Watershed Characterization Model

This report was auto-generated by the Watershed Characterization Tool. Approximately six months of effort were devoted to the development and modification of the Watershed Characterization Tool for the study area. Utah State University's WRIA- Decision Support System (DSS) provided the framework for the development of this tool[1]. The WRIA- DSS includes three large models- surface water quality, surface water quantity, and instream flow/fish habitat, in addition to other functions. The result is a simulation model with a user-interface that can analyze water quality and quantity data, display data, and create scenarios. However, since the WRIA-DSS was developed for watersheds in Washington State, most of the code was rewritten to fit the geographic focus of this project. Annual climate change, annual stream flow change, impervious land cover, and well maps are examples of data and information added to the original watershed characterization tool. Graphics and tables were generated at the sub-watershed level, and data was assembled from various sources. Figure 3 shows the interface of this tool.

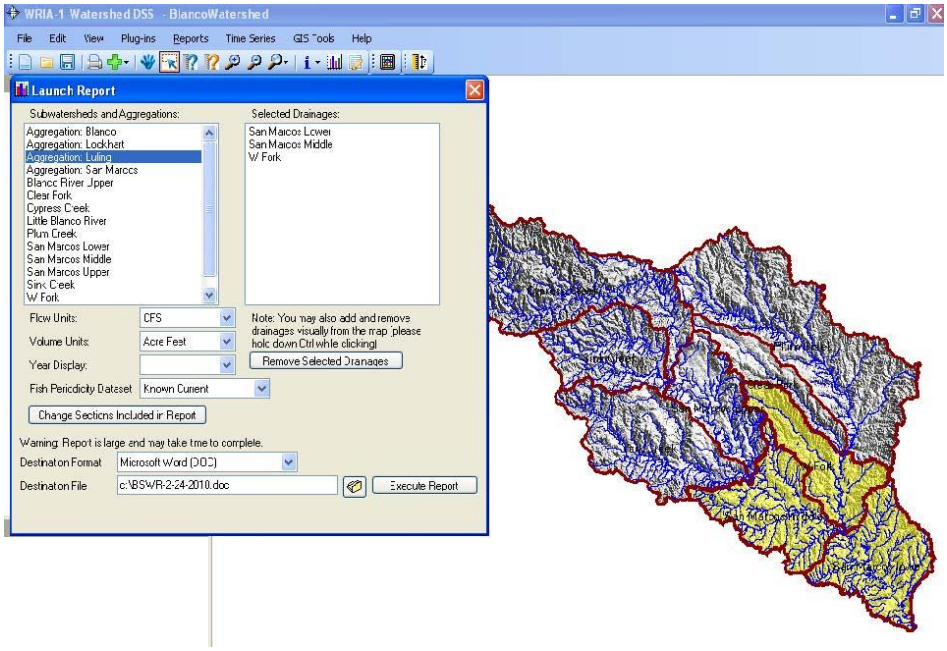


Figure 3 Blanco-San Marcos Watershed Characterization Tool Interface Example

Since it is impossible to show all of the data that were used as inputs to the Blanco Watershed Characterization Tool, this section provides overview of the data that were used as inputs for the tool. It also includes several examples of detailed data at the sub-watershed level used in the Tool. It also includes outputs and examples of analyses that water resources managers can conduct with the Tool.

[1] Utah State University. November 2008. WRIA 1 Decision Support System. Retrieved December 15, 2010. http://wria1project.whatcomcounty.org/uploads/PDF/Decision%20Support%20System/Decision%20Support%20System%20Executive%20Summary_Final_11.14.08_11x17.pdf>

Social Economic Conditions Output Examples

This section provides overview of the total population, population category and economic activities of the study area that were used as inputs for the tool. It also includes several examples of detailed data at the sub-watershed level used in the tool.

The Blanco watershed has witnessed some of the fastest economic growth in the country with an average annual growth rate of at least 2.68%. The city population data listed below in Table 2 are from the 1990 US Census[2].

Table 2 City Population from 1990 Census.

City Name	Total Population
Blanco	1238
San Marcos	28743
Wimberley	2403
Luling	4661
Lockhart	9205
Kyle	2225

Table 3 lists the population from the 2000 census[3]. Comparing the population changes between 1990 and 2000 demonstrates that Kyle and Wimberley are the two fastest growing communities on the watershed.

[2] Texas State Library and Archives Commission (TSLAC 2010 B). 2000 Census: Population of Texas Cities. Retrieved December 15, 2010. http://www.tsl.state.tx.us/ref/abouttx/popcity12000.html

[3] United States Census Bureau. (2010). American FactFinder Fact Sheet: Kyle city, Texas. Retrieved December 15, 2010. http://factfinder.census.gov/servlet/SAFFPopulation?_event=Search&geo_id=16000US4845096&_geoContext=01000US|04000US48|16000US4845096&_street=&_county=kyle&_cityTown=kyle&_state=0400730US48&_zip=&_lang=en&_sse=on&ActiveGeoDiv=geoSelect&_useEV=&pctxt=fph&pgsl=160&_submenuId=population_0&ds_name=null&_ci_nbr=null&qr_name=null&reg=null:null&_keyword=&_industry=

Table 3 City Population from 2000 Census.

