7

Drought Response Information, Activities and Recommendations

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7 Drought Response Information, Activities and Recommendations

Droughts are of great importance to the planning and management of water resources in Texas. Although droughts can occur in all climatic zones, they have the greatest potential to become catastrophic in dry or arid regions such as West and Central Texas. It is not uncommon for mild droughts to occur over short periods of time in Texas; however, there is no certain way to predict how long or severe a drought will be while it is occurring. The only defense available in drought prone areas such as the Brazos G Area is proper planning and preparation for worst case scenarios. This requires understanding of drought patterns and the historical droughts in the region.

Due to significant population growth throughout Texas, which is expected to continue in the Brazos G Area based on Texas Water Development Board (TWDB) projections, the demand for water has increased. With growing demand and the threat of climate change contributing to water scarcity, planning is even more important to prevent shortages, deterioration of water quality and lifestyle/financial impacts on water suppliers and users. This chapter presents information on drought preparedness in the Brazos G Area, including regional droughts of record, current example drought contingency plans, emergency interconnects, and responses to local drought conditions, and methods to estimate available water supplies in the region.

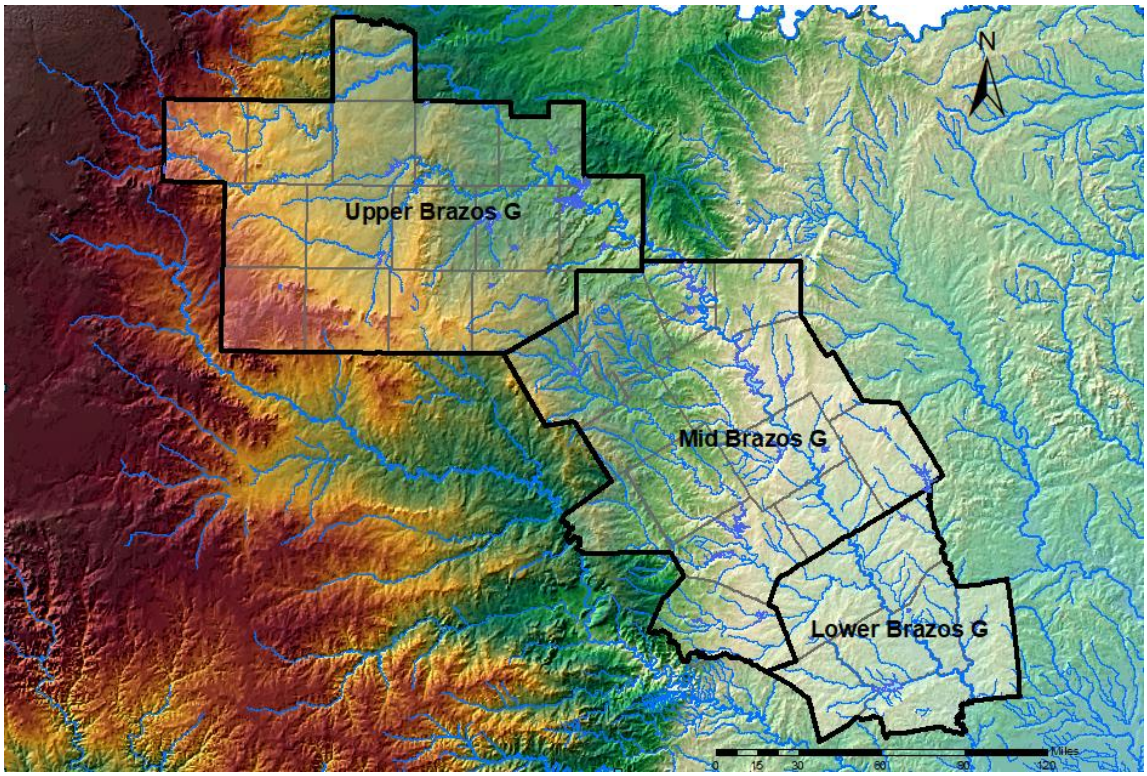
7.1 Droughts of Record in the Brazos G Area

7.1.1 Background

One of the best tools in drought preparedness is a thorough understanding of the drought of record (DOR), or the worst drought to occur for a particular area during the available period of hydrologic data. However, there are many ways that the “worst drought” can be defined (degree of dryness/severity, duration, relative soil moisture content, agricultural impacts, socioeconomic impacts, etc.). Regional water planning focuses on hydrological drought, which is typically the type of drought associated with the largest shortfalls in surface and/or subsurface water supply. The frequency and severity of hydrological drought is often defined on a watershed or river basin scale, although it could be different from one area to the next, even within a planning region.

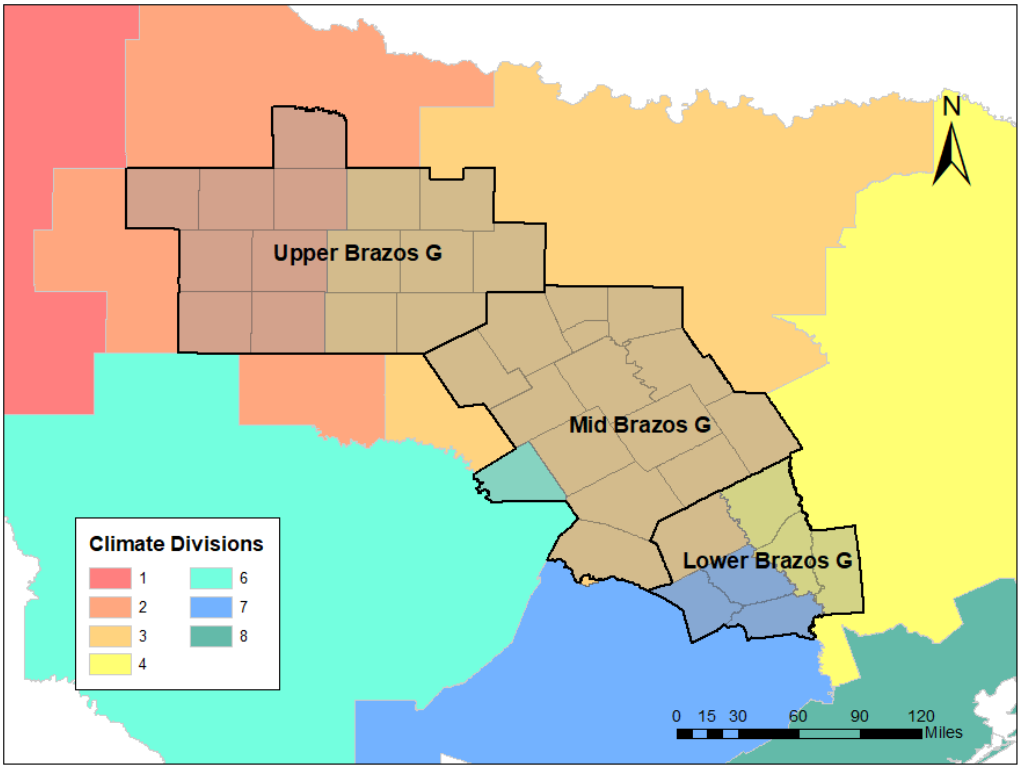
The Brazos G Area encompasses all or parts of 37 counties and stretches from Kent County in the northwest to Grimes County in the Southeast, this means that it is a very hydrologically, geographically, and physiographically diverse area. Due to this, Brazos G was divided into three smaller areas to assess the drought of record. The northernmost area, referred to as Upper Brazos G, is made up of Palo Pinto, Stephens, and Eastland counties, and all counties to their northwest. The middle area, referred to as Mid Brazos G, contains all of the counties south of Stephens and Palo Pinto, and north of Milam and Robertson. The southernmost area, referred to as Lower Brazos G, is made up of Milam, Robertson, Lee, Burleson, Brazos, Washington, and Grimes counties. Figure 7-1 depicts these three areas.

Figure 7-1. Map of Brazos G Sub-Areas



Texas is divided into ten climate divisions by the National Oceanic and Atmospheric Administration (NOAA), which are regions with consistent climatological behaviors. Figure 7-2 shows Brazos G in relationship to these climate divisions with the majority lying within Climate Division 3, but also intersecting Divisions 2, 4, 6, and 7. It is necessary to consider these divisions as numerous drought indices are calculated based on these divisions.

Figure 7-2. Map of Brazos G Climate Divisions



7.1.2 Current Drought of Record

In terms of severity and duration, the devastating drought of the 1950s generally is considered the drought of record for most of Texas, including most of the Brazos G Area. By 1956, 244 of the 254 counties in the state were considered disaster areas. At that time, the 1950s' drought included the 2nd, 3rd, and 8th driest years on record (1956, 1954, and 1951, respectively). This drought lasted almost a decade in many places and affected numerous states across the nation. The 1950s' drought kick-started Texas's water supply planning effort and has been used by water resource engineers and managers as a benchmark drought for water supply planning. However, Texas has experienced two recent droughts centered around 2006 and 2011 that were significant enough to necessitate considering them as DORs for the Brazos G Area. In 2011, severely decreased precipitation resulted in substantial declines in streamflow throughout Texas. Record high temperatures also occurred June through August leading to an increase in evaporation rates. The evaporation was so great that by August 4, 2011, state climatologist John Nielson-Gammon declared 2011 to be the worst 1-year drought on record in Texas. The 2011 water year statewide annual precipitation was 11.27 inches, more than 2 inches less than the previous record low of 13.91 inches in 1956.

7.1.3 Drought Indicators

Several techniques can be used to assess the effect of a drought assessing parameters such as severity, duration and spatial extent. As previously mentioned, there are numerous ways that the "worst drought" can be defined, and it is important to consider multiple methods of assessing a drought. The Palmer Drought Severity Index, analysis of results

from water availability modeling, analysis of historical naturalized streamflows, and evaluation of parameters used to develop groundwater availability models can be incorporated into planning efforts and are discussed in more detail below.

Palmer Drought Severity Index (PDSI)

The Palmer Drought Severity Index (PDSI), first published in 1965, was one of the first comprehensive efforts using precipitation and temperature for estimating the moisture of a region. Using monthly temperature and precipitation data along with the moisture capacity of soils, the PDSI takes into account previous months water balance to more accurately track drought over time. NOAA publishes weekly and monthly PDSI maps by climate division for the Contiguous United States, going as far back as 1895. This makes it a widely used and robust tool to monitor long term drought conditions. PDSI values can range from -10 to 10, with negative values indicating dry conditions. Ranges assigned to drought levels are summarized in Table 7-1.

Table 7-1. PDSI Value Ranges

PDSI Value Range	Drought/Moisture Level
Less than -4	Extreme Drought
-4 to -3	Severe Drought
-3 to -2	Moderate Drought
-2 to 2	Mid-Range
2 to 3	Moderately Moist
3 to 4	Very Moist
Greater than 4	Extremely Moist

As stated earlier, most of Brazos G lies in Texas Climate Division 3. Figure 7-3 shows annual PDSI values for Texas Climate Division 3. While the 1908 and the more recent drought in the early 21st century were severe, the drought of the 1950s was the most intense over a longer period of time, supporting the continued use of this drought as the drought of record for Brazos G. However, the eight most upstream counties in Brazos G are in Texas Climate Division 2. Figure 7-4 shows that while the drought of the 1950s has, to this point, lasted longer than the most recent drought, the PDSI in 2011 is more severe than the PDSI in 1956. The available information is not strong enough to change the drought of record, but it is worth noting the intensity of 2011.

Figure 7-3. Historical Palmer Drought Severity Indices: Division 3

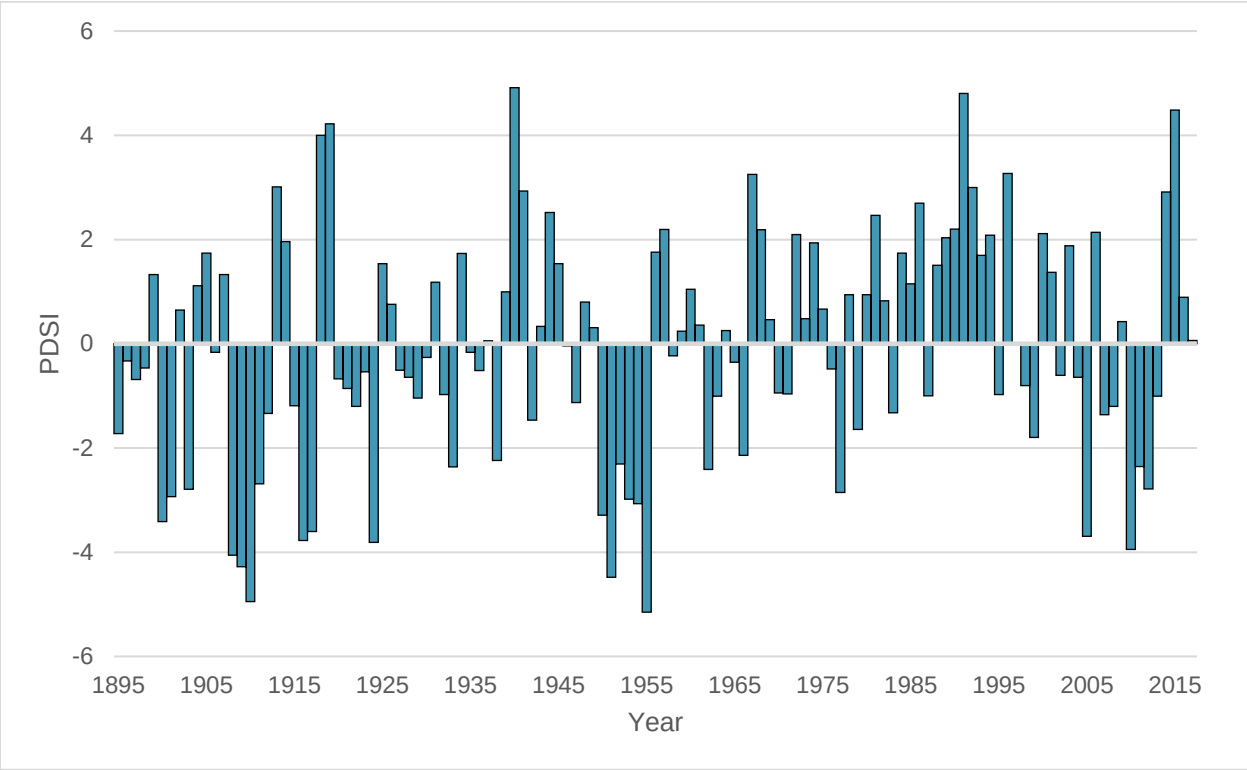
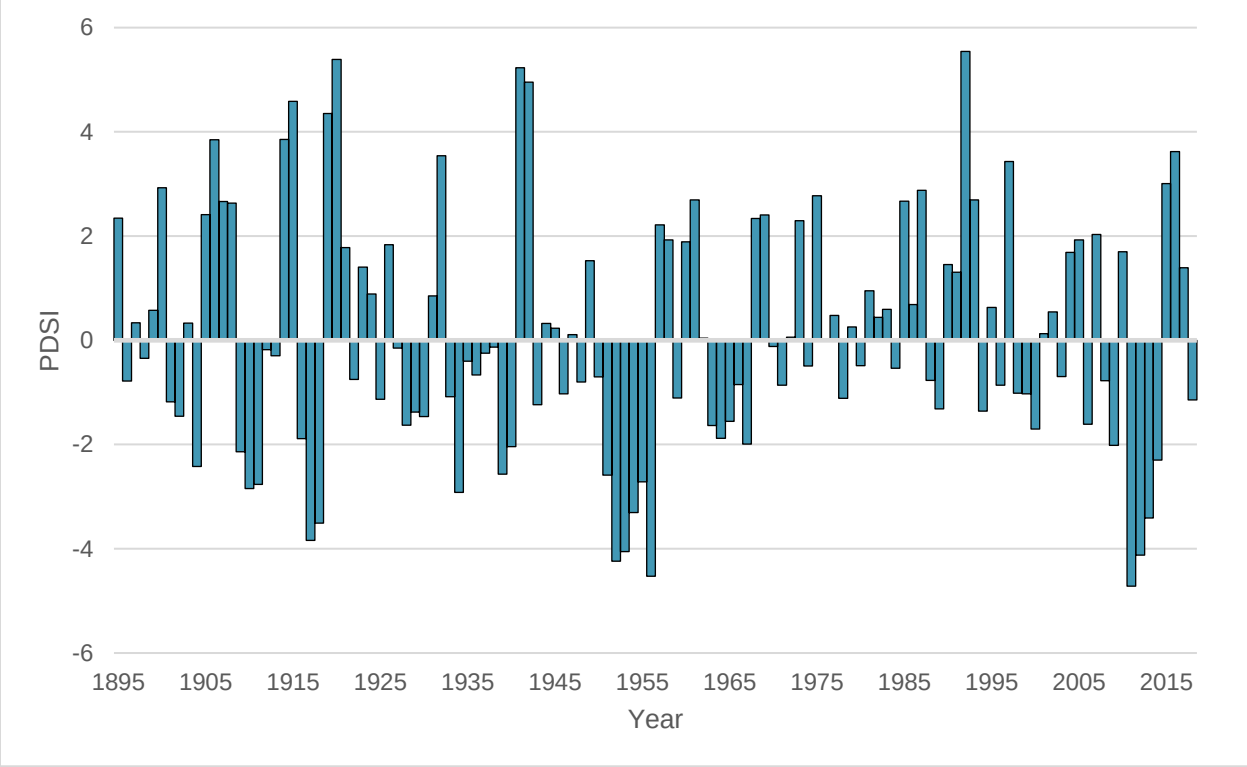


Figure 7-4. Historical Palmer Drought Severity Indices: Division 2



The differences between the two climate divisions further emphasizes the importance of dividing Brazos G into sub-areas. One way to address varying Climate Divisions and sub-regions is to incorporate a weighted average of Climate Division PDSI values within the sub-areas. Figure 7-5, Figure 7-6 and Figure 7-7 show the historical weighted PDSI values by sub-area. As can be seen in all of the sub-areas, the 1950s drought is longer and more intense than any other drought period. This indicates that the 1950s drought should be used as the drought of record when considering the PDSI.

