

West Fork White River Stream Restoration Project ANRC Project 07-400



Watershed Conservation Resource Center



Beaver Water District, Northwest Arkansas Land Trust, Arkansas Game and Fish

Project Objectives

- Utilize reference or stable stream reaches to assist in restoration design
- Reduce streambank erosion
- Quantify sediment reduction
- Improve aquatic habitat
- Increase pollutant removal potential
- Improve local ecology
- Transfer technology

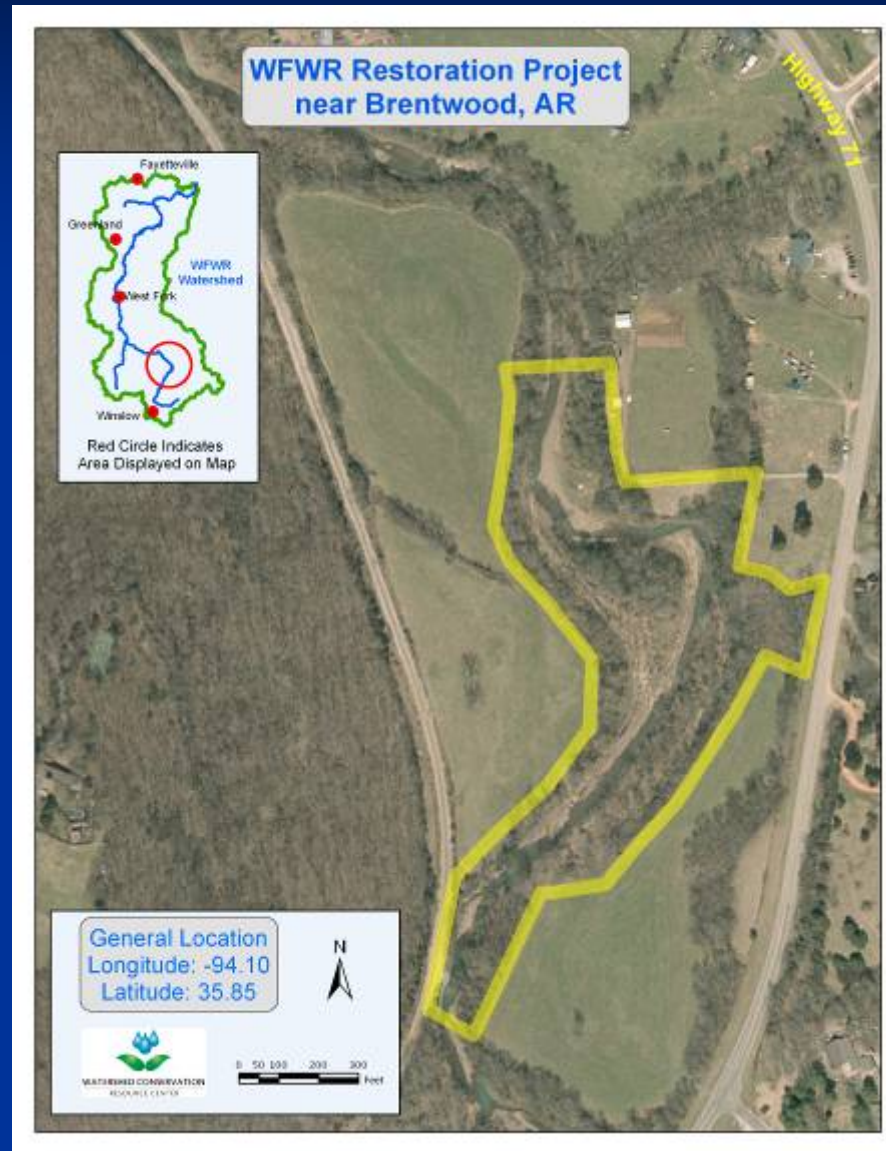


Major Project Tasks

- Develop QAPP ✓ (July '08)
- Conduct Pre-Implementation Data
 - Bank erosion inventory ✓
 - Install and survey toe pins ✓
 - Survey site morphology **Fall '08**
 - Survey Reference Reach **Fall '08**
 - Re-survey toe pins to estimate erosion
- Develop Conservation Easement Program ✓
- Develop restoration plan **Winter '08-2009**
- Implement Plan **2009**
- Re-inventory Streambanks

