TRACKING SOURCES OF ERODED SEDIMENTS IN CEAP WATERSHEDS
A Progress Report

Carlos Alonso

NATIONAL SEDIMENTATION LABORATORY
Watershed Physical Processes Research Unit

Objectives of Study

- There is a growing body of evidence that channel systems are a dominant source of sediment in many disturbed systems
- Determine when sediment contributions from the channel system are significant in relation to field sources in CEAP watersheds
- Determine the proportions of sediment emanating from fields and channels

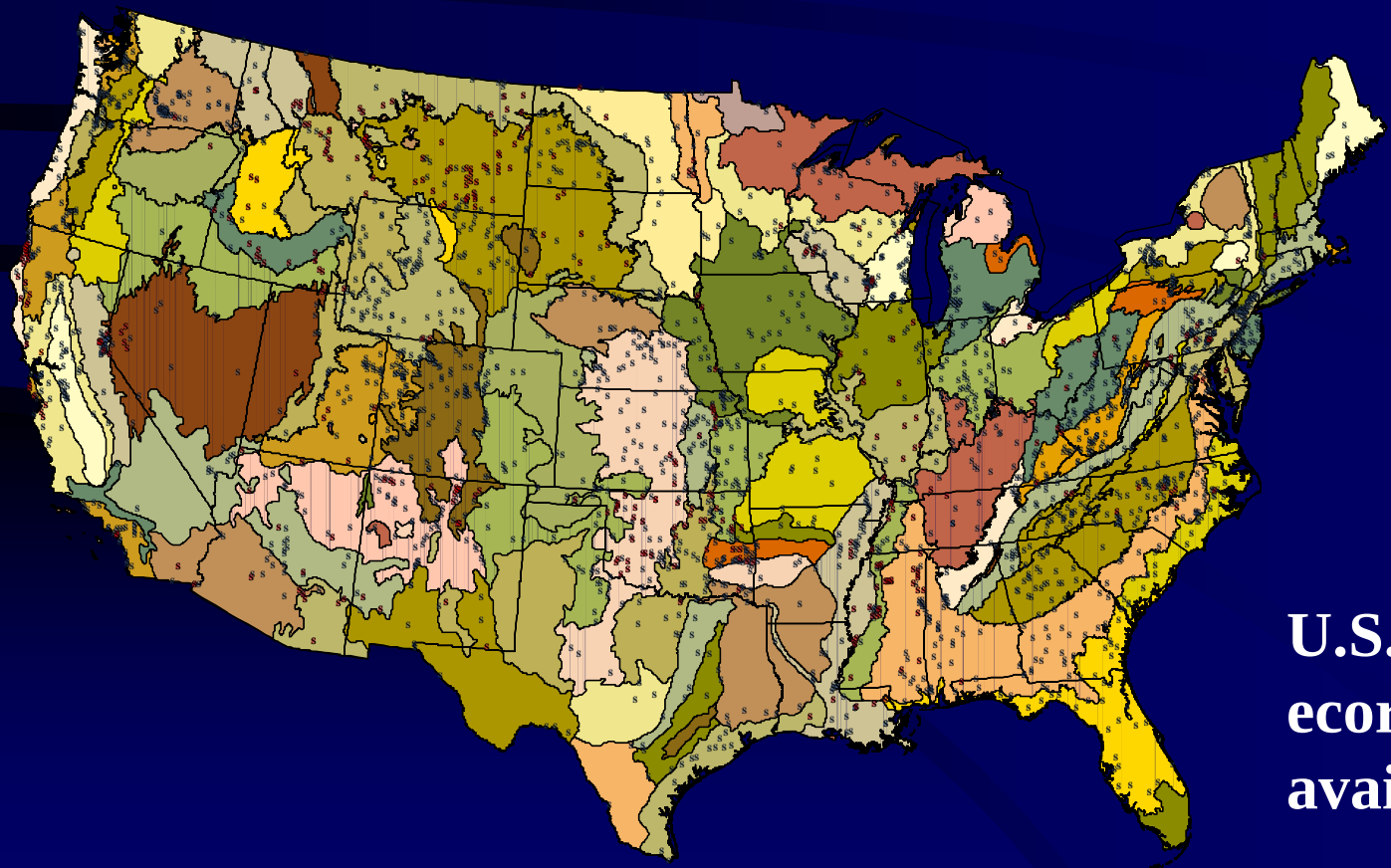
Benchmark CEAP Watersheds

METHODOLOGY

Determination of Sediment Impact

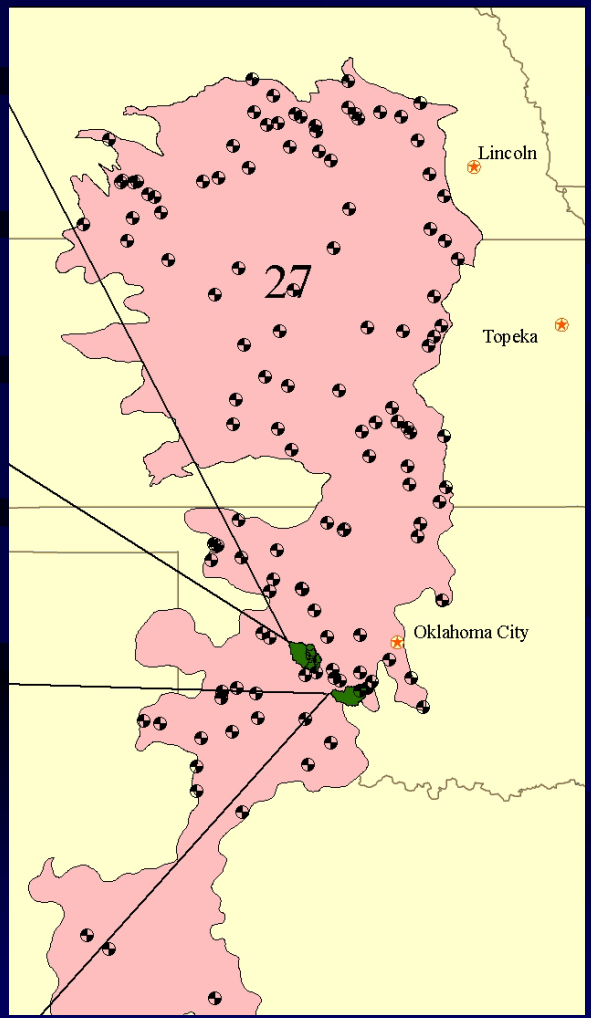
Andrew Simon

1. Stream gauging stations with historical flow and suspended-sediment transport data are grouped into ecoregional sets containing containing the selected CEAP watersheds.



U.S. level III ecoregions and available data

Determination of Sediment Impact

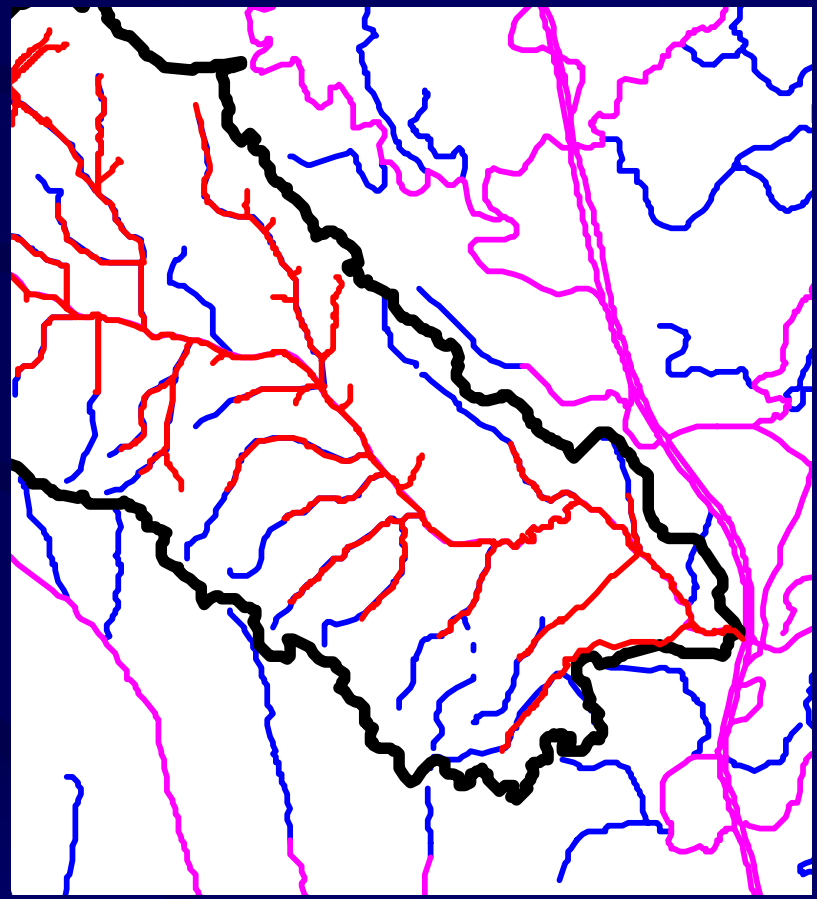


2. Sediment load at the 1.5-year recurrence interval (effective) flow discharge is computed for each station, and sediment yield at each station is obtained by dividing by the contributing drainage area.

