Nardus grasslands and wet heaths are affected differently by reintroduction of management and pH recovery

Leonie Mazalla[1]
Gerhard Ludwig[2]
Cord Peppler-Lisbach[3]
Contact: mazalla@uni-bremen.de

Nardus grassland

Wet heath

Background

Semi-natural habitats in temperate regions are local hotspots of biodiversity, but threatened by multiple stressors such as land-use change and atmospheric deposition. We conducted a resurvey of *Nardus* grasslands and wet heaths in the Eifel mountains, Germany, to evaluate the implementation of a long-term management regime and the above-mentioned stressors. **Prior to the first survey** in 1986, the meadows had lain **fallow for approximately 30 years. Shortly afterwards**, they were entered into a contractual nature conservation program with **annual mowing after mid-July**.

Methods – Resurvey

- 50 plots of *Nardus* grassland, 14 of wet heath, plot size 20m².
- First survey by LUDWIG (1987), repeated in 2018.
- Soil pH measurements in both years.
- Relocation via precisely drawn maps and differential GPS.

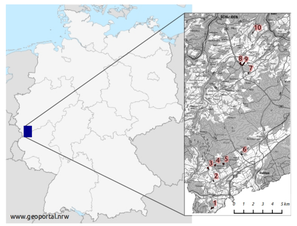


Fig. 1: Location of the study sites.

Results

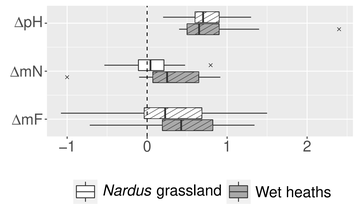


Fig. 2: Changes (Δ) in soil pH and mean unweighted Ellenberg indicator values for soil nutrients and moisture between 1986 and 2018. Stripes indicate a significant shift.

Soil pH increased significantly, from mean 3.9 in 1986 to mean 4.6 in 2018. It was lower than the threshold for aluminium toxicity (4.5, DE GRAAF et al. 2009) in only 22% of cases in 2018, compared to 98% in 1986. The mean unweighted indicator value for soil nutrients did not increase in *Nardus* grassland, but in wet heath.

Tab. 1: Significant changes (Δ) in number and cover sums of species from four species groups between 1986 and 2018.

	Nardus grassland		Wet heath	
species group	number	cover	number	cover
Δ*Nardus* grassland specialists		−		
ΔWet heath specialists	−	−	−	−
ΔAgricultural grassland species	+		+	+
ΔSmall segde fen species	+	+	+	+

The ***Nardus*-grasslands proved quite stable.** All *Nardus* grasslands from 1986 were still typical *Nardus* grasslands in 2018, with a high total species number (mean 34.3 / 20m²) and proportion of character species (on average 40% of species). However, these decreased in cover (Tab. 1). Species of agricultural grasslands only increased in number, not in cover. Small sedge fen species increased in number and cover. Non-competitive species (e.g. *Pedicularis sylvatica*) were promoted.

Wet heaths basically disappeared. In 2018, their character species accounted for only 3% of species, with an average cover of 4%. Especially dwarf shrubs declined. The former wet heaths transformed into wet variants of *Nardus* grasslands, small sedge-dominated swards or wet meadows with signs of eutrophication (e.g. presence of *Angelica sylvestris* and *Galium mollugo* agg.)

