Chalk downland with common spotted orchid and rough hawkbit, Hampshire
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Agri-Environment Evidence Annual Report 2023

A summary of recently published project reports

July 2024

Natural England Research Report NERR138

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NATURAL ENGLAND

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Catalogue code: NERR138

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Keywords

Agri-Environment Schemes, Monitoring, AES Options, AES Agreement, AES Implementation, AES Impact, AES Design, AES Delivery, Landscape, Climate Change, Historic Environment, Evaluation

Acknowledgements

Thanks to Andrew Cole, Jess Flack, Andrew Mackintosh, Brian McDonald, Louise Montgomery, Margaret Nieke, Susanna Phillips, Hannah Townley, Emma Waite, Erica Wayman and Defra colleagues for their input and support.

Citation

Waygood, U. A. 2024. Agri-Environment Evidence Annual Report 2023. A summary of recently published projects. Natural England Research Report, NERR138. Natural England.

Executive summary

This report provides summaries of recent projects of the Natural England Agri-Environment Evidence Programme. It covers the implementation and impact of Agri-environment Schemes (AES) across different spatial scales, scheme design and delivery, and an overarching analysis of different land-use scenarios. The studies summarised assess Countryside Stewardship and Environmental Stewardship options identifying issues and areas of success and informing best practice for the development of Environmental Land Management schemes, as well as establishing baseline data for future monitoring.

Scheme Effectiveness: Uptake, Implementation and Impact

The research highlighted in this report ranged from landscape scale, which used gradients of AES intervention, to parcel and feature scale which investigated specific AES options and their implementation. This evidence covering a range of spatial scales helps address questions focused on outputs, outcomes and impact.

A study of mobile species is the first in England to monitor the responses of multiple species to AES at the landscape-scale beyond the specific area of land or farm under AES management. The study established that local scale (1 x 1 km) and landscape scale (3 x 3 km) AES gradients, affected the abundance, richness and/or diversity of butterfly, moths and bats. AES gradients represented the density of uptake of AES options, weighted by benefits each option gives to the target species. As an example, a correlation was found between greater total butterfly abundance and squares with high AES uptake at a landscape scale. Moths showed more varied and complex relationships with AES gradients, with strong evidence that moth species abundance, richness and diversity were all affected. The study findings showed weaker evidence of AES gradients affecting birds and little or no evidence of AES gradients affecting either bees or hoverflies.

Overall, the baseline survey showed positive associations between AES gradients and several target taxa. A future resurvey would analyse the temporal change in the mobile taxa responses to AES gradients and establish the extent to which AES interventions benefit target species and increase their populations.

Other studies focused on evaluating the implementation and impact of specific options. A study of the cultural capital benefits and effectiveness of the maintenance options for traditional farm buildings showed these have high uptake rates and are effective and successful in delivering desired outcomes such as protecting the historic environment and enhancing the local landscape. Two studies focused on understanding barriers to option uptake and option effectiveness. An evaluation of the impacts of AES on geological Sites of Special Scientific Interest showed that there was a low awareness of the option to manage geological features and a lack of agreement holder understanding of how AES can assist the positive management of geological features on their land. A review of the delivery of the educational access option highlighted the many potential social benefits farm visits provide to learners and the providers alike, whilst identifying the main barriers faced by agreement holders to hosting and delivering effective educational site visits. These included pressures on schools and limited knowledge among agreement holders of the national curriculum and how to link it to outdoor learning.

Scheme Delivery and Design

The permissive access option in Environmental Stewardship closed to new applicants in 2010 with the last of those agreements expiring in 2020. A study of the attitudes of farmers and landowners who had the option showed that 57% of the permissive access routes provided by those surveyed were still in existence. Of the 57%, 34% of these were voluntarily maintained, 21% were offered but not maintained, and 2% had modified the routes in some way. The study showed that there was significant appetite for this option to be reintroduced albeit with a desire for greater flexibility in how the option can be managed to better respond to any changes in farm operations over the agreement lifetime and in response to misuse of the access routes by the public. The report suggested that improved maintenance and enforcement of public access route usage via a strengthened collaboration between public bodies, scheme holders, and other land managers could help increase uptake of a reintroduced permissive access option amongst agreement holders.

A fourth study of the Countryside Stewardship Facilitation Fund (CSFF) showed that CSFF groups support management of large areas of land for environmental benefit by facilitating the setting up and targeting of agreements among its members. A total of 80% of those surveyed considered their membership of a CSFF group to be useful or very useful to them, with the majority (90%) citing access to advice and support as the main reason for this.

Evaluation of Land-use: Trade-offs and Synergies

The 2050 net zero emissions target for Agriculture, Forestry and Other Land Use sector as well as the UK Government's target to prioritise creation of 500,000 ha of new wildlife-rich habitat in low grade farmland puts competing pressures on agricultural land. Crucially, the land-sector is the only sector with the potential to provide negative emissions at scale. A study using scenario modelling examined a range of potential futures to explore different land-use scenarios in England. This showed that there was a strong trade-off between food production and climate change mitigation, breeding bird habitat provision and north-south habitat connectivity. No scenario delivered a strong reduction in greenhouse gas emissions or large increase in potential bird populations without also seeing a large reduction in food supply. The study suggests potential for nature-based solutions to deliver climate change mitigation and biodiversity conservation but there may be challenges in making space for semi-natural habitat and mitigating impact of land use change on farm wildlife.

Key Highlights

This report highlights how AES can bring about benefits beyond the field scale to a landscape scale, helping us move towards our species abundance target. However, there is the potential to redirect and improve schemes to further encourage this trend. The report also highlights the social benefits of AES options that enhance public engagement with the natural environment and improve access to nature as stipulated in the Environmental Improvement Plan 2023. Mentioned across studies was the potential for improved advice, guidance and support to further increase the effectiveness of scheme options. Improvements to monitoring and reporting systems was also suggested by a number of studies to help make future monitoring and evaluation more efficient and conclusive.

Contents

Table of Abbreviations

Phrase	Acronym
Agri-environment Scheme(s)	AES
Agriculture, Forestry and Other Land Use	AFOLU
Building Maintenance Plan and Log	BMPL
Building Wildlife Assessment Form	BWAF
Countryside Stewardship	CS
Countryside Stewardship Facilitation Fund	CSFF
Entry Level Stewardship	ELS
Environmental Improvement Plan	EIP
Environmental Land Management	ELM
Environmental Stewardship	ES
Greenhouse Gas	GHG
Higher Level Stewardship	HLS
National Character Area	NCA
Priority Habitat Inventory	PHI
Site(s) of Special Scientific Interest	SSSI(s)
Traditional Farm Buildings	TFB

Background – Agri-Environment Schemes in England

Agri-Environment Schemes (AES) encourage farmers and other landowners to protect and enhance the environment on their land by paying them for the provision of environmental services, including the protection of historic features and landscape character. Each scheme offers a range of management options to deliver target outcomes for specific features. Schemes also include a range of one-off capital items which can be used to support management options or deliver their own environmental outcomes. Prescriptions set out the management that must or must not be carried out for each option, and Indicators of Success describe what success will look like. The AES referenced in this report are:

- **Environmental Stewardship (ES)** - opened to applications between 2005 and 2014, it consisted of:
    - Entry Level Stewardship (ELS) aiming for high coverage of basic environmental management options
    - Organic Entry Level Stewardship (OELS)
    - Uplands Entry Level Stewardship (UELS)
    - Higher Level Stewardship (HLS) with more demanding options targeted to features of high environmental value

- **Countryside Stewardship (CS)** - started in 2016. Like ES, the scheme consists of two main tiers, a Mid-Tier (MT) and a Higher Tier (HT), however CS also consists of Wildlife Offers (simplified, focused forms of MT agreements), capital grants (for water quality, air quality, and boundaries, trees and orchards), historic buildings grants, woodland support grants and CS Facilitation Fund.