3. Suspended-sediment yield is computed using this procedure for all stations within an ecoregion set including the CEAP watershed.

Determination of Sediment Impact

4. The relative stream stability at each station within the ecoregion is evaluated for the sampling period, using Rapid-Geomorphic-Assessment (RGA) tools.

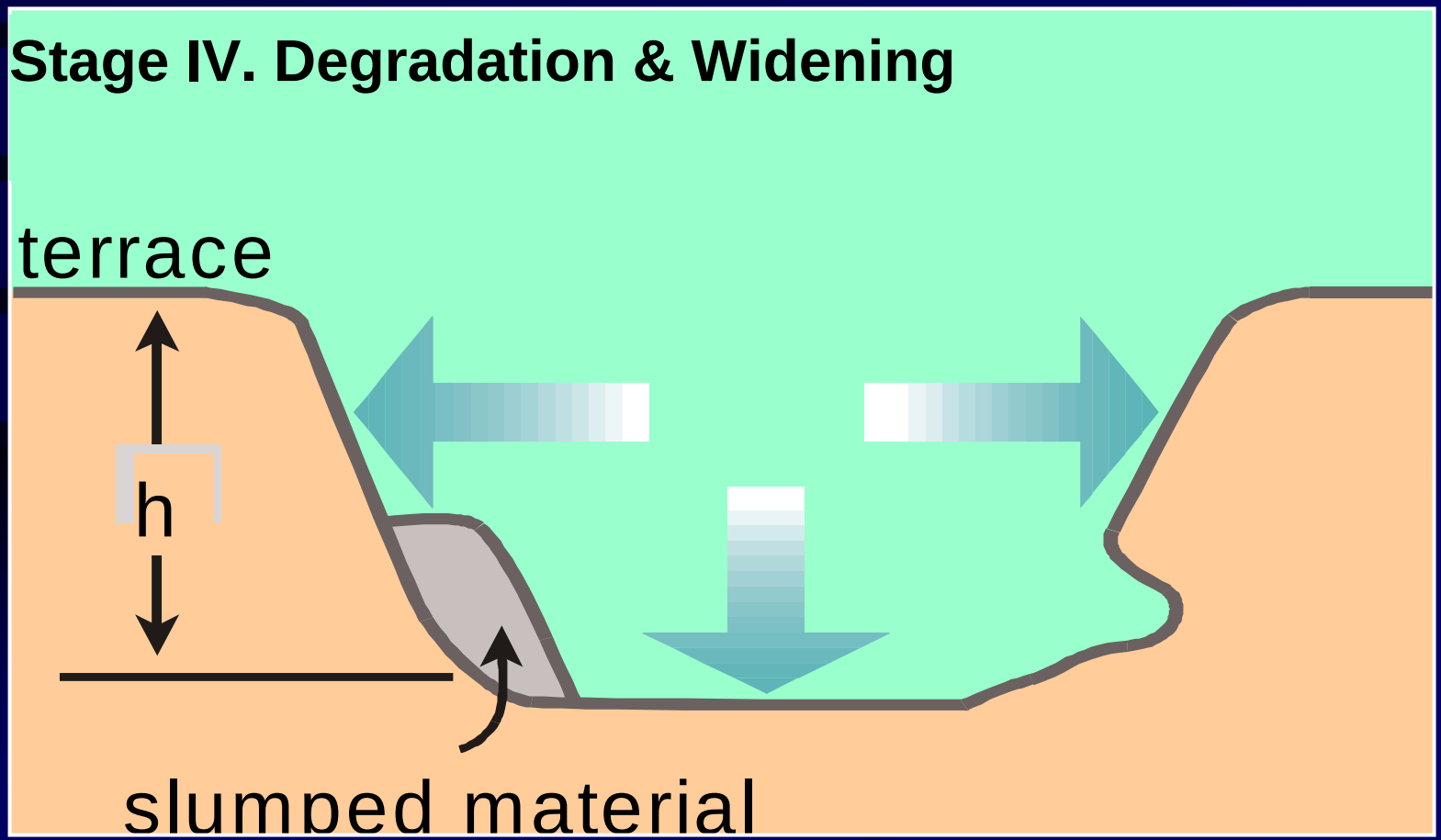


Determination of Sediment Impact

4. The relative stream stability at each station within the ecoregion is evaluated for the sampling period, using Rapid-Geomorphic-Assessment (RGA) tools.

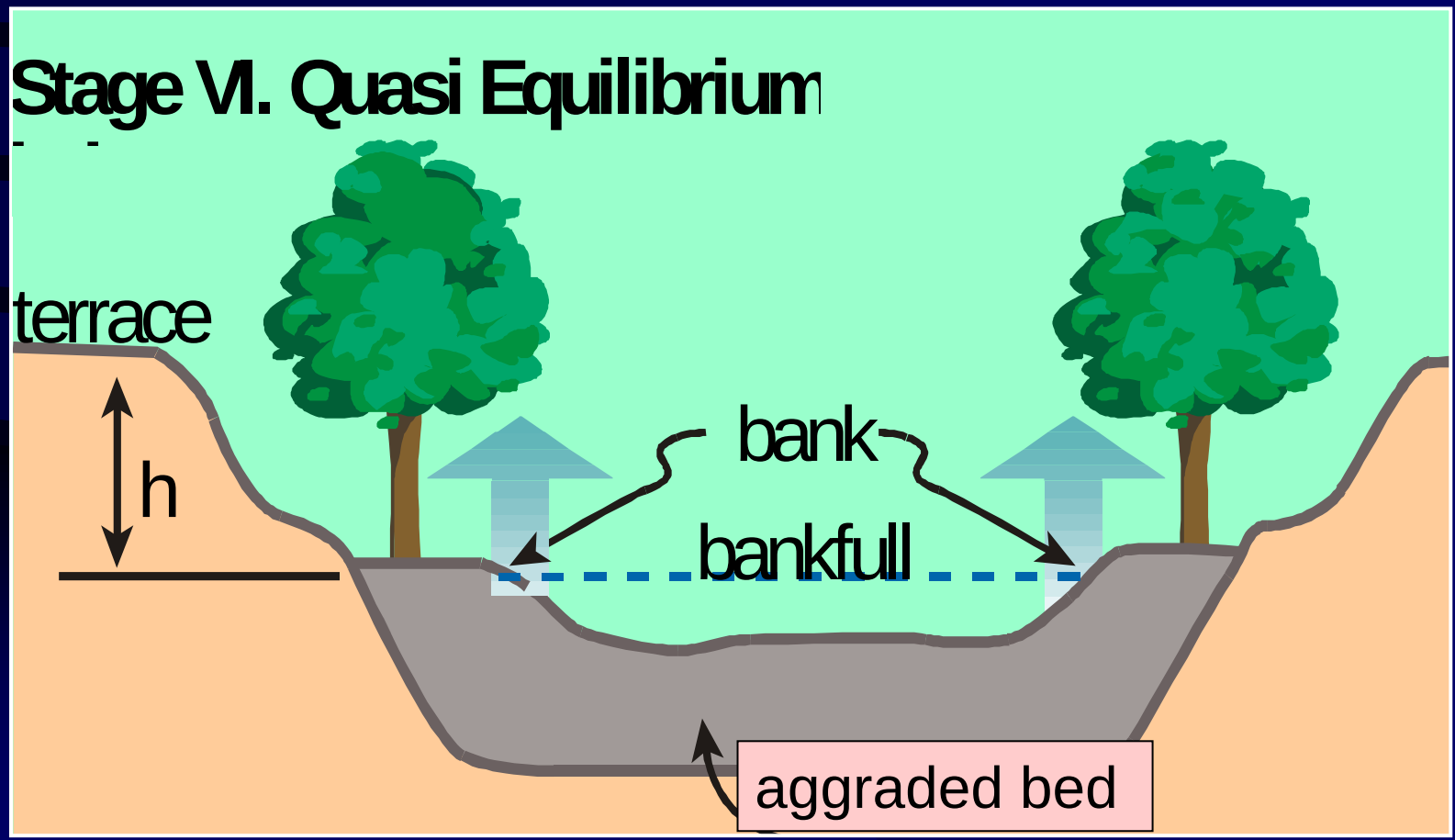
Determination of Sediment Impact

4. The relative stream stability at each station within the ecoregion is evaluated for the sampling period, using Rapid-Geomorphic-Assessment (RGA) tools.



