

# Hay mowing and scrub clearance enhance floristic species richness on a green lane in Norwood End, Essex, England

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## SUMMARY

An experimental hay mowing and scrub clearance regime was introduced to Perryfield Lane - a 'green lane' site (i.e. a double hedged unsurfaced track) in Norwood End, Essex (England), with the aim of increasing floristic species richness. After two years of management, the floristic species richness doubled on the grassy verges of the lane, a smaller increase in the number of plant species was noted for the central track, which is used by (occasional) motorised vehicles due to the legal status of the lane as a public byway. Plants that benefited from hay mowing and scrub clearance included unimproved grassland indicator species such as black knapweed *Centaurea nigra*, hairy St. John's-wort *Hypericum hirsutum* and primrose *Primula vulgaris*. There were substantial reductions in bramble *Rubus fruticosus* agg. and blackthorn *Prunus spinosa* achieved, thereby preventing their encroachment and smothering of the remnant grassland flora.

## BACKGROUND

The byways (public rights of way open to all traffic; walkers, horse riders, cyclists, motorised vehicles and carriage drivers) of Essex (south-east England) were surveyed in 2002 and 2003 to describe their value for conservation, archaeology and amenity. This survey led to the publication of a report (Plumb 2004), which has been further analysed by Gardiner (2008). There are approximately 270 byways in Essex, many of which are green lanes (i.e. unsurfaced tracks with a hedgerow running along either side). Green lanes and hedgerows are a Biodiversity Action Plan (BAP) habitat in Essex, and ancient/species rich hedgerows have a UK Habitat Action Plan (HAP) highlighting their importance for wildlife in the countryside. It would seem that the current treeless width (mean width: 2.7 m) of byways is substantially reduced compared to the historical width (mean width: 6.7 m; Gardiner 2008). This considerable reduction in the non-wooded width of byways is due to scrub/tree encroachment, probably brought about due to changes in the usage and management of the

routes from the days when they would have been regularly used as cart tracks connecting one village with another. Grazing animals would have browsed herbage and trampling by horses and walkers would have restricted tree growth. The reduction in the area of grassy verge and track caused by scrub encroachment is likely to have had a detrimental impact on the ground flora of the byways; plant species such as cowslip *Primula veris* and primrose *Primula vulgaris* need plenty of light to maintain their populations and are unable to persist under the shade of the now closed woodland canopies of many byways.

Perryfield Lane in Norwood End, Fyfield, has one of the best ground floras of any byway in Essex (Gardiner 2008), but this is threatened by scrub encroachment and overgrowth with coarse grasses such as cock's-foot *Dactylis glomerata* and false-oat grass *Arrhenatherum elatius*. It is the aim of this paper to document the response of the flora of this green lane to a hay cutting and scrub clearance regime introduced by Epping Forest Countryside in the summer of 2007.

