Jack W. Tatum
Sabine River Authority of Texas
Chair

SABINE-NECHES BBEST

BBEST Members

Member	Affiliation
Gary Graham, P.E.	G.E. Walker & Associates, L.L.C.
Scott Hall, P.E. (Co-Chair)	Lower Neches Valley Authority
Dr. Richard C. Harrel	Lamar University, Clean Air & Water, Inc.
Rex H. Hunt, P.E.	Alan Plummer Associates, Inc.
J. Roger Kelley, P.E.	LBG, Inc., Environmental
Matthew McBroom, Ph.D.	Stephen F. Austin State University
Jack D. McCullough, Ph.D.	Stephen F. Austin State University
David L. Parkhill, P.E.	AECOM Water
Jack W. Tatum (Chairman)	Sabine River Authority of Texas
Samuel Kent Vaugh, P.E.	HDR Engineering
Kirk Winemiller, Ph.D.	Texas A&M University

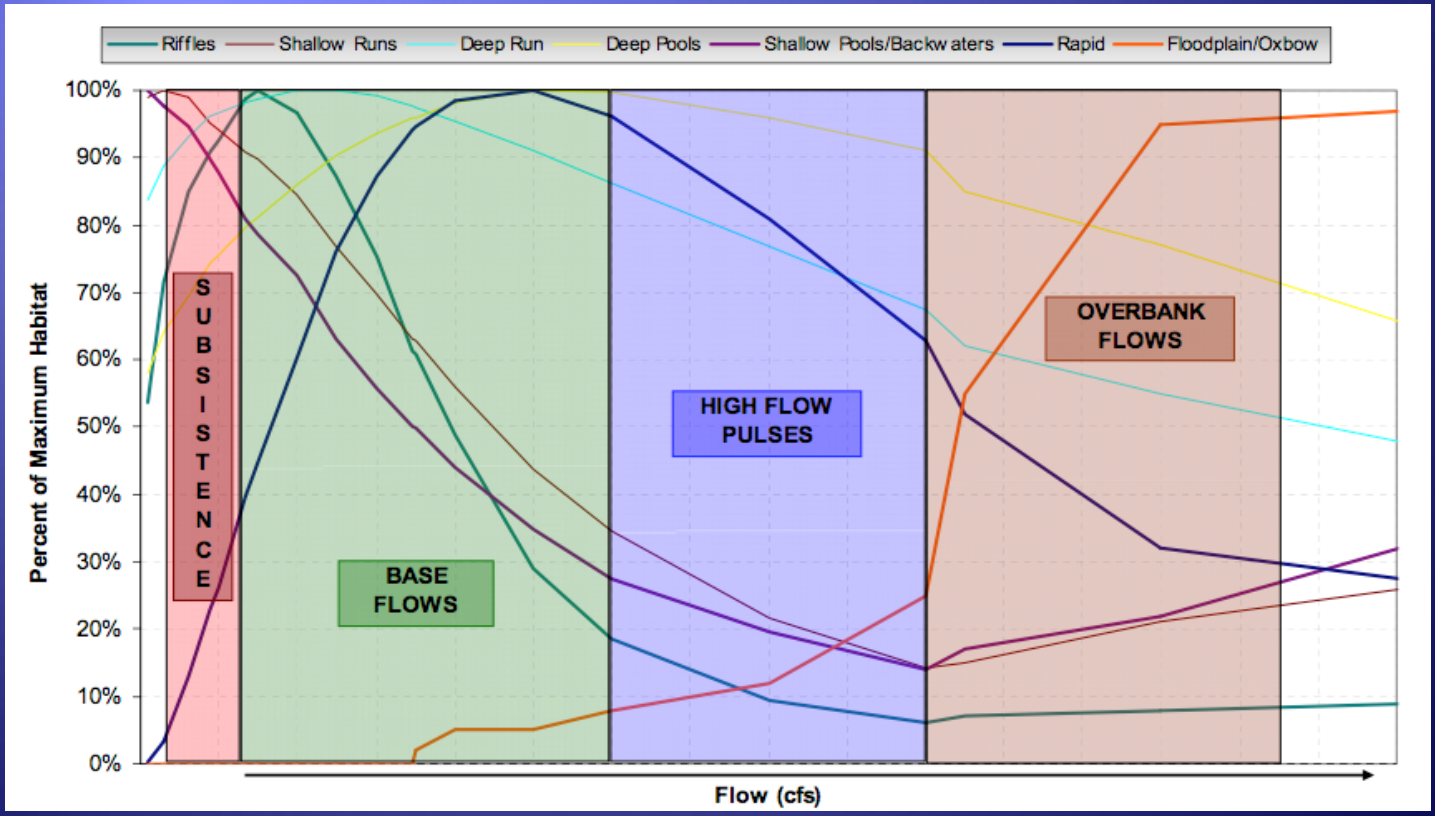
Primary Charge

- Environmental Flow Analysis
- Environmental Flow Regime

Instream Flow Regime Components

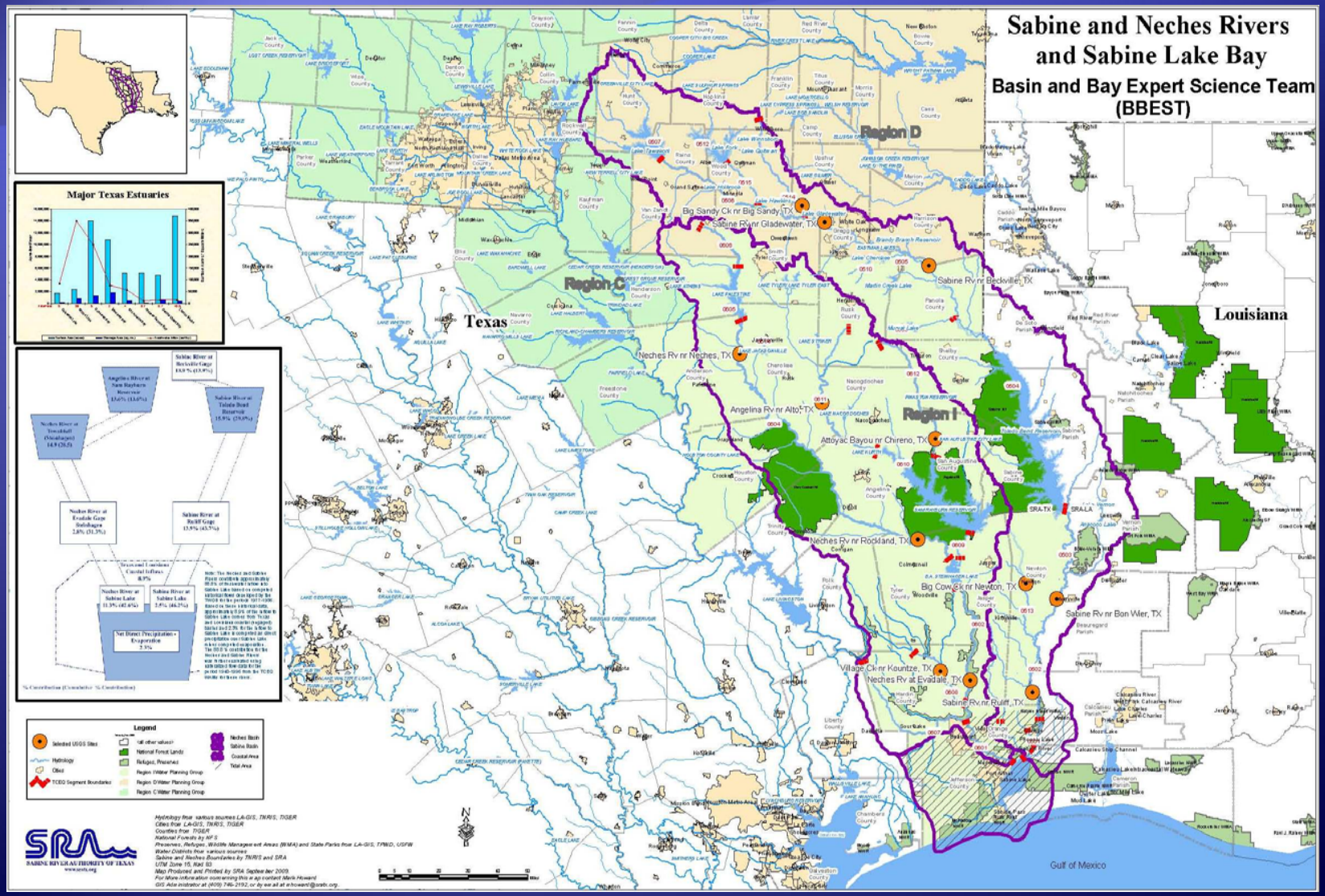
- Overbank Flows
- High Flow Pulses
- Base Flows
- Subsistence Flows