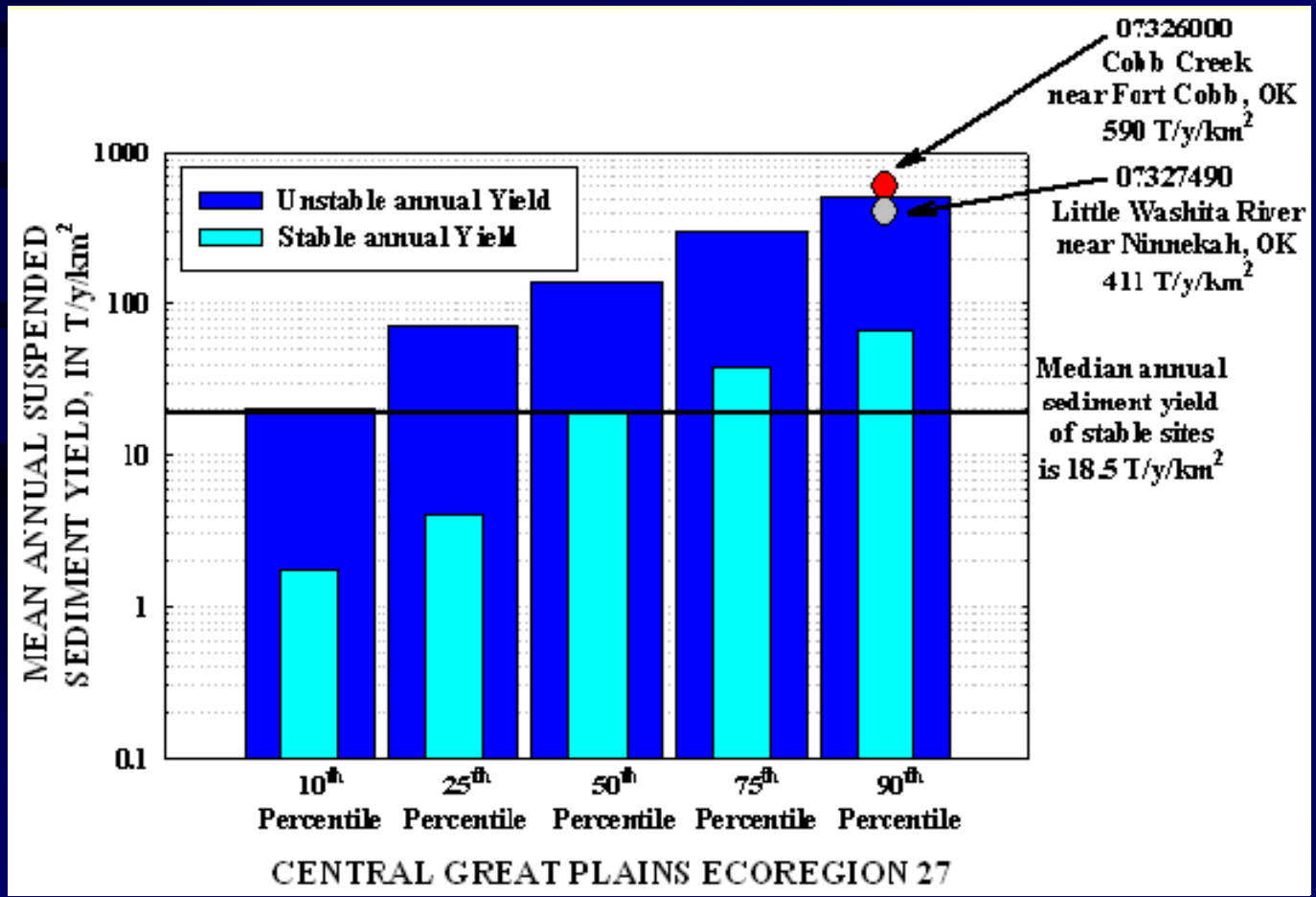
Determination of Sediment Impact

4. The relative stream stability at each station within the ecoregion is evaluated for the sampling period, using Rapid-Geomorphic-Assessment (RGA) tools.



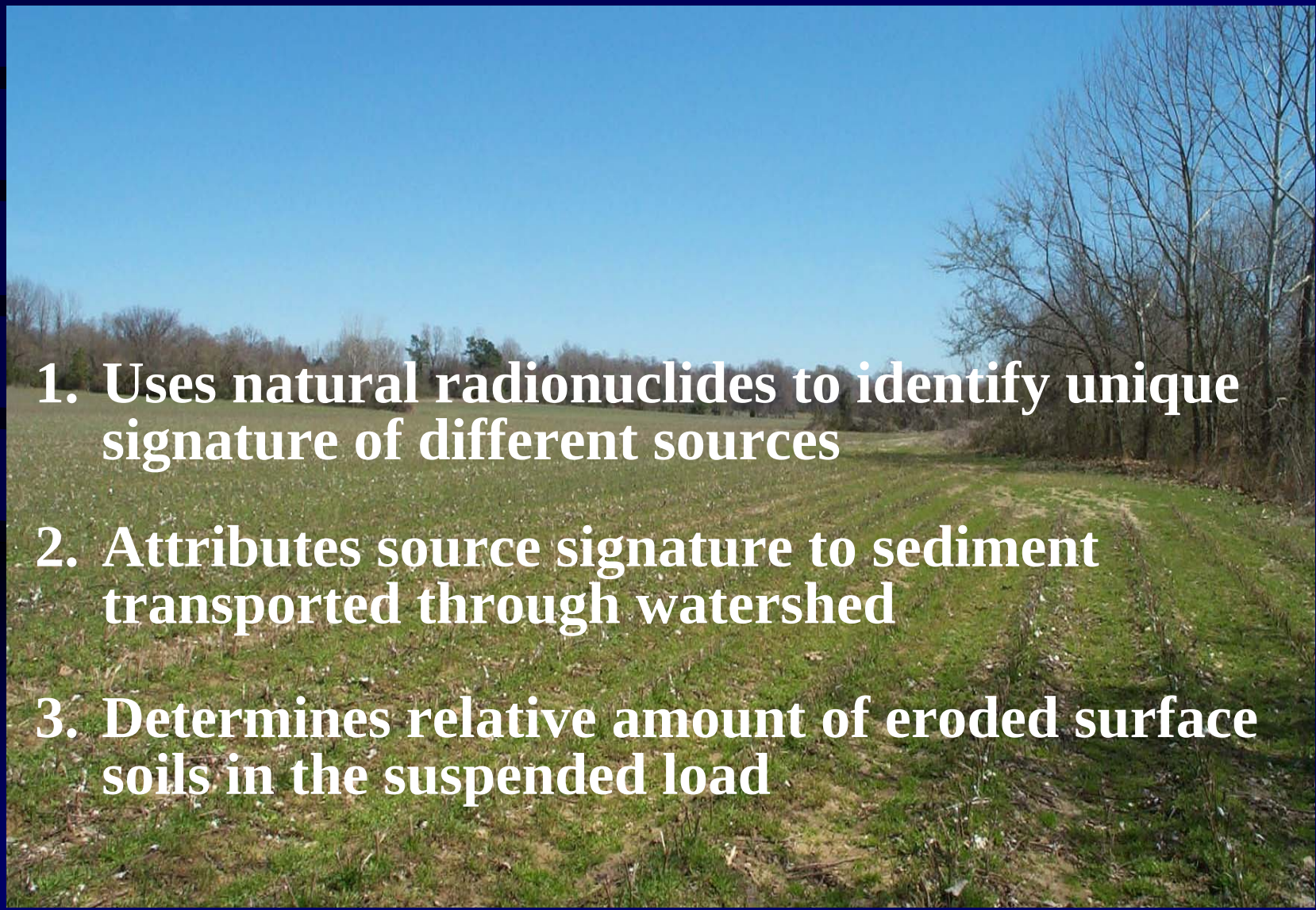
Determination of Sediment Impact

5. **Finally, sediment yields are sort into stable and unstable sites, and yield from the CEAP watershed is compared to yields for <u>stable sites</u> within the ecoregion to determine relative impact.**



