# CHAPTER 7

# DROUGHT RESPONSE INFORMATION, ACTIVITIES, AND RECOMMENDATIONS

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# 7 REGIONAL DROUGHT RESPONSE

Drought is a frequent and inevitable factor in the climate of Texas. The seven-year drought of record in the 1950s was a turning point in Texas history. Since then, Texas has faced numerous droughts, including the second worst and second-longest Statewide drought that began in August 2010 and lasted through October 2014. Widespread drought returned to much of the State in 2022, rivaling 2011 conditions and again illustrating drought's reoccurring threat to cause significant harm.

Therefore, it is vital to plan for the effect that droughts will have on the use, allocation and conservation of water in the State. Through the regional water planning process, requirements for drought management planning are found in Title 31 of the Texas Administrative Code (TAC), Part 10, Chapter 357, Subchapter D. Texas Statute reference §357.42 includes requirements regarding drought response information, activities, and recommendations. This chapter examines these specific requirements and identifies significant drought impacts within the Region.

# 7.1 DROUGHT OF RECORD IN THE PLATEAU REGION

The severity of the most recent drought significantly impacted the lives of water users, providers and water managers who were hard-pressed to find solutions to critical supply and demand issues. The severity of the impacts varied, but the overriding sense of urgency to create workable strategies and solutions was acknowledged and acted upon Statewide. Therefore, it is critical in this planning cycle to continue to address the impact that drought ~~is currently~~ has had and will continue to have on the future use, allocation and conservation of water in the State.

There are different types of drought that have been defined in various ways; however, these definitions fall into four primary categories: (1) meteorological, (2) agricultural, (3) hydrological and (4) socioeconomic drought. According to the American Meteorological Society, drought is a period of abnormally dry weather sufficiently long enough to cause a serious hydrological imbalance. ~~In the most general sense, drought is a deficiency of precipitation over an extended period of time, resulting in a water shortage for some activity, group or environmental purpose.~~ The State Drought Preparedness Plan provides more specific and detailed definitions and is located at the following link:

https://www.dps.texas.gov/dem/CouncilsCommittees/droughtCouncil/droughtPrepPlan.pdf.

Meteorological drought is quantified by how dry it is (for example, a rain deficit) compared to normal conditions as well as the duration of the dry period. This is typically a region-specific metric, since factors affecting meteorological drought can vary so much in different regions. This type of drought does not necessarily impact water supply.

Agricultural drought looks at the effects of meteorological drought in terms of agricultural impacts. For example, evapotranspiration, soil moisture and plant stress are measures of agricultural drought, which account for vulnerability of crops through the various growth stages. This type of drought often leads to drought disaster declarations and, in many cases, is an indicator of an impending hydrological drought.

Hydrological drought is measured in terms of effects on surface and subsurface waters, such as reservoir stage and capacity, stream flow or groundwater levels in wells. Hydrological drought is usually defined on a river-basin or watershed scale. Hydrological droughts typically lag behind meteorological and agricultural droughts because it takes more time for the evidence of basin-wide impacts to manifest. This type of drought typically always impacts water supplies and is the focus of the TWDB's water planning process.

Socioeconomic drought occurs when physical water needs affect the health, safety, and quality of life of the general public or when the drought affects the supply and demand of an economic product. An example of socioeconomic drought is when the demand for an economic product ~~The demand for an economic product~~ (such as hydroelectric power) exceeds supply due to a weather-related deficit. Typically, demand for a product increases with population growth and per capita consumptions, and supply increases due to efficiency technology and the construction of new water projects. If both are increasing, the rate of change between supply and demand determines the level of socioeconomic drought. ~~is the key.~~ However, regardless of the rate of change, when demand exceeds supply, vulnerability is magnified by water shortages during drought.

Several climatological drought indicators have been formulated in order to quantify drought. The Palmer Drought Severity Index (PDSI) was developed in 1965 and is currently used by many F~~f~~ederal and S~~s~~tate agencies. The PDSI attempts to measure the duration and intensity of the long-term drought-inducting

circulation patterns. Long-term drought is cumulative, so the intensity of drought during the current month is dependent on the current weather patterns plus the cumulative patterns of previous months.~~is a soil moisture index that works best in relatively large regions with uniform topography that don't experience extreme climate shifts~~. PDSI values can lag oncoming drought by several months. The PDSI quantifies drought using values ranging between ~~The TWDB uses the PDSI to monitor State drought conditions, which has values ranging between~~ -6.0 (driest) to 6.0 (wettest), and the TWDB uses the PDSI to monitor State drought conditions~~.~~ "Extreme drought" conditions have a PDSI between -6.0 and -4.0, and "severe drought" conditions have a PDSI between -3.99 and -3.0.

An accumulated area graph of the weekly PDSI categories for the Edwards Plateau Region of Texas is included as Figure 7-1. Since 2000, the Plateau Region experienced recurring extreme drought conditions in 2006-2007, ~~and~~ 2008-2009, 2011-2015, 2018-2019, and 2020-2024.

The Plateau Region experienced the longest sustained periods of extreme drought between November 2010 and May 2012, ~~and~~ between September 2012 and May 2015, and between November 2022 and January 2024.

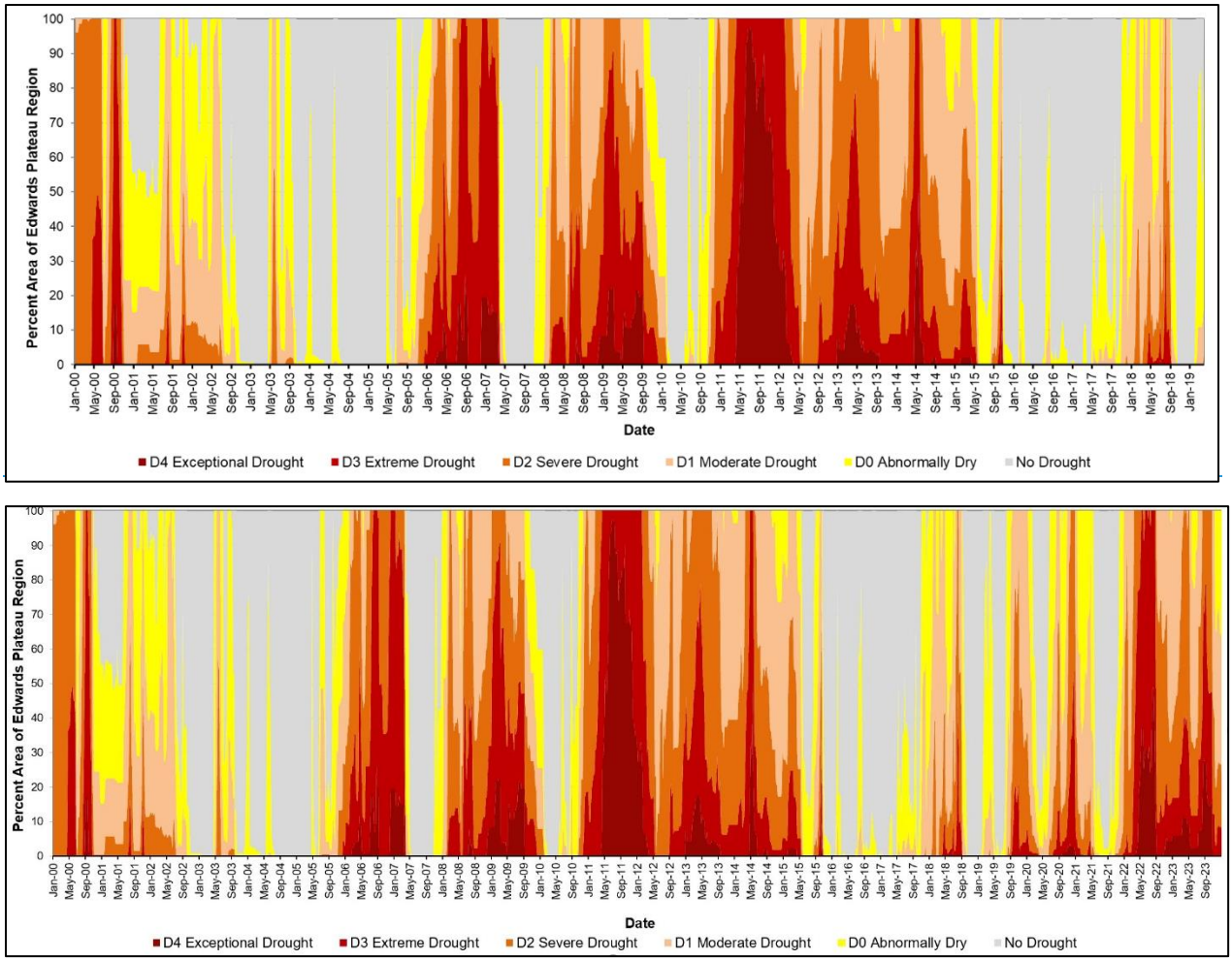



**Figure 7-1. Drought in the Edwards Plateau Region of Texas, 2000-~~2018~~2023**
Source: U.S. Drought Monitor

The climate of the Plateau Region is intermediate to the more humid climates of regions to the east and drier climates of regions to the west. The combination of high temperatures, high potential evapotranspiration and intermediate rainfall totals combine to produce a semi-arid climate with drought conditions during all or parts of some years (Bomar, 1995).

### 7.1.1 Precipitation Indicator

Although residents are generally accustomed to the highly variable climatic conditions typical of the Plateau Region, the relatively low rainfall and the accompanying high levels of evaporation underscore the necessity of developing plans that respond to potential disruptions in the supply of groundwater and surface water caused by drought conditions.

For this planning cycle, the drought of the 1950s is considered the drought of record (DOR). The DOR and ~~Comparing the 1950s DOR and the current~~ recent droughts can be compared ~~done~~ using historic precipitation, stream flow records, spring discharge and water level measurements in wells for locations that have accumulated data measurements since the 1940s.

Precipitation data for quadrangles 807 (west Plateau Region - portions of Edwards, Kinney and Val Verde Counties) and 808 (east Plateau Region - portions of Bandera, Kerr, Real, and Medina Counties) from 1940 through ~~2018~~2023 are shown on

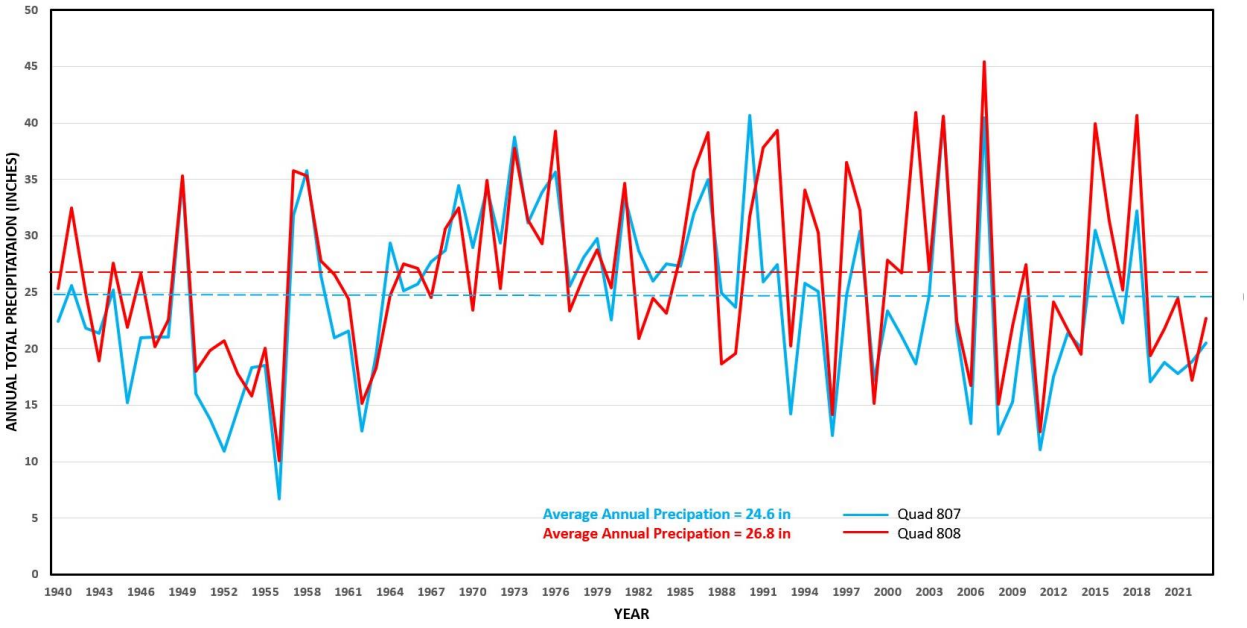



Figure **7-2**. Average annual rainfall for these quadrangles is 24.6 and 26.8 inches, respectively. These data indicate that the DOR in the 1950s was associated with seven years of below average rainfall (5-inch deficit per year). The ~~current~~ most recent drought indicates a trend toward below average annual rainfall between ~~2008~~2018 and ~~2015~~2023. Years with below average rainfall have a deficit of about 8 to 10 inches for the year.

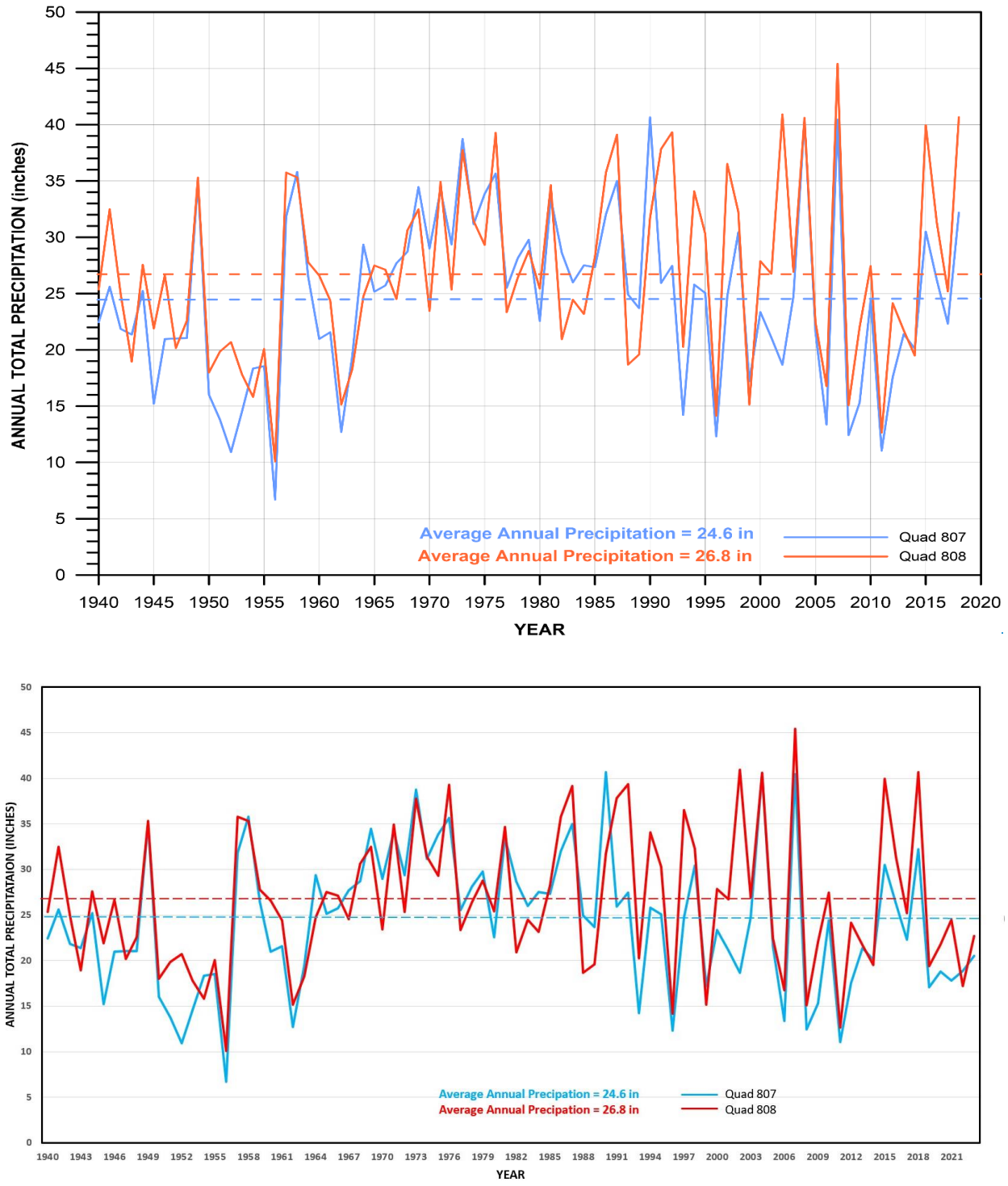



**Figure 7-2. Annual Precipitation, 1940-~~2013~~2023**
Source: TWDB

### 7.1.2 Stream Flow Indicator

The U.S. Geological Survey (USGS) has six stream gages located in or proximal to the Plateau Region that have flow data measurements extending back to 1943 (). Graphs of the annual mean daily discharge

(by calendar year) are presented with the average annual mean daily discharge, in cubic feet per second (cfs).

