# Hill slope and erosional controls on soil organic geochemistry in intensely managed landscapes

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Like many regions of North America, the last 100 years of agriculture in the glaciated upper Midwest has lead to a major redistribution of soil carbon and nitrogen on the landscape. In the Intensively-Managed Landscapes - Critical Zone Observatory (IML-CZO) these processes are being studied with a combination of surface soil geochemical surveys and simulated rainfall/erosion experiments to document how the organic geochemistry of hillslopes were evolved during early management and pre settlement. Using a combination of soil analyses including elemental, stable isotope, textural, and soil biopolymers (lignin and cutin/suberin fatty acids (SFA)) we investigated the spatial patterns of static surface soil properties and time course rainfall-erosional experiments along the same slopes to gain insight into soil carbon and biopolymer enrichment patterns in east-central Iowa within the Clear Creek Watershed. Both lignin and substituted fatty acid concentration and their molecular ratios highlighted differences in C3/C4 (soy/corn) management activities in surface soils while over 40 years of prairie restoration dramatically altered surface soil profiles. For example, a general pattern in static baseline samples was an enrichment of $^{15}N$ in soils down slope and an opposite pattern of accumulation/loss of lignin and SFA in topographic highs and lows. Transport of soil particles, associated biopolymers, and elemental and isotope signatures, exhibited distinct patterns based upon both position of the hillslope and directionality of flow with respect to rill/gully direction created by tillage activity. This indicates that particle/chemistry transport and enrichment of organic chemical signatures down slope and into associated flood plains and streams in modern intensively managed systems should be distinct from pre-settlement patterns and help interpret pre- and post settlement alluvium sediment.