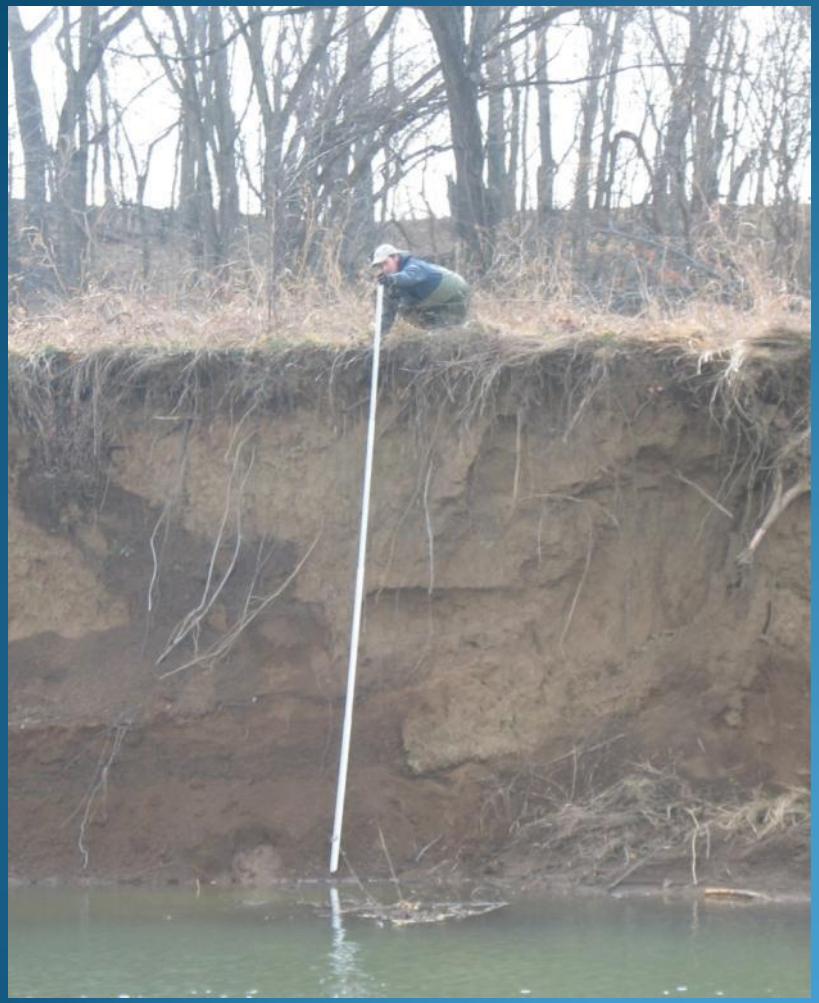
White River Streambank Restoration Project

