DROUGHT

Hazard Description

Drought is a period of time without substantial rainfall that persists from one year to the next. Drought is a normal part of virtually all climatic regions, including areas with high and low average rainfall. Drought is the consequence of anticipated natural precipitation reduction over an extended period of time, usually a season or more in length. Droughts can be classified as meteorological, hydrologic, agricultural, and socioeconomic. Table 1 presents definitions for these different types of drought.

Droughts are one of the most complex of all natural hazards as it is difficult to determine their precise beginning or end. In addition, droughts can lead to other hazards such as extreme heat and wildfires. Their impact on wildlife and area farming is enormous, often killing crops, grazing land, edible plants and even in severe cases, trees. A secondary hazard to drought is wildfire because dying vegetation serves as a prime ignition source. Therefore, a heat wave combined with a drought is a very dangerous situation.

Table 10-1. Drought Classification Definitions[1]

Meteorological Drought	The degree of dryness or departure of actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales.
Hydrologic Drought	The effects of precipitation shortfalls on stream flows and reservoir, lake, and groundwater levels.
Agricultural Drought	Soil moisture deficiencies relative to water demands of plant life, usually crops.

[1] Source: Multi-Hazard Identification and Risk Assessment: A Cornerstone of the National Mitigation Strategy, FEMA

Socioeconomic Drought	The effect of demands for water exceeding the supply as a result of a weather-related supply shortfall.

Location

Droughts occur regularly throughout Texas and the GBRA Basin and are a normal condition. However, they can vary greatly in their intensity and duration. There is no distinct geographic boundary to drought; therefore, it can occur throughout the GBRA Basin area equally.

Extent

The Palmer Drought Index is used to measure the extent of drought by measuring the duration and intensity of long-term drought-inducing circulation patterns. Long-term drought is cumulative, with the intensity of drought during the current month dependent upon the current weather patterns plus the cumulative patterns of previous months. The hydrological impacts of drought (e.g., reservoir levels, groundwater levels, etc.) take longer to develop. Table 10-2 depicts magnitude of drought while the Table 10-3 is describes the classification descriptions.

Table 10-2. Palmer Drought Index

Drought Index	Drought Condition Classifications						
	Extreme	Severe	Moderate	Normal	Moderately moist	Very moist	Extremely moist
Z index	-2.75 and below	-2.00 to -2.74	-125 to -1.99	-1.24 to +.99	+1.00 to +2.49	+2.50 to +3.49	n/a
Meteorological	-4.00 and below	-3.00 to -3.99	-2.00 to -2.99	-1.99 to +1.99	+2.00 to +2.00	+3.00 to +3.00	+4.00 and above
Hydrological	-4.00 and below	-3.00 to -3.99	-2.00 to -2.99	-1.99 to +1.99	+2.00 to +2.00	+3.00 to +3.00	+4.00 and above

Table 10-3. Palmer Drought Category Descriptions[2]

Category	Description	Possible Impacts	Palmer Drought Index
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures; fire risk above average. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered.	-1.0 to -1.9
D1	Moderate Drought	Some damage to crops, pastures; fire risk high; streams, reservoirs, or wells low, some water shortages developing or imminent, voluntary water use restrictions requested	-2.0 to -2.9
D2	Severe Drought	Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed	-3.0 to -3.9
D3	Extreme Drought	Major crop/pasture losses; extreme fire danger; widespread water shortages or restrictions	-4.0 to -4.9
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; exceptional fire risk; shortages of water in reservoirs, streams, and wells, creating water emergencies	-5.0 or less

Drought is monitored nationwide by the National Drought Mitigation Center (NDMC). Indicators are used to describe broad scale drought conditions across the U.S. Indicators correspond to the intensity of drought.

Based on the historical occurrences for drought and the location of the Guadalupe-Blanco River Basin to the coast, the area can anticipate a range of drought from abnormally dry to extreme or D0 to D3 based on the Palmer Drought Category.

Historical Occurrences

Although the GBRA Basin does not typically experience severe or extreme drought due to its proximity to the coast. It has been affected by key historic events. Figure 10-1 depicts key historic occurrences in the Gulf region overall, while Table 10-4 provides specific events by county as reported in the National Climatic Data Center (NCDC).