City Name	Total Population
Blanco	1505
San Marcos	34733
Wimberley	3797
Luling	5080
Lockhart	11615
Kyle	5314

Figure 4 presents the boundary of cities and their extra-territorial jurisdictions in the watershed in 2007.

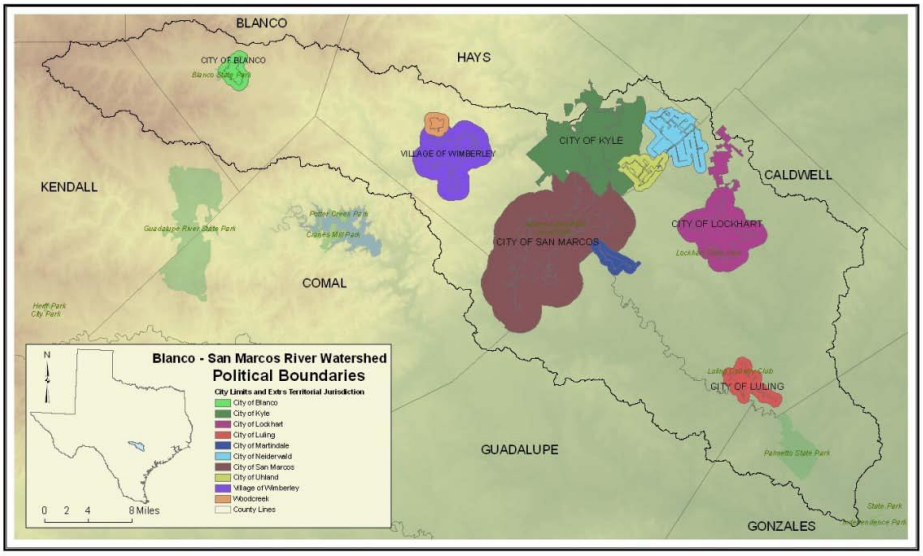


Figure 4 Watershed Cities and City ETJs, 2007

Climate Output Examples

In order to understand climate trends, the climate section of the Blanco Watershed Characterization Tool reports monthly average as well as annual changes over the last 50 years. What follows are examples of the type of data that were used as inputs for the Tool. In addition, we have included examples of the types of analyses that water resources managers can conduct with the Tool.

Using data from weather station 410832 in Blanco, Figures 8 through 11 present annual average values of temperature and precipitation in the last 50 years. Analysis of the data show that 1954,

1956, 1990, 1998, 1999, and 2004 have the highest annual average temperatures, while the most precipitation was recorded in 2004-2005. Evaluation of data indicated that 1954 to 1956, 1986 to 1988, and 2004 to 2006 showed the highest temperature variations in the data set. The recorded climate data capture the extremes experienced in this region, which can be obscured by the average temperature and precipitation values.

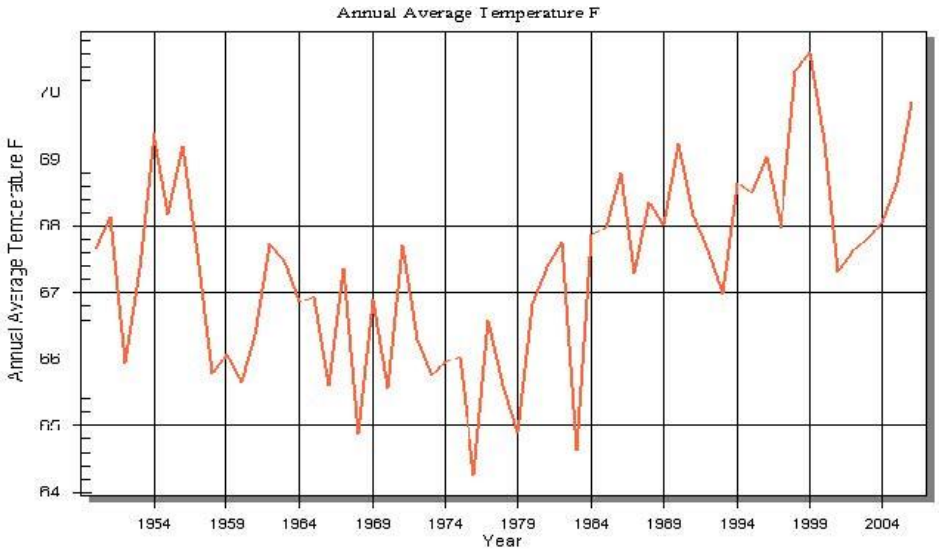
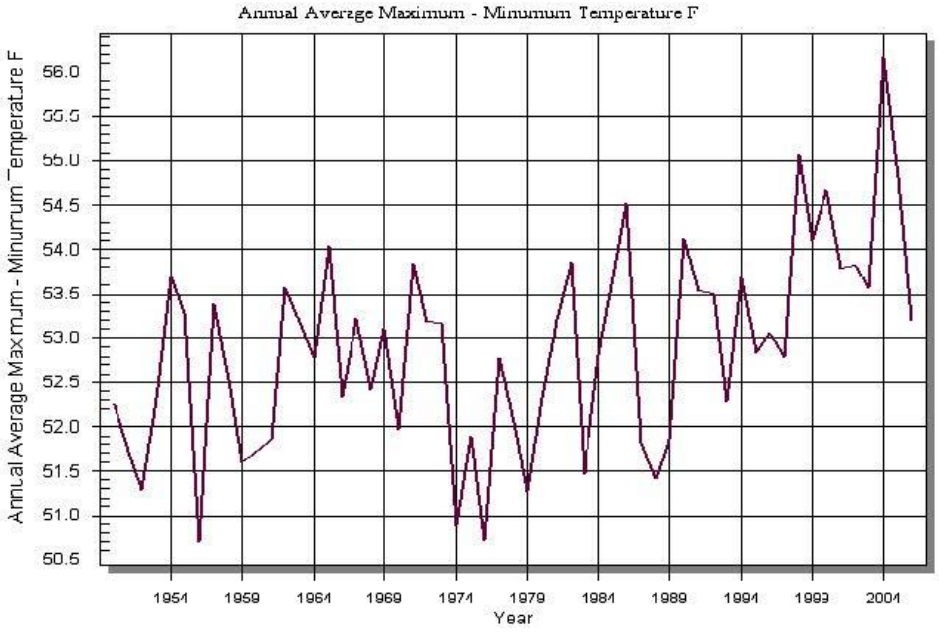


