Term Project Update CE394K Heather Davis

October 25, 2011

Title: ***Historical Drought Mapping of the Pedernales Watershed***

Background & Objective: As the availability of usable water becomes scarce, competition for water among agricultural, industrial, commercial, and residential sectors starts to propagate. For this reason, it would benefit those in charge of water resources management to be able to predict when a drought might occur. The Pedernales Watershed is the focus of this project, see Figure 1. It contains the Pedernales River which flows into Lake Travis. The major objective of this analysis is to use historical rainfall information within the Pedernales Watershed to analyze drought frequency pertaining soley to weather conditions to aid in the prediction of future drought occurrence.

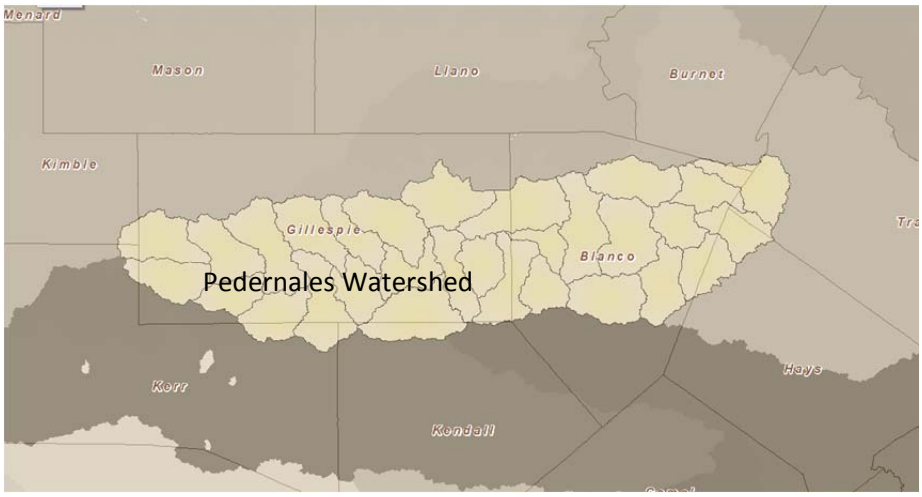

Figure 1: ArcGIS Map of Pedernales Watershed

Method: This will be accomplished through a combination of the available water storage data provided by SSURGO (Soil Survey Geographic Database), USGS, National Hydrography Dataset and Texas Water Development Board (TWDB), among other sources. The SSURGO data apportions land areas into polygons with unique values describing the maximum potential water content for the given polygon. These unique values will be attached to rainfall data from the National Hydrography Dataset to enable analysis of precipitation throughout the last 30 years in order to potentially predict the next drought. The Texas Water Development Board (TWDB) contains historical drought data for the state of Texas. Several different incides are tabulated. The Palmer Drought Severity Index (PDSI) will be the main focus for this project with comparisons to the Crop Moisture Index (CMI).

The PDSI is most effective in determining long term drought. It uses a 0 as normal, and drought is shown in terms of minus numbers; for example, minus 2 is moderate drought, minus 3 is severe drought, and minus 4 is extreme drought. Conversely, positive numbers would reflect rainfall, or an abundance of available water. See Figure 1 for the most current map of PDSI levels for the state of Texas (note the Pedernales Watershed is located in Region 6). The advantage of the Palmer Index is that it is standardized to local climate, so it can be applied to any part of the country to demonstrate relative drought or rainfall conditions. The negative is that it is not as good for short term forecasts, and is not particularly useful in calculating supplies of water locked up in snow.

The CMI responds more rapidly than the Palmer Index and can change considerably from week to week, so it is more effective in calculating short-term abnormal dryness or wetness affecting agriculture. It is designed to indicate normal conditions at the beginning and end of the growing season and uses the same levels as the Palmer Drought Index. The key difference in the formulas is that the CMI places less weight on the data from previous weeks and more weight on the recent week. Figure 2 shows the most current map of CMI levels for the state of Texas.

