

FARMING WITH NATURE

Promoting biodiversity
across Europe through
partridge conservation



JEN BREWIN, FRANCIS BUNER & JULIE EWALD

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*A summary of scientific evidence underlying the
North Sea Region Interreg PARTRIDGE project.*

<https://northsearegion.eu/partridge>

This publication describes how grey partridge conservation helps to address the farmland biodiversity crisis across Europe. It summarises the most relevant scientific evidence regarding grey partridge management and the biodiversity benefits associated with it. We have selected what we felt were the best and most thorough studies and papers available. We cite high-impact peer-reviewed papers wherever possible, relying on our combined experience and expertise to quote non-reviewed reports where published papers were unavailable.

Jen Brewin, Francis Buner & Julie Ewald





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CABINET SECRETARY'S FOREWORD

Once a common farmland bird, the grey partridge has declined in abundance and range significantly across Europe. It has been the subject of much research, focused on investigating the causes of this change in status and designing practical measures which aim to halt and reverse it. Sadly, many other species which rely on farmland have suffered similar fates.



Fergus Ewing

This publication summarises much of the knowledge regarding grey partridge ecology gathered from studies carried out by a variety of organisations across northern Europe. It details the problems partridges face and most importantly what can be done by land managers to change this situation.

What is particularly refreshing from my point of view is the acknowledgement, and indeed the clear assumption, that the solutions have to go hand-in-hand with productive farming practices, to succeed. Scotland is recognised for innovation and collaborative approaches across our agricultural industries. Demonstrating how we can extend this skill and experience to deliver both for our economy and our environment is key. If we want sympathetically-managed habitats to be fostered on Scottish farmland at a scale that will have a positive effect on grey partridge populations and those of other farmland wildlife, we have to make sure those habitats fit alongside productive land uses and are easily managed by the farmers themselves; after all, who else will do it?

It is also particularly pleasing to see that any such measures introduced are almost guaranteed to help a wide range of other farmland wildlife including plants, insects, birds and mammals. The practical information and guidance in this booklet will be invaluable to those hoping to help restore farmland wildlife and could help guide future agri-environment policy in Scotland, which provides important support without which farmers cannot implement the necessary measures.

A handwritten signature in blue ink that reads "Fergus Ewing".

FERGUS EWING, Scottish Government's Cabinet Secretary for Rural Economy and Tourism



EUROPE'S FARMLAND BIODIVERSITY PROBLEM

THE BIODIVERSITY CRISIS

Europe's farmland has been dramatically transformed by modernisation over the past century. These changes have increased the efficiency of food production, but they have also contributed to a widespread decline in ecosystem health, affecting water, air and soil quality as well as farmland biodiversity.

Across society, this degradation is widely recognised as a serious problem, through to the highest political levels in Europe. The targets set in the European Union's Biodiversity Strategy aim to reverse these declines, with Target 3a specifically designed to 'increase the contribution of agriculture to maintaining and enhancing biodiversity'¹.

The mid-term review on meeting these targets by 2020² clearly states that this will not be achieved. Therefore, tested working solutions are urgently needed to ensure that the biodiversity crisis can be halted at least by 2030.

HOW TO ACHIEVE PROGRESS

Providing real-world examples that reverse the ongoing decline of farmland biodiversity over large areas, and in different countries and regions, is crucial to addressing the farmland biodiversity crisis across Europe. People typically only believe what they see working with their own eyes, whether they are farmers, hunters, conservationists, local authorities, policy makers or governments.

The NSR Interreg PARTRIDGE project (referred to as PARTRIDGE throughout this booklet) was initiated to specifically fill this gap, providing a way forward to address the farmland biodiversity crisis across Europe. This project aims to demonstrate how farmland biodiversity can be reversed at 10 real-life demonstration sites, based on scientific grey partridge conservation knowledge.

WHY THE GREY PARTRIDGE?

The grey partridge is one of the most rapidly declining farmland birds in Europe - its numbers have declined by more than 90% since the 1970s³. It has also been the subject of thorough research, so we have a more detailed picture of what is driving the decline in grey partridge numbers than for many other species sharing the same farmland ecosystem.

Labelled a 'barometer of the countryside'⁴, the grey partridge is an ideal indicator of arable farmland ecosystem health: where partridges thrive, other farmland wildlife also thrives.

WHY THE PARTRIDGE PROJECT?

Several conservation projects across Europe, either at a small scale on single farms or across groups of farms, have shown that well-designed conservation measures are effective in helping grey partridges. Research and practical conservation initiatives from various parts of Europe show that where partridge conservation measures are introduced, a wide range of other farmland species benefit.

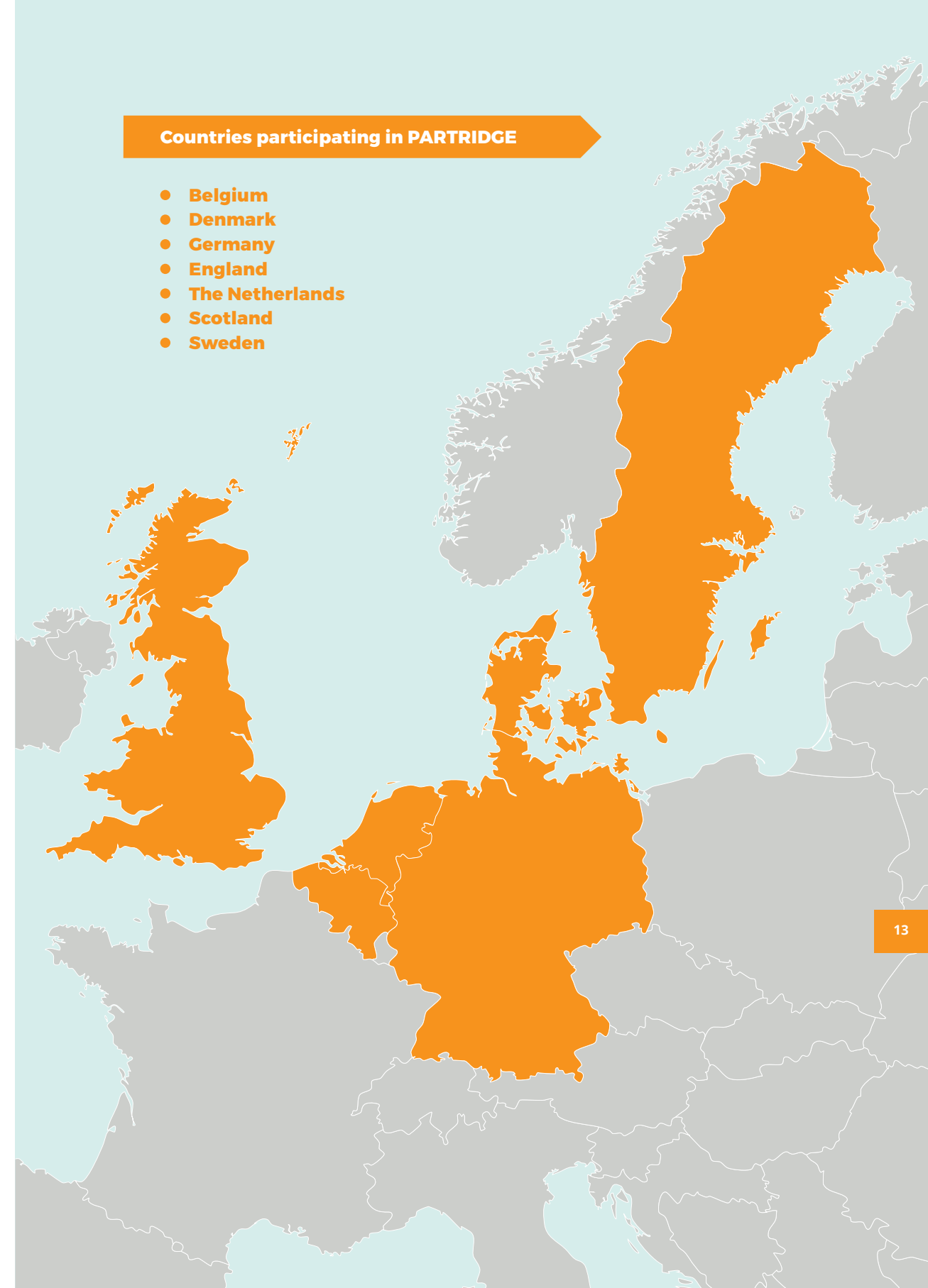
PARTRIDGE pulls together these management elements into a practical and effective conservation package that works alongside profitable farming, as long as those who implement the necessary measures are adequately compensated for their efforts.

Across Europe financial support is provided by Agri-Environment (AE) schemes. These AE schemes are the key policy instrument of the EU's Common Agricultural Policy (CAP), aiming to reverse the decline of farmland biodiversity by incorporating wildlife-friendly management into farming businesses⁵.

Besides farmers, other rural stakeholders also have a part to play in conserving grey partridges and other farmland biodiversity. PARTRIDGE demonstrates the feasibility of this in an innovative way, regardless of state borders.

Countries participating in PARTRIDGE

- Belgium
- Denmark
- Germany
- England
- The Netherlands
- Scotland
- Sweden



**THE PARTRIDGE PROJECT
BRINGS TOGETHER
THE KNOWLEDGE AND
UNDERSTANDING FROM
INITIATIVES ACROSS
EUROPE, INTO ONE
PRACTICAL PACKAGE
FOR FARMLAND WILDLIFE
RECOVERY BASED
ON GREY PARTRIDGE
CONSERVATION**

WHY THIS BOOKLET?

This booklet provides an overview of the grey partridge conservation research from across Europe applied within PARTRIDGE. It briefly explains grey partridge biology, the key management measures needed for this species' survival and the benefits of grey partridge conservation for farmland wildlife in general.

It is only through applying well-tested conservation approaches across regions and countries, and by developing them further, that we will ensure the recovery of farmland biodiversity today and a healthy future for us all.