Figure 8 Annual Average Temperature Trend, Blanco station 410832 (1954-2004)



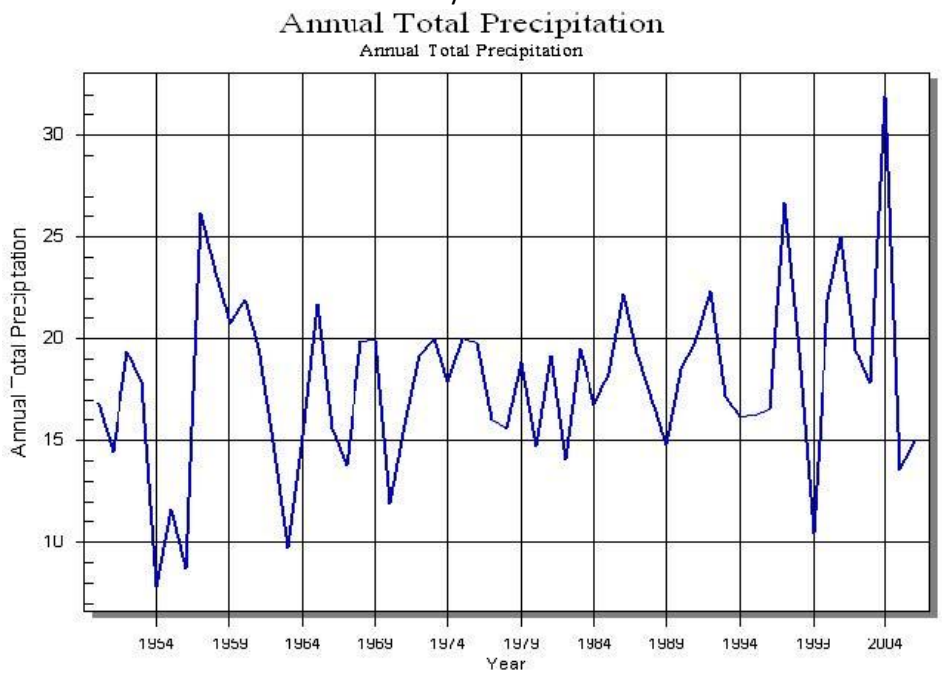


Figure 10 Annual Total Precipitation Trend, Blanco station 410832 (1954-2004) (centimeters per year)

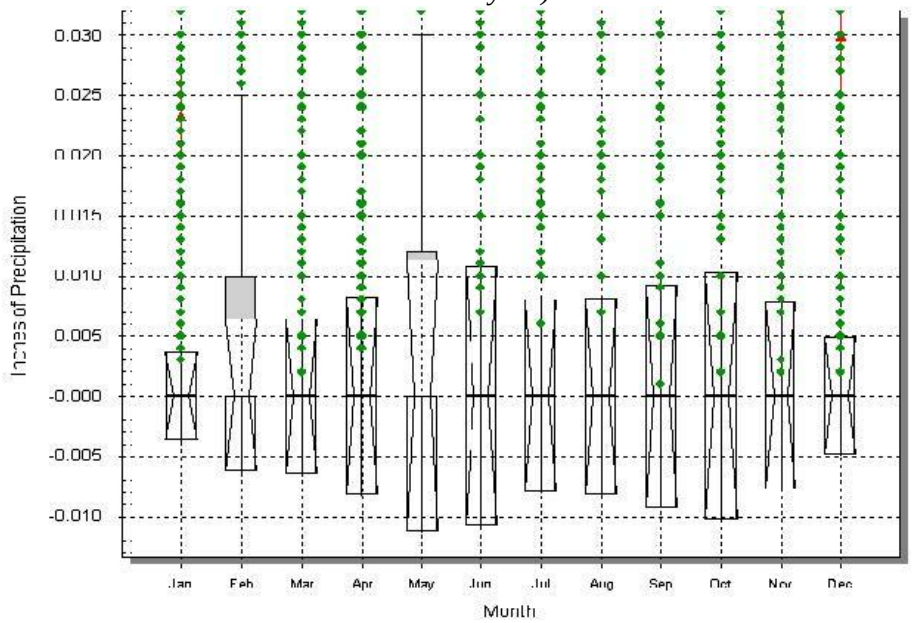


Figure 11 Monthly Average Precipitation, Blanco station 410832 (1954-2004)

Surface Water Hydrology Output Examples

The surface water hydrology section of the Tool reports stream, stream gages and stream flow information as well as flood plains. Several maps and graphs are generated for this section and examples are shown below.

