Fine Sediment Sources on CEAP Watersheds

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Problem:
From where is the sediment transported in streams coming?

Fields?
Channel?

How can you tell the difference?

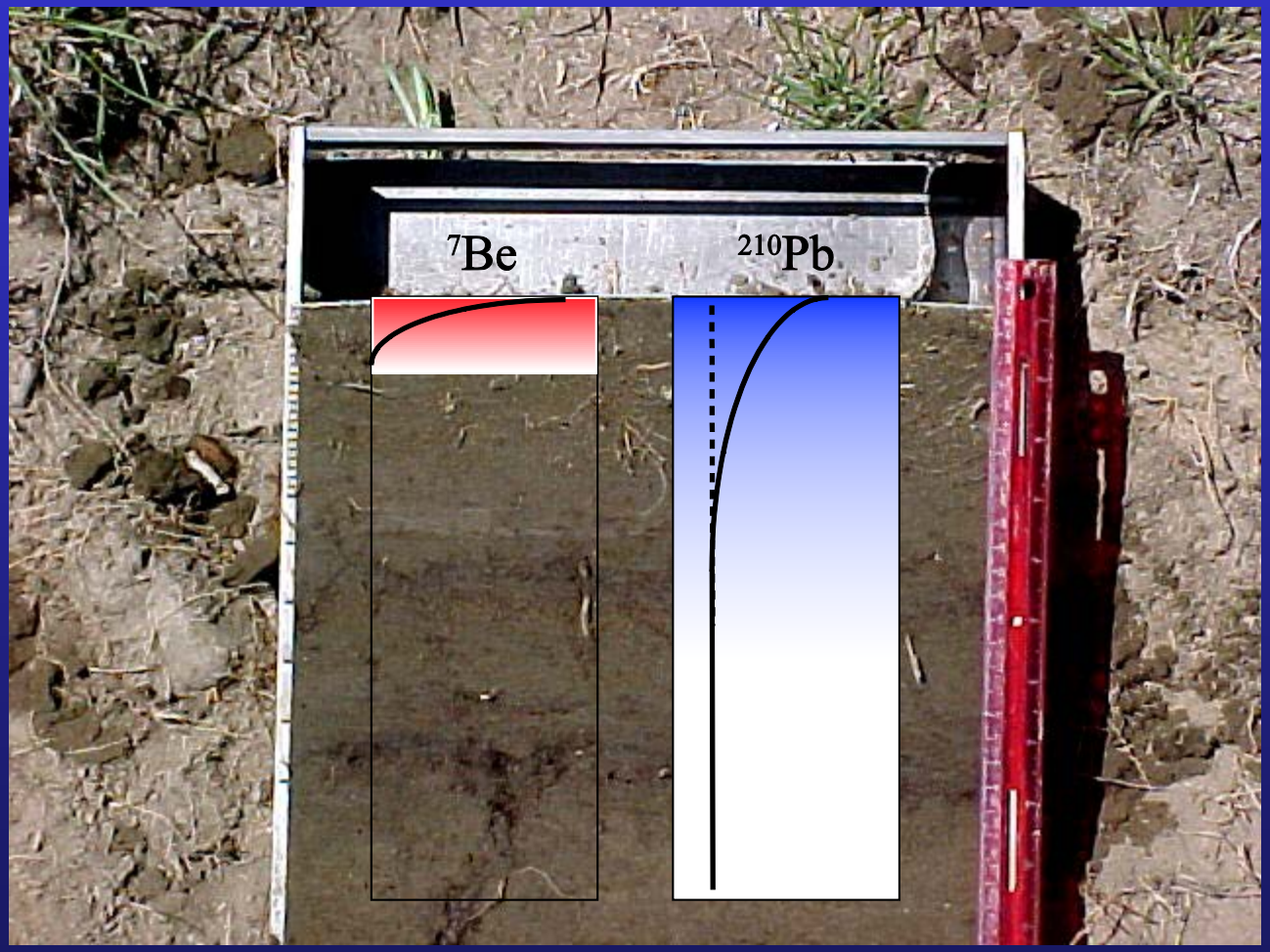
Answer:
1. Detailed study of bank erosion
2. Using naturally occuring radionuclides.