Figure 7-5. Historical Weighted Average Palmer Drought Severity Indices: Upper Brazos G

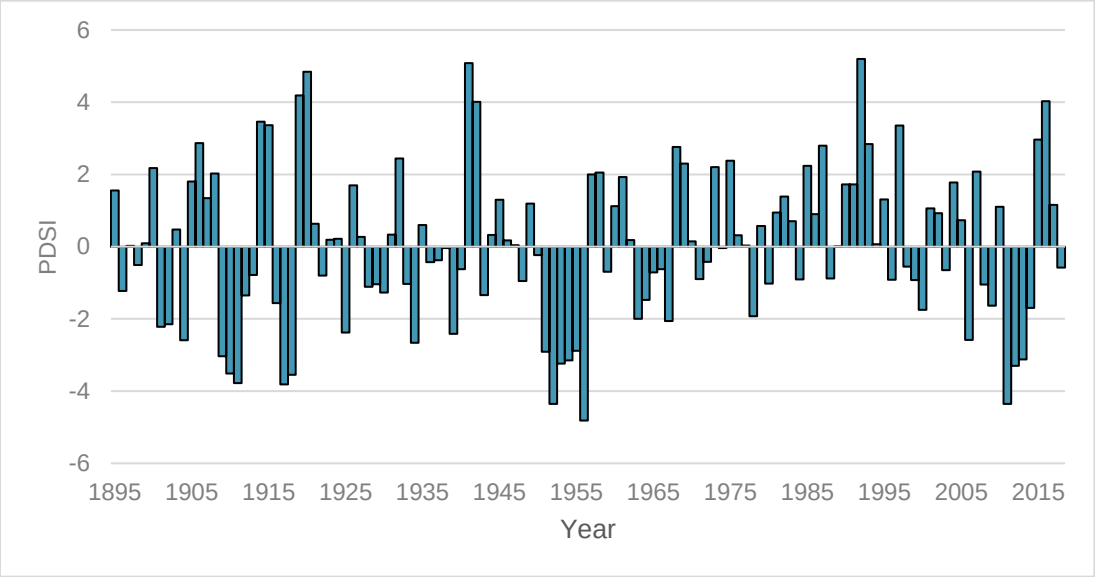


Figure 7-6. Historical Weighted Average Palmer Drought Severity Index: Mid Brazos G

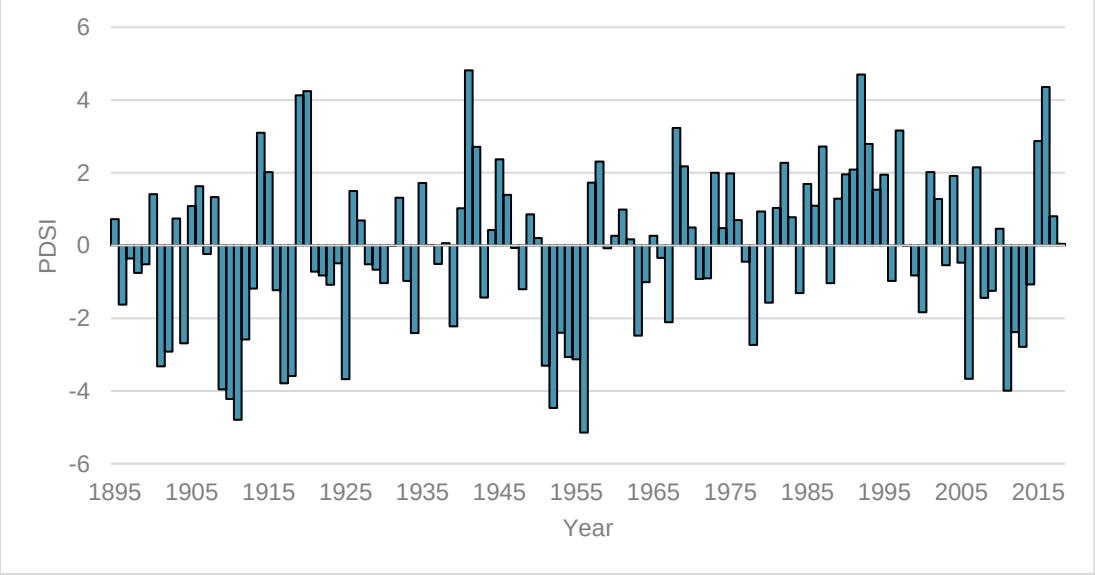
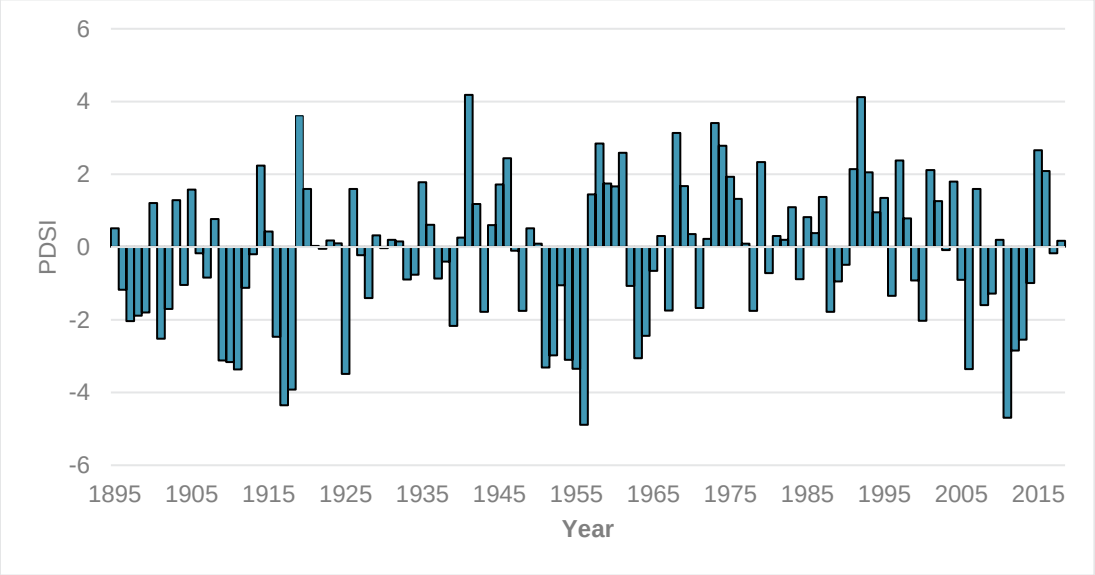


Figure 7-7. Historical Weighted Average Palmer Drought Severity Index: Lower Brazos G



Water Availability Modeling

Engineers and planners often use surface water models to demonstrate the effects of historical droughts on water supply. Effects can be more readily observed on surface water than groundwater. Reservoir supplies that were not in place during historic droughts can be assessed using historic hydrology and these modeling tools. The primary tool used in regional planning in Texas to observe the performance of reservoirs under historic drought conditions is the Texas Commission on Environmental Quality (TCEQ) water availability model (WAM). The WAM is the tool used to determine the available flow, firm yield, and safe yield of surface water projects in the regional water plan. The Brazos River Basin WAM (Brazos WAM) was updated to include hydrologic information from 1940 through 2015, and is referred to as the Brazos G WAM.

The extended Brazos G WAM was used to analyze the DOR for each reservoir in the Brazos G Area, as shown in Table 7-2. The DOR is considered for a reservoir as the period in which the critical month (month with lowest storage) occurs during a firm yield simulation. In the Middle Brazos G Area, twelve out of fourteen reservoirs still have the 1950s' drought as their DOR and in the Lower Brazos G Area, four out of six have the 1950s' drought as their DOR. This supports the continued use of the 1950s' drought as the DOR for reservoirs in the Lower and Middle Brazos G Areas. However, with the extended years of data of the Brazos G WAM, the most recent drought that broke in 2015 is supported as the DOR for the Upper Brazos G Area. In the Upper Brazos G area, nine out of fourteen reservoirs indicate the 2015 drought as their DOR and zero of the reservoirs indicated the 1950s' drought as their DOR. This indicates that the 1950s' drought is no longer the best representation of the DOR for the Upper Brazos G Area.

Table 7-2. Drought of Record Based on Reservoir Firm Yield Analysis

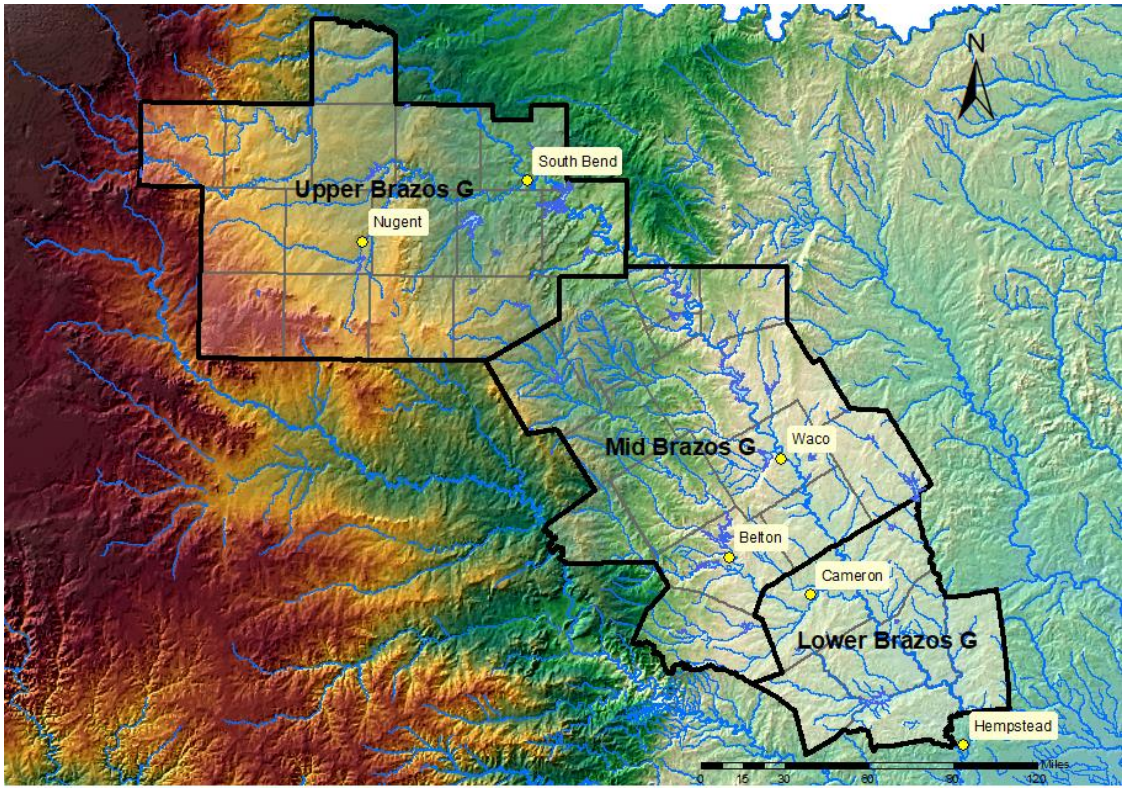
	Reservoir	County	Critical Year	Critical Month	New DOR?
Upper Brazos G	Hubbard Creek Reservoir	Shackelford, Stephens	2015	4	Yes
	Lake Abilene	Taylor	2014	12	Yes
	Lake Cisco	Eastland	1981	9	Yes
	Lake Daniel	Stephens	2004	10	Yes
	Lake Davis	Knox	2004	11	Yes
	Lake Fort Phantom Hill	Jones	2015	4	Yes
	Lake Graham	Young	2004	10	Yes
	Lake Kirby	Taylor	2014	12	Yes
	Lake Leon	Eastland	2015	4	Yes
	Lake Palo Pinto	Palo Pinto	2015	2	Yes
	Lake Stamford	Haskell	2014	4	Yes
	Lake Sweetwater	Nolan	2015	2	Yes
	Millers Creek Reservoir	Throckmorton, Baylor	2004	11	Yes
	Possum Kingdom Lake	Stephens, Young, Palo Pinto	2015	3	Yes
Middle Brazos G	Aquilla Lake	Hill	1957	3	No
	Belton Lake	Bell, Coryell	1957	2	No
	Granger Lake	Williamson	1957	2	No
	Lake Creek Lake	McLennan	1957	1	No
	Lake Georgetown	Williamson	1957	2	No
	Lake Granbury	Hood	2015	2	Yes
	Lake Mexia	Limestone	1952	1	No
	Lake Pat Cleburne	Johnson	1957	2	No
	Lake Waco	McLennan	1957	2	No
	Lake Whitney	Bosque, Hill, Johnson	1952	10	No
	Proctor Lake	Comanche	2015	2	Yes
	Squaw Creek Reservoir	Somervell, Hood	1957	3	No
	Stillhouse Hollow Lake	Bell	1957	2	No
	Tradinghouse Creek Reservoir	McLennan	1957	2	No
Lower Brazos G	Lake Limestone	Robertson, Leon, Limestone	1964	12	Yes
	Alcoa Lake	Milam	1956	10	No
	Gibbons Creek Reservoir	Grimes	1956	11	No
	Somerville Lake	Washington, Lee, Burleson	1957	2	No
	Twin Oak Reservoir	Robertson	1957	4	No

Naturalized Streamflow

Naturalized streamflow data can be used as an indicator of drought. Streamflow as an indicator tends to be more sensitive to short-term drought than reservoir modeling due to its lack of storage. To analyze the health of runoff-dependent streams in the basin, naturalized streamflows were obtained from the Brazos WAM at the six locations shown in Figure 7-8. Naturalized flows represent flows that would have been in the stream naturally without the influences of water management activities such as diversions, reservoir operations and wastewater discharges.

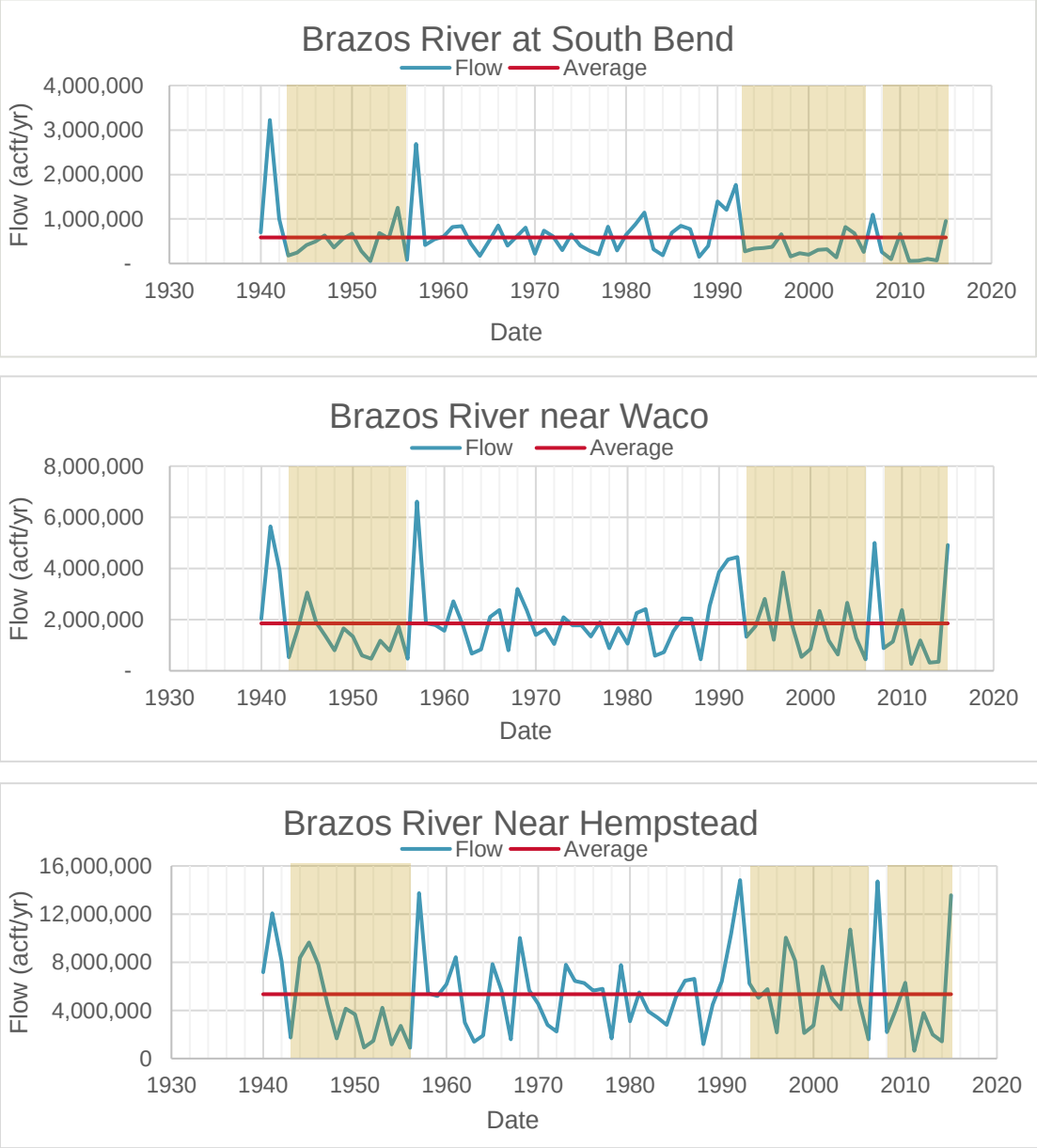
Two monitoring sites were chosen in each of the three Brazos G sub-areas. In each area, one site is a tributary and one is on the main stem of the Brazos River. In Upper Brazos G, sites were chosen on the Clear Fork at Nugent, and on the Brazos River near South Bend. Sites were chosen on the Leon River near Belton and on the Brazos River at Waco for Mid Brazos G. For Lower Brazos G, sites were chosen on the Little River at Cameron and on the Brazos River near Hempstead. These specific sites were selected due to the completeness of the USGS gage data upon which the flow naturalization is based.

Figure 7-8. Sites Selected for Naturalized Streamflow Analysis



Annual naturalized flows at the three main stem sites are shown graphically in Figure 7-9 and numerically in Table 7-3. These graphs and table compare annual flows to the mean flow for the entire time period (1940-2015). The graphs illustrates the amount of time the streams spent below the long-term mean flow during the three severe drought periods identified. In the Upper, Lower, and Middle Brazos G areas the 2010s' drought is the one for which the Brazos River spent the highest percentage of time below the long-term mean flow, indicating that a greater severity than the other two drought periods. However, the 2010s' drought was much shorter than both the 1950s' drought and the 2000s' drought. In Upper Brazos G, the 2000s' drought had the most total time spent below the long-term average while in the Mid and Lower Brazos G Areas, the 1950s' drought had the most total time spent below the long-term average.

Figure 7-9. Annual Naturalized Flows at Three Sites on the Main Stem of the Brazos River



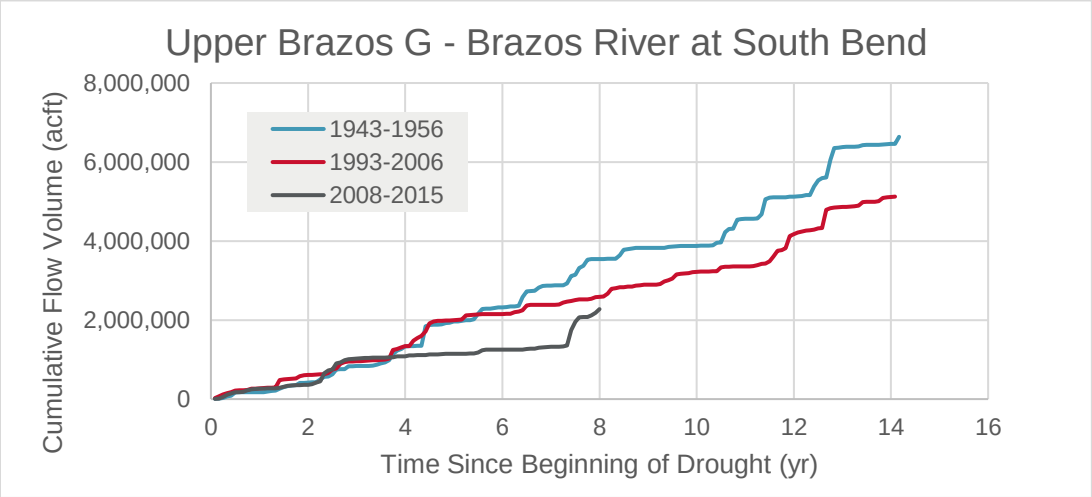
Note: Shaded regions correspond to the 1950s', 2000s', and 2010s' droughts

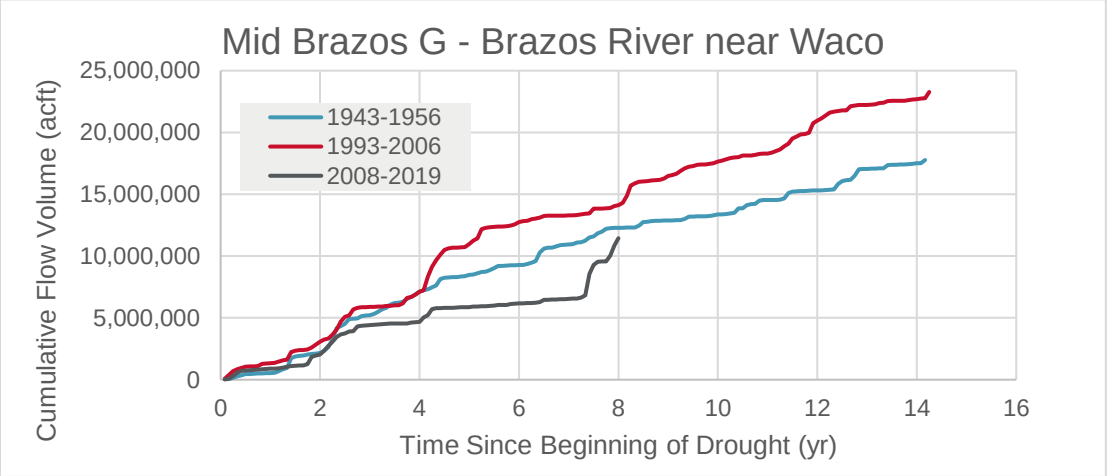
Table 7-3. Percent of Time the Brazos River is Below Mean Annual Flow for Three Drought Periods

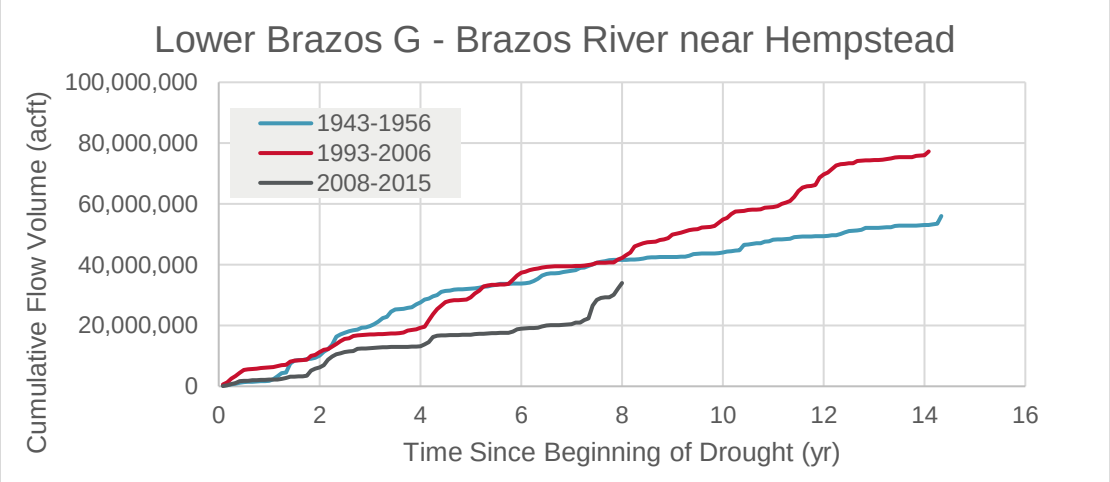
Brazos G Sub-Area	Location	1950s drought	2000s Drought	2010s Drought
Upper	Brazos River at South Bend	78.8%	84.8%	93.9%
Middle	Brazos River near Waco	77.6%	71.5%	84.1%
Lower	Brazos River near Hempstead	75.8%	65.8%	82.9%

The severity of each drought is illustrated in Figure 7-10, which presents cumulative streamflows measured at each of the aforementioned locations. In the figure, cumulative streamflows since drought initiation are compared for three drought periods: 1943 – 1956, 1993 – 2006, and 2008 – 2015. While the 2011 drought year and recent years were very severe and can provide helpful information to water planners and managers throughout the state, it broke in May of 2015 after only seven years. The duration of the 1950s' drought (13 years) combined with the overall severity of it in the Brazos G Area suggests that it is still a valid choice as the DOR for regional planning purposes in the Lower and Middle Brazos G areas. For the Upper Brazos G Area, cumulative streamflow data suggests that the drought ending in 2006 was dryer and lasted just as long as the 1950s drought, indicating that it should be considered to be the new drought of record for streamflow (useful for evaluating run-of-river water rights) in the Upper Brazos G area.