ANRC Project 09-1900

NPS Annual Meeting September 27, 2012

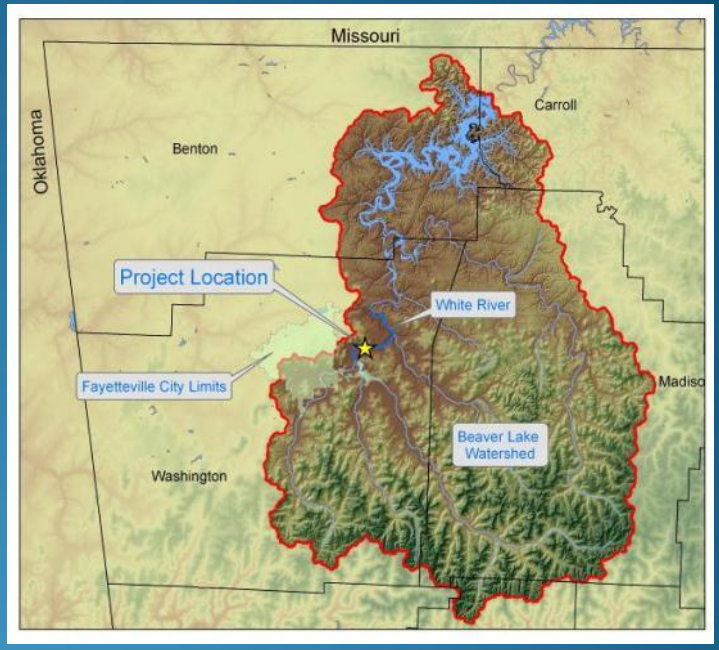


Project Partners

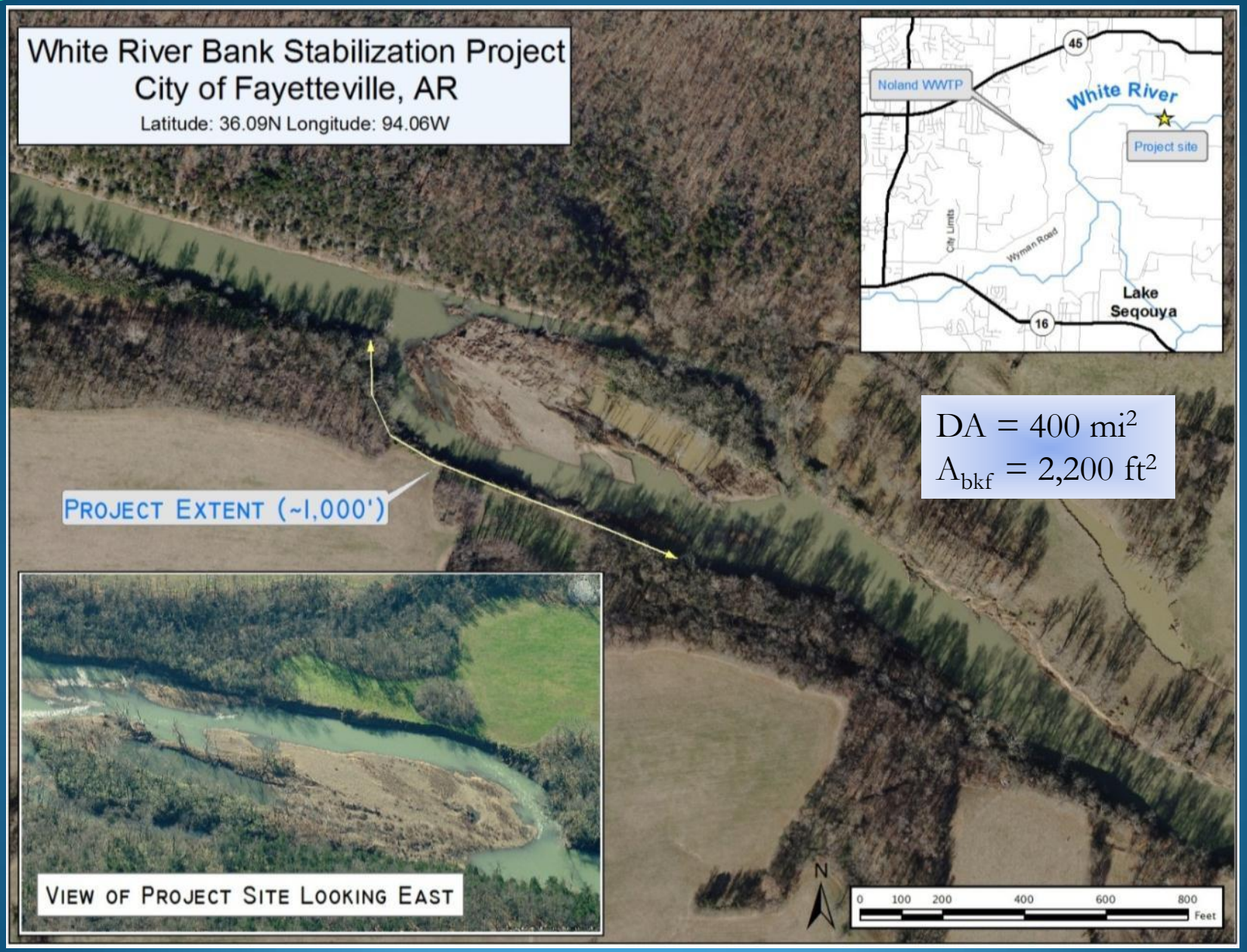
Watershed Conservation Resource Center, City of Fayetteville, Arkansas Natural Resources Commission, US Environmental Protection Agency, CH2M Hill

