
Subtotal			**27,296**	**27,223**	**27,296**	**27,223**	**27,296**	**27,223**
Counties in Upper Trinity GCD								
Hood (downdip)	Region G	Brazos	36	36	36	36	36	36
Subtotal			**36**	**36**	**36**	**36**	**36**	**36**
Groundwater Management Area 8			**27,332**	**27,259**	**27,332**	**27,259**	**27,332**	**27,259**

TABLE 18. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (HOSSTON) IN GROUNDWATER MANAGEMENT AREA 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Counties Not in Upper Trinity GCD								
Bell	Region G	Brazos	7,193	7,174	7,193	7,174	7,193	7,174
Bosque	Region G	Brazos	3,772	3,762	3,772	3,762	3,772	3,762
Brown	Region F	Brazos	3	3	3	3	3	3
Brown	Region F	Colorado	355	353	355	353	355	353
Burnet	Lower Colorado	Brazos	1,027	1,025	1,027	1,025	1,027	1,025
Burnet	Lower Colorado	Colorado	355	354	355	354	355	354
Comanche	Region G	Brazos	5,875	5,858	5,875	5,858	5,875	5,858
Comanche	Region G	Colorado	6	6	6	6	6	6
Coryell	Region G	Brazos	2,167	2,161	2,167	2,161	2,167	2,161
Dallas	Region C	Trinity	0	0	0	0	0	0
Ellis	Region C	Trinity	5,040	5,026	5,040	5,026	5,040	5,026
Erath	Region G	Brazos	6,400	6,383	6,400	6,383	6,400	6,383
Falls	Region G	Brazos	1,438	1,434	1,438	1,434	1,438	1,434
Hamilton	Region G	Brazos	386	385	386	385	386	385
Hill	Region G	Brazos	3,026	3,018	3,026	3,018	3,026	3,018
Hill	Region G	Trinity	255	254	255	254	255	254
Johnson	Region G	Brazos	1,311	1,307	1,311	1,307	1,311	1,307
Johnson	Region G	Trinity	2,553	2,546	2,553	2,546	2,553	2,546
Kaufman	Region C	Trinity	0	0	0	0	0	0
Lampasas	Region G	Brazos	786	783	786	783	786	783
Lampasas	Region G	Colorado	72	72	72	72	72	72
Limestone	Region G	Brazos	0	0	0	0	0	0
Limestone	Region G	Trinity	0	0	0	0	0	0
McLennan	Region G	Brazos	15,980	15,937	15,980	15,937	15,980	15,937
Milam	Region G	Brazos	0	0	0	0	0	0
Mills	Lower Colorado	Brazos	376	375	376	375	376	375
Mills	Lower Colorado	Colorado	1,096	1,093	1,096	1,093	1,096	1,093
Navarro	Region C	Trinity	0	0	0	0	0	0
Somervell	Region G	Brazos	845	843	845	843	845	843
Travis	Lower Colorado	Brazos	0	0	0	0	0	0
Travis	Lower Colorado	Colorado	2,791	2,783	2,791	2,783	2,791	2,783
Williamson	Region G	Brazos	1,933	1,928	1,933	1,928	1,933	1,928
Williamson	Region G	Colorado	5	5	5	5	5	5

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Williamson	Lower Colorado	Brazos	0	0	0	0	0	0
Williamson	Lower Colorado	Colorado	0	0	0	0	0	0
Subtotal			**65,046**	**64,868**	**65,046**	**64,868**	**65,046**	**64,868**
Counties in Upper Trinity GCD								
Hood (downdip)	Region G	Brazos	53	53	53	53	53	53
Subtotal			**53**	**53**	**53**	**53**	**53**	**53**
Groundwater Management Area 8			**65,099**	**64,921**	**65,099**	**64,921**	**65,099**	**64,921**

TABLE 19. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE TRINITY AQUIFER (ANTLERS) IN GROUNDWATER MANAGEMENT AREA 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Counties Not in Upper Trinity GCD								
Brown	Region F	Brazos	48	48	48	48	48	48
Brown	Region F	Colorado	1,007	1,004	1,007	1,004	1,007	1,004
Callahan	Region G	Brazos	444	443	444	443	444	443
Callahan	Region G	Colorado	1,285	1,282	1,285	1,282	1,285	1,282
Collin	Region C	Trinity	1,966	1,961	1,966	1,961	1,966	1,961
Comanche	Region G	Brazos	5,855	5,839	5,855	5,839	5,855	5,839
Cooke	Region C	Red	2,191	2,184	2,191	2,184	2,191	2,184
Cooke	Region C	Trinity	8,353	8,330	8,353	8,330	8,353	8,330
Denton	Region C	Trinity	16,591	16,545	16,591	16,545	16,591	16,545
Eastland	Region G	Brazos	5,194	5,180	5,194	5,180	5,194	5,180
Eastland	Region G	Colorado	553	552	553	552	553	552
Erath	Region G	Brazos	2,636	2,628	2,636	2,628	2,636	2,628
Fannin	Region C	Red	0	0	0	0	0	0
Fannin	Region C	Sulphur	0	0	0	0	0	0
Fannin	Region C	Trinity	0	0	0	0	0	0
Grayson	Region C	Red	6,678	6,660	6,678	6,660	6,678	6,660
Grayson	Region C	Trinity	4,059	4,048	4,059	4,048	4,059	4,048
Lamar	Northeast Texas	Red	0	0	0	0	0	0
Lamar	Northeast Texas	Sulphur	0	0	0	0	0	0
Red River	Northeast Texas	Red	0	0	0	0	0	0
Tarrant	Region C	Trinity	1,251	1,248	1,251	1,248	1,251	1,248
Taylor	Region G	Brazos	5	5	5	5	5	5
Taylor	Region G	Colorado	9	9	9	9	9	9
Subtotal			**58,125**	**57,966**	**58,125**	**57,966**	**58,125**	**57,966**
Counties in Upper Trinity GCD								
Montague (outcrop)	Region B	Red	154	154	154	154	154	154
Montague (outcrop)	Region B	Trinity	3,732	3,721	3,732	3,721	3,732	3,721
Parker (outcrop)	Region C	Brazos	257	256	257	256	257	256
Parker (outcrop)	Region C	Trinity	2,648	2,640	2,648	2,640	2,648	2,640
Wise (outcrop)	Region C	Trinity	7,698	7,677	7,698	7,677	7,698	7,677

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Wise (downdip)	Region C	Trinity	2,062	2,057	2,062	2,057	2,062	2,057
Subtotal			**16,551**	**16,505**	**16,551**	**16,505**	**16,551**	**16,505**
Groundwater Management Area 8			**74,676**	**74,471**	**74,676**	**74,471**	**74,676**	**74,471**

TABLE 20. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE WOODBINE AQUIFER IN GROUNDWATER MANAGEMENT AREA 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Collin	Region C	Sabine	0	0	0	0	0	0
Collin	Region C	Trinity	4,263	4,251	4,263	4,251	4,263	4,251
Cooke	Region C	Red	262	261	262	261	262	261
Cooke	Region C	Trinity	540	538	540	538	540	538
Dallas	Region C	Trinity	2,804	2,796	2,804	2,796	2,804	2,796
Denton	Region C	Trinity	3,616	3,607	3,616	3,607	3,616	3,607
Ellis	Region C	Trinity	2,078	2,073	2,078	2,073	2,078	2,073
Fannin	Region C	Red	3,553	3,544	3,553	3,544	3,553	3,544
Fannin	Region C	Sulphur	551	550	551	550	551	550
Fannin	Region C	Trinity	829	827	829	827	829	827
Grayson	Region C	Red	5,615	5,599	5,615	5,599	5,615	5,599
Grayson	Region C	Trinity	1,926	1,922	1,926	1,922	1,926	1,922
Hill	Region G	Brazos	285	284	285	284	285	284
Hill	Region G	Trinity	303	302	303	302	303	302
Hunt	Northeast Texas	Sabine	269	268	269	268	269	268
Hunt	Northeast Texas	Sulphur	165	165	165	165	165	165
Hunt	Northeast Texas	Trinity	330	329	330	329	330	329
Johnson	Region G	Brazos	24	24	24	24	24	24
Johnson	Region G	Trinity	1,961	1,956	1,961	1,956	1,961	1,956
Kaufman	Region C	Trinity	0	0	0	0	0	0
Lamar	Northeast Texas	Red	0	0	0	0	0	0
Lamar	Northeast Texas	Sulphur	49	49	49	49	49	49
McLennan	Region G	Brazos	0	0	0	0	0	0
Navarro	Region C	Trinity	68	68	68	68	68	68
Red River	Northeast Texas	Red	2	2	2	2	2	2
Rockwall	Region C	Trinity	0	0	0	0	0	0
Tarrant	Region C	Trinity	1,141	1,138	1,141	1,138	1,141	1,138
Groundwater Management Area 8			**30,634**	**30,553**	**30,634**	**30,553**	**30,634**	**30,553**

TABLE 21. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE EDWARDS (BALCONES FAULT ZONE) AQUIFER IN GROUNDWATER MANAGEMENT AREA 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN. MODELED AVAILABLE GROUNDWATER VALUES ARE FROM GAM RUN 08-010MAG BY ANAYA (2008).

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Bell	Region G	Brazos	6,469	6,469	6,469	6,469	6,469	6,469
Travis	Lower Colorado	Brazos	275	275	275	275	275	275
Travis	Lower Colorado	Colorado	4,962	4,962	4,962	4,962	4,962	4,962
Williamson	Region G	Brazos	3,351	3,351	3,351	3,351	3,351	3,351
Williamson	Region G	Colorado	101	101	101	101	101	101
Williamson	Lower Colorado	Brazos	6	6	6	6	6	6
Williamson	Lower Colorado	Colorado	4	4	4	4	4	4
Groundwater Management Area 8			**15,168**	**15,168**	**15,168**	**15,168**	**15,168**	**15,168**

TABLE 22. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE MARBLE FALLS AQUIFER IN GROUNDWATER MANAGEMENT AREA 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Brown	Region F	Colorado	25	25	25	25	25	25
Burnet	Lower Colorado	Brazos	1,387	1,383	1,387	1,383	1,387	1,383
Burnet	Lower Colorado	Colorado	1,357	1,353	1,357	1,353	1,357	1,353
Lampasas	Region G	Brazos	1,958	1,952	1,958	1,952	1,958	1,952
Lampasas	Region G	Colorado	887	885	887	885	887	885
Mills	Lower Colorado	Brazos	1	1	1	1	1	1
Mills	Lower Colorado	Colorado	24	24	24	24	24	24
Groundwater Management Area 8			**5,639**	**5,623**	**5,639**	**5,623**	**5,639**	**5,623**

TABLE 23. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE ELLENBURGER-SAN SABA AQUIFER IN GROUNDWATER MANAGEMENT AREA 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Brown	Region F	Colorado	131	131	131	131	131	131
Burnet	Lower Colorado	Brazos	3,833	3,822	3,833	3,822	3,833	3,822
Burnet	Lower Colorado	Colorado	7,024	7,005	7,024	7,005	7,024	7,005
Lampasas	Region G	Brazos	1,685	1,680	1,685	1,680	1,685	1,680
Lampasas	Region G	Colorado	916	913	916	913	916	913
Mills	Lower Colorado	Brazos	93	93	93	93	93	93
Mills	Lower Colorado	Colorado	407	406	407	406	407	406
Groundwater Management Area 8			**14,089**	**14,050**	**14,089**	**14,050**	**14,089**	**14,050**

TABLE 24. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE HICKORY AQUIFER IN GROUNDWATER MANAGEMENT AREA 8. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN.

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Brown	Region F	Colorado	12	12	12	12	12	12
Burnet	Lower Colorado	Brazos	1,240	1,236	1,240	1,236	1,240	1,236
Burnet	Lower Colorado	Colorado	2,183	2,177	2,183	2,177	2,183	2,177
Lampasas	Region G	Brazos	80	79	80	79	80	79
Lampasas	Region G	Colorado	34	34	34	34	34	34
Mills	Lower Colorado	Brazos	7	7	7	7	7	7
Mills	Lower Colorado	Colorado	29	29	29	29	29	29
Groundwater Management Area 8			**3,585**	**3,574**	**3,585**	**3,574**	**3,585**	**3,574**

LIMITATIONS:

The groundwater model used in completing this analysis is the best available scientific tool that can be used to meet the stated objectives. To the extent that this analysis will be used for planning purposes and/or regulatory purposes related to pumping in the past and into the future, it is important to recognize the assumptions and limitations associated with the use of the results. In reviewing the use of models in environmental regulatory decision making, the National Research Council (2007) noted:

> *"Models will always be constrained by computational limitations, assumptions, and knowledge gaps. They can best be viewed as tools to help inform decisions rather than as machines to generate truth or make decisions. Scientific advances will never make it possible to build a perfect model that accounts for every aspect of reality or to prove that a given model is correct in all respects for a particular regulatory application. These characteristics make evaluation of a regulatory model more complex than solely a comparison of measurement data with model results."*

A key aspect of using the groundwater model to evaluate historic groundwater flow conditions includes the assumptions about the location in the aquifer where historic pumping was placed. Understanding the amount and location of historic pumping is as important as evaluating the volume of groundwater flow into and out of the district, between aquifers within the district (as applicable), interactions with surface water (as applicable), recharge to the aquifer system (as applicable), and other metrics that describe the impacts of that pumping. In addition, assumptions regarding precipitation, recharge, and streamflow are specific to a particular historic time period.

Because the application of the groundwater model was designed to address regional scale questions, the results are most effective on a regional scale. The TWDB makes no warranties or representations relating to the actual conditions of any aquifer at a particular location or at a particular time.

It is important for groundwater conservation districts to monitor groundwater pumping and groundwater levels in the aquifer. Because of the limitations of the groundwater model and the assumptions in this analysis, it is important that the groundwater conservation districts work with the TWDB to refine this analysis in the future given the reality of how the aquifer responds to the actual amount and location of pumping now and in the future. Historic precipitation patterns also need to be placed in context as future climatic conditions, such as dry and wet year precipitation patterns, may differ and affect groundwater flow conditions.

REFERENCES:

Anaya, R., 2008, Gam Run 08-010mag: Managed available groundwater for the Edwards (Balcones Fault Zone) Aquifer in Bell, Travis, and Williamson counties, 7 p., http://www.twdb.texas.gov/groundwater/docs/GAMruns/GR08-10mag_final.pdf?d=16598.495

Beach, J., Keester, M., and Konetchy, B, 2016, LBG-Guyton Associates Technical Memorandum: Results of Predictive Simulation in Support of GMA 8 Joint Planning – NTGCD GMA 8 Run 10 (January 14, 2016).

Harbaugh, A. W., and McDonald, M. G., 1996, User's documentation for MODFLOW-96, an update to the U.S. Geological Survey modular finite-difference ground-water flow model: U.S. Geological Survey Open-File Report 96-485, 56 p.

Jones, I., 2003, Groundwater Availability Modeling: Northern Segment of the Edwards Aquifer, Texas (December 2003), 75 p., http://www.twdb.texas.gov/publications/reports/numbered_reports/doc/R358/Report%20358%20Northern%20Edwards.pdf?d=1503601352574.

Kelley, V.A., Ewing, J., Jones, T.L., Young, S.C., Deeds, N., and Hamlin, S., 2014, Updated Groundwater Availability Model of the Northern Trinity and Woodbine Aquifers – Draft Final Model Report (August 2014), 990 p., http://www.twdb.texas.gov/groundwater/models/gam/trnt_n/Final_NTGAM_Vol%20I%20Aug%202014_Report.pdf?d=1503601407956.

National Research Council, 2007, Models in Environmental Regulatory Decision Making Committee on Models in the Regulatory Decision Process, National Academies Press, Washington D.C., 287 p., http://www.nap.edu/catalog.php?record_id=11972.

Niswonger, R.G., Panday, S., and Ibaraki, M., 2011, MODFLOW-NWT, a Newton formulation for MODFLOW-2005: United States Geological Survey, Techniques and Methods 6-A37, 44 p.

Panday, S., Langevin, C.D., Niswonger, R.G., Ibaraki, M., and Hughes, J.D., 2013, MODFLOW–USG version 1: An unstructured grid version of MODFLOW for simulating groundwater flow and tightly coupled processes using a control volume finite-difference formulation: U.S. Geological Survey Techniques and Methods, book 6, chap. A45, 66 p.

Shi, J., Boghici, R., Kohlrenken, W., and Hutchison, W.R., 2016, Numerical Model Report: Minor Aquifers of the Llano Uplift Region of Texas (Marble Falls, Ellenburger-San Saba, and Hickory). Texas Water Development Board, November 2016, 435p.

http://www.twdb.texas.gov/groundwater/models/gam/llano/Llano_Uplift_Numerical_Model_Report_Final.pdf?d=1503601525245.

Texas Water Code, 2011, http://www.statutes.legis.state.tx.us/docs/WA/pdf/WA.36.pdf.

Appendix A

Comparison between Desired Future Conditions and Simulated Drawdowns for the Trinity and Woodbine Aquifers

Drawdown values for the Trinity and Woodbine aquifers between 2009 and 2070 were based on the simulated head values at individual model cells extracted from predictive simulation head file submitted by Groundwater Management Area 8.

The Paluxy, Glen Rose, Twin Mountains, Travis Peak, Hensell, Hosston, and Antlers are subunits of the Trinity Aquifer. These subunits and Woodbine Aquifer exist in both outcrop and downdip areas (Figures 1 through 8). Kelley and others (2014) further divided these aquifers into five (5) regions, each with unique aquifer combinations and properties (table below and Figures 1 through 8).

<table>
<tr><th>Model Layer</th><th>Region 1</th><th>Region 2</th><th>Region 3</th><th colspan="2">Region 4</th><th colspan="2">Region 5</th></tr>
<tr><td>2</td><td colspan="4">Woodbine</td><td colspan="3">Woodbine (no sand)</td></tr>
<tr><td>3</td><td colspan="7">Washita/Fredericksburg</td></tr>
<tr><td>4</td><td rowspan="5">Antlers</td><td colspan="4">Paluxy</td><td colspan="2">Paluxy (no sand)</td></tr>
<tr><td>5</td><td colspan="6">Glen Rose</td></tr>
<tr><td>6</td><td rowspan="3">Twin Mountains</td><td rowspan="3" colspan="2">Travis Peak</td><td>Hensell</td><td rowspan="3">Travis Peak</td><td>Hensell</td></tr>
<tr><td>7</td><td>Pearsall/Sligo</td><td>Pearsall/Sligo</td></tr>
<tr><td>8</td><td>Hosston</td><td>Hosston</td></tr>
</table>

Vertically, the Trinity and Woodbine aquifers could contain multiple model layers and some of the model cells are pass-through cells with a thickness of one foot. To account for variable model cells from multiple model layers for the same aquifer, Beach and others (2016) adopted a method presented by Van Kelley of INTERA, Inc., which calculated a single composite head from multiple model cells with each adjusted by transmissivity. This composite head took both the head and hydraulic transmissivity at each cell into calculation, as shown in the following equation:

$$Hc = \frac{\sum_{i=UL}^{LL} T_i H_i}{\sum_{i=UL}^{LL} T_i}$$

Where:

Hc = Composite Head (feet above mean sea level)

T_i = Transmissivity of model layer i (square feet per day)

H_i = Head of model layer i (feet above mean sea level)

LL = Lowest model layer representing the regional aquifer

UL = Uppermost model layer representing the regional aquifer.

The average head for the same aquifer in a county (*Hc_County*) was then calculated using the following equation:

$$Hc\_County = \frac{\sum_{i=1}^{n} Hc_i}{n}$$

Where:

Hc_County = Average composite head for a county (feet above mean sea level)

Hc_i = Composite Head at a lateral location as defined in last step (feet above mean sea level)

n = Total lateral (row, column) locations of an aquifer in a county.

Drawdown of the aquifer in a county (*DD_County*) was calculated using the following equation:

$$DD\_County = Hc\_County_{2009} - Hc\_County_{2070}$$

Where:

Hc_County_{2009} = Average head of an aquifer in a county in 2009 as defined above (feet above mean sea level)

Hc_County_{2070} = Average head of an aquifer in a county in 2070 as defined above (feet above mean sea level).

Model cells with head values below the cell bottom in 2009 were excluded from the calculation. Also, head was set at the cell bottom if it fell below the cell bottom at 2070.

In comparison with a simple average calculation based on total model cell count, use of composite head gives less weight to cells with lower transmissivity values (such as pass-through cells, cells with low saturation in outcrop area, or cells with lower hydraulic conductivity) in head and drawdown calculation.

Per Groundwater Management Area 8, a desired future condition was met if the simulated drawdown from the desired future condition was within five percent or five feet. Using the head output file submitted by Groundwater Management Area 8 and the method described above, the TWDB calculated the drawdowns (Tables A1 and A2) and performed the comparison against the corresponding desired future conditions by county (Tables A3, A4, A5, and A6). The review by the TWDB indicates that the predictive simulation meets the desired future conditions (Tables A7 and A8).

TABLE A1. SIMULATED DRAWDOWN VALUES OF THE TRINITY AND WOODBINE AQUIFERS FOR COUNTIES NOT IN THE UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT. DRAWDOWNS ARE IN FEET.