Habitat Availability Curve

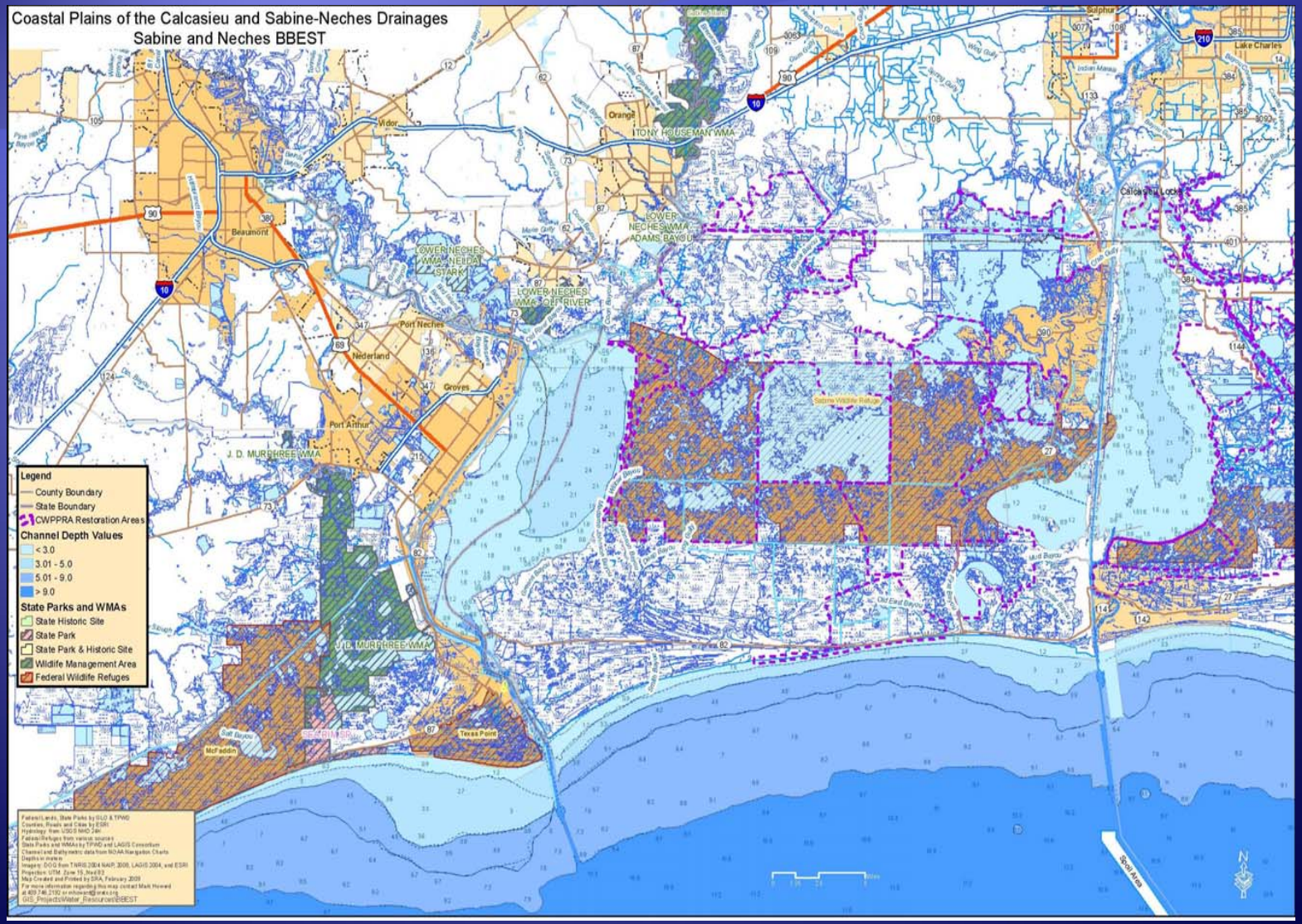


Taken from recent instream flows research, Lower Colorado River (BIO-WEST 2008).