2000

FUTURE



INTERREG NORTH SEA REGION PARTRIDGE PROJECT

The PARTRIDGE project is an international collaboration between 13 European partners from within the North Sea Region. Together, we manage ten 500-hectare demonstration sites (two each in England, Scotland, the Netherlands, Belgium and Germany), where the project has established and improved conservation measures developed for grey partridges, but which can benefit many species.

PARTRIDGE aims for a 30% increase in farmland biodiversity by 2023 in all of its demonstration sites, measuring farmland wildlife indicators such as grey partridge, breeding songbird and brown hare numbers. These support the targets in the EU's Biodiversity Strategy for agricultural land.

We have tailored our approach to the needs of each country, to demonstrate how to successfully increase farmland biodiversity across the EU. We actively promote our solutions among a wide range of relevant stakeholder groups, and seek to influence agri-environmental policy, especially by holding farm walk events tailored to those different groups at our demonstration areas. Our Swedish and Danish partners actively promote our solutions in their respective countries, although we have no demonstration sites there.

Our approach can be incorporated into standard farming practices regardless of region or country, which is key to persuading governments to support these methods through national AE schemes or equivalent alternatives that may be available in the future.

United Kingdom

Game & Wildlife Conservation Trust - *Lead partner*

Netherlands

BirdLife Netherlands - *Co-ordinating partner*

Stichting Landschapsbeheer Zeeland

Brabants Landschap

Stichting Het Zeeuwse Landschap

Germany

Georg-August-Universität, Abt. Naturschutzbiologie

Belgium

Flemish Land Agency (VLM) - *Co-ordinating partner*

Research Institute for Nature and Forest (INBO)

Inagro

Boerennatuur Vlaanderen

Flemish Hunters Association (HVV)

Denmark

Danish Hunters Association

Sweden

Odling I Balans



BACKGROUND

– THE GREY PARTRIDGE

LIFE CYCLE

Grey partridges are ground-dwelling birds that are site-faithful, spending their life within a few kilometres of where they hatch. They roost and nest on the ground and have the largest average clutch size of all birds (15 eggs in north-west Europe). If the first clutch is lost, grey partridges will make a second attempt at breeding with a replacement clutch, which contains fewer eggs. First clutches tend to hatch from the middle of June and replacement ones up until early August.

When they hatch, the chicks are mobile almost immediately and the adults move the chicks off the nest within a few hours to suitable areas nearby where they can find food. Chicks forage on the ground in tall but relatively open farmland vegetation, eating mainly insects and their larvae for the first two weeks. Their diet then changes to include seeds, grains and green leaves of grasses, cereals and flowering plants⁶⁻⁹.

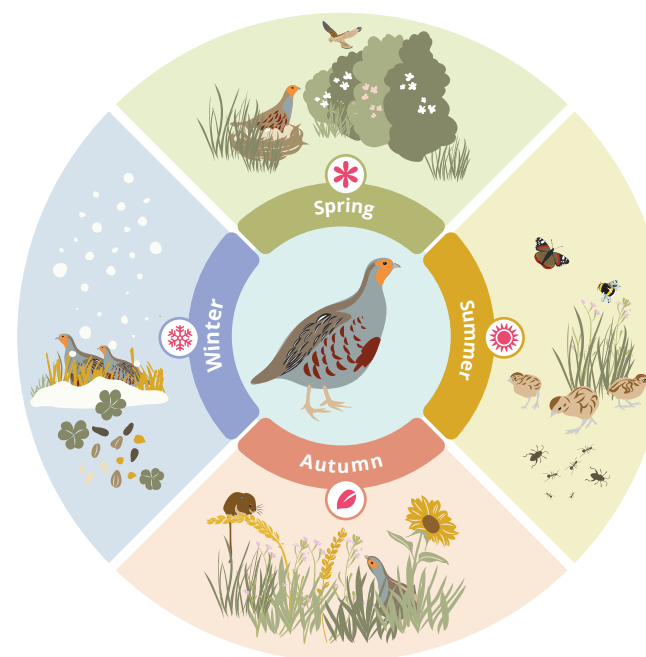


Figure 1 In this guide we describe the habitat measures that provide resources for the partridge's life cycle throughout the year.

There are pinchpoints for grey partridge survival in every season. Our habitat measures are aimed at making improvements to address each of these bottlenecks.

The chicks' early reliance on a high-protein diet made up mainly of insects has important implications, both for understanding the needs of the grey partridge and for designing conservation strategies to support them. Chicks become capable of flight at around 10-15 days. The family group, sometimes joined by other adults, stays together in a covey through the summer and winter before breaking up. The young then form pairs with individuals from neighbouring coveys for the next breeding season. Grey partridge pairs stay together throughout the year.

PARTRIDGE DECLINES

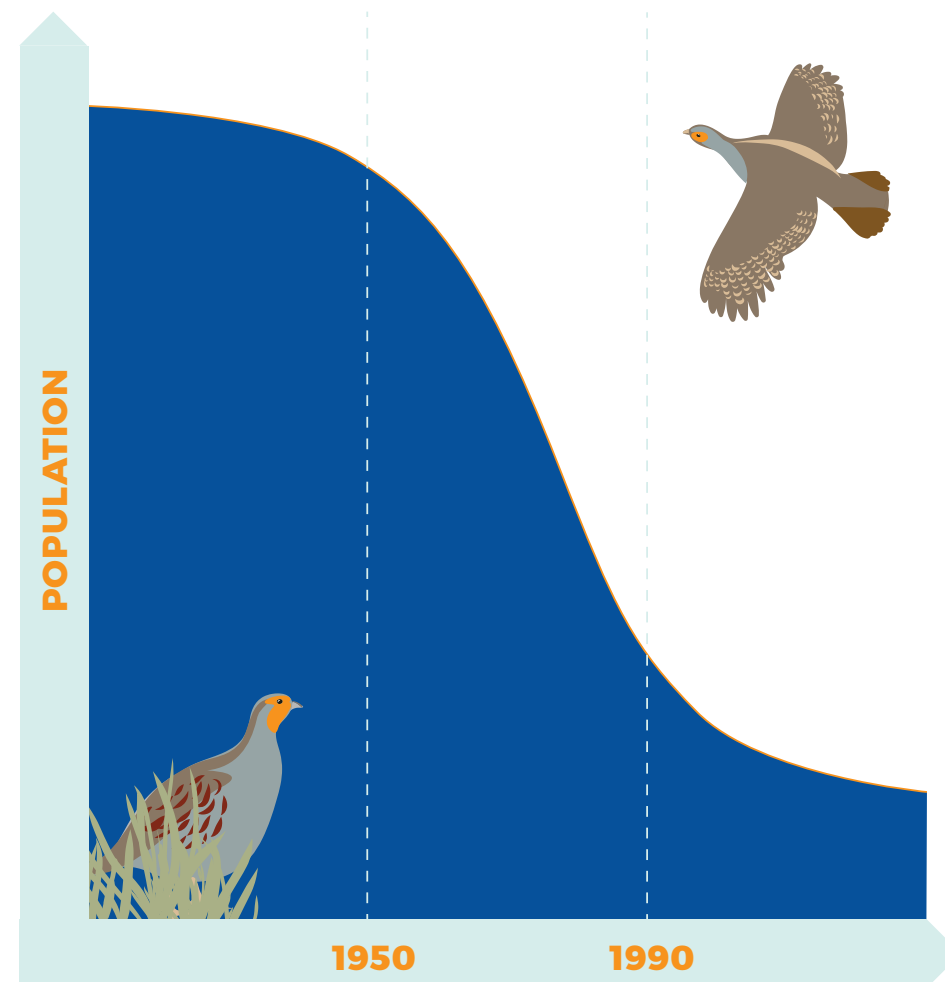
Across Europe over the past 150 years, grey partridge abundance shows three distinct trends (as shown in Figure 2). The general pattern is of stable high numbers in the late 1800s to 1950s/60s, then a sharp decline, followed by an ongoing more gradual decline¹⁰⁻¹⁴.

These trends coincide with changes in farming methods. In the late 1800s to mid-1900s, farming methods provided good habitat for partridges and numbers were high.

The 1950s-1960s saw the widespread introduction of herbicides. This affected grey partridges and other farmland species by disrupting the food chain, removing weeds (arable flora) which are the host plants for insects that partridge chicks depend upon for food (Figure 3)¹⁵⁻¹⁸.

