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Evaluating the Contribution from AES to the conservation of Coastal & Floodplain Grazing Marsh

FINAL REPORT

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Evaluating the Contribution from AES to the conservation of Coastal & Floodplain Grazing Marsh

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Abbreviations

AES	Agri-Environment Schemes
BAP	Biodiversity Action Plan
BPS	Basic Payment Scheme
CFGM	Coastal and Floodplain Grazing Marsh (as defined in PHI v2.2)
CSF	Catchment Sensitive Farming
CS	Countryside Stewardship
CROME	Crop Map of England
DEFRA	Department for Environment food and Rural Affairs
EA	Environment Agency
ELMS	Environmental Land Management Scheme
ELS	Entry Level Stewardship
ESA	Environmentally Sensitive Areas
EN	English Nature
ES	Environmental Stewardship
FC	Forestry Commission
FWM	Floodplain Wetland Mosaic
HLS	Higher Level Stewardship
HT	Higher Tier
IDB	Internal Drainage Board
NNR	National Nature Reserve
NVC	National Vegetation Classification
NE	Natural England
MAFF	The Ministry of Agriculture, Fisheries and Food
MT	Mid-Tier
M&E	Monitoring and evaluation
NBN	National Biodiversity Network
PH	Priority Habitat
PHI	Priority Habitat Inventory
RPA	Rural Payments Agency
SBI	Single Business Identifier
SSSIs	Sites of Special Scientific Interest
SAC	Special Areas of Conservation
SPA	Special Protection Areas
WFD	Water Framework Directive
WWT	Wildlife and Wetland Trust

Executive Summary

Background to the research

Coastal and Floodplain Grazing Marsh (CFGM) comprises a landscape mosaic of different habitats which are characterised by frequent inundation and a combination of landscape and biological characteristics. Managed water levels retain one or more features of the pre-existing floodplain. The land supports important species in particular breeding waders. This Priority Habitat (PH) has a very wide definition and broad scope and currently includes arable and intensive pasture land which does not support high biodiversity value. Natural England wish to begin to understand more about this important group of habitats and how they can help support Floodplain Wetland Mosaics (FWM), both those with naturally inundated land, and those where flooding is controlled. This project set out to identifying those areas which are particularly significant because of their high biodiversity value.

Key aims were:

1. How effective Agri-Environment Schemes (AES) have been in terms of protecting the interest features of the current Coastal & Floodplain Grazing Marsh (CFGM) in accordance with the existing habitat definition, and
2. If and how AES have been used to contribute towards improving natural floodplain functioning in line with the proposals set out to develop a new definition for this habitat as a floodplain wetland mosaic.

To meet these aims the project had three parts; the first was to define and map high biodiversity areas of CFGM, the second was to look at agri-environment options taken up on CFGM and the third was a series of case studies to understand how the biodiversity and hydrology were being assisted by the schemes, and what the barriers and enablers to the schemes are, as well as how a new scheme could be more effective. This report concludes by drawing conclusions and pointing to the possible next steps that could be taken to help explain this important landscape mosaic further.

Review of biodiversity interest in CFGM

The first task of the project was to identify and map those areas within the existing Priority Habitat Inventory (PHI) area which have higher biodiversity interest. As the PHI is represented across England, only nationally available data was deemed to be suitable for inclusion. The key factors which contribute to high value CFGM include:

- The ground should partially or wholly flood within an annual cycle with a network of ditches with water levels such that ditches retain aquatic wildlife and a rich plant and invertebrate assemblage throughout the year.
- Contain natural grassland and wetland communities and species.
- Host breeding waders and/or wintering wildfowl or other important wetland species.

In order to be considered as highly important for biodiversity each of these attributes needs to be present. Data was sourced to describe each of these factors, and a large number of stakeholders were consulted to obtain suitable data and to ensure the definitions worked to were robust.

A reductive approach was applied to the mapping, with the first level including any known SSSIs in good ecological condition, areas that fell without this definition then went forward to subsequent tests. In total 28.2% of the existing PHI has been classified as highly important for biodiversity. The large majority of the rest of the PHI (71.6%) either has no evidence of high biodiversity or is known to be in intensive management. This land still retains the hydrological attributes necessary to function as CFGM and could revert with appropriate management, this has therefore been tagged as 'potentially important'.

A number of data gaps were identified, both within data sets and in the collection and application of the data. Other techniques for refining the area of 'potentially important' CFGM, including use of remote sensing, field survey and water quality data, have been suggested in order to expand and refine this mapping further.

Role of AES in conserving biodiversity in CFGM

Task 2 was a desk-based activity that explored the role of agri-environment schemes in restoring, conserving and enhancing the biodiversity value of CFGM. This was based on a national analysis of the take up of agri-environment scheme options within the CFGM Priority Habitat Inventory (PHI) area. It explored differences in the spatial pattern of option take up, particularly within Sites of Special Scientific Interest, with the Countryside Stewardship Higher Level Stewardship (CS HLS) Target Area and those areas identified in Task 1 of this report as being highly important or potentially important refuges for CFGM.

A suite of Environmental Stewardship (ES) and Countryside Stewardship (CS) options that should fall within the scope of the analysis were agreed through a three-stage process:

1. Identify all AES options taken up in CFGM PHI area (315 ES, 177 CS options);
2. Identify options with most beneficial impact on CFGM habitat by grading options 1 (most beneficial) to 5 (least beneficial) to give 84 ES, 55 CS options grades 1-3;
3. Classify these subsets of options in terms of their relative focus on managing the existing CFGM habitat and / or contributing to the natural functioning of FWM.

Securing comparisons between the two schemes is difficult given the different time periods they have been operating, the different characteristics of the two schemes, the competitive nature of CS, scheme eligibility and uncertainty regarding the future of AES support. Nevertheless, some broad conclusions from Task 2 can be made:

- A large number of possible options are taken up within CFGM areas, including a range of options not directly related to CFGM habitat or the move towards FWM;
- Eight most frequent ES and CS options account for 60% of take up in CFGM areas;
- The two most frequent options are effectively the same; HK15 and HK10 in ES and GS10 and GS13 in CS;
- The analysis suggests that greater targeting of options occurs under CS than ES.
- Option take up is generally higher within SSSIs and areas that Task 1 of this report had defined as being 'highly important' for CFGM suggesting that AES are successfully targeting conservation of the highest value habitats and work to improve biodiversity value elsewhere.
- While there are a range of options to support FWM, the analysis showed that quite a large number of these options have low levels of take up overall.
- There is a much larger number of agreements under ES covering a larger area, but on comparing the payment rates under the two schemes for some of the most popular options, CS payment rates were lower than under the previous and equivalent ES option.

The analysis confirmed that AES do contribute to the positive management of existing biodiversity on CFGM and this management in concentrated in a few options. What this Task is not able to take account of is the application of the options on the ground, or the influence of land manager motivations and awareness of CFGM. This is considered in the case studies.

Case Studies of AES and CFGM

Five case studies were selected to represent a range of CFGM habitats and management approaches:

1. Severn Estuary: Steart Marshes, Somerset and Lydney, Gloucestershire
2. Test Valley, Hampshire
3. Yare Valley, Norfolk
4. Cayton and Flixton Carrs, North Yorkshire
5. Lyth Valley, Cumbria Body

GIS was used to highlight areas of interest, such as areas of CFGM habitat identified as 'highly important', location of grade 1 and grade 5 AES, areas outside the current CFGM habitat that had high levels of beneficial options taken up which could signal a need to change the current CFGM boundary. Interviews were undertaken with landowners and NE project officers.

The main motivation for joining AES is, as with other evaluations, financial. In the case of CFGM, management is complex and time intensive so private landowners and environmental NGOs place financial reasons at the top of the list. There is no specific option for the management of CFGM habitat and so upon entering an AES agreement, decisions need to be made about the desired outcome. This will vary depending on the motivations of the agreement holder.

In most areas, AES have not brought about the improvements to biodiversity interest on CFGM that were intended, but rather have maintained species interest and prevented any further declines. For individual farmers it has been more difficult to achieve notable improvements in biodiversity. Consequently, the size of the agreement and nature of land management around the holding are important factors that influence the extent of success. For some key species, such as lapwing, landscape-scale contiguous management is required. Successful management of the CFGM as a dynamic habitat requires continual tweaking of prescriptions and a close guiding relationship with an adviser has been integral to the success of management. Rush dominance part way through the term of agreement was a consistent issue across the case study locations.

All landscapes within the case study areas are subject to highly engineered hydrological systems with land managers in all areas artificially adjusting water levels on their land through use of water control structures. Consequently, any return to natural function would require a catchment-level feasibility study to fully explore the impacts on farm businesses, biodiversity, water quality, flood management, and production. Almost all case study agreements contain, or have in close proximity, options that are part of a more varied mosaic of wetland habitats, that could support a FWM approach to management. This highlights the importance of considering the management of CFGM in the context of the surrounding habitats, and not in isolation.

The move towards FWM was challenging in all case studies. The intensive management required to maintain the biodiversity value of CFGM is influenced by the wider hydrological conditions, surrounding land management and climate. To create landscape-scale sustainable changes in species present on this habitat, this management needs to be undertaken *en masse* as opposed to on isolated holdings. To be effective it would require a catchment-level approach to restore a sustainable functioning system but the benefits of this approach provide

a sustainable approach to land management with possible multiple benefits, such as reducing flood risk elsewhere.

Conclusions and next steps

Coastal and floodplain grazing marsh is an important priority habitat distinguished by a mosaic of habitats and species interests that are driven by specific hydrological regimes. The land is dependent on periodic inundation. CFGM can either be a managed hydrological regime with flooding and water levels controlled by a series of ditches, or areas subject to natural flooding either through natural coastal or riverine floodplain processes. It is the combination of different types of habitats which are in turn predicated on the varied hydrology of the area that, at its best, provide an FWM of extremely high biodiversity value. Many areas of the priority habitat have, however been drained and used for high intensity agriculture. The land is inherently fertile and rarely dries out, due to drought events.

The work in this project has helped towards creating and mapping a definition of high biodiversity CFGM, clearly confirming 27.8% of the current PHI as of high biodiversity value. The case studies confirmed these areas but also suggested that land outside the existing PHI should be considered as there is a high possibility of CFGM with high biodiversity value outside the current PHI. This was supported by options uptake data for specific habitats, and the actions that support this habitat that were outside the PHI area reported in Section 3. Suggestions for potential next steps to utilise and implement the key findings from this project are as follows.

1. A phased approach to improving the data available
    - Using the methodology developed in this project it could be possible to look outside of the existing CFGM boundary to see if any land not currently in the PHI qualifies for inclusion;
    - Remote sensing could be used on the land contained in the ‘potentially important’ category to help split this further into intensively managed land very unlikely to have high biodiversity, and areas much more likely to be considered to support high biodiversity;
    - A project considering the ‘potentially important’ category to ascertain if this land on the PHI could be restored to high biodiversity CFGM. This could include considering regional differences and field work checking.
    - The hydrology of these areas could also be the subject of further research with possible data available on hard engineering on rivers and coasts and how this connects with any proposed move towards the FWM approach.
2. Disseminating the main findings to key catchments
    - The condition of CFGM depends on factors outside the habitat itself, so it makes sense to take a landscape-scale perspective regarding CFGM and highlight the benefits to existing catchment partnerships, especially those where there is a high concentration of CFGM, both ‘potential’ and ‘highly important’.
    - Dissemination of the project findings so the proposed framework and key outcomes can be incorporated into catchment management plans and appropriate projects developed and implemented across the partnership.
    - Focusing on collaborative schemes at the landscape scale. This would have the advantage of having a stronger investment in advice, support and knowledge exchange amongst all potential agreement holders.

3. Considering the findings for future schemes such as the new Environmental Land Management Scheme (ELMS).

    - Simplicity in application process, agreement, option prescription and monitoring are beneficial, especially concerning complex habitats such as CFGM.
    - Ongoing guidance and training for agreement holders throughout the term of their agreement as well as encouraging knowledge exchange opportunities between farmers for peer-to-peer learning was also seen as highly beneficial.
    - Greater flexibility in option prescriptions for grazing and the balance of livestock on the land year-round, the spreading of farmyard manure and weed control operations, and to allow for external factors such as weather, site-specific issues, and the availability of farming contractors to be accommodated.
    - A move towards an outputs-based payment scheme under ELM could help focus management on the biodiversity outcomes desired rather than maintenance of a specific habitat. This could allow greater flexibility in how habitats are managed, and provide space for agreement holders to bring their own knowledge and understanding of management techniques to create the desired outcomes.

1. Background to the research

Priority habitats cover a wide range of semi-natural habitat types, and are those that were identified as being the most threatened and requiring conservation action under the UK Biodiversity Action Plan (UK BAP) (Maddock 2008). One such habitat is that of grazing marsh. The JNCC website defines grazing marsh as:

> *Periodically inundated pasture, or meadow with ditches which maintain the water levels, containing standing brackish or fresh water. The ditches are especially rich in plants and invertebrates. Sites may contain seasonal water-filled hollows and permanent ponds with emergent swamp communities, but not extensive areas of tall fen species like reeds.*

It is estimated that there is about 300,000 ha of grazing marsh in the UK with England holding the largest proportion of this habitat. However, only a small proportion is thought to contain a high diversity of native plant species, as little as 10,000 ha in the UK (Mainstone et al 2016a). Key characteristics of grazing marsh landscapes are:

- 'Periodic flooding' and a sufficiently high and dependable water table to maintain aquatic life in the ditches;
- Hosts a range of breeding waders (e.g. snipe, lapwing and curlew) and/or wintering wildfowl (e.g. Bewick's and whooper swans);
- Undulating topography and a sufficiently high-water table to sustain temporary or permanent open water and/or swamp;
- Water levels that may be managed to a greater or lesser extent, or could follow natural hydrological functioning; and
- Contain rich plant and invertebrate assemblages in the ditches.

Potentially, a large amount of the area that is currently mapped in NE's Habitat Inventory as 'grazing marsh' does not conform to this standard and in some cases the wildlife value may be quite low. This is important as such inventories are linked to Agri-Environment Schemes (AES) and associated management. AES are one of the central mechanisms to manage priority habitats sensitively as these schemes were set up and designed to reduce the negative impact of human activity on the environment. This is done through encouraging the sensitive management of important habitats, the restoration of degraded habitats and features and the creation of new habitats, to safeguard and benefit the habitats themselves, the species that inhabit them and the human interface with those habitats. This has been achieved through agreements with farmers and land managers, and implemented through a series of prescriptions with target outcomes that can be both measured and monitored.

To address the issue of where AES should focus its effort regarding grazing marsh, NE is undertaking a range of work to help understand the issues, constraints and opportunities that need to be considered (Maidstone et al 2016b). NE wish to take account of the wider environmental benefits that greater natural functioning brings to floodplains and, wanting to retain & enhance the current biodiversity value of this habitat, they are looking at redefining the habitat towards a FWM. The approach is outlined in a conceptual framework below.

