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CHAPTER 7.0: DROUGHT RESPONSE INFORMATION, ACTIVITIES AND RECOMMENDATION

This chapter presents information on drought management and Drought Contingency Plans, as well as a summary of information provided by water systems in the Lower Colorado Regional Water Planning Area regarding drought management, including preparations and response throughout the Region.

Drought Definitions

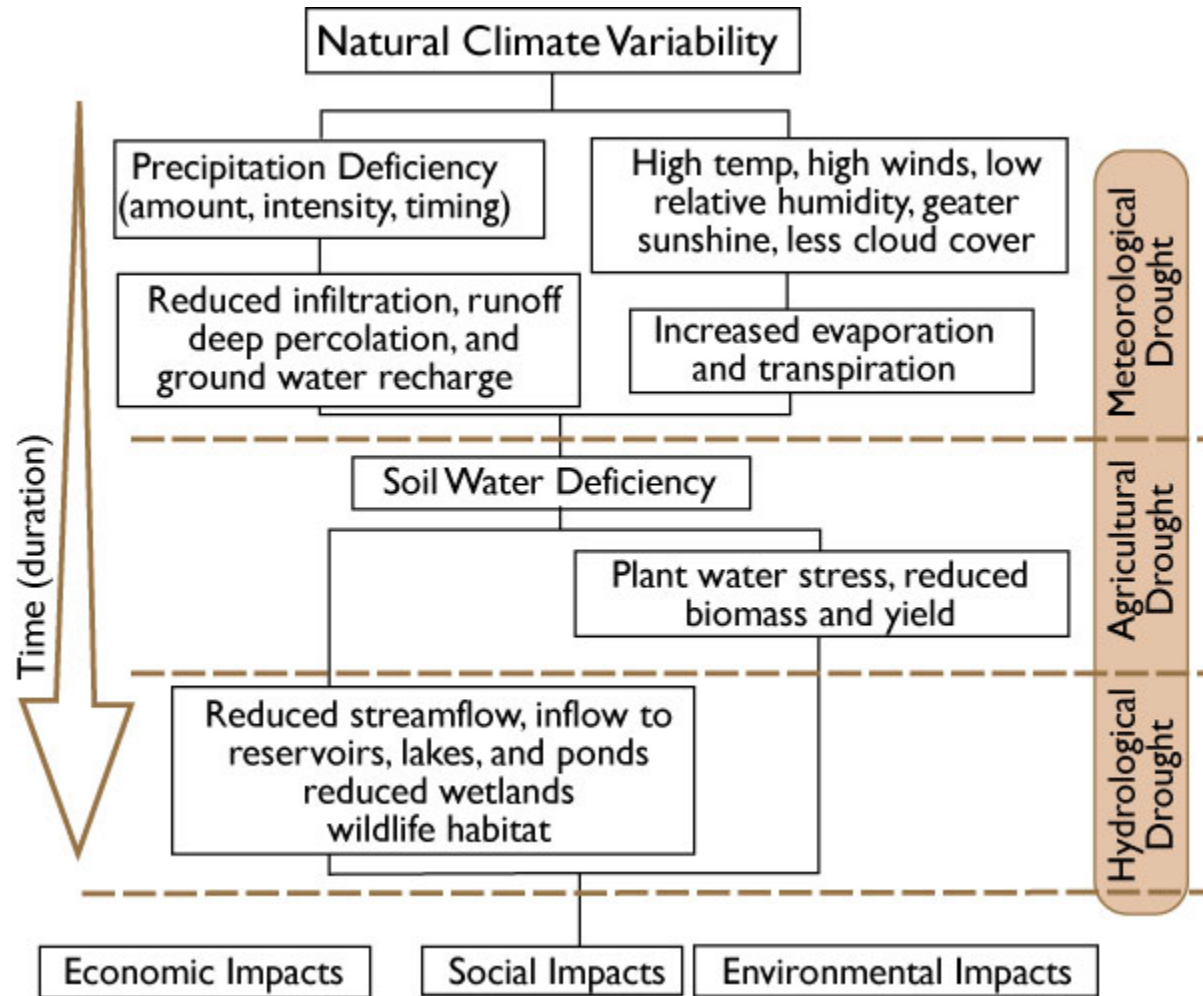
Drought is often referred to as a slow-moving emergency. The impact of droughts can be far-reaching but can be challenging to define due to the gradual and sometimes subtle progression of severity, as well as the tendency for temporal and geographic variations such as isolated rain events to shift perception of the drought severity. The types of droughts are sometimes characterized as meteorological, agricultural, and hydrological, which are events leading to the recognized socioeconomic impacts of drought. These drought terms are integrated and ordered such that as one type of drought intensifies it may lead to the development of another category of drought. The following definitions of categories of drought are taken from the State of Texas Drought Preparedness Plan and are further reflected in *Figure 7.1*:

- A meteorological drought is often defined as a period of substantially diminished precipitation duration and/or intensity that persists long enough to produce a significant hydrologic imbalance. The commonly used definition of meteorological drought is an interval of time, generally of the order of months or years, during which the actual moisture supply (typically rainfall in this region) of a given place consistently falls below the average moisture supply or average rainfall amount.
- Agricultural drought occurs when there is inadequate precipitation and/or soil moisture to sustain crop or forage production systems. The water deficit results in serious damage and economic loss to plant or animal agriculture. Agricultural drought usually begins after meteorological drought but before hydrological drought and can also affect livestock and other agricultural operations.
- Hydrological drought refers to reductions in surface and groundwater water supplies. It is measured as streamflow, and as lake, reservoir, and groundwater levels. There is usually a time lag between a lack of rain and lower amounts of measurable water in streams, lakes, and reservoirs.
- Socioeconomic drought occurs when physical water shortages start to affect the health, well-being, and quality of life of the people, or when the drought starts to affect the supply and demand of an economic product.

Determining if a dry weather pattern substantiates a meteorological drought requires an area-specific analysis that is first typically signified by dry meteorological patterns. Short intervals of dry patterns are considered within the norm of meteorological variation (seasonally and annually) so it is important to note that a true meteorological drought is dependent on the area in which it occurs.

In areas where surface and/or groundwater supplies are full at the start of a dry pattern, there is often minimal impact on water use or economic and agricultural activity. However, as dry pattern intensities deepen and duration of the meteorological drought continues and water supplies are stressed, the impacts of meteorological drought transition and begin to indicate other drought categories.

Figure 7.1: Categories of Drought and Natural Climate Variability



Source: National Drought Mitigation Center website “What is Drought?”

7.1 DROUGHT OF RECORD

The definition of Drought of Record is “the period of time when historical records indicate that natural hydrological conditions would have provided the least amount of water supply,” per TAC Title 31, Part 10, Chapter 357, Subchapter A, Rule 357.10.

Hydrological droughts can be assessed using the Texas Commission on Environmental Quality (TCEQ) Water Availability Model (WAM); this assessment is directly associated with the use of the WAM model to determine firm availability of surface water for the Regional Water Plan.

Another indicator commonly used by federal and state agencies to characterize drought severity is the Palmer Drought Severity Index (PDSI). The PDSI is an estimate of soil moisture conditions calculated based on precipitation and temperature. The PDSI classifies soil moisture on a scale ranging from

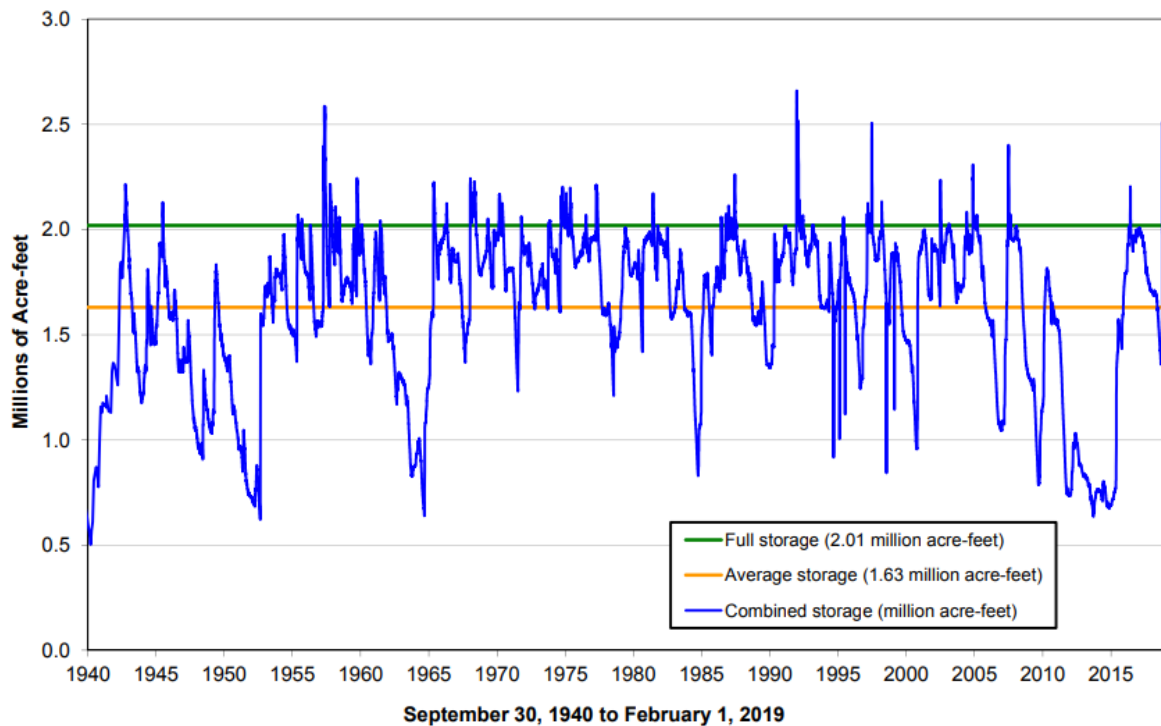
approximately -6.0 to 6.0, with values of approximately -0.49 to 0.49 reflecting normal conditions and -4.0 or lower representing extreme drought.