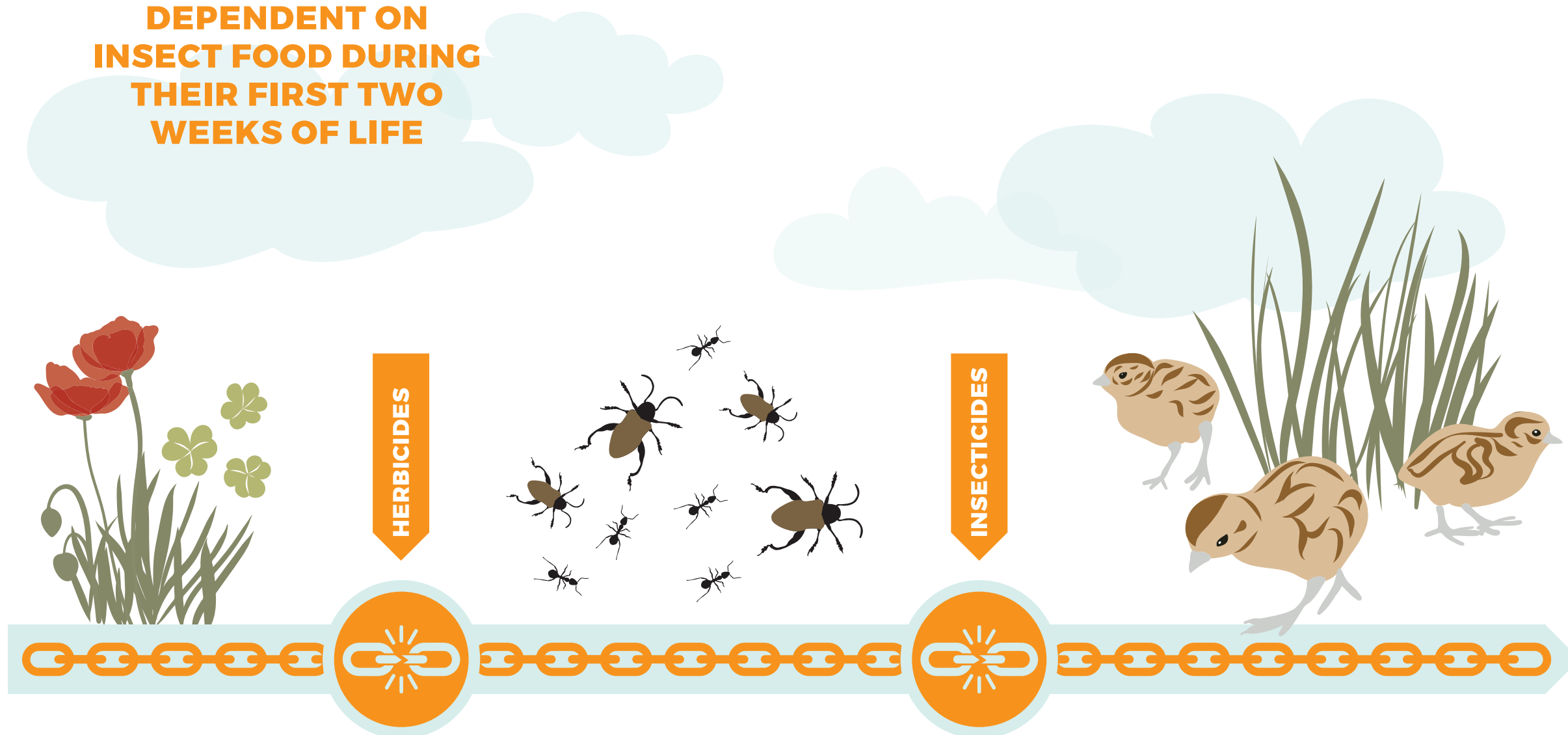
Some of the early insecticides whose usage also became common around this time were directly toxic to partridges¹⁹. More recently, although most insecticide treatments applied to fields are not directly toxic to farmland birds²⁰, they still affect grey partridges - and other insect-eating farmland birds - by reducing the abundance of insects important in chick diet^{18,21}.

Figure 2 Changes in partridge abundance through time across Europe. Numbers have generally followed three phases: high and stable numbers historically, followed by a steep decline from around the early 1950s to the 1990s and a continuing, more gradual decline thereafter. These trends mainly reflect changes in agricultural practice.



PARTRIDGE CHICKS ARE COMPLETELY DEPENDENT ON INSECT FOOD DURING THEIR FIRST TWO WEEKS OF LIFE

Figure 3 Grey partridge chicks rely on insects during their first two weeks of life. This food supply can be disrupted directly by the use of insecticides, which kill the insects. Or, indirectly by the use of herbicides, which kill the plants that support the chicks' insect food.



KEY FACTORS IMPLICATED IN GREY PARTRIDGE DECLINES

Extensive research across Europe in the second half of the 20th century has helped us understand grey partridge declines in more detail. Across the continent, the three main reasons are:

- Loss of insects from cropped fields because of herbicide and insecticide use.
 - This lack of food led to smaller broods, i.e. fewer surviving young per nesting female^{11,22,23}.
- Loss of nesting habitat because hedgerows and grass banks were removed, and fields combined.
 - This led to fewer successful breeding pairs in spring²⁴⁻²⁶.
- Increased predation, especially by generalist predators such as the red fox, because of land use changes, a reduction in legal predator control and a change in the behaviour of hunters²⁷.
 - This led to higher losses, particularly of nesting females^{28,29}.

This trio of causes was first proposed by the British farmland ecologist Dr Dick Potts in the 1970s as the ‘three-legged stool’⁸. His theory, now widely accepted, was based on his own scientific studies in the UK²³, influenced by other studies of grey partridge ecology⁶⁻⁹, and is supported by more recent research³⁰⁻³³. Modern farming methods either affect all three legs of the stool or affect one so much that ‘the whole stool becomes unsteady’.

Further research suggests a fourth element: poor survival during the late-winter period. It is thought to be driven by predation and worsened by the lack of suitable winter cover and food resources^{20,31,34,35}.

The collapse of the three-legged stool has affected both partridge numbers and the wildlife that thrives alongside them. Reinstating the supporting legs can provide a stable foundation for farmland biodiversity. Farmland conservation based on this model has been shown to successfully increase both partridge numbers^{36,37} and farmland biodiversity as a whole³⁸⁻⁴¹, by providing nesting habitat, brood-rearing habitat, winter cover and food, and by managing predation.

These topics are examined individually in the following chapters.



PARTRIDGE wild bird mix at Balgonie demonstration site, Scotland. Molly Crookshank



Partridge female with chicks David Mason

NESTING HABITAT – SAFE NEST SITES

Key point

Partridges need plenty of high-quality nesting habitat.

Provided by

Permanent and semi-permanent vegetation features such as wildflower plots, hedgerows, grass margins and beetle banks.

Grey partridges nest on the ground. The preferred nest site is in unmown tussocky grasses with old vegetation, typically found along hedgerows, ditches, dikes or grassy field margins that have plenty of dead grass from the previous year^{24,42}. Nests can also be found in the crops themselves, especially cereals⁴³.

In recent years AE schemes have introduced some habitats that can replace or augment the more traditional grassy nesting habitats that are now scarce in modern farmland. These include wildflower plots^{44,45}, beetle banks that provide suitable nesting cover in the middle of large arable fields and field corners or fallow land⁸.

THE EVIDENCE for partridges

Although partridges prefer to nest in vegetation with unmown tussocky grasses, actual nesting sites vary across Europe depending on the available habitat. For example, in the UK 65% of partridge nests are found in field margins, including the base of hedgerows, grassy banks or uncut margins^{24,46}. In Germany nearly 95% of grey partridge nests were found in similar permanent vegetation, with a quarter in wildflower blocks specifically designed to provide nesting and foraging habitat in the breeding season⁴⁴. Conversely, in north-central France, 65% of grey partridge nests were found in cereal crops, with only 13% in linear features like hedges⁴³.

This indicates that the availability of habitat types influences grey partridge nest-site selection.



In PARTRIDGE, the quality and quantity of nesting habitats on demonstration sites are increased both through changes in management of existing habitats and provision of new habitats. This includes implementing hedgerow management, adding in new grass margins and beetle banks, and ensuring grass margins are not mown before chicks can fly. The mowing date will differ slightly between regions, for example, in Germany it is recommended not to mow before 15 August. Where appropriate we are involving agencies such as water boards in Flanders (Belgium) to adjust their mowing regimes and ensure nests are not destroyed during the breeding season.

Partridge breeding density is closely associated with the amount of available nesting cover: where there is more high-quality cover, there are more partridges, and increasing the amount available can increase partridge breeding densities^{10,25,33,43,47}.

Five main habitats are known to provide nesting cover across farmland: hedgerows, grass margins and ditches, wildflower plots, beetle banks and cereal crops.

For hedgerows, grass margins and ditches to provide optimal nesting cover, management is key. For example, in the spring these features should retain enough dead grass or similar vegetation from the previous year to provide cover for a female grey partridge sitting on a nest^{8,9,24}. This also means that they need to remain uncut during the nesting season to avoid destroying the nest and killing the sitting female. Hedges should be cut in rotation (up to every three years), to allow a dense base to develop²⁴.

Wildflower plots can provide ideal nesting sites because of their open structure at ground level, combined with vegetation that provides suitable cover and camouflage. In Switzerland and Germany, partridges preferred to nest and spend time in or near wildflower plots^{44,45}.

It is essential not to mow these areas when females are incubating or when chicks are very young (May-August). Management of wildflower plots is discussed further on pages 42-44.

Several successful UK partridge recovery projects have used beetle banks to provide additional nesting habitat⁴⁸⁻⁵⁰. This is because they are dry and disconnected from the edges of the field, which may reduce predation⁵¹. Beetle banks are quicker and easier to establish than a traditional hedgerow.

However, linear nesting habitats like beetle banks or those along field boundaries are usually not appropriate in areas without lethal predator management, because they can act as corridors to concentrate predators and prey, and lead to more predation rather than less^{43,44}.



For other species

Hedgerows are important habitats for farmland invertebrates^{52,53}, being able to support more than 1,500 different invertebrate species from 70 families. Hawthorn alone has 209 species associated with it⁵⁴. Many butterflies such as small tortoiseshell, red admiral, gatekeeper, orange tip, ringlet, and several whites are commonly found alongside farmland hedgerows⁵⁵.

Many declining farmland bird species rely on hedgerows as nesting habitats, for instance yellowhammer, whitethroat, linnet, and turtle dove⁵⁶.

Beetle banks were designed to provide overwintering sites for beneficial insects⁵⁷, with higher numbers in fields with beetle banks⁵⁸ than in those without. Invertebrates such as predatory ground beetles use tussocky grasses to shelter overwinter, and thousands can be found per square metre on a beetle bank^{59,60}. These can reduce the number of pest insects, for example aphids, in the nearby crop in spring and summer⁵⁸.

Beetle banks are also a haven for other farmland wildlife. Together with grass margins and wildflower plots, they provide ideal nest sites for small mammals such as harvest mouse^{61,62}, common vole⁶³, and brown hare⁶⁴.



Beetle banks are raised banks (0.5m high by 3m wide) that are sown with a mix of tussocky grasses, typically dividing a field in two but not connecting to the field edges.