Sediment Source Tracking

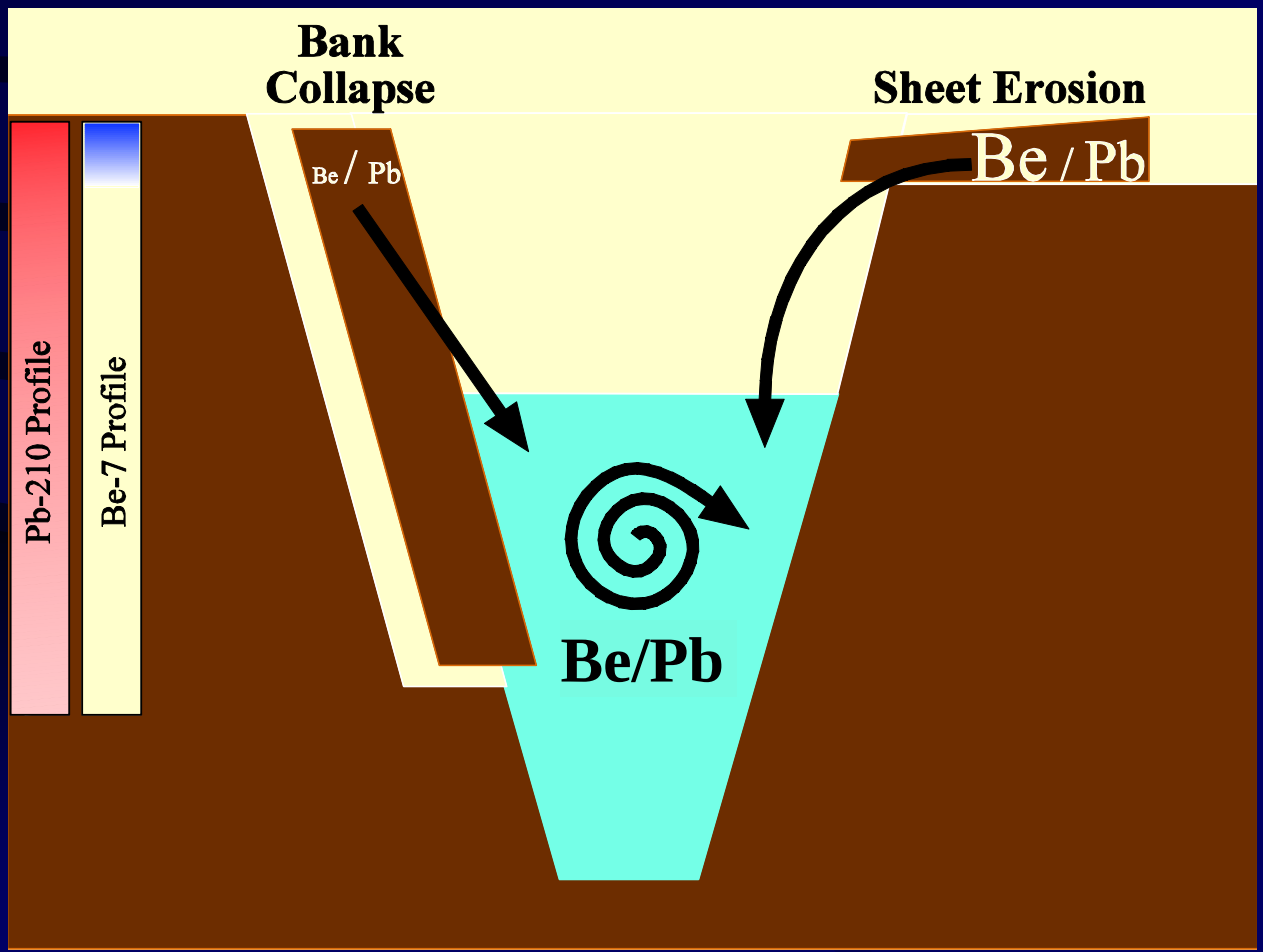
Roger Kuhnle and Chris Wilson



1. Uses natural radionuclides to identify unique signature of different sources
2. Attributes source signature to sediment transported through watershed
3. Determines relative amount of eroded surface soils in the suspended load

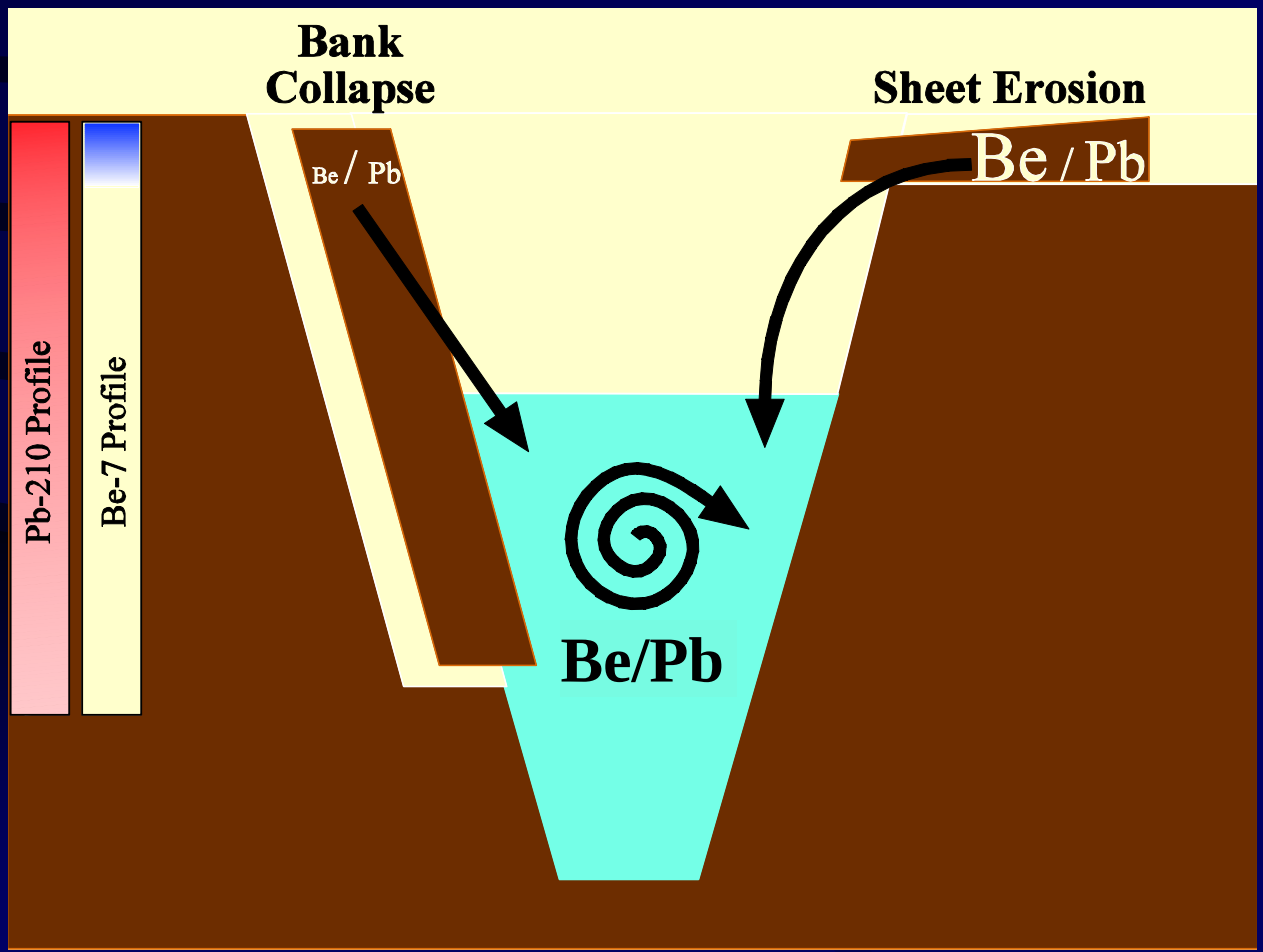
^{7}Be and ^{210}Pb Signatures

These radionuclides are delivered by precipitation, and have distinct half-lives (^{7}Be=53 days; ^{210}Pb=22 years) suitable to differentiate land surface from streambank sources.