White River Streambank Restoration Project Objectives

- **Improve Water Quality and Local Ecology**
  - Restore 1,000 feet of streambank and riparian using natural channel design principles
  - Reduce sediment and nutrients loadings from severe bank erosion
  - Improve aquatic and terrestrial habitats
- **Conduct Restoration in Priority Watershed**
  - Beaver Lake provides drinking water for over 420,000 people in NWA
  - Section of White River on the State 303(d) list
  - NPS priority for reducing nutrients



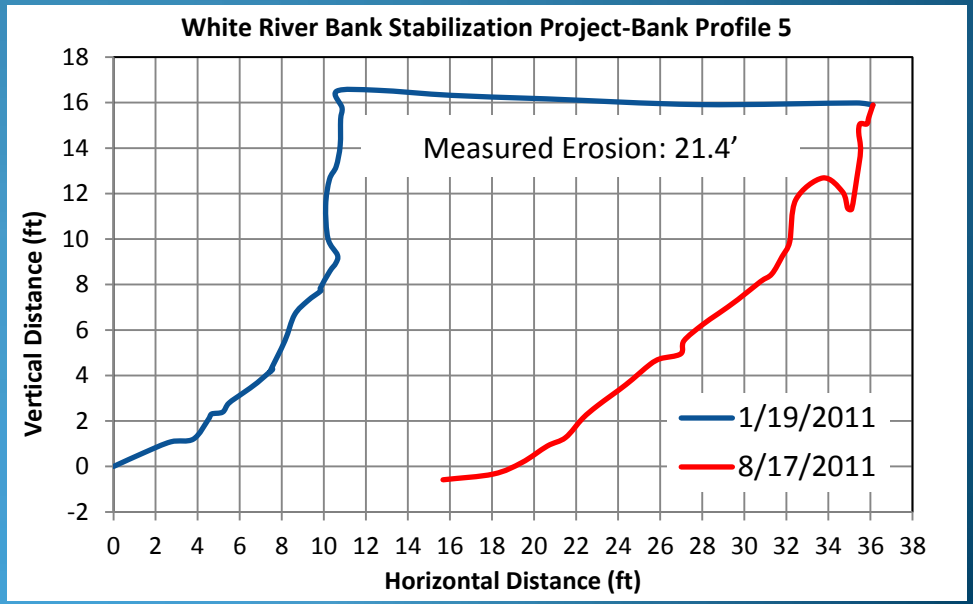
Site Map


White River Bank Stabilization Project
City of Fayetteville, AR
Latitude: 36.09N Longitude: 94.06W
45
Noland WWTP
White River
Project site
City Limits
Wyman Road
Lake Seqouya
16
DA = 400 mi²
A_bkf = 2,200 ft²
PROJECT EXTENT (~1,000')
VIEW OF PROJECT SITE LOOKING EAST
N
0 100 200 400 600 800
Feet

Erosion During Bankfull Event

Pre-Restoration Site Monitoring

- Bank Erosion Monitoring
  - Bank Profile Survey
  - Resurvey After Spring Rain
- Bank Material Sampling
  - 30 Samples
  - Particle Size and Nutrient Analysis