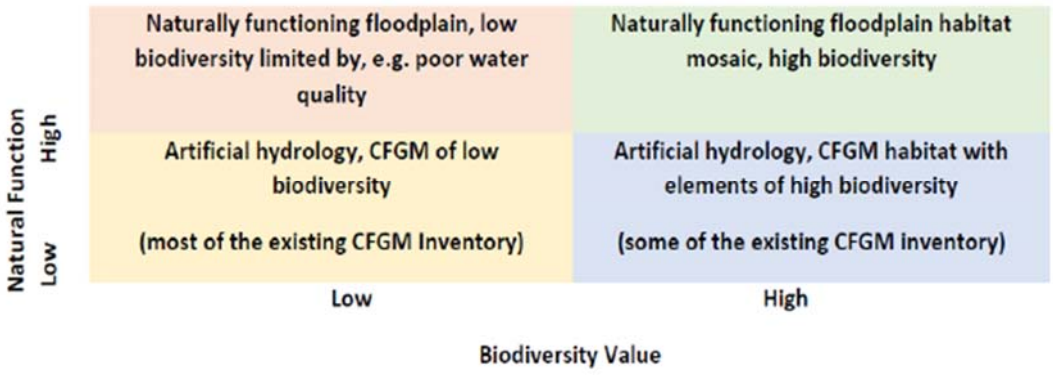


Figure 1.1: Conceptual Framework of Change in Approach (Crosher et al 2013)

Floodplain Wetland Mosaic

The current definition of CFGM is based on the aspects of modified floodplain grasslands that support populations of ground-nesting wading birds and wintering wildfowl, and freshwater species in the surrounding ditches. This definition does not include natural components of the wider hydrological system such as fen, reed swamp and saltmarsh which have been lost in order to drain and create CFGM. The current definition therefore limits any ambition to restore naturally functioning habitat mosaics characteristic of river and coastal floodplains (Mainstone et al 2016b).

Much of the CFGM has been drained and, due to its fertility, is used in arable rotations or for intensive grassland production. Although some of this land is used by species of international importance, such as breeding waders who like bare fields to feed in, the majority has been modified and is therefore of less biodiversity value (Mainstone et al 2016b).

The other important consideration in the management of CFGM is its hydrological function (Mainstone et al 2016a). Much of the CFGM is protected by coastal and river artificial flood defences and flooding is restricted to extreme events. In a natural state, coastal and river floodplains are a dynamic environment with changes taking place seasonally. The importance of allowing areas this dynamic movement have been seen in the added benefits (natural capital) that a fully functioning hydrological system provides. With likely changes to sea levels as the climate warms, areas of coast that were once protected are being released into natural coastal retreat (Crosher et al 2013). Rivers are also allowed to meander rather than having a straightened course (Mainstone et al 2016a). Where the land is protected by artificial embankments, some is still controlled by the management of ditches which move the water to and from the floodplains (Clarke 2014). The allowance of natural function provides an opportunity to enhance the biodiversity value of coastal and floodplain wetlands beyond the current limitations of the defined CFGM and towards a more diverse FWM (Crosher et al 2013)

This project seeks to identify the biodiversity value of the existing habitat as defined by the current CFGM PHI and identify the current biodiversity value which will fall within both the green and blue boxes (Figure 1.1). In order to review the existing CFGM PHI, we agreed and assessed how these habitats related to ‘highly important refuges for wetland wildlife’ by bringing data from a range of sources together into one data set. This included an interest in features such as:

- Wet grassland for birds.

- Ditches with botanical or vertebrate interest.
- Fish.
- Other priority habitats within the floodplain.

This will enable an assessment to take place as to the role of AES schemes in protecting the biodiversity interest of these important habitats as well as understanding how AES has contributed towards improving natural floodplain functioning. AES under both Environmental Stewardship (ES) and Countryside Stewardship are targeted and the effectiveness of this approach and the accuracy of the HLS target boundary for grazing marsh, in terms of the overlap with the refined definition can be assessed.

The key objectives of the project are to assess:

1. How effective Agri-Environment Schemes (AES) have been in terms of protecting the interest features of the current coastal & floodplain grazing marsh in accordance with the existing habitat definition; and
2. If and how AES have been used to contribute towards improving natural floodplain functioning in line with the proposals set out to develop a new definition for this habitat as FWM.

The report is structured in two parts. The first part presents the review of the biodiversity interest in CFGM. Part two of the project considered how agri-environment schemes (AES) are protecting the biodiversity interest of these important habitats as well as improving natural floodplain functioning. A series of case studies was developed showing how this is working in key areas.

2. Review of biodiversity interest in CFGM

2.1 Introduction

Coastal and Floodplain and Grazing Marsh (CFGM) is a key priority habitat in the UK. However, unlike other key habitats it is defined through a combination of landscape and biological characteristics. These include 'wet grassland for birds', 'floodplain grassland of botanical interest', and 'ditches with botanical or invertebrate interest'. JNCC define the habitat as:

> *"Periodically inundated pasture, or meadow with ditches which maintain the water levels, containing standing brackish or fresh water. The ditches are especially rich in plants and invertebrates. Almost all areas are grazed and some are cut for hay or silage. Sites may contain seasonal water-filled hollows and permanent ponds with emergent swamp communities, but not extensive areas of tall fen species like reeds; although they may abut with fen and reed swamp communities. Grazing marshes are particularly important for the number of breeding waders such as snipe (Gallinago gallinago), lapwing (Vanellus vanellus) and curlew (Numenius arquata) they support. Internationally important populations of wintering wildfowl also occur."*

CFGM can therefore be considered essentially as a land use type with varying proportions of the individual habitat components present across different sites which can also differ significantly in quality. Due to the complexity of the definition, the mapping of the Priority Habitat Inventory (PHI) has been drawn to include a very wide area, parts of which are not species rich or do not host important species. This project set out to identify and map those areas within the existing PHI which have higher biodiversity CFGM and to identify 'highly important refuges for wetland wildlife'.

2.2 Background

Coastal Floodplain and Grazing Marsh can be regarded as a cultural landscape being a partially drained version of naturally functioning wetland systems. As the floodplains are flat and often fertile land, they can be managed by draining and agricultural improvement to be productive grassland or arable land. However, CFGM priority habitat which is high in biodiversity, should contain the following key features:

1. The ground should be partially or wholly flooded within an annual cycle;
2. Have a network of ditches with water levels such that ditches retain aquatic wildlife and a rich plant and invertebrate assemblage throughout the year;
3. Contain natural grassland and wetland communities;
4. Host breeding waders and/or wintering wildfowl.

This work is set amongst other projects which are considering how best to manage the CFGM priority habitat as well as related subjects such as restoring natural function in freshwater systems and integrating advice on habitat mosaics and relevant species, how condition should be monitored and restoration be undertaken, for example Mainstone et al (2016a) and Mainstone et al (2018).

2.3 Current interest features of Coastal & Floodplain Grazing Marsh:

1. The ground should partially or wholly flood within an annual cycle

Key attributes associated with seasonal flooding include:

- The presence of seasonal water-filled hollows and permanent ponds, e.g., due to fluctuating groundwater levels, pluvial or overbank flooding.
- For floodplains, the areas can be dynamic with gradual erosion and movement of the river bed and river banks as new channels. Temporary ponds in old channels and wet grassland form as conditions change. In addition, deposits of gravel, sand and silt appear in the river channel and on the floodplain after a flood.

2. Have a network of ditches with water levels such that ditches retain aquatic wildlife and a rich plant and invertebrate assemblage throughout the year

- Key features relating to ditches of importance include:
  - Ditches that retain a high-water table all year round, giving suitable water conditions to support a range of species. Amoros & Bornette (2002) state that ditches have an important role as refuge for a number of aquatic species, whilst Buglife (2011) show the importance of the ditches for invertebrates. Where water conditions are good, ditches can be important for fish species (English Nature, 1998).
  - The definition of high importance ditches is not widely agreed upon. Clarke (2014) used criteria for defining SSSI ditches. The criteria recognise that ditches can be important for, and hence defined by, both flora and fauna.
    To be defined on floral grounds, at least 50% of wet ditches in a complex should rate as “good” or “exceptional”:
    - “Good” ditches are considered to have 10-14 submerged, floating, emergent or wet bank species per 20m survey length
    - “Exceptional” ditches are considered to have 15 or more submerged, floating, emergent or wet bank species per 20m survey length.
  - Species within the ditches include both wetland species normally associated with fens and pond species. During a 2007-2009 study of 500 coastal grazing marsh ditches across southern England and Wales, seventy rare and threatened aquatic invertebrates were found, 47 of which were water beetles and 9 of which are on the UK Biodiversity Action Plan (BAP) (Buglife, 2011).
  - It is important to maintain a high diversity of structural conditions on the ditches with areas of open water as well as vegetated banks which help prevent siltation. This is often achieved by maintaining a management cycle of dredging the ditches and then leaving them for several years where they will vegetate and become more shaded until they are cleared again. This 10-year rolling management cycle is extremely important for maintaining the high biodiversity value (Natural England, 2010).

3. Contain natural grassland and wetland communities

- Natural England’s (2010) report ‘Managing for species: Integrating the needs of England’s priority species into habitat management’ identifies 47 UK BAP/Section and 41 species associated with CFGM. The list of species consists largely of vascular plants, invertebrates and vertebrates and there are relatively few restricted or very restricted species associated with this habitat. A large

number of the invertebrate and plant species on the Section 41 priority species list are associated with open freshwater habitats and related wetlands.

- The Wildlife Trust (n.d.) recorded 500 plant species as being found in the most diverse grazing marshes, which comprises only 5% of total grazing marsh area. The small percentage with this level of diversity is recorded as a result from agricultural intervention with drainage and linear features like hedges and fences being put in place to better mitigate agricultural operations (Eglington et al., 2009; The Wildlife Trusts, n.d.).

4. Host breeding waders and/or wintering wildfowl

CFGM host five important waders / wintering wildfowl of conservation concern, Lapwing (*Vanellus vanellus)*, Redshank (*Tringa tetanus)*, Curlew (*Numenius arquata),* Snipe (*Gallinago gallinago)* and Oystercatcher (*Haemotopus ostralegus).* Many areas of CFGM which support these species are counted as Important Bird Areas by The Royal Society for the Protection of Birds (RSPB).

2.4 Proposed assessment criteria for identifying CFGM

In order to determine the extent of high biodiversity interest and important wetland wildlife refuges within the current Priority Habitat Inventory it was necessary to consider each of the key features contributing to CFGM habitat in turn. Source data were used to describe these features in as much detail as possible. Together with the combination of individual key factor maps, this arrived at a final area, which highlights only those CFGM areas within the current PHI likely to support high biodiversity. A key challenge of this phase of the project was to create a national dataset, it is possible that some areas of local significance do not meet the national criteria for high biodiversity areas. If these are under active management then they can be added in at a later review stage once they fulfil the criteria.

Methodology

1. A list of data sets for each of the key features was established, which can help describe these important features and species. These needed to be able to be identified and mapped from available data, without the need for field survey.
2. For each of the data sets, the attributes which best described the features of relevance where chosen and a mapping methodology developed. This is described in detail for each key feature below.
3. In order to combine the layers, we considered both the ecological aspects that would promote these types of grazing marsh features into the ‘highly important’ category and the existence of spatially explicit data which would allow us to identify these. In addition, the areas need to have the suitable configuration of floodplain and ditches /watercourses as suitable site features (Figure 2.).

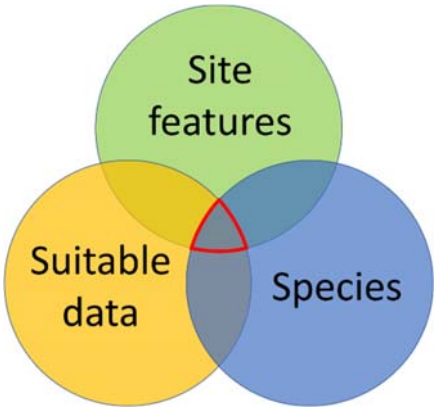


Figure 2.1: Identification of high biodiversity CFGM depended on all the three key aspects being present

4. Using this combination of ecological understanding and available data resulted in the design of a reductive approach:

   Starting with the existing PHI layer as the widest extent to be considered, we evaluated each piece of ecological and site evidence, removing areas from the existing PHI layer if they did not fulfil the criteria agreed for each stage. The order of the various stages is shown in Figure 2.2.2.

   The advantage of the reductive approach is that all the areas currently identified fulfil the requirements and can be considered for future parts of the project.

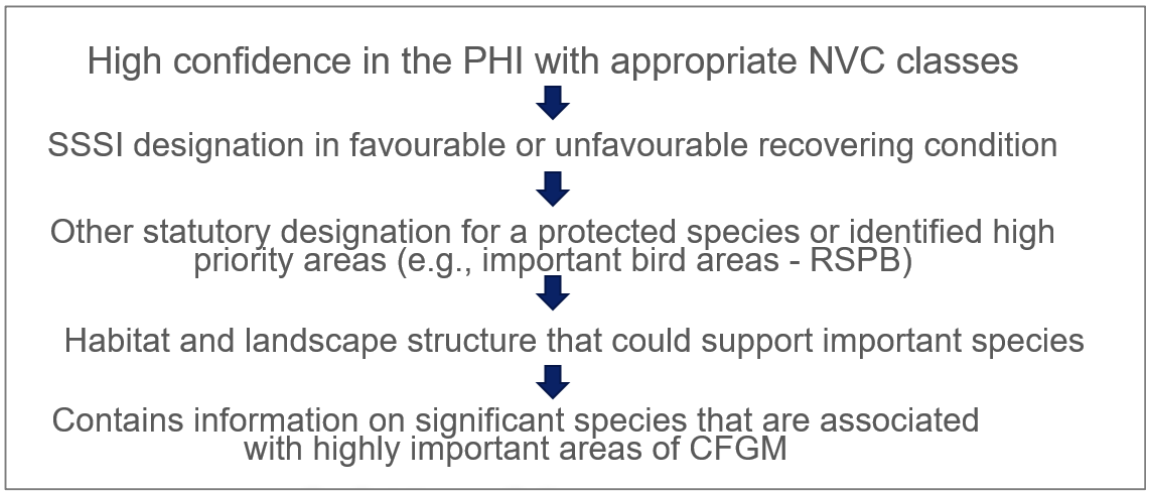


Figure 2.2: Factors considered in the reductive approach to mapping CFGM of high biodiversity value

5. Sourcing data: Considerable effort went into sourcing and collation of data from relevant stakeholders and a complete list of organisations and data repositories consulted is contained in Annex 1. Despite the effort put into sourcing data, there are some data sets that are not yet available. The advantage of the reductive approach taken is that the main important areas of high biodiversity interest are identified early on in the processes and supplementary data will only make small differences. These could be added at a later stage.

6. Where key records exist that demonstrate the site has high biodiversity because of species of interest (Figure 2.3), we deem these areas **'highly important'**. There are areas where there is some evidence that the site may have the potential to be 'highly important' due to the presence of habitat and/or site features which are likely to support high biodiversity, but no actual species field recordings exist or were accessible for this project to verify this. These have been recorded as '**potentially highly important'** sites on the PHI and could form the basis of sites for targeted future survey.
7. This mapping methodology was developed through three iterations following discussions with Natural England experts in species and habitats associated with CFGM and is based on the reclassification of all CFGM PHI parcels based on the inclusion attributes.
8. The analysis was undertaken using FME. This facilitated a flexible and adaptive approach that can be re-iterated with the introduction of new or updating of existing datasets. The full workbench has been provided as a deliverable of the project (see Annex 2).

