Environmental Flows - Validation
BBASC Meeting
May 22, 2015
Project Scope

• Project goal is to enhance the understanding of flow-ecology relationships and develop a methodology for testing established flow standards

• Primarily interested in how flow tiers influence biology
## Timeline

<table>
<thead>
<tr>
<th>Event</th>
<th>2014</th>
<th>2015</th>
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<tbody>
<tr>
<td>Complete Contract with TWDB</td>
<td>May: May 2015</td>
<td>May: Sep 2015</td>
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<tr>
<td>Sub-Contract Approval</td>
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<tr>
<td>Workshop 1</td>
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<tr>
<td>Methodology Testing</td>
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<td>Workshop 2</td>
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<td>TWDB Interim Report</td>
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<td>Method Implementation</td>
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<td>Data Processing, Reduction and Analysis</td>
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<tr>
<td>Preliminary Verification</td>
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<td>Draft Project Report</td>
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<td>Final Report</td>
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Presentation overview

- Aquatic
- Riparian
- Fish Recruitment (Otoliths)
- Oxbow Connectivity
- Report Format
### Aquatics*

<table>
<thead>
<tr>
<th></th>
<th>GSA (4 Seasons)</th>
<th>BRA (3 seasons)</th>
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<tbody>
<tr>
<td>Sites</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Visits</td>
<td>41</td>
<td>32</td>
</tr>
<tr>
<td>Sub</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Base</td>
<td>19</td>
<td>12</td>
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<tr>
<td>HFP</td>
<td>17</td>
<td>13</td>
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<tr>
<td>4/S</td>
<td></td>
<td>3</td>
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<tr>
<td>3/S</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2/S</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>1/S</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>1/Y</td>
<td>5</td>
<td>1</td>
</tr>
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Aquatics

- Sampled habitats:
  >300 seine hauls
  ~70 riffles
  ~73 runs

- Fish (95%): 47 species; \( N = 17,430 \)
- Aquatic insects (80%): 8 orders, \( N = 16,204 \)
- Mussels: 10 species, \( N = 896 \)
Flow Dependent Variable

Discharge

Subsistence Flow

Base Flow

High Flow Pulses

2 per season

1 per season

1 per year

1 per 2 year
Density of slackwater inverts

Month

0 2 4 6 8 10 12

0.0
0.2
0.4
0.6
0.8
1.0

1/s
2/s
3/s
1/y
2/y
3/y
Aquatics

• Data analysis (riffle, run):
  – Dependent variables (e.g., community structure, habitat factors, condition factors)
  – Multi-factor ANOVA:
    • Flow tier
    • Season
    • Drainage (or skinny vs big waters)
    • Interactions
Riparian

• Riparian vs. upland species success

• Seedling
  – Distribution/germination and survival

• Sapling
  – Distribution, recruitment, and survival

• Mature tree survival
Indicator species

• Black Willow (*Salix nigra*)
  – Seed deposition early spring through summer

• Box Elder (*Acer negundo*)
  – Fall/overwinter

• Green Ash (*Fraxinus pennsylvanica*)
  – Spring and Fall/overwinter
Fish recruitment (otolith aging)

Very low N in Texas State U. seine hauls
Fish recruitment (otolith aging)

- San Antonio - Goliad
- San Antonio - Falls City
- Brazos Hempstead
- Brazos Rosharon
Oxbow Connectivity

• 7 “floodplain lakes” evaluated
  – 5 on lower Guadalupe
  – 2 on lower San Antonio

• Fish Community Data
  – Electrofishing, seining

• Connection Data
  – Elevation of control points and water surface
  – Connection discharge interpolated from nearest gauges using previously established techniques (Osting et al. 2004)
Oxbow Connectivity

• 7,623 fishes representing 37 species
  – Per site species richness ranges from 2 to 32

• Initial estimates of connection discharge range from 207 cfs to over 10,000 cfs

• One additional sampling event scheduled in early June
Hydrograph

Discharge

Flow Dependent Variable

Time

High Flow Pulses

Subsistence Flow

Base Flow

2 per season per season

1 per year

1 per 2 year

?
Draft Report
Schedule

• July 31: Draft report to TWDB

• June 29 – July 30: draft sections sent to lead authors, integrate, review, revise, format, team meeting, review, revise, format
Draft Report
Outline

• Follow TWDB contract outline

I. Executive Summary

II. Introduction: Overview, expert panel workshops, working hypotheses

III. Material and Methods
Draft Report Outline

IV. Results & Discussion

V. Multidisciplinary Assessment
   - ecological links to environmental flow recommendations and standards
   - how this information can be viewed and interpreted by BBASC

VI. Approach Recommendations and Future Research

Other: Conclusions, Acknowledgments, References, Appendices