Figure 7-10. Cumulative Naturalized Streamflow for Three Drought Periods for Upper, Mid, & Lower Brazos G

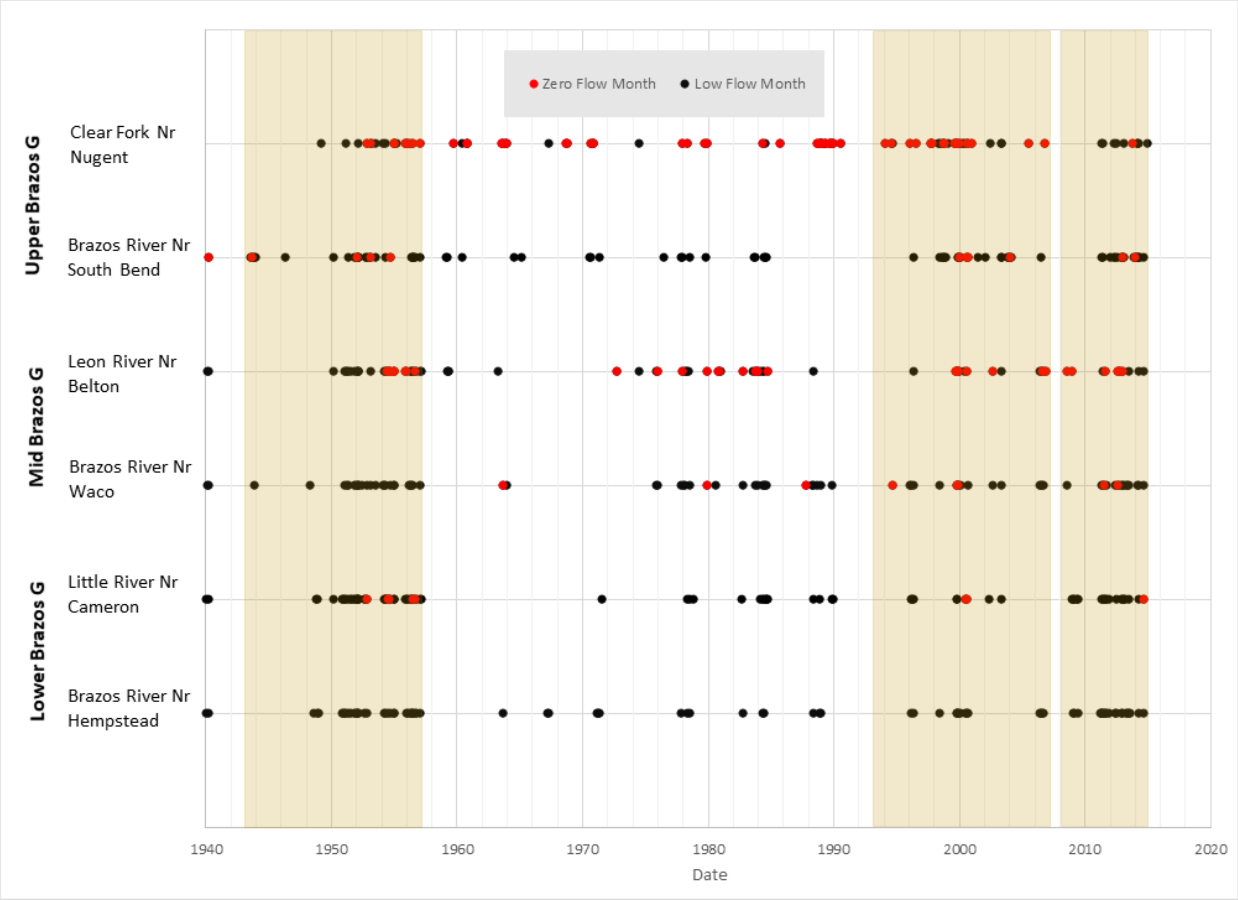






A comparison of low-flow periods for each of the six selected stream locations was also performed and is shown in Figure 7-11 below. For this graph, a low-flow period is a month below the ten percent of the average flow for each month. This comparison highlights each of the drought periods, shows which sites spent the most time in low-flow conditions, and which site spent the most time at zero flow. For all of the streams selected in Lower and Mid Brazos G, the 1950s' drought was the most severe. In Upper Brazos G the Clear Fork at Nugent's most severe period was the drought from 1993-2006 and the Brazos River near Southbend had its most severe period during the 1950s' drought. This further supports the use of the 1950s' drought as the DOR in the Lower and Mid regions and is inconclusive as to which drought should be used as the DOR in the upper region.

Figure 7-11. Comparison of Low-Flow Periods for Six Selected Locations



Note: Shaded regions correspond to the 1950s', 2000s', and 2010s' droughts

Groundwater

Groundwater systems continually adjust to changes in climate, water withdrawal, and land use. Certain aquifers are more drought sensitive than others based on a multitude of factors including land type, recharge rates, and discharge rates. Sensitivity analyses can provide information on how different variables affect aquifer conditions. An aquifer is susceptible to drought if a small change in the inflow or outflow greatly affects the water level of the aquifer. Sensitivities to drought for aquifers in Brazos G range from very low to high. A very low sensitivity implies that small changes in the inflow or outflow do not cause a significant change in aquifer conditions while a high sensitivity implies that small changes

in the inflow or outflow cause a significant change aquifer conditions. Table 7-4 presents drought sensitivity assessments obtained from the TWDB groundwater availability modeling (GAM) reports. The Edwards BFZ, Seymour, Trinity, Brazos River Alluvium, and Woodbine aquifers were found to be the most drought susceptible with sensitivities ranging from moderate to high.

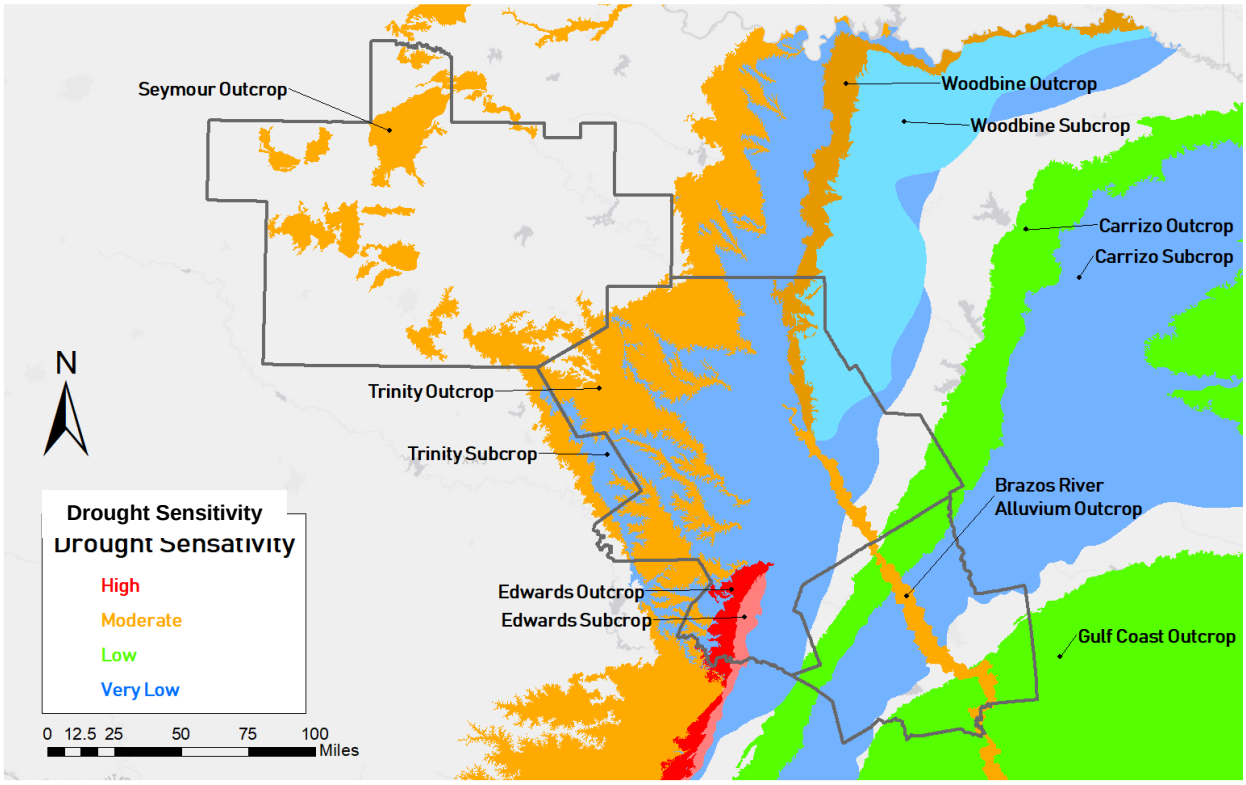
Table 7-4. Drought Sensitivity of Brazos G Aquifers

Aquifer Name	Aquifer Type	Drought Sensitivity		Counties	GMAs
		Outcrop	Subcrop		
Carrizo-Wilcox	Major	Low	Very Low	Brazos, Burleson, Falls, Grimes, Lee, Limestone, Milam, Robertson, Williamson	11, 12, 13, 14, 15, 16
Edwards (BFZ)	Major	High	High	Bell, Williamson	8, 9, 10, 13
Edwards-Trinity (Plateau)	Major	Low	Very Low	Nolan, Taylor	2, 3, 4, 7, 8, 9, 10
Gulf Coast	Major	Low	--	Brazos, Grimes, Washington	11, 12, 13, 14, 15, 16
Seymour	Major	Moderate	--	Fisher, Haskell, Jones, Kent, Knox, Stonewall, Throckmorton, Young	1, 6, 7
Trinity	Major	Moderate	Very Low	Bell, Bosque, Callahan, Comanche, Coryell, Eastland, Erath, Falls, Hamilton, Hill, Hood, Johnson, Lampasas, Limestone, McLennan, Milam, Palo Pinto, Somervell, Taylor, Williamson	6, 7, 8, 9, 11, 12, 13
Blaine	Minor	Low	Very Low	Fisher, Haskell, Jones, Kent, Knox, Nolan, Stonewall	1, 6, 7
Brazos River Alluvium	Minor	Moderate	--	Bosque, Brazos, Burleson, Falls, Grimes, Hill, McLennan, Milam, Robertson, Washington	8, 12, 14
Dockum	Minor	Low	Very Low	Fisher, Kent, Nolan	1, 2, 3, 6, 7
Ellenburger-San Saba	Minor	Very Low	Very Low	Lampasas	7, 8, 9
Marble Falls	Minor	Low	--	Lampasas	7, 8, 11
Queen City	Minor	Low	Very Low	Brazos, Burleson, Grimes, Lee, Milam, Robertson, Washington	11, 12, 13, 14, 15
Sparta	Minor	Very Low	Very Low	Brazos, Burleson, Grimes, Lee, Robertson, Washington	11, 12, 13, 14, 16
Woodbine	Minor	Moderate	Very Low	Hill, McLennan	8
Yegua-Jackson	Minor	Low	--	Brazos, Burleson, Grimes, Lee, Washington	11, 12, 13, 14, 15, 16

Note: "--" indicates information not available

The subcrop and outcrop areas of Brazos G aquifers are shown in Figure 7-12. The colors on the map represent the drought sensitivities with blue representing least sensitive and red representing most sensitive. The Edwards BFZ is the only Brazos G aquifer with a high sensitivity to drought in both its subcrop and outcrop. The Seymour Aquifer, Trinity Outcrop, Brazos River Alluvium Outcrop, and Woodbine Outcrop have a moderate sensitivity to drought. The remaining aquifers in Brazos G have a low or very low sensitivity to drought.

Figure 7-12. Drought Sensitivity of Brazos G Aquifers



7.1.4 Recent Droughts and New DORs

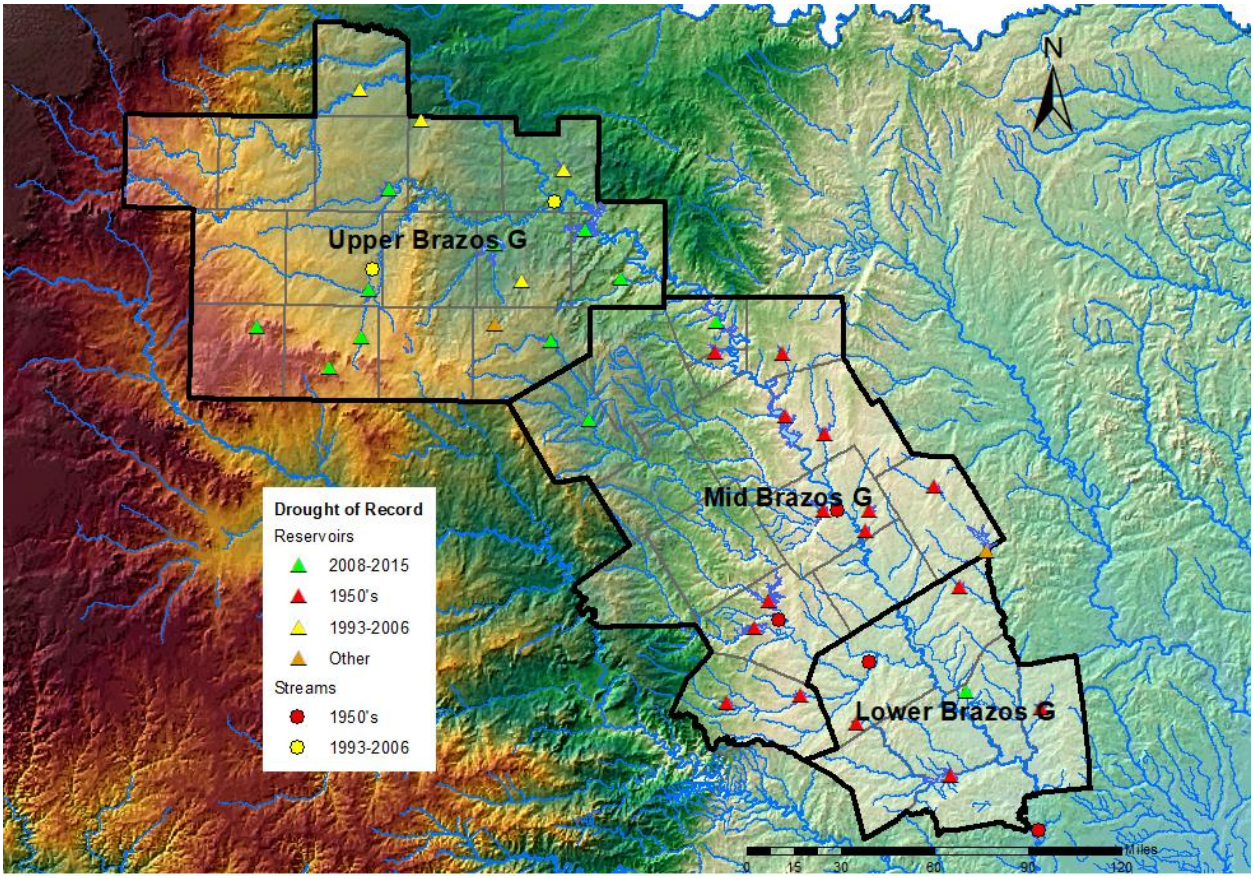
Three separate droughts were considered in this drought of record analysis: the 1950s' drought, the drought that lasted from 1993-2006, and the 2008-2015 drought. The 1950s' drought was arguably the most devastating drought ever recorded in Texas and has been used by water planners and engineers as the drought of record for many years. It included three of the driest years on record at the time it occurred: 1956 (2nd), 1954 (3rd), and 1951 (8th). However, due to concerns that the drought conditions experienced from 1993-2006 and 2008-2015 were more severe than those of the 1950s' drought, these droughts were also considered as potential DORs.

The Brazos WAM was used to evaluate the firm yields of the major reservoirs in the Brazos G Area. The analysis indicates that a new drought of record has occurred for each reservoir in Upper Brazos G, with 9 out of 14 having the 2008-2015 drought as their DOR, 4 out of 14 with 1993-2006 as the DOR, and one having the critical year occur in 1981. This indicates that the 1950s' drought should no longer be used as the DOR in Upper Brazos G and that the 2008-2015 drought should be used instead. In Mid Brazos G, 12 out of 14

reservoirs still had the 1950s' drought as their DOR and 2 out of 14 had the 2008-2015 drought as their DOR. In Lower Brazos G, 4 out of the 6 reservoirs had the 1950s' drought as their DOR, one had the 2008-2015 drought as the DOR, and one had its critical year in 1964. This indicates that the 1950s' drought should still be considered as the DOR in Mid and Lower Region G.

Three different metrics were used to evaluate six different stream segments, 2 in each subregion (Upper, Mid, and Lower), to determine the DOR for run-of-river flows. The three metrics used were cumulative flows for each stream site, annual flow data, and an evaluation of which drought period contained the most low-flow months (flow below 10% of the average annual flow) and zero flow months. Both the cumulative flows and annual flows indicate that Upper Brazos G has a new DOR while the 1950s' drought is still the DOR for Mid and Lower Brazos G. The low-flow month analysis indicated that the 1950s' drought should be considered the DOR in Mid and Lower Brazos G but was inconclusive for Upper Brazos G.

Figure 7-13. Map of DOR for Reservoirs and Streams



7.2 Current Drought Preparations and Response

7.2.1 Current Drought Preparations and Response

Water User Group Level Planning

Water user groups (WUGs) in Brazos G can prepare for drought by participating in the regional planning process. The regional planning process attempts to meet projected water demands during a drought of severity equivalent to the drought of record. WUGs that provide accurate information to the planning group and TWDB and consider recommendations accepted by the regional planning group should be able to supply water through drought periods. In addition, all wholesale water providers (WWPs) and most municipalities develop individual drought contingency plans or emergency action plans to be implemented at various stages of a drought.

