Quantifying Sediment Loads from Channel Erosion Over Short Time Scales

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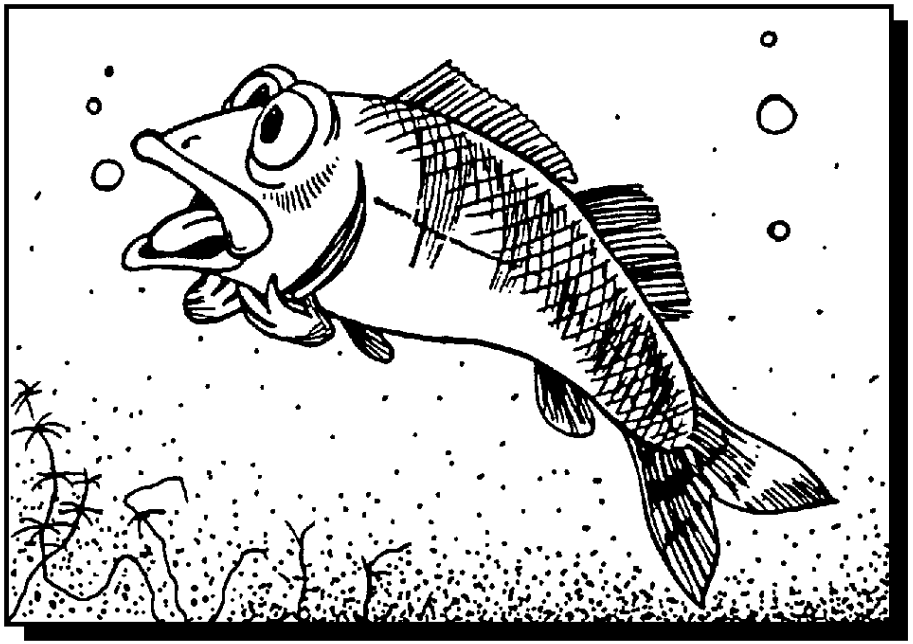
Sediment is a leading cause of water quality impairment