Decision process

The flow chart (Figure 2.3) shows the process of selection for each of the layers included and how the decision process has been structured. It illustrates the test each PHI parcel was subjected to in order to establish their inclusion within the 'highly important' areas. The decision boxes describe the decision processes at each stage of testing in detail with consideration to the data used, whereby any intersection with qualifying data will lead to a positive decision outcome.

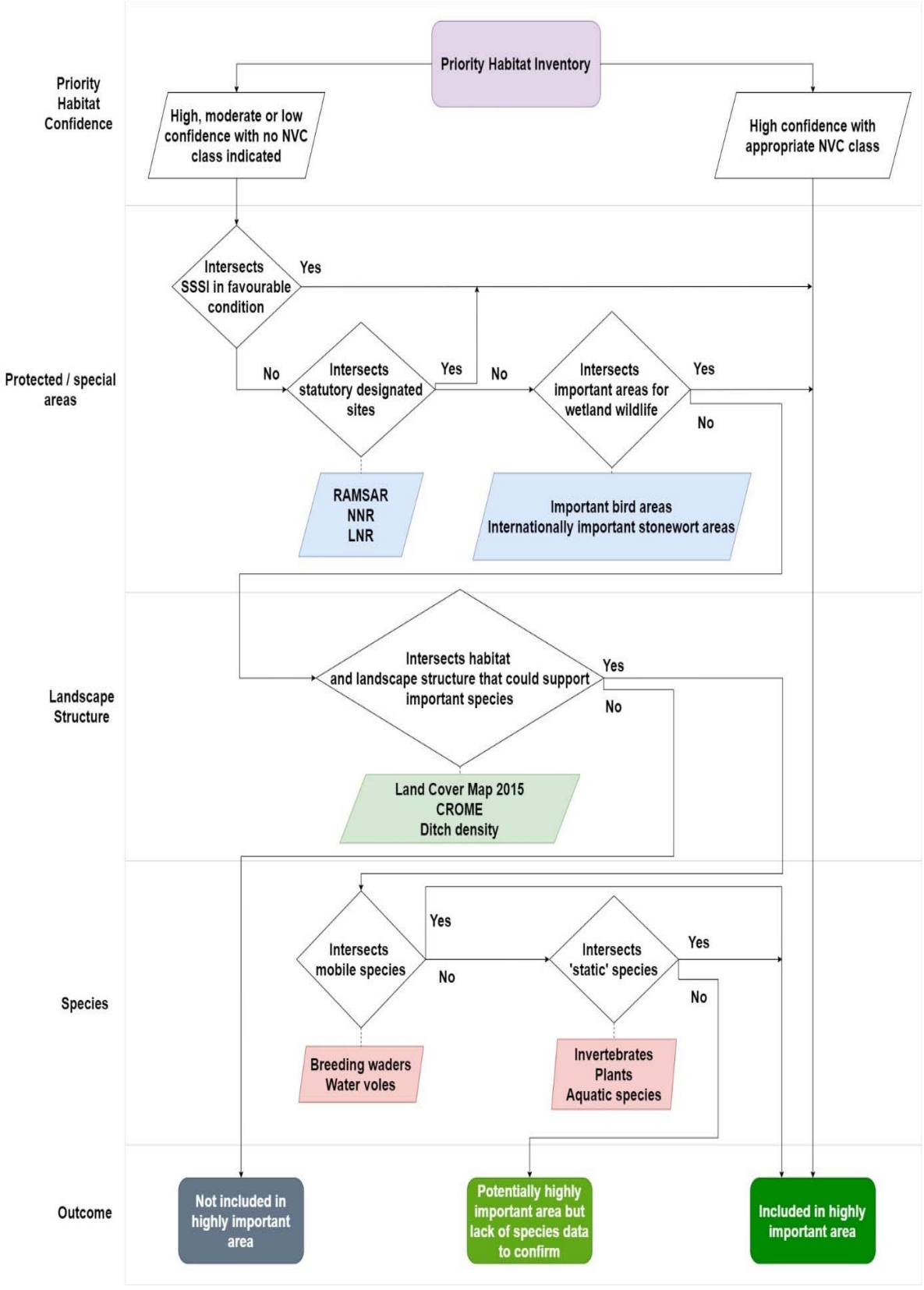


Figure 2.3: Flow chart showing how each area of 'highly important' CFGM has been selected

Priority Habitat Inventory (PHI) data

Natural England's Priority Habitats' Inventory (PHI) is a spatial dataset that describes the geographic extent and location of priority habitats in England. The PHI has been developed to replace twenty-four separate Biodiversity Action Plan (BAP) priority habitat inventories.

PHI's core underpinning data is derived from the 24 separate habitat inventories, a combination of national and local datasets collated since 1999. The survey data itself originates from the 1970s onwards, with, exceptionally, a few examples of older data; the most recent records are from 2015. These original habitat inventories were known to have gaps, including for some high value habitats. In producing the PHI, Natural England therefore drew on additional data held within the ENSIS and Genesis databases.

Each polygon is being attributed with a main habitat and information on the sources from which it has been mapped, which can vary considerably. Polygons may contain more than one priority habitat and the existing CFGM description may overlap with other priority habitats within floodplain areas and so additional habitats are attributed where data indicates they may be present within a broader habitat mosaic. When using the PHI to estimate the extent of habitats, it is recommended that only the main habitat field is used.

The PHI represents the best available information on priority habitats at an England-wide level, however, for parts of the country, or for specific habitats, there may be more recent or better quality data available, such as held by local partners, which Natural England has either not had access to or permission to publish and might be able to be included in future updates.

The quality of the inventory is variable: some polygons are derived from recent survey with habitat boundaries mapped accurately and high confidence in the determination of the habitat. However, for other polygons the information available may be insufficient to confidently confirm the presence of priority habitats.

The project used the existing CFGM PHI main habitat extent as a constraint for the assessment, with no evaluation of additional land areas outside of this. A review of potential sites outside of the PHI would entail a significant amount of ecological spatial modelling which was agreed with the Steering Group was outside of the scope of the project. In addition, the PHI has been drawn very widely and is likely to capture most of the eligible land area of CFGM present.

The priority habitat data set is spilt into three levels of confidence (Figure 2.4):

- High = Inventory with NVC data less than 5 years old.
- Medium = Inventory less than 10 years old, with NVC data or with corresponding HLS options.
- Low = All other polygons (County records, aerial photo interpretation, older AES data).

Within the high confidence class where there are records of the habitats types on the ground comprising semi-natural grasslands and wetlands, these are considered to be supporting high biodiversity and therefore are included into the 'highly important' class. They were identified using the attributes recorded by Natural England field team visits in the past five years (4 sites).

There are 2199.18km² contained within the current CFGM PHI for England. This area is divided as follows to different levels of confidence:

8.08km² (0.37% of the PHI) = High confidence

295.27km² (13.43% of the PHI) = Medium confidence

1895.83km² (86.21% of the PHI) = Low confidence

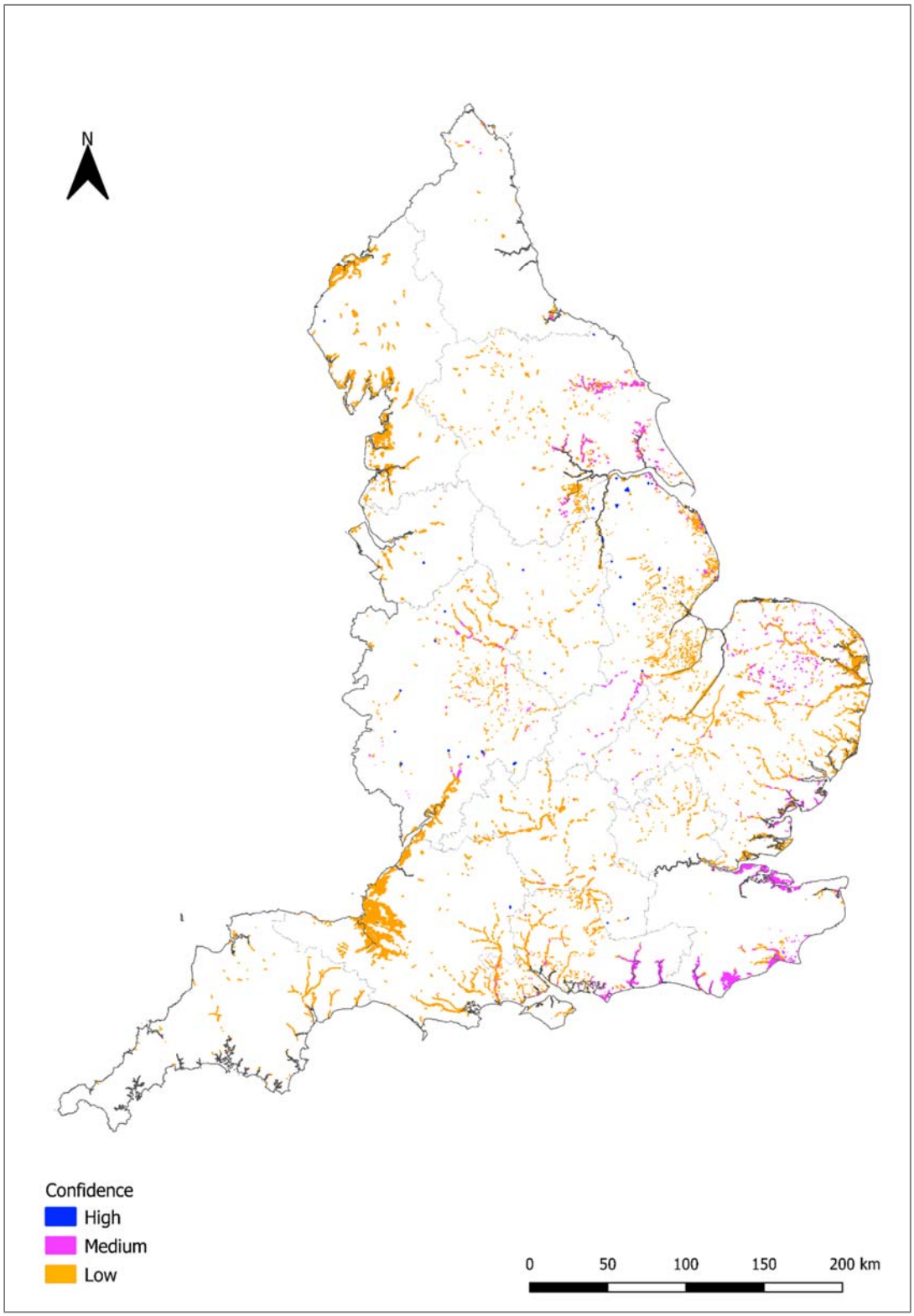


Figure 2.4: Total extent of the current CFGM Priority Habitat Inventory showing confidence in the correct identification of the habitat

Designated Sites and Important Areas

Protected sites which comprise Sites of Scientific Interest (SSSIs) in England are areas of land notified for their diverse range of biological and geological features. They include the most important areas for habitat and species conservation, at both national and international levels. These areas are dominated by native species and typically retain a high species richness. As such their extent is considered a useful proxy of high diversity and interest.

Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) were not explicitly considered as all these sites within England are also Sites of Special Scientific Interest (SSSI). However, we note that the overlap is not perfect as SSSIs are mainly terrestrial. Each SSSI is monitored to check its condition as some have not maintained their biodiversity interest since they were first designated. These are marked as 'unfavourable no change' or 'unfavourable declining' (Williams, 2006). As unfavourable no change and unfavourable declining sites might no longer meet the standard required for 'highly important', the data was used in the following way:

1. If the priority habitat is already part of an SSSI that is in favourable or unfavourable recovering condition, the site is very likely to be 'highly important' as a grazing or floodplain marsh. These areas were therefore included as 'highly important'. (Figure 2.5)
2. If the site is in unfavourable no change or unfavourable declining condition then it would be subject to the next test as more evidence is required to show that it is supporting species and habitats of relevance considered 'highly important'.

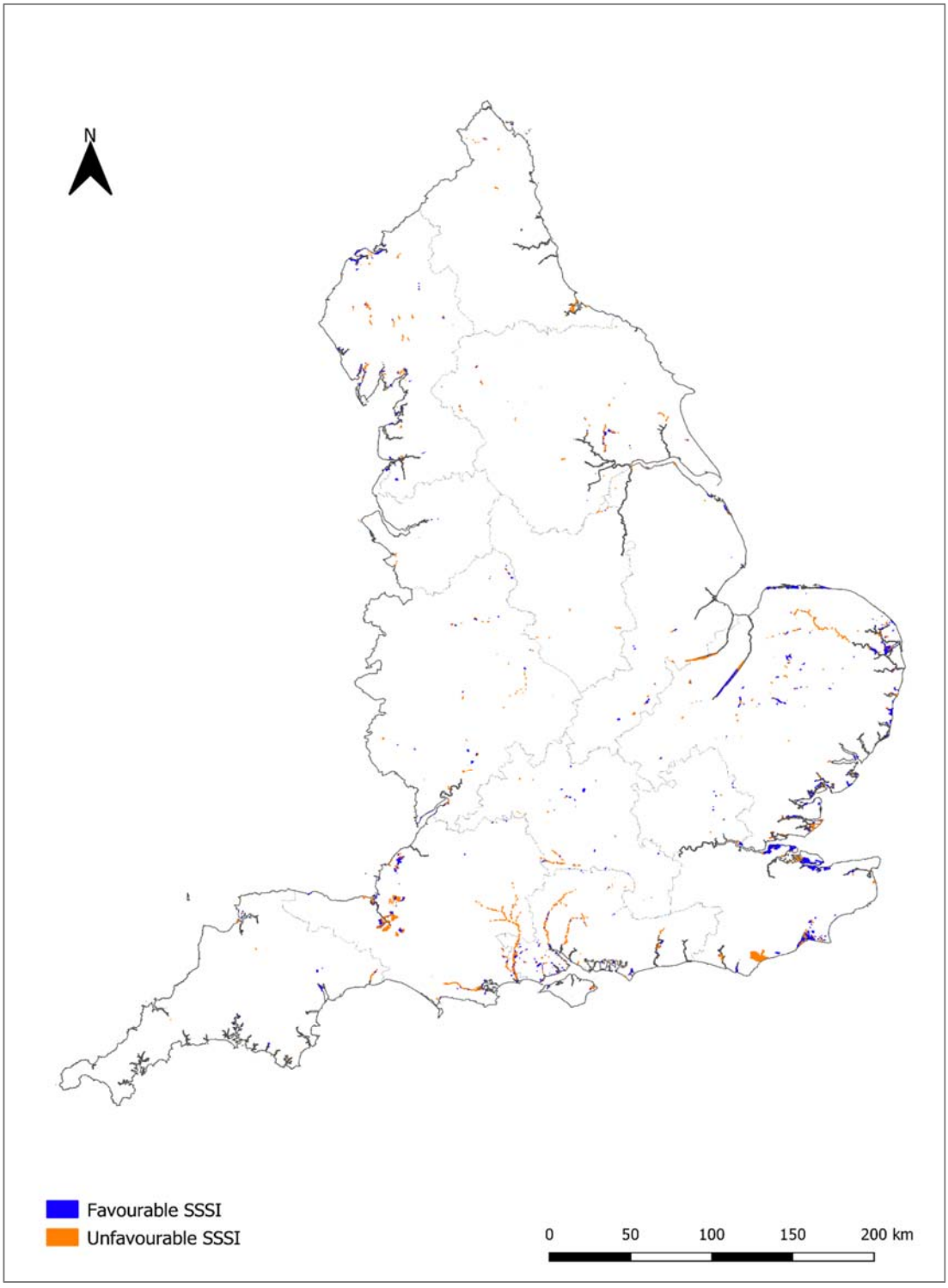


Figure 2.5: SSSIs in favourable and unfavourable condition within the CFGM PHI

Other designations

RAMSAR sites are wetlands of international importance providing waterfowl habitats, generally supported in the UK through prior notification of these areas as SSSIs. Where these designations intersect the CFGM priority habitats, they will be included as 'highly important'. While this might be achieved through the use of the SSSI designation and condition status alone, including the RAMSAR network allows a further measure of importance due to their international importance. This accumulation of intersections is recorded during the execution of the decision tree process and provided as an additional attribute in the final output (Figure 2.9).