- **Environmental Land Management (ELM)** - the new umbrella term used to refer to the schemes that have replaced the EU's Common Agricultural Policy. The main schemes within ELM are:
    - Sustainable Farming Incentive (SFI) which incentivises practices across a broader range of environmental land management activities at the farm level.
    - An expanded Countryside Stewardship offer which entails more specific and demanding environmental land management options.
    - Landscape Recovery which focuses on restoring and enhancing nature on a landscape scale by connecting up landowners and managers.

Agri-Environment Evidence Programme

The Agri-Environment Evidence Programme 2023 sought to monitor and evaluate existing AES, including Countryside Stewardship and Environmental Stewardship. The programme is delivered by Natural England on behalf of Defra, with input from the staff across Defra, the Forestry Commission, Environment Agency and Historic England. Natural England's scheme monitoring work focuses on terrestrial habitats, while Environment Agency focuses on freshwater habitats, natural resources and reducing the risk of flooding and pollution.

The programme delivers evidence to:

- Evaluate the delivery of AES and their effectiveness in achieving their intended policy objectives.
- Inform current and future agri-environment policy, scheme delivery and development.
- Fulfil domestic reporting requirements.

Purpose of this Report

This report summarises findings from projects in Natural England's Agri-Environment Evidence Programme, completed during 2022 and 2023. Natural England works with Defra to understand these findings and incorporate them into AES development and operational delivery. Key messages are shared internally to inform Natural England staff and help ensure the organisation remains evidence based. This report is also intended to be shared with key partners who contribute to and have an interest in the performance of AES. The research summarised in this report contributes to understanding the following evaluation questions:

Describe the scheme and programme level contribution to the goals of the Environmental Improvement Plan 2023.
Describe the scheme and programme level contribution to the Environment Act 2021 target areas.
Describe the direct and indirect social, economic and environmental impacts and outcomes of the schemes.
Describe the influence and contribution of externalities on the outcomes and impacts of the schemes.
Describe the positive and negative unintended effects of the AES.
Describe whether the scheme impacts are as planned (consider spatial variations and timings).
Describe whether the schemes made a difference and how.

Each project referenced in this report has a unique code which is used to identify it. A list of the project codes, their titles and links to the reports are below:

LM0465 - Landscape-scale species monitoring of agri-environment schemes

LM04113 - The role of English agri-environment schemes in managing geological Sites of Special Scientific Interest

LM04125 - Assessing the effectiveness and cultural capital value of countryside stewardship options HS1 and HS8

LM04133 - Evaluation of Educational Access

LM04132 - Evaluation of Post-Agreement Higher Level Stewardship Permissive Access Provision

LM04127 - Countryside Stewardship Facilitation Fund Evaluation Phase 4

LM04111 - Evaluating the performance of national-scale land-use scenarios for climate change mitigation, nature conservation and food, timber and biomass production

Study Summaries

Scheme Effectiveness: Uptake, Implementation and Impact

LM0465: Landscape-scale Species Monitoring of Agri-environment Schemes

Evaluation Questions	
Describe the scheme and programme level contribution to the Environmental Improvement Plan 2023 and Environment Act 2021 target areas.	This study evaluates the extent to which AES contribute to the UK Government's key biodiversity target to halt the decline in species abundance in England by 2030.

One of the goals of AES is to increase population growth (or reverse the decline in populations), for key mobile species such as farmland birds and pollinating insects, in line with UK's key biodiversity target (Environment Act 2021). Previous studies of AES found mixed evidence of the effects on biodiversity and largely monitored the effectiveness of individual AES options or agreements over short timescales, with less assessment of effects at the landscape scale beyond the option or agreement boundary. Individual mobile taxa who move onto land under AES when resources increase may benefit without necessarily having a sustained effect on population size over time or at a landscape scale.

The Landscape-scale species monitoring of AES assessed the response of mobile species (bees, hoverflies, butterflies, moths, bats and birds) to local and landscape gradients in AES. It was the first project in England to monitor the responses of multiple mobile taxa to AES gradients at a larger spatial scale to specifically address impacts beyond AES option or agreement boundaries. The aim was to determine whether AES management effects extend beyond the short-term redistribution of individuals in response to increased AES resources (such as floral abundance). AES gradient scores were calculated for 1km squares by using data on the density of uptake of AES options for biodiversity, weighted by benefits each option gives to target taxa. To construct contrasting local and landscape gradients in AES intervention, the local scale was defined as a 1 × 1 km square, and landscape scale as the surrounding eight 1 km squares, i.e. a 3 × 3 km annular landscape unit (Fig. 1).

The research collected a baseline survey dataset surveying abundance, species richness and diversity across mobile taxa in relation to local and landscape AES gradients. Surveys were over four years (2017 to 2021) across six National Character Areas (NCAs) in England, covering arable, grassland and upland agricultural systems. The AES gradient relationship is the spatial association between changes in AES uptake with changes in species abundance, species richness and/or species diversity.

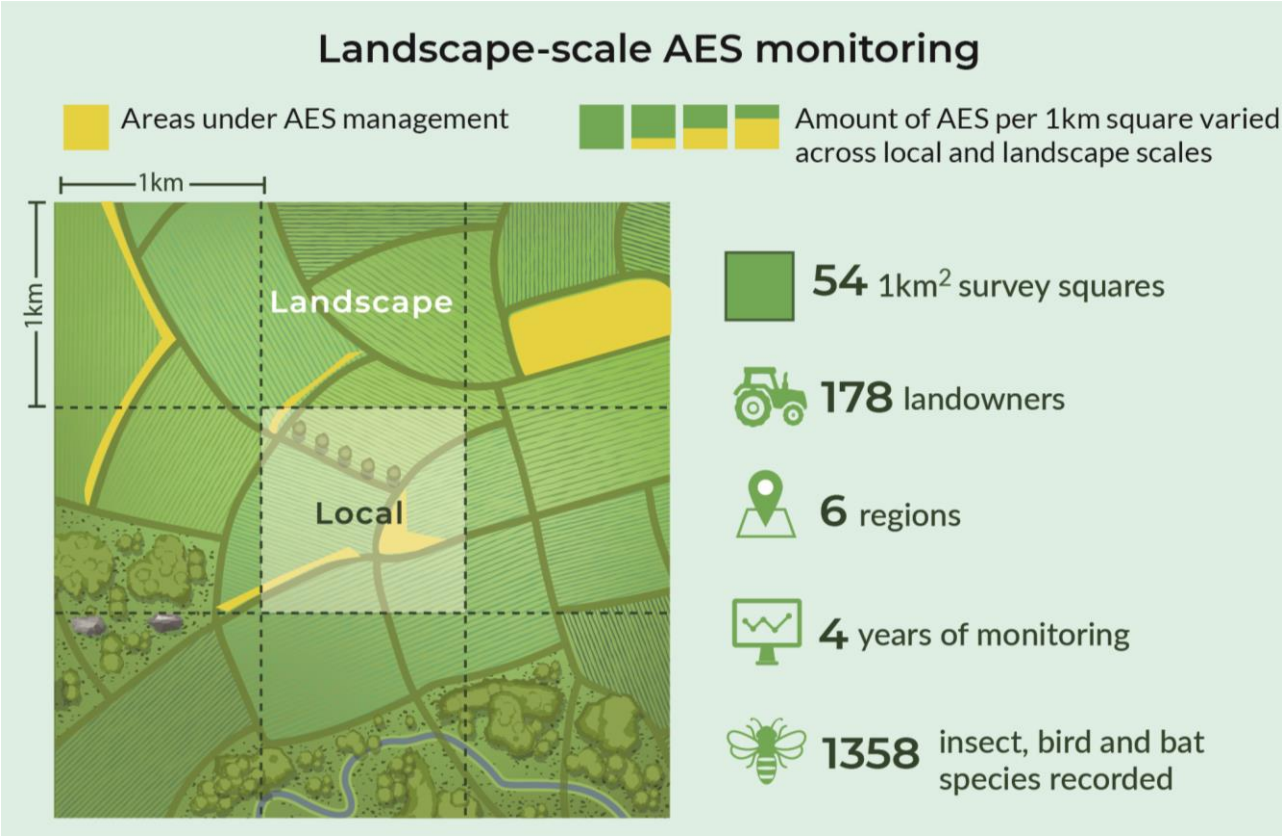

Figure 1: Infographic of the methodology employed in the landscape-scale AES monitoring study. Reproduced from Staley et al., LM0465 (2022). © Natural England.