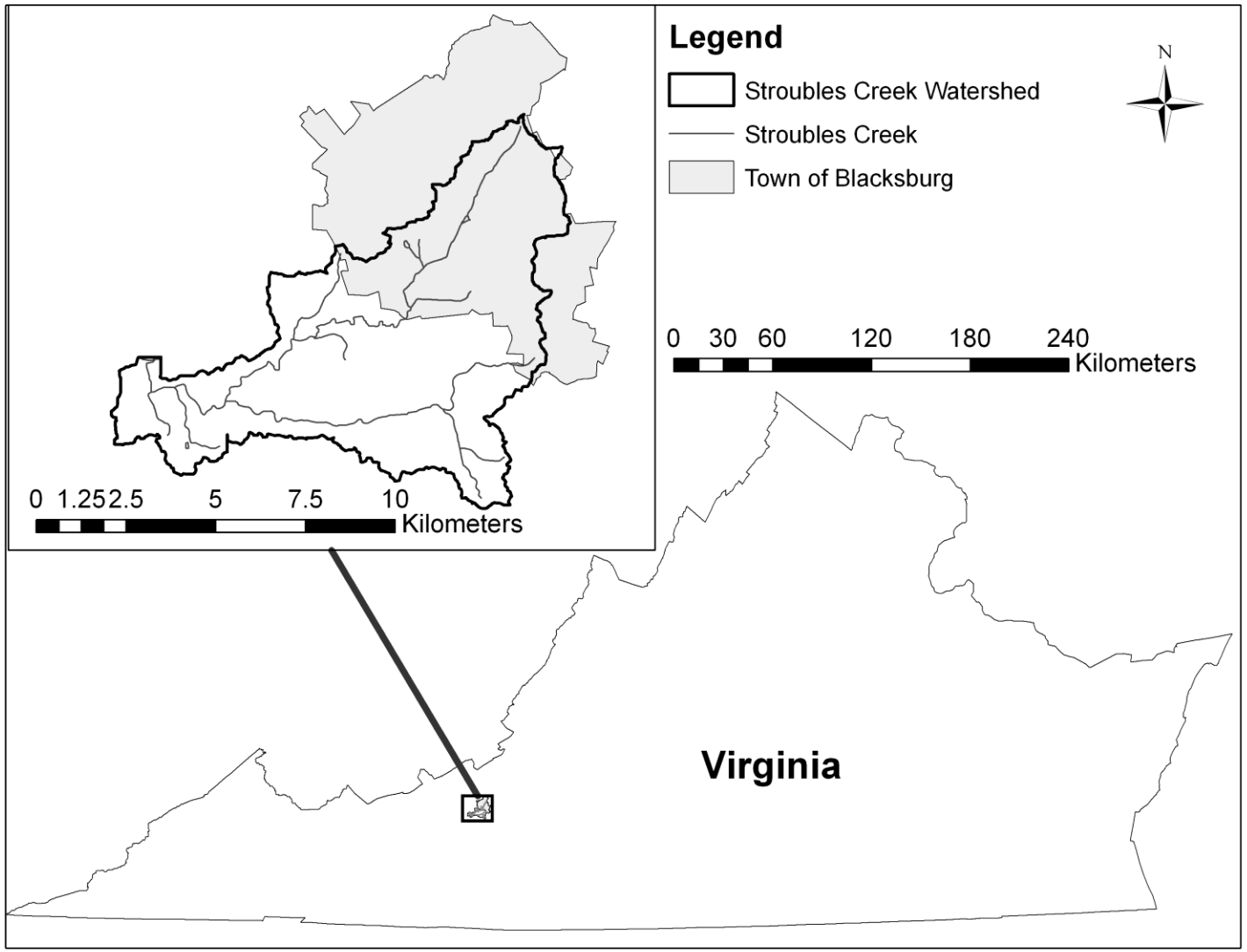


http://clean-water.uwex.edu/pubs/clipart/runoff.25.htm

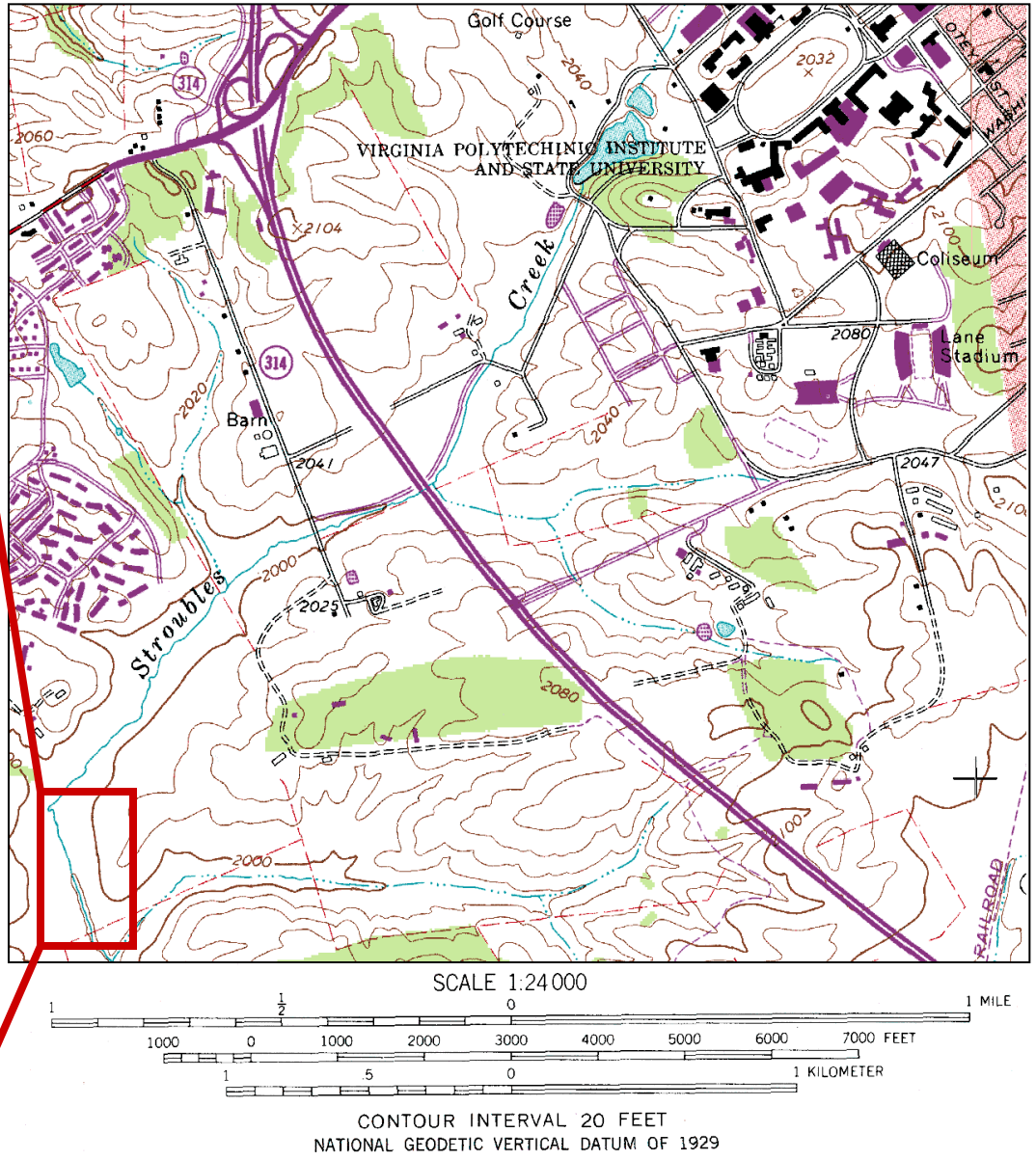
© Hession, 2006

Identifying sediment sources is critical to improving water quality

Stroubles Creek catchment is “impaired”; sediment identified as the stressor



The overall goal of this project was to compare three methods for quantifying sediment loads due to channel erosion