County	Woodbine	Paluxy	Glen Rose	Twin Mountains	Travis Peak	Hensell	Hosston	Antlers
Bell	—	19	83	—	294	137	330	—
Bosque	—	6	49	—	167	129	201	—
Brown	—	—	2	—	1	1	1	2
Burnet	—	—	2	—	16	7	20	—
Callahan	—	—	—	—	—	—	—	1
Collin	459	705	339	526	—	—	—	570
Comanche	—	—	1	—	2	2	3	9
Cooke	2	—	—	—	—	—	—	179
Coryell	—	7	14	—	100	66	130	—
Dallas	123	324	263	463	350	332	351	—
Delta	—	264	181	—	186	—	—	—
Denton	19	552	349	716	—	—	—	398
Eastland	—	—	—	—	—	—	—	3
Ellis	61	107	194	333	305	263	310	—
Erath	—	1	5	6	19	11	31	11
Falls	—	144	215	—	460	271	465	—
Fannin	247	688	280	372	269	—	—	251
Grayson	157	922	337	417	—	—	—	348
Hamilton	—	2	4	—	24	13	35	—
Hill	16	38	133	—	299	186	337	—
Hunt	598	586	299	370	324	—	—	—
Johnson	3	-61	58	156	184	126	235	—
Kaufman	208	276	269	381	323	309	295	—
Lamar	38	93	97	—	114	—	—	122
Lampasas	—	—	1	—	6	1	11	—
Limestone	—	178	271	—	393	183	404	—
McLennan	6	35	133	—	468	220	542	—
Milam	—	—	212	—	344	229	345	—
Mills	—	1	1	—	7	2	13	—
Navarro	92	119	232	—	291	254	291	—
Red River	2	21	36	—	51	—	—	13
Rockwall	243	401	311	426	—	—	—	—
Somervell	—	1	4	31	52	26	83	—
Tarrant	6	101	148	315	—	—	—	149

County	Woodbine	Paluxy	Glen Rose	Twin Mountains	Travis Peak	Hensell	Hosston	Antlers
Taylor	—	—	—	—	—	—	—	0
Travis	—	—	85	—	142	51	148	—
Williamson	—	—	76	—	172	73	176	—

—: Not available.

TABLE A2. SIMULATED DRAWDOWN VALUES OF THE TRINITY AQUIFER FOR COUNTIES IN THE UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT. DRAWDOWNS ARE IN FEET.

County	Paluxy	Glen Rose	Twin Mountains	Antlers
Hood (outcrop)	5	7	4	—
Hood (downdip)	—	27	46	—
Montague (outcrop)	—	—	—	18
Montague (downdip)	—	—	—	—
Parker (outcrop)	5	10	1	11
Parker (downdip)	1	28	46	—
Wise (outcrop)	—	—	—	35
Wise (downdip)	—	—	—	142

—: Not available.

TABLE A3. RELATIVE DIFFERENCE BETWEEN SIMULATED DRAWDOWNS AND DESIRED FUTURE CONDITIONS OF THE TRINITY AND WOODBINE AQUIFERS FOR COUNTIES NOT IN THE UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT. VALUES GREATER THAN THE ERROR TOLERANCE OF FIVE PERCENT ARE HIGHLIGHTED.

County	Woodbine	Paluxy	Glen Rose	Twin Mountains	Travis Peak	Hensell	Hosston	Antlers
Bell	—	0%	0%	—	-2%	0%	0%	—
Bosque	—	0%	0%	—	0%	0%	0%	—
Brown	—	—	0%	—	0%	0%	0%	0%
Burnet	—	—	0%	—	0%	0%	0%	—
Callahan	—	—	—	—	—	—	—	0%
Collin	0%	0%	0%	0%	—	—	—	0%
Comanche	—	—	0%	—	0%	0%	0%	0%
Cooke	0%	—	—	—	—	—	—	2%
Coryell	—	0%	0%	—	1%	0%	0%	—
Dallas	0%	0%	0%	0%	1%	0%	0%	—
Delta	—	0%	0%	—	0%	—	—	—
Denton	-16%	0%	0%	0%	—	—	—	1%
Eastland	—	—	—	—	—	—	—	0%
Ellis	0%	0%	0%	0%	1%	0%	0%	—
Erath	—	0%	0%	0%	0%	0%	0%	-9%
Falls	—	0%	0%	—	0%	0%	0%	—
Fannin	0%	0%	0%	0%	0%	—	—	0%
Grayson	-2%	0%	0%	0%	—	—	—	0%
Hamilton	—	0%	0%	—	0%	0%	0%	—
Hill	-25%	0%	0%	—	0%	0%	0%	—
Hunt	0%	0%	0%	0%	0%	—	—	—
Johnson	33%	0%	0%	0%	3%	0%	0%	—
Kaufman	0%	0%	0%	0%	0%	0%	0%	—
Lamar	0%	0%	0%	—	0%	—	—	0%
Lampasas	—	—	0%	—	0%	0%	0%	—
Limestone	—	0%	0%	—	0%	0%	0%	—
McLen—n	0%	0%	0%	—	-1%	0%	0%	—
Milam	—	—	0%	—	0%	0%	0%	—
Mills	—	0%	0%	—	0%	0%	0%	—
—varro	0%	0%	0%	—	0%	0%	0%	—
Red River	0%	0%	0%	—	0%	—	—	0%
Rockwall	0%	0%	0%	0%	—	—	—	—

County	Woodbine	Paluxy	Glen Rose	Twin Mountains	Travis Peak	Hensell	Hosston	Antlers
Somervell	—	0%	0%	0%	2%	0%	0%	—
Tarrant	-17%	0%	0%	0%	—	—	—	1%
Taylor	—	—	—	—	—	—	—	0%
Travis	—	—	0%	—	1%	2%	1%	—
Williamson	—	—	-1%	—	-1%	-1%	-1%	—

—: Not available.

TABLE A4. RELATIVE DIFFERENCE BETWEEN SIMULATED DRAWDOWNS AND DESIRED FUTURE CONDITIONS OF THE TRINITY AQUIFER FOR COUNTIES IN THE UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT. VALUES GREATER THAN THE ERROR TOLERANCE OF FIVE PERCENT ARE HIGHLIGHTED.

County	Paluxy	Glen Rose	Twin Mountains	Antlers
Hood (outcrop)	0%	0%	0%	—
Hood (downdip)	—	-4%	0%	—
Montague (outcrop)	—	—	—	0%
Montague (downdip)	—	—	—	—
Parker (outcrop)	0%	0%	0%	0%
Parker (downdip)	0%	0%	0%	—
Wise (outcrop)	—	—	—	3%
Wise (downdip)	—	—	—	0%

—: Not available.

TABLE A5. DIFFERENCE BETWEEN SIMULATED DRAWDOWNS AND DESIRED FUTURE CONDITIONS OF THE TRINITY AND WOODBINE AQUIFERS FOR COUNTIES NOT IN THE UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT. VALUES GREATER THAN THE ERROR TOLERANCE OF FIVE FEET ARE HIGHLIGHTED.

County	Woodbine	Paluxy	Glen Rose	Twin Mountains	Travis Peak	Hensell	Hosston	Antlers
Bell	—	0	0	—	-6	0	0	—
Bosque	—	0	0	—	0	0	0	—
Brown	—	—	0	—	0	0	0	0
Burnet	—	—	0	—	0	0	0	—
Callahan	—	—	—	—	—	—	—	0
Collin	0	0	0	0	—	—	—	0
Comanche	—	—	0	—	0	0	0	0
Cooke	0	—	—	—	—	—	—	3
Coryell	—	0	0	—	1	0	0	—
Dallas	0	0	0	0	2	0	0	—
Delta	—	0	0	—	0	—	—	—
Denton	-3	0	0	0	—	—	—	3
Eastland	—	—	—	—	—	—	—	0
Ellis	0	0	0	0	4	0	0	—
Erath	—	0	0	0	0	0	0	-1
Falls	—	0	0	—	-2	0	0	—
Fannin	0	0	0	0	0	—	—	0
Grayson	-3	0	0	0	—	—	—	0
Hamilton	—	0	0	—	0	0	0	—
Hill	-4	0	0	—	1	0	0	—
Hunt	0	0	0	0	0	—	—	—
Johnson	1	0	0	0	5	0	0	—
Kaufman	0	0	0	0	0	0	0	—
Lamar	0	0	0	—	0	—	—	0
Lampasas	—	—	0	—	0	0	0	—
Limestone	—	0	0	—	1	0	0	—
McLennan	0	0	0	—	-3	0	0	—
Milam	—	—	0	—	-1	0	0	—
Mills	—	0	0	—	0	0	0	—
Navarro	0	0	0	—	1	0	0	—
Red River	0	0	0	—	0	—	—	0
Rockwall	0	0	0	0	—	—	—	—

County	Woodbine	Paluxy	Glen Rose	Twin Mountains	Travis Peak	Hensell	Hosston	Antlers
Somervell	—	0	0	0	1	0	0	—
Tarrant	-1	0	0	0	—	—	—	1
Taylor	—	—	—	—	—	—	—	0
Travis	—	—	0	—	1	1	2	—
Williamson	—	—	-1	—	-1	-1	-1	—

—: Not available.

TABLE A6. DIFFERENCE BETWEEN SIMULATED DRAWDOWNS AND DESIRED FUTURE CONDITIONS OF THE TRINITY AQUIFER FOR COUNTIES IN THE UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT. NO VALUES ARE GREATER THAN THE ERROR TOLERANCE OF FIVE FEET.

County	Paluxy	Glen Rose	Twin Mountains	Antlers
Hood (outcrop)	0	0	0	—
Hood (downdip)	—	-1	0	—
Montague (outcrop)	—	—	—	0
Montague (downdip)	—	—	—	—
Parker (outcrop)	0	0	0	0
Parker (downdip)	0	0	0	—
Wise (outcrop)	—	—	—	1
Wise (downdip)	—	—	—	0

—: Not available.

TABLE A7. COMPARISON OF SIMULATED DRAWDOWNS WITH THE DESIRED FUTURE CONDITIONS OF THE TRINITY AND WOODBINE AQUIFERS FOR COUNTIES NOT IN THE UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT. NO VALUES ARE GREATER THAN BOTH ERROR TOLERRANCES OF FIVE PERCENT AND FIVE FEET AT THE SAME TIME. THUS, PREDICTIVE SIMULATION MEETS ALL DESIRED FUTURE CONDITIONS.

County	Woodbine	Paluxy	Glen Rose	Twin Mountains	Travis Peak	Hensell	Hosston	Antlers
Bell	—	MEET	MEET	—	MEET	MEET	MEET	—
Bosque	—	MEET	MEET	—	MEET	MEET	MEET	—
Brown	—	—	MEET	—	MEET	MEET	MEET	MEET
Burnet	—	—	MEET	—	MEET	MEET	MEET	—
Callahan	—	—	—	—	—	—	—	MEET
Collin	MEET	MEET	MEET	MEET	—	—	—	MEET
Comanche	—	—	MEET	—	MEET	MEET	MEET	MEET
Cooke	MEET	—	—	—	—	—	—	MEET
Coryell	—	MEET	MEET	—	MEET	MEET	MEET	—
Dallas	MEET	MEET	MEET	MEET	MEET	MEET	MEET	—
Delta	—	MEET	MEET	—	MEET	—	—	—
Denton	MEET	MEET	MEET	MEET	—	—	—	MEET
Eastland	—	—	—	—	—	—	—	MEET
Ellis	MEET	MEET	MEET	MEET	MEET	MEET	MEET	—
Erath	—	MEET	MEET	MEET	MEET	MEET	MEET	MEET
Falls	—	MEET	MEET	—	MEET	MEET	MEET	—
Fannin	MEET	MEET	MEET	MEET	MEET	—	—	MEET
Grayson	MEET	MEET	MEET	MEET	—	—	—	MEET
Hamilton	—	MEET	MEET	—	MEET	MEET	MEET	—
Hill	MEET	MEET	MEET	—	MEET	MEET	MEET	—
Hunt	MEET	MEET	MEET	MEET	MEET	—	—	—
Johnson	MEET	MEET	MEET	MEET	MEET	MEET	MEET	—
Kaufman	MEET	MEET	MEET	MEET	MEET	MEET	MEET	—
Lamar	MEET	MEET	MEET	—	MEET	—	—	MEET
Lampasas	—	—	MEET	—	MEET	MEET	MEET	—
Limestone	—	MEET	MEET	—	MEET	MEET	MEET	—
McLennan	MEET	MEET	MEET	—	MEET	MEET	MEET	—
Milam	—	—	MEET	—	MEET	MEET	MEET	—
Mills	—	MEET	MEET	—	MEET	MEET	MEET	—
Navarro	MEET	MEET	MEET	—	MEET	MEET	MEET	—

County	Woodbine	Paluxy	Glen Rose	Twin Mountains	Travis Peak	Hensell	Hosston	Antlers
Red River	MEET	MEET	MEET	—	MEET	—	—	MEET
Rockwall	MEET	MEET	MEET	MEET	—	—	—	—
Somervell	—	MEET	MEET	MEET	MEET	MEET	MEET	—
Tarrant	MEET	MEET	MEET	MEET	—	—	—	MEET
Taylor	—	—	—	—	—	—	—	MEET
Travis	—	—	MEET	—	MEET	MEET	MEET	—
Williamson	—	—	MEET	—	MEET	MEET	MEET	—

—: Not available.

TABLE A8. COMPARISON OF SIMULATED DRAWDOWNS WITH THE DESIRED FUTURE CONDITIONS OF THE TRINITY AQUIFER FOR COUNTIES IN THE UPPER TRINITY GROUNDWATER CONSERVATION DISTRICT. NO VALUES ARE GREATER THAN BOTH ERROR TOLERRANCES OF FIVE PERCENT AND FIVE FEET AT THE SAME TIME. THUS, PREDICTIVE SIMULATION MEETS ALL DESIRED FUTURE CONDITIONS.

County	Paluxy	Glen Rose	Twin Mountains	Antlers
Hood (outcrop)	MEET	MEET	MEET	—
Hood (downdip)	—	MEET	MEET	—
Montague (outcrop)	—	—	—	MEET
Montague (downdip)	—	—	—	—
Parker (outcrop)	MEET	MEET	MEET	MEET
Parker (downdip)	MEET	MEET	MEET	—
Wise (outcrop)	—	—	—	MEET
Wise (downdip)	—	—	—	MEET

—: Not available.

Appendix B

Comparison between Desired Future Conditions and Simulated Saturated Thickness for the Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Brown, Burnet, Lampasas, and Mills Counties

The predictive simulation used to evaluate the desired future conditions and the modeled available groundwater values for the Marble Falls, Ellenburger-San Saba, and Hickory aquifers in Brown, Burnet, Lampasas, and Mills counties within Groundwater Management Area 8 involves rewriting all relevant MODFLOW-USG packages to reflect the predictive simulation. The initial pumping for the predictive simulation was based on the last stress period of the groundwater availability model. In its clarification, Groundwater Management Area 8 also provided estimated pumping to use for the predictive simulation by TWDB (Table B1).

These pumping values from Groundwater Management Area 8 are more than the pumpage from the last stress period of the groundwater availability model. This surplus pumping for each aquifer was redistributed uniformly in each county according to its modeled extent.

The head file from the model output was used to calculate the remaining saturated thickness (*ST*) within the modeled extent for each aquifer between 2009 and 2070 using the following equation:

$$ST = \frac{\sum_{i=1}^{n} \left(h2070_i - e_i\right)}{\sum_{i=1}^{n} \left(h2009_i - e_i\right)}$$

Where:

n = Total model cells in a county

$h2009_i$ = Head of 2009 at model cell i (feet)

$h2070_i$ = Head of 2070 at model cell i (feet)

e_i = Bottom elevation of model cell i (feet).

Model cells with head values below the cell bottom in 2009 were excluded from the calculation. Also, head was set at the cell bottom if it fell below the cell bottom at 2070.

The comparison between the simulated remaining saturated thickness and the desired future conditions is presented in Table B2. Table B2 indicates that the predictive simulation meets the desired future conditions of the Marble Falls, Ellenburger-San Saba, and Hickory aquifers in Brown, Burnet, Lampasas, and Mills counties.

TABLE B1. GROUNDWATER PUMPING RATES FOR THE MARBLE FALLS, ELLENBURGER-SAN SABA, AND HICKORY AQUIFERS IN BROWN, BURNET, LAMPASAS, AND MILLS COUNTIES PROVIDED BY GROUNDWATER MNAAGMENT AREA 8.

County	Aquifer	2010 to 2070 (acre-feet per year)
Burnet	Marble Falls	2,736
Lampasas	Marble Falls	2,837
Brown	Marble Falls	25
Mills	Marble Falls	25
Burnet	Ellenburger-San Saba	10,827
Lampasas	Ellenburger-San Saba	2,593
Brown	Ellenburger-San Saba	131
Mills	Ellenburger-San Saba	499
Burnet	Hickory	3,413
Lampasas	Hickory	113
Brown	Hickory	12
Mills	Hickory	36

TABLE B2. COMPARISON BETWEEN SIMULATED REMAINING AQUIFER SATURATED THICKESS AND DESIRED FUTURE CONDITIONS OF MARBLE FALLS, ELLENBURGER-SAN SABA, AND HICKORY AQUIFERS IN BROWN, BURNET, LAMPASAS, AND MILLS COUNTIES.

County	Aquifer	Remaining Aquifer Saturated Thickness Defined by Desired Future Condition	Simulated Remaining Aquifer Saturated Thickness	Is Desired Future Condition Met?
Brown	Marble Falls	at least 90%	99.8%	Yes
Brown	Ellenburger-San Saba	at least 90%	99.9%	Yes
Brown	Hickory	at least 90%	99.9%	Yes
Burnet	Marble Falls	at least 90%	98.8%	Yes
Burnet	Ellenburger-San Saba	at least 90%	99.3%	Yes
Burnet	Hickory	at least 90%	99.5%	Yes
Lampasas	Marble Falls	at least 90%	98.2%	Yes
Lampasas	Ellenburger-San Saba	at least 90%	99.0%	Yes
Lampasas	Hickory	at least 90%	99.5%	Yes
Mills	Marble Falls	at least 90%	99.5%	Yes
Mills	Ellenburger-San Saba	at least 90%	99.7%	Yes
Mills	Hickory	at least 90%	99.8%	Yes

Appendix C

Summary of Dry Model Cell Count for the Trinity and Woodbine Aquifers

TABLE C1. SUMMARY OF DRY MODEL CELLS FOR THE TRINITY AQUIFER (PALUXY) FROM THE REVISED PREDICTIVE SIMULATION.

Year	Collin	Dallas	Denton	Johnson	Tarrant
Total Active Official Aquifer Model Cells	12,062	14,532	3,520	11,627	15,389
2009 (baseline)	0	0	0	17	3
2010	0	0	9	0	3
2011	1	0	49	0	3
2012	4	0	83	0	17
2013	8	0	140	0	47
2014	35	0	196	0	91
2015	49	0	264	0	146
2016	64	0	306	0	209
2017	72	0	349	0	291
2018	83	0	385	0	373
2019	93	0	428	0	460
2020	99	0	482	0	555
2021	109	0	550	0	620
2022	115	0	622	0	684
2023	125	0	695	0	746
2024	129	0	780	0	802
2025	138	0	879	0	862
2026	147	0	957	0	919
2027	151	0	1,018	0	964
2028	159	0	1,087	0	995
2029	166	0	1,171	0	1,038
2030	173	0	1,262	0	1,072
2031	176	0	1,326	0	1,101
2032	180	0	1,379	0	1,137
2033	187	0	1,420	0	1,156
2034	193	0	1,461	0	1,194
2035	201	0	1,492	0	1,224
2036	204	0	1,520	0	1,240
2037	209	0	1,554	0	1,274
2038	212	0	1,584	0	1,292
2039	215	0	1,607	0	1,317
2040	217	0	1,627	0	1,347
2041	224	0	1,659	0	1,362
2042	228	0	1,682	0	1,377

Year	Collin	Dallas	Denton	Johnson	Tarrant
2043	235	0	1,710	0	1,409
2044	239	0	1,735	0	1,425
2045	242	0	1,755	0	1,438
2046	247	0	1,777	0	1,455
2047	250	0	1,790	0	1,477
2048	251	0	1,807	0	1,497
2049	253	0	1,823	0	1,517
2050	254	0	1,834	0	1,530
2051	258	2	1,847	0	1,539
2052	264	2	1,860	0	1,562
2053	266	2	1,874	0	1,585
2054	270	3	1,883	0	1,594
2055	272	3	1,893	0	1,606
2056	275	3	1,902	0	1,621
2057	276	3	1,923	0	1,634
2058	280	4	1,929	0	1,650
2059	282	4	1,934	0	1,666
2060	286	4	1,943	0	1,679
2061	288	4	1,947	0	1,693
2062	288	4	1,961	0	1,701
2063	290	5	1,973	0	1,712
2064	291	5	1,977	0	1,726
2065	292	5	1,988	0	1,739
2066	295	5	1,996	0	1,752
2067	297	6	2,002	0	1,760
2068	300	7	2,009	0	1,769
2069	304	7	2,017	0	1,778
2070	305	7	2,024	0	1,784

TABLE C2. SUMMARY OF DRY MODEL CELLS FOR THE TRINITY AQUIFER (GLEN ROSE) FROM THE REVISED PREDICTIVE SIMULATION.

