Riparian Corridor Protection as a Watershed Restoration Tool in the Missouri Ozarks

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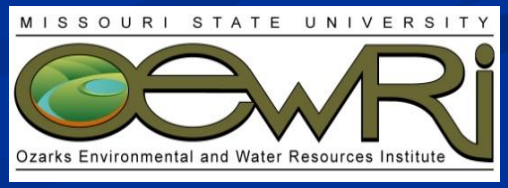


OUR MISSION

Working to protect and improve the water quality in our springs, streams rivers, and lakes.

OUR VISION

Clean water for you, your children and your grandchildren.

OBJECTIVES

1. Overview of the Riparian Corridor Protection Program as a Non-point Source 319 project

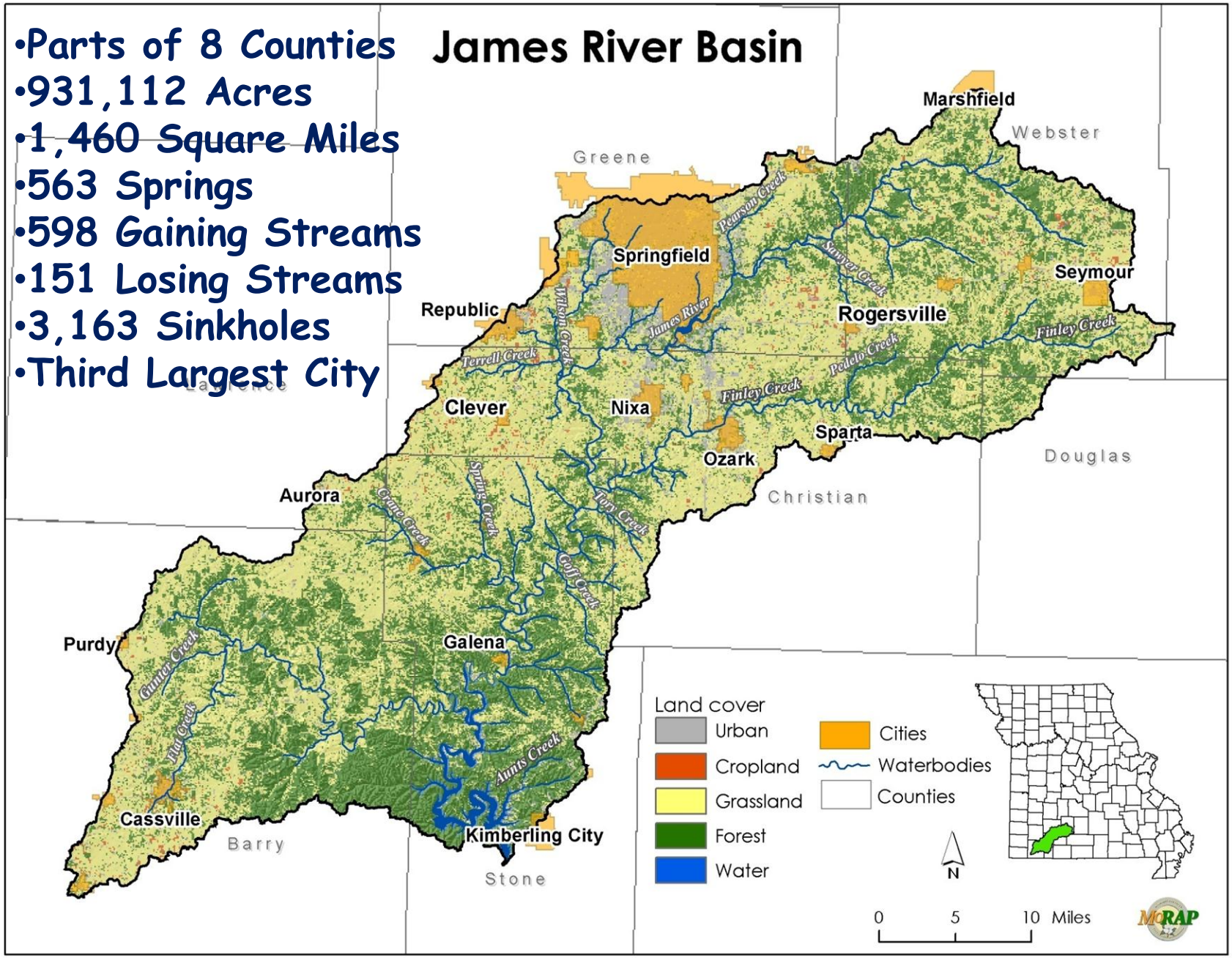
2. Review progress to date

3. Describe the assessment study and load reduction analysis for one corridor project site on the **James River** in Stone County, MO.

4. Summarize the benefits of this program for 319 projects

James River Basin

- Parts of 8 Counties
- 931,112 Acres
- 1,460 Square Miles
- 563 Springs
- 598 Gaining Streams
- 151 Losing Streams
- 3,163 Sinkholes
- Third Largest City



Riparian Corridor Restoration and Protection Project

- $600,000 Grant received from the Missouri Department of Natural Resources in 2009 Matched with $400,000 for total of $1 Million
- Targeted protection: 10 mi. of riparian corridor- Nearly 20 Miles Presently Protected
- Donated Easements for Perpetuity