Study Site (1500 ha catchment)

At each sampling bridge two Eureka Mantas with wiped turbidity probes were installed

Upstream

Downstream

Turbidity and stage were recorded every 10 min. from May 2006 to May 2007

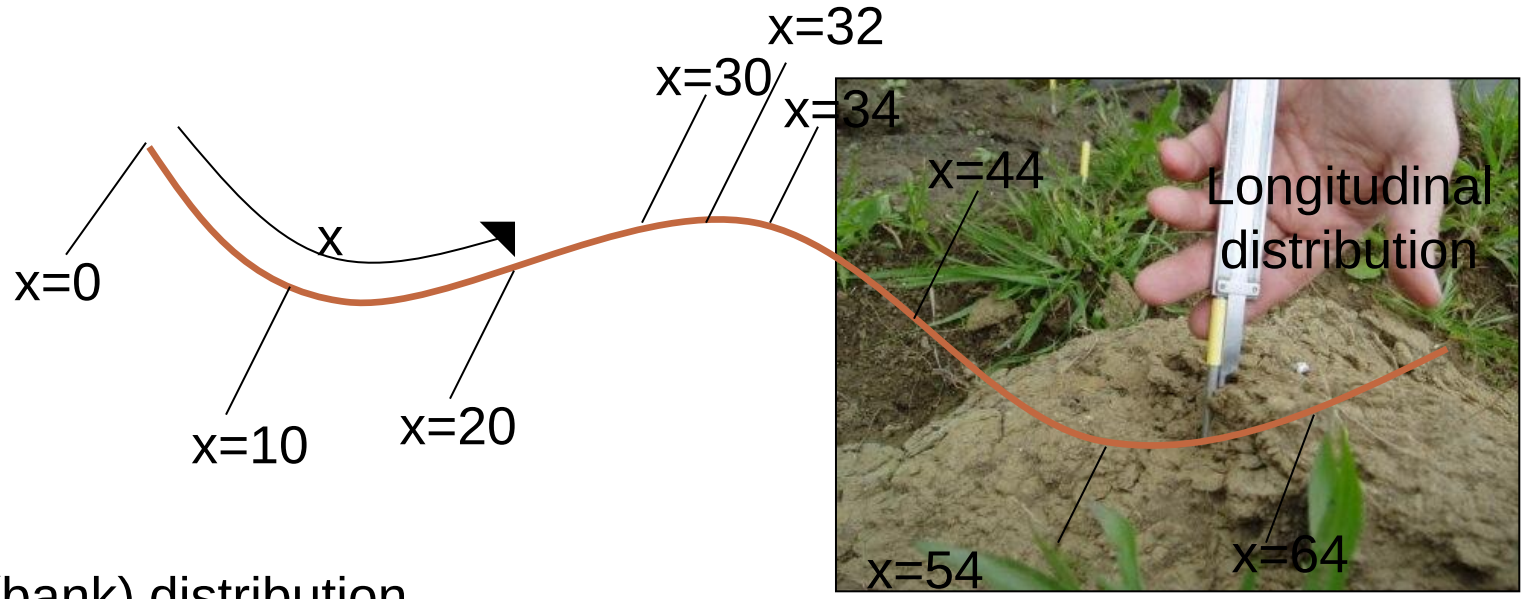
Discharge and SSC were sampled during storm events at each bridge