Basin Responses

Throughout Texas, including the Brazos River Basin, water rights are issued under the prior appropriation system. During times of shortage, curtailment of water rights has become necessary in recent droughts. Dow Chemical made priority water rights calls in the Brazos River Basin in 2009, 2011, 2012, and 2013. When a priority call is made, upstream water rights that are junior in priority to the water right making the call are required to forgo diversions and impoundment of water and allow streamflows to pass downstream to honor the priority of downstream senior rights. The priority calls affected most water rights in the basin. Partly in response to the priority calls and in response to the ongoing drought, the Brazos Watermaster Program was established by petition and subsequent order issued by the TCEQ Commissioners on April 21, 2014. The program has jurisdiction over the Lower Brazos River Basin including and below Possum Kingdom Reservoir. The Brazos Watermaster will monitor water use and streamflow, and coordinate with water rights holders when flows need to be passed to honor senior water rights.

7.2.2 Assessment of Local Drought Contingency Plans

Predicting the timing, severity and length of a drought is an inexact science; however, it is safe to assume that it is an inevitable component of the Texas climate. For this reason, it is critical to plan for these occurrences with policy outlining adjustments to the use, allocation and conservation of water in response to drought conditions. Drought and other circumstances that interrupt the reliable supply or water quality of a source often lead to water shortages. During a drought period, there generally is a greater demand on the already decreased supply as individuals attempt to maintain landscape vegetation through irrigation because less rainfall is available. This can further exacerbate a water supply shortage situation.

In accordance with the requirements outlined in the Texas Water Code (TWC) Chapter 11 and the Texas Administrative Code §288(b), WWPs suppliers, retail public water suppliers (serving 3,300 connections or more), and irrigation districts must submit a revised and adopted drought contingency plan to TCEQ every five years for approval. Retail public water systems with less than 3,300 connections must have their drought contingency plans

(DCPs) available during TCEQ inspections, but they are not required to submit their plan to TCEQ. The most recent deadline to submit updated DCPs to TCEQ was May 1, 2019.

TCEQ has developed model DCPs for wholesale and retail water providers to use as a guidance tool when preparing their respective drought contingency plans. Although the model DCPs might not be applicable to every water system, it can serve as a starting point and an example for most entities to follow. Important DCP components that should be addressed in the plan include the following:

- Specific and quantified goals targeted for water use reduction;
- Drought response stages, including triggers to initiate and terminate each stage;
- Descriptions of drought indicators along with supply/demand management measures;
- Notification and enforcement procedures, including variance for granting exceptions;
- Public education and input into the plan; and
- Coordinating with regional water planning groups.

In order to minimize or mitigate the impact of water shortages due to emergency situations, including severe drought and equipment failure, the structure of DCPs is based on a variety of triggers that initiate a variety of responses depending on the 'stage' or severity of the situation. Stage one of a DCP typically represents a situation of mild water shortage, which results in initiating water conservation measures on a voluntary basis. The last stage of a DCP usually represents an emergency water situation for a community and triggers an extreme water shortage.

Local DCP information adopted by 10 wholesale and 57 retail water providers, as well as 13 groundwater conservation districts in the region was reviewed and summarized for each stage, including drought triggers used for initiating specific drought responses. The total number of DCPs reviewed was 80, which also included the 24 entities' DCPs reviewed during the previous planning cycle. Brazos River Authority provided the Brazos G team with copies of DCPs received from approximately 32 wholesale and retail water providers; however, follow-up calls were made to many of those entities along with the remaining 33 wholesale and retail water providers to obtain copies of their recently updated DCPs. Approximately 82 percent of the wholesale and retail water providers adopted revised DCPs during 2018-2019.

A summary of drought triggers evaluated during the review of each DCP, included the following:

- Natural/Manmade Contamination;
- Demand/Capacity Based;
- Mechanical Failure;
- Groundwater Level;
- Groundwater Production Rate;
- Reservoir Level;
- Supply Based;

- Time Period;
- Wholesale Provider (initiated by); and
- Other (i.e. Contractual Obligation, Natural Disaster, Notification by Executive Leadership).

In addition, the following drought responses were reviewed based on the drought stage and associated triggers of the DCP:

- Assessment and Identification of Situation;
- Water Rate Change or Surcharge;
- Irrigation Schedule;
- Mandatory Reduction;
- Notification of Public Agencies or Specific Users;
- Prohibited Use;
- Public Notification;
- Discontinue Water Diversions;
- Suspend Service;
- Water Allocation; and
- Other (i.e. Additional Fees, Temporary Variance).

Water User Groups

Based on TWDB guidance outlined in this regional water planning cycle, drought triggers used for initiating drought responses are summarized for 55 retail water providers and presented in Table 7-5.

Wholesale Water Providers

Drought contingency plans for 10 of the 12 WWPs in the Brazos G Area were also evaluated. Since the WWPs typically serve a number of cities and entities in the region, they play a different role than the retail providers in how they monitor the onset of drought, as well as respond to their wholesale customers to address drought conditions. In addition, telephone discussions were conducted with a majority of the WWPs to better understand their plans on how they would address the impact of severe drought or contamination of their water supplies. A summary of their DCP triggers and responses is presented below in Table 7-6.

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Table 7-5. Summary of DCPs for WUGs in the Brazos G Area

Entity Name	DCP Date	Stage Number	Triggers									Responses												Water Supplies	
			Contamination	Demand/Capacity Based	Failure	Groundwater Level	Production Rate	Reservoir Level	Supply Based	Time	Wholesale Provider	Other[1]	Assessment and Identification	Water Rate Change or Surcharge	Irrigation Schedule	Mandatory Reduction	Notification of Public Agencies or Specific Users	Prohibited Use	Public Notification	Discontinue Water Diversions	Suspend Service	Water Allocation	Other[2]	SW	GW
City of Thrall	2003	1								√					√	√			√				√		
		2		√		√									√			√	√				√		
		3		√		√									√			√	√				√		√
		4		√		√									√			√	√				√		
		Emerg.	√		√							√					√	√	√				√		
City of Harker Heights	2019	1		√							√				√				√				√		
		2		√					√		√				√		√	√	√				√	√	
		3		√					√		√						√	√	√				√		
		4 - Emerg.	√	√	√				√			√				√	√	√	√		√	√	√		
City of Sweetwater	2019	1		√			√	√											√				√		
		2		√			√	√							√		√	√	√				√		
		3		√			√	√							√		√	√	√				√	√	√
		4		√			√	√						√	√		√	√	√			√	√		
		Emerg.		√	√				√			√	√	√		√	√	√	√				√		
City of Comanche	2011	1		√				√				√			√	√	√		√				√		
		2		√				√				√			√	√	√		√				√		
		3		√				√				√			√	√	√	√	√				√	√	
		Emerg.	√	√	√			√				√		√	√		√		√			√	√		
City of Robinson	2019	1								√		√					√		√				√		
		2						√	√	√		√			√		√		√				√		
		3		√				√	√	√		√			√		√	√	√				√		
		4		√				√	√	√		√			√		√	√	√				√	√	√
		5		√	√			√	√	√		√			√		√	√	√				√		
		6						√	√			√			√		√	√	√				√		
		7 - Emerg.	√		√				√			√		√		√	√	√	√			√	√		
City of Mexia	2019	1		√					√		√				√		√		√						
		2		√					√		√				√		√	√	√				√	√	√
		3		√					√		√			√		√	√	√	√			√	√		
		4 - Emerg.	√		√								√			√	√		√						
City of Lampasas	2019	1		√							√	√			√				√				√		
		2		√							√	√			√		√	√	√				√		
		3		√							√	√			√		√	√	√				√	√	
		4		√							√	√			√		√	√	√				√		
		5 - Emerg.	√		√						√	√				√	√	√	√			√	√		

Table 7-5. Summary of DCPs for WUGs in the Brazos G Area

Entity Name	DCP Date	Stage Number	Triggers									Responses												Water Supplies	
			Contamination	Demand/Capacity Based	Failure	Groundwater Level	Production Rate	Reservoir Level	Supply Based	Time	Wholesale Provider	Other[1]	Assessment and Identification	Water Rate Change or Surcharge	Irrigation Schedule	Mandatory Reduction	Notification of Public Agencies or Specific Users	Prohibited Use	Public Notification	Discontinue Water Diversions	Suspend Service	Water Allocation	Other[2]	SW	GW
Bethesda WSC	2019	Dry										√			√				√				√	√	√
		1		√							√	√			√		√	√	√				√		
		2		√					√		√	√			√		√	√	√				√		
		3	√	√	√				√		√	√				√	√	√	√				√		
City of Hearne	2001	1					√									√	√		√				√	√	√
		2					√								√	√	√		√				√		
		3					√								√	√	√		√				√		
		4					√								√	√	√		√				√		
		5 - Emerg.	√		√												√		√						
City of Georgetown	2019	1		√		√		√	√			√			√		√	√	√				√	√	√
		2		√		√		√	√			√			√		√	√	√				√		
		3 - Emerg.		√					√			√				√	√	√	√				√		
		4	√	√	√				√			√	√			√	√	√	√			√	√		
Tri-County SUD	2019	1		√															√				√	√	√
		2		√										√	√		√	√	√			√	√		
		3		√										√	√		√	√	√			√	√		
		4		√										√	√		√	√	√			√	√		
		5 - Emerg.	√		√							√				√	√	√	√		√	√			
City of Taylor	2019	1		√											√				√				√	√	
		2		√											√		√	√	√				√		
		3		√											√		√	√	√				√		
		4		√											√		√	√	√				√		
		5 - Emerg.	√	√	√				√			√					√	√	√				√		
		6 - Wtr Alloc.		√										√			√	√	√			√	√		
City of Copperas Cove	2015	1		√							√				√		√	√	√				√	√	
		2		√							√				√		√	√	√				√		
		3		√							√				√		√	√	√				√		
		4 - Emerg.	√		√							√				√	√	√	√		√	√	√		
City of Anson	2011	1		√				√									√		√					√	
		2		√				√								√	√		√						
		3		√				√						√		√	√	√	√			√	√		
		4 - Emerg.	√		√								√				√						√		

Table 7-5. Summary of DCPs for WUGs in the Brazos G Area

Entity Name	DCP Date	Stage Number	Triggers								Responses											Water Supplies	
			Contamination	Demand/Capacity Based	Failure	Groundwater Level	Production Rate	Reservoir Level	Supply Based	Time	Wholesale Provider	Other[1]	Assessment and Identification	Water Rate Change or Surcharge	Irrigation Schedule	Mandatory Reduction	Notification of Public Agencies or Specific Users	Prohibited Use	Public Notification	Discontinue Water Diversions	Suspend Service	Water Allocation	Other[2]	SW	GW
Manville WSC	2016	1		√			√								√		√		√				√	√	√
		2		√			√		√						√		√	√	√				√		
		3		√	√		√		√			√				√	√	√	√				√		
		4 - Emerg.	√		√							√	√				√		√			√	√		
Stephens Regional SUD	2019	1		√				√	√			√			√				√				√	√	
		2		√				√	√			√			√		√	√	√				√		
		3		√	√			√	√			√				√	√	√	√				√		
		4 - Emerg.			√			√	√			√	√	√		√	√	√	√			√	√		
City of Rule	2013	1									√				√								√	√	√
		2									√				√			√					√		
		3									√				√			√					√		
		4 - Emerg.	√		√									√				√				√	√		
Block House MUD	2019	1									√	√			√				√				√	√	
		2		√					√		√	√			√		√	√	√				√		
		3	√	√					√		√	√			√		√	√	√				√		
		4 - Emerg.							√		√	√			√		√	√	√		√	√	√		
City of Stamford	2012	1						√	√														√	√	
		2		√				√	√					√	√			√					√		
		3		√				√	√					√	√			√					√		
		4		√	√			√	√			√		√				√				√	√		
City of Killeen	2019	1		√				√	√		√	√			√				√				√	√	
		2		√				√	√		√	√			√		√	√	√				√		
		3		√				√	√		√	√			√		√	√	√				√		
		4		√				√	√		√	√			√		√	√	√				√		
		5 - Emerg.	√		√						√	√					√	√	√				√		
City of Gatesville	2018	1		√					√		√				√				√				√	√	
		2		√							√				√		√	√	√				√		
		3 - Emerg.	√		√						√	√				√	√	√	√				√		
		4 - Pro Rata									√	√		√			√		√			√	√		
City of Abilene	2019	Voluntary								√					√				√				√	√	
		1		√				√	√			√			√		√	√	√				√		
		2		√	√			√	√			√			√		√	√	√				√		
		3 - Emerg.		√	√			√	√			√		√		√	√	√	√			√	√		
		4 - Wtr Crisis	√		√							√		√		√	√	√	√			√	√		

Table 7-5. Summary of DCPs for WUGs in the Brazos G Area

Entity Name	DCP Date	Stage Number	Triggers								Responses											Water Supplies	
			Contamination	Demand/Capacity Based	Failure	Groundwater Level	Production Rate	Reservoir Level	Supply Based	Time	Wholesale Provider	Other[1]	Assessment and Identification	Water Rate Change or Surcharge	Irrigation Schedule	Mandatory Reduction	Notification of Public Agencies or Specific Users	Prohibited Use	Public Notification	Discontinue Water Diversions	Suspend Service	Water Allocation	Other[2]	SW	GW
City of Cedar Park	2019	1										√			√				√				√	√	
		2		√				√	√		√	√			√		√	√	√				√		
		3	√	√				√	√		√	√			√		√	√	√				√		
		4 - Emerg.									√	√				√	√	√	√		√	√	√		
City of Leander	2014	1		√					√	√					√				√					√	
		2		√					√		√				√	√	√	√	√				√		
		3		√					√		√	√			√	√	√	√	√				√		
		4 - Emerg.	√	√	√				√		√	√				√	√	√	√				√		
City of Belton	2019	1		√				√	√		√	√			√				√				√	√	
		2		√				√	√		√	√			√		√	√	√				√		
		3		√				√	√		√	√			√		√	√	√				√		
		4						√	√		√	√			√		√	√	√				√		
		5 - Emerg.	√		√						√	√		√		√	√	√	√			√	√		
City of Liberty Hill	2012	1		√					√			√			√				√				√	√	√
		2		√					√			√			√		√	√	√				√		
		3	√	√	√				√		√	√				√	√	√	√				√		
City of Acton	2019	1		√								√			√				√				√	√	√
		2		√								√			√		√	√	√				√		
		3		√								√			√		√	√	√				√		
		4							√			√			√		√	√	√				√		
		5 - Emerg.	√		√		√		√			√				√	√	√	√				√		
		6 - Wtr Alloc.		√								√		√			√		√			√	√		
City of Albany	2019	1						√	√		√				√				√				√	√	
		2						√	√		√				√		√	√	√				√		
		3						√	√		√			√			√	√	√			√	√		
		4 - Emerg.	√		√			√	√		√		√			√	√	√	√				√		
Bold Springs WSC	2018	1								√		√			√				√				√		√
		2					√					√			√			√	√				√		
		3					√					√				√		√	√				√		
		4					√					√				√	√	√	√			√	√		
		5 - Emerg.	√		√							√				√	√	√	√			√	√		

Table 7-5. Summary of DCPs for WUGs in the Brazos G Area

Entity Name	DCP Date	Stage Number	Triggers								Responses											Water Supplies	
			Contamination	Demand/Capacity Based	Failure	Groundwater Level	Production Rate	Reservoir Level	Supply Based	Time	Wholesale Provider	Other[1]	Assessment and Identification	Water Rate Change or Surcharge	Irrigation Schedule	Mandatory Reduction	Notification of Public Agencies or Specific Users	Prohibited Use	Public Notification	Discontinue Water Diversions	Suspend Service	Water Allocation	Other[2]	SW	GW
City of Breckenridge	2019	1			√			√	√			√					√		√				√	√	
		2			√			√	√			√			√		√	√	√				√		
		3			√			√	√			√				√	√	√	√			√	√		
		4 - Emerg.	√		√			√				√	√			√	√	√	√			√	√		
City of Bryan	2019	1								√		√			√				√				√	√	
		2		√								√			√		√	√	√						√
		3	√	√	√		√		√			√				√	√	√	√			√			
City of Cisco	2019	1						√	√			√			√		√		√				√	√	
		2						√	√			√			√		√	√	√			√	√		
		3 - Emerg.						√	√			√		√		√	√	√	√			√	√		
City of Cleburne	2019	1		√	√			√	√			√			√		√	√	√				√	√	
		2		√	√			√	√			√			√		√	√	√				√		
		3		√	√			√	√			√				√	√	√	√				√		
		4 - Emerg.	√		√							√			√	√	√	√	√		√		√		
City of College Station	2019	1		√	√					√	√	√			√		√	√	√				√		
		2		√					√			√			√		√	√	√			√	√		√
		3 - Emerg.	√		√							√				√	√	√	√		√	√	√		
City of Waco	2019	1						√				√					√	√	√				√		
		2						√	√			√			√		√	√	√				√	√	
		3						√	√			√			√		√	√	√				√		
		4 - Emerg.						√	√			√				√	√	√	√				√		
Fort Belknap WSC	2019	1		√					√			√			√		√	√	√				√	√	
		2		√					√							√	√	√	√				√		
		3	√	√	√				√		√	√				√	√	√	√			√	√		
Gholson WSC	2019	1		√								√							√				√		
		2		√								√		√	√		√	√	√				√		
		3		√								√		√	√		√	√	√				√		√
		4		√								√		√	√		√	√	√				√		
		5 - Emerg.	√		√							√				√	√	√	√		√	√	√		
City of Graham	2019	1		√				√				√			√				√				√		
		2		√				√	√			√			√		√	√	√				√		
		3		√				√	√			√			√		√	√	√				√	√	
		4		√				√	√			√			√		√	√	√			√	√		
		5 - Emerg.	√		√			√	√			√				√	√	√	√			√	√		

Table 7-5. Summary of DCPs for WUGs in the Brazos G Area

Entity Name	DCP Date	Stage Number	Triggers									Responses												Water Supplies	
			Contamination	Demand/Capacity Based	Failure	Groundwater Level	Production Rate	Reservoir Level	Supply Based	Time	Wholesale Provider	Other[1]	Assessment and Identification	Water Rate Change or Surcharge	Irrigation Schedule	Mandatory Reduction	Notification of Public Agencies or Specific Users	Prohibited Use	Public Notification	Discontinue Water Diversions	Suspend Service	Water Allocation	Other[2]	SW	GW
City of Granbury	2019	1		√											√		√		√				√	√	√
		2		√											√		√	√	√				√		
		3		√											√		√	√	√				√		
		4							√						√		√	√	√				√		
		5 - Emerg.	√		√		√		√			√		√		√	√	√	√			√			
Hill County WSC	2018	1					√								√		√		√				√	√	√
		2					√								√		√	√	√				√		
		3					√								√		√	√	√				√		
		4					√								√		√	√	√				√		
		5 - Emerg.	√		√							√				√	√	√	√				√		
		6 - Wtr Alloc.					√					√		√		√	√		√			√	√		
City of Midlothian	2019	1	√	√	√			√	√		√	√			√		√	√	√				√	√	
		2	√	√	√			√	√		√	√			√		√	√	√				√		
		3	√	√	√			√	√		√	√				√	√	√	√			√	√		
		Emerg.	√	√	√							√		√		√	√	√	√			√	√		
Paloma Lake MUD No. 2	2019	1								√	√	√			√		√	√	√			√	√	√	
		2	√	√	√				√		√	√			√		√	√	√			√	√		
		3 - Emerg.	√	√	√				√		√	√				√	√	√	√			√	√		
Possum Kingdom WSC	2019	1		√				√	√	√	√	√			√				√				√	√	
		2		√				√	√		√	√		√	√		√	√	√			√	√		
		3 - Emerg.		√	√			√	√		√	√		√		√	√	√	√			√	√		
City of Rockdale	2019	1		√								√			√		√		√				√		√
		2		√								√			√		√	√	√				√		
		3		√								√			√		√	√	√				√		
		4		√								√			√		√	√	√				√		
		5 - Emerg.	√	√	√							√				√	√	√	√				√		
City of Round Rock	2015	1		√				√	√	√	√	√			√		√		√				√	√	√
		2		√				√	√		√	√			√		√	√	√						
		3		√				√	√		√	√				√	√	√	√						
Somervell County Water District	2019	1	√	√	√			√	√			√					√		√				√	√	
		2	√	√	√			√	√			√			√	√	√	√	√			√	√		
		3	√	√	√			√	√			√				√	√	√	√			√	√		
		4 - Emerg.			√							√				√	√	√	√			√	√		