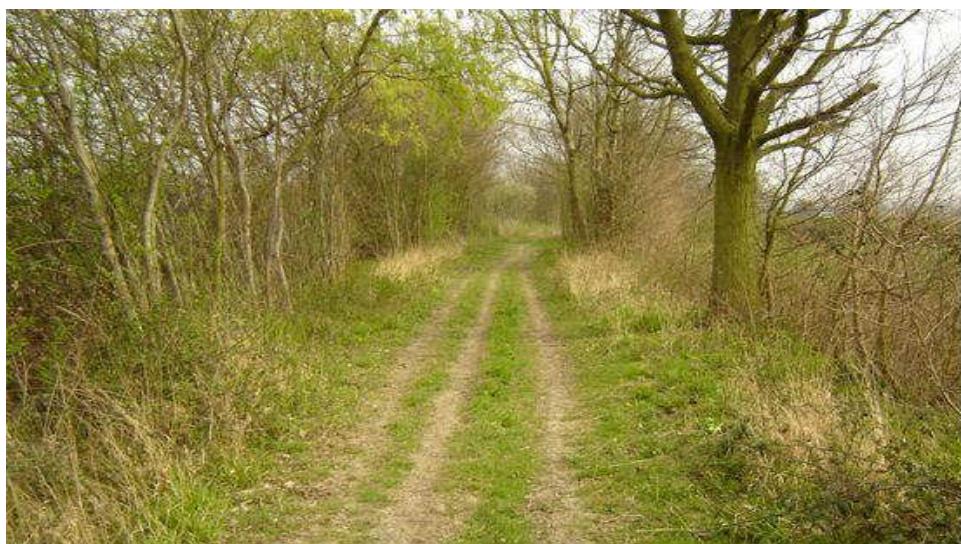
## ACTION

**Perryfield Lane description:** The green lane is classified as a public byway open to all traffic (including motorised vehicles) and is approximately 760 m in length. The byway (Byway 21 Fyfield; Ordnance Survey grid ref. TL 569084) is situated in the parish of Fyfield (west Essex) and has a hedgerow on both sides for most of its length. The lane is approximately 6 m wide, although some scrub (mainly blackthorn *Prunus spinosa* and dogwood *Cornus sanguinea*) has encroached onto the verges, narrowing its width to 4 m in places. The central track (approximately 2 m wide, with sporadic wheel ruts; Fig. 1) used by occasional motor vehicles is unsurfaced and has natural vegetation cover except in wheel ruts. Although walkers and horse riders often use the lane, its usage by motorised vehicles (e.g. land rovers and motorbikes) is very infrequent (< 1 vehicle passage per week), probably due to the poor surface condition at its eastern end and narrow exit (hedges restrict vehicles, usable width only c. 2 m wide) onto the B184. The soil, a chalky boulder clay, supports a rich flora comprising indicators of calcareous grassland such as early purple orchid *Orchis mascula* and *P.veris*. The lane runs approximately east to west, and has a diverse woody flora (one 30 m section of hedgerow has 10 woody species), supporting the idea that the green lane may be ancient (Rackham 1986). *C.sanguinea* and spindle *Euonymus europaeus* are numerous in the hedgerows further indicating their old age, as these species (although commonly found in

hedges with high diversity) are poor colonisers of newly planted hedges (Rackham 1986).

**Hay mowing and scrub clearance of the verge and track:** On the lane, grass and scrub was cut using a self propelled flail mower along the entire length of the byway on 7 August 2007, 11 September 2007 and 19 August 2008 by Epping Forest Countryside and volunteers. A late summer cut was chosen as by this time in the year most herbs have seeded (additionally, any birds nesting in the hedgerows would have fledged their young). All cut material was collected by raking and removed from the verge and track, being deposited in piles along the lane. Two cuts were necessary in 2007 due to the overgrown nature of the lane after several years of neglect.

**Monitoring:** In both survey years (2007 and 2009) 20 (50 x 50 cm) quadrats were placed randomly on the grassy verge and central track (10 on verge, 10 on track; 40 quadrats sampled in total) to monitor the response of the ground flora to management. Monitoring of the flora took place on 12 April 2007 (before hay mowing and scrub clearance commenced) and 10 April 2009 (after two years of cutting) in the same area of the lane (although exact locations of quadrats varied due to the random positioning within the area). The frame quadrat used had 100 divisions to assist percentage cover/occurrence estimates of the vegetation.



**Figure 1.** Perryfield Lane in early spring 2007 before hay mowing, note the primroses *Primula vulgaris* on the right hand side verge and the wheel ruts on the central track (photo: Tim Gardiner).

In each quadrat, the number of squares that each plant species (only herbs, sedges and woody shrub species identified) was recorded in was noted (e.g. if a species appeared in 100 squares it was recorded as having 100% occurrence). Grasses were not recorded due to difficulty in identification to species level early in the growing season. The method allowed an objective determination of the abundance/species richness of plants that could be repeated on each survey date. The site was walked in June 2009 to observe any additional herb species that were not recorded in the April 2009 quadrat survey.

## CONSEQUENCES

The floristic species richness of the grassy verges was twice as high after two seasons of hay cutting and scrub clearance (mean species/quadrat =  $3.9 \pm 0.6$  April 2007 vs.  $7.8 \pm 0.4$  April 2009; Table 1). Floristic species richness also increased on the track itself but not to the same magnitude ( $1.9 \pm 0.3$  vs.  $3.1 \pm 0.3$  species/quadrat). On the verges, there were noticeable increases in the ground cover of unimproved grassland indicator species such as black knapweed *Centaurea nigra*, hairy St. John's-wort *Hypericum hirsutum* and *P. vulgaris*. Increases in the abundance of fertile grassland species such as cow parsley *Anthriscus sylvestris* and cleavers *Galium aparine* were also recorded. The scrub clearances led to a substantial reduction in the ground cover of woody species such as bramble *Rubus fruticosus* agg. and *P. spinosa*; the verge was widened by approximately 0.5 m either side of the lane following the scrub cutting.