Taxa responses to the local and landscape AES gradients

For **butterflies, moths and two bat species** strong evidence for relationships with local and / or landscape AES gradients was found for one or more of the outcomes measured. Weaker evidence for relationships with the AES gradients was found for birds. Little or no evidence of AES gradient relationships was found for either bees or hoverflies at the local survey square scale. The results of this research are from an analysis of baseline data and, hence, focus on spatial effects. Where spatial evidence was found for relationships between AES gradients and mobile taxa, the relationships were mostly positive, indicating that an increase in AES uptake was associated with greater species richness, diversity, abundance or presence. A future resurvey of this baseline would be required to confirm this is the result of AES intervention.

For the larger more mobile **butterflies, moths and hoverflies,** either their abundance or species richness responded to AES management at the larger, landscape spatial scale. This suggests that having landscapes of high AES uptake is most important for the most mobile invertebrate taxa. This could show an underlying effect of high-AES landscapes supporting more of these species, or that these species move into areas with high levels of AES resources at a large scale (reflecting the mobility of the larger species). Both factors probably interact, with more mobile species being both better able to locate AES resources (and thus relocate to landscapes with higher AES scores) and to benefit from spatially distributed AES options once in the landscape (and thus increase populations). The relationships observed here between more mobile species and landscape but not local AES scores, suggest that these species are not simply relocating to the highest AES areas but may also be deriving some increases across wider scales.

For **butterflies and moths**, there was also evidence that the smaller, less mobile species had a positive relationship with the local AES gradient, as might be expected given their more limited ability to forage and disperse at the landscape scale, but only in the lowland NCAs.

There were positive responses of **two bat species** (Barbastelle and Daubenton) to AES management at the landscape scale, albeit with small effect sizes. The large-scale responses suggest that AES effects on the bat foraging community apply mostly across broad landscapes.

For **birds** no strong relation to AES gradients was measured. Bird responses showed stronger relationships with habitat diversity than with the AES gradients. There was only evidence for spatial effects of AES on birds. For breeding birds, a positive association was found between local AES and abundance of invertebrate feeders. Given the mobility of birds, it is surprising that the community-level relationships with birds are at the local scale alone, rather than at least some being at the landscape scale. This may indicate that the results are more reflective of background habitat structural factors than AES management per se, but the latter was also expected to affect changes in abundance over time rather than purely spatial variation in abundance. Effects of AES on birds may be more detectable in future analyses through a repeat survey to detect species-level patterns and temporal change or through the selection of AES habitats at the patch scale. These will complement the existing evidence for AES benefits for birds that is based on long-term studies and farm-scale comparisons.

Overall, **bees and hoverflies** appeared to be driven more by background habitat and plant structures that were independent of AES intervention, than with the AES gradients. Particularly, total bumblebee abundance was found to relate more strongly to overall floral resources available than to AES resources per se. However, since delivery of floral resources is a key objective of AES options that target conservation of pollinating insects, this suggests that AES provision is not consistently contributing to greater abundance of floral resources compared to the overall floral resources available within the 1km survey square. In fact, details of the implementation assessment for the sown arable floristically enhanced margin options showed that cover of sown species was frequently low.

Butterfly and bumblebee responses to within-square AES option patches

The survey was designed to detect effects of local and landscape AES gradients at the scale of 1km survey squares. In addition, for butterflies and bumblebees surveyed on transects, limited within-square analyses were carried out that compared on vs. off AES option at the patch-level. Within square analyses of insect responses to AES showed that the abundance, species richness and diversity of butterflies and bumblebees increased substantially on AES options compared to off-option patches. However, only butterfly abundance was affected by the AES gradient, i.e. landscape scale. These results suggested that, in common with other large-scale AES studies (Carvell et al. 2007, Pywell et al. 2011), effects observed when comparing options vs. non-option parcels within the same square do not necessarily scale up. The lack of response of some taxa at the 1km square level may be due to insufficient quality or quantity of the relevant options for those specific taxa across the wider countryside. However, there are also suggestions that in some taxa and for some responses (e.g. butterfly abundance, moth responses), AES uptake may be achieving beneficial effects at both the whole-square and landscape scales.

Overall, the positive, spatial relationships shown with the AES gradients by several taxa suggested that current AES may be benefiting some mobile species. A **future resurvey**

would analyse temporal change in the mobile taxa responses to the AES gradients and would establish the extent to which AES interventions benefit target species and increase their populations. The AES gradient design will likely be a useful tool to monitor the response of key mobile taxa to future ELM schemes, albeit taking into consideration the recommendation for an enlarged sample size.

LM04113: The Role of English Agri-Environment Schemes in Managing Geological Sites of Special Scientific Interest

Evaluation Questions	
Describe the scheme and programme level contribution to the goals of the Environmental Improvement Plan 2023	This research evaluates the schemes contribution towards the key policy (1) to conserve and enhance the natural, geological, and cultural heritage of our landscapes, and (2) protect our historic and natural environment for the benefit and enjoyment of future generations.
Describe the positive and negative unintended effects of the AES	The study highlights that AES are supporting the positive management of geological features on only 10% of geological Sites of Special Scientific Interest (SSSIs). A small proportion of the most frequently used AES options within and close to designated geological sites are likely resulting in negative impacts on geological features. Two thirds of the most frequently used options are considered to have either a positive or negative effect depending on the character of the geological site and on how the option is implemented
Describe the influence and contribution of externalities on the outcomes and impacts of the schemes	The omission of geology and geomorphology from the statements of priority defined for each National Character Area and knowledge gap among farm advisers contributes to the low uptake of FM1 option among agreement holders and their limited knowledge of positive management of geological SSSIs.

There are 4000 SSSIs in England which protect the country's most important wildlife and geological sites. A total of 30% of these sites are geological or mixed geological and biological SSSIs. Geological features are particularly vulnerable to declines in condition due to natural vegetation growth or by inadvertent damage due to tree planting. A 'favourable condition' status on these SSSIs means geological features need to be visible and conserved through appropriate management.

Countryside Stewardship (CS) is currently the only mechanism for directly funding works to improve geological SSSI condition. A bespoke capital item with 100% funding, option FM1 **Management of geodiversity features**, is the only option specifically targeted at the positive management of geological features. This study confirmed that uptake of this option is extremely limited with less than 2% of CS agreements within a geological or mixed interest SSSI including it in their agreements. The project aimed to evaluate any positive or negative impacts of CS options in managing and conserving geological features

on SSSIs and, through interviews with land managers, explore why uptake of the FM1 option has been low.

