Creating acid grassland by sheep grazing and natural reversion at Minsmere RSPB Reserve, Suffolk, England

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SUMMARY

On former arable land at Minsmere RSPB Reserve in eastern England, sheep grazing was introduced with the objective of creating acid grassland. Seven years after the introduction of grazing, the fields still had a significantly lower cover and species-richness of target acid grassland plant species compared to the existing adjacent acid grassland.

BACKGROUND

This case study describes one of three methods used to try to create acid grassland on former arable land at Minsmere Royal Society for the Protection of Birds (RSPB) Reserve in eastern England. The method used in this study is grazing by sheep and natural reversion. The other methods were addition of sulphur plus re-seeding (Ausden & Kemp 2005a) and addition of sulphur, bracken *Pteridium aquilinum* litter and heather *Calluna vulgaris* cuttings (Ausden & Kemp 2005b).

Prior to the current trial, arable cropping had been undertaken on the fields every year between 1990 and 1996 inclusive with the aim of reducing soil fertility, particularly levels of extractable phosphorous (P) and exchangeable calcium Ca) on the northern reversion block between 1990 and 1996. This period of cropping had no significant effect on soil pH or extractable Ca and P levels (Marrs *et al*. 1998).

ACTION

Study site: The habitat creation took place on two former arable fields, Field 63 (17.7 ha) and Field 64 (15.8 ha) on the Typical Brown Sands soil of the Suffolk Sandlings at Minsmere RSPB Reserve (National Grid ref: TM 454686) on the Suffolk coast. The fields had been arable for at least the previous 150 years.

Soil properties in the field prior to the start of the current trial (mean values) were:

Field 63: Loss on ignition (% of dry weight) 1.8; pH 7.2; Olsen extractable P (μg P/g) 7.2

Field 64: Loss on ignition (% of dry weight) 1.8; pH 6.7; Olsen extractable P (μg P/g) 5.7.

Grazing: The field was part of a larger grazing unit that was grazed by sheep (mainly Speckled-faced Beulahs) year round since January 1999. Annual average grazing densities varied from 1.3 to 1.6 sheep/ha. The overall annual grazing intensity was equivalent to between 0.09 and 0.10 livestock units/ha, assuming that one medium ewe is considered equivalent to 0.08 livestock units (lsu) and one lamb equivalent to 0.04 lsu.

Ragwort control: The abundance of ragwort *Senecio jacobaea* (toxic to sheep) in some fields meant that the flock was unable to graze all the areas that would otherwise have been open to them. Portable electric fencing was used to segregate the flock from areas containing abundant ragwort. Sheep grazing was used to control ragwort where it occurred at lower density. Where ragwort was more prevalent mowing or weed-wiping with herbicide (Roundup Biactive) was used to control it, the latter mainly in Field 63.

Soil and vegetation monitoring: Soil conditions were determined from 20 randomly located, 15 cm deep soil samples extracted from each field. Vegetation composition was monitored in 12 (in 1999) or 15 (in 2003) randomly located 1 x 1 m frame quadrats within each field. The cover of individual plant

species within each quadrat was determined using 50 'hits' of a point quadrat. The presence of any additional plant species within the quadrat, which was not recorded by point sampling, was also recorded.

Existing acid grassland adjacent to the reversion fields was surveyed (using 15 randomly placed quadrats) in order to define the 'target vegetation community' that was hoping to be acheived.

CONSEQUENCES

Vegetation composition: Two measures of vegetation composition were used to assess the success of the habitat creation:

a) The percentage cover of the species that were found in the 'target acid grassland'. These were defined as all species found in fifteen quadrats recorded on adjacent existing short, rabbit grazed acid grassland excluding bracken *Pteridium aquilinum*, bramble *Rubus fructicosus* agg. and honeysuckle *Lonicera periclymenum*.

b) The species-richness of these 'target acid grasslands'.

Changes in the flora of the former arable fields are shown in Figure 1, and a comparison of the abundance of the desirable target acid grassland species in Table 1. Both the natural reversion fields still had a significantly lower cover and species-richness of target acid grassland plant species compared to the existing acid grassland in 2003. The dominant species in 2003, seven years after the start of the trials, are shown in Table 2. Photo 1 shows one of the natural reversion fields in 2004.

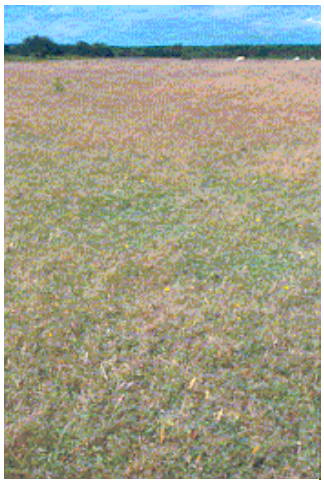


Photo 1. One of the natural reversion fields in 2004.