National Nature Reserves (NNR) protect nationally important habitats and species. They are generally actively managed by Natural England or by organisations with a track record of site management to enhance specific features relevant to the habitats and species they protect and are therefore included as 'highly important'.

Local Nature Reserves (LNR) are statutory sites with wildlife features that are of special interest locally. They are managed sites which are significant locally. As they are of local significance and generally activity managed, they were included in the 'highly important' definition.

Important Bird Areas (IBAs) have been designated in the UK by RSPB and Birdlife International. These areas are important for rare, threatened and migratory birds which are vulnerable to land use change and management. Within the UK, these areas have been used to help designate Special Protection Areas (SPAs), but IBAs cover a wider area than the SPAs. As so many wildfowl and waders are significant for the CFGM, the IBAs which intersect the current PHI have been included as 'highly important'.

Plantlife have designated several areas as Internationally Important Stonewort (Stewart, 2004). Stoneworts are a unique group of complex algae that typically grow in fresh or brackish water that is clear and unpolluted. Due to the relationship between this species and water quality, it was deemed that the ditches associated with CFGM would reflect high biodiversity value areas and these sites intersecting the priority habitats were included as 'highly important'.

Buglife also collect areas of significance to key invertebrates. Unfortunately, it was not possible to access this data within the time frame of the project. These sites could be added in a further phase of the project.

Local wildlife sites were considered as these will be locally managed and maintained areas considered significant from a local point of view. However, there were problems with sourcing this data. The data available is from National Biodiversity Network (NBN) but only in a pictorial form rather than as spatial data. It was considered out of scope of this project to contact individual records centres or local organisations for this information.

Habitat and landscape structure that could support important species

Areas where there is evidence that the landform and habitats are those associated with species rich grazing marsh could be included within the 'highly important' areas where they intersect with known species data. To meet the criteria of appropriate landform, qualifying habitats were identified from:

- Landcover Map 2015: Semi-natural grasslands (acid, neutral and calcareous) fen/marsh and swamp, fresh water and saltmarsh (Figure 2.6).
- CROME: Covering all arable land parcels, including non-agricultural land and permanent grassland (Figure 2.6).
- Areas where there is a density of ditches and water courses appropriate to floodplain and grazing marsh. To calculate this, we derived a layer of relative watercourse and ditch density on a 1km^2 grid basis from OSMM water features. An example of this for Norfolk is shown in Figure 2.7. To calculate the percentage of ditches/watercourses to use in the analysis, known areas of significant watercourse density were explored and Jenks Natural Breaks statistical analysis was used. This method seeks to reduce the variance within classes and maximize the variance between classes by grouping values that are closest together. Table 2.1 below shows that over 90% (91.84%) of the 1km^2 grid squares were found to have less than 10,000m of watercourse. As a result, this was chosen as a threshold for density. Using this threshold, 8.16% of the grid squares were selected as having a density of ditches and watercourses appropriate to floodplain and grazing marsh. These grid squares covered 6,555km² and contained 100,213.07km of ditches and watercourses.
- In addition, flood zones data was sought from the Environment Agency (EA). It is the EA's estimation of the areas of land at risk of flooding when the presence of flood defences is ignored. It covers land with a 1 in 100 (1%) or greater chance of flooding each year from rivers; or with a 1 in 200 (0.5%) or greater chance of flooding each year from the sea. However, on evaluation this was not included as it was felt that a 1:100-year flood event was too high a threshold to set on land that should have an annual or frequent inundation.

Table 2.1: Jenks Natural Break grouping for ditch/watercourse density

Range	Number of grid squares	Percentage of grids	Total length	Percentage of total length
0-10000m	73780	91.84%	215,836,302m	68.29%
10000m-20000m	5539	6.90%	74,891,320m	23.70%
20000m-30000m	884	1.10%	20,982,746m	6.64%
30000m-40000m	129	0.16%	4,208,505m	1.33%
40000m+	3	0.00%	130,494m	0.04%
TOTAL	80335	100.00%	316,049,368m	100.00%

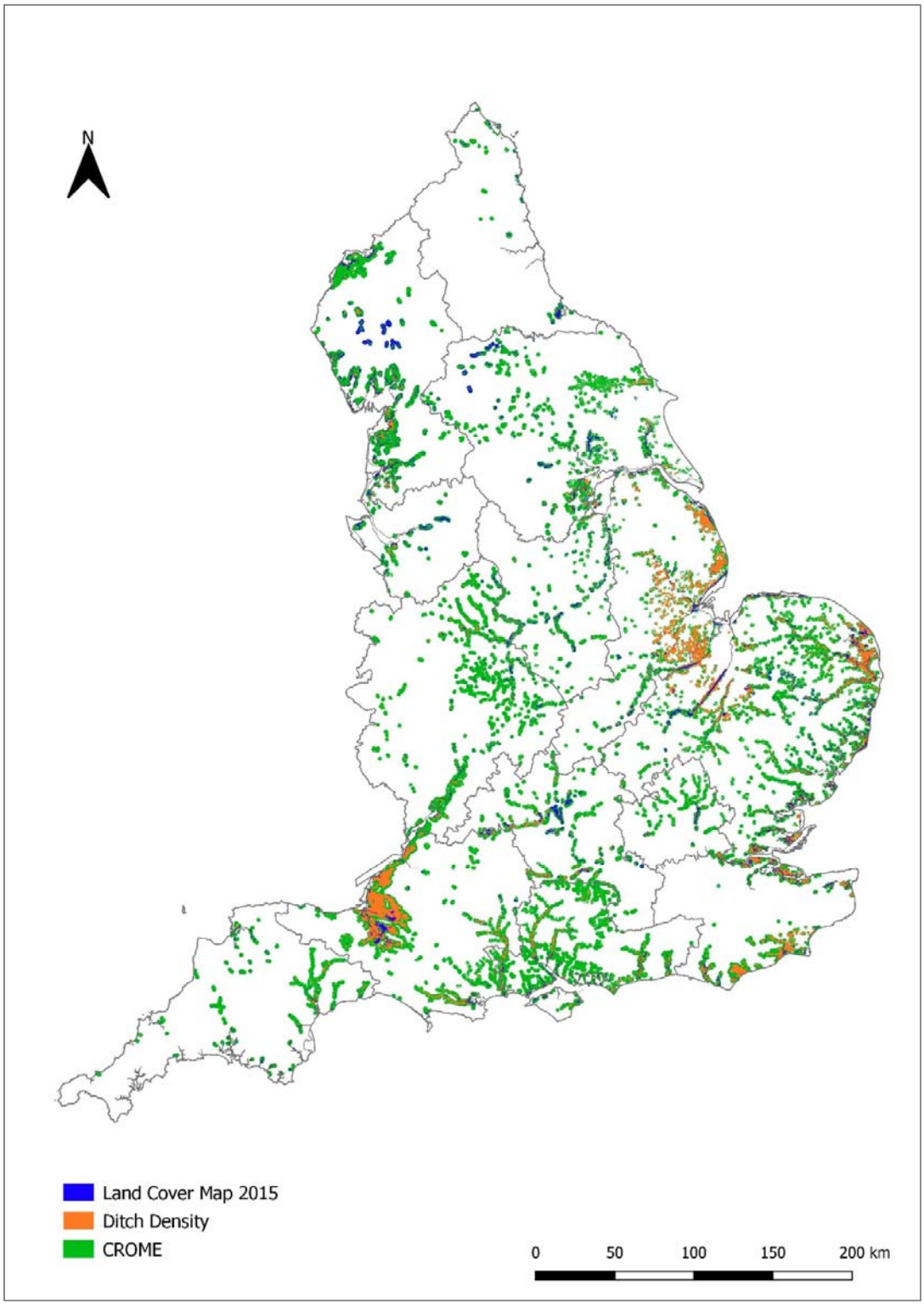


Figure 2.6: Land with appropriate habitats and ditch/watercourse density present. Those areas which are within the PHI have the potential to support high biodiversity CFGM

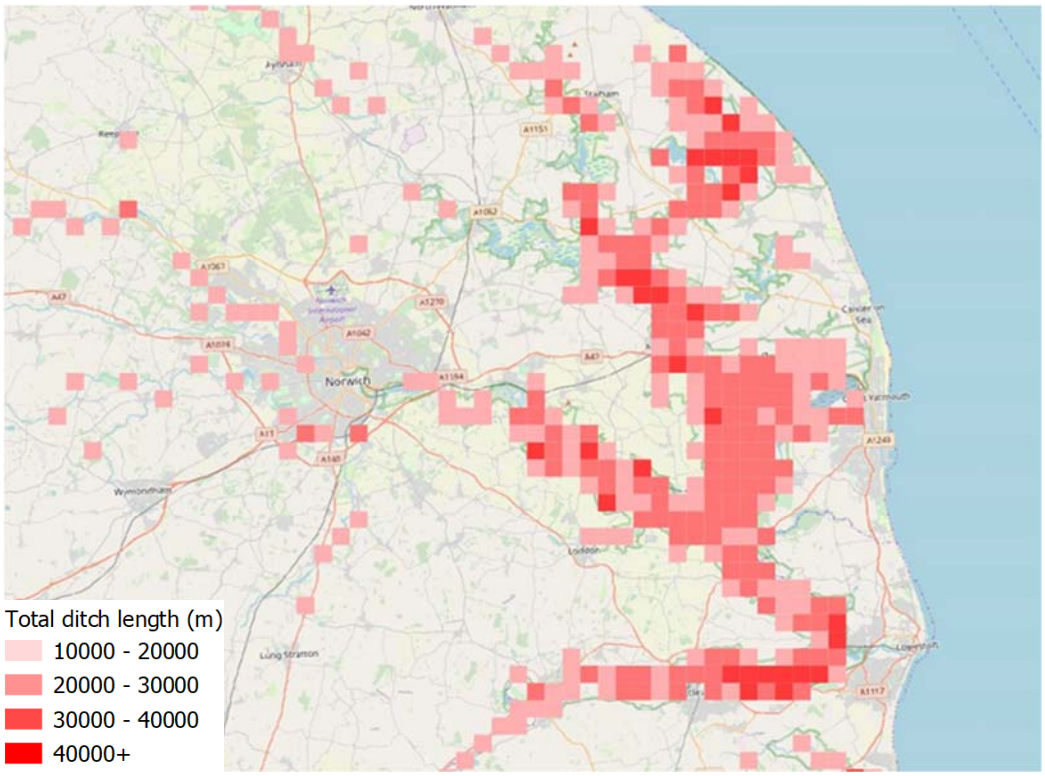


Figure 2.7: Length of watercourses in metres within each square kilometre OS grid square intersecting the CFGM PHI in Norfolk

Species Data

Where there is evidence that there are suitable habitats, a final check was undertaken to understand if there were species records which support the land as 'highly important'. Species with a strong association to CFGM and national records available were chosen (see Annex 1 and separate spreadsheet detailing all datasets and sources underpinning the FME workbench and final GIS layer). The best available data was utilised for the project, however, it should be acknowledged that these datasets are derived from field surveys that were commissioned with different objectives and aims and will frequently contain gaps in coverage, leading to unavoidable false absences.

For mobile species, data on birds and mammals known to associate with the habitats were sourced. With these species we considered a buffer of 500m around the actual location point given as this is a standard distance when considering the impact on species for developments and EIA purposes. Where these records intersected with individual, single-part PHI polygons, the parcel would be included as 'highly important' (Figure 2.8). Mobile species data included for this project are:

- Curlew
- Lapwing
- Oystercatcher
- Redshank
- Snipe

Data on water vole distribution was accessed through the National Water Vole Database and Mapping project but could not be licensed for use in this project and has therefore not been included in the final mapped output.
Where we consider the species relatively static (that is, only moving a few metres, if at all), then the actual parcels they are associated with were selected (Figure 2.8). The species included in this analysis were decided in discussion with Natural England specialists and included:

- Anisodactylus poeciloides (Saltmarsh shortspur beetle)
- Badister collaris (Badister collaris)
- Hydrometra gracilenta (Lesser water measurer)
- Panagaeus cruxmajor (Crucifix ground beetle)
- Alisma gramineum (Ribbon-leaved Water-plantain)
- Apium repens (Creeping marshwart)
- Blysmus compressus (Flat sedge)
- Bupleurum tenuissimum (Slender Hare's Ear)
- Carex divisa (Sedge)
- Ceratophyllum submersum (Soft hornwort)
- Hordeum marinum (Sea Barley)
- Hydrocharis morsus-ranae (Frogbit)
- Leesia oryzoides (Cut Grass)
- Myriophyllum verticillatum (Whorled Water-Milfoil)
- Oenathe fistulosa (Tubular Water-Dropwort)
- Potamogetum acutifolius (Sharp-leaved pondweed)
- Potamogetum compressus (Grass-Wrack Pondweed)
- Puccinellia fasciculata (Saltmarsh Grass)
- Wolffia arrhizal (Rootless duckweed)

Where the land showed signs of appropriate habitats but did not have associated species data present, the hypothesis was that the land might be ‘highly important’ but there may not have been any species survey undertaken (a lack of true absence data is problematic in many analyses of this kind). This land has been included in the analysis as ‘potentially highly important’. All other land was not included as there was lack of evidence of its significance as a ‘highly important’ refuge for wetland wildlife.

