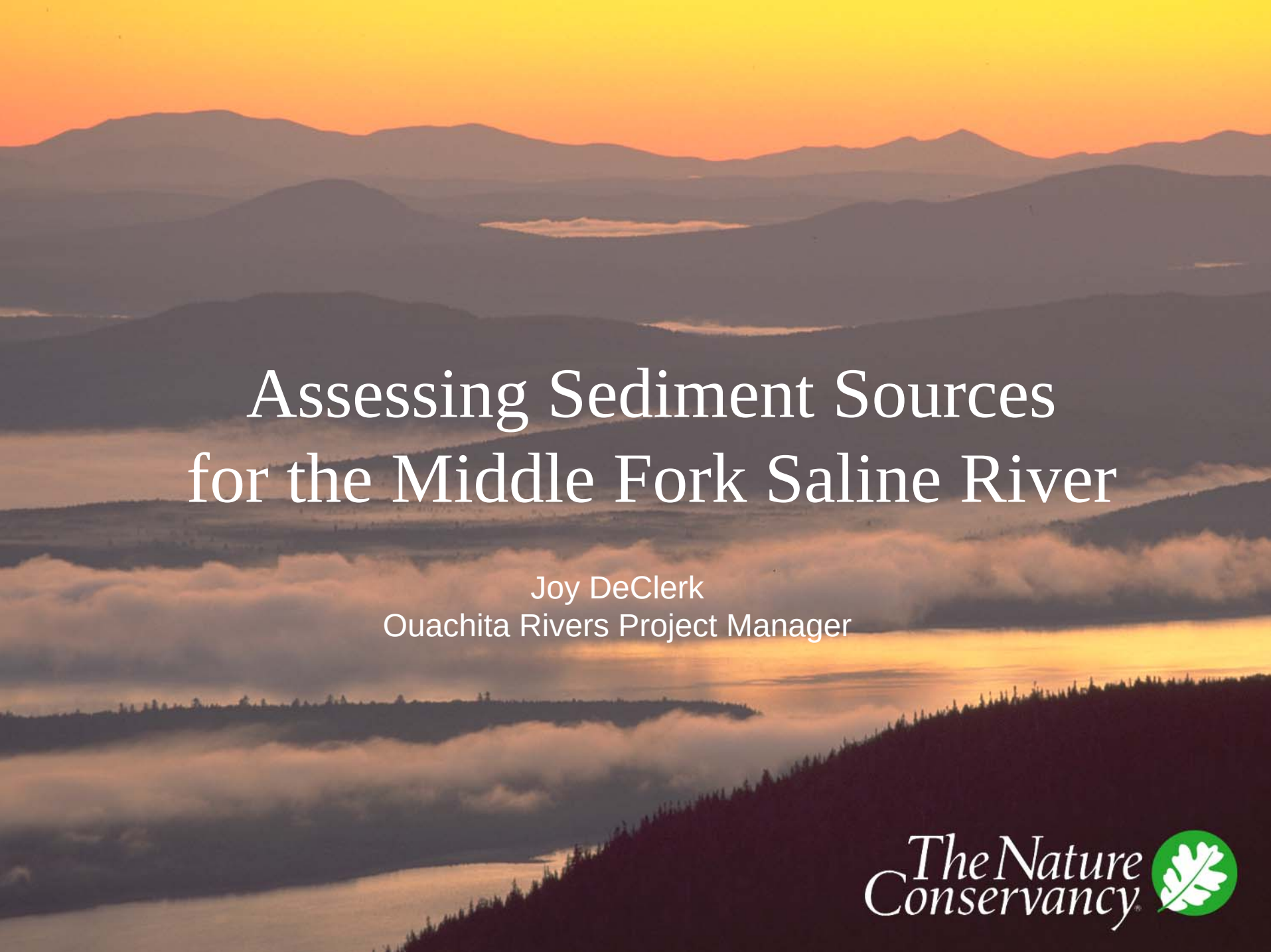
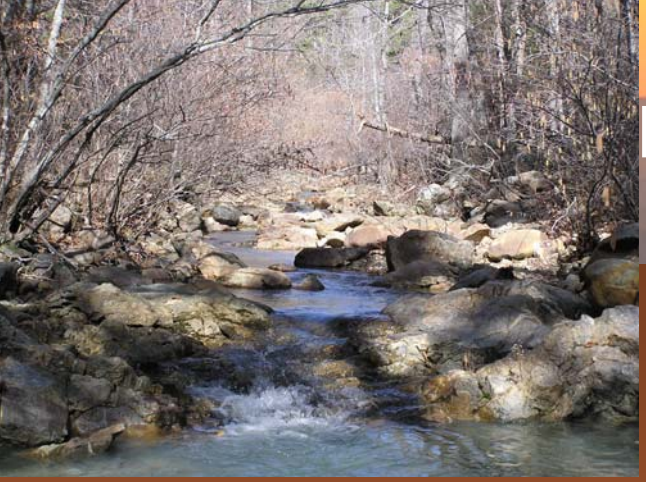


Assessing Sediment Sources for the Middle Fork Saline River

Joy DeClerk
Ouachita Rivers Project Manager

The Nature Conservancy



Project Objectives:

1. Prioritize sub-basins of Upper Saline.

2. Assess/Prioritize sediment from the following land uses:

- Stream bank erosion
- Unpaved roads
- Pasture
- Urban
- Timber harvest

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Methods for Evaluating Sediment

Soil & Water Assessment Tool (SWAT)

- Urban
- Forest
- Pasture
- Timber Harvest

Water Erosion Prediction Project (WEPP)

- Unpaved Roads

Bank Erosion Hazard Index (BEHI)

- In-stream Erosion

Results First, discussion follows

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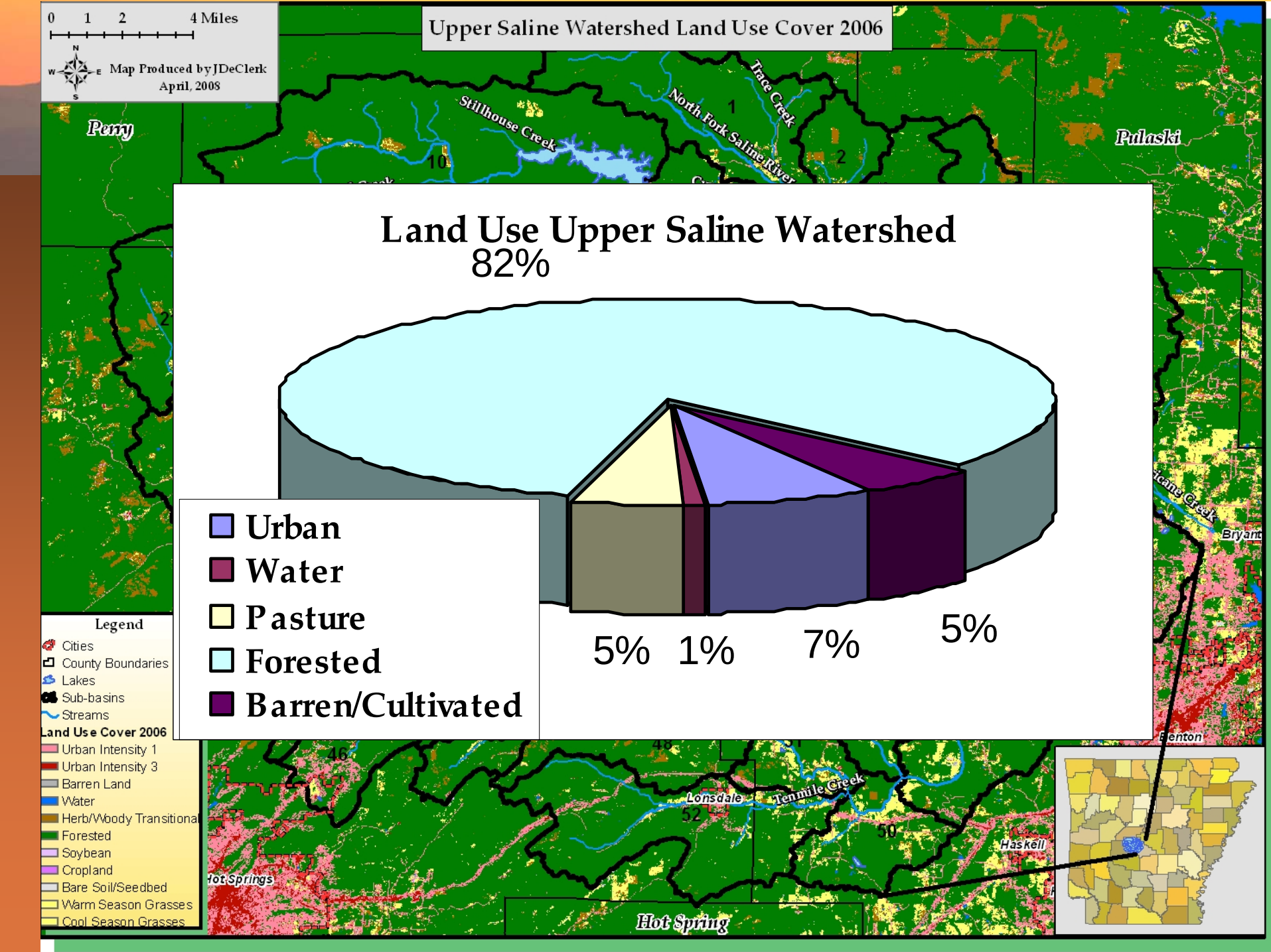
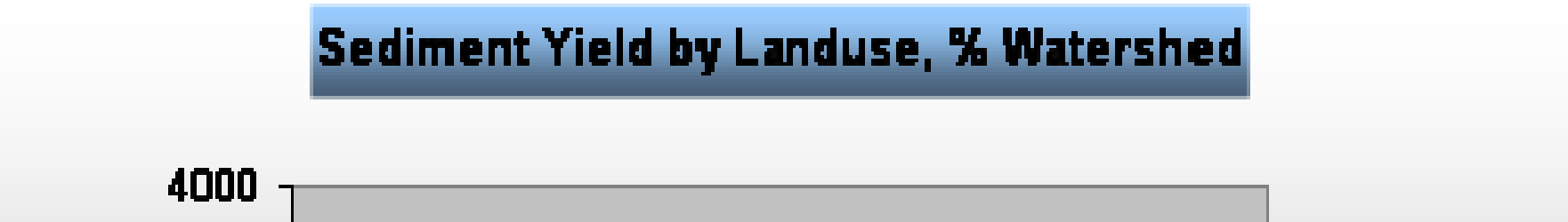

