Technical Study Summaries: Lower Sabine River
Biological Data

Historic Sabine River Mussel Collections

Sabine River Authority, Tulane University

Historic mussel data was obtained through joint efforts between SRA and Tulane University to recover, process, and identify archived samples from the Royal D. Suttkus collection at the Tulane University Museum of Natural History.

- Data represented collections from 22 sites on the lower Sabine River and Anacoco Bayou between July 1964 and September 1982;
- 977 specimens were observed, with 20 species being represented (Table 1);
- The American Fisheries Society considers three of these mussel species of special concern – southern hickorynut, Louisiana pigtoe, and Texas heelsplitter.

Sabine River Mussel Surveys (July 22-24 and October 16-18, 2008)

By Charles Randklev and Dr. James Kennedy, University of North Texas

This was a 2008 follow-up survey of the mussels inhabiting the lower Sabine River.

- The July survey yielded 164 specimens from nine species;
- In October, 49 live mussels representing seven species were documented;
- Survey suggests that the lower Sabine River harbors a diverse community of mussels;
- Apparent absence of mussels upstream of Highway 190; more intensive survey needed.

Extraction, Analysis and Summary of Fish Community Data from the Sabine River System (Louisiana, Texas) [July 2008]

By Dr. Henry L. Bart, Jr., Tulane University

Data from fish surveys of the Sabine River covering a 60-year time period were extracted from the Tulane University Museum database. A total of 79 fish species were represented from the Sabine River system. Generally, comparisons were made across three time periods: 1962-69; 1970-79; and 1980-85.

- Minnows made up 80-95 percent of the overall catch;
- Populations of red shiner, bullhead minnow, ghost shiner, and shoal chub appear to have decreased in the lower Sabine River (red shiner and ghost shiner appear to have disappeared); whereas, blacktail shiner, Sabine shiner, weed shiner, and mimic shiner have increased.
- The upper Sabine River fish community during the most recent period analyzed differed from the lower river for the same time period.

Fish Assemblage Changes in Three Western Gulf Slope Drainages (July 2007)

By Dr. Timothy Bonner and Dennis T. Runyan, Texas State University

A total of 90 species were observed in 183 historical collections from the lower Sabine River from 1948 through 2006. This study drew from museum records, unpublished and published data, and agency reports. The Tulane data cited above is included in this dataset.

- Minnows comprised the most abundant fish family (93%), followed by sunfish (2.2%), livebearers (1.4%), and catfish (0.8%).
- Non-native fishes represented only a minor component of the lower Sabine River fish assemblage.
- Nine species had declining population trends (See Table 2);
- Eight species had increasing trends;
- One formerly common species—red shiner—disappeared from the lower Sabine River by 1973.

Full report: http://www.twdb.state.tx.us/RWPG/rpgm_rpts/2005483033_fish.pdf

Baseline Fish Collections: Lower Sabine River Priority Instream Flow Study

Sabine River Authority, Texas Commission on Environmental Quality, Texas Parks and Wildlife Department, and Texas Water Development Board

The goals of this project, which took place in 2006 and 2007, were to conduct new collections to augment historical information on fish assemblages in the lower Sabine River. Sampling sites were selected to fill geographical data gaps as well as update collections at sites that have been sampled historically, but infrequently in recent years. Eight sites were ultimately selected, with six spread longitudinally along the main river and two sites on major tributaries, Bayou Anacoco and Big Cow Creek.

In addition to providing a baseline for potential instream flow studies, the data are designed to aid in identifying trends in fish populations and developing a conceptual model of fish population dynamics. Fish were collected using backpack and boat electrofishing and seining in discrete habitats. Global positioning system coordinates and photos were taken at each sample location and the habitat was measured for depth, substrate, and current velocity.

A total of 64 species comprising more than 15,000 individuals were collected.

Full report: http://www.twdb.state.tx.us/RWPG/rpgm_rpts/2006483567_SabineFish.pdf

Preliminary Analysis of Riparian Area Survey Methodology (Fall 2008 - April 2009)

By Hans Williams, Stephen F. Austin State University

This study was established to evaluate the proposed methodology described in the TIFP Technical Overview for determining the extent, hydrologic requirements, and connectivity of riparian areas. Results are pending, but components of the study include:

- Literature review to evaluate riparian area methodology and identify a definition of riparian areas suitable for application across the state of Texas
- Evaluate and refine field sampling methods of vegetative and soils data
- Evaluate methods to determine flow requirements of riparian areas
- Evaluate suitability of inundation curve approach

Table 1. Mussel species historically and recently collected in the lower Sabine River basin. Historic collections from the Tulane University Museum of Natural History represent 22 sites sampled between July 1964 and September 1982. Recent collections are from 2008 by Randklev and Kennedy.

