Technical Study Summaries: Middle and Lower Brazos River
Hydrologic Data

Median flows in Brazos River have changed over 85 years

The amount of water flowing in the Middle Brazos River during median flow conditions has changed over the past 85 years, according to data collected from a gage maintained by the US Geological Survey. The figure below shows the median daily flow of the river at Waco, TX for the time periods from 1923-1941 and 1970-2007. Median flows have decreased during the months of April through June and increased for the months of July, August, and November through February. This hydrologic change, however, doesn't extend across the entire basin. A plot of data from the gage on the Brazos River at Richmond, TX (Figure 2) indicates very little change during the same time period. Using similar techniques and data from a network of USGS gages, the hydrologic character of the Middle and Lower Brazos Sub-basin can be analyzed. The relative location of gages currently maintained by the USGS is shown in Figure 3. A table of current and historical gages of interest to this is study is also provided.

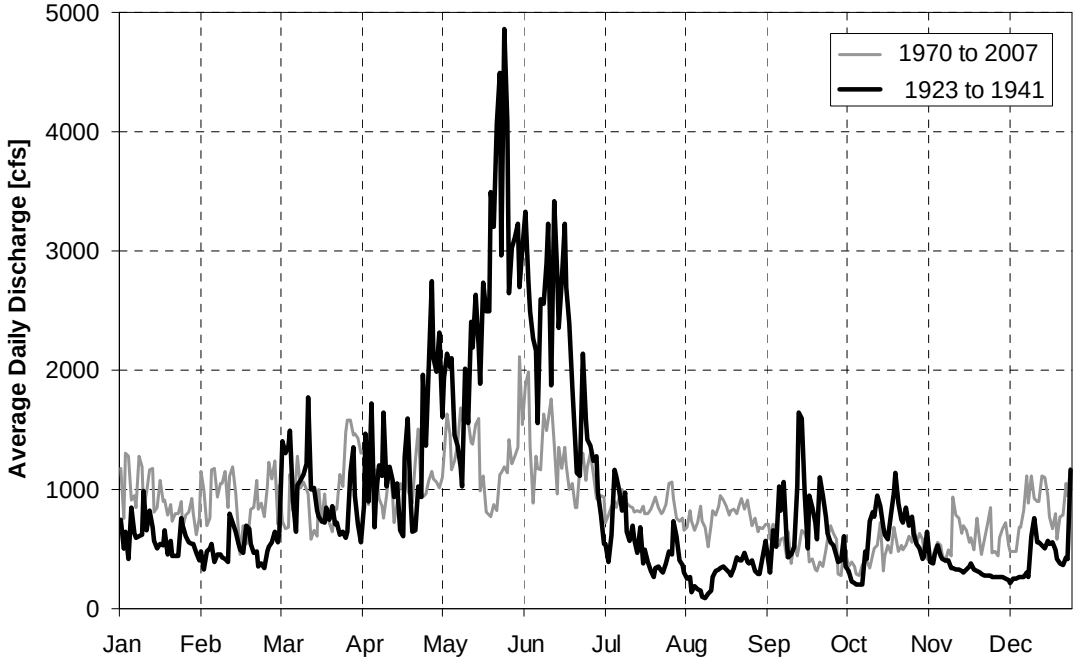

Figure 1. Median of daily discharge values for USGS gage # 08096500, Brazos River at Waco, TX.

Figure 2. Median of daily discharge values for USGS gage # 08114000, Brazos River at Richmond, TX.