Table 7-5. Summary of DCPs for WUGs in the Brazos G Area

Entity Name	DCP Date	Stage Number	Triggers									Responses												Water Supplies	
			Contamination	Demand/Capacity Based	Failure	Groundwater Level	Production Rate	Reservoir Level	Supply Based	Time	Wholesale Provider	Other[1]	Assessment and Identification	Water Rate Change or Surcharge	Irrigation Schedule	Mandatory Reduction	Notification of Public Agencies or Specific Users	Prohibited Use	Public Notification	Discontinue Water Diversions	Suspend Service	Water Allocation	Other[2]	SW	GW
Sonterra MUD	2019	Voluntary								√					√				√				√		
		1		√											√			√	√				√		
		2		√					√			√			√			√	√				√		√
		3		√					√			√			√			√	√				√		
		4 - Emerg.	√		√							√				√	√	√	√			√	√		
Southwest Milam WSC	2019	1		√					√			√			√				√				√		
		2		√					√									√	√				√		√
		3	√	√	√				√		√	√				√	√	√	√			√	√		
Sportsman's World MUD	2019	1		√											√				√				√		
		2		√											√			√	√				√	√	
		3		√										√	√		√	√	√				√		
		4 - Emerg.										√		√		√	√	√	√						
City of Temple	2019	1								√					√				√				√		
		2		√							√	√			√		√	√	√				√	√	
		3		√							√	√			√		√	√	√			√	√		
		4 - Emerg.	√		√						√	√				√	√	√	√			√	√		
Vista Oaks MUD	2019	Voluntary								√					√		√		√				√		
		1			√						√	√			√		√	√	√				√	√	
		2			√						√	√			√		√	√	√				√		
		3	√		√						√	√				√	√	√	√		√	√	√		
Williamson County MUD No. 10	2019	Voluntary								√					√				√				√		
		1	√	√	√			√	√		√	√			√		√	√	√				√	√	
		2	√	√	√			√	√		√	√			√		√	√	√				√		
		3 - Emerg.	√	√	√			√	√		√	√				√	√	√	√				√		
Williamson County MUD No. 11	2019	Voluntary								√					√				√				√		
		1	√	√	√			√	√		√	√			√		√	√	√				√	√	
		2	√	√	√			√	√		√	√			√		√	√	√				√		
		3 - Emerg.	√	√	√			√	√		√	√				√	√	√	√				√		
Williamson County MUD No. 22	2019	1		√			√			√	√				√				√				√		
		2		√			√		√		√				√		√	√	√				√		√
		3		√	√		√		√		√				√		√	√	√				√		
		4 - Emerg.	√		√						√					√	√	√	√				√		

Table 7-5. Summary of DCPs for WUGs in the Brazos G Area

Entity Name	DCP Date	Stage Number	Triggers								Responses											Water Supplies	
			Contamination	Demand/Capacity Based	Failure	Groundwater Level	Production Rate	Reservoir Level	Supply Based	Time	Wholesale Provider	Other[1]	Assessment and Identification	Water Rate Change or Surcharge	Irrigation Schedule	Mandatory Reduction	Notification of Public Agencies or Specific Users	Prohibited Use	Public Notification	Discontinue Water Diversions	Suspend Service	Water Allocation	Other[2]	SW	GW
City of Hubbard	2018	1				√			√						√				√				√	√	√
		2				√			√						√		√	√	√				√		
		3				√			√						√		√	√	√				√		
		4				√			√						√		√	√	√				√		
		5 - Emerg.	√		√									√			√	√	√			√			
City of Gordon	2014	1		√				√									√		√					√	
		2		√				√								√	√		√						
		3 - Emerg.		√				√								√	√		√			√			
RMS WSC	2019	1		√								√			√		√		√				√		√
		2		√								√			√		√	√	√				√		
		3		√								√			√		√	√	√			√	√		
		4 - Emerg.	√		√							√				√	√	√	√			√			

NOTES:

[1] Additional triggers: any unforeseen conditions that may occur, including extended period of low rainfall/drought conditions; executive leadership declares critical shortage

[2] Water use restrictions on: watering with handheld hose, use of greywater, hotel/motel/restaurant water use, pools, fountains, golf courses, athletic fields, parks, car washes

Table 7-6. Summary of DCPs for WWPs in the Brazos G Area

Entity Name	DCP Date	Primary Water Supply Source	Stage Number	Triggers									Responses											Water Supplies	
				Contamination	Demand/WTP Capacity	Duration Period	Equipment out of Service or Failure	Groundwater Level	Production Rate	Reservoir Level	Supply Based	Raw Water Provider	Weather Conditions	Other[1]	Review System Ops/Make Repairs	Initiate Measures from Raw Water Provider	Irrigation Schedule	Mandatory Reduction	Notify Wholesale Customers &/or Emerg.	Notify Board Members & Public	Discontinue Water Diversions	Water Allocation	Water Rate Change or Surcharge	SW	GW
Central Texas WSC	2018	Lake Stillhouse	1		√					√		√			√				√	√				√	√
			2		√					√		√			√	√		√	√	√		√			
			3		√					√		√			√	√		√	√	√		√	√		
			4 - Emerg.	√			√			√		√			√	√		√	√	√	√				
Upper Leon River MWD	2014	Lake Proctor	1							√	√	√	√		√	√			√	√				√	
			2							√	√	√	√		√	√		√	√	√					
			3 - Emerg.	√			√			√	√	√	√		√	√		√	√	√		√	√		
North Central Texas Municipal Water Authority	2019	Millers Creek Reservoir	1							√	√				√				√	√				√	√
			2							√	√				√			√	√	√					
			3							√	√				√			√	√	√		√	√		
			4 - Emerg.	√			√								√			√	√	√	√	√	√		
Aquilla WSD	2019	Lake Aquilla	1		√	√				√	√	√	√		√	√	√		√	√				√	
			2		√	√				√	√	√	√		√	√	√	√	√	√					
			3	√	√	√	√			√	√	√	√	√	√	√		√	√	√		√			
			4 - Emerg.	√			√			√	√	√	√	√	√	√		√	√	√		√			
Bistone MWSD[2]	2019	Lake Mexia; Carrizo-Wilcox Aquifer	1		√	√		√		√	√						√		√	√				√	√
			2		√	√		√		√	√						√	√	√	√					
			3 - Emerg.		√	√	√	√		√	√							√	√	√		√	√		
Eastland County WSC	2019	Lake Leon	1		√	√				√							√		√	√				√	
			2		√	√				√								√	√	√		√	√		
			3		√	√				√								√	√	√		√	√		
			4 - Emerg.			√	√			√	√			√	√			√	√	√		√	√		
West Central TX MWD	2019	Hubbard Creek Reservoir	1							√	√		√			√			√	√				√	
			2							√	√		√		√	√		√	√	√					
			3							√	√		√		√	√		√	√	√		√			
			4							√	√		√		√	√		√	√	√		√			
			5 - Emerg.				√							√	√	√		√	√	√					
Bell County WCID No. 1	2019	Lake Belton & Lake Stillhouse	1		√	√				√	√	√	√		√	√			√	√		√	√	√	
			2		√	√	√			√	√	√	√		√	√		√	√	√		√	√		
			3	√	√	√	√			√	√	√	√	√	√	√		√	√	√		√	√		
Bluebonnet WSC	2019	Lake Belton	1							√		√	√		√	√			√	√				√	
			2							√		√	√		√	√		√	√	√					
			3							√		√	√		√	√		√	√	√					
			4 - Emerg.							√		√	√		√	√		√	√	√		√	√		

Table 7-6. Summary of DCPs for WWPs in the Brazos G Area

Entity Name	DCP Date	Primary Water Supply Source	Stage Number	Triggers									Responses											Water Supplies	
				Contamination	Demand/WTP Capacity	Duration Period	Equipment out of Service or Failure	Groundwater Level	Production Rate	Reservoir Level	Supply Based	Raw Water Provider	Weather Conditions	Other[1]	Review System Ops/Make Repairs	Initiate Measures from Raw Water Provider	Irrigation Schedule	Mandatory Reduction	Notify Wholesale Customers &/or Emerg.	Notify Board Members & Public	Discontinue Water Diversions	Water Allocation	Water Rate Change or Surcharge	SW	GW
Palo Pinto County MWD No. 1	2014	Lake Palo Pinto	1							√					√				√	√				√	
			2							√					√				√	√					
			3				√			√					√				√	√		√	√		
			4 - Emerg.	√			√				√			√	√			√	√	√		√	√		
Brazos River Authority	2019	Multiple reservoirs	1	√	√	√	√		√	√			√	√	√				√	√				√	
			2	√	√	√	√		√	√			√	√	√			√	√	√					
			3	√	√	√	√		√	√			√	√	√			√	√	√	√	√			
			4 – Pro-rata Curtailment	√	√	√	√		√	√			√	√	√			√	√	√	√	√			

NOTES:

[1] Additional triggers: any unforeseen conditions that may occur, such as acts of God or man.

[2] Bistone MWSD is both a WUG and WWP, but the DCP is more similar to those provided by WWPs and is included here instead of the WUG table.

Groundwater Conservation Districts

According to the Texas Water Code, Section 36.1071(a), groundwater conservation districts (GCDs) are required to adopt management plans that addresses natural resource issues, drought conditions, conservation, recharge enhancement, rainwater harvesting, and precipitation enhancement/brush control, as well as include desired future conditions (DFCs). Since GCDs are water regulators and not water suppliers, their role is to provide scientific information to those entities with permits to help them make informed decisions during emergency conditions. As a result, drought response measures are typically addressed within a GCD's Management Plan instead of a separate drought contingency plan. Of the thirteen GCDs located in the Brazos G Area, the following Districts have developed a separate DCP in conjunction with their Management Plan: Brazos Valley GCD, Clearwater Underground Water Conservation District, and Middle Trinity GCD. A summary of their DCP triggers and responses are summarized below in Table 7-7.

Table 7-7. Summary of Groundwater Conservation District DCPs in the Brazos G Area

Groundwater Conservation District	Major Aquifer(s)	Stage Number	Drought Triggers	District's Responses
Brazos Valley GCD	Carrizo-Wilcox, Queen City, Sparta, Yegua-Jackson & Brazos River Alluvium	1-Mild	NOAA 30-day rain node deficit from avg rainfall; PDSI shows mild drought.	Conduct water conservation public education; keep up-to-date drought information (PDSI) and other helpful drought indicators on website.
		2-Moderate	NOAA 30-day rain node deficit from avg rainfall; PDSI shows moderate level of drought for 6 mo.	Conduct water conservation public education; keep up-to-date drought information (PDSI) and other helpful drought indicators on website; review and confirm permit holders are enforcing their DCPs.
		3-Severe	NOAA 30-day rain node deficit from avg rainfall; or PDSI shows severe level of drought; natural or man-made contamination of water supply source(s); or declaration by State or Federal Gov't of disaster due to drought condition in a county served by District; or unforeseen events cause health/safety risks to the public.	Conduct water conservation public education; keep up-to-date drought information (PDSI) and other helpful drought indicators on website; review and confirm permit holders are enforcing their DCPs; monitor well levels frequently basis after consulting District's hydrologist.
		4-Extreme	NOAA 30-day rain node deficit from avg rainfall; or PDSI shows extreme level of drought for 12 mo.; water level monitoring indicates significant decrease in water levels to affect GW production of permit holders; natural or man-made contamination of water supply source(s); or declaration by State or Federal Gov't of disaster due to drought condition in a county served by District; or unforeseen events cause health/safety risks to the public.	Conduct water conservation public education; keep up-to-date drought information (PDSI) and other helpful drought indicators on website; review and confirm permit holders are enforcing their DCPs; monitor well levels frequently basis after consulting District's hydrologist; designate DMZ under Rule 7.2 as appropriate and/or restrict GW production by permittees.

Table 7-7. Summary of Groundwater Conservation District DCPs in the Brazos G Area

Groundwater Conservation District	Major Aquifer(s)	Stage Number	Drought Triggers	District's Responses
Clearwater Underground Water CD	Edwards BFZ	1-Aware	*PDI 70 to 79%; Spring Discharge 900 to 701 ac-ft/month* (PDI monitored daily on running-year basis & based on NEX-RAD rainfall data; PDI trigger cond. must be exceeded 28 consecutive days; Spring Discharge monitored with daily max discharge values averaged over 5 consecutive days on running 5-day basis)	Continue or increase voluntary reduction; check for plumbing leaks; no filling of ponds, lakes, tanks, reservoirs, swimming pools or other surface impoundments w/total capacity of more than 50,000 gallons except for PWSs (goal to achieve 10% reduction in water usage)
		2-Concern	*PDI 60 to 69%; Spring Discharge 700 to 401 ac-ft/month* (PDI monitored daily on running-year basis & based on NEX-RAD rainfall data; PDI trigger cond. must be exceeded 28 consecutive days; Spring Discharge monitored with daily max discharge values averaged over 5 consecutive days on running 5-day basis)	Continue or increase voluntary reduction; check for plumbing leaks; no filling of ponds, lakes, tanks, reservoirs, swimming pools or other surface impoundments w/total capacity of more than 50,000 gallons except for PWSs (goal to achieve 20% reduction in water usage); limit outdoor watering to once every 5-7 days bet. 7pm and 7am (ag/horticulture operations exempted but encouraged to reduce watering by 20%); wash vehicles at car wash only as needed; water livestock in leak-proof troughs if possible.
		3-Serious	*PDI 50 to 59%; Spring Discharge 400 to 201 ac-ft/month* (PDI monitored daily on running-year basis & based on NEX-RAD rainfall data; PDI trigger cond. must be exceeded 28 consecutive days; Spring Discharge monitored with daily max discharge values averaged over 5 consecutive days on running 5-day basis)	Continue or increase voluntary reduction; check for plumbing leaks; no filling of ponds, lakes, tanks, reservoirs, swimming pools or other surface impoundments w/total capacity of more than 50,000 gallons except for PWSs (goal to achieve 30% reduction in water usage); limit outdoor watering to once every 5-7 days bet. 7pm and 7am (ag/horticulture operations exempted but encouraged to reduce watering by 30%); wash vehicles at car wash only as needed; water livestock in leak-proof troughs if possible; fountains/swimming pools/décor. ponds covered where possible; water for dust control when req'd by law.
		4-Critical	*PDI < 50%; Spring Discharge 200 ac-ft/month or less* (PDI monitored daily on running-year basis & based on NEX-RAD rainfall data; PDI trigger cond. must be exceeded 28 consecutive days; Spring Discharge monitored with daily max discharge values averaged over 5 consecutive days on running 5-day basis)	Continue or increase voluntary reduction; check for plumbing leaks; no filling of ponds, lakes, tanks, reservoirs, swimming pools or other surface impoundments (goal to achieve 40% reduction in water usage); no outdoor watering (ag/horticulture operations exempted but encouraged to reduce watering by 40%); no vehicle washing; water livestock in leak-proof troughs if possible; water for dust control when req'd by law.

Table 7-7. Summary of Groundwater Conservation District DCPs in the Brazos G Area

Groundwater Conservation District	Major Aquifer(s)	Stage Number	Drought Triggers	District's Responses
Clearwater Underground Water CD	Trinity	1-Aware	*PDI 70 to 79%;* (PDI monitored daily on running-year basis & based on NEX-RAD rainfall data; PDI trigger cond. must be exceeded 28 consecutive days)	Continue or increase voluntary reduction; check for plumbing leaks; no filling of ponds, lakes, tanks, reservoirs, swimming pools or other surface impoundments w/total capacity of more than 50,000 gallons except for PWSs (goal to achieve 10% reduction in water usage)
		2-Concern	*PDI 60 to 69%;* (PDI monitored daily on running-year basis & based on NEX-RAD rainfall data; PDI trigger cond. must be exceeded 28 consecutive days)	Continue or increase voluntary reduction; check for plumbing leaks; no filling of ponds, lakes, tanks, reservoirs, swimming pools or other surface impoundments w/total capacity of more than 50,000 gallons except for PWSs (goal to achieve 20% reduction in water usage); limit outdoor watering to once every 5-7 days bet. 7pm and 7am (ag/horticulture operations exempted but encouraged to reduce watering by 20%); wash vehicles at car wash only as needed; water livestock in leak-proof troughs if possible.
		3-Serious	*PDI 50 to 59%;* (PDI monitored daily on running-year basis & based on NEX-RAD rainfall data; PDI trigger cond. must be exceeded 28 consecutive days)	Continue or increase voluntary reduction; check for plumbing leaks; no filling of ponds, lakes, tanks, reservoirs, swimming pools or other surface impoundments w/total capacity of more than 50,000 gallons except for PWSs (goal to achieve 30% reduction in water usage); limit outdoor watering to once every 5-7 days bet. 7pm and 7am (ag/horticulture operations exempted but encouraged to reduce watering by 30%); wash vehicles at car wash only as needed; water livestock in leak-proof troughs if possible; fountains/swimming pools/décor. ponds covered where possible; water for dust control when req'd by law.
		4-Critical	*PDI < 50%;* (PDI monitored daily on running-year basis & based on NEX-RAD rainfall data; PDI trigger cond. must be exceeded 28 consecutive days)	Continue or increase voluntary reduction; check for plumbing leaks; no filling of ponds, lakes, tanks, reservoirs, swimming pools or other surface impoundments (goal to achieve 40% reduction in water usage); no outdoor watering (ag/horticulture operations exempted but encouraged to reduce watering by 40%); no vehicle washing; water livestock in leak-proof troughs if possible; water for dust control when req'd by law.

Table 7-7. Summary of Groundwater Conservation District DCPs in the Brazos G Area

Groundwater Conservation District	Major Aquifer(s)	Stage Number	Drought Triggers	District's Responses
Middle Trinity GCD	Trinity	0	*PDSI > 80%; soil moisture index*	N/A
		1	*PDSI 70 to 80%; soil moisture index*	Reduction of pumping by 10% on voluntary basis; information posted on District's website
		2	*PDSI 60 to 70%; soil moisture index*	Reduction of pumping by 20% on voluntary basis; information posted on District's website
		3	*PDSI 50 to 60%; soil moisture index*	Reduction of pumping by 30% on voluntary basis; information posted on District's website
		4	*PDSI < 50%; soil moisture index*	Reduction of pumping by 40% on voluntary basis; information posted on District's website

Also, GCDs are generally more concerned about long-term pumping (decades usage) than short-term drought conditions. All of the GCDs use either the PDSI or Precipitation Deficit Index (PDI) to monitor the severity of drought conditions. Based on PDSI or PDI readings, the GCDs then notify all of their permitted public water suppliers to implement their respective DCPs. Also, each of the GCDs focus on their respective DFCs based on specific aquifer characteristics within their management area (i.e. Carrizo-Wilcox versus the Trinity Aquifer).

7.3 Existing and Potential Emergency Interconnects

In the event of a severe and prolonged drought, interruption or contamination of an existing water supply, it is important for municipal water user groups (WUGs) to have a back-up plan and alternative source of supply available. In fact, TCEQ requires all public water systems (PWSs) to have a plan in place based on the guidelines outlined in 30 TAC, Chapter 290, Subchapter F. Interconnects between two municipal WUGs are an acceptable alternative for emergency water supply in lieu of trucking in treated drinking water to a community.

The TCEQ Texas Drinking Water Watch database (TCEQ database) was the primary source used to identify existing emergency interconnect information for the Brazos G Area. The availability of each PWS water source is categorized as Permanent, Seasonal, Interim or Emergency in the TCEQ database; however, details on existing interconnect supply capacity or location is not provided. As a result, numerous emergency users and providers were contacted by phone to obtain infrastructure details about each interconnect, such as meter size, pipeline diameter and capacity; information regarding future emergency interconnects was also collected. In many cases, an understanding or agreement is already in place between the interconnect provider and user about the transfer volume of water supply in the event of an emergency. According to Texas Water Code §16.053(r), confidential information regarding the location coordinates of each of the emergency interconnect was not gathered or included in the regional plan.

A summary of the number of existing and future emergency interconnects in the Brazos G Area, including who is connected to whom, principal county served, infrastructure details and the emergency provider's source of supply, is presented in Table 7-8. During this planning cycle, 125 interconnects were identified compared to 32 interconnects in the 2016 Brazos G Plan. A few of the WUGs, including the Cities of Bryan, College Station and Round Rock, had more than one interconnect with particular WUGs.

Forty-four of the potential emergency providers have a single source of water supply. If this source became contaminated or no longer available for the emergency user, then other alternatives or arrangements would be necessary. Twenty-one of the WUG providers have two supply sources, and four of the listed WUG providers have three or more sources of supply.