Sabine and Neches Rivers and Sabine-Neches Estuary (Sabine Lake)



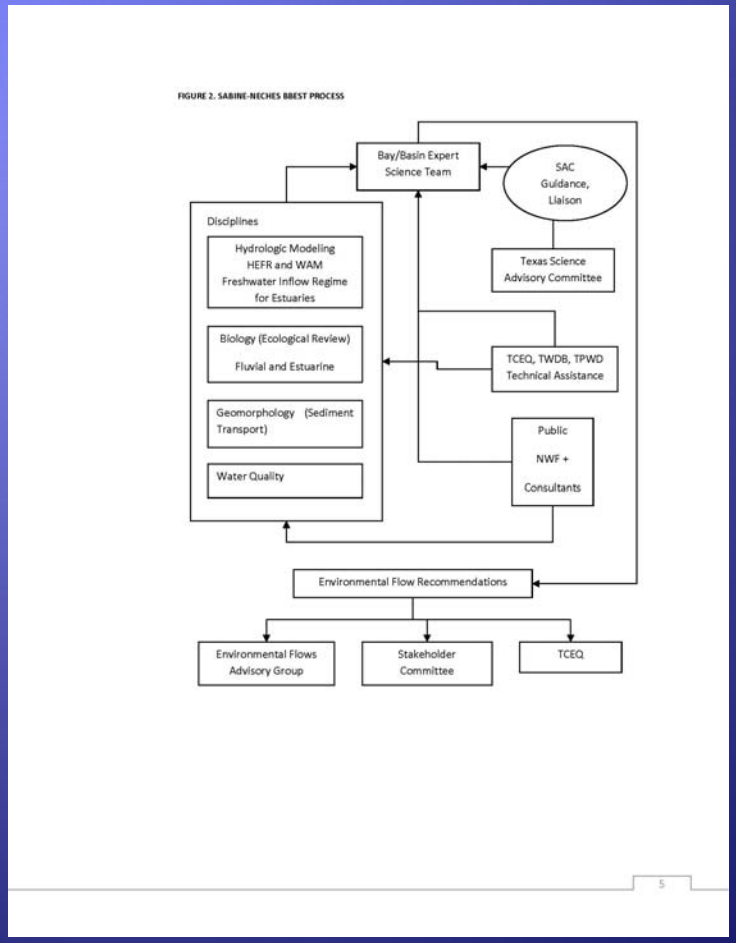
Coastal Plains of the Calcasieu and Sabine-Neches Drainages



Goal and Objectives

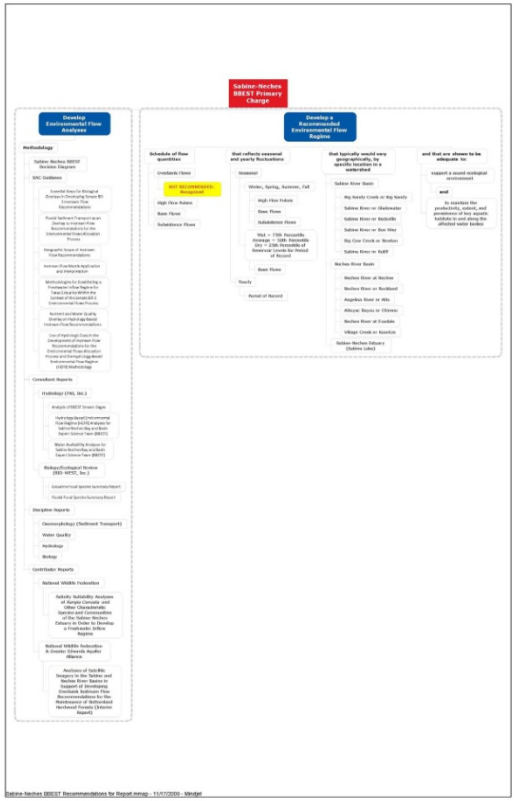
- Goal: Maintain a sound ecological environment
- Sound Ecological Environment: the Sabine-Neches BBEST adopted the SAC definition
- Objectives: to meet the criterion of a sound ecological environment