Riparian Corridor Restoration and Protection Project

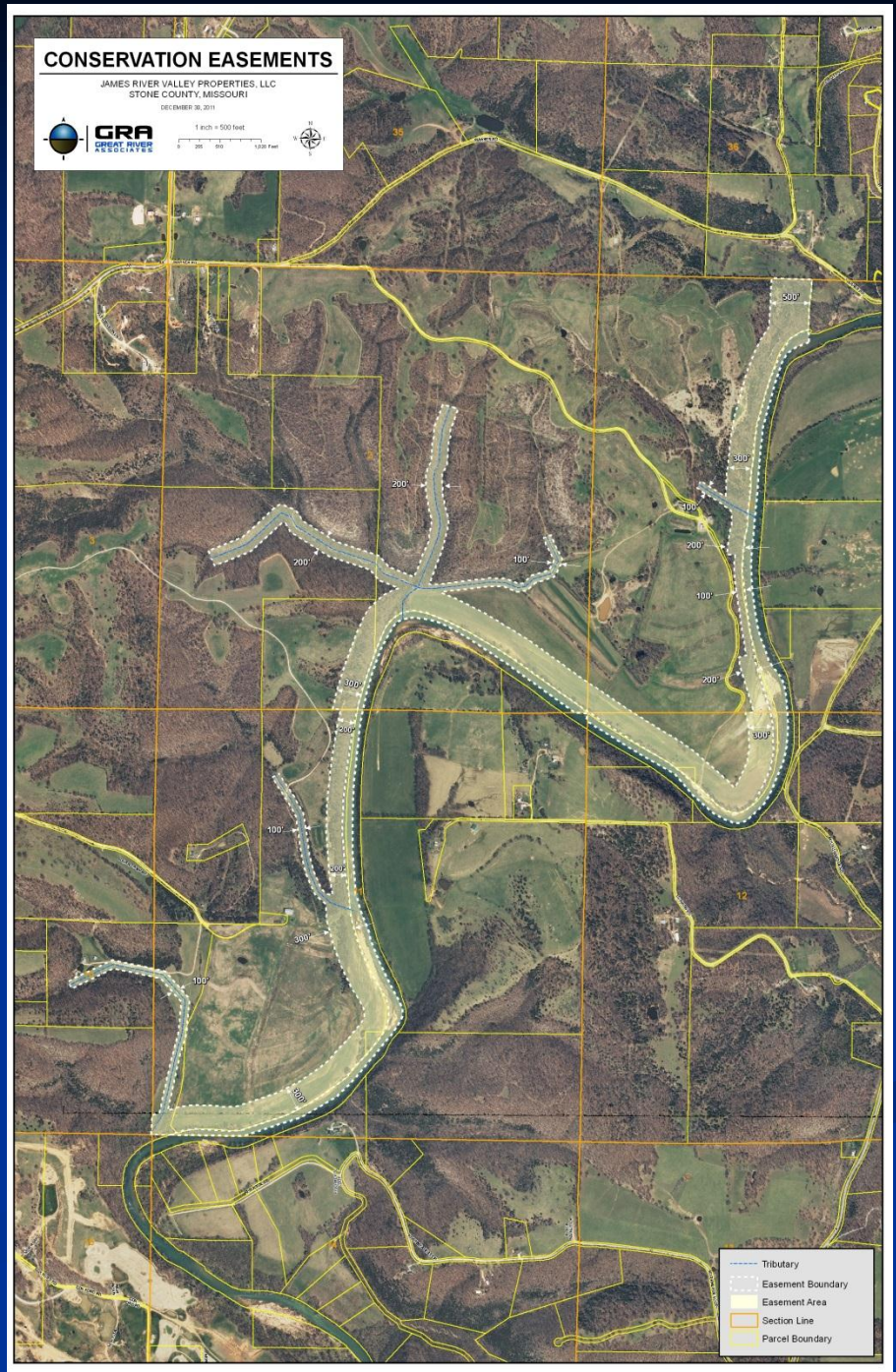
- River Bluff Farm-Stone County-Complete-Approximately 5 linear miles
- River Cut Golf Course and Kreider Park-Greene County-Nearly Complete—Awaiting Modeling Report-Approximately 5 linear miles
- Wilson's Creek above SW Wastewater Plant-Greene County-Complete-Approximately 4 linear miles

PENDING PROJECTS

- 3 Private Properties—2 on the James and 1 on the Finley—Preliminary Site Visits To Be Scheduled.

The Larry O'Reilly River Bluff Farm in Stone County. The first private landowner to join the program.

- Counting spring tributaries nearly 5 miles of riparian conservation easement donated.
- Easement ranges from 100 to 500 ft. wide.
- Stream bank stabilization work done on lower reach of the easement with willow staking.



Upstream View of the O'Reilly Easement Along The James River in Stone County.

The North (right) Side of This View Will Be Protected In Perpetuity!

PROGRESS: Wilson's Creek Restoration Project

- Two Linear Miles (both sides) of Cattle Exclusion and Fencing
- 5000 Trees Planted by Volunteers

THINGS WE LEARNED

- The term "Easement" is a loaded term.
- Private easements are hard to get.
- Public easements are sometimes easier.
- Allow an average of 3 years for each easement.
- Make sure your grant can be extended.

National Association Of Clean Water Agencies Conservation Award 2013

Partnership of:

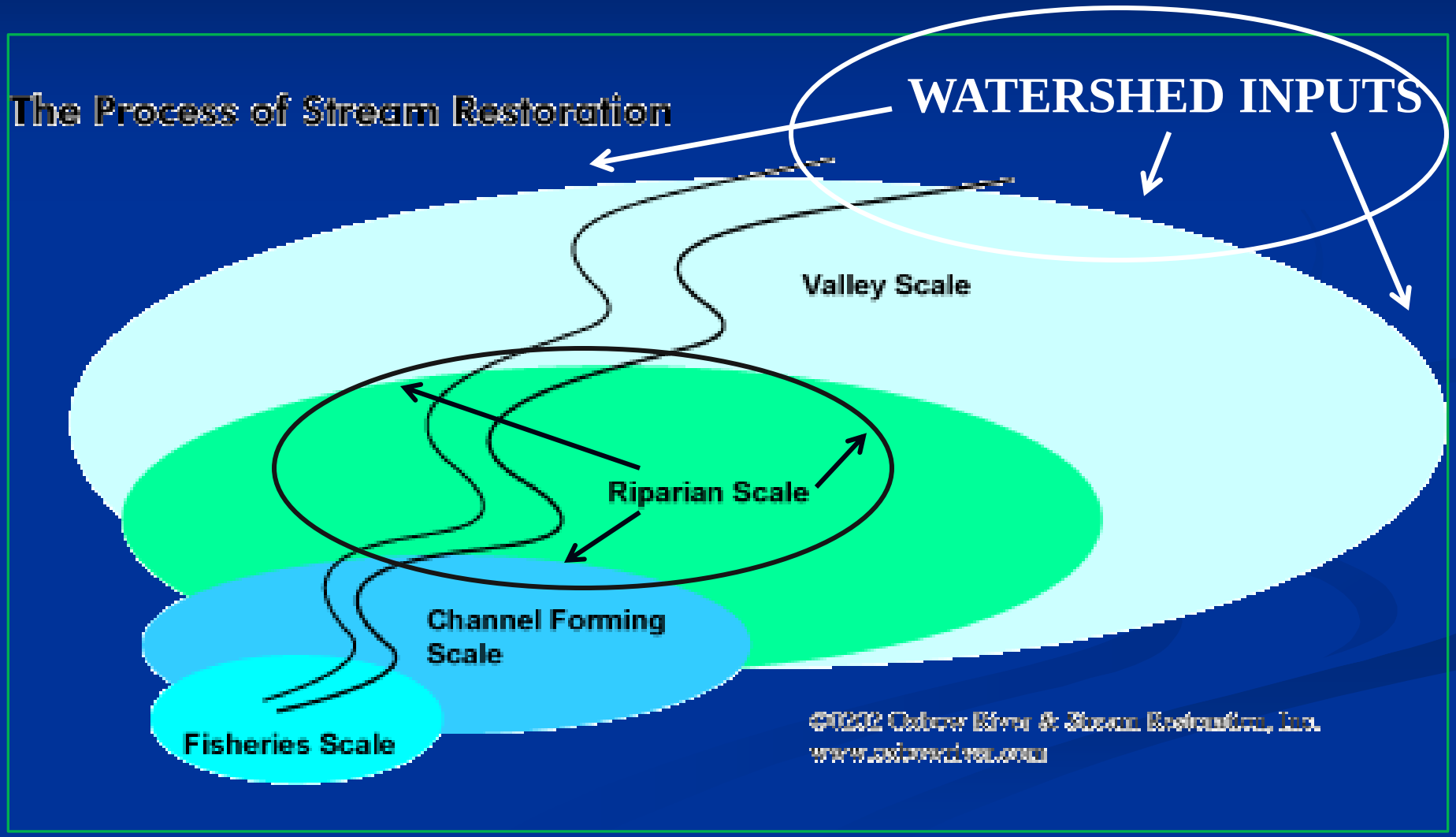
1) City of Springfield
2) Missouri Department of Conservation
3) Ozark Greenways
4) JRBP & MSU