Two additional direct methods of measuring streambank retreat were used to compute sediment volume lost

Detailed topographic surveys conducted in May 06 and May 07

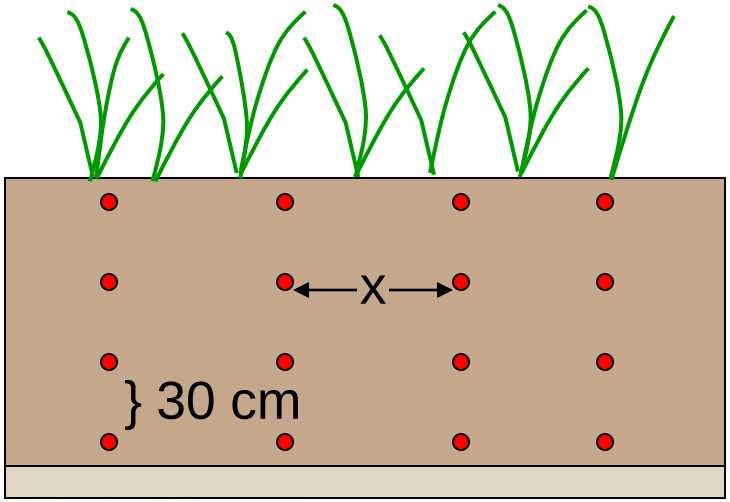
250 erosion pins and 7 scour chains were read monthly

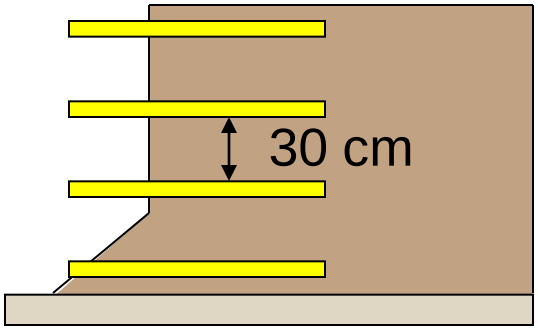
Erosion pin layout



Simpson, 2006

Vertical (bank) distribution





Additional Questions

Turbidity → Suspend sensor near surface or attach to bed?

Erosion Pins → Average pins over entire bank face?

