

A guide to insect-rich farmland habitats





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Invertebrates play many important roles on agricultural land which support food production and the farmland ecosystem. These roles include control of crop pests, improving the health of soil and pollinating crops, as well as being a food supply for many animals including farmland birds, whose chicks depend on there being insects available in late spring/early summer.

Many types of beneficial invertebrates have been declining, and this has been linked to intensive land management and use of pesticides amongst other factors. A long-running Game & Wildlife Conservation Trust (GWCT) study on farmland in Sussex showed a 37% decline in invertebrate abundance in cereal crops since 1970, with a sharp decline in key beneficial groups such as predatory ground beetles (-80%) and adult ladybirds (-78%). The steepest declines occurred in the 1960s and 1970s when there was a period of widespread and fast agricultural intensification. The rates of invertebrate decline slowed down from 1970 to 1990, but they have steepened again from 2010 onward (Ewald *et al.* 2023).

Recognising the importance of having healthy insect populations, the farming sector has found nature-based solutions to address declines that also benefit farm production, leading to 'win-win' situations. For example,

in one study agricultural researchers showed that a population of aphids on a crop were better controlled when a half-dose of insecticide was applied compared to a full dose. Closer examination revealed that at the lower dose the principal aphid predators were able to survive and they then helped to control the remaining aphids. Plus, there were benefits for the farm, due to savings in time and money.

The researchers coined a new phrase for this – Integrated Pest Management or IPM, which has been promoted and adopted by many countries across the world. Farmers, agronomists and researchers have showed that it's possible to harness the natural control of crop pests, and be proactive in the creation of habitat to boost beneficial insect numbers. This contributes to minimising the impact of food production on the environment, and at the same time, other invertebrates and wildlife can thrive and help to restore the wider agricultural ecosystem.

This practical field guide aims to help farmers and agronomists choose the most suitable options for their land, as well as giving establishment and management advice. Creating the habitats described in this guide will help to achieve a balanced landscape and scientifically-proven outcomes for wildlife and crop protection.



Alastair Leake

THE ALLERTON PROJECT DIRECTOR



This guide has been compiled by GWCT's Farmland Ecology Department and The Allerton Project who between them have over 80 years' experience of trials, research and demonstration. It also draws on the findings of the GWCT's ongoing Sussex Study, which has been monitoring invertebrate populations alongside changing farming practices since 1970 (see above). The team combines the expertise of scientists with the practical knowledge of farm managers and agronomists.

Our thanks go to the team at BEESPOKE, a project which developed new approaches to increase insect pollinators and thereby crop yields. BEESPOKE brought together 16 partners from six North Sea region countries, many of whom helped with the preparation of this guide. Thanks are also due to the farmers and scientists who worked on PARTRIDGE, another Interreg project, which demonstrated how wildlife could be restored by up to 30% at ten 500-hectare demonstration sites. Finally special thanks go to Kellogg's Origins, a global sustainable agriculture initiative and an IPM research partner of The Allerton Project since 2015, for their generous sponsorship of this document.

Alastair Leake

Integrated Pest Management (IPM)

Integrated Pest Management is defined as combined use of all available control methods, including targeted use of pesticides when alternatives are ineffective or unavailable. IPM emphasises crop health and minimal disruption to the agro-ecological system. IPM also

includes measures to optimise pesticide application, with the aim of reducing non-target effects and unnecessary environmental exposure. IPM follows a step-by-step approach and in practice, should be individually tailored to the crop or pest.





a. Prevention and Suppression

The first line of pest control is the use of preventative cultural methods to reduce the risk of pest damage occurring, such as crop rotation, growing pest-resistant varieties, selecting appropriate sites and sowing dates, sanitation and reduced tillage practices. These measures provide prophylactic pest management with little or no environmental risk.



b. Monitoring

IPM is founded upon effective monitoring including inspection, identification, forecasting and assessing levels of pest populations. Not all potentially damaging insects, weeds, and other living organisms require control, and organisms classified as pests may be important to the structure and function of local ecosystems. As such, regular observation is crucial. Accurate identification of the pest allows the right control to be decided upon. Effective monitoring ensures that plant protection is only used when necessary, but also that suitable products are selected and applied in the right way at the right time.




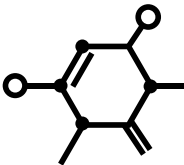
c. Thresholds

Some pests have control thresholds. Thresholds are set above which pest damage or pest population levels become economically or environmentally unsustainable. Once a threshold has been exceeded, actions are taken to control the pest. The emphasis is on control rather than eradication, as allowing a pest population to survive at reasonable levels may not only provide food for natural predators, but by reducing pest exposure to plant protection products, can also help prevent resistance developing.



d. Control

The methods of pest control should be selected on both effectiveness and risk, with a view to reduce dependency on pesticides. Control methods can be selected through the following hierarchy:

Mechanical	Including hand weeding/rogueing, mechanical weeding and physical barriers.
	Natural biological processes and materials can provide control, often with less risk to the environment. This includes enhancing predatory and parasitic species through provision of appropriate habitats and resources and to reduce use of harmful pesticides. Biopesticides may also be available, but it is important to recognise that biopesticides do not inherently pose less risk to the environment and, as such, should be also used in a targeted and responsible way.
	Plant protection products should be used when alternatives are ineffective or unavailable. The economic justification should mean application in the most effective and targeted way, using selective products whenever possible and modifying doses according to antagonistic pressure with the aim of optimising to reduce negative environmental impacts. Use of precision technology, spot treatments, weed wipers, drift reduction and other similar tools and techniques will aid with this. Anti-resistance strategies should also be utilised.



e. Review

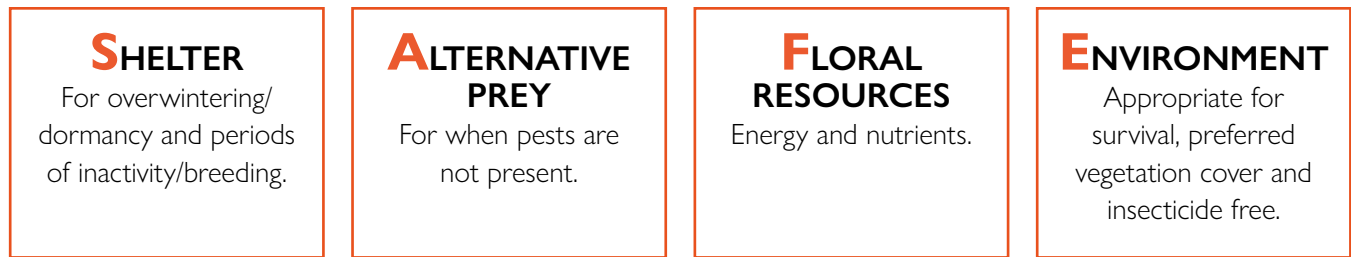
It is important that all plant protection and pest control measures are reviewed regularly so that effectiveness can be assessed, adjusted and tailored for continued effective management.