Load Reduction Assessment at James River at River Bluff Farm (7.2 km mainstem)

- Field survey of nonpoint source characteristics of stream channel and banks
- Erosion pin monitoring of bank erosion rates along an eroding and recently willow staked 200 m bank.
- Historical aerial photographs (1952-2008) used to determine long-term erosion rates for the easement segment (56 year period).
- Load reduction analysis (STEP-L, Load duration analysis, Bank erosion calculations)

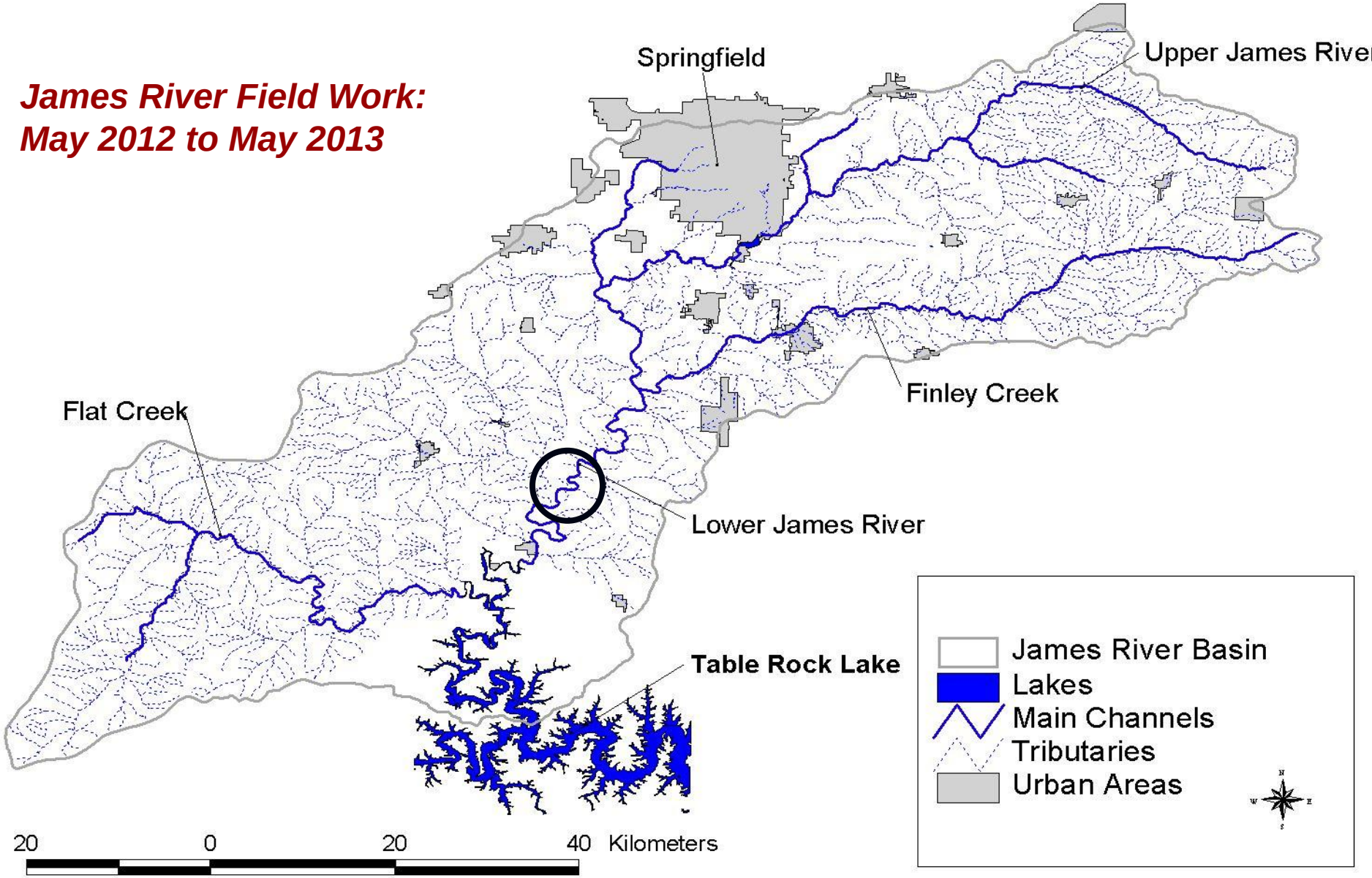
Assessment Goals:

1) Floodplain services & bank erosion rates
2) Watershed-scale significance

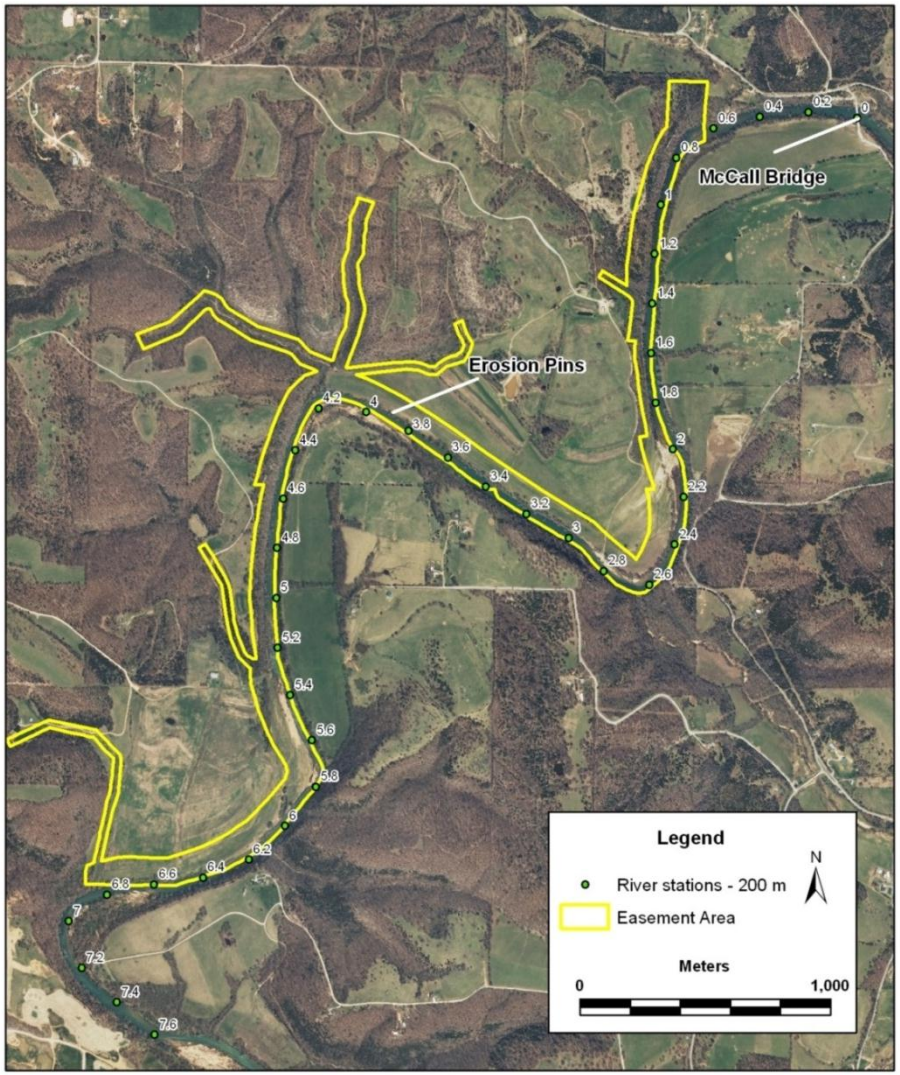


James River Basin

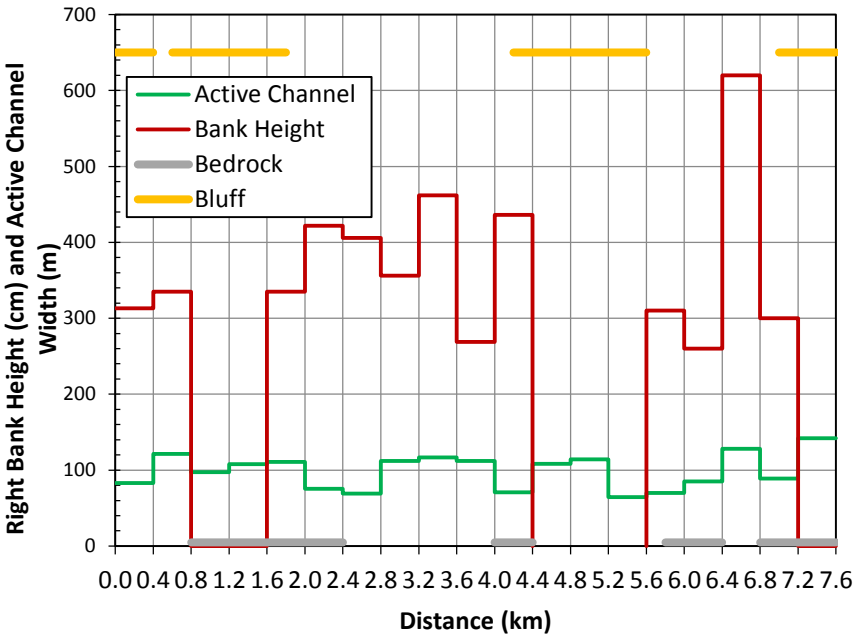
James River Field Work:
May 2012 to May 2013



River Bluff Farm Project Segment (7.2 km)

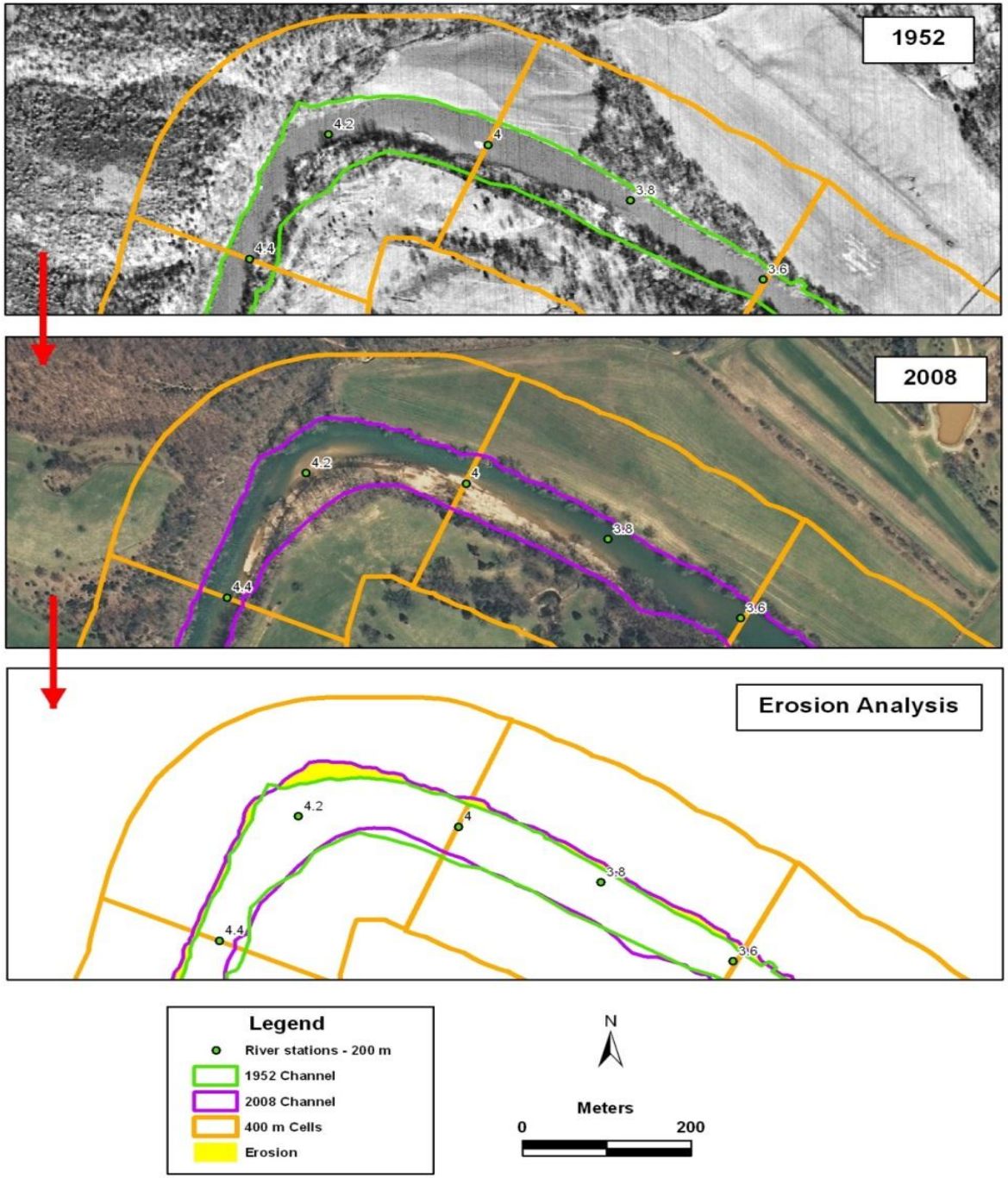


Bank heights range from 2.5 to 6 m



Bedrock influence and confined reaches add "natural" stability

Geomorphic trends in channel form and substrate condition previously studied by DeWitt (2012).