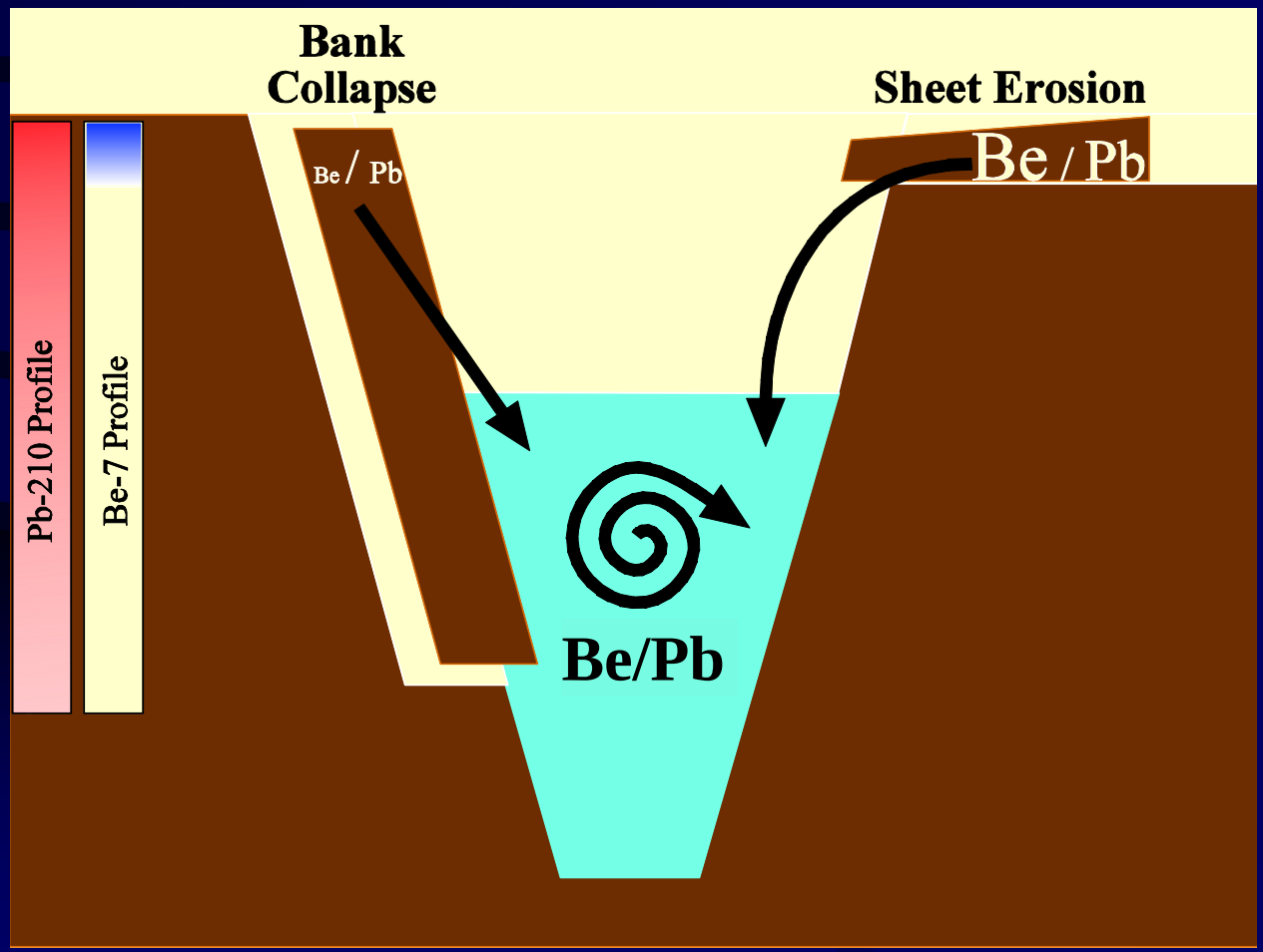
^{7}Be and ^{210}Pb Signatures

Sediment from sheet erosion reach streams during storm events with relatively high activities of ^{7}Be and ^{210}Pb because fresh fallout concentrates on the soil surface.



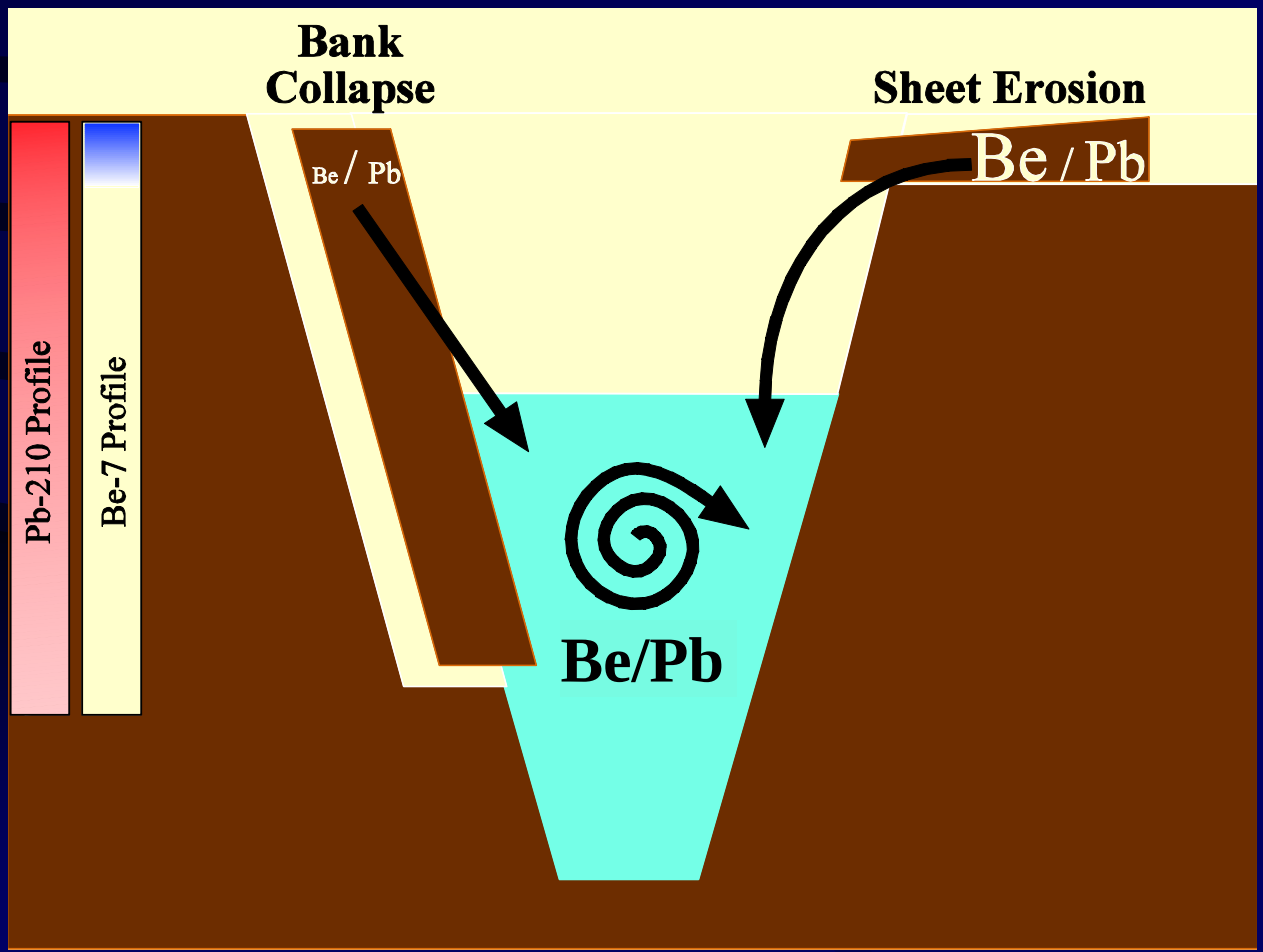
^{7}Be and ^{210}Pb Signatures

Eroded streambank sediment have relatively low activities of ^{7}Be and ^{210}Pb because these radionuclides reside there for long periods of time without replenishment and undergo substantial decay.



^{7}Be and ^{210}Pb Signatures

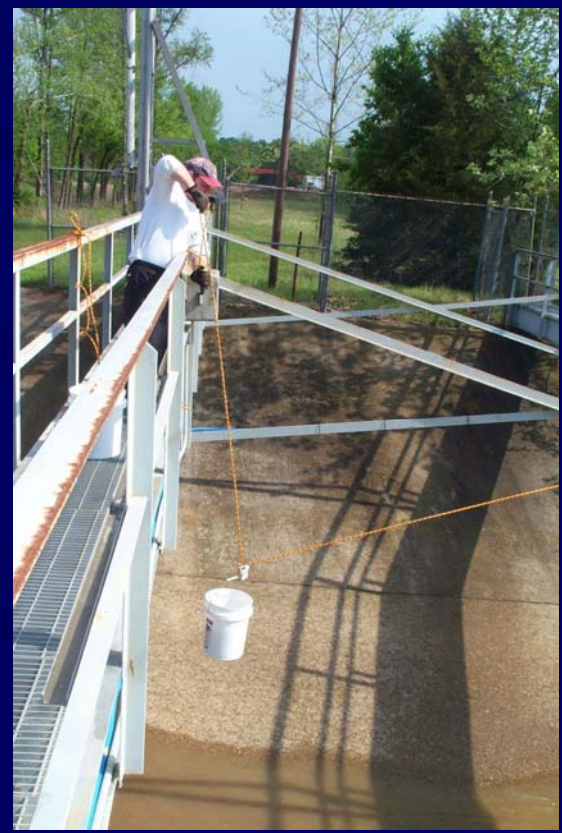
Upland and bank derived sediments mix in the suspended load. During runoff events, high ^{7}Be and ^{210}Pb activity in the load signals higher land erosion and lower activity denotes stream erosion.



Source Sampling

^{7}Be and ^{210}Pb activity in fields and banks are sampled prior to a runoff event. Precipitation and radionuclide-activity in suspended sediment load are sampled during the runoff event.