Conservation Biological Control – providing habitat for pest natural enemies

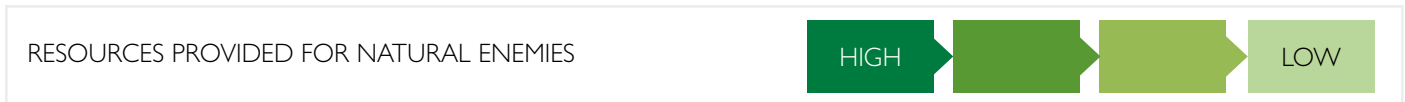
Pest natural enemies can reduce the chance of pests establishing and proliferating in crops and consequently causing economic damage. Indeed, the absence of pests is testament that biological control is successfully occurring. However, it is not a quick fix solution like an insecticide, but instead relies on building up a diverse range and abundance of natural enemies. This ensures that when pests do arrive there are sufficient natural enemies of the

type that can control the pest in question. This can be delivered by providing a range of habitats and adhering to IPM principles.




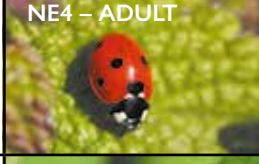


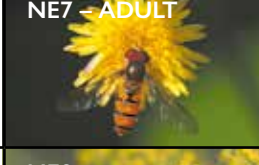




Overall, the aim is to deliver right types of natural enemies, at the right time and in the right place. This can be achieved by providing all of the resources that they need following the **SAFE** approach.



HABITAT TYPE	OVERWINTER SHELTER	ALTERNATIVE PREY	FLORAL RESOURCES	ENVIRONMENT
SHRUBBY VEGETATION (HEDGES)	High	High	High	High
UNCULTIVATED AREA (GRASSY)	High	High	Medium	High
WILD BIRD SEED MIXTURE	Medium	High	Medium	High
FLOWER-RICH HABITATS	High	High	High	High
OVERWINTERED STUBBLES	High	Medium	Low	Medium
UNCUT, TUSSOCKY GRASS MARGINS AND BEETLE BANKS	High	High	Low	High
UNHARVESTED CEREAL HEADLAND	Low	High	Medium	High
UNDERSOWN SPRING CEREALS	High	High	Low	High
UNCROPPED, ANNUALLY CULTIVATED	Low	High	Medium	High
NON-INVERSION TILLAGE	High	Medium	Low	Medium
LOW INPUT GRASSLANDS	High	High	Medium	High



How to recognise and support key groups of pest natural enemies

NATURAL ENEMY	PESTS ATTACKED	HABITATS/MANAGEMENT	PHOTO
GROUND BEETLE* <i>Carabidae</i>	MOST INSECT PESTS, SLUGS AND WEED SEEDS	GRASSY/BETTER BANKS/LOW TILLAGE/WEED COVER	NE1 
ROVE BEETLES* <i>Staphylinidae</i>	APHIDS, FLIES, MOTHS, FUNGAL DISEASES	GRASSY/BETTER BANKS/LOW TILLAGE	NE2 
SOLDIER BEETLES* <i>Cantharidae</i>	FLIES, CATERpillARS	SIMPLE OPEN FLOWERS (UMBELLIFERS)	NE3 
LADYBIRDS <i>Coccinellidae</i>	APHIDS, SCALE INSECTS AND FUNGAL DISEASES	SIMPLE OPEN FLOWERS, TREES, SHRUBS AND HEDGES	NE4 – ADULT 
SPIDERS* <i>Araneae</i>	ALL INSECT PESTS	MOST HABITATS, LOW TILLAGE, VERY VULNERABLE TO INSECTICIDES	NE5 
PREDATORY FLIES* <i>Dolichopodidae, Empididae, Asilidae, Rhagionidae, Tabanidae, Therevidae, Milichiidae, Sciomyzidae</i>	MOST INSECT PESTS	FLOWER-RICH, GRASSY, SHRUBS, DITCHES AND PONDS	NE6 
HOVERFLIES* <i>Syrphidae</i>	APHIDS AND BUGS	SIMPLE OPEN FLOWERS, DITCHES AND PONDS	NE7 – ADULT 
PARASITIC WASPS* <i>Ichneumonidae, Braconidae, Chalcidae, Proctotrupidae, Mymaridae</i>	ALL PESTS	SIMPLE OPEN FLOWERS (UMBELLIFERS)/PREY HOST	NE8 
LACEWINGS* <i>Neuroptera</i>	APHIDS AND BUGS (PREDATED PRIMARILY BY LACEWING LARVAE)	FLOWER-RICH, TREES, SHRUBS AND HEDGES	NE9 
PREDATORY MITES <i>Phytoseiidae</i>	MITES	FLORAL RESOURCES	NE10 
PREDATORY BUGS* <i>Reduviidae, Nabidae, Phymatida, Anthocoridae, some Miridae, a few species of Lygaeidae, a few species of Pentatomidae</i>	APHIDS, THRIPS, WHITEFLY, BEETLES, CATERpillARS AND MITES	FLOWER-RICH	NE11 

For further details see AHDB Encyclopaedia of pests and natural enemies <https://ahdb.org.uk/pests>

*Also farmland bird chick food.

Habitats covered in this Guide



Descriptions of the main farm habitats for insects are provided in the following pages. Creating these, or optimising management of these on your farm can deliver 'win-win' situations for you, including:

- enhancing numbers of beneficial insects (e.g. pollinators, pest natural enemies);
- building soil fertility and structure;
- supporting other farm wildlife (e.g. farmland birds);
- preventing soil erosion and run-off;
- storing carbon; and
- improving the aesthetic value of farmed landscapes.

Some habitats are better at providing certain services than others. For example, a beetle bank (page 24) is particularly effective at harbouring predatory beneficial insects such as ground beetles, ladybirds and spiders in close proximity to crops where they can eat pests. Some habitat options are short-lived and designed to be rotational if needed, such as the nectar flower mix (page 16). Others, such as the wildlife plot (page 20) are excellent long-lasting multi-taskers.

A note on timing

It is essential to ensure that there is sufficient habitat for invertebrates all year round. As mentioned above in relation to beneficial pest species, there is a risk that mitigation efforts will be in vain if food source is provided in summer but there are no areas for them to overwinter. Timing is also key further up the food chain. If the group of invertebrates which provides food for farmland bird chicks is not available in late spring/early summer it will be of little benefit.

A note on management

To ensure that these habitats deliver the maximum benefits it is important that they are established and managed appropriately.

For new habitats, creating the right conditions for establishment is critical, just like any crop. Typically, this involves creating a weed-free, fine seedbed with drilling or broadcasting when soil conditions are best for rapid germination. Some may require further management to ensure the sown species have the best chance of survival, such as cutting at appropriate times or controlling weeds.