7.1.1 Drought of Record

Statewide, the period typically considered the Drought of Record occurred in the 1950s and had significant hydrologic and economic consequences throughout the State. Within the Lower Colorado Regional Planning Area, the Drought of Record is most specifically associated with the hydrologic conditions of the Highland Lakes. The current Drought of Record for the Highland Lakes began in October 2007 and lasted through December 2016. Modeling efforts confirm that 2011 represents the worst single-year drought on record, or the dry year of the Colorado River basin. The previous Drought of Record began in May 1947 and lasted through April 1957. During this time, the Highland Lakes reached a lowest combined storage of 621,221 acre-feet on September 9, 1952.

Due to schedule requirements of the current regional plan development process, the planning group was able to extend the hydrologic data set used for the plan’s surface water availability analysis through the end of 2016. However, since the full and final 2017 data sets were not yet available, analysis of any additional drought data through 2017 and beyond will need to be conducted for future planning analyses. The 5-year frequency of the regional planning cycles provides the opportunity on a regular basis to update the analyses that go into developing the plan. The 2007 to 2016 Drought of Record resulted in persistently low lake levels from 2011 to mid-2015. As of December 2019, lake storage is at 87%. *Figure 7.2* shows how the combined storage in the last several years compares to historical storage levels dating back to 1940, when the lakes were built.

Figure 7.2: Total Combined Storage Levels of Lakes Buchanan and Travis



7.2 CURRENT DROUGHT PREPARATIONS AND RESPONSE

The TCEQ, in accordance with the Texas Administrative Code (TAC), requires all wholesale public water suppliers, retail public supplier, and irrigation districts to prepare and submit Drought Contingency Plans (DCPs) meeting the requirements of 30 TAC Chapter§288(b) and to update these plans at least every five years.

While drought may be considered an emergency, it is often a slowly developing situation that provides increasing signs that water supplies could become scarce. By contrast, some supply deficiencies, such as equipment or pipeline failures, happen on shorter time intervals and provide little or no advance warning. System limitations that result from unexpected events including equipment failures, water supply contaminations, and other sudden decrease of supply should be planned for just as other emergency events. It is also important for communities to be aware that loss of supply may be a result of intentional damage or attack on a system.

The recent drought provided many water systems in the region with the opportunity to experience implementation of their Drought Contingency Plans. That real-world experience has helped shaped updates to their Drought Contingency Plans. Outdoor watering restrictions are a common method of reducing water use and are now being suggested as voluntary measures for several months a year in various water systems in the region. This effort prepares customers for anticipated water restrictions during periods of drought.

The Drought Contingency Plans show that a variety of triggers have been specified by the different water suppliers as initiators of water shortage conditions. These triggers include a threshold level of total water use, well levels, and conditions caused by mechanical failure of water service systems. Strategies planned for dealing with drought conditions included restrictions on water use for irrigation, vehicle washing, and construction. The amount of water saved for each drought response conditions varied by community.

Appendix 7A provides the drought triggers for severe and critical/emergency water shortages for water users in the region, as available from the Drought Contingency Plans. The water reduction goals for the triggers are also included.

7.3 EXISTING AND POTENTIAL EMERGENCY INTERCONNECTS

The Texas Administrative Code (31 TAC 357.42(d)) states that the regional water planning groups will collect confidential information on infrastructure and submit the information to the Executive Administrator of the Texas Water Development Board in accordance with the guidance provided.

The guidance provided by the Texas Water Development Board states that “RWPGs shall collect and summarize information on existing major water infrastructure facilities that may be used for emergency interconnects and provide this information to the EA confidentially and separately from the final adopted RWP...This information may be collected in a tabular format that shows the potential user(s) of the interconnect(s), the potential supplier(s), the estimated potential volume of supply that could be provided via the interconnect (including the source name), and a general description of the facility/infrastructure and its location.”