Beetle banks were invented in the UK in the early 1990s where, based on research, they made it into the English AE scheme in the mid-1990s, and Scottish and Welsh schemes shortly thereafter.

PARTRIDGE introduced beetle banks to the Netherlands in 2017, Belgium in 2018, and Germany in 2019. They were adopted into AE schemes in the Netherlands in 2018 as a direct result of the PARTRIDGE project. PARTRIDGE aims to introduce beetle banks into the AE schemes of all North Sea member states.

Kestrel hunting for voles in a PARTRIDGE flower block at Burgh Sluis demonstration site, NL Jannie Timmer





BROOD-REARING HABITAT – PROVIDING CHICK FOOD

Key point

Partridge chicks need insect-rich foraging habitat, near to where they hatch, to survive the first few weeks of life.

Provided by

Wildflower plots, conservation headlands, annual arable margins.

In the first two weeks of life, grey partridge chicks eat mainly insects¹⁶. This high-protein diet is very important for chick growth and, if other factors are favourable, the more insect-food there is, the better chicks will survive.

Guided by their parents, partridge chicks forage for insects within an area of 4-10 hectares, depending on how much habitat providing chick food is available near the nest⁴⁵.

It is critical for partridge conservation to provide a rich and accessible supply of insects close to the nest. It is commonly believed that chick mortality increases if the family group (covey) must travel some distance to find food, as they are more vulnerable to predation and bad weather conditions.

THE PARTRIDGE PROJECT USES WILDFLOWER PLOTS TO PROVIDE INSECT-RICH FORAGING HABITAT



THE EVIDENCE for partridges

The insects that grey partridge chicks eat live on plants within crops, or on the crops themselves¹⁸. These plants are known as arable flora or, more commonly, weeds. Insect declines across the globe have recently received great attention⁶⁵. Removing either weeds with herbicides^{8,66} or insects with insecticides⁶⁷ destroys the chicks' food supply (see Figure 3, page 27).

In the UK, before the introduction of herbicides, grey partridge chick survival averaged 49%. This dropped to 32% once they were widely used¹¹.

Decreased chick survival was then the main driver of the grey partridge decline: not enough chicks were making it to adulthood, so numbers were falling. Increased insecticide use added to the problem, with grey partridge chick survival a third lower in areas of widespread insecticide use than in areas with little or no use²². This seminal work from the UK has been replicated most recently in Poland, where increases in pesticide use are correlated with declining chick survival rates¹⁶⁷.

Therefore, areas that receive no or only selective pesticide treatments during the summer can provide a haven for chicks. On modern farms these are provided by wildflower plots, conservation headlands (see page 45), or other forms of open, insect-rich vegetation^{15,68}.

It is essential that brood-rearing habitats provided for grey partridge chicks are not treated with summer insecticides. The accepted management of weeds varies, with some habitats receiving no herbicide. Selective herbicides that remove only pernicious weeds but do not harm the plant species that support insects can be used where needed.

The structure of the vegetation in these areas is also very important. There needs to be a canopy for protection from aerial predators such as raptors and corvids, but the underlying structure needs to be more open to allow chicks to move freely through the habitat^{15,68}.

The seed mixes used in wildflower plots in PARTRIDGE contain various flowers and other plant species chosen for their ability to support insects^{69,70}, produce seeds for adult birds⁷¹⁻⁷⁴ and give overhead protection. Four times as many insects have been found in wildflower strips as in conventional wheat fields^{75,76}. Adding wildflower plots to the landscape (typically up to 1 hectare but sometimes larger) stabilised the previously declining grey partridge numbers across a large study area in Germany⁴⁴. In one area where these wildflower plots covered 7% of farmland, grey partridge numbers increased 10-fold⁴⁴.

In the UK, wildflower plots have been associated with larger grey partridge broods, more young per adult and improved grey partridge survival in winter⁷⁷. In Switzerland, reintroduced grey partridges chose to settle in areas with the most wildflower strips and hedges⁴⁵.



Wildflower plots are the key habitat measure recommended by PARTRIDGE. PARTRIDGE uses blocks or wide strips (at least 20 metres wide) sown with a mix of different flower species to provide good habitat for partridges.

Much consideration has gone into developing mixes that suit the project's varying local conditions, ensuring suitable nesting, foraging and winter habitat all year round at all the demonstration sites.

They are managed in a rotation to achieve this. Alternate halves of each plot are re-established each year in spring or autumn (depending on local conditions), and the differently aged vegetation on the two halves provides habitat variety. Having more variety in the structure and composition of the mixes results in higher biodiversity overall.

The key plants used are sunflower, mustard, kale, chicory, perennial rye, lucerne (alfalfa), sweet clover and teasel. Various other species are added to the mix at different sites to increase diversity and suitability for farmland biodiversity.

Flower power

In PARTRIDGE, the mixes were developed taking into consideration seed prices, to ensure that the cost of the mix was acceptable to farmers, while also including as many native species as possible. The seeds of native species are usually more expensive, so although an entirely native mix would be desirable, a compromise was needed for PARTRIDGE.

The literature describing wildflower plots varies in how they are named. Sometimes they are referred to as wildflower mixes, in other cases as wild bird seed mixes. In this document, we use wildflower mix when referring to seed mixes, and wildflower plot when referring to the area once it is sown. Where size, shape or species composition is important, we highlight that. Where we refer to a paper that mentions such plots, we use the same terminology as the paper.



PARTRIDGE flower block at Diemarden demonstration site, D, Eckhard Gottschalk

Conservation headlands are currently supported by AE schemes in the UK and Switzerland. They are strips around the edge of cereal fields, usually 6-12 metres wide, which are part of the crop but managed with no or only selective pesticides during the summer. They may also be sown at lower densities and may have a lower nitrogen input. This allows arable plants (weeds) to grow, and supports the insects that grey partridge chicks need^{15,78}.

More than twice as many insects have been found in conservation headlands compared with headlands sprayed as normal¹⁵. This more plentiful food supply can improve chick survival^{15,68,78-80}.

Annual arable margins, also called cultivated margins and including floristically-enhanced margins, are uncropped strips around fields that are renewed each year. They are usually 3-6 metres wide and aim to provide habitat for arable plants, in particular those that are rare or endangered. In the case of cultivated uncropped margins, they are ploughed and left unsown to allow natural regeneration of weeds from the seeds in the soil, while sown/floristically-enhanced arable margins are sown with native arable flora.

They are expected to give good foraging habitat for partridge chicks and may act as a substitute for, or addition to, conservation headlands because they benefit chick-food insects⁸¹⁻⁸³. Sown weed strips (floristically-enhanced margins) are very attractive to insects⁸².

The conservation value of field margins sown with a seed mix compared with naturally regenerated strips will vary greatly, depending on the soil type, the seeds present in the soil and the management approach. Arable margins are also supported by AE schemes in several European countries.



In PARTRIDGE we provide brood-rearing habitat mainly using wildflower plots and arable margins – both cultivated and sown. The key is to provide a lightly managed vegetation, rich in floral resources, that will support the necessary chick-food insects, with an open structure to allow chicks to forage.



For other species

Wildflower plots provide good habitat for a variety of species, many of which are found in higher numbers than in adjacent conventional crops⁸⁴. These include the common vole^{85,86}, a range of farmland birds⁸⁷ such as skylark⁸⁸, corn bunting⁸⁹, kestrel⁸⁶, and long-eared owl⁸⁶. Many insects and spiders^{90,91} can also benefit, including ground beetles⁹², hoverflies⁹³, butterflies and moths^{74,82}, and wild bees^{74,82}. Wildflower plots also contain high numbers of beneficial predatory insects, which can help control pest outbreaks in nearby crops^{94,95}.

Although conservation headlands were originally designed to aid grey partridge numbers, they are also beneficial for other species. Many invertebrates including butterflies are more abundant in these areas^{15,96,97}. More food is available for butterflies in conservation headlands, so feeding is more efficient and butterflies are able to spend more time resting and interacting with each other⁹⁸. The increased number of flowers³⁹ in conservation headlands attracts hoverflies, whose larvae eat crop pests such as aphids⁹⁹. Conservation headlands also provide ideal habitat for small mammals such as wood mice, who actively seek out these areas¹⁰⁰.

Cultivated arable margins and extensively managed cereals were developed to aid arable flora. Cultivated arable margins were deemed to have the potential to conserve up to 40 species of rare arable flora¹⁰¹ and a system of cereal fields managed with little or no agricultural chemicals ('extensively' managed) has been used to create mini-nature reserves for arable flora across Germany in the '100 Fields for Diversity' programme¹⁰².

In addition to arable flora, more spiders and ground beetles are found in cultivated arable margins compared with conventionally cropped margins in spring^{81,103}, and they are known to be beneficial to other farmland birds such as corn bunting^{89,104}.

Another role that wildflower plots, conservation headlands and other AE scheme measures can fulfil is that of a buffer for agricultural chemicals. Where there are areas of unsprayed vegetation such as conservation headlands or wildflower plots at the edge of fields, there is less pesticide drift onto adjacent hedgerows, ditches and bodies of water. This reduces the effects of pesticides on insect populations in field boundary features^{105,106} and on nearby aquatic life¹⁰⁷.



Bumblebee *Bombus pratorum* on marsh thistle *Cirsium palustre* Peter Thompson



WINTER COVER AND FOOD

Key point

Winter survival is improved by cover and food.

Provided by

Wildflower mixes, winter stubbles, supplementary feeding.

Measures to improve grey partridge winter survival are an important part of partridge conservation packages. These consist of providing winter cover, which gives protection from severe weather and predators^{108,109}.

Lack of food over winter can also be a problem because seeds are scarce on modern farmland in winter¹¹⁰, particularly during the period known as the 'hungry gap', which runs from January to early May in north-western Europe¹¹¹.

Wildflower plots sown for nesting and brood-rearing can also provide seed resources and cover in winter for grey partridges and other farmland wildlife³⁴. This requires careful selection of the species included in these mixes because they need to hold seeds until early spring.