Long-term bank erosion rates and sediment/TP loads

Annual Rate Calculations (sum of mean cell rates)

<u>Multiply the following:</u>

1) Eroded width (m)
2) Bank height (m)
3) Bank length (m)
4) Fine soil fraction (0-1)
5) Soil bulk density (Mg/m^3)

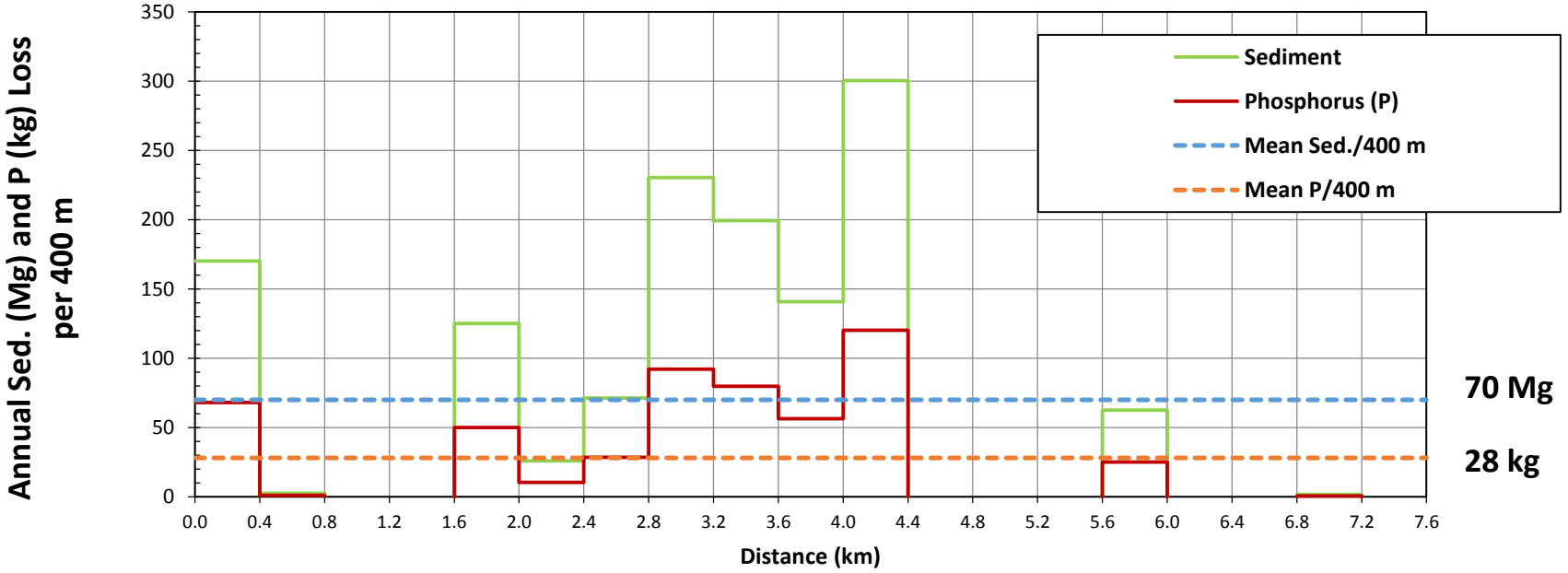
= Total mass eroded (Mg)

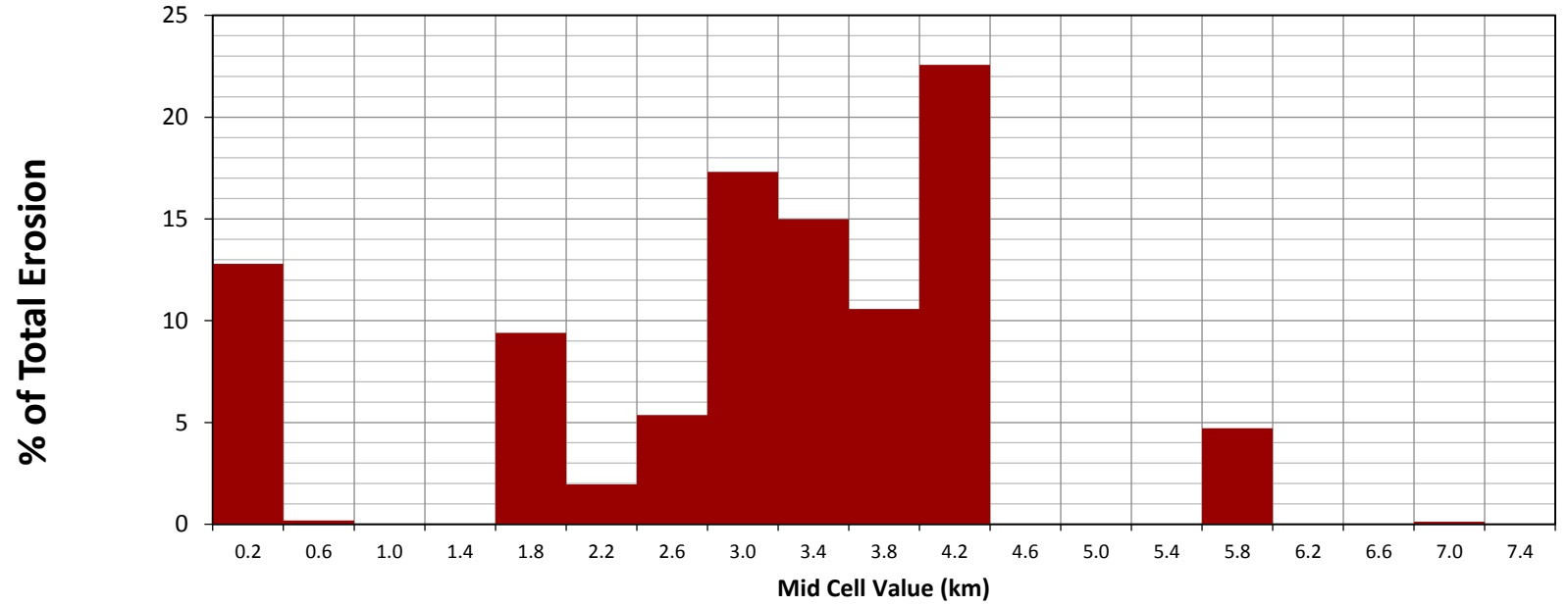
<u>Divide total mass by:</u>

6) Period of observation (yr)

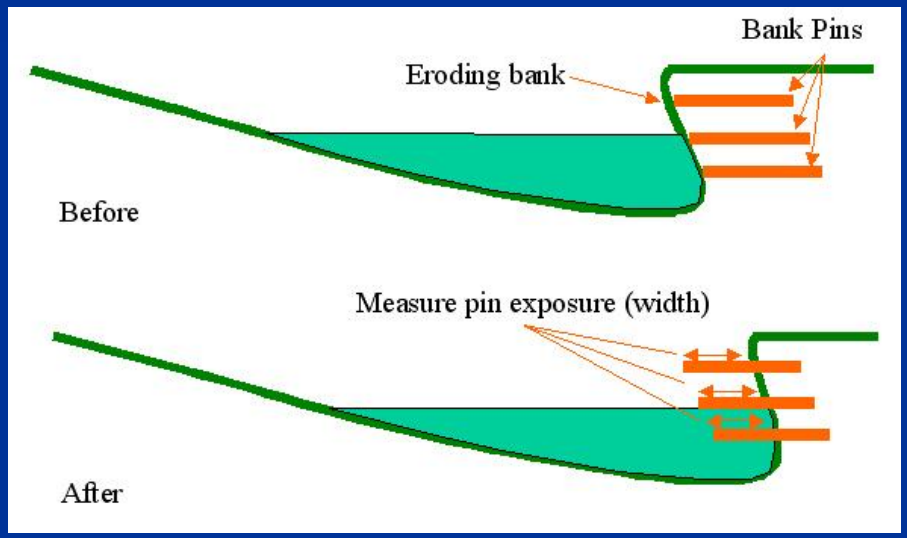
=Annual load (Mg/yr)