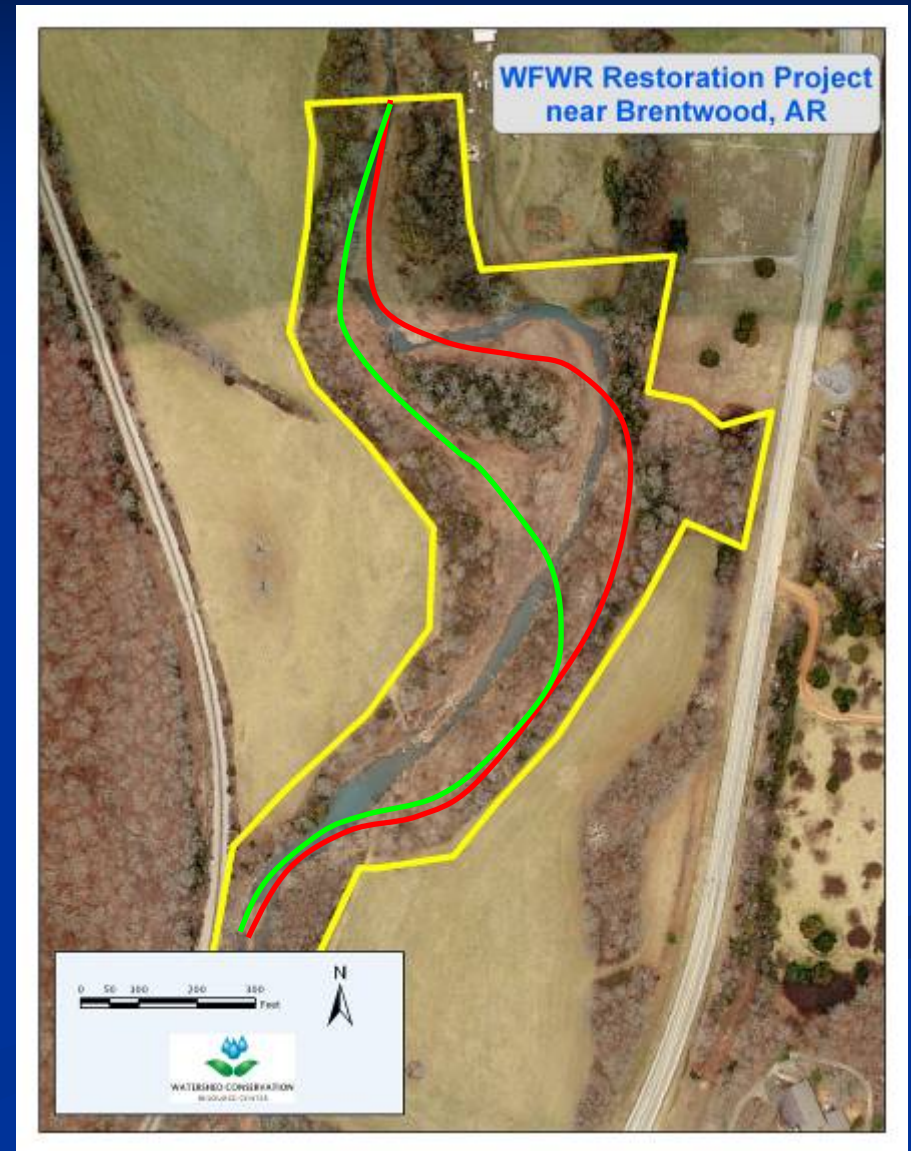


Project Location



Site Specifics

- Drainage Area 12 mi²
- Rural Watershed
 - Forest
 - Pasture
- ~2000' of Stream Channel
- Rosgen C-Type Stream
- 3 Landowners