It is likely that the low uptake of CS options focused on managing geological sites is, in part, a reflection of the omission of geology and geomorphology from the statements of priority defined for each NCA. This is noteworthy, given that these statements are designed to assist scheme applicants to identify priority features and issues on their land and to help choose which options they should include as part of their application. Options for the maintenance of geological features also do not register in the scoring system for CS agreements.

The study found that 27% of all agreement options used within designated geological sites were likely having **a positive effect** on geological features. These included options such as hedgerow management, bracken control, and educational access. However, the uptake of positive options did not appear to reflect the distribution or density of designated geological sites across the country. Just 4% of nationally significant geological sites included potentially positive options. A further 6% of sites included options which could be having positive or negative effects depending on their implementation. This suggests that, at most, AES are supporting the positive management of 10% of SSSIs with a geological component.

A relatively small proportion of the most frequently used options were likely resulting in **negative impacts** on geological features. Of these, the most common option was livestock exclusion in successional areas which suggests this option should be accompanied by measures to manage invasive scrub and vegetation growth where they could encroach on geological sites.

Two thirds of the most frequently used options could be having **either a positive or negative effect**. This depended on the character of the geological site and the way the options, such as grazing, management of scrub, and woodland improvement, were implemented. The lack of guidance on the use of these AES options to manage geological sites, together with the omission of geodiversity information in CS priority statements means it is possible that opportunities for positive management are being missed and, at worst, sites are being adversely impacted by options. An awareness of the geological site and its management needs are therefore important to ensure positive outcomes.

104 interviews were conducted with CS and ES land managers whose agreements contained a geological SSSI within their boundary. The survey found that only around a third of respondents had high awareness of the geological SSSI on their land holding. While advice should have been able to address this low awareness, it suggests many still enter into AES agreements without a full understanding of how the geological SSSI on their land should be managed. Added to this is the low take up and low awareness of the one option, FM1, specifically designed to manage geological sites. Relatively few agreement holders had considered other options which could have assisted management of the geological SSSI or had chosen not to select options because of the potential impacts on the designated site. This suggests that Natural England advisers, backed by good guidance and spatial information, could play a key role in raising awareness of geological sites and increasing uptake of positive AES options.

Areas for Improvement

While the 25 Year Environment Plan indicators suggest that the overall condition of almost 70% of geological features within SSSIs is good or recovering, AES would, at best, seem to be playing a limited role in the management of such sites. Additionally, while the uptake of potentially damaging options within geological SSSIs is relatively limited, evidence from land managers and the analysis of before and after photography indicates that condition is deteriorating, with many sites seeing an increase in scrub and other vegetation cover.

The findings suggest there is significant potential for AES to play a greater role in the positive management of nationally important geological sites. The below measures would help integrate conservation of geological sites more fully within the design of AES agreements and the selection of scheme options:

- Expand National Character Area based Statements of Priority to include geological priorities.
- Improve spatial guidance by including mapping of Geological Conservation Review sites and geological or mixed interest SSSIs in MAGIC CS targeting layers.
- Improve the design and integration of AES option in the conservation of geodiversity sites.
- Enhance AES manuals and guidance to:
    - raise awareness of the use of scheme options to manage geological sites.
    - describe how options should be used to manage geological sites positively and, equally importantly, the importance of avoiding negative impacts.
    - describe how land managers and advisers should identify important geological assets on the land, select options for their positive management, and how condition will be monitored.
- Deliver training for Natural England area staff and land management advisers to raise awareness of the changes in Statements of Priority, data layers, and guidance and opportunities to use scheme options to deliver positive outcomes for geological sites.

LM04125: Assessing the Effectiveness and Cultural Capital Value of Countryside Stewardship Options HS1 and HS8

Evaluation Questions	
Describe the scheme and programme level contribution to the goals of the Environmental Improvement Plan 2023	This study evaluated to what extent options HS1 & HS8 help deliver across the beauty, heritage and engagement agenda of the EIP 2023 by supporting the conservation and enhancement of the historic environment and the cultural diversity of our landscapes.
Describe the scheme and programme level contribution to the Environment Act 2021 target areas	This study evaluated the schemes contribution to our general duty to conserve and enhance biodiversity (section 102, Environment Act 2021) and identified opportunities to improve roosting, nesting and feeding habitat for Biodiversity Action Plan and European Protected Species such as bats.

Evaluation Questions	
Describe the direct and indirect social, economic and environmental impacts and outcomes of the schemes	The study identified the following scheme impacts: Social: The scheme supports the health and well-being of agreement holders and the public through affirmation of their farming and cultural identity, and public access and engagement with the historic and natural environment. Environmental: The scheme conserves and contributes to the local landscape character, distinctiveness and historic functions. It also provides nature conservation benefits by improving habitats for roosting, nesting, and feedings sites for bird species, as well as lichens and mosses. Economic: The scheme supports the local economy through (1) conservation of local craft skills and employment of suitable experienced local workers, (2) maintaining and enhancing traditional skills, and (3) providing provisioning services which allow the buildings to remain in farm use.
Describe the positive and negative unintended effects of the AES	The maintenance upgrades made to traditional farm building via the scheme have a range of unintended effects, the majority of which are positive (see previous evaluation question). The social values in particular are often not considered in scheme design. IIn some cases there may be a trade-off between intensity of building use and suitability of the buildings for wildlife. In general though, the wildlife assessment required as part of the scheme provides a useful new dataset showing how protected species can benefit from these buildings.

Since its inception, AES policy has consistently included options to protect and manage the historic environment, including traditional farm buildings (TFBs), to secure a range of public goods for society. The purpose of options HS1 and HS8 is to benefit the environment by helping to maintain weatherproof TFBs, using traditional methods and materials, while enhancing the local landscape and preserving places for wildlife. The aim of this research was to assess the effectiveness of CS TFB maintenance options and its wider benefits including for health, wellbeing and wildlife.

Traditional farm buildings are the most numerous types of historic structure in the countryside. Analysis of option uptake, interviews and building surveys showed that these were extremely popular options among agreement holders. These options were shown to be making a strong positive contribution to the maintenance and enhancement of the TFB stock and in sustaining the supporting, provisioning, regulating, and cultural ecosystem services. Nine out of 10 CS agreement holders said they would choose the options again and four out of five felt better able to maintain their TFBs because of the scheme.

Effectiveness of the wildlife assessment and building maintenance protocols

The findings of past evaluations of the effectiveness of ES TFB maintenance options informed the development of the TFB maintenance options for CS which now requires a wildlife survey as part of the Building Wildlife Assessment Form (BWAF) and the maintenance of a plan and log of annual repair works as part of the Building Maintenance Plan and Log (BMPL).

This research showed that the building wildlife assessment is having most impact as a means of raising general awareness of the benefits of TFBs for wildlife on the holding. It also concluded that although three quarters of the building ranges (72%) were in very good or good condition and 92 per cent showed visible evidence of maintenance work, the fact that less than half of the agreement holders were keeping their BMPL up to date meant that the introduction of the form has only been a partial success. This conclusion was supported by the finding that over half the building ranges (57%) were assessed as requiring further maintenance work at the time of the survey.

Natural & cultural capital benefits

More generally, the report considers how TFB maintenance options may help sustain the four main ecosystem services, specifically: (1) **supporting services** by providing and helping to improve roosting and nesting opportunities for wildlife; (2) **provisioning services** by encouraging their agricultural use and the utilisation of traditional skills and sustainable traditional materials; (3) **regulating services** by contributing to carbon storage by extending the working life-time of the buildings and retaining their embedded carbon; and (4) **cultural services** by conserving and enhancing the historic character of TFBs and the landscape character; and by promoting health and well-being of agreement holders through, for example, affirmation of their farming identity, and of the public through access and engagement with the historic and natural environment. The surveys showed that the TFB stock was both highly visible and accessible to the public.