Year	Bell	Burnet	Coryell	Erath	Hamilton	Hood	Johnson	Mills	Parker	Travis
Total Active Official Aquifer Model Cells	23,737	22,534	41,647	20,905	36,944	14,461	12,342	10,615	11,389	14,552
2009 (baseline)	0	0	11	0	0	0	15	0	8	25
2010	0	0	11	0	0	0	15	0	9	29
2011	0	0	11	0	0	0	15	0	12	29
2012	0	0	11	0	0	0	15	0	15	29
2013	0	0	11	1	0	0	15	1	19	29
2014	0	1	11	1	0	1	15	1	22	31
2015	0	1	11	1	0	1	15	1	23	32
2016	0	1	12	1	0	1	15	1	30	33
2017	0	1	12	2	0	2	15	1	37	34
2018	0	1	12	3	0	2	15	1	38	34
2019	0	1	14	3	0	2	16	1	44	34
2020	0	1	14	3	0	2	16	1	46	34
2021	0	1	14	3	0	3	16	1	48	35
2022	0	1	14	3	0	3	16	1	49	38
2023	0	1	14	3	0	3	17	1	54	41
2024	0	1	15	3	0	3	17	1	58	45
2025	0	1	15	3	0	3	17	1	65	47
2026	0	1	15	3	0	5	19	1	72	48
2027	0	1	15	4	0	5	21	1	78	50
2028	0	1	15	4	0	5	21	1	82	51
2029	0	1	15	4	0	6	22	1	84	51
2030	0	1	15	4	0	6	22	1	90	54
2031	0	1	15	8	0	6	22	1	99	54
2032	0	1	15	8	0	8	23	1	103	55
2033	0	1	15	8	0	8	23	1	105	56
2034	0	1	15	9	0	9	23	1	108	56
2035	0	1	15	9	0	10	23	1	109	57
2036	0	1	15	9	0	12	23	1	110	58
2037	0	1	15	9	0	13	23	1	110	58
2038	0	1	15	9	0	14	23	1	113	59

Year	Bell	Burnet	Coryell	Erath	Hamilton	Hood	Johnson	Mills	Parker	Travis
2039	0	2	15	9	0	14	23	1	113	59
2040	0	2	15	9	0	14	23	1	116	60
2041	0	2	15	9	0	16	23	1	119	60
2042	0	2	15	10	1	16	23	1	122	61
2043	0	2	15	10	2	16	23	1	124	61
2044	0	2	15	10	2	18	24	1	125	62
2045	0	2	15	10	2	18	25	1	131	63
2046	0	2	15	10	2	18	25	1	131	63
2047	0	2	16	10	3	18	25	1	134	64
2048	0	2	16	10	4	18	26	1	137	64
2049	0	2	16	11	4	20	26	1	139	65
2050	0	2	16	11	4	22	26	1	143	65
2051	0	2	16	12	5	22	29	1	144	66
2052	1	2	16	12	5	22	31	1	147	66
2053	3	2	16	12	7	24	32	1	149	67
2054	4	2	17	12	7	27	32	1	151	67
2055	4	2	17	12	7	27	34	1	152	67
2056	4	2	17	12	7	30	34	1	152	68
2057	6	2	17	13	7	31	34	1	156	69
2058	7	2	17	13	7	31	34	1	159	69
2059	7	2	17	13	7	31	34	1	164	69
2060	7	2	17	13	8	34	34	1	166	69
2061	7	2	17	13	8	34	34	1	165	69
2062	7	2	17	13	9	35	34	1	168	69
2063	7	2	17	14	9	36	34	1	168	69
2064	7	2	17	16	9	36	34	1	172	69
2065	8	2	17	16	9	36	34	2	176	69
2066	8	2	17	16	10	36	34	2	180	69
2067	8	3	17	19	10	36	34	2	184	69
2068	8	3	17	19	11	38	34	2	188	69
2069	8	3	17	20	11	38	34	2	191	69
2070	8	4	17	20	11	41	34	2	194	69

TABLE C3. SUMMARY OF DRY MODEL CELLS FOR THE TRINITY AQUIFER (TWIN MOUNTAINS) FROM THE REVISED PREDICTIVE SIMULATION.

Year	Denton	Erath	Hood	Johnson	Parker	Tarrant
Total Active Official Aquifer Model Cells	10,560	46,642	37,444	6,816	30,830	40,713
2009 (baseline)	0	20	0	0	0	0
2010	0	27	0	0	0	0
2011	0	33	0	0	0	0
2012	0	40	0	0	0	0
2013	0	44	0	0	0	0
2014	0	48	0	0	0	0
2015	0	53	0	0	0	0
2016	0	56	0	0	0	0
2017	0	61	0	0	0	0
2018	0	65	0	0	0	0
2019	0	68	1	0	0	0
2020	0	71	1	0	0	0
2021	0	76	1	0	1	0
2022	0	80	1	0	4	0
2023	0	81	1	0	8	2
2024	0	85	4	0	13	6
2025	0	88	7	0	16	10
2026	0	91	15	0	17	16
2027	0	94	18	0	18	25
2028	0	97	23	0	18	32
2029	0	101	28	0	23	36
2030	0	107	33	0	24	41
2031	1	108	41	0	25	48
2032	1	111	46	0	25	53
2033	1	119	56	0	26	56
2034	1	122	64	0	27	66
2035	1	123	68	0	27	74
2036	2	126	75	0	29	93
2037	2	131	82	0	29	127
2038	2	134	95	0	30	170
2039	2	136	100	0	31	231
2040	2	137	114	0	32	289
2041	2	143	129	0	32	354

Year	Denton	Erath	Hood	Johnson	Parker	Tarrant
2042	2	146	137	0	32	426
2043	2	150	150	0	32	500
2044	2	154	165	0	32	587
2045	3	157	178	0	34	648
2046	4	161	194	0	35	711
2047	4	167	212	0	36	767
2048	4	171	228	0	38	832
2049	5	174	242	0	38	889
2050	7	176	251	0	38	930
2051	8	178	262	0	38	996
2052	8	181	272	2	38	1,057
2053	9	184	282	7	38	1,114
2054	9	186	297	13	39	1,169
2055	9	189	313	19	40	1,234
2056	10	194	320	26	40	1,303
2057	11	196	330	33	41	1,366
2058	14	207	336	41	42	1,435
2059	14	211	341	49	42	1,508
2060	15	221	351	57	42	1,595
2061	16	221	363	67	43	1,681
2062	17	223	368	75	43	1,783
2063	18	224	375	83	43	1,899
2064	20	228	385	94	45	1,988
2065	22	229	393	105	46	2,104
2066	23	231	401	115	47	2,188
2067	24	233	408	130	47	2,285
2068	27	236	416	139	47	2,364
2069	31	240	424	155	47	2,468
2070	35	242	429	168	47	2,553

TABLE C4. SUMMARY OF DRY MODEL CELLS FOR THE TRINITY AQUIFER (TRAVIS PEAK) FROM THE REVISED PREDICTIVE SIMULATION.

Year	Burnet	Comanche	Erath	Johnson	Lampasas	McLennan	Travis
Total Active Official Aquifer Model Cells	46,474	78,137	39,220	28,386	63,905	50,973	30,318
2009 (baseline)	217	0	0	0	1	0	57
2010	176	0	1	0	1	0	59
2011	186	0	1	0	1	0	60
2012	218	0	1	0	1	0	63
2013	249	0	1	0	1	0	65
2014	271	0	1	0	1	0	68
2015	291	0	1	0	1	0	68
2016	314	0	3	0	1	0	70
2017	331	0	4	0	1	0	70
2018	345	0	5	0	1	0	71
2019	363	0	6	0	1	0	72
2020	378	0	11	0	1	0	72
2021	394	0	17	0	1	0	74
2022	400	0	29	0	1	0	74
2023	414	0	59	0	1	0	76
2024	424	0	93	0	1	0	77
2025	438	1	114	0	1	0	77
2026	450	9	130	0	1	0	79
2027	463	14	160	0	1	0	80
2028	474	14	183	0	1	0	80
2029	483	18	205	0	1	0	82
2030	494	30	238	0	1	0	82
2031	505	34	266	0	1	0	83
2032	512	35	299	0	1	0	83
2033	520	41	328	0	1	0	84
2034	527	54	343	0	1	0	85
2035	533	67	351	0	1	0	85
2036	543	72	370	0	1	0	87
2037	545	77	398	0	1	0	88
2038	554	85	414	0	1	0	88
2039	564	94	421	0	1	0	90
2040	571	103	435	0	1	1	90
2041	579	111	453	0	1	1	91
2042	588	116	481	0	1	1	92

Year	Burnet	Comanche	Erath	Johnson	Lampasas	McLennan	Travis
2043	599	116	497	0	1	1	93
2044	604	121	507	0	1	1	93
2045	609	128	520	0	1	1	94
2046	618	138	538	0	1	1	95
2047	623	146	557	0	1	2	97
2048	629	152	590	0	1	2	97
2049	634	160	606	0	1	2	98
2050	640	166	620	0	1	2	99
2051	644	172	638	1	1	2	100
2052	648	180	651	1	1	2	100
2053	654	186	665	1	1	2	101
2054	658	190	678	1	1	2	102
2055	670	194	690	1	1	2	103
2056	675	196	699	1	1	2	103
2057	678	199	711	1	1	2	104
2058	692	206	723	1	1	2	105
2059	702	216	746	1	1	2	106
2060	717	222	774	1	1	2	106
2061	714	225	776	1	1	2	106
2062	719	227	790	1	1	2	107
2063	723	231	799	1	1	3	107
2064	728	235	813	2	1	3	109
2065	730	238	822	3	1	3	109
2066	730	245	832	3	1	3	109
2067	734	252	841	3	1	3	110
2068	741	258	850	3	1	3	110
2069	745	264	861	6	1	3	111
2070	748	269	871	7	1	3	112

TABLE C5. SUMMARY OF DRY MODEL CELLS FOR THE TRINITY AQUIFER (HENSELL) FROM THE REVISED PREDICTIVE SIMULATION.

Year	Erath	Lampasas
Total Active Official Aquifer Model Cells	21,880	25,364
2009 (baseline)	0	1
2010	0	1
2011	0	1
2012	0	1
2013	0	1
2014	0	1
2015	0	1
2016	0	1
2017	0	1
2018	0	1
2019	0	1
2020	0	1
2021	0	1
2022	0	1
2023	0	1
2024	0	1
2025	0	1
2026	0	1
2027	0	1
2028	0	1
2029	0	1
2030	0	1
2031	0	1
2032	0	1
2033	0	1
2034	0	1
2035	0	1
2036	0	1
2037	0	1
2038	0	1
2039	0	1
2040	1	1
2041	1	1
2042	3	1
2043	3	1

Year	Erath	Lampasas
2044	3	1
2045	6	1
2046	7	1
2047	7	1
2048	12	1
2049	14	1
2050	14	1
2051	18	1
2052	20	1
2053	22	1
2054	24	1
2055	25	1
2056	25	1
2057	30	1
2058	31	1
2059	35	1
2060	37	1
2061	37	1
2062	40	1
2063	42	1
2064	42	1
2065	44	1
2066	46	1
2067	46	1
2068	48	1
2069	50	1
2070	52	1

TABLE C6. SUMMARY OF DRY MODEL CELLS FOR THE TRINITY AQUIFER (HOSSTON) FROM THE REVISED PREDICTIVE SIMULATION.

Year	Burnet	Comanche	Erath	Johnson	McLennan	Travis
Total Active Official Aquifer Model Cells	24,354	41,062	8,464	9,462	16,991	9,480
2009 (baseline)	217	0	0	0	0	57
2010	176	0	1	0	0	59
2011	186	0	1	0	0	60
2012	218	0	1	0	0	63
2013	247	0	1	0	0	65
2014	269	0	1	0	0	68
2015	288	0	1	0	0	68
2016	310	0	1	0	0	70
2017	325	0	1	0	0	70
2018	338	0	1	0	0	71
2019	353	0	1	0	0	72
2020	368	0	1	0	0	72
2021	382	0	2	0	0	74
2022	387	0	9	0	0	74
2023	400	0	25	0	0	76
2024	409	0	51	0	0	77
2025	423	1	66	0	0	77
2026	433	9	75	0	0	79
2027	444	14	93	0	0	80
2028	455	14	99	0	0	80
2029	463	18	105	0	0	82
2030	473	30	111	0	0	82
2031	484	34	118	0	0	83
2032	491	35	127	0	0	83
2033	498	41	132	0	0	84
2034	505	54	138	0	0	85
2035	511	67	143	0	0	85
2036	520	72	151	0	0	87
2037	522	77	158	0	0	88
2038	531	85	162	0	0	88
2039	541	94	162	0	0	90
2040	547	103	166	0	1	90
2041	555	111	174	0	1	91
2042	563	116	183	0	1	92
2043	570	116	187	0	1	93

Year	Burnet	Comanche	Erath	Johnson	McLennan	Travis
2044	575	121	192	0	1	93
2045	579	128	198	0	1	94
2046	588	138	206	0	1	95
2047	591	146	211	0	2	97
2048	597	152	219	0	2	97
2049	602	160	222	0	2	98
2050	607	166	227	0	2	99
2051	609	172	229	1	2	100
2052	613	180	232	1	2	100
2053	619	186	239	1	2	101
2054	623	190	246	1	2	102
2055	633	194	253	1	2	103
2056	637	196	259	1	2	103
2057	640	199	263	1	2	104
2058	651	206	269	1	2	105
2059	659	216	283	1	2	106
2060	673	222	294	1	2	106
2061	671	225	295	1	2	106
2062	675	227	297	1	2	107
2063	679	231	299	1	3	107
2064	684	235	305	2	3	109
2065	686	238	307	3	3	109
2066	686	245	310	3	3	109
2067	689	252	315	3	3	110
2068	696	258	317	3	3	110
2069	700	264	320	6	3	111
2070	703	269	323	7	3	112

TABLE C7. SUMMARY OF DRY MODEL CELLS FOR THE TRINITY AQUIFER (ANTLERS) FROM THE REVISED PREDICTIVE SIMULATION.

Year	Collin	Comanche	Cooke	Denton	Eastland	Erath	Grayson	Montague	Parker	Tarrant	Wise
Total Active Official Aquifer Model Cells	7,055	23,711	77,143	59,107	44,009	9,287	77,954	56,141	42,539	5,009	92,333
2009 (baseline)	0	123	0	0	74	0	0	0	0	0	0
2010	1	80	0	0	91	6	0	0	0	0	1
2011	3	85	0	5	94	13	0	0	0	0	5
2012	7	92	0	29	99	29	0	0	0	0	6
2013	11	99	0	95	108	34	0	0	0	1	6
2014	16	103	1	201	110	36	0	0	0	6	6
2015	22	111	2	341	111	36	0	0	0	15	8
2016	30	120	3	500	113	36	0	0	0	28	67
2017	37	130	4	616	115	36	2	0	0	40	221
2018	44	141	7	721	117	39	6	0	1	58	372
2019	47	156	10	806	120	44	10	0	1	78	484
2020	53	167	17	901	125	48	22	0	2	94	574
2021	57	176	27	1,017	127	51	29	0	2	111	654
2022	62	186	37	1,199	130	52	36	0	2	124	741
2023	67	202	49	1,375	130	60	48	0	6	140	810
2024	71	230	64	1,543	133	74	57	0	9	151	879
2025	77	270	76	1,692	137	81	72	0	19	158	947
2026	79	294	95	1,803	139	90	90	0	54	162	995
2027	83	327	111	1,903	149	102	101	0	84	167	1,053
2028	86	373	123	1,983	156	110	106	0	112	171	1,109
2029	90	422	140	2,056	162	128	117	0	141	179	1,180
2030	94	448	152	2,121	179	171	122	0	166	183	1,236

Year	Collin	Comanche	Cooke	Denton	Eastland	Erath	Grayson	Montague	Parker	Tarrant	Wise
2031	96	478	164	2,180	204	185	134	0	184	190	1,294
2032	100	517	175	2,244	221	197	140	0	206	195	1,368
2033	103	554	185	2,299	233	208	148	0	218	202	1,479
2034	105	617	199	2,364	236	222	152	0	234	208	1,551
2035	110	669	216	2,436	242	225	161	0	244	215	1,628
2036	111	710	222	2,517	249	232	168	0	254	222	1,713
2037	113	771	234	2,623	259	246	175	0	262	229	1,809
2038	116	836	245	2,708	282	262	184	0	270	236	1,879
2039	121	865	256	2,788	304	283	191	0	278	244	1,952
2040	122	913	264	2,879	321	303	195	0	285	256	2,029
2041	123	957	276	2,951	331	313	201	0	292	291	2,085
2042	126	998	292	3,038	344	326	205	0	295	349	2,130
2043	128	1,032	300	3,119	363	334	210	0	303	383	2,174
2044	130	1,074	307	3,189	380	351	215	0	305	414	2,214
2045	131	1,129	314	3,251	397	359	221	0	309	446	2,253
2046	131	1,171	323	3,336	412	372	230	0	312	472	2,291
2047	136	1,221	333	3,405	442	390	233	0	318	501	2,349
2048	137	1,266	340	3,465	453	415	239	0	319	533	2,382
2049	139	1,320	353	3,524	474	440	240	0	325	558	2,413
2050	141	1,351	361	3,589	502	455	244	0	326	583	2,442
2051	141	1,389	367	3,633	525	468	247	0	327	608	2,458
2052	143	1,435	376	3,688	548	482	254	0	331	632	2,480
2053	146	1,469	379	3,745	590	493	257	0	332	652	2,496
2054	147	1,510	384	3,788	619	506	258	0	334	671	2,518
2055	148	1,548	392	3,849	645	526	264	0	335	697	2,533
2056	149	1,585	399	3,897	668	548	267	0	337	719	2,545

Year	Collin	Comanche	Cooke	Denton	Eastland	Erath	Grayson	Montague	Parker	Tarrant	Wise
2057	150	1,626	402	3,948	681	564	270	0	340	754	2,558
2058	150	1,703	407	3,981	715	578	274	0	340	788	2,574
2059	152	1,750	411	4,028	733	606	280	1	346	817	2,586
2060	154	1,813	416	4,067	751	627	283	1	346	845	2,594
2061	155	1,846	424	4,115	756	637	283	1	350	872	2,607
2062	156	1,909	428	4,152	777	646	287	1	350	898	2,616
2063	158	1,944	434	4,193	793	673	288	1	350	930	2,629
2064	158	1,968	441	4,232	807	711	292	1	350	953	2,635
2065	158	2,001	448	4,260	821	744	294	1	350	966	2,642
2066	158	2,065	450	4,295	842	770	298	1	352	984	2,653
2067	160	2,117	454	4,335	854	792	301	1	354	1,005	2,665
2068	162	2,154	455	4,360	863	802	303	1	355	1,016	2,676
2069	162	2,198	459	4,395	876	825	303	1	359	1,017	2,684
2070	164	2,268	462	4,438	881	846	307	1	360	1,019	2,691

TABLE C8. SUMMARY OF DRY MODEL CELLS FOR THE WOODBINE AQUIFER FROM THE REVISED PREDICTIVE SIMULATION.

Year	Collin	Cooke	Denton	Fannin	Grayson	Johnson	Tarrant
Total Active Model Cells in Official Aquifer Boundary	11,762	5,700	11,991	15,443	17,911	8,407	8,901
2009 (baseline)	0	0	3	3	2	14	2
2010	0	4	3	3	3	16	2
2011	0	4	3	4	3	16	2
2012	0	4	3	4	5	16	2
2013	0	4	3	4	5	19	2
2014	0	4	3	5	6	23	2
2015	0	4	3	6	7	23	2
2016	0	5	3	6	8	23	2
2017	0	5	3	8	9	24	2
2018	0	5	3	9	10	26	2
2019	0	5	3	10	11	26	2
2020	0	5	3	11	11	26	2
2021	0	5	3	12	13	27	2
2022	0	5	3	12	14	28	2
2023	0	5	3	12	14	28	2
2024	0	5	4	13	14	29	2
2025	0	5	5	14	15	29	2
2026	0	5	5	15	15	30	2
2027	0	5	5	15	15	31	2
2028	0	6	5	15	15	33	2
2029	0	6	5	15	15	34	2
2030	0	6	5	15	15	36	2
2031	0	6	5	16	15	37	2
2032	0	6	5	17	16	37	2
2033	0	6	5	18	17	38	2
2034	0	6	5	20	18	40	2
2035	0	6	5	21	19	40	2
2036	0	6	5	22	19	41	2
2037	0	6	5	24	19	41	2
2038	0	6	5	25	23	42	2
2039	0	6	5	26	25	42	2
2040	0	6	5	27	25	42	2
2041	0	6	5	27	25	42	2

Year	Collin	Cooke	Denton	Fannin	Grayson	Johnson	Tarrant
2042	0	6	5	27	27	42	2
2043	0	6	5	27	27	42	2
2044	0	6	5	28	30	42	2
2045	0	6	5	29	31	43	2
2046	0	6	6	30	31	43	2
2047	0	6	6	30	31	43	2
2048	0	6	7	32	34	43	2
2049	0	6	8	35	34	43	2
2050	0	7	8	35	35	43	2
2051	0	8	8	35	35	43	2
2052	0	8	8	37	35	43	2
2053	0	8	8	38	35	44	2
2054	0	8	8	38	37	45	2
2055	0	9	8	38	38	45	2
2056	0	10	8	38	38	46	2
2057	0	10	9	39	38	46	2
2058	0	10	9	42	39	50	3
2059	0	10	9	44	40	52	3
2060	0	13	9	47	41	54	3
2061	0	14	9	47	41	53	3
2062	0	14	9	47	41	53	3
2063	0	17	9	47	42	55	3
2064	0	20	9	47	42	55	3
2065	0	21	9	47	42	56	3
2066	1	23	9	47	42	57	3
2067	1	23	9	48	45	58	3
2068	2	24	9	49	45	59	3
2069	2	24	9	50	45	59	3
2070	2	24	9	50	45	60	3

Appendix D

Summary of Dry Model Cell Count for the Marble Falls, Ellenburger-San Saba, and Hickory Aquifers in Brown, Burnet, Lampasas, and Mills Counties

TABLE D1. SUMMARY OF DRY MODEL CELLS FOR THE MARBLE FALLS, ELLENBURGER-SAN SABA, AND HICKORY AQUIFERS IN BROWN, BURNET, LAMPASAS, AND MILLS COUNTIES FROM THE PREDICTIVE SIMULATION.