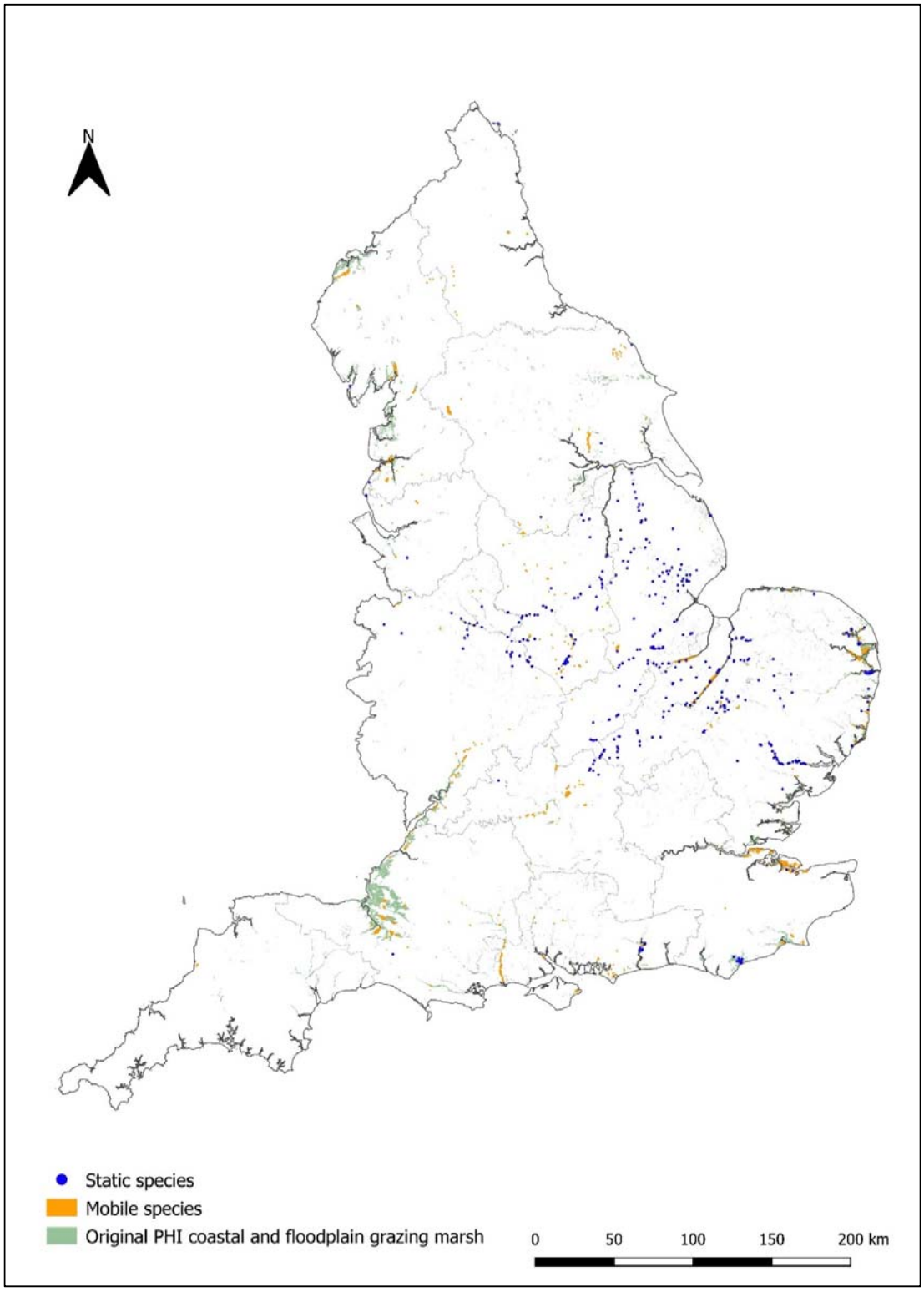
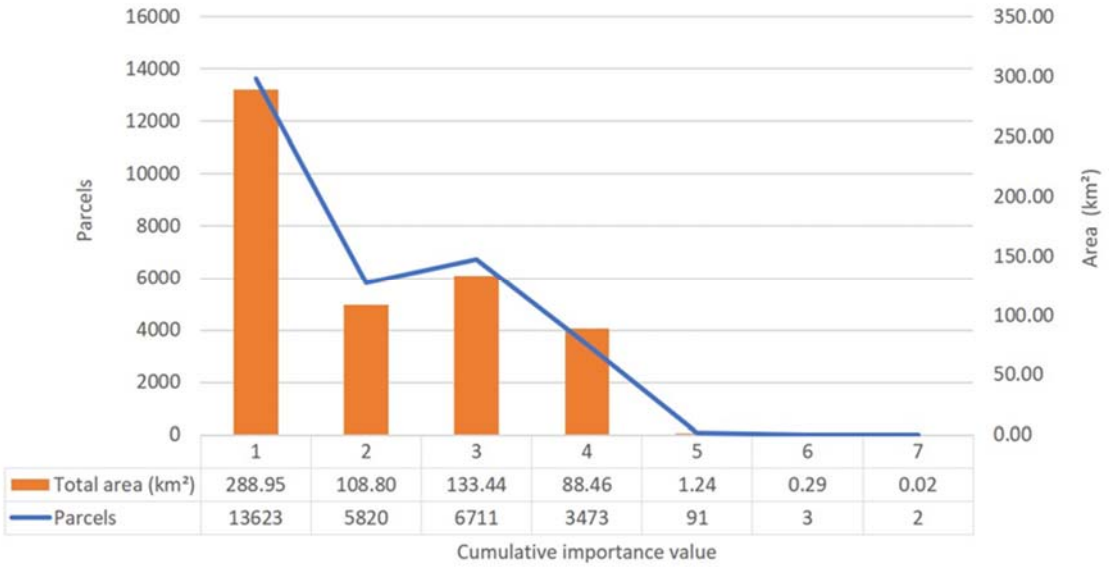


Figure 2.8: Areas where species records intersect the PHI

Quantifying High Importance

To help differentiate levels of importance between the parcels that are included as 'highly important' CFGM, a cumulative testing method was implemented into the FME workbench. At each stage of testing where a test outcome would result in the area being included as 'highly important' CFGM, a value of one was added to the cumulative importance value of the area. There was a total of 30 tests that could have resulted in a parcel being included as a 'highly important' CFGM area, so the highest score possible was 30.

Figure 2.9 shows the overall cumulative importance values for the parcels that were found to be 'highly important'. The maximum possible cumulative value was 30, however the largest found was 7. The distribution of importance values in Figure 2.9 indicate that there is not a great amount of cumulative overlap between the individual factors determining 'highly important' status within the PHI. However, as the datasets included vastly differ extent and nature, from wide-ranging statutory designations to point locations of individual species derived from field work, this might be expected.



	1	2	3	4	5	6	7
Total area (km²)	288.95	108.80	133.44	88.46	1.24	0.29	0.02
Parcels	13623	5820	6711	3473	91	3	2

Figure 2.9: Overall cumulative importance values displayed by number of parcels and total area (km²)

Table 2.2 details the contribution of individually tested attributes to the final 'highly important' area layer for various factors such as total area contributed and the percentage of area solely covered by individual attributes that would not be included if the relevant data layer had not been utilised in the tests leading to this result. The contrast between the columns E and F is of particular interest. Column F details the percentage area of the 'highly important' area that is included solely due the particular attribute tested, while column F demonstrates how much of the area covered by this attribute is included only because of this and no other dataset, i.e., equalling an importance ranking of 1.

For example, lapwing records only account for 394.6ha of the 'highly important' area identified, but 218.1ha (55.3%) of this would not be included if the lapwing records were removed from the analysis. Conversely, a number of species records tested, e.g., snipe, did not contribute to the final extent of the 'highly important' areas. This is due to all records for these species being located outside of the current PHI.

Table 2.2 further demonstrates that the most area was contributed by the inclusion of a relatively small number of wide-ranging datasets and that individual species records only contributed proportionally small percentages of the total area that would have otherwise been omitted.

Table 2.2: Contribution of individual datasets (attributes) to inclusion within the 'highly important' area

A	B	C	D	E	F
Attribute	**Total area containing attribute (ha)**	**% of 'highly important' area covered by attribute**	**Area included as 'highly important' solely due to attribute (ha)**	**% area included as 'highly important' solely due to attribute**	**Proportion of the total area containing the attribute that is included solely due to the attribute ($\frac{D}{B} \times 100$)**
High confidence in relevant habitat type (from PHI)	**<1**	**<1%**	**<1**	**<1%**	**100%**
Favourable condition SSSI	**24,545.5**	**39.5%**	**<1**	**<1%**	**<1%**
Statutory designated sites	**35,411.6**	**56.9%**	**<1**	**<1%**	**<1%**
Important areas for wetland wildlife	**36,815.3**	**59.3%**	**2.3**	**<1%**	**<1%**
Breeding Wader Hotspots	**27,017.6**	**43.5%**	**11,206.1**	**18.0%**	**41.5%**
Curlew	**314.5**	**<1 %**	**13.5**	**<1%**	**4.3%**
Lapwing	**394.6**	**<1 %**	**218.1**	**<1%**	**55.3%**
Oystercatcher	**280.8**	**<1 %**	**0.0**	**0%**	**0%**
Redshank	**309.5**	**<1%**	**0.0**	**0%**	**0%**
Snipe	**0.0**	**0%**	**0.0**	**0%**	**N/A**
Water vole	**1,649.3**	**2.7%**	**985.9**	**1.6%**	**59.8%**
Anisodactylus poeciloides (Saltmarsh shortspur beetle)	**22.6**	**<1%**	**0.0**	**0%**	**0%**
Badister collaris (Badister collaris)	**0.0**	**0%**	**0.0**	**0%**	**N/A**
Hydrometra gracilenta (Lesser water measurer)	**74.1**	**<1%**	**0.0**	**0%**	**0%**
Panagaeus cruxmajor (Crucifix ground beetle)	**0.0**	**0%**	**0.0**	**0%**	**N/A**
Alisma gramineum (Ribbon-leaved Water-plantain)	**0.0**	**0%**	**0.0**	**0%**	**N/A**
Apium repens (Creeping marshwart)	**0.0**	**0%**	**0.0**	**0%**	**N/A**

A	B	C	D	E	F
Attribute (cont.)	Total area containing attribute (ha)	% of 'highly important' area covered by attribute	Area included as 'highly important' solely due to attribute (ha)	% area included as 'highly important' solely due to attribute	Proportion of the total area containing the attribute that is included solely due to the attribute $(\frac{D}{B} \times 100)$
Blysmus compressus (Flat sedge)	0.0	0%	0.0	0%	N/A
Bupleurum tenuissimum (Slender Hare's Ear)	4.0	<1%	4.0	<1%	100%
Hordeum marinum (Sea Barley)	0.0	0%	0.0	0%	N/A
Hydrocharis morsus-ranae (Frogbit)	0.0	0%	0.0	0%	N/A
Leesia oryzoides (Cut Grass)	5.6	<1%	0.0	0%	0%
Myriophyllum verticillatum (Whorled Water-Milfoil)	0	0%	0.0	0%	N/A
Oenathe fistulosa (Tubular Water-Dropwort)	5.3	<1%	0.0	0%	0%
Potamogetum acutifolius (Sharp-leaved pondweed)	35.2	<1%	0.0	0%	0%
Potamogetum compressus (Grass-Wrack Pondweed)	0	0%	0.0	0%	N/A
Puccinellia fasciculata (Saltmarsh Grass)	22.6	<1%	0.0	0%	0%
Wolffia arrhizal (Rootless duckweed)	0	0%	0.0	0%	N/A

2.5 Identified areas of ‘highly important’ refuges for CFGM

Results

Of the current PHI for CFGM only 28.2% (

Table 2.3) has been classified as having sufficient evidence to be regarded as ‘highly important’ for biodiversity (Figure 2.).

	Highly Important	Potentially Highly Important	Not important	Total area of CFGM PHI
Area (ha)	**62,115**	**157,513**	**290**	**219,918**
Percentage	**28.2**	**71.6**	**0.1**	**100**

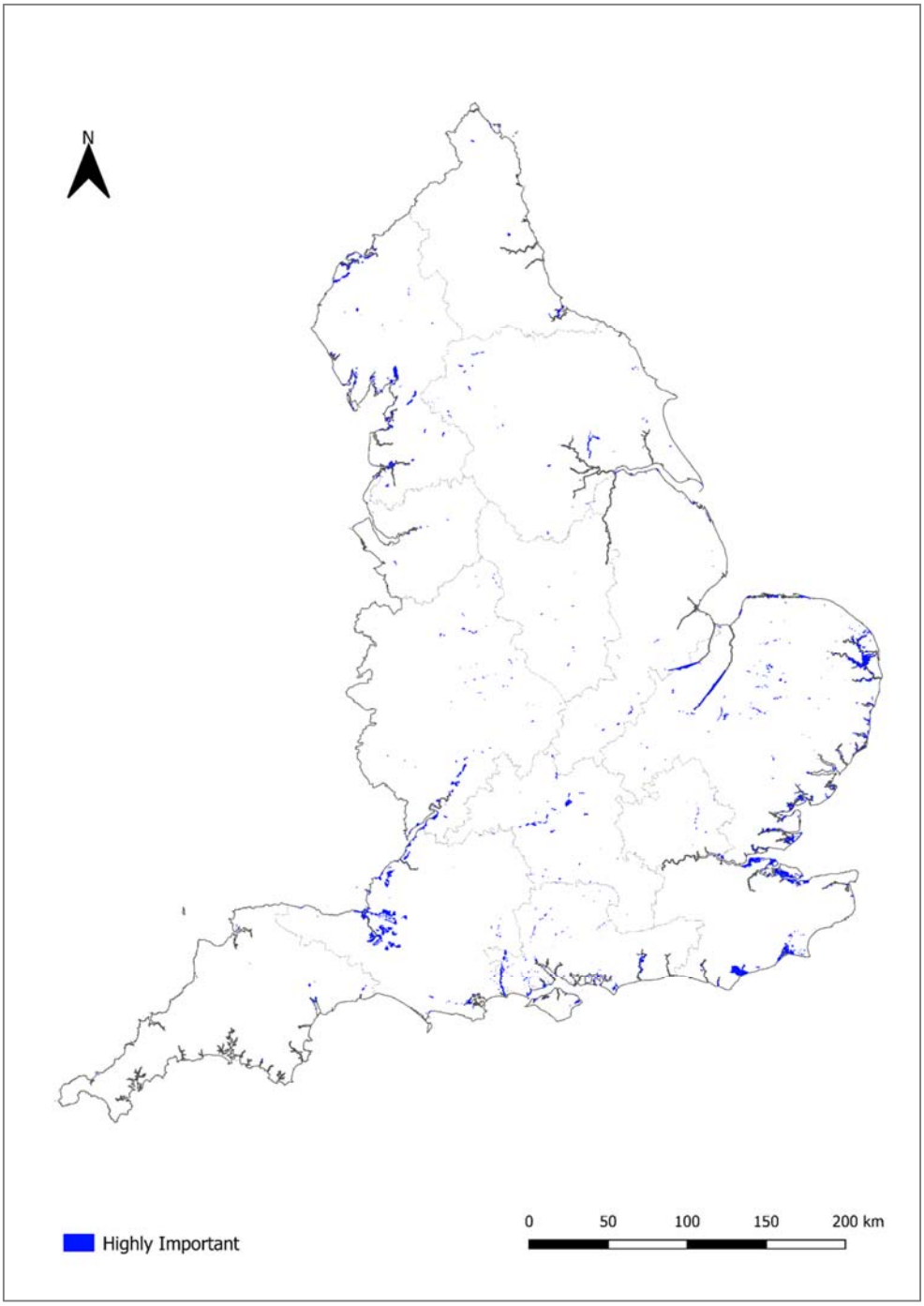


Figure 2.10: CFGM sites of high importance within the current PHI

Table 2.3 further shows that the majority (71.6%) of the current PHI has evidence that conditions could support high biodiversity but no species data to support this. These areas could be regarded as 'potentially highly important' as the physical site conditions exist to support high levels of relevant species interest features. It is also possible that species of high interest are present on these sites but no current survey data exists which evidences this. Even where species are not present, if appropriate management interventions were re-instated, they

could return. Little of the current PHI area (0.1%) has no evidence of appropriate conditions for CFGM.