Sabine-Neches BBEST Process



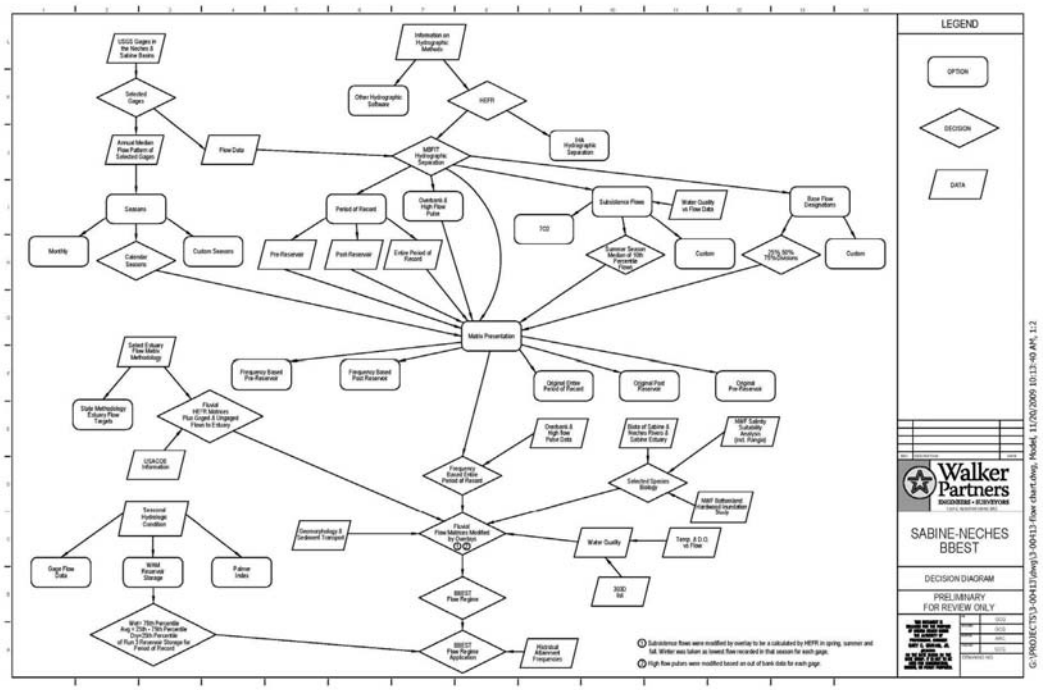
Accomplishment of Primary Charge

FIGURE 3. SABINE-NECHES BBEST - ACCOMPLISHMENT OF PRIMARY CHARGE



Decision Tree

FIGURE 4. SABINE-NECHES BBEST DECISION TREE



SAC Guidance

- Geographic Scope
- Use of Hydrologic Data
- Fluivial Sediment Transport (Geomorphology)
- Freshwater Inflow Regime
- Water Quality
- Biology

Sabine-Neches Basins: Unique Issues

- Texas/ Louisiana
- Texas State Water Quality Flows (7Q2)
- Senate Bill 2: Lower Sabine River Priority Instream Flow Study
- Toledo Bend Project Joint Operations (FERC Relicensing)
- Sabine River Compact
- Lower Neches River Saltwater Barrier
- Cutoff Bayou: Lower Sabine River
- USACE Sabine-Neches Waterway Feasibility Study

Discipline Reports

- Hydrology
- Biology (Ecological Review)
- Geomorphology (Sediment Transport)
- Application of Water Quality in Environmental Flows

Consultants and Contributors Work

- Hydrology (Freese and Nichols, Inc.)
  - Gage Memo, HEFR Memo, WAM Memo
- Biology (BIO-WEST, Inc.)
  - Estuarine and Fluvial Focal Species Summary Reports
- National Wildlife Federation
  - Salinity Suitability Analyses of *Rangia Cuneata …*
  - Analyses of Satellite Imagery … in Support of Developing Overbank Instream Flow Recommendations … (with the Greater Edwards Aquifer Alliance)

HEFR

- **H**ydrology-Based **E**nvironmental **F**low **R**egime (HEFR)
  - Developed by the Texas Parks and Wildlife Department (TPWD) to efficiently use hydrologic data to populate a flow regime matrix
  - The Sabine-Neches BBEST selected HEFR as the desktop method to use for developing the required flow matrices for the Sabine and Neches River Basins and the Sabine-Neches Estuary.