Year	Burnet	Lampasas	Burnet	Burnet
	Marble Falls		Ellenburger-San Saba	Hickory
Total Active Cells in modeled extent	10,810	7,614	13,618	14,334
2009 (baseline)	2298	611	709	111
2010	2353	631	724	112
2011	2363	638	735	112
2012	2376	641	744	113
2013	2386	642	758	113
2014	2391	646	769	113
2015	2395	650	776	113
2016	2397	653	781	115
2017	2405	654	787	117
2018	2406	657	795	117
2019	2409	659	801	118
2020	2413	661	804	118
2021	2419	661	809	118
2022	2419	661	810	118
2023	2421	661	811	118
2024	2422	662	813	119
2025	2423	662	817	120
2026	2425	664	821	120
2027	2426	665	821	120
2028	2428	666	823	120
2029	2433	667	824	122
2030	2433	669	824	123
2031	2435	670	825	123
2032	2436	671	828	123
2033	2438	671	830	123
2034	2440	672	832	124
2035	2441	673	832	124
2036	2441	675	833	124
2037	2442	676	833	124
2038	2442	677	834	125
2039	2443	678	837	126
2040	2443	678	837	126

Year	Burnet	Lampasas	Burnet	Burnet
	Marble Falls		Ellenburger-San Saba	Hickory
2041	2443	680	839	126
2042	2443	680	840	126
2043	2443	680	842	127
2044	2444	680	842	127
2045	2445	680	842	128
2046	2446	680	843	128
2047	2446	680	843	128
2048	2446	680	843	128
2049	2446	680	844	128
2050	2446	680	845	128
2051	2446	681	846	128
2052	2446	681	846	128
2053	2446	681	846	130
2054	2446	681	846	130
2055	2447	681	846	130
2056	2447	681	847	130
2057	2447	681	848	130
2058	2447	682	848	130
2059	2448	682	849	130
2060	2448	682	849	130
2061	2448	682	849	130
2062	2448	682	849	130
2063	2448	682	849	130
2064	2449	682	849	130
2065	2449	683	849	130
2066	2449	683	849	130
2067	2449	683	850	130
2068	2449	683	850	130
2069	2450	683	850	130
2070	2450	683	850	130

GAM RUN 21-002: RED RIVER GROUNDWATER CONSERVATION DISTRICT MANAGEMENT PLAN

Grayson Dowlearn and Shirley Wade, Ph.D, P.G.
Texas Water Development Board
Groundwater Division
Groundwater Modeling Department
(512) 475-1552
January 11, 2022

STATE OF TEXAS
SHIRLEY C. WADE
GEOLOGY
No. 525
LICENSED
PROFESSIONAL GEOSCIENTIST

Shirley C. Wade
1/11/22

This page is intentionally blank

GAM RUN 21-002: RED RIVER GROUNDWATER CONSERVATION DISTRICT MANAGEMENT PLAN

Grayson Dowlearn and Shirley Wade, Ph.D, P.G.
Texas Water Development Board
Groundwater Division
Groundwater Modeling Department
(512) 475-1552
January 11, 2022

EXECUTIVE SUMMARY:

Texas State Water Code, Section 36.1071, Subsection (h) (Texas Water Code, 2011), states that, in developing its groundwater management plan, a groundwater conservation district shall use groundwater availability modeling information provided by the Executive Administrator of the Texas Water Development Board (TWDB) in conjunction with any available site-specific information provided by the district for review and comment to the Executive Administrator.

The TWDB provides data and information to the Red River Groundwater Conservation District in two parts. Part 1 is the Estimated Historical Water Use/State Water Plan dataset report, which will be provided to you separately by the TWDB Groundwater Technical Assistance Department. Please direct questions about the water data report to Mr. Stephen Allen at 512-463-7317 or stephen.allen@twdb.texas.gov. Part 2 is the required groundwater availability modeling information and this information includes:

1. the annual amount of recharge from precipitation, if any, to the groundwater resources within the district;

2. for each aquifer within the district, the annual volume of water that discharges from the aquifer to springs and any surface-water bodies, including lakes, streams, and rivers; and

3. the annual volume of flow into and out of the district within each aquifer and between aquifers in the district.

The groundwater management plan for the Red River Groundwater Conservation District should be adopted by the district on or before February 11, 2022 and submitted to the executive administrator of the TWDB on or before March 13, 2022. The current management plan for the Red River Groundwater Conservation District expires on May 12, 2022.

We used one groundwater availability model to estimate the management plan information for the aquifers within the Red River Groundwater Conservation District. Information for the Trinity and Woodbine aquifers is from version 2.01 of the groundwater availability model for the northern portion of the Trinity Aquifer and the Woodbine Aquifer (Kelley and others, 2014).

This report replaces the results of GAM Run 16-005 (Boghici, 2016), as the approach used for analyzing model results has been since refined to more accurately delineate groundwater flows. Additionally, we routinely update the spatial grid file used to define county, groundwater conservation district, and aquifer boundaries, which can also impact the water budget. Tables 1 and 2 summarize the groundwater availability model data required by statute. Figures 1 and 3 show the area of the models from which the values in the tables were extracted. Figures 2 and 4 provide generalized diagrams of the groundwater flow components provided in Tables 1 and 2. If, after review of the figures, the Red River Groundwater Conservation District determines that the district boundaries used in the assessment do not reflect current conditions, please notify the TWDB at your earliest convenience.

METHODS:

In accordance with the provisions of the Texas State Water Code, Section 36.1071, Subsection (h), the groundwater availability model mentioned above was used to estimate information for the Red River Groundwater Conservation District management plan. Water budgets were extracted for the historical model period for the Trinity and Woodbine aquifers (1980-2012) using ZONEBUDGET Version 3.01 (Harbaugh, 2009). The average annual water budget values for recharge, surface-water outflow, inflow to the district, outflow from the district, and the flow between aquifers within the district are summarized in this report.

PARAMETERS AND ASSUMPTIONS:

Trinity and Woodbine Aquifers

- We used version 2.01 of the groundwater availability model for the northern portion of the Trinity Aquifer and the Woodbine Aquifer. See Kelley and others (2014) for assumptions and limitations of the model.
- The groundwater availability model for the northern portion of the Trinity Aquifer and Woodbine Aquifer contains eight layers that generally represent the following: Layer 1 (the surficial outcrop area of the units in layers 2 through 8 and units younger than the Woodbine Aquifer), Layer 2 (Woodbine Aquifer), Layer 3 (Washita and Fredericksburg Groups, and the Edwards [Balcones Fault Zone] Aquifer), and Layers 4 through 8 (Trinity Aquifer). Layers 2 through 7 also include pass-through cells.
- Perennial rivers and reservoirs were simulated using the MODFLOW River package. Ephemeral streams, flowing wells, springs, and evapotranspiration in riparian zones along perennial rivers were simulated using the MODFLOW Drain package.
- The model was run using MODFLOW-NWT (Niswonger and others, 2011).

RESULTS:

A groundwater budget summarizes the amount of water entering and leaving the aquifer according to the groundwater availability model. Selected groundwater budget components listed below were extracted from the groundwater availability model results for the Trinity and Woodbine aquifers located within the Red River Groundwater Conservation District and averaged over the historical calibration period, as shown in Tables 1 and 2.

1. Precipitation recharge—the areally distributed recharge sourced from precipitation falling on the outcrop areas of the aquifers (where the aquifer is exposed at land surface) within the district.
2. Surface-water outflow—the total water discharging from the aquifer (outflow) to surface-water features such as streams, reservoirs, and springs.
3. Flow into and out of district—the lateral flow within the aquifer between the district and adjacent counties.

4. Flow between aquifers—the net vertical flow between the aquifer and adjacent aquifers or confining units. This flow is controlled by the relative water levels in each aquifer and aquifer properties of each aquifer or confining unit that define the amount of leakage that occurs.

The information needed for the district's management plan is summarized in Tables 1 and 2. It is important to note that sub-regional water budgets are not exact. This is due to the size of the model cells and the approach used to extract data from the model. To avoid double accounting, a model cell that straddles a political boundary, such as a district or county boundary, is assigned to one side of the boundary based on the location of the centroid of the model cell. For example, if a cell contains two counties, the cell is assigned to the county where the centroid of the cell is located.

TABLE 1: SUMMARIZED INFORMATION FOR THE TRINITY AQUIFER THAT IS NEEDED FOR THE RED RIVER GROUNDWATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Trinity Aquifer	2,873
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Trinity Aquifer	1,486
Estimated annual volume of flow into the district within each aquifer in the district	Trinity Aquifer	4,995
Estimated annual volume of flow out of the district within each aquifer in the district	Trinity Aquifer	2,999
Estimated net annual volume of flow between each aquifer in the district	To the Trinity Aquifer from the Washita Group of the Cretaceous System	1,451
	To the Trinity Aquifer from equivalent hydrogeologic units in Oklahoma	3,702

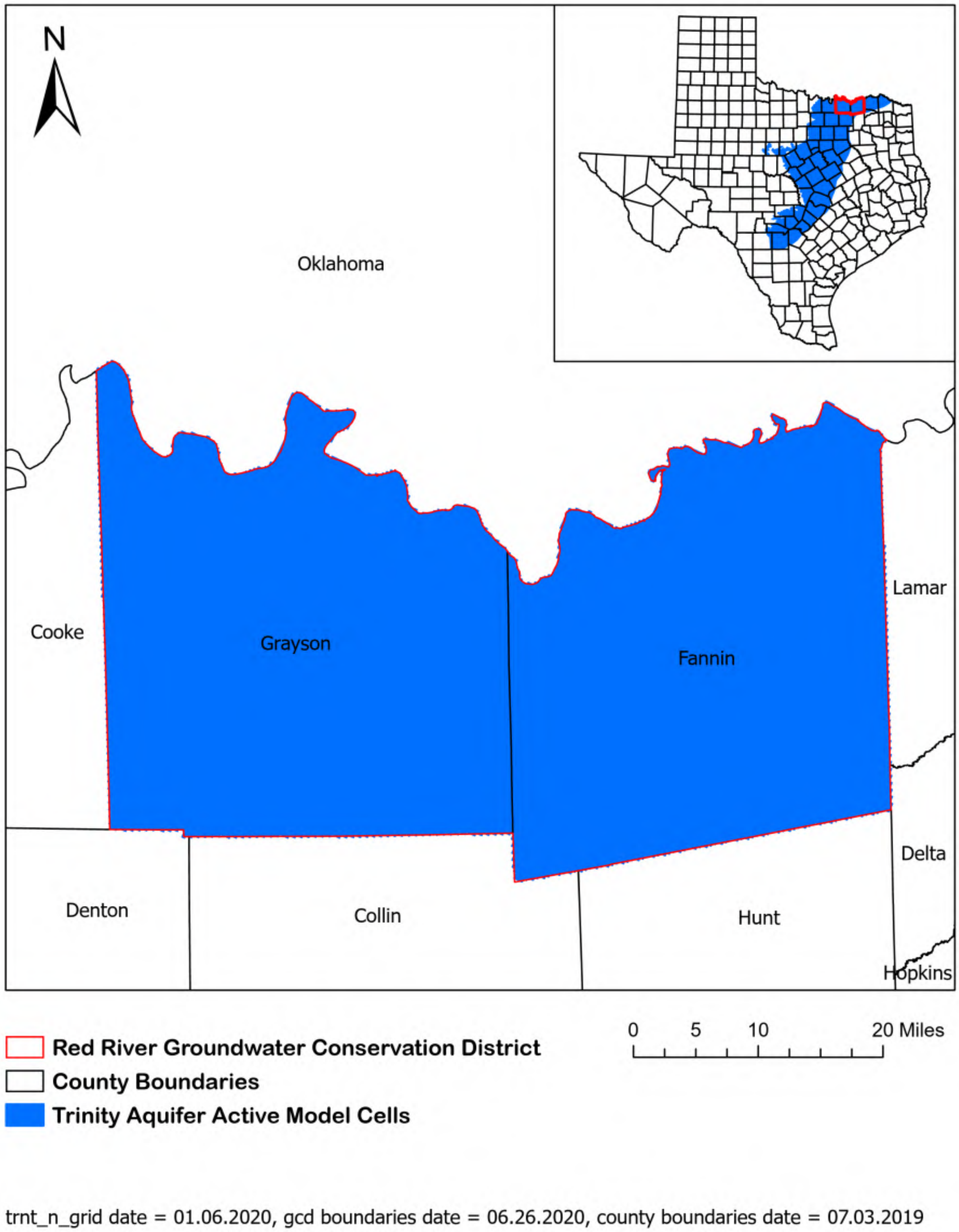
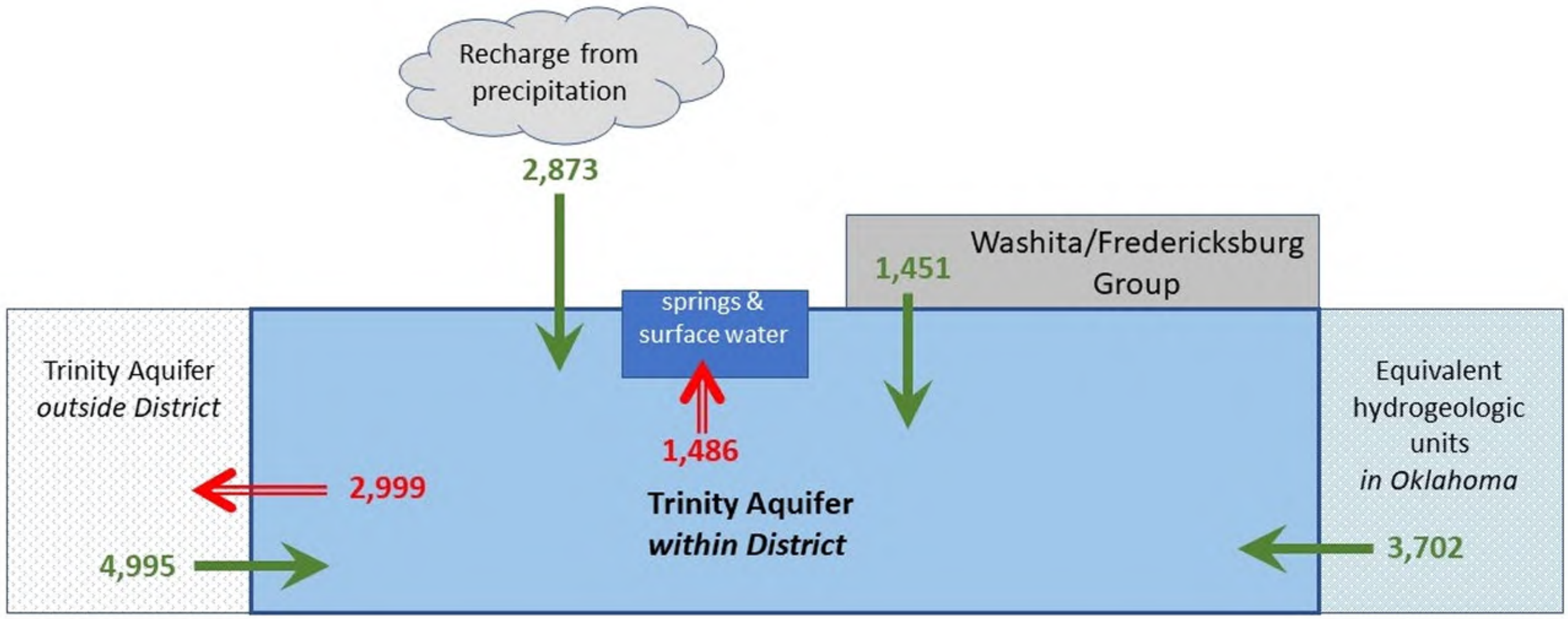


FIGURE 1: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE TRINITY AQUIFER AND THE WOODBINE AQUIFER FROM WHICH THE INFORMATION IN TABLE 1 WAS EXTRACTED (THE TRINITY AQUIFER EXTENT WITHIN THE DISTRICT BOUNDARY).



Note: This diagram only includes the water budget items provided in Table 1. If the District requires values for additional water budget items, please contact TWDB.

FIGURE 2: GENERALIZED DIAGRAM OF THE SUMMARIZED BUDGET INFORMATION FROM TABLE 1, REPRESENTING DIRECTIONS OF FLOW FOR THE TRINITY AQUIFER WITHIN RED RIVER GROUNDWATER CONSERVATION DISTRICT. FLOW VALUES EXPRESSED IN ACRE-FEET PER YEAR (AFY).

TABLE 2: SUMMARIZED INFORMATION FOR THE WOODBINE AQUIFER THAT IS NEEDED FOR THE RED RIVER GROUNDWATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Woodbine Aquifer	63,673
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Woodbine Aquifer	45,461
Estimated annual volume of flow into the district within each aquifer in the district	Woodbine Aquifer	2,151
Estimated annual volume of flow out of the district within each aquifer in the district	Woodbine Aquifer	1,138
Estimated net annual volume of flow between each aquifer in the district	From the Woodbine Aquifer to equivalent units outside the official Woodbine Aquifer extent	173
	To the Woodbine Aquifer from younger units	6,383
	From the Woodbine Aquifer to Washita and Fredericksburg confining units	5,091
	From the Woodbine Aquifer to equivalent hydrogeologic units in Oklahoma	8,954

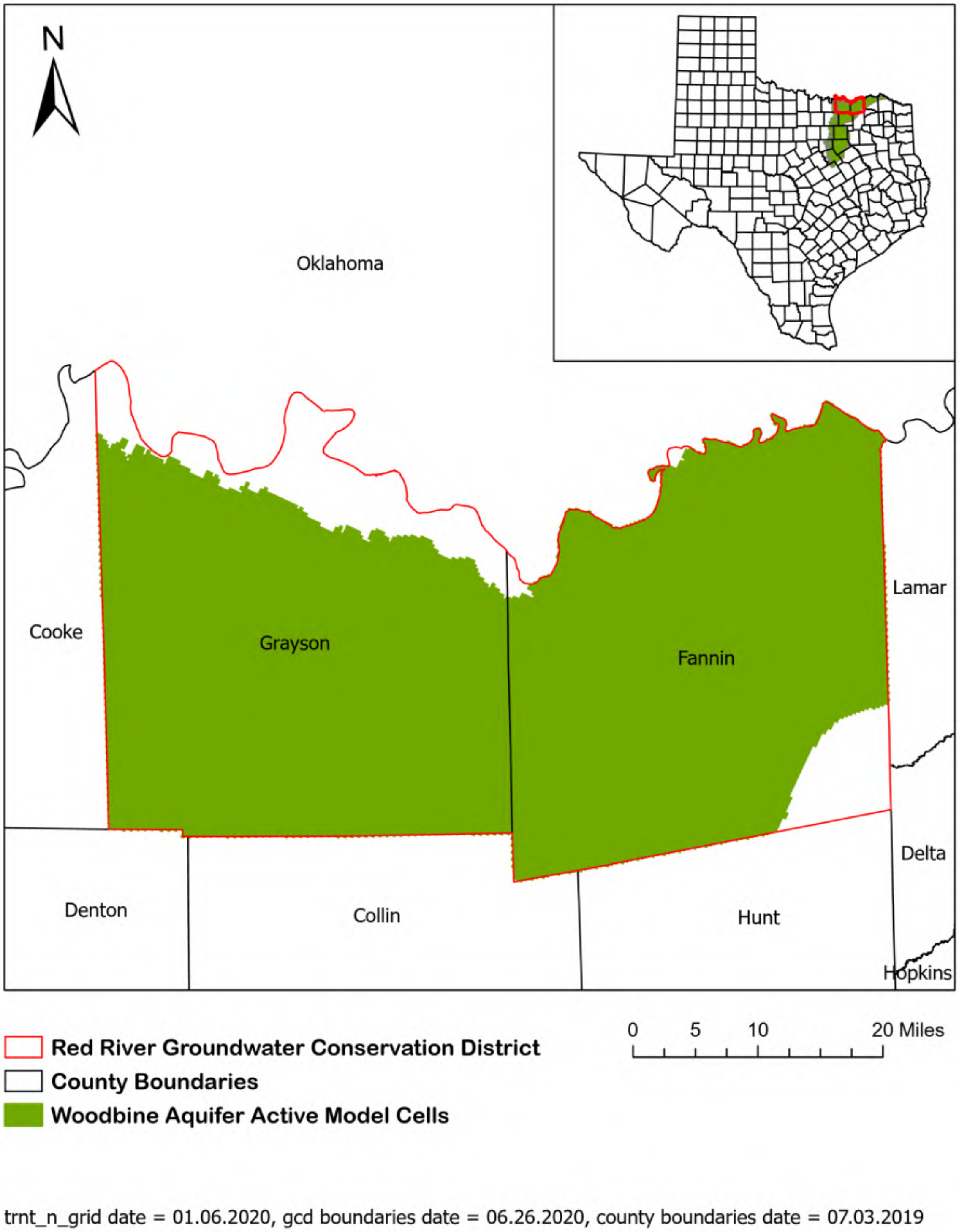
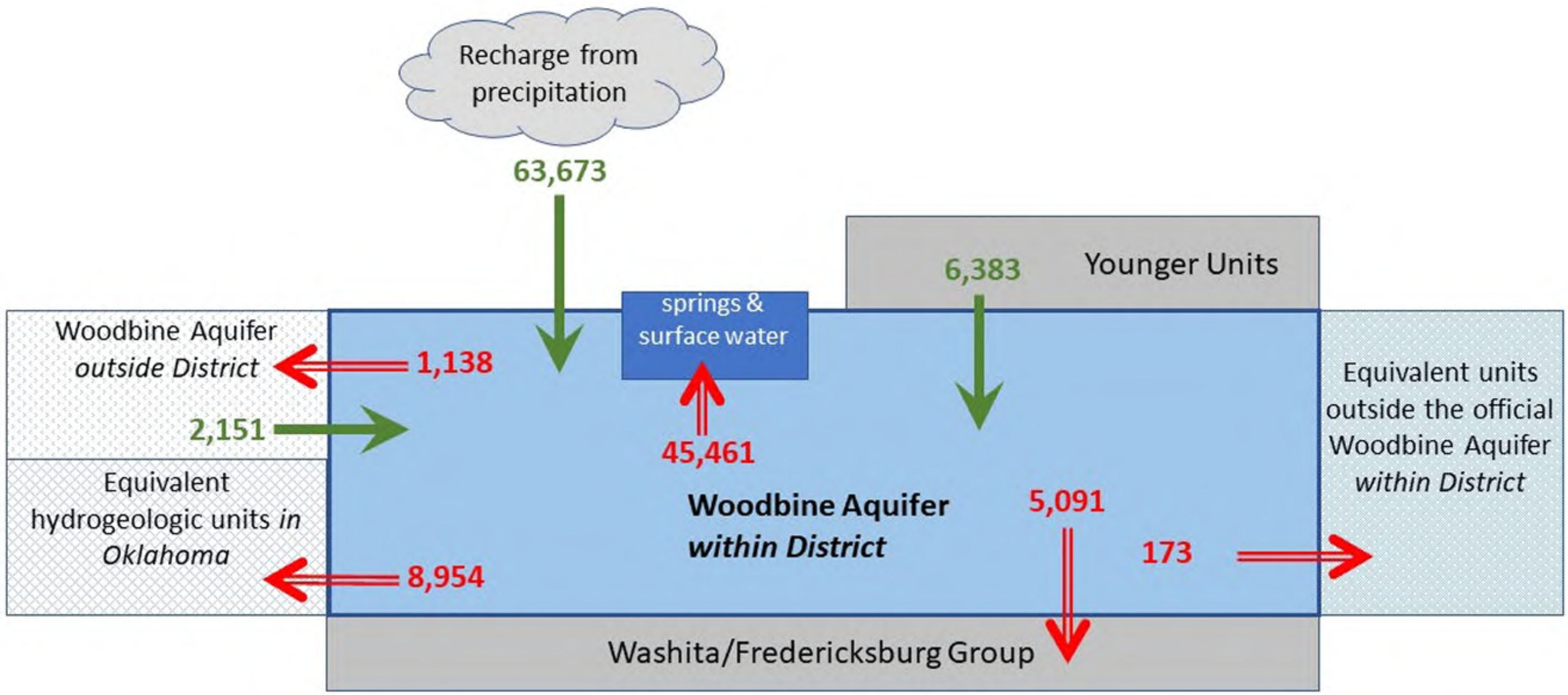


FIGURE 3: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE WOODBINE AQUIFER FROM WHICH THE INFORMATION IN TABLE 2 WAS EXTRACTED (THE WOODBINE AQUIFER EXTENT WITHIN THE DISTRICT BOUNDARY).



