

Lake Taneycomo Watershed Management Plan - Load Reductions and Best Management Practices

October 25, 2023



Nonpoint Source Pollution

▶ Pollutants

- ▶ Sediment
- ▶ Nutrients (Phosphorus & Nitrogen) in fertilizers and pesticides
- ▶ Oil, grease, heavy metals, and chemicals from vehicles
- ▶ Bacteria

▶ Pollutant Effects

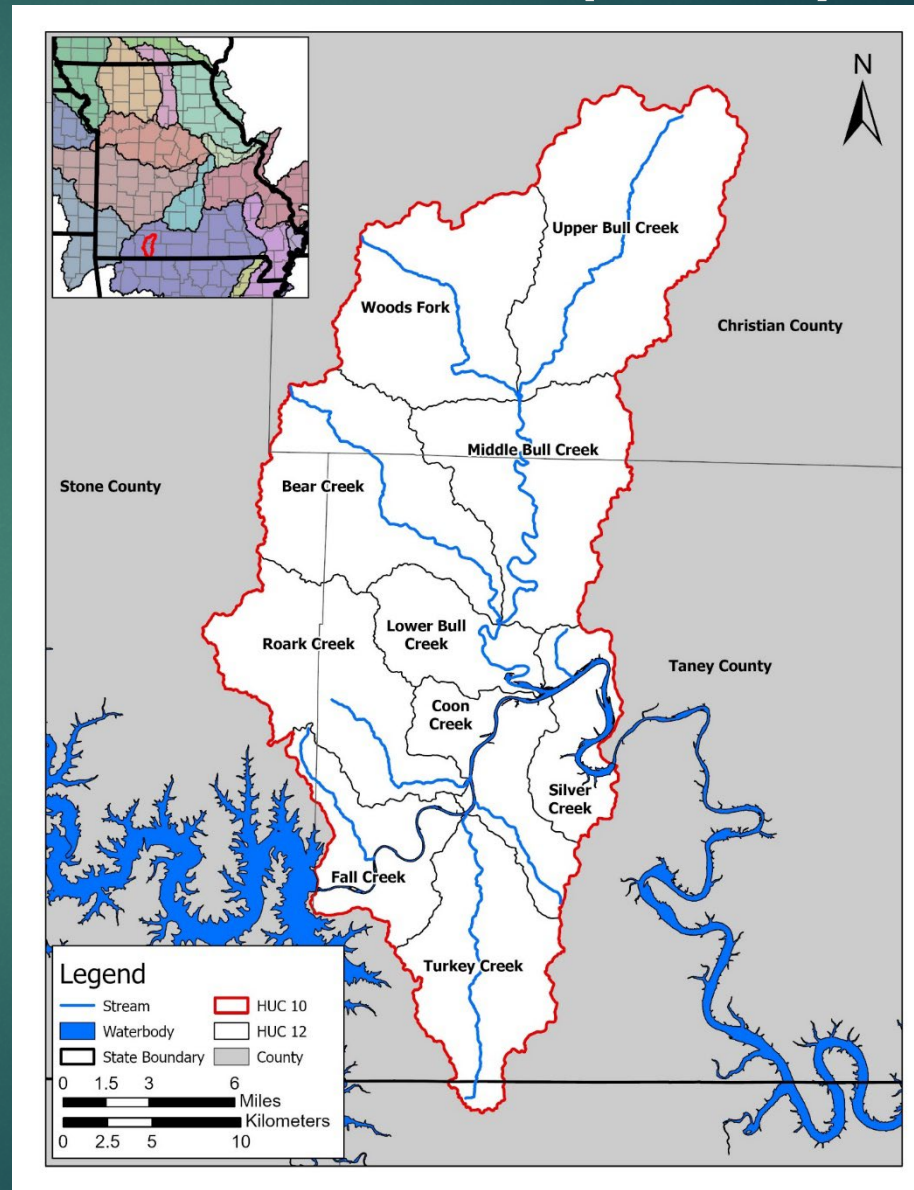
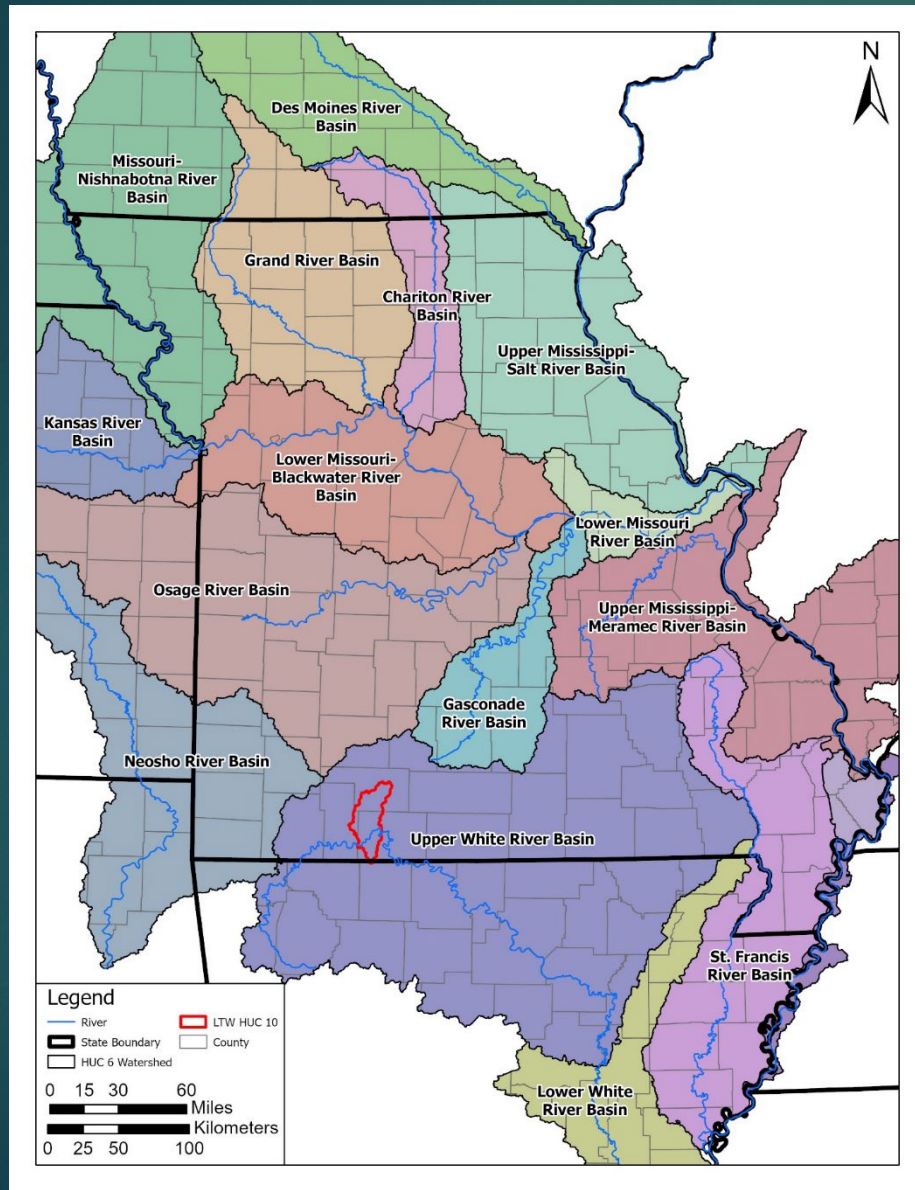
- ▶ Sedimentation
- ▶ Increased Vegetation
- ▶ Algal Blooms
- ▶ Eutrophication (increased plant growth leading to oxygen depletion and mortality of aquatic organisms)