Some general comparisons can be made between the gaging stations during the DOR. It appears that the DOR affected stream flow in the Nueces River basin by 1950, whereas in the Frio and Guadalupe River basins, stream flow was not impacted until after 1950. Since the western counties in the Region average about 2 inches of rainfall less than the eastern counties, this impact lag is somewhat intuitive but worth noting, nonetheless. The stream flow data in the Frio, Sabinal and Guadalupe River basins illustrate this more readily than the gages located in the Nueces River basin. Additionally, the gaging data highlights the gradual decrease in stream flow that can be seen during the DOR in the 1950s compared to the sudden decrease of flow that is evident in the more recent flow data. These graphs show that recent stream flow in all river basins decreased suddenly compared to the DOR in the 1950s, and that the decreased flow occurred nearly simultaneously in all basins. Generally, it appears that the prolonged drought of 2022 ~~current drought~~ is having a more intense and rapid impact on stream flow; however, it is uncertain what portion of the decrease in stream flow can be attributed to a decrease in base flow due to increased groundwater pumping. Also, except for perhaps the West Nueces River gaging station near Brackettville (the most arid station location), there does not appear to be a historical decrease in flow since year 2000 as has been observed in the Upper Colorado River basin (

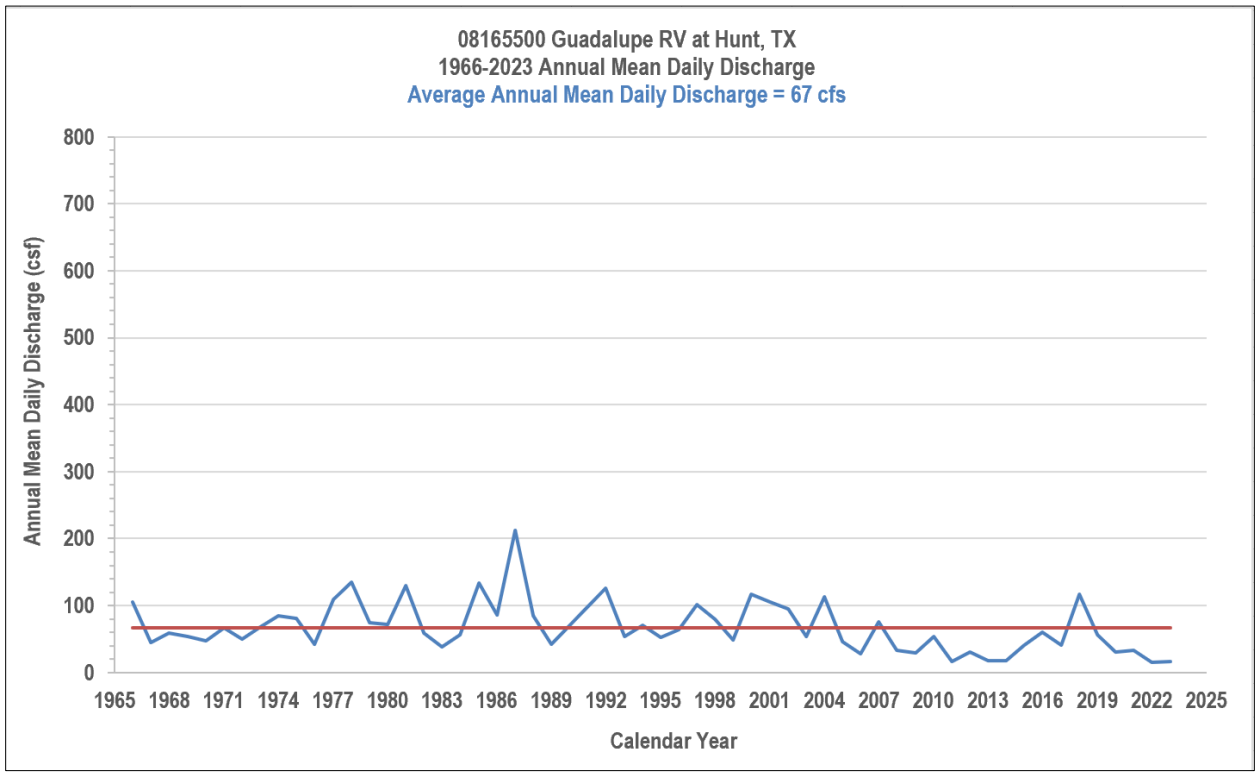
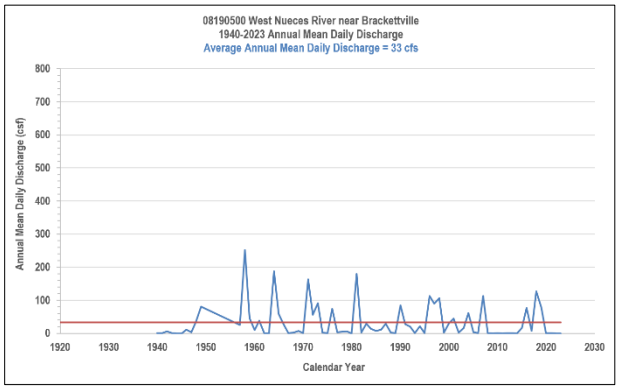
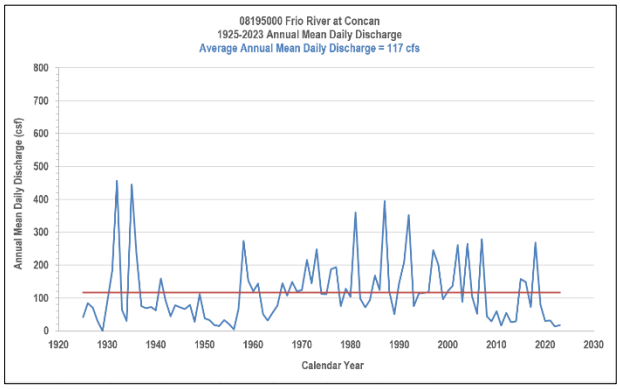
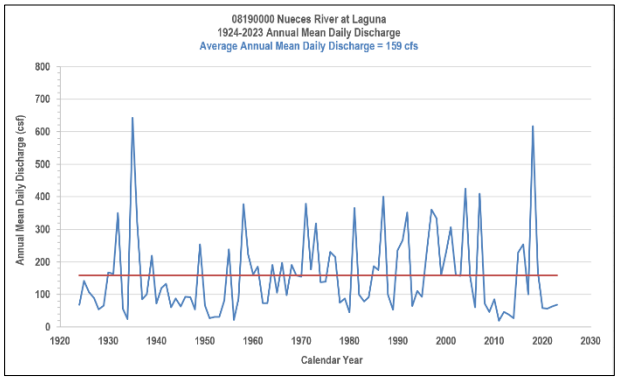
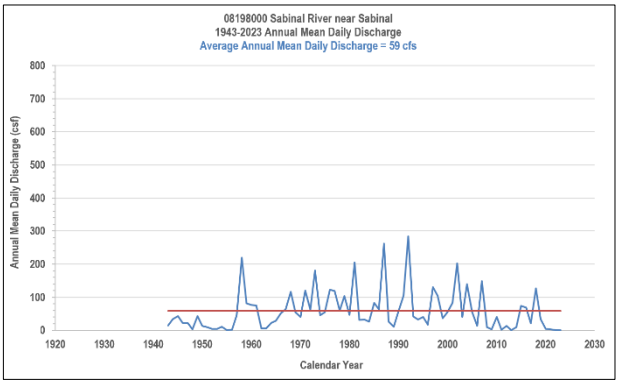



Figure 7-3).


08190500 West Nueces River near Brackettville
1940-2023 Annual Mean Daily Discharge
Average Annual Mean Daily Discharge = 33 cfs
Annual Mean Daily Discharge (csf)
Calendar Year


08195000 Frio River at Concan
1925-2023 Annual Mean Daily Discharge
Average Annual Mean Daily Discharge = 117 cfs
Annual Mean Daily Discharge (csf)
Calendar Year


08190000 Nueces River at Laguna
1924-2023 Annual Mean Daily Discharge
Average Annual Mean Daily Discharge = 159 cfs
Annual Mean Daily Discharge (csf)
Calendar Year


08198000 Sabinal River near Sabinal
1943-2023 Annual Mean Daily Discharge
Average Annual Mean Daily Discharge = 59 cfs
Annual Mean Daily Discharge (csf)
Calendar Year

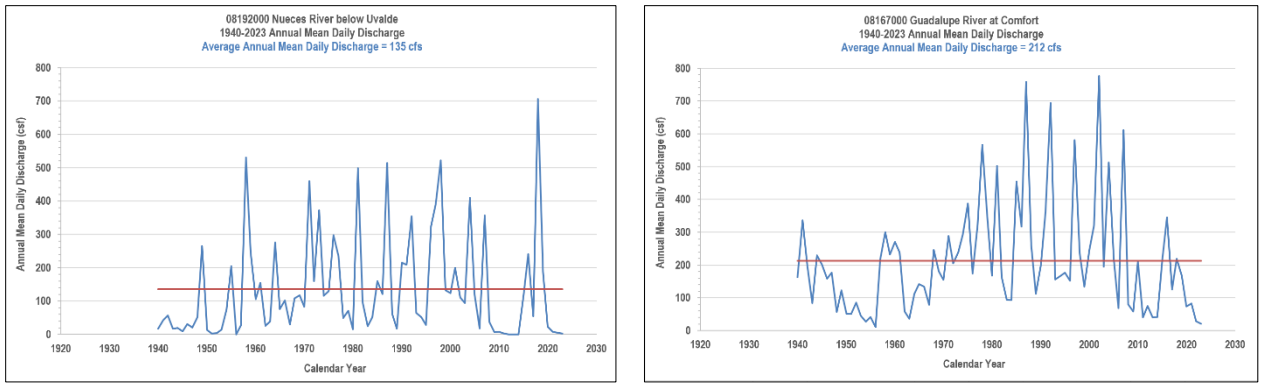
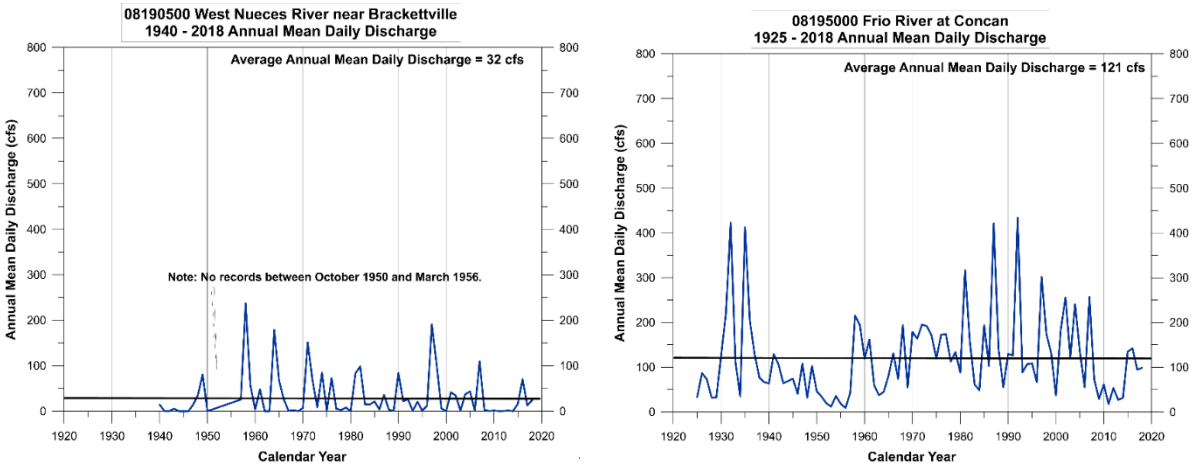
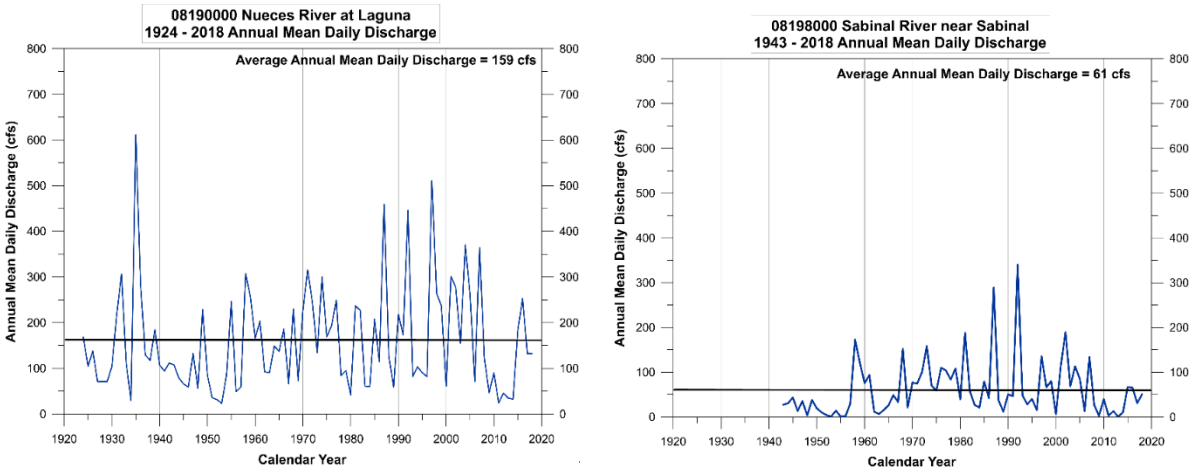
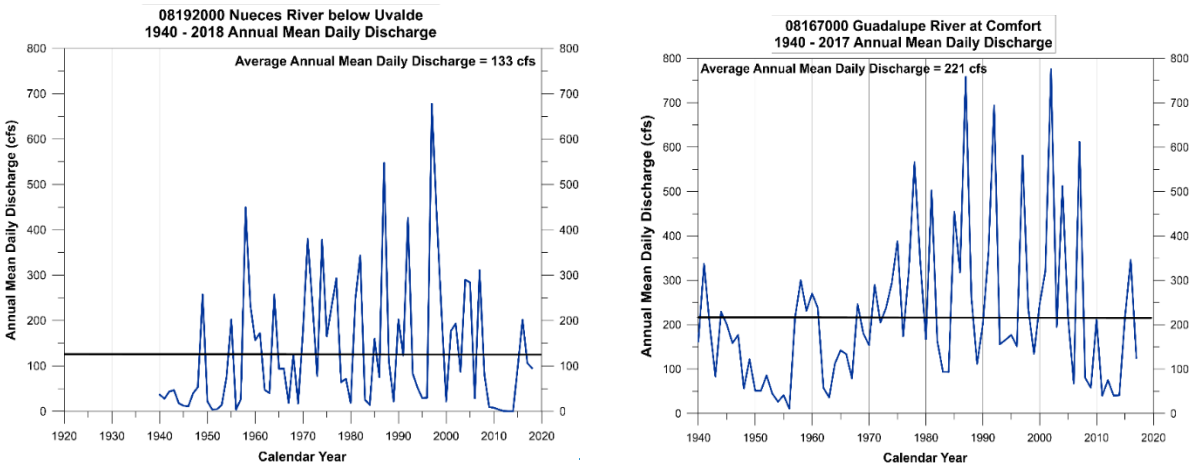


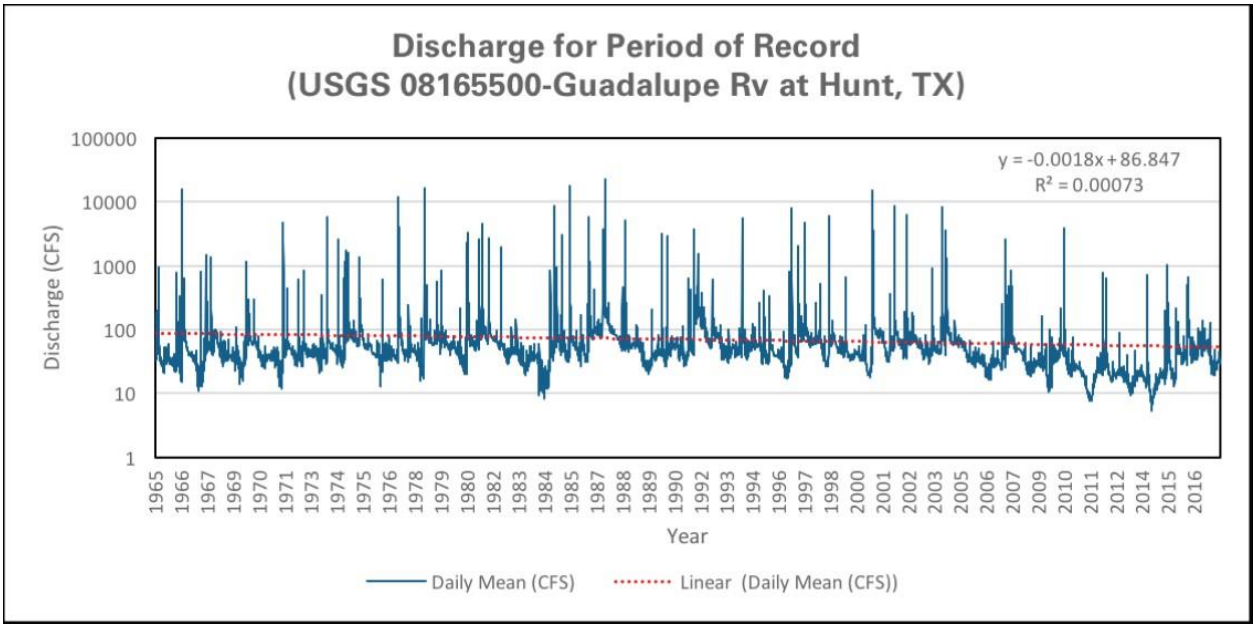

**Figure 7-3. Historic Streamflow Gaging Data (1925-2023)**
Source: USGS






**~~Figure 7-3. Historic Streamflow Gaging Data~~**
~~Source: USGS~~



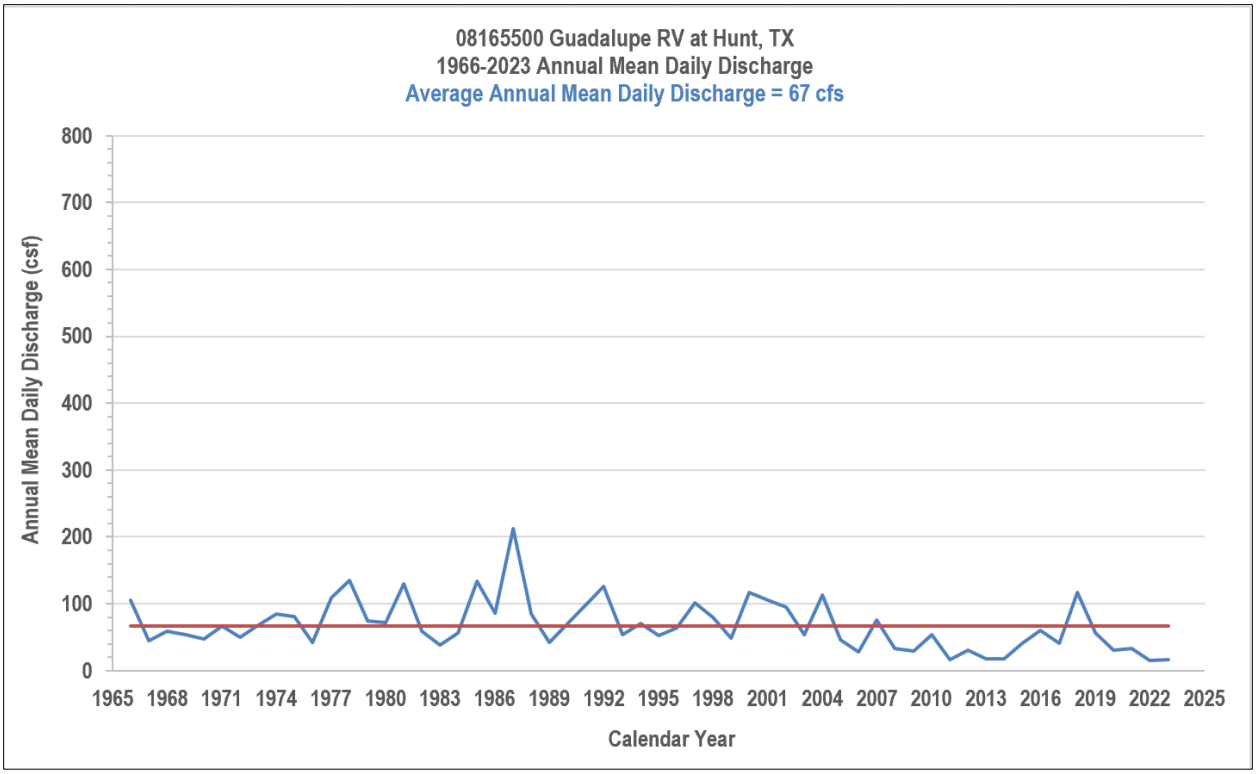




**Figure 7-3. Guadalupe River at Hunt Discharge (~~2000~~1965-~~2017~~2023).**
Source: ~~Meadows Center, 2019.~~USGS

### 7.1.3 Spring Discharge Indicator

Historic spring flow at USGS station 0846300 – Las Moras Springs at Brackettville, is available for years 1895 through ~~2014~~2023. ~~These~~ This data ~~are~~ is shown on

