How will the semi-natural vegetation in the UK have changed by 2030 given likely changes in nitrogen deposition?

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Aims

• Critical loads currently exceeded in 60% of sensitive terrestrial habitats, this is expected to fall to 49% by 2020.

• But:
  – Recovery is slow, if at all
  – Impacts of N deposition may well be cumulative

• Aim: Provide provisional predictions of future change in the community composition of UK semi-natural habitats due to N deposition
Methods

• Mix of literature review (experiments, gradient studies and modelling studies)
• Modelling individual species responses using Countryside Survey data
Methods
Methods

- MultiMOVE comprises three statistical modelling techniques
- GLMs, GAMs and MARS.
- Consistent messages and relationships from the driver variables across models provides strong evidence base.
- More models help to understand and interpret the uncertainty in the model predictions.
Deciduous woodlands
Deciduous woodlands

• ↑ grass cover in woodlands with a low nutrient status
• Change in species composition.
• ↑ nitrophilic vascular plants e.g. *Deschampsia flexuosa*, *Holcus lanatus*, *Rubus idaeus* and *Urtica dioica*.
• ↓ species such as *Calluna vulgaris* and *Oxalis acetosella*.
• Change in epiphytic bryophyte and lichen communities.
• ↓ lichen occurrence.
Grasslands

Species richness (mean number of species for 5 x 2 m quadrats) vs. Total inorganic N deposition (kg N ha\(^{-1}\) yr\(^{-1}\)). The graph shows a negative correlation with a coefficient of determination (R\(^2\)) of 0.4023.
Grasslands

Probability of presence of *Ononis repens* in lowland calcareous grassland (BSBI local change)

Change in the probability of presence of *Dryas octopetala* in upland calcareous grassland (vascular plant database)
Grasslands

Carex panicea

Lotus corniculatus

Plantago lanceolata

Urtica dioica
Grasslands

• ↓ species richness in acid grasslands and possibly in other types.
• ↑ in the cover of grasses ↓ forbs.
• ↑ Ellenberg N score.
• ↑ ↓ Individual species depending on species and grassland type.
• ↓ Terricolous lichens are likely to decrease in occurrence.
Heathland and Bog

Field et al., in press
Heathland and Bog
Heathland and Bog

Trichophorum cespitosum

Calluna vulgaris

Erica tetralix

Rumex acetosa

Year
cumN
Heathland and Bog

- ↓ species richness.
- ↓ cover of dwarf shrubs including *Calluna vulgaris* and *Eric* spp. ↑ grass cover, particularly *Molinea caerulea*, *Holcus lanatus* and *Deschampsia flexuosa*.
- ↑ Ellenberg N score.
- ↓ individual species of vascular plant.
- ↓ *Spagnum* productivity.
- ↓ Terricolous lichens.
Conclusions

• It seems likely that plant communities will continue to change
• Nitrophilous species are likely to increase, as is grass cover whilst species richness declines
• There are few mitigation options so N deposition needs to be reduced.
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