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Indicating Impacts of Climate Change and Nitrogen Deposition on Ecological Integrity of Forests

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Under action 5 of the EU Biodiversity Strategy to 2020, the condition of ecosystems and their services should be mapped and assessed across Europe. As a contribution to reach this aim, a method for evaluating and mapping historical, current and potential future ecological integrity of forests was developed using examples from Germany. The methodology integrated data on vegetation, chemical and physical soil conditions as well as on climate change and atmospheric deposition of nitrogen. A key component for evaluating ecosystem integrity is a classification of ecosystems containing data on indicators for ecological functions. Respective historical data covering 1961-1990 were regarded for reference. The assessment of ecological integrity relies on comparing a current or future ecosystem status quantified by indicators with respective historical reference values. Whilst historical and current ecosystem conditions were quantified by measurements, potential future developments were projected by geo-chemical soil modelling and data from a regional climate change model.

The ecosystem types refer to the potential natural vegetation and mapped using geo-data on current tree species coverage and land use. The current ecosystem types were related to geo-data (a.s.l. elevation, soil texture, air temperature, humidity, evapotranspiration, precipitation 1961-1990) by Classification and Regression Trees. The relations determined by this were applied to the above mentioned geo-data and then used to map the spatial pattern of ecosystem type clusters for 1961-1990. Then, the climate data 1961-1990 were replaced by results from a regional climate model for 1991-2010, 2011-2040, and 2041-2070. Accordingly, for each period one map of ecosystem type clusters was produced and evaluated with regard to the development of areal coverage of ecosystem clusters across time due to climate change. This evaluation of structural aspects of ecological integrity in terms of bio-geographical coverage on the national level was added by projecting potential future values of indicators for ecological functions at site-level. This was achieved by using the Very Simple Dynamics soil modelling technique using the above mentioned climate data and two scenarios of atmospheric nitrogen deposition as input. The results were compared to the reference and enabled evaluating site-specific ecosystem integrity over time which proved to be both positive and negative with regard to nature protection.

REFERENCES

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