Note: This diagram only includes the water budget items provided in Table 2. If the District requires values for additional water budget items, please contact TWDB.

FIGURE 4: GENERALIZED DIAGRAM OF THE SUMMARIZED BUDGET INFORMATION FROM TABLE 2, REPRESENTING DIRECTIONS OF FLOW FOR THE WOODBINE AQUIFER WITHIN RED RIVER GROUNDWATER CONSERVATION DISTRICT. FLOW VALUES EXPRESSED IN ACRE-FEET PER YEAR (AFY).

LIMITATIONS:

The groundwater models used in completing this analysis are the best available scientific tools that can be used to meet the stated objectives. To the extent that this analysis will be used for planning purposes and/or regulatory purposes related to pumping in the past and into the future, it is important to recognize the assumptions and limitations associated with the use of the results. In reviewing the use of models in environmental regulatory decision making, the National Research Council (2007) noted:

> *"Models will always be constrained by computational limitations, assumptions, and knowledge gaps. They can best be viewed as tools to help inform decisions rather than as machines to generate truth or make decisions. Scientific advances will never make it possible to build a perfect model that accounts for every aspect of reality or to prove that a given model is correct in all respects for a particular regulatory application. These characteristics make evaluation of a regulatory model more complex than solely a comparison of measurement data with model results."*

A key aspect of using the groundwater model to evaluate historic groundwater flow conditions includes the assumptions about the location in the aquifer where historic pumping was placed. Understanding the amount and location of historical pumping is as important as evaluating the volume of groundwater flow into and out of the district, between aquifers within the district (as applicable), interactions with surface water (as applicable), recharge to the aquifer system (as applicable), and other metrics that describe the impacts of that pumping. In addition, assumptions regarding precipitation, recharge, and interaction with streams are specific to particular historic time periods.

Because the application of the groundwater models was designed to address regional scale questions, the results are most effective on a regional scale. The TWDB makes no warranties or representations related to the actual conditions of any aquifer at a particular location or at a particular time.

It is important for groundwater conservation districts to monitor groundwater pumping and overall conditions of the aquifer. Because of the limitations of the groundwater model and the assumptions in this analysis, it is important that the groundwater conservation districts work with the TWDB to refine this analysis in the future given the reality of how the aquifer responds to the actual amount and location of pumping now and in the future. Historic precipitation patterns also need to be placed in context as future climatic conditions, such as dry and wet year precipitation patterns, may differ and affect groundwater flow conditions.

REFERENCES:

Boghici, R., 2016, GAM Run 16-005: Texas Water Development Board, GAM Run 16-005 Report, 12 p., https://www.twdb.texas.gov/groundwater/docs/GAMruns/GR16-005.pdf.

Harbaugh, A. W., 2009, Zonebudget Version 3.01, A computer program for computing subregional water budgets for MODFLOW ground-water flow models, U.S. Geological Survey Groundwater Software.

Kelley, V.A., Ewing, J., Jones, T.L., Young, S.C., Deeds, N., and Hamlin, S., 2014, Updated Groundwater Availability Model of the Northern Trinity and Woodbine Aquifers – Final Model Report, 984 p., http://www.twdb.texas.gov/groundwater/models/gam/trnt_n/Final_NTGAM_Vol%20I%20Aug%202014_Report.pdf

National Research Council, 2007, Models in Environmental Regulatory Decision Making Committee on Models in the Regulatory Decision Process, National Academies Press, Washington D.C., 287 p., http://www.nap.edu/catalog.php?record_id=11972.

Niswonger, R.G., Panday, S., and Ibaraki, M., 2011, MODFLOW-NWT, a Newton formulation for MODFLOW-2005: USGS, Techniques and Methods 6-A37, 44 p.

Texas Water Code, 2011, http://www.statutes.legis.state.tx.us/docs/WA/pdf/WA.36.pdf

Appendix E: Estimated Historical Water Use and 2022 State Water Plan Datasets

Estimated Historical Groundwater Use And 2022 State Water Plan Datasets:

Red River Groundwater Conservation District

Texas Water Development Board
Groundwater Division
Groundwater Technical Assistance Section
stephen.allen@twdb.texas.gov
(512) 463-7317
January 5, 2022

GROUNDWATER MANAGEMENT PLAN DATA:

This package of water data reports (part 1 of a 2-part package of information) is being provided to groundwater conservation districts to help them meet the requirements for approval of their five-year groundwater management plan. Each report in the package addresses a specific numbered requirement in the Texas Water Development Board's groundwater management plan checklist. The checklist can be viewed and downloaded from this web address:

http://www.twdb.texas.gov/groundwater/docs/GCD/GMPChecklist0113.pdf

The five reports included in this part are:

1. Estimated Historical Groundwater Use (checklist item 2)

   from the TWDB Historical Water Use Survey (WUS)

2. Projected Surface Water Supplies (checklist item 6)
3. Projected Water Demands (checklist item 7)
4. Projected Water Supply Needs (checklist item 8)
5. Projected Water Management Strategies (checklist item 9)

   from the 2022 Texas State Water Plan (SWP)

Part 2 of the 2-part package is the groundwater availability model (GAM) report for the District (checklist items 3 through 5). The District should have received, or will receive, this report from the Groundwater Availability Modeling Section. Questions about the GAM can be directed to Dr. Shirley Wade, shirley.wade@twdb.texas.gov, (512) 936-0883.

DISCLAIMER:

The data presented in this report represents the most up-to-date WUS and 2022 SWP data available as of 1/5/2022. Although it does not happen frequently, either of these datasets are subject to change pending the availability of more accurate WUS data or an amendment to the 2022 SWP. District personnel must review these datasets and correct any discrepancies in order to ensure approval of their groundwater management plan.

The WUS dataset can be verified at this web address:

http://www.twdb.texas.gov/waterplanning/waterusesurvey/estimates/

The 2022 SWP dataset can be verified by contacting Sabrina Anderson (sabrina.anderson@twdb.texas.gov or 512-936-0886).

For additional questions regarding this data, please contact Stephen Allen (stephen.allen@twdb.texas.gov or 512-463-7317).

Estimated Historical Water Use
TWDB Historical Water Use Survey (WUS) Data

Groundwater and surface water historical use estimates are currently unavailable for calendar year 2020. TWDB staff anticipates the calculation and posting of these estimates at a later date.

FANNIN COUNTY

All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2019	GW	3,063	0	0	0	819	1,239	5,121
	SW	1,476	0	1,550	0	2,072	137	5,235
2018	GW	3,141	0	0	0	632	1,239	5,012
	SW	1,481	0	2,294	0	837	137	4,749
2017	GW	2,913	0	0	0	2,322	1,193	6,428
	SW	1,464	0	2,373	0	1,077	133	5,047
2016	GW	2,962	0	0	0	1,650	1,271	5,883
	SW	1,525	0	2,373	0	6,857	141	10,896
2015	GW	2,944	0	0	0	508	1,247	4,699
	SW	1,493	0	1,535	0	11,217	138	14,383
2014	GW	2,716	0	0	0	1,578	1,356	5,650
	SW	1,447	0	2,236	0	11,374	151	15,208
2013	GW	3,256	0	0	0	676	1,367	5,299
	SW	1,594	0	505	0	12,081	152	14,332
2012	GW	3,326	0	0	0	2,757	1,092	7,175
	SW	1,517	5	449	0	10,818	122	12,911
2011	GW	3,607	0	0	0	743	1,273	5,623
	SW	1,764	12	574	0	6,013	141	8,504
2010	GW	3,269	0	2	319	1,090	1,260	5,940
	SW	1,540	0	428	65	8,800	140	10,973
2009	GW	3,010	0	2	373	1,888	1,445	6,718
	SW	1,475	0	127	307	14,346	160	16,415
2008	GW	3,140	0	2	486	0	1,321	4,949
	SW	1,603	0	132	285	9,153	147	11,320
2007	GW	2,945	0	1	373	0	1,705	5,024
	SW	1,619	0	0	0	4,324	188	6,131
2006	GW	3,377	0	6	80	0	1,495	4,958
	SW	1,595	5	0	281	5,567	166	7,614
2005	GW	2,986	0	19	71	322	1,539	4,937
	SW	1,632	5	0	0	5,907	171	7,715
2004	GW	2,677	0	7	243	921	86	3,934
	SW	1,564	5	8	1	78	1,418	3,074

GRAYSON COUNTY

All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2019	GW	9,988	769	1	0	1,017	259	12,034
	SW	8,606	1,714	0	1,899	397	778	13,394
2018	GW	10,257	773	13	0	1,325	259	12,627
	SW	9,122	1,664	3	2,134	274	778	13,975
2017	GW	8,248	742	1	0	2,481	252	11,724
	SW	7,082	1,186	0	2,128	157	757	11,310
2016	GW	8,410	753	2	0	1,879	311	11,355
	SW	9,243	1,227	1	2,134	182	933	13,720
2015	GW	9,510	803	104	0	2,003	300	12,720
	SW	9,646	1,377	26	1,948	274	902	14,173
2014	GW	8,766	771	229	0	2,632	305	12,703
	SW	7,900	617	57	0	611	915	10,100
2013	GW	9,399	1,041	42	0	3,533	268	14,283
	SW	7,920	1,019	11	0	619	805	10,374
2012	GW	11,385	1,194	44	0	7,589	222	20,434
	SW	8,775	861	11	0	707	668	11,022
2011	GW	10,931	707	2	0	3,668	319	15,627
	SW	14,588	557	1	0	750	958	16,854
2010	GW	9,818	1,649	18	0	1,690	314	13,489
	SW	7,250	978	48	0	450	940	9,666
2009	GW	9,979	1,171	15	0	222	293	11,680
	SW	7,397	435	39	0	1,326	877	10,074
2008	GW	10,324	993	12	0	0	281	11,610
	SW	8,358	436	31	0	394	844	10,063
2007	GW	10,078	904	0	0	616	536	12,134
	SW	7,231	919	0	0	327	1,608	10,085
2006	GW	10,649	1,234	0	0	334	360	12,577
	SW	9,844	1,008	0	0	937	1,080	12,869
2005	GW	9,542	1,290	0	0	1,911	353	13,096
	SW	9,182	2,227	0	0	311	1,058	12,778
2004	GW	9,579	1,193	0	0	1,546	70	12,388
	SW	9,583	800	0	0	144	1,212	11,739

Projected Surface Water Supplies
TWDB 2022 State Water Plan Data

FANNIN COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
C	BONHAM	RED	BONHAM LAKE/RESERVOIR	2,024	2,505	3,184	3,187	3,188	3,189
C	COUNTY-OTHER, FANNIN	RED	SULPHUR RUN-OF-RIVER	43	43	43	43	43	43
C	COUNTY-OTHER, FANNIN	SULPHUR	SULPHUR RUN-OF-RIVER	3	3	3	3	3	3
C	COUNTY-OTHER, FANNIN	TRINITY	SULPHUR RUN-OF-RIVER	3	3	3	3	3	3
C	DELTA COUNTY MUD	SULPHUR	BIG CREEK LAKE/RESERVOIR	3	3	3	3	3	3
C	IRRIGATION, FANNIN	RED	RED RUN-OF-RIVER	4,269	4,269	4,269	4,269	4,269	4,269
C	IRRIGATION, FANNIN	SULPHUR	RED RUN-OF-RIVER	90	90	90	90	90	90
C	IRRIGATION, FANNIN	TRINITY	RED RUN-OF-RIVER	254	254	254	254	254	254
C	LIVESTOCK, FANNIN	RED	RED LIVESTOCK LOCAL SUPPLY	724	724	724	724	724	724
C	LIVESTOCK, FANNIN	RED	SULPHUR LIVESTOCK LOCAL SUPPLY	202	202	202	202	202	202
C	LIVESTOCK, FANNIN	RED	TRINITY LIVESTOCK LOCAL SUPPLY	45	45	45	45	45	45
C	LIVESTOCK, FANNIN	SULPHUR	RED LIVESTOCK LOCAL SUPPLY	203	203	203	203	203	203
C	LIVESTOCK, FANNIN	SULPHUR	SULPHUR LIVESTOCK LOCAL SUPPLY	57	57	57	57	57	57
C	LIVESTOCK, FANNIN	SULPHUR	TRINITY LIVESTOCK LOCAL SUPPLY	13	13	13	13	13	13
C	LIVESTOCK, FANNIN	TRINITY	RED LIVESTOCK LOCAL SUPPLY	46	46	46	46	46	46
C	LIVESTOCK, FANNIN	TRINITY	SULPHUR LIVESTOCK LOCAL SUPPLY	13	13	13	13	13	13
C	LIVESTOCK, FANNIN	TRINITY	TRINITY LIVESTOCK LOCAL SUPPLY	3	3	3	3	3	3
C	MANUFACTURING, FANNIN	RED	BONHAM LAKE/RESERVOIR	12	12	11	8	7	6
C	MINING, FANNIN	RED	RED RUN-OF-RIVER	55	55	55	55	55	55
C	MINING, FANNIN	SULPHUR	RED RUN-OF-RIVER	17	17	17	17	17	17
C	NORTH HUNT SUD	SULPHUR	TAWAKONI LAKE/RESERVOIR	18	16	13	11	9	7
C	WOLFE CITY	SULPHUR	TURKEY CREEK LAKE/RESERVOIR	10	10	10	10	10	10
	Sum of Projected Surface Water Supplies (acre-feet)			**8,107**	**8,586**	**9,261**	**9,259**	**9,257**	**9,255**

All values are in acre-feet

GRAYSON COUNTY

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
C	COUNTY-OTHER, GRAYSON	RED	RANDELL LAKE/RESERVOIR	66	60	59	53	45	34
C	COUNTY-OTHER, GRAYSON	RED	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION	1,369	1,377	1,400	1,405	1,263	1,180
C	COUNTY-OTHER, GRAYSON	TRINITY	RANDELL LAKE/RESERVOIR	2	2	2	2	1	1
C	COUNTY-OTHER, GRAYSON	TRINITY	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION	43	42	44	45	40	37
C	DENISON	RED	RANDELL LAKE/RESERVOIR	852	855	854	860	865	873
C	DENISON	RED	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION	5,542	5,530	5,438	5,362	5,175	5,321
C	HOWE	RED	NORTH TEXAS MWD LAKE/RESERVOIR SYSTEM	0	3	7	9	13	16
C	HOWE	TRINITY	NORTH TEXAS MWD LAKE/RESERVOIR SYSTEM	0	8	17	24	32	40
C	HOWE	TRINITY	TAWAKONI LAKE/RESERVOIR	0	1	1	2	2	3
C	IRRIGATION, GRAYSON	RED	RED RUN-OF-RIVER	604	604	604	604	604	604
C	IRRIGATION, GRAYSON	TRINITY	RED RUN-OF-RIVER	487	487	487	487	487	487
C	LIVESTOCK, GRAYSON	RED	RED LIVESTOCK LOCAL SUPPLY	440	440	440	440	440	440
C	LIVESTOCK, GRAYSON	RED	TRINITY LIVESTOCK LOCAL SUPPLY	248	248	248	248	248	248
C	LIVESTOCK, GRAYSON	TRINITY	RED LIVESTOCK LOCAL SUPPLY	248	248	248	248	248	248
C	LIVESTOCK, GRAYSON	TRINITY	TRINITY LIVESTOCK LOCAL SUPPLY	139	139	139	139	139	139
C	MANUFACTURING, GRAYSON	RED	FORK LAKE/RESERVOIR	2	0	0	0	0	0
C	MANUFACTURING, GRAYSON	RED	NORTH TEXAS MWD LAKE/RESERVOIR SYSTEM	15	14	12	11	9	10
C	MANUFACTURING, GRAYSON	RED	RANDELL LAKE/RESERVOIR	442	450	450	450	450	450
C	MANUFACTURING, GRAYSON	RED	RED RUN-OF-RIVER	30	30	30	30	30	30
C	MANUFACTURING, GRAYSON	RED	TAWAKONI LAKE/RESERVOIR	2	1	1	1	1	0
C	MANUFACTURING, GRAYSON	RED	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION	2,206	2,250	2,250	2,250	1,834	1,110
C	MANUFACTURING, GRAYSON	TRINITY	NORTH TEXAS MWD LAKE/RESERVOIR SYSTEM	0	0	0	0	0	0
C	MANUFACTURING, GRAYSON	TRINITY	RANDELL LAKE/RESERVOIR	1	1	1	1	1	1
C	MANUFACTURING,	TRINITY	RED RUN-OF-RIVER	0	0	0	0	0	0

	GRAYSON								
C	MANUFACTURING, GRAYSON	TRINITY	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION	7	7	7	7	6	3
C	MARILEE SUD	TRINITY	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION	78	92	105	103	83	50
C	MUSTANG SUD	TRINITY	CHAPMAN/COOPER LAKE/RESERVOIR NON-SYSTEM PORTION	5	4	4	4	4	3
C	MUSTANG SUD	TRINITY	RAY ROBERTS-LEWISVILLE-GRAPEVINE LAKE/RESERVOIR SYSTEM	18	16	15	13	12	11
C	OAK RIDGE SOUTH GALE WSC	RED	RANDELL LAKE/RESERVOIR	37	32	34	34	38	41
C	OAK RIDGE SOUTH GALE WSC	RED	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION	170	147	155	155	173	184
C	POTTSBORO	RED	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION	311	381	469	572	783	673
C	RED RIVER AUTHORITY OF TEXAS	RED	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION	358	392	421	454	487	467
C	SHERMAN	RED	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION	4,967	5,309	5,418	6,275	8,569	9,391
C	STEAM ELECTRIC POWER, GRAYSON	TRINITY	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION	4,387	4,387	4,387	4,387	4,387	4,387
C	VAN ALSTYNE	TRINITY	FORK LAKE/RESERVOIR	1	0	0	0	0	0
C	VAN ALSTYNE	TRINITY	NORTH TEXAS MWD LAKE/RESERVOIR SYSTEM	5	94	199	281	614	682
C	VAN ALSTYNE	TRINITY	TAWAKONI LAKE/RESERVOIR	1	5	10	14	30	34
	Sum of Projected Surface Water Supplies (acre-feet)			**23,083**	**23,656**	**23,956**	**24,970**	**27,113**	**27,198**

Projected Water Demands
TWDB 2022 State Water Plan Data

Please note that the demand numbers presented here include the plumbing code savings found in the Regional and State Water Plans.

