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Lateral distribution of soil nitrogen in a naturally eroding zero-order watershed

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In recent years, the role of soil erosion on terrestrial carbon sequestration has been a focus of growing number of studies. Comparatively, little attention has been paid to the role of erosion on soil nitrogen. We know very little about the rate of nitrogen distribution within a watershed and its export from eroding watersheds. Here we present primary data on the stock of nitrogen different erosional and depositional landform positions and its rate of distribution and export from four different types of landform positions, two eroding (summit and backslope) and two depositional (hollow and plain), at a recently anthropogenically-undisturbed, zero-order watershed in northern California. We found that the depositional positions contain up to 3-times more N in their soil profiles than the eroding positions. Our findings show that 1.1-1.8 gN m^{-2} $yr^{-1}$is transported from the upper eroding positions, and about 2/3^{rd} of it enters the lower-lying depositional settings. After density fractionation at 1.8g cm^{-3}, we found that 92-percent of all soil nitrogen was found associated with the dense fraction in the four landform positions, compared to 2 to 4 percent each that was found in the free light and occluded light fractions. More N is associated with the free light fraction in the less than 25 cm soil depth, possibly rending it more susceptible to loss by soil erosion. By comparison, more N is associated with the aggregate protected, occluded light fractions and the mineral-associated heavy fraction in the depositional positions where it is likely to be protected from mineralization and loss.