Contribution of Stream Channel Erosion to Sediment Yield from an Urbanizing Watershed

By Stanley W. Trimble

Trimble's Hypothesis:

- Channel erosion can be a major source of sediment yield from urbanizing areas, channel stabilization should be a priority in managing sediment yield.
- Area of study: San Diego Creek watershed

Data/Methods:

- Trimble used measurements from 1983-1993 that stream channel erosion added 10^5 megagrams per year of sediment, or about two-thirds of the total sediment yield.
- An initial channel study using historical methods and aerial photogrammetry indicated that from the late 1930s to the early 1980s channel erosion supplied more than one-fourth of all sediment yield, but there were many uncertainties, especially regarding total sediment yield from the basin

Geomorphologic effects of urbanization

- Little research on the geomorphologic effects of urbanization in arid regions than in humid regions
- In most arid urban areas, irrigation increases antecedent soil moisture in vegetated areas, further increasing storm runoff.
- Urban development within the basin may displace rather than replace irrigated agriculture, so that agricultural impacts remain.

Clean Water Act

- A federal CWA study of the basin in 1981 concluded that the sediment sources were agriculture, steep foothills, and construction.
- Channel erosion was considered unimportant.

Results of Survey

- The results indicated that the net average rate of channel erosion was 106 x 10^3 Mg year between 1983-1993.
- Total sediment sink and efflux is 150 X 10^3 Mg year.
- Thus channel erosion accounted for about two-thirds of the measured sediment yield from San Diego Creek.

Average Erosion Rates

- Show few signs of declining,
- And new development may locally accelerate channel erosion
- Thus, amelioration of channel erosion is an appropriate management strategy for sediment control, but little had been done by 1993

The Problem with Stream Channel Erosion:

- Channel erosion has damaging downstream effects in streams, lakes, and estuaaries.
- Channel enlargement is often lateral, thus removing substantial areas of valuable urban land; damaging parkland, bridges, and other infrastructure; and making channels unsightly.
- Additional sediment yield could relegate channel erosion to a somewhat smaller proportion of total sediment yield but probably no less than half.

Trimble's Final Statement:

- "Erosion of earthen channels will remain a substantial source of sediment yield from urban stream systems until proper ameliorative measures are taken."

About the Author

- Professor Trimble is currently affiliated with UCLA Department of Geography
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