Species	Common name	Historic	2008
Amblema plicata	threeridge	X	X
Arcidents confragosus	rock-pocketbook	X	
Fusconaia askewi	Texas pigtoe	X	X
Fusconaia sp.		X	
Lampsilis hydiana	Louisiana fatmucket	X	X
*Lampsilis s*atura	sandback pocketbook	X	X
Lampsilis teres	yellow sandshell	X	X
Leptodea fragilis	fragile papershell	X	
Ligumia subrostrata	pond mussel	X	
Megalonaias nervosa	washboard	X	
Obliquaria reflexa	threehorn wartyback	X	
Obovaria jacksoniana	southern hickorynut	X	
Plectomerus dombeyanus	bankclimber	X	
Pleurobema riddellii	Louisiana pigtoe	X	
Potamilus amphichaenus	Texas heelsplitter	X	
Potamilus purpuratus	bleufer	X	X
Quadrula apicluata	southern mapleleaf		X
Quadrula mortoni	western pimpleback	X	X
Quadrula nobilis	Gulf mapleleaf	X	X
Quadrula verrucosa	pistolgrip	X	
Truncilla donaciformis	fawnsfoot	X	
Villosa lienosa (iris)	little spectaclecase	X	
Taxa Richness		20	9

Table 2. Fish species historically and recently collected in the lower Sabine River (from Bonner and Runyan [2006], Tulane University, and others) and their status (after Bonner and Runyan 2006). Population trends are indicated as increasing (↑), decreasing (↓), stable (S), or indeterminate (-). A blank indicates the species was not included in the analysis.

Species	Common name	Trend Status	Historical Main River	2006 - 2007 Main River	2006 - 2007 Tributary Sites
Alosa chrysochloris	skipjack herring	-	X	X	
Ameiurus melas	black bullhead	-	X		
Ameiurus natalis	yellow bullhead	-	X		
Amia calva	bowfin	S	X	X	
Ammocrypta clara	western sand darter	-	X		
Ammocrypta vivax	scaly sand darter	↑	X	X	X
Anchoa mitchilli	bay anchovy	-	X	X	
Anguilla rostrata	American eel		X	X	
Aphredoderus sayanus	pirate perch	↓	X		X
Aplodinotus grunniens	freshwater drum		X	X	
Ariopsis felis	hardhead catfish	-	X		
Atractosteus spatula	alligator gar	-	X	X	
Brevoortia patronus	Gulf menhaden	-	X	X	
Carpiodes carpio	river carpsucker	S	X	X	
Centrarchus macropterus	flier	-	X		
Citharichthys spilopterus	bay whiff			X	
Cycleptus elongates	blue sucker	-	X	X	
Cyprinella lutrensis	red shiner	↓	X		
Cyprinella lutrensis X venusta			X		
Cyprinella venusta	blacktail shiner	↑	X	X	X
Cyprinus carpio	common carp	-	X	X	
Dorosoma cepedianum	gizzard shad	S	X	X	
Dorosoma petenense	threadfin shad	S	X	X	
Elassoma zonatum	banded pygmy sunfish	-	X	X	
Elops saurus	ladyfish	-	X		
Erimyzon oblongus	creek chubsucker	-	X	X	
Erimyzon sucetta	lake chubsucker	-	X		
Esox americanus	redfin pickerel	-	X	X	
Etheostoma artesiae	redspot darter	-	X		
Etheostoma asprigene	mud darter	-	X		
Etheostoma chlorosoma	bluntnose darter	S	X		
Etheostoma gracile	slough darter	-	X		
Etheostoma histrio	harlequin darter	-	X	X	X
Etheostoma proeliare	cypress darter	-	X		
Fundulus chrysotus	golden topminnow	-	X	X	
Fundulus dispar	starhead topminnow			X	
Fundulus notatus	blackstripe topminnow	S	X	X	X
Fundulus olivaceus	blackspotted topminnow	↑	X	X	X
Gambusia affinis	western mosquitofish	↓	X	X	X
Hybognathus hayi	cypress minnow	-	X		
Hybognathus nuchalis	Miss. silvery minnow	↓	X	X	X
Hybopsis amnis	pallid shiner	S	X		X
Ichthyomyzon castaneus	chestnut lamprey	S	X		X
Ichthyomyzon gagei	southern brook lamprey	-	X		
Ictalurus furcatus	blue catfish	-	X	X	
Ictalurus punctatus	channel catfish	-	X	X	X
Ictiobus bubalus	smallmouth buffalo	-	X	X	

Table 2 continued. Fish species historically and recently collected in the lower Sabine River.

