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 occurring radionuclides.
### $^{7}\text{Be}$ and $^{210}\text{Pb}$

<table>
<thead>
<tr>
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<th>$^{7}\text{Be}$</th>
<th>$^{210}\text{Pb}$</th>
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<tbody>
<tr>
<td><strong>Half-life</strong></td>
<td>53 days</td>
<td>22 years</td>
</tr>
<tr>
<td><strong>Source</strong></td>
<td>Spallation</td>
<td>$^{238}\text{U}$ decay series</td>
</tr>
<tr>
<td><strong>Delivery</strong></td>
<td>Precipitation</td>
<td>Precipitation</td>
</tr>
<tr>
<td><strong>partition coeff -$K_d$</strong></td>
<td>$10^4$ to $10^5$</td>
<td>$10^5$ to $10^6$</td>
</tr>
</tbody>
</table>
1. Identify unique signature of sediment sources
Soil Profiles of $^{7}\text{Be}$ & $^{210}\text{Pb}$
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

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

04/18/04

\[ \text{Be Activity (Bq/g)} \]

\[ \text{\(^{210}\text{Pb Activity (Bq/g)}\)} \]
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
Independent Studies

  75% fines, channel sources

  64% fines, channel sources

  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