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Table 7-8. Summary of Emergency Interconnects in the Brazos G Area

Emergency User [A]	Emergency Provider [B]	Provider's Sources [C]		
		Source #1	***Source #2***	***Source # 3***
ACTON MUD	CITY OF GRANBURY	LAKE GRANBURY (SW)	HOOD COUNTY (GW)	
CITY OF ALVARADO	JOHNSON COUNTY SUD	MANSFIELD (SW)	BRA-LAKE GRANBURY (SW)	JOHNSON COUNTY (GW)
AQUA WSC	CITY OF WACO	LAKE WACO (SW)	MCLENNAN COUNTY (GW)	
AXTELL WSC	EOL WSC	MCLENNAN COUNTY (GW)		
CITY OF BAIRD	CALLAHAN COUNTY WSC	CLYDE (SW)	BAIRD(SW)	
CITY OF BAIRD	CITY OF CLYDE	LAKE CLYDE (SW)	ABILENE (SW)	
BEACHVIEW ACRES WATER ASSOCIATION	LAKESHORE WATER SYSTEM	HILL COUNTY (GW)		
BELL MILAM FALLS WSC	EAST BELL WSC	CENTRAL TEXAS WSC (SW)	BELL COUNTY (GW)	
CITY OF BELTON	CENTRAL TEXAS WSC	STILLHOUSE HOLLOW (SW)	BELL COUNTY (GW)	
BENTWATER ON LAKE GRANBURY	CITY OF GRANBURY	LAKE GRANBURY (SW)	HOOD COUNTY (GW)	
BETHANY SUD	BETHESDA WSC	FORT WORTH (SW)	JOHNSON COUNTY (GW)	
BLOCK HOUSE MUD	CITY OF LEANDER	LCRA-LAKE TRAVIS (SW)		
BLUE WATER OAKS ESTATES	JOHNSON COUNTY SUD	BRA-LAKE GRANBURY (SW)	MANSFIELD (SW)	JOHNSON COUNTY (GW)
BOLD SPRINGS WSC	CITY OF WEST	WACO (SW)	MCLENNAN COUNTY (GW)	
BRAZOS RIVER ACRES	RIVER COUNTRY ACRES	HOOD COUNTY (GW)		
CITY OF BREMOND	TRI COUNTY SUD	FALLS COUNTY (GW)	ROBERTSON COUNTY (GW)	
BRUSHY CREEK MUD	CITY OF ROUND ROCK	BRA-LAKE GEORGETOWN (SW)	WILLIAMSON COUNTY (GW)	
CITY OF BRYAN	CITY OF COLLEGE STATION	BRAZOS COUNTY (GW)		
CITY OF BRYAN	WICKSON CREEK SUD	BRAZOS COUNTY (GW)		
CANYON CREEK ADDITION	ACTON MUD	BRA-LAKE GRANBURY (SW)	HOOD COUNTY (GW)	
CEDRON CREEK RANCH WATER SUPPLY	STEELE CREEK HARBOR	BOSQUE COUNTY (GW)		
CHALK BLUFF WSC	ROSS WSC	MCLENNAN COUNTY (GW)	WACO (SW)	
CITY OF COLLEGE STATION	CITY OF BRYAN	BRAZOS COUNTY (GW)		
CITY OF COLLEGE STATION	TEXAS A&M UNIVERSITY MAIN CAMPUS	BRAZOS COUNTY (GW)		
CITY OF COLLEGE STATION	WELLBORN SUD	NAVASOTA RIVER (SW)	BRAZOS (GW)	
COMANCHE COVE	CITY OF GRANBURY	LAKE GRANBURY (SW)	HOOD COUNTY (GW)	

Table 7-8. Summary of Emergency Interconnects in the Brazos G Area

Emergency User [A]	Emergency Provider [B]	Provider's Sources [C]		
		Source #1	***Source #2***	***Source # 3***
COTTONWOOD WSC	CITY OF WEST	WACO (SW)	MCLENNAN COUNTY (GW)	
CROSS COUNTRY WSC	HIGHLAND PARK WSC	BOSQUE COUNTY (GW)		
CROSS COUNTRY WSC	PATRICK WSC	MCLENNAN COUNTY (GW)		
CROWN RANCH SUBDIVISION	DOBBIN PLANTERSVILLE WSC 1	MONTGOMERY COUNTY (GW)		
DOBBIN PLANTERSVILLE WSC 2	DOBBIN PLANTERSVILLE WSC 1	MONTGOMERY COUNTY (GW)		
EAST BELL WSC	BELL MILAM FALLS WSC	CENTRAL TEXAS WSC (SW)	BELL MILAM FALLS WSC (GW)	
EAST BELL WSC	CITY OF TEMPLE	LEON RIVER (SW)		
EOL WSC	AXTELL WSC	MCLENNAN COUNTY (GW)		
EOL WSC	PRAIRIE HILL WSC	LIMESTONE COUNTY (GW)		
EULA WSC	CITY OF CLYDE	LAKE CLYDE (SW)	ABILENE (SW)	
FALCON CREST ADDITION	NORTHCREST ADDITION	JOHNSON COUNTY (GW)		
CITY OF FLORENCE	CITY OF GEORGETOWN	BRA-LAKE GEORGETOWN (SW)	WILLIAMSON COUNTY (GW)	
CITY OF GEORGETOWN	CITY OF LEANDER	LCRA-LAKE TRAVIS (SW)		
CITY OF GEORGETOWN	CITY OF ROUND ROCK	BRA-LAKE GEORGETOWN (SW)	WILLIAMSON COUNTY (GW)	
CITY OF GEORGETOWN (FUTURE)	CITY OF ROUND ROCK	LCRA-LAKE TRAVIS (SW)	WILLIAMSON COUNTY (GW)	
CITY OF GEORGETOWN (FUTURE)	CITY OF ROUND ROCK	LCRA-LAKE TRAVIS (SW)	WILLIAMSON COUNTY (GW)	
GLEN OAKS MOBILE HOME PARK	WICKSON CREEK SUD	BRAZOS COUNTY (GW)		
CITY OF GODLEY	JOHNSON COUNTY SUD	BRA-LAKE GRANBURY (SW)	MANSFIELD (SW)	JOHNSON COUNTY (GW)
CITY OF GRANBURY	BRAZOS REGIONAL PUA	BRA-LAKE GRANBURY (SW)		
GRANBURY ACRES	CITY OF GRANBURY	LAKE GRANBURY (SW)	HOOD COUNTY (GW)	
GUN & ROD ESTATES	CITY OF BRENHAM	LAKE SOMERVILLE (SW)		
HAMILTON INN	CITY OF HAMILTON	UPPER LEON MWD (SW)		
HILLTOP WSC	BOLD SPRINGS WSC	MCLENNAN COUNTY (GW)		
CITY OF HUBBARD	POST OAK SUD	DAWSON (SW)	CORSICANA (SW)	
JARRELL SCHWERTNER WSC	SONTERRA MUD	WILLIAMSON COUNTY (GW)	BRA-LONE STAR RWA (SW)	
JONAH WATER SUD	CITY OF GEORGETOWN	BRA-LAKE GEORGETOWN (SW)	WILLIAMSON COUNTY (GW)	

Table 7-8. Summary of Emergency Interconnects in the Brazos G Area

Emergency User [A]	Emergency Provider [B]	Provider's Sources [C]		
		Source #1	***Source #2***	***Source # 3***
CITY OF KILLEEN	CENTRAL TEXAS WSC	STILLHOUSE HOLLOW (SW)	BELL COUNTY (GW)	
LAGUNA VISTA SUBDIVISION	LAGUNA TRES SUBDIVISION	HOOD COUNTY (GW)		
LAKESHORE WATER SYSTEM 2	LAKESHORE WATER SYSTEM	HILL COUNTY (GW)		
LATHAM SPRINGS BAPTIST ENCAMPMENT	GHOLSON WSC	HILL & MCLENNAN COUNTY (GW)		
CITY OF LEANDER	CITY OF CEDAR PARK	LCRA-LAKE TRAVIS (SW)		
LEE COUNTY FWSD #1	LEE COUNTY WSC	LEE COUNTY (GW)		
LEON JUNCTION WSC	FLAT WSC	GATESVILLE (SW)		
LINCOLN WSC	LEE COUNTY WSC	LEE COUNTY (GW)		
CITY OF LORENA	CITY OF HEWITT	MCLENNAN COUNTY (GW)	WACO (SW)	LORENA (SW/GW)
LTG WSC	PURE WSC	MCLENNAN COUNTY (GW)		
MALLARD POINTE	CITY OF GRANBURY	LAKE GRANBURY (SW)	HOOD COUNTY (GW)	
MANVILLE WSC	130 REGIONAL WSC	EPCOR 130 PROJECT (GW)	BURLESON COUNTY (GW)	
MESA GRANDE WSC	CITY OF GRANBURY	LAKE GRANBURY (SW)	HOOD COUNTY (GW)	
METROPLEX HOMESTEADS WATER SUPPLY	JOHNSON COUNTY SUD	JOHNSON COUNTY (GW)	BRA-LAKE GRANBURY (SW)	MANSFIELD (SW)
CITY OF MEXIA	BISTONE MWSD	LIMESTONE COUNTY (GW)	LAKE MEXIA (SW)	
MINERVA WSC	SOUTHWEST MILAM WSC	MILAM COUNTY (GW)		
CITY OF MINGUS	CITY OF STRAWN	LAKE TUCKER (SW)		
CITY OF MOUNT CALM	BIROME WSC	HILL COUNTY (GW)		
MURRAY HILL WATER SYSTEM	HILL COUNTY WSC	AQUILLA WSD (SW)		
NOLAN COUNTY FWSD #1	CITY OF SWEETWATER	OAK CREEK LAKE, LAKES SWEETWATER & TRAMMELL (SW)	NOLAN COUNTY (GW)	
NORTH MILAM WSC	CITY OF CAMERON	LITTLE RIVER (SW)		
OAK HILL WATER SYSTEM	HILL COUNTY WSC	AQUILLA WSD (SW)		
OAKVIEW FARMS SUBDIVISION	BETHESDA WSC	FORT WORTH (SW)	JOHNSON COUNTY (GW)	
CITY OF OGLESBY	CORYELL CITY WSD	GATESVILLE (SW)		
PRAIRIE HILL WSC	EOL WSC	MCLENNAN COUNTY (GW)		
PURE WSC	LTG WSC	MCLENNAN COUNTY (GW)		

Table 7-8. Summary of Emergency Interconnects in the Brazos G Area

Emergency User [A]	Emergency Provider [B]	Provider's Sources [C]		
		Source #1	***Source #2***	***Source # 3***
RIDGE CREST ADDITION & MISTY HOLLOW	BETHESDA WSC	FORT WORTH (SW)	JOHNSON COUNTY (GW)	
CITY OF RIESEL	TRI COUNTY SUD	FALLS COUNTY (GW)	ROBERTSON COUNTY (GW)	
CITY OF RIO VISTA	JOHNSON COUNTY SUD	BRA-LAKE GRANBURY (SW)	MANSFIELD (SW)	JOHNSON COUNTY (GW)
RIVER COUNTRY ACRES	BRAZOS RIVER ACRES	HOOD COUNTY (GW)		
CITY OF ROCKDALE	SOUTHWEST MILAM WSC	MILAM COUNTY (GW)		
CITY OF ROGERS	BELL MILAM FALLS WSC	CENTRAL TEXAS WSC (SW)	BELL COUNTY (GW)	
CITY OF ROUND ROCK	CITY OF AUSTIN	LCRA-LAKE TRAVIS (SW)	LCRA-LAKE AUSTIN (SW)	
CITY OF ROUND ROCK	CITY OF GEORGETOWN	BRA-LAKE GEORGETOWN (SW)		
CITY OF ROUND ROCK (FUTURE)	CITY OF GEORGETOWN	LCRA-LAKE TRAVIS (SW)		
CITY OF ROUND ROCK (FUTURE)	CITY OF GEORGETOWN	LCRA-LAKE TRAVIS (SW)		
CITY OF ROUND ROCK	BRUSHY CREEK MUD	BRA-LAKE GEORGETOWN (SW)		
SHADY HILLS ESTATES WATER SYSTEM	BETHESDA WSC	FORT WORTH (SW)	JOHNSON COUNTY (GW)	
SHADY MEADOWS ESTATES	OAKVIEW FARMS SUBDIVISION	JOHNSON COUNTY (GW)		
SONTERRA MUD	JARRELL SCHWERTNER WSC	WILLIAMSON COUNTY (GW)	CENTRAL TEXAS WSC (SW)	SALADO WSC (GW)
SOUTH BOSQUE WSC	CITY OF WACO	LAKE WACO (SW)	MCLENNAN COUNTY (GW)	
SOUTH SAN GABRIEL RANCHES	HIGH GABRIEL WSC	WILLIAMSON COUNTY (GW)		
SOUTHWEST MILAM WSC	CITY OF ROCKDALE	MILAM COUNTY (GW)		
STEPHENS REGIONAL SUD	CITY OF BRECKENRIDGE	WEST CENTRAL TEXAS MWD (SW)	LAKE DANIELS (SW)	LAKE HUBBARD (SW)
SUNDANCE ADDITION	JOHNSON COUNTY SUD	MANSFIELD (SW)	BRA-LAKE GRANBURY (SW)	MANSFIELD (SW)
SYLVESTER MCCAULLEY WSC	CITY OF HAMLIN	ABILENE (SW)		
TEXAS A&M UNIVERSITY MAIN CAMPUS	CITY OF COLLEGE STATION	BRAZOS COUNTY (GW)		
CITY OF THROCKMORTON	FORT BELKNAP WSC	CITY OF GRAHAM (SW)		
TWIN CREEK SUBDIVISION	BETHESDA WSC	FORT WORTH (SW)	JOHNSON COUNTY (GW)	
CITY OF WACO	BLUEBONNET WSC	LAKE BELTON (SW)		
WELLBORN SUD	CITY OF BRYAN	BRAZOS COUNTY (GW)		
WELLBORN SUD	CITY OF COLLEGE STATION	BRAZOS COUNTY (GW)		

Table 7-8. Summary of Emergency Interconnects in the Brazos G Area

Emergency User [A]	Emergency Provider [B]	Provider's Sources [C]		
		Source #1	***Source #2***	***Source # 3***
WELLBORN SUD	TEXAS A&M UNIVERSITY MAIN CAMPUS	BRAZOS COUNTY (GW)		
WEST BELL COUNTY WSC	CITY OF KILLEEN	BELL COUNTY WCID 1 (SW)		
WEST BRAZOS WSC	CITY OF WACO	LAKE WACO (SW)	MCLENNAN COUNTY (GW)	
WESTERN HILLS	CITY OF GRANBURY	LAKE GRANBURY (SW)	HOOD COUNTY (GW)	
WESTSIDE RURAL WSC	BETHESDA WSC	FORT WORTH (SW)	JOHNSON COUNTY (GW)	
CITY OF WHITNEY	HILL COUNTY WSC	AQUILLA WSD (SW)		
WICKSON CREEK SUD	CITY OF BRYAN	BRAZOS COUNTY (GW)		
WICKSON CREEK SUD	WELLBORN SUD	NAVASOTA RIVER (SW)	BRAZOS (GW)	
WILLIAMSON COUNTY WSID 3	CITY OF ROUND ROCK	BRA-LAKE GEORGETOWN (SW)	WILLIAMSON COUNTY (GW)	
WORTH RANCH	PALO PINTO WSC	MINERAL WELLS (SW)		
*Emergency interconnect users/providers listed in TCEQ Drinking Water Watch Database; infrastructure details provided by email and/or via phone discussions.				

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7.4 Emergency Responses to Local Drought Conditions or Loss of Water Supply

As a result of the severe drought experienced during 2015 and 2016, the state water planning process encourages entities to plan for this potential emergency condition based on the drought of record. It is especially important for small entities that rely on a sole source of supply to have a back-up plan in case they experience a local drought, infrastructure/equipment failure or water supply contamination. Although many entities and WWPs have adopted DCPs, it is less common for the smaller municipalities or those included in County-Other to have these types of emergency plans in place.

All municipal WUGs in the region were evaluated regarding their potential emergency response to local drought conditions or loss of existing water supplies. Based on TWDB's template for this task, the emergency response alternatives included both temporary and/or permanent solutions. For the purpose of the evaluation, it was assumed that the entities being evaluated had approximately 180 days or less of water supply remaining. Municipal WUGs using groundwater supplies also considered implementing desalination of brackish groundwater, depending on the aquifers located in the area, as an alternative source of supply. MAG availability was not included in the analysis/alternative of drilling additional wells since the emergency supply would be used on a temporary basis. Municipal WUGs using surface water supplies were analyzed for curtailment of junior water rights and for releases from upstream reservoirs; additional yield availability was not analyzed for reservoir releases.

A high-level review and analysis were performed for (1) small WUGs having 2010 Census populations of less than 7,500 and relying on a sole source of water supply; and (2) all County-Other WUGs in the Brazos G Area regardless of population or number of sources. Several of the small WUGs are split by county, but it is the total WUG population that includes them on the list for having a total population of less than 7,500. If a WUG relied on surface water from an intake structure or a specific reservoir, then it was considered to have a sole source of supply, regardless of the number of contracts in place. A WUG that had a contract for purchasing treated water from Brazos River Authority (BRA) was not considered to have a sole source of supply due to BRA's system operations. WUGs using both groundwater and surface water supplies were not included in the evaluation, with the exception of County-Other entities.

Many of the WWPs in the Brazos G Area are also looking for ways to diversify their water supply portfolio in case a severe drought or loss of water supply; examples of water supply initiatives that have been identified or implemented are highlighted below.

Table 7-9. Alternative Water Supply Initiatives for WUG/WWPs in the Brazos G Area

WUG/WWP	Alternative Water Supply Initiative(s)
Bluebonnet WSC	Contracted with the Cities of Waco, Woodway and McGregor to construct a 16-inch diameter line/interconnect (serves both directions) as an alternative water supply source in case of an emergency.
Bistone MWD	Secured dual water supply sources, including Carrizo-Wilcox groundwater wells and water rights in Lake Mexia.
Bell County WCID No. 1	In the process of constructing a new water treatment plant at Lake Stillhouse and will tie it into their Lake Belton water system in order to incorporate redundancy into their water supply.
Palo Pinto County MWD No. 1	Secured an alternative source from Hilltop Reservoir in case they experience high turbidity or contamination of their current water supplies (primarily blend and treat water from the Brazos River and Lake Palo Pinto); Hilltop Reservoir is located adjacent to the Palo Pinto County MWD No. 1 water treatment plant and provides an additional 90-day water supply in case of an emergency.
City of Bryan	Considering Gibbons Creek as an alternative surface water supply along with their Aquifer Storage and Recovery (ASR) project to diversify their groundwater portfolio.
West Central Texas MWD	Secured an additional source of supply, Possum Kingdom Reservoir, in case the District experiences severe drought or emergency conditions impacting their primary water supply from Lake Hubbard.
City of Stamford	Identified additional groundwater supplies from property owners located north of the city, as well as additional surface water supplies from Cedar Ridge Reservoir.
Central Texas WSC	Will be able to supplement and firm up their water supply as a result of the Lake Granger Augmentation Project.
North Central Texas MWA	Drilled nine wells in the Seymour Aquifer during 2015 to provide back-up groundwater supplies for the Authority.

A nearby entity that could provide supply in the case of an isolated incident was identified for each WUG and existing interconnects were noted based on information listed in the TCEQ database. For the small WUGs split by county, a nearby entity was identified for that particular county if possible. In addition, trucking in water was considered as a supply option under severe circumstances. A total of 197 WUG entries (including small WUGs split by county) were researched and analyzed using the TCEQ database, including 37 County-Other WUGs. Over twice as many WUG entries were evaluated during this planning cycle compared to the 2016 Brazos G Regional Water Plan; the results of this effort are summarized below in Table 7-10.