^{7}Be and ^{210}Pb

	^{7}Be	***^{210}Pb***
Half-life	53 days	22 years
Source	Spallation	^{238}U decay series
Delivery	Precipitation	Precipitation
partition coeff -K_d	10^4 to 10^5	10^5 to 10^6

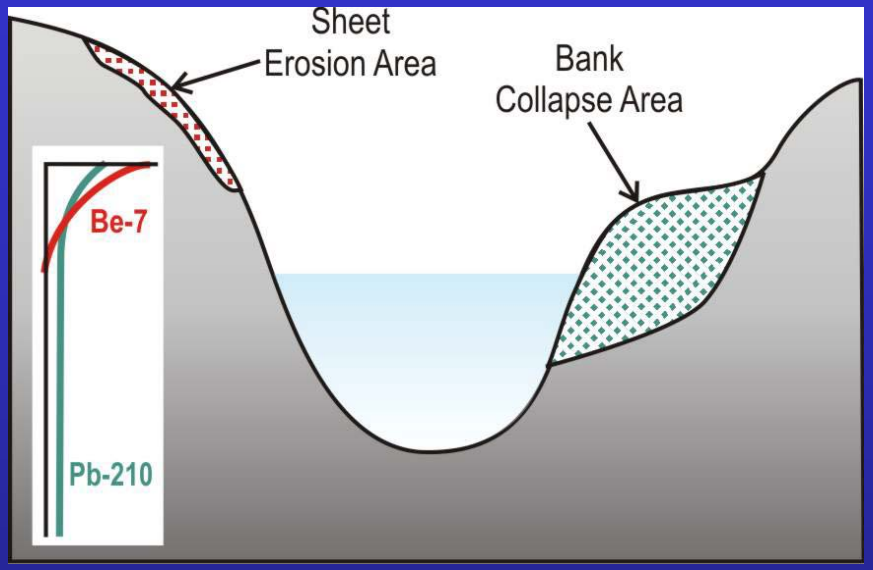
1. Identify unique signature of sediment sources