HEFR Matrix – Big Sandy Creek Near Big Sandy, Texas

USGS 08019500 Big Sandy Ck nr Big Sandy, TX

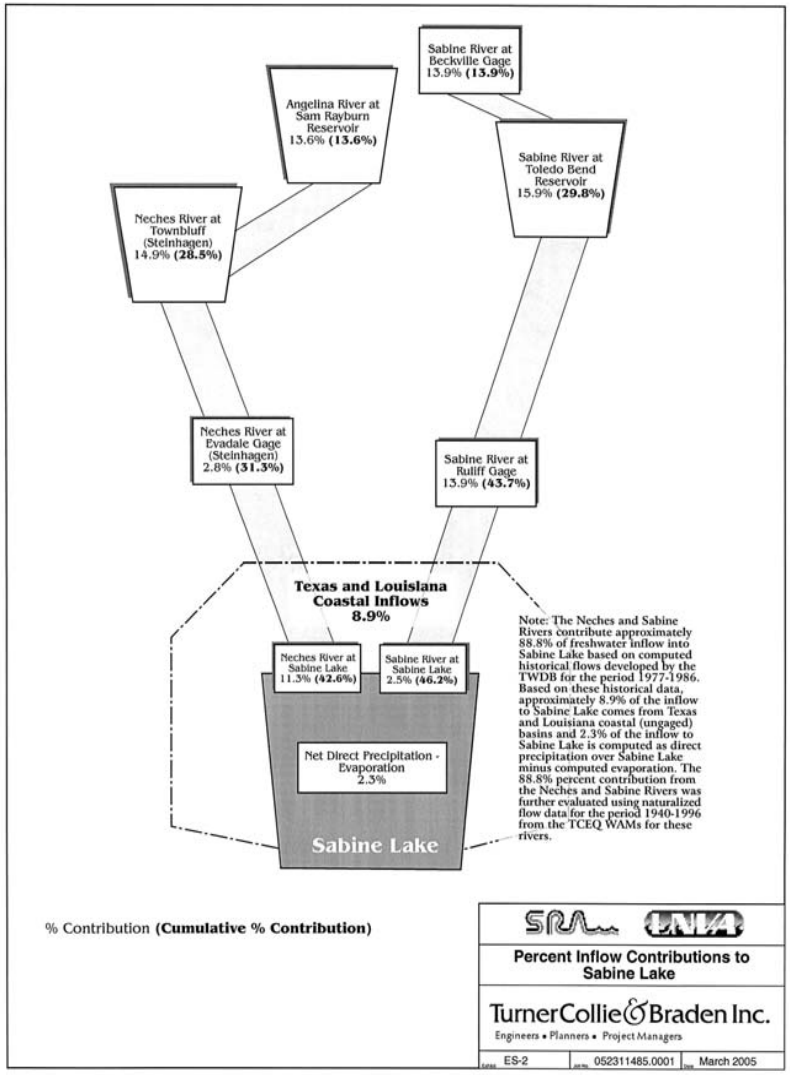
Full Period

Overbank Flows	Qp: 2,930 cfs with Frequency 1 per 2 years Volume is 35,703 Duration is 30			
	Overbank flows may cause extensive damage to private property and endanger the public. Therefore, the Sabine-Neches BBEST recognizes the ecological benefits of these events, but cannot recommend such events be produced.			
High Flow Pulses	Qp: 942 cfs with Frequency 1 per season Volume is 14,544 Duration is 16	Qp: 950 cfs with Frequency 1 per season Volume is 12,852 Duration is 19	Qp: 132 cfs with Frequency 1 per season Volume is 2,054 Duration is 11	Qp: 367 cfs with Frequency 1 per season Volume is 6,055 Duration is 14
	Qp: 358 cfs with Frequency 2 per season Volume is 5,932 Duration is 10	Qp: 313 cfs with Frequency 2 per season Volume is 5,062 Duration is 13	Qp: 50 cfs with Frequency 2 per season Volume is 671 Duration is 6	Qp: 130 cfs with Frequency 2 per season Volume is 2,189 Duration is 9
	Translation of seasonal pulse flows of specified frequencies into environmental flow standards and permit conditions may result in less frequent occurrence of high flow pulses as a result of the issuance of new surface water appropriations or amendments. This reduced frequency of occurrence is deemed an acceptable environmental risk at this time, subject to review as new studies and information become available.			
Base Flows (cfs)	163	111	26	63
	106	51	18	36
	66	30	14	20
	Seasonal base flows represent thresholds for environmental protection based on current scientific understanding of fluvial and estuarine ecosystems. As new studies and monitoring information become available, these base flow thresholds may be revised.			
Subsistence Flows (cfs)	20	9	8	8
	Translation of seasonal subsistence flows into environmental flow standards and permit conditions should not result in more frequent occurrence of flows less than the recommended seasonal subsistence values as a result of the issuance of new surface water appropriations or amendments.			
	Jan, Feb, Mar	Apr, May, Jun	Jul, Aug, Sep	Oct, Nov, Dec
	Winter	Spring	Summer	Fall