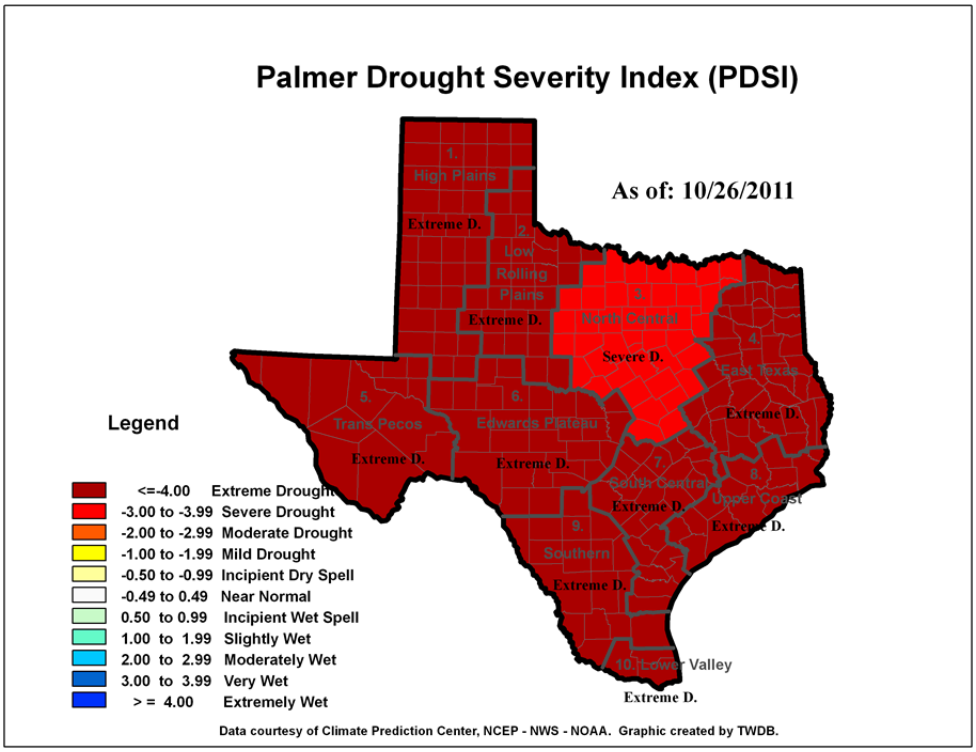

Figure 2: Current PDSI

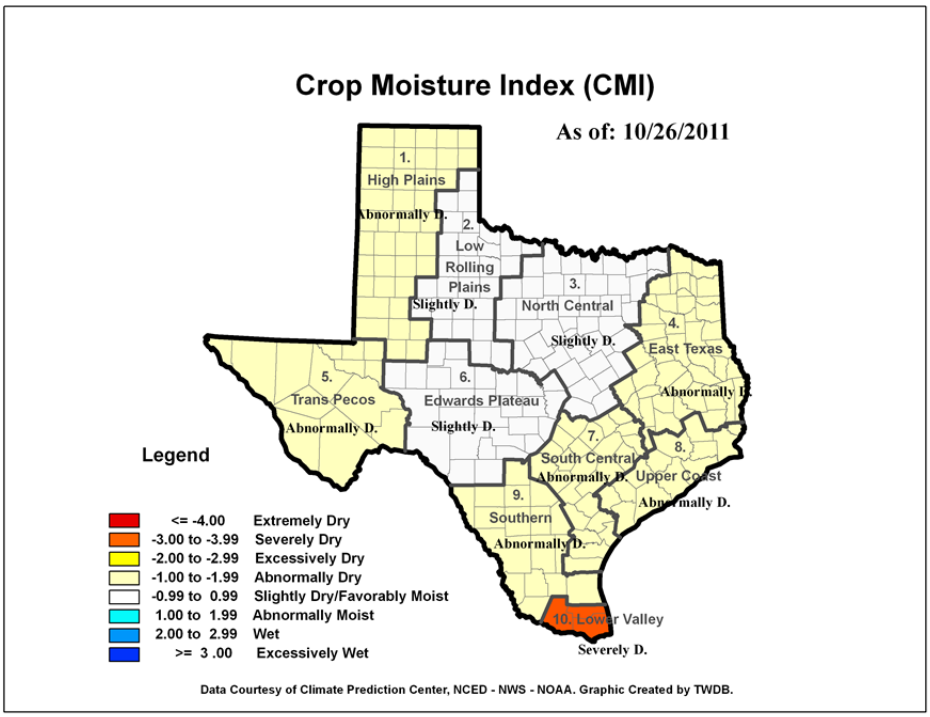

Figure 3: Current CMI

How best to incorporate this information into ArcGIS has yet to be determined. I am working with both Johnny Sullivan, who is researching a similar topic, and Professor Maidment to develop a strategy.