BEHI Mapping

- 7 Mapped Areas
- Total Estimate of Eroding Banks 1400'
- Max Estimated Erosion Rate: ~10 ft/yr
- Estimated Sediment Load: 845 ton/yr



Toe Pin Installation

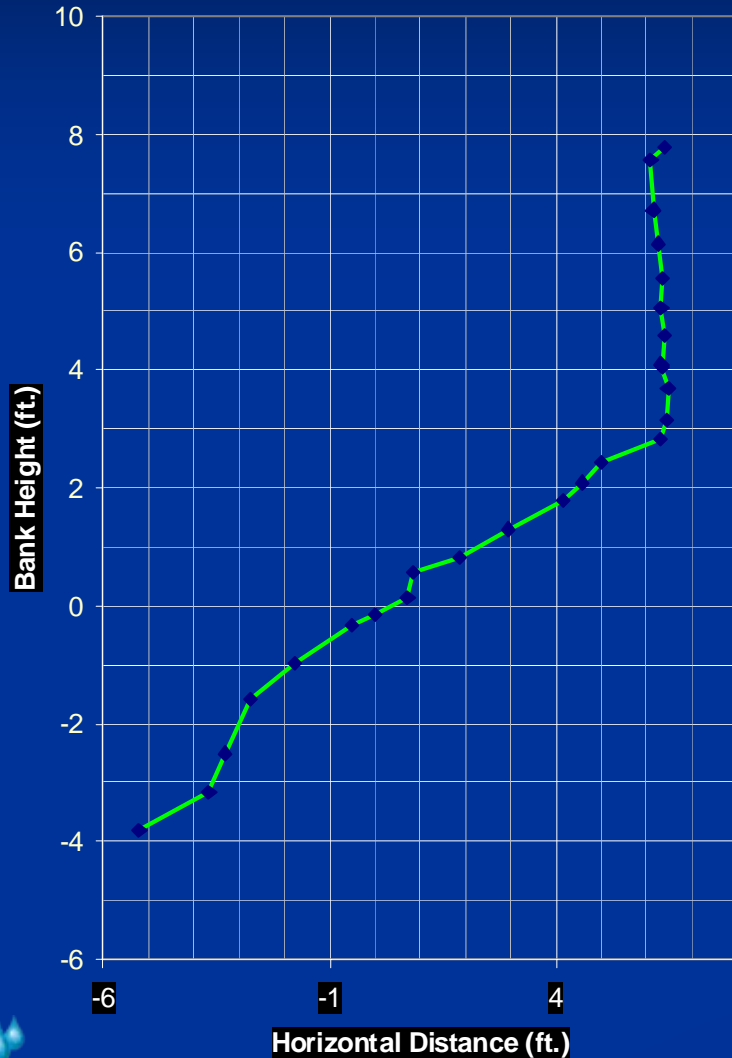


- 7 Toe Pins Installed (06/24/2008)
- Used to Determine Erosion Rates



Toe Pin Installation

Toe Pin 3 Profile
as of 6/25/2008



Site Photos



Site Photos



Site Photos



Demonstration of Natural Channel Design to Restore a Stream Reach Draining an Urbanized Sub-Watershed of Mud Creek ANRC Project 06-600



