

Critical Loads Approach to Ecosystem Services

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Public policy decision-making on natural resource issues increasingly relies on two tools: ecosystem services (ES) and critical loads (CL). An integrated approach is applied here to the application of ES and CL for public land management, using as an example the acidification of soil and drainage water by atmospheric deposition of acidifying sulfur (S) and nitrogen (N) compounds. This case study of the central Appalachian Mountain region focuses on areas where effects of acidic deposition on aquatic and terrestrial resources have been relatively well-studied and pronounced. A conceptual framework is presented that illustrates how the ES and CL approaches can be combined in a way that enhances the strengths of each. A suite of ES can be lost or compromised by acidic deposition. Impacted services are associated with maintenance of a healthy fishery resource and the occurrence of benthic macroinvertebrates on which they feed. To a lesser extent, affected ES in this region include adverse impacts on the growth, vigor, and regeneration of sugar maple, which is broadly distributed throughout the study region and which is known to be sensitive to acidification and base cation depletion. Red spruce is also highly sensitive, but only occurs within the study region at scattered high-elevation locations. Impacted aquatic and terrestrial resources are mapped and quantified. They relate to maintenance of healthy trout fisheries and sugar maple trees, including recreational fishing, tourism, aesthetic values, iconic species values, and the cottage industries focused on maple syrup and related sugar maple products.

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