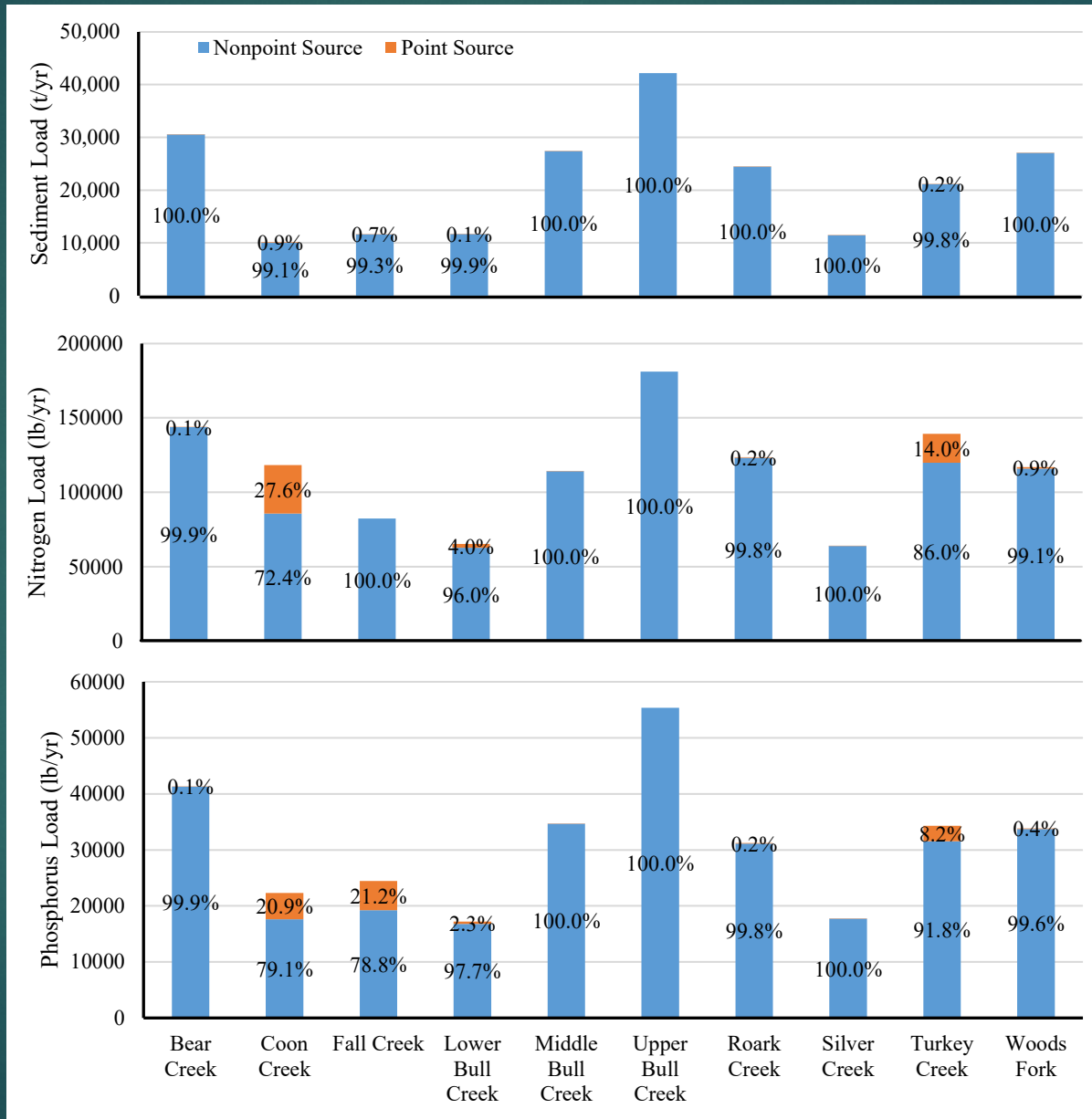
Suspended sediment and vegetation near Rockaway Beach
(Reinig, 2012 – Branson Tri-Lakes News)



Lake Taneycomo Watershed (LTW)

