To Whom it May Concern:

We can help!

Sincerely,

Streams

2019 Kentucky Association of Mitigation Managers Conference

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Presentation Outline

• What's the Problem
• Ecological benefit
• Case Study: Katy Prairie
Pollution in Kentucky Streams

- Nutrients: 24%
- Sediment: 29%
- Legacy Pollutants: 4%
- Conductivity: 13%
- Bacteria: 14%
- pH: 1%
- Temperature: 1%
- Other: 1%
- Cause Unknown: 7%
- Metals: 6%
- Radiation: 0%
Non-point Source Pollution
Non-point Source Pollution: Soil Erosion
Non-point Source Pollution: Other Pollutants
Other Pollutants: Organics, Pesticides, Slurry

Courtesy: WDRB
Ecological Benefits

• Improved hydrologic & hydraulic function
• Lowered water temperature
• Pollutant filtration
• Habitat diversity
• Floodplain connectivity
CASE STUDY: Katy Prairie Stream Restoration
An Illustrative Use of Stream Restoration to Create Resilient Ecosystems
1. Generate Stream Mitigation Credits

2. Stable Stream
   - Dimension – Pattern - Profile
   - 100-Year Flood Event

3. Restore Habitat
Summary

- Umbrella Mitigation Bank
- 5 Phases
- Phases 1 – 4 Constructed
- 86,000 Total Feet
- Post Construction Monitoring

Phase 1: Warren Creek
Simon’s Modification of Schumm’s Model

Class I. Sinuous, Premodified
$h < h_c$

Class II. Channelized
$h < h_c$
Floodplain

Class III. Degradation
$h < h_c$

Class IV. Degradation and Widening
$h > h_c$
Terrace
Slumped material

Class V. Aggradation and Widening
$h > h_c$
Terrace
Slumped material
Aggraded material

Class VI. Quasi Equilibrium
$h < h_c$
Terrace
Bank
Bankfull
Aggraded material
Shear Stresses in Streams

Shear Stress = \( \gamma R S \)

Channelized Stream

Natural Stream

Discharge Return Interval

Shear Stress

100-Year Storm

2-Year Storm

D100

D2
Design Process

- Review of Watershed
- Overview of Site (Toothpick Survey)
- Gage Analysis/Region Geomorphic Relationships
- Geomorphic Data Collection
  - Cross Sections
  - Longitudinal Profile
  - Pebble Counts
  - Bar Samples
- Sediment Transport Analysis
1. Logs shall be straight and limbs shall be trimmed flush.
2. Minimum log length is 50 feet and minimum diameter is 18 inches.
3. Fabric shall be completely buried and not visible.
Construction Phase
Monitoring Phase
Monitoring Summary

- As-Built Survey
- Geomorphic Survey
  - Longitudinal Profile
  - Cross Sections
- Photographic Documentation
- Vegetation Survey
  - Species Composition
  - % Cover
  - Density
- Level 1 Stream Condition Assessment
- Bankfull Event
Daily Discharge 1976 - 2017

USGS 08068720 Cypress Ck at Katy-Hockley Rd nr Hockley, TX

- Daily mean discharge
- Estimated daily mean discharge
- Daily maximum discharge
- Estimated daily maximum discharge
- Daily minimum discharge
- Estimated daily minimum discharge
- Period of approved data
- Period of provisional data
<table>
<thead>
<tr>
<th>Cross-Section</th>
<th>Reach</th>
<th>Type</th>
<th>As-built Cross-Sectional Area (ft²)</th>
<th>Year 2 Cross-Sectional Area (ft²)</th>
<th>Year 3 Cross-Sectional Area (ft²)</th>
<th>Year 4 Cross-Sectional Area (ft²)</th>
<th>Year 5 Cross-Sectional Area (ft²)</th>
<th>Year 5 Percent Change from As-built</th>
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<td>Riffle</td>
<td>50.3</td>
<td>48.9</td>
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<td>Pool</td>
<td>62.8</td>
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<td>68.1</td>
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<td>21.8</td>
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Photos Station 1 – As-Built Survey
Photos Station 1 – 2013
Photos Station 1 – 2014
Photos Station 1 – 2015
Summary

• Importance of Floodplain Access
• Majority of Site Performing Well
• Few Areas in Need of Repair
  • Areas with Difficulty Establishing Vegetation
  • Poor Topsoil Conditions
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