This guide lists the most important plant species typically included in each option; however, seed mixes should be tailored to local conditions (soil type, pH, degree of shade) and can be tweaked to encourage particular groups of organisms (e.g. bumblebees, solitary bees, butterflies, natural enemies, chick food insects).

This guide also highlights the types of beneficial insects and other wildlife that each habitat option supports. The more habitats that are present, the more biodiversity and benefits you will have. For example, natural pest control is most effective when you support a broad range of predatory insects and ensure they have resources throughout the year.

A note on weeds

Many natural enemies and pollinators also make use of the resources provided by weeds. They typically have simple or open flowers (e.g. poppies, thistles) and therefore the pollen and nectar is easily available and attractive to wild bees. The seeds are eaten by ground beetles, birds and small mammals. The vegetation supports small herbivorous insects, larvae and soft-bodied invertebrates that are important prey for natural enemies and farmland bird chicks, while also providing cover and structure for web-spinning spiders. Provided the weeds do not become too dominant, they can be left as an additional resource in the habitats and even in crops. Rare arable plants may also be present in annually cultivated habitats, such as shepherd's needle, weasel's snout and pheasant's eye which are among the rarest plants in Britain.



A note on funding

Most of these habitats are eligible for financial support through UK agri-environment schemes, which are administered by Natural England and the Rural Payments Agency. For more information search 'Rural payments and grants' on [gov.uk](https://www.gov.uk).

The habitats listed here also have substantial natural capital value, which can be traded as units within schemes such as Biodiversity Net Gain, carbon offsetting, or private Environmental, Social and Governance (ESG) green finance markets. For more information get in touch with GWCT's Natural Capital Service on [naturalcapitaladvisory.co.uk](https://www.naturalcapitaladvisory.co.uk).



Cover, Catch & Companion Crops

These are all crops that can help with providing habitat and food resources for natural pest enemies, they also mitigate against soil run-off and flooding. Please be aware they can harbour pests as well.



PLANT SPECIES

Cover crops

Usually preceding a spring crop – typically oats, oil radish (fodder radish), phacelia, mustard.

Catch crops

Usually sown in July and terminated in October – buckwheat, oil radish (fodder radish), berseem clover, crimson clover, phacelia, buckwheat, vetch, oil and tillage radish.

Companion crops

Usually grown with the main cash crop and terminated in late autumn/early spring or taken through to harvest as two cash crops such as oats and beans – buckwheat, linseed and undersown clovers, legumes and grasses.

SOIL TYPE AND DRAINAGE

Mixes will grow on most soil types with a pH above 5.6. Species composition can be tailored to soil type and desired outcome.

ESTABLISHMENT

When to sow: July–August or undersown in spring.

How to sow: cover crops and catch crops can be sown behind subsoiler, broadcast or drilled. Companion crops can be mixed with cash crop or undersown into standing cash crop.

LONGEVITY

Up to 1 year.

MANAGEMENT

Catch and cover crops can be destroyed by rolling in frosty weather, which breaks stems. Some crops can be left if not frost tolerant i.e. mustard. Spray off using herbicides, grazed with sheep or the following crop can be drilled directly into cover crop canopy.

PEST NATURAL ENEMIES

Ground beetles, spiders.

OTHER BENEFITS



NATURAL ENEMIES



POLLINATORS



BUTTERFLIES



FARMLAND BIRDS



NESTING SITES



GROUND BEETLES



SMALL MAMMALS



AMPHIBIANS



SOIL HEALTH BIODIVERSITY



CHICK FOOD



WATER QUALITY PROTECTION



CARBON SEQUESTERING HABITAT

Cultivated margins on my arable farm produced very interesting results with a number of rare plants like night-flowering catchfly, which is pollinated by moths. Careful management to keep problematic weeds like couch and thistles at bay was always going to be important.

– Farmer Tim



Cultivated Margins



PLANT SPECIES

Uncropped, cultivated arable field margins aim to encourage rare arable plants such as red hemp nettle, round-headed prickly poppy, fine-leaved fumitory, flixweed and night-scented catchfly. The more common arable plants such as speedwells, field pansies and forget-me-knot will also be encouraged.



SOIL TYPE AND DRAINAGE

Light chalky or sandy soils, especially brows of slopes and corners that receive less herbicide.



LONGEVITY

Cultivate annually and seasonally rotate around the farm.



PEST NATURAL ENEMIES

Parasitic wasps, beetles, hoverflies and spiders.



ESTABLISHMENT

Select a location where arable plants have proliferated in the past or where rare species have been found. Locations should be free from pernicious weeds and have less competitive arable plants and grass weeds. Annually cultivate at least a 3m wide margin to a fine tilth to 10–15cm. The area should be left undrilled and undisturbed to allow for natural regeneration. The time of cultivation should be suited to germination time of any rare arable species present.



MANAGEMENT

Fertiliser should not be applied, and pesticide drift onto the uncropped areas should be prevented. Rotation of plots may be necessary to control competitive weeds, such as docks, bromes, cleavers and blackgrass.

OTHER BENEFITS



NATURAL ENEMIES



POLLINATORS



BUTTERFLIES



FARMLAND BIRDS



NESTING SITES



GROUND BEETLES



SMALL MAMMALS



AMPHIBIANS



SOIL HEALTH & BIODIVERSITY



CHICK FOOD



WATER QUALITY PROTECTION



CARBON SEQUESTERING HABITAT

Green Headlands

Green headlands are annual flower and legume mixes used to attract pollinators and fix soil nitrogen.



PLANT SPECIES

Fast growing annual mixes can be established on turning headlands in late spring when soils warm up. They can include berseem clover, crimson clover, phacelia, buckwheat, vetch, oil and tillage radish.



SOIL TYPE AND DRAINAGE

Mixes will grow on most soil types, with a pH above 5.6. Species composition can be tailored to soil type.



LONGEVITY

Seasonal.



PEST NATURAL ENEMIES

Hoverflies, ladybirds, predatory bugs, parasitic wasps.

OTHER BENEFITS



NATURAL ENEMIES



POLLINATORS



BUTTERFLIES



FARMLAND BIRDS



NESTING SITES



GROUND BEETLES



ESTABLISHMENT

When to sow: May–August.

How to sow: best drilled shallow into a fine, firm seedbed or alternatively mixes can be broadcast or direct drilled into stubble at a maximum of 1cm, ideally into warm soils (especially if containing legumes) and when rain is imminent.



MANAGEMENT

Once established, leave as long as feasible into autumn. Investigate whether margins can be incorporated into UK agri-environment schemes and deliver both pollinator, carbon and seed benefits.



