Technical Study Summaries: Lower Sabine River
Geomorphic Data

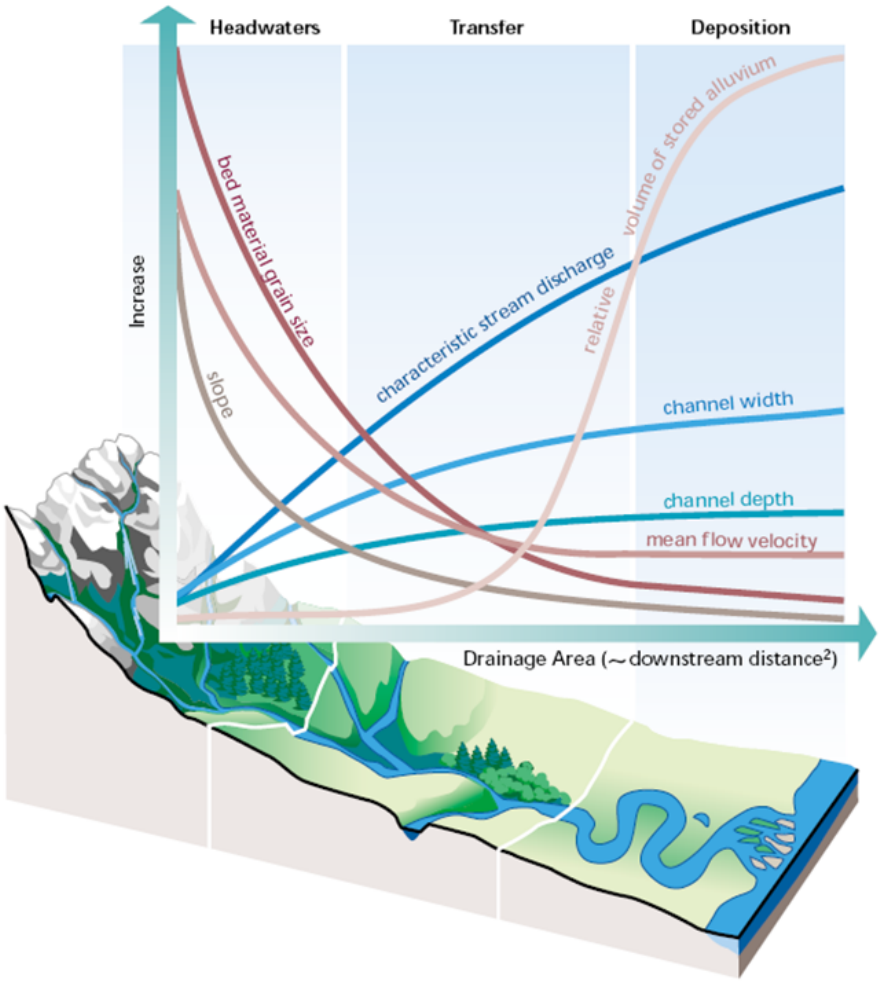
Active physical processes and characteristics are an important influence on the Lower Sabine River system. Studies of these processes and characteristics (termed "fluvial geomorphology") contribute to our understanding of the system and the flows required to maintain a sound ecological environment.

Stream corridor restoration: principles, processes, and practices (1998)
By Federal Interagency Stream Restoration Working Group (FISRWG)

Interest in restoring stream ecosystems has driven recent advances in understanding the physical processes at work in healthy rivers and streams. It is now recognized that the relative importance of different physical processes varies along the length of a river. One particular instream flow recommendation is typically not sufficient to ensure the health of the entire length of a stream. Somewhat different flows may be required to ensure the health of different portions of the river.

As shown in the figure below, river basins can be divided into three general zones (headwaters, transfer, and deposition) based on dominant physical processes. Physical characteristics (such as channel slope, width and depth; bed material; and average discharge and velocity) vary from the upper watershed area to the mouth of a river. For most rivers, variable conditions such as climate and underlying geology interact to create a more complex situation than the idealized pattern of Figure 1.

Full report: http://www.nrcs.usda.gov/technical/stream_restoration



Headwaters Zone: Main source of water and sediment for a river system. Water and sediment are generally moving from the watershed to the channel.

Transfer Zone: Principle region of sediment transport in a river system. Channel and valley become larger, more developed.

Deposition Zone: Region of sediment dispersal and deposition. River has a well developed valley over which the channel is free to meander. At its mouth, the river may divide into multiple channels as it flows across a delta of built up sediment into the receiving water body (ocean or larger river).

Figure 1. General zones of a river based on dominant physical processes (adapted from FISRWG, 1998).

