Analysis of Groundwater Level Conditions in the Texas Hill Country June 2011 to October 2011

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INTRODUCTION

From October 2010 through September 2011, Texas has faced serious drought (LCRA 2011). Water conservation has become one of the most critical issues in Texas. This drought combined with an increasing population has created conditions under which it has become imperative to preserve this natural resource. The Hill Country Alliance (HCA), a nonprofit organization that seeks to preserve natural resources in the Texas Hill Country (17 Central Texas counties), sought the help of Bobcat Geospatial Solutions (BGS) to analyze current groundwater level conditions in the Texas Hill Country. BGS used Geographic Information Systems (GIS) to produce a map to illustrate current water levels throughout the region. Our water well level data provides the groundwork for the HCA to improve and build upon in their continuous effort to work with the Hill Country community and promote ways to preserve natural resources of the Texas Hill Country.

PURPOSE AND SCOPE

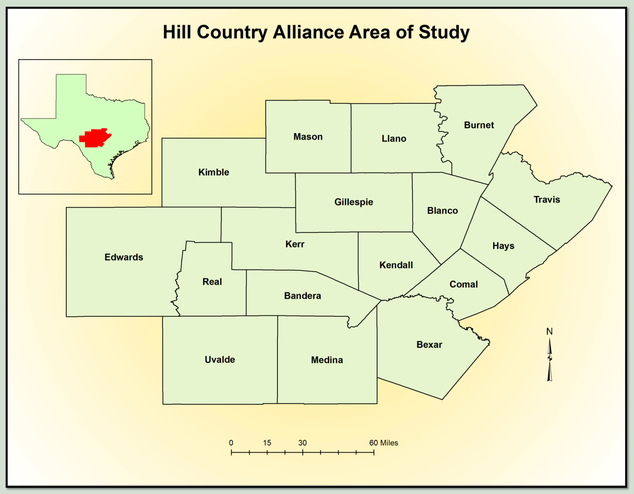
•This study provides a map product that presents recent groundwater data in colors that illustrate a percentile range based on well water elevation levels.

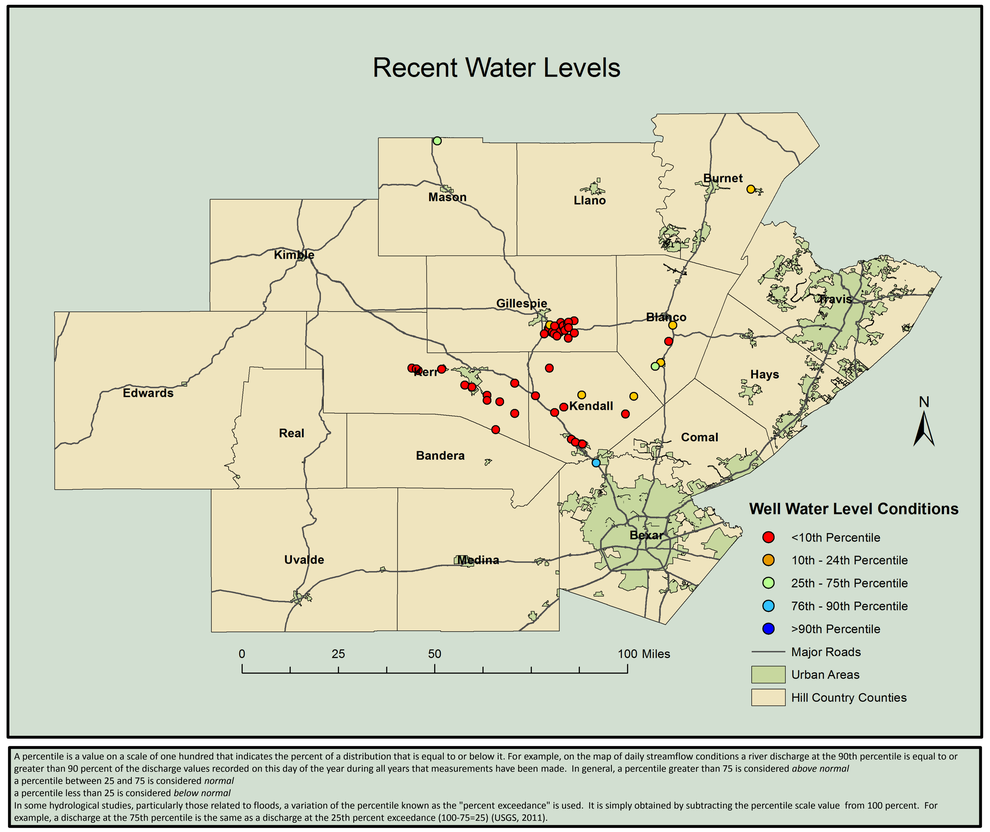
•Historic well data was collected from the United States Geological Survey (USGS), Texas Water Development Board (TWDB) and local groundwater districts.