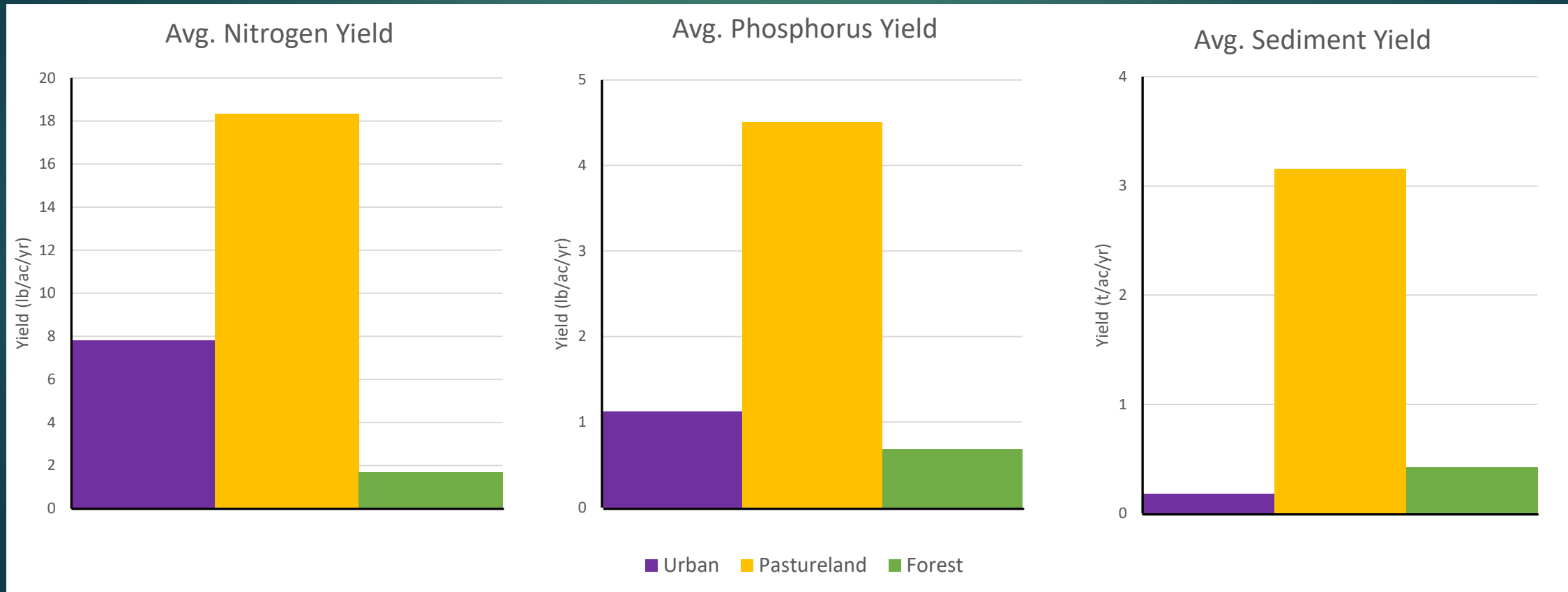


Nonpoint & Point Sources

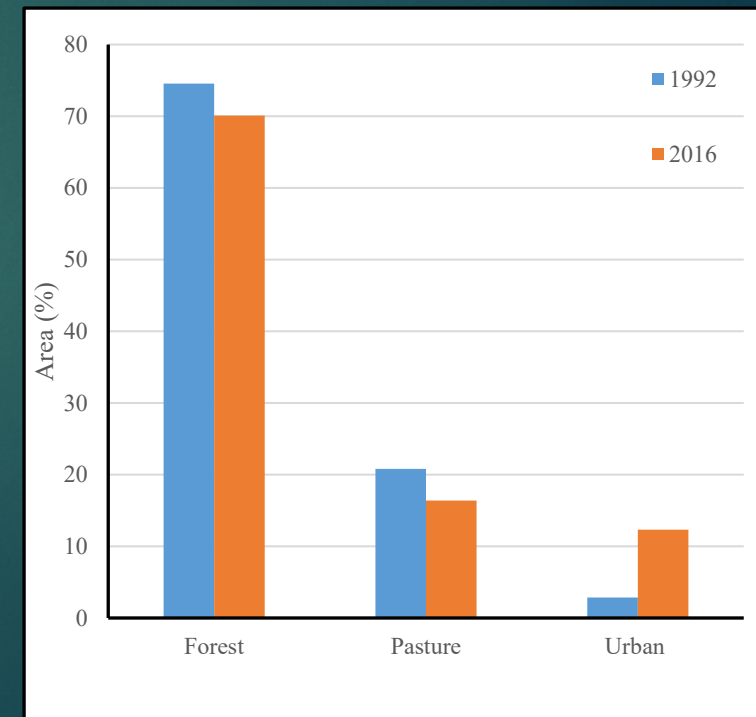
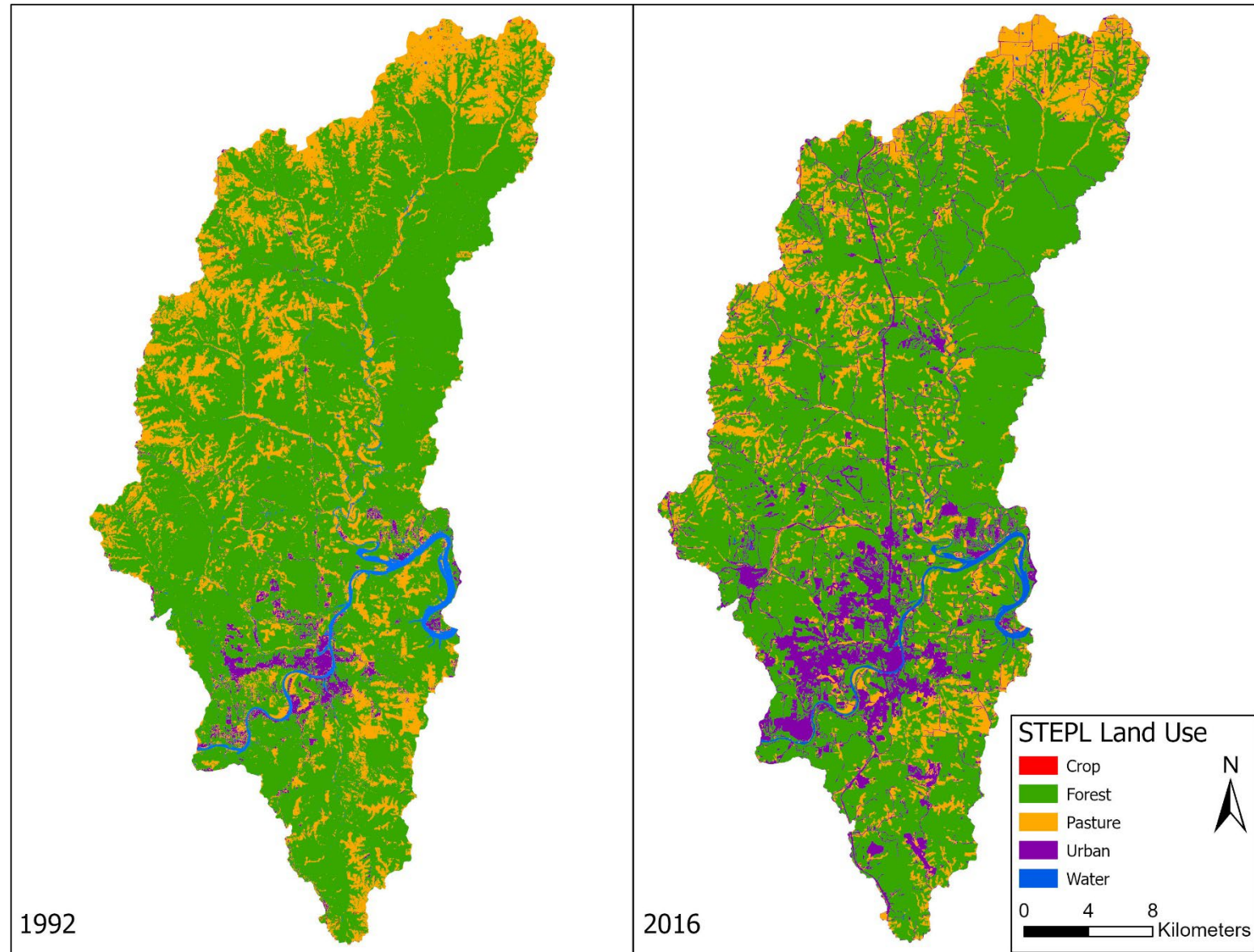