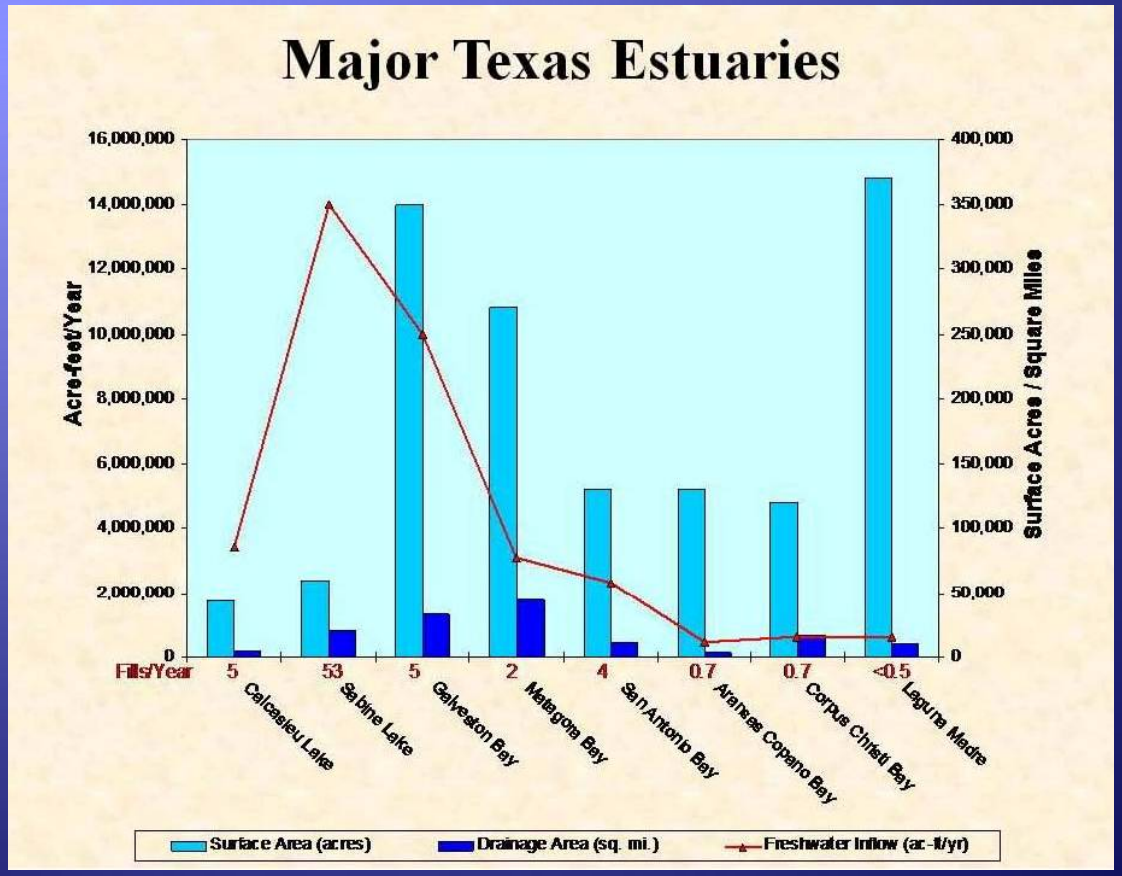
Sabine-Neches Estuary (Sabine Lake)

Numerous man-made alterations have influenced the current ecological condition in the Sabine-Neches Estuary and the lower tidal reaches of the Sabine and Neches Rivers. These systems are generally sound, exhibiting good overall water quality and diverse fish and wildlife communities . The Sabine-Neches Estuary receives more fresh water than all other estuaries on the Texas Gulf Coast (next slide) and provides enough fresh water to Sabine Lake for the focal species studied there (NWF 2009).

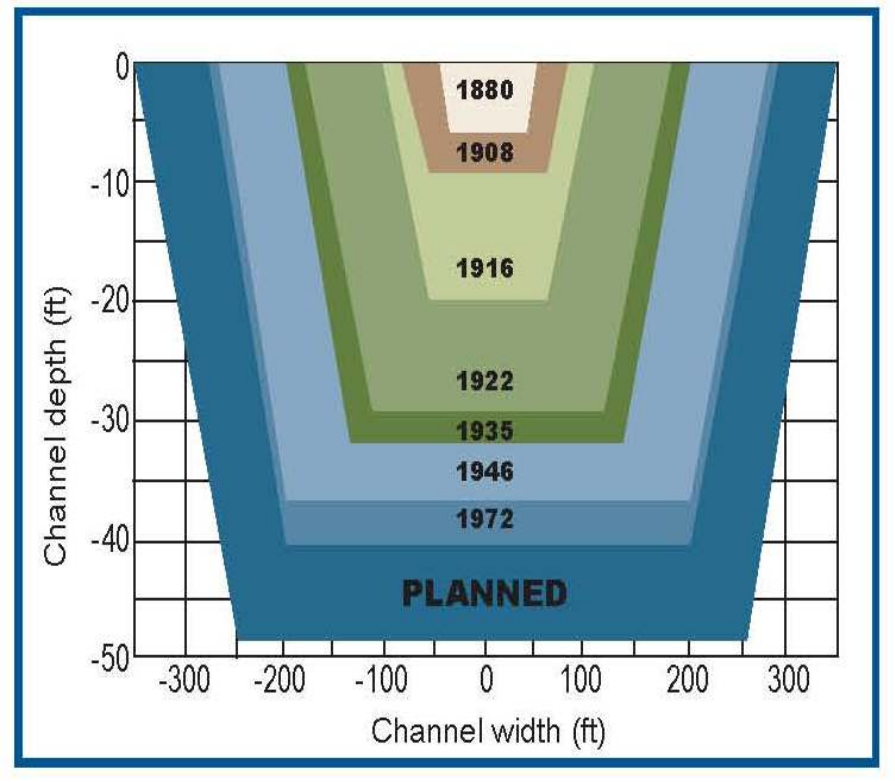
Percent Inflow Contributions to Sabine Lake



