Cow Bayou Tidal Use Attainability Analysis

Cindy Contreras and Adam Whisenant
Coastal Fisheries Division
Water Quality Program

TEXAS PARKS & WILDLIFE

Cow Bayou, Sept 2003

Tidal Streams

- Interface between freshwater rivers and bays
- Vital nursery habitat for shrimp and fish

Carancahua 2 looking downstream spring 2003

Regulatory Perspective:

Federal Clean Water Act

↓

Water Quality Standards

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Water Quality Inventory
305(b) report

↓

List of Impaired Water Bodies
303(d) list

Tidal Streams
Aquatic Life Use is Tied to Dissolved Oxygen

Tidal streams listed as impaired for aquatic life

- Adams Bayou
- Armand Bayou
- Cow Bayou
- Dickinson Bayou
- Tres Palacios Creek
- Garcitas Creek
- Arroyo Colorado

Aquatic Life Use	D.O.(mg/L)
Exceptional	5.0
High	4.0
Intermediate	3.0

Tidal Streams
Use Attainability Analysis Project Goals

- **Develop a Use Attainability Analysis (UAA) for tidal portions of Cow Bayou, Tres Palacios and Garcitas Creek**
- **Advance the science of tidal streams**

TEXAS PARKS & WILDLIFE

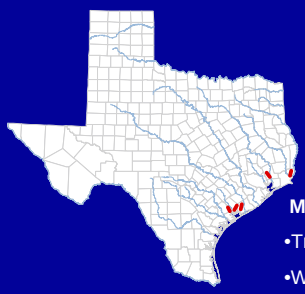
Tidal Stream Study Funding

EPA Section 106 Grant; TCEQ contract ($563,560); TPWD donation of salaries ($342,601 – Resource Protection, Inland Fisheries, Coastal Fisheries Divisions)

Project runs 8/1/02 – 2/28/07

Supported by TCEQ lab and field biologists, TWDB, TAMU-CC, SRA field biologists, in consultation with GBRA, LCRA, LNRA, and TRA

Study Sites



Upper Coast

•Cow Bayou

•Lost River

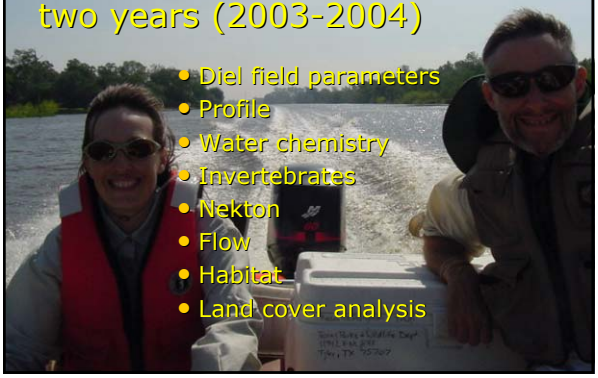
Middle Coast

•Tres Palacios Creek

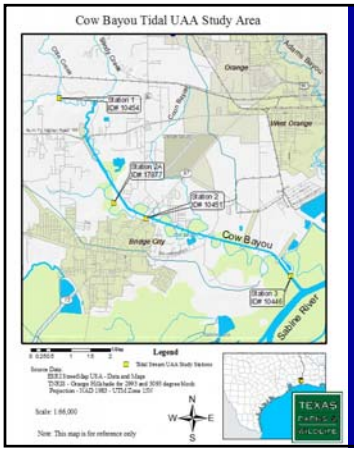
•West Carancahua Creek

•Garcitas Creek

Field Sampling – 12 trips over two years (2003-2004)



- Diel field parameters
- Profile
- Water chemistry
- Invertebrates
- Nekton
- Flow
- Habitat
- Land cover analysis



•Fifteen wastewater dischargers – municipal and industrial

•Dredged for barge traffic

•Sinuous relict channel crosses dredged channel at numerous points

•4 stations: 3 main stem and 1 in relict channel

Cow Bayou stations

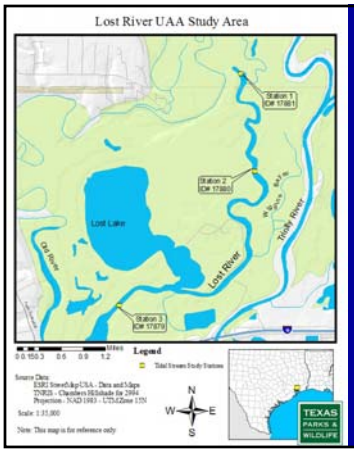
CB 1 (Apr 2004)