FANNIN COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
C	ARLEDGE RIDGE WSC	RED	113	123	145	189	276	375
C	ARLEDGE RIDGE WSC	SULPHUR	44	48	57	74	109	148
C	BOIS D ARC MUD	RED	273	297	352	458	672	912
C	BONHAM	RED	2,024	2,505	3,393	4,598	5,662	6,882
C	COUNTY-OTHER, FANNIN	RED	584	465	486	700	1,965	3,404
C	COUNTY-OTHER, FANNIN	SULPHUR	36	29	30	43	121	210
C	COUNTY-OTHER, FANNIN	TRINITY	43	35	36	52	146	252
C	DELTA COUNTY MUD	SULPHUR	3	3	3	3	3	3
C	DESERT WSC	RED	1	1	1	1	2	3
C	DESERT WSC	TRINITY	85	94	98	119	171	253
C	HICKORY CREEK SUD	SULPHUR	28	29	31	32	35	39
C	HICKORY CREEK SUD	TRINITY	2	2	2	2	2	2
C	HONEY GROVE	RED	61	60	58	58	58	58
C	HONEY GROVE	SULPHUR	231	224	219	217	216	216
C	IRRIGATION, FANNIN	RED	10,691	10,691	10,691	10,691	10,691	10,691
C	IRRIGATION, FANNIN	SULPHUR	226	226	226	226	226	226
C	IRRIGATION, FANNIN	TRINITY	636	636	636	636	636	636
C	LADONIA	SULPHUR	248	304	332	376	451	451
C	LEONARD	RED	3	3	3	3	3	3
C	LEONARD	SULPHUR	6	7	7	7	7	7
C	LEONARD	TRINITY	319	337	343	353	366	380
C	LIVESTOCK, FANNIN	RED	1,051	1,051	1,051	1,051	1,051	1,051
C	LIVESTOCK, FANNIN	SULPHUR	294	294	294	294	294	294
C	LIVESTOCK, FANNIN	TRINITY	66	66	66	66	66	66
C	MANUFACTURING, FANNIN	RED	12	12	12	12	12	12
C	MINING, FANNIN	RED	435	266	97	97	97	97
C	MINING, FANNIN	SULPHUR	139	85	31	31	31	31
C	NORTH HUNT SUD	SULPHUR	35	39	41	44	48	52
C	SOUTHWEST FANNIN COUNTY SUD	RED	388	413	432	453	542	643
C	SOUTHWEST FANNIN COUNTY SUD	TRINITY	19	20	21	22	27	32
C	TRENTON	RED	0	0	0	1	2	2
C	TRENTON	TRINITY	136	166	365	728	1,254	1,778
C	WEST LEONARD WSC	TRINITY	165	176	165	174	202	249

C	WHITE SHED WSC	RED	301	327	386	501	735	998
C	WHITEWRIGHT	RED	1	1	2	2	2	2
C	WOLFE CITY	SULPHUR	9	10	13	16	22	29
	Sum of Projected Water Demands (acre-feet)		**18,708**	**19,045**	**20,125**	**22,330**	**26,203**	**30,487**

GRAYSON COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
C	BELLS	RED	182	206	232	250	580	783
C	COLLINSVILLE	TRINITY	282	333	395	473	498	653
C	COUNTY-OTHER, GRAYSON	RED	724	584	352	413	1,390	2,284
C	COUNTY-OTHER, GRAYSON	TRINITY	23	18	11	13	44	72
C	DENISON	RED	7,226	7,888	7,877	8,598	9,992	13,298
C	DESERT WSC	TRINITY	78	83	89	95	105	114
C	DORCHESTER	RED	83	85	89	92	99	111
C	DORCHESTER	TRINITY	40	41	43	44	48	53
C	GUNTER	TRINITY	297	400	527	656	803	936
C	HOWE	RED	77	86	95	104	117	130
C	HOWE	TRINITY	197	220	244	266	299	334
C	IRRIGATION, GRAYSON	RED	2,479	2,479	2,479	2,479	2,479	2,479
C	IRRIGATION, GRAYSON	TRINITY	1,998	1,998	1,998	1,998	1,998	1,998
C	KENTUCKYTOWN WSC	RED	182	211	241	269	341	437
C	KENTUCKYTOWN WSC	TRINITY	173	201	228	256	324	415
C	LIVESTOCK, GRAYSON	RED	731	731	731	731	731	731
C	LIVESTOCK, GRAYSON	TRINITY	412	412	412	412	412	412
C	LUELLA SUD	RED	338	376	415	444	499	583
C	LUELLA SUD	TRINITY	49	54	60	64	72	84
C	MANUFACTURING, GRAYSON	RED	2,942	3,000	3,000	3,000	3,000	3,000
C	MANUFACTURING, GRAYSON	TRINITY	9	9	9	9	9	9
C	MARILEE SUD	TRINITY	458	490	512	510	509	509
C	MINING, GRAYSON	RED	312	210	107	123	142	163
C	MUSTANG SUD	TRINITY	40	39	40	40	41	41
C	NORTHWEST GRAYSON COUNTY WCID 1	RED	194	194	199	221	298	418
C	OAK RIDGE SOUTH GALE WSC	RED	221	209	224	249	335	459
C	PINK HILL WSC	RED	228	242	236	263	355	486
C	POTTSBORO	RED	518	655	791	1,030	1,624	2,920
C	RED RIVER AUTHORITY OF TEXAS	RED	358	392	421	454	487	467
C	SHERMAN	RED	10,701	11,043	11,152	12,009	15,825	24,226
C	SOUTH GRAYSON SUD	TRINITY	355	373	420	435	458	472
C	SOUTHMAYD	RED	143	153	164	179	240	323
C	SOUTHWEST FANNIN COUNTY SUD	RED	171	221	289	369	501	656
C	STARR WSC	RED	242	255	245	273	368	504
C	STEAM ELECTRIC POWER, GRAYSON	TRINITY	4,387	4,387	4,387	4,387	4,387	4,387

C	TIOGA	TRINITY	165	175	184	196	430	589
C	TOM BEAN	RED	30	34	37	41	50	75
C	TOM BEAN	TRINITY	207	230	252	279	344	515
C	TWO WAY SUD	RED	440	552	642	769	1,026	1,325
C	TWO WAY SUD	TRINITY	242	303	353	423	564	728
C	VAN ALSTYNE	TRINITY	518	710	983	1,258	2,420	3,047
C	WESTMINSTER WSC	TRINITY	3	3	4	5	5	6
C	WHITESBORO	RED	218	214	210	205	258	341
C	WHITESBORO	TRINITY	251	247	243	236	299	394
C	WHITEWRIGHT	RED	258	252	247	235	248	276
C	WHITEWRIGHT	TRINITY	2	2	2	2	2	2
C	WOODBINE WSC	TRINITY	8	9	10	10	12	13
		Sum of Projected Water Demands (acre-feet)	**39,192**	**41,009**	**41,881**	**44,867**	**55,068**	**72,258**

Projected Water Supply Needs
TWDB 2022 State Water Plan Data

Negative values (in red) reflect a projected water supply need, positive values a surplus.

FANNIN COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
C	ARLEDGE RIDGE WSC	RED	21	11	-11	-55	-142	-241
C	ARLEDGE RIDGE WSC	SULPHUR	9	5	-4	-21	-56	-95
C	BOIS D ARC MUD	RED	-2	-26	-81	-187	-401	-641
C	BONHAM	RED	0	0	-209	-1,411	-2,474	-3,693
C	COUNTY-OTHER, FANNIN	RED	0	118	98	-116	-1,381	-2,820
C	COUNTY-OTHER, FANNIN	SULPHUR	0	8	6	-7	-85	-174
C	COUNTY-OTHER, FANNIN	TRINITY	0	8	7	-9	-103	-209
C	DELTA COUNTY MUD	SULPHUR	0	0	0	0	0	0
C	DESERT WSC	RED	2	0	1	-1	0	0
C	DESERT WSC	TRINITY	69	64	54	39	1	-61
C	HICKORY CREEK SUD	SULPHUR	-7	-13	-19	-23	-28	-32
C	HICKORY CREEK SUD	TRINITY	0	-1	-1	-1	-1	-1
C	HONEY GROVE	RED	0	1	3	3	3	3
C	HONEY GROVE	SULPHUR	0	7	12	14	15	15
C	IRRIGATION, FANNIN	RED	-3,550	-3,550	-3,550	-3,550	-3,550	-3,550
C	IRRIGATION, FANNIN	SULPHUR	-75	-75	-75	-75	-75	-75
C	IRRIGATION, FANNIN	TRINITY	-211	-211	-211	-211	-211	-211
C	LADONIA	SULPHUR	0	-56	-84	-128	-203	-203
C	LEONARD	RED	0	258	246	239	229	216
C	LEONARD	SULPHUR	0	57	68	76	86	99
C	LEONARD	TRINITY	0	-334	-339	-350	-363	-377
C	LIVESTOCK, FANNIN	RED	0	0	0	0	0	0
C	LIVESTOCK, FANNIN	SULPHUR	0	0	0	0	0	0
C	LIVESTOCK, FANNIN	TRINITY	0	0	0	0	0	0
C	MANUFACTURING, FANNIN	RED	0	0	-1	-4	-5	-6
C	MINING, FANNIN	RED	-380	-211	-42	-42	-42	-42
C	MINING, FANNIN	SULPHUR	-122	-68	-14	-14	-14	-14
C	NORTH HUNT SUD	SULPHUR	-11	-17	-23	-29	-35	-42
C	SOUTHWEST FANNIN COUNTY SUD	RED	33	0	-27	-57	-152	-257
C	SOUTHWEST FANNIN COUNTY SUD	TRINITY	2	1	-1	-2	-7	-12
C	TRENTON	RED	0	0	0	-1	-2	-2
C	TRENTON	TRINITY	0	-30	-229	-592	-1,118	-1,642
C	WEST LEONARD WSC	TRINITY	152	139	130	101	54	0
C	WHITE SHED WSC	RED	0	-26	-85	-200	-434	-697

C	WHITEWRIGHT	RED	0	1	1	0	1	0
C	WOLFE CITY	SULPHUR	5	3	1	-2	-8	-15
	Sum of Projected Water Supply Needs (acre-feet)		**-4,358**	**-4,618**	**-5,006**	**-7,088**	**-10,890**	**-15,112**

GRAYSON COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
C	BELLS	RED	100	76	50	32	-298	-501
C	COLLINSVILLE	TRINITY	15	-91	-153	-231	-256	-411
C	COUNTY-OTHER, GRAYSON	RED	857	999	1,253	1,191	64	-924
C	COUNTY-OTHER, GRAYSON	TRINITY	26	30	39	38	1	-30
C	DENISON	RED	-748	-1,419	-1,501	-2,292	-3,868	-7,020
C	DESERT WSC	TRINITY	64	56	49	31	1	-27
C	DORCHESTER	RED	50	48	44	41	34	22
C	DORCHESTER	TRINITY	24	23	21	20	16	11
C	GUNTER	TRINITY	-124	-227	-354	-483	-630	-763
C	HOWE	RED	3	-1	-4	-8	-14	-21
C	HOWE	TRINITY	5	-3	-8	-18	-35	-54
C	IRRIGATION, GRAYSON	RED	0	0	0	0	0	0
C	IRRIGATION, GRAYSON	TRINITY	0	0	0	0	0	0
C	KENTUCKYTOWN WSC	RED	5	-24	-53	-82	-154	-250
C	KENTUCKYTOWN WSC	TRINITY	5	-23	-51	-78	-146	-237
C	LIVESTOCK, GRAYSON	RED	95	95	95	95	95	95
C	LIVESTOCK, GRAYSON	TRINITY	52	52	52	52	52	52
C	LUELLA SUD	RED	2	-35	-75	-104	-159	-243
C	LUELLA SUD	TRINITY	1	-5	-10	-14	-22	-34
C	MANUFACTURING, GRAYSON	RED	458	448	445	443	25	-701
C	MANUFACTURING, GRAYSON	TRINITY	1	1	1	1	0	-3
C	MARILEE SUD	TRINITY	-1	1	0	1	-18	-51
C	MINING, GRAYSON	RED	-100	2	105	89	70	49
C	MUSTANG SUD	TRINITY	0	-10	-14	-18	-21	-23
C	NORTHWEST GRAYSON COUNTY WCID 1	RED	-31	-31	-36	-58	-135	-255
C	OAK RIDGE SOUTH GALE WSC	RED	-14	-30	-35	-60	-124	-234
C	PINK HILL WSC	RED	0	-14	-8	-35	-127	-258
C	POTTSBORO	RED	-95	-162	-210	-346	-729	-2,135
C	RED RIVER AUTHORITY OF TEXAS	RED	0	0	0	0	0	0
C	SHERMAN	RED	0	0	0	0	-1,522	-9,101
C	SOUTH GRAYSON SUD	TRINITY	0	-34	-99	-133	-168	-194
C	SOUTHMAYD	RED	-49	-59	-70	-85	-146	-229
C	SOUTHWEST FANNIN COUNTY SUD	RED	14	-28	-87	-158	-284	-435
C	STARR WSC	RED	262	249	259	231	136	0
C	STEAM ELECTRIC POWER, GRAYSON	TRINITY	0	0	0	0	0	0
C	TIOGA	TRINITY	0	-10	-19	-31	-265	-424

C	TOM BEAN	RED	0	-3	-7	-11	-20	-45
C	TOM BEAN	TRINITY	0	-24	-45	-72	-137	-308
C	TWO WAY SUD	RED	-3	-114	-203	-330	-586	-884
C	TWO WAY SUD	TRINITY	-2	-63	-112	-181	-322	-486
C	VAN ALSTYNE	TRINITY	0	-31	-104	-220	-755	-1,248
C	WESTMINSTER WSC	TRINITY	3	3	2	1	1	0
C	WHITESBORO	RED	36	40	44	49	-4	-87
C	WHITESBORO	TRINITY	42	46	50	57	-6	-101
C	WHITEWRIGHT	RED	44	49	53	65	52	25
C	WHITEWRIGHT	TRINITY	0	0	0	1	0	0
C	WOODBINE WSC	TRINITY	0	-1	-2	-2	-4	-5
	Sum of Projected Water Supply Needs (acre-feet)		**-1,167**	**-2,442**	**-3,260**	**-5,050**	**-10,955**	**-27,722**

Projected Water Management Strategies
TWDB 2022 State Water Plan Data

FANNIN COUNTY

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
ARLEDGE RIDGE WSC, RED (C)							
ARLEDGE RIDGE WSC - NEW WELL(S) IN WOODBINE AQUIFER	WOODBINE AQUIFER [FANNIN]	0	0	251	252	251	251
CONSERVATION - ARLEDGE RIDGE WSC	DEMAND REDUCTION [FANNIN]	1	1	1	3	4	7
CONSERVATION, WATER LOSS CONTROL - ARLEDGE RIDGE WSC	DEMAND REDUCTION [FANNIN]	1	1	0	0	0	0
		2	**2**	**252**	**255**	**255**	**258**
ARLEDGE RIDGE WSC, SULPHUR (C)							
ARLEDGE RIDGE WSC - NEW WELL(S) IN WOODBINE AQUIFER	WOODBINE AQUIFER [FANNIN]	0	0	99	98	99	99
CONSERVATION - ARLEDGE RIDGE WSC	DEMAND REDUCTION [FANNIN]	0	0	1	1	2	3
CONSERVATION, WATER LOSS CONTROL - ARLEDGE RIDGE WSC	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
		0	**0**	**100**	**99**	**101**	**102**
BOIS D ARC MUD, RED (C)							
CONSERVATION - BOIS D ARC MUD	DEMAND REDUCTION [FANNIN]	1	2	4	6	11	18
CONSERVATION, WATER LOSS CONTROL - BOIS D ARC MUD	DEMAND REDUCTION [FANNIN]	1	1	0	0	0	0
NTMWD - BOIS D'ARC LAKE	BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	23	77	181	390	623
		2	**26**	**81**	**187**	**401**	**641**
BONHAM, RED (C)							
CONSERVATION - BONHAM	DEMAND REDUCTION [FANNIN]	10	23	42	72	108	155
CONSERVATION, WATER LOSS CONTROL - BONHAM	DEMAND REDUCTION [FANNIN]	10	13	0	0	0	0
NTMWD - BOIS D'ARC LAKE	BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	0	167	1,339	2,366	3,538
		20	**36**	**209**	**1,411**	**2,474**	**3,693**
COUNTY-OTHER, FANNIN, RED (C)							
CONSERVATION - FANNIN COUNTY	DEMAND REDUCTION [FANNIN]	2	4	6	9	33	68
CONSERVATION, WATER LOSS CONTROL - FANNIN COUNTY	DEMAND REDUCTION [FANNIN]	3	3	0	0	0	0
NTMWD - BOIS D'ARC LAKE	BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	38	39	269	1,566	3,023

		5	**45**	**45**	**278**	**1,599**	**3,091**
COUNTY-OTHER, FANNIN, SULPHUR (C)							
CONSERVATION - FANNIN COUNTY	DEMAND REDUCTION [FANNIN]	0	0	0	1	2	4
CONSERVATION, WATER LOSS CONTROL - FANNIN COUNTY	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
NTMWD - BOIS D'ARC LAKE	BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	2	2	16	96	186
		0	**2**	**2**	**17**	**98**	**190**
COUNTY-OTHER, FANNIN, TRINITY (C)							
CONSERVATION - FANNIN COUNTY	DEMAND REDUCTION [FANNIN]	0	0	0	1	2	5
CONSERVATION, WATER LOSS CONTROL - FANNIN COUNTY	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
NTMWD - BOIS D'ARC LAKE	BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	3	3	20	116	224
		0	**3**	**3**	**21**	**118**	**229**
DESERT WSC, RED (C)							
CONSERVATION - DESERT WSC	DEMAND REDUCTION [FANNIN]	0	0	0	1	0	0
CONSERVATION, WATER LOSS CONTROL - DESERT WSC	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
DESERT WSC - NEW WELL(S) IN WOODBINE AQUIFER	WOODBINE AQUIFER [FANNIN]	0	0	0	0	0	0
		0	**0**	**0**	**1**	**0**	**0**
DESERT WSC, TRINITY (C)							
CONSERVATION - DESERT WSC	DEMAND REDUCTION [FANNIN]	1	1	1	1	2	5
CONSERVATION, WATER LOSS CONTROL - DESERT WSC	DEMAND REDUCTION [FANNIN]	1	1	0	0	0	0
DESERT WSC - NEW WELL(S) IN WOODBINE AQUIFER	WOODBINE AQUIFER [FANNIN]	0	0	0	0	0	56
		2	**2**	**1**	**1**	**2**	**61**
HONEY GROVE, RED (C)							
CONSERVATION - HONEY GROVE	DEMAND REDUCTION [FANNIN]	0	0	1	1	1	1
CONSERVATION, WATER LOSS CONTROL - HONEY GROVE	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
NTMWD - BOIS D'ARC LAKE	BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	59	57	57	57	57
		0	**59**	**58**	**58**	**58**	**58**
HONEY GROVE, SULPHUR (C)							
CONSERVATION - HONEY GROVE	DEMAND REDUCTION [FANNIN]	1	2	2	3	4	4
CONSERVATION, WATER LOSS CONTROL - HONEY GROVE	DEMAND REDUCTION [FANNIN]	2	2	0	0	0	0
NTMWD - BOIS D'ARC LAKE	BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	221	217	214	212	212
		3	**225**	**219**	**217**	**216**	**216**

IRRIGATION, FANNIN, RED (C)

IRRIGATION, FANNIN - NEW WELL(S) IN TRINITY AQUIFER	TRINITY AQUIFER [FANNIN]	1,473	1,473	1,473	1,473	1,473	1,473
NON-MUNICIPAL CONSERVATION, IRRIGATION, FANNIN	DEMAND REDUCTION [FANNIN]	1	17	31	39	46	54
		1,474	**1,490**	**1,504**	**1,512**	**1,519**	**1,527**

IRRIGATION, FANNIN, SULPHUR (C)

IRRIGATION, FANNIN - NEW WELL(S) IN TRINITY AQUIFER	TRINITY AQUIFER [FANNIN]	31	31	31	31	31	31
NON-MUNICIPAL CONSERVATION, IRRIGATION, FANNIN	DEMAND REDUCTION [FANNIN]	0	0	1	1	1	1
		31	**31**	**32**	**32**	**32**	**32**

IRRIGATION, FANNIN, TRINITY (C)

IRRIGATION, FANNIN - NEW WELL(S) IN TRINITY AQUIFER	TRINITY AQUIFER [FANNIN]	88	88	88	88	88	88
NON-MUNICIPAL CONSERVATION, IRRIGATION, FANNIN	DEMAND REDUCTION [FANNIN]	0	1	2	2	3	3
		88	**89**	**90**	**90**	**91**	**91**

LADONIA, SULPHUR (C)

ANRA-COL - LAKE COLUMBIA	COLUMBIA LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	9
CONSERVATION - LADONIA	DEMAND REDUCTION [FANNIN]	1	2	3	5	8	9
CONSERVATION, WATER LOSS CONTROL - LADONIA	DEMAND REDUCTION [FANNIN]	2	4	0	0	0	0
DWU - CONSERVATION SURPLUS REALLOCATION	RAY ROBERTS-LEWISVILLE-GRAPEVINE LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	0	1	0
DWU - INDIRECT REUSE IMPLEMENTATION	INDIRECT REUSE [COLLIN]	0	1	4	6	9	8
DWU - INDIRECT REUSE IMPLEMENTATION	INDIRECT REUSE [DENTON]	0	0	1	2	4	3
DWU - INDIRECT REUSE IMPLEMENTATION	INDIRECT REUSE [ELLIS]	0	0	0	11	19	16
DWU - LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	4	13	14	22	17
MARVIN NICHOLS (328) STRATEGY FOR NTMWD, TRWD, AND UTRWD	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	48	66	59
UNM-ROR-NECHES RUN OF RIVER	NECHES RUN-OF-RIVER [ANDERSON]	0	0	0	0	10	8
UTRWD - ADDITIONAL INDIRECT REUSE	INDIRECT REUSE [DENTON]	0	0	0	19	26	31
UTRWD - RALPH HALL RESERVOIR AND REUSE	INDIRECT REUSE [FANNIN]	0	18	31	28	39	35
UTRWD - RALPH HALL RESERVOIR AND REUSE	RALPH HALL LAKE/RESERVOIR [RESERVOIR]	0	52	82	71	99	88
WRIGHT PATMAN REALLOCATION FOR NTMWD, TRWD, AND UTRWD	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	20
		3	**81**	**134**	**204**	**303**	**303**