[2] Source: National Drought Mitigation Center

Figure 10-1. Drought in the Texas Gulf Basin

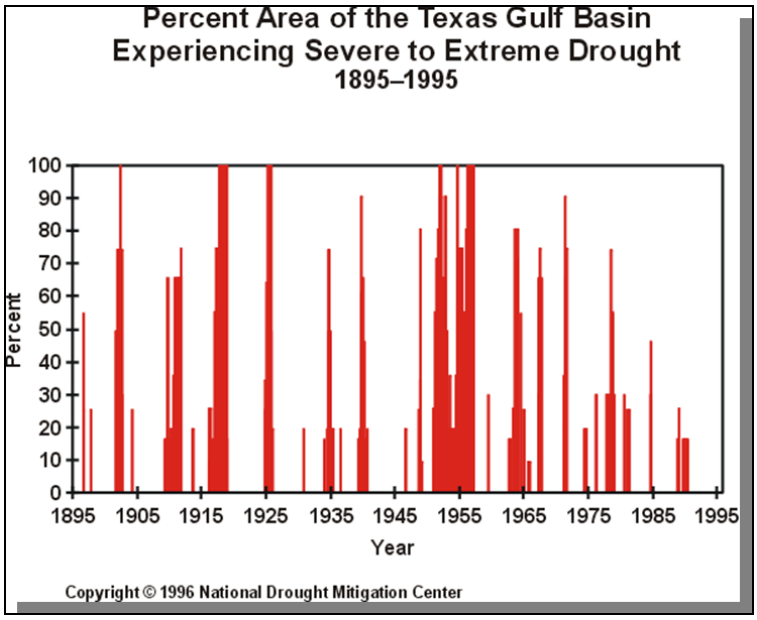

Table 10-4. Historical Drought Instances by Jurisdiction (NCDC, 1996-2009)

JURISDICTION	TOTAL EXPOSURE	ANNUALIZED LOSS (AL)	ANNUALIZED LOSS RATIO (ALR)
Caldwell County	$1,528,875,000	Negligible	0.00%
Calhoun County	$1,403,343,000	Negligible	0.00%
DeWitt County	$1,404,274,000	Negligible	0.00%
Gonzales County	$991,702,000	Negligible	0.00%
Kendall County	$1,676,308,000	$14,703	0.00%
Refugio County	$469,041,000	Negligible	0.00%
Victoria County	$5,117,120,000	Negligible	0.00%
City of Cibolo (Guadalupe County)	$221,273,000	Negligible	0.00%
TOTALS FOR STUDY AREA[2]	**$12,811,936,000**	**$19,301**	**0.00%**

Probability of Future Events

Based on historical drought in Texas and the GBRA region, the probability of a future drought occurrence is likely, with an event probable in the next three years, and a major drought every 20 years.

Impact and Vulnerability

In order to analyze the risk of the GBRA study area to drought and estimate potential losses, 13 years of statistical data from the NCDC and 2002 United States Department of Agriculture (USDA) agriculture data was used. A drought event frequency-impact was then developed to determine an impact profile on agriculture products and estimate potential losses due to drought in the area. Table 10-5 shows annualized exposure by county.

Table 10-5. Estimated Annualized Agricultural Market Losses to Drought by County

JURISDICTION	TOTAL AGRICULTURAL PRODUCTS EXPOSURE	ANNUALIZED LOSS (AL)	ANNUALIZED LOSS RATIO (ALR)
Caldwell County	$4,193,000	$58,667	1.40%
Calhoun County	$9,183,000	Negligible	0.00%
DeWitt County	$2,286,000	$58,667	2.57%
Gonzales County	$21,669,000	$58,667	0.27%
Kendall County	$970,000	$139,348	14.37%
Refugio County	$12,547,000	Negligible	0.00%
Victoria County	$13,958,000	Negligible	0.00%
City of Cibolo[3] (Guadalupe County)	N/A	N/A	N/A
TOTALS FOR STUDY AREA[4]	**$64,806,000**	**$315,349**	**18.61%**

Drought impacts large areas and crosses jurisdictional boundaries. All existing and future buildings, facilities and populations are exposed to this hazard and could potentially be impacted. However, drought impacts are mostly experienced in water shortages and crop/livestock losses on agricultural lands and typically have no impact on buildings.

The economic impact of droughts can be significant as they produce a complex web of impacts that spans many sectors of the economy and reach well beyond the area experiencing physical drought. This complexity exists because water is integral to our ability to produce goods and provide services. If droughts extend over a number of years, the direct and indirect economic impact can be significant.

[3] Given the relatively urban nature of the City of Cibolo, and the inability (based on available data) to statistically determine an exact percentage of exposure and historical loss for this one area of Guadalupe County, information for Cibolo is not included in this table at this time. Future plan updates may be able to revisit this portion of the planning area based on future data and/or methodologies that may be available at that time. From the broader planning perspective and for the purposes of this risk assessment, an alternative could be to assume that historical loss, exposure, annualized loss, and annualized loss ratio would all be negligible for Cibolo.

[4] Totals for the study area may include values less than $5,000 for dollar amounts that are classified as "Negligible" in the table.

SECTION 10: DROUGHT

Based on the previous occurrences and potential exposure for the hazard, the potential severity of impact of droughts is substantial, especially taking into consideration the economic losses that may result.