REFERENCES

Ausden M. & Kemp M. (2005a) Creating acid grassland by adding sulphur and re-seeding at Minsmere RSPB Reserve, Suffolk, England. *Conservation Evidence*, 2, 13-15.

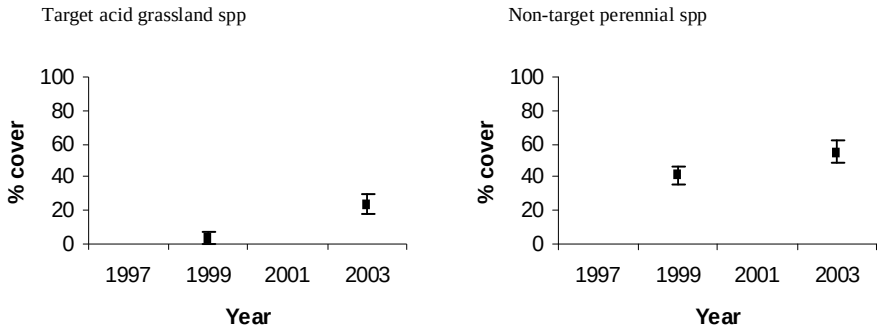
Ausden M. & Kemp M. (2005b) Creating acid grassland by adding sulphur, bracken *Pteridium* litter and heather *Calluna* cuttings at Minsmere RSPB Reserve, Suffolk, England. *Conservation Evidence*, 2, 21-23.

Marrs R.H., Snow C.S.R., Owen K.M. & Evans C.E. (1998) Heathland and acid grassland creation on arable soils at Minsmere: identification of potential problems and a test of cropping to impoverish soils. *Biological Conservation*, 85, 69-82.

Table 1. Comparison of the vegetation in natural reversion fields ay Minsmere with that of adjacent existing acid grassland. Values are mean percentage cover in 2003 ± one standard error. Means with different superscripts differ significantly from each other (Tukey test, $P < 0.05$).

	Existing acid grassland	Field 63	Field 64	*F*	*P*
Target acid grassland species (% cover)	85.6 + 2.5a	22.9 + 5.8b	11.2 + 3.9b	70.3	<0.001
Target acid grassland species (no. of species/m^2)	5.7 + 0.7a	2.7 + 0.5b	2.1 + 0.3b	17.2	<0.001

(a) Field 63



(b) Field 64

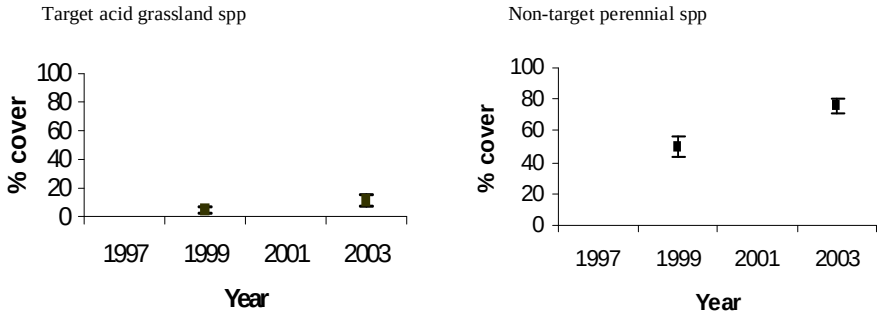


Figure 1. Changes in vegetation cover on natural reversion Field 63 (a) and Field 64 (b) at Minsmere, 1997-2003. Values are means ± one standard error.

Table 2. Dominant plant species on the field and on adjacent existing acid grassland in 2003. Values are mean % cover ± one standard error.

Existing acid grassland:		
Sheep's sorrel	*Rumex acetosella*	49.9 ± 7.4
Common bent	*Agrostis capillaris*	11.6 ± 4.0
Fine-leaved fescue	*Festuca filiformis*	9.0 ± 3.6
Brown bent	*Agrostis vinealis*	4.3 ± 3.6
Natural reversion fields:		
Field 63		
Yorkshire-fog	*Holcus lanatus*	19.6 ± 5.9
Sheep's/fine-leaved fescue	*Festuca ovina/filiformis*	11.0 ± 2.8
Common couch	*Elytrigia repens*	9.6 ± 2.2
Black bent	*Agrostis gigantea*	8.3 ± 2.9
Field 64		
Yorkshire-fog	*Holcus lanatus*	40.2 ± 6.8
Cat's-ear	*Hypochaeris radicata*	17.7 ± 2.8
White clover	*Trifolium repens*	10.0 ± 3.0
Squirrel-tail/rat's-tail fescue	*Vulpia bromides/myuros*	8.8 ± 2.5