Although grey partridge adults eat mainly leaves and other plant matter in winter¹¹², additional feeding with grain is often used to supplement their natural food.

For some countries in north-west Europe, where comparatively few plant species bear seeds into early spring, it may be difficult to grow plants that provide seed into mid-February. In these cases, supplementary feeding may be even more important.

The thinking on supplementary feeding is two-fold: firstly it could reduce foraging time and hence predation risk¹⁰⁸, and secondly high-energy food, such as seeds, may lead to better breeding condition¹¹³.

THE EVIDENCE for partridges

A review of scientific evidence from across Europe found that winter survival of females was a key factor in population growth^{29,35}. Because grey partridges stay in the same area all year round, they must find enough food and cover from predators during winter.

Radio-tracking studies carried out during the winter months in Germany and Switzerland have shown that grey partridges spend most of their time in the middle of arable fields, in particular cereal fields, stubbles and oilseed rape^{44,45}. During this time, they feed mainly on the shoots of short winter crops, while taller vegetation provides cover from predators.

Winter stubbles

Winter stubbles are crop stalks left in the ground over winter. Winter stubbles, especially weedy ones or those sown with a structurally open cover crop, provide a valuable resource for partridges and other seed-eating farmland birds^{110,114}. In the past, cereals were sown with ley crops (grass/legumes), resulting in undersown green stubbles post-harvest. This practice had benefits for sawfly larvae – important chick-food insects – but has largely been abandoned⁴.

The diet of grey partridges feeding in stubble fields is more varied than those feeding in winter-sown cereal fields or oilseed rape, with more grain and seeds compared with mostly leaves¹¹². Although a predominantly leaf-based diet is sufficient for grey partridges, it is generally thought that seeds provide a more nutritious diet⁸.

Stubble fields also provide cover for grey partridges during the winter, another important factor in their overwinter survival¹⁰⁸. Unfortunately, winter stubbles are now uncommon on farmland, following changes in cropping and management of cereal fields¹¹⁵. Where they still exist, they contain lower seed resources owing to intensive management of the crop preceding the stubble, as well as more efficient harvesting techniques¹¹⁶.

Cover

Cover is needed to help partridges avoid predation in winter. Grey partridge winter losses across Europe range from 30-81% of autumn partridge numbers^{31,34,117,118}, with particularly high losses seen in late winter and early spring^{34,108}. Grey partridges are five times more likely to experience predation in winter on days with snow cover than on snow-free days⁴⁴. This is assumed to be because they are much easier for predators to spot when they lose the protection provided by their camouflage.

Supplementary feeding

Seed food for farmland birds can be scarce during the hungry gap in late winter¹¹¹. Providing supplementary seed food during winter has become commonplace on shooting estates across Europe, where it is thought to help maintain partridges in good condition into the breeding season. The effect of this has not been scientifically tested for grey partridges, but it is known to help another gamebird, the pheasant, gain better body condition during the breeding period^{119,120}.

Supplementary feeding may also decrease foraging time, and therefore reduce vulnerability to predation. During times of high snow cover, supplementary feeding may also reduce winter mortality, however, neither of these aspects have been scientifically tested. It is known that partridges utilise feeders and that some areas with extensive winter feeding in France have high partridge densities¹²¹.



For other species

Breeding populations of many farmland birds are in decline, and the reduced amount of seed available to them in modern farming systems contributes to this^{72,115}. Stubble fields, particularly weedy ones, may provide a good source of grain and weed seeds in early winter¹²², and many species of farmland birds are known to feed in them, including skylark, linnet, yellowhammer and reed bunting as well as grey partridge¹²³. A loss of weedy stubble fields is one of the factors contributing to their decline¹¹⁵.

A comparison of seed-bearing crops with conventional crops across 192 farmland sites in the UK found that overall, winter bird densities were more than 12 times higher on these plots. When the analysis was confined to the 'most preferred' of those seed crops, this rose to 50 times higher⁷³. This is just one of many studies that show the value of seed-bearing crops in winter to many farmland bird species⁷².

In Scottish plots sown with mixes consisting of kale, triticale, mustard and quinoa, up to 100 times as many songbirds per hectare were recorded during the winter compared with set-aside, stubble or conventional crops. The plots in this study attracted 50% more bird species than set aside or cereal stubble, and 91% more species than conventional crops, including linnet, reed bunting, tree sparrow and song thrush⁷¹. Researchers in the Netherlands found a much higher density of farmland birds within winter food plots than on the farmland nearby¹²⁴.

Overwintering arthropods were found in higher densities in sown wildflower strips in Switzerland than in arable fields¹²⁵. In the UK, small mammals (mainly wood mouse) have been shown to use wild bird cover crops more than conventional cereals in the winter¹²⁶. In Switzerland kestrels and long-eared owls benefit from this, with wild bird cover being their preferred hunting habitat over winter due to an increased density of field voles⁸⁶.

Providing extra seed for birds during winter can help increase their winter survival and breeding condition¹²⁷. In the UK, when grain feeders were provided for gamebirds in winter, they were also visited by many other species including dunnock, blackbird and yellowhammer¹²⁸.

At one site in the UK, the years with no winter feeding had fewer seed-eating songbirds, particularly in late winter¹²⁹⁻¹³¹. In this study, songbirds accounted for 38% of visits to the feeder. Thanks to this research, supplementary feeding in late winter is now supported by AE schemes in England. At the Allerton Project study area at Loddington, the abundance of songbirds decreased after winter feeding was stopped¹³¹.

THE PARTRIDGE PROJECT ADOPTS MEASURES TO IMPROVE SURVIVAL OF FARMLAND BIRDS IN WINTER

Greenfinch and bramblings feeding in PARTRIDGE flower block at Burgh Sluis demonstration site, NL Jannie Timmer





The PARTRIDGE flower plots provide suitable cover and food for partridges and other farmland birds at least through early winter as they include sunflowers, teasel and chicory. The hollow stems of sunflowers and teasel make ideal overwintering or nesting sites for wild solitary bees and other insects. The flower plots also attract small mammals that are food for wintering raptors and owls. Providing supplementary winter food helps partridges and other farmland birds to bridge the hungry gap during winter months.

Partridge covey at feeder Chris Knights



Winter aspect of PARTRIDGE autumn-sown mix at Diemarden demonstration site, Germany Eckhard Gottschalk

WHAT DOES THE IDEAL PARTRIDGE LANDSCAPE LOOK LIKE?

There is no strict 'correct' way to arrange partridge-friendly habitats in the landscape, although there are some guiding principles. The objective is to provide all necessary habitat requirements summarised in this booklet (nesting, brood-rearing and winter cover) in the territory of a grey partridge pair.

Ideally brood-rearing cover, which could be a first-year PARTRIDGE wildflower plot, arable margin or conservation headland, should be next to nesting cover, provided by either a hedge, unmown grass margin or beetle bank. A sterile or bare strip nearby allows chicks to dry in the sun after a summer rain shower and search for insects. The illustration on the following page shows an idealistic layout, that can be applied with local adjustments at any farmland biodiversity recovery project across Europe^{44,45,80,121,130,132}.

HOW MUCH SUITABLE HABITAT DO WE NEED?

Early work from Switzerland on the area of land needed to maintain biodiversity on farmland concluded that between 12% and 15% needed to be managed for conservation to maintain the existing biodiversity on lowland farmland^{133,134}. The EU set targets for 5% of arable land to be used for ecological focus areas, with little consideration for the quality of this area¹³⁵.

PARTRIDGE recommends managing a minimum of 7% of the total arable area for grey partridges, made up of high-quality habitat distributed as evenly across the project area as possible. This figure is based on several scientific studies examining the effect that increased nesting and brood-rearing cover may have on partridge chick survival^{8,15,24,25}, as well as the effect of non-cropped areas¹³⁶, natural areas, or 'Ecological Compensation Areas' on farmland birds or biodiversity more broadly¹³⁸.

HOW BIG DOES THE PROJECT AREA NEED TO BE?

For grey partridge conservation projects, the area can vary from as little as 400 hectares¹³⁹ (the minimum recommendation), to as large as 100,000 hectares⁴⁴. PARTRIDGE demonstration sites are the result of a compromise between the desirable and the feasible. Therefore, the project partners decided on an area of 500 hectares for each demonstration site.

Depending on the country, this can mean that up to 30 neighbouring farmers must cooperate to implement 7% high-quality wildlife habitat across the 500-hectare demonstration area. This is a huge challenge in itself. It can only be achieved by the collaboration and involvement of many different stakeholders including farmers, hunters, local, regional and national conservation organisations, volunteers from the local communities, farm advisors, scientists and government bodies.