SMALL MAMMALS



AMPHIBIANS



SOIL HEALTH
BIODIVERSITY



CHICK FOOD



WATER QUALITY
PROTECTION



CARBON
SEQUESTERING
HABITAT

Pollen & Nectar Mixes



PLANT SPECIES

Pollen and nectar habitats are an easy way to boost 'on farm' flower-rich habitats and are often targeted at supporting bumblebees. They usually include a range of clovers, bird's-foot trefoil, sainfoin, lucerne and vetches.



SOIL TYPE AND DRAINAGE

These mixes are best on light to medium soils that are free draining.



LONGEVITY

3–4 years. Grass free mixes will last longer, but clovers will diminish.



PEST NATURAL ENEMIES

Ladybirds, parasitic wasps, hoverflies, predatory bugs and mites.

OTHER BENEFITS



NATURAL ENEMIES



POLLINATORS



BUTTERFLIES



FARMLAND BIRDS

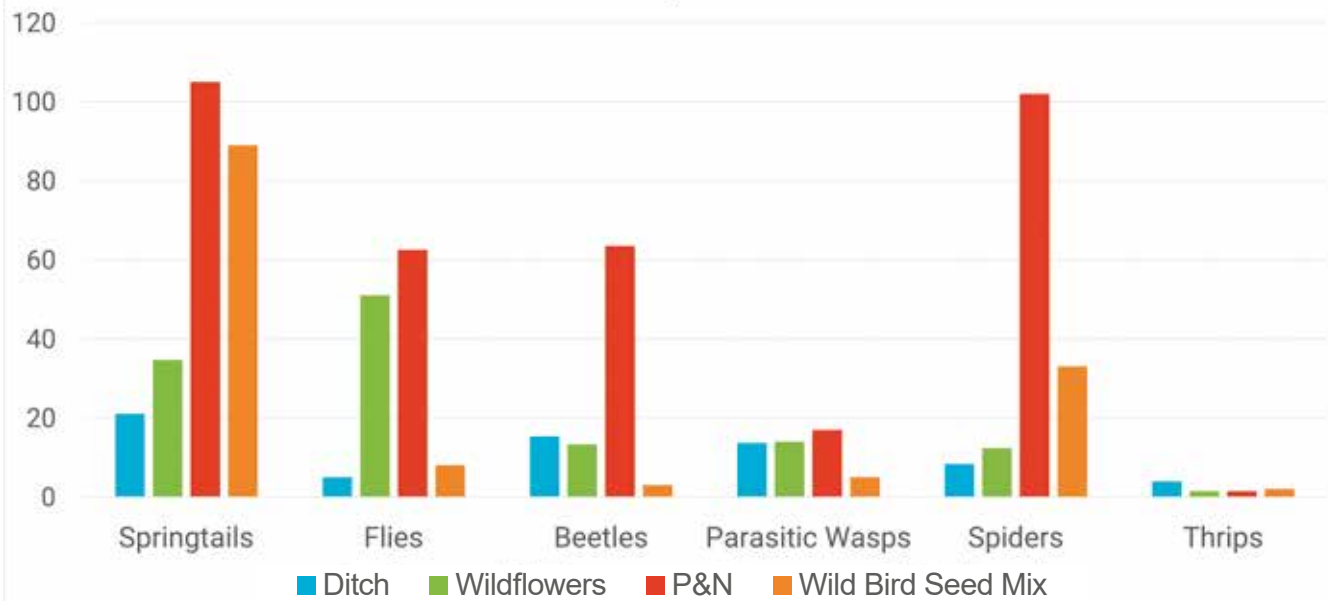


NESTING SITES



GROUND BEETLES

Pitfalls by Habitat



The graph above is taken from the Kellogg's Report of 2020 and shows springtails, flies, beetles, parasitic wasps and spiders were more prevalent in pollen and nectar habitats. (Y axis = numbers).

Reference: Jarvis, P. *et al.* 2020. Invertebrate numbers on three farms in Bedfordshire, Leicestershire and Norfolk.



ESTABLISHMENT

When to sow: March to May or August up to mid-September. Sow when soil is warm.

How to sow: sow into a fine and firm seedbed.



MANAGEMENT

In the first year, mow several times to control weeds.

After establishment pollen and nectar mixes are best mown after flowering. Ideally remove cuttings to encourage further flowering. To extend the flowering period, half of the plot can be cut between mid-May and mid-June and then the whole plot is cut from mid-September up to mid-March.



Wildflower Margins



PLANT SPECIES

Wildflower margins are usually comprised of at least 10 perennial wildflower species such as oxeye daisies, knapweed, plantains, umbellifers, musk mallow, tufted vetch and self-heal and three fine-leaved grass species. Cornfield annual species can be added to provide flowers in the first year.



SOIL TYPE AND DRAINAGE

Mixtures are available for different soil types, e.g. clay, loamy, chalk and limestone and sandy soils.



LONGEVITY

Can last many years. Removing cuttings increases longevity by decreasing competition from grasses.



PEST NATURAL ENEMIES

Soldier beetles, ladybirds, predatory flies, mites and bugs, parasitic wasps, lacewings, hoverflies and spiders.

OTHER BENEFITS



NATURAL ENEMIES



POLLINATORS



BUTTERFLIES



FARMLAND BIRDS



NESTING SITES



GROUND BEETLES



Our wildflower margins are very rich in farmland bird chick-food. Sawfly larvae and caterpillars are some of the species within the vast range of insects that come and go as the different plant species mature. We have high numbers of wild grey partridge here, which rely on these margins to forage with their young. The management can be intense in the first two years, but this eases with time and with very little input. Looked after correctly they may last a lifetime.

– Gamekeeper Nathan



ESTABLISHMENT

When to sow: autumn or spring, just before rain.

How to sow: eliminate pernicious weeds beforehand. Prepare a firm, fine, weed free seed bed, spread seed on the soil surface and then roll.



MANAGEMENT

In the first year mow regularly to maintain a sward height of 5–10cm. From year 2 onwards, if sward is >15cm cut in March, otherwise cut or graze annually in the autumn. Remove cuttings to reduce fertility, allow seeds to drop and prevent new flowers from being smothered. Spot treat pernicious weeds.



SMALL
MAMMALS



AMPHIBIANS



SOIL HEALTH
& BIODIVERSITY



CHICK FOOD



WATER QUALITY
PROTECTION



BATS

Wildlife Plot



PLANT SPECIES

A mixture of annual, biennial and perennial flowering plants such as: triticale, sunflower, kale, millet, stubble turnip, teasel, sweet fennel, sainfoin, chicory, kidney vetch, black medick, yarrow, cornflower, corn cockle, corn poppy, black knapweed, wild carrot, self-heal, winter vetch, musk mallow, greater mullein and oxeye daisy.



SOIL TYPE AND DRAINAGE

Most seed merchants can adjust the plant species mix to suit your soil type and management regime.



LONGEVITY

Up to 10 years.



PEST NATURAL ENEMIES

Soldier beetles, lacewings, hoverflies, ladybirds, spiders, predatory flies, mites and bugs, parasitic wasps.