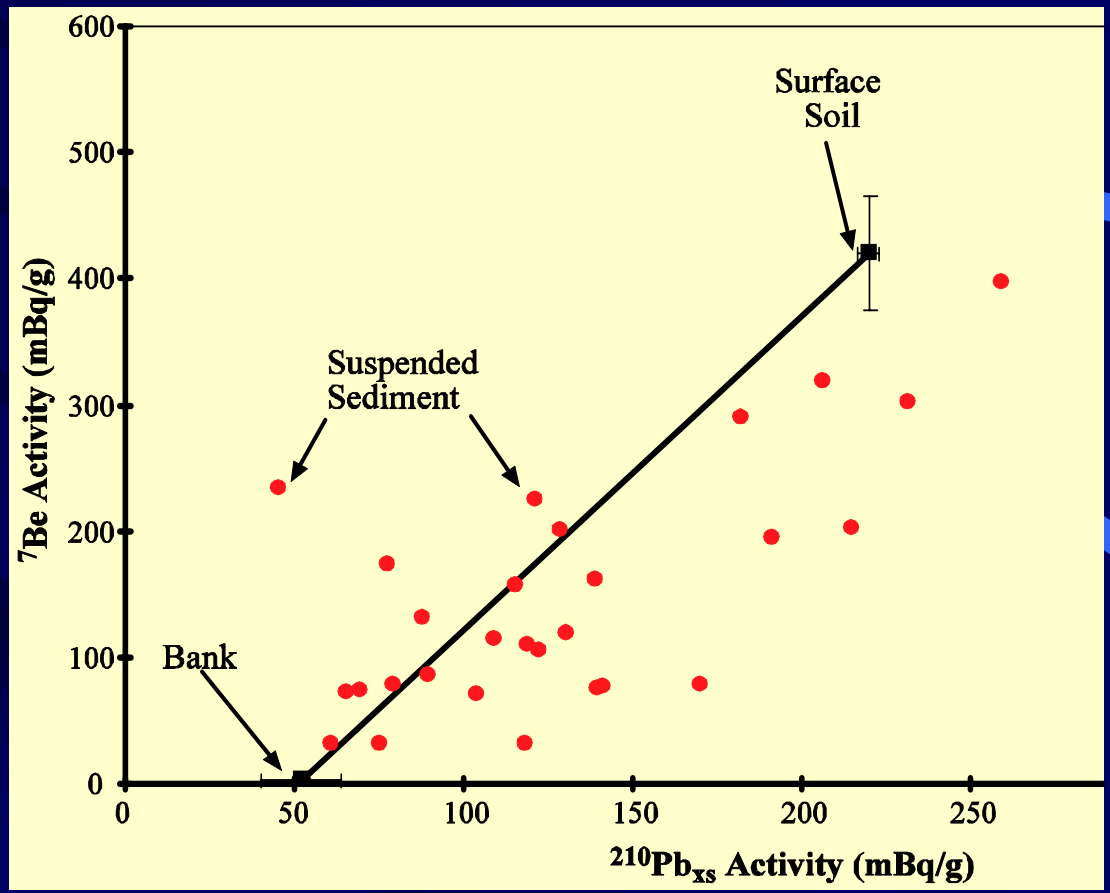
Upland and Bank Soil Material



Suspended Load

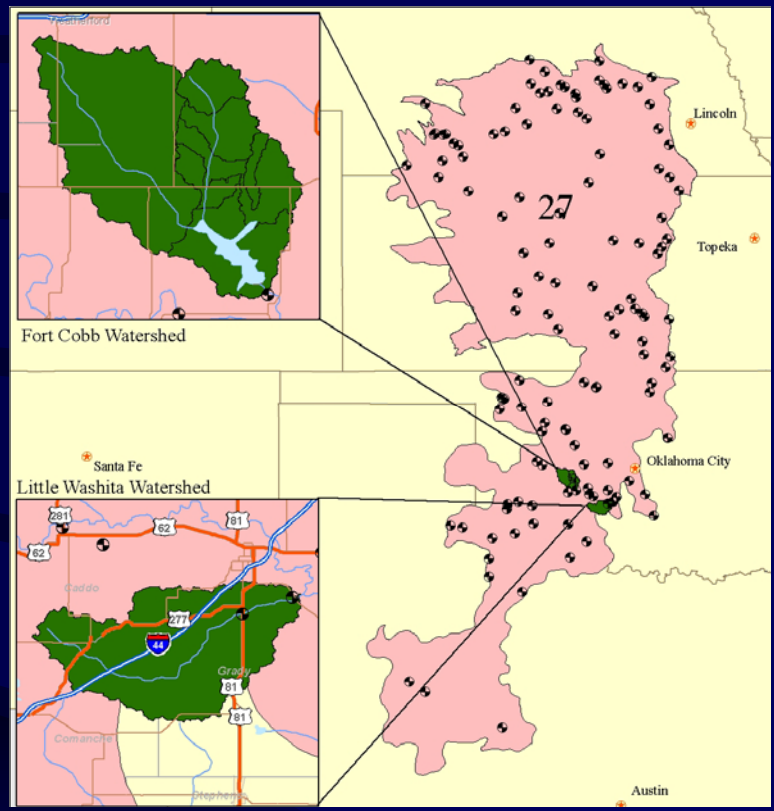
Attribution of Radionuclide Signature to Sediment Sources

Gamma spectroscopy is used to measure ^{7}Be and ^{210}Pb activities in precipitation, soil, streambank, and suspended sediment samples. A two-end member mixing model determines the relative contribution of each source.



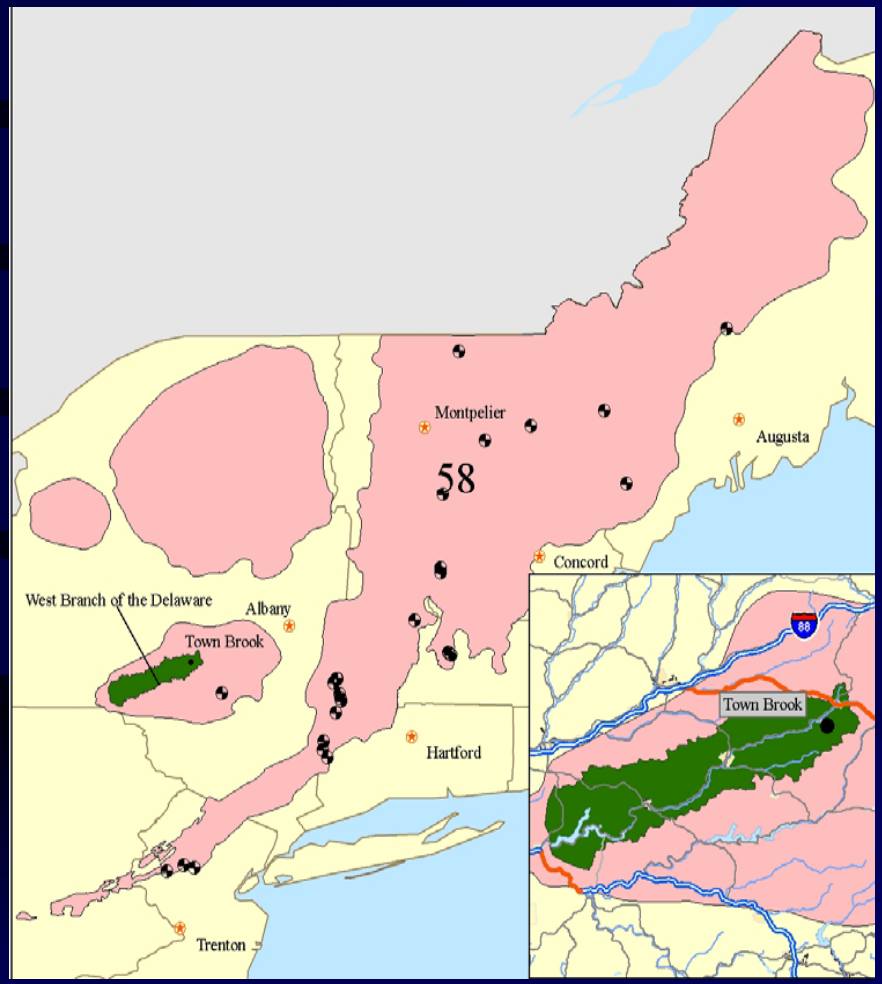
RESULTS (as of yet…)

ER 27: Ft Cobb and Little Washita Watersheds, Oklahoma



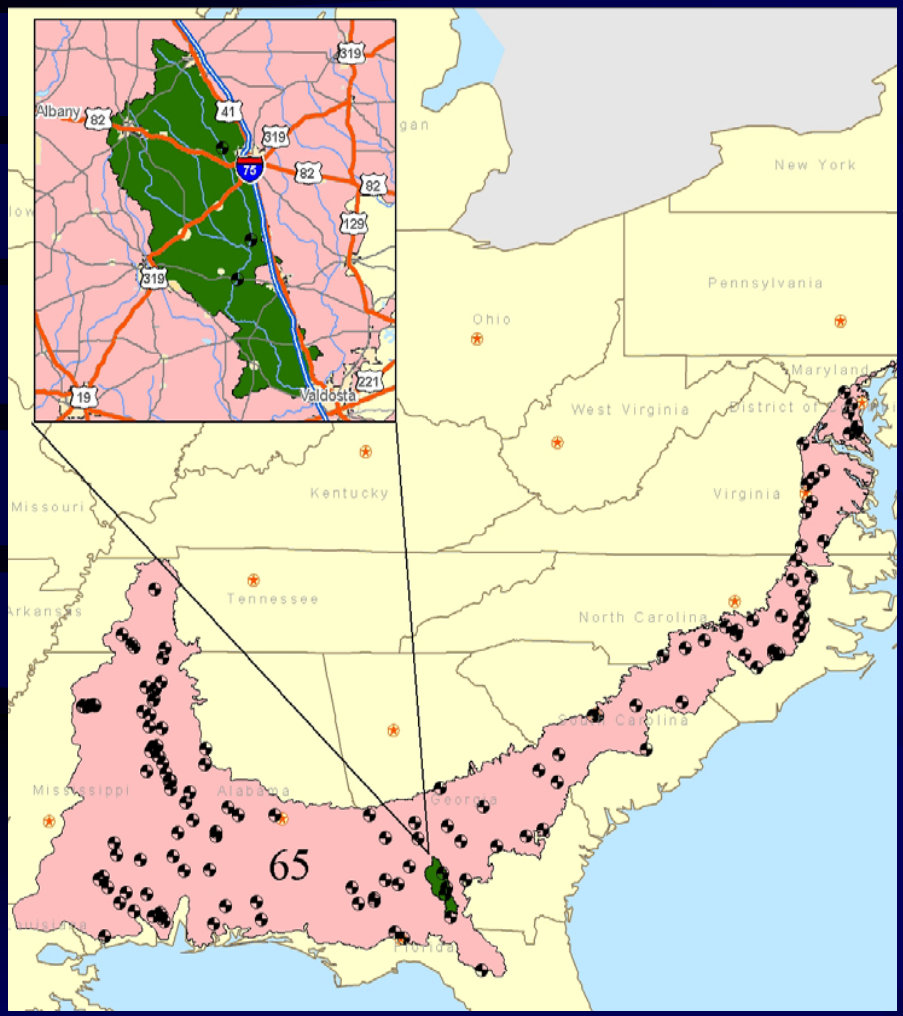
Both watersheds contain unstable channel systems characterized by incised channels and unstable banks

