

Tracking Erosion and Sediment Re-distribution in a Small Watershed

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Abstract

Current erosion and sediment monitoring systems are limited to sediment leaving a watershed outlet or to spatial distribution of loss using single tracer techniques. A new method is introduced to track erosion, translocation, and re-deposition of sediment in a small watershed, thus allowing a complete, spatially distributed, sediment balance to be made as a function of morphological landscape elements. A 0.68 ha watershed in Coshocton, OH with a silt loam soil and an average gradient of 8% was divided into six morphological units: lower channel, upper channel, lower hillslope, upper hillslope, interfluvium, and toeslope. The six units were tagged with six rare earth element (REE) oxides in a powder form. Sediment leaving the watershed was collected, and soil translocation was evaluated using spatially distributed sampling of the soil surface. While the average soil loss on the watershed between May 2nd and November 8th 2001 was 6.1 t ha⁻¹, local rates varied between 46 t ha⁻¹ of loss to 50 t ha⁻¹ of gain through deposition. The advantage of the multiple tracer technique was the ability to distinguish between multiple sources of sediment both exiting the watershed and re-deposited within the watershed. For the first time it was possible to itemize the sediment budget at any specific landscape element as three components: 1) the soil from the element that left the watershed with runoff, 2) soil from the element that was re-deposited on lower positions, and 3) soil originating from the upper positions and deposited on the element.

Keywords: sediment tracers, spatial distribution, sediment re-distribution, Coshocton OH

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