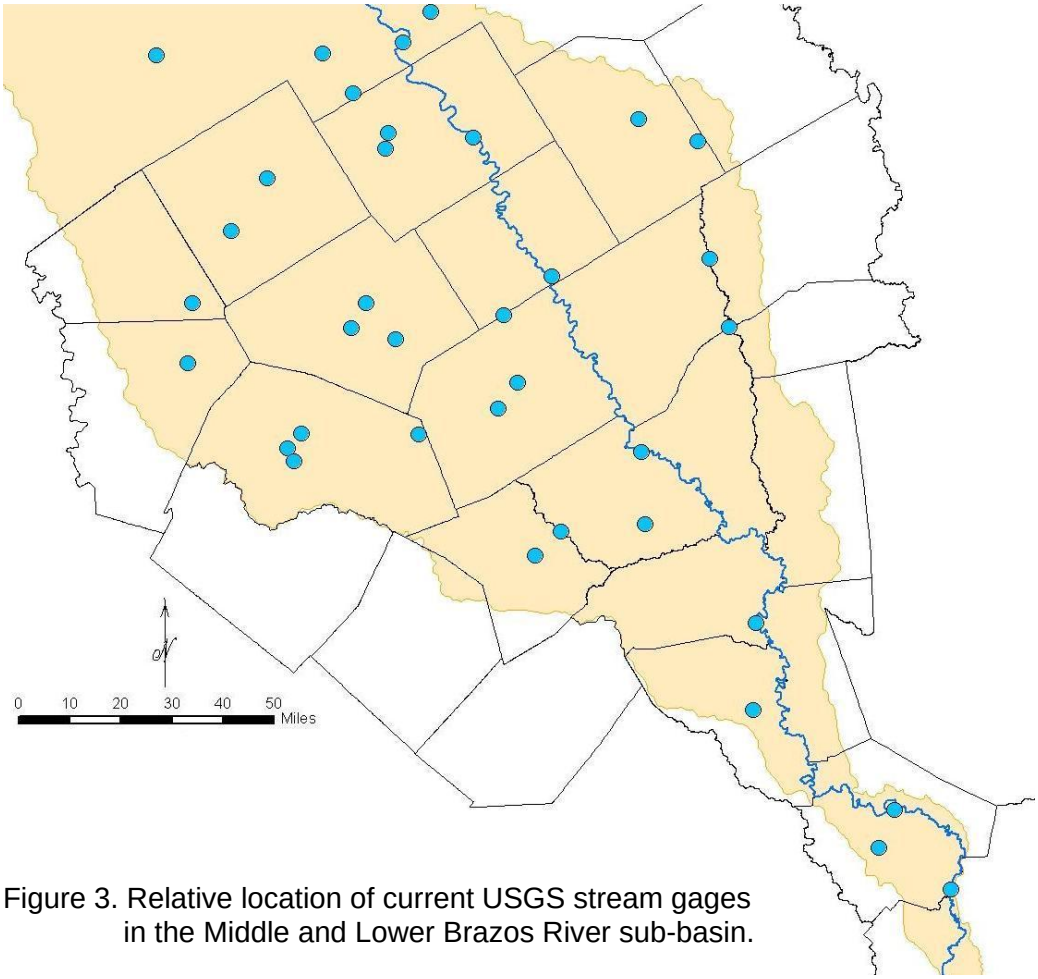

Figure 3. Relative location of current USGS stream gages in the Middle and Lower Brazos River sub-basin.

Table 1. USGS Stream Flow Gages of Interest in the Middle and Lower Brazos River Sub-basin.

Gage #	Gage Name	Earliest Record	Latest Record	Median (cfs)	Drainage Area (mi^2)
08096500	Brazos Rv at Waco, TX	1898	Present	822	29,559
08097500	Brazos Rv nr Marlin, TX	1938	1951		30,211
08098290	Brazos Rv nr Highbank, TX	1965	Present	1,010	30,436
08106500	Little Rv nr Cameron, TX	1916	Present	504	7,065
08108700	Brazos Rv at SH 21 nr Bryan, TX	1993	Present	1,700	39,049
08109000	Brazos Rv nr Bryan, TX	1899	1993		39,515
08110000	Yegua Ck nr Somerville, TX	1924	1991		1,009
08110100	Davidson Ck nr Lyons, TX	1962	Present	2.8	195
08110800	Navasota Rv at OSR nr Bryan, TX	1997	Present	69	1,287
08111000	Navasota Rv nr Bryan, TX	1951	1997		1,454
08111010	Navasota Rv nr College Station,TX	1977	1985		1,809
08110200	Brazos Rv at Washington, TX	1965	1987		41,192
08111500	Brazos Rv nr Hempstead, TX	1938	Present	2,570	43,880
08111700	Mill Ck nr Bellville, TX	1963	Present	34	376
08114000	Brazos Rv at Richmond, TX	1903	Present	2,960	45,107
08114500	Brazos Rv nr Juliff, TX	1949	1969		45,189
08115000	Big Ck nr Needville, TX	1947	Present	1.8	42.8
08116650	Brazos Rv nr Rosharon, TX	1967	Present	3,610	45,339
08117290	Brazos Rv at Freeport, TX	2002	2002		45,603

Base flow (1966-2005) and streamflow gain and loss (2006) of the Brazos River, McLennan County to Fort Bend County, Texas (2007)
By M.J. Turco, J.W. East, and M.S. Milburn

The Brazos River is hydraulically connected to an alluvial aquifer which is in turn connected to several underlying aquifers. This study divided this portion of river into 35 segments and determined gains and losses within those segments. The gain/loss character of a segment was found to be somewhat seasonal, probably due to changes in groundwater levels in various aquifers.