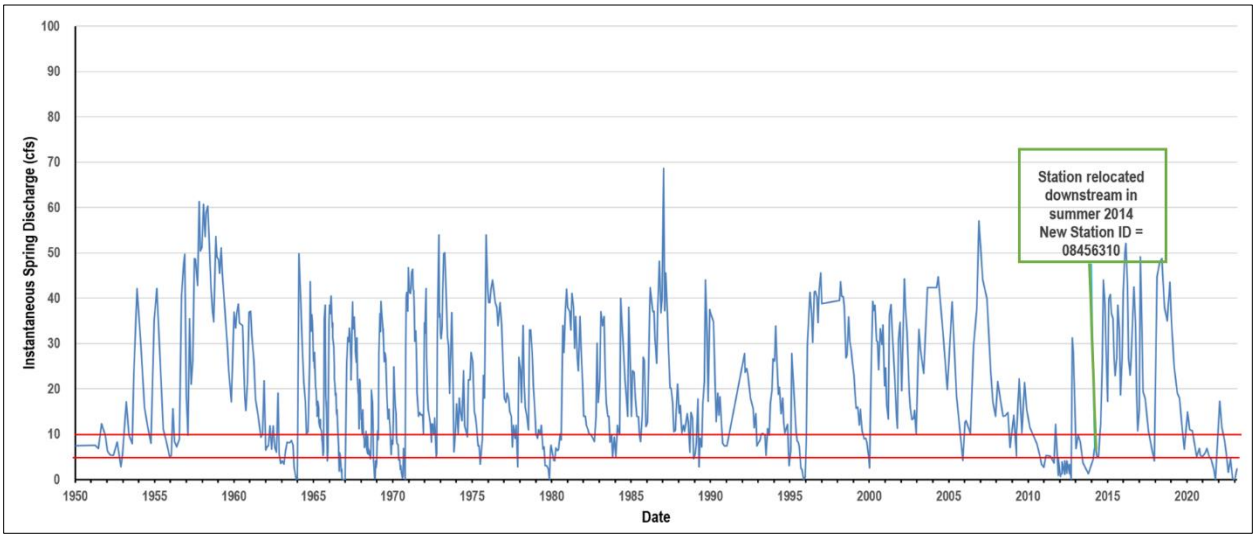



Figure **7-4**. The available data are instantaneous discharge measurements which do not necessarily occur on a regularly scheduled interval. Spring discharge has dropped below five cfs numerous times since 1952 (1953, 1956, 1963, 1964, 1966, 1967, 1969, 1971, 1976, 1978, 1980, 1989, 1995, 1996, 2000, 2006, 2011, 2012, ~~and~~ 2014, 2018, 2022, and 2023). The periods with flow less than five cfs typically lasted for up to 3 months. The only exception is a ten-month period between July 2012 and May 2013. A few zero measurements have also occurred (1964, 1967, 1971, ~~and~~ 1996, 2022 and 2023). Most of these occurrences appear to have lasted less than six weeks.

San Felipe Springs discharge data were not used because the construction of Lake Amistad in 1968 permanently affected the ~~s~~Spring discharge measurements and therefore comparison between the ~~current~~ most recent drought and the DOR would be difficult. According to the USGS webpage, San Felipe Springs (08452800) approved data is undergoing revisions at the monitoring location, making data collection impossible until further notice. ~~Flow at the springs has been greater than five cfs since October, 2014.~~

It is uncertain how much of the low flow at Las Moras can be attributed to the anthropological impacts on drought indicators, such as increased groundwater pumping due to drought conditions and increased demands since the 1950s.

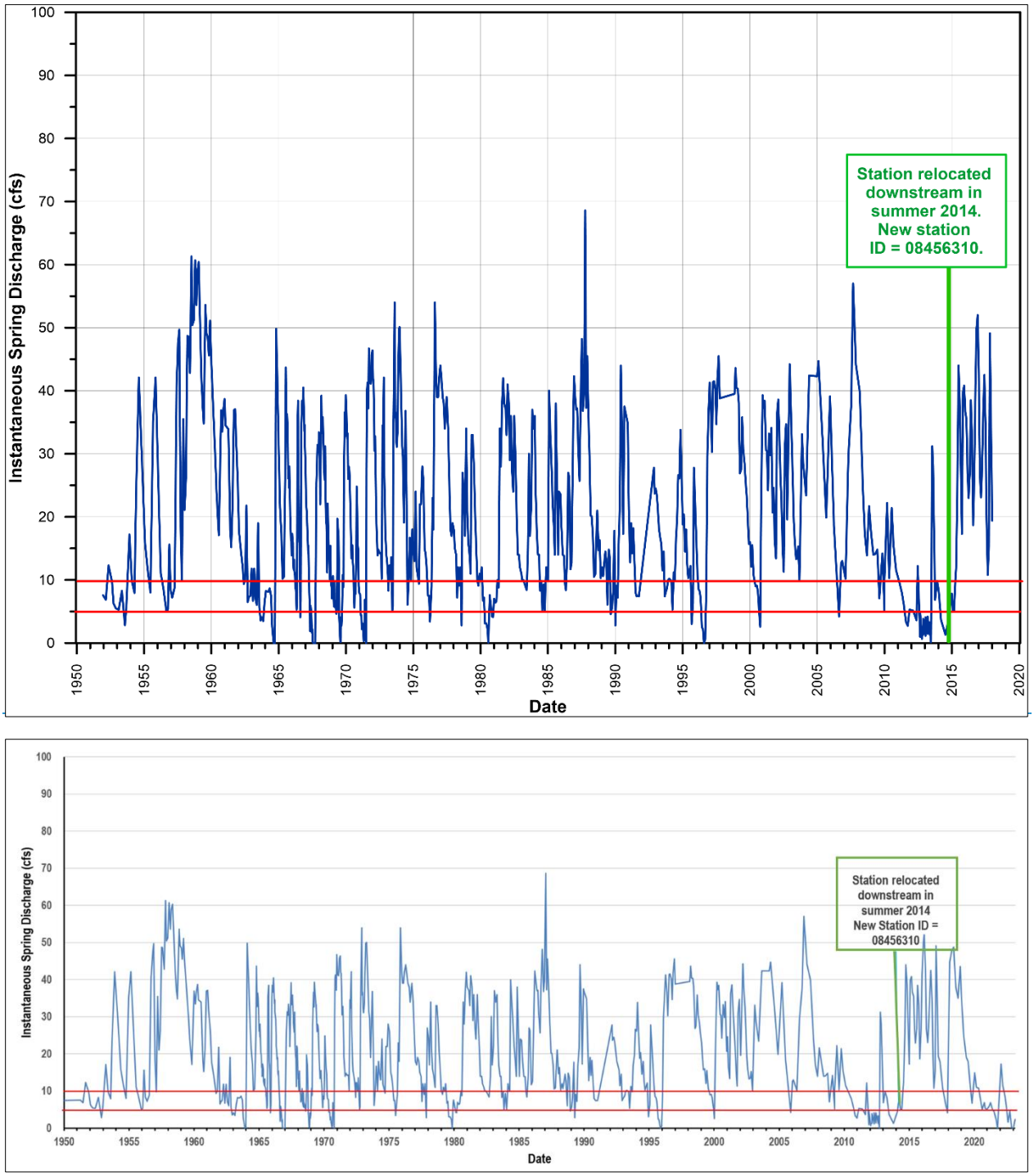



**Figure 7-4. Historic Discharge Measurements at Las Moras Springs**
Source: U.S. Geological Survey

### 7.1.4 Groundwater Level Indicator

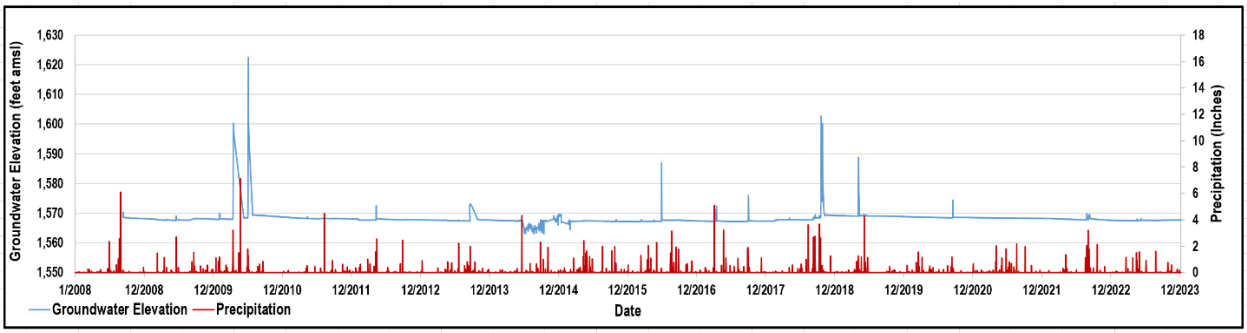



Figure **7-5** and

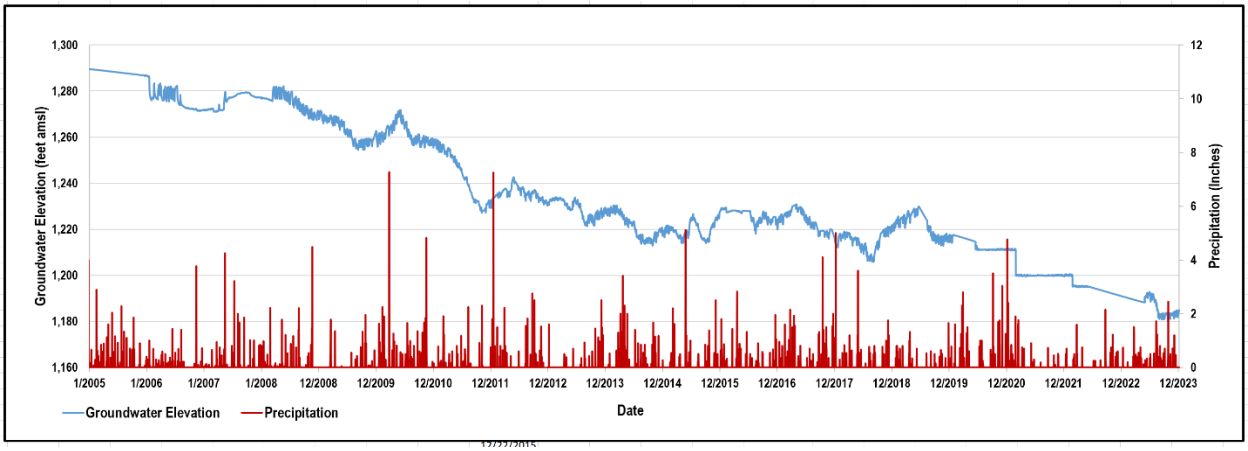



Figure **7-6** compare daily water level data from existing real-time monitoring wells with daily precipitation data from nearby NWS Cooperative Weather Stations to illustrate aquifer response to precipitation events.

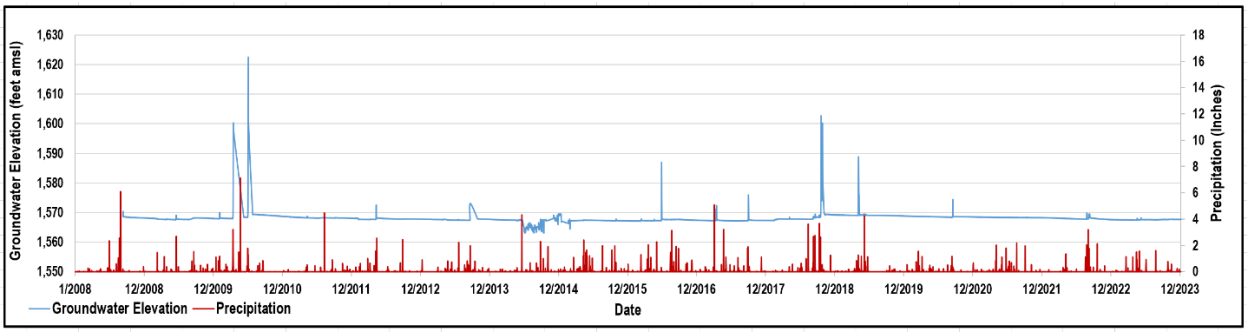



Figure **7-5** represents a well in the Edwards-Trinity (Plateau) Aquifer in Val Verde County. The data suggests that response time in the aquifer is quite rapid and occurs within a few days. Note that the water levels in the aquifer remain relatively constant, which suggests that there is not much competition for groundwater near this location. The recent severe drought does not appear to have affected water levels significantly at this location.

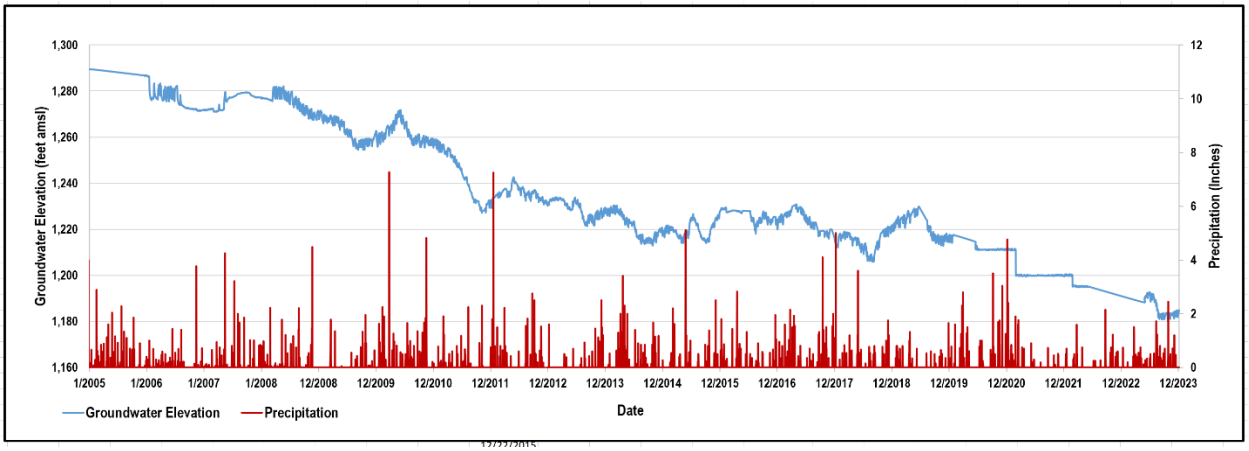



Figure **7-6** shows a well completed in the Trinity Aquifer in Real County near Leakey, Texas. The data suggests that response time in the Aquifer is quite rapid and occurs within a few days. Total water level decline in the well is over ~~80~~ 100 feet in a span of ~~thirteen~~ 18 years. This is likely due to both drought conditions and population growth which both contribute to increased pumping.