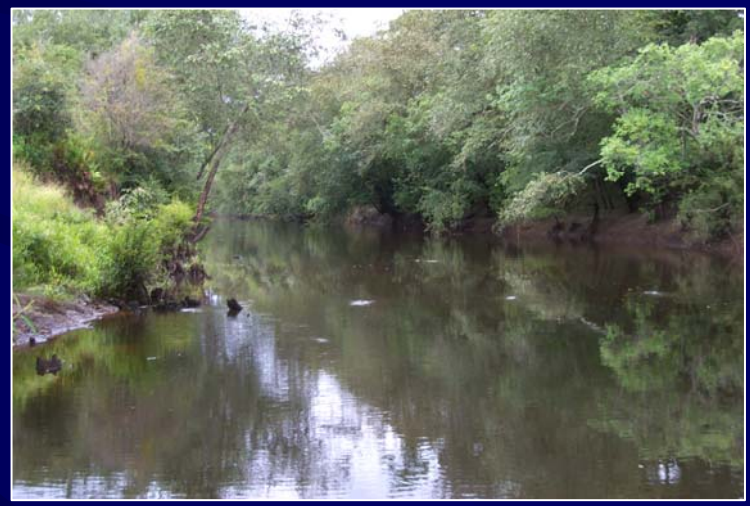
ER58: Town Brook Watershed New York



Channel erosion is an important issue in this watershed

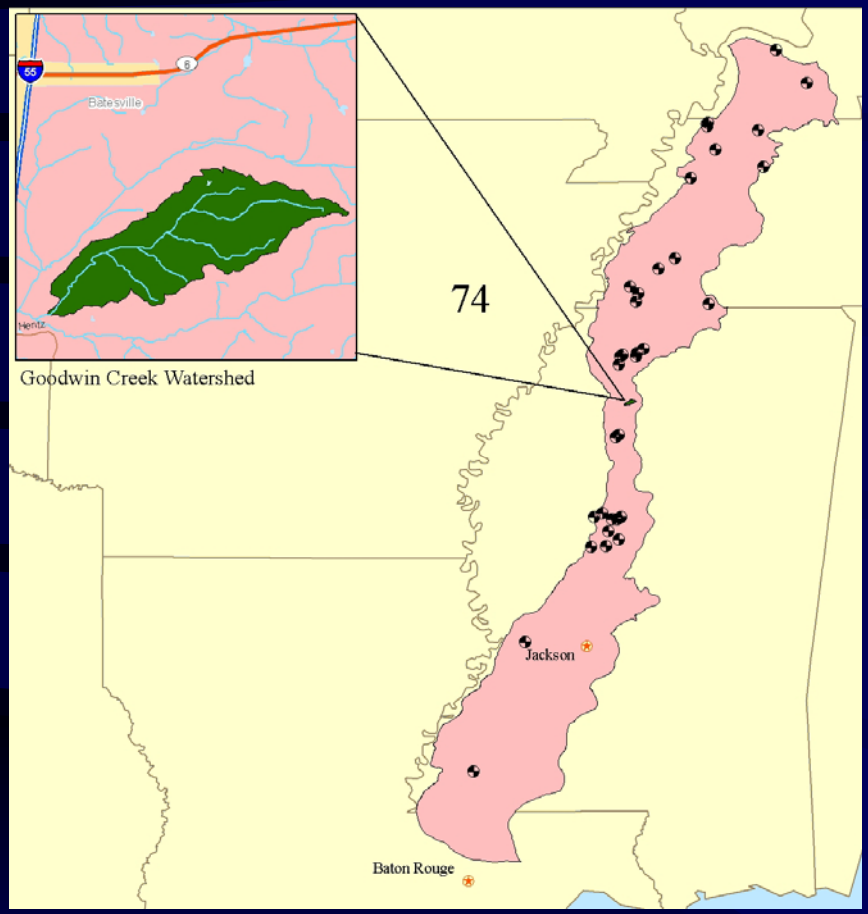
ER65: Little River Watershed Georgia





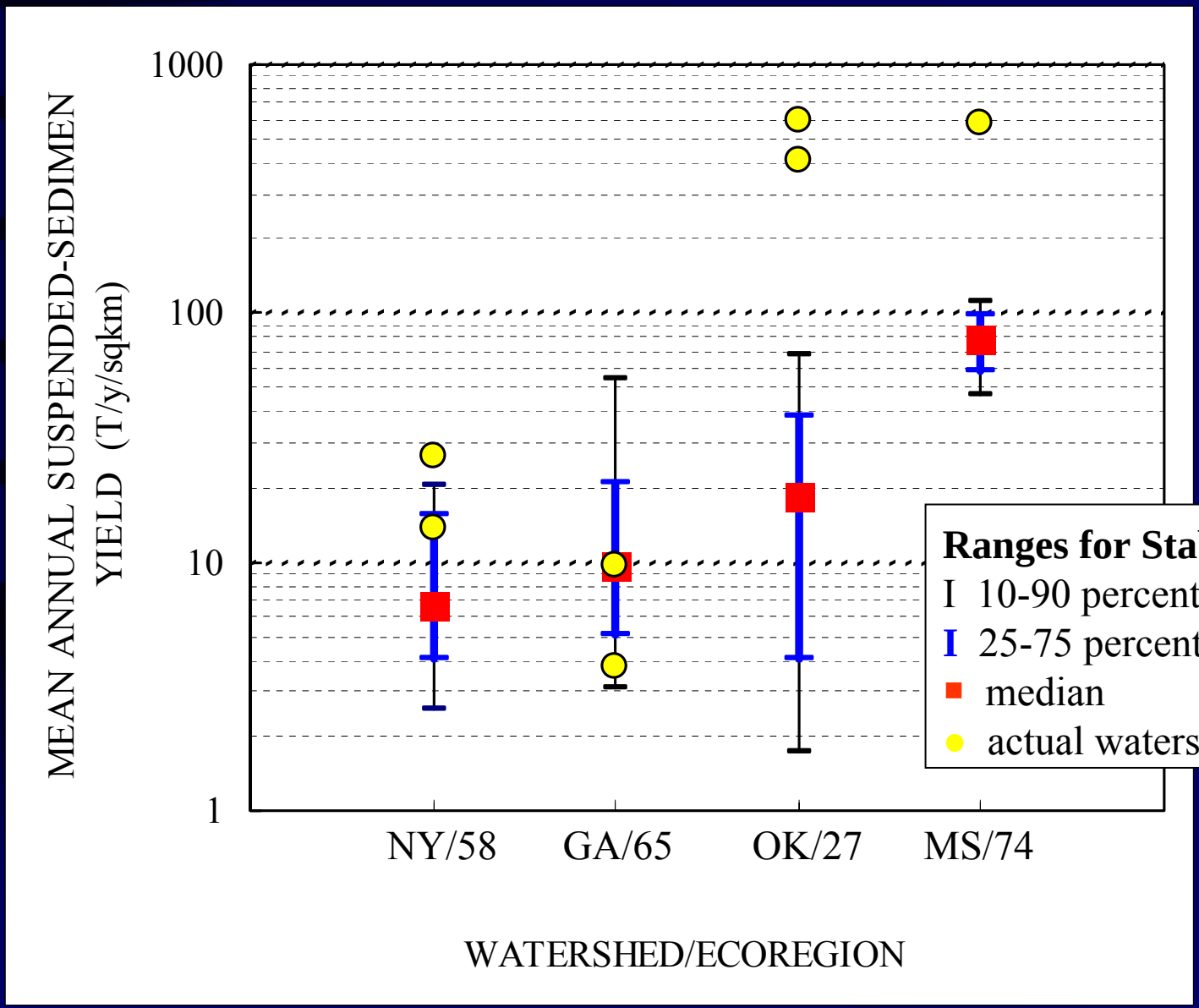
Channel erosion is not an important issue in this watershed

