HABITAT MANAGEMENT GUIDE

Conserving Important Arable Plants on Heavy Soils


Corn Buttercup © Cath Shellswell

Introduction

As early arable farmers cleared the land for cropping, they inadvertently increased the ecological niche for weed species. Many of the species that we think of as arable weeds were present in the UK before arable farming developed. They would have been present where soils were naturally eroded, where wild animals had disturbed the ground and in areas of inherently infertile or shallow soils. The Bronze Age and Romano British periods saw an increase in the area of land under cultivation, together with an increase in the variety of crops grown. Crops introduced from mainland Europe would have brought new weed species with them, transported accidentally with the crop seed. Before the rise of agricultural seed suppliers cereal seed was often kept by farmers to sow the next season and with it weed seeds were safely stored and dispersed. As arable farming spread across the landscape, farmers encountered problems familiar to us today, especially in relation to utilising difficult to work soils.

Why are heavy soils so important for arable plants?

Arable land occupies roughly one third of Britain's land surface and in general, the areas that have been under cultivation for the longest time host the richest communities of arable plants. Heavy soils presented early farmers with a multitude of obstacles to overcome. Compared to lighter sandy soils and calcareous chalks and limestone, they were slow to warm in the spring and often lay wet due to impermeable subsoils. Arable farming grew slowly on heavier soils, more often livestock farming utilised the land for grazing. Nevertheless, where arable crops were sown on heavy soils, the yields would have been relatively high as the soils held onto nutrients, boosting productivity. This inherent fertility of many heavy soils means they support a different suite of arable plants to lighter soils.

Compared to what is the norm today, historically spring sowing on heavy soil was very late and harvest went on into late autumn. Autumn cultivation and sowing was also undertaken, so that the land could be worked while it was still dry after the summer. However, the crops faced the cold winter and harvests were less reliable.

The presence of arable plants on a farm helps facilitate a healthy arable ecosystem from the 'bottom up', offering greater resilience than simply planting plots of short lived agricultural cultivars to bolster food chains. Arable plants provide food for a wide range of farmland invertebrates, which in turn increase the foraging value of the habitat for farmland birds. This is especially important at the time of year when adults are seeking food items for fledglings. Farmland bird chick survival rates are heavily dependent on suitable food availability.

Where can arable plants be found?

Heavier, moisture retentive soils offer a suite of circumstances absent from lighter land rotations and thus have unique species associated with them. Many of our rarer species are adapted to autumn cultivation and germination and are able to survive the cold winter period. This includes Spreading Hedge-parsley, Corn Buttercup and Grass-poly.

The widespread adoption of modern farming methods has played a role in suppressing some of our rarer arable plants. The efficiency of herbicides coupled with nitrogen responsive crops can leave little room for non-target species within intensive modern production. Due to the fertility of heavy soils pernicious weeds can be difficult to control, suppressing populations of less competitive annual arable plants. The adoption of early winter planting requires a

Field Madder © Cath Shellswell

Common Fumitory © Cath Shellswell

comprehensive herbicide program, which has further reduced some populations of key arable species. However, it is possible to maintain arable plant populations on a productive modern farm.

Arable plants have held on by exploiting the gaps we have left: larger trailed equipment finds it difficult to access tight corners, game covers offer a spring germination opportunity and field headlands have always been seen as poor places to target inputs towards.

Many growers now use minimum tillage cultivations coupled with relatively simple rotations when compared to intensive light lands that feature deep soil movements to provide vegetable beds. The widespread adoption of agri-environment scheme options has expanded the potential suitable habitat: annually sown wild bird mixtures, cultivated headland strips and large cultivated plots aimed at ground nesting birds can hold successful populations of arable plants.

What options and opportunities are there alongside modern farming?

The moisture retentive, potentially slower drying nature of heavier soils often means field work is carried out in brief periods of workability in spring and autumn. Sowing crops in early autumn offers arable plants a window of germination, but this early cropping can exacerbate weed issues, such as Blackgrass and therefore often means a robust program of herbicide application. To avoid Blackgrass competition, crops are being sown later and increasingly, the Blackgrass cycle is being broken by the introduction of a spring sown crop. Typical arable species of heavier soils, such as Field Madder and Sharp-leaved Fluellen, can thrive from a spring cultivation, partly because the more aggressive species like Bristly Oxtongue have to start from scratch too. Where rotations allow Bristly Oxtongue to exist as a biennial it can out compete its annual neighbours. Other arable plants of heavy soils require autumn cultivation and so will be detrimentally affected if the entire cropping system shifts to spring cultivations.