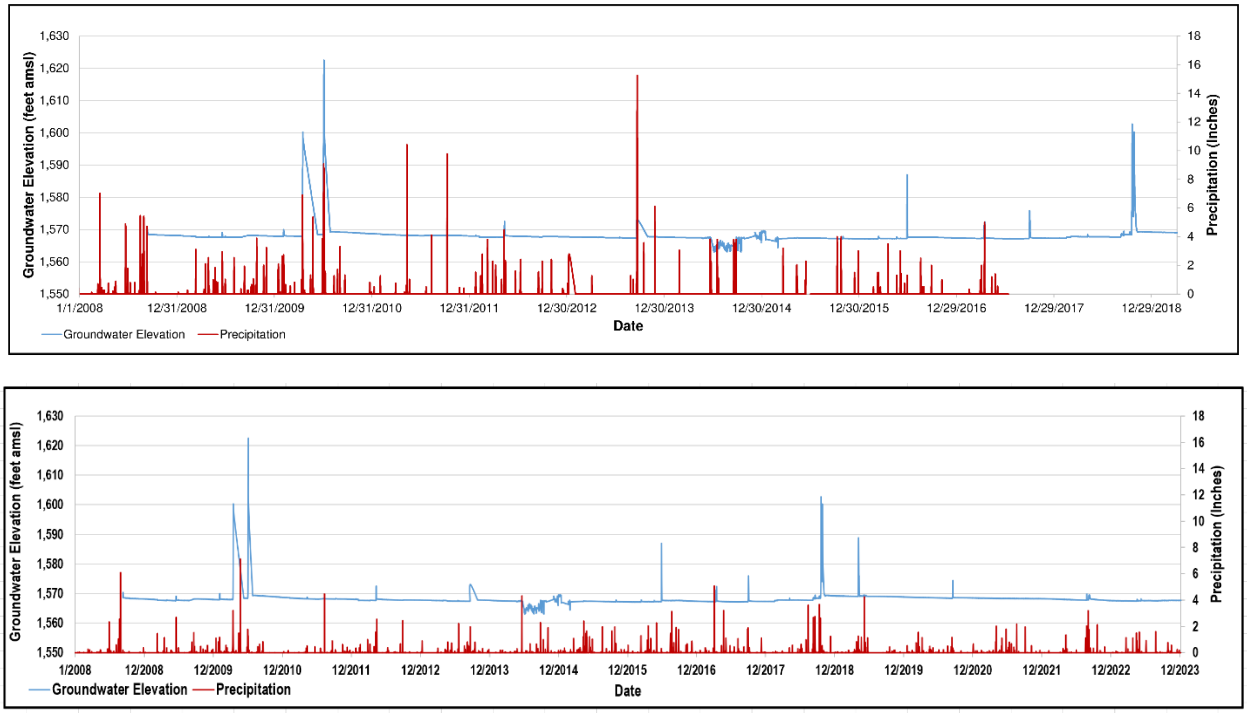



**Figure 7-5. Daily Groundwater Elevation and Daily Precipitation, Edwards-Trinity (Plateau), Val Verde County**

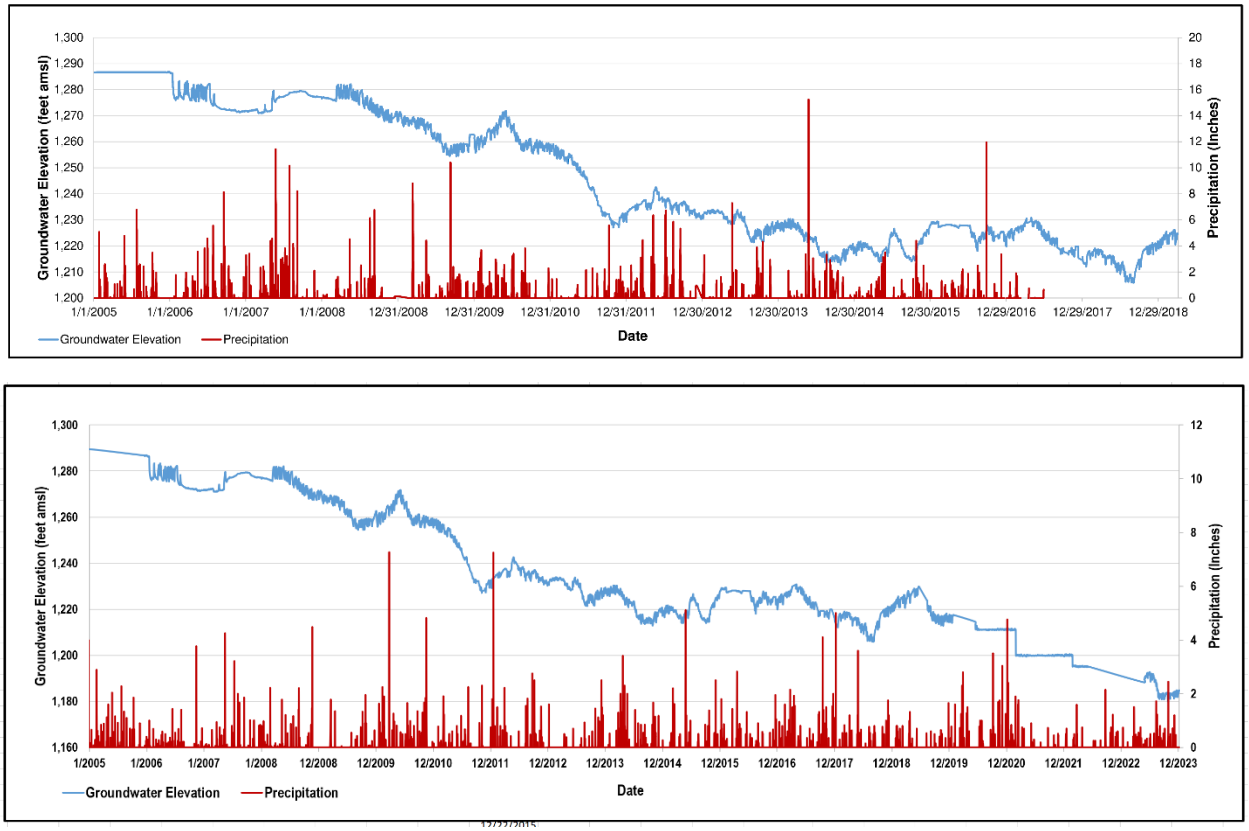



**Figure 7-6. Daily Groundwater Elevation and Daily Precipitation, Trinity Aquifer, Real County**

### 7.1.5 Plateau Region Drought of Record

For this planning cycle, the drought of the 1950s is declared the Drought of Record.

The catalyst for the recent drought can be attributed primarily to rainfall deficit (meteorological drought). The hydrological drought that has occurred because of rainfall deficit is evident in the decrease in stream flow and spring discharge data that has been presented. However, the greatest unknown factor that these data collectively point to is the impact that can be attributed to anthropological factors.

The hydrological drought (impact on surface waters and groundwater) is a result of both meteorological and socioeconomic drought. To reiterate, socioeconomic drought occurs when physical water needs affect the health, safety, and quality of life of the general public or when the drought affects the supply and demand of an economic product. An example of socioeconomic drought is when the demand for an economic product (such as hydroelectric power) ~~demand~~ exceeds supply due to a weather-related deficit. Typically, demand for a product increases with population growth and per capita consumptions, and supply increases due to efficiency technology and the construction of new water projects. If both are increasing, the rate of change between supply and demand determines the level of socioeconomic drought. ~~is the key.~~ However, regardless of the rate of change, when demand exceeds supply, vulnerability is magnified by water shortages during drought.

In future planning cycles, the PWPG encourages studies to ~~it would be interesting to attempt to~~ quantify how much anthropological factors exacerbate drought severity. Suggested areas of investigation include base flow studies, sub-watershed scale water balance calculations, rainfall deficit quantification, and historical pumping.

## 7.2 CURRENT DROUGHT PREPARATIONS AND RESPONSE

As mandated by 31 TAC 357.42(a)&(b), this section of the ~~RWP~~ *Plan* summarizes and assesses all preparations and drought contingency plans (DCPs) that have been adopted by municipalities and GCDs within the Plateau Region. The summary includes ~~what~~ specific triggers ~~are~~ used to determine the onset of each defined drought stage and the associated response actions ~~that have been~~ developed by local entities to decrease water demand during the particular drought stage.

Because of the range of conditions that affected the more than 4,000 water utilities throughout the State in 1997, the Texas Legislature directed the TCEQ to adopt rules establishing common drought plan requirements for water suppliers. As a result, TCEQ requires all wholesale public water providers, retail public water suppliers serving 3,300 connections or more, and irrigation districts to submit drought contingency plans every five years. The deadline for these plans to be submitted to TCEQ was May 1, 2024. In addition, many GCDs also have DCPs that provide education and voluntary action recommendations.

Wholesale water providers and retail public water suppliers serving less than 3,300 connections are ~~now~~ required to prepare and ~~administer~~ adopt updated DCPs. ~~no later than May 1, 2014.~~ Plans are required to be made available for inspection upon request but are not required to be submitted to the TCEQ. Guidelines as to what should be included in each drought contingency plan can be found on TCEQ's website. at the following link: https://www.tceq.texas.gov/permitting/water_rights/wr_technical-resources/contingency.html

DCPs are intended to establish criteria to identify when water supplies may be threatened and the actions that should be taken to ensure these potential threats are minimized. A common feature of drought contingency plans is a structure that allows increasingly stringent drought response measures to be implemented in successive stages as water supply decreases and water demand increases. This measured or gradual approach allows for timely and appropriate action as a water shortage develops. The onset and termination of each implementation stage should be defined by specific "triggering" criteria. Triggering criteria are intended to ensure that: 1) timely action is taken in response to a developing situation, and 2) the response is appropriate to the level of severity of the situation. Each water-supply entity is responsible for establishing its own DCP that includes appropriate triggering criteria and responses.

Figure 7-1 illustrates that drought conditions during this current planning period (~~2016-2020~~ 2021-2025) were ~~less~~ more severe than during the previous planning period (~~2011-2015~~ 2016-2020). As a result, water utilities and conservation districts implemented ~~less~~ stringent measures during this recent period. Most entities declared severe or critical stages of drought ~~no more than a low drought condition with voluntary restrictions~~ throughout the warmer/dryer part of ~~the year~~ 2024. Four public water supply systems were reported by TCEQ to have less than 100-day water supply in August of 2024. These systems escalated to an emergency state of drought. Fort Clark Springs MUD is the only system of the four that has recently reverted back to a moderate condition. Systems within Bandera County are still experiencing extreme drought conditions. ~~and escalating to moderate drought declarations during the dryer than normal summer months of 2018.~~ The Bandera County River Authority and Groundwater District has moved to a 40% reduction in pumping and continues to monitor water levels within the aquifers. ~~did resort to a severe declaration from December 2019 through January 2020 but is currently back to a moderate condition.~~

### 7.2.1 Drought Response Triggers

Drought response triggers should be specific to each water supplier and should be based on an assessment of the water user's vulnerability. In some cases, it may be more appropriate to establish triggers based on a supply source volumetric indicator such as a lake surface elevation or an aquifer static water level. Similarly, triggers might be based on supply levels remaining in an elevated or ground storage tank within the water distribution system; this is not a recommended approach, as the warning of supply depletion would be only three to four days. Triggers based on demand levels can also be effective, if the demands are very closely and frequently monitored. Whichever method is employed, trigger criteria should be defined on well-established relationships between the benchmark and historical experience. If historical observations have not been made, then common sense must prevail until such time that more specific data can be presented.

### 7.2.2 Surface Water Triggers

Surface water sources are among the first reliable indicators of the onset of hydrologic drought. Diminished spring discharge and stream flow, for example, can be monitored daily by city, county, and ~~s~~State agencies. Of interest, however, are the levels to which spring discharge and stream flow are reduced before the onset of drought is declared and appropriate response measures are initiated in the ~~r~~Region. Cities that rely exclusively on spring flow for municipal water are particularly vulnerable to drought-induced reductions in discharge, especially if alternative sources of supply have not been developed to make up potential shortfalls created by lower discharge. As an operating definition of hydrologic drought, it is recommended that reductions of spring discharge between 25 percent and 33 percent be considered effective hydrologic drought triggers in the Plateau Region.

### 7.2.3 Groundwater Triggers

Groundwater triggers that indicate the onset of drought are not as easily identified as factors related to surface-water systems. This is attributable to (1) the rapid response of stream discharge and reservoir storage to short-term changes in climatic conditions within a region and within adjoining areas where surface drainage originates, and (2) the typically slower response of groundwater systems to recharge processes. Although climatic conditions over a period of one or two years might have a significant impact on the availability of surface water, aquifers of the same area might not show comparable levels of response for much longer periods of time, depending on the location and size of recharge areas in a basin, the distribution of precipitation over recharge areas, the amount of recharge, and the extent to which aquifers are developed and exploited by major users of groundwater. However, karstic formations such as the Edwards-Trinity (Plateau) may produce rapid recharge rates in aquifers.

Except for the Trinity Aquifer of Bandera and Kerr Counties, all other aquifers in the rural counties are unlikely to experience significant water-level declines, based on comparisons between projected water demand, aquifer recharge and storage. In these areas, water levels are expected to remain constant or

relatively constant over the 50-year planning period (see

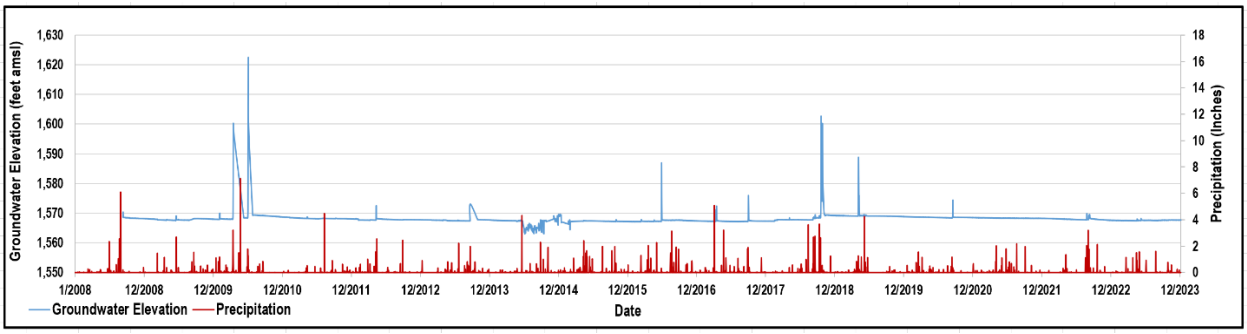



Figure **7-5**). Observation wells in major recharge areas and in areas adjacent to municipal well fields in the rural counties might provide a sufficient number of points to monitor water levels, provided that water-level measurements are made on a regular basis for long periods of time. Water levels below specified elevations for a pre-determined period might be interpreted to be reasonable groundwater indicators of drought conditions in any basin.

Basins that do not receive sufficient recharge to offset natural discharge and pumpage may be depleted of groundwater (e.g., mined). This is especially the case with the Trinity Aquifer of Bandera and Kerr Counties. The rate and extent of groundwater mining in any area are related to the timeframe and the extent to which withdrawals exceed recharge. In such basins, water levels may fall over long periods of time, eventually reaching a point at which the cost of lifting water to the surface becomes an economical concern. Thus, water levels in such areas may not be a satisfactory drought trigger. Instead, communities might consider the rate at which water levels decline in response to increased demand as a sufficient indicator of drought. Entities that utilize groundwater triggers include Bandera, Rocksprings, Ingram, Loma Vista Water Supply, Brackettville and Fort Clark Springs MUD.

### 7.2.4 System Capacity Triggers

Because of the above described problems with using water levels as drought-condition indicators, several municipal water-supply entities in the Plateau Region that rely on groundwater generally establish drought-condition triggers based on levels of demand that exceed a percentage of the systems' production capacity. Rocksprings, Ingram (Aqua Texas), Loma Vista Water System, Camp Wood, City of Del Rio and City of Kerrville utilize drought triggers that consider demand and system capacity components.

### 7.2.5 Municipal and Wholesale Water Provider Drought Contingency Plans

The TCEQ requires all retail public water suppliers serving 3,300 connections or more and wholesale public water providers to submit a drought contingency plan to prepare and respond to water shortages. The amended *Title 30, Texas Administrative Code, Chapter 288* became effective on December 6, 2012 addressing TCEQ's guidelines and plan requirements. The forms for wholesale public water providers, retail public water suppliers and irrigation districts are available at:

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

Drought contingency plans for municipal uses by public water suppliers must document coordination with the regional water planning groups to ensure consistency with the regional water plans. The following entities have prepared drought contingency plans:

- City of Bandera
- City of Kerrville
- City of Rocksprings
- City of Camp Wood
- ~~Wiedenfeld Water Works~~
- City of Ingram (Aqua Texas)
- Loma Vista Water System (Aqua Texas)
- City of Brackettville
- Fort Clark Springs Municipal Water District
- City of Del Rio (Wholesale Water Provider)
- City of Leakey

A list of entities, their supply source, specific triggers and actions, for each drought stage is provided in Table 7-1. A DCP was not provided to the Regional Planning Group by Laughlin AFB.