Watershed Conservation Resource Center

City of Fayetteville, AR



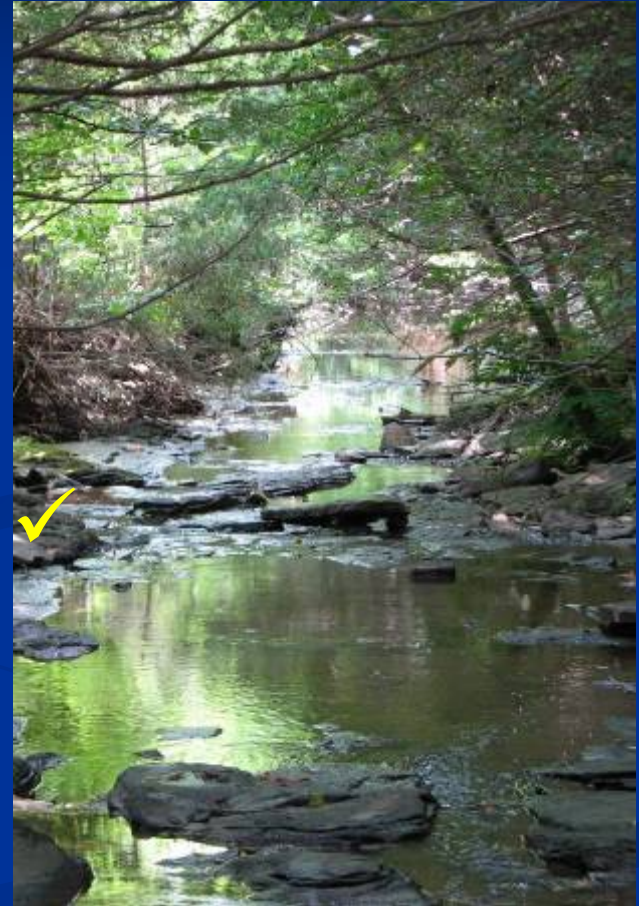
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- Implement Plan ✓
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Project Location