Table 2.3: Final national area statistics for 'highly', 'potentially' and 'not important' areas

Table 2.4 and Figure 2.2: Distribution of 'highly important' and 'potentially important' CFGM areas per EA/NE administrative areaFigure 2.2 detail the distribution of 'highly' and 'potentially important' CFGM areas within EA/NE administrative boundaries.

Table 2.4: Statistics for 'highly' and 'potentially important' areas within EA/NE administrative areas

	Highly Important	Potentially Highly Important	Not important	Total area of CFGM PHI
Area (ha)	62,115	157,513	290	219,918
Percentage	28.2	71.6	0.1	100

EA/NE administrative area	Highly Important (ha)	Potentially Highly Important (ha)	Highly Important (%)	Potentially Highly Important (%)
Cumbria and Lancashire	7,500	25,300	12.0	16.1
Devon and Cornwall	700	5,700	1.1	3.6
East Anglia	17,700	23,300	28.4	14.8
East Midlands	100	2,200	0.2	1.4
Greater Manchester, Merseyside and Cheshire	300	2,700	0.5	1.7
Herts and North London	300	1,200	0.5	0.8
Kent, South London and East Sussex	12,600	5,400	20.2	3.4
Lincolnshire and Northants	1200	7400	1.9	4.7
North East	800	700	1.3	0.4
Solent and South Downs	3,400	8,500	5.5	5.4
Thames	2,200	5,700	3.5	3.6
Wessex	10,700	43,500	17.2	27.6
West Midlands	3,200	13,700	5.1	8.7
Yorkshire	1,600	12,200	2.6	7.7

Figure 2.2: Distribution of 'highly important' and 'potentially important' CFGM areas per EA/NE administrative area

2.6 Key findings

Coastal and floodplain grazing marsh is a cultural as well as biologically defined habitat. It has been formed on floodplains that are artificially managed to maintain drainage systems, resulting in a simple habitat largely composed of improved or semi-improved grasslands. The interest features are the species that colonise this habitat and the distribution and abundance of these might vary considerably across sites. Judging the threshold for what is 'important' to merit priority habitat status is therefore more complex as multiple combinations of interest features might qualify a site as such and any set of criteria judging the importance status of a site has to take this into account.

This project found that 28.2% of the area covered in the current priority habitat definition can actually be regarded as 'highly important' areas, based on available evidence. Analysis showed that the existing protected site networks contained a large proportion of the highly important CGFM for diversity, and that records for breeding birds and water voles are most important in determining the high biodiversity value, with other species records adding less information to the analysis.

The large majority of the PHI (71.6%) has habitats and ditch/watercourse densities present that would allow for the support of high biodiversity and species interest but there is no current field data that supports this. As the land is flat, can be fertile, has drainage and is easy to manage, much is now being farmed intensively. However, this project does show that the conditions still exist in many of these places to restore CFGM to biodiversity rich habitats or to consider a more naturally functioning hydrology approach in line with the FWM approach suggested by Natural England.

Figure 2. shows a detailed view of areas of CFGM which are 'highly important' and 'potentially important' in Norfolk, demonstrating that sites graded differently can commonly occur adjacent to each other or are connected by shared waterways. This suggests that there is the potential for species to move from 'highly important' sites, where they are currently recorded, to 'potentially important' sites close by, if they are not already present on these but not recorded in the available survey data.

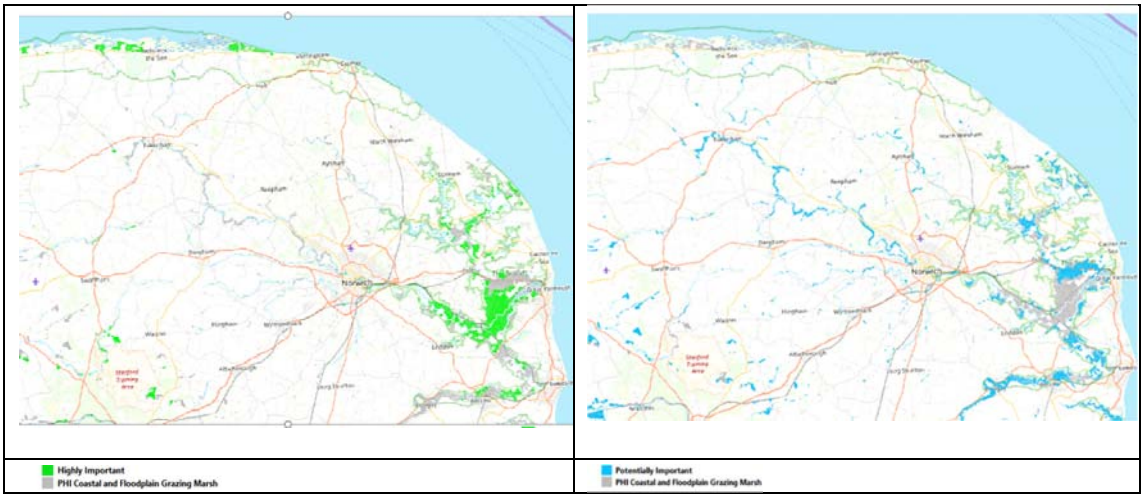


Figure 2.12: Detailed view showing areas of 'highly important' and 'potentially important' CFGM areas within the current PHI in Norfolk

For the mapping, both the ecology and geography of CFGM was investigated and the data available to describe these attributes. A group of experts from Natural England input into the project and a number of other stakeholder organisations were consulted who have an interest in the habitat (Annex 1). This allowed the collation of a credible range of data sets to describe the geographical and biological features of the current CFGM PHI. In order to create the model, an FME workbench was built. This allows easy re-running of the data and re-evaluation if other data becomes available and this will be supplied as part of the deliverables of the project to Natural England.

In discussions with other organisations, it became apparent that there is more data that could be included. Some of this might be onerous to collect, for example, some data sets might necessitate contacting every Local Record Centre in the country. The following section highlights some of the data gaps and issue encountered in the project and suggests a way forward for future work.

	Highly Important	Potentially Highly Important	Not important	Total area of CFGM PHI
Area (ha)	**62,115**	**157,513**	**290**	**219,918**
Percentage	**28.2**	**71.6**	**0.1**	**100**

Data gaps and considerations

1. The National Biodiversity Network (NBN) was used as a key source of species data. This allows access to national scale data, however, there are some issues with this, in that it only contains positive records. No recordings are made where a survey was undertaken but the expected species was not found, so absence of a record could be a lack of a survey rather than a lack of the species itself.
2. Participation by local record centres in uploading data to the NBN might also vary and this will have an impact on the completeness of national datasets.
3. More detail for plant species is included on the BSBI database. However, this was unfortunately not accessible for the purposes of this project.
4. The water vole trust has a centrally located dataset that could have been used by the project. However, even though the dataset is centrally held, in order to include it in analysis, permission would have to be agreed with every Local Record Centre in the country. This would be extremely time consuming and would likely lead to areas where no permission could be obtained, therefore a dataset that has no parity across the UK. While water vole records are included in statistics of area contribution above (
5. Table 2.3), they were omitted from the final GIS layer.
6. There are a large number of invertebrate species ranked sufficiently important with association to CFGM to include them in the assessment. However, this number was capped to capture the most important records and to maintain proportionate effort in data collation and preparation throughout the project.
7. Table 2.3 suggests that individual records of invertebrates contribute relatively little unique area to the final extent of ‘highly important’ areas.
8. Landcover Map 2015 and CROME are both strategic data sets at a field sale, created by remote sensing. It is therefore very possible that subfield parcel sized areas of more semi-natural grasslands could be present that are not identified in either of these data sets. More targeted habitat mapping could help refine this aspect. This could include the use of more targeted remote sensing, particularly using a time series of Sentinel-1 radar imagery across a whole year to establish cropping cycles. This could identify heavily utilised (arable) land and in addition help identify larger areas of inundation that

stay wet for over 12 days (covering subsequent acquisition passes by the Sentinel-1 satellite).

9. The actual density of ditches/watercourses which gives the best representation of the habitat is not known and could vary from one part of the country to another. It would be useful to explore this in more detail.

Next steps or potential for further work

The following actions stand out as possible next steps to enhance the mapping of 'highly important' refuges of wetland wildlife within CFGM further:

1. A review of potential sites of CFGM outside of the current PHI would entail a significant amount of ecological spatial modelling which was agreed with the Steering Group was outside of the scope of this project. However, using the methodology developed as part of this project, it would be feasible to assess land outside of the existing CFGM PHI boundary to see if it qualifies for inclusion as either 'highly important' or 'potentially important'. Table 2.2 suggests that a number of relevant species records exist that would qualify sites for inclusion into the 'highly important' category, which are largely or exclusively located outside the current PHI (e.g., snipe).

2. The analysis could be expanded to include datasets that could not be accessed as part of this project to refine the mapping. However, the individual contribution of datasets demonstrated in Column E of Table 2.2 show that a small number of national data layers cover the vast majority of area qualifying as 'highly important' within the current PHI. Therefore, the effort of sourcing and adding additional datasets to the analysis, particularly individual species records, might not be proportionate to the gain derived from these. Considering the species spread, number of records and significance in confirming good quality semi-natural habitats, it would be necessary to concentrate effort on only those which are likely to significantly improve the analysis.

3. Compilations of records such as the National Water Vole Database and Mapping Project overseen by the Wildlife Trust could be very significant in helping to understand high biodiversity values across the CFGM nationally. However, data sharing restrictions prevented the inclusion of the data in the project and it is in effect not usable unless permission is separately sought from each data provider into the project, such as local records centres. A simple project could be undertaken to work with such species recording groups to develop a data sharing template which allow research and government projects to use the data by signing a disclaimer on release of the raw data into the repository. Such national data projects are fundamental for this type of scientific evaluation and their strengthening and enhancement should be continually born in mind.

4. A project considering the land that fell into the 'potentially highly important' category could be carried out to ascertain if this land could be restored through management action to high biodiversity value CFGM. Alternatively, this land would be suitable as more natural functioning as FWM. This could include considering regional differences and field work efforts to determine the presence or absence of key species.

5. A separate project could consider the role remote sensing could play in identifying and monitoring areas of intensive agriculture, included in the PHI where used as feeding/breeding grounds for waders and migrating/overwintering birds, as well as areas of frequent inundation which could be opportunities for reinstatement of more naturally functioning floodplains. This could also assist in prioritising field work effort to survey sites where species and habitat presence could confirm the area into the 'high biodiversity' value class. This would dovetail in with Natural England's Living England project which is aiming to integrate more detail on priority habitats and would benefit from a further targeting study aimed at CGFM.

6. Task 1 of this project identified the 'high biodiversity' part of the CFGM. It was out of scope to consider the hydrological differences between natural flooding, managed flooding and drainage to prevent flooding in all but the most extreme events, of the areas. It would be possible to source data that might help separate the PHI into these different areas. It would be necessary to understand rivers and coastland and the hard engineering infrastructure around them (this data is collected by EA but are large and complex data sets). Water quality data, such as that associated with the Water Framework Directive (WFD), could also be sourced to establish if this could contribute to any further useful division of the PHI.

3. Role of AES in conserving biodiversity in CFGM

3.1 Introduction

This part of the research explored the role of agri-environment schemes in conserving and enhancing the biodiversity value of CFGM. This was based on a national analysis of the take up of agri-environment scheme options within the CFGM Priority Habitat Inventory (PHI) area. Agri-Environment Schemes (AES) were originally established and designed to reduce the negative impact of human activity on the environment. This has been achieved through voluntary agreements with farmers and landowners, and implemented through a series of options, each with its own prescriptions that are linked to target outcomes. AES options and the associated prescriptions have been developed over a period of years, each with specific environmental objectives and outcomes in mind. By way of example, there are over 400 options across the Environmental Stewardship (ES), which ran from 2005-2015, and almost 250 in the current Countryside Stewardship (CS) scheme, which started in 2015. The associated prescriptions for each option cover the management of the habitat or feature and need to be followed in order to comply with the terms of the agreement.

This task explored differences in the spatial pattern of option take up, particularly within Sites of Special Scientific Interest, with the Cs Higher Level Stewardship (HLS) Target Area and those areas identified in Section 2 of this report as being highly important or potentially important refuges for CFGM. The analysis allowed comparison of the option take up within the ES and CS, mindful of some key differences between the two schemes (See Chapter 4).

The national option uptake analysis also allowed some consideration of the relative emphasis that agri-environment scheme options placed on maintaining CFGM habitat in line with the current definition of the priority habitat (noting that this habitat is often dependent on the maintenance of artificial water levels and other interventions) and those options which have the potential to allow the creation of more naturally functioning FWM, as introduced in Section 1. This analysis was based on a simple categorisation of options depending on whether their application was most relevant to CFGM habitats, the establishment of more natural processes or equally applicable to both.

Since this part of the project comprised a desk-based analysis it was based on the assumption that options were delivering their environmental outcomes as set out in option descriptions. While field survey and verification were not practical at the national level, the analysis does identify themes that could be explored in the context of case studies presented in Section 3 of this report.

The desk-based nature of this analysis also means that, while it identifies some clear differences in the level of take up between options, between different areas on the ground and between different schemes, the data do not reveal the reasons for such variations. The research has avoided speculating on drivers which may be financial, to do with land management practices and priorities, the transition between different schemes or perceptions about the importance of the CFGM habitat. The case studies do, however, provide an opportunity to explore some of the reasons behind land managers' selection of different scheme options.

3.2 Methodology

Identification of AES options and capital items to be assessed

The first task was to identify and agree the suite of Environmental Stewardship (ES) and Countryside Stewardship (CS) options that should fall within the scope of the analysis. It was agreed that this would be a three-stage process:

1. Identify all the AES options that had been taken up within the CFGM PHI area. This identified a total of 315 ES and 177 CS options;
2. Identify which of those options are likely to have the most beneficial impact on conserving the biodiversity of CFGM habitat. This involved grading the options from 1 to 5 from most to least beneficial (shown in Table 3.1). We identified a total of 84 ES and 55 CS options within the most beneficial grades (1-3). These options provide the focus for the analysis presented in this chapter; and
3. Classify these subsets of options in terms of their relative focus on managing the existing CFGM habitat and / or contributing to the natural functioning of FWM. We provide a commentary on the relative take up of options in these categories in the following sections.

The results of this categorisation are included in Annex 3.

The grading of beneficial options is shown in Table 3.1 with further detail on this process below.

Table 3.1 Grading of beneficial options

Option grade	Benefit	Reasoning
1	*Most beneficial*	Directly focused on managing habitat / focus on particular species of interest
2	*Quite beneficial*	Could be high / low benefit but determined by onsite circumstances; Entry Level options are less demanding of the land manager than Higher Level and so have a less beneficial impact (equivalent organic options have been included in Higher bracket due to organic management of surrounding land having higher value)
3	*Of benefit*	Some option prescriptions that will have lower positive impact. Organic conversion included here due to long duration of change
4	*Less benefit*	Of less benefit to CFGM
5	*Least beneficial*	Including options which may have adverse impacts on CFGM habitat

(Note that options irrelevant to conserving the biodiversity value of CFGM habitat were discarded at this stage. Examples included options focused on woodland management [e.g. ES HC7] and hedgerow restoration [e.g. ES EB14]).