CB 2

CB 2A

Photos from Apr 2003 unless otherwise noted

CB 3



- Chosen as reference stream for Cow Bayou
  - *needed a low-salinity tidal stream with forested riparian zone and minimal human influence*
- Little development in watershed
- No permitted wastewater discharges
- Smaller, fresher system than Cow Bayou
- 3 stations

Lost River stations

LR 1

LR 2

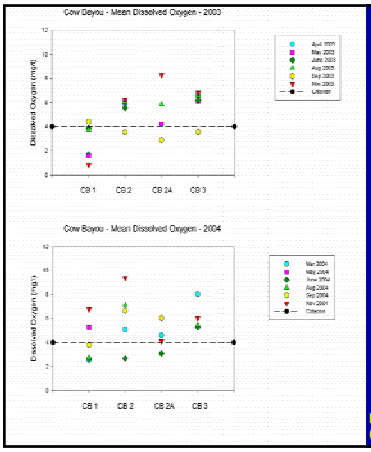
LR 3

Photos from Apr 2003

Habitat – Cow Bayou vs. Lost River

- Cow was deeper than Lost (except for CB 2A)
- Human influence index (Kaufmann et al. 1999) much greater at Cow (1.02) that at Lost (0.11)

Photos from Cow Bayou, Sep and Nov 2003



Cow Bayou

Exceedances* of DO mean: 11/26

Exceedances* of DO min.: 7/26

*during index period

Figure reprinted from Radloff (2005)

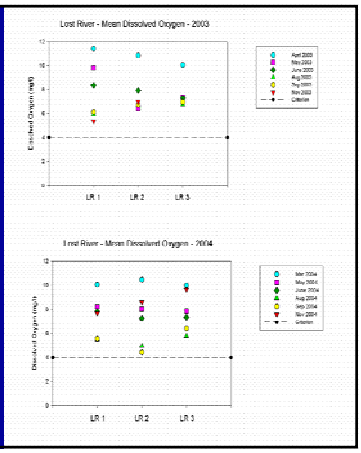
Lost River

Exceedances* of DO mean: 0/24

Exceedances* of DO min.*: 1/24

*during index period

Figure reprinted from Radloff (2005)



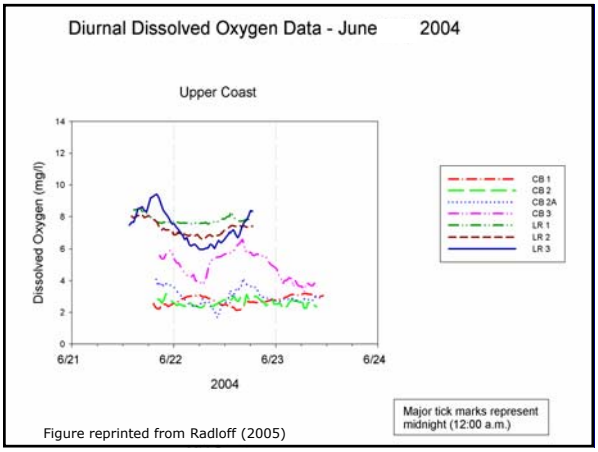


Figure reprinted from Radloff (2005)

Invertebrates - overview

- Middle of channel (Ekman dredge)
  N = 6,030 individuals
- Side of channel (Ekman dredge)
  N = 15,128
- Shoreline (D-frame net sweeps)
  N = 8,014