STEPL – Nonpoint Pollutant Sources

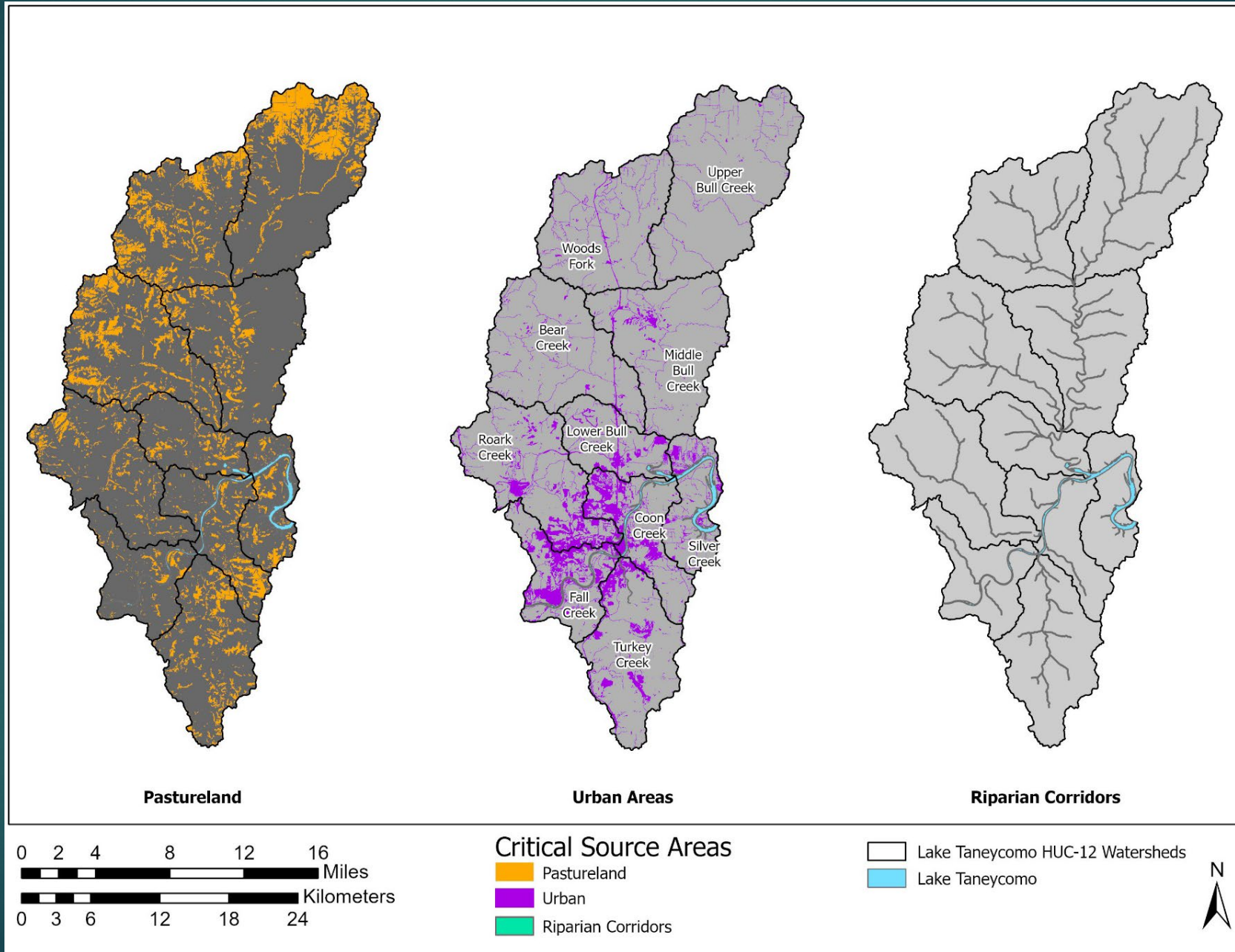
- ▶ Pastureland within the LTW is the highest contributor of nitrogen, phosphorus, and sediment.
- ▶ Streambank erosion contributes 23% of the total sediment load for the entire LTW.



Land Use Change in LTW

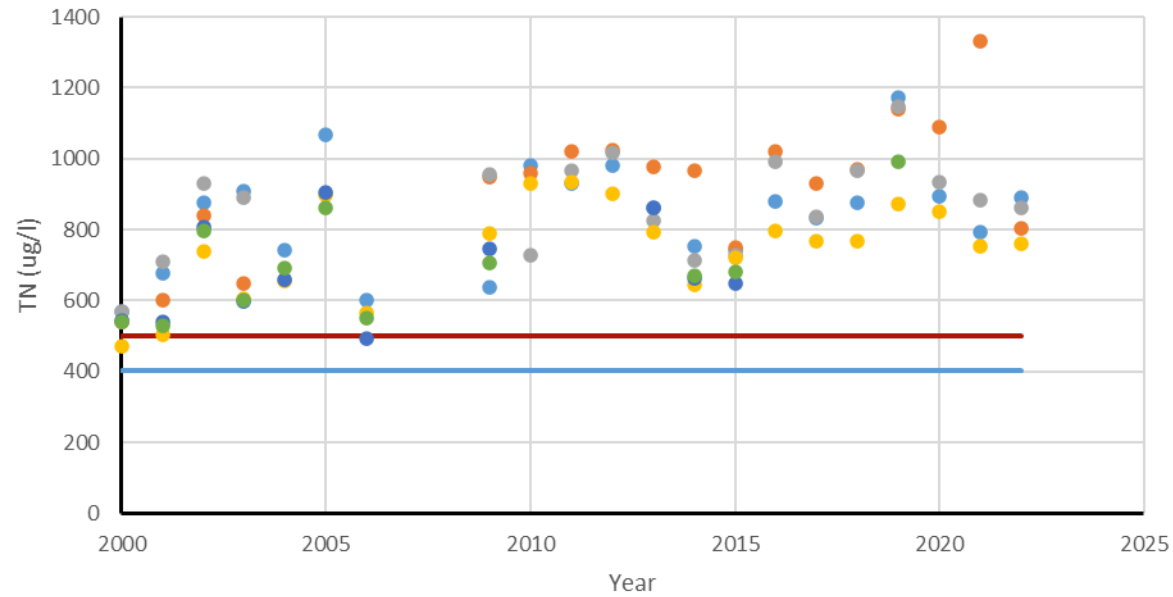


Critical Source Areas

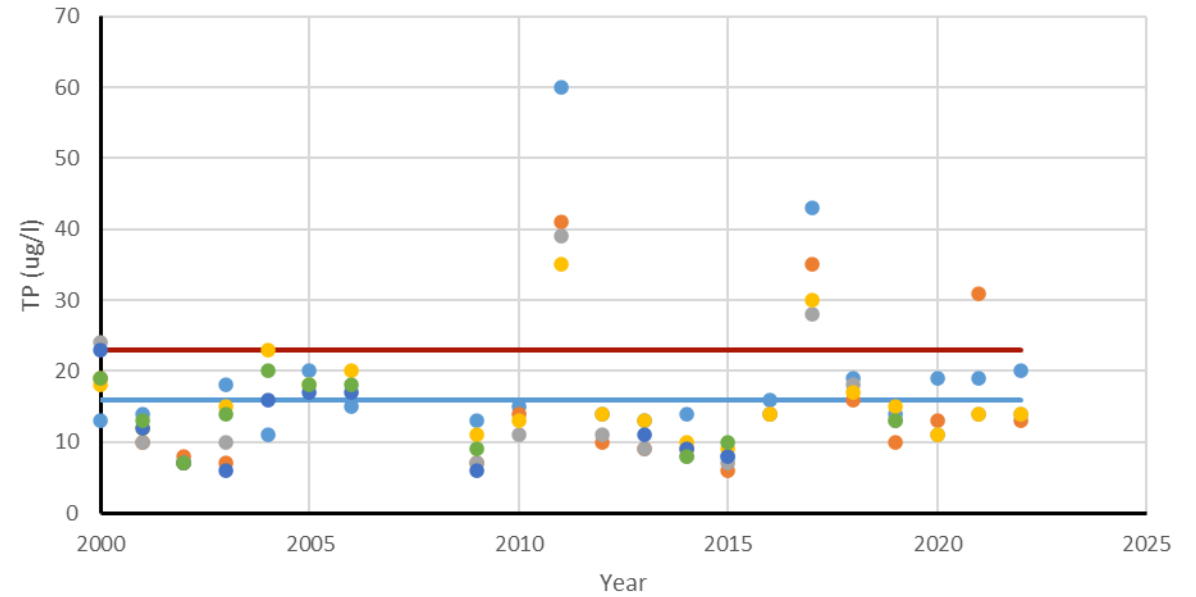


Lakes of Missouri Volunteer Program – Water Quality Data

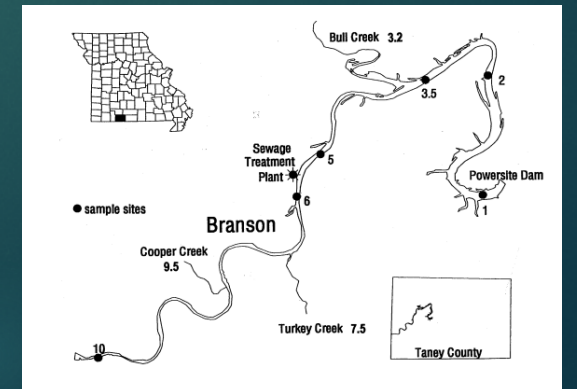
Total Nitrogen (TN)



