

**Development of a base cation weathering (BCw) datalayer
to support the calculation of critical loads of nitrogen (N)
and sulfur (S) deposition of in the United States:
Pennsylvania as the trial state.**

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Determination of critical loads of atmospheric deposition is becoming an increasingly important component of natural resource policy and management. However, availability of good-quality and defensible estimates of base cation weathering (BCw) rates limits the ability to calculate accurate critical loads of nitrogen (N) and sulfur (S) deposition in terrestrial ecosystems in the United States. The objective of our study was to evaluate the feasibility of a PROFILE model-based methodology to produce a high-quality, continuous coverage datalayer of BCw. The methodology was applied to forested areas in Pennsylvania using currently existing national- and state-level databases, and BCw rates were calculated at the U.S. Department of Agriculture (USDA)-National Resources Conservation Service (NRCS) SSURGO soil polygon level (0.1 km²). The model was successfully applied to 617,249 sites and BCw rates were found to range between 0.02 and 320.43 keq/ha/yr. The average BCw rate was 2.34 keq/ha/yr. Insufficient forest parameter and soil mineralogy data were found to be the main limitation to the model estimates of BCw.

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