Upper Saline Watershed Land Use Cover 2006
0 1 2 4 Miles
Map Produced by JDeClerk
April, 2008
Land Use Upper Saline Watershed
82%
5%
1%
7%
5%
Urban
Water
Pasture
Forested
Barren/Cultivated
Legend
Cities
County Boundaries
Lakes
Sub-basins
Streams
Land Use Cover 2006
Urban Intensity 1
Urban Intensity 3
Barren Land
Water
Herb/Woody Transitional
Forested
Soybean
Cropland
Bare Soil/Seedbed
Warm Season Grasses
Cool Season Grasses
Perry
Pulaski
Stillhouse Creek
North Fork Saline River
Trace Creek
Lonsdale
Tenmile Creek
Haskell
Hot Springs
Hot Spring
Benton
Bryant

SWAT Model Outputs:



	Forested	Cultivated	S.Pasture	Urban	W.Pasture
Sed. Yield, tons	702	1298	3512	1736	294
% Watershed	79.63%	5.53%	4.33%	7.82%	1.08%

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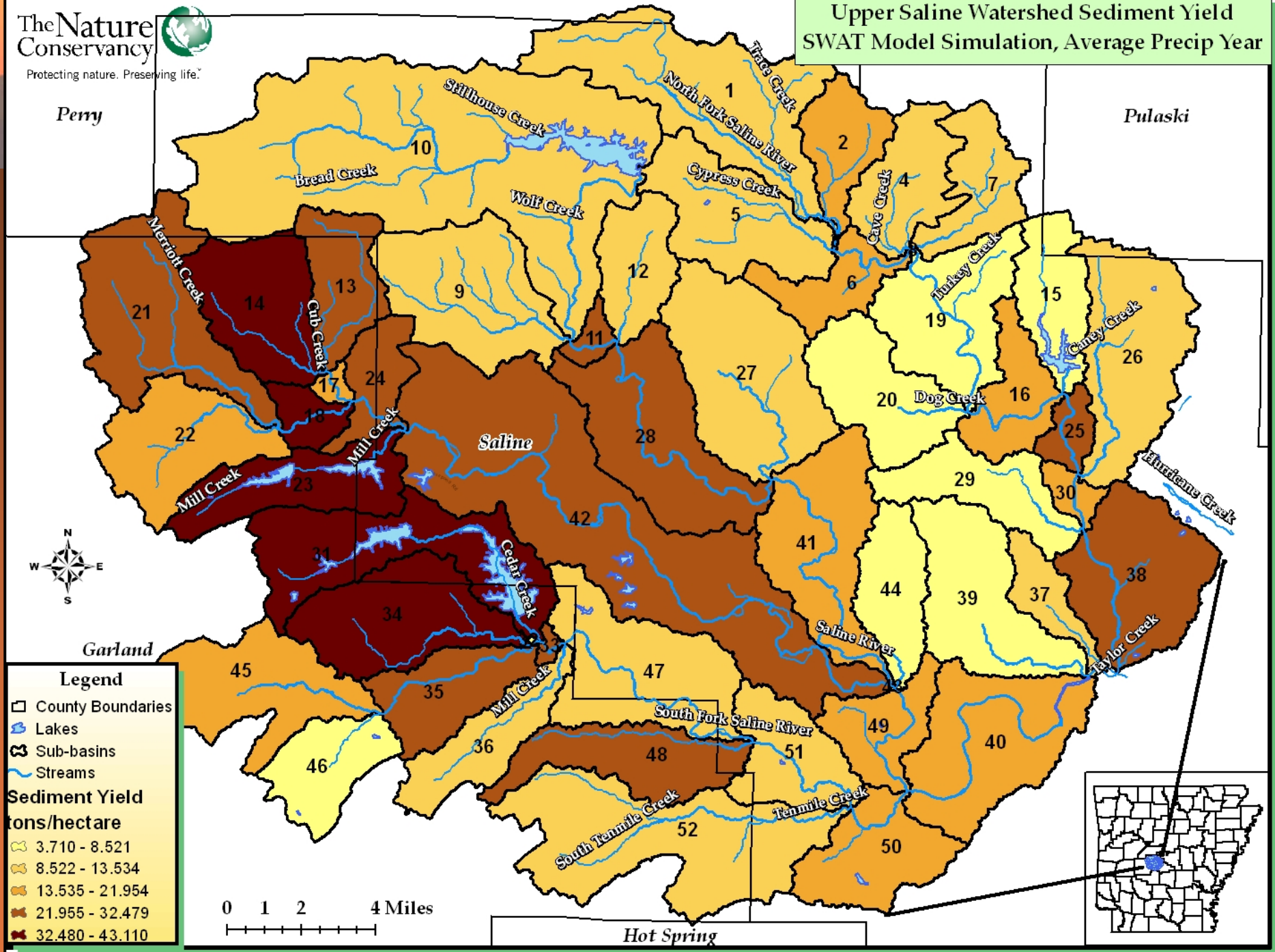
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Upper Saline Watershed Sediment Yield
SWAT Model Simulation, Average Precip Year
Perry
Pulaski
Garland
Hot Spring
Saline
Tracy Creek
North Fork Saline River
Stillhouse Creek
Bread Creek
Wolf Creek
Cypress Creek
Cave Creek
Turkey Creek
Caney Creek
Dog Creek
Merriott Creek
Cub Creek
Mill Creek
Mill Creek
Cedar Creek
Saline River
Mill Creek
South Fork Saline River
South Tenmile Creek
Tenmile Creek
Taylor Creek
Hurricane Creek
1
2
4
5
6
7
9
10
11
12
13
14
15
16
17
19
20
21
22
23
24
25
26
27
28
29
30
31
34
35
36
37
38
39
40
41
42
44
45
46
47
48
49
50
51
52
N
W
E
S
Legend
County Boundaries
Lakes
Sub-basins
Streams
Sediment Yield
tons/hectare
3.710 - 8.521
8.522 - 13.534
13.535 - 21.954
21.955 - 32.479
32.480 - 43.110
0 1 2 4 Miles

Sediment Contribution by Land Use Type		
Land Uses:	Sediment Yield Annual tons	% of total watershed
Stream bank Erosion:		
High BEHI Scores	2,897	
Very High Scores	2,212	
Extreme Scores	24,005	
Total Stream Bank *	**29,114**	
Pasture	**3,806**	**4.3%**
Urban	**1,736**	**7.8%**
Cultivated	**1,298**	**5.5%**
Forested	**702**	**79.6%**
Unpaved Roads	**288**	

***Does not include deposition of this material.**

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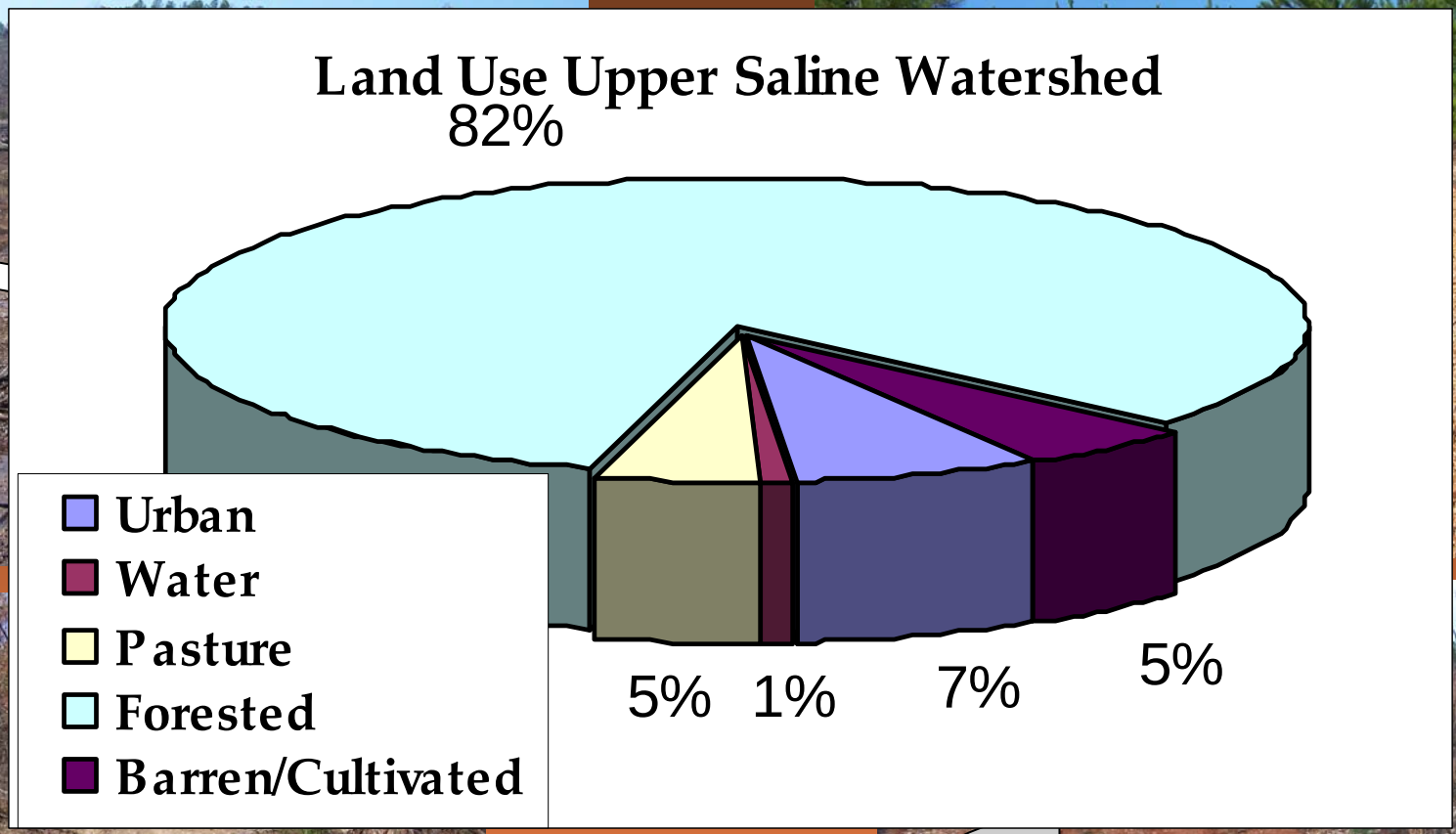
Middle Fork Road Inventory

The Middle Fork has 162 gravel road crossings within its drainage, and approx 180 miles of gravel road.