Labidesthes sicculus	brook silverside	S	X	X	X
Lagodon rhomboides	pinfish			X	
Lepisosteus oculatus	spotted gar	S	X	X	X
Lepisosteus osseus	longnose gar	S	X	X	
Lepomis cyanellus	green sunfish	-	X		
Lepomis gulosus	warmouth	↓	X	X	X
Lepomis humilis	orangespotted sunfish	-	X	X	X
Lepomis macrochirus	bluegill	↑	X	X	X
Lepomis marginatus	dollar sunfish	-	X		
Lepomis megalotis	longear sunfish	↑	X	X	X
Lepomis microlophus	redear sunfish	S	X	X	X
Lepomis miniatus	redspotted sunfish	-	X	X	X
Lepomis symmetricus	bantam sunfish	-	X		
Lythrurus fumeus	ribbon shiner	S	X		X
Lythrurus umbratilis	redfin shiner	-	X		
Macrhybopsis hyostoma	shoal chub	↓	X	X	X
Menidia beryllina	inland silverside	↑	X	X	X
Micropterus punctulatus	spotted bass	↑	X	X	X
Micropterus salmoides	largemouth bass	S	X	X	X
Minytrema melanops	spotted sucker	S	X	X	X
Morone mississippiensis	yellow bass	-	X	X	
Morone saxatilis	striped bass		X		
Moxostoma poecilurum	blacktail redhorse	-	X	X	X
Mugil cephalus	striped mullet	S	X	X	
Mugil curema	white mullet	-	X		
Notemigonus crysoleucas	golden shiner	-	X		
Notropis atherinoides	emerald shiner	↓	X		
Notropis atrocaudalis	blackspot shiner	-	X		
Notropis blennius	river shiner	-	X		
Notropis buchanani	ghost shiner	↓	X		
Notropis sabinae	Sabine shiner	S	X	X	X
Notropis shumardi	silverband shiner	-	X		
Notropis texanus	weed shiner	S	X	X	X
Notropis volucellus	mimic shiner	S	X	X	X
Noturus gyrinus	tadpole madtom	-	X		
Noturus nocturnus	freckled madtom	-	X	X	X
Opsopoeodus emiliae	pugnose minnow	S	X	X	
Paralichthys lethostigma	southern flounder	-	X	X	
Percina caprodes	logperch	-	X		
Percina macrolepida	bigscale logperch	S	X		
Percina sciera	dusky darter	↑	X	X	X
Percina shumardi	river darter	-	X		
Phenacobius mirabilis	suckermouth minnow	S	X	X	
Pimephales vigilax	bullhead minnow	↓	X	X	X
Pomoxis annularis	white crappie	-	X	X	
Pomoxis nigromaculatus	black crappie	-	X	X	
Pylodictis olivaris	flathead catfish	-	X	X	X
Semotilus atromaculatus	creek chub	-	X		
Strongylura marina	Atlantic needlefish	-	X	X	
Trinectes maculates	hogchoker	S	X	X	

Potential Biological Indicators: Lower Sabine River

Biological Objectives

- Maintain and/or improve sustainable native biological communities/habitats
- Control invasive and non-native species that threaten the function of the aquatic and terrestrial ecosystems

Biological Indicators

Category	Indicator	Explanation
Instream Biological Communities	Native Richness	Richness, or the number of species or taxa, is a measure of community health, can be applied at a variety of scales (reach to basin to statewide), and can be related to modifications in flow. May also use proportions such as the proportion of native to non-native species.
	Relative Abundance	The number of organisms of a particular species as a percentage of the total community
	Fish	Fish are useful indicators because: • they occupy a range of habitats and have a variety of life histories that are generally known; • their position at various levels of the aquatic food chain provides an integrative view of the watershed; • they are useful for examining both direct toxicity and stressful conditions by looking at indicators such as missing species or depressed growth and reproduction; • they are valued by the public. There are many species of fish in the river and all of them cannot be studied individually. Those that may warrant study include: • Flow sensitive species • Sport fishes • Prey species • Imperiled species • Intolerant species
	Other Aquatic Organisms	Benthic invertebrates, mussels, river and riparian plants, and other vertebrates may be appropriate as indicators.

Instream Habitat	Habitat Quality and Quantity for Key Species	Involves relating suitable habitat (microhabitat) and flow for key species. Habitat attributes may include current velocity, depth, substrate and cover; other attributes may be important for some species.
	Mesohabitat Area and Diversity	This indicator stems from the knowledge that diverse habitats support diverse communities. Mesohabitat analysis provides a quantifiable relationship between larger scale habitat (e.g. riffles, runs, pools) area and flow; habitat diversity can be derived from same data. Uses biological data for all species in a community (e.g., fish species) to define the attributes of each mesohabitat.
Riparian Habitat	<u>Vegetation</u> • Age class distribution of riparian plant species • Riparian species richness and diversity • Density • % Canopy cover	These are key components in assessing the diversity, health, and functionality of riparian habitat and ensuring that adequate riparian species are present for recruitment and maintenance of the ecosystem. Riparian plants typically must maintain contact with the water table, so their presence and diversity is an important indicator of soil moisture (water table) characteristics. The listed vegetation parameters can be correlated with important riparian functions, such as streambank stabilization, temperature dynamics, and nutrient cycling.
	<u>Soils</u> • Riparian soil types	In the absence of riparian vegetative indicators, soil characteristics identified by the soil survey database can be used to determine past or present hydrologic influence and hence historical riparian area extent.
	<u>Hydrology</u> • Gradient of inundation, base flow levels	Periodic occurrence of flood (overbanking) flows, associated channel dynamics, and the preservation of base flows capable of sustaining high floodplain water tables are essential to maintaining the health of riparian ecosystems. Ground water depths can be sampled at each study reach and coupled with surface water data to produce a probability of inundation curve. Overbanking flow requirements can be modeled.