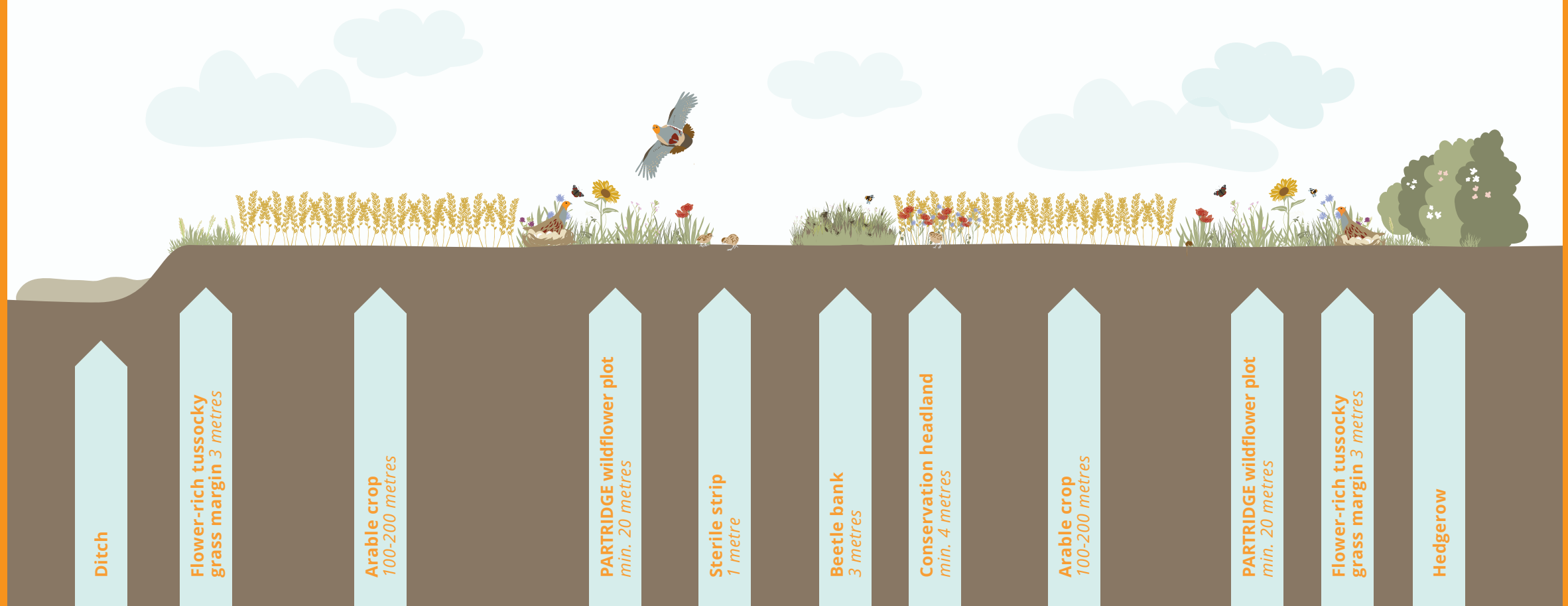


Figure 4 An idealised arrangement of PARTRIDGE conservation measures for farmland biodiversity recovery projects in Europe. When applied together, they provide for the needs of grey partridges all year round and allow farmland wildlife generally to recover.



PREDATION

Key point

Partridge abundance is heavily affected by predation; reducing the effect of predation helps to increase numbers.

Provided by

Habitat and predator management.

Partridges are particularly vulnerable to predation because they nest, forage and roost on the ground. Up to three-quarters of the potential reproduction for a year can be lost through egg predation^{8,44}. We know that predation has become more of a problem for many farmland species in recent decades, particularly ground-nesting birds^{28,29,140} and hares⁴⁰. This may be because the number of generalist predators (those that eat whatever food is available to them) has increased overall during that period²⁸, or because the farmed landscape has become simpler, with fewer hedgerows and other features, or a combination of both. This simplification means that predator and prey species increasingly share the same areas and resources, and are therefore more likely to meet, with prey less able to hide¹⁴¹.

GREY PARTRIDGES ARE VULNERABLE TO PREDATION

The grey partridge is a very short-lived species in comparison with other birds of similar size – its average life expectancy is thought to be only around 1.5 years¹⁴². This is because its life is typically curtailed through predation^{6–8}. This means that most partridges will have only one opportunity to breed in their lifetime. During the breeding season the main partridge predator is the red fox⁸ – but during the winter months, particularly during times of heavy snow, birds of prey are the main threat, especially sparrowhawk and goshawk^{34,117,143,144}. As well as this, a range of other European predators also kill partridges. The famous German naturalist Alfred Brehm summed it up in the 1860s as follows: *'If one visualises the threats to which a grey partridge is exposed including all predators, it is hard to comprehend why partridges are actually still around'*¹⁴⁵.

The nesting female is particularly vulnerable to predation. In unmanaged areas, more than half of the females present may be lost during the breeding season^{109,142,146}. Nesting success is therefore heavily influenced by predation^{20,30}. Nest predation by generalist predators is generally density-dependent, which means that nest losses are relatively higher in areas with higher partridge densities compared to where there are fewer partridges, all else being equal⁸. Predation can suppress the growth of a low-density partridge population¹⁴¹. Local conditions, such as the density of other prey species, the distribution of nesting habitat and predator searching may counteract this. The most convincing study highlighting the influence of predation on partridge breeding numbers comes from an experiment carried out in England. There, where predator management

was carried out during the breeding season, grey partridges produced more chicks and autumn numbers increased by 75% each year (this included all predators legally controllable under UK law, including foxes, corvids and mustelids). This increased spring breeding numbers, which were nearly three times higher on average after three years, compared to a nearby comparison area where breeding success was much lower¹⁴⁷.



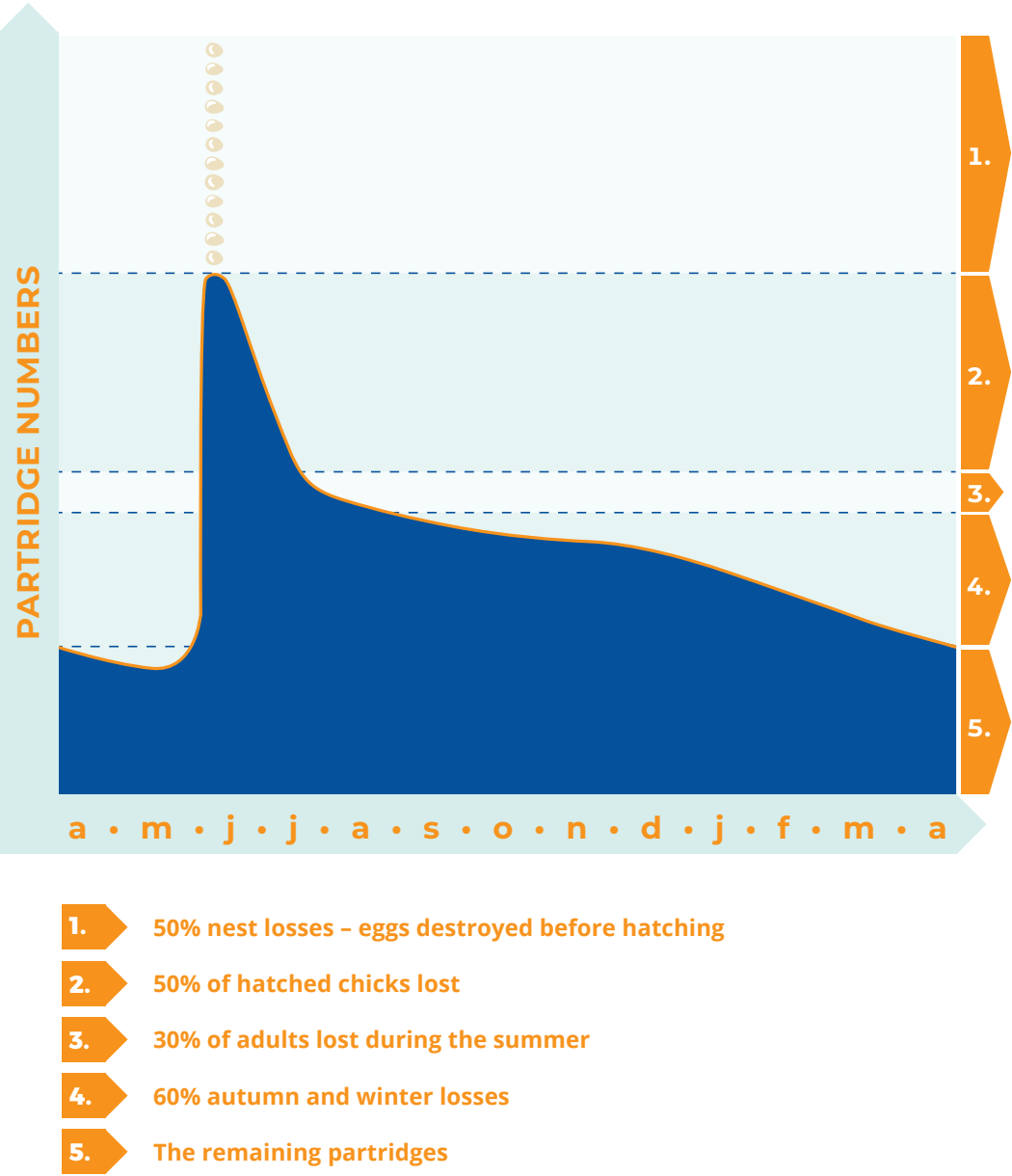
Within PARTRIDGE we are very aware of the sensitive issues revolving around lethal predation management. The partnership includes those with different views, working within different legal frameworks in different countries with different socio-cultural backgrounds, reflecting the diversity found across European society. Therefore, the conservation methods used within PARTRIDGE are designed to be applied alongside either of the main predation management approaches. Each demonstration site chose the predation management approach that was most suitable for its particular situation and aims.

HABITAT MANAGEMENT TO LIMIT PREDATION

In grey partridge conservation projects where lethal predator management is not carried out, the effects of predation may be reduced through habitat improvements. This improvement is directed towards the amount, types and layout of nesting, brood-rearing and overwinter habitat to increase partridge survival. How these are implemented varies between sites. Up until now, there has been little scientific investigation into how exactly habitat management alone can best support sustainable partridge populations in the long-term.

One exception to this is a demonstration site in the UK, where low grey partridge numbers recovered and could be maintained with habitat management alone. This occurred in an area with low background predator densities¹³⁰. The important things to consider are the size of the area being managed for conservation and how fragmented the areas of suitable nesting, brood-rearing and overwinter habitats are, as well as the background density of predators. The presence of partridges nearby is also likely to play an important role in buffering numbers¹⁴⁸.

Figure 5 Schematic representation of fluctuation in grey partridge numbers over the course of a year. Adapted from Pegel¹⁴². The exact timing and proportion of losses will vary depending on local conditions.





Partridge female buried by fox Francis Buner

THE EVIDENCE for partridges

Adjusting habitat can help manage predation pressure. In a simple open landscape with fewer areas for wildlife to use, it is more likely that predator and prey will meet, than in a more complex landscape with many areas of suitable habitat¹⁴¹. Both the amount of good-quality habitat and its layout are important to reduce predation risk for partridges.