Streams, Stream Gages and Stream Flows

Figure 12 shows the rivers and streams (level 1 though 4) within the watershed. The stream flow

data used in this study was downloaded from the USGS daily stream flow data at five stream gages, shown in Figure 13. The stream gage data from 1950 to 2009 were utilized for this research. Figure 14 shows the monthly average stream flow data recorded at USGS station

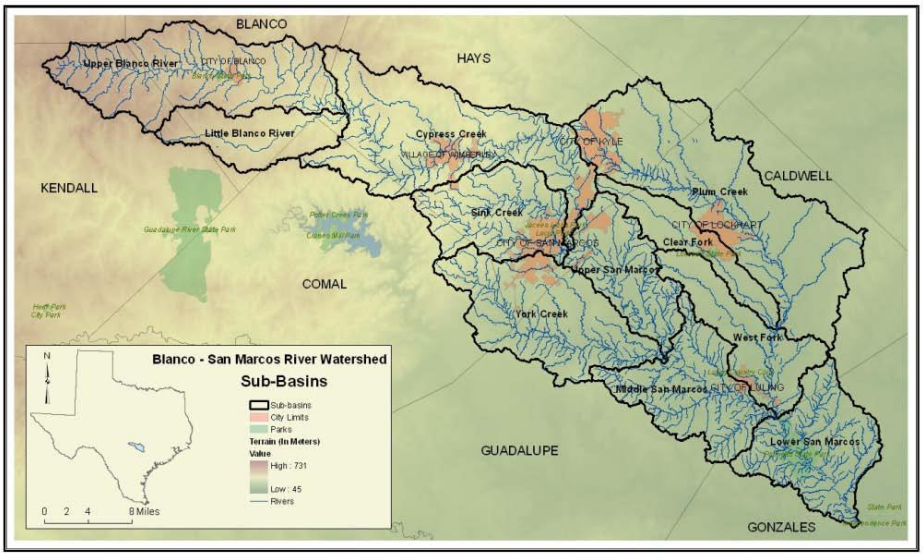
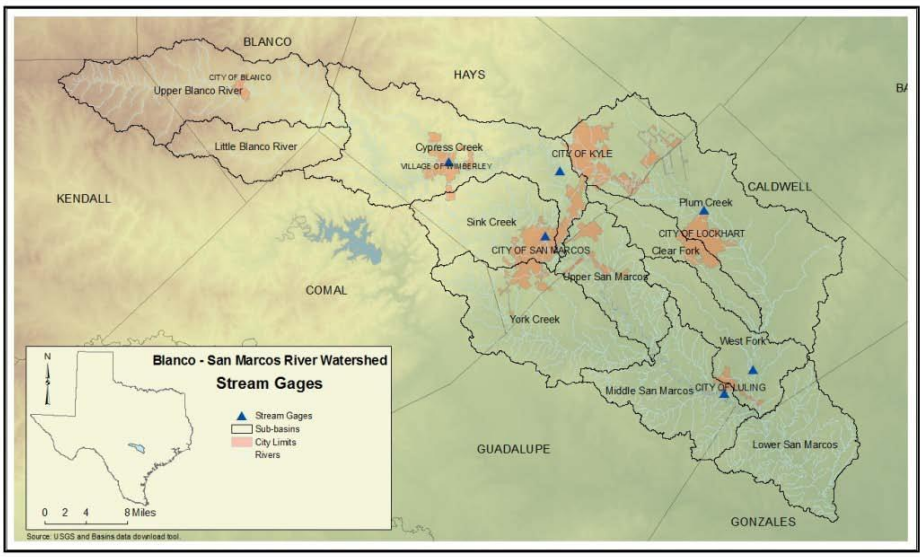