Table 7-10. Potential Emergency Water Supplies for Small and County-Other WUGs Facing Loss of Supply

Entity				Potential Emergency Water Supply Sources							Implementation Requirements			
Water User Group	County	2020 Population	2020 Demand (AF/yr)	Release From Upstream Reservoir	Curtailment of Upstream/Downstream Water Rights	Local Groundwater Well	Brackish Groundwater Desalination	Truck in Water	Supply from Nearby Entity	Existing Emergency Interconnect	Potential Entity Providing Supply	Other Local Entities Required to Participate/Coordinate	Emergency Agreements/Arrangements Already in Place?	Type of Infrastructure Required
BELL COUNTY-OTHER	BELL	5,166	870		X	X	X	X	X		KILLEEN			Well, Pipeline, Transportation
BARTLETT	BELL	827	158			X		X	X		HOLLAND			Well, Pipeline, Transportation
BELL COUNTY WCID 3	BELL	7,403	1,207					X	X		NOLANVILLE			Pipeline, Transportation
CENTRAL TEXAS COLLEGE DISTRICT	BELL	70	12					X	X		COPPERAS COVE			Pipeline, Transportation
DOG RIDGE WSC	BELL	5,211	724			X		X	X		HARKER HEIGHTS			Well, Pipeline, Transportation
ELM CREEK WSC	BELL	2,257	241			X		X	X		MOODY			Well, Pipeline, Transportation
HOLLAND	BELL	1,100	108			X		X	X		BARTLETT			Well, Pipeline, Transportation
JARRELL SCHWERTNER WSC	BELL	2,264	308		X	X		X	X	SONTERRA MUD	BRA-LONE STAR RWA			Well, Pipeline, Transportation

Table 7-10. Potential Emergency Water Supplies for Small and County-Other WUGs Facing Loss of Supply

Entity				Potential Emergency Water Supply Sources							Implementation Requirements			
Water User Group	County	2020 Population	2020 Demand (AF/yr)	Release From Upstream Reservoir	Curtailment of Upstream/Downstream Water Rights	Local Groundwater Well	Brackish Groundwater Desalination	Truck in Water	Supply from Nearby Entity	Existing Emergency Interconnect	Potential Entity Providing Supply	Other Local Entities Required to Participate/Coordinate	Emergency Agreements/Arrangements Already in Place?	Type of Infrastructure Required
MORGANS POINT RESORT	BELL	5,077	582		X	X		X	X		TEMPLE			Well, Pipeline, Transportation
ROGERS	BELL	1,343	177			X		X	X	BELL MILAM FALLS WSC	BELTON			Well, Pipeline, Transportation
THE GROVE WSC	BELL	1,218	177			X		X	X		MOODY			Well, Pipeline, Transportation
WEST BELL COUNTY WSC	BELL	4,911	758			X		X	X		KILLEEN			Well, Pipeline, Transportation
BOSQUE COUNTY-OTHER	BOSQUE	5,645	899			X		X	X		CLIFTON			Well, Pipeline, Transportation
CHILDRESS CREEK WSC	BOSQUE	2,226	343			X		X	X		CLIFTON			Well, Pipeline, Transportation
HIGHLAND PARK WSC	BOSQUE	415	118			X		X	X		CLIFTON			Well, Pipeline, Transportation
MUSTANG VALLEY WSC	BOSQUE	2,104	2,104			X		X	X		MERIDIAN			Well, Pipeline, Transportation
SMITH BEND WSC	BOSQUE	751	99			X		X	X		CLIFTON			Well, Pipeline, Transportation

Table 7-10. Potential Emergency Water Supplies for Small and County-Other WUGs Facing Loss of Supply

Entity				Potential Emergency Water Supply Sources							Implementation Requirements			
Water User Group	County	2020 Population	2020 Demand (AF/yr)	Release From Upstream Reservoir	Curtailment of Upstream/Downstream Water Rights	Local Groundwater Well	Brackish Groundwater Desalination	Truck in Water	Supply from Nearby Entity	Existing Emergency Interconnect	Potential Entity Providing Supply	Other Local Entities Required to Participate/Coordinate	Emergency Agreements/Arrangements Already in Place?	Type of Infrastructure Required
VALLEY MILLS	BOSQUE	1,370	267			X		X	X		CLIFTON			Well, Pipeline, Transportation
BRAZOS COUNTY-OTHER	BRAZOS	2,687	429			X	X	X	X		COLLEGE STATION			Well, Pipeline, Transportation
BURLESON COUNTY-OTHER	BURLESON	5,502	800			X	X	X	X		CALDWELL			Well, Pipeline, Transportation
CALDWELL	BURLESON	4,896	1,027			X		X	X		ROCKDALE			Well, Pipeline, Transportation
DEANVILLE WSC	BURLESON	3,186	411			X		X	X		CALDWELL			Well, Pipeline, Transportation
MILANO WSC	BURLESON	1,774	201			X		X	X		ROCKDALE			Well, Pipeline, Transportation
SNOOK	BURLESON	865	288			X	X	X	X		CALDWELL			Well, Pipeline, Transportation
SOMERVILLE	BURLESON	1,530	273			X	X	X	X		CALDWELL			Well, Pipeline, Transportation
CALLAHAN COUNTY-OTHER	CALLAHAN	2,887	267	X	X	X		X	X		CLYDE			Well, Pipeline, Transportation

Table 7-10. Potential Emergency Water Supplies for Small and County-Other WUGs Facing Loss of Supply

Entity				Potential Emergency Water Supply Sources							Implementation Requirements			
Water User Group	County	2020 Population	2020 Demand (AF/yr)	Release From Upstream Reservoir	Curtailment of Upstream/Downstream Water Rights	Local Groundwater Well	Brackish Groundwater Desalination	Truck in Water	Supply from Nearby Entity	Existing Emergency Interconnect	Potential Entity Providing Supply	Other Local Entities Required to Participate/Coordinate	Emergency Agreements/Arrangements Already in Place?	Type of Infrastructure Required
CALLAHAN COUNTY WSC	CALLAHAN	2,097	179			X		X	X		CLYDE			Well, Pipeline, Transportation
CROSS PLAINS	CALLAHAN	1,134	193			X		X	X		CLYDE			Well, Pipeline, Transportation
POTOSI WSC	CALLAHAN	79	12			X		X	X		CLYDE			Well, Pipeline, Transportation
COMANCHE COUNTY-OTHER	COMANCHE	7,715	355	X	X	X		X	X		COMANCHE			Well, Pipeline, Transportation
COMANCHE	COMANCHE	4,491	520		X	X		X	X		DE LEON			Well, Pipeline, Transportation
DE LEON	COMANCHE	2,296	219		X	X		X	X		COMANCHE COUNTY WSC			Well, Pipeline, Transportation
CORYELL COUNTY-OTHER	CORYELL	2,474	614	X	X	X	X	X	X		COPPERAS COVE			Well, Pipeline, Transportation
CENTRAL TEXAS COLLEGE DISTRICT	CORYELL	710	120					X	X		COPPERAS COVE			Pipeline, Transportation
ELM CREEK WSC	CORYELL	395	42			X		X	X		OGLESBY			Well, Pipeline, Transportation

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FLAT WSC	CORYELL	467	100			X		X	X		GATESVILLE			Well, Pipeline, Transportation
FORT GATES WSC	CORYELL	1,913	380			X		X	X		GATESVILLE			Well, Pipeline, Transportation
MULTI-COUNTY WSC	CORYELL	2,445	236			X		X	X		GATESVILLE			Well, Pipeline, Transportation
MUSTANG VALLEY WSC	CORYELL	28	6			X		X	X		GATESVILLE			Well, Pipeline, Transportation
OGLESBY	CORYELL	645	53			X				CORYELL CITY WSD	GATESVILLE			Well, Pipeline, Transportation
THE GROVE WSC	CORYELL	181	26			X		X	X		OGLESBY			Well, Pipeline, Transportation
EASTLAND COUNTY-OTHER	EASTLAND	5,211	470	X	X	X		X	X		EASTLAND			Well, Pipeline, Transportation
CISCO	EASTLAND	4,108	729	X		X		X	X		EASTLAND			Well, Pipeline, Transportation
EASTLAND	EASTLAND	3,946	622	X		X		X	X		CISCO			Well, Pipeline, Transportation

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FORT GRIFFIN SUD	EASTLAND	12	2	X		X		X	X		CISCO			Well, Pipeline, Transportation
GORMAN	EASTLAND	1,082	94			X		X	X		CARBON			Well, Pipeline, Transportation
RISING STAR	EASTLAND	867	99			X		X	X		GORMAN			Well, Pipeline, Transportation
STAFF WSC	EASTLAND	1,269	128			X		X	X		GORMAN			Well, Pipeline, Transportation
STEPHENS REGIONAL SUD	EASTLAND	140	15	X		X		X	X	BRECKENRIDGE	EASTLAND			Well, Pipeline, Transportation
ERATH COUNTY-OTHER	ERATH	18,611	3,333		X	X		X	X		STEPHENVILLE			Well, Pipeline, Transportation
DUBLIN	ERATH	4,449	418		X	X		X	X		STEPHENVILLE			Well, Pipeline, Transportation
GORDON	ERATH	31	7		X	X		X	X		STEPHENVILLE			Well, Pipeline, Transportation
FALLS COUNTY-OTHER	FALLS	6,108	776		X	X	X	X	X		MARLIN			Well, Pipeline, Transportation

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CEGO-DURANGO WSC	FALLS	1,054	176			X		X	X		MARLIN			Well, Pipeline, Transportation
FISHER COUNTY-OTHER	FISHER	655	76			X	X	X	X		ROTAN			Well, Pipeline, Transportation
BITTER CREEK WSC SOUTH	FISHER	1,013	134			X	X	X	X		ROTAN			Well, Pipeline, Transportation
GRIMES COUNTY-OTHER	GRIMES	8,833	1,251			X	X	X	X		NAVASOTA			Well, Pipeline, Transportation
NAVASOTA	GRIMES	7,529	1,474			X		X	X		COLLEGE STATION			Well, Pipeline, Transportation
TDCJ LUTHER UNITS	GRIMES	1,478	289			X	X	X	X		NAVASOTA			Well, Pipeline, Transportation
TDCJ W PACK UNIT	GRIMES	1,687	397			X	X	X	X		NAVASOTA			Well, Pipeline, Transportation
HAMILTON COUNTY-OTHER	HAMILTON	3,609	450			X		X	X		HAMILTON			Well, Pipeline, Transportation
HAMILTON	HAMILTON	2,991	512			X		X	X		MULTI COUNTY WSC			Well, Pipeline, Transportation

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HICO	HAMILTON	1,387	180			X		X	X		HAMILTON			Well, Pipeline, Transportation
MULTI COUNTY WSC	HAMILTON	575	55			X		X	X		HAMILTON			Well, Pipeline, Transportation
HASKELL COUNTY-OTHER	HASKELL	2,640	360		X	X	X	X	X		HASKELL			Well, Pipeline, Transportation
HASKELL	HASKELL	3,239	504			X	X	X	X		STAMFORD			Well, Pipeline, Transportation
STAMFORD	HASKELL	34	9			X	X	X	X		HASKELL			Well, Pipeline, Transportation
HILL COUNTY-OTHER	HILL	1,974	163	X	X	X	X	X	X		HILLSBORO			Well, Pipeline, Transportation
CHATT WSC	HILL	726	95			X		X	X		HILLSBORO			Well, Pipeline, Transportation
FILES VALLEY WSC	HILL	2,538	389			X		X	X		HILLSBORO			Well, Pipeline, Transportation
GHOLSON WSC	HILL	677	89			X	X	X	X		AQUILLA	X		Well, Pipeline, Transportation

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ITASCA	HILL	1,727	152			X		X	X		HILLSBORO			Well, Pipeline, Transportation
POST OAK SUD	HILL	898	66			X		X	X		HUBBARD			Well, Pipeline, Transportation
WHITNEY	HILL	2,570	492			X		X	X	HILL COUNTY WSC	AQUILLA			Well, Pipeline, Transportation
WOODROW-OSCEOLA WSC	HILL	3,406	311			X		X	X		HILLSBORO			Well, Pipeline, Transportation
HOOD COUNTY-OTHER	HOOD	25,280	798	X	X	X		X	X		GRANBURY			Well, Pipeline, Transportation
LIPAN	HOOD	946	115			X		X	X		GRANBURY			Well, Pipeline, Transportation
SANTO SUD	HOOD	55	7			X		X	X		GRANBURY			Well, Pipeline, Transportation
TOLAR	HOOD	1,026	143			X		X	X		GRANBURY			Well, Pipeline, Transportation
JOHNSON COUNTY-OTHER	JOHNSON	8,874	2,988	X	X	X		X	X		BURLESON			Well, Pipeline, Transportation

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GODLEY	JOHNSON	1,009	102			X		X	X	JOHNSON COUNTY SUD	CLEBURNE			Well, Pipeline, Transportation
GRANDVIEW	JOHNSON	1,755	182			X		X	X		ALVARADO			Well, Pipeline, Transportation
RIO VISTA	JOHNSON	1,117	154			X		X	X	JOHNSON COUNTY SUD	CLEBURNE			Well, Pipeline, Transportation
JONES COUNTY-OTHER	JONES	2,853	290	X	X	X	X	X	X		ABILENE			Well, Pipeline, Transportation
ANSON	JONES	2,565	365			X	X	X	X		STAMFORD			Well, Pipeline, Transportation
HAMLIN	JONES	2,254	423			X	X	X	X		STAMFORD			Well, Pipeline, Transportation
STAMFORD	JONES	3,305	840			X	X	X	X		ANSON			Well, Pipeline, Transportation
KENT COUNTY-OTHER	KENT	116	15			X	X	X	X		JAYTON			Well, Pipeline, Transportation
JAYTON	KENT	682	118			X	X	X	X		ASPERMONT			Well, Pipeline, Transportation

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KNOX COUNTY-OTHER	KNOX	1,255	139		X	X	X	X	X		MUNDAY			Well, Pipeline, Transportation
KNOX CITY	KNOX	1,147	237			X		X	X		MUNDAY			Well, Pipeline, Transportation
MUNDAY	KNOX	1,327	253			X		X	X		GOREE			Well, Pipeline, Transportation
LAMPASAS COUNTY-OTHER	LAMPASAS	1,119	206			X	X	X	X		LAMPASAS			Well, Pipeline, Transportation
LAMPASAS	LAMPASAS	7,852	1265			X		X	X		LOMETA	X		Well, Pipeline, Transportation
LEE COUNTY-OTHER	LEE	1,286	156			X	X	X	X		GIDDINGS			Well, Pipeline, Transportation
GIDDINGS	LEE	5,792	1154			X	X	X	X		THRALL			Well, Pipeline, Transportation
LEXINGTON	LEE	1,373	244			X		X	X		GIDDINGS			Well, Pipeline, Transportation
LIMESTONE COUNTY-OTHER	LIMESTONE	3,270	539	X	X	X	X	X	X		MEXIA			Well, Pipeline, Transportation

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GROESBECK	LIMESTONE	4,377	688	X	X			X	X		MEXIA			Pipeline, Transportation
MART	LIMESTONE	5	1			X	X	X	X		MEXIA	X		Well, Pipeline, Transportation
MEXIA	LIMESTONE	8,458	568			X		X	X	BISTONE MWD	SLC WSC			Well, Pipeline, Transportation
POST OAK SUD	LIMESTONE	152	11			X		X	X		TEHUACANA	X		Well, Pipeline, Transportation
PRAIRIE HILL WSC	LIMESTONE	846	140			X	X	X	X	EOL WSC	MEXIA	X		Well, Pipeline, Transportation
SLC WSC	LIMESTONE	1,229	107			X		X	X		MEXIA			Pipeline, Transportation
MCLENNAN COUNTY-OTHER	MCLENNAN	9,914	1,175	X	X	X		X	X		WACO			Well, Pipeline, Transportation
AXTELL WSC	MCLENNAN	1,378	166			X	X	X	X	EOL WSC	WACO	X		Well, Pipeline, Transportation
CHALK BLUFF WSC	MCLENNAN	2,646	268			X	X	X	X	ROSS WSC	WACO	X		Well, Pipeline, Transportation

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CRAWFORD	MCLENNAN	727	148		X	X		X	X		MCGREGOR			Well, Pipeline, Transportation
EAST CRAWFORD WSC	MCLENNAN	967	328			X		X	X		WOODWAY			Well, Pipeline, Transportation
ELM CREEK WSC	MCLENNAN	1,807	193			X		X	X		BRUCEVILLE-EDDY			
EOL WSC	MCLENNAN	1,894	231			X	X	X	X	AXTELL WSC & PRAIRIE HILL WSC	WACO	X		Well, Pipeline, Transportation
GHOLSON	MCLENNAN	1,760	232			X	X	X	X		WACO	X	X	Well, Pipeline, Transportation
H & H WSC	MCLENNAN	1,607	188			X	X	X	X		TRI COUNTY SUD	X		Well, Pipeline, Transportation
HIGHLAND PARK WSC	MCLENNAN	170	48			X		X	X		WACO, GHOLSON WSC			Well, Pipeline, Transportation
LACY LAKEVIEW	MCLENNAN	6,831	745			X		X	X		WACO			Well, Pipeline, Transportation
LEVI WSC	MCLENNAN	912	107			X		X	X		LORENA			

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MART	MCLENNAN	2,370	351			X	X	X	X		WACO	X		Well, Pipeline, Transportation
MCGREGOR	MCLENNAN	5234	801			X		X	X		MOODY			Well, Pipeline, Transportation
MCLENNAN COUNTY WCID 2	MCLENNAN	1762	273			X	X	X	X		WACO	X		Well, Pipeline, Transportation
NORTH BOSQUE WSC	MCLENNAN	2,229	566			X		X	X		WACO			Well, Pipeline, Transportation
PRAIRIE HILL WSC	MCLENNAN	611	101			X	X	X	X	EOL WSC	WACO	X		Well, Pipeline, Transportation
RIESEL	MCLENNAN	1,241	163			X	X	X	X	TRI COUNTY SUD	RMS WSC	X	X	Well, Pipeline, Transportation
TEXAS STATE TECHNICAL COLLEGE	MCLENNAN	579	888			X		X	X		LACY LAKEVIEW			
VALLEY MILLS	MCLENNAN	23	4			X		X	X		WACO			Well, Pipeline, Transportation
WINDSOR WATER	MCLENNAN	636	104			X		X	X		WOODWAY			Well, Pipeline, Transportation

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MILAM COUNTY-OTHER	MILAM	1,050	160		X		X	X	X		CAMERON			Pipeline, Transportation
CAMERON	MILAM	5,904	1363			X		X	X		MILANO WSC			Well, Pipeline, Transportation
MILANO WSC	MILAM	1,841	209			X		X	X		CAMERON			Well, Pipeline, Transportation
ROCKDALE	MILAM	6,004	1173			X		X	X	SOUTHWEST MILAM WSC	CAMERON			Well, Pipeline, Transportation
THORNDALE	MILAM	1,415	183			X		X	X		ROCKDALE			Well, Pipeline, Transportation
NOLAN COUNTY-OTHER	NOLAN	1,074	140		X	X		X	X		SWEETWATER			Well, Pipeline, Transportation
ROSCOE	NOLAN	1,402	199			X		X	X		SWEETWATER			Well, Pipeline, Transportation
BITTER CREEK WSC SOUTH	NOLAN	1,462	193			X		X	X		ROSCOE			Well, Pipeline, Transportation
PALO PINTO COUNTY-OTHER	PALO PINTO	3,021	92	X	X			X	X		MINERAL WELLS			Pipeline, Transportation
GORDON	PALO PINTO	636	140	X		X		X	X		STRAWN			

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LAKE PALO PINTO AREA WSC	PALO PINTO	1004	106	X				X	X		SANTO SUD			
NORTH RURAL WSC	PALO PINTO	1631	158	X	X			X	X		PALO PINTO WSC			
PALO PINTO WSC	PALO PINTO	864	115	X	X			X	X		NORTH RURAL WSC			
POSSUM KINGDOM WSC	PALO PINTO	1946	834	X	X			X	X		GRAFORD			
SANTO SUD	PALO PINTO	2028	254	X		X		X	X		GORDON			
SPORTSMANS WORLD MUD	PALO PINTO	123	122	X	X			X	X		PALO PINTO WSC			
STEPHENS REGIONAL SUD	PALO PINTO	43	5	X		X		X	X	BRECKENRIDGE	POSSUM KINGDOM WSC			
STRAWN	PALO PINTO	753	145	X	X			X	X		MINERAL WELLS			Pipeline, Transportation
STURDIVANT PROGRESS WSC	PALO PINTO	2,606	240	X	X			X	X		PALO PINTO WSC			
ROBERTSON COUNTY-OTHER	ROBERTSON	1,353	155			X	X	X	X		HEARNE			Well, Pipeline, Transportation