Computer modelling of UK partridge populations has predicted that numbers could be stabilised without predator control if 3% of the total arable area of the UK comprised insect-rich brood-rearing habitat and if there were 4.3 kilometres of nesting cover per 100 hectares^{8,25}. The results of this modelling have, to date, not been experimentally demonstrated.

In Germany, the Göttinger Grey Partridge project, covering an area of 100,000 hectares, managed to hold the local grey partridge population stable at two pairs/100 hectares between 2007 and 2018, while in the rest of Lower Saxony numbers fell by half. This was achieved by adding 540 hectares of wildflower plots in blocks of up to one hectare to the suitable partridge habitat that already existed in the area. Lethal predator management was not part of the project, but fox control did occur at low levels as local hunters culled foxes during the winter as part of their existing routine⁴⁴. Partridge numbers fluctuated greatly between years and between local areas, with some areas losing their partridges, then being re-colonised by partridges from nearby areas. A nine-fold increase from 0.6 to 5.6 pairs/100 hectares was recorded in one area of approximately 600 hectares, where the amount of newly-created high-quality habitat was 7%⁴⁴.

Nesting success can be heavily influenced by the structures provided for nesting habitat. In the Göttinger study, 62% of nests in linear structures such as hedgerows or field margins (10 metres wide or less) were predated. Wider structures provided more safety, with only 24% of the nests predated if they were located in structures more than 20m wide such as wildflower plots⁴⁴. Narrow strips of good-quality partridge habitat can concentrate the birds into corridors, allowing ground predators to easily find them⁵¹, with the nesting corridors acting as what is commonly called a 'predator trap'^{49,149}.

However, success based on habitat measures alone is not always possible, as a partridge recovery project in Switzerland showed. In the canton of Geneva, where lethal predator management is forbidden by law all year round, an attempt to minimise nest predation using electric

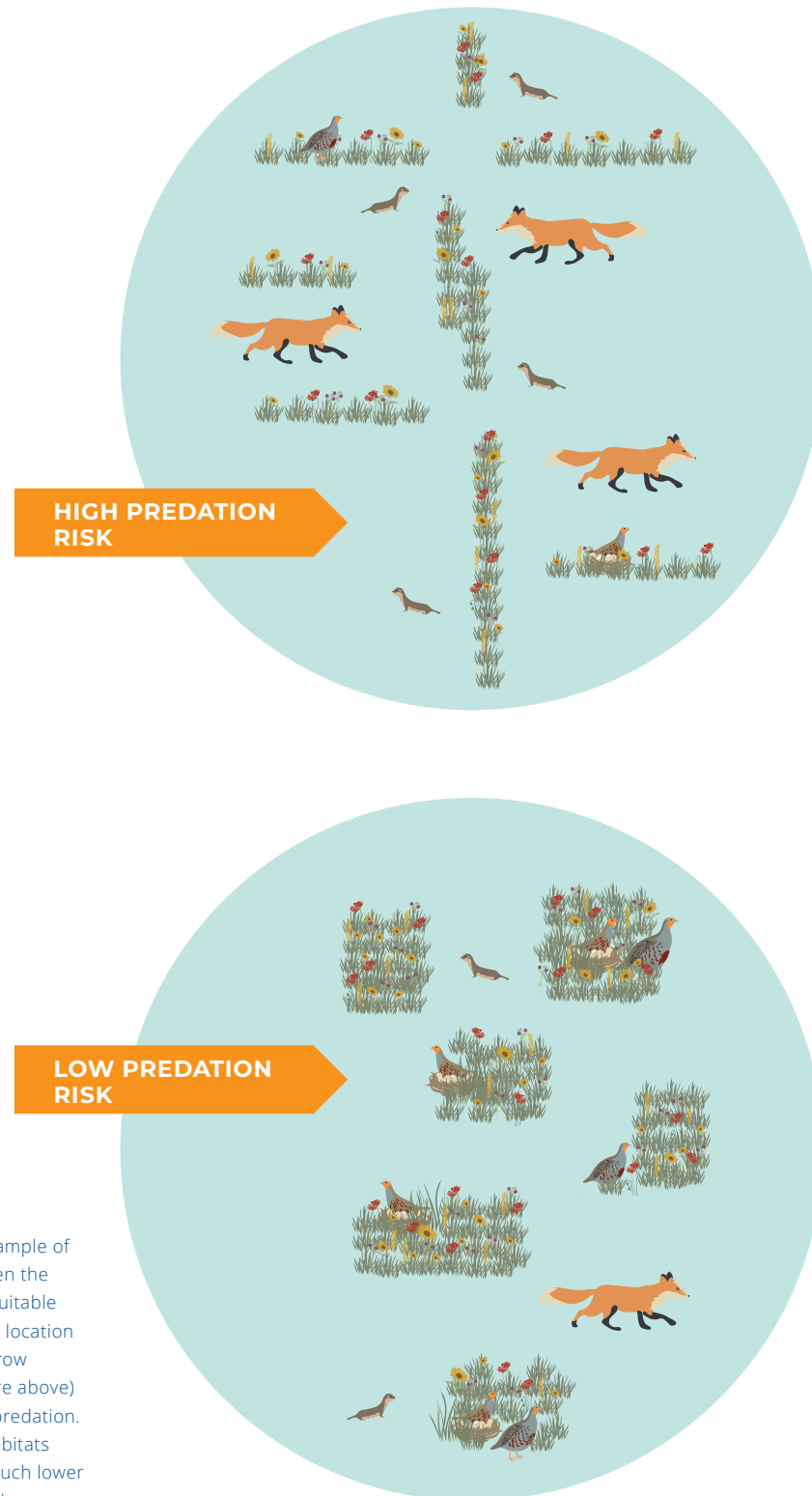


Figure 6 Schematic example of the relationship between the spatial distribution of suitable nesting habitat and the location of partridge nests. Narrow breeding habitats (figure above) result in a high risk of predation. Bigger block-shaped habitats (figure below) have a much lower risk of predation. Based on Gottschalk & Beeke⁴⁴.

fencing was unsuccessful despite increasing hatching success¹⁵⁰. The grey partridge could not be saved from extinction, even with the provision of 5.3% high-quality insect-rich habitat, across an area of 10,000ha^{132,148,168}. Notwithstanding habitat measures undertaken over a 15-year period, the project area was too isolated from the next known partridge population 70 kilometres away to be sustainable. Despite the release of reared grey partridges to supplement the wild population, from a starting point of two wild pairs on the study area in 2007, only three pairs were present in 2016^{148,151} and the species was considered extinct in Switzerland in 2020¹⁶⁸.

For other species

The same Swiss study that failed to increase partridge numbers with habitat measures and nest fencing, did result in higher numbers of some other farmland birds. Six of twelve species studied increased over the study period: whitethroat, melodious warbler, stonechat, yellowhammer, red-backed shrike and curl bunting¹³².

One RSPB-run demonstration farm in the UK, where predator densities were relatively low, increased numbers of farmland birds through habitat management alone (including winter feeding)¹³⁰.

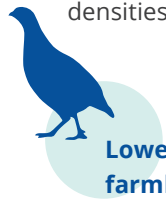
Excluding predators from nest sites of other species using physical barriers such as fencing has also been trialled and has been successful in some cases, for example protecting lapwing chicks in Switzerland^{152,153}, various meadow bird species in the Netherlands and waders across other parts of Europe¹⁵⁴.

There is also growing evidence that AE scheme measures, such as unimproved field margins¹⁵⁵⁻¹⁵⁷ and wildflower blocks lead to reduced predation pressure, which benefits hares^{64, 155-157}.

PREDATOR MANAGEMENT TO MINIMISE PREDATION

As well as providing habitat to limit predation, where there are high levels of generalist predators, direct (i.e. lethal) predator management is widely used to protect vulnerable prey species. This is particularly the case in ground-nesting species such as seabirds, waders and gamebirds²⁸. In the case of grey partridges, creating a shootable surplus is often the motivation behind the predator management^{10,36}.

Grey partridge recovery programmes that do not have shooting as motivation also use lethal predator management⁴¹. How this is done and which species are involved depends on the legal framework, which varies across European countries. Where legally permitted, predator management aims to reduce the density of generalist predators such as red fox and crow during the nesting season to ensure good partridge reproduction⁸⁰. This type of management can be carried out successfully across relatively small areas, resulting in high grey partridge spring pair densities of up to 40-80 pairs per square kilometre^{41,80,158}.



Lowering predation pressure contributes to partridge and other farmland wildlife conservation. It can be achieved by making habitats more predation-proof and limiting predator access to nest sites, with the highest level of protection involving lethal predator control. The highest density of partridges is achieved where all of these management techniques are combined.

THE EVIDENCE for partridges

Where it is permitted, and carried out to the highest possible standard, combining lethal predator management with habitat measures leads to higher grey partridge numbers^{80,158}. Early studies in the UK indicated that partridge numbers were higher where there was more gamekeeping^{23,159}.

These results were followed by a replicated controlled experimental field study where predator management was carried out only during the partridge breeding season. Grey partridge breeding success was higher and autumn numbers increased. This increased spring breeding numbers, which were on average nearly three times higher after three years, compared with a nearby reference area without predator management¹⁴⁷.

More recent analyses using computer models predict that combining habitat management with predator management as described above results in faster and higher grey partridge recovery than habitat measures alone^{25,160}. This has been demonstrated several times in the UK, France and Ireland^{41,48,80,121,158}.

In cases where grey partridges are reintroduced after they had gone locally extinct, predator control is paramount for success. All known successful reintroductions of grey partridges in Europe that have been

scientifically documented have used direct predator management, in addition to providing good-quality habitat across a suitable area.