Figure 12 Rivers and Streams within the Watershed Study Area



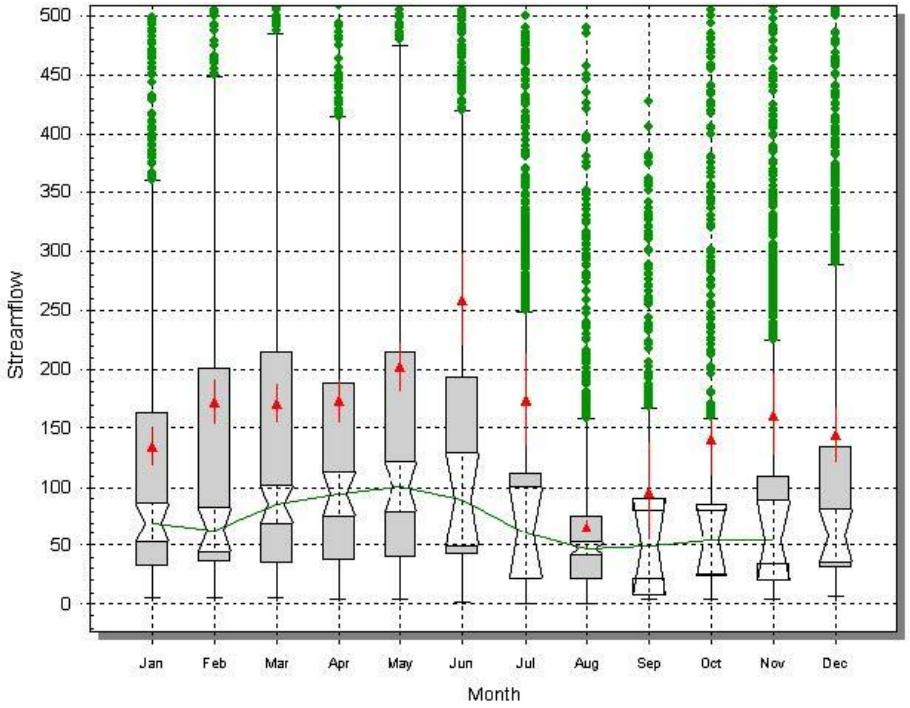


Figure 14 Monthly Average Stream Flow in the Cypress Creek sub-watershed, USGS Station 8171000, CFS (1950-2000)

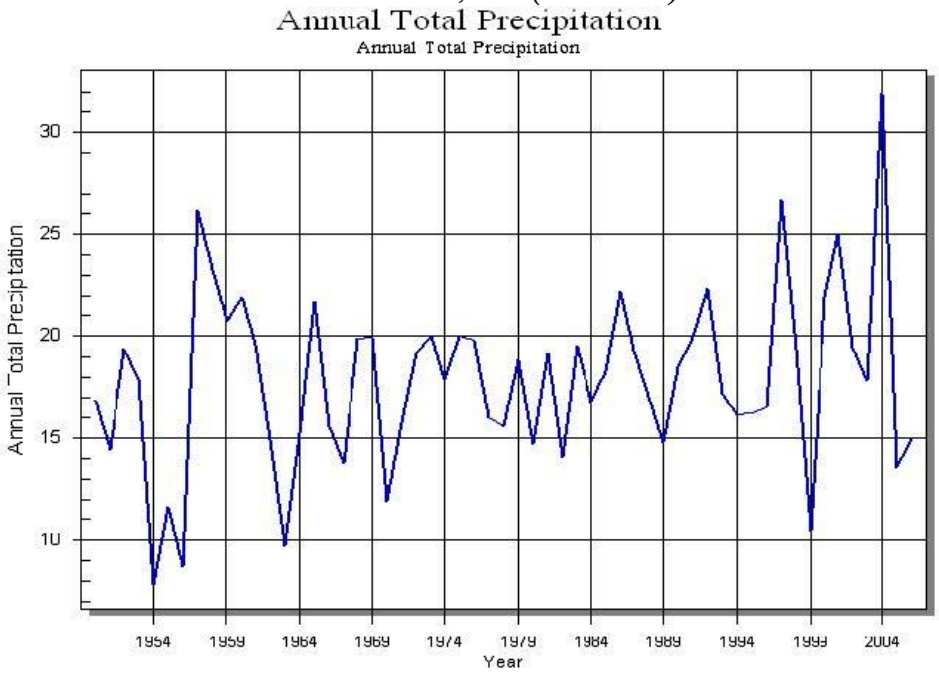
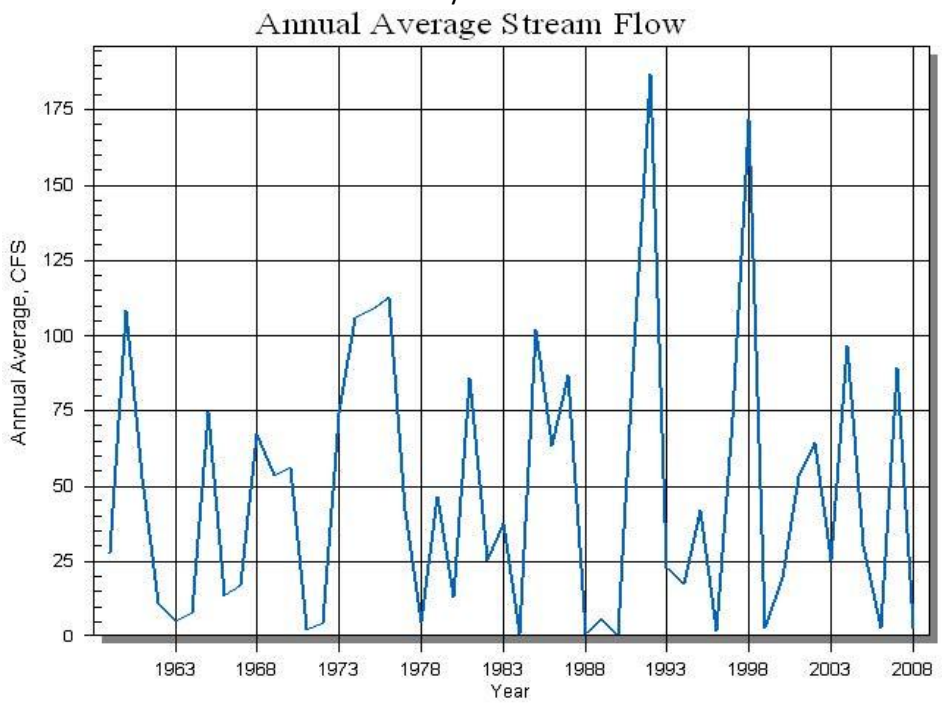


Figure 15 Annual Streamflow in the Cypress Creek Sub-watershed at USGS Station 417983



Flood Plains Output Examples

Flood plain maps, showing the 100-year flood plain, were available from Texas Natural Resources Information System (TNRIS) in all studies counties except Caldwell and Gonzales counties[4]. First American Flood Data Services provided the digital data for those two counties (Figure 16).