However, trade-offs must be made in the provision of these ecosystem services, for example between the intensity of use and disturbance and the capacity for wildlife. The results from the data analysis showed that the sites and building ranges chosen for the CS TFB maintenance options possessed substantial potential as wildlife habitats. Only, one quarter of sites (23%) were assessed as not being suitable for wildlife mainly due to over-use, being unintentionally 'over sealed', or being exposed to the elements or traffic.

Overall, the study concluded that the TFB maintenance options offer good value for money:

- The payments are an important source of income to fund the repair of the buildings and can trigger further investment.
- Without the payments two thirds of the buildings would be maintained to a lower standard or not at all.
- The maintenance of the TFB building stock enhances the flow of ecosystem services and benefits provided.

HS1 and HS8 options are popular among agreement holders and there has been widespread uptake. The study showed how the options are effective, straightforward to implement and successful in delivering the desired outcomes. Carrying forward the options into the new ELM schemes would continue to maintain and enhance the flow of benefits evidenced in this report.

Areas for Improvement

The report recognised some areas for improvement to the scheme including the introduction of increased payment rates in return for the provision of additional environmental benefits. This was in reference to special features or older buildings needing more complex maintenance or specialist craft skills. Additional options or blended finance opportunities might also be explored under the new ELM and rural development schemes to address specific issues identified in the report. It was also suggested that additions and improvements could be made to the agreement application guidance expanding on public benefit of TFB maintenance, eligibility criteria and requirements, and repair of TFBs. The BMPL in turn would benefit from a simplified format including a one-page checklist for annual inspections. The BWAF could also include an additional category for nesting bird species. To aid future monitoring and evaluation, it was suggested that improvements could be made to the access and the consistency of agreement application supporting documents, including improvements made to the agreement maps to identify footprint of the building range at an appropriate scale.

LM04133: Evaluation of Educational Access

Evaluation Questions	
Describe the scheme and programme level contribution to the goals of the Environmental Improvement Plan 2023	This study evaluated the schemes contribution to the UK Government's long-term strategy to meeting its environmental goals through increasing the number of children connecting with nature through school.
Describe the direct and indirect social, economic and environmental impacts and outcomes of the schemes	The study identified the following impacts of the scheme: **For pupils:** The scheme provides the opportunity to (1) connect children with nature; (2) bring the subjects to life in an outdoor setting which has shown to improve pupils' engagement, focus, enthusiasm, learning recall and academic attainment; and (3) develop their 'soft skills' supported within the national curriculum such as critical thinking, problem solving, social skills, and self-esteem. **For teachers:** Outdoor learning provides an opportunity to trial alternative teaching approaches in a more relaxed environment, increase their skills and confidence in teaching in this setting, and build relationships more informally with their pupils. **For providers:** The scheme provides an important opportunity to educate younger generations about farming and nature, as well as engaging with their current and future consumers. Providers also benefit from the enjoyment of engaging with pupils. The financial payment attached to school visits which covered their costs of visits was not considered the primary motivation for taking part in educational access but was a motivating factor.

Evaluation Questions	
Describe the influence and contribution of externalities on the outcomes and impacts of the schemes	Transport costs, teacher capacity, curriculum demands and lack of knowledge of the educational access option within schools were key barriers to providers being able to host school visits.

The educational access option (in its most recent iteration referred to as ED1) is available to agri-environment scheme participants and funds them to open their sites for school groups to undertake accompanied educational visits on their farm or wildlife sites. This provides opportunities for pupils to learn about the environment and understand the links between farming, food production, conservation, landscape, and historical features. The overarching aims of this study were to review and develop best practices in non-residential outdoor learning and compare these with the current delivery of the educational access option.

Overall, the research highlighted the many benefits associated with educational access visits for learners, and highlighted that providers were taking initiative and making efforts to ensure that visits were engaging, stimulating and valuable for visitors. The main gaps between current delivery and best practice were that visits were not always explicitly linked to curriculum subjects or academic goals, particularly for younger pupils. This was in part because providers lacked detailed curriculum knowledge. Additionally, schools/teachers did not always conduct pre-visits to the farm foregoing an opportunity to enhance the quality of visits. In line with literature, providers noted that teachers generally lacked knowledge, skills and creativity to deliver outdoor learning, suggesting a need to build teacher capacity to do this in the absence of time and resources for pre-visits. Co-planning and co-delivery between provider, teachers and pupils tended to also be limited, in part due to time pressures on schools.

The study identified numerous **key barriers faced by providers** in hosting educational access visits. Consistent with existing literature, providers highlighted transport costs, teacher capacity, and curriculum demands as key reasons preventing schools from taking up farm visit offers. This reflects previous Natural England research that demonstrates how a lack of teacher time is one of the biggest barriers to learning in the natural environment (Waite et al. 2016). A general lack of recognition of the educational access option within schools made it difficult to initiate engagement with them and made providers more reliant on personal networks and connections. Providers also struggled to find appropriate resources which were relevant to their setting or the age group visiting. Their knowledge of the curriculum was limited, for example the connection to the food component of Design and Technology. Most providers also suggested that the scheme's funding per visits was not enough to cover the costs of planning, preparation and delivery required and did not fairly reflect hosting larger group sizes which requires additional capacity and resources. Many providers were running educational access visits 'out of pocket' and did not see it as a viable business option.

This study highlighted the **opportunities identified by providers**. For example, providers valued opportunities for peer learning, from observing educational access visits at other farms, and speaking with providers or teachers' experiences of running educational access visits. These informal training opportunities provided them with ideas for activities

to run and alternative approaches to engage pupils. To encourage better uptake and more consistent delivery of the educational access option**,** providers suggested:

- More considered and accessible resources and information appropriate to providers and teachers to enable pre-visit co-planning.
- Targeted curriculum resources to tie to the educational access visits.
- Clearer communication to schools about the educational access option and opportunities for schools to engage and take part
- Shared best practices.

Areas for Improvement

Overall, the study emphasised how, at present, visits through the option represented somewhat of an untapped resource for delivering learning experiences that reflect and reinforce the content of the national curriculum. Numerous areas for improvement are identified in the report in terms of how the educational access option might best provide an opportunity for supporting the national curriculum, but also in terms of the running of the scheme more broadly. For example, providers and teachers are encouraged to engage in more pre-visit communication, co-planning and co-delivery of school visits to maximise their value. Follow-up activities in the classroom and repeat visits are also encouraged to enhance learning outcomes.

The report also suggested that Defra, Department for Education and Natural England collaborate to provide more guidance, shared resources and good practice examples to providers and teachers outlining how the national curriculum subjects across key stages can be supported through outdoor learning. A dedicated Education Outreach Officer intermediary, for example, might also be a way to help facilitate connecting providers and schools and supporting them with guidance and resources.

Another area for improvement is in marketing and communication to raise awareness in schools of the educational access option, the opportunities for schools to take part, and how they can get involved in setting up and delivering an effective visit.

Regarding the educational access option process and eligibility, a review of scheme criteria and thresholds is suggested, such as removing the 25-visit cap, and improving the efficiency of claim and payment system and the payment structure. For example, a graded fee scale or per capita payment structure would mean different rates would apply that reflect the size of the group, and ultimate number of learners hosted on a visit, in order to better reflect the extent of providers' efforts and preparation. Financial incentives to providers might also be offered to join up visits with national curriculum and to support schools with transport costs.