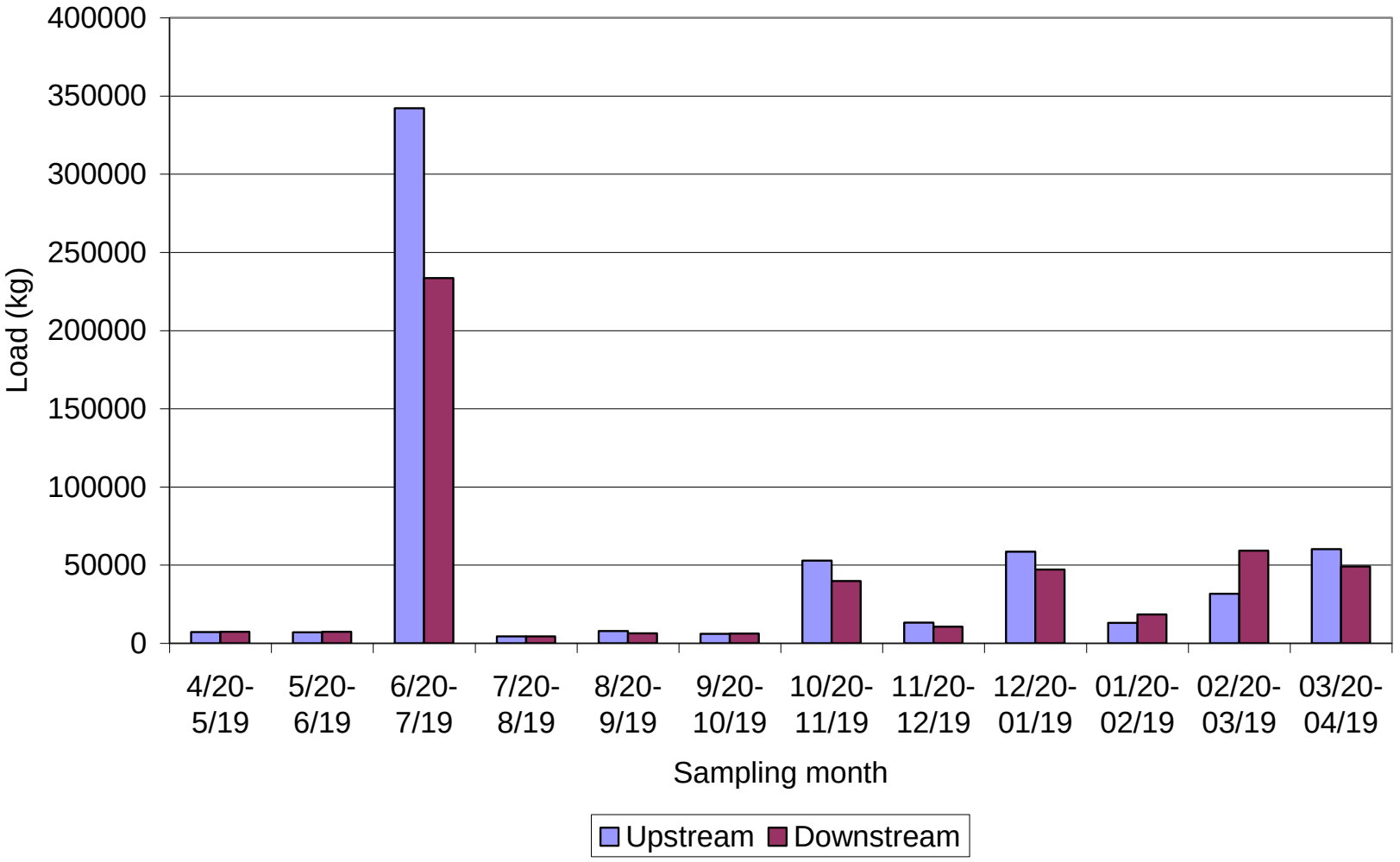
Erosion Pins → Conduct spatial interpolation of erosion amounts?

Surveying → Average end method vs. CAD surface?

Surveying → Composite vs. regional TIN?

