

A framework for analyzing terrestrial-aquatic interactions in a land-lake mosaic

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ABSTRACT:

Biogeochemical cycles in lakes and on land are relatively well understood, yet there are considerable gaps in understanding their interactions in extensive land-lake mosaics. The Northern Highlands Lake District is a spatially complex landscape dominated by diverse forests, wetlands, shrublands (together covering 89% of the surface area) and lakes (covering 11%) in northern Wisconsin and Michigan. We are developing a new model of hydrologic and nutrient fluxes within and among watersheds ($n > 7800$) to answer basic questions about the complete, integrated landscape: What are the controls of carbon and hydrologic cycling across the region? Are some lakes more important than others to the cycling of water or carbon? What are the relative importance of surface and sub-surface connections to our understanding of water and carbon cycling in the region? What is the importance and function of the spatial arrangement of lakes, and the groundwater and surface connections among them, to the variation in patterns of rates of chemical processing across the region? Using the Northern Highlands as a representative region, we describe a general framework for modeling each component, introduce the representations of key surface and subsurface connections, and discuss the variation of process rates across the region.

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