Our Objective: Two-fold

- **Develop Database**
- **Run WEPP Model**

Unpaved Roads – Assessment



Incised Road

Middle Fork Saline Watershed Gravel Road Inventory & WEPP Modeling Results				
Inventoried Road Groups	Total Road Segments	Total Miles	Total Sediment Loading	
			Leaving Road (tons)	Entering Stream (tons)
Total 1-Lane No Ruts	1036	125.57	1631.32	214.32
Total 1-Lane Ruts/Rills	97	8.97	94.90	8.64
Total 2-Lane	72	11.09	372.09	21.74
Total 2-Track	320	32.97	308.76	43.19
Grand Total	1525	178.60	2407.07	287.89

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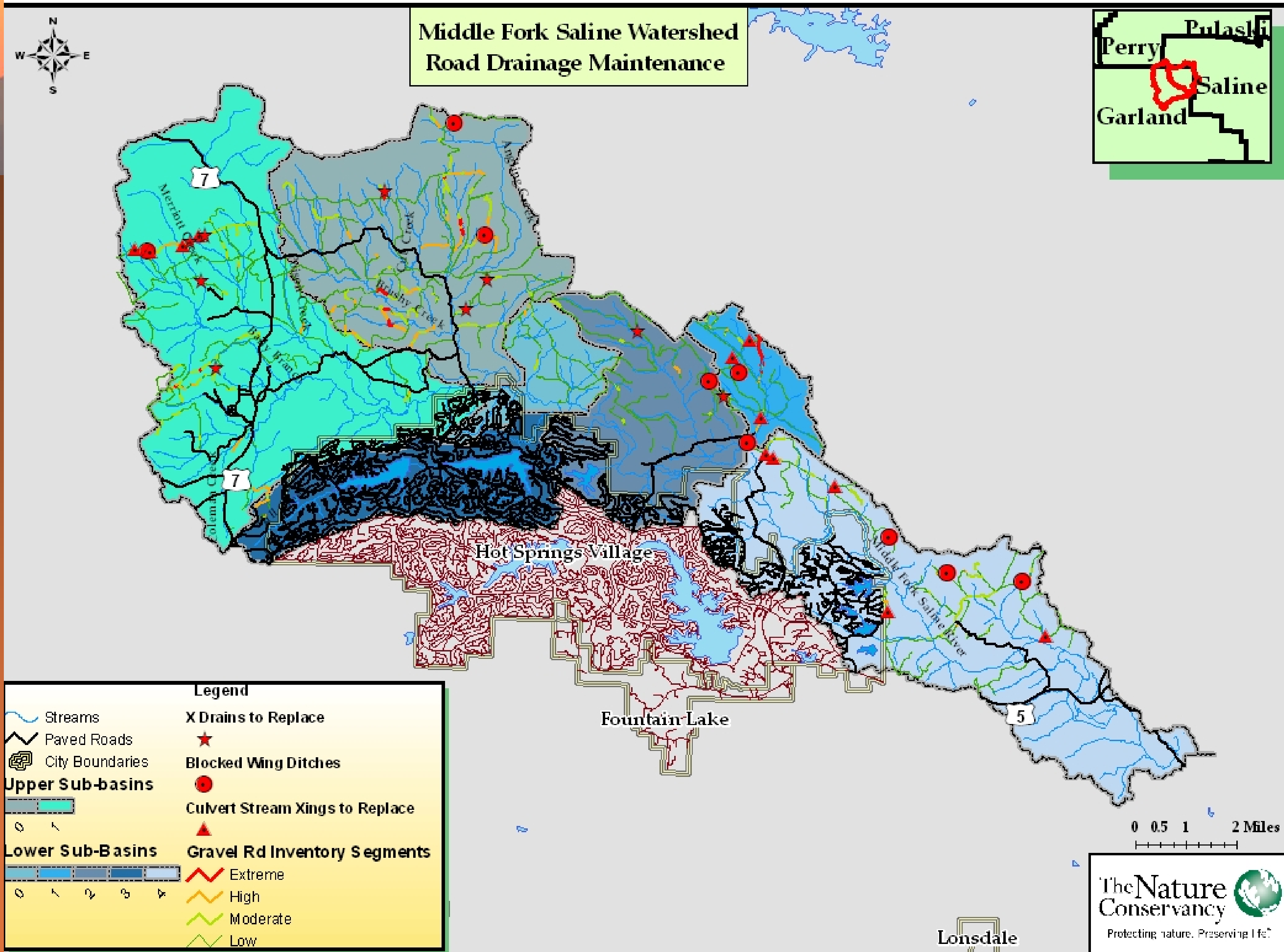
Middle Fork Saline Watershed
Road Drainage Maintenance
N
S
E
W
Pulaski
Perry
Saline
Garland
7
7
5
Merritt Creek
Coleman Creek
Angeline Creek
Bushy Creek
Hot Springs Village
Fountain Lake
Lonsdale
Middle Fork Saline River
0 0.5 1 2 Miles
Legend
Streams
Paved Roads
City Boundaries
Upper Sub-basins
0 1
Lower Sub-Basins
0 1 2 3 4
X Drains to Replace
Blocked Wing Ditches
Culvert Stream Xings to Replace
Gravel Rd Inventory Segments
Extreme
High
Moderate
Low
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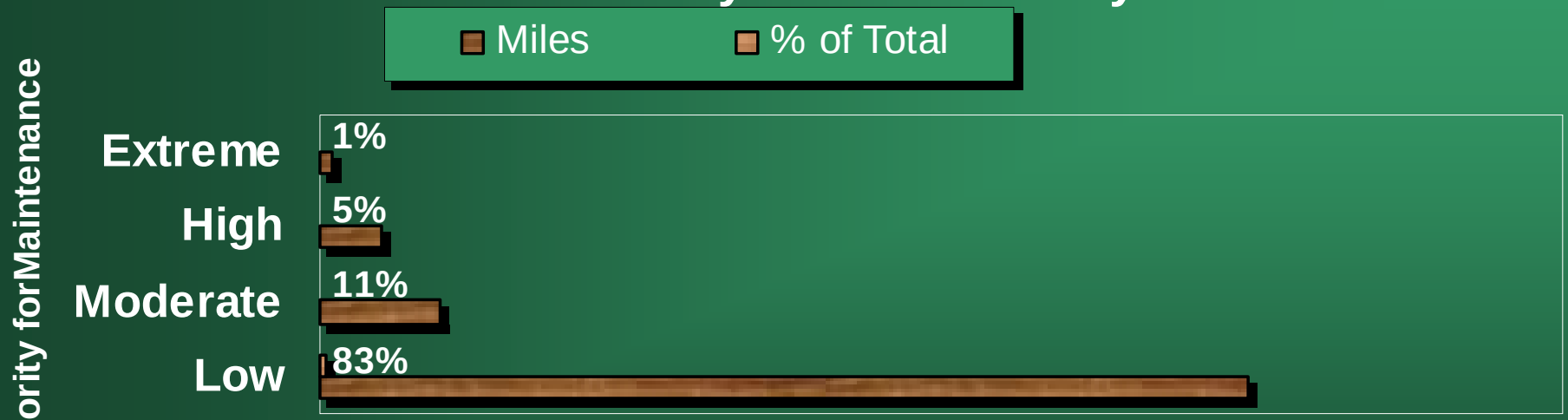
Road Inventory Results: Priority