On the central track, cutting seemed to increase the ground cover of vegetation, as there was a substantial reduction in bare earth in the quadrats, although no measures of level of vehicle or pedestrian use were made which may have influenced this (Table 1). Higher than average rainfall in the 2008 growing season may also have led to enhanced plant growth. Plant species that seemed to benefit from the cutting regime included *C. nigra*, creeping buttercup *Ranunculus repens* and greater plantain *Plantago major*, the latter two species being particularly tolerant of the disturbed and compacted conditions created by vehicular usage, often being recorded in damp wheel ruts.

The June 2009 survey revealed the presence of summer-flowering herbs such as agrimony *Agrimonia eupatoria*, field scabious *Knautia arvensis*, restharrow *Ononis repens* and wild basil *Clinopodium vulgare*, which were not recorded in the April surveys.

**Discussion:** It appears that after only two years of management by hay cutting and scrub clearance, the floristic species richness doubled on the grassy verges of this green lane, a smaller increase in the number of plant species was also noted for the central track. Removal of the cuttings by raking was an important feature of the management, therefore preventing nutrients returning to the soil, which would increase the abundance of competitive grass species at the expense of less competitive herbs such as *P. vulgaris*. Scrub clearance also prevented *R. fruticosus* agg. and *P. spinosa* from further smothering the grassland flora.

Localised plant species in Essex that were recorded in low abundance on the lane, such as false oxlip *Primula veris x vulgaris* and goldilocks *Ranunculus auricomus* (Jermyn 1974), may depend on annual mowing of the lane for their survival in the sward. Due to the presence of a diverse, unimproved grassland flora and the age of the hedgerows, Perryfield Lane is to be considered as a candidate Local Wildlife Site (LoWS) in a forthcoming review. A LoWS is “*a discrete area of land which is considered to be of significance for its wildlife features in at least a District/Borough/Unitary Authority context*”; although not protected by legislation, their importance is recognised by local authorities when considering any relevant planning applications (Epping Forest District Council 2009).

Hay mowing in August may enhance the abundance of plants that flower in midsummer such as those recorded during the June 2009 survey (e.g. *A. eupatoria*, *K. arvensis*, *O. repens* and *C. vulgare*), these species should benefit from being allowed to flower and set seed before cutting commences in mid to late August. It is also hoped that the hay mowing regime will benefit certain invertebrates including localised butterflies such as ringlet *Aphantopus hyperantus*, and the range-expanding Roesel's bush-cricket *Metrioptera roeselii*; both insects (recorded during the June 2009 plant survey) need tall grass throughout June and July to meet their habitat requirements.

**Table 1.** Mean percentage ground cover ( $\pm$  standard error) of vascular plant species (excluding grasses) on the verges and track in April 2007 (before hay mowing and scrub clearance commenced) and April 2009 (after two annual hay cuts and scrub clearances).