Total Phosphorus (TP)

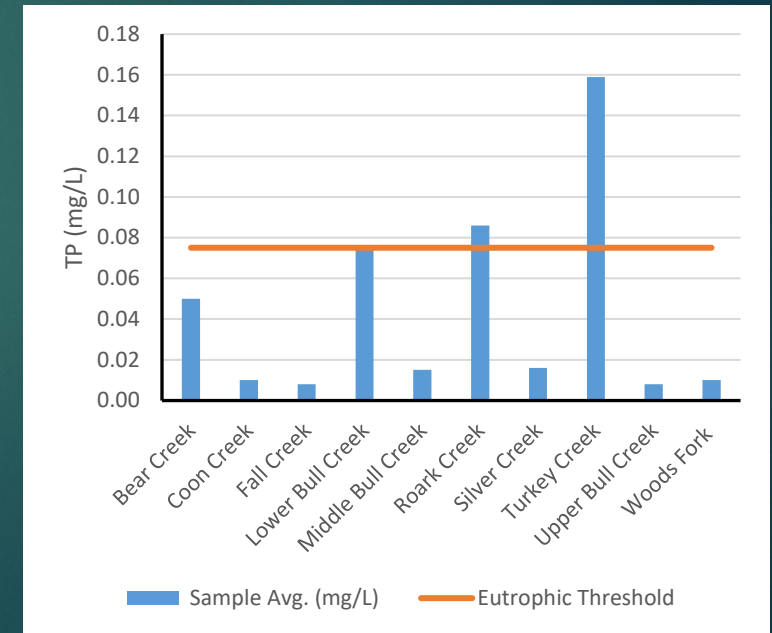
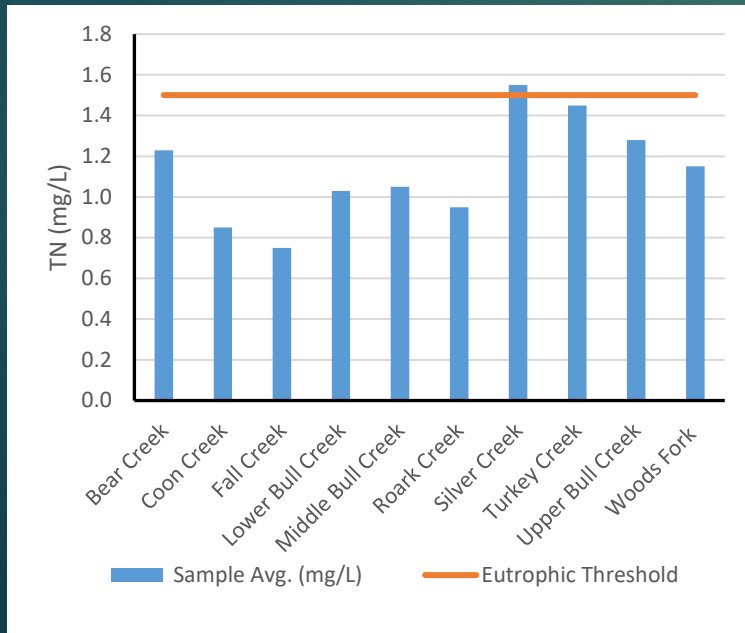


● Site 10	● Site 6	● Site 5
● Site 3.5	● Site 2	● Site 1
— EPA Screening Value	— MO DNR Screening Value	



Baseflow Water Quality Sampling

- ▶ Average TP (Total Phosphorus) and TN (Total Nitrogen) concentrations were typically below the eutrophic threshold (EPA, 2000).
- ▶ Average TP concentrations were higher at two sites.
- ▶ Average TN concentrations were higher at one site.





Nonpoint Source Load Reduction



- ▶ Currently the waterbodies in the LTW are not considered impaired for nutrients or sediment.
- ▶ Therefore, load reduction goals were based on feasibility and similarity to approved 319 watershed management plans for two neighboring watersheds with similar nutrient and sediment problems (James River and Spring River).
- ▶ Load Reduction Goals
 - ▶ Treat 25% of urban (6,628 ac) and pastureland (8,814 ac) areas.
 - ▶ Treat 2,500 ft of eroding streambanks.
 - ▶ TN, TP, and sediment loads could be reduced by 10%, 6%, and 7%, respectively.

BMP Implementation

HUC-12	Pastureland (Acres)			Urban (Acres)			Eroding Streambanks (Feet)		
	Total	25%	Acres/year	Total	25%	Acres/year	Total	Treated	Feet/Year
Bear Creek	6,181	1,545	77	1,498	375	19	36,640	278	14
Coon Creek	2,304	576	29	4,063	1,016	51	22,844	278	14
Fall Creek	932	233	12	4,400	1,100	55	17,539	278	14
Lower Bull Creek	1,390	348	17	1,936	484	24	15,264	278	14
Middle Bull Creek	2,614	653	33	1,621	405	20	51,449	278	14
Roark Creek	2,356	589	29	4,805	1,201	60	44,426	278	14
Silver Creek	1,576	394	20	1,845	461	23			
Turkey Creek	3,263	816	41	3,361	840	42	26,388	278	14
Upper Bull Creek	8,871	2,218	111	1,267	317	16	22,535	278	14
Woods Fork	5,769	1,442	72	1,716	429	21	45,595	278	14
Total	35,255	8,814	441	26,513	6,628	331	282,680	2,500	125

Pastureland BMPs

▶ Access Control

- ▶ Provides barriers (fences) that limit animal, human, and wildlife entry into specific areas to protect natural resources.



▶ Alternative Water

- ▶ Limiting livestock from entering streams, by providing them with an alternative water source.



▶ Heavy Use Protection

- ▶ Involves the establishment of vegetation and/or the installation of erosion prevention materials that protect areas where heavy traffic is expected.



▶ Forage and Biomass Planting

- ▶ Prevents soil erosion and improves water quality by establishing native or introduced forages in fields or pastures.

▶ Prescribed Grazing

- ▶ Prescribed grazing is the controlled harvest of vegetation with grazing or browsing animals, managed with the intent to maintain or improve water quality and quantity.



Urban BMPs

▶ Extended Wet Retention

- ▶ An extended wet detention basin is a detention basin designed to increase the length of time that storm water is retained. Detention basins are often heavily vegetated so the vegetation can filter pollutants.



▶ Dry Detention

- ▶ A dry detention basin is a storm water retention basin that remains dry except for short periods following rainstorms or snowmelt events. Its main benefit is its moderating influence on peak flows, helping to control streambank erosion.