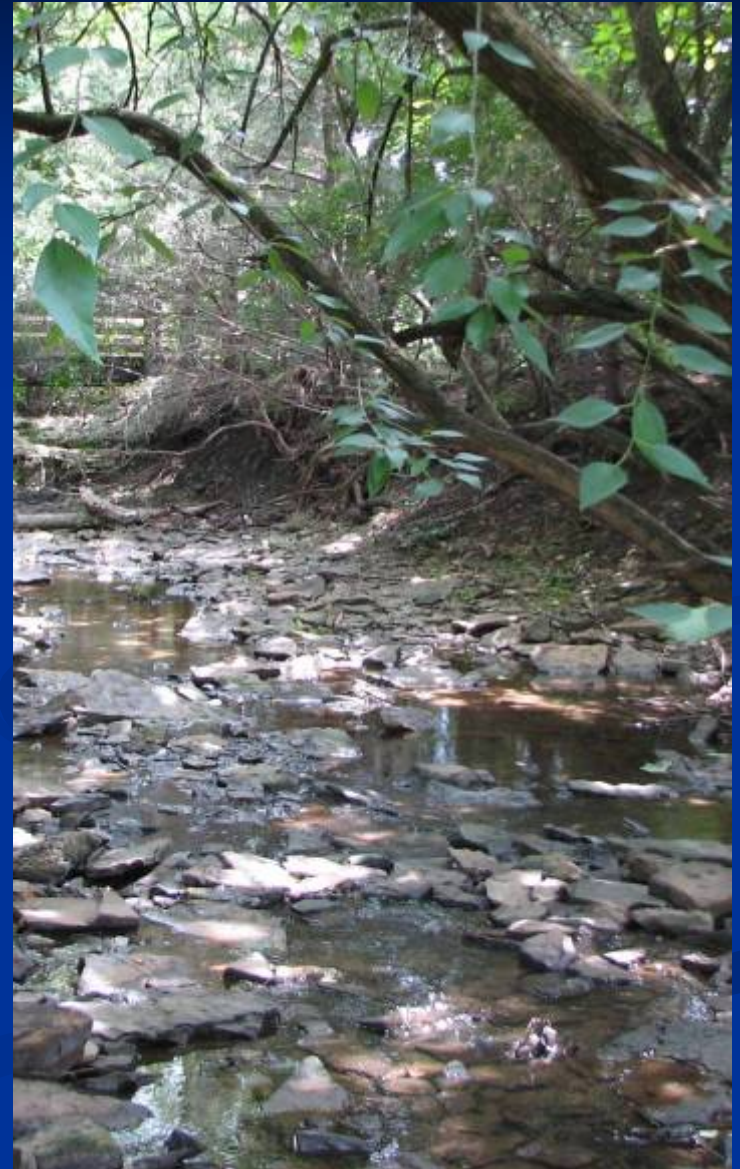


Project Location



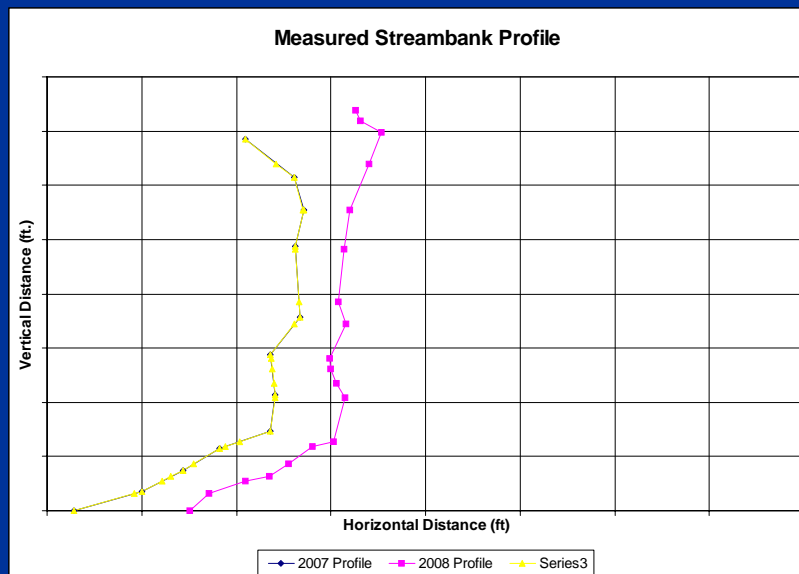
Site Specifics

- Drainage Area 1.25 mi²
- Urbanized Basin
- ~1500' of Stream Channel
- Rosgen B-Type Stream



Toe Pin Measurement and Analysis

- Erosion Rate:
Range 0.2 to 0.7 ft/yr
- Estimated Sediment Load:
120,000 lb/yr



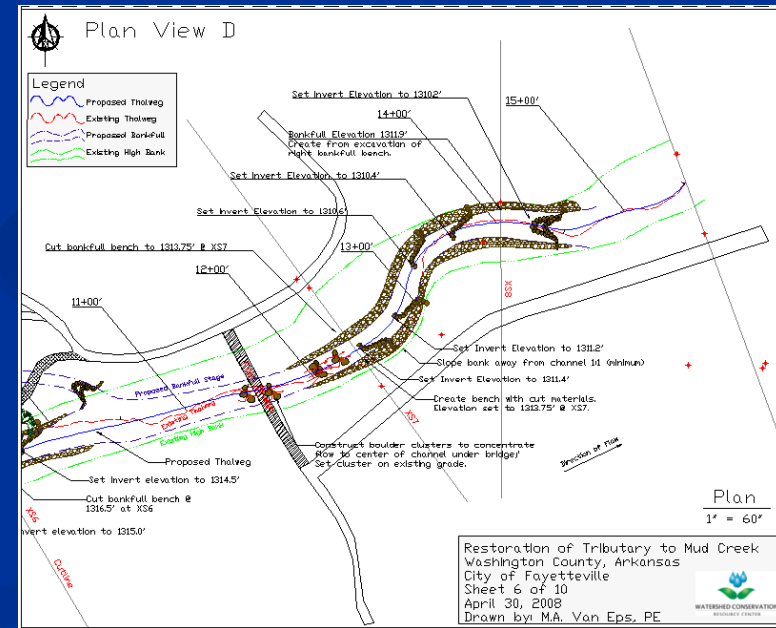
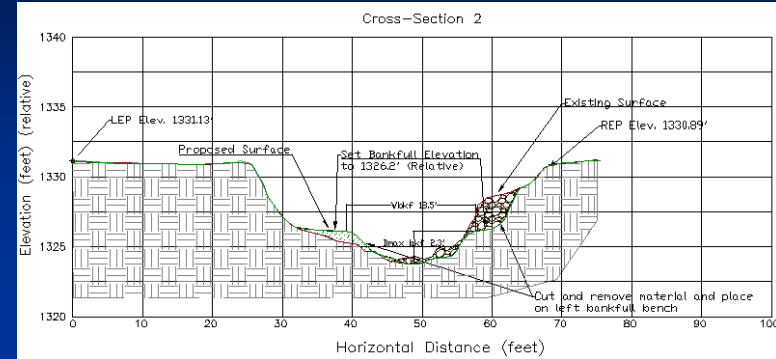
Design Constraints

