Draft Study Design

Instream Flow Study of the Lower Sabine River

Draft Study Design

Prepared for
Lower Sabine River Sub-Basin Study Design Workgroup

Prepared by
TEXAS INSTREAM FLOW PROGRAM
AND SABINE RIVER AUTHORITY OF TEXAS

MARCH 26, 2010
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Statewide Conceptual Model

- **Base flows**
- **High flow pulses**
- **Overbank flows**
- **Subsistence flows**
Conceptual Model of lower Sabine River
## Ecological Processes/Flow Regime of Sabine River

<table>
<thead>
<tr>
<th>Component</th>
<th>Hydrology</th>
<th>Geomorphology</th>
<th>Biology</th>
<th>Water Quality</th>
<th>Connectivity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Subsistence flows</strong>&lt;br&gt;Infrequent, low flows (typically during summer)</td>
<td>Increase deposition of fine and organic particles</td>
<td></td>
<td>Provide limited aquatic habitat</td>
<td>Maintain adequate levels of dissolved oxygen, temperature, and constituent concentrations (particularly nutrients)</td>
<td>Provide limited lateral connectivity along the length of the river</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Maintain populations of organisms capable of repopulating system when favorable conditions return</td>
<td></td>
<td>May be affected by groundwater/surface water interactions</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Maintain longitudinal connectivity</td>
</tr>
<tr>
<td><strong>Base flows</strong>&lt;br&gt;Average flow conditions, including variability.</td>
<td>Influenced by reservoir operation, peaking hydropower, and land use changes&lt;br&gt;Vary by season and year</td>
<td>Maintain soil moisture and groundwater table in riparian areas</td>
<td>Provide suitable aquatic habitat for all life stages of native species</td>
<td>Provide suitable in-channel water quality</td>
<td>Provide connectivity along channel corridor&lt;br&gt;May be affected by groundwater/surface water interactions</td>
</tr>
</tbody>
</table>
## Eco. Proc./Flow Regime (continued)

<table>
<thead>
<tr>
<th>Component</th>
<th>Hydrology</th>
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<th>Biology</th>
<th>Water Quality</th>
<th>Connectivity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High flow pulses</strong>&lt;br&gt;In-channel, short duration, high flows</td>
<td>Influenced by reservoir operations, peeking hydropower, and land use changes</td>
<td>Maintain channel and substrate characteristics&lt;br&gt;Prevent encroachment of riparian vegetation&lt;br&gt;Play an important role in recovery of channel after flood events</td>
<td>Provide migratory and spawning cues for organisms&lt;br&gt;Transport semi-buoyant fish eggs</td>
<td>Restore in-channel water quality after prolonged low flow periods</td>
<td>Provide connectivity to near-channel water bodies (e.g. oxbows and distributary channels)</td>
</tr>
<tr>
<td><strong>Overbank flows</strong>&lt;br&gt;Infrequent, high flows that exceed the channel</td>
<td>Influenced by reservoir operation</td>
<td>Provide lateral channel movement, an important source of coarse material for channel&lt;br&gt;Form new habitats&lt;br&gt;Flush organic material/woody debris into channel&lt;br&gt;Transport nutrients and sediment to floodplain</td>
<td>Provide spawning cues for organisms&lt;br&gt;Provide access to floodplain habitats&lt;br&gt;Maintain diversity of riparian vegetation</td>
<td>Restore water quality in floodplain water bodies</td>
<td>Provide connectivity to floodplain&lt;br&gt;Recharge alluvial aquifers&lt;br&gt;Provide large volumes of freshwater to Sabine Lake</td>
</tr>
</tbody>
</table>
Indicators and Activities

Flow regime components
(frequency, timing, duration, rate of change, magnitude)

Natural variability

Indicators
Flow regime components (frequency, timing, duration, rate of change, magnitude)
Natural variability

Activities
Hydrologic evaluation
Hydrologic evaluation
Hydrology and Hydraulics

Hydrologic Evaluation
Hydrology and Hydraulics

Activities to support Other disciplines

2-d hydraulic modeling

Biology
(habitat modeling)

Physical Processes
(sediment transport)
<table>
<thead>
<tr>
<th>Indicators</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bank stability</td>
<td>Analysis of aerial photos</td>
</tr>
<tr>
<td>(lateral migration, channel avulsion, bank erosion rates)</td>
<td>Sediment budgeting, transport modeling</td>
</tr>
<tr>
<td>Channel maintenance</td>
<td>NWS flood impacts</td>
</tr>
<tr>
<td>(in-channel bars, meander pools)</td>
<td></td>
</tr>
<tr>
<td>Flood impacts</td>
<td></td>
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</tbody>
</table>
Connectivity

**Indicators and Activities**

- **Riparian zone** (habitat and total area)
- **Lateral connectivity** (frequency, duration, timing)
- **Longitudinal connectivity**

**Activities**

- Inundation modeling
- Pressure transducer deployment
- Non-proposed at this time
Inundation Modeling

5-m DEM Coverage (based on LiDAR)
Inundation Modeling

Legend

GParkhouse_grd_gcs

VALUE

0 - Water
01 - Bottomland Hardwood
02 - Secondary Bottomland Hardwood
03 - Cedar-Hardwood/Pine-Hardwood
04 - Oak-Hickory
05 - Pure Pine/Cedar Grove
06 - Pasture/Grassland
07 - Crops/Managed Pasture
10 - Bare Soil/Ground

Grey masked area
Outside 156.9 cms (5,540 cfs, 98.7pctl) flood plain

Red contour line
63.7 cms (3,250 cfs; 94.3 pctl) flood plain

Black masked area
Inside 5.24 cms (185 cfs; 76.7 pctl) flood plain

White masked area
Outside 314.0 cms (11,100 cfs, 99.7pctl) flood plain

Area #110
Downstream from the Proposed George Parkhouse I Reservoir
Pressure Transducer Deployment

Graph showing rainfall (in) and WSE (ft above MSL NAVD88) over time from 11/03 to 9/04 with specific dates highlighted for 12-1994 to 12-2003.

Legend:
- Red dotted line: Big Bend Oxbow Lake WSE
- Blue line: Brazos River WSE
- Black dotted line: Control Point Elevation
Next Steps

2005

Stage 1: Identify and Engage Stakeholders

2008

Stage 2: Conduct Sub-basin Orientation Meetings

Goal Development Consistent with Sound Ecological Environment

2008-10

Stage 3: Establish Sub-basin Workgroups and Conduct Study Design Workshops

Study Design

Peer Review

2010

Stage 4: Conduct Data Collection Workshops/Field Demonstrations (by request)

Multidisciplinary Data Collection and Evaluation

2010-2012

Stage 5: Conduct Data Integration Workshops

Data Integration to Generate Flow Recommendations

2012

Stage 6: Review Study Report

Draft Study Report

Peer Review

2013

Final Study Report

Next Steps: Implementation, Monitoring, and Adaptive Management

2013

SB 2 Ends Post-SB 2
Comments on Draft Study Design

- Today’s meeting

- Send comments by Apr. 23, 2010
  - E-mail: tifp@twdb.state.tx.us
  - Mail: Texas Instream Flow Program
    P.O. Box 13231
    Austin, TX 78711-3231
How to stay involved

- Check website for updates
  - [www.twdb.state.tx.us/instreamflows/](http://www.twdb.state.tx.us/instreamflows/)
- Electronic/postal newsletter
- Contact TIFP if interested in seeing study activities in field
- Participate in Data Integration Workshops
- Review Study Report