Mapping potential future developments of forest ecosystems due to climate change and nitrogen deposition

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Abstract

Excerpts from a complex methodology to assess and classify forest ecosystem integrity under climate change and nitrogen deposition are presented. Vegetation and soil data from approximately 22,000 stands collected 1961-1990 were used to classify forest ecosystem types. These were linked to Germany's potential natural vegetation and biotope types, FFH habitat types, and the European Nature Information System classification and mapped nationwide. Using 14 indicators for 6 ecosystem functions, historical reference conditions (1961-1990) were quantitatively described for 60 forest ecosystem types. Comparison with current (1991-2010) and future ecosystem conditions (2011-2040, 2041-2070) was the basis for ordination of ecosystem integrity at the indicator, function, and ecosystem type levels. Projections of expected ecosystem changes were generated by dynamic modelling of soil science indicators considering climate change and anthropogenic nitrogen inputs for 2011-2040 and 2041-2070. The ordination of ecosystem integrity development provides an ecological basis for nature conservation monitoring of habitat types according to the Habitats Directive and for an assessment of ecosystem services. A validation of the methodology for ecosystem integrity classification on a regional scale was carried out using the Kellerwald National Park (Germany) as an example. Soil moisture was found to be a particularly sensitive indicator of climate change-induced changes.

Keywords: European Moss Survey, chemical transport models (EMEP, LOTOS EUROS), open field deposition, throughfall deposition.

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