- Floodplain No-Rise
- Park Infrastructure
 - Trails
 - Bridges
 - Sewer Lines
- Fixed Flood Prone Width
- Limited Allowance for Vegetation Removal
- Presence of Park Patrons



Design Specifics

- Detailed Data Evaluation
 - Topographic Survey
 - Geomorphologic Analysis
 - Hydrology Analysis
- 40 Step Engineering Process
 - Dimension, Pattern, Profile
 - Flow Capacity
 - Sediment Transport
- Bankfull Discharge: 130 cfs
- Design Cross Section: 30 ft²
- Bankfull Slope: 0.01180 ft/ft
- Bankfull Shear: 1.04 lb/ft²



Structure Design

- J-Hook
- Cross-Vanes
- Short Vanes
- Rock Sizing
 - Based on shear force
 - Rock with 3 ft. B-axis
 - Approximately $\frac{3}{4}$ ton per rock
- Vane Slope and Length
 - 20' length with a slope of 8-10%



Revegetation Plan

- Critical Element of the Restoration Design
 - Provides Stability (high and moderate flows)
 - Habitat
 - Forage
 - Aesthetics
- Consult with local specialists
- 4000 Individual plants
- Native Species by Sun/Water needs
 - Inland Sea Oats, Prairie Drop Seed
 - Button Bush, Spice Bush
 - Green Ash, Plum, Wafer Ash, Sycamore
- Irrigation into late fall
- Additional planting in the fall



