Eroded soil C and where to find it: Lessons from the Upper Sangamon Basin, Illinois USA

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The loss of soil and its associated organic C is well-documented in agricultural systems. The bulk of eroded C is thought to be trapped downslope. However, other studies point to reservoir lacustrine sediments as globally significant traps. In this study, we present preliminary C-budget estimates for post-settlement (~1850) alluvium/colluvium (PSA/C) in downslope wash and valley bank floodplains, and reservoir sediments in the Upper Sangamon River Basin (USRB). Carbon isotopic and biomarker measurements were used to distinguish between original row crop C and C added after post-field loss. The USRB is within the U.S. NSF's Intensively Managed Landscape Critical Zone Observatory. Land use is dominated by row crop (corn/soybean) agriculture. The 3690 km^2 USRB is terminated by the 12 km^2 reservoir, Lake Decatur.

The volumes of post-settlement sediment accumulation in downslope basins and depressions, and floodplains were estimated by assessing the thickness and the aerial extent. Fly ash and/or radiochemical measurements (^{210}Pb, ^{137}Cs) were used to identify the thicknesses of PSA/C. Lake Decatur sedimentation was determined by historical surveys over its lifetime, the identification of key time markers in cores, and ^{210}Pb, ^{137}Cs measurements. Organic C concentration measurements made on floodplain PSA and Lake Decatur sediments were combined with the sediment volumes to determine C-budgets.

Approximately 57% of the organic C has been detained in the basins and depressions, 34% in floodplains, 7% in Lake Decatur. Approximately 2% escaped the reservoir and was exported downstream. Isotopic and biomarker measurements indicate that while the row crop C travels the length of the system, not all of the C is from that source. Organic C from both terrestrial and aquatic sources is added. The general pattern of decreasing flux with distance from source is intuitive. It also suggests that landscape sinks are quantitatively more important than reservoirs.