OTHER BENEFITS



NATURAL ENEMIES



POLLINATORS



BUTTERFLIES



FARMLAND BIRDS



NESTING SITES



GROUND BEETLES



Birds and bees should be part of farming – that’s why I plant wildlife plots on my land.
– Farmer Kobus



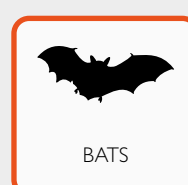
ESTABLISHMENT

Sow at a rate of 20kg/ha into 1ha blocks or 15m+ wide strips (15m+) on the edges of arable or grass fields in autumn or spring before rain. Plant into a well-prepared sterile seedbed and roll afterwards to press the seed into the soil.



MANAGEMENT

Leave it alone in years 1 and 2. Mow 50% of the plot annually in autumn from year 3 onward and remove cuttings. Mow in a block or strips and alternate the cut area between years. Cultivate the cut area to encourage the newly-shed seed to germinate and renew the plot. Spot-treat pernicious weeds.



Bees & Seed Mixes



PLANT SPECIES

These mixes provide both pollination services and seed-bearing crops for birds. They can include cereals, vetch, linseed, sunflowers, kale, mustards, teasels, gold of pleasure and fodder radish. Bumblebird (Stewardship) mixes which need a minimum of 6 flowering and 6 seed bearing species are similar but usually include bird's-foot trefoil, oxeye daisy, knapweed, phacelia and crimson clover.



SOIL TYPE AND DRAINAGE

Mixes can be tailored to be suitable for most soil types.



ESTABLISHMENT

When to sow: mid-May up to mid-July (preferably on warm moist soil) or before mid-September for Bumblebird mixes.

How to sow: drilling to a max depth of 15mm into weed free seedbed.



LONGEVITY

2 years.



MANAGEMENT

In the spring of a bi-annual mix, the plot should be topped, cutting a few centimetres below the top of the flowering plants. It is recommended to re-sow some fresh seed mix each year, so a combination of year one and year two habitats are available.



PEST NATURAL ENEMIES

Hoverflies, lacewings, parasitic wasps, ladybirds, beetles.

OTHER BENEFITS



NATURAL ENEMIES



POLLINATORS



BUTTERFLIES



FARMLAND BIRDS



NESTING SITES



GROUND BEETLES



SMALL MAMMALS



AMPHIBIANS



SOIL HEALTH BIODIVERSITY



CHICK FOOD



WATER QUALITY PROTECTION



CARBON SEQUESTERING HABITAT



PLANT SPECIES

Small seeds and cereals especially triticale, kale, millet, quinoa, linseed, gold of pleasure and fodder radish.



SOIL TYPE AND DRAINAGE

Wild bird seed is suitable for most soil types with a pH above 5.5.



ESTABLISHMENT

When to sow: April–May.

How to sow: prepare a seedbed and drill the crop. If not sown in spring can be sown in autumn but this will only provide food in alternate winters. If sown too late, there is a chance that seed might not reach maturity before the onset of winter.



LONGEVITY

1–2 years.



MANAGEMENT

Plots with only annual crops (cereals with linseed or mustard) should be re-established every spring. Mixtures of cereals including kale as a biennial crop should be re-established every other spring.



PEST NATURAL ENEMIES

Spiders, hoverflies, ladybirds, parasitic wasps, predatory bugs and flies.

OTHER BENEFITS



NATURAL ENEMIES



POLLINATORS



BUTTERFLIES



FARMLAND BIRDS



NESTING SITES



GROUND BEETLES



SMALL MAMMALS



AMPHIBIANS



SOIL HEALTH & BIODIVERSITY



CHICK FOOD



WATER QUALITY PROTECTION



CARBON SEQUESTERING HABITAT

Grass Margins & Beetle Banks



I built this beetle bank with my own hands. It benefits insects that control pests in the adjacent crops, and I get to enjoy all the wildlife in and around it. Works for me!

– Farmer Gert



PLANT SPECIES

Broad and fine leaved grasses can provide several different functions within beetle banks, grass margins and buffer strips. Tussock forming grasses are important as overwintering sites for invertebrates. Herbs can be added for higher floristic diversity but tussock forming grasses can become dominant.



SOIL TYPE AND DRAINAGE

Mixes are suitable for most soil types where the pH is 5.5 or above. Beetle Banks should be raised and free draining.



LONGEVITY

8 years +.



PEST NATURAL ENEMIES

Spiders, ground and rove beetles, predatory flies.



ESTABLISHMENT

When to sow: March to early-May or August to late-September. (Late sowings are slower to establish and can be vulnerable to slugs, but can benefit from better soil moisture).

How to sow: the mix should be sown onto a fine but firm seedbed, no more than 1cm. If broadcasting it is best to lightly harrow and roll twice after sowing.



MANAGEMENT

Beetle banks and grass margins should be cut two or three times in the first year for annual weed control but, once established, are cut only to prevent the encroachment of woody and suckering weeds.

Once established, buffer strips can be cut in autumn when needed, to maintain plant diversity or to control scrub. It is important to leave some patches or strips uncut each year to provide undisturbed areas for insects and wildlife.

OTHER BENEFITS



NATURAL ENEMIES



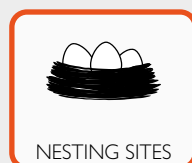
POLLINATORS



BUTTERFLIES



FARMLAND BIRDS



NESTING SITES



GROUND BEETLES



SMALL MAMMALS



AMPHIBIANS



SOIL HEALTH & BIODIVERSITY



CHICK FOOD



WATER QUALITY PROTECTION



CARBON SEQUESTERING HABITAT



PLANT SPECIES

Less intensively managed grassland can support a diverse array of plant species and is one of the most important habitats for pollinators. The plant community will depend on the soil type and conditions. For natural enemies, yarrow, oxeye daisy, bird's-foot trefoil, bush vetch, yellow rattle, teasel and red and white clover; amongst others, are valuable along with the umbellifers which are a favourite of parasitic wasps. Campions, willowherb, forget-me-not and cuckoo flower can thrive if left ungrazed.



SOIL TYPE AND DRAINAGE

Low nutrient soil is preferable for flowers and the best results are seen when pH is higher than 6.5.



ESTABLISHMENT

Fence areas off to allow natural regeneration of grassland, or you can use grassland seed tailored to soil type in these areas.



LONGEVITY

Indefinite, though highly dependent on management.



MANAGEMENT

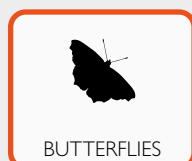
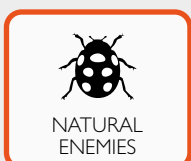
In the first year mow the grassland when it reaches a height of 10–15cm, down to about 5cm. The grass cuttings should be removed. You may need to repeat this a few times in the first year. Over the following years allow the sward to fill out, the grassland should be cut or grazed once a year after it has flowered, and the seed has dropped (late July–August). Less intensively managed grassland and mob grazing in which plants have chance to flower can also be useful.