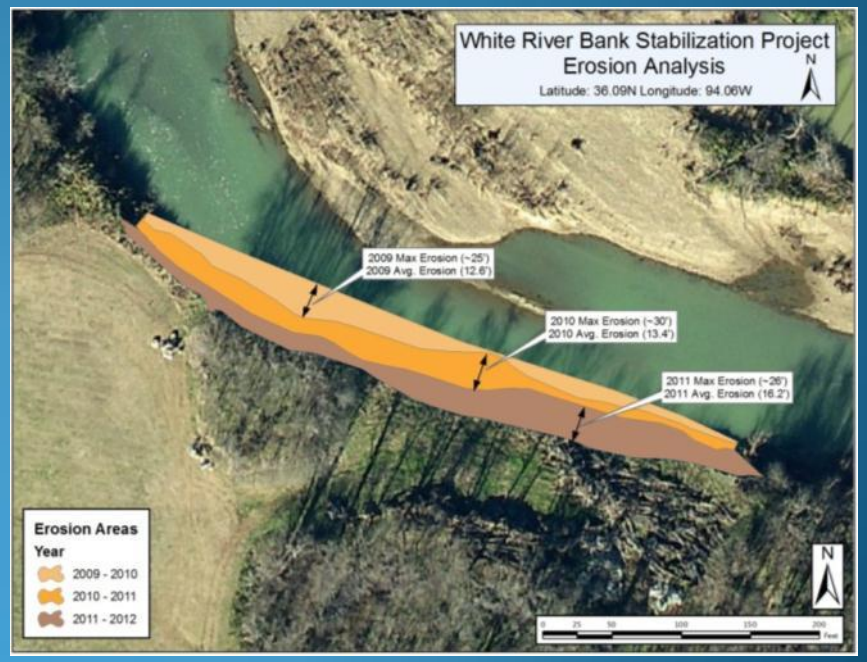


Pre-Restoration Site Monitoring

- Bank Erosion Monitoring Results
  - Sites 1-5 ranged from 3.1 to 21.7 feet over a 7 month period
  - Included two major flood events that occurred in April and May 2011