LEONARD, RED (C)

CONSERVATION - LEONARD	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
CONSERVATION, WATER LOSS CONTROL - LEONARD	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
NTMWD - BOIS D'ARC LAKE	BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	3	3	3	3	3
		0	**3**	**3**	**3**	**3**	**3**

LEONARD, SULPHUR (C)

CONSERVATION - LEONARD	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
CONSERVATION, WATER LOSS CONTROL - LEONARD	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
NTMWD - BOIS D'ARC LAKE	BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	7	7	7	7	7
		0	**7**	**7**	**7**	**7**	**7**

LEONARD, TRINITY (C)

CONSERVATION - LEONARD	DEMAND REDUCTION [FANNIN]	1	2	4	5	6	8
CONSERVATION, WATER LOSS CONTROL - LEONARD	DEMAND REDUCTION [FANNIN]	2	2	0	0	0	0
NTMWD - BOIS D'ARC LAKE	BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	333	339	348	360	372
		3	**337**	**343**	**353**	**366**	**380**

MANUFACTURING, FANNIN, RED (C)

MARVIN NICHOLS (328) STRATEGY FOR NTMWD, TRWD, AND UTRWD	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	0
NTMWD - ADDITIONAL LAVON WATERSHED REUSE	INDIRECT REUSE [COLLIN]	0	0	0	0	0	0
NTMWD - ADDITIONAL MEASURES TO ACCESS FULL LAVON YIELD	NORTH TEXAS MWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	0	0	0
NTMWD - BOIS D'ARC LAKE	BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	0	1	4	5	6
NTMWD - EXPANDED WETLAND REUSE	INDIRECT REUSE [COLLIN]	0	0	0	0	0	0
NTMWD - EXPANDED WETLAND REUSE	INDIRECT REUSE [KAUFMAN]	0	0	0	0	0	0
NTMWD - OKLAHOMA	OKLAHOMA RUN-OF-RIVER [OKLAHOMA]	0	0	0	0	0	0
NTMWD - TEXOMA BLENDING	NORTH TEXAS MWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	0	0	0
WRIGHT PATMAN REALLOCATION FOR NTMWD, TRWD, AND UTRWD	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	0
		0	**0**	**1**	**4**	**5**	**6**

NORTH HUNT SUD, SULPHUR (C)

CONSERVATION - NORTH HUNT SUD	DEMAND REDUCTION [FANNIN]	0	0	0	1	1	1

DRILL NEW WELLS (NORTH HUNT SUD, HUNT, NACATOCH, SABINE)	NACATOCH AQUIFER [HUNT]	11	17	23	29	35	42
		11	**17**	**23**	**30**	**36**	**43**

SOUTHWEST FANNIN COUNTY SUD, RED (C)

CONSERVATION - SOUTHWEST FANNIN COUNTY SUD	DEMAND REDUCTION [FANNIN]	1	3	4	6	10	14
CONSERVATION, WATER LOSS CONTROL - SOUTHWEST FANNIN COUNTY SUD	DEMAND REDUCTION [FANNIN]	2	2	0	0	0	0
NTMWD - BOIS D'ARC LAKE	BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	0	5	0	92	194
SOUTHWEST FANNIN COUNTY SUD - NEW WELL(S) IN WOODBINE AQUIFER	WOODBINE AQUIFER [FANNIN]	0	63	18	51	50	49
		3	**68**	**27**	**57**	**152**	**257**

SOUTHWEST FANNIN COUNTY SUD, TRINITY (C)

CONSERVATION - SOUTHWEST FANNIN COUNTY SUD	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	1
CONSERVATION, WATER LOSS CONTROL - SOUTHWEST FANNIN COUNTY SUD	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
NTMWD - BOIS D'ARC LAKE	BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	4	9
SOUTHWEST FANNIN COUNTY SUD - NEW WELL(S) IN WOODBINE AQUIFER	WOODBINE AQUIFER [FANNIN]	0	3	1	2	3	2
		0	**3**	**1**	**2**	**7**	**12**

TRENTON, RED (C)

CONSERVATION - TRENTON	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
CONSERVATION, IRRIGATION RESTRICTIONS – TRENTON	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
CONSERVATION, WATER LOSS CONTROL - TRENTON	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
NTMWD - BOIS D'ARC LAKE	BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	0	0	1	2	2
		0	**0**	**0**	**1**	**2**	**2**

TRENTON, TRINITY (C)

CONSERVATION - TRENTON	DEMAND REDUCTION [FANNIN]	0	3	11	25	46	74
CONSERVATION, IRRIGATION RESTRICTIONS – TRENTON	DEMAND REDUCTION [FANNIN]	0	4	11	22	38	53
CONSERVATION, WATER LOSS CONTROL - TRENTON	DEMAND REDUCTION [FANNIN]	1	1	0	0	0	0
NTMWD - BOIS D'ARC LAKE	BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	0	182	520	1,009	1,490
TRENTON - NEW WELL(S) IN WOODBINE AQUIFER	WOODBINE AQUIFER [FANNIN]	0	25	25	25	25	25
		1	**33**	**229**	**592**	**1,118**	**1,642**

WEST LEONARD WSC, TRINITY (C)

CONSERVATION - WEST LEONARD WSC	DEMAND REDUCTION [FANNIN]	1	1	2	2	3	5

CONSERVATION, WATER LOSS CONTROL - WEST LEONARD WSC	DEMAND REDUCTION [FANNIN]	1	1	0	0	0	0
		2	**2**	**2**	**2**	**3**	**5**
WHITE SHED WSC, RED (C)							
CONSERVATION - WHITE SHED WSC	DEMAND REDUCTION [FANNIN]	1	2	4	7	12	21
CONSERVATION, WATER LOSS CONTROL - WHITE SHED WSC	DEMAND REDUCTION [FANNIN]	2	2	0	0	0	0
WHITE SHED WSC - NEW WELL(S) IN WOODBINE AQUIFER	WOODBINE AQUIFER [FANNIN]	0	22	81	193	422	676
		3	**26**	**85**	**200**	**434**	**697**
WHITEWRIGHT, RED (C)							
CONSERVATION - WHITEWRIGHT	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
CONSERVATION, WATER LOSS CONTROL - WHITEWRIGHT	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	0
SHERMAN - TREATMENT OF LAKE TEXOMA	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	0	0	1	0
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	0	0	0	0
		0	**0**	**0**	**0**	**1**	**0**
WOLFE CITY, SULPHUR (C)							
CONSERVATION - WOLFE CITY	DEMAND REDUCTION [FANNIN]	0	0	0	0	0	1
NEW CONTRACT WITH GREENVILLE AND PIPELINE TO WOLFE CITY	TAWAKONI LAKE/RESERVOIR [RESERVOIR]	0	0	0	2	8	15
		0	**0**	**0**	**2**	**8**	**16**
Sum of Projected Water Management Strategies (acre-feet)		**1,653**	**2,587**	**3,451**	**5,636**	**9,409**	**13,562**

GRAYSON COUNTY

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
BELLS, RED (C)							
BELLS - NEW WELL(S) IN WOODBINE AQUIFER	WOODBINE AQUIFER [GRAYSON]	0	55	55	55	55	55
CONSERVATION - BELLS	DEMAND REDUCTION [GRAYSON]	1	1	2	3	10	16
CONSERVATION, WATER LOSS CONTROL - BELLS	DEMAND REDUCTION [GRAYSON]	1	1	0	0	0	0
SHERMAN - TREATMENT OF LAKE TEXOMA	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	4	19	37	374	571
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	4	15	14	0	0
		2	**65**	**91**	**109**	**439**	**642**

COLLINSVILLE, TRINITY (C)

CONSERVATION - COLLINSVILLE	DEMAND REDUCTION [GRAYSON]	1	2	4	6	8	13
CONSERVATION, WATER LOSS CONTROL - COLLINSVILLE	DEMAND REDUCTION [GRAYSON]	1	2	0	0	0	0
GTUA - REGIONAL WATER SYSTEM	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	44	84	163	248	398
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	43	65	62	0	0
		2	**91**	**153**	**231**	**256**	**411**

COUNTY-OTHER, GRAYSON, RED (C)

CONSERVATION - GRAYSON COUNTY	DEMAND REDUCTION [GRAYSON]	2	4	4	6	23	46
CONSERVATION, WATER LOSS CONTROL - GRAYSON COUNTY	DEMAND REDUCTION [GRAYSON]	4	3	0	0	0	0
DENISON - TEXOMA WITH INFRASTRUCTURE IMPROVEMENTS	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	24	56	61	93	142	199
SHERMAN - TREATMENT OF LAKE TEXOMA	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	373	469	673	1,138	1,666
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	364	365	258	0	0
		30	**800**	**899**	**1,030**	**1,303**	**1,911**

COUNTY-OTHER, GRAYSON, TRINITY (C)

CONSERVATION - GRAYSON COUNTY	DEMAND REDUCTION [GRAYSON]	0	0	0	0	1	1
CONSERVATION, WATER LOSS CONTROL - GRAYSON COUNTY	DEMAND REDUCTION [GRAYSON]	0	0	0	0	0	0
DENISON - TEXOMA WITH INFRASTRUCTURE IMPROVEMENTS	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	1	2	2	3	5	6
SHERMAN - TREATMENT OF LAKE TEXOMA	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	12	15	21	36	53
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	11	11	8	0	0
		1	**25**	**28**	**32**	**42**	**60**

DENISON, RED (C)

CONSERVATION - DENISON	DEMAND REDUCTION [GRAYSON]	141	231	257	308	392	565
CONSERVATION – WASTE PROHIBITION, DENISON	DEMAND REDUCTION [GRAYSON]	15	21	21	25	32	50
CONSERVATION, IRRIGATION RESTRICTIONS – DENISON	DEMAND REDUCTION [GRAYSON]	199	243	242	265	309	413

CONSERVATION, WATER LOSS CONTROL - DENISON	DEMAND REDUCTION [GRAYSON]	157	435	395	432	502	667
DENISON - TEXOMA WITH INFRASTRUCTURE IMPROVEMENTS	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	236	489	586	1,262	2,633	5,325
		748	**1,419**	**1,501**	**2,292**	**3,868**	**7,020**
DESERT WSC, TRINITY (C)							
CONSERVATION - DESERT WSC	DEMAND REDUCTION [GRAYSON]	0	1	1	1	2	2
CONSERVATION, WATER LOSS CONTROL - DESERT WSC	DEMAND REDUCTION [GRAYSON]	0	0	0	0	0	0
DESERT WSC - NEW WELL(S) IN WOODBINE AQUIFER	WOODBINE AQUIFER [FANNIN]	0	0	0	0	0	25
		0	**1**	**1**	**1**	**2**	**27**
DORCHESTER, RED (C)							
CONSERVATION - DORCHESTER	DEMAND REDUCTION [GRAYSON]	0	1	1	1	1	2
CONSERVATION, WATER LOSS CONTROL - DORCHESTER	DEMAND REDUCTION [GRAYSON]	1	1	0	0	0	0
DORCHESTER - NEW WELL(S) IN TRINITY AQUIFER	TRINITY AQUIFER [GRAYSON]	0	61	61	61	61	61
SHERMAN - TREATMENT OF LAKE TEXOMA	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	0	0	0	0
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	0	0	0	0
		1	**63**	**62**	**62**	**62**	**63**
DORCHESTER, TRINITY (C)							
CONSERVATION - DORCHESTER	DEMAND REDUCTION [GRAYSON]	0	0	0	1	1	1
CONSERVATION, WATER LOSS CONTROL - DORCHESTER	DEMAND REDUCTION [GRAYSON]	0	0	0	0	0	0
DORCHESTER - NEW WELL(S) IN TRINITY AQUIFER	TRINITY AQUIFER [GRAYSON]	0	29	29	29	29	29
SHERMAN - TREATMENT OF LAKE TEXOMA	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	0	0	0	0
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	0	0	0	0
		0	**29**	**29**	**30**	**30**	**30**
GUNTER, TRINITY (C)							
CONSERVATION - GUNTER	DEMAND REDUCTION [GRAYSON]	5	11	5	9	13	19
CONSERVATION, IRRIGATION RESTRICTIONS – GUNTER	DEMAND REDUCTION [GRAYSON]	8	12	0	0	0	0
CONSERVATION, WATER LOSS CONTROL - GUNTER	DEMAND REDUCTION [GRAYSON]	11	42	0	0	0	0
GTUA - REGIONAL WATER SYSTEM	TEXOMA LAKE/RESERVOIR NON-	0	319	1,606	2,060	2,846	2,840

	SYSTEM PORTION [RESERVOIR]						
GUNTER - NEW WELL(S) IN TRINITY AQUIFER	TRINITY AQUIFER [GRAYSON]	50	50	50	50	50	50
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	273	311	1,248	790	0	0
		347	**745**	**2,909**	**2,909**	**2,909**	**2,909**

HOWE, RED (C)

CONSERVATION - HOWE	DEMAND REDUCTION [GRAYSON]	0	1	1	1	2	3
CONSERVATION, WATER LOSS CONTROL - HOWE	DEMAND REDUCTION [GRAYSON]	0	1	0	0	0	0
GTUA - CONNECTION FROM SHERMAN TO CGMA	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	1	2	3	5	6
MARVIN NICHOLS (328) STRATEGY FOR NTMWD, TRWD, AND UTRWD	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	2	4	5
NTMWD - ADDITIONAL LAVON WATERSHED REUSE	INDIRECT REUSE [COLLIN]	0	0	0	0	1	1
NTMWD - ADDITIONAL MEASURES TO ACCESS FULL LAVON YIELD	NORTH TEXAS MWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	0	0	0
NTMWD - BOIS D'ARC LAKE	BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	0	1	1	3	4
NTMWD - EXPANDED WETLAND REUSE	INDIRECT REUSE [COLLIN]	0	0	0	0	0	1
NTMWD - EXPANDED WETLAND REUSE	INDIRECT REUSE [KAUFMAN]	0	0	0	0	0	1
NTMWD - OKLAHOMA	OKLAHOMA RUN-OF-RIVER [OKLAHOMA]	0	0	0	0	0	2
NTMWD - TEXOMA BLENDING	NORTH TEXAS MWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	1	1	3	3
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	1	1	1	0	0
WRIGHT PATMAN REALLOCATION FOR NTMWD, TRWD, AND UTRWD	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	2
		0	**4**	**6**	**9**	**18**	**28**

HOWE, TRINITY (C)

CONSERVATION - HOWE	DEMAND REDUCTION [GRAYSON]	1	1	2	4	5	6
CONSERVATION, WATER LOSS CONTROL - HOWE	DEMAND REDUCTION [GRAYSON]	1	1	0	0	0	0
GTUA - CONNECTION FROM SHERMAN TO CGMA	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	3	4	7	12	14
MARVIN NICHOLS (328) STRATEGY FOR NTMWD, TRWD, AND UTRWD	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	6	12	14

NTMWD - ADDITIONAL LAVON WATERSHED REUSE	INDIRECT REUSE [COLLIN]	0	0	0	1	1	3
NTMWD - ADDITIONAL MEASURES TO ACCESS FULL LAVON YIELD	NORTH TEXAS MWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	1	1	1	1
NTMWD - BOIS D'ARC LAKE	BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	0	4	3	9	10
NTMWD - EXPANDED WETLAND REUSE	INDIRECT REUSE [COLLIN]	0	0	1	1	1	1
NTMWD - EXPANDED WETLAND REUSE	INDIRECT REUSE [KAUFMAN]	0	0	0	1	1	1
NTMWD - OKLAHOMA	OKLAHOMA RUN-OF-RIVER [OKLAHOMA]	0	0	0	0	0	4
NTMWD - TEXOMA BLENDING	NORTH TEXAS MWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	1	4	6	9
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	2	4	3	0	0
WRIGHT PATMAN REALLOCATION FOR NTMWD, TRWD, AND UTRWD	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	4
		2	**7**	**17**	**31**	**48**	**67**

KENTUCKYTOWN WSC, RED (C)

CONSERVATION - KENTUCKY TOWN WSC	DEMAND REDUCTION [GRAYSON]	1	1	2	3	6	9
CONSERVATION, WATER LOSS CONTROL - KENTUCKY TOWN WSC	DEMAND REDUCTION [GRAYSON]	1	1	0	0	0	0
SHERMAN - TREATMENT OF LAKE TEXOMA	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	11	29	57	148	241
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	11	22	22	0	0
		2	**24**	**53**	**82**	**154**	**250**

KENTUCKYTOWN WSC, TRINITY (C)

CONSERVATION - KENTUCKY TOWN WSC	DEMAND REDUCTION [GRAYSON]	0	2	3	4	5	8
CONSERVATION, WATER LOSS CONTROL - KENTUCKY TOWN WSC	DEMAND REDUCTION [GRAYSON]	1	1	0	0	0	0
SHERMAN - TREATMENT OF LAKE TEXOMA	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	10	27	54	141	229
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	10	21	20	0	0
		1	**23**	**51**	**78**	**146**	**237**

LUELLA SUD, RED (C)

CONSERVATION - LUELLA SUD	DEMAND REDUCTION [GRAYSON]	1	2	5	7	10	12
CONSERVATION, WATER LOSS CONTROL - LUELLA SUD	DEMAND REDUCTION [GRAYSON]	2	2	0	0	0	0

MARVIN NICHOLS (328) STRATEGY FOR NTMWD, TRWD, AND UTRWD	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	0
NTMWD - EXPANDED WETLAND REUSE	INDIRECT REUSE [COLLIN]	0	0	0	0	0	0
NTMWD - EXPANDED WETLAND REUSE	INDIRECT REUSE [KAUFMAN]	0	0	0	0	0	0
NTMWD - OKLAHOMA	OKLAHOMA RUN-OF-RIVER [OKLAHOMA]	0	0	0	0	0	0
NTMWD - TEXOMA BLENDING	NORTH TEXAS MWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	0	0	0
SHERMAN - TREATMENT OF LAKE TEXOMA	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	16	39	70	149	231
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	15	31	27	0	0
WRIGHT PATMAN REALLOCATION FOR NTMWD, TRWD, AND UTRWD	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	0
		3	**35**	**75**	**104**	**159**	**243**

LUELLA SUD, TRINITY (C)

CONSERVATION - LUELLA SUD	DEMAND REDUCTION [GRAYSON]	0	1	0	0	0	1
CONSERVATION, WATER LOSS CONTROL - LUELLA SUD	DEMAND REDUCTION [GRAYSON]	0	0	0	0	0	0
MARVIN NICHOLS (328) STRATEGY FOR NTMWD, TRWD, AND UTRWD	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	0
NTMWD - EXPANDED WETLAND REUSE	INDIRECT REUSE [COLLIN]	0	0	0	0	0	0
NTMWD - EXPANDED WETLAND REUSE	INDIRECT REUSE [KAUFMAN]	0	0	0	0	0	0
NTMWD - OKLAHOMA	OKLAHOMA RUN-OF-RIVER [OKLAHOMA]	0	0	0	0	0	0
NTMWD - TEXOMA BLENDING	NORTH TEXAS MWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	0	0	0
SHERMAN - TREATMENT OF LAKE TEXOMA	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	2	6	10	22	33
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	2	4	4	0	0
WRIGHT PATMAN REALLOCATION FOR NTMWD, TRWD, AND UTRWD	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	0
		0	**5**	**10**	**14**	**22**	**34**

MANUFACTURING, GRAYSON, RED (C)

GTUA - CONNECTION FROM SHERMAN TO CGMA	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	5	3	4	4	3

MARVIN NICHOLS (328) STRATEGY FOR NTMWD, TRWD, AND UTRWD	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	4	4	4
NTMWD - ADDITIONAL LAVON WATERSHED REUSE	INDIRECT REUSE [COLLIN]	0	0	0	0	1	1
NTMWD - ADDITIONAL MEASURES TO ACCESS FULL LAVON YIELD	NORTH TEXAS MWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	0	0	0
NTMWD - BOIS D'ARC LAKE	BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	4	6	3	4	4
NTMWD - EXPANDED WETLAND REUSE	INDIRECT REUSE [COLLIN]	0	0	0	0	0	0
NTMWD - EXPANDED WETLAND REUSE	INDIRECT REUSE [KAUFMAN]	0	0	0	0	0	0
NTMWD - OKLAHOMA	OKLAHOMA RUN-OF-RIVER [OKLAHOMA]	0	0	0	0	0	1
NTMWD - TEXOMA BLENDING	NORTH TEXAS MWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	1	2	2	2
SHERMAN - TREATMENT OF LAKE TEXOMA	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	0	0	416	1,141
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	4	3	1	0	0
WRIGHT PATMAN REALLOCATION FOR NTMWD, TRWD, AND UTRWD	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	1
		0	**13**	**13**	**14**	**431**	**1,157**

MANUFACTURING, GRAYSON, TRINITY (C)