PEST NATURAL ENEMIES

Beetles, spiders, predatory flies and hoverflies.

OTHER BENEFITS



Hedges



We maintain a variety of hedge shapes and sizes to cater for all creatures. Some woody hedge species only produce flowers on second-year twigs, so a cutting rotation is very important. Sometimes we borrow a shaping saw to deal with the thicker regrowth, as the flail can tear and split branches, which isn't good for the trees.

– Farmer Joyce

PLANT SPECIES

Hedges provide key resources for a range of wildlife. They also link habitats, allowing safe movement through the landscape. Common hedge species include blackthorn, dogwood, field maple, hawthorn, hazel, whilst wild rose and other 'climbers' can give longevity of flowering and varying structures.

SOIL TYPE AND DRAINAGE

Beech can thrive in dry soils, whereas alder can perform well in wetter soils. Waterlogged soils should be avoided for all hedges.

LONGEVITY

With appropriate management, hedgerows can last for centuries.

PEST NATURAL ENEMIES

Lacewings, ladybirds, parasitic wasps and spiders.

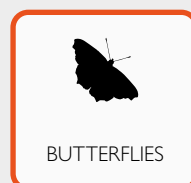
OTHER BENEFITS



NATURAL ENEMIES



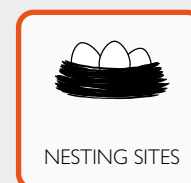
POLLINATORS



BUTTERFLIES



FARMLAND BIRDS



NESTING SITES



GROUND BEETLES



ESTABLISHMENT

Plant a diverse range of native species, include both evergreen and deciduous plants and where possible link to other hedges or habitats. Try to source plants locally. The best time to plant hedges is in winter.

Prepare site by clearing area and planting into bare soil to avoid competition. Bare root plants are the cheapest and most easily acquired, but some species such as holly are only available as container- or cell-grown plants. Plastic tubes, spirals or quills will likely be needed to protect young plants from grazing animals, such as deer and rabbits. Consider future use of biodegradable hedge guards.



MANAGEMENT

Whilst establishing, light and regular trimming can encourage dense, bushy growth.

Once established, cut hedges on rotation with a minimum of a three-year cycle to deliver more benefits for biodiversity. Alternatively leave 10cm of incremental growth each year. Trim in January or February to allow berries to be used by wintering birds. This can be done in the autumn, but delaying the hedge cut until January/February can really benefit biodiversity. Aim for a variety of hedge heights and widths. Hedges can also be coppiced or layered to provide different hedge structures.

Plant hedgerow gaps with species native to the area.



SMALL MAMMALS



AMPHIBIANS



SOIL HEALTH & BIODIVERSITY



WATER QUALITY & PROTECTION



CARBON SEQUESTERING HABITAT



BATS

Hedge Bases



PLANT SPECIES

The hedgerow base can be comprised of tussocky grasses such as cocksfoot which provide nesting sites for birds including whitethroat, yellowhammer and grey partridge. Herbaceous plants can also thrive including hedge mustard, hedge garlic, dead nettles, cranesbill, common vetch, wood forget-me-not, primrose and campions. Umbellifers such as wild carrot, wild parsnip, hogweed, yarrow and angelica can be added to a mix. A word of caution with inclusion of umbellifers, as some can support pests of carrots and parsnips and become a weed itself within the crop. Hedge base mixes are available from some seed merchants and can be adapted to local conditions.

SOIL TYPE AND DRAINAGE

The flora of a hedge base will often be determined by the soil fertility and subsequently a cover of grasses and nettle can develop if nitrogen fertiliser is inaccurately spread. Soil type will also influence the flora. Herbaceous plants will flourish if soil is not waterlogged.

LONGEVITY

Hedge grass margins can last indefinitely if managed sensitively to allow light to the hedge base vegetation and restrict hedges (especially blackthorn) from suckering into the margin.

PEST NATURAL ENEMIES

Flowers can be chosen to encourage hoverflies, parasitic wasps and ladybirds. Ground beetles will use this habitat. Diversity will help give more control over crop pests which will inhabit these margins as well.

OTHER BENEFITS



NATURAL ENEMIES



POLLINATORS



BUTTERFLIES



FARMLAND BIRDS



NESTING SITES



GROUND BEETLES



ESTABLISHMENT

A hedge base can be established by natural regeneration, but if planting a hedge in a new location then hedgerow species are unlikely to be present in the seedbank. Hedge base seed mixes can be sown in spring or autumn to compete with less desirable weeds. Seed can be broadcast and lightly covered.



MANAGEMENT

Hedge management will affect the area of grass and flowers at the hedge base, large hedges create shade leading to fewer flowering plants. South facing margins will also be better for flowers, with north facing margins better for grass. Regular topping and weed control is recommended in first few seasons to help establish base cover. The cutting should be managed rotationally to vary habitats and stop woody growth spreading from the hedge itself. Crop inputs such as fertilisers and spray should be precisely applied to crop areas to reduce their impact on the hedge base plants.



Woodland



PLANT SPECIES

Deciduous trees provide habitat, shelter and food for pest natural enemies as well as birds and bats that feed upon crop pests. Flowering trees are also a huge and valuable resource for pollinators. Little is known about the contribution that trees make to the natural enemy populations in crops. Tree species differ in the number of invertebrates associated with them; with oak, willow species and birch having the most and holly, sweet and horse chestnut, yew, walnut and plane trees the least. A diverse plant understorey in woodland can also provide resources for natural enemies. Trees should be sourced from the UK.



SOIL TYPE AND DRAINAGE

Some species prefer particular soil types. Surrounding tree populations will give a good guide as to successful species.



LONGEVITY

20–100+ years.



PEST NATURAL ENEMIES

Ladybirds, lacewings, spiders, predatory mites and beetles.

OTHER BENEFITS



NATURAL ENEMIES



POLLINATORS



BUTTERFLIES



BIRDS



NESTING SITES



GROUND BEETLES



ESTABLISHMENT

Trees can be planted as new woodlands, as part of new hedgerows or planted in existing gaps.

They can be planted bare-rooted between October and March. Container-grown trees can be planted at any time in the year (if in late spring or summer they should be watered during dry spells for first season).

An appropriate planting density should be chosen to allow an understorey to develop and space left for woodland rides and glades as these offer alternative habitats.



MANAGEMENT

Tree management will depend on the purpose of the woodland and any management conditions that grant schemes may stipulate. The Woodland Trust, Local Authorities and The Forestry Commission run such schemes. There are developing alternatives to plastic tree guards and the longevity of such guards should be determined before planting. Thinning or coppicing will encourage a diverse understorey.