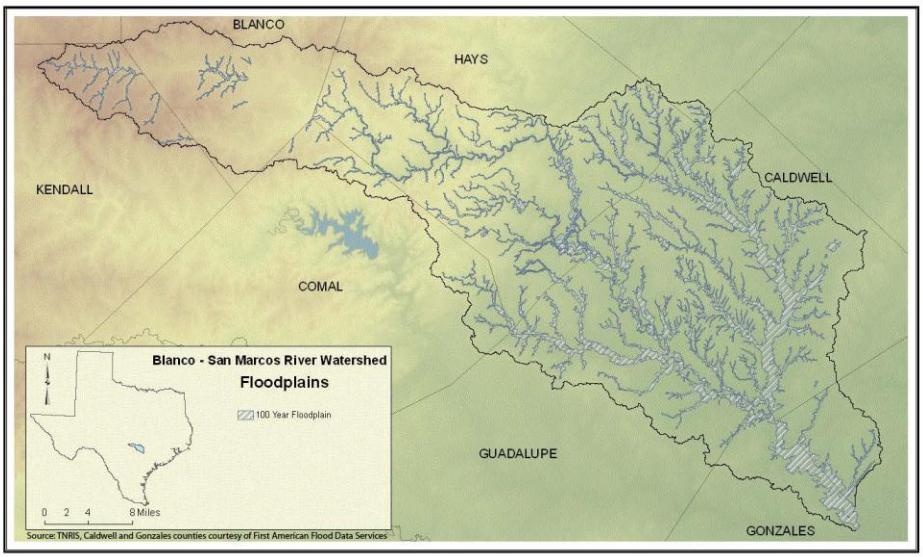


Figure 16 100-Year Flood Plains in Study Area/Watershed.

[4] Texas Natural Resources Information System (TNRIS). Floodplain Mapping. Retrieved in 2008. http://www.tnris.state.tx.us/Programs/NFIP/Index.aspx>

Groundwater Output Examples

Aquifers are the most important water sources for drinking and irrigation for communities in the watershed. There are four major aquifers in the study area. They are the Carrizo, Edwards, Trinity and Edward-Trinity aquifers (Figure 17). All zones of the Edwards Aquifer are present within the Blanco-San Marcos River Watershed (Figure 18).

Water Quality Monitoring Stations Output Examples

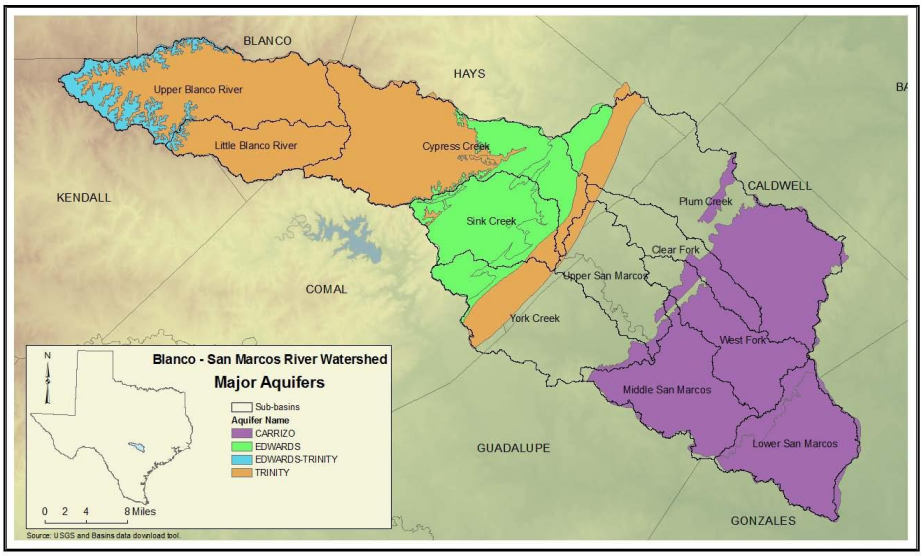


Figure 17 Aquifers in the Study Area/Watershed.