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BETHANY HEARNE WSC	ROBERTSON	323	43			X	X	X	X		CALVERT			
BREMOND	ROBERTSON	989	181			X	X	X	X	TRI COUNTY SUD	HEARNE			Well, Pipeline, Transportation
CALVERT	ROBERTSON	1,193	190			X	X	X	X		HEARNE			Well, Pipeline, Transportation
FRANKLIN	ROBERTSON	1,851	274			X	X	X	X		HEARNE			Well, Pipeline, Transportation
HEARNE	ROBERTSON	4,474	759			X	X	X	X		FRANKLIN			Well, Pipeline, Transportation
ROBERTSON COUNTY WSC	ROBERTSON	2,849	424			X	X	X	X		HEARNE			Well, Pipeline, Transportation
TWIN CREEK WSC	ROBERTSON	1,496	265			X	X	X	X		FRANKLIN			Well, Pipeline, Transportation
SHACKELFORD COUNTY-OTHER	SHACKELFORD	247	25	X	X			X	X		ALBANY			Pipeline, Transportation
CALLAHAN COUNTY WSC	SHACKELFORD	55	5	X		X		X	X		MORAN			

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FORT GRIFFIN SUD	SHACKELFORD	635	96	X		X		X	X		MORAN			
STEPHENS REGIONAL SUD	SHACKELFORD	16	2	X		X		X	X	BRECKENRIDGE	ALBANY			
SOMERVELL COUNTY-OTHER	SOMERVELL	5,289	644	X	X			X	X		GLEN ROSE			Pipeline, Transportation
GLEN ROSE	SOMERVELL	2,836	605			X		X	X		TOLAR			Well, Pipeline, Transportation
STEPHENS COUNTY-OTHER	STEPHENS	453	55			X		X	X		BRECKENRIDGE			Well, Pipeline, Transportation
FORT BELKNAP WSC	STEPHENS	50	6			X		X	X		BRECKENRIDGE			
FORT GRIFFIN SUD	STEPHENS	679	102	X		X		X	X		BRECKENRIDGE			
POSSUM KINGDOM WSC	STEPHENS	80	34	X	X			X	X		BRECKENRIDGE			
STAFF WSC	STEPHENS	415	42			X		X	X		BRECKENRIDGE			
STEPHENS REGIONAL SUD	STEPHENS	2,347	257	X		X		X	X	BRECKENRIDGE	ALBANY			

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STONEWALL COUNTY-OTHER	STONEWALL	576	70			X	X	X	X		ASPERMONT			Well, Pipeline, Transportation
TAYLOR COUNTY-OTHER	TAYLOR	5,769	573		X			X	X		ABILENE			Pipeline, Transportation
POTOSI WSC	TAYLOR	5,187	801			X		X	X		ABILENE			
STEAMBOAT MOUNTAIN WSC	TAYLOR	4,410	376			X		X	X		ABILENE			
TYE	TAYLOR	1,319	184			X		X	X		ABILENE			
VIEW CAPS WSC	TAYLOR	1,593	195			X		X	X		ABILENE			
THROCKMORTON COUNTY-OTHER	THROCKMORTON	317	99		X			X	X		THROCKMORTON			Pipeline, Transportation
FORT BELKNAP WSC	THROCKMORTON	185	20			X		X	X		THROCKMORTON			
FORT GRIFFIN SUD	THROCKMORTON	128	19	X		X		X	X		THROCKMORTON			
STEPHENS REGIONAL SUD	THROCKMORTON	155	17	X		X		X	X	BRECKENRIDGE	THROCKMORTON			
THROCKMORTON	THROCKMORTON	846	185		X			X	X	FORT BELKNAP WSC	GRAHAM			Pipeline, Transportation

Table 7-10. Potential Emergency Water Supplies for Small and County-Other WUGs Facing Loss of Supply

Entity				Potential Emergency Water Supply Sources							Implementation Requirements			
Water User Group	County	2020 Population	2020 Demand (AF/yr)	Release From Upstream Reservoir	Curtailment of Upstream/Downstream Water Rights	Local Groundwater Well	Brackish Groundwater Desalination	Truck in Water	Supply from Nearby Entity	Existing Emergency Interconnect	Potential Entity Providing Supply	Other Local Entities Required to Participate/Coordinate	Emergency Agreements/Arrangements Already in Place?	Type of Infrastructure Required
WASHINGTON COUNTY-OTHER	WASHINGTON	10,687	1,381			X	X	X	X		BRENHAM			Well, Pipeline, Transportation
CENTRAL WASHINGTON COUNTY WSC	WASHINGTON	1,990	254			X	X	X	X		BRENHAM			
CHAPPELL HILL WSC	WASHINGTON	922	141			X	X	X	X		BRENHAM			
WILLIAMSON COUNTY-OTHER	WILLIAMSON	39,226	5,376	X	X	X	X	X	X		ROUND ROCK			Well, Pipeline, Transportation
BARTLETT	WILLIAMSON	1,047	200			X	X	X	X		ROUND ROCK			Well, Pipeline, Transportation
BLOCK HOUSE MUD	WILLIAMSON	6,419	846			X		X	X	LEANDER	ROUND ROCK			
FERN BLUFF MUD	WILLIAMSON	5,793	1187			X		X	X		BRUSHY CREEK MUD			
FLORENCE	WILLIAMSON	1,357	1357			X		X	X	GEORGETOWN	ROUND ROCK		X	Well, Pipeline, Transportation
GRANGER	WILLIAMSON	1,551	209			X	X	X	X		ROUND ROCK		X	Well, Pipeline, Transportation

Table 7-10. Potential Emergency Water Supplies for Small and County-Other WUGs Facing Loss of Supply

Entity				Potential Emergency Water Supply Sources							Implementation Requirements			
Water User Group	County	2020 Population	2020 Demand (AF/yr)	Release From Upstream Reservoir	Curtailment of Upstream/Downstream Water Rights	Local Groundwater Well	Brackish Groundwater Desalination	Truck in Water	Supply from Nearby Entity	Existing Emergency Interconnect	Potential Entity Providing Supply	Other Local Entities Required to Participate/Coordinate	Emergency Agreements/Arrangements Already in Place?	Type of Infrastructure Required
JARRELL-SCHWERTNER WSC	WILLIAMSON	4786	650		X	X		X	X	SONTERRA MUD	GEORGETOWN			
PALOMA LAKE MUD 1	WILLIAMSON	2339	305			X		X	X		GEORGETOWN		X	Well, Pipeline, Transportation
PALOMA LAKE MUD 2	WILLIAMSON	2058	245			X		X	X		GEORGETOWN		X	Well, Pipeline, Transportation
THORNDALE	WILLIAMSON	3	0			X	X	X	X		ROUND ROCK		X	Well, Pipeline, Transportation
WALSH RANCH MUD	WILLIAMSON	714	199			X		X	X		BRUSHY CREEK MUD			
WILLIAMSON COUNTY MUD 10	WILLIAMSON	3,402	727			X		X	X		GEORGETOWN		X	Well, Pipeline, Transportation
WILLIAMSON COUNTY MUD 11	WILLIAMSON	4,074	820			X		X	X		GEORGETOWN		X	Well, Pipeline, Transportation
WILLIAMSON COUNTY MUD 9	WILLIAMSON	2,724	548			X		X	X		GEORGETOWN		X	Well, Pipeline, Transportation

Table 7-10. Potential Emergency Water Supplies for Small and County-Other WUGs Facing Loss of Supply

Entity				Potential Emergency Water Supply Sources							Implementation Requirements			
Water User Group	County	2020 Population	2020 Demand (AF/yr)	Release From Upstream Reservoir	Curtailment of Upstream/Downstream Water Rights	Local Groundwater Well	Brackish Groundwater Desalination	Truck in Water	Supply from Nearby Entity	Existing Emergency Interconnect	Potential Entity Providing Supply	Other Local Entities Required to Participate/Coordinate	Emergency Agreements/Arrangements Already in Place?	Type of Infrastructure Required
WILLIAMSON TRAVIS COUNTIES MUD 1	WILLIAMSON	4,596	598			X		X	X		GEORGETOWN		X	Well, Pipeline, Transportation
YOUNG COUNTY-OTHER	YOUNG	1,718	334		X	X		X	X		GRAHAM			Well, Pipeline, Transportation
FORT BELKNAP WSC	YOUNG	3,883	430			X		X	X		OLNEY	X		Well, Pipeline, Transportation

7.5 Region-Specific Drought Response Recommendations and Model Drought Contingency Plans

Brazos G acknowledges that DCPs are a useful drought management tool for entities with both surface and groundwater sources and recommends that all entitles consider adopting a DCP in preparation for drought conditions. The region also recommends that in accordance with TCEQ guidelines, entities update their DCPs every five years as triggers can change as wholesale and retail water providers reassess their contracts and supplies.

7.5.1 Drought Response Recommendations for Surface Water

Surface water accounts for approximately 75% of projected 2070 municipal supplies in Brazos G. Surface water supply is sold by more than 25 WUG/WWPs and comes from over 50 lakes and numerous river intakes. With such a variety of supply sources it is difficult to create a set of triggers and responses that fit the needs of each WUG in the regional planning area. Brazos G recognizes that supplies are understood best by the operators and suggests that WUGs without DCPs look to the DCPs of their water providers as examples, if available.

For entities without DCPs which supply themselves with local surface water, Brazos G suggests reviewing the drought responses and recommendations used by similar entities in the region. An example of triggers and responses from the DCP for the City of Waco is presented below (Table 7-11). Waco was selected as a representative example because they provide water to several entities throughout the Brazos G Area and rely on a single source of surface water, i.e., Lake Waco. The DCP includes four water stages ranging from “Water Alert” to “Water Crisis”. The triggers depend on parameters such as treatment plant use, storage levels, reservoir elevations, and system failures. The responses include categories ranging from home irrigation limits to commercial and industrial use reductions.

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Table 7-11. Waco Surface Water Drought Contingency Response

Drought Stage	Trigger	Actions	Goals
Stage 1 – MILD Water Shortage	• Lake Waco reservoir level decreases to 455 feet msl (about 72% of capacity) • Weather forecasts and streamflow conditions warrant restrictions, based on opinion of the city manager	Mandatory restrictions: • Limit water use to activities necessary to maintain public health, safety and welfare and any computer-controlled irrigation systems that incorporate evapotranspiration data in setting irrigation run times. • Monitor “excessive watering” and issue notifications to customers. “Excessive watering” defined as run-off extending greater than ten feet from the owner’s property, or washing or hosing down of buildings, sidewalks, driveways, patios, porches, parking surfaces or other paved surfaces. Criminal penalties do NOT apply during Stage 1.	• Reduction of previous 3-year average daily use by 1%
Stage 2 – MODERATE Water Shortage	• Lake Waco reservoir level decreases to 452 feet msl (about 60% capacity) • Inability to recover approximately 90 percent of water stored in all storage facilities within a 24-hour period • Weather forecasts and streamflow conditions warrant restrictions, based on opinion of the city manager	Mandatory restrictions: • Landscape irrigation and other outdoor water used limited to twice per week, with water days based on street address. Criminal penalties DO apply during Stage 2. Note: Watering of newly installed landscaping is exempt from Stage 2 for no more than one month from date of planting	• Reduction of previous 3-year average daily use by 5%
Stage 3 – SEVERE Water Shortage	• Lake Waco reservoir level decreases to 452 feet msl (about 60% capacity) • Weather forecasts and streamflow conditions warrant restrictions, based on opinion of the city manager • Total water available is determined to be less than a 24-month supply	Mandatory restrictions: • Landscape irrigation and other outdoor water used limited to once per week, with water days based on street address • Swimming pools, spas, ornamental ponds and fountains replenished by hand-held holes to maintain operational purposes only • Permitting of new swimming pools, hot tubs, spas, ponds and ornamental fountains prohibited. Facilities under construction at time of Stage 3 announcement may be completed and filled to 75% capacity • Excessive water run-off is prohibited. • Washing or hosing down of buildings, sidewalks, driveways, patios, porches, parking areas or other paved surfaces is prohibited. Note: Exemptions apply to commercial nurseries, certain commercial car washes, and golf courses using evapotranspiration data to set irrigation run times.	• Reduction of previous 3-year average daily use by 7%
Stage 4 – EMERGENCY Water Shortage	• Lake Waco reservoir level decreases to 445 feet msl (about 40% capacity) • City manager determines that catastrophically decreasing lake levels and/or delivery capabilities with an inability to recover to provide necessary services • Weather forecasts and streamflow conditions warrant restrictions, based on opinion of the city manager • Total water available is determined to be less than a 12-month supply	Mandatory restrictions: • Any and all outdoor/landscape water usage is prohibited, including all metered water users using the city’s public water supply • Water used for municipal purposes shall be limited to only those activities necessary to maintain the public health and safety • Use of water from fire hydrants is prohibited except for firefighting and other health and safety related activities	• Reduction of previous 3-year average daily use by 10%

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7.5.2 Drought Response Recommendations for Groundwater

Groundwater accounts for approximately 25 percent of projected 2070 municipal supplies. Entities in Brazos G use both brackish and non-brackish wells from over 15 aquifers or formations. With such a variety of supply sources it is difficult to create a set of triggers and responses that fit the needs of each WUG in the regional planning area. Brazos G recognizes that supplies are understood best by the operators and suggests that WUGs without DCPs look to the DCP's of their water providers and groundwater conservation districts as examples, if available.

For entities without DCPs supplying themselves with local groundwater, Brazos G suggests reviewing the drought responses and recommendations used by similar nearby entities. An example of triggers and responses from the DCP for the City of Thrall is presented below (Table 7-12). Thrall was selected as a representative example because they are a small WUG using local groundwater like many of the groundwater reliant WUGS who have not yet developed a DCP. The DCP includes four water stages ranging from "Mild" to "Water Emergency". The triggers depend on parameters such as season, ground storage levels, contamination, and system failures. The responses include categories ranging from residential irrigation limits to commercial and industrial use reductions. Note that Thrall is in the process of updating this DCP.

Table 7-12. Thrall Groundwater Drought Contingency Response

Drought Stage	Trigger	Actions
Stage I – MILD	Yearly: May 1st – September 30th.	• City reduces water main flushing • Voluntary limit on irrigation to 2 days a week at designated times • City of Thrall should adhere to Stage 2 restrictions below • Customers are requested to minimize or discontinue non-essential water use
Stage II – MODERATE	Ground Storage does not gain over 20ft.	• Mandatory limit on irrigation to 2 days a week at designated times or by hand held hose or 5 gallon bucket • Vehicle washing allowed only with hand held bucket or hose • Filling of pools or Jacuzzis limited to watering days/times • Non-circulating ponds or fountains are prohibited unless supporting aquatic life. • Use of water from fire hydrants shall be limited to firefighting activities or other activities necessary to maintain public health, safety and welfare. • All restaurants are prohibited from serving water unless requested • Non-essential uses are prohibited
Stage III – SEVERE	Ground Storage does not gain over 15 ft.	• All actions listed in Stage II • Irrigation limited to hand held hose or less than 5 gallons of faucet water is used during designated watering days and times. • The use of water for construction from designated hydrants under special permit is discontinued.

Table 7-12. Thrall Groundwater Drought Contingency Response

Drought Stage	Trigger	Actions
Stage IV – CRITICAL	Ground Storage does not gain over 10 ft	• All actions listed in Stages II and III • Only washing of mobile equipment in the critical interest of the public health or safety is allowed. Commercial car washes can be used during designated hours. • Filling of swimming pools or fountains is prohibited • No applications for new, additional or expanded water service infrastructure shall be approved
Stage V – EMERGENCY	• Infrastructure breaks • Contamination • System outage	• All actions described in previous stages • Irrigation of landscaped areas is absolutely prohibited • Use of water to wash any vehicle is absolutely prohibited

7.5.3 Model Drought Contingency Plans

TCEQ has prepared model drought contingency plans for wholesale and retail water suppliers and irrigation districts to provide guidance and suggestions to entities with regard to the preparation of drought contingency plans. Not all items in the model will apply to every system's situation, but the overall model can be used as a starting point for most entities. Brazos G suggests that the TCEQ Model DCPs should be used in conjunction with drought contingency measures such as those listed above for Waco and Thrall for entities wishing to develop a new DCP. The DCPs for Waco and Thrall can be found in Appendix J.

The TCEQ model drought contingency plans can be found on TCEQ's website at the following link:

https://www.tceq.texas.gov/permitting/water_rights/wr_technical-resources/contingency.html#additional

7.6 Drought Management WMS

The regional water plan is developed to meet projected water demands during a drought of severity equivalent to the drought of record. Brazos G sees the purpose of the planning as ensuring that sufficient supplies are available to meet future water demands. For this reason, drought management recommendations have not been made by Brazos G as a water management strategy for specific WUG needs. Reducing water demands during a drought as a defined water management strategy does not ensure that sufficient supplies will be available to meet the projected water demands; but simply eliminates the demands. While Brazos G encourages entities in the region to promote demand management during a drought, it should not be identified as a "new source" of supply. Recommending demand reductions as a water management strategy is antithetical to the concept of planning to meet projected water demands. It does not make more efficient use of existing supplies as does conservation, but instead effectively turns the tap off when the water is needed most. It is planning to not meet future water demands.

While Drought Management WMS are not recommended as water management strategies by the BGRWPG, DCPs are encouraged for all entities and the region supports the implementation of the drought responses outlined in these DCPs when corresponding triggers occur. While the relief provided from these DCP responses can prolong supply and reduce impacts to communities, they are not considered to be reliable for all entities under all potential droughts.

7.7 Drought Preparedness Council Report

The Drought Preparedness Council provided a letter to the BGRWPG on August 1, 2019. In this letter, the Council offered two recommendations to Brazos G:

1. "Follow the outline template for Chapter 7 provided to the regions by Texas Water Development Board staff in April of 2019, making an effort to fully address the assessment of current drought preparations and planned responses, as well as planned responses to local drought conditions or loss of municipal supply."

Brazos G Response: Brazos G has utilized the Chapter 7 template provided by TWDB staff, and has reviewed and summarized drought contingency plans in the Brazos G Area.

2. "Develop region-specific model drought contingency plans for all water use categories in the region that account for more than 10 percent of water demands in any decade over the 50-year planning horizon."

Brazos G Response: Municipal use represents between 36% and 50% of water use in the Brazos G Area. Brazos G has included two model drought contingency plans for municipal utilities.

Irrigation and Steam-electric power generation also represent more than 10% of water use in the Brazos G Area. Situations regarding water supply shortages caused by drought can vary widely across a regional water planning area as large and diverse as Brazos G. Therefore, no region-specific model drought contingency plan can be developed that would provide a useable set of recommended actions that would be applicable across the regional water planning area for irrigation or steam-electric water uses. Brazos G encourages local irrigators and operators of steam-electric generating facilities to evaluate the vulnerability of their individual water supplies and identify individual actions they should take when water supplies are reduced by drought.

7.8 Other Drought Recommendations

7.8.1 Model Updates

It is of upmost importance that regional water planning groups have the most up to date information available to make decisions. The Brazos G WAM is used to determine both the drought of record and the firm yield of reservoirs, but has not been updated in almost 20 years. The Brazos G Regional Water Planning Group appreciates that the Texas legislature has directed TCEQ to update the Brazos WAM.

7.8.2 Counterproductive Variations in Drought Response Strategies

Review of drought contingency plans in the Brazos G Area identified instances where:

1. Neighboring utilities relying on the same source utilize different drought triggers, and
2. Neighboring utilities relying on different sources utilize the same trigger due to the convenience of the media sources available from the larger market (usually smaller suburban communities following the lead of the larger urban community).

Both of these situations can be counterproductive during times of drought, and require education of utility customers regarding their source(s) of supply.

7.8.3 Recommendations to the Drought Preparedness Council

Brazos G offers no recommendations to the Drought Preparedness Council nor any recommendations regarding the State Drought Preparedness Plan.

7.8.4 Monitoring and Assessment

Brazos G recommends that all entities monitor the drought situation around the state and locally in order to prepare for and facilitate decisions. Several state and local agencies are monitoring and reporting on conditions with up to date information. More information can be found at these local, state and federal resources.

- Brazos River Authority Drought Information:

  https://www.brazos.org/About-Us/Water-Supply/Drought
- Palmer Drought Severity Index:

  http://www.ncdc.noaa.gov/temp-and-precip/drought/historical-palmers/
- TWDB Drought Information:

  http://waterdatafortexas.org/drought/
- TCEQ Drought Information:

  https://www.tceq.texas.gov/response/drought
- Drought Annex: State of Texas Emergency Management Plan (2014, updated 2016):

  https://waterdatafortexas.org/drought/twdb-reports/state_of_texas_drought_annex_2016.pdf
- National Drought Mitigation Center:

  https://drought.unl.edu/droughtplanning/StatePlanning.aspx?st=TX
- National Integrated Drought Information System:

  https://www.drought.gov/drought/states/texas