SMALL MAMMALS



AMPHIBIANS



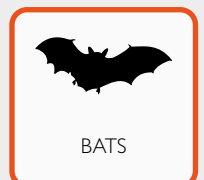
CHICK FOOD



WATER QUALITY & PROTECTION



CARBON SEQUESTERING HABITAT



BATS



PLANT SPECIES

Agroforestry can be established to provide several benefits to a landscape and business. It can provide a new habitat with a diverse plant community, support game and produce harvestable fruit, nuts or wood. Agroforestry is often integrated with livestock, providing food and shelter. Check trees are not poisonous to livestock, such as some privet and yew. The choice of tree will depend on the agroforestry objective, but as the name implies it will combine agricultural output with the other benefits that a wooded landscape can provide. Benefits will vary according to the type of agroforestry and species planted.



SOIL TYPE AND DRAINAGE

Free-draining, fertile and moisture-retentive soil in the sunniest aspect will help. Heavy clay or sandy soils are not ideal for nut trees. Larch, spruce and beech may be better for lighter soil, whereas hawthorn, crab apple, alder, hornbeam, maple, apples and pears will grow on heavier soils. Cherry, oak, holly, dogwood, privet and hazel will grow on most soil types.



LONGEVITY

Nut tree 20–30 years, fruit trees 30–40 years, mixed deciduous trees 100–200 years, and coppiced stands of hazel 80 years while sweet chestnuts can last centuries!



PEST NATURAL ENEMIES

Spiders, lacewings, other predators will increase if open flowered trees are included.

OTHER BENEFITS



NATURAL ENEMIES



POLLINATORS



BUTTERFLIES



BIRDS



NESTING SITES



GROUND BEETLES



ESTABLISHMENT

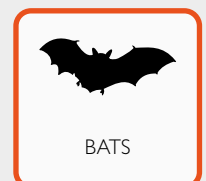
Avoid exposed sites or frost pockets where strong winds and late frosts may damage flowers on nut or fruit trees. Plant over winter, preferably before the end of March and ensure they have sufficient water to establish a good root system in first few seasons.



MANAGEMENT

Plan tree density, species grouping, harvesting, pruning, longer term thinning and felling policy from the outset. Tree guards will be needed protect against grazing livestock.

MORE INFORMATION: <https://www.soilassociation.org/farmers-growers/technicalinformation/agroforestry-handbook/>



Shrubs



A wet corner on our small upland farm just wants to be willow carr and shrubs, so we've stopped fighting it. Goat willow and hawthorn blossom is incredibly attractive to bees in spring – in fact the buzz beneath the trees can be deafening!

– Farmer Jenna



PLANT SPECIES

Shrubs can give a more diverse and different structure to rural landscape. Shrubs provide food, habitat and shelter for most of the year for crop pest predators. Species such as dog rose, spindle, dogwood, privet, bramble, holly, hazel and hawthorn can be managed as a shrub habitat. If livestock are present check the toxicity of shrub mixes.



SOIL TYPE AND DRAINAGE

Some species prefer particular soil types. Surrounding tree populations will give a good guide as to successful species.



ESTABLISHMENT

Habitats made up of young trees and shrubs can develop naturally if allowed, for example, areas within or adjacent to woodland, or in field corners next to hedges. Planting is only necessary if there is no natural source of regeneration. Protecting existing areas from grazing and browsing may help allow the habitat to establish.



LONGEVITY

Matures at 15 years.



MANAGEMENT

Light grazing can help to maintain the scrub edge. Browsing from animals creates better structural diversity in the vegetation, but be mindful of the ways in which different livestock species and breeds browse.

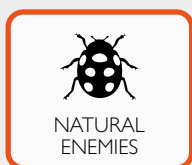
Cut areas of scrub in rotation, only cutting between September and February, to avoid breeding bird season. Try to leave berry-bearing shrubs until after Christmas.



PEST NATURAL ENEMIES

Ladybirds, predatory flies and mites, spiders and beetles.

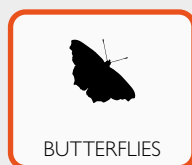
OTHER BENEFITS



NATURAL ENEMIES



POLLINATORS



BUTTERFLIES



FARMLAND BIRDS



NESTING SITES



GROUND BEETLES



SMALL MAMMALS



AMPHIBIANS



SOIL HEALTH & BIODIVERSITY



CHICK FOOD



WATER QUALITY & PROTECTION



CARBON SEQUESTERING HABITAT

I think ponds are the most beautiful and successful wildlife habitats we have. Dragonflies, bees and hoverflies love perching on the aquatic plants and when we put a trail camera out we were amazed how much wildlife comes to drink and wash.

– Farmer Ben



Wetlands & Ponds



PLANT SPECIES

Natural wetland habitats provide a variety of different flowering plants including water forget-me-not, brooklime, marsh marigold, water crowfoot and marsh woundwort. Sown mixtures can include marsh-mallow, meadowsweet, yellow iris, loosestrife and meadow foxtail.



SOIL TYPE AND DRAINAGE

Soils with a low infiltration rate e.g., dense clay soils, are the most suitable for pond construction or lining can be used.



ESTABLISHMENT

Artificial ponds can be dug using machinery, try to create a variety of water depths, make sure the pond has a shallow sloping area for easy access in and out of water. Many plants will arrive naturally.



LONGEVITY

10+ years.



MANAGEMENT

In the first year, annual weed growth may be cut back to encourage development of good perennial ground cover.

Aim to create variation in vegetation surrounding the pond with the minimum amount of disturbance, preferably on a rotation of 2–3 years. Vegetation should be removed like a wedge and must be carried out between September and November. On larger sites light grazing in late summer can be used.



PEST NATURAL ENEMIES

Predatory flies, spiders and ladybirds.

OTHER BENEFITS



NATURAL ENEMIES



POLLINATORS



BUTTERFLIES



BIRDS



NESTING SITES



GROUND BEETLES



SMALL MAMMALS



AMPHIBIANS



CHICK FOOD



WATER QUALITY & PROTECTION



DRAGONFLIES/ DAMSONFLIES



BATS

Ditches & Dykes



PLANT SPECIES

Ditches and dykes tend to be predominantly grassy banks, hogweed and cow parsley, but also support wetland species including reeds, sedges, bullrushes and a range of flowering plants.



SOIL TYPE AND DRAINAGE

Ditches and dykes can be managed on all soil types. Ditches that are very shallow, unconnected to watercourses, or on free-draining soil may only be wet in the winter.



LONGEVITY

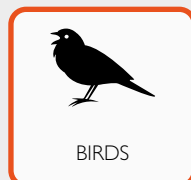
10–50+ years.