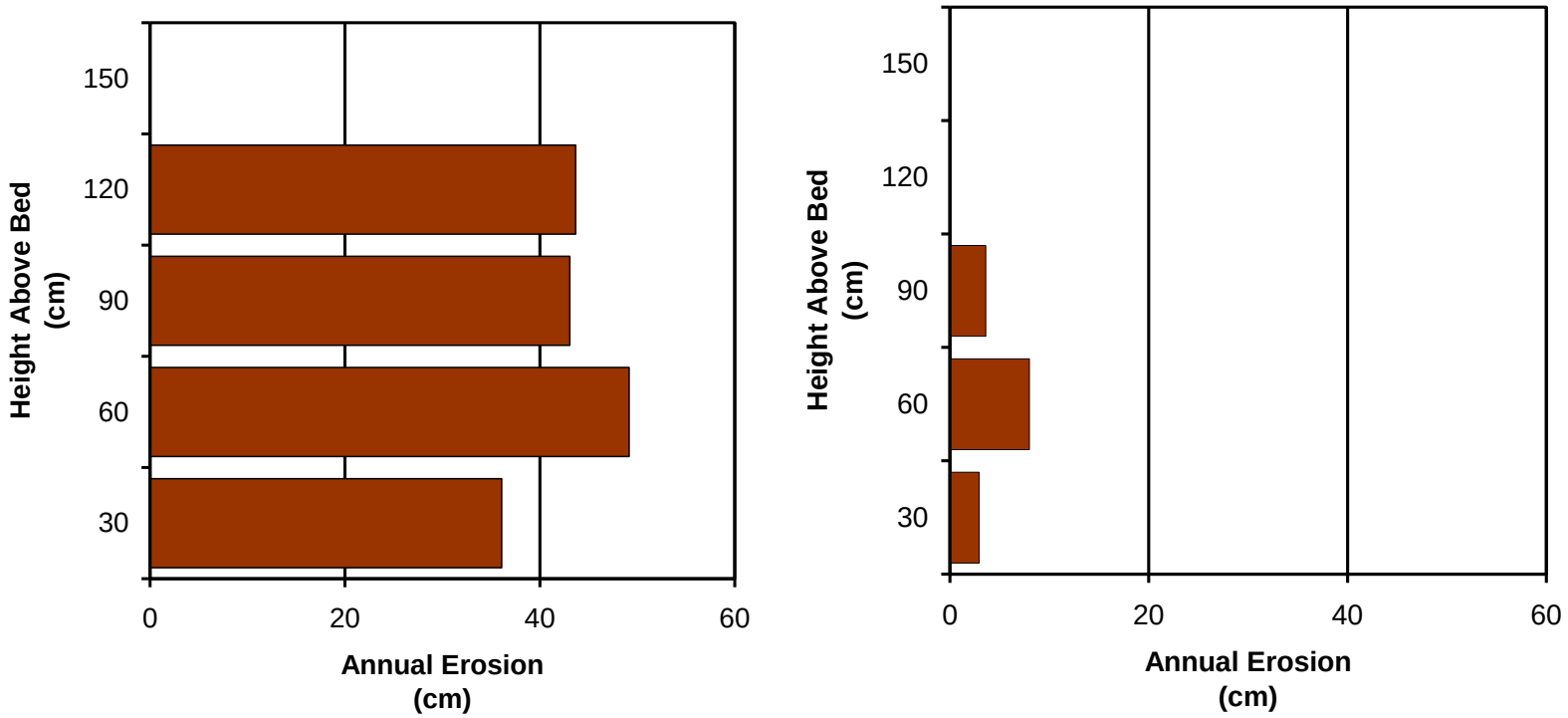
Results?