Full report: http://pubs.usgs.gov/sir/2007/5286/pdf/sir2007-5286.pdf

Recent studies focus on characteristics of Brazos River alluvium aquifer (2007)
By US Geological Survey and Texas Water Development Board

The Brazos River alluvium aquifer, which extends along the river from Bosque County to Fort Bend County, has been the focus of several recent studies. These studies have determined the location and thickness of the aquifer, as well as hydraulic properties such as specific conductance, transmissivity, and hydraulic conductivity. The water table generally slopes toward the river, indicating that the aquifer provides water to the river in most places.

The Brazos River alluvium aquifer supplies water for irrigation, domestic, stock and commercial use. As demand for water increases statewide, the aquifer will likely become more heavily used in the future. Ongoing studies are developing a Groundwater Availability Model for the area, which will allow estimation of the impacts of future development on the aquifer and river.

Titles of these reports are provided below, as well as links to the reports themselves.

Geologic and Hydrogeologic Information for a Geodatabase for the Brazos River Alluvium Aquifer, Bosque County to Fort Bend County, Texas (2007)
By Sachin D. Shah and Natalie A. Houston

Full report: http://pubs.usgs.gov/of/2007/1031/pdf/ofr2007-1031.pdf

Hydrogeologic Characterization of the Brazos River Alluvium Aquifer, Bosque County to Fort Bend County, Texas (2007)
By Sachin D. Shah, Natalie A. Houston, and Christopher L. Braun

Full report: http://pubs.usgs.gov/sim/2989/

Application of Surface Geophysical Methods, With Emphasis on Magnetic Resonance Soundings, to Characterize the Hydrostratigraphy of the Brazos River Alluvium Aquifer, College Station, Texas, July 2006—A Pilot Study (2007)
By Sachin D. Shah, Wade H. Kress, and Anatoly Legchenko

Full report: http://pubs.usgs.gov/sir/2007/5203/pdf/sir2007-5203.pdf

Indicators: Middle and Lower Brazos River
Hydrology / Hydraulics

Hydrology Objectives

- Identify flow components and their characteristics (frequency, timing, duration, rate of change, magnitude) of benefit to the environment in order to assist in managing the system for the benefit of the environment, economy and society
- Determine current and historical/natural pattern of flows and potential environmental consequences of changing from either of these patterns
- Identify all sources of instream flow and factors which may affect those sources

Hydrologic Indicators

Category	Indicator	Explanation
Flow regime components	Overbank flows (frequency, timing, duration, rate of change, and magnitude)	Infrequent, high magnitude flow events that enter the floodplain. • Maintenance of healthy riparian areas • Transport of sediment and nutrients to/from floodplain • Connectivity of riparian and floodplain habitats to the river channel • Recharge alluvial aquifer
	High pulse flows (frequency, timing, duration, rate of change, and magnitude)	Short duration, high magnitude within channel flow events • Maintain sediment transport and physical habitat features of the river channel • Provide longitudinal connectivity along the river corridor for many species (e.g., migratory fish)
	Base habitat flows (timing, range of magnitudes)	Range of average or “normal” flow conditions • Provide instream habitat quantity and quality needed to maintain the diversity of biological communities • Maintain water table and support/maintain healthy riparian vegetation
	Subsistence flows (frequency, timing, duration, rate of change, and magnitude)	Low flows maintained during times of very dry conditions • Maintain water quality standards • Prevent loss of aquatic organisms
Natural variability	Natural	Determination of the natural variability of the above indicators, based on the older portions of gage records, presumably less impacted by human activity. The exact time period may vary by site.
	Current	Variability of the above indicators based on the last 20-25 years of gage records.
Sources of instream flow	Flow gain or loss in section of river	Difference in the amount of water entering and leaving a specific section of the river channel. Sources of gains include inflow from tributaries, alluvial and deeper aquifers, and discharges to the river. Sources of losses include evaporation, evapo-transpiration from riparian areas, diversions, and recharge of alluvial and deeper aquifers. Indicator may be influenced by shallow groundwater surface elevation and hydraulic head of deeper aquifers.