Segment Bank Erosion Results



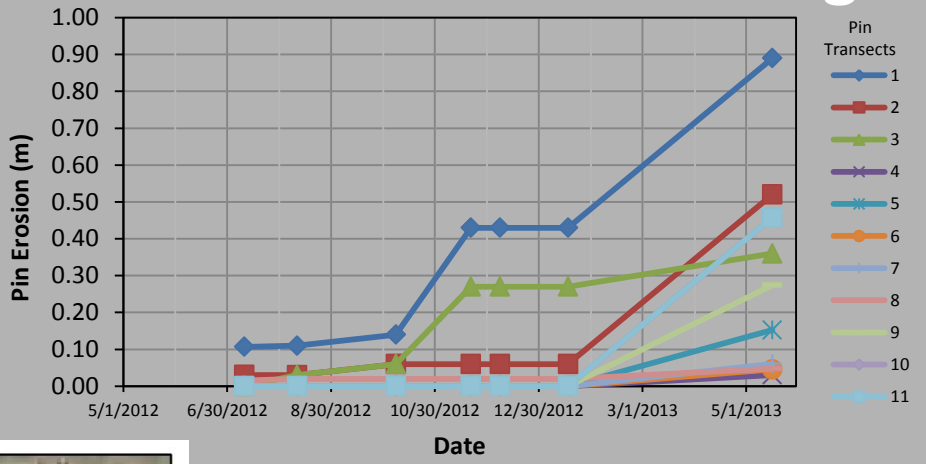


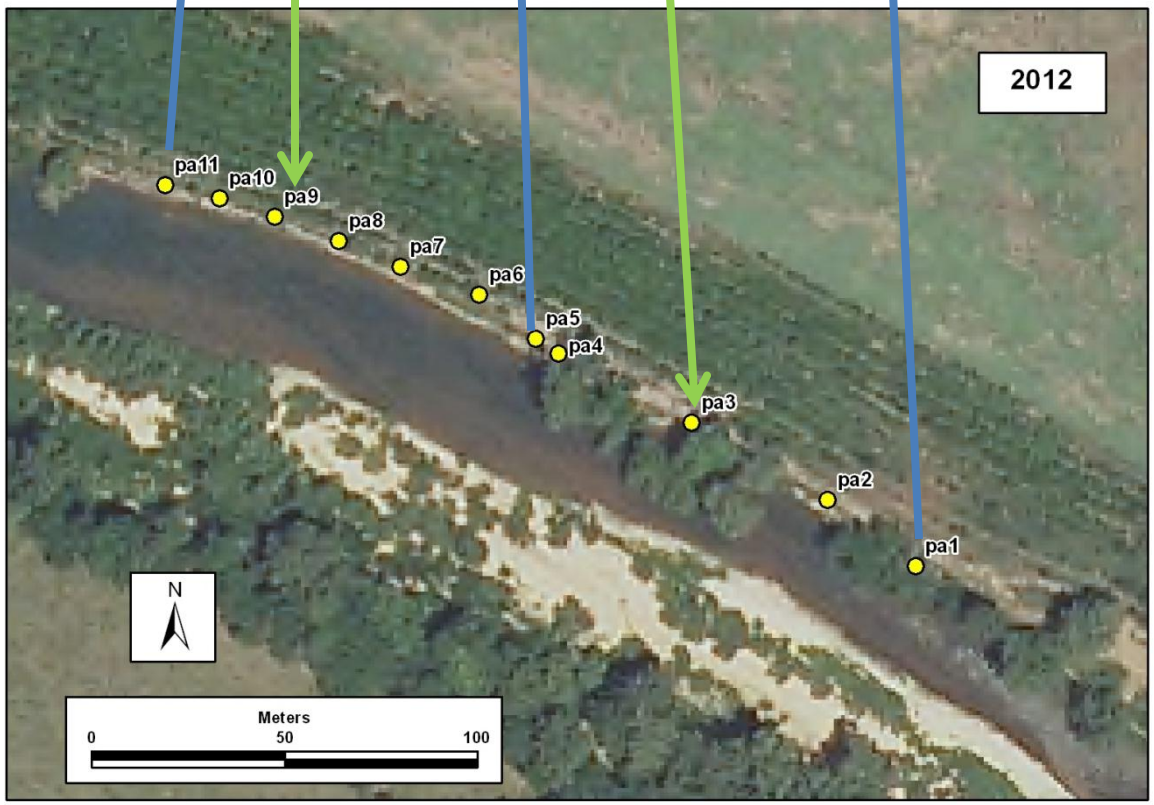
Load Reduction Analysis



- **Bank erosion rates**
  - Long-term (aerial photos)
  - Short-term (erosion pins)
  - Annual Sediment and P loads
- **Management scenario modeling**
  - **Spreadsheet Tool for Estimating Pollutant Load** (STEPL)
  - Existing conditions vs. forest, agriculture, & urban
  - THIS STUDY: Comparison to watershed-scale sediment and P loading study by OEWRI (Hutchison, 2010).
- **Nonpoint load reduction results**
  - Loading (mass/time)
  - Percent change is due to management practice