	Low	Moderate	High	Extreme
% of Total	83%	11%	5%	1%
Miles	149.32	19.51	9.73	1.76

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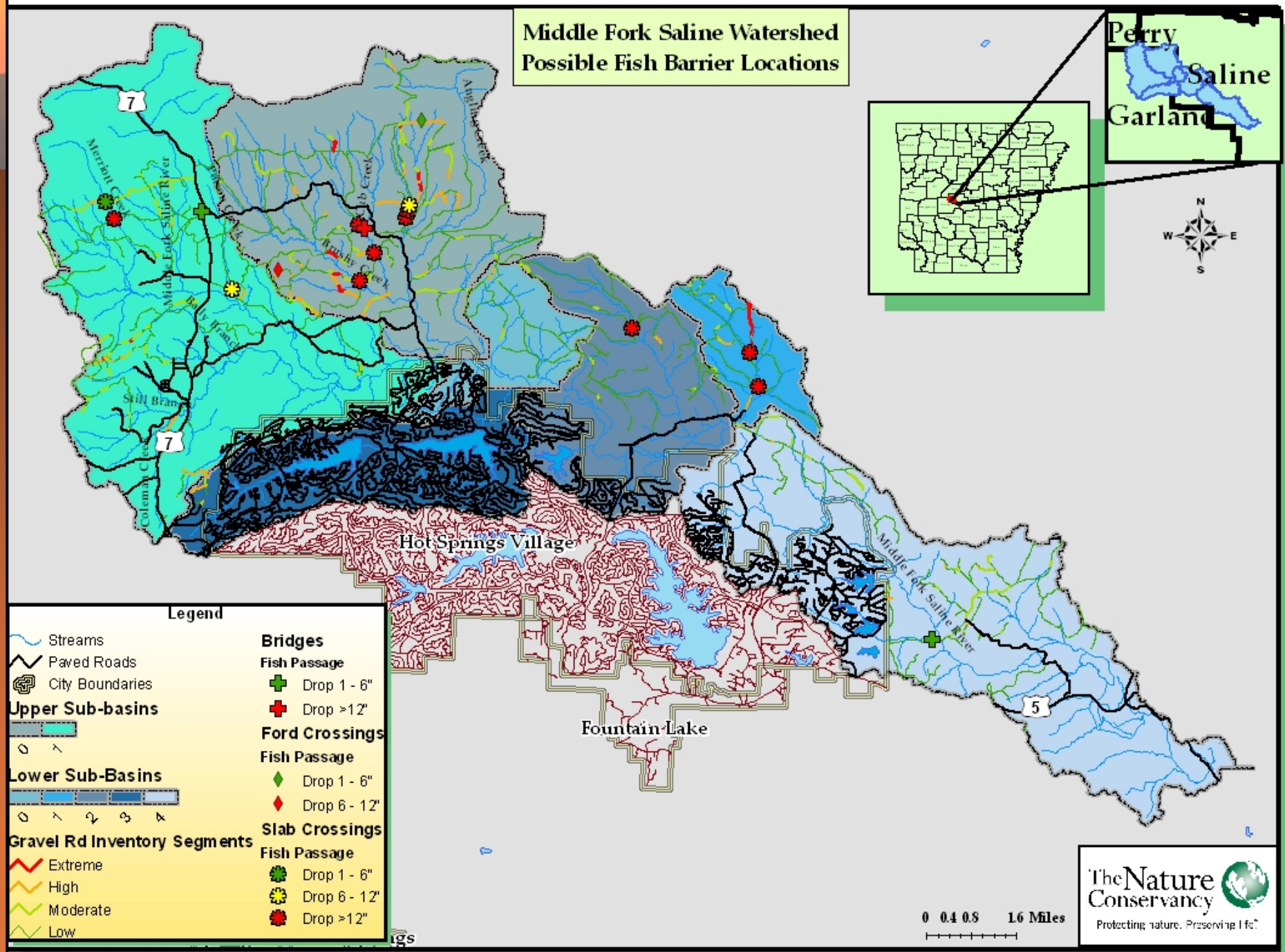
Middle Fork Saline Watershed
Possible Fish Barrier Locations
Perry
Saline
Garland
N
W
E
S
Hot Springs Village
Fountain Lake
Middle Fork Saline River
Merriott Creek
Middle Fork Saline River
Bailey Branch
Still Branch
Coleman Creek
Bailey Creek
Anglin Creek
7
7
5
Legend
Streams
Paved Roads
City Boundaries
Upper Sub-basins
Lower Sub-Basins
Gravel Rd Inventory Segments
Extreme
High
Moderate
Low
Bridges
Fish Passage
Drop 1 - 6"
Drop >12"
Ford Crossings
Fish Passage
Drop 1 - 6"
Drop 6 - 12"
Slab Crossings
Fish Passage
Drop 1 - 6"
Drop 6 - 12"
Drop >12"
0 0.4 0.8 1.6 Miles
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Back to Holy Moley

Sediment Contribution by Land Use Type		
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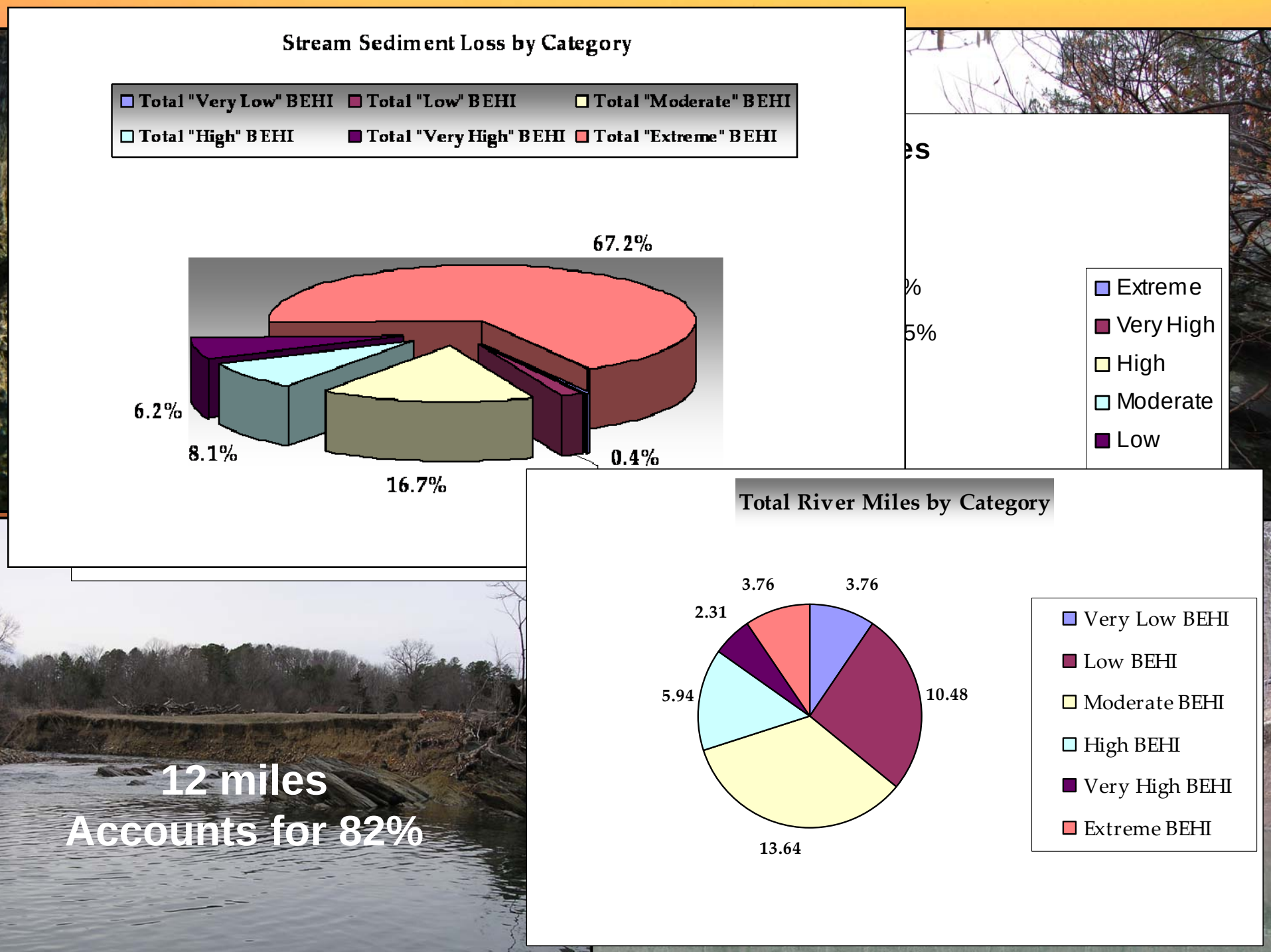
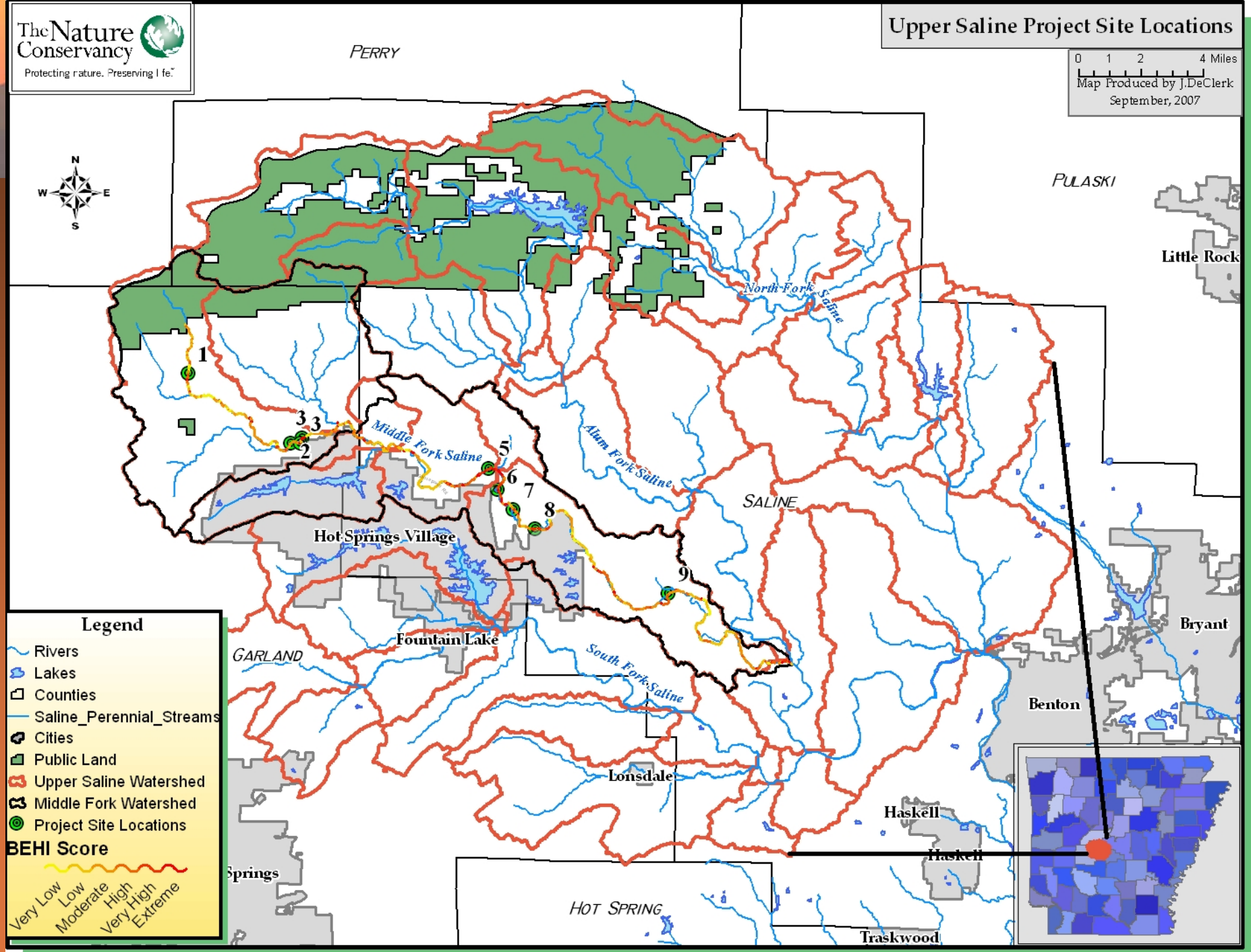
Unpaved Roads	**288**	