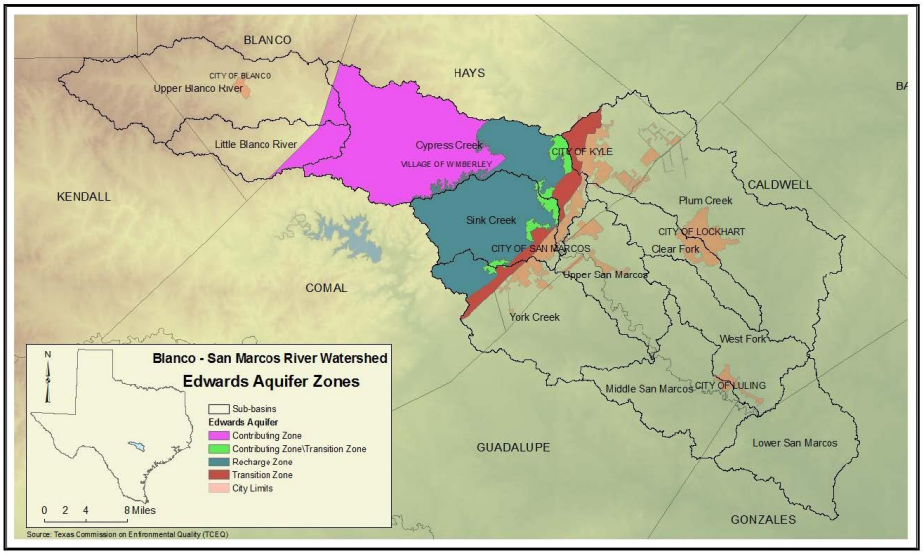


Figure 18 Edwards Aquifer Zones in the Study Area.

The water quality section of the Tool contains information from water quality monitoring stations. There are 106 Texas Commission of Environmental Quality water quality monitoring stations in the watershed. However, there are no listed 303(d) sections in the study area. Figure

20 shows an example of water quality station maps generated by the watershed characterization tool.

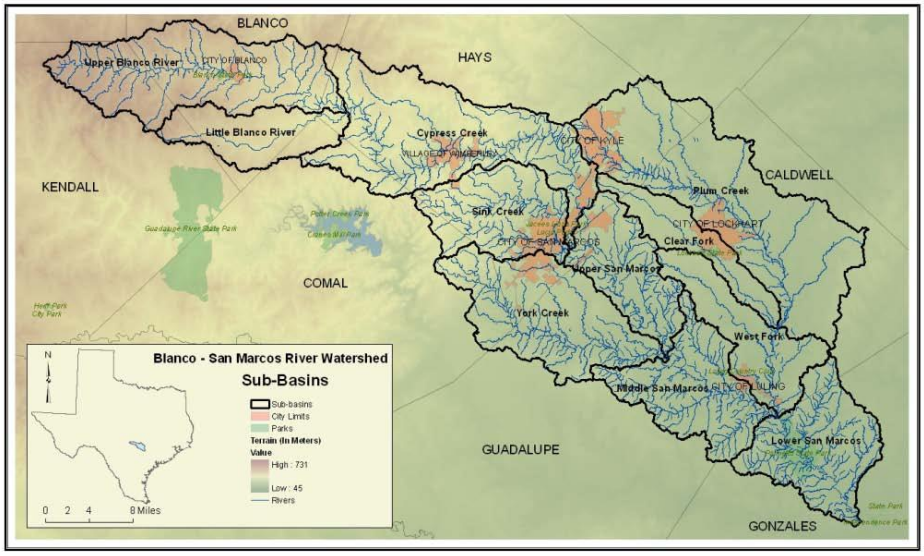


Figure 12 Rivers and Streams within the Watershed Study Area

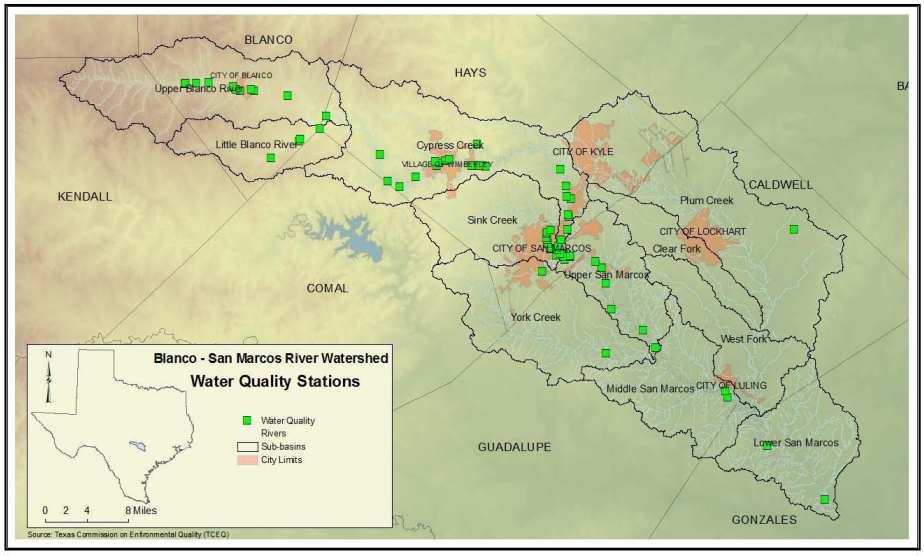


Figure 20 Water Quality Stations in the Study Area

Land Use and Land Cover Output Examples

The data used for the land use and land cover section is derived from the 2001 National Land Cover Dataset[5]. Figure 22 through 24 are examples of the land cover type, impervious level and canopy level maps generated in the watershed characterization tool.