Grade 1-3 options were further classified into the function they provide for the habitat and whether they maintain the CFGM in accordance with the current definition of the priority habitat[1] or whether they encourage natural function towards a Floodplain Wetland Mosaic (FWM). Options were divided into three groups: CFGM, FWM and both CFGM/FWM. The classification was undertaken through reference to the option prescriptions within the relevant stewardship guidance (more information is available in the Higher Level Stewardship: Environmental Stewardship Handbook and the Countryside Stewardship grants website) as well as discussions with Natural England specialists.

Criteria and assessment process to evaluate the effectiveness of AES in conserving the existing biodiversity value of CFGM

[1] http://data.jncc.gov.uk/data/82b0af67-d19a-4a89-b987-9dba73be1272/UKBAP-BAPHabitats-07-CoastFloodGrazingMarsh.pdf

This part of the project was desk based and used uptake of AES options as an indicator of positive effects on biodiversity value. Effectiveness of AES option was determined to be the coincidence and pattern of option uptake across the following spatial areas:

- Coastal and Floodplain Grazing Marsh (CFGM) Priority Habitat Inventory (PHI) area;
- Environmental Stewardship HLS Target Area (for ES only) which are geographic areas where environmental outcomes are likely to be greatest[2];
- Areas within the CFGM area which are designated as SSSI;
- 'Highly Important' and 'Potential' areas of CFGM as identified under Task 1; and
- Permutations of these different areas.

The relative extent of these areas is summarised in Table 3.2. It should be noted that there is considerable overlap between these different categories, as reflected in the permutations set out in the table.

Table 3.2 Extent of spatial areas included in the analysis

Spatial definition	Hectares
Coastal & Floodplain Grazing Marsh (CFGM) Priority Habitat Inventory (PHI) area	219,918
CFGM and identified as 'Highly Important' areas	62,050
CFGM and identified as 'Potentially Important' areas	157,266
CFGM and designated as SSSI	31,784
CFGM, designated as SSSI and identified as 'Highly Important' areas	29,710
CFGM, designated as SSSI and identified as 'Potentially Important' areas	2,071
CFGM and CS HLS Target Area	116,671
CFGM, CS HLS Target Area and designated as SSSI	21,925
CFGM, CS HLS Target Area and identified as 'Highly Important' areas	41,493
CFGM, CS HLS Target Area and identified as 'Potentially Important' areas	75,070

The CS HLS Target Area (all habitats) totals 4,711,499 hectares of which 116,671 hectares or 2.5% coincides with the Coastal and Floodplain Grazing Marsh Priority Habitat Inventory area.

3.3 Results of option uptake analysis

The following subsections present the results of the analysis, focusing on those options which were taken up most frequently, or applied to the largest area in each case. Full results, showing the uptake of all options are included in Annex 4.

The analysis presented in this chapter maintains a distinction between options taken up under the ES and CS schemes. The latter is more recent, and the total number of options is significantly lower.

The analysis is presented in three ways:

[2] https://data.gov.uk/dataset/ccb69892-13ff-45ad-9347-f6aeeb7b84b0/hls-target-areas

- In terms of the number of options taken up;
- The physical unit (e.g. area or length) covered by options; and
- For those options which are measured in hectares, the proportion of the area in question (e.g. CFGM or 'important' area) covered by these options.

Analysis by number of agreements

Environmental Stewardship

Table A4.1 shows the 20 most popular options taken up by the number of ES agreements they feature within. The table shows that, in terms of numbers of agreements, relatively few options dominate, with a similar pattern across most of the geographic areas analysed.

Overall, **HK15** *Maintenance of grassland for target features* and **HK10** *Maintenance of wet grassland for wintering waders and wildfowl* are by far the most popular options, between them accounting for more than a quarter of agreements. **HK15** is most popular within non-SSSI parts of the CFGM area and in areas judged to be of 'potential' importance for CFGM habitat. The more specific **HK10** is more popular in SSSIs and 'highly important' areas.

The following eight most frequently used options account for around 60% of the option uptake within the CFGM area:

- **HK15** *Maintenance of grassland for target features* (14%)
- **HK10** *Maintenance of wet grassland for wintering waders and wildfowl* (13%)
- **HR1** *Grazing supplement for cattle* (7%)
- **EB6** *Ditch management* (6%)
- **HK9** *Maintenance of wet grassland for breeding waders* (6%)
- **HK7** *Restoration of species-rich, semi-natural grassland* (5%)
- **EB7** *Half ditch management* (4%)
- **HK11** *Restoration of wet grassland for breeding waders* (4%)

Options categorised as focusing on the management of existing CFGM are most numerous, with only one option in the 'top ten' (**HR1** *Grazing supplement for cattle*) potentially contributing to FWM. **HQ6** *Maintenance of Fen*, is the most numerous option focused specifically on FWM, ranked as the 19th most popular of these options within the CFGM area.

This finding may reflect the emphasis of current agri-environment schemes on maintaining existing areas of CFGM in line with the recognised definition of the habitats, rather than on the more recent interests in moving towards more naturally functioning floodplains. With no specific HLS or CS option for CFGM habitat, management is geared towards species management (waders/wildfowl or/and ditches) rather than consider what needs to be done for the floodplain as a habitat.

Countryside Stewardship

Table A4.2 shows the 20 most popular options taken up by the number of CS agreements they feature within. Again, the table shows that in terms of the number of agreements, relatively few options dominate. **GS10** *Management of wet grassland for wintering waders and wildfowl* is the most numerous option within all geographic permutations, suggesting that CS is achieving a more targeted and species-specific influence than ES. This is evident within SSSI and 'Highly important' areas. The top three options, all focusing on the management of grassland for target features, waders or wildfowl, account for over a third of all the options taken up within the CFGM area. This suggests that CS is having a more targeted effect on managing the CFGM habitat for biodiversity.

More broadly, the following eight most frequently used options account for around 60% of the option uptake within the CFGM area:

- **GS10** *Management of wet grassland for wintering waders and wildfowl* (16%)
- **GS13** *Management of grassland for target features* (10%)
- **GS9** *Management of wet grassland for breeding waders* (9%)
- **FG12** *Wooden Field Gate* (7%)
- **WT3** *Management of ditches of high environmental value* (7%)
- **GS17** *Lenient Grazing Supplement* (6%)
- **SP6** *Cattle grazing supplement* (4%)
- **GS16** *Rush infestation control supplement* (3%)

Two options, **FG12** *Wooden Field Gate*[3] and **GS17** *Lenient Grazing Supplement*, are not geared towards better management of CFGM as per the JNCC definition of the habitat and show relatively lower levels of take up in SSSI and 'highly important' areas and higher take up in 'potential' areas.

Compared with ES and based on the number of options recorded, CS options offer greater potential for the creation of natural functioning FWM, with half of the top ten options offering potential to support for FWM. **WT8** *Management of Fen* is the most numerous of these options, ranked as the 11th most popular of these options within the CFGM area. The option guidelines for **WT8** indicate that the option is suited to Priority Habitat fen, small areas of Priority Habitat reedbed (<2 ha) or a mosaic of the two. It may include habitat in poor condition where there is a reliable and adequate water supply to enable restoration. This suggests that this option is acceptable for CFGM but offers the option to expand this habitat. It may indicate management incorporating wetland habitat mosaics and potentially a move towards natural functioning.

Analysis by option area, length and number

Environmental Stewardship

Area (ha)

Table A4.3 shows the top 20 ES options with the greatest take up in area in hectares. The table shows that, in contrast to the analysis of the number of agreements, the options with the greatest area coverage mainly relate to the management of rush pasture (both ELS and its HLS equivalent option feature in the top 20), and successional areas and scrub (**EK4** *Manage rush pastures: outside SDA & ML*, **HC15** *Maintenance of successional areas and scrub*, **HC16** *Restoration of successional areas and scrub*, **HC17** *Creation of successional areas and scrub*).

It is possible the high uptake of ELS options could be related to the requirement of points to enter into HLS (**EK4** *Manage rush pastures* and **EK5** *Mixed Stocking* have the greatest coverage). While included in the top 20 options in terms of area take up, options focussing on the maintenance or restoration of water meadows (**HD10** *Maintenance of wet grassland for wintering waders and wildfowl* and **HD11** *Restoration of traditional water meadows*) and options focused on wet grassland, waders, wildfowl and other target species (**HK10** *Maintenance of wet grassland for wintering waders and wildfowl*, **HK11** *Restoration of wet grassland for breeding waders*, **HK12** *Restoration of wet grassland for wintering waders and wildfowl,* **HK13** *Creation of wet grassland for breeding waders,* **HK14** *Creation of wet grassland for wintering waders and wildfowl*, **HK15** *Maintenance of grassland for target features,* **HK16** Restoration of grassland for target features and **HK17** *Creation of grassland for target features*) account for 15% of the total area covered by all ES options within the CFGM area.

Patterns of take up are broadly similar across geographic areas. The principal exceptions include a greater emphasis on maintenance of successional areas and scrub (**HC15**) within

[3] The ES equivalent is GF Wooden field/river gate

SSSIs and 'highly important' areas. Within the wider HLS Target Area (outside the CFGM area), **HC16** *Restoration of successional areas and scrub* accounts for the largest area.

Interestingly, this analysis suggests much greater support for FWM, with four of the five options with greatest coverage within the CFGM focused specifically on FWM or potentially supporting more naturally functioning floodplains.

The eight most popular options account for nearly 80% of the area uptake.

Area (m^2)

Table A4.4 shows the ES options in order of the greatest take up in area in m^2. The figures suggest a clear emphasis on pond restoration across most of the geographic areas with the largest area accounted for by option **PR** *Pond restoration - first 100 sq m*. Pond creation is occurring at a much smaller scale, but appears to be the main focus of activity within 'potentially' important areas. All four of these options could contribute to more naturally functioning floodplains.

Length

Table A4.5 shows the ES options measured in linear metres in the order of greatest uptake. The table shows a very clear emphasis on the restoration of ditches, dykes and rhines (**DR** *Ditch, dyke and rhine restoration*) and, to a lesser extent, the management of ditches or half ditches (**EB6** *Ditch management* and **EB7** *Half ditch management*). This pattern appears consistent across all geographic areas.

Number

Several ES options are measured in terms of the number of items implemented on the ground. Table A4.6 shows the take up of these options according to the different permutations of geographic areas. The table shows that the most common item in this category is related to the maintenance of large ponds of high wildlife value. Coppicing of bank side trees was also a frequent item, though it is notable that no examples of this option were recorded in 'highly important' areas, with all found in 'potential' areas. This suggests the absence of bank side trees as a characteristic of 'important' areas and the targeting of work within 'potential' areas to improve their value.

Countryside Stewardship

Area (ha)

Table A4.7 shows the top 20 CS options with the greatest take up in area in hectares. Unlike ES, the table shows that the CS options with the greatest area coverage focus on the management of wet grassland for wildfowl and wintering and breeding waders (**GS10** *Management of wet grassland for wintering waders and wildfowl* and **GS9** *Management of wet grassland for breeding waders*), together accounting for around 50% of the total hectare uptake in the CFGM area. This indicates that the most popular options across agreements also account for the largest areas of option uptake. 'Potential' areas have a lower proportion of uptake under **GS9** *Management of wet grassland for breeding waders* and higher proportions under management for target features (**GS13** *Management of grassland for target features*) and lenient grazing (**GS17** *Lenient Grazing Supplement*).

The top eight options together account for almost 90% of area uptake.

The analysis shows moderate support for naturally functioning FWM, with three of the most popular options having potential to contribute to this type of management and a further four within the top 20 more specifically categorised as focusing on FWM (**WT8** *Management of fen*, **CT3** *Management of coastal saltmarsh*, **WT12** *Wetland grazing supplement,* **SW16** *Flood mitigation on permanent grassland,* **WT6** *Management of reedbed,* **WT11** *Wetland cutting supplement*). However, there is a notable absence of uptake of **SW16** *Flood mitigation on permanent grassland* in SSSIs and 'highly important' areas.

Length

Table A4.8 shows the CS options measured in linear metres in the order of greatest uptake. The table shows that, unlike ES where the emphasis was on ditch, dyke and rhine restoration, the focus of CS options was on the management of ditches of high environmental value (**WT3** *Management of ditches of high environmental value*). This suggests a greater emphasis on those areas which are already of higher value. The exception to this is 'potential' areas where there is an increased proportion of options focused on restoration of ditch, dykes and rhines, and implementation of infrastructure for stock management. Most of these options have potential to contribute to more naturally functioning floodplains.

Number

Several CS options are measured in terms of the number of items implemented on the ground. Table A4.9 shows the take up of these options according to the different permutations of geographic areas.

The most numerous options, measured in number of items taken up, are wooden field gates, followed by pond restoration, and creation and the installation of culverts and ditches. Five of the eight options listed have potential to contribute to more naturally functioning floodplains.

Proportion of area covered by options

Environmental Stewardship

Area (ha)

Table A4.10 shows the relative proportion of each geographic area covered by ES options according to the different permutations of geographic areas as described in 1.2 above. Together, the top 20 options account for close to 95% of the area covered by all options in the CFGM area.

The proportion of each area covered by these ES options varied considerably. Taking account of all the options (not just the top 20), this proportion ranged from around 80% for SSSIs and over 55% for 'highly important' areas to around 20% for the 'potential' and just 9% for the wider HLS target area (reflecting the inclusion of other target habitats). While, in reality, it is likely that there are many instances of overlapping options (meaning that these percentage figures are misleading), they do confirm a focus within the most valuable areas – SSSIs and 'important' areas.

This pattern is evident across many of the options. **EK4** *Management of rush pastures*, for example, accounts for around 16% of the area of CFGM that are designated as SSSI, 12% of the area of CFGM that falls into the 'highly important' category and 17% of the areas of CFGM that are simultaneously designated as SSSI and 'highly important'. This compares to just 6.5% of the CFGM area as a whole. **HC15** *Management of successional scrub* shows a similar pattern. Again, it is possible the high uptake of ELS options could be related to the number of points required under ES to enter into HLS. As would be expected from the previous analysis of hectare take up, those options focusing on the management of wet grassland for birds account for a very much smaller proportion of each area, though the bias in favour of SSSIs and 'important' areas is repeated.

Again, this analysis suggests support for FWM, with four of the five options with greatest coverage within the CFGM focused specifically on FWM or potentially supporting more naturally functioning floodplains. The relative take up of FWM options is higher within those parts of the CFGM area designated as SSSI or identified as 'highly important'.

Area (m^2/100ha)

Implementation of a number of ES options is expressed in m^2. **Table A4.11** shows the relative proportion of each geographic area covered by ES options (expressed as m^2 per 100 hectares) according to the different permutations of geographic areas as described in 1.2 above.

Again, the figures suggest a clear emphasis on pond restoration across most of the geographic areas with the largest area accounted for by option **PR** *Pond restoration - first 100 sq. m*. Rates of pond restoration appear to be significantly higher in parts of the CFGM area that fall within SSSIs, 'highly important' areas, and/or the HLS Target area. It is notable that 'potential' areas have much lower rates of pond restoration (though there is some evidence of temporary ponds being created in areas that are within SSSIs and are designated as 'potential' areas). This suggests that in terms of pond restoration, ES is targeting pond restoration in those areas of greatest importance for CFGM habitats.

