National Critical Load Database: an assessment of atmospheric deposition effects across the U.S.

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In the United States, critical loads are emerging as an important assessment and policy tool for protecting ecosystems from atmospheric deposition of pollutants. Critical loads simplify complex scientific information on exposure to air pollutants, making them an effective tool for informing policy and land management decisions. However, only limited national assessment of critical loads and exceedances have been undertaken in the United States because of a lack of a repository for critical load data and coordination between scientists and federal managers. Beginning in 2006, the primary forum for critical loads research and development coordination in the United States has been the Critical Loads of Atmospheric Deposition Science Committee (CLAD) of the National Atmospheric Deposition Program. In 2010, the "FOCUS Pilot Study" project began a national effort to synthesize empirical and calculated critical loads and to submit data unofficially to the UNECE Coordinating Center on Effects in the interests of international cooperation and exchange of information on the effects of atmospheric deposition on ecosystems. The goals include developing methods to characterize CLs in a standardized reproducible fashion, characterize uncertainty in CLs, identify gaps in available data, and advance efforts to use CLs as an air quality management tool for policy and land management assessment. This national database for sulfur (S) and nitrogen (N) compounds is comprised of three major critical load sources: 1) empirical N critical loads for fungi, lichens, herbaceous, forests (Pardo et al. 2011; Geiser et al. 2010); 2) steady-state soil critical load for acidity (McNulty et al. 2007); and 3) steady-state surface water CLs of acidity. We present two analyses that use the CL database to examine the reliability and uncertainty of CL values and assess national CL exceedances with respect to current deposition loading of NOx and SOx. We found that different surface water CL models for acidity produced comparable values. In addition, emission control programs, such as the Acid Rain Program, NOx Budget Trading Program and Clean Air Interstate Rule, together with other controls, have increased ecosystem protection from acidic deposition across the US.

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