Conservancy


Stream Sediment Loss by Category
Total "Very Low" BEHI
Total "Low" BEHI
Total "Moderate" BEHI
Total "High" BEHI
Total "Very High" BEHI
Total "Extreme" BEHI
67.2%
6.2%
8.1%
16.7%
0.4%
Extreme
Very High
High
Moderate
Low
Total River Miles by Category
3.76
3.76
2.31
5.94
10.48
13.64
Very Low BEHI
Low BEHI
Moderate BEHI
High BEHI
Very High BEHI
Extreme BEHI
12 miles
Accounts for 82%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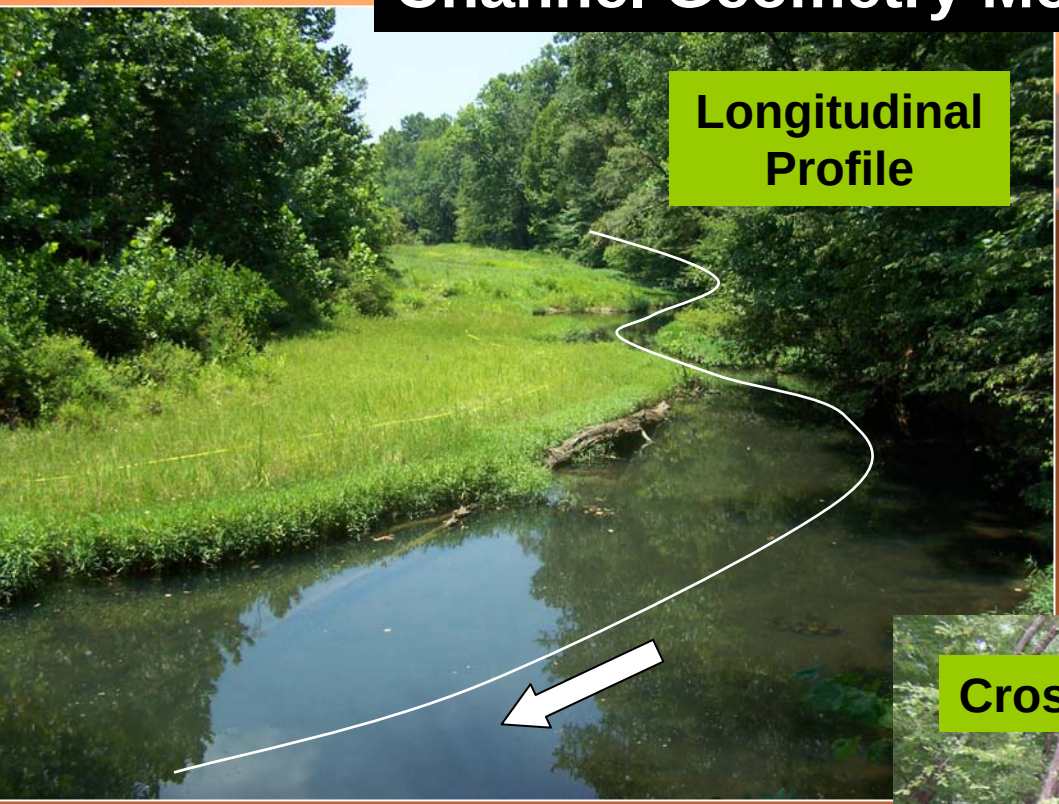
Upper Saline Project Site Locations
0 1 2 4 Miles
Map Produced by J.DeClerk
September, 2007
N
W
E
S
PERRY
PULASKI
Little Rock
North Fork Saline
Middle Fork Saline
Alum Fork Saline
South Fork Saline
SALINE
GARLAND
HOT SPRING
Hot Springs Village
Fountain Lake
Lonsdale
Bryant
Benton
Haskell
Traskwood
1
2
3
3
5
6
7
8
9
Legend
Rivers
Lakes
Counties
Saline_Perennial_Streams
Cities
Public Land
Upper Saline Watershed
Middle Fork Watershed
Project Site Locations
BEHI Score
Very Low
Low
Moderate
High
Very High
Extreme

Channel Geometry Measurements



Longitudinal Profile

- Long. Pro. measures bed features, channel slope, & bankfull slope

- Cross Sections measure Channel width, bankfull width, Floodprone area

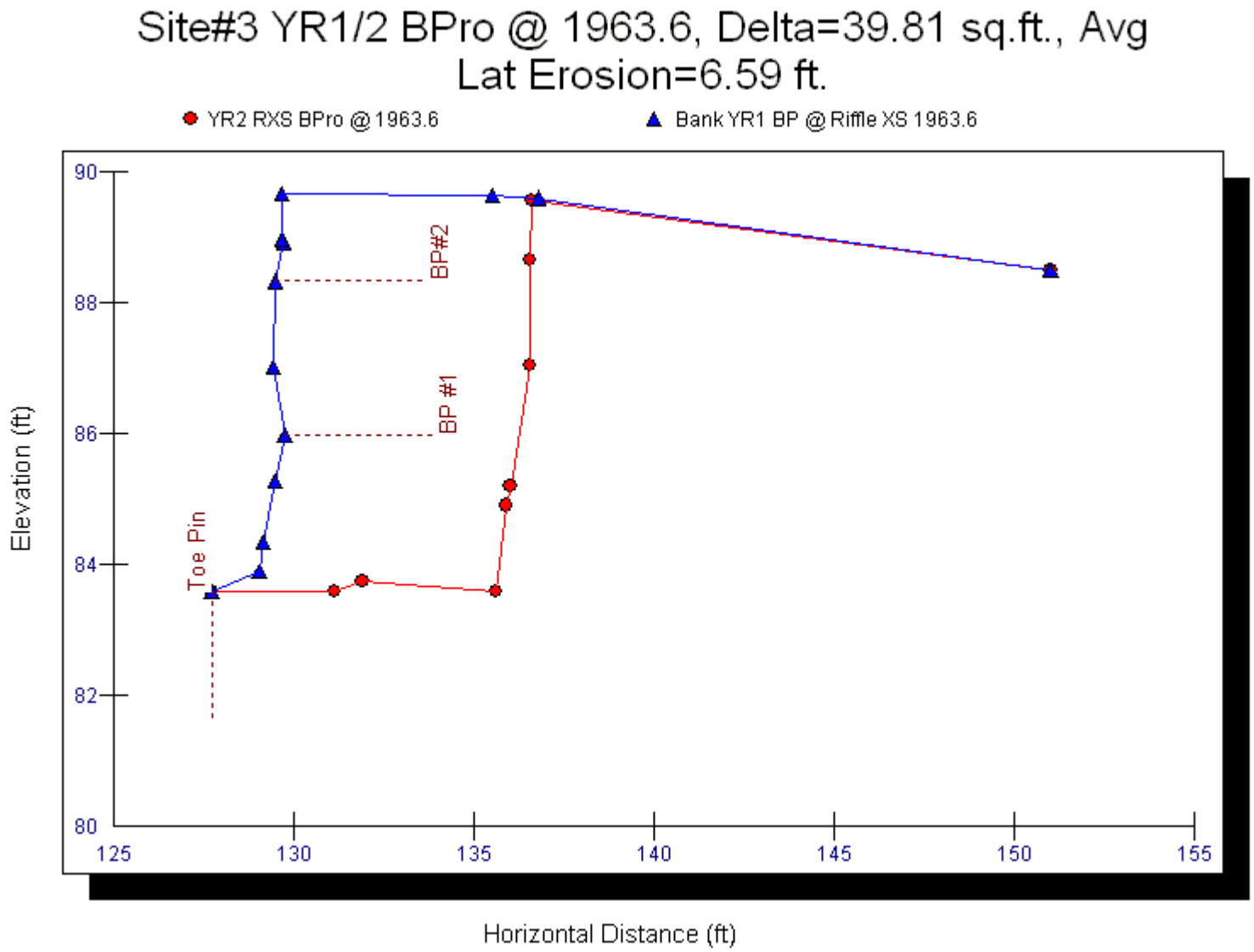
Cross Sections

Scour Chain Installation

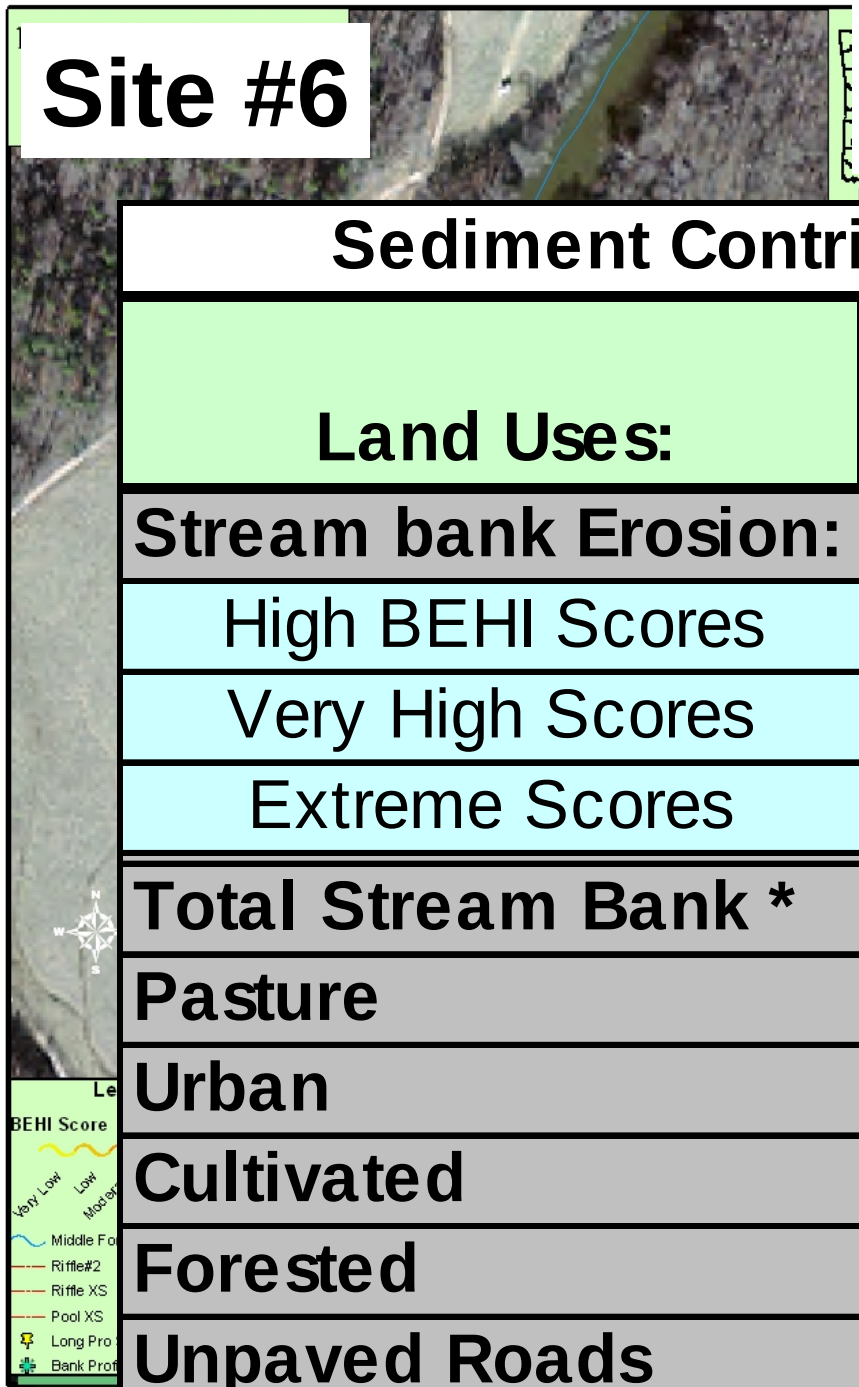
Scour Chains tell:

- Amount of sediment aggradation (sediment buildup/filling in) or degradation (scour, downcutting)

27 total Bank Profiles



Site #6



Discussion:

Where the rubber meets the road

Sediment Contribution by Land Use Type		
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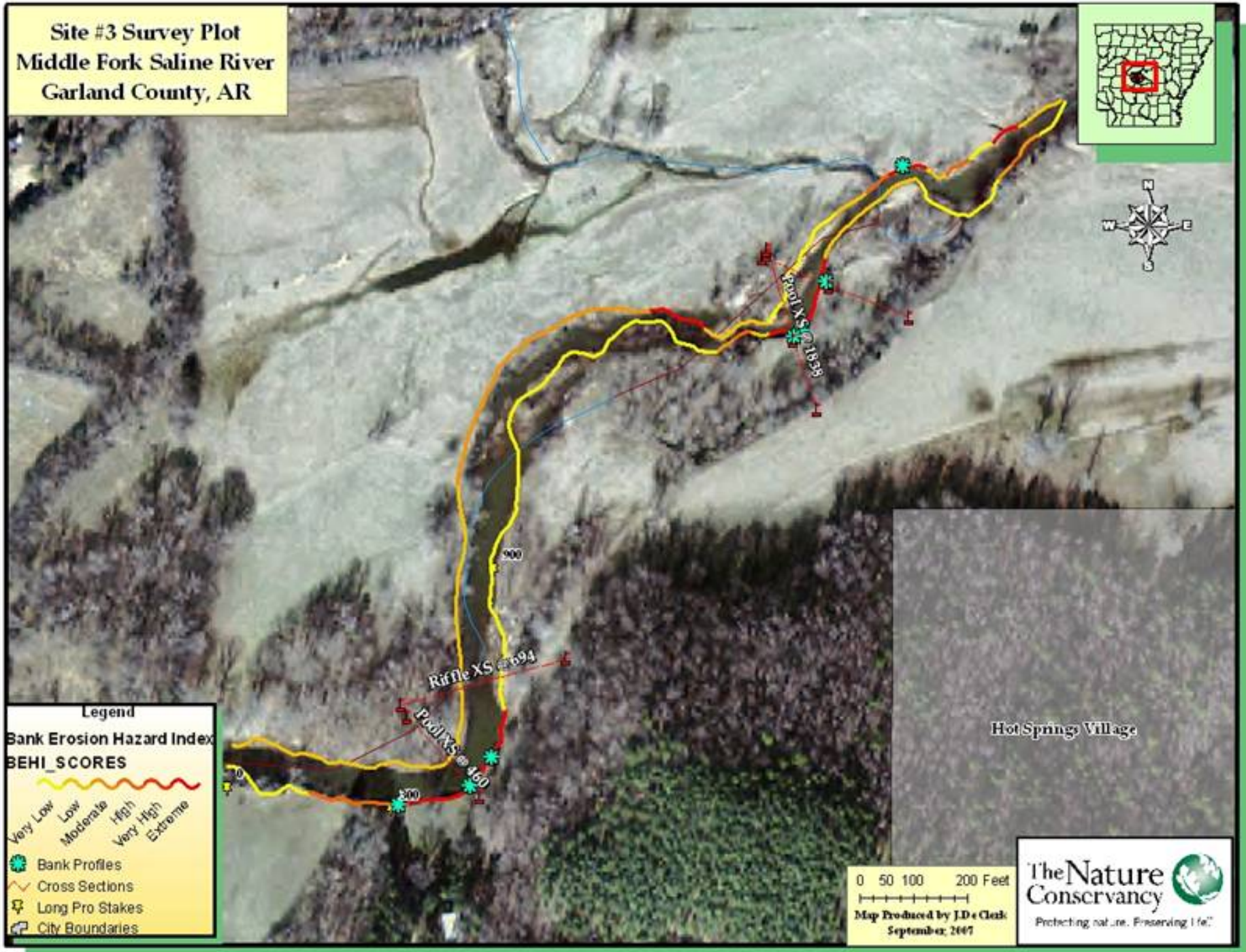
Site #3 Survey Plot
Middle Fork Saline River
Garland County, AR
Pool XS @ 1838
900
Riffle XS @ 894
Pool XS @ 460
300
0
Hot Springs Village
Legend
Bank Erosion Hazard Index
BEHI_SCORES
Very Low
Low
Moderate
High
Very High
Extreme
Bank Profiles
Cross Sections
Long Pro Stakes
City Boundaries
0 50 100 200 Feet
Map Produced by J.D. Clark
September 2007
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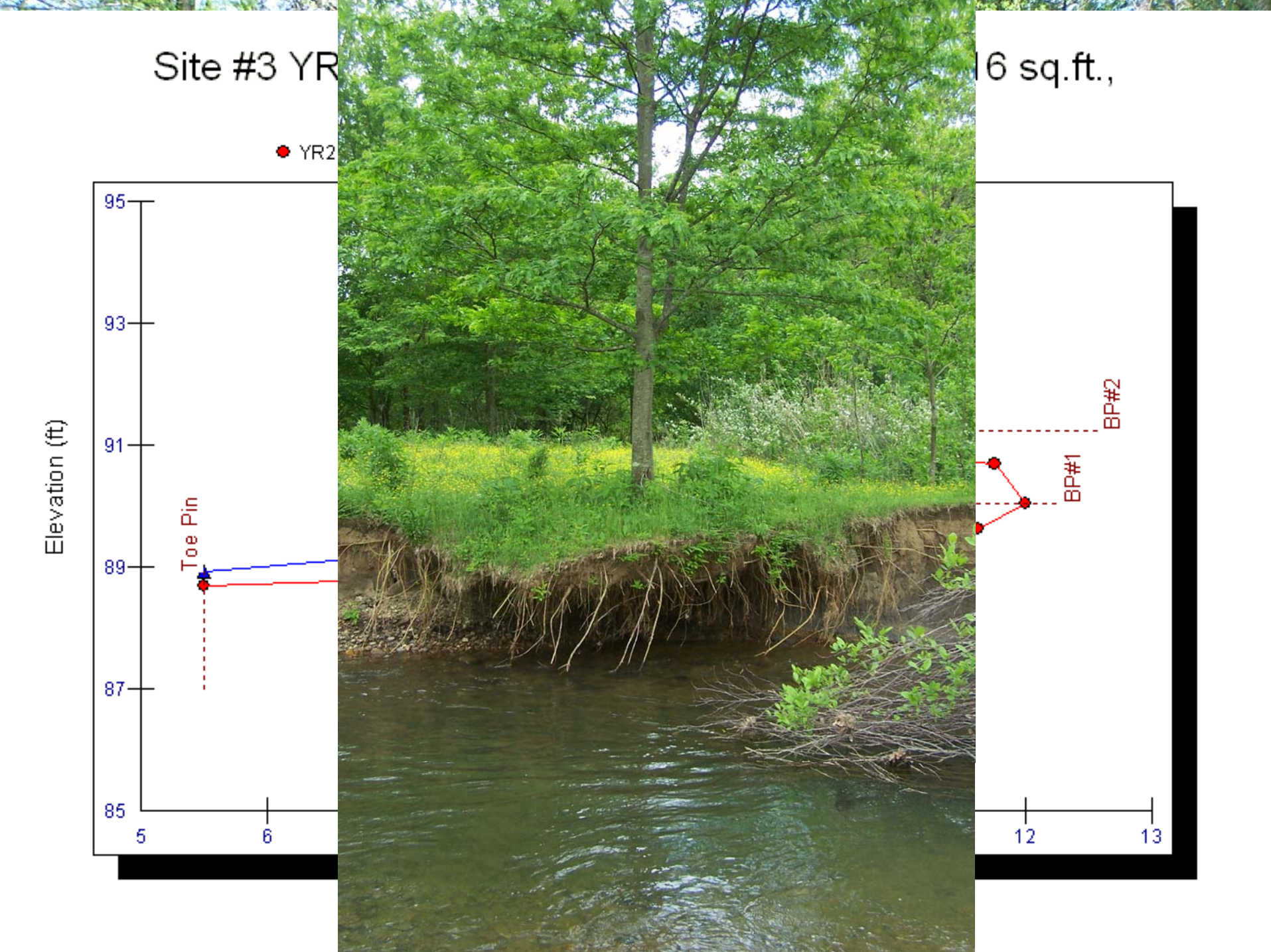
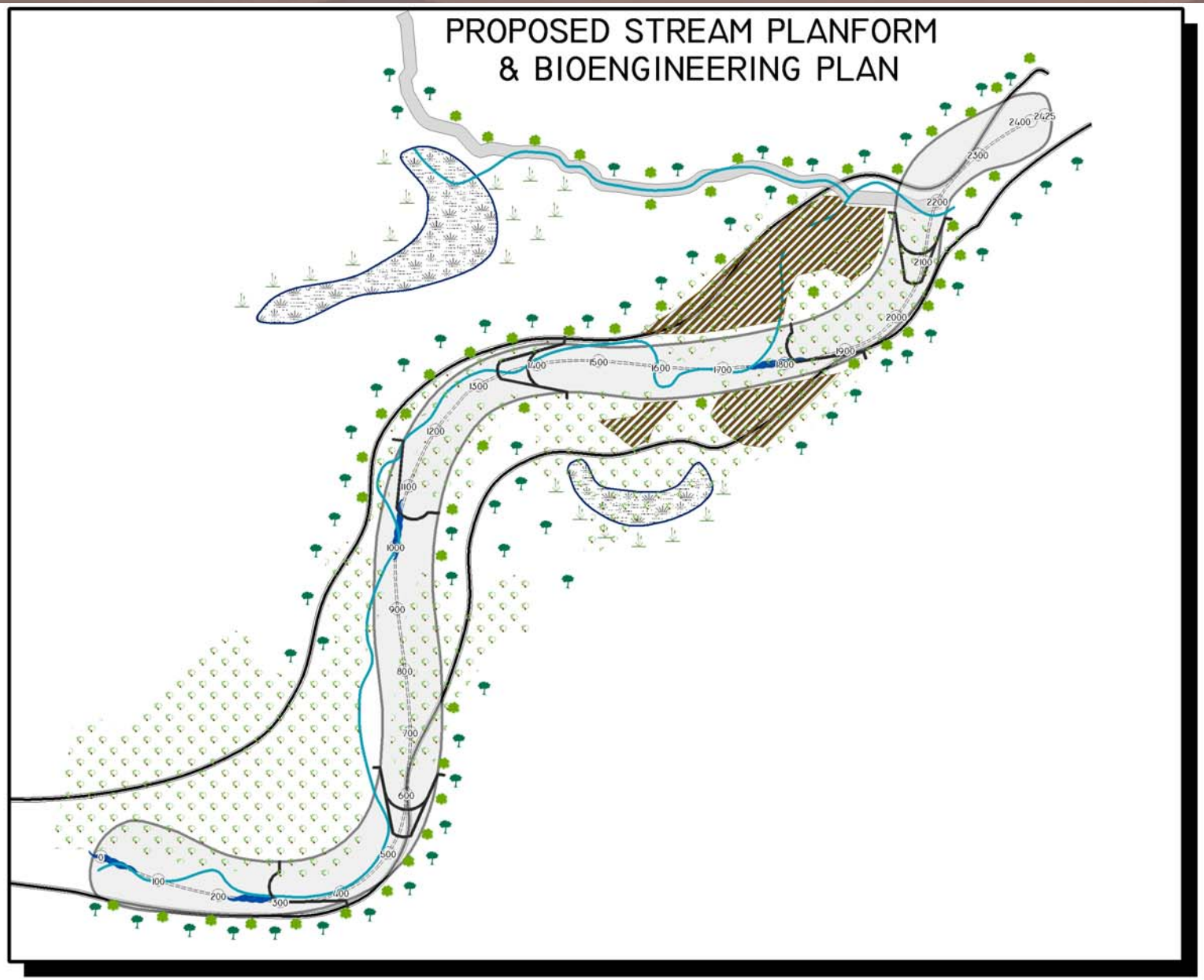
April, 2007