Benthic infauna – dominant taxa

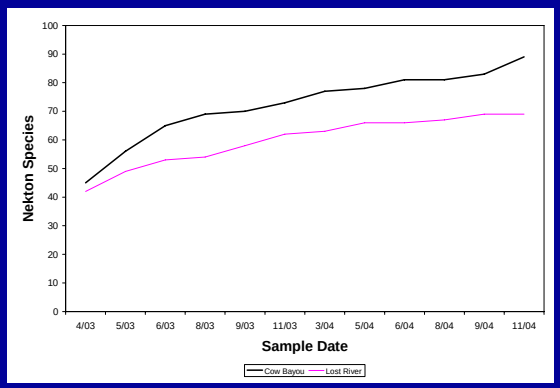
EKMAN
- Oligochaetes
- *Rangia* clams
- Chironomids
- Hydrobiid snails
- Amphipods
- Polychaete worms
- Phantom midges

SHORELINE
- Mysid crustaceans
- Oligochaetes
- Chironomids
- Caenid mayflies
- Amphipods
- Hemipterans

Nekton overview

- Total number of species ≥104 (94 fish, 7 crustaceans, 5 mollusk or vertebrate taxa)
- Cow Bayou N = 18,663 individuals
- Lost River N = 60,978

Jun 2004 Lost River



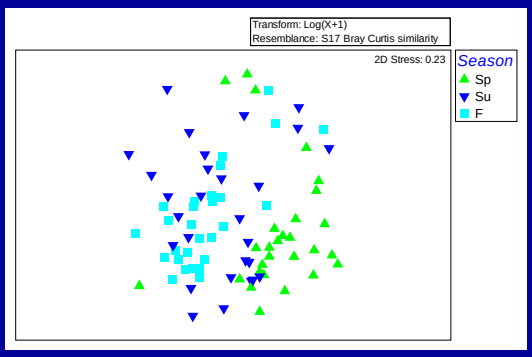
Still catching new species on the last of 12 sampling trips

Nekton – seine, dominant taxa by numbers

COW BAYOU
- Gulf menhaden
- Grass shrimp
- Blue crab
- Bay anchovy
- Western mosquitofish

LOST RIVER
- Gulf menhaden
- Grass shrimp
- Blue crab
- Bay anchovy
- White shrimp

Nekton – seine, Cow Bayou and Lost River



Seasonal differences between spring and fall samples (Cow Global R = 0.214, prob.=0.001; Lost Global R = 0.4, prob.=0.001).

Nekton – trawl, dominant taxa by numbers

COW BAYOU
- Atlantic croaker
- Freshwater prawn
- Blue catfish
- Bay anchovy
- White shrimp

LOST RIVER
- Atlantic croaker
- Grass shrimp
- Blue catfish
- Bay anchovy
- Gulf menhaden

Conclusions – Water and Sediment Quality

- Cow Bayou and Lost River were distinctly different with respect to physicochemical parameters and water chemistry
- Cow Bayou showed many episodes of low DO while Lost River had good DO levels

Conclusions - Biota

- Invertebrates – more individuals were collected near the side of the channel than in the middle. Most of the taxa were considered tolerant of disturbance, pioneering or colonizing forms
- Nekton - abundance was higher at Lost River, but Cow Bayou had more species and greater taxonomic diversity -more sampling effort (4 stations instead of 3) and more variety of habitat at Cow Bayou might help explain this

Is Cow Bayou meeting the high aquatic life use?

- Yes!
- A diversity of vertebrate and invertebrate organisms were collected during the study
- However, there are water quality concerns that need to be addressed

Challenges in Sampling Tidal Streams

Alligator at CB 2A 9 Apr 2003

Large holes in gill net at LR 1, Sep 2004

Lost River near LR 2, Nov 2004

"Trees" in trawl, CB 2, Jun 2004

Lost River Jun 2004

Recommendations for Sampling Tidal Streams

- Reference stream selection is difficult along the Texas coast - instead collect comparable data from several streams along a gradient of human influence
- Invertebrates – a variety and abundance of invertebrates were collected. Ekman is inexpensive and easy to deploy, except under high flow conditions
- Shoreline invertebrate sampling collected many terrestrial forms and data did not reveal seasonal distinctions

Recommendations for Sampling Tidal Streams

- Seine collected lots of individuals and species, inexpensive and easy to deploy.
- Trawls are a good complement to seines since they sample the channel.
- Data collected from seines and trawls showed distinctions between stations and between seasons.
- Electrofishing was effective but did not show seasonality; more expensive. Gill nets – could try a smaller mesh size
- Budget for gear replacement

Acknowledgements

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