XS2 Before



XS2 After



XS3 Before



XS3 After



XS4 Before



XS4 After



XS5 Before



XS5 After



XS6 Before



XS6 After



XS7 Before



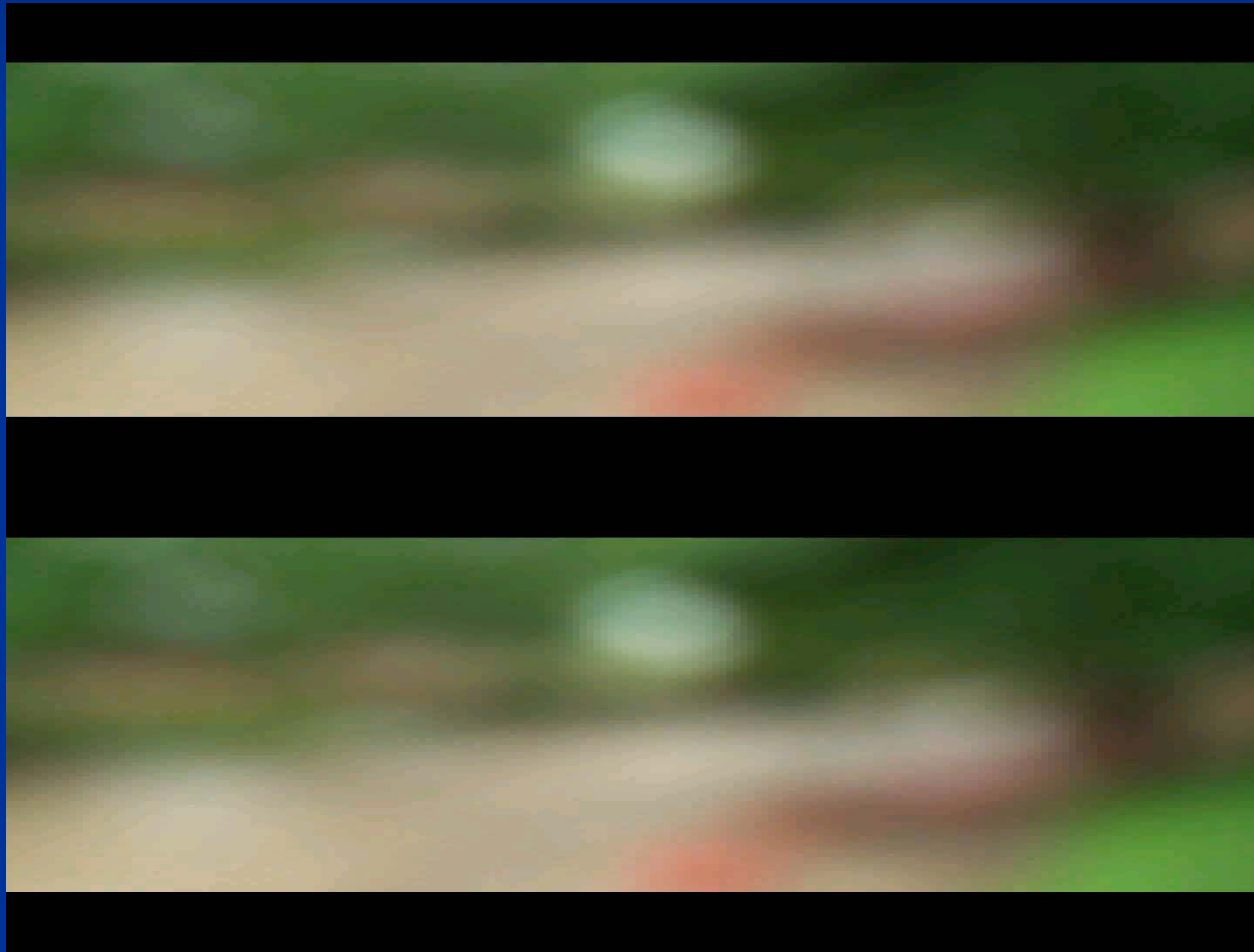
XS7 After



Post Construction Rain

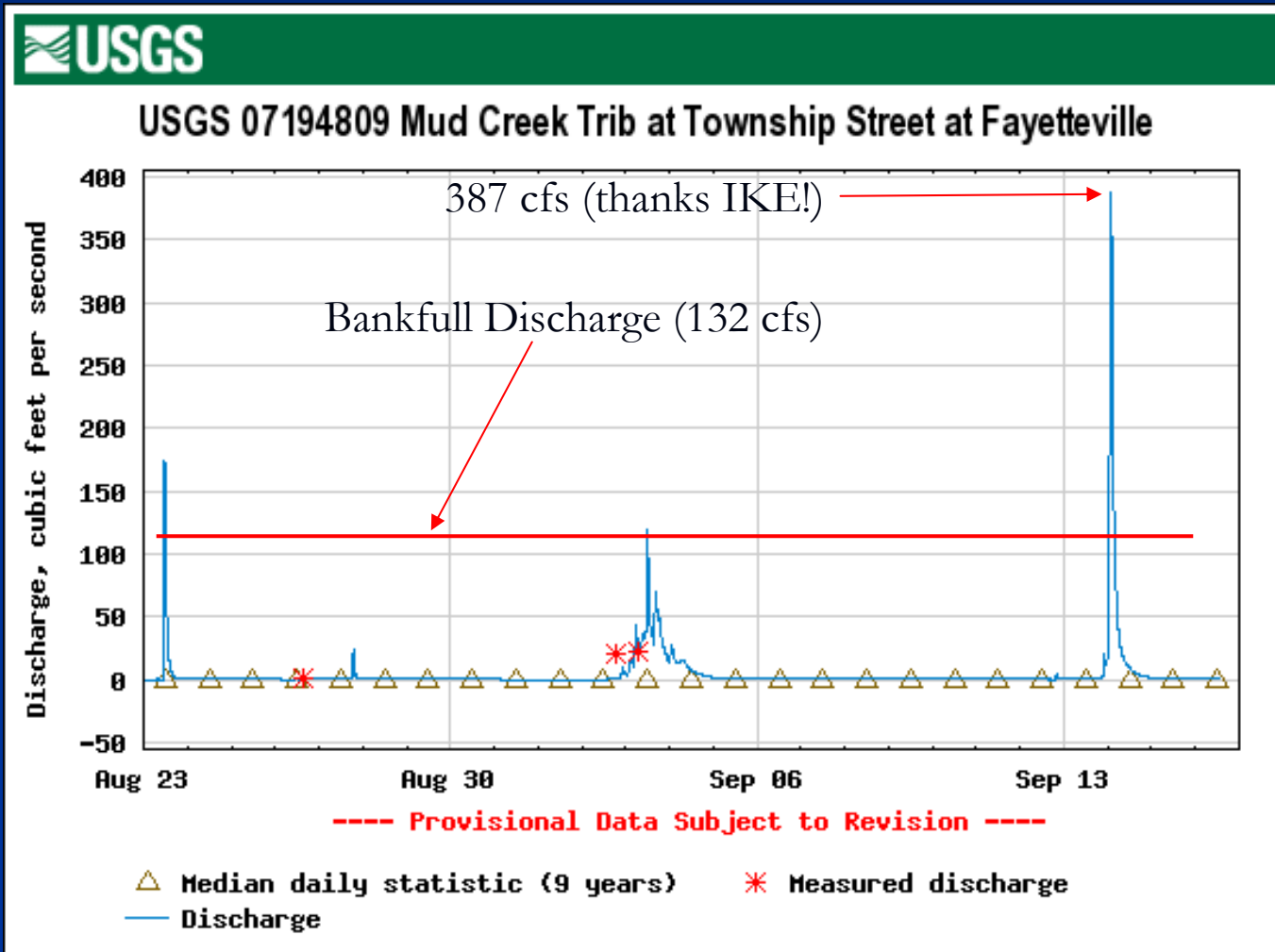
If you build it, IT WILL RAIN

(i.e. T-storms.....TD Gustav.....TS Ike



Post Construction Rain

Storm Events within 4 weeks of implementation



March 18, 2008 Storm Event



March 18, 2008 Storm Event



September 23, 2008 Storm Event



September 23, 2008 Storm Event



Gulley Park Restoration



Gulley Park Restoration



Gulley Park Restoration



Gulley Park Restoration



Gulley Park Restoration



Gulley Park Restoration



Gulley Park Restoration



Gulley Park Restoration



Gulley Park Restoration



Gulley Park Restoration



Lessons Learned and Recommendations

- Get necessary permits
 - 404 Permit
 - ADEQ Short Term Activity Authorization
 - Floodplain Administrator Approval
- When working within incised channels, structures will have less effect during flows above bankfull
- Address areas where channel constriction may occur (pinch point)
- Plan for irrigation if working in summer/fall
- Plant vegetation as you work on channel
- Maintain continuous oversight



Project Summary

- All Project Objectives Were Achieved
- Streambank erosion reduced
 - Reduced sediment loads
- Safety Hazards were eliminated
- Aesthetics were improved
 - Very positive feedback from park users
- Improved Water Quality
 - Increased clarity
 - Increased pool habitat



Thanks to Our Partners

- U.S EPA Region VI
- Arkansas Natural Resources Commission
- City of Fayetteville
 - City Engineering
 - Parks and Recreation



Questions?



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