Erosion Pin Monitoring

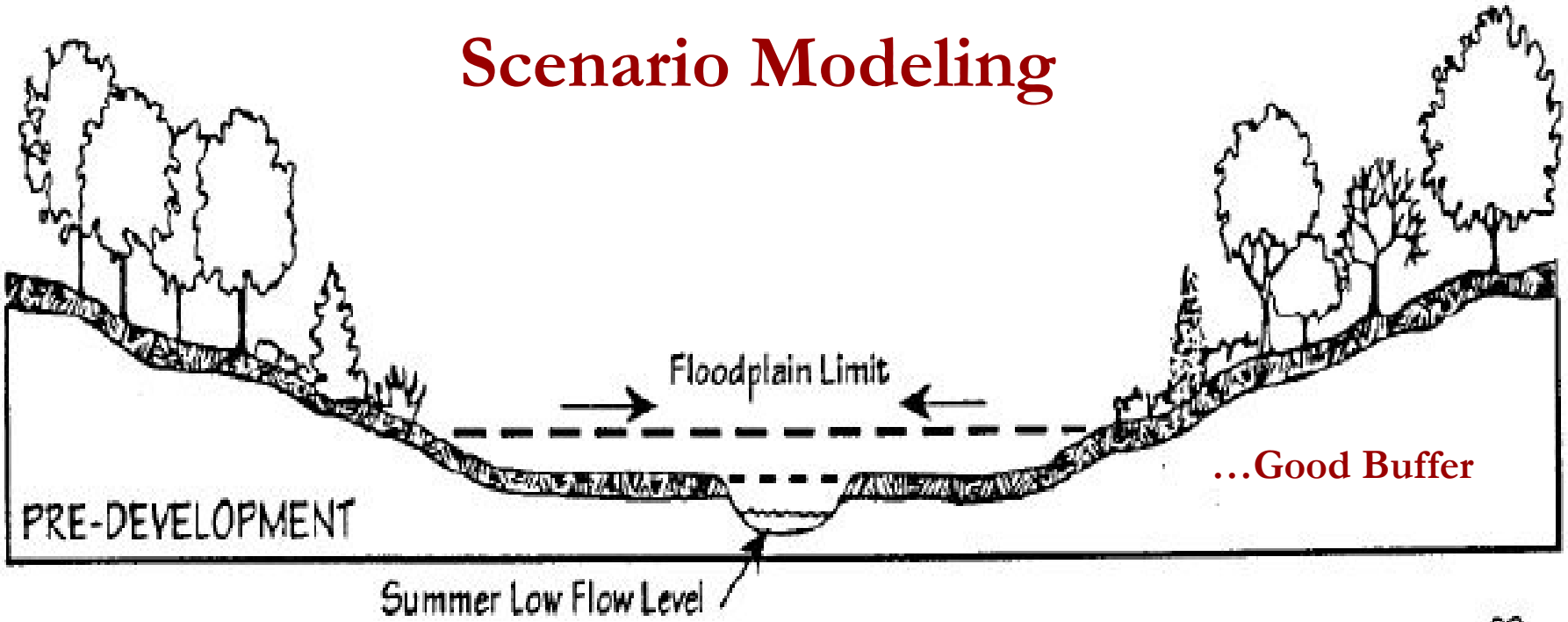


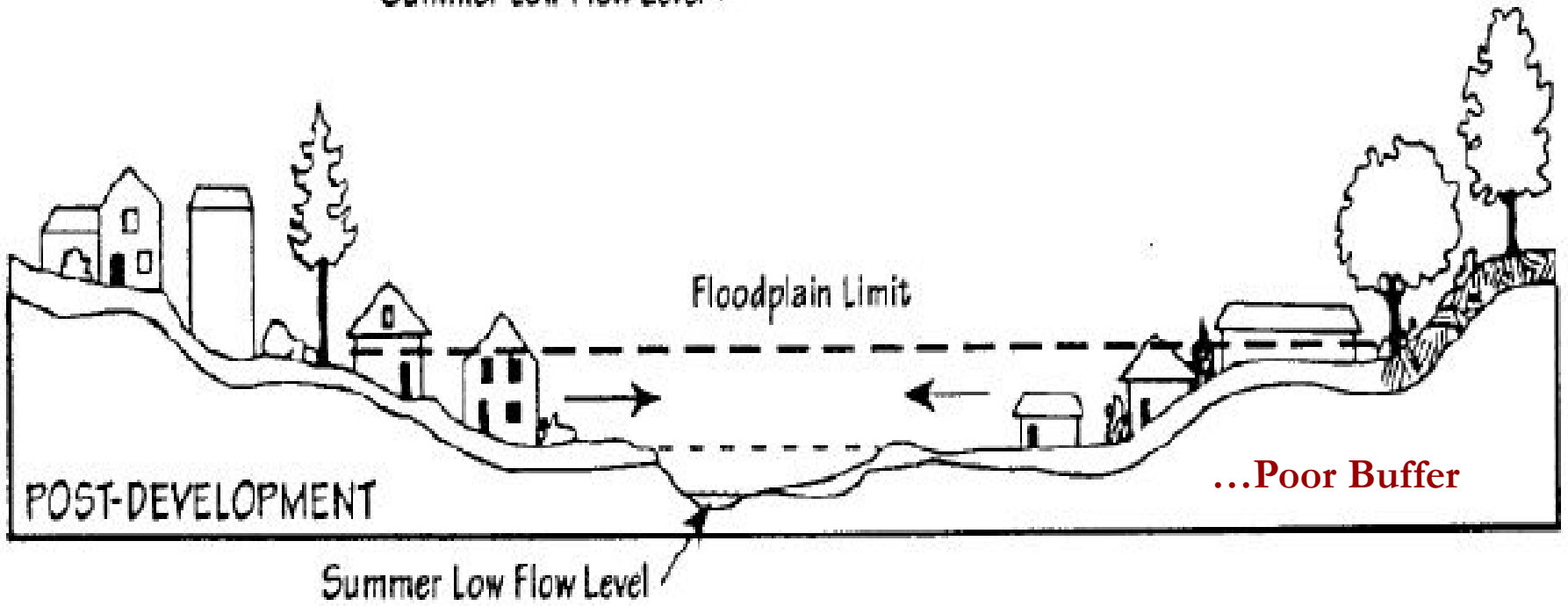


Bank Erosion Results

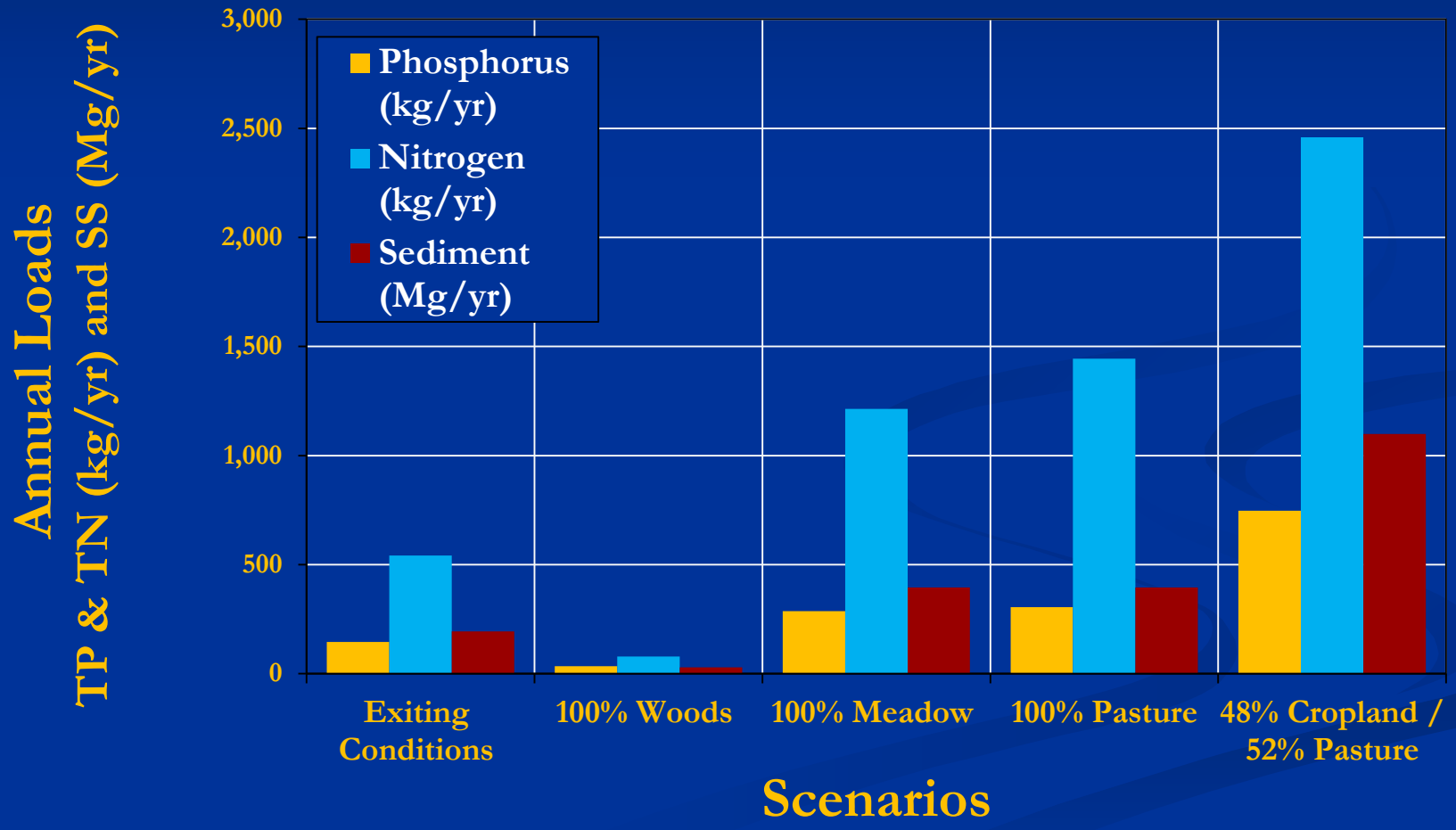
- Long-term bank erosion inputs for project segment (aerial photograph analysis):
  - 1,331 Mg/yr of sediment (0.18 Mg/m/yr sed)
  - 532 kg/yr of P (0.07 kg/m/yr P)
  - 65% of load from 2.8 km (40%) of the project reach
- Reach erosion inputs (erosion pins):
  - 1.24 Mg/m/yr sediment
  - 0.5 kg/m/yr P
  - Most of the load came from eroding area upstream of the willow staked area.

