

MILES planted birch plots: MOORCO – Moorland colonisation



We use long-term experimental plots to assess the impact on above and below-ground biodiversity and ecosystem services of a change in landuse from moorland to woodland

Background

These plots are part of the [MOORCO](#) ^[1] project and were established in order to experimentally test the results from the [MOORCO chronosequence](#) ^[2] plots. The effects of birch (*Betula* sp.) on moorland soils is being tested using a replicated paired plot [experiment](#) established at three [sites](#) in Scotland in the early 1980s. [Data](#) collected from these plots has enabled us to assess the ecological engineering impact of birch on above and below-ground species and processes.

Key results

- Under the birch, plant species richness decreased and the ground vegetation composition changed, from being dominated by *Calluna vulgaris* to being dominated by either grasses and *Vaccinium myrtillus* or bare ground depending on the density of the trees.
- The depth of the soil organic horizon, its moisture content and percentage carbon were all smaller under the birch than under the heather.
- Concentrations of available phosphorus and mineralisable-N were significantly greater in the soil under birch than under the heather plots.
- Decomposition was faster in the birch than in the heather plots.
- The abundance and species richness of Collembola and oribatid, mesostigmatid and prostigmatid mites were all significantly greater under the birch than under the heather.
- Under birch, total microbial biomass (total phospholipid fatty acids (PLFAs)) declined, species richness increased and the ratio of fungal:bacterial PLFA declined.
- The fungal PLFA marker increased with increasing organic matter and depth of the LFH and O soil horizons, characteristics associated with moorland soils.

- Bacterial PLFAs increased with increasing birch canopy cover.
- The fungal community (as measured using polymerase chain reaction–denaturing gradient gel electrophoresis (*PCR-DGGE*)) of the birch plots was different from that in the heather plots and changes in the fungal community composition were related to the size of the birch trees in the plots.
- Changes in the soil microbial community were also related to changes in mineralizable N. Mineralizable N was correlated with both decreasing total soil microbial biomass and decreasing fungal:bacterial ratio.
- This work has provided experimental evidence that birch acts as a top-down engineer, driving cascading effects on both above- and below-ground communities, soil chemical and physical properties and ecosystem processes

See [Publications](#) ^[3] for further details of results.

Sites

Site Name	Grid reference
Dalnalyne	NJ189175
Craggan (a)	NJ197326
Kerrow	NH336299

Experimental design

Treatments

- Planted plots: *Betula pubescens* planted at 1m spacing in plots
- Control plots: Open heather moorland
- *Betula pendula*: at Kerrow an addition 6 plots were established with *Betula pendula* planted

Replication

Paired plot design 6 control plots and 6 *Betula pubescens* plots at each site. In addition a further 6 plots at Kerrow with the second birch species

Data collected

Data type	Date	Details
Vegetation	1985, 2003	Species composition (% cover)
Soil chemistry	1978, 1986, 2003	Al, C, C:N, Ca, Ca, Fe, K, LOI, Mg, Mn, moisture, N, Na, N-mineralization, P, pH
Soil microbial	2003	PLFAs and DGGE
Decomposition rates	2003	Filter papers and wooden sticks
Soil physical properties	1978, 2003	LFH depth, O depth, bulk density

Data type	Date	Details
Tree density and size	2003	Number, height and DBH
Soil invertebrates	2004	Collembolla and mites (to species) Enchytraeidaes numbers

Contact

MOORCO [1] is a collaborative project across several groups and themes within the James Hutton Institute and with many different staff involved. In the first instance please contact Dr Ruth Mitchell [4] for further details.

Related Staff

Related staff

Ruth Mitchell [5]

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[1] <http://www.hutton.ac.uk/research/groups/ecological-sciences/community-ecology/moorco>

[2] <http://www.hutton.ac.uk/research/groups/ecological-sciences/community-ecology/moorco/chrono>

[3] <https://www.hutton.ac.uk/research/departments/ecological-sciences/research-facilities/moorco/publications>

[4] <mailto:ruth.mitchell@hutton.ac.uk?subject=Enquiry%20about%20MOORCO>

[5] <https://www.webarchive.hutton.ac.uk/staff/ruth-mitchell>