- Air Photo Evaluation of Lateral Bank Erosion

  2009 - 2011
  - Average rate over three years was 14 ft/year



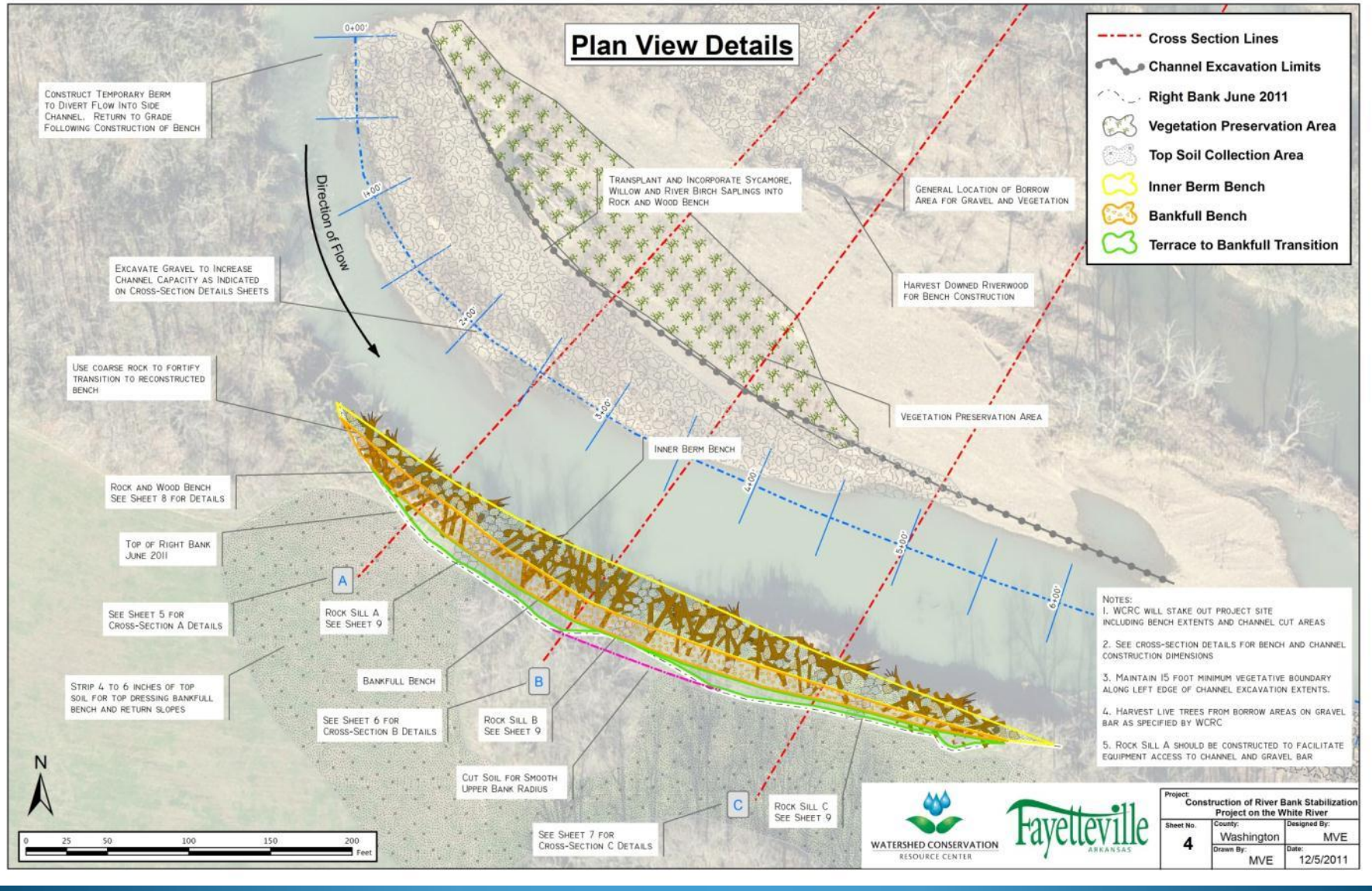
Pre-Restoration Site Monitoring

- Results of Bank Material Sampling

Soil Type	Bulk Density (lb/ft3)	TP (lb/ton)	TN (lb/ton)
Silt Loam	104.9	1.0	1.7
Clay Loam	88.0	1.0	2.3

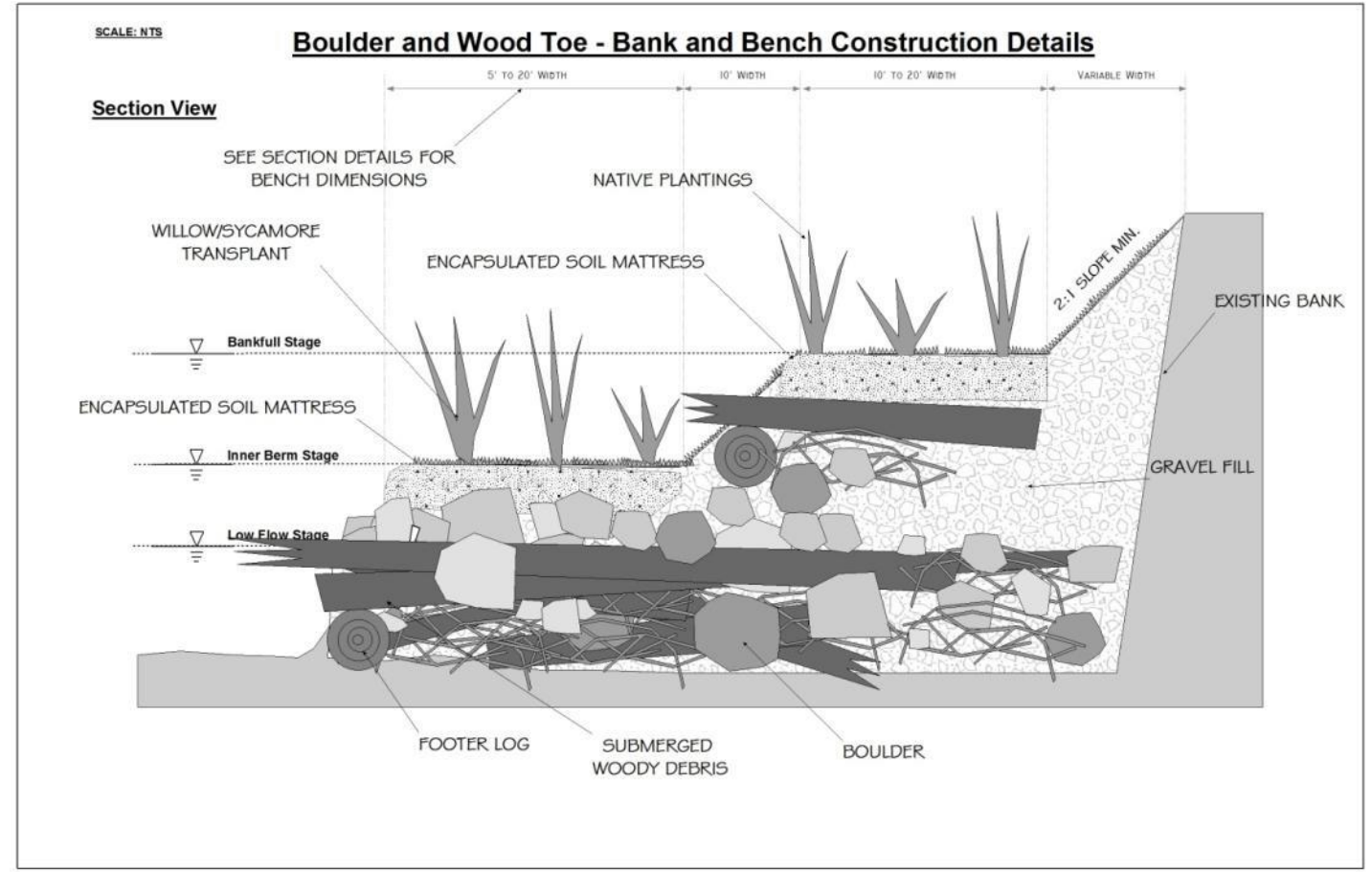
- Pre-Restoration Estimated Loadings
  - Calculated over 7 month monitoring period
    - Sediment: 15,000 tons
    - T Phosphorus: 14,200 lbs
    - T Nitrogen: 26,100 lbs
  - Estimated for average flow year
    - Sediment: 11,250 tons/year
    - T Phosphorus: 10,500 lbs/year
    - T Nitrogen: 19,500 lbs/year