Length (m/100ha)

Several ES options are linear in nature with implementation measured in metres. **Table A4.12** shows the relative proportion of each geographic area covered by ES options (in metres per 100 ha) according to the different permutations of geographic areas as described in 1.2 above. Column 1 indicates whether the option in question has been categorised as focusing on the management of CFGM (green), FWM (blue) or both (amber).

The table suggests a clear emphasis on ditch, dyke and rhine restoration and, to a lesser extent, ditch management, across most of the geographic areas. Rates of restoration and management appear to be significantly higher in parts of the CFGM area that fall within SSSIs, 'highly important' areas, and/or the HLS Target area. 'Potential' areas generally have lower rates, except where they include SSSIs. This suggests that in terms of ditch restoration and management, ES is targeting those areas of greatest importance for CFGM habitats.

Options with the greatest length per 100 ha tend to be focused on CFGM, with two having potential to support FWM. **FPE** *Permanent Electric Fencing* appears to be most used in parts of the CFGM area that are both SSSI and 'highly important', but comparatively less used in areas of the CFGM that are 'important' but not SSSI. **HB14** *Management of ditches of very high environmental value* is most used within SSSIs.

Number per 100ha

Several ES options are measured in terms of the number of items implemented on the ground. Table A4.13 shows the relative proportion of the number of items per 100 hectares according to the different permutations of geographic areas as described in 1.2 above.

The table shows the most common item in this category related to the maintenance of large ponds of high wildlife value and there was a relative concentration of this option taken up within SSSI and 'important' areas. Coppicing of bankside trees was also a frequent item, though as noted previously, no examples of this option were recorded in 'highly important' areas, with all found in 'potential' areas. This suggests the absence of bankside trees as a characteristic of 'highly important' areas and the targeting of work within 'potential' areas to improve their value. This suggests that for maintenance of large ponds and pollarding of bank side trees, there is clear targeting of activity to where it contributes to conservation or restoration of CFGM habitat.

Again, the most numerous options per 100ha tend to be focused on CFGM habitats. Those that do offer potential support for FWM tend to be of most importance in SSSIs.

Countryside Stewardship

Area (ha)

Table A4.14 shows the relative proportion of each geographic area covered by CS options according to the different permutations of geographic areas as described in 1.2 above.

Unlike ES, the table shows that the CS options with the greatest area coverage focus on the management of wet grassland for wintering waders and wildfowl, target features and breeding waders (**GS10** *Management of wet grassland for wintering waders and wildfowl*, **GS13** *Management of grassland for target features* and **GS9** *Management of wet grassland for breeding waders*). 'Potential' areas have a lower proportion of area under **GS9** *Management*

of wet grassland for breeding waders and higher proportions under management for target features (**GS13**) and lenient grazing (**GS17**).

Three of the four most important options have potential to contribute to FWM, but options categorised as focusing more specifically on FWM management account for much lower proportions across the board. Comparing the number of CS agreements that feature these FWM options with the spatial area and the proportion of these geographic iterations that they cover suggests that although they do not feature in many agreements, where they are taken up their coverage is relatively high.

Length (m/100ha)

Several CS options are linear in nature with implementation measured in metres. **Table A4.15** shows the relative proportion of each geographic area covered by CS options (in metres per 100 ha) according to the different permutations of geographic areas as described in 1.2 above.

The table shows that, unlike ES where the emphasis was on ditch, dyke and rhine restoration, the focus of CS options was on the management of ditches of high environmental value (**WT3** *Management of ditches of high environmental value*). This suggests a greater emphasis on those areas which are already of higher value. The exception to this are 'potential' areas where there an increased proportion of options focused on restoration and stock management. Four of these options have the potential to contribute to more naturally functioning floodplains.

Number per 100ha

Several CS options are measured in terms of the number of items implemented on the ground. Table A4.16 shows the relative proportion of the number of items per 100 hectares according to the different permutations of geographic areas as described in 1.2 above.

The most numerous options, measured in take up per 100ha, are wooden field gates, followed by pond restoration, and creation and the installation of culverts and ditches. Five of the eight options listed have potential to contribute to more naturally functioning floodplains.

Comparison of ES and CS

The final stage was to provide a ranked analysis of the number of agreements and the area covered by ES and CS options together. There is a clear difference in the number of options taken up under each scheme with more than four times as many ES options recorded in the CFGM area than under CS. This is largely a result of the different periods over which the schemes have operated (ES ran from 2005 until being replaced by the current Countryside Stewardship Scheme in 2014). It also reflects the larger number of options that were applicable to CFGM (the analysis here identified 84 ES options compared with 55 CS options relevant to this habitat). It may also be a product of the different characteristics of the schemes, including the competitive nature of CS, scheme eligibility and a suggestion that some agreement holders are holding off entering CS in anticipation of the forthcoming Environmental Land Management scheme.

Table A4.17 compares the two schemes' options, based on an unpublished equivalence table prepared by Natural England. While there is not complete read-across between the two schemes, it does allow comparison of the rates paid under the two schemes, including for the most frequently used options.

- Looking across all the options included in this analysis, the figures indicate that payments under CS are generally higher than under ES (29 option rates are higher and only 8 option rates lower under CS).
- Focusing on the most frequently used CS options, the picture is slightly different, with equal numbers of option rates being higher and lower under CS).
- Furthermore, the top three CS options (accounting for over a third of option take up) the option rates are lower than for the equivalent ES options.

- Comparison of options classified as potentially supportive of FWM and those more clearly focused on maintaining CFGM habitats suggests that over 40% of FWM options have lower rates under CS than ES compared to just 13% for CFGM focused options.
- While two of the most frequently used ES options (**EB6** and **EB7** ditch and half ditch management – both of which are Entry Level Stewardship option) do not have direct equivalents under CS. The closest is CS option **WT3** *Management of ditches of high environmental value*, which focuses support on more environmentally valuable ditches.

Taken together, these figures suggest that the option payments for the most frequently used CS options, and those with potential to support management for FWM, are more likely to have seen a reduction (compared with ES rates) than the longer list of options analysed here. This may have had the effect of discouraging uptake in CS compared with ES.

Table A4.18 shows the number of ES and CS agreements, Table A4.18 shows the total area coming under these agreements, in hectares and Table A4.19 shows the proportions of each area covered by ES and CS options. While the analysis confirms the dominance of ES in terms of numbers of agreements, it does highlight a number of CS options that are of significance in terms of the number of agreements and the area covered (in absolute and relative terms). Five of the top ten options in terms of area and proportion of area covered support more naturally functioning floodplains.

3.4 Conclusions

This section provides a summary of the findings from the national analysis of option take-up with the CFGM area. These conclusions are based on an analysis of the take up of AES options and the assumption that these options are effective in delivering their environmental objectives. It is a national level assessment and therefore not able to draw conclusions about the take-up of options relating to specific features such as ditches relative to the actual extent of that feature on the ground. Nor has it been able to explain differences in take-up, particularly where local factors and land manager motivations and awareness are important. However, it has allowed comparison of the number of options and the area covered. It has also allowed the comparison of rates of take-up within different spatial areas, including areas designated as SSSI or defined as being 'highly important' or 'potentially important' areas for CFGM in Section 2 of this report.

- The analysis of AES (ES and CS) suggests a large number of possible options are taken up within the CFGM area. This includes a range of options not directly related to CFGM habitat or the move towards FWM, reflecting wider patterns of land management within holdings.
- Within these long lists of ES and CS options, a relatively small number of options accounts for a significant share of uptake. The eight most frequent ES options, and eight most frequent CS options both account for 60% of take up within the CFGM area, and, under both schemes, the two most frequent options accounting for around a quarter of uptake. For both schemes, these two most frequent options are effectively the same; HK15 *Maintenance of grassland for target features* and HK10 *Maintenance of wet grassland for wintering waders and wildfowl* under ES, and GS10 *Management of wet grassland for wintering waders and wildfowl*, and GS13 *Management of grassland for target features*.
- The analysis suggests that greater targeting of options occurs under CS than ES. The most popular ES option, for example, focuses on undefined 'target features' whereas the equivalent CS option targets wintering waders and wildfowl. This pattern is particularly evident when the area covered by options is considered, with ES options covering the largest area relating to broader habitat management, whereas for CS options with the objective of achieving conditions for wetland birds have the greatest coverage. Some

options which could play a key role in managing CFGM habitats (e.g. management of ditches of high environmental value) show relatively low uptake, particularly for ES.

- The analysis included a comparison of take up in different geographic areas. It showed that option take up is generally higher within SSSIs and areas that Task 1 of this report had defined as being 'highly important' for CFGM (in part reflecting their protected status). This pattern is particularly true for those options focused on conserving nature conservation interest. In areas outside SSSIs and where the Task 1 analysis identified areas of 'potential importance', the emphasis was on options supporting restoration or management of CFGM habitats. This suggests that AES are successfully targeting conservation of the highest value habitats and work to improve biodiversity value elsewhere.
- The analysis considered the relative importance of options focused on managing CFGM habitats, those focused on supporting more naturally functioning FWM and those that could achieve both objectives. The analysis suggested that many of the options with the greatest geographic coverage had potential to support a move towards FWM or could support FWM or conserve CFGM habitats. However, it also showed that quite a large number of FWM options have low levels of take up overall.
- The comparison of uptake under ES and CS schemes confirmed the much larger number of agreements under ES, largely a reflection of the longer operation of that scheme. However, comparison of payment rates under the two schemes indicated that, for some of the most popular options, CS payment rates were lower than under the previous and equivalent ES option. This may also contribute to lower option take up, together with the suggestion that some land managers have been reluctant to enter CS, instead waiting for the new ELM scheme to come into operation.

Therefore, the overall conclusion from this national analysis, is that AES do appear to be contributing to the conservation of existing biodiversity value of CFGM. This contribution is concentrated amongst a relatively small number of options, with some options which offer potential benefit having low levels of take up. CS does appear to be more targeted than ES, while both schemes show an emphasis on conservation within the areas of highest habitat value and restoration/management in areas of lower value, or potential value. Many of the options with the greatest coverage support more naturally functioning FWM. Many of the options with the greatest coverage could support a change in management approach with a move towards restoring a more naturally functioning FWM.

While this analysis has been able to point to a number of factors which may influence the pattern of option take up, it has not been able to take account of their application on the ground, or the influence of land manager motivations and awareness of CFGM. Section 4 of this report presents the findings from a series of case studies which provided an opportunity to explore some of these issues if different settings around the country.

4. Case Studies of AES and CFGM

4.1 Methodology for Case Study Selection

The next step was to understand how AES are performing on the ground in locations across the country, and to explore any challenges and opportunities presented through further desk study and interviews with agreement holders and NE advisers.

The objective was to identify five case study areas in which the spatial patterns and issues raised in Tasks 1 and 2 of the report could be explored in greater detail.

The process was broken down into the following four sub-tasks:

1: To agree the case study sites and the issues to be explored in each.
2: To confirm the AES options and capital items relevant to each of the case studies and analyse the level of uptake within each case study area.
3: To define the criteria that will be used to evaluate the influence of AES options on wildlife value and natural floodplain functioning.
4: To agree and implement the assessment process. Site analysis will evidence the influence of AES options on the ground.

Sub-task 1: To agree the case study sites and the issues to be explored in each

A long list of 47 potential case study sites was developed (see **Annex 5**) which included the initial 12 listed in the project brief, and guided by both the spatial analysis undertaken in Task 1 and the option analysis undertaken in Task 2. This long list was reduced to a short list of five case studies to provide a varied sample of the following features:

- Geographic spread across England
- Different agricultural landscape types (e.g. eastern arable versus western mixed)
- Coastal and riparian
- Areas inside and outside of 'highly important' areas as identified in Task 1
- Areas inside and outside the general HLS target area
- Areas with higher and lower uptake of AES options
- Areas where there are relevant options taken up outside of the CFGM PHI
- Areas inside and outside of SSSIs (in favourable or unfavourable condition)
- A range of land managers (private farmers and NGOs)

The five shortlisted case studies were agreed given the above considerations and through consultation with the project Steering Group. They are as follows:

1. Severn Estuary: Steart Marshes, Somerset and Lydney, Gloucestershire
2. Test Valley, Hampshire
3. Yare Valley, Norfolk
4. Cayton and Flixton Carrs, North Yorkshire
5. Lyth Valley, Cumbria

A summary of each case study and the reason(s) for inclusion is included in Table 4.1.

The location of each case study within England is shown in Figure 4.1.

Table 4.1 Case study selection criteria

Case study Area	Agreement holders (type)	CFGM Highly Important area (H) / Potentially important area (P)	Coastal (C) / Floodplain (F)	Linear (L) / Group (G)	SSSI	AES (ES, CS)	HLS target area (Y/N)	Soils	Reasons for inclusion / Issues to be explored
1. Severn Estuary, Steart Marshes (Somerset)	NGO	H / P	C	G	Partially	Mainly ES	N	Loamy & Sandy	Coastal realignment: A highly engineered coastal realignment managed by an NGO (Wildfowl and Wetland Trust) under ES agreement. Dependent on AES for the work to be realised. Comparison with coastal realignment at Lydney. Looking at coastal floodplain management approach moving from heavily managed towards a more naturally functioning floodplain. Land both in and out of SSSI.
1. Severn Estuary, Lydney (Gloucester)	Private Farmers	H / P	C	G	N	Mainly ES	N	Loamy	Coastal realignment: A breached sea defence on Environment Agency owned land that is managed by tenant farmers. Dependent on AES for the work to be realised. Comparison with coastal realignment at Steart Marshes. Looking at coastal floodplain management approach moving from heavily managed towards a more naturally functioning floodplain.
2. Test Valley, north of Romsey (Hampshire)	Private Farmers	P	F	L	Partially	Mainly ES	Y	Loamy	All of the study area is 'potentially highly important' as opposed to 'highly important'.
3. Yare Valley (Norfolk)	Private Farmers, NGO	H	F	L	Partially	ES, CS	Y	Loamy	Land management practises and motivation of an NGO- RSPB Buckenham and Cantley. Widespread beneficial option uptake in both ES and CS agreements in this area.

Case study Area	Agreement holders (type)	CFGM Highly Important area (H) / Potentially important area (P)	Coastal (C) / Floodplain (F)	Linear (L) / Group (G)	SSSI	AES (ES, CS)	HLS target area (Y/N)	Soils	Reasons for inclusion / Issues to be explored
									Most of the area is classified as 'highly important'. Land both in and out of SSSI. Grade 1 options for restoration and maintenance of fen (HQ6, HQ7) taken up outside of CFGM PHI, particularly in RSPB managed land. May suggest a more naturally functioning floodplain.
4. Cayton and Flixton Carrs (North Yorks)	Private Farmers	P	F	G	N	ES, CS	N	Peaty	No national or local designations. Peri-urban. All of the case study area is 'potentially highly important', no areas classified as 'highly important'. There has been a long-standing project to bring land managers into AES in the area, although local advisers feel that this has been unsuccessful. Opportunity to discuss some FWM options taken up in the surrounding area - does the area lend itself perhaps to restoration of natural function?
5. Lyth Valley (Cumbria)	NGO, Private Farmers	H / P	F	G	N	ES	Y	Peaty	Opportunity for engagement with an NGO (the National Trust) on their CFGM habitat creation and management work. Engagement with National Trust and their tenant farmers on the Park End Scheme wetland restoration work outside of the CFGM.