ER74: Goodwin Creek Watershed Mississippi

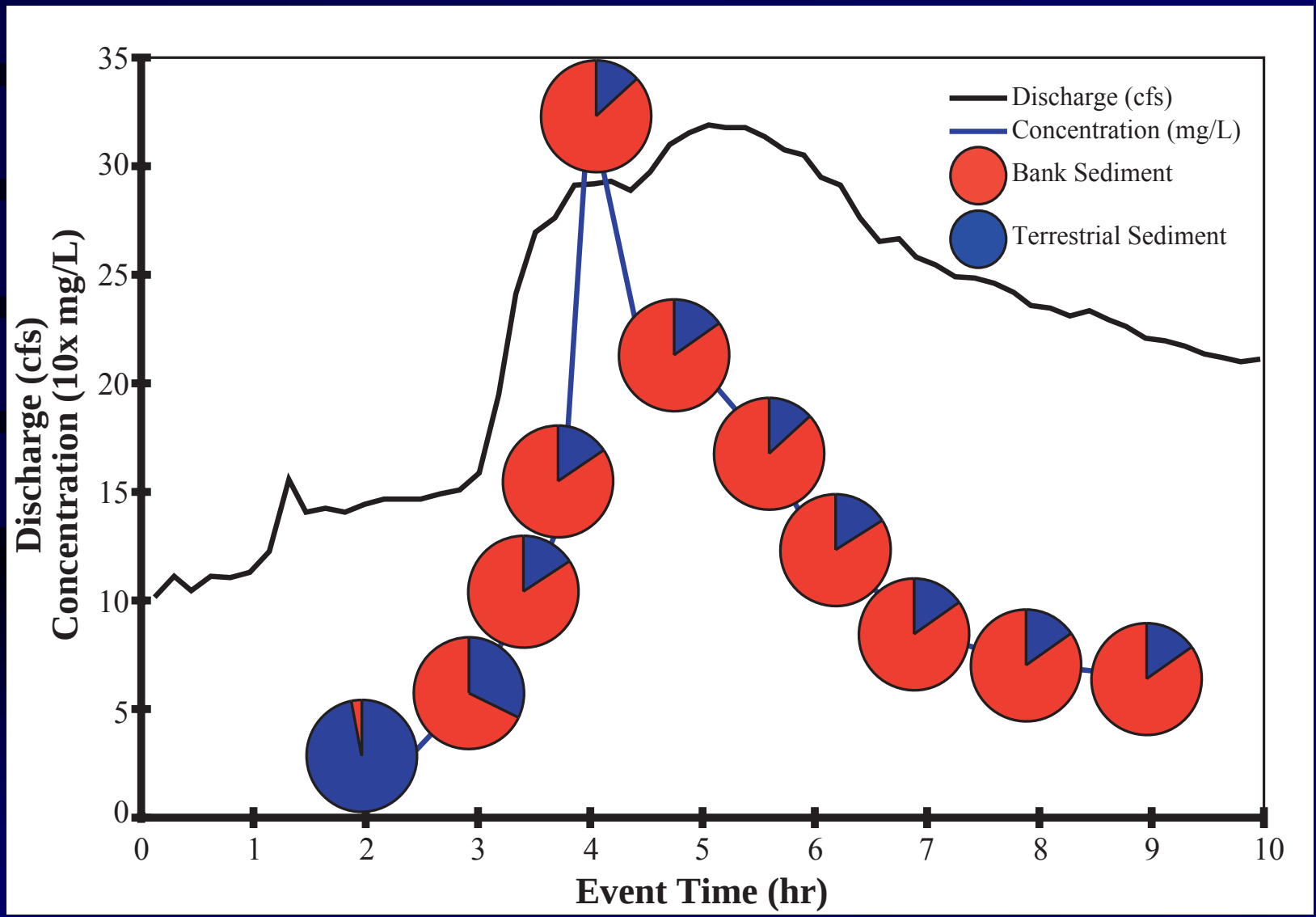


This watershed contains a channel system characterized by incised channels and unstable banks upstream and recovery downstream

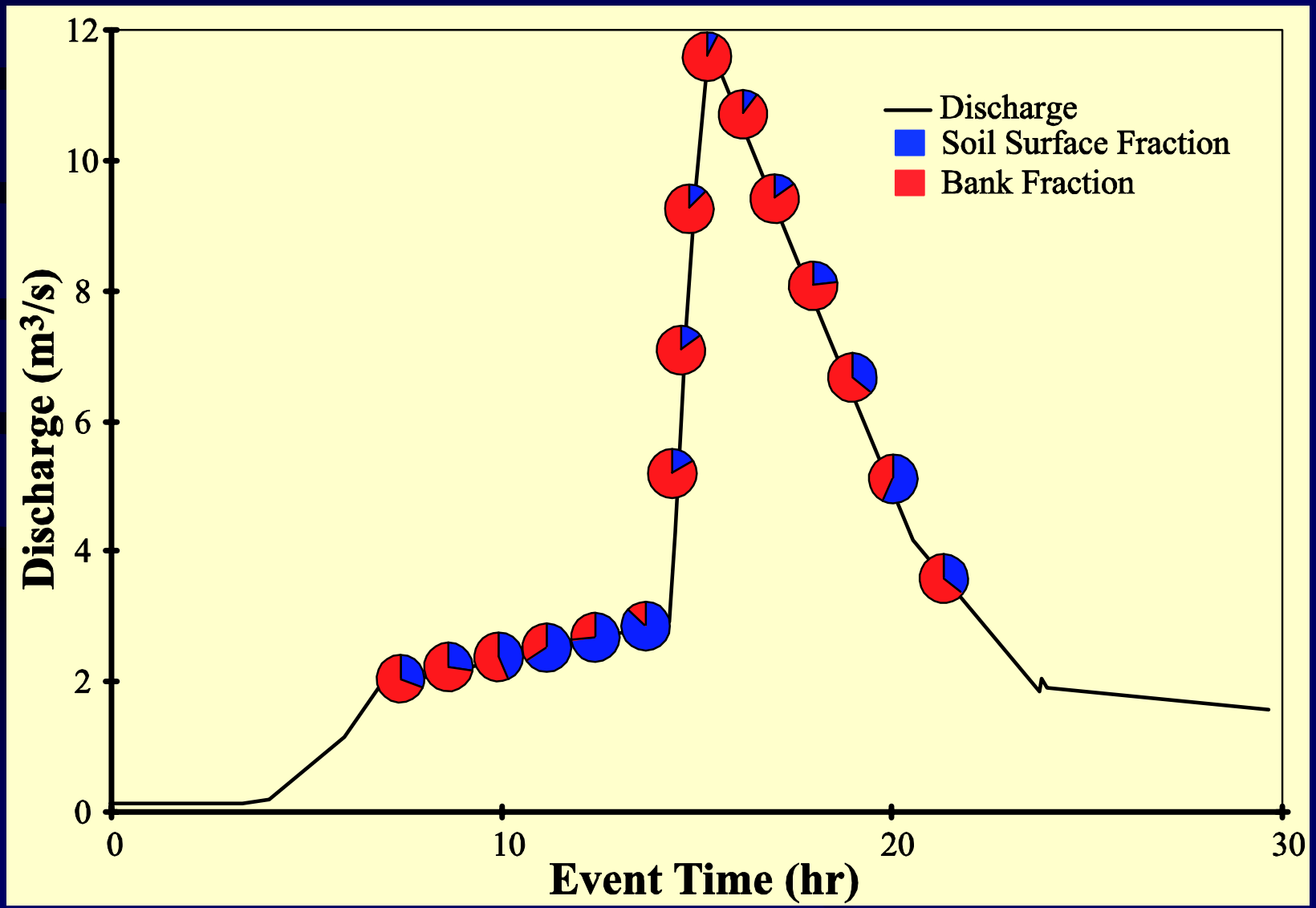
Sediment Impact on Evaluated CEAP Watersheds



Sediment-Source Identification Goodwin Creek: 2005



Sediment-Source Identification Goodwin Creek: 2006



Status of Work

CEAP Watershed	RGA	Refer. Yields	CEAP Yields	Source Sampling	SuspLoad Sampling	Samples Analyzed	All Work Completed
Goodwin Creek, MS							
Little Topashaw, MS							
Little River, GA							
Town Brook, NY							
S. Fork Iowa River							
Little Washita, OK							
Ft. Coob, OK				N.A.			
Walnut Creek, IA							
Big Walnut Ck, OH							
Mark Twain, MO							
Upper Leon R., TX							
St. Joseph R., IN							

Work not Stared	Work in Progress	Done

Conclusions (as of yet….)

- **The CEAP watersheds in MS, NY, and OK are impacted by stream sediment.**
- **RGA and sediment yield analyses indicate that channel erosion is a significant source of sediment in the these watersheds.**
- **The use of ^{7}Be and ^{210}Pb was shown to be a viable method to identify sediment sources.**
- **Natural radionuclide method requires substantial time to collect and analyze samples.**

OXFORD, MISSISSIPPI

Where you are always welcome…