Restoration Design



Restoration Design

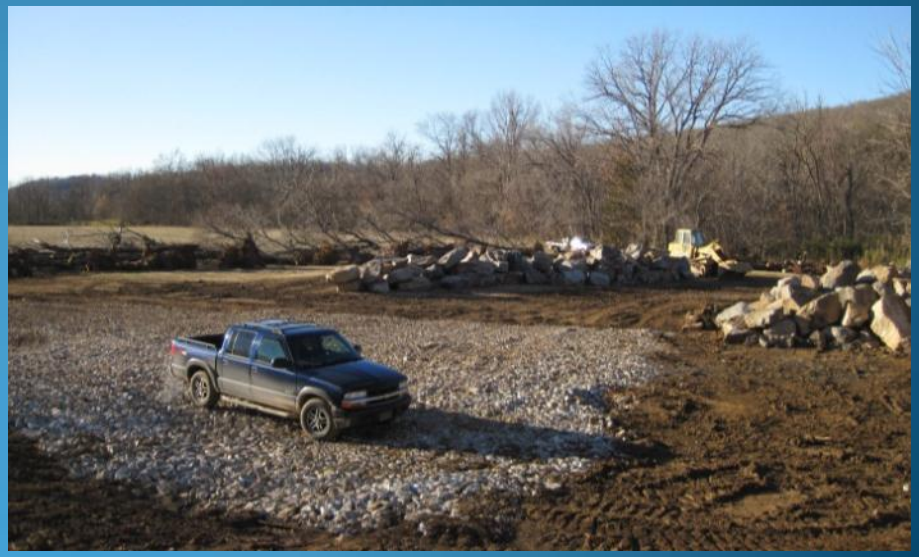
The primary component of the stabilization design was the construction of a multi-level bench composed of boulders, trees, and gravel with a layer of topsoil encapsulated in coconut fiber fabric on top.



Implementation of Restoration

Pre-Construction – 2011 through 2012

- 200 trees were salvaged and brought to the site
  - City of Fayetteville and CH2M Hill delivered downed trees
  - Nabholz Construction donated trees from Highway 265 project
- 30 footer logs were compromised tree harvested on site
- 900 tons of rock delivered
- Gravel road was constructed across the pasture to handle the heavy trucks and equipment during wet weather



Implementation of Restoration

Heavy Equipment Construction – Feb & Mar 2012

- Inner-berm Bench Construction
  - Built outward from 16 ft high cutbank
  - Widest point 40 feet
  - Gravel from point bar on opposite side was removed to maintain design cross-sectional area
  - Incorporated vegetation from gravel bar into bench

Implementation of Restoration

Heavy Equipment Construction – Feb & Mar 2012

- Bankfull Bench Construction
  - Built on top of inner-berm bench
  - Widest point 20 feet
  - Logs, boulders, and soil
- Soil Mattresses Constructed on both Benches
  - Coconut fiber erosion control fabric filled with soil
  - Hardwood stakes were used to secure mattresses
  - Provide growing medium
  - Provides additional weight