## Table 7-1. Municipal Mandated Drought Triggers and Actions

| Water Supply Entity | Water Supply Source | Drought Trigger | Drought Stage and Response | | | | |
|---|---|---|---|---|---|---|---|
| | | | Mild | Moderate | Severe | Critical | Emergency |
| City of Bandera | Trinity | Multi-stage drop in water levels in the Dallas Street Municipal Well. | Voluntary conservation May 1 - Sept 30. | Depth to water between 516 and 531 feet. | Depth to water between 532 and 546 feet. | Depth to water between 547 and 566 feet. | Depth to water below 567 feet, or system failure. |
| | | | Voluntary usage reduction. | Reduce demand by 20%. | Reduce demand by 35%. | Reduce demand by 50%. | Reduce demand by 90%. |
| City of Rocksprings | Edwards-Trinity (Plateau) | Based on a comparison of the daily water demand to the static water level of the Sharp Well (55-63-803). | Depth to water reaches 429 feet for 3 consecutive days. | Depth to water reaches 445 feet for 3 consecutive days. | Depth to water reaches 461 feet for 3 consecutive days. | N/A | Depth to water reaches 477 feet for 3 consecutive days. |
| | | | Reduce demand by 10%. | Reduce demand by 20%. | Reduce demand by 30%. | N/A | Notify state emergency response officials. |
| City of Kerrville | Upper Guadalupe River and Trinity Aquifer | Based on a comparison of demand and system's safe operating capacity, which is the maximum amount of water the city can safely deliver to the distribution system. Safe capacity is calculated using the following sources: 1) the WTP, 2) ASR, 3) City wells and 4) other potable sources. | Seven-day average demand exceeds 65% of the system's safe operating capacity. | Seven-day average demand exceeds 75% of the system's safe operating capacity. | Seven-day average demand exceeds 85% of the system's safe operating capacity. | Seven-day average demand exceeds 95% of the system's safe operating capacity. | Seven-day average demand exceeds 100% of the system's safe operating capacity. |
| | | | Implement landscape watering schedule; no operation of fountains/ponds. | Landscape watering with hand held hose only; non-essential water use prohibited. | No application for new, additional, or expanded water service connections. | Landscape watering with potable water prohibited. | Allocation of available water; notify state emergency response officials. |
| City of Ingram (Aqua Texas) | Trinity | Demand-based triggers include the following components: 1) percent of water treatment capacity, 2) total daily demand as percent of pumping capacity, 3) storage capacity (tank level) and 4) well pump run time. | Voluntary conservation late Spring and Summer. | 75%, tank level within 4 feet of low-level lockout, 16 hours. | 85%, tank level within 3 feet of low-level lockout, 20 hours. | 95%, tank level reaches low-level lockout, 22 hours. | |
| | | | Reduce demand by 5%. | Reduce demand by 10%. | Reduce demand by 20%. | Reduce demand by 40%. | N/A |

**Table 7-1. (Continued) Municipal Mandated Drought Triggers and Actions**

| Water Supply Entity | Water Supply Source | Drought Trigger | Drought Stage and Response | | | | |
|---|---|---|---|---|---|---|---|
| | | | Mild | Moderate | Severe | Critical | Emergency |
| City of Ingram (Aqua Texas) | Purchased supply | Supply-based triggers are utilized for systems Aqua provides water from either a district, authority or wholesale supplier. | Upon notification by district, authority, or wholesale supplier, Aqua may implement equivalent stage and restrictions. | | | | |
| City of Brackettville | Edwards-Trinity (Plateau) | Multi-stage drop in water levels in city well. | Depth to water reaches 50 feet or less while pumping (based on 10-day moving average). | Depth to water reaches 65 feet or less while pumping (based on 10-day moving average). | Depth to water reaches 85 feet or less while pumping (based on 10-day moving average). | Depth to water reaches 110 feet or less while pumping (based on 10-day moving average). | |
| | | | Reduce demand by 10%. | Reduce demand by 15%. | Reduce demand by 25%. | N/A | Notify state emergency response officials. |
| Fort Clark Springs Municipal Water District | Edwards-Trinity (Plateau) | Multi-stage drop in water levels in municipal well. | Depth to water reaches 25 feet or less while pumping (based on 10-day moving average). | Depth to water reaches 35 feet or less while pumping (based on 10-day moving average). | Depth to water reaches 50 feet or less while pumping (based on 10-day moving average). | Depth to water reaches 75 feet or less while pumping (based on 10-day moving average). | |
| | | | Voluntary - reduce demand by 10%. | Reduce demand by 15%. | Reduce demand by 25%. | N/A | Notify state emergency response officials. |
| City of Camp Wood | Spring flow from Edwards-Trinity (Plateau) | Base on system capacity limits. | Low distribution pressure for more than 6 hours. | Demand exceeds 70% of safe operating capacity (based on seven-day average). | Demand exceeds 80% of safe operating capacity (based on seven-day average). | Demand exceeds 90% of safe operating capacity (based on seven-day average). | Major system failures or supply contamination. |
| | | | Voluntary - reduce demand by 6%. | Reduce demand by 6%. | Reduce demand by 11%. | Reduce demand by 20%. | Reduce demand by 30%. |
| City of Leakey | Frio River Alluvium | | NO DCP | | | | |

**Table 7-1. (Continued) Municipal Mandated Drought Triggers and Actions**

| Water Supply Entity | Water Supply Source | Drought Trigger | Drought Stage and Response | | | | |
|---|---|---|---|---|---|---|---|
| | | | Mild | Moderate | Severe | Critical | Emergency |
| City of Del Rio | San Felipe Springs Edwards-Trinity (Plateau) | Water levels in Bedell Street Storage Reservoirs are less than a designated depth; San Felipe Spring flow drops below a specific flow rate. | Water levels are less than 100 % full; San Felipe Spring flow is less than 40 mgd. | Water levels are less than 30 feet; San Felipe Spring flow is less than 25 mgd. | Water levels are less than 25 feet; San Felipe Spring flow is less than 20 mgd. | Water levels are less than 20 feet; San Felipe Spring flow is less than 15 mgd. | Water levels are less than 15 feet; San Felipe Spring flow is less than 10 mgd. |
| | | | Reduce demand to 95% of the 30-day average prior to initiation. | Reduce demand to 90% of the 30-day average prior to initiation. | Reduce demand to 80% of the 30-day average prior to initiation. | Reduce demand to 70% of the 30-day average prior to initiation. | Notify state emergency response officials. |
| Wiedenfeld Water Works | Trinity (HGCD MW-7, HGCD MW-11, HGCD MW-ISD, Cedar Springs well, 169 Greenwood well, CCGCD Langford, and EAA J17 well). | Cumulative point system based upon water levels and daily pumping time (in minutes) in 7 different wells. Two if the wells monitor both upper and lower Trinity water levels. | | 3 points | 6 points | 8 points | |
| | | | N/A | Reduce non-essential & outdoor use by 50% of summer water use. | Elimination of non-essential & outdoor use. | Allocation of available water. | N/A |
| Loma Vista Water Supply (Aqua Texas) | Trinity | Demand-based triggers include the following components: 1) percent of water treatment capacity, 2) total daily demand as percent of pumping capacity, 3) storage capacity (tank level) and 4) well pump run time. | Voluntary conservation late Spring and Summer. | 75%, tank level within 4 feet of low-level lock out, 16 hours. | 85%, tank level within 3 feet of low-level lock out, 20 hours. | 95%, tank level reaches low-level lock out, 22 hours. | |
| | | | Reduce demand by 5%. | Reduce demand by 10%. | Reduce demand by 20%. | Reduce demand by 40%. | N/A |
| | Purchased supply | Supply-based triggers are utilized for systems Aqua provides water from either a district, authority or wholesale supplier. | Upon notification by district, authority, or wholesale supplier, Aqua may implement equivalent stage and restrictions. | | | | |

### 7.2.6 Groundwater Conservation District Drought Contingency Plans

A discussion of the creation and the goals of the four GCDs formed in the Plateau Region are discussed in more detail in Chapter 5, Section 5.3.7. This section will focus on summarizing drought management by the Districts.

Four districts are currently in operation within the planning region:

Bandera County River Authority and Groundwater District (http://bcragd.org)

Headwaters Groundwater Conservation District (Kerr County) (http://hgcd.org)

Kinney County Groundwater Conservation District (https://www.kinneycountygcd.org/)

Real-Edwards Conservation and Reclamation District (http://recrd.org)

Groundwater Conservation Districts are required to define management goals that specifically address drought conditions within their groundwater management plans. These are delineated via management objectives and performance standards. DCPs have also been adopted by three of the four GCDs in the Plateau Region. The following are the four District's drought management objectives.

#### 7.2.6.1 Bandera County River Authority and Groundwater District

**Management Objective 1** – Record the Palmer Drought Severity Index ~~once at the first of the~~ each month, post the drought stage and any appropriate drought restrictions outlined in the ~~and when drought conditions exist~~, ~~implement to~~ Drought Management Plan as adopted in ~~April 2009~~ October 2013.

**Management Objective 2** – Evaluate groundwater availability each year by monitoring water levels of the aquifer from ~~at least six~~ monitor wells ~~with continuous recorders~~ within Bandera County.

The District has implemented a drought management plan to aid in groundwater conservation and is designed to reduce pumpage of the aquifer during the different drought stages. The triggers and actions incorporated into the drought plan are summarized below. These five drought stages are mandated restrictions for permitted wells and recommended restrictions for exempt wells.

**Bandera County River Authority and Groundwater District**
**Drought Triggers and Actions**

| Stage & Description | 1 – Mild | 2 – Moderate | 3 – Severe | 4 – Extreme | 5 - Exceptional |
|---|---|---|---|---|---|
| Trigger | Stages are triggered by the U.S. Drought Monitor but can be adjusted at the discretion of the District when aquifer levels, rainfall and river flow conditions warrant. | | | | |
| Conservation Goal (percent reduction in pumpage) | 10% | 20% | 30% | 40% | 50% |

### 7.2.6.2 Headwaters Groundwater Conservation District

**Management Objective 1** – Monitor drought conditions by reviewing aquifer data monthly and declaring drought stages based on the District's defined drought triggers.

**Management Objective 2** – The District will monitor and consider the Lower Trinity drought index wells (HGCD Monitor Well #2, HGCD Monitor Well #18, COK Mack Holliman, and Aqua Texas Kelly Street, Center Point).

**Management Objective 3** – The District will also monitor and consider the Palmer Drought Severity Index (PDSI) and the Guadalupe River Flow Rate at Kerrville in initiating drought stages.

The District has implemented a drought management plan to aid in groundwater conservation and is designed to reduce pumpage of the aquifer during the different drought stages. The triggers and actions incorporated into the drought plan are summarized below.

**Headwaters Groundwater Conservation District Drought Triggers and Actions**

| Stage & Description | 1 – Mild | 2 – Moderate | 3 – Severe | 4 – Extreme |
|---|---|---|---|---|
| Trigger | 14~~10~~20 feet amsl | 14~~00~~10 feet amsl | ~~1390~~ 1400 feet amsl | 13~~80~~90 feet amsl |
| Conservation Goal (percent reduction in pumpage) | 10% | 20% | 30% | 40% |

The HGCD Drought Index Levels which are the average water level in four selected monitor wells (~~Stonehenge~~HGCD MW #5 Middle Trinity, HGCD MW # 7 Middle Trinity, HGCD MW #11 Middle Trinity, and County Agriculture Barn). ~~The District will also monitor and consider the Palmer Drought Severity Index (PDSI) and the Guadalupe River Flow Rate at Kerrville in initiating drought stages and notices of impending drought or extremely dry conditions.~~ Drought stages may be initiated at the discretion of the District depending on the ability of the City of Kerrville to draw surface water from the Guadalupe River.

These four drought stages invoke mandated restrictions for permitted wells and recommended restrictions for exempt wells.

### 7.2.6.3 Kinney County Groundwater Conservation District

**Management Objective** – Once a month, the District will download the latest drought information from the National Weather Service – Climate Prediction Center website. A report on the drought data obtained from the National Weather Service will be included in the regular monthly meeting agenda and retained in the meeting minutes kept at the District office.

### 7.2.6.4 Real-Edwards Conservation and Reclamation District

**Management Objective** – Curtailment of Groundwater Withdrawal. To accomplish this objective, the annual amount of groundwater permitted by the District for withdrawal from the portion of the aquifers located within the District may be curtailed during periods of extreme drought in the recharge zones of the aquifers or because of other conditions that cause significant declines in groundwater surface

elevations. Such curtailment may be triggered by the District's Board of Directors based on the groundwater elevation measured in the District's monitoring well(s) and/or stream flow measurements along with other indices such as rainfall and soil moisture. District staff currently monitors three locations along the Frio River and its tributaries and two locations on the Nueces River. A weir box will be placed on Old Faithful Spring and measurements will be routinely taken at that location. The triggers and actions incorporated into the drought plan are summarized below.

**Real-Edwards Conservation and Reclamation District Drought Triggers and Actions**

| Stage & Description | 1 – Mild | 2 – Moderate | 3 – Severe | 4 – Extreme |
|---|---|---|---|---|
| Trigger | PDSI -1 or less | PDSI -2 or less | PDSI -3 or less | PDSI -4 or less |
| Conservation Goal (percent reduction in pumpage) | Voluntary | 10% | 20% | 30% |

The Palmer Drought Severity Index, which is an index based on regional meteorological and hydrological data such as rainfall, temperature and soil moisture content will be used as the primary triggering criteria for the initiation and termination of the drought plan.

The four drought stages are mandated restrictions for permitted wells during stages 2, 3, and 4 and recommended restrictions for exempt wells.

## 7.3 EXISTING AND POTENTIAL EMERGENCY INTERCONNECTS

According to Texas Statute §357.42(d), (e) regional water planning groups are to collect information on existing major water infrastructure facilities that may be used in the event of an emergency shortage of water. Pertinent information includes identifying the potential user(s) of the interconnect, the potential supplier(s), the estimated potential volume of supply that could be provided, and a general description of the facility. Texas Water Code §16.053(c) requires information regarding facility locations to remain confidential. This section provides general information regarding existing and potential emergency interconnects among water user groups within the Plateau Region.

The RWPG is required to gather information pertinent to major water infrastructure facilities that are currently or could potentially be utilized during emergency water shortages. Major water infrastructure facilities within the Plateau Region were identified through a survey process to better evaluate existing and potentially feasible emergency interconnects. There are no existing emergency interconnects. There are only ~~two~~ three potential interconnects that have been identified within the Plateau Region in the current planning cycle, as shown below. With regard to the City of Leakey, the City has acquired a well that was once privately owned. This well is not currently being used by the City but would be added to the City's supply in a state of emergency.

**Potential Emergency Interconnects to Major Water Facilities**

| Entity Providing Supply | Entity Receiving Supply |
|---|---|
| City of Kerrville | Cherokee Mobile Home Park |
| City of Del Rio | Laughlin AFB and the Landings at Laughlin |
| City of Leakey | City of Leakey |

## 7.4 EMERGENCY RESPONSES TO LOCAL DROUGHT CONDITIONS OR LOSS OF MUNICIPAL SUPPLY

Texas Statute §357.42(~~g~~d) requires regional water planning groups to evaluate potential temporary emergency water supplies for all county-other WUGs and municipalities that have 2030 projected populations ~~with 2010 populations~~ less than 7,500 that rely on a sole source of water. The purpose of this evaluation is to identify potential alternative water sources that may be considered for temporary emergency use in the event that the existing water-supply sources become temporarily unavailable due to extreme hydrologic conditions such as emergency water right curtailment, unanticipated loss of reservoir conservation storage, or other localized drought impacts.

This section provides potential solutions that should act as a guide for municipal water users that are most vulnerable in the event of a loss of supply. Entities evaluated for emergency responses to local drought conditions or loss of municipal supply were assumed to have 180 days or less of remaining supply. This review was limited and did not require technical analyses or evaluations following in accordance with 31 TAC §357.34.

In the Plateau Region, there are ~~seven~~ 22 municipal and county-other WUGs that have a ~~2010~~ 2030 projected ~~Census~~ population of less than 7,500. Of those 22 WUGs, seven entities ~~and~~ rely upon a sole source of water. Six of the sole source WUGs rely on groundwater, and one WUG relies on surface water (City of Camp Wood).

Potential emergency water-supply sources that might be used by small sole-source municipal WUGs or county-other WUGs include the following:

- New local groundwater well
- Emergency interconnect
- Use of other named local supply
- Trucked-in water delivery
- Brackish groundwater limited treatment
- Brackish groundwater desalination
- Release from upstream reservoir
- Curtailment of upstream and/or downstream water rights

Based upon personal communication with the WUGs within the Plateau Region, the addition of a new local groundwater well was identified for all entities as a potential emergency water supply source. The Bandera County FWSD #1 (Bandera county-other) would also consider the curtailment of proximal water rights, and the City of Bandera would also consider trucked-in water delivery as a feasible option under emergency conditions. The entities along with feasible potential emergency water supply options have been included in Table 7-2.