Geomorphic Processes, Controls, and Transition Zones in the Lower Sabine River (2008)
By J.D. Phillips

A detailed geomorphic classification of the Lower Sabine River provides a useful tool to understand differences in physical processes and habitats along the river. In this study, the river from Toledo Bend Reservoir to Sabine Lake was segmented into six geomorphic process zones based on channel and valley characteristics. A description of each zone was provided, including distinguishing characteristics and primary geomorphic controls.

Full report:
http://www.twdb.state.tx.us/RWPG/rpgm_rpts/0600010595_Sabine.pdf

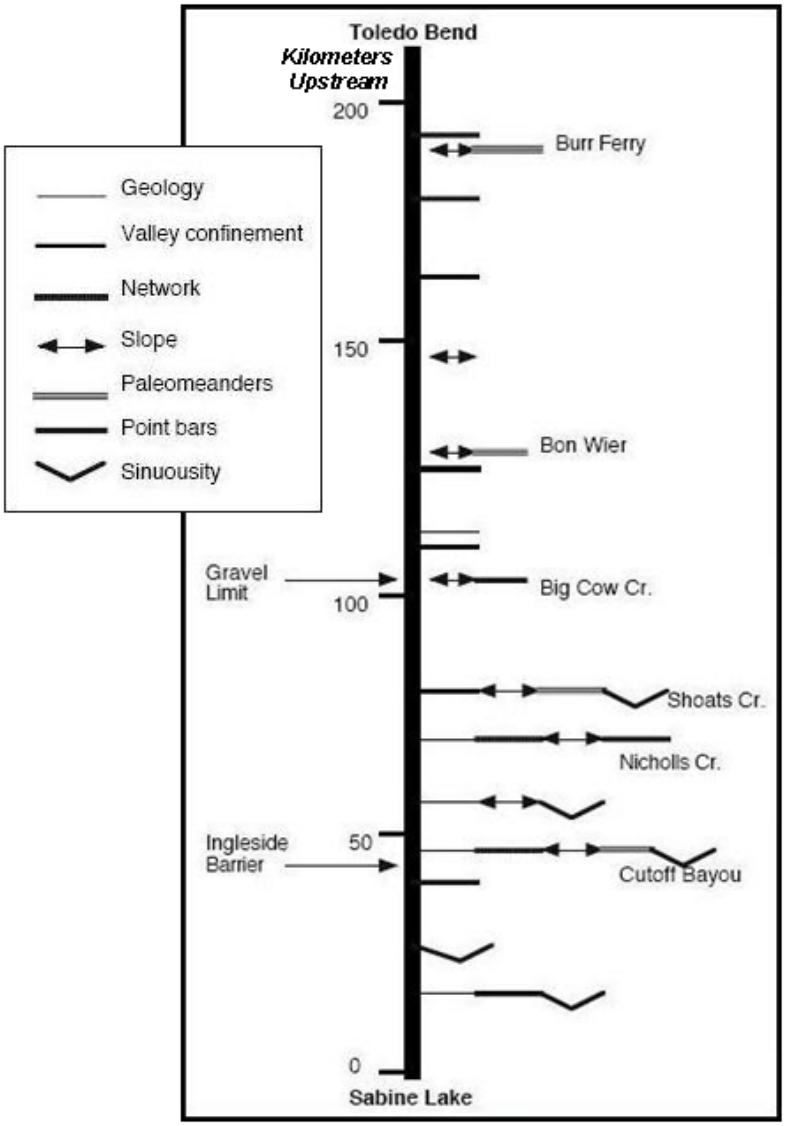


Figure 2. Geomorphic classification of the Lower Sabine River (from Phillips, 2008).

Table 1. Description of geomorphic process zones of Lower Sabine River (from Phillips, 2008).

Reach	River Miles	Distinguishing Characteristics	Primary Geomorphic Controls
Toledo Bend to Burr Ferry	131-146	Incision, steep slope, bedrock control, valley constriction, low sediment loads, pulsed flows	Geologic framework; Toledo Bend Dam releases
Burr Ferry to Bon Wier	91-131	Active lateral migration, ubiquitous large point bars, wider valley, larger sediment load	Valley width; avulsion
Bon Wier to Big Cow Ck.	70-91	Active lateral migration, ubiquitous large point bars, wider valley, larger sediment load; high floodplain/channel connectivity; low slope	Valley width; avulsion; neotectonics
Big Cow Cr. to Shoats Cr.	54-70	Active lateral migration, fewer point bars, high floodplain/channel connectivity, low slope	Neotectonics; valley width; coastal plain paleogeography
Shoats Cr. to Cutoff Bayou	29-54	Few and finer-grained point bars, high floodplain/channel connectivity with multiple high flow distributary channels, high sinuousity, embayed tributary mouths	Holocene sea level rise; geology & coastal plain paleogeography; Pleistocene stream capture
Cutoff Bayou to Sabine Lake	0-29	Rare point bars; distributary flow network; very high sinuousity; deltaic; tidal influence	Holocene sea level rise; tidal and coastal influences; Pleistocene stream capture