Implementation of Restoration

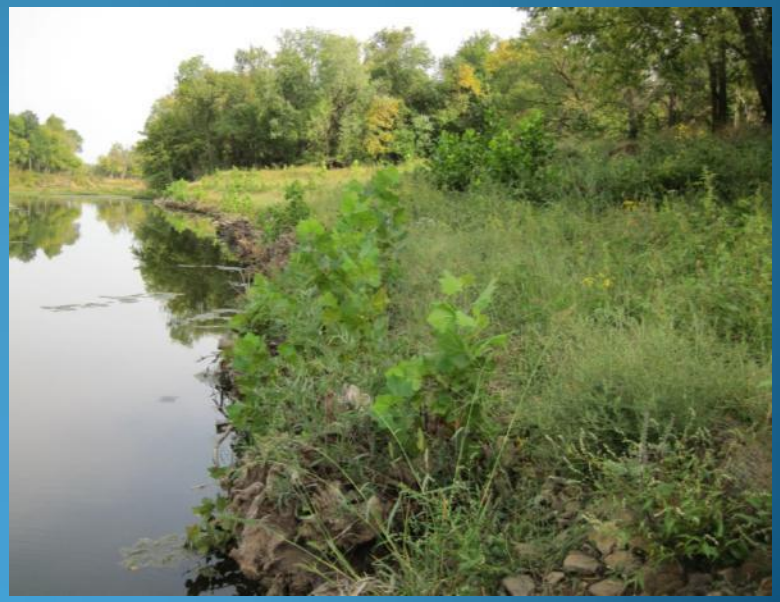
Site Finishing, Re-vegetation, & Irrigation

Mar - Apr 2012

- Seeded with native grasses and wildflowers
- Site was planted with native trees, shrubs, and grasses
  - Purchased potted plants, such as, sycamore, button bush, alders, river birch, witch hazel, wild hydrangea, indigo bush, blackhaw viburnum, and more
  - Harvested local river oats, button bush, willow, sycamore, switch grass, river cane, gamma grass
  - Sod mats of native plants harvested along the fringe of the pasture
- 400 feet of riparian that was previously pasture was tilled and planted with natives
- Leftover rocks were used to create a boundary between the pasture land and the newly established riparian planted with natives
- Irrigation system was designed and assembled for the site

Post Restoration

Post Restoration



Post Restoration

- 6 months – September 24, 2012

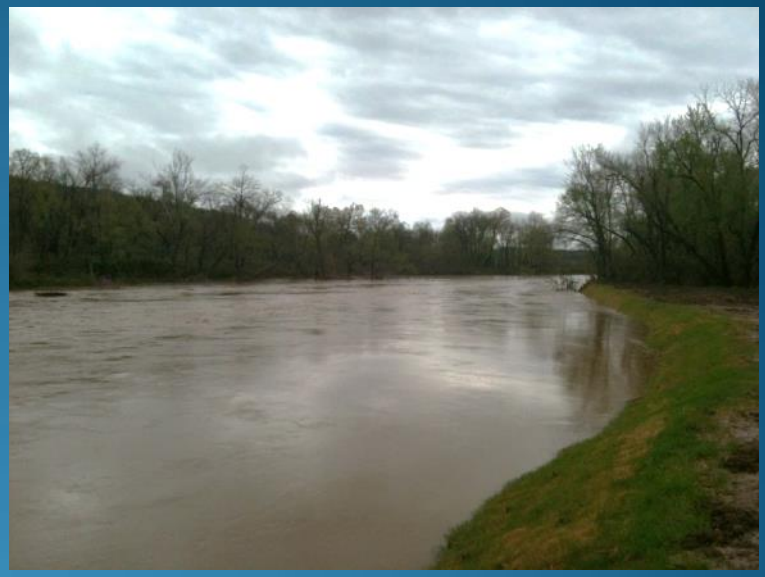
Post Restoration

- If you need rain, build a stream restoration
- Two weeks following construction, 13,000 cfs peak flow (bankfull Q is 11,500 cfs)

Post Restoration

Load Reductions

- March 2012 storm, peak flow 13,000 cfs
- Previously, similar storm events generated:
  - 2,000 - 4,000 tons of sediment
  - 2,000 – 4,000 lbs of total phosphorus
- No significant erosion
- Expect 95-100% reduction in annual sediment and nutrient loads from streambank erosion at this site for an average flow year:
  - 11,250 tons/year of sediment reduced
  - 10,500 lbs/year of total phosphorus
  - 19,500 lbs/year of total nitrogen



Project Summary

- 1,000 feet of bank stabilized and enhanced
- Sediment and Phosphorus Loads Reduced
- Establishment of Native Riparian Community
- Expansion of Riparian Zone
- Outreach and Education Opportunity
- Irrigation and Maintenance Ongoing
- Performance Monitoring to Continue

Questions?

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