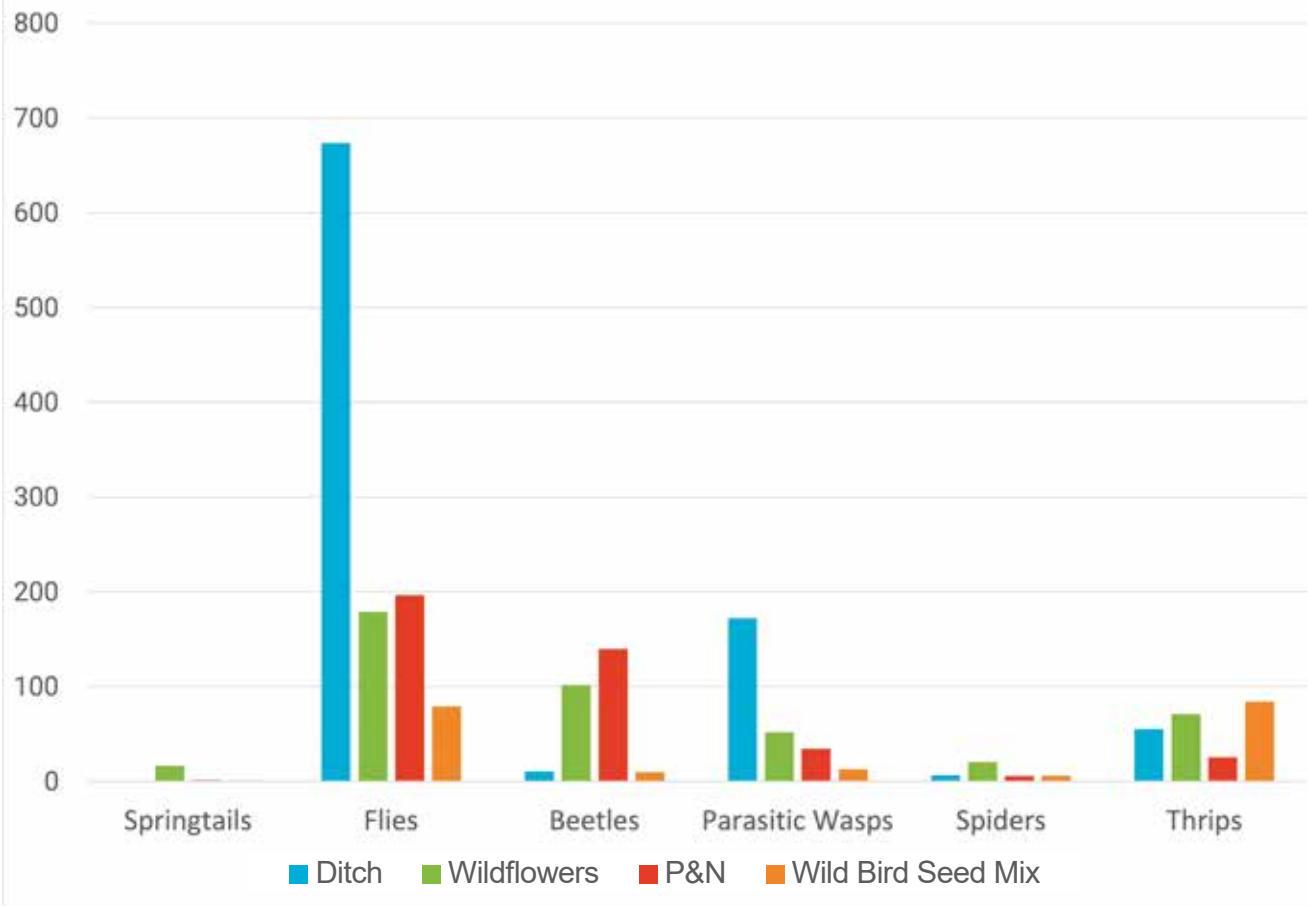
PEST NATURAL ENEMIES

Parasitic wasps, predatory flies, spiders and hoverflies.

OTHER BENEFITS



Sweep Net by Habitat



The graph above is taken from the Kellogg's Report of 2020 and shows high numbers of flies and parasitic wasps in ditch habitats. (Y axis = numbers).

Reference: Jarvis, P. et al. 2020. Invertebrate numbers on three farms in Bedfordshire, Leicestershire and Norfolk.



ESTABLISHMENT

Create or maintain with gently sloping sides to create a wider range of habitats from wet to dry. Locate away sources of pollution such as silage clamps and manure heaps.



MANAGEMENT

They should be managed on a rotation of 2–5 years, with no more than half of the ditches managed in one year. Clearing and trimming is often essential to ensure water flow and land drainage and is best undertaken in autumn or winter months. Invasive non-native species should be controlled. Allow light to penetrate by cutting back overgrowing hedges and removing all trimmings from the area.



SMALL MAMMALS



AMPHIBIANS



CHICK FOOD



WATER QUALITY & PROTECTION



DRAGONFLIES/ DAMSONFLIES



BATS

Spotlight on... The Wildlife Plot



Developed by the Interreg PARTRIDGE Project, The Wildlife Plot is the result of years of research across Europe and field trials led by GWCT and Oakbank Game. It was initially designed as a superior wild bird seed mix, but it contains a wider range of resource-rich native plants than most other mixes available, making it very beneficial for insects and other groups of farmland wildlife, not just birds.

Studies by GWCT ecologists reveal that it is the best wild bird seed mix in the country for insects, both in quantity and variety of species. It's also a great provider of insect food in summer for farmland bird chicks such as grey partridge, and it contains plants highly attractive to a diverse range of wild solitary bees and bumblebees.

The wildlife plot is very good value for money, lasting up to 10 years. The secret to this is the native plants that come back every year, and the practice of cutting and cultivating half of the plot each year to keep up the plant diversity. For more about species mix and management, see page 20.

Here are the year-round benefits of an established wildlife plot for farmland insects:

Spring – Red and white campions, vetches and self-heal **provide early flowers** for pollinators such as wild bee queens, which need lots of energy from nectar and pollen when they awake from hibernation.

Summer – Wild carrot, black medick and vetches provide sawfly larvae, aphids, spiders and other **chick food insects** at pecking height for grey partridge and lapwing chicks. Vipers bugloss, kidney vetch, knapweed and cornfield annuals **provide flowers** for pollinators. The insect richness will normally peak in its sixth summer.

Autumn – Musk mallow, yarrow and vetches continue to provide **nectar and pollen for the late season pollinators** and allow new bee queens to top up their reserves before hibernation. Cutting half of the plot results in a **fresh flush of most perennial flowers**.

Winter – The uncut areas and tall perennials such as chicory and teasel provide wind breaks and **dense warm shelter** for overwintering insects such as butterfly caterpillars, bumblebee queens and predatory ground beetles.





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Content: Holly Turner, John Holland, Phil Jarvis, Alastair Leake, Jess Brooks and Joe Dimbleby.
Images supplied courtesy of Peter Thompson, Phil Jarvis, John Holland, Jess Brooks and Francis Buner.
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