Negative impacts of overbank flows estimated for different sizes of floods (Ongoing)
By National Weather Service

The negative impacts of overbanks flows are summarized at most streamflow gages maintained by the US Geological Service. These estimates are based on observations and damage reports from previous flooding incidents. The magnitude of floods is described by the surface elevation of the water, not the discharge value. However, because of the stage discharge relationship developed at each USGS gage, the value for surface elevation of the water or "stage" can be converted into an approximate discharge value. This allows comparison to the magnitude of overbank flows that may be part of an instream flow recommendation. An example from USGS gage #08030500, Sabine River near Ruliff, TX, is provided in the table below.

For flood impact data:
http://ahps.srh.noaa.gov/ahps2/hydrograph.php?wfo=lch&gage=dwyt2&view=1,1,1,1,1,1,1,1&toggles=10,7,8,2,9,15,6&type=0

Table 1. Flood impacts of various stages at USGS gage #08030500, Sabine River near Ruliff, TX.

Stage [feet]	Flood Impact
32.7	The river has reached its unofficial highest gage reading previously set in may 1884. Widespread catastrophic flooding will occur.
30.0	The river is at its flood of record. Widespread major to catastrophic flooding will occur.
29.0	Major flooding occurring leaving the town of Deweyville isolated. Numerous homes are flooded.
27.0	Widespread moderate lowland flooding will occur. Homes in Deweyville closest to the river are flooded. Flooding of homes in the Indian Lakes and River Oaks sections will also occur. Low-lying roads and a few homes in southwest Beauregard Parish have some flooding.
26.0	Moderate lowland flooding will occur. The lowest homes between Deweyville and the river begin to flood, especially in the Indian Lakes and River Oaks sections. Low-lying roads and a few homes in southwestern Beauregard Parish have some flooding.
25.0	Lowest roads beside the river flood around Deweyville and are subject to being closed. In addition...low-lying roads in southwest Beauregard Parish are flooded including Robert Clark Road. Flooding occurs on the south side of Niblett Bluff Park with access roads to camp houses cut off around the park. Access roads to the river in northeastern Orange County become flooded.
24.0	Minor lowland flooding will occur. Low-lying roads in southwestern Beauregard Parish, including Robert Clark Road will have water over them.
23.0	The river is at bankfull stage.

Developing large woody debris budgets for Texas Rivers (2010)
By M.W. McBroom (Stephen F. Austin State University)

The amount of large woody debris (LWD) in a river is dependant on geomorphic processes. This study is developing a LWD budget (similar to sediment budget developed to understand the movement of sand or gravel in a river system) for the Lower Sabine River. For more information about this study, please see the Connectivity Summary.

Indicators: Lower Sabine River

Geomorphology

Geomorphology Objectives

- Protect/enhance current fluvial geomorphologic processes that create natural habitat

Geomorphic Indicators

Category	Indicator	Explanation
Bank Stability	Rate of lateral channel migration	Rate of lateral movement of channel across valley. Some migration of the channel is crucial to support diverse riparian habitats and a healthy ecosystem.
	Rate of channel avulsion	Rate of creation of channel cut-offs. Cut-offs, in the form of oxbow lakes, back water areas, and abandoned channels, provide distinct and important habitats.
	Rate of bank erosion	The rate at which flows erode the sides of channels. This will vary by bank material and condition of the banks (vegetated, saturated, etc.).
Channel maintenance	In-channel bars (area, configuration, sediment size)	Sediment bars are an important in-channel bed form. Flow across these features provides a diversity of hydraulic conditions. Bar formation, in combination with opposite-bank erosion, is the driving process behind channel migration. As bars age, they gradually create new areas of floodplain and riparian habitat.
	Meander pools (depth)	Meander pools are another important in-channel bed form. Deep pools provide diverse hydraulic conditions and cover for some species. They also provide refuge habitat for many species during low flow periods.
Flood impacts	Stage (at USGS gage locations)	The National Weather Service provides flood impact summaries for most USGS streamflow gage sites, based on water surface elevation or “stage.” These summaries provide an estimate of impacts of overbank flows.