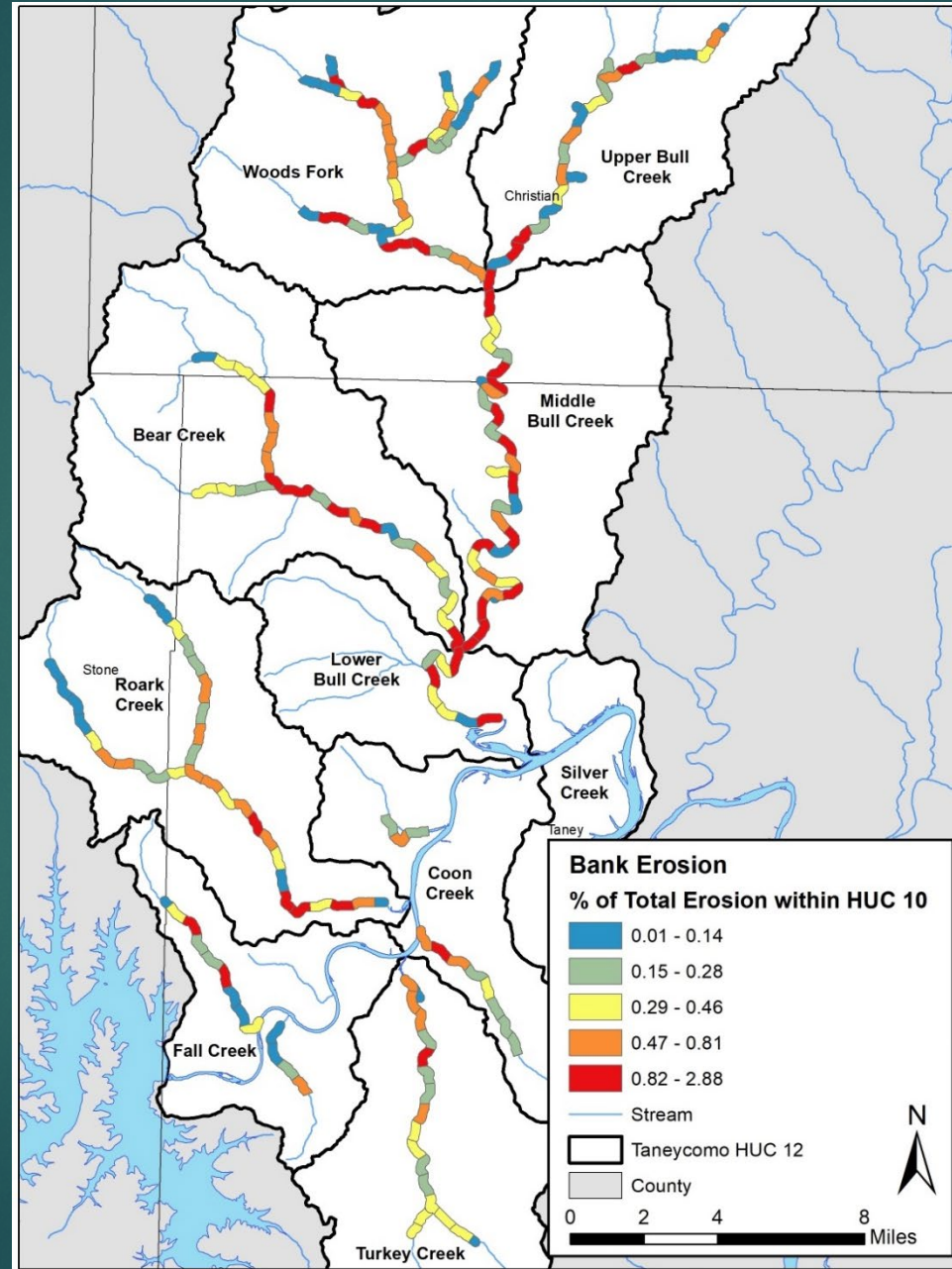
Streambank BMPs

▶ Streambank Stabilization and Fencing

- ▶ Streambank protection methods include modifying the channel capacity, channel armoring (riprap lining), providing channel crossings for livestock, seeding (vegetating or planting the channel to prevent erosion), and using fencing to restrict animal access.