## Table 7-2. Emergency Responses to Local Drought Conditions

| Entity | | | | | | Implementation Requirements | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Water User Group Name** | **County** | **2024 Population Served by Water System (per TCEQ)** | **2024 Service Connections (per TCEQ)** | **2030 Projected Population** | **2030 Projected Water Demand (AF/year)** | **Drill additional groundwater wells** | **Brackish groundwater limited treatment** | **Brackish groundwater desalination** | **Emergency interconnect** | **Other named local supply** | **Trucked-in water** | **Type of infrastructure required** | **Entity providing supply** | **Other local entities required to participate/ coordinate** | **Emergency agreements/ arrangements already in place?** |
| City of Bandera | Bandera | 3,066 | 1,070 | 1,949 | 347 | ▪ | | | ▪ | | ▪ | Well | City | N/A | N/A |
| Bandera County FWSD #1 | Bandera | 1,092 | 438 | 1,074 | 342 | ▪ | | | ▪ | | ▪ | Well | District | N/A | N/A |
| City of Rocksprings | Edwards | 1,857 | 574 | 666 | 175 | ▪ | | | ▪ | | ▪ | Well | City | N/A | N/A |
| Kerrville South Water | Kerr | Data Not Available | | 3,600 | 457 | ▪ | | | | | ▪ | Well | Aqua Texas | N/A | N/A |
| City of Brackettville | Kinney | 2,570 | 831 | 1,077 | 528 | ▪ | | | | | ▪ | Well | | N/A | N/A |
| Fort Clark Springs MUD | Kinney | 1,200 | 989 | 1,372 | 727 | ▪ | | | | | ▪ | Well | | N/A | N/A |
| City of Camp Wood | Real | 1,380 | 460 | 339 | 147 | ▪ | | | ▪ | | ▪ | Well | City | N/A | N/A |
| City of Leakey | Real | 1,758 | 586 | 210 | 143 | ▪ | | | ▪ | | ▪ | Well | City | N/A | N/A |
| Laughlin Air Force Base | Val Verde | 4,010 | 497 | 1,640 | 969 | ▪ | | | ▪ | | ▪ | Well | City of Del Rio | N/A | N/A |
| **County-Other** | | | | | | | | | | | | | | | |
| Bandera River Ranch 1 | Bandera | 1,038 | 346 | Data Not Provided | | ▪ | | | ▪ | | ▪ | Well | WSC | N/A | N/A |
| Medina WSC | Bandera | 774 | 258 | | | ▪ | | | | | ▪ | Well | | N/A | N/A |
| Flying L Ranch PUD | Bandera | 987 | 329 | | | ▪ | | | | | ▪ | Well | | N/A | N/A |
| Barksdale WSC | Edwards | 279 | 93 | | | ▪ | | | | | ▪ | Well | | N/A | N/A |
| Center Point North WS | Kerr | 270 | 90 | | | ▪ | | | ▪ | | ▪ | Well | | N/A | N/A |
| Center Point Taylor System | Kerr | 531 | 177 | | | ▪ | | | ▪ | | ▪ | Well | District | N/A | N/A |
| Cedar Springs MHP | Kerr | 144 | 48 | | | ▪ | | | ▪ | | ▪ | Piping | Ingram Oaks Park | N/A | N/A |
| Heritage Park WS | Kerr | 87 | 29 | | | ▪ | | | ▪ | | ▪ | Piping | Aqua Texas | N/A | N/A |
| Oak Ridge Estates WS | Kerr | 123 | 41 | | | ▪ | | | | | ▪ | Well | | N/A | N/A |
| Verde Park Estates | Kerr | 213 | 71 | | | ▪ | | | ▪ | | ▪ | Piping | Elmwood MHP | N/A | N/A |
| Vista Hills | Kerr | 48 | 16 | | | ▪ | | | | | ▪ | Well | | N/A | N/A |
| Westwood WS | Kerr | 339 | 113 | | | ▪ | | | ▪ | | ▪ | Well | | N/A | N/A |
| Windwood Oaks WS | Kerr | 60 | 20 | | | ▪ | | | ▪ | | ▪ | Piping | The Woods Sub. | N/A | N/A |

| Entity | | | | | | Implementation Requirements | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water User Group Name | County | 2019 Population Served by Water System (per TCEQ) | 2019 Service Connections (per TCEQ) | 2020 Population | 2020 Demand (AF/year) | Drill additional groundwater wells | Brackish groundwater limited treatment | Brackish groundwater desalination | Emergency interconnect | Other named local supply | Trucked - in water | Type of infrastructure required | Entity providing supply | Other local entities required to participate | Emergency agreements already in place |
| City of Bandera | Bandera | 3,19 | 1,060 | 1,875 | 342 | ▪ | | | ▪ | | ▪ | Well | City | - | - |
| City of Rocksprings | Edwards | 1,85 | 619 | 1,259 | 198 | ▪ | | | ▪ | | ▪ | Well | City | - | - |
| Ingram Water Supply | Kerr | 5,23 | 1,746 | 1,837 | 165 | ▪ | | | | | ▪ | Well | - | - | - |
| City of Brackettville | Kinney | 2,42 | 835 | | | ▪ | | | | | ▪ | Well | - | - | - |
| Fort Clark Springs MUD | Kinney | 1,20 | 989 | 1,259 | 618 | ▪ | | | | | ▪ | Well | - | - | - |
| City of Camp Wood | Real | 1,35 | 450 | 747 | 143 | ▪ | | | ▪ | | ▪ | Well | City | - | - |
| Laughlin Air Force Base | Val | 4,01 | 495 | 1,767 | 1,018 | ▪ | | | ▪ | | ▪ | Well | City of Del Rio | - | - |
| County Other | | | | | | | | | | | | | | | |
| Bandera County FWSD 1 | Bandera | 1,04 | 348 | 679 | 141 | ▪ | | | ▪ | | ▪ | Well | District | - | - |
| Bandera River Ranch 1 | Bandera | 822 | 274 | 929 | 97 | ▪ | | | ▪ | | ▪ | Well | WSC | - | - |
| Barksdale WSC | Edwards | 249 | 83 | 264 | 29 | ▪ | | | | | ▪ | Well | - | - | - |
| Center Point North Water System | Kerr | 237 | 79 | 255 | 22 | ▪ | | | | | ▪ | Well | - | - | - |
| Center Point Taylor System | Kerr | 492 | 164 | 530 | 45 | ▪ | | | ▪ | | ▪ | Well | District | - | - |
| Center Point Wiedenfeld Works | Kerr | 168 | 56 | 161 | 14 | ▪ | | | ▪ | | ▪ | Piping | Aqua Texas | - | - |
| Cedar Springs MHP | Kerr | 144 | 48 | - | - | ▪ | | | ▪ | | ▪ | Piping | Ingram Oaks Park | - | - |
| Heritage Park Water System | Kerr | 87 | 29 | - | - | ▪ | | | ▪ | | ▪ | Piping | Aqua Texas | - | - |
| Hills & Dales Wiedenfeld Water Works | Kerr | 222 | 74 | 202 | 17 | ▪ | | | ▪ | | ▪ | Piping | Aqua Texas | - | - |
| Kerrville South Water | Kerr | | | 2,851 | 341 | ▪ | | | | | ▪ | Well | Aqua Texas | | |
| Oak Ridge Estates Water System | Kerr | 132 | 44 | - | - | ▪ | | | | | ▪ | Well | - | - | - |
| Southern Hills Wiedenfeld Water | Kerr | 891 | 297 | - | - | ▪ | | | ▪ | | ▪ | Piping | Aqua Texas | - | - |
| Verde Park Estates Wiedenfeld Water | Kerr | 210 | 70 | 178 | 15 | ▪ | | | ▪ | | ▪ | Piping | Elmwood MHP | - | - |
| Vista Hills | Kerr | 42 | 14 | - | - | ▪ | | | | | ▪ | Well | - | - | - |
| Westwood Water System | Kerr | 390 | 130 | 269 | 23 | ▪ | | | | | ▪ | Well | - | - | - |
| Windwood Oaks Water System | Kerr | 57 | 19 | - | - | ▪ | | | ▪ | | ▪ | Piping | The Woods Sub. | - | - |
| Woodhaven Mobile Home Park | Kerr | 96 | 32 | - | - | ▪ | | | ▪ | | ▪ | Piping | Aqua Texas | - | - |
| Flying L Ranch PUD | Bandera | 903 | 301 | - | - | ▪ | | | | | ▪ | Well | - | - | - |
| City of Leakey | Real | 1,74 | 582 | 1,415 | 193 | ▪ | | | ▪ | | ▪ | System | City | - | - |
| Medina WSC | Bandera | 810 | 270 | 895 | 93 | ▪ | | | | | ▪ | Well | - | - | - |

To qualify for emergency funds that are earmarked for emergency groundwater supply wells, entities must have a drought plan in place and be currently listed as an entity that is limiting water use to avoid shortages. This list is updated weekly by the TCEQ's Drinking Water Technical Review and Oversight Team and can be found at: https://www.tceq.texas.gov/drinkingwater/trot/droughtw.html. ~~https://www.tceq.texas.gov/drinkingwater/trot/droughtw.html.~~

There is some assistance available through the Texas Department of Agriculture and the Texas Water Development Board. There are requirements, deadlines, and a specific application process. Contact the TWDB by e-mail at Financial_Assistance@twdb.texas.gov, or call 512-463-7853. Contact the Texas Department of Agriculture, Community Development Block Grants, or call 512-936-7891. Funding is limited.

TCEQ offers a variety of resources pertaining to drought, current priority calls, current drought conditions, water conservation and more. Those ~~Other~~ TCEQ Guidance resources can be found here: https://www.tceq.texas.gov/response/drought.

- ~~Emergency and Temporary Use of Wells for Public Water Supplies (RG-485)~~
- ~~https://www.tceq.texas.gov/assets/public/comm_exec/pubs/rg/rg-485.pdf~~
- ~~Questions from the TCEQ's Workshops on Drought Emergency Planning: Answers to Help Drinking Water Systems Prepare for Emergencies http://www.rgrwa.org/images/pdfs/workshop-questions071312.pdf~~
- ~~Video: Workshop on Drought Emergency Planning for Public Water Systems in Texas~~
- ~~http://www.youtube.com/watch?v=BdlF9CEcGPI&feature=plcp&context=C34378a7UDOEgsToPDskJNYWXf5I3pKq8tW9pkVqQU~~

# 7.5 REGION-SPECIFIC DROUGHT RESPONSE RECOMMENDATIONS AND MODEL DROUGHT CONTINGENCY PLANS

As mandated by TAC 357.42(c)&(i), the RWPGs shall develop drought response recommendations regarding the management of existing groundwater and surface water sources in the RWPA designated in accordance with §357.32. The RWPGs shall make drought preparation and response recommendations regarding the development of, content contained within, and implementation of local drought contingency plans. The RWPGs shall develop region-specific model drought contingency plans that shall be presented in the RWP which shall be consistent with 30 TAC Chapter 288 requirements.

Regional drought planning expands the conceptualization and application of drought planning by specific entities to encompass the entire Plateau Region. The approach utilized in developing a region-specific drought plan will consider the following: 1) all regional groundwater and surface water sources, 2) current drought plans that are being utilized by user entities within the Region, and 3) current monitoring stations within the Region that have evolved since the previous planning cycle.

The goals of this approach are: 1) to gain a comprehensive view of what particular resources are being monitored by entities within the Region, 2) determine which resources are not being monitored, 3) determine which users do not fall under the umbrella of existing DCPs, 3) identify potential monitoring stations with publicly accessible real-time data that currently exist, and 4) determine how these data can be utilized for the water-user groups that do are not subject to existing DCPs, and ultimately 5) development of a regional model drought contingency plan.

As discussed in Section 7.2, several GCDs, towns/cities and various public supply systems have written drought management / contingency plans and have provided them for inclusion in this *Plan.*

### 7.5.1 Regional Groundwater Resources and Monitoring

The six groundwater resources identified within the Plateau Region and their contribution to total regional groundwater supply are:

- Austin Chalk (~~less than 3~~2%)
- Edwards (BFZ) (~~less than 7~~4%)
- Edwards-Trinity (Plateau) (~~6~~12%)
- Edwards-Trinity (Plateau), Pecos Valley & Trinity (76%)
- Ellenburger-San Saba (1%)
- Frio River Alluvium (~~less than~~ 1%)
- Nueces River Alluvium (~~less than 1~~2%)
- Trinity (~~29~~13%)

The aquifer contribution to the regional supply calculation is based upon Table 3-1. Water Source Availability. This data is provided by the TWDB for regional planning purposes. ~~historical pumping averages for years 2012 through 2016.~~

Current drought contingency plans were detailed in Section 7.3.5 and Table 7-1. State well numbers of the monitoring wells used by municipal entities that utilize groundwater triggers are shown in Table 7-3. A map of these locations is included as Figure 7-7.

**Table 7-3. Current Municipal Trigger Monitoring Wells**

| Water Supply Entity | County | Water Supply Source | Well ID |
|---|---|---|---|
| City of Rocksprings | Edwards | Edwards-Trinity (Plateau) | 55-63-803 Sharp Well |
| City of Bandera | Bandera | Trinity | 69-24-102 Dallas Street Well |
| Fort Clark Springs MUD | Kinney | Edwards-Trinity (Plateau) | 70-45-504 Well #1 |
| City of Brackettville | Kinney | Edwards-Trinity (Plateau) | 70-45-601 Well #1 |

Previous *Plateau Regional Water Plans* identified wells that could potentially be used for drought monitoring.

Table 7-4 provides a selection of groundwater trigger wells included in the *2011, 2016 and 2021 Plans*, with an updated status and ~~history of measurements~~ period of record.

**Table 7-4. RWP Groundwater Trigger Monitoring Wells**

| Aquifer | County | Well ID | Monitoring Agency | Period of Record | Current Status |
|---|---|---|---|---|---|
| Trinity | Bandera | 69-16-902 (Purple Sage Well) | Unknown | Unknown | Inactive - ~~Replaced by BCRAGD~~ |
| Edwards-Trinity (Plateau) | Edwards | 55-63-803 (City of Rocksprings) | TWDB | 1953-2022 | Active |
| Trinity | Kerr | 56-63-916 | HGCD (Donna Drive Well) | 1977-2019 | Currently active in HGCD network |
| Edwards-Trinity (Plateau) | Kerr | 56-53-304 | Not being monitored | 1966-1998 | Inactive - Replaced by HGCD network |
| Edwards-Trinity (Plateau) | Kinney | Ring Well | Unknown | Unknown | Unknown |
| Edwards (BFZ) | Kinney | 70-38-902 | TWDB | 1973-2020 | Active |
| Austin Chalk | Kinney | 70-45-404 | TWDB | 1937-2009 | Unknown |
| Frio River Alluvium | Real | 69-18-302 (City of Leakey) | Unknown | Unknown | Unknown |
| Edwards-Trinity (Plateau) | Val Verde | Old Y Well | City of Del Rio | 2013-2014 | Inactive |
| Edwards-Trinity (Plateau) | Val Verde | Agarita Well | City of Del Rio | Unknown | Inactive |
| Edwards-Trinity (Plateau) | Val Verde | Tiera del Largo Well | City of Del Rio | Unknown | Inactive |

| ~~Aquifer~~ | ~~County~~ | ~~Well ID~~ | ~~Monitoring Agency~~ | ~~Period of Record and Measurement Count~~ | ~~Current Status~~ |
|---|---|---|---|---|---|
| ~~Trinity~~ | ~~Bandera~~ | ~~69-16-902 (Purple Sage Well)~~ | ~~Unknown~~ | ~~1 measurement~~ | ~~Inactive – Replaced by BCRAGCD network~~ |
| ~~Edwards-Trinity~~ | ~~Edwards~~ | ~~55-63-803 (City of Rocksprings)~~ | ~~TWDB~~ | ~~1953 – 2019 (39 measurements)~~ | ~~Active~~ |

| | | | | | |
|---|---|---|---|---|---|
| Trinity | Kerr | 56-63-916 | HGCD (Donna Drive well) | 1977—2019 (340 measurements) | Currently active in HGCD network |
| Edwards-Trinity | Kerr | 56-53-304 | Not being monitored | 1966—1997 (16 measurements) | Inactive—Replaced by HGCD network |
| Edwards-Trinity | Kinney | Ring Well | Unknown | Unknown | Unknown |
| Edwards (BFZ) | Kinney | 70-38-902 | TWDB | 1973—2013 (113 measurements) | Active |
| Austin Chalk | Kinney | 70-45-404 | TWDB | 1937—2008 (91 measurements) | Unknown |
| Frio River Alluvium | Real | 69-18-302 (City of Leakey) | Unknown | 2 measurements on WIID | Unknown |
| Edwards-Trinity | Val Verde | Old Y Well | City of Del Rio | 2013—2014 | Inactive |
| Edwards-Trinity | Val Verde | Agarita Well | City of Del Rio | Unknown | Inactive |
| Edwards-Trinity | Val Verde | Tiera del Largo Well | City of Del Rio | Unknown | Inactive |

The TWDB has a component of their website called Water Data for Texas (similar to the U.S. Geological Survey's NWIS server) that is a collective of real-time monitoring data from both groundwater wells and reservoir stage-capacity gages. Table 7-5 is a summary of the 24 18 groundwater wells located within the Plateau Region. These locations are included on Figure 7-7.

**Table 7-5. Currently Active (Real-Time) Monitoring Wells**
**Source: Water Data for Texas**

| County | State Well ID | Aquifer | Aquifer Type | Entity/Cooperator | Data Transmission | Latest Transmission Date as of 9/2024 |
|---|---|---|---|---|---|---|
| Bandera | 6912206 | Edwards-Trinity (Plateau) | Unconfined | U.S. Geological Survey | Satellite | 9/18/2024 |
| Bandera | 6923402 | Trinity | Confined | U.S. Geological Survey | Satellite | 8/5/2024 |
| Bandera | 6924225 | Trinity | Confined | Texas Water Development Board | Satellite | 9/17/2024 |
| Edwards | 5545902 | Edwards-Trinity (Plateau) | Unconfined | Texas Water Development Board | Satellite | 9/17/2024 |
| Edwards | 7013906 | Edwards-Trinity (Plateau) | Unconfined | Texas Water Development Board | Satellite | 9/17/2024 |
| Kerr | 5644901 | Edwards-Trinity (Plateau) | Confined | Headwaters GCD | Satellite | 9/17/2024 |
| Kerr | 5654405 | Trinity | Confined | Texas Water Development Board | Satellite | 9/18/2024 |
| Kerr | 5659201 | Edwards-Trinity (Plateau) | Confined | Headwaters GCD | Satellite | 9/17/2024 |
| Kerr | 5663922 | Trinity | Confined | Texas Water Development Board | Satellite | 9/17/2024 |
| Kerr | 5663923 | Trinity | Confined | Headwaters GCD | Satellite | 9/18/2024 |
| Kerr | 5663924 | Trinity | Confined | Headwaters GCD | Satellite | 9/18/2024 |
| Kerr | 6801703 | Trinity | Confined | Headwaters GCD | Satellite | 9/17/2024 |
| Kerr | 6801704 | Trinity | Confined | Headwaters GCD | Satellite | 9/17/2024 |
| Kerr | 6904503 | Trinity | Confined | Headwaters GCD | Satellite | 5/12/2024 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Kinney | 7038902 | Edwards (Balcones Fault Zone) | Unconfined | Texas Water Development Board | Satellite | 9/17/2024 |
| Real | 6919401 | Trinity | Confined | Texas Water Development Board | Satellite | 9/17/2024 |
| Val Verde | 5463401 | Edwards-Trinity (Plateau) | Unconfined | Texas Water Development Board | Satellite | 9/17/2024 |
| Val Verde | 7001707 | Edwards-Trinity (Plateau) | Unconfined | Texas Water Development Board | Satellite | 9/17/2024 |