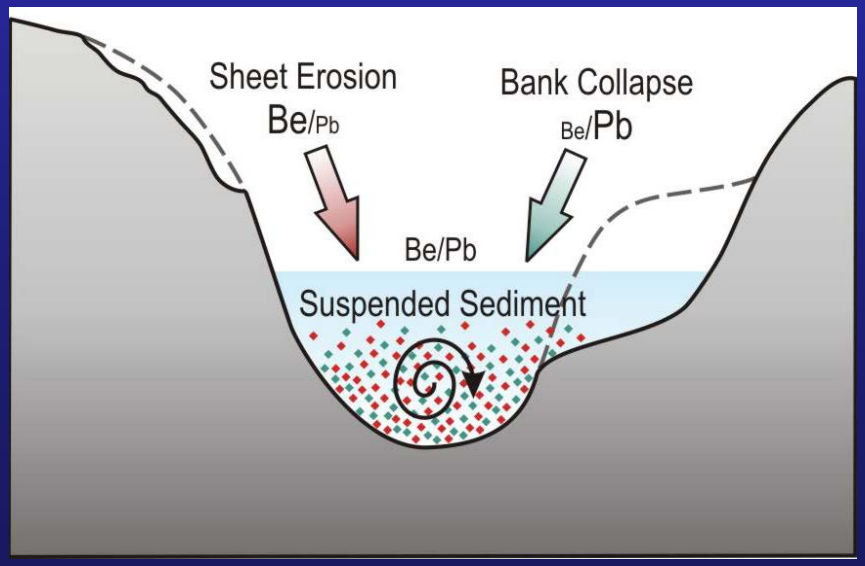
Soil Profiles of ^{7}Be & ^{210}Pb



1. Identify unique signature of sediment sources
2. Attribute source signature to sediment transported through watershed

Sediment Contributions to Suspended Load





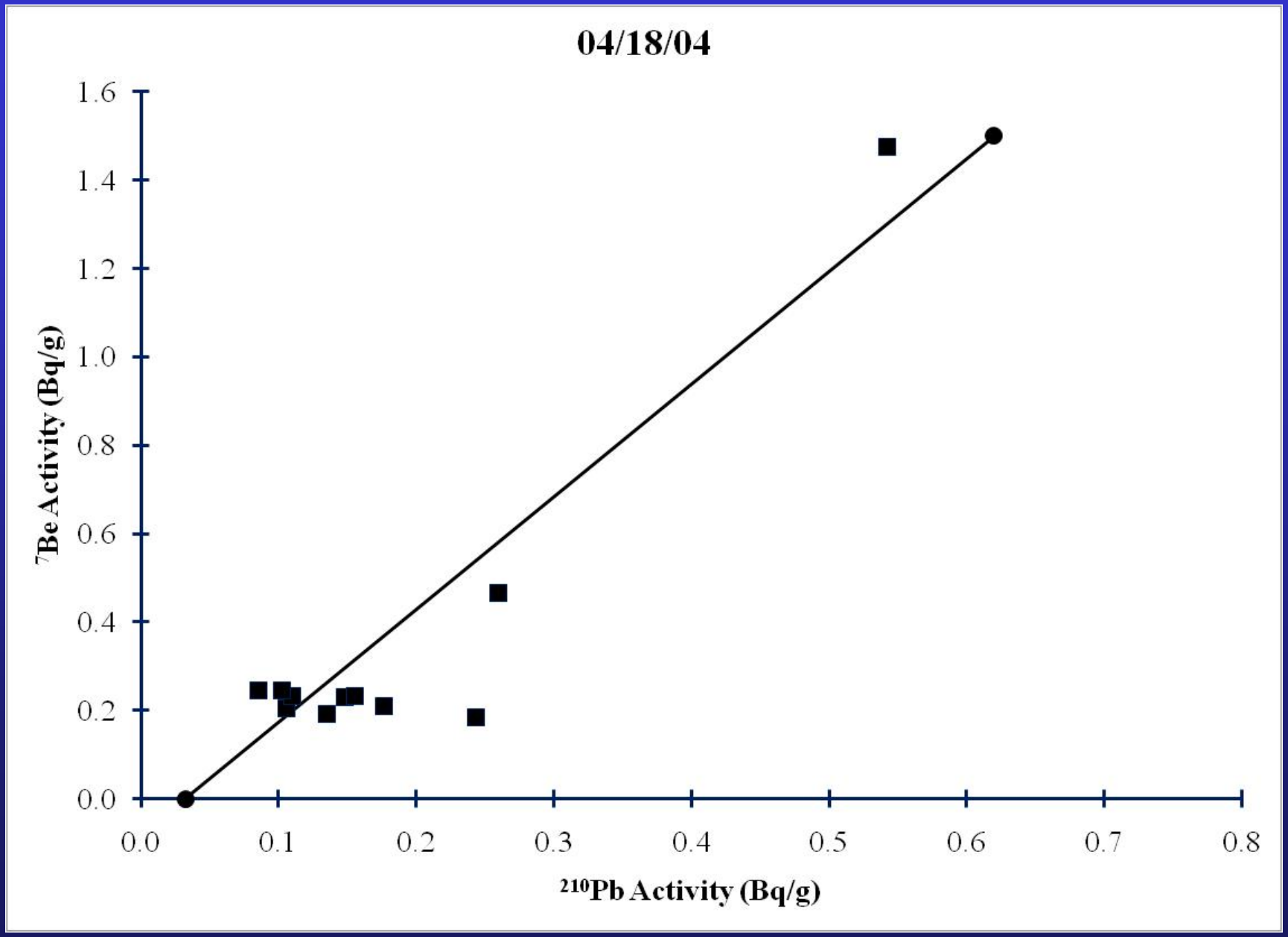
Discrimination of Channel Sources

1. Channels – includes sources
   erode >2-4 cm depth – headcuts
   gullies

2. Discriminate gullies – channels?
   not with 2 tracers.

1. Identify unique signature of sediment sources
2. Attribute source signature to sediment transported through watershed
3. Determine relative amount of eroded surface soils in suspended load