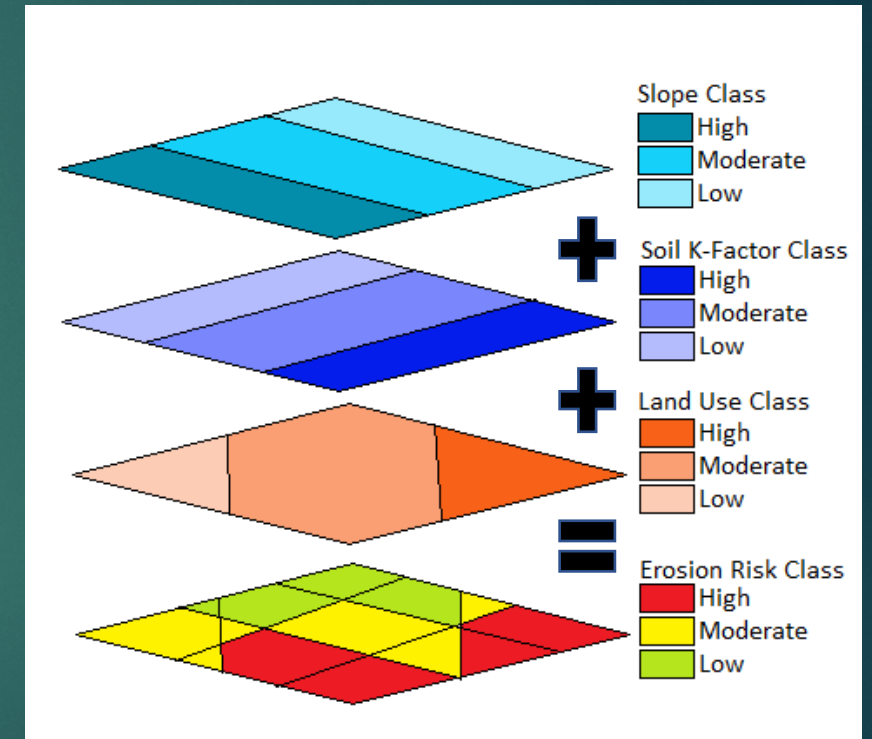


Bank Erosion Identification



Lake Taneycomo Shoreline Erosion Assessment

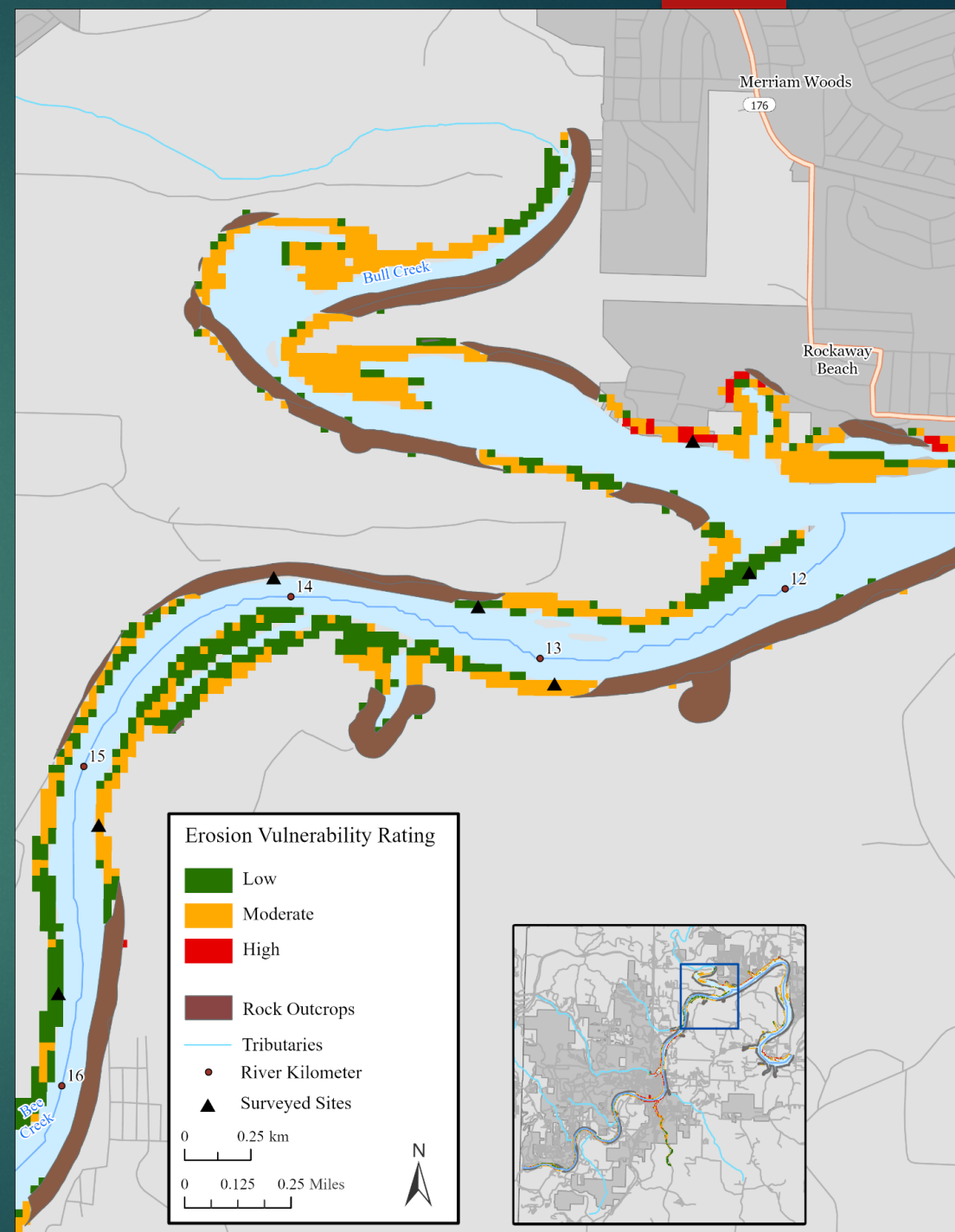
- ▶ Used a GIS-based assessment to predict erosion potential of the Lake Taneycomo shoreline and verified the results through ground-truthing.
 - ▶ Digital Elevation Model (DEM)
 - ▶ Soil Data
 - ▶ Land Use
- ▶ Steep slopes, thin erosive soils, and developed or agricultural land uses have high erosion potential.



Results – GIS Analysis

Erosion Vulnerability Risk Class	Forest/Shrub	Pasture	Barren	Developed	Total
Low	21.4	2.7	0.0	0.0	24.0
Moderate	41.6	11.2	0.6	7.7	61.1
High	0.0	0.2	0.3	14.4	14.9
Total	62.9	14.1	0.9	22.1	100

Segment	Length (%)			
	Bluff	High	Moderate	Low
1	38.1	5.5	41.8	14.6
2	38.6	8.4	18.6	34.3
3	18.7	18.4	40.8	22.1
4	28.0	22.4	35.5	14.2
5	32.5	1.3	35.8	30.4
6	37.8	8.2	46.3	7.7
7	55.3	4.9	31.2	8.6
Total	37.2	8.5	36.1	18.2

