

Relationship of riparian land–cover change and initial lake color, clarity and conductivity in Northern Wisconsin, USA

Authors: Anna E. Marburg, Mark M. Binder, Stephen R. Carpenter, Jonathan W. Chipman, Timothy K. Kratz, Thomas M. Lillesand, and Monica G. Turner

Abstract:

We studied riparian land–cover change from 1939 to 1996 around 47 lakes in the Northern Highlands Lake District (NHLD), Wisconsin USA, using historical aerial photography and limnological data to address two questions: (1) How has riparian land cover changed around lakes in the NHLD? (2) Did lakes with shoreline clearcuts or development in 1939 differ from undeveloped lakes in either the 1930s or 1980s? We used ordination to identify groups of lakes that had similar net changes. The riparian landscape was dominated by forest (60–70%) throughout the study. The dominant anthropogenic land cover switched from clearcuts (declined from 11% to 0% of the shoreline) to residential development (increased from 4% to 12%). The ordination showed two trajectories of net land–cover change: (1) a decline in clearcuts and increase in mixed forest (15% of the study lakes), and (2) a decrease in mixed forest and wetland and an increase in low–density development and evergreen forest (32% of lakes). Development in 1939 was not related to riparian land cover or to initial lake attributes. Similarly, lake color, conductivity and Secchi depth varied little during the study period and were not related to anthropogenic land uses in the riparian zone. The absence of measurable effects of anthropogenic riparian land–cover change on these variables may reflect the minimal topographic relief and dominance of groundwater flow in this region. Ecological effects of development may occur in variables other than water chemistry. These results underscore the importance of historical context when studying spatial patterns of human development and their consequences for ecosystems.