Lower Sabine River
Biological Indicators

Texas Instream Flow Program
Third Stakeholder Workshop
January 6, 2009
Orange, Texas
Biology

Biodiversity

Habitat Diversity

MEAN HABITAT USE

DEEP POOL

MEDIUM POOL

RACEWAY

FAST RIFFLE

SHALLOW POOL

SLOW RIFFLE

VELOCITY (cm/s)

DEPTH (cm)
Analysis of Existing Biological Data

- Extensive historical fish collections available from the Sabine drainage
- Mostly housed at Tulane University
- Coverage skips the 1990s
1940s Fish Collections
Analysis of Existing Fish Data

Bonner and Runyan
2007

Not ath

P < 0.001
Declining species

- Pirate perch
- Red shiner
- Western mosquitofish
- Mississippi silvery minnow
- Warmouth
- Shoal chub
- Emerald shiner
- Ghost shiner
- Bullhead minnow
Increasing species

- Scaly sand darter
- Blacktail shiner
- Blackspotted topminnow
- Bluegill
- Longear sunfish
- Inland silverside
- Spotted bass
- Dusky darter
Other species assessed

• 23 species were stable in population

• More than 50 species had trends that could not be determined from available data
Lower Sabine River Instream Flow – TIFP Fish Collection

2006-2007
Summary

- Lower Sabine River – 64 species comprising more than 15,000 individuals.

- State threatened blue sucker collected.
Mussel Surveys
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
Potential Indicators

Native Species Richness - the number of species or taxa

Relative Abundance – the number of organisms of a particular species as a percentage of the total community
Taxa

Fishes
- Flow sensitive species
- Sport fishes
- Prey species
- Imperiled species
- Intolerant species
Other Taxa

- Benthic invertebrates
- River prawn
- Mussels
- River and riparian plants
- Other vertebrates
Instream Habitat

- Habitat Quality and Quantity for Key Species
- Mesohabitat Area and Diversity
Riparian Habitat

Vegetation

- Age class distribution of riparian plant species
- Riparian species richness and diversity
- Density
- % Canopy cover
Riparian Habitat

Soils
- Riparian soil types

Hydrology
- Gradient of inundation
- Base flow levels
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
Hydraulic Modeling

Depth at Rainwater Ranch at Q=100cfs

Depth at Rainwater Ranch at Q=1000cfs

Velocity at Rainwater Ranch at Q=100cfs

Velocity at Rainwater Ranch at Q=1000cfs
Biology

- Examine integrity of biological community
- Examine biodiversity within ecosystem
- Assess habitat-flow relationships
Suitability Criteria for Habitat Modeling

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N = 146  2055

Velocity Criteria

Velocity (fps) Bins

Habitat Suitability Criteria

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0.0  0.1  0.2  0.3  0.4  0.5  0.6  0.7  0.8  0.9  1.0
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0.0  0.1  0.2  0.3  0.4  0.5  0.6  0.7  0.8  0.9  1.0
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0.0  0.1  0.2  0.3  0.4  0.5  0.6  0.7  0.8  0.9  1.0
2-D Microhabitat Modeling

Habitat Description

1. (Longear Sunfish) =
   0.68 < Depth < 4.09
   0.46 < Velocity < 2.01
   All Substrates

Legend:
- Unsuitable
- 90% CI

Depth (feet):
- Dry Areas
- 0 - 1
- 1 - 2
- 2 - 3
- 3 - 4
- > 4

Velocity (fps):
- Dry Areas
- 0 - 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.8
- > 0.8

Substrate:
- Pebble - Cobble
- Gravel - Pebble
- Gravel - Sand
- Sand - Gravel
- Sand
- Sand - Fine
- Organic
Use of Habitat Guilds for Mesohabitat Modeling
Hydraulically-defined Mesohabitats
2-D Mesohabitat Modeling

Flow = 100 cfs

Mesohabitat:
- Deep Pool
- Medium Pool
- Shallow Pool
- Run
- Slow Riffle
- Fast Riffle
- Dry

[Map showing different mesohabitat areas]
2-D Mesohabitat Modeling

Flow = 1,000 cfs
Mesohabitat Area vs. Flow (cfs)