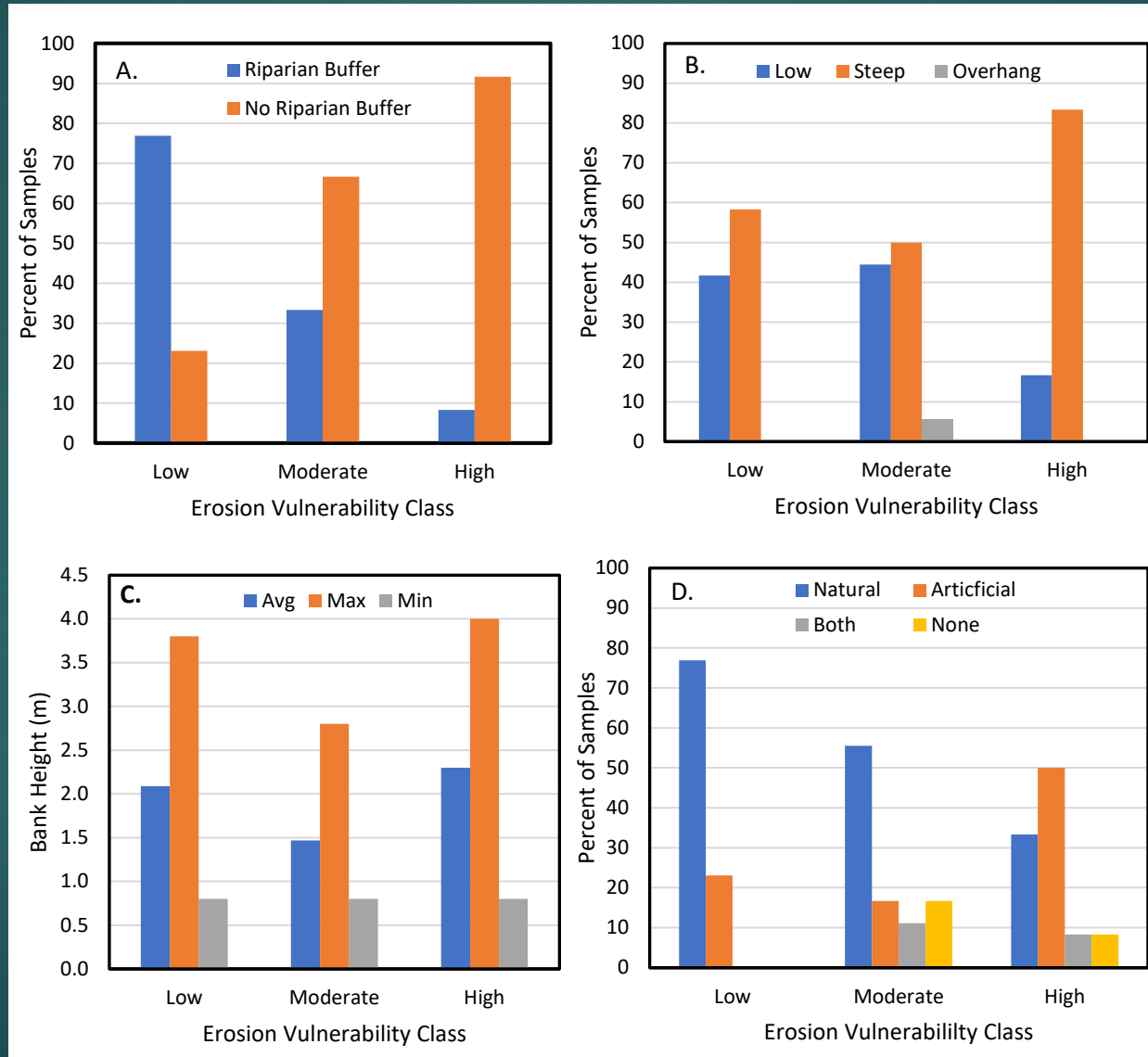


Results – Field Verification

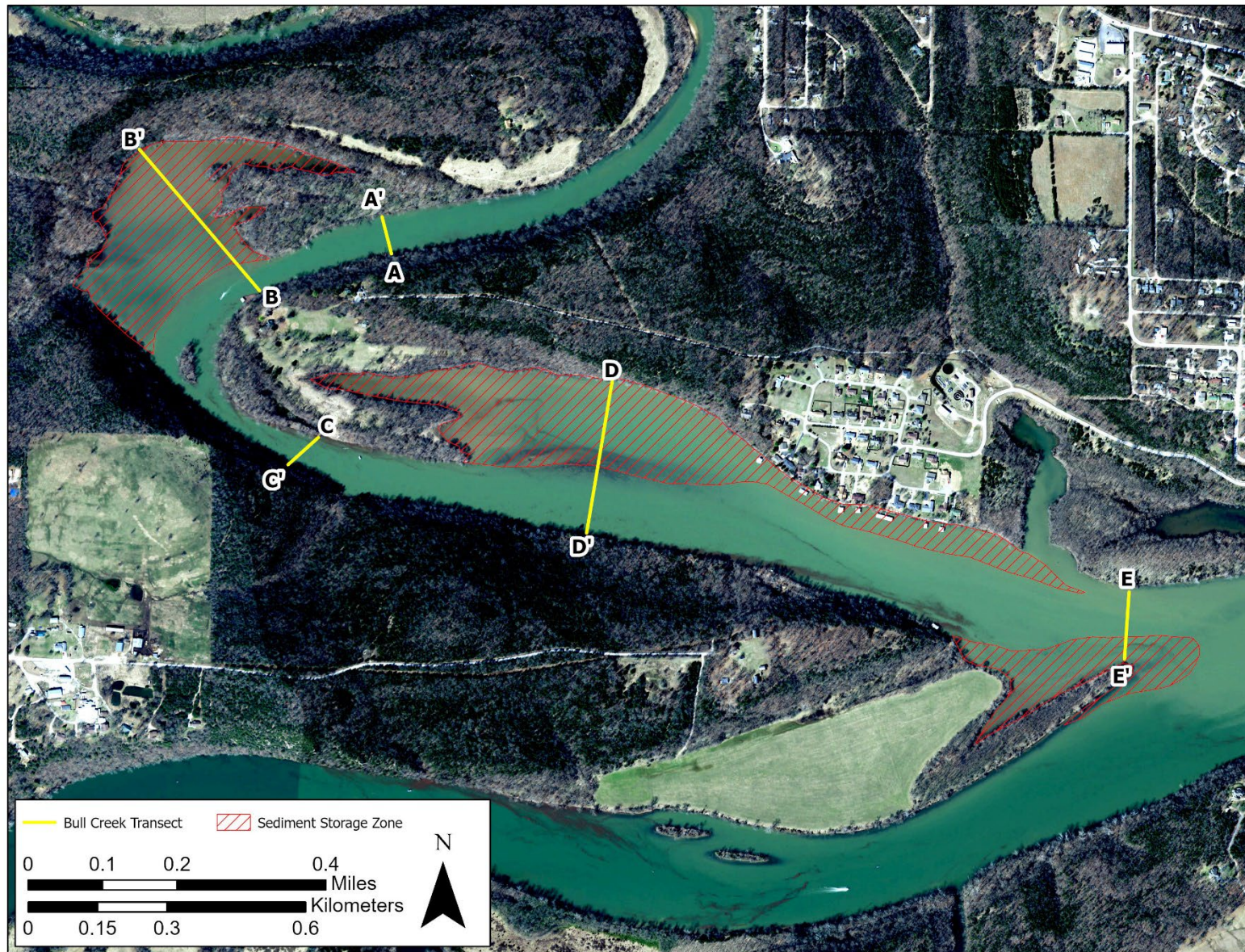
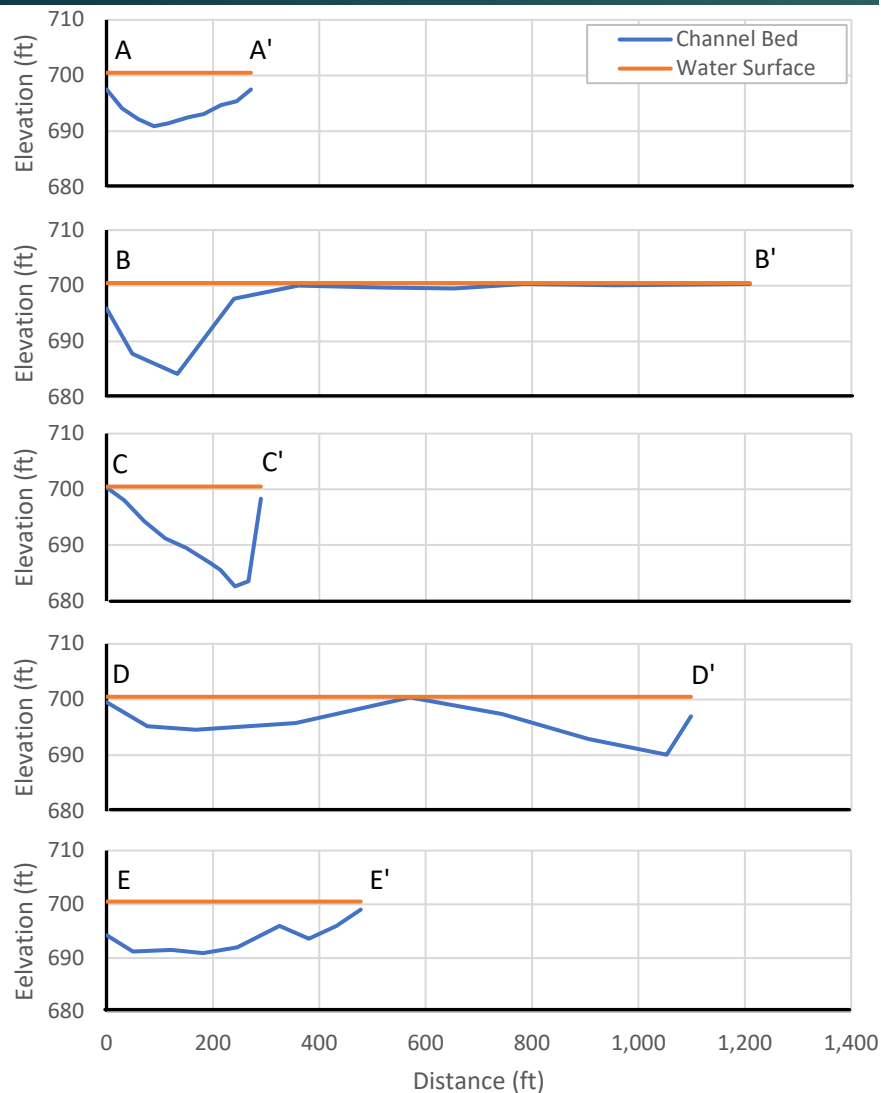
- ▶ Evaluated 43 sites in the field
 - ▶ 13 Low Risk
 - ▶ 18 Moderate Risk
 - ▶ 12 High Risk



Results – Field Verification



Tributary Sedimentation



Shoreline Assessment Takeaways

- ▶ High risk areas were identified as having steep slopes, erosive soil properties, and developed or agricultural land uses.
- ▶ In total (excluding bluffs) the GIS assessment of the Lake Taneycomo shoreline found 21% as low erosion risk, 64% as moderate risk, and 15% as high risk.
- ▶ Field verification found that across the erosion risk classes, bank height remained similar, bank angle was steeper in moderate and high vulnerability classes, and riparian buffer presence decreased as vulnerability class increased.
- ▶ However, evidence of erosion in the field was minimal and 91% all banks regardless of risk class had some form of bank protection. Therefore, sediment inputs from shoreline erosion to the Lake are minimal.