

Dry wells in Hays County: Is the Culprit Drought or Development?

What's the problem?

During the last few months, at least 100 wells in northern Hays County have been reported dry or have had to have pumps lowered in the area. Many of the wells have been in operation for decades and have survived past droughts that were more severe or longer lasting. Many rumors and reports indicate the current drought to be the worst or one of the worst in history, and at least one radio broadcast documented the drought to be the worst since 1925. Others have indicated that the well problems are due to increased groundwater pumpage from recent and current land development in the County.

If the well problems are caused solely by unprecedented or extremely dry conditions, such conditions would be expected to rarely occur and eventually end, thus water levels would be expected to recover during wetter (more normal) conditions for rainfall and runoff. However, if the problems are due to (or at least partly attributed to) increased groundwater pumpage, the problem likely would get worse and more widespread, especially considering that Hays County is projected to have substantial population growth in the immediate future.

How are droughts evaluated?

The severity of a drought must be evaluated with respect to area (location) and duration. Who can say when a drought begins or how large an area it covers? However, if a beginning date and an area are identified, the severity of a drought can be evaluated based on data such as rainfall, streamflow conditions, and water levels in wells. In order to evaluate the severity of the drought, current or recent data values for these constituents must be compared with historical data values.

Does Hays County have a good database to evaluate drought?

Absolutely. The Texas Water Development Board assesses the severity of droughts by a Standardized Precipitation Index, (SPI) which is updated at the end of each month. The maps present drought conditions by county for the past one, three, and six months, and for the past one and three years—the maps are available at: <http://www.txwin.net/Monitoring/Meteorological/Drought/spi.htm>.

Sixteen rain gages with current and historic data are operated in Hays County by five agencies or entities. Some of these data provide the basis for the SPI described above. All of the data are available in real-time on the Internet. Additionally, 4 streamflow-gaging stations with current and historical data are in Hays County—those data also are available on the Internet in real-time. Finally, several water wells with historic data are in Hays County. For two of those wells, current and historic water-level data are available on the Internet.

How bad is the drought in Hays County based on drought data?

Standardized precipitation Index: One of four conditions are calculated for each of the five periods identified above: near normal, moderately dry, severely dry, and extremely dry. For the most recent one, three, and six-month periods, precipitation conditions for Hays County are near normal. Based on the previous year, conditions are severely dry and for the previous three years, conditions are near normal.

Streamflow conditions: The monthly mean streamflow discharge was calculated for 3 of the 4 Hays County streamflow gages for May, June, and July 2006. For the Onion Creek at Driftwood gage, the flow has been zero or near zero for most of the past 3 months, likely due to increased withdrawals from the creek upstream from the gage. The flow for each of the other 3 gages for each month was compared to historic monthly flows. The percent of time that the monthly flows are less than the gaged flows for the past 3 months are presented below.

Percent of time that the monthly mean discharges have been lower than monthly mean discharges for May, June, and July 2006.

<u>Station name and location</u>	<u>May streamflow</u>	<u>June streamflow</u>	<u>July streamflow</u>
Bear Creek below FM 1826 near Driftwood, TX	50 %	37 %	27%
Blanco River at Wimberley, TX	43 %	19 %	8 %
Blanco River near Kyle, TX	25 %	9 %	6 %

As the table shows, May 2006 flows were near normal—flows have reduced since then but monthly flows have been lower than the July 2006 flows for percentages ranging from 6 to 27 % of the time. Additionally, the July 2006 flow is about normal when compared to July flows for previous years.

Groundwater levels: One Trinity aquifer well and one Edwards aquifer well with real-time water-level data in Hays County are available on the Internet. For the Trinity aquifer well, the most recent available depth to water (July 11, 2006) is about 232 feet (<http://hyper20.twdb.state.tx.us/twdbwells/hays5763705>). However, as the data show, the depth to water in this well has been lower than the current level since record began at the well (April 2002) until about February 2005. Therefore, based on the 4 years and 3 months of water-level data for this well, the current water level is higher than normal. This well is remote from areas experiencing large groundwater pumpage thus its water level probably represents “natural” conditions of the Trinity aquifer rather than areas experiencing large pumpage rates due to development.

The Edwards aquifer well is in the southeast part of Hays County. A graph of long-term water levels for that well (http://nwis.waterdata.usgs.gov/usa/nwis/gwlevels/?site_no=295443097554201) indicate the water level to be low. However, as the graph shows, water levels have been lower than the current level many times.

So what is to culprit for the dry wells?

Based on available precipitation, streamflow, and groundwater-level data, the current drought in Hays County is deemed moderate or severely dry—but not extremely dry. The data and associated analyses cannot conclusively identify the drought or increased pumpage as the sole cause for the problem wells. However:

1. groundwater pumpage associated with much recent development has increased substantially in northern Hays County;
2. many wells are dry in northern Hays County--many of those have been used for many decades and have not been previously dry; and,
3. the substantial database of rainfall, streamflow, and groundwater data all indicate that the drought is not severe.

Therefore, it is concluded that at least most of the dry wells are associated with increased pumpage due to recent development.

Will the problem of dry wells get worse?

The Texas Water Development Board (TWDB) presents current and projected planning data for different water planning strategies (<http://wiid.twdb.state.tx.us/ims/WIID/Viewer.asp?MapService=wuswp>).

The table below presents projections for population, total water demand, and total water needs for Hays County. Very little surface water is used in Hays County. The TWDB database indicates that only 27,400 acre-feet per year of groundwater are available in the county, of which about 14,000 acre-feet per year can be obtained for water supplies.

Year	Hays County Population or population projection	Total Water Demand (acre-feet per year)	Total water needed (acre-feet per year)
2000	103,000	20,800	5,319
2010	140,000	31,875	9,406
2020	175,000	36,240	13,526
2030	217,000	43,030	19,871
2040	264,000	51,021	27,587

As the data show, the population and water demand in Hays County is projected to increase substantially in the near future. Additionally, data from the Texas State Data Center and Office of the State Demographer (<http://txsdc.utsa.edu/tpepp/txpopest.php>) predict Hays County will have much greater future population than presented above by the TWDB. Hays County is one of the fastest growing counties in the State; recent population growth in Hays County has exceeded past population projections, and this trend might continue because of unprecedented growth in the county. Therefore, the water needs for the County could be greater than projected in the table above.

What is the conclusion?

Although precipitation and streamflow data indicate dry conditions throughout most of Hays County, they are nevertheless near normal relative to most summers. Also, groundwater levels are near or slightly below normal for wells remote from developed areas in the county. However, new and old wells near high-density developments, most of which have occurred recently, are experiencing extremely low water levels. Many such wells are dry. If substantial rainfall occurs later this year, the problem might be temporarily solved. However, just as past droughts have been worse, the effects of the current drought could eventually become much worse as greater development materializes. Future occurrences of prolonged drought and (or) additional growth will cause many more wells to become dry and probably result in many thousands of people to be without well water in the county. Although nobody knows exactly when this will happen, it will most likely occur during this or the next decade.

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