April, 2007


Site #3 YR
16 sq.ft.,
YR2
Elevation (ft)
95
93
91
89
87
85
5
6
12
13
Toe Pin
BP#1
BP#2

Good News…


PROPOSED STREAM PLANFORM
& BIOENGINEERING PLAN
Middle Fork Saline River
Stream Restoration Project
Newkirk Road, Garland County, AR
The Nature Conservancy
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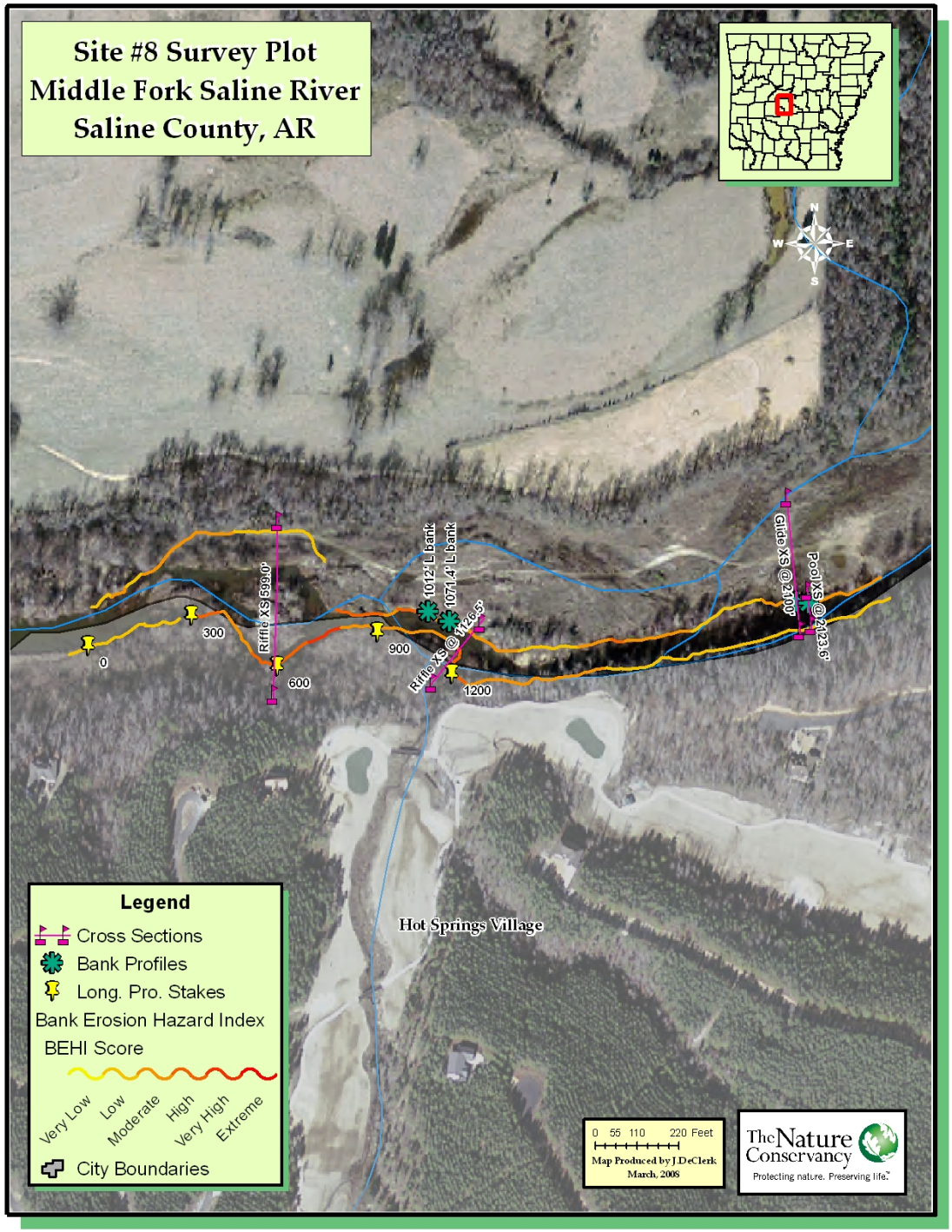
Arkansas Field Office
601 North University Ave.
Little Rock, AR 72205
Legend
Alder & Willow
Proposed Pond/Wetland
Wetland_Plantings
HardwoodPlantings
Existing Vegetation
Existing Thalweg
Existing Bankfull CHNL
Structures
Design Thalweg
Long Pro Stations
Design Channel
Design Trib Channel
Channel Plugs
Design_Riffles
0 35 70 140 Feet
Map Produced by TNC ARFO
J. DeClerk
PROPOSED STREAM PLANFORM &
BIOENGINEERING PLAN
SHEET 20 OF 22
August, 2008
Datum: NAD83
Projection: UTM Zone 15N