During the previous planning cycle, the Region K Drought Committee determined that a low number of responses would be expected if the planning group sent a letter requesting emergency interconnect data. Instead of a letter/survey, the Region K consultant submitted an information request to the TCEQ for

information on emergency interconnects within the counties in Region K. After repeating the process for the new cycle, the TCEQ provided an Excel spreadsheet containing data on the potential user of the interconnect, the potential supplier, source information, and contact information. *Table 7.1* shows emergency interconnects for 19 WUGs within Region K; although the submitted information included 38 existing and potential interconnects, some of the sellers or recipients were private or non-WUGs and are not included in the table. Information on existing and potential interconnect supply capacity and details related to location were not available. The confidential information was provided electronically, along with a transmittal letter, to the Executive Administrator prior to March 1, 2020.

Table 7.1: Existing and Potential Emergency Interconnects

Water User Group Recipient	Water User Group Seller	Supply Source
La Grange	Fayette WSC	GW
Fayette County WCID Monument Hill	Fayette WSC	GW
Fayette WSC	La Grange	GW
Fayette WSC	Fayette County WCID Monument Hill	GW
Manor	Austin	SW
Lakeway MUD	Travis County WCID 17	SW
Travis County WCID 17	Lakeway MUD	SW
Hurst Creek MUD	Lakeway MUD	SW
Hurst Creek MUD	Travis County WCID 17	SW
Travis County WCID 20	Travis County MUD 4	SW
Travis County WCID 20	West Travis County Public Utility Agency	SW
West Travis County Public Utility Agency	Travis County WCID 17	SW
Travis County MUD 4	Travis County WCID 20	SW
Georgetown	Round Rock	SW
Georgetown	Jonah Water SUD (Region G)	SW
Leander	Cedar Park	SW
Jonah Water SUD (Region G)	Georgetown	SW
Brushy Creek MUD	Round Rock	SW
Williamson County WSID 3	Round Rock	SW

Additionally, available DCPs for entities within the Region were reviewed to identify establishment or activation of interconnects as a drought response. The following entities have Drought Contingency Plans that mention the possibility of establishing or activating emergency interconnects as a drought response: Brookesmith SUD, Creedmoor-Maha WSC, Deer Creek Ranch, Fayette County WCID Monument Hill, Hays, Horseshoe Bay, Hurst Creek MUD, Lago Vista, Lakeway MUD, Leander, Travis County MUD 10, and Travis County WCID 17.

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

Emergency preparedness is of particular importance for entities that rely on a sole-source of water for supply purposes. In instances where water systems rely exclusively on a single source, the State of Texas has identified a need to develop emergency preparedness protocols should a source's availability be significantly and suddenly reduced for any reason, including drought, equipment failure, or accidental or deliberate source contamination.

7.4.1 WUGs with 2010 Population less than 7,500 and with a sole-source of water¹

The Texas Administrative Code (31 TAC §357.42) requires that regional planning groups evaluate potential emergency responses to drought conditions or loss of existing water supplies for municipal water user groups with a population of less than 7,500 and with a sole-source of water, as well as all county-other water user groups. For these emergency responses to local drought conditions or loss of municipal supply, the WUGs were assumed to have 180 days or less of remaining supply.

A list of identified single-source municipal Water User Groups with population less than 7,500 and with a sole-source of water is provided in *Table 7.2* on the next page. The table also lists potential emergency water supply options for each Water User Group.

7.4.2 County-Other WUGs

Table 7.3 on the following pages provides the list of County-Other Water User Groups in Region K, and their potential emergency water supply options. For these emergency responses to local drought conditions or loss of municipal supply, the WUGs were assumed to have 180 days or less of remaining supply.

¹ Information in this subsection was obtained from the Texas Administrative Code, specifically TAC Title 30, Part 1, Chapter 288, Subchapter A, Rule 288.2.0

Table 7.2: Municipal Region K WUGs under 7,500 in population and with a sole-source of water

Entity					Potential Emergency Water Supply Source(s)							Implementation Requirements					
Water User Group Name	County	2020 Population	2020 Demand (AF/year)	Supply Source	Release from upstream reservoir	curtailment of upstream/downstream water rights	local groundwater well	brackish groundwater limited treatment	brackish groundwater desalination	emergency interconnect	other named local supply	trucked-in water	Type of infrastructure required (numerical values explained on pg 7-9)	Entity providing supply (letter codes explained on pg 7-9)	Other local entities required to participate/ coordinate	Emergency agreements/ arrangements already in place?	other
Barton Creek West WSC	Travis	1,337	436	Highland Lakes						X		X	1	A		unk	
Barton Creek WSC	Travis	702	524	Highland Lakes			X					X	2				
Boling MWD	Wharton	855	105	Gulf Coast Aquifer			X					X	2				
Briarcliff	Travis	2,009	300	Highland Lakes								X					
Caney Creek MUD of Matagorda County	Matagorda	2,088	252	Gulf Coast Aquifer			X					X	2				
Cimarron Park Water Company	Hays	2,115	244	Edwards-BFZ			X					X	2				
Columbus	Colorado	3,832	1,134	Gulf Coast Aquifer	X		X					X	2,3				
Cottonwood Creek MUD 1	Travis	1,447	95	Carrizo-Wilcox			X					X	2				
Cottonwood Shores	Burnet	1,395	245	Highland Lakes			X			X		X	1,2	B		unk	
Deer Creek Ranch Water	Travis/Hays	887	69	Highland Lakes			X					X	2				
Eagle Lake	Colorado	3,803	521	Gulf Coast Aquifer			X					X	2				
Fayette County WCID Monument Hill	Fayette	760	184	Gulf Coast Aquifer			X			X		X	2	P			
Flatonía	Fayette	1,658	346	Yegua-Jackson			X					X	2				