Major Texas Estuaries



Historic Widening and Deepening of the Sabine-Neches Ship Channel*



* The latest USACE draft study report indicates just deepening with selected widening areas; they do not plan to widen the entire channel length.

Development of Environmental Flows/ Recommendations/ Unresolved Issues

- Recommendations
- Recognitions
- Unresolved Issues
- Future Studies
- Adaptive Management

Recommendations (1-3)

1. Definition of a Sound Ecological Environment
   - The Sabine-Neches BBEST recommended the SAC definition that it adopted
2. The Current Conditions of the Sabine and Neches Rivers and the Sabine-Neches Estuary are Sound
3. Acknowledgement That Flows in the Sabine and Neches Rivers and Inflows to the Sabine-Neches Estuary will Change Over Time

Recommendations (4-5)

4. Future Study, Data Gathering, and Adaptive Management are Necessary to Determine Whether or Not Changes in Environmental Flows will Maintain a Sound Ecological Environment
5. Applicable Hydrologic Conditions for the Entire Season are Defined on the Basis of an Assessment of Hydrologic Conditions of Storage in Selected Reservoirs at the Beginning of the First Day of the Season Thereby Recognizing Both Drought Persistence and Practical Operations

Recommendations (6)

6. Subsistence Flows
   - The Sabine-Neches BBEST recommends adoption of the seasonal subsistence flows from MBFIT/ HEFR, unless:
     1. the seasonal value is less than the summer value in which case the summer value is adopted by default, and
     2. MBFIT/HEFR failed to calculate a value (this occurred usually for winter) in which case the lowest recorded flow value for that season at that gage was adopted by default.
   - Translation of seasonal subsistence flows into environmental flow standards and permit conditions should not result in more frequent occurrence of flows less than the recommended seasonal subsistence values as a result of the issuance of new surface water appropriations or amendments.

Recommendations (7-8)

7. Base Flows
   - Seasonal base flows represent thresholds for environmental protection based on current scientific understanding of fluvial and estuarine ecosystems. As new studies and monitoring information become available, these base flow thresholds may be revised.
8. High Flow Pulses
   - Seasonal high flow pulses have recognized ecological benefits and are recommended for protection with certain reservations associated with environmental and operational liability risks.

Recommendations (9)

9. Fluvial Matrices Inflow Recommendations are Adequate to Maintain a Sound Ecological Environment in the Sabine-Neches Estuary (Sabine-Lake)

Recognitions (1)

1. Overbank Flows Have Recognized Ecological Benefits but are not Recommended
   - Overbank flows may cause extensive damage to private property and endanger the public. Therefore the Sabine-Neches BBEST recognizes the ecological benefits of these events, but cannot recommend such events be produced.

Recognitions (2-4)

2. Toledo Bend FERC* Relicensing
   - The relicensing of the Toledo Bend Project is ongoing at this time. The relicensing will recognize the Project's primary use as a water supply project with the capability of generating hydroelectric power. Since no major changes in operations are planned, a maintenance flow will continue to be maintained from the spillway.
3. Sabine River Compact
   - The major purposes of the Sabine River Compact are to provide for the equitable apportionment between the States of Louisiana and Texas of the waters of the Sabine River and its tributaries.
4. Cutoff Bayou
   - Environmental flows as well as the diversions for the water supply canal system in Texas are adversely affected by migration of channel flow to the Old River Channel in Louisiana during low and average flow conditions.

* Federal Energy Regulatory Commission

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Environmental Flows Recommendations Report:

http://www.sratx.org/BBEST/RecommendationsReport/