Where continuous cereals have become uneconomic, we may see more land remaining un-cropped and managed as fallow. This could be simply to avoid applying inputs to areas with low yield potential or to receive environmental payments through existing or future schemes. Several agri-environment options benefit benign arable plants: cultivated fallow for arable plants and low input cereal options are the best, but arable plants can also grow within other options such as under-sown cereals, wild bird seed mixtures and over-wintered or spring fallows.

Key management principles to benefit rare arable plants and avoid pernicious weeds:

- Treat the arable plant areas as a hub for the generation of a vital ecosystem, for the healthy running of the farm. More invertebrates usually means better pollination and better farmland bird survival. Consider arable plants to be a 'crop' of flowers – this is what you are trying to achieve. Plan their position to avoid high burdens of problem weeds and prepare the ground well. The aim is to create an area with a range of annual flowers that will be home for invertebrates and provide a seed source for small mammals and farmland birds.
- Identify areas of the farm with thin, poor soils. It might be better economically to take these out of production as well as

Arable plants in winter wheat at Rothamstead © E L Cooke

the best places that the un-competitive arable plants may grow.

- Choose land that is out of full shade and free from winter water logging. If a cereal crop does not grow in a shaded headland then arable plants will struggle too.
- If headland sites are chosen, ensure they face south or west to make the most of a short spring growing season. The land should not be subject to pernicious weeds such as Sterile Brome and Cleavers.
- Identifying a number of potential sites from the outset is the key; if aggressive species proliferate, be prepared to move the area targeted for arable plants. Use cultural control, such as rotating the plots or autumn or spring cultivations, ahead of the ideal germinating period. Experience may prove that the sterile seedbed technique is the most efficient way to combat unwanted, aggressive species. Chemical control may be the key where it is difficult to rotate areas.
- Assess which arable plants are present and target cultivation dates to encourage germination. Maximise germination potential by carrying out cultivations on different plots in both autumn and spring.
- Plan and manage the option with the same care as you would a commercial crop. Cultivating the plot to a fine tilth gives arable plants the best growing medium to germinate, as if the area was being cultivated for a cereal crop. Remember that these are plants of cultivated and disturbed land. Without cultivation the arable plant seeds will not be triggered to germinate, and some weeds, such as Creeping Thistle, can establish and start to dominate.
- Ploughing often gets the best response from arable plants. Shallow cultivations do not disturb the soil sufficiently to trigger germination and management in

Field Woundwort © Cath Shellswell

the absence of herbicide may allow aggressive grasses to win the battle for light and moisture. Some rare plants, like Corn Buttercup, require ploughing to bring buried seed to the soil surface and trigger germination. It starts to decline in areas that are subject to shallow cultivations.

- Ensure farm traffic does not use the area unnecessarily. It is not uncommon for contractors unfamiliar with the farm to treat cultivated headland strips as 'fallow' and use them for access.
- Do not ignore the value of the seed production from arable plants. Birds, such as Turtle Dove and Cirl Bunting, seek out suitable seed sources. There is often very little available to them within a 'clean' growing crop.
- Un-harvested conservation headlands offer a useful dual role in making space for arable plants in the absence of herbicides and providing some seed foraging for wintering birds.
- Carry out a survey to see what you have and use your knowledge of current distributions to try and extend them. Arable plant seeds can remain dormant in the soil for many years. It is never too late to try.

Typical benign "indicator" species of heavy arable soil:

Small Toadflax	*Chaernorhinum minus*
Fig-leaved Goosefoot	*Chenopodium ficifolium*
Maple-leaved Goosefoot	*Chenopodiastrum murale*
Many-seeded Goosefoot	*Lipandra polyspermum*
Smooth Tare	*Ervum tetrasperma*
Dwarf Spurge	*Euphorbia exigua*
Broadleaved Spurge	*Euphorbia platyphyllos*
False Cleavers	*Galium spurium*
Jagged Chickweed	*Holosteum umbellatum*
Sharp-leaved Fluellen	*Kickxia elatine*
Round-leaved Fluellen	*Kickxia spuria*
Henbit Dead-nettle	*Lamium amplexacaule*
Northern Dead-nettle	*Lamium confertum*
Venus'-looking-glass	*Legousia hybrida*
Field Pepperwort	*Lepidium campestre*
Small Bugloss	*Lycopsis arvensis*
Blue Pimpernel	*Lysimachia foemina*
Corn Mint	*Mentha arvensis*
Annual Mercury	*Mercurialis annua*
Yellow-juiced Poppy	*Papaver lecoqii*
Field Madder	*Sherardia arvensis*
Corn Parsley	*Sison segetum*
Field Woundwort	*Stachys arvensis*
Knotted Hedge-parsley	*Torilis nodosa*
Green Field-speedwell	*Veronica agrestis*
Grey Field-speedwell	*Veronica polita*
Wild Pansy	*Veronica tricolor* subsp. *tricolor*