Two End Member Model for Goodwin Creek, MS



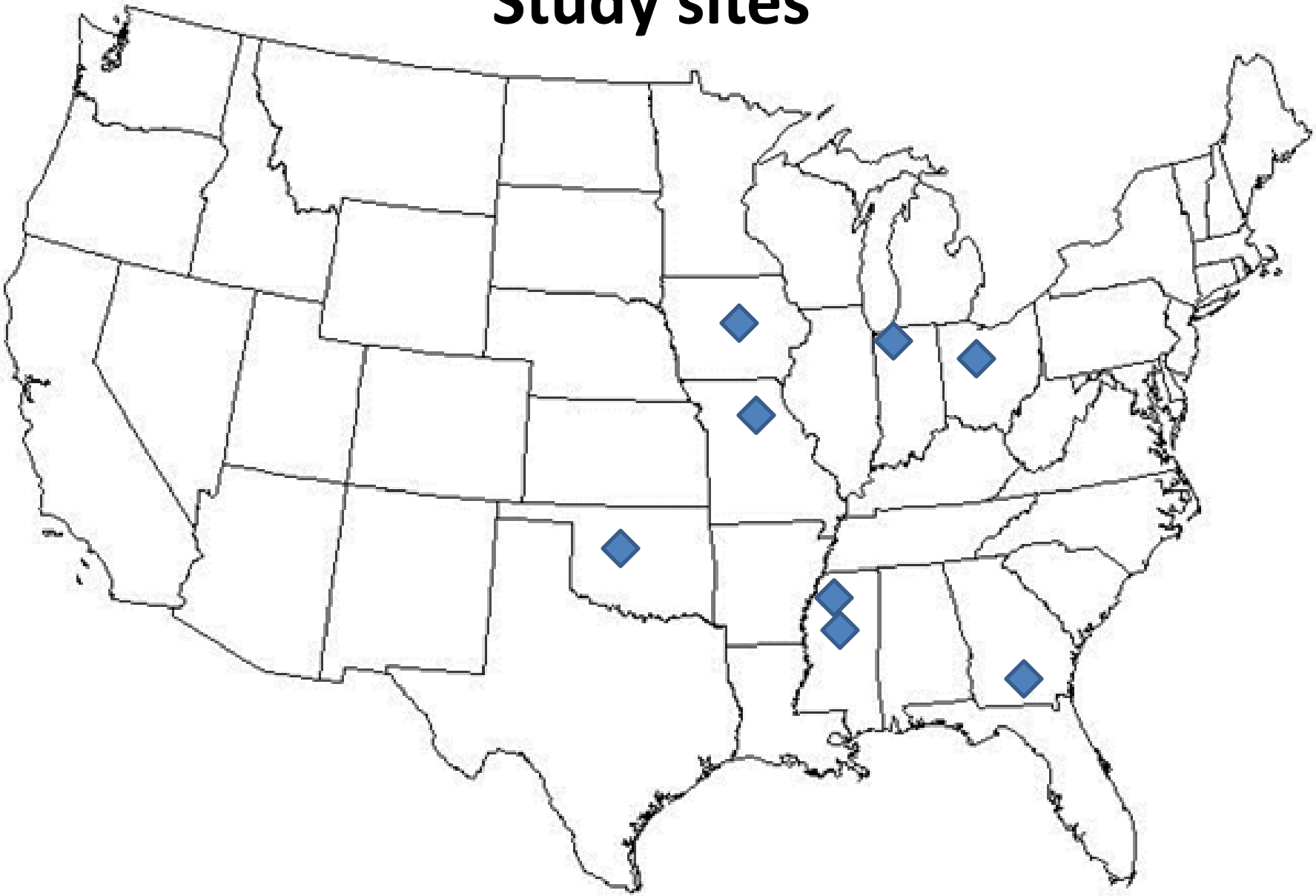
Procedure

- Collect source samples and run through gamma spectrometer
- Collect transported sediment samples during runoff event
- Determine relative amount of eroded surface soils in suspended load using a two end member model