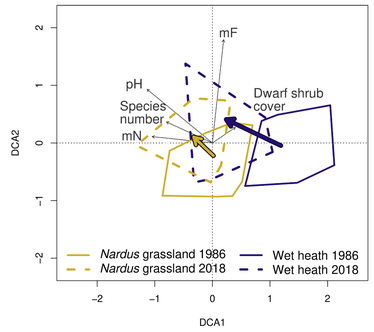
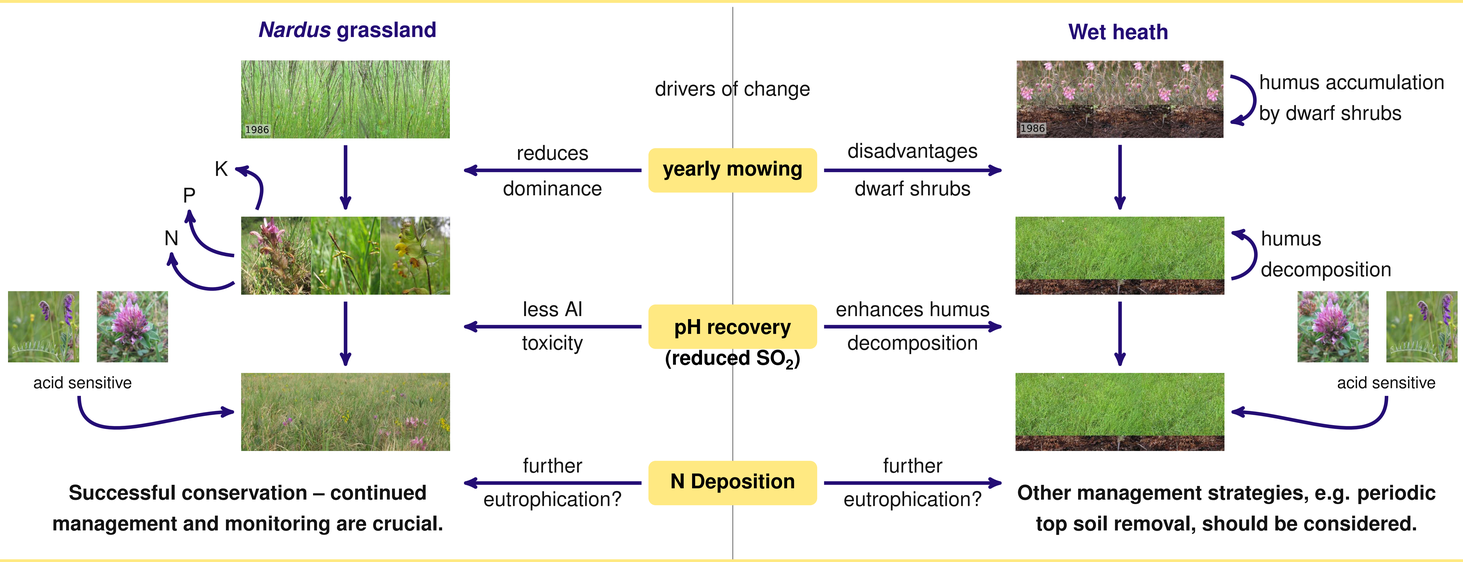


Fig. 3: DCA of all plots in 1986 and 2018, based on species presence/absence data.

Wet heaths (blue) have changed more between surveys than *Nardus* grasslands (yellow). They have become more similar to the *Nardus* grasslands, with which they overlapped in 2018 (dashed) but not in 1986 (solid).

Discussion



[1] Vegetation Ecology and Conservation Biology, Institute of Ecology, FB 2, University of Bremen, Leobener Str. 5, 28359 Bremen, Germany.
[2] Bundesamt für Naturschutz, Konstantinstr. 110, 53179 Bonn, Germany.
[3] Department of Biology, Earth and Environmental Sciences, Landscape Ecology Group, University of Oldenburg, 26111 Oldenburg, Germany.

References

Ludwig, G. (1987): Vegetationskundliche und standörtliche Untersuchungen der Borstgrasrasen (*Nardetalia*) im Kreis Euskirchen unter besonderer Berücksichtigung der Bryophyta. Friedrich-Wilhelms-Universität Bonn. Diplomarbeit, unveröffentlicht: 98 pp.
De Graaf, M.C.C., Bobbink, R., Smits, N.A.C., Van Diggelen, R., & Roelofs, J.G.M. (2009): Biodiversity, vegetation gradients and key biogeochemical processes in the heathland landscape. Biol. Conserv. 142: 2191–2201.