Scheme Design & Delivery

LM04132: Evaluation of Post-Agreement Higher Level Stewardship Permissive Access Provision

Evaluation Questions	
Describe the scheme and programme level contribution to the goals of the Environmental Improvement Plan 2023	The scheme enabled permissive access routes through land for public recreational use thereby contributing to the EIP goal to enhance engagement with the natural environment and improve access to nature. This evaluation contributes to the development of a policy to add more accessible routes to and through nature and enhance existing ones, a commitment in the EIP 2023.
Describe the direct and indirect social, economic and environmental impacts and outcomes of the schemes	Permissive access routes played an essential social and environmental role in connecting the public with the countryside and raising awareness and appreciation of wildlife protection and agriculture.

This research investigated the attitudes of farmers and landowners around the provision of funded permissive access options that were offered as part of HLS until 2010. After this, funding was withdrawn, and no new agreements were put in place. Live agreements did continue to run, with the last of these ending in 2020/2021. Permissive access routes can function as an essential means for allowing the public to enjoy and understand the countryside and wildlife, but they likewise face numerous challenges that require attention and effort from all parties involved. The purpose of this study was to determine how many land managers had continued to provide routes after their agreements had ended, and what their reasons were for voluntarily continuing or withdrawing permissive access provision.

From the sample of 227 completed responses, 57% of the permissive access routes provided by these respondents were still in existence. Of the 57%, 34% of these were still maintained, 21% were offered but not maintained, and 2% had modified the routes in some way. Those who had chosen to continue offering the routes voluntarily until this point were unlikely to discontinue them now. When it came to reinstatement of permissive access, over half of the 43% who had ceased to offer permissive access would be happy to consider reinstating their routes. This was comprised of 53% who would only be willing to reinstate permissive access on a funded basis.

Public behaviour was identified as a concern for permissive access on their land. Respondents reported issues with dog walkers, horse riders, and individuals not following designated paths, leaving gates open, and engaging in illegal activities. These issues were especially pertinent and concerning for livestock farmers, and difficulties with members of the public were, aside from the cessation of funding, a primary factor in respondents' decisions to close their permissive access. In addition to public behaviour, agricultural challenges were a recurring theme. Respondents stressed the importance of preserving wildlife habitats, the balance between access and wildlife protection, and managing land effectively.

Overall, the analysis revealed an overarching need for addressing issues surrounding public behaviour, lack of funding, legal concerns, impact on wildlife, and collaboration between farmers and government agencies. The appetite for the reintroduction of funding in exchange for permissive access provision was high with 92% of respondents encouraged by a funding scheme

to offer permissive access on their land again, or to continue with the permissive access they already offer. Even those who had ceased offering permissive access routes would likely consider reinstating them should funding and ongoing financial support with the maintenance of such routes be offered, provided the funding available is truly reflective of their incurred costs.

Considerations for future Permissive Access Schemes

The report noted that any **future funding** in exchange for permissive access would need to be mindful of the costs, both in terms of maintenance, signage, and boundary provision, but also of the financial implications to farmers of allowing the public access over their land. A provision of additional funding could be considered specifically to address common issues related to permissive access, such as installing dog waste bins or assisting with the erection of temporary fencing during sensitive periods (e.g. nesting season, lambing, or calving). Noteworthy is that any future permissive access scheme would likely fund permissive access that is already provided whilst also securing additional public value.

An area for improvement would be through the implementation of a **monitoring and reporting** system where farmers and members of the public could report issues such as littering, trespassing, or wildlife disturbances on permissive access routes. This would enable Defra and other relevant authorities to monitor and address problems more effectively.

The provision of **advice and guidance** about how to manage permissive access and the public would be helpful to land managers to reduce confrontations and conflict whilst likely securing better outcomes for nature as well. Funded permissive access options would be supported by **public engagement** on the importance of respecting the countryside, wildlife, and access routes, including proper dog control and adherence to designated paths. An information hub to map permissive access provision could help the public easily access information on routes and guidelines for appropriate use of such routes. This may also serve to increase the uptake of less well-known routes.

The report suggested allowing farmers and landowners more **flexibility** with access decision-making, allowing them to provide access that directly correlates with the type of farming operation and its location to improve relevance, greater uptake by the public, and more positive experiences. Additionally, any future schemes would benefit from a wider engagement programme with providers of permissive access around decisions of a reintroduced scheme. This could include workshops or training sessions for farmers and landowners to enable them to better understand the various schemes and benefits of permissive access.

Lastly, the report encouraged strengthened **collaboration** between Defra and Natural England, scheme holders, local authorities, and other organisations involved in land management and the provision of access, such as National Parks. This would help to ensure proper maintenance and enforcement of access routes. This may include sharing responsibilities for signage, litter control, and addressing antisocial behaviour. Encouraging community involvement in the maintenance of permissive access routes could reduce the financial burden both on the authority funding any future schemes and the landowner providing them. This may include organising regular clean-up events, creating volunteer groups, or establishing partnerships with schools and community centres for educational purposes.

LM04127: Countryside Stewardship Facilitation Fund – Monitoring and Evaluation Phase 4

Evaluation Questions	
Describe the scheme and programme level contribution to the goals of the Environmental Improvement Plan 2023	The facilitation fund scheme helps groups of farmers and land managers to improve their local environment collaboratively on a landscape scale. This evaluation focused on improving the design and delivery of such a scheme to maximise its output and delivery for the environment in line with the EIP's apex goal to improve nature on a landscape scale.
Describe the direct and indirect social, economic and environmental impacts and outcomes of the schemes	The study identified the following impacts of the scheme: Social: Countryside Stewardship Facilitation Fund (CSFF) group membership supports the wellbeing of farmers/land managers by helping them develop a collective voice, feel part of a community and feel that their activities are deemed worthwhile. Environmental: CSFF membership improves individual's farming and environmental management for nature recovery by playing a key role in developing the confidence of land managers concerning aspects of AES delivery and development.

Monitoring and evaluation studies have found that by coordinating action and working together, groups have achieved greater environmental benefits on a landscape scale than would be the case from individual actions alone. In this sense, collaboration is critical to the development and success of the Local Nature Recovery and Landscape Recovery elements of ELM.

Since 2015 CSFF has provided funding at the landscape scale for individuals or organisations to bring farmers, foresters, and other land managers together to increase their knowledge and awareness and align delivery with the environmental priorities for the area. The aim is to maximise the impact AES has on the environment by bringing larger areas of land under active management. CSFF funds groups of farmers and land managers, with and without AES agreements, to work together in local partnership, with a paid facilitator coordinating training and advice. The focus on additional environmental benefit beyond simple scheme agreement is considered an important and innovative addition for AES going forward.

Since 2018 there have been three previous phases of evaluating CSFF process and outcomes. The fourth phase mainly focused on: (1) CSFF groups' potential to restore and create habitat at scale in line with Nature Recovery ambitions; (2) CSFF group membership potential to maintain resilience and wellbeing among members; and (3) what the use of technology among CSFF groups means for the future functioning of and collaboration within these groups. The research comprised a spatial analysis of all CSFF groups against data layers linked to nature recovery, such as Priority Habitat Inventory (PHI) and Natural Capital. It also included surveys with CSFF group members.

CSFF groups' contribution to nature recovery at scale

The national level spatial analysis assessed the **distribution of CSFF** groups. It aimed to identify and prioritise underrepresented areas of CSFF group coverage when measured against different environmental and administrative geographies (e.g. Priority Habitats, Agricultural Landscape Type, Nature Improvement Area). The analysis identified where there is significant potential to support the establishment of new CSFF groups, or the expansion and linking of existing CSFF groups, to address many of the geographic disparities in coverage and deliver greater environmental benefits. For example, Priority Habitats showed a wide variation in CSFF group coverage, with highest levels found in grassland and upland habitats and lower levels in coastal, wetland, woodland and lowland heath habitats.