GTUA - CONNECTION FROM SHERMAN TO CGMA	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	0	0	0	0
MARVIN NICHOLS (328) STRATEGY FOR NTMWD, TRWD, AND UTRWD	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	0
NTMWD - ADDITIONAL LAVON WATERSHED REUSE	INDIRECT REUSE [COLLIN]	0	0	0	0	0	0
NTMWD - ADDITIONAL MEASURES TO ACCESS FULL LAVON YIELD	NORTH TEXAS MWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	0	0	0
NTMWD - BOIS D'ARC LAKE	BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	0
NTMWD - EXPANDED WETLAND REUSE	INDIRECT REUSE [COLLIN]	0	0	0	0	0	0
NTMWD - EXPANDED WETLAND REUSE	INDIRECT REUSE [KAUFMAN]	0	0	0	0	0	0
NTMWD - OKLAHOMA	OKLAHOMA RUN-OF-RIVER [OKLAHOMA]	0	0	0	0	0	0
NTMWD - TEXOMA BLENDING	NORTH TEXAS MWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	0	0	0
SHERMAN - TREATMENT OF LAKE TEXOMA	TEXOMA LAKE/RESERVOIR NON-	0	0	0	0	1	3

		SYSTEM PORTION [RESERVOIR]						
	SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	0	0	0	0
	WRIGHT PATMAN REALLOCATION FOR NTMWD, TRWD, AND UTRWD	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	0
			0	**0**	**0**	**0**	**1**	**3**
MARILEE SUD, TRINITY (C)								
	CONSERVATION - MARILEE SUD	DEMAND REDUCTION [GRAYSON]	2	3	5	7	9	10
	CONSERVATION, WATER LOSS CONTROL - MARILEE SUD	DEMAND REDUCTION [GRAYSON]	2	3	0	0	0	0
	GTUA - REGIONAL WATER SYSTEM	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	296	377	484	648	614
	SHERMAN - TREATMENT OF LAKE TEXOMA	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	0	0	19	52
	SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	288	293	185	0	0
			4	**590**	**675**	**676**	**676**	**676**
MINING, GRAYSON, RED (C)								
	MINING, GRAYSON - NEW WELL(S) IN TRINITY AQUIFER	TRINITY AQUIFER [GRAYSON]	100	100	100	100	100	100
			100	**100**	**100**	**100**	**100**	**100**
MUSTANG SUD, TRINITY (C)								
	ANRA-COL - LAKE COLUMBIA	COLUMBIA LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	1
	CONSERVATION - MUSTANG SUD	DEMAND REDUCTION [GRAYSON]	0	2	1	1	1	1
	CONSERVATION, WATER LOSS CONTROL - MUSTANG SUD	DEMAND REDUCTION [GRAYSON]	0	0	0	0	0	0
	DWU - CONSERVATION SURPLUS REALLOCATION	RAY ROBERTS-LEWISVILLE-GRAPEVINE LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	0	0	0
	DWU - CONSERVATION SURPLUS REALLOCATION	TAWAKONI LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	0
	DWU - INDIRECT REUSE IMPLEMENTATION	INDIRECT REUSE [COLLIN]	0	0	0	0	0	0
	DWU - INDIRECT REUSE IMPLEMENTATION	INDIRECT REUSE [DENTON]	0	0	0	0	0	0
	DWU - INDIRECT REUSE IMPLEMENTATION	INDIRECT REUSE [ELLIS]	0	0	0	1	1	1
	DWU - LAKE PALESTINE	PALESTINE LAKE/RESERVOIR [RESERVOIR]	0	0	1	1	2	1
	MARVIN NICHOLS (328) STRATEGY FOR NTMWD, TRWD, AND UTRWD	MARVIN NICHOLS LAKE/RESERVOIR	0	0	0	4	5	5

	[RESERVOIR]						
UNM-ROR-NECHES RUN OF RIVER	NECHES RUN-OF-RIVER [ANDERSON]	0	0	0	0	1	1
UTRWD - ADDITIONAL INDIRECT REUSE	INDIRECT REUSE [DENTON]	0	0	0	2	2	2
UTRWD - RALPH HALL RESERVOIR AND REUSE	INDIRECT REUSE [FANNIN]	0	2	3	3	3	3
UTRWD - RALPH HALL RESERVOIR AND REUSE	RALPH HALL LAKE/RESERVOIR [RESERVOIR]	0	6	9	6	7	7
WRIGHT PATMAN REALLOCATION FOR NTMWD, TRWD, AND UTRWD	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	2
		0	**10**	**14**	**18**	**22**	**24**

NORTHWEST GRAYSON COUNTY WCID 1, RED (C)

CONSERVATION - NORTHWEST GRAYSON CO WCID 1	DEMAND REDUCTION [GRAYSON]	1	1	2	3	5	8
CONSERVATION, WATER LOSS CONTROL - NORTHWEST GRAYSON COUNTY WCID 1	DEMAND REDUCTION [GRAYSON]	1	1	0	0	0	0
GTUA - REGIONAL WATER SYSTEM	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	98	322	413	572	572
NORTHWEST GRAYSON COUNTY WCID 1 - NEW WELL(S) IN TRINITY AQUIFER	TRINITY AQUIFER [GRAYSON]	29	29	34	55	130	247
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	96	250	159	0	0
		31	**225**	**608**	**630**	**707**	**827**

OAK RIDGE SOUTH GALE WSC, RED (C)

CONSERVATION - OAK RIDGE SOUTH GALE WSC	DEMAND REDUCTION [GRAYSON]	1	1	2	3	6	9
CONSERVATION, WATER LOSS CONTROL - OAK RIDGE SOUTH GALE WSC	DEMAND REDUCTION [GRAYSON]	1	1	0	0	0	0
DENISON - TEXOMA WITH INFRASTRUCTURE IMPROVEMENTS	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	12	28	33	57	118	225
		14	**30**	**35**	**60**	**124**	**234**

PINK HILL WSC, RED (C)

CONSERVATION - PINK HILL WSC	DEMAND REDUCTION [GRAYSON]	1	2	2	4	6	10
CONSERVATION, WATER LOSS CONTROL - PINK HILL WSC	DEMAND REDUCTION [GRAYSON]	1	1	0	0	0	0
PINK HILL WSC - NEW WELL(S) IN TRINITY AND WOODBINE AQUIFER	TRINITY AQUIFER [GRAYSON]	0	6	3	16	61	124
PINK HILL WSC - NEW WELL(S) IN TRINITY AND WOODBINE AQUIFER	WOODBINE AQUIFER [GRAYSON]	0	6	3	16	61	124
		2	**15**	**8**	**36**	**128**	**258**

POTTSBORO, RED (C)

CONSERVATION - POTTSBORO	DEMAND REDUCTION [GRAYSON]	10	17	24	35	61	123

CONSERVATION, IRRIGATION RESTRICTIONS – POTTSBORO	DEMAND REDUCTION [GRAYSON]	14	20	24	31	49	88
CONSERVATION, WATER LOSS CONTROL - POTTSBORO	DEMAND REDUCTION [GRAYSON]	3	3	0	0	0	0
DENISON - TEXOMA WITH INFRASTRUCTURE IMPROVEMENTS	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	68	122	162	280	619	1,009
SHERMAN - TREATMENT OF LAKE TEXOMA	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	0	0	0	915
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	0	0	0	0
		95	**162**	**210**	**346**	**729**	**2,135**

RED RIVER AUTHORITY OF TEXAS, RED (C)

CONSERVATION - RED RIVER AUTHORITY OF TEXAS	DEMAND REDUCTION [GRAYSON]	1	3	4	6	8	9
CONSERVATION, WATER LOSS CONTROL - RED RIVER AUTHORITY OF TEXAS	DEMAND REDUCTION [GRAYSON]	2	2	0	0	0	0
		3	**5**	**4**	**6**	**8**	**9**

SHERMAN, RED (C)

CONSERVATION - SHERMAN	DEMAND REDUCTION [GRAYSON]	98	151	195	251	621	1,141
CONSERVATION, IRRIGATION RESTRICTIONS – SHERMAN	DEMAND REDUCTION [GRAYSON]	0	0	0	0	427	727
CONSERVATION, WATER LOSS CONTROL - SHERMAN	DEMAND REDUCTION [GRAYSON]	54	55	0	0	0	0
MARVIN NICHOLS (328) STRATEGY FOR NTMWD, TRWD, AND UTRWD	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	0
NTMWD - ADDITIONAL LAVON WATERSHED REUSE	INDIRECT REUSE [COLLIN]	0	0	0	0	0	0
NTMWD - EXPANDED WETLAND REUSE	INDIRECT REUSE [COLLIN]	0	0	0	0	0	0
NTMWD - EXPANDED WETLAND REUSE	INDIRECT REUSE [KAUFMAN]	0	0	0	0	0	0
NTMWD - OKLAHOMA	OKLAHOMA RUN-OF-RIVER [OKLAHOMA]	0	0	0	0	0	0
NTMWD - TEXOMA BLENDING	NORTH TEXAS MWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	0	0	0
SHERMAN - TREATMENT OF LAKE TEXOMA	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	0	0	474	7,233
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	0	0	0	0
WRIGHT PATMAN REALLOCATION FOR NTMWD, TRWD, AND UTRWD	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	0
		152	**206**	**195**	**251**	**1,522**	**9,101**

SOUTH GRAYSON SUD, TRINITY (C)

CONSERVATION - SOUTH GRAYSON WSC	DEMAND REDUCTION [GRAYSON]	1	2	5	7	7	9
CONSERVATION, WATER LOSS CONTROL - SOUTH GRAYSON SUD	DEMAND REDUCTION [GRAYSON]	2	2	0	0	0	0
SHERMAN - TREATMENT OF LAKE TEXOMA	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	15	53	91	161	185
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	15	41	35	0	0
		3	**34**	**99**	**133**	**168**	**194**
SOUTHMAYD, RED (C)							
CONSERVATION - SOUTHMAYD	DEMAND REDUCTION [GRAYSON]	0	1	2	2	4	6
CONSERVATION, WATER LOSS CONTROL - SOUTHMAYD	DEMAND REDUCTION [GRAYSON]	1	1	0	0	0	0
SHERMAN - TREATMENT OF LAKE TEXOMA	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	29	38	60	142	223
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	48	28	30	23	0	0
		49	**59**	**70**	**85**	**146**	**229**
SOUTHWEST FANNIN COUNTY SUD, RED (C)							
CONSERVATION - SOUTHWEST FANNIN COUNTY SUD	DEMAND REDUCTION [GRAYSON]	1	1	3	5	9	15
CONSERVATION, WATER LOSS CONTROL - SOUTHWEST FANNIN COUNTY SUD	DEMAND REDUCTION [GRAYSON]	1	1	0	0	0	0
NTMWD - BOIS D'ARC LAKE	BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	0	3	106	228	371
SOUTHWEST FANNIN COUNTY SUD - NEW WELL(S) IN WOODBINE AQUIFER	WOODBINE AQUIFER [FANNIN]	0	34	81	47	47	49
		2	**36**	**87**	**158**	**284**	**435**
STARR WSC, RED (C)							
CONSERVATION - STARR WSC	DEMAND REDUCTION [GRAYSON]	1	2	2	4	6	10
CONSERVATION, WATER LOSS CONTROL - STARR WSC	DEMAND REDUCTION [GRAYSON]	1	1	0	0	0	0
		2	**3**	**2**	**4**	**6**	**10**
STEAM ELECTRIC POWER, GRAYSON, TRINITY (C)							
SHERMAN - TREATMENT OF LAKE TEXOMA	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	0	0	0	0
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	0	0	0	0
		0	**0**	**0**	**0**	**0**	**0**

TIOGA, TRINITY (C)

CONSERVATION - TIOGA	DEMAND REDUCTION [GRAYSON]	16	16	20	21	68	95
CONSERVATION, WATER LOSS CONTROL - TIOGA	DEMAND REDUCTION [GRAYSON]	1	1	0	0	0	0
SHERMAN - TREATMENT OF LAKE TEXOMA	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	0	7	197	329
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	0	3	0	0
		17	**17**	**20**	**31**	**265**	**424**

TOM BEAN, RED (C)

CONSERVATION - TOM BEAN	DEMAND REDUCTION [GRAYSON]	0	1	1	1	1	3
CONSERVATION, IRRIGATION RESTRICTIONS – TOM BEAN	DEMAND REDUCTION [GRAYSON]	0	1	1	1	2	2
CONSERVATION, WATER LOSS CONTROL - TOM BEAN	DEMAND REDUCTION [GRAYSON]	0	3	8	9	11	16
SHERMAN - TREATMENT OF LAKE TEXOMA	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	0	0	6	24
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	0	0	0	0
		0	**5**	**10**	**11**	**20**	**45**

TOM BEAN, TRINITY (C)

CONSERVATION - TOM BEAN	DEMAND REDUCTION [GRAYSON]	1	5	8	9	14	21
CONSERVATION, IRRIGATION RESTRICTIONS – TOM BEAN	DEMAND REDUCTION [GRAYSON]	0	6	8	9	10	16
CONSERVATION, WATER LOSS CONTROL - TOM BEAN	DEMAND REDUCTION [GRAYSON]	1	17	54	60	73	110
SHERMAN - TREATMENT OF LAKE TEXOMA	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	0	0	40	161
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	0	0	0	0
		2	**28**	**70**	**78**	**137**	**308**

TWO WAY SUD, RED (C)

CONSERVATION - TWO WAY SUD	DEMAND REDUCTION [GRAYSON]	1	4	6	12	20	30
CONSERVATION, WATER LOSS CONTROL - TWO WAY SUD	DEMAND REDUCTION [GRAYSON]	2	3	0	0	0	0
GTUA - REGIONAL WATER SYSTEM	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	276	357	547	1,006	1,050
MARVIN NICHOLS (328) STRATEGY FOR NTMWD, TRWD, AND UTRWD	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	0
NTMWD - EXPANDED WETLAND	INDIRECT REUSE	0	0	0	0	0	0

REUSE	[COLLIN]						
NTMWD - EXPANDED WETLAND REUSE	INDIRECT REUSE [KAUFMAN]	0	0	0	0	0	0
NTMWD - OKLAHOMA	OKLAHOMA RUN-OF-RIVER [OKLAHOMA]	0	0	0	0	0	0
NTMWD - TEXOMA BLENDING	NORTH TEXAS MWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	0	0	0
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	269	278	210	0	0
WRIGHT PATMAN REALLOCATION FOR NTMWD, TRWD, AND UTRWD	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	0
		3	**552**	**641**	**769**	**1,026**	**1,080**

TWO WAY SUD, TRINITY (C)

CONSERVATION - TWO WAY SUD	DEMAND REDUCTION [GRAYSON]	1	2	4	6	11	16
CONSERVATION, WATER LOSS CONTROL - TWO WAY SUD	DEMAND REDUCTION [GRAYSON]	1	1	0	0	0	0
GTUA - REGIONAL WATER SYSTEM	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	152	197	301	553	576
MARVIN NICHOLS (328) STRATEGY FOR NTMWD, TRWD, AND UTRWD	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	0
NTMWD - EXPANDED WETLAND REUSE	INDIRECT REUSE [COLLIN]	0	0	0	0	0	0
NTMWD - EXPANDED WETLAND REUSE	INDIRECT REUSE [KAUFMAN]	0	0	0	0	0	0
NTMWD - OKLAHOMA	OKLAHOMA RUN-OF-RIVER [OKLAHOMA]	0	0	0	0	0	0
NTMWD - TEXOMA BLENDING	NORTH TEXAS MWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	0	0	0
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	148	153	116	0	0
WRIGHT PATMAN REALLOCATION FOR NTMWD, TRWD, AND UTRWD	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	0
		2	**303**	**354**	**423**	**564**	**592**

VAN ALSTYNE, TRINITY (C)

CONSERVATION - VAN ALSTYNE	DEMAND REDUCTION [GRAYSON]	5	8	16	23	58	90
CONSERVATION, IRRIGATION RESTRICTIONS – VAN ALSTYNE	DEMAND REDUCTION [GRAYSON]	16	21	29	38	73	91
CONSERVATION, WATER LOSS CONTROL - VAN ALSTYNE	DEMAND REDUCTION [GRAYSON]	3	4	0	0	0	0
GTUA - CONNECTION FROM SHERMAN TO CGMA	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	31	53	84	239	280
MARVIN NICHOLS (328) STRATEGY FOR NTMWD, TRWD, AND UTRWD	MARVIN NICHOLS LAKE/RESERVOIR	0	0	0	62	233	302

	[RESERVOIR]						
NTMWD - ADDITIONAL LAVON WATERSHED REUSE	INDIRECT REUSE [COLLIN]	0	0	0	4	36	70
NTMWD - ADDITIONAL MEASURES TO ACCESS FULL LAVON YIELD	NORTH TEXAS MWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	4	4	15	17
NTMWD - BOIS D'ARC LAKE	BOIS D ARC LAKE/RESERVOIR [RESERVOIR]	0	0	38	44	164	213
NTMWD - EXPANDED WETLAND REUSE	INDIRECT REUSE [COLLIN]	0	0	3	5	22	30
NTMWD - EXPANDED WETLAND REUSE	INDIRECT REUSE [KAUFMAN]	0	0	2	4	21	37
NTMWD - OKLAHOMA	OKLAHOMA RUN-OF-RIVER [OKLAHOMA]	0	0	0	0	0	90
NTMWD - TEXOMA BLENDING	NORTH TEXAS MWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	12	36	133	206
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	30	42	32	0	0
WRIGHT PATMAN REALLOCATION FOR NTMWD, TRWD, AND UTRWD	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	102
		24	**94**	**199**	**336**	**994**	**1,528**

WESTMINSTER WSC, TRINITY (C)

CONSERVATION - WESTMINSTER WSC	DEMAND REDUCTION [GRAYSON]	0	0	0	0	0	0
CONSERVATION, WATER LOSS CONTROL - WESTMINSTER WSC	DEMAND REDUCTION [GRAYSON]	0	0	0	0	0	0
		0	**0**	**0**	**0**	**0**	**0**

WHITESBORO, RED (C)

CONSERVATION - WHITESBORO	DEMAND REDUCTION [GRAYSON]	1	1	2	3	4	7
CONSERVATION, WATER LOSS CONTROL - WHITESBORO	DEMAND REDUCTION [GRAYSON]	1	1	0	0	0	0
GTUA - REGIONAL WATER SYSTEM	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	107	117	146	214	212
MARVIN NICHOLS (328) STRATEGY FOR NTMWD, TRWD, AND UTRWD	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	0
NTMWD - EXPANDED WETLAND REUSE	INDIRECT REUSE [COLLIN]	0	0	0	0	0	0
NTMWD - EXPANDED WETLAND REUSE	INDIRECT REUSE [KAUFMAN]	0	0	0	0	0	0
NTMWD - OKLAHOMA	OKLAHOMA RUN-OF-RIVER [OKLAHOMA]	0	0	0	0	0	0
NTMWD - TEXOMA BLENDING	NORTH TEXAS MWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	0	0	0
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	104	91	56	0	0

WRIGHT PATMAN REALLOCATION FOR NTMWD, TRWD, AND UTRWD	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	0
		2	**213**	**210**	**205**	**218**	**219**
WHITESBORO, TRINITY (C)							
CONSERVATION - WHITESBORO	DEMAND REDUCTION [GRAYSON]	1	2	3	3	5	8
CONSERVATION, WATER LOSS CONTROL - WHITESBORO	DEMAND REDUCTION [GRAYSON]	1	1	0	0	0	0
GTUA - REGIONAL WATER SYSTEM	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	124	135	168	248	244
MARVIN NICHOLS (328) STRATEGY FOR NTMWD, TRWD, AND UTRWD	MARVIN NICHOLS LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	0
NTMWD - EXPANDED WETLAND REUSE	INDIRECT REUSE [COLLIN]	0	0	0	0	0	0
NTMWD - EXPANDED WETLAND REUSE	INDIRECT REUSE [KAUFMAN]	0	0	0	0	0	0
NTMWD - OKLAHOMA	OKLAHOMA RUN-OF-RIVER [OKLAHOMA]	0	0	0	0	0	0
NTMWD - TEXOMA BLENDING	NORTH TEXAS MWD LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	0	0	0
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	121	105	65	0	0
WRIGHT PATMAN REALLOCATION FOR NTMWD, TRWD, AND UTRWD	WRIGHT PATMAN LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	0
		2	**248**	**243**	**236**	**253**	**252**
WHITEWRIGHT, RED (C)							
CONSERVATION - WHITEWRIGHT	DEMAND REDUCTION [GRAYSON]	1	2	3	3	4	6
CONSERVATION, WATER LOSS CONTROL - WHITEWRIGHT	DEMAND REDUCTION [GRAYSON]	1	1	0	0	0	0
SHERMAN - TREATMENT OF LAKE TEXOMA	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	26	34	94	93
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	21	13	0	0
		2	**3**	**50**	**50**	**98**	**99**
WHITEWRIGHT, TRINITY (C)							
CONSERVATION - WHITEWRIGHT	DEMAND REDUCTION [GRAYSON]	0	0	0	0	0	0
CONSERVATION, WATER LOSS CONTROL - WHITEWRIGHT	DEMAND REDUCTION [GRAYSON]	0	0	0	0	0	0
SHERMAN - TREATMENT OF LAKE TEXOMA	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	0	0	0	1	1
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-	0	0	0	0	0	0

	SYSTEM PORTION [RESERVOIR]						
		0	**0**	**0**	**0**	**1**	**1**
WOODBINE WSC, TRINITY (C)							
CONSERVATION - WOODBINE WSC	DEMAND REDUCTION [GRAYSON]	0	0	0	0	0	0
CONSERVATION, WATER LOSS CONTROL - WOODBINE WSC	DEMAND REDUCTION [GRAYSON]	0	0	0	0	0	0
GTUA - REGIONAL WATER SYSTEM	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	5	7	8	12	12
SHERMAN - UNALLOCATED SUPPLY UTILIZATION	TEXOMA LAKE/RESERVOIR NON-SYSTEM PORTION [RESERVOIR]	0	4	5	3	0	0
		0	**9**	**12**	**11**	**12**	**12**
Sum of Projected Water Management Strategies (acre-feet)		**1,650**	**6,296**	**9,814**	**11,681**	**18,098**	**33,884**