| ~~County~~ | ~~State Well Number~~ | ~~Aquifer~~ | ~~Aquifer Type~~ | ~~Entity/Cooperator~~ | ~~Data Transmission~~ | ~~Start Date Period of Record~~ |
|---|---|---|---|---|---|---|
| ~~Bandera~~ | ~~6912206~~ | ~~Edwards-Trinity (Plateau)~~ | ~~Unconfined~~ | ~~U.S. Geological Survey~~ | ~~Satellite~~ | ~~11/6/2012~~ |
| ~~Bandera~~ | ~~6924225~~ | ~~Trinity~~ | ~~Confined~~ | ~~Texas Water Development Board~~ | ~~Satellite~~ | ~~8/11/2008~~ |
| ~~Kerr~~ | ~~5643901~~ | ~~Trinity~~ | ~~Confined~~ | ~~Headwaters GCD~~ | ~~Satellite~~ | ~~5/6/2009~~ |
| ~~Kerr~~ | ~~5652704~~ | ~~Trinity~~ | ~~Confined~~ | ~~Headwaters GCD~~ | ~~Satellite~~ | ~~12/9/2010~~ |
| ~~Kerr~~ | ~~5654106~~ | ~~Trinity~~ | ~~Confined~~ | ~~Headwaters GCD~~ | ~~Satellite~~ | ~~11/29/2010~~ |
| ~~Kerr~~ | ~~5654405~~ | ~~Trinity~~ | ~~Confined~~ | ~~Texas Water Development Board~~ | ~~Satellite~~ | ~~8/10/2004~~ |
| ~~Kerr~~ | ~~5655805~~ | ~~Trinity~~ | ~~Confined~~ | ~~Headwaters GCD~~ | ~~Satellite~~ | ~~3/15/2007~~ |
| ~~Kerr~~ | ~~5659201~~ | ~~Trinity~~ | ~~Confined~~ | ~~Headwaters GCD~~ | ~~Satellite~~ | ~~5/6/2009~~ |
| ~~Kerr~~ | ~~5661101~~ | ~~Trinity~~ | ~~Confined~~ | ~~Headwaters GCD~~ | ~~Satellite~~ | ~~3/13/2007~~ |
| ~~Kerr~~ | ~~5663922~~ | ~~Trinity~~ | ~~Confined~~ | ~~Texas Water Development Board~~ | ~~Satellite~~ | ~~12/5/2002~~ |
| ~~Kerr~~ | ~~5663923~~ | ~~Trinity~~ | ~~Confined~~ | ~~Headwaters GCD~~ | ~~Satellite~~ | ~~7/5/2010~~ |
| ~~Kerr~~ | ~~5663924~~ | ~~Trinity~~ | ~~Confined~~ | ~~Headwaters GCD~~ | ~~Satellite~~ | ~~7/12/2010~~ |
| ~~Kerr~~ | ~~5664301~~ | ~~Trinity~~ | ~~Confined~~ | ~~Headwaters GCD~~ | ~~Satellite~~ | ~~3/20/2013~~ |
| ~~Kerr~~ | ~~5664302~~ | ~~Edwards-Trinity (Plateau)~~ | ~~Unconfined~~ | ~~Headwaters GCD~~ | ~~Satellite~~ | ~~3/20/2013~~ |
| ~~Kerr~~ | ~~5757805~~ | ~~Trinity~~ | ~~Confined~~ | ~~Headwaters GCD~~ | ~~Satellite~~ | ~~7/16/2008~~ |
| ~~Kerr~~ | ~~6801703~~ | ~~Trinity~~ | ~~Confined~~ | ~~Headwaters GCD~~ | ~~Satellite~~ | ~~10/5/2009~~ |
| ~~Kerr~~ | ~~6801704~~ | ~~Trinity~~ | ~~Confined~~ | ~~Headwaters GCD~~ | ~~Satellite~~ | ~~5/14/2009~~ |
| ~~Kerr~~ | ~~6904503~~ | ~~Trinity~~ | ~~Confined~~ | ~~Headwaters GCD~~ | ~~Satellite~~ | ~~10/6/2009~~ |
| ~~Kerr~~ | ~~6907107~~ | ~~Trinity~~ | ~~Confined~~ | ~~Headwaters GCD~~ | ~~Satellite~~ | ~~5/8/2008~~ |
| ~~Kerr~~ | ~~6908304~~ | ~~Trinity~~ | ~~Confined~~ | ~~Headwaters GCD~~ | ~~Satellite~~ | ~~3/2/2008~~ |
| ~~Kerr~~ | ~~6908305~~ | ~~Trinity~~ | ~~Confined~~ | ~~Headwaters GCD~~ | ~~Satellite~~ | ~~3/2/2008~~ |
| ~~Real~~ | ~~6919401~~ | ~~Trinity~~ | ~~Confined~~ | ~~Texas Water Development Board~~ | ~~Satellite~~ | ~~2/15/1993~~ |
| ~~Val Verde~~ | ~~5463401~~ | ~~Edwards-Trinity (Plateau)~~ | ~~Unconfined~~ | ~~Texas Water Development Board~~ | ~~Satellite~~ | ~~9/9/2008~~ |
| ~~Val Verde~~ | ~~7001707~~ | ~~Edwards-Trinity (Plateau)~~ | ~~Unconfined~~ | ~~Texas Water Development Board~~ | ~~Data Card~~ | ~~8/6/2007~~ |

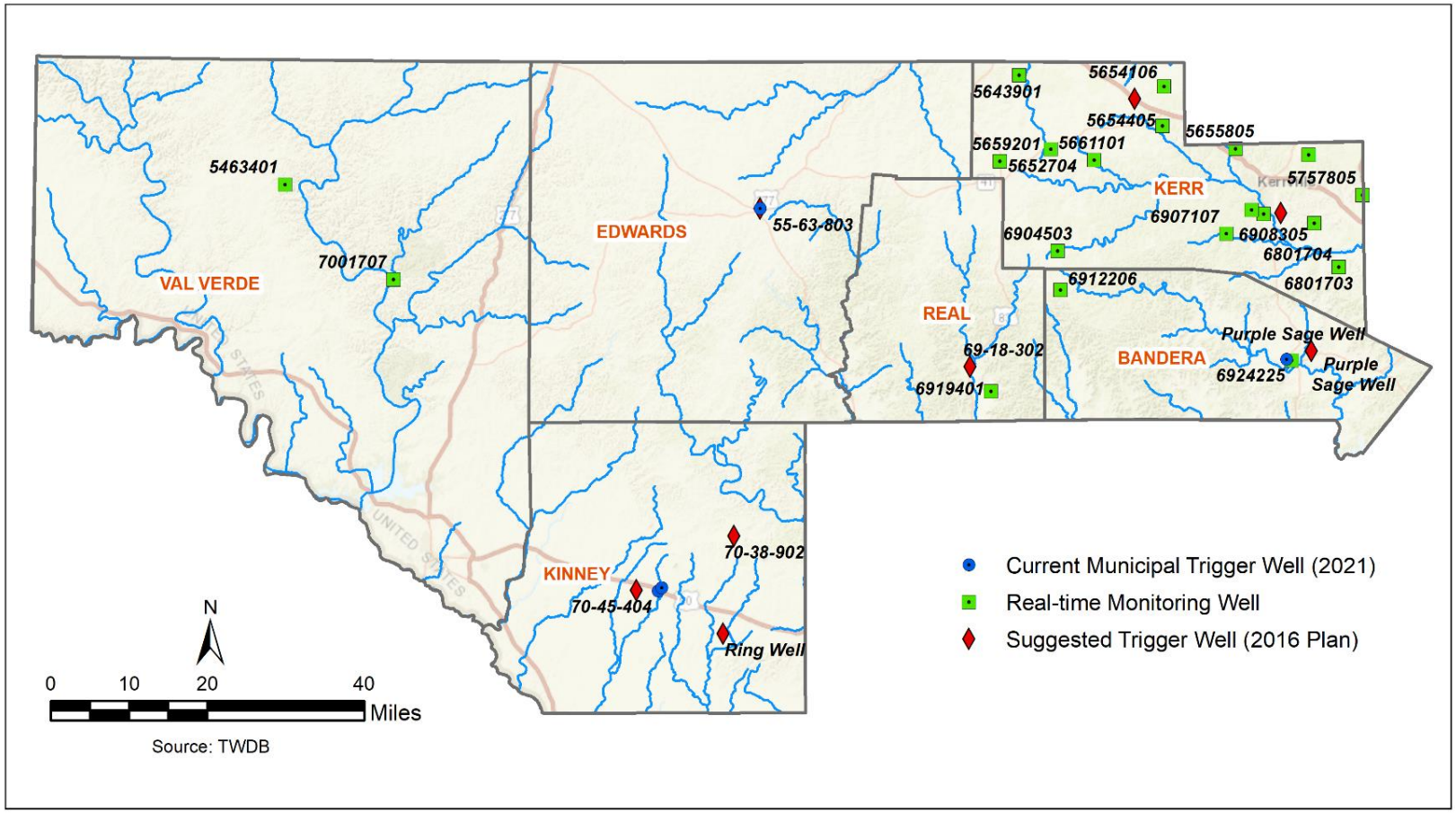



**Figure 7-7. Regional Monitoring and Trigger Wells**

### 7.5.2 Regional Surface Water Resources and Monitoring

The five surface water basins identified within the Plateau Region and their contribution to total regional surface water supply are:

- Colorado River Basin (<1%)
- Rio Grande Basin (~~84~~79%)
- Nueces River Basin (~~9~~10%)
- Guadalupe River Basin (~~6~~10%)
- San Antonio River Basin (<1%)

The basin contribution to the regional supply calculation is based upon the WAM Run 3 (Full Authorization) availability numbers. Surface water features that are actively being monitored by an entity within the Plateau Region are detailed in Table 7-6.

**Table 7-6. Surface Water Sources Currently Monitored by Regional Entities**
Source: Plateau Region Drought Contingency Plans

| Entity | County | Water Supply Source | Station ID | Measuring Agency | Period of Record | Current Measurement Frequency |
|---|---|---|---|---|---|---|
| City of Del Rio | Val Verde | San Felipe Springs | 08-4530.00 (gage on creek) | IBWC | 1931-2024 | 15 minutes |
| Headwaters GCD | Kerr | Guadalupe River | 08166200 Guadalupe River at Kerrville | USGS | 1986 -2024 | Daily |
| Real-Edwards CRD | Real | Frio River | Fulgham's crossing, Leakey Springs crossing, Mill Creek crossing, Frio River Place crossing | RECRD | ? – 2019 | Monthly |
| Real-Edwards CRD | Real | Frio River - West Prong | Rancho Real crossing, Kent Creek crossing | RECRD | ? – 2019 | Monthly |
| Real-Edwards CRD | Edwards | Nueces River | McDonald's Crossing, Nueces River Dam | RECRD | ? – 2019 | Monthly |
| Real-Edwards CRD | Edwards | South Llano River | Telegraph crossing, Hwy 377 at Evergreen School crossing | RECRD | ? – 2019 | Monthly |

The only station that is utilized as an active trigger is San Felipe Springs. The other stations are included in this table to present a complete list of surface water locations that are currently being monitored within the Region. Note that the Guadalupe River is an optional trigger for HGCD. The Frio and Nueces crossings that are measured by the RECRD are posted on their website monthly.

A list of all currently active stream flow, spring flow and reservoir stage gaging stations are listed in Table 7-7. The USGS stations have real-time data that is publicly accessible online. These locations are shown on Figure 7-8.

**Table 7-7. Currently Active Surface Water Gaging Locations**
Source: Water Data for Texas

| County | Station ID | Station Name | Agency |
|---|---|---|---|
| **Rio Grande Basin** | | | |
| Val Verde | 8449100 | Dolan Creek abv Devils River near Comstock, TX | USGS |
| Val Verde | 8447410 | Pecos River near Langtry, TX | USGS |
| Val Verde | 08-3772.00 | Rio Grande at Foster Ranch near Langtry, TX | IBWC |
| Val Verde | 08-4508.00 | International Amistad Reservoir Storage | IBWC |
| Val Verde | 08-4530.00 | San Felipe Creek | IBWC |
| Kinney | 8456300 and 8456310 | Las Moras Springs at Brackettville, TX (main channel) | USGS |
| **Nueces River Basin** | | | |
| Kinney | 8190500 | W Nueces River near Brackettville, TX | USGS |
| Edwards | 818999010 | Nueces River near Barksdale, TX | USGS |
| Real | 8194840 | Frio River at Leakey, TX | USGS |
| Bandera | 8197936 | Sabinal River below Mill Creek near Vanderpool, TX | USGS |
| | | | |
| | | | |
| **Guadalupe River Basin** | | | |
| Kerr | 8165300 | North Fork Guadalupe River near Hunt, TX | USGS |
| Kerr | 8165500 | Guadalupe River at Hunt, TX | USGS |
| Kerr | 8166000 | Johnson Creek near Ingram, TX | USGS |
| Kerr | 8166140 | Guadalupe River above Bear Creek at Kerrville, TX | USGS |
| Kerr | 8166200 | Guadalupe River at Kerrville, TX | USGS |
| Kerr | 8166250 | Guadalupe River near Center Point, TX | USGS |
| **San Antonio River Basin** | | | |
| Bandera | 817887350 | Medina River at Patterson Road at Medina, TX | USGS |
| Bandera | 8178880 | Medina River at Bandera, TX | USGS |
| Bandera | 8178980 | Medina River above English Creek Spring near Pipe Creek, TX | USGS |
| Medina | 8179500 | Medina Lake near San Antonio, TX | USGS |

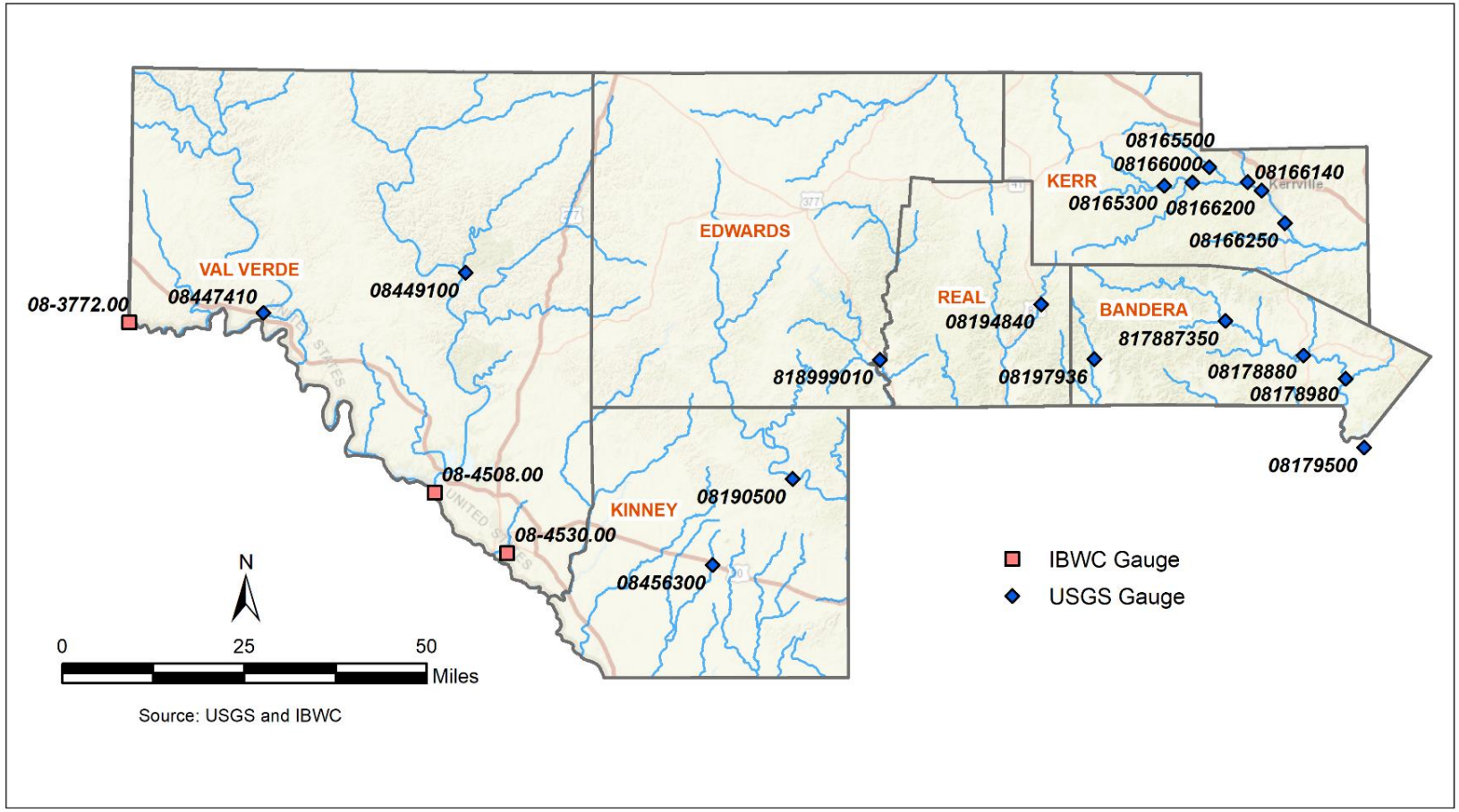



**Figure 7-8. Currently Active Surface Water Gaging Locations**

### 7.5.3 Regional Model Drought Contingency Plan

The Regional Model DCP summary table (Table 7-8) provides an overview of all existing regional water sources, WUGs, monitoring wells, and gaging stations as well as recommended drought triggers and actions. The intent of including the monitoring wells and stations is to provide a comprehensive Region-wide assessment of what current tools are available to WUGs and districts to monitor resources within the Plateau Region.

The Regional Model DCP will undoubtedly change over time in order to address particular needs and issues of the Region's users. ~~Therefore, this initial~~ The version of the model in this *Plan* will primarily focus on identifying all sources, users and monitoring tools in order to find the particular components within the Region that are not currently incorporated into any existing drought plan but could potentially utilize existing data resources. Another focus of this ~~first~~ model plan will consider consistency of existing plans within the Region. Entities that have adopted drought plans will only be assessed to this end, therefore fine-tuning existing triggers of existing municipal drought plans is not a goal of the model plan beyond an effort toward achieving consistent responses/actions to drought across the Region. Triggers have been recommended ~~that~~ and are listed in Table 7-1 that are consistent with existing Municipal and GCD plans. An effort has been made to make the percent reduction of demand/use ~~a little~~ slightly more aggressive and more equitable ~~across the board~~. Additionally, "voluntary conservation" has been removed as a stage 1 action. Conservation is a Best Management Practice (BMP) that ideally will ultimately be practiced on a daily basis, and not merely as a reaction to drought conditions, therefore it has been removed as an action in the Regional Model DCP.