The study found that a very high proportion of CSFF group members (84%) engaged in AES agreements at the time of the study. This was complemented by 61% of all land within CSFF groups being under management options. This key finding suggests CSFF groups help support larger areas of land under active management for environmental benefit by facilitating the setting up and targeting of agreements among its members.

The findings showed that the CSFF approach was helping support a wide range of **natural capital** assets by influencing land management and changing the behaviour of farmers and land managers. Whilst there were CSFF groups present across most habitats and PHIs the proportion is variable between respective groups (some having 10% coverage and others 75% coverage of **priority habitats**). This impacts the group's ability to contribute to natural capital asset stock and local land management priorities. A particularly encouraging observation was the fact that almost 72% of the total area of CSFF groups under AES agreement was comprised of PHIs. This suggests that option targeting within CSFF groups achieves a good coverage for active management of PHI habitat already, maintaining and enhancing their extent and condition. Overall, at the time of the study in 2020, the CSFF groups covered just over 10% of priority habitat within England. There has been a significant increase to date with a further 100 having been created since then.

Resilience and wellbeing among CSFF group members

Results from the surveys and interviews showed that membership of a CSFF group was considered 'important' (55%) or 'very important' (25%) by a large majority of members. The most common benefit was 'access to advice and support' (90%). Access to resources, other opportunities, and information about changes to agricultural policy/support were all supported by 67% of respondents. A key reason for communicating was the gaining and sharing of knowledge concerning CS delivery. This was viewed as helping the CSFF group function successfully and accumulating or enriching knowledge of the members. The key area for knowledge exchange concerned biodiversity.

In terms of wellbeing, responses emphasised links to a positive attitude towards the individual's farming and environmental management. This included CSFF membership leading to activities that were deemed worthwhile, feeling part of a community, and developing a collective voice. This was nuanced by the covid pandemic taking place at the time of the study. The report concluded from this study that CSFF groups play a key role in developing the confidence of land managers concerning aspects of AES delivery and development.

The overwhelming view of the participants was for CSFF to continue. However, several group members mentioned that the current fixed view of what could and could not be included was hampering the development of the group. The constraints mentioned included the limit of attendees per event, and the need to be more adventurous to meet the challenges of nature recovery. Administration requirements were also seen as overzealous.

Review of technology use by CSFF facilitators

The survey questions explored the potential of technology to provide technical assistance and support collaboration, as well as discussing the possible format of such support in the future. The findings showed a clear growth in the use of virtual communication tools over the past 2 years, particularly in the use of WhatsApp and Zoom. However, a range of one-to-one meetings and other communications were also required. It was noted that CSFF members were a heterogenous group with the facilitator determining which combination worked best for their group. A key resource used to assist completion of CS applications remained MAGIC. This was supplemented by other GIS resources such as The Land App and Catchment Explorer.

Areas for Improvement

The report highlighted several opportunities for improving the outcomes of the CSFF scheme. For example, the CSFF groups covered just over 10% of priority habitat within England. A focus on **increasing the spatial distribution** of CSFF groups to expand to areas of priority habitat would help bring a greater proportion of the PHI under this type of landscape scale agreement. Such a targeted increase in the number of CSFF groups and associated AES agreements would thereby provide additional environmental benefits.

To **improve data collection and management**, the report suggested the development of a mechanism whereby the CSFF groups themselves might identify, record, and measure a baseline within an England-wide framework and allow for a range of local actions linked to CS options, to increase natural capital. Such a mechanism could then also be used as an active monitoring tool to record the benefit of working at a landscape scale.

To overcome future data issues, it would be beneficial to collect spatial details on the location and landscape context of actions/outcomes at parcel and sub-parcel level, to contribute to the accurate assessment of natural capital levels and the status of ecological networks. Implementing these changes in data collection and management could reduce the degree of uncertainty in how effective CSFF groups are in AES delivery.

The study further highlights how the accuracy of future analysis would be greatly assisted by complete and up-to-date references of land within each CSFF group. This was considered important to understand how CSFF groups change and develop over time both in terms of membership and area under AES agreement. For example, the report suggested obliging members to supply an accurate record of all the RLR parcel references belonging to their holding and notify of any changes in these.

Interaction between facilitators was seen as important and largely an unfulfilled opportunity. The need for an opportunity to hear from others, share knowledge and network was strongly felt. The CSFF scheme might therefore benefit from **improved collaboration,** such as a collaboration hub, to enable facilitators to share best practice

and event ideas, linking into current policy opportunities and securing a sustainable legacy from all CSFF groups.

Evaluation of Land-use: Trade-offs and Synergies

LM04111: Evaluating the performance of national-scale land-use scenarios for climate change mitigation, nature conservation and food, timber and biomass production.

Impact Evaluation Questions	
Describe the scheme and programme level contribution to the goals of the Environmental Improvement Plan 2023	This study evaluates different land-use scenarios and England's potential to support a prosperous, healthy and nature positive food system which is sustainable. The study informs the EIP's considerations for net zero alongside nature, biodiversity and climate adaption goals and can also contribute to the Land Use Framework.
Describe the direct and indirect social, economic and environmental impacts and outcomes of the schemes	The study reveals how AES can lead to trade-offs between social, economic, and environmental impacts and outcomes, between nature recovery, food production and climate change mitigation.

Finite land is under pressure to deliver (among other things) food, timber and fuel production, climate change mitigation and biodiversity conservation. At present the land sector (agriculture, forestry and peatlands) is a substantial greenhouse gas (GHG) emitter and contributor to climate change. This study used scenario modelling to explore how land in England might plausibly change in the future. This enabled an evaluation of the associated trade-offs and co-benefits with respect to climate change mitigation, meaning (the reduction and/or capture of GHG emissions), bird habitat availability, food, timber and biomass production, and south–north habitat connectivity to help wildlife migrate north to adapt to expected warmer temperatures.

Nine land use scenarios were explored (Fig. 2) each representing an alternative UK land use future which saw up to 10 land-based climate change mitigation measures deployed in different quantities and combinations. Each scenario was run from a 2015 baseline to 2100, in five-year intervals. UK land use change policies were apportioned into the four devolved nations of England, Wales, Scotland and Northern Ireland, with this study focusing on England.