Site #8

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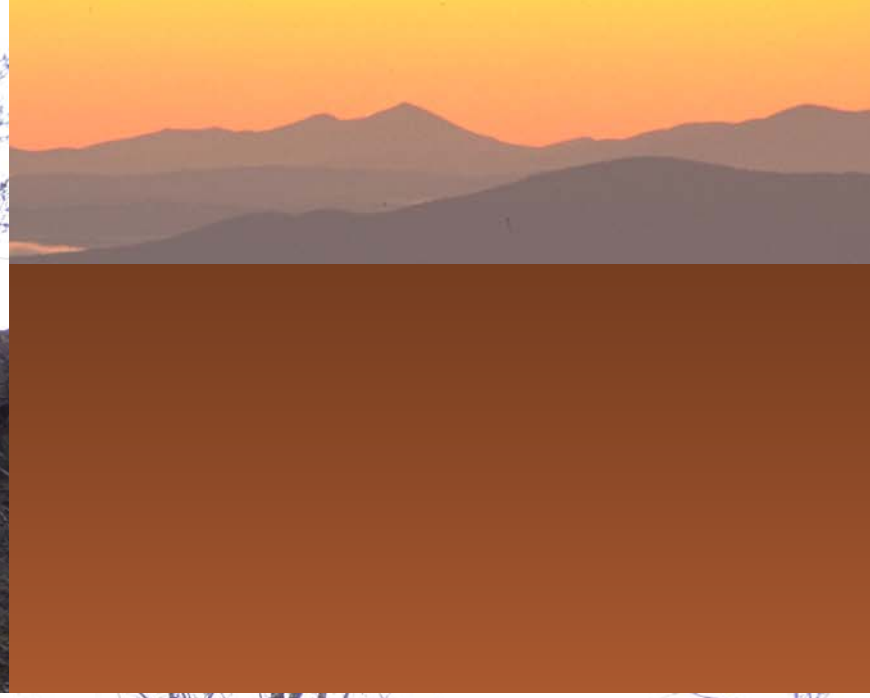
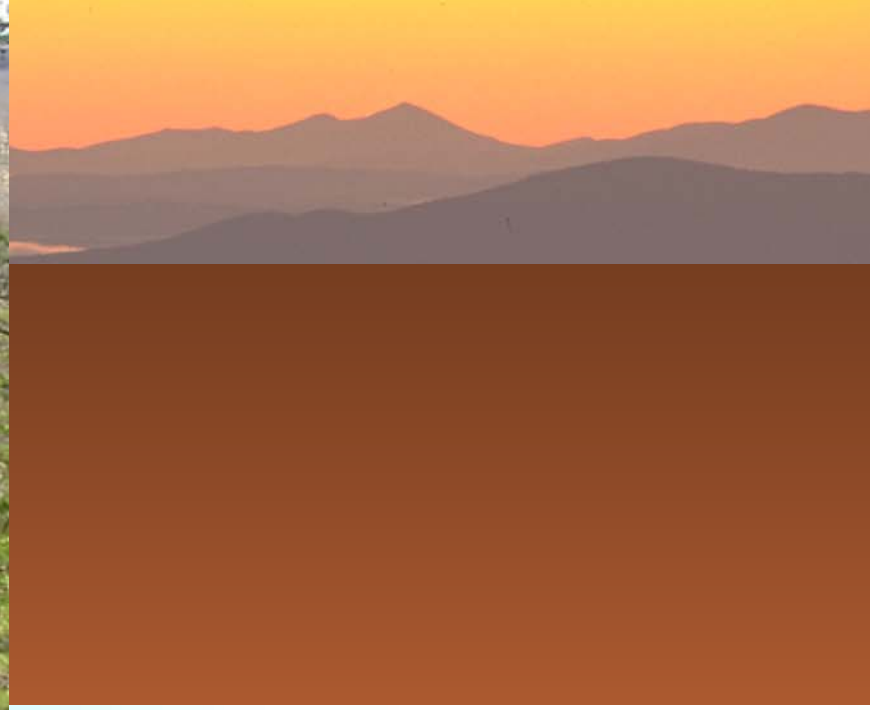
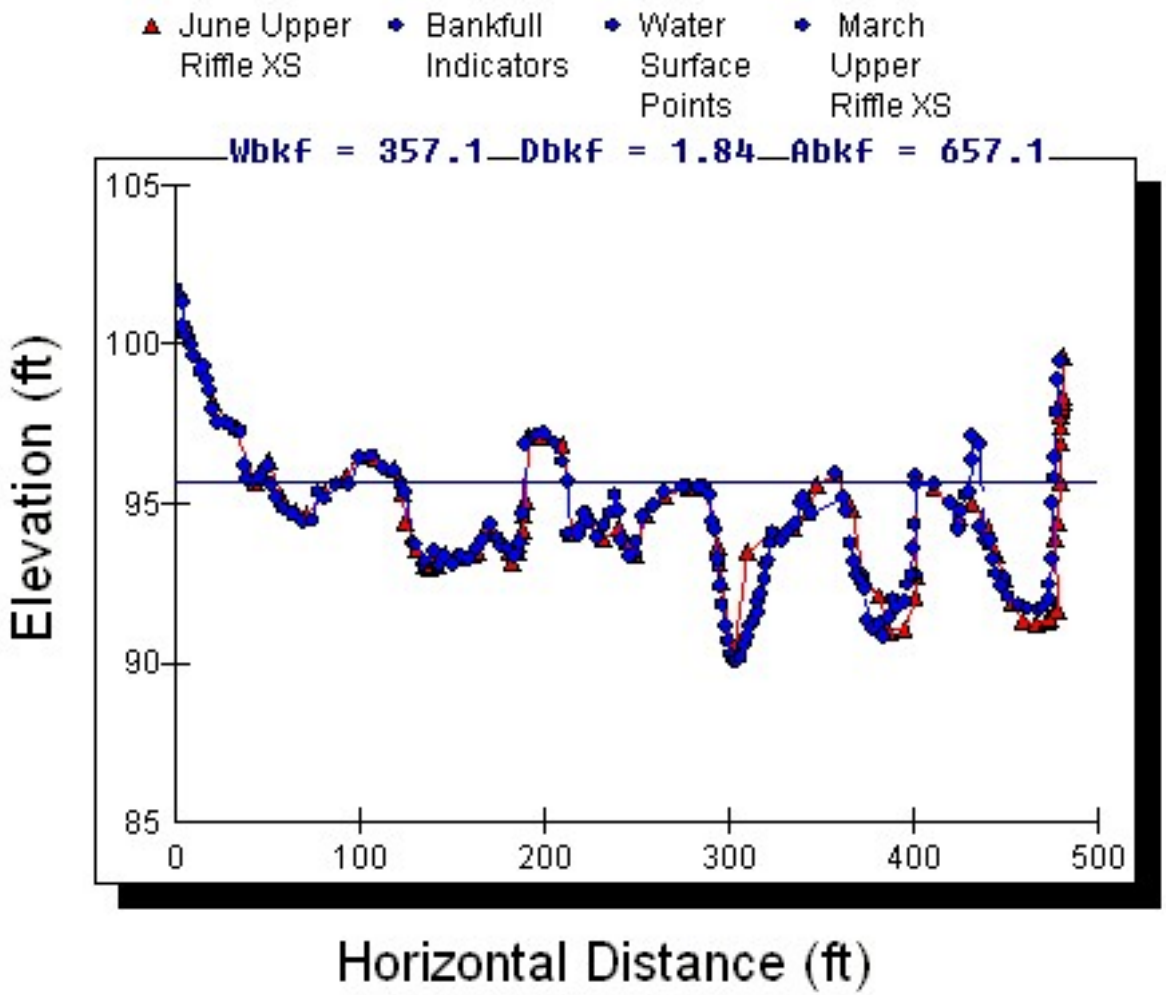




Site #8, Riffle XS Overlay March - June 2007



Conclusions

- Sediment problems in the MF are a cumulative process.
  - This study is a snapshot in time.
- the stream has experienced periods of rapid change and channel adjustment
  - Sites most susceptible are those with any level of disturbance in the riparian zone. (Rip veg = glue, ex: Ref Reach)

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Recommendations

- Efforts should be two-fold:
  - Manage sediment at the watershed scale
    - Ex: Mitigate for land-clearing activities either on-site or as close to the impact as possible.
  - Assist in restoration of highly impacted sites
  - Maintenance/preservation of existing riparian zones

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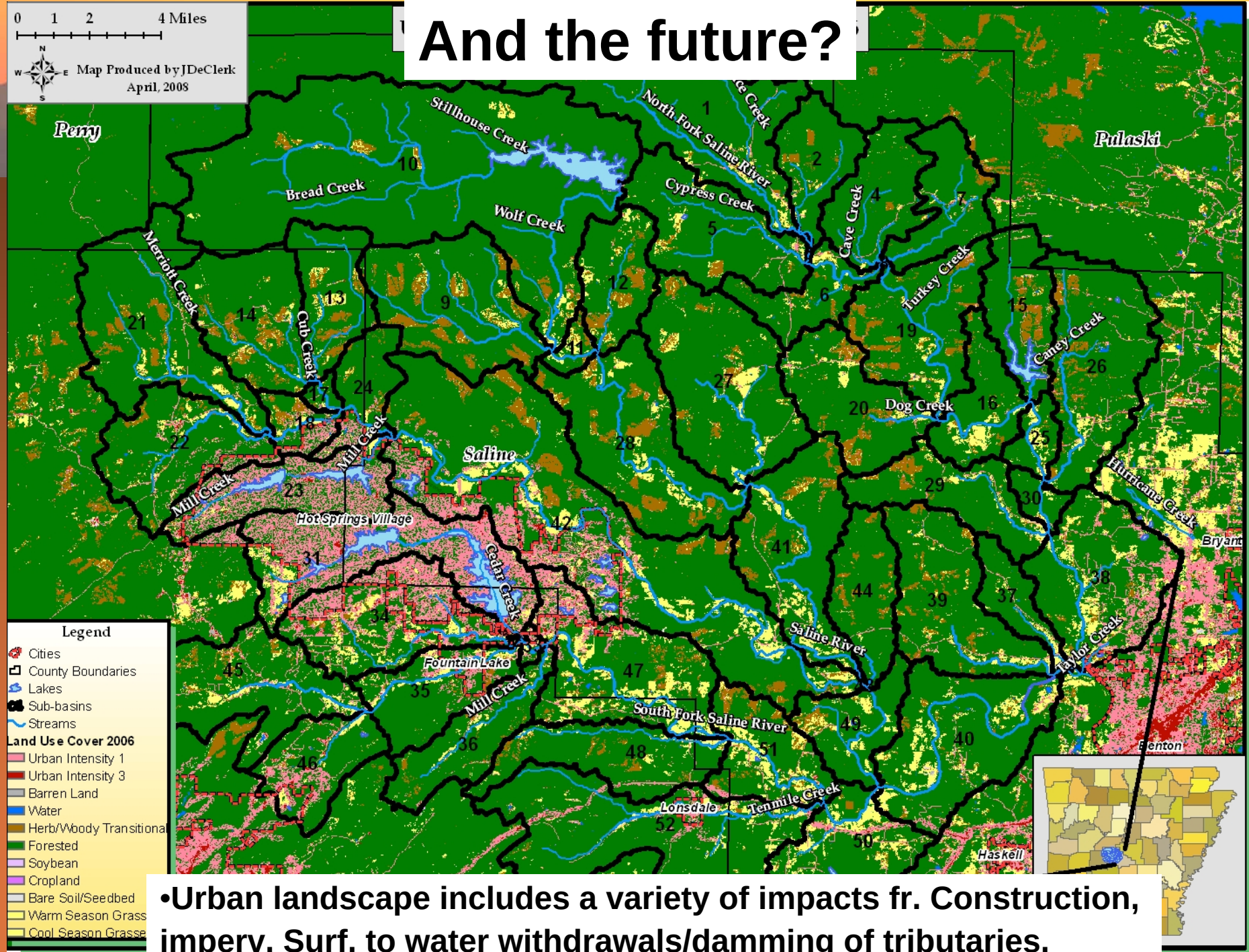
And the future?



- **Urban landscape includes a variety of impacts fr. Construction, imperv. Surf, to water withdrawals/damming of tributaries.**

Questions?

A copy of the Report:
http://conserveonline.org/workspaces/sedimentsaline/

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