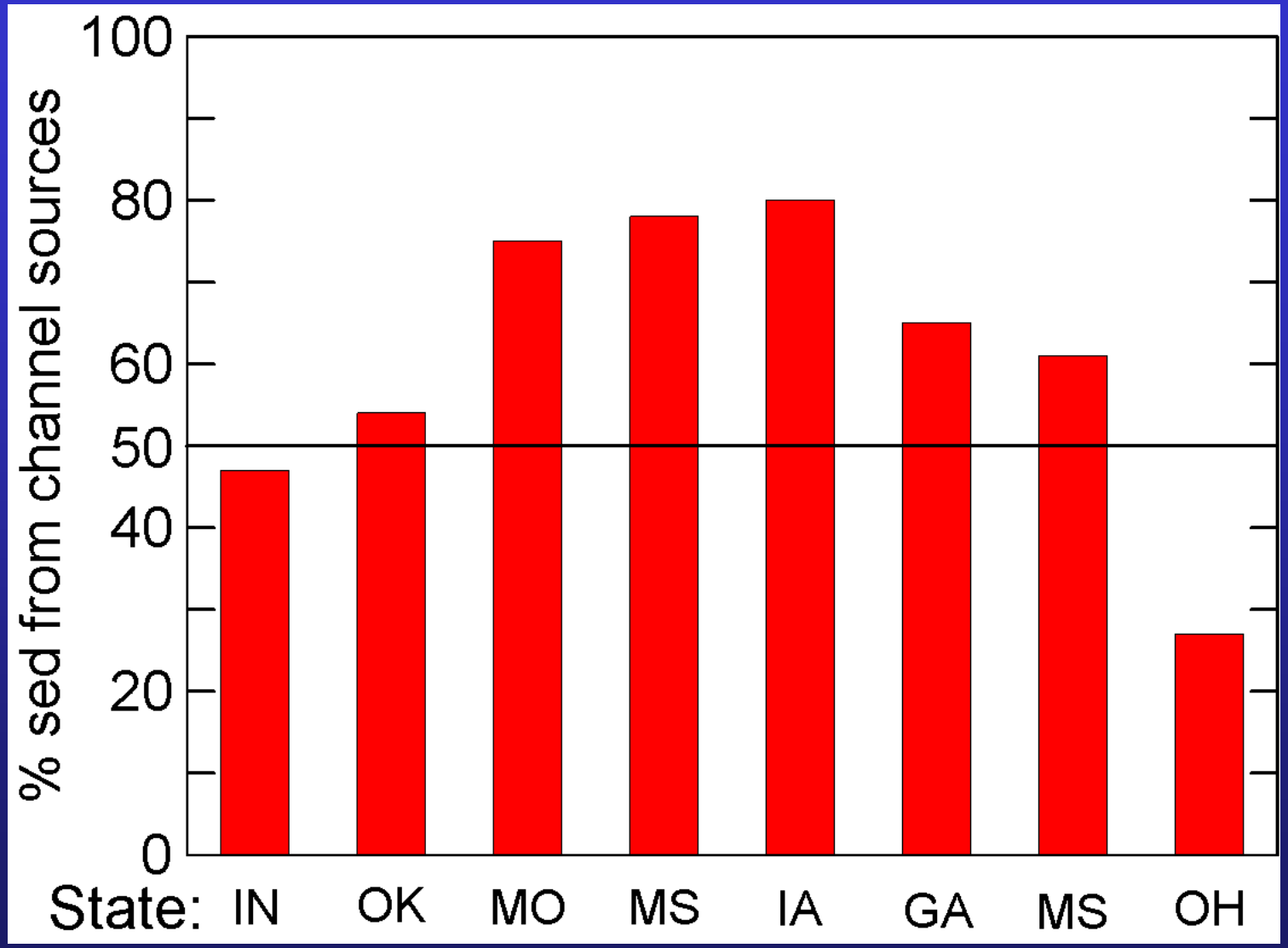
Study Sites on CEAP Watersheds

Cedar Creek, Indiana
Fort Cobb Reservoir (Lake Creek), Oklahoma
Goodwater Creek, Missouri
Goodwin Creek, Mississippi
South Fork of Iowa River (Tipton Creek), Iowa
Little River (Heard Creek), Georgia
Topashaw Creek (Little Topashaw Cr), Mississippi
Upper Big Walnut Creek, Ohio

Study sites



Percent sediment from channels



Independent Studies

Grissinger, Bowie, Murphy, 1991. Goodwin Creek bank instability and sediment yield. 5th Federal Interagency Sedimentation Conference, Las Vegas, Nevada, v.2, p.PS-32-PS-39.

75% fines, channel sources

Kuhnle, Bingner, Foster, Grissinger, 1996. Effect of Land Use Changes on Sediment Transport in Goodwin Creek. Water Resources Research, 32(10): 3189-3196.

64% fines, channel sources

Willett, Lerch, Peacher, Schultz, 2012. Streambank erosion rates in two Watersheds of the central clayplan region, Missouri. Presentation.

88% fines, channel sources

Conclusions

- Fine sediment, channel sources dominant on the 7 of 9 CEAP watersheds sampled
- Need for management practices which consider streambank erosion and/or gullies (ephemeral or edge-of-field) if present.

Practices to control streambank erosion

- Bioengineering techniques – erosion control fabrics
- Riparian buffer systems – grass-shrub-tree systems
- Exclude or limit cattle access
- Traditional engineering structures – rip rap, boulder weirs, etc…

- Methods to reduce peak and volume of discharge - Case study : Goodwin - cropland to CRP – 60% decrease fines

- Practices to control gully erosion
  - Grassed waterways
  - Runoff management
  - Stiff grass hedges