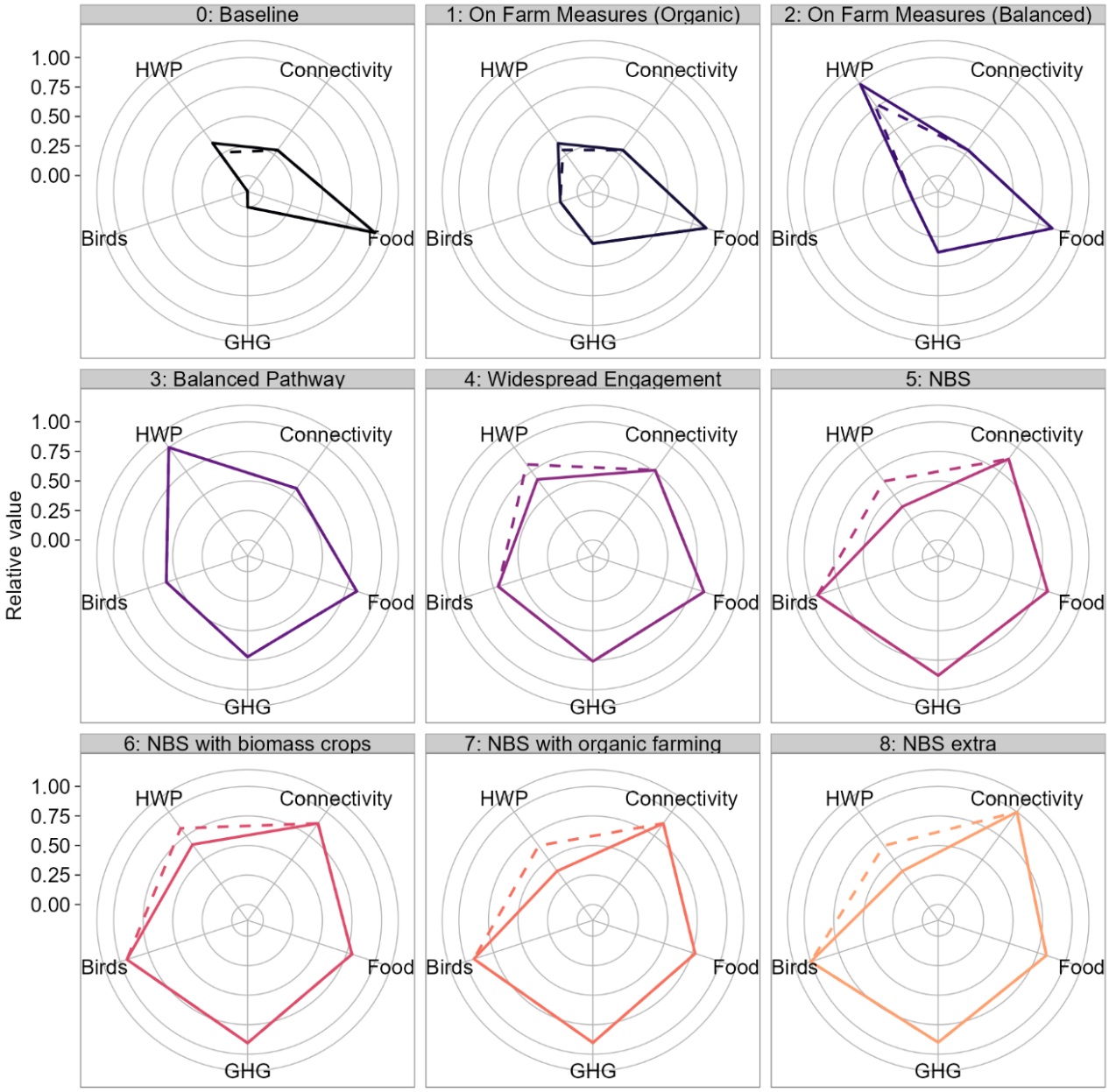

Figure 2: Summary of the performance of each scenario in England across five modelled outcomes. GHG = annual net GHG emissions in 2050, Food = 2050 calorific production, Birds = relative breeding bird habitat index, HWP (Harvested Wood Product) = annual fuel and timber production averaged 2045-2054 (solid line) and 2091-2100 (dashed line), Connectivity = speed of S-N movement averaged across woodland and open habitat. Each outcome is expressed relative to its maximum value across scenarios. The GHG axis has been transformed ($-x + 1$) such that high values correspond to low net emissions. NBS = Nature-based Solutions Reproduced from Finch et al., LM04111 (2024). © Natural England.

The study highlighted that across scenarios, there was a strong trade-off between food production and climate change mitigation, breeding bird habitat provision and south-north habitat connectivity. The scenarios with the best outcomes for GHG, bird populations and south-north habitat connectivity caused the biggest drop in food production. No scenario delivered strong reductions in GHG emissions (or large increases in potential bird

populations) without also seeing a large reduction in food supply (Fig. 2). Conversely, timber and biomass fuel production did not strongly co-vary with any other outcome. The report emphasised the need for a strategic approach to future land-use to balance the trade-offs of different land-use choices (Finch et al 2023).

Challenges and Opportunities

The study emphasised it was exploratory, illustrative, and non-exhaustive but rather highlighted some challenges and opportunities caused by land uses competing for a finite amount of space. In particular:

Breeding bird population: Scenarios which deliver strong climate change mitigation also deliver increases in potential bird population size through increases in the area of semi-natural habitats (Fig. 2, scenarios 5-8 for example). However, despite this broad synergy, trade-offs still exist. Farmland-associated bird species (some of which are amongst our most depleted in recent decades) are expected to lose habitat, highlighting the need for successful agri-environment measures that explicitly target farmland-associated species to (at least) offset these losses. If these agri-environment measures in turn reduce food production, then the trade-off will be amplified.

Food supply: At the UK scale, there is a strong trade-off between emissions reduction and food production. Under the most ambitious climate change mitigation scenario food production is expected to decline by up to 25%. A decline in food production is unavoidable under these climate change mitigation scenarios. Mitigation measures within the food system are thus needed to ensure that this does not result in offshoring of environmental impacts via increased food imports. Ambitious combinations of measures including reducing food waste, using arable land to grow crops for direct human consumption rather than livestock feed (and thus implying a dietary change), and increased productivity on remaining farmland, could fully mitigate expected reductions in food production.

25 Year Environment Plan target: The target to create or restore 500,000 hectares of wildlife-rich habitat could prioritise habitat creation in low grade farmland (usually in the uplands). In which case there is a trade-off between increased food production and reduced climate change mitigation, bird habitat availability and south–north habitat connectivity. In contrast, prioritising habitat creation close to population centres decreases food production and bird habitat availability but increases climate change mitigation and south–north connectivity.

Net greenhouse gas emissions*:* The 2050 net zero target for the Agriculture, Forestry and Other Land Use (AFOLU) sector is difficult to achieve and to sustain, especially when emissions from imported feed and fertiliser manufacture are attributed to agriculture (as opposed to other countries/sectors). However, through ambitious roll-out of nature-based solutions, especially for peatland restoration and woodland creation, alongside reductions in agricultural emissions, large cuts to net greenhouse gas emissions from AFOLU are possible. Scenarios in which the full suite of mitigation measures was widely deployed delivered substantial reductions in net GHG emissions from the land sector (falling by up to 88% between 2015 and 2050). However, net emissions are expected to rise after 2060 without the introduction of additional mitigation measures post-2050.

Whilst no scenario achieved net zero emissions from the AFOLU sector in England by 2050, complementary research showed four scenarios deliver net zero at the UK scale

(Finch et al. 2023). This reflects the fact that England has relatively higher agricultural emissions, and relatively less space for new trees, compared to other nations. Alongside a net-zero target by 2050, the report pointed out that it is likely that negative emissions will be required by mid-century to “net out” i.e., sequester residual emissions. At present the land sector is the only sector with the potential to provide negative emissions at scale.

Future Evidence Needs

Projects detailed in this report have addressed in part some of the evidence needs identified in previous annual reports (Brown 2020; Cole 2019; Oatway 2018) such as setting the baseline for evaluating AES impact beyond short-term, localised species abundance to landscape-scale species abundance change over time (LM0465), agreement holder attitudes related to SSSI management (LM04113), and improved data capture in CSFF monitoring (LM04127). Projects in this report have also identified some specific future research needs:

- A resurvey of the landscape-scale species monitoring of AES should be conducted in 5 to 8 years to allow an assessment of population change over time in response to levels of AES management at local and landscape scales. It is suggested that such a resurvey includes an enlarged (100-200) sample size (Staley et al. 2016) (LM0465).
- A future evaluation of the educational access option would benefit from engaging teachers and schools to understand their perspectives on the current delivery of educational access. More research is needed to address the evidence gap on the value and benefits of non-residential visits to farms and wildlife sites to young learners and especially considering opportunities to best support delivery of the national curriculum in England (LM04133). Some of these questions will be addressed in the 2024 follow-up study of the educational access option due to be published.
- Engagement with the general public through a further research study designed to analyse and evaluate their needs and desire for countryside access routes would help inform future policy decisions and help to ensure that these are relevant and any routes that are subsequently put in place are utilised (LM04132).

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