Turbidity sensors indicated ~10 Mg of deposition each month



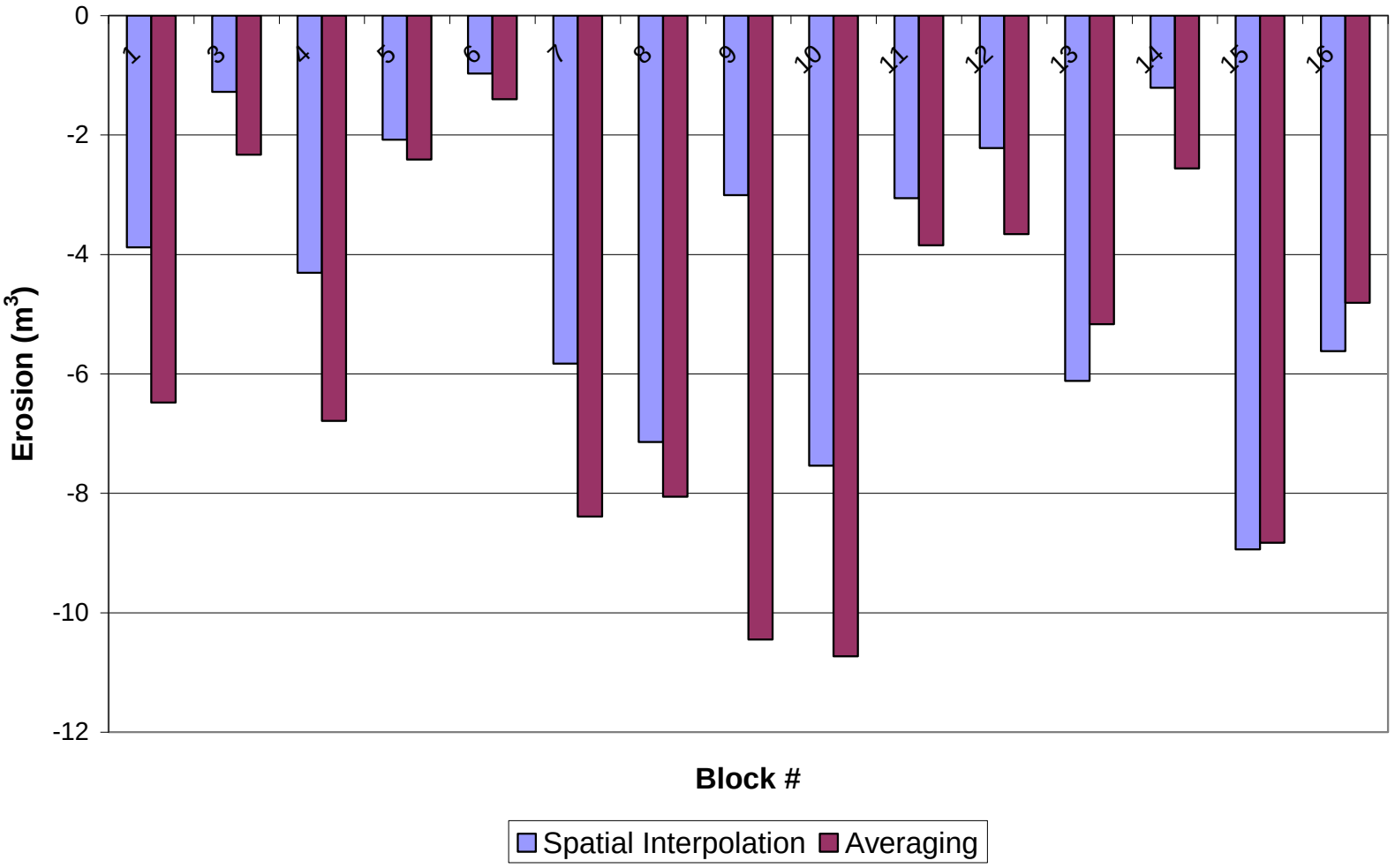
Erosion pins measured 43 m^3 of erosion (median of 12 cm for all the erosion pins)