Smaller PWS entities (county-other), manufacturing, power, and irrigation water wells that exceed GCD exempt well production thresholds are subject to drought actions imposed by the conservation districts. Exempt well users are requested to voluntarily follow the actions specified by the Districts for non-exempt users. Generally, the water user groups within the Region that are not included in these plans (or included on a voluntary basis) are: (1) all exempt water wells in counties with established GCDs, and (2) all users in Val Verde County except those who are provided water by the City of Del Rio.

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**Table 7-8. Recommended Regional Drought Plan Triggers and Actions**

| Source Name | Source Type (SW or GW) | Source User Entity | Current WUG Monitoring | Real-time Source Monitoring | Factors to be Considered | Recommendations | Specific Triggers | | | | | | | | Specific Actions (Percent Reduction Demand/ Use) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Source Manager *a | | | | Users *b | | | | Source Manager *c | | | | Users *d | | | |
| | | | | | | | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| | | | | | | | Mild | Mod | Severe | Critical | Mild | Mod | Severe | Critical | Mild | Mod | Severe | Critical | Mild | Mod | Severe | Critical |
| Edwards - Trinity (Plateau) | GW | City of Rocksprings | 55-63-803 (Sharp well) | --- | Plan in place | Add stage 4. | ***a** | ***a** | ***a** | ***a** | | | | | 10 | 20 | 30 | 40 | 10 | 20 | 30 | 40 |
| | | City of Brackettville | 70-45-601 (Well #1) | --- | Plan in place | Add stage 4. | ***a** | ***a** | ***a** | ***a** | | | | | 10 | 15 | 25 | 35 | 10 | 15 | 25 | 35 |
| | | Fort Clark Springs MUD | 70-45-504 (Well #1) | --- | Plan in place | Remove voluntary conservation as a stage | ***a** | ***a** | ***a** | ***a** | | | | | 10 | 15 | 25 | 35 | 10 | 15 | 25 | 35 |
| | | City of Del Rio | No groundwater triggers | --- | Plan in place | Make stage 1 a 10% demand reduction. | ***a** | ***a** | ***a** | ***a** | | | | | 10 | 20 | 30 | 40 | 10 | 20 | 30 | 40 |
| | | Laughlin AFB | | | | | | | | | *b | *b | *b | *b | | | | | | | | |
| | | County Other | N/A | 69-12-206 (Bandera)<br>56-64-302 (Kerr)<br>54-63-401 (Val Verde)<br>70-01-707 (Val Verde) | District plans in place | Make stage 1 a 10% demand reduction (REGRD only). | | | | | *b | *b | *b | *b | 10 | 20 | 30 | 40 | 10 | 20 | 30 | 40 |
| | | Irrigation | | | | | | | | | *b | *b | *b | *b | | | | | | | | |
| | | MAN, MIN | | | | | | | | | *b | *b | *b | *b | | | | | | | | |
| Trinity | GW | City of Bandera | Groundwater triggers | TWDB 69-24-225 | Plan in place | Remove voluntary conservation as a stage. | ***a** | ***a** | ***a** | ***a** | | | | | 10 | 20 | 35 | 50 | 10 | 20 | 35 | 50 |
| | | City of Kerrville | Comparison of demand and safe operation capacity | --- | Plan in place | No change. | ***a** | ***a** | ***a** | ***a** | | | | | *c | *c | *c | *c | | | | |
| | | City of Ingram | Demand-based triggers | --- | Plan in place | Remove voluntary conservation as a stage. Make stage 1 a 10% demand reduction. | ***a** | ***a** | ***a** | ***a** | | | | | 10 | 20 | 30 | 40 | 10 | 20 | 30 | 40 |
| | | County Other | N/A | 56-54-405 (Kerr)<br>56-63-922 (Kerr)<br>69-19-401 (Real)<br>16 HGCD wells (Kerr) | District plans in place | No change. | | | | | *b | *b | *b | *b | 10 | 20 | 30 | 40 | 10 | 20 | 30 | 40 |
| | | Irrigation | | | | | | | | | *b | *b | *b | *b | | | | | | | | |
| | | MAN, MIN | | | | | | | | | *b | *b | *b | *b | | | | | | | | |
| Edwards (BFZ) | GW | County Other | N/A | 70-38-902 (Kinney) | No drought plan | No change. | | | | | *b | *b | *b | *b | | | | | *d | *d | *d | *d |
| | | Irrigation | | | | | | | | | *b | *b | *b | *b | | | | | | | | |
| | | MAN, MIN | | | | | | | | | *b | *b | *b | *b | | | | | | | | |
| Austin Chalk | GW | County Other | N/A | --- | No drought plan | No change. | | | | | *b | *b | *b | *b | | | | | *d | *d | *d | *d |
| | | Irrigation | | | | | | | | | *b | *b | *b | *b | | | | | | | | |
| | | MAN, MIN | | | | | | | | | *b | *b | *b | *b | | | | | | | | |
| Frio River Alluvium | GW | City of Leakey | N/A | --- | District plan in place | Remove voluntary conservation as a stage. | | | | | *b | *b | *b | *b | 10 | 20 | 30 | 40 | 10 | 20 | 30 | 40 |
| | | Irrigation | N/A | | | | | | | | *b | *b | *b | *b | | | | | | | | |
| | | County Other | | | | | | | | | *b | *b | *b | *b | | | | | | | | |
| Nueces River Alluvium | GW | Community of Barksdale | Unknown | --- | District plan in place | Remove voluntary conservation as a stage. | | | | | *b | *b | *b | *b | 10 | 20 | 30 | 40 | 10 | 20 | 30 | 40 |
| | | Irrigation | N/A | | | | | | | | *b | *b | *b | *b | | | | | | | | |
| | | County Other | | | | | | | | | *b | *b | *b | *b | | | | | | | | |

*a Source Manager Triggers – See Table 7-1 for specific triggers in Municipal and GCD drought management plans.
*b User Triggers – Follow local Municipal or GCD drought management plans as shown in Table 7-1.
*c Source Manager Action – See Table 7-1 for specific triggers in Municipal and GCD drought management plans.
*d User Action – Follow local Municipal or GCD drought management plans as shown in Table 7-1.

**Table 7-8. (Continued) Recommended Regional Drought Plan Triggers and Actions**

| Source Name | Source Type (SW or GW) | Source User Entity | Current WUG Monitoring | Real-time Source Monitoring | Factors to be Considered | Recommendations | Specific Triggers | | | | | | | | Specific Actions (Percent Reduction Demand/ Use) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Source Manager *a | | | | Users *b | | | | Source Manager | | | | Users | | | |
| | | | | | | | Mild | Mod | Severe | Critical | Mild | Mod | Severe | Critical | Mild | Mod | Severe | Critical | Mild | Mod | Severe | Critical |
| **Rio Grande Basin** | | | | | | | | | | | | | | | | | | | | | | |
| Las Moras Springs | SW | City of Brackettville | N/A | USGS station 08456300 and 08456310 | Plan in place | Add stage 4. | *a | *a | *a | *a | | | | | 10 | 15 | 25 | 35 | 10 | 15 | 25 | 35 |
| San Felipe Springs | | City of Del Rio | stages triggered by spring discharge and storage reservoirs | IBWC station 08-4530.00 | Plan in place | Increase stage 1 to a 10% demand reduction. | *a | *a | *a | *a | | | | | 10 | 20 | 30 | 40 | 10 | 20 | 30 | 40 |
| San Felipe Creek | | | N/A | IBWC station 08-4530.00 | No drought plan | | | | | | *b | *b | *b | *b | | | | | *d | *d | *d | *d |
| Rio Grande | | County Other | | IBWC station 08-3772.00 | | | | | | | | | | | | | | | | | | |
| Pecos River | | Irrigation | | USGS station 08447410 | | | | | | | | | | | | | | | | | | |
| Devils River | | MAN, MIN | | USGS station 08449100 | | | | | | | | | | | | | | | | | | |
| Amistad Reservoir | | | | IBWC station 08-4508.00 | | | | | | | | | | | | | | | | | | |
| Cienegas Creek | | | | --- | | | | | | | | | | | | | | | | | | |
| **Nueces River Basin** | | | | | | | | | | | | | | | | | | | | | | |
| Old Faithful Springs | SW | City of Camp Wood | RECRD weir box; based on system capacity limits | RECRD weir box | Plan in place | Remove voluntary conservation as a stage. Make stage 1 a 10% mandated demand reduction. | *a | *a | *a | *a | | | | | 10 | 20 | 30 | 40 | 10 | 20 | 30 | 40 |
| West Nueces River | | | RECRD monitors two gages RECRD monitors six gages | USGS station 08190500 | No drought plan | | | | | | *b | *b | *b | *b | | | | | *d | *d | *d | *d |
| Nueces River Basin | | County Other | | USGS station 0818999010 | | | | | | | | | | | | | | | | | | |
| Frio River | | Irrigation | | USGS station 08194840 | | | | | | | | | | | | | | | | | | |
| Sabinal River | | MAN, MIN | | USGS station 08197936 | | | | | | | | | | | | | | | | | | |
| Hondo Creek | | | | N/A | | | | | | | | | | | | | | | | | | |
| **Colorado River Basin** | | | | | | | | | | | | | | | | | | | | | | |
| Llano River | SW | County Other | RECRD monitors two gages | Telegraph crossing, Hwy 377 at Evergreen School crossing | District plans in place (HGCD and REGRD) | Make stage 1 a 10% demand reduction (REGRD only). | | | | | *b | *b | *b | *b | 10 | 20 | 30 | 40 | 10 | 20 | 30 | 40 |
| | | Irrigation | | | | | | | | | | | | | | | | | | | | |
| | | MAN, MIN | | | | | | | | | | | | | | | | | | | | |
| **San Antonio River Basin** | | | | | | | | | | | | | | | | | | | | | | |
| Medina River | SW | County Other | N/A | USGS stations 0817887350, 08178880, and 08178980 | | | | | | | *b | *b | *b | *b | | | | | *d | *d | *d | *d |
| Medina Lake | | Irrigation, MAN, Min | N/A | USGS station 08179500 | | | | | | | | | | | | | | | | | | |
| **Guadalupe River Basin** | | | | | | | | | | | | | | | | | | | *d | *d | *d | *d |
| Guadalupe River | SW | City of Kerrville | Comparison of demand and safe operation capacity | --- | Plan in place | No change. | *a | *a | *a | *a | | | | | *c | *c | *c | *c | | | | |
| | | County Other | N/A | USGS stations 08165300, 08165500, 08166000, 08166140, 08166200, and 08166250 | District plan in place | No change. | | | | | *b | *b | *b | *b | 10 | 20 | 30 | 40 | 10 | 20 | 30 | 40 |
| | | Irrigation, MAN, Min | N/A | | | | | | | | *b | *b | *b | *b | | | | | *d | *d | *d | *d |

### 7.5.4 Model Drought Contingency Plans

In 2019, the Drought Preparedness Council recommended that a model DCP be in place for any water user group that exceeds ten percent of the Region's water demands. For the Plateau Region, these user groups include irrigation and municipal. Based on this recommendation, model DCPs for municipal and irrigation, along with wholesale, are available under the heading of MODEL DROUGHT CONTINGENCY PLANS on the *Plateau Region Water Plan* website: http://www.ugra.org/plateau-water-planning-group.

**Public Water Supplier**

Drought contingency plans have previously been adopted by the majority of the public suppliers and municipalities in the Plateau Region, although some suppliers did not provide any adopted plans. Current triggers and response actions for participating entities are summarized in Table 7-1.

**Irrigation**

Irrigation wells located within a municipality are subject to the triggers and response actions designated by the city's drought plan. Non-exempt irrigation wells located outside of a municipality but within a GCD are subject to the triggers and response actions of the GCD. Exempt irrigation wells located within a GCD are requested to comply voluntarily with response actions that have been mandated for non-exempt well owners. No response actions have been designated for irrigators located in Val Verde County except for those located within the City of Del Rio's jurisdictional boundary.

**Wholesale Water Provider**

The only wholesale water provider in the Plateau Region is the City of Del Rio. Generally, triggers are invoked when water levels in the Bedell Street Storage Reservoirs are less than a designated depth and San Felipe Spring flow drops below a specific flow rate. Currently adopted triggers and actions are summarized below in Table 7-9.

**Table 7-9. City of Del Rio Drought Triggers and Response Actions**

| Stage & Description | 1 – Mild | 2 – Moderate | 3 – Severe | 4 – Extreme | 5 – Emergency |
|---|---|---|---|---|---|
| Trigger | Water levels in the Bedell Street Storage Reservoir do not recover to 100% full during a 24-hour period; or are less than 30 ft. at any time; | Maximum water levels decrease over three consecutive days; or water levels are less than 25 ft. at any time; | Maximum water levels decrease over five consecutive days; or water levels are less than 20 ft. at any time; | Maximum water levels decrease over seven consecutive days; or water levels are less than 15 ft. at any time; | Water levels are less than 10 feet; |
| | San Felipe Spring flow is less than 25 mgd. | San Felipe Spring flow is less than 20 mgd. | San Felipe Spring flow is less than 15 mgd. | San Felipe Spring flow is less than 10 mgd. | San Felipe Spring flow is less than 5 mgd. |

| | | | | | |
|---|---|---|---|---|---|
| Conservation Goal (percent reduction in pumpage) | Reduce demand to 95% of the 30-day average prior to initiation | Reduce demand to 93% of the 30-day average prior to initiation | Reduce demand to 90% of the 30-day average prior to initiation | Restrictions to ensure adequate water supply for public health and safety, as demonstrated by meeting minimum system pressure requirements and fire flow demands. | Notify state |

| ~~Stage & Description~~ | ~~1 – Mild~~ | ~~2 – Moderate~~ | ~~3 – Severe~~ | ~~4 – Extreme~~ | ~~5 – Emergency~~ |
|---|---|---|---|---|---|
| ~~Trigger~~ | ~~Water levels are less than 100% full; San Felipe Spring flow is less than 40 mgd.~~ | ~~Water levels are less than 30 feet; San Felipe Spring flow is less than 25 mgd.~~ | ~~Water levels are less than 25 feet; San Felipe Spring flow is less than 20 mgd.~~ | ~~Water levels are less than 20 feet; San Felipe Spring flow is less than 15 mgd.~~ | ~~Water levels are less than 15 feet; San Felipe Spring flow is less than 10 mgd.~~ |
| ~~Conservation Goal (percent reduction in pumpage)~~ | ~~Reduce demand to 95% of the 30-day average prior to initiation~~ | ~~Reduce demand to 90% of the 30-day average prior to initiation~~ | ~~Reduce demand to 80% of the 30-day average prior to initiation~~ | ~~Reduce demand to 70% of the 30-day average prior to initiation~~ | ~~Notify state~~ |

## 7.6 DROUGHT WATER MANAGEMENT STRATEGIES

The PWPG has designated drought management strategies (J-14 and J-18) for the Bandera County Other category to be administered by the Bandera County River Authority and Groundwater District. Drought management stages by the District are triggered by the U.S. Drought Monitor and adjusted at the discretion of the District when aquifer levels, rainfall and river flow conditions warrant. Drought management is considered a temporary measure aimed at conserving available water supplies during times of drought or emergencies. Drought management is most adequately addressed in the Region through the implementation of local drought contingency plans. The PWPG is supportive of the development and use of these plans during periods of drought or emergency water needs.

# 7.7 OTHER DROUGHT-RELATED CONSIDERATIONS AND RECOMMENDATIONS

### 7.7.1 Texas Drought Preparedness Council and Drought Preparedness Plan

In accordance with TWDB rules, all relevant recommendations from the Drought Preparedness Council (DPC) were considered in the writing of this Chapter. The Texas Drought Preparedness Council is composed of representatives from multiple State agencies and plays an important role in monitoring drought conditions, advising the governor and other groups on significant drought conditions, and facilitating coordination among local, State, and Federal agencies in drought-response planning. The Council meets regularly to discuss drought indicators and conditions across the State and releases Situation Reports summarizing their findings. Additionally, the Council has developed the State Drought Preparedness Plan, which sets forth a framework for approaching drought in an integrated manner to minimize impacts to people and resources. The Plateau Region supports the ongoing efforts of the Texas Drought Preparedness Council and recommends that water providers and other interested parties regularly review the Situation Reports as part of their drought monitoring procedures. The Council provided ~~two~~ three new recommendations in ~~2019~~2024 to all RWPGs which are addressed in this chapter.

- ~~Follow the outline template for Chapter 7 provided to the regions by TWDB 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.~~

- The regional water plans and state water plan shall serve as water supply plans under drought of record conditions. The DPC encourages regional water planning groups to consider planning for drought conditions worse than the drought of record, including scenarios that reflect greater rainfall deficits and/or higher surface temperatures.

- The DPC encourages regional water planning groups to incorporate projected future reservoir evaporation rates in their assessments of future surface water availability.

- The DPC encourages regional water planning groups to identify in their plans utilities within their boundaries that reported having less than 180 days of available water supply to the Texas Commission on Environmental Quality during the current or preceding planning cycle. For systems that appeared on the 180-day list, RWPGs should perform the evaluation required by Texas Administrative Code Section 357.42(g), if it has not already been completed for that system.

- ~~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.~~

To meet these recommendations, the PWPG has developed this Chapter to correspond with the sections of the outline template and has provided model DCPs for both municipal and irrigation users.

### 7.7.2 Other Drought Recommendations

The PWPG recognizes that while drought preparedness, including DCPs, are an important tool, in some instance's drought cannot be prepared for, it must be responded to. The PWPG maintains that DCPs developed by the local, individual water providers are the best available tool for drought management. The PWPG fully supports the use and implementation of individual DCPs during times of drought. The PWPG has reviewed provided DCPs and specific drought response strategies proposed in this *Plan* and find no unnecessary or counterproductive variations to exist.

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