•HCA will build upon our data to create and maintain a real-time study of groundwater level conditions.

•Our study includes 17 counties that encompass the Texas Hill Country (Burnet, Mason, Llano, Kimble, Gillespie, Blanco, Travis, Hays, Comal, Bexar, Kendall, Medina, Uvalde, Bandera, Real, Edwards and Kerr County).

•We only reported on wells that met HCA's qualifications (at least 40 water level measurements over at least a 10-year period that are currently measured by local groundwater districts, USGS or TWDB).





A percentile is a value on a scale of one hundred that indicates the percent of a distribution that is equal to or below it. For example, on the map of daily streamflow conditions a river discharge at the 90th percentile is equal to or greater than 90 percent of the discharge values recorded on this day of the year during all years that measurements have been made. In general, a percentile greater than 75 is considered *above normal*
a percentile between 25 and 75 is considered *normal*
a percentile less than 25 is considered *below normal*
In some hydrological studies, particularly those related to floods, a variation of the percentile known as the "percent exceedance" is used. It is simply obtained by subtracting the percentile scale value from 100 percent. For example, a discharge at the 75th percentile is the same as a discharge at the 25th percent exceedance (100-75=25) (USGS, 2011).

RESULTS AND CONCLUSIONS

- Most qualifying wells are located in just four of the 17 Hill Country Counties.
- All but a few of the latest well measurements are extremely low compared to their historical elevations.
- There are no discernible patterns in the location of the four wells with the highest water elevation (> 50 percentile value).
- Qualifying wells are not distributed evenly throughout the geographic area.

Four wells with higher water elevations are located in clusters of wells with extremely low levels. This pattern is significant and is deserving of further investigation. However, any spatial pattern identified in this project is limited by the lack of available historical data (a 10 year or longer series) for many Hill Country counties.

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DATA

•Data layers collected from the Texas Natural Resources Information System (TNRIS) website were used for display purposes.

•County boundaries provide the study region viewpoint.

•Roads and urban area data layers were used to assist HCA in readily identifying well locations.

METHODS

•Collected information from wells with at least 10 years of data and at least 40 independent measurements from USGS and TWDB.

•Gathered recent water level measurements from the Hill Country groundwater conservation districts.

•Calculated the percentile values for each well with statistics software at Wessa.Net.

•Combined all of the information in a spreadsheet with the following headings: well number, aquifer, county, latitude and longitude coordinates, depth from land surface, surface elevation, recent measurement date and percentile value.

•Imported our spreadsheet into ArcGIS 10 to create our well data layer

•Clipped data layers from TNRIS to focus on the HCA area of study.

•Utilized ArcGIS 10 to perform analysis on our data and create our map product.

Image by Tomasz Plawski

REFERENCES

LCRA. "Texas Drought." LCRA. 04 Nov. 2011. http://www.lcra.org/water/drought/index.html (last accessed 03 Dec. 2011).

USGS. "USGS Water Data for Texas." USGS. 05 Dec. 2011. http://waterdata.usgs.gov/tx/nwis/?percentile_help (last accessed 05 Dec. 2011)

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