Scour chains indicated 226 m^3 of deposition

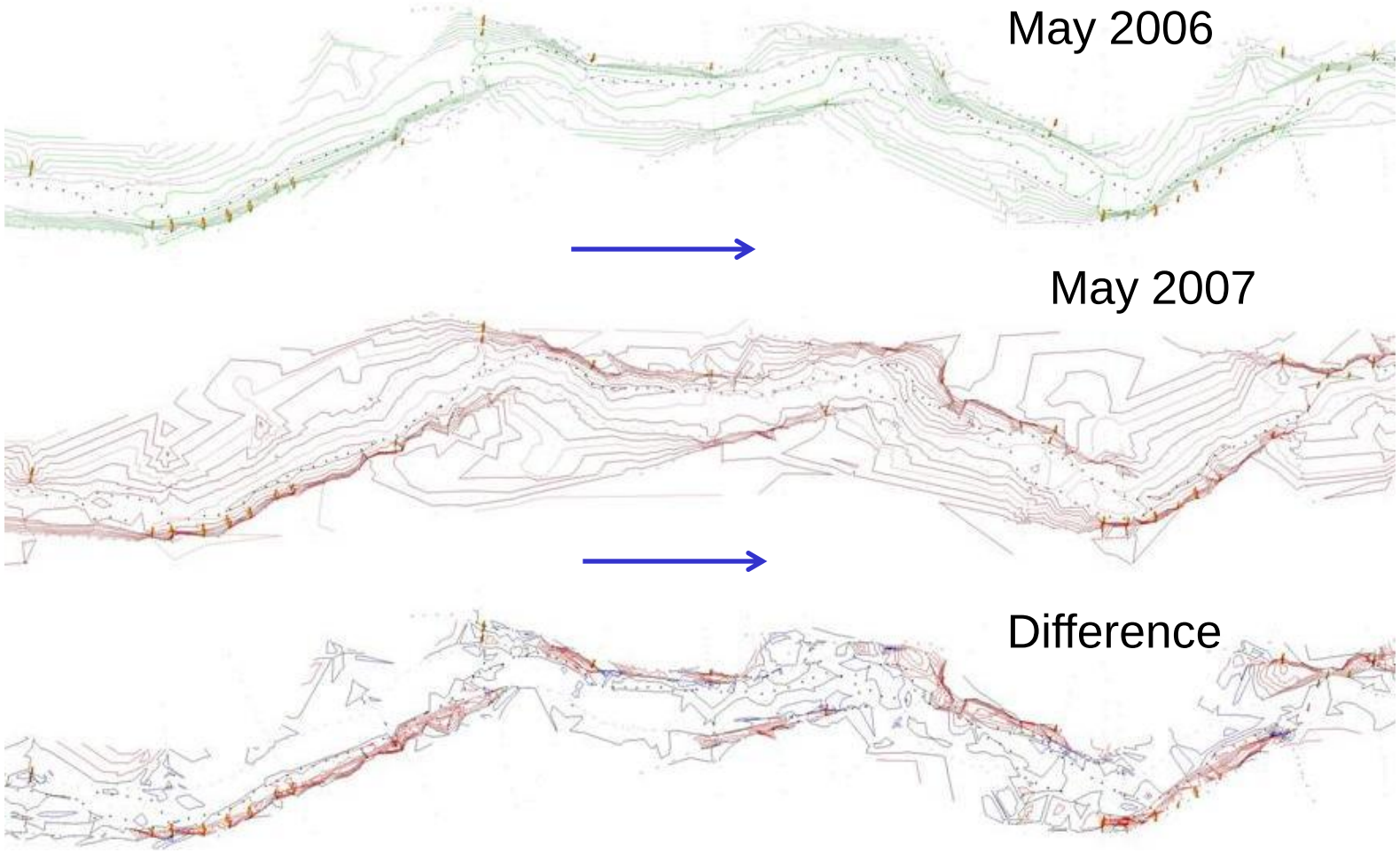


Sediment deposition = 240 Mg

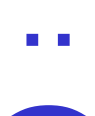
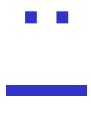
Erosion per bank area calculated by two different methods summed over the entire study period



Pre- and post-surveys measured 200 m^3 of deposition with the composite method and 55 m^3 of erosion with bounded volumes (260 Mg deposition or 70 Mg of erosion)



Which method is better for measuring sediment loading from streambanks?

Method	Temporal Resolution	Spatial Resolution	Effort
Turbidity			
Erosion pins			
Repeated surveying			

Conclusions

- Study duration must be long enough to capture major processes
- Visual assessment of sediment sources can be deceiving
- Extensive spatial extrapolation can lead to extensive error


Questions?
Comments?