Dose-effect Relations for Habitat types and Nitrogen deposition

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Abstract

Natura 2000 sites are threatened by excessive nitrogen deposition. Legislation is in place to protect the sites and habitat types, of which the critical load (CL) for nitrogen deposition is key. However, little or nothing is known what happens beyond the CL. How is species composition changing with increasing nitrogen deposition? We estimated dose-effect relations for habitat types and nitrogen deposition based on the responses of individual species. Question is if these univariate response curves are robust enough or that multivariate responses are needed instead.

Keywords: Nitrogen deposition, Habitat type, Natura 2000

1. Introduction

Nitrogen deposition is one of the threats of biodiversity in many places of the world. To protect biodiversity Natura 2000 sites have been assigned in Europe. The sites and the present habitat types are protected through European legislation. Critical Loads (CL) for nitrogen deposition have been estimated for these habitat types and are part of European and national law. The CL indicates the deposition rate in kg/ha/y above which habitat types are expected to become threatend. Not much is known how fast this deterioration commences. This could give a lot of insight in the ongoing effect of deposition and the loss of species Therefore, we estimated dose-effect relations for habitat types and nitrogen deposition, based on the indicating species.

2. Material and Methods

For nitrogen deposition we used the EMEP data. The maps were interpolated in between years and cells to get more site and year specific values. Vegetation type was used as covariance to distinguish between grassland, scrub and heathland and forest. The deposition was linked to the species present in over 1,000,000 vegetation releves of the EVA database (http://euroveg.org/eva-database). The deposition at the site was calculated as the average deposition of the previous five years. Per species a response curve for nitrogen deposition was estimated. Of this spline function the percentiles were used to estimate the response of a habitat type to nitrogen deposition. The percentiles and the deposition of indicator species of a habitat type were added together and subsequently a response curve was estimated.

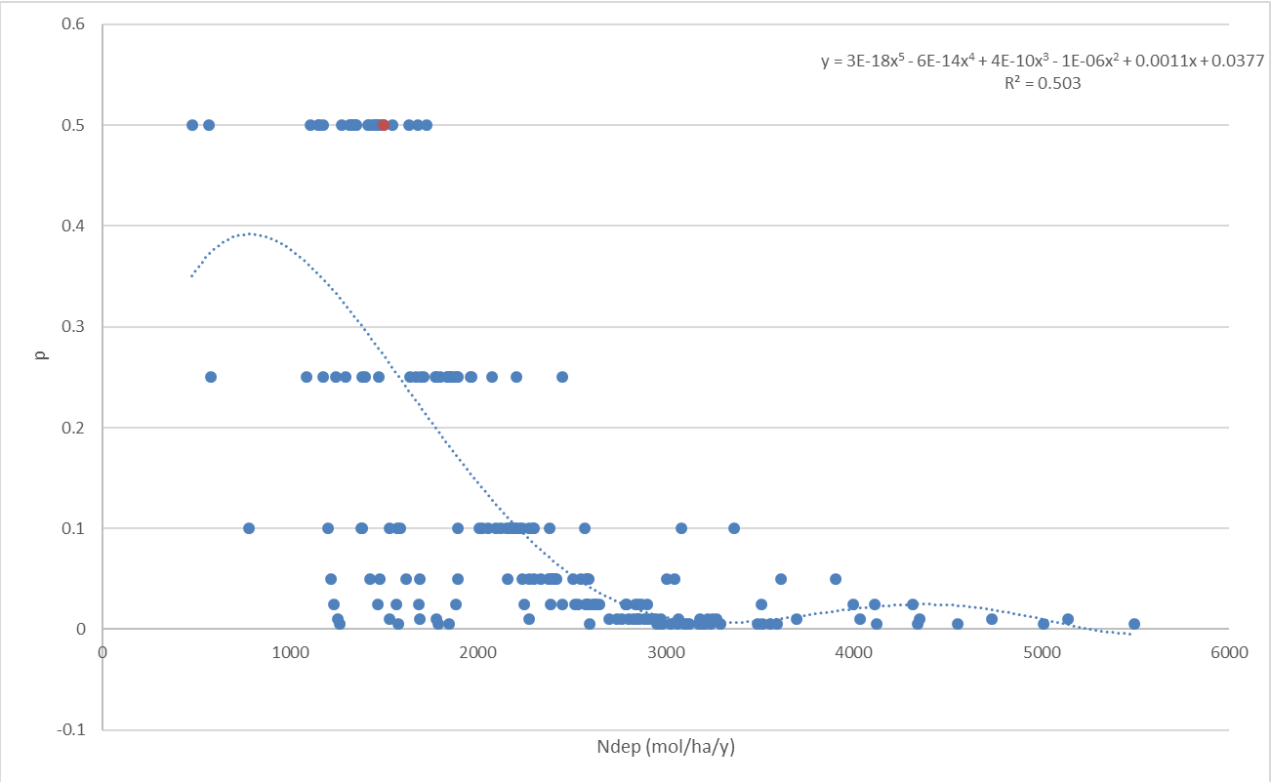

Fig. 1: Dose-effect relation for 'Semi-natural dry grasslands and scrubland on calcareous substrates' (H6210) based on indicating species. Blue dots: percentiles (50, 25, 10, 5, 1 and 0.1) of the response curves of the species, red dot: CL (1500 mol/ha/y).

3. Results and Discussion

For many habitat types we were able to estimate a significant response curve. Mostly, the CL of the type is 'nearby' the optimum of the response curve, however sometimes it is higher, but also lower. We estimated univariate response curves where multivariate could be more appropriate, but also more complicated. Factors as climate soil type and management are ignored and this is influencing the result, because it gives rise to uncertainty.

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