[5] Environmental Protection Agency (EPA). 2001 National Land Cover Data (NLCD 2001). Retrieved in 2008. http://www.epa.gov/mrlc/nlcd-2001.html>

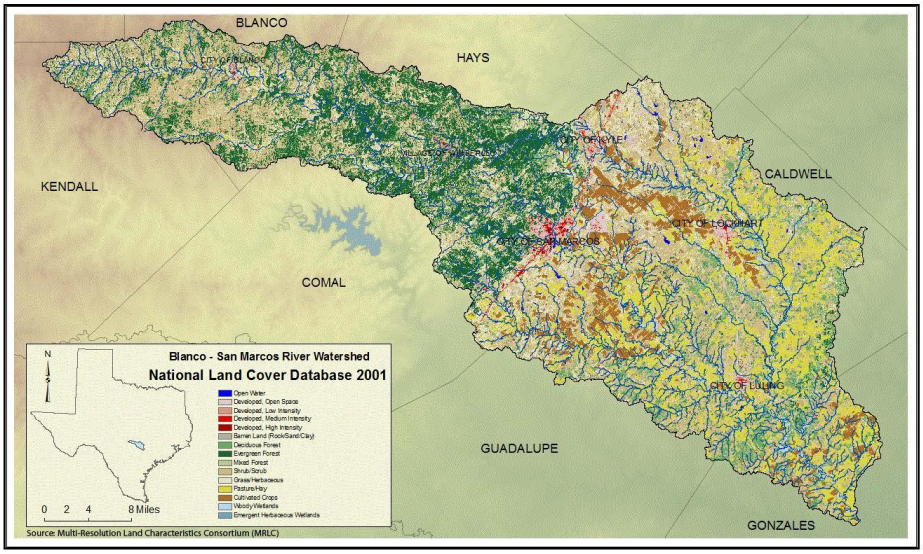
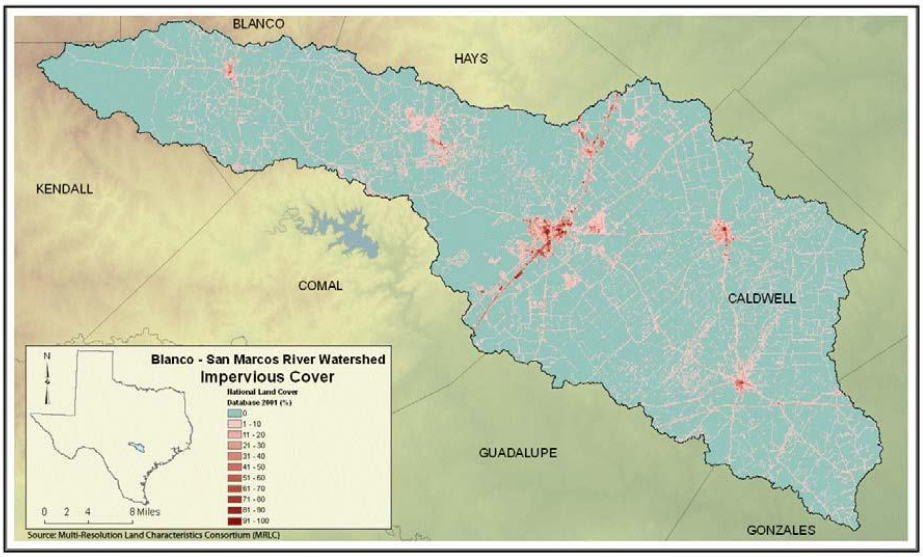


Figure 22 Land Use and Land Cover (NCLD 2001)



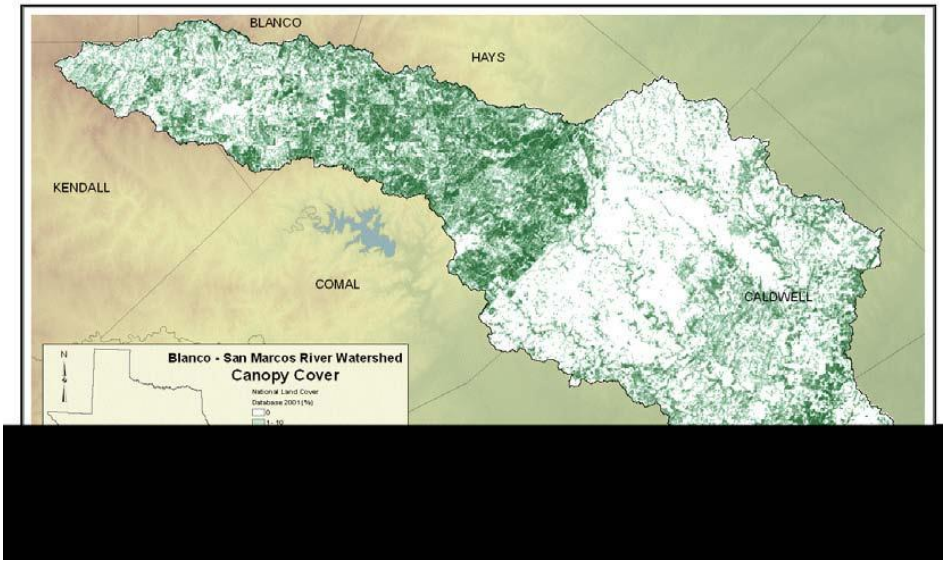


Figure 24 Canopy Cover