<b>Plant species/bare earth</b>	<b>Verge</b>		<b>Track</b>	
	<b>2007</b>	<b>2009</b>	<b>2007</b>	<b>2009</b>
Bare earth	0.0 $\pm$ 0.0	0.4 $\pm$ 0.3	54.5 $\pm$ 7.1	27.8 $\pm$ 5.0
Black knapweed <i>Centaurea nigra</i>	2.7 $\pm$ 1.8	6.7 $\pm$ 2.7	2.4 $\pm$ 1.1	7.4 $\pm$ 1.9
Blackthorn <i>Prunus spinosa</i>	3.1 $\pm$ 1.8	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0
Bramble <i>Rubus fruticosus</i> agg.	10.2 $\pm$ 5.1	0.6 $\pm$ 0.3	0.0 $\pm$ 0.0	0.1 $\pm$ 0.1
Broad-leaved dock <i>Rumex obtusifolius</i>	0.0 $\pm$ 0.0	0.3 $\pm$ 0.2	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0
Bush vetch <i>Vicia sepium</i>	0.0 $\pm$ 0.0	0.3 $\pm$ 0.3	0.0 $\pm$ 0.0	0.4 $\pm$ 0.3
Cleavers <i>Galium aparine</i>	0.1 $\pm$ 0.1	5.1 $\pm$ 1.6	0.0 $\pm$ 0.0	0.5 $\pm$ 0.5
Cow parsley <i>Anthriscus sylvestris</i>	0.7 $\pm$ 0.7	6.6 $\pm$ 2.6	0.0 $\pm$ 0.0	0.1 $\pm$ 0.1
Cowslip <i>Primula veris</i>	0.0 $\pm$ 0.0	0.7 $\pm$ 0.7	0.7 $\pm$ 0.5	1.0 $\pm$ 0.7
Creeping buttercup <i>Ranunculus repens</i>	1.1 $\pm$ 0.7	0.8 $\pm$ 0.6	4.1 $\pm$ 1.6	10.2 $\pm$ 3.2
Cut-leaved crane's-bill <i>Geranium dissectum</i>	0.0 $\pm$ 0.0	0.3 $\pm$ 0.2	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0
Dandelion <i>Taraxacum officinale</i> agg.	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0	0.2 $\pm$ 0.2
Dog rose <i>Rosa canina</i> agg.	0.0 $\pm$ 0.0	2.0 $\pm$ 0.9	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0
Dog's mercury <i>Mercurialis perennis</i>	11.0 $\pm$ 7.9	9.6 $\pm$ 2.0	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0
Dogwood <i>Cornus sanguinea</i>	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0
False oxlip <i>Primula veris</i> x <i>vulgaris</i>	0.0 $\pm$ 0.0	0.3 $\pm$ 0.3	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0
Garlic mustard <i>Alliaria petiolata</i>	0.0 $\pm$ 0.0	0.1 $\pm$ 0.1	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0
Goldilocks <i>Ranunculus auricomus</i>	0.1 $\pm$ 0.1	1.2 $\pm$ 1.2	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0
Greater plantain <i>Plantago major</i>	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0	2.5 $\pm$ 0.8	4.4 $\pm$ 1.3
Ground ivy <i>Glechoma hederacea</i>	0.4 $\pm$ 0.4	0.6 $\pm$ 0.3	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0
Hairy St. John's-wort <i>Hypericum hirsutum</i>	7.3 $\pm$ 2.6	12.1 $\pm$ 4.6	1.3 $\pm$ 1.3	0.0 $\pm$ 0.0
Hedge bedstraw <i>Galium mollugo</i>	0.4 $\pm$ 0.4	2.2 $\pm$ 2.2	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0
Hedge woundwort <i>Stachys sylvatica</i>	3.0 $\pm$ 1.7	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0
Hogweed <i>Heracleum sphondylium</i>	0.2 $\pm$ 0.2	1.4 $\pm$ 0.6	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0
Lesser celandine <i>Ranunculus ficaria</i>	0.0 $\pm$ 0.0	0.4 $\pm$ 0.4	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0
Lords and ladies <i>Arum maculatum</i>	0.0 $\pm$ 0.0	0.7 $\pm$ 0.7	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0
Nipplewort <i>Lapsana communis</i>	0.0 $\pm$ 0.0	0.2 $\pm$ 0.2	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0
Pendulous sedge <i>Carex pendula</i>	9.0 $\pm$ 0.9	0.0 $\pm$ 0.0	2.0 $\pm$ 2.0	0.0 $\pm$ 0.0
Primrose <i>Primula vulgaris</i>	2.9 $\pm$ 2.3	9.8 $\pm$ 3.7	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0
Red campion <i>Silene dioica</i>	1.0 $\pm$ 1.0	1.6 $\pm$ 1.1	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0
Red dead nettle <i>Lamium purpureum</i>	0.0 $\pm$ 0.0	0.1 $\pm$ 0.1	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0
Self-heal <i>Prunella vulgaris</i>	0.5 $\pm$ 0.5	0.0 $\pm$ 0.0	0.4 $\pm$ 0.4	0.0 $\pm$ 0.0
Spindle <i>Euonymus europaeus</i>	1.0 $\pm$ 0.1	0.3 $\pm$ 0.3	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0
Sweet violet <i>Viola odorata</i>	0.0 $\pm$ 0.0	0.9 $\pm$ 0.6	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0
<b>Mean number of species/quadrat <math>\pm</math> SE</b>	<b>3.9 <math>\pm</math> 0.6</b>	<b>7.8 <math>\pm</math> 0.4</b>	<b>1.9 <math>\pm</math> 0.3</b>	<b>3.1 <math>\pm</math> 0.3</b>

## ACKNOWLEDGEMENTS

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