Examples of successful reintroductions include one in Ireland⁴¹ and one in the UK¹⁶¹. These reintroductions made the decision to undertake direct predator management in light of IUCN guidelines for introductions^{162,163}. These state that the original reasons for extinction must be removed before reintroduction takes place. For the grey partridge, this includes high rates of predation as well as loss of habitat, and both must be suitably addressed for reintroduced birds to be able to persist¹³⁹.

For other species

Reducing predator numbers using legal lethal management to help grey partridges, eases the pressure on other species. Direct predator management for grey partridge conservation resulted in higher numbers of birds of conservation concern in two project areas in the UK^{4,161} and on areas managed through the GWCT Partridge Count Scheme³⁸. Direct predator management resulted in greater nesting success for five of six species nesting in hedgerows, including yellowhammer¹⁶⁴.

The usefulness of lethal predator management depends on the background density of predators present. In areas with high predator densities, predator management was required for songbird numbers to recover, whereas where there were fewer predators, habitat management was enough without predator management^{130,164}.

This has also been shown for lapwing, which bred better where generalist predators were removed in areas with a high background level of these predators¹⁶⁵. In a recent review of whether predation can limit prey populations, removing predators allowed prey populations to rise in 80% of studies that looked at seabirds, 81% looking at gamebirds, 45% of those studying waders and 40% focusing on songbirds²⁸.

Reducing the density of common generalist predators such as foxes can also benefit brown hares. A combined analysis of three separate UK studies showed that in all three, brown hare densities increased rapidly and were always higher when predators were controlled than when they were not⁴⁰.

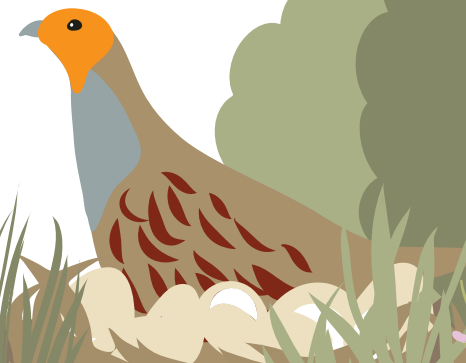




Ethics and science

Predator management is a highly debated topic across Europe. For many people, including much of the general public, the killing of one or more species for the benefit of others is ethically unacceptable. To others, such as some species conservation managers, lethally managing common predators to protect red-listed prey species is necessary to help these more vulnerable species to survive. For others still, such as hunters, lethal predator management allows high enough numbers of their quarry species for shooting, acting as a motivation for the habitat and predator management carried out to achieve this¹⁶⁶.

Ethics are beyond the scope of this booklet. Nevertheless, PARTRIDGE is very aware of the ethical issues that revolve around predator management. We therefore simply provide as concise and balanced a summary as possible of the current evidence concerning the effects of indirect and direct predator management practices across Europe.





WORKING TOGETHER FOR A COMMON AIM

Successful conservation projects understand and respect the views of different groups with different priorities, values and ideas. Bringing together and uniting a wide range of stakeholders working together towards a common goal is what PARTRIDGE is all about. The main roles of the seven key stakeholder groups that need to work together are summarised below. Many people or groups fulfil several of these roles.

The following is based on characteristics of stakeholders involved in this project and others. It represents an ambitious, aspirational interpretation, but those who wish to restore numbers of grey partridges and other farmland wildlife should live up to these expectations to ensure success.

The role of the farmer

Farmers are the core component of PARTRIDGE. Those who manage the land have the ability to create and manage habitats for biodiversity. Many farmers have an intrinsic interest in wildlife and biodiversity. However, they must also run a profitable business and produce food. This is where AE scheme funding is extremely important as it compensates farmers for the income that is lost when they choose to use land for conservation rather than production.

Farmers and landowners working together, in farmer collectives in the Netherlands or Farmer Clusters in the UK, can produce conservation benefits over a large area.

Almost 100 farmers across our 10 demonstration sites manage all the PARTRIDGE habitat measures, while helping to showcase how farmland biodiversity can be restored alongside running a modern farm business.

The role of the hunter

Hunting and shooting organisations from several countries are key partners in PARTRIDGE. Hunters of small game (gamebirds and hares) have a strong motivation to conserve and support their quarry species, and other associated wildlife. Many hunters are keen conservationists and as such manage their quarry sustainably. Their understanding of and investment in the countryside can contribute to conservation projects.

In the UK, where the shooting rights lie with the landowner, this is straightforward. In other parts of Europe, such as France and Germany, the hunter may rent land from farmers to plant and manage wildlife habitats that benefit their quarry species, or may pay the farmer to provide these services.

Arrangements will vary, but hunters often make a contribution to management for quarry species. When this management is done in line with the appropriate guidelines and codes of practice, it benefits many other farmland species.



Sustainable shooting is an important aspect of how hunters manage quarry species. One example from the UK recommends that no grey partridges are shot unless there are more than 20 birds per 100 hectares in autumn, and that hunting stops for the year if that threshold is reached. In the UK, on areas with habitat management providing both nesting and brood-rearing cover, together with legal predator control, grey partridge numbers can sustain moderate shooting of 20% of autumn stocks^{48,166}. In the modern farmed environment, there are unlikely to be that many wild partridges without either seven percent of high-quality habitat, direct predator management, or both.

PARTRIDGE partners with local stakeholders Francis Buner



The role of the general public

PARTRIDGE unites around 300 volunteers from the general public engaging in habitat management, monitoring activities (citizen science such as bird surveys), media campaigns and lobbying. They are typically members of conservation organisations, helping both financially and by adding a voice to the cause of conservation through support for conservation-friendly policy choices.

Pressure from our volunteers and the wider public is one of the most effective tools in achieving change and steering regional, national and international policy. Public appreciation for the work done by farmers and hunters can go a long way towards motivating land managers to undertake conservation work.

The role of the advisory body

Within PARTRIDGE, advice on AE schemes, wildlife and management is provided by a group of experts with different strengths. These advisors work together to offer a wide range of expertise and real-world experience, acting as a link between scientific and conservation organisations and land managers.

They understand both wildlife requirements and the details of running a farm business, effectively integrating new farming methods or conservation measures into a working farm. They help and support the application process for AE schemes, the financial support which makes implementing conservation measures possible for most farmers. It is important that advisors are respected and trusted by farmers, not only for their knowledge but also for their practical approach to implementation.

The role of the scientist

PARTRIDGE includes several scientific organisations that have researched and developed new techniques and conservation measures directed towards farmland conservation, as summarised in this publication. Producing the evidence that conservation measures are effective is crucial to the successful conservation of farmland biodiversity, but it must be combined with demonstrating how these measures can be incorporated into farming practice without hampering operational efficiency or business profitability.

Within PARTRIDGE, existing scientific evidence has guided the selection of measures implemented at the 10 demonstration sites. Monitoring biodiversity indicators provides the evidence that our measures work under a range of circumstances irrespective of borders and regional differences.

The role of the conservation organisation

Conservation bodies forge partnerships across different groups, are influential in directing policy and thus play a critical part in PARTRIDGE. They often manage nature reserves themselves so can demonstrate best practice and they can create connections that will lead to conservation change.

Conservation bodies effectively communicate to policy makers and the general public the benefit and importance of conservation. In PARTRIDGE they educate policy-makers on the researched conservation approaches used, so that these measures can be rapidly integrated into governmental policy and AE schemes.

The role of government

PARTRIDGE highlights the benefits of partridge conservation for policy makers in government and provides the evidence that they need to support farmland conservation. Policy makers are key to ensuring that the enthusiasm and resources provided by all the other PARTRIDGE partners results in widespread and long-lasting conservation improvements. Policy makers that understand the science and its application will enact appropriate legislation and provide financial support, allowing funding for techniques that give maximum benefit.

Co-operation

Co-operation - between groups and across countries - is a core value of PARTRIDGE, enabling us to achieve our joint vision of the best outcomes for wildlife and people. There are complex challenges when working across many countries. Not only language but traditions, culture and perspectives differ. However, the successful establishment of PARTRIDGE demonstrates the rewards that can come from international co-operation within conservation, based on science.

WHERE CAN I LEARN MORE?

All the latest news and results of the PARTRIDGE project can be found on the following webpages:

www.northsearegion.eu/partridge

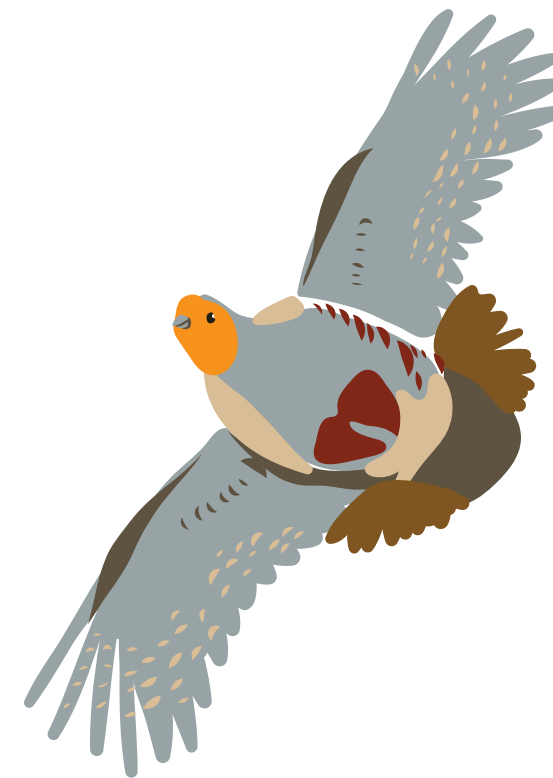
www.gwct.org.uk

https://twitter.com/PARTRIDGE_NSR

In the UK, the PARTRIDGE wildflower mixes mentioned in this booklet are available from Oakbank Game & Conservation and Kings Crops.

www.oakbankgc.co.uk/wild-game

www.kingscrops.co.uk/products/conservation-crops/wild-bird-seed-mixes





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