Scenario Modeling





STEPL Modeling Results
Runoff Contribution



Modeling Results

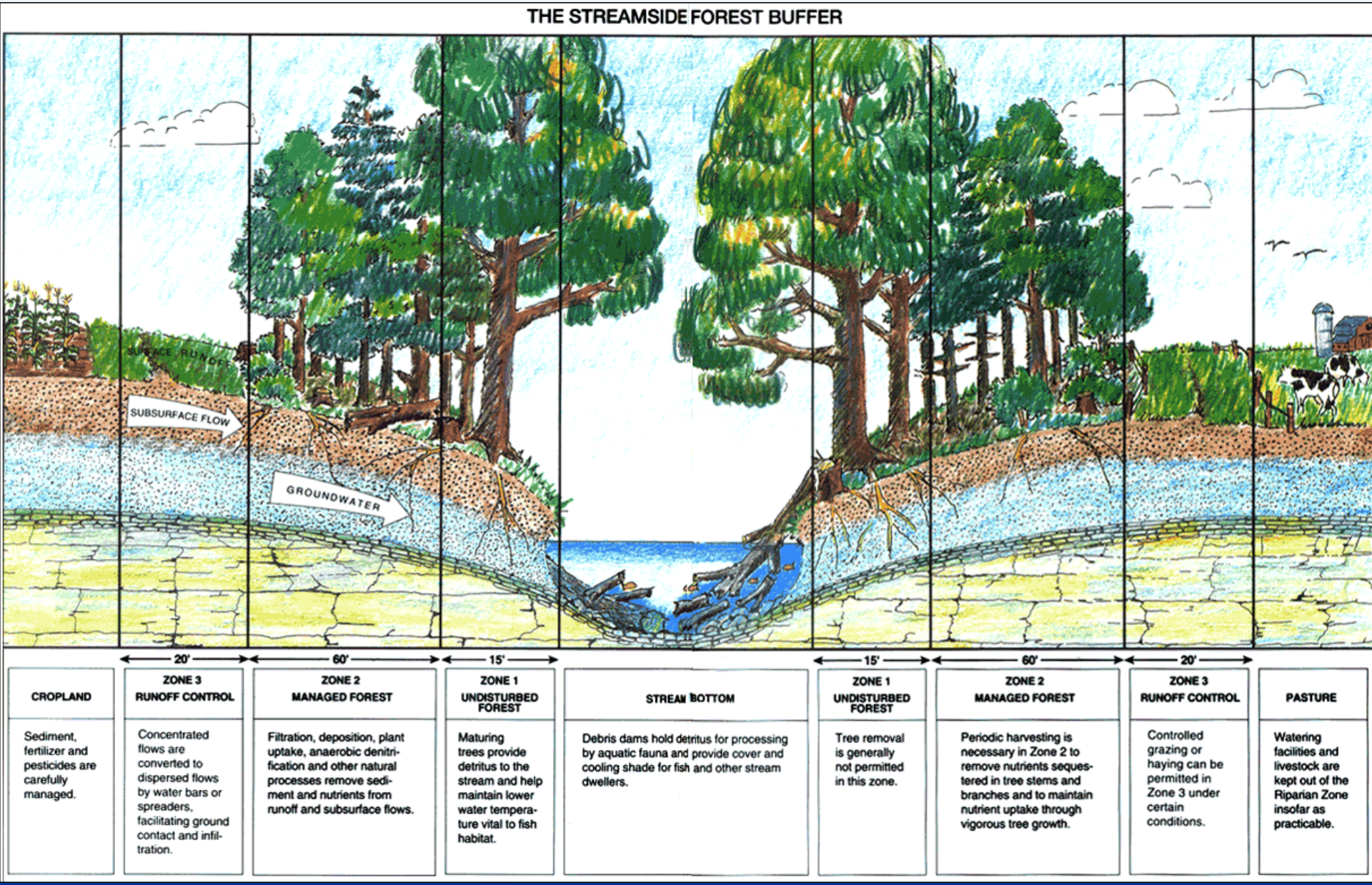
- Up to 80% of the existing nonpoint load from surface runoff can be reduced if 100% forest occupies the riparian easement.

- Protection from additional nonpoint loadings released by more intense agricultural land use (these could be 3-5 times higher than present).

Potential Impact of Riparian Easement Program on the Main Stem James River

- If results are applied to the entire main stem of the James River (Hutchison, 2010), nonpoint loads to Table Rock lake at Galena could be reduced by 10-25 percent.
- TMDL Targets
  - TP- 75 ug/l
  - TN- 1.5 mg/l
  - Also: Suspended sediment

Riparian easements can reduce nonpoint source loads



Conclusions:

Load reduction approach is effective

This methodology can:

- **Economically evaluate 319 nonpoint source benefits of riparian easement programs.**
- **Quantify the effects of both runoff and bank erosion on nonpoint loads from project land areas.**
- **Evaluate the influence of watershed contributions, channel conditions, and geomorphic history on nonpoint source location/cause and priority for control.**
- **Provide an assessment tool and reporting framework that addresses management goals.**