Shepherd's-needle © E L Cooke

Rare arable species of arable land with heavy soil:

Corn Chamomile	*Anthemis arvensis*
Stinking Chamomile	*Anthemis cotula*
Rye Brome	*Bromus secalinus*
Slender Tare	*Ervum gracile*
Large-flowered Hemp-nettle	*Galeopsis speciosa*
Yellow Vetchling	*Lathyrus aphaca*
Darnel	*Lolium temulentum*
Grass-poly	*Lythrum hyssopifoilum*
Mouse-tail	*Myosurus minimus*
Corn Buttercup	*Ranunculus arvensis*
Greater Hay-rattle	*Rhinanthus angustifolius*
Shepherd's-needle	*Scandix pecten-veneris*
Night-flowering Catchfly	*Silene noctiflora*
Corn Spurrey	*Spergula arvensis*
Spreading Hedge-parsley	*Torilis arvensis*
Narrow-fruited Cornsalad	*Valerianella detata*
Broad-fruited Cornsalad	*Valerianella rimosa*

Recommended References

Rare arable flowers app (2015) Centre for Ecology and Hydrology, Botanical Society of Britain and Ireland, Plantlife, Joint Nature Conservation Committee, Biological Records Centre and Natural England. Available on Apple Store and Google Play.

Managing for arable plants (2019) Plantlife plantlife.org.uk/uk/discover-wild-plants-nature/habitats/arable-farmland/land-management-for-arable-plants-agri-environment-schemes

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Arable Plants – a field guide (2003) Wilson, P. and King, M. WildGuides Ltd

A Norfolk case study – White House Farm

White House Farm lies south of Kings Lynn on the interface between the organic soils of the Fens, the mixed sands and clays of North Norfolk and the clay loams of Mid Norfolk. The East Anglian Plain, which starts in Mid Norfolk and is a broad expanse of clay soils, developed into a dairying region with small fields and a strong hedgerow network. Agricultural practices first started to change in the 18th Century with the introduction of horse drawn drills and Townshends four-course rotation. The greatest change to affect farming across the East Anglian Plain came in the inter-war period. Modern powered machinery replaced horses; land could be cultivated swiftly and sown earlier. Field enlargement and the widespread adoption of winter sown cereals gradually replaced dairying.

Soils across the farm are predominantly heavy loams and these lie over a clay subsoil which impairs drainage. The arable sections of the farm are mainly sown with winter crops, as the soils respond well to early autumn plantings. Spring pulses are sown as break crops along with sugar beet. Land preparation for spring crops features ploughing and the deep inversion encourages a healthy population of arable plants, including Sharp-leaved Fluellen, Field Madder, Common Fumitory and Sun Spurge. Problems experienced in establishing spring sown bird seed mixtures has led to planting being delayed until late spring, sometimes into June. This later window has seen a strong germination of arable plants, able to thrive in a relatively low input situation. Interestingly, ploughing was traditionally done pre-Christmas with the aim of utilising winter frosts to break the soil down. In an effort to reduce nutrient leaching, early spring ploughing has been introduced, creating conditions favoring spring germinating arable plants. While there is a risk of being caught out by a late, wet spring, the key has been to carefully manage the size of the spring cultivation commitment. The available window can be literally a matter of days.

The spring germination opportunity has been further enhanced by ensuring that each spring sown crop carries at least one six meter cultivated headland. The cultivated headlands simply rotate around the farm with the spring crops, providing a valuable germination window. These have proved the most challenging when trying to control aggressive species, such as Sowthistles and Wild Oats. Weed wiping has been effective in years when moisture availability has favored fast growth of taller species. Interestingly, in dry springs, topping of unwanted annuals has been surprisingly effective. It should be done in full sun to help achieve a quick wilt of the cut material, and exposure of the crowns causes major moisture loss, partly desiccating taller species and stunting them. This technique should not be attempted if a large, wet, grassy canopy of material lies over the target arable species. The sudden increase in light ingress can cause rapid growth of target annuals and this must not be suppressed a by a swath of cut material. Rotating locations allows easy control of Sterile Brome and Couch.

The arable plants present in the autumn strips provide an early nectar source and set seed early enough to fill a hungry gap for foraging farmland birds such as Linnet, Yellowhammer and Grey Partridge, breeding populations of which have all increased on the farm. The need to cultivate in order to stimulate conditions suitable for germination is emphasised by the apparent 'clean' conditions experienced within over wintered stubbles.

Left: Each year one small field is sown with spring barley under a low input regime. The reduction in fertiliser and herbicide allows arable plants to complete a full life cycle.