Entity					Potential Emergency Water Supply Source(s)								Implementation Requirements				
Water User Group Name	County	2020 Population	2020 Demand (AF/year)	Supply Source	Release from upstream reservoir	curtailment of upstream/downstream water rights	local groundwater well	brackish groundwater limited treatment	brackish groundwater desalination	emergency interconnect	other named local supply	trucked-in water	Type of infrastructure required (numerical values explained on pg 7-9)	Entity providing supply (letter codes explained on pg 7-9)	Other local entities required to participate/ coordinate	Emergency agreements/ arrangements already in place?	other
Garfield WSC	Travis	1,772	199	Trinity Aquifer			X					X	2				
Granite Shoals	Burnet	5,401	578	Highland Lakes			X			X		X	1,2	C		unk	
Hays	Hays	1,222	183	Edwards-BFZ			X			X		X	1	O		unk	
Hays County WCID 1	Hays	3,647	821	Highland Lakes			X					X	2				
Hays County WCID 2	Hays	1,224	285	Highland Lakes			X					X	2				
Hornsby Bend Utility	Travis	7,066	594	Carrizo-Wilcox			X					X	2				
Horseshoe Bay	Burnet/ Llano	6,125	2,268	Highland Lakes/Direct Reuse			X			X		X	1,2	D		unk	
Hurst Creek MUD	Travis	3,095	1,718	Highland Lakes						X		X		F		unk	
Jonestown	Travis	3,948	675	Highland Lakes						X		X	1	E		unk	
Kelly Lane WCID 1	Travis	1,693	322	Trinity Aquifer			X					X	2				
La Grange	Fayette	5,478	957	Yegua-Jackson	X		X			X		X	2,3	P		unk	
Llano	Llano	3,565	862	Llano Lake		X						X					
Loop 360 WSC	Travis	2,086	1,225	Highland Lakes								X					
Markham MUD	Matagorda	1,013	97	Gulf Coast Aquifer			X					X	2				
Matagorda County WCID 6	Matagorda	1,099	113	Gulf Coast Aquifer			X					X	2				
Matagorda Waste Disposal & WSC	Matagorda	691	127	Gulf Coast Aquifer			X					X	2				

Entity				Potential Emergency Water Supply Source(s)								Implementation Requirements					
Water User Group Name	County	2020 Population	2020 Demand (AF/year)	Supply Source	Release from upstream reservoir	curtailment of upstream/downstream water rights	local groundwater well	brackish groundwater limited treatment	brackish groundwater desalination	emergency interconnect	other named local supply	trucked-in water	Type of infrastructure required (numerical values explained on pg 7-9)	Entity providing supply (letter codes explained on pg 7-9)	Other local entities required to participate/ coordinate	Emergency agreements/ arrangements already in place?	other
Meadowlakes	Burnet	2,540	852	Colorado Run-of-River			X			X		X	1,2	J		unk	
North San Saba WSC	San Saba	647	185	Ellenburger-San Saba			X					X	2				
Palacios	Matagorda	5,019	615	Gulf Coast Aquifer			X					X	2				
Rollingwood	Travis	1,421	383	Austin Water Contract			X					X	2				
Rough Hollow in Travis County	Travis	2,767	589	Highland Lakes			X					X	2				
Senna Hills MUD	Travis	1,219	420	Highland Lakes			X			X		X	2	M		unk	
Shady Hollow MUD	Travis	4,366	793	Austin Water Contract			X					X	2				
Smithville	Bastrop	4,797	821	Carrizo-Wilcox	X		X					X	2,3				
Sweetwater Community	Travis	2,760	408	Highland Lakes			X					X	2				
Travis County MUD 10	Travis	348	74	Highland Lakes			X			X		X	2	unk		unk	
Travis County MUD 14	Travis	2,015	172	Carrizo-Wilcox			X					X	2				
Travis County MUD 4	Travis	2,446	1,500	Highland Lakes						X		X		K		unk	
Travis County WCID 18	Travis	6,344	1,070	Highland Lakes			X			X		X	1,2	K		unk	
Travis County WCID 19	Travis	682	449	Highland Lakes						X		X		K		unk	

Entity				Potential Emergency Water Supply Source(s)									Implementation Requirements				
Water User Group Name	County	2020 Population	2020 Demand (AF/year)	Supply Source	Release from upstream reservoir	curtailment of upstream/downstream water rights	local groundwater well	brackish groundwater limited treatment	brackish groundwater desalination	emergency interconnect	other named local supply	trucked-in water	Type of infrastructure required (numerical values explained on pg 7-9)	Entity providing supply (letter codes explained on pg 7-9)	Other local entities required to participate/ coordinate	Emergency agreements/ arrangements already in place?	other
Travis County WCID 20	Travis	1,130	584	Highland Lakes						X		X	1	A		unk	
Travis County WCID Point Venture	Travis	1,036	255	Highland Lakes			X			X		X	2	N		unk	
Weimar	Colorado	2,164	496	Gulf Coast Aquifer	X		X					X	2,3				
Wharton County WCID 2	Wharton	2,235	456	Gulf Coast Aquifer			X					X	2				

Type of Infrastructure Required:

1. Transmission pipeline and pump station
2. Water Well
3. River intake, transmission pipeline, and surface water treatment plant

Entities potentially providing emergency interconnect water

- A. Travis County MUD 4
- B. Horseshoe Bay
- C. Sunrise Beach
- D. Cottonwood Shores
- E. Lago Vista
- F. Lakeway MUD or Travis County WCID 17
- G. Jonestown
- H. Austin
- I. Meadowlakes
- J. Marble Falls
- K. Travis County WCID 20
- L. West Travis County PUA
- M. Hurst Creek MUD
- N. Travis County MUD 1
- O. Buda
- P. Fayette WSC West

Table 7.3: County-Other WUGs in Region K

Entity					Potential Emergency Water Supply Source(s)							Implementation Requirements					
Water User Group Name	County	2020 Population	2020 Demand (AF/year)	Supply Source(s)	Release from upstream reservoir	curtailment of upstream/downstream water rights	local groundwater well	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?	other
County-Other	Bastrop	7,794	1,418	Carrizo Wilcox / Highland Lakes			X			X		X	well	Aqua WSC			
County-Other	Blanco	8,141	1,008	Ellenburger-San Saba Aquifer / Hickory / Trinity / Canyon Lake			X					X	well				
County-Other	Burnet	22,242	3,414	Ellenburger-San Saba / Hickory / Marble Falls Aquifer / Other Alluvium / Trinity / Highland Lakes			X					X	well				
County-Other	Colorado	11,810	1,453	Gulf Coast Aquifer			X					X	well				

Entity					Potential Emergency Water Supply Source(s)							Implementation Requirements					
Water User Group Name	County	2020 Population	2020 Demand (AF/year)	Supply Source(s)	Release from upstream reservoir	curtailment of upstream/downstream water rights	local groundwater well	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?	other
County-Other	Fayette	9,532	1,238	Gulf Coast Aquifer / Fayette WSC / Sparta / Yegua-Jackson / Highland Lakes			X					X	well				
County-Other	Gillespie	14,739	1,735	Edwards-Trinity Plateau / Ellenburger-San Saba / Hickory / Highland Lakes			X					X	well				
County-Other	Hays (p)	10,986	1,351	Edwards-BFZ / Trinity / Canyon Lake			X					X	well				
County-Other	Llano	2,455	260	Ellenburger-San Saba / Hickory / Other-alluvium / Highland Lakes			X			X		X	well	Horse-shoe Bay			
County-Other	Matagorda	9,928	1,036	Gulf Coast Aquifer			X					X	well				
County-Other	Mills	2,676	343	Ellenburger-San Saba / Trinity			X					X	well				

Entity					Potential Emergency Water Supply Source(s)							Implementation Requirements					
Water User Group Name	County	2020 Population	2020 Demand (AF/year)	Supply Source(s)	Release from upstream reservoir	curtailment of upstream/downstream water rights	local groundwater well	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?	other
County-Other	San Saba	1,403	218	Ellenburger-San Saba / Hickory / Marble Falls / Highland Lakes			X					X	well				
County-Other	Travis	6,206	870	Carrizo-Wilcox / Other Aquifer / Trinity / Highland Lakes			X			X		X	well	Lakeway MUD			
County-Other	Wharton (p)	14,640	2,385	Gulf Coast			X					X	well				
County-Other	Williamson (p)	434	67	Colorado Run-of-River, Highland Lakes			X					X	well				

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

7.5.1 Surface Water

The Highland Lakes and Colorado River provide substantial water supply to the Lower Colorado Region, and almost exclusively provide the primary source water for a number of Central Texas municipal utilities, including Austin (Austin Water). The Lower Colorado River Authority manages the Highland Lakes and closely monitors total combined storage in the lakes and establishes drought stages based on combined storage levels. *Table 7.4* below summarizes recommended drought stage triggers and actions as identified in the LCRA’s DCP for Firm Water Customers. LCRA requires all customers to submit drought contingency plans (DCPs) stating the specific combined storage triggers located in its water management plan and requires customers to update their plans every five years. Austin also follows Drought Contingency Plan triggers based on the combined storage levels in the Highland Lakes, as well as other triggers based on peak day system demand.

Table 7.4: Summary of LCRA Recommended Drought Triggers and Responses

Drought Stage	Trigger	Action
Stage 1	Combined Storage less than 1.4 million acre-feet and interruptible stored water is being curtailed	5% reduction by customers
Stage 2	Combined Storage less than 900,000 acre-feet and interruptible stored water is being curtailed	10-20% reduction by customers LCRA will implement an aggressive public information campaign
Stage 3	LCRA Board of Directors declares a Drought Worse than the Drought of Record	Minimum 20% reduction by customers and encouragement to use alternative supplies All uses of interruptible stored water will be cut off.
Stage 4	LCRA Board determines that conditions constitute a water supply emergency	Determined by LCRA Board. Encourage customers to use alternative water supplies

Based on LCRA Drought Contingency Plan for Firm Water Customers, February 2019.

The Lower Colorado Regional Water Planning Group (LCRWPG) acknowledges that the Major Water Providers in Region K have extensive knowledge regarding surface water sources in the region, and they may play a leadership role in developing appropriate drought response actions for themselves and their customers. Please see *Appendix 7A* for severe and critical/emergency triggers and responses associated with the surface water customers of the Major Water Providers in the region. One area the LCRWPG feels could potentially be improved upon is the coordination and uniformity of Drought Stage levels for all users of a particular source. It has been acknowledged that there can be some confusion when two

water users of the same water source are at different Drought Stage levels, even if they are implementing similar drought responses. No unnecessary or counterproductive variations in specific drought response strategies among user groups in Region K were identified that may confuse the public or otherwise impede drought response efforts.

7.5.2 Groundwater

A large portion of the region uses groundwater as their main source of supply. Throughout the region, the Drought Contingency Plans for groundwater users are developed specifically to their use and location. Aquifer characteristics can vary across the region and it can be difficult to require the same triggers for all users of a particular groundwater source that covers several counties. The LCRWPG acknowledges that the municipalities and water utilities that rely upon groundwater should have the best knowledge to develop their Drought Contingency Plan triggers and responses using their specialized knowledge. Please see *Appendix 7A* for severe and critical/emergency triggers and responses associated with groundwater users in the region. Even so, the LCRWPG encourages ongoing coordination between groundwater users, Groundwater Conservation Districts, and the Groundwater Management Areas to monitor local conditions for necessary modifications to the Drought Contingency Plans.

Several resources are available to aid in drought monitoring. The following sources provide information related to drought that groundwater suppliers, Groundwater Conservation Districts, and Groundwater Management Areas can all use to monitor drought conditions and help aid in making decisions related to triggers and drought response.

Texas Drought Preparedness Council:

<http://www.txdps.state.tx.us/dem/CouncilsCommittees/droughtCouncil/stateDroughtPrepCouncil.htm>

Palmer Drought Severity Index:

<https://www.drought.gov/drought/data/category/pdsi-palmer-drought-severity-index>

TCEQ drought information:

<https://www.tceq.texas.gov/response/drought>

7.5.3 Region-Specific Model-Drought Contingency Plans

Model drought contingency plans addressing the requirements of 30 TAC Chapter §288(b) were developed for Region K and are available in *Appendix 7B*. Model plans were developed for wholesale water providers, retail public water suppliers, irrigation water users, and steam-electric water users, based on the recommendations of the Drought Preparedness Council this planning cycle. The recommendation was to include region-specific model drought contingency plans for any water use category that uses 10 percent or more of the region's water demand in any given decade. Other than for steam-electric, these model plans were largely based on templates provided by the TCEQ with modifications made to acknowledge coordination with the Lower Colorado Regional Water Planning Group and to make the template more specific to the region. The TCEQ does not have templates for steam-electric water users, so a model plan was developed using a Drought Contingency Plan from a steam-electric facility in the region as an example.

7.6 DROUGHT MANAGEMENT WATER MANAGEMENT STRATEGIES

7.6.1 Potentially Feasible Drought Management WMS Considered

The Lower Colorado Regional Water Planning Group considers drought management an integral component of meeting the future water needs of the Region. Although drought management measures are often temporary mechanisms to reduce water consumption and drought impact, it is equally evident that some drought management measures may develop into permanent shifts or reductions in water use practices in the region. The Lower Colorado River Authority and Austin (Austin Water), as well as other smaller water providers throughout the Region, have implemented drought contingency measures largely since 2011. These measures and the subsequent awareness for mindful water use among citizens have become an important part of managing water supplies throughout the Region, particularly in the Highland Lakes.

Drought management as a water management strategy was considered for each municipal WUG, regardless of whether they had water needs. In general, the following guidelines were utilized in considering drought management as a municipal WUG strategy:

- For municipal WUGs with GPCD equal to or less than 100 gallons per capita daily, a 5% demand reduction was recommended.
- For municipal WUGs with GPCD greater than 100 gallons per capita daily, a 20% demand reduction was recommended.
- The demand reduction percentages listed above were modified based on available Drought Contingency Plans for individual WUGs to reflect the utilities' identified goal for reduction during severe drought.
- Consideration was given whether water use restrictions were in place in 2011.

Drought management was also considered as a potentially feasible strategy for several irrigation water user groups with water needs. Irrigation in Colorado, Matagorda, and Wharton counties has severe shortages throughout the planning period, and drought management may be a necessary strategy to implement. Rice farming is prominent in these three counties, and generally involves growing both a first and second (ratoon) crop. Drought management would assume that most rice farmers would grow only a first crop and not a second crop. In addition, drought management is recommended for irrigation in Mills County (Brazos Basin.) There are limited supplies of water in that area of the county, and it is assumed that the water use by agriculture would be reduced based on drought conditions.

7.6.2 Recommended Drought Management WMS

Drought management was recommended as a water management strategy for nearly all municipal WUGs that have Region K as their primary region, and for the irrigation WUGs mentioned in *Section 7.6.1*. Triggers associated with these recommended strategies include those referenced in the LCRA Water Management Plan and the individual utility drought contingency plans. The Palmer Drought Severity Index is another resource that could be used for determining triggers for these strategies. Please refer to *Chapter 5* for additional details.

Total water savings for municipal and irrigation-related drought management strategies within the Region reach approximately 83,000 ac-ft/yr by the year 2070, with the largest portion of that coming from municipal utilities.

Other recommended drought-related strategies that may be implemented specifically to help manage extreme drought conditions and extend water supplies include two strategies for Austin (Austin Water). The two Austin strategies include the Indirect Potable Reuse through Lady Bird Lake strategy and the Lake Austin Operations strategy, both discussed more fully, including drought triggers, in *Chapter 5*. In addition, Llano has a recommended strategy for purchasing water that would need to be trucked in. It is acknowledged that this strategy would only be implemented under extreme drought conditions where senior downstream water users divert all of their authorized water. This strategy is discussed in more detail in *Chapter 5*.

7.6.3 Alternative Drought Management WMS

There is one alternative strategy for LCRA that would likely be implemented only during times of drought. This is the Supplement Bay and Estuary Inflows with Brackish Groundwater strategy, discussed in *Chapter 5*.

7.7 OTHER DROUGHT RECOMMENDATIONS

Housed within the Office of Emergency Management within the Texas Department of Public Safety, the Drought Preparedness Council was authorized and established by the 76th legislature (HB-2660) in 1999, subsequent to the establishment of the Drought Monitoring and Response Committee (75th legislature, SB1.) The Council is composed of representatives of state agencies and appointees by the governor. As defined by the Texas Water Code, the Council is responsible for the monitoring and assessing drought conditions and advising elected and planning officials about drought-related topics.

During the 2021 cycle, the Lower Colorado Regional Water Planning Group (LCRWPG) reviewed and considered recommendations from the Drought Preparedness Council with regards to developing region-specific model drought contingency plans for water use categories in the region with more than 10 percent of water demands, as well as following the outline template provided by the Texas Water Development Board, making an effort to fully address the assessment of current drought preparations, as well as planned responses to local drought conditions or loss of municipal supply. The LCRWPG recommended conservation and drought management as water management strategies for municipal water user groups, which will aid in buffering any unanticipated population growth.

The Lower Colorado Regional Water Planning Group recognizes that the most valuable contingency will be completed at a local level. Further guidance and regional cooperation would be valuable in producing meaningful plans with clear trigger definition and implementation guidance. Communication of these between state, regional, and local levels would also further facilitate necessary emergency responses when drought measures need to be implemented. The following recommendations are made to support development and implementation of meaningful Drought Contingency Plans during times of drought:

- Uniform consistency of drought stage definition among users of the same source of water.
- Coordination by water providers with local Groundwater Conservation Districts, in order to consider more uniform triggers and responses from a particular source within the district, as applicable.

- Coordination with wholesale providers regarding drought conditions and potential implementation of drought stages.
- Communication with customers upon reaching a voluntary drought stage level to raise public awareness and facilitate potential implementation of drought measures.
- Communication with customers upon reaching a mandatory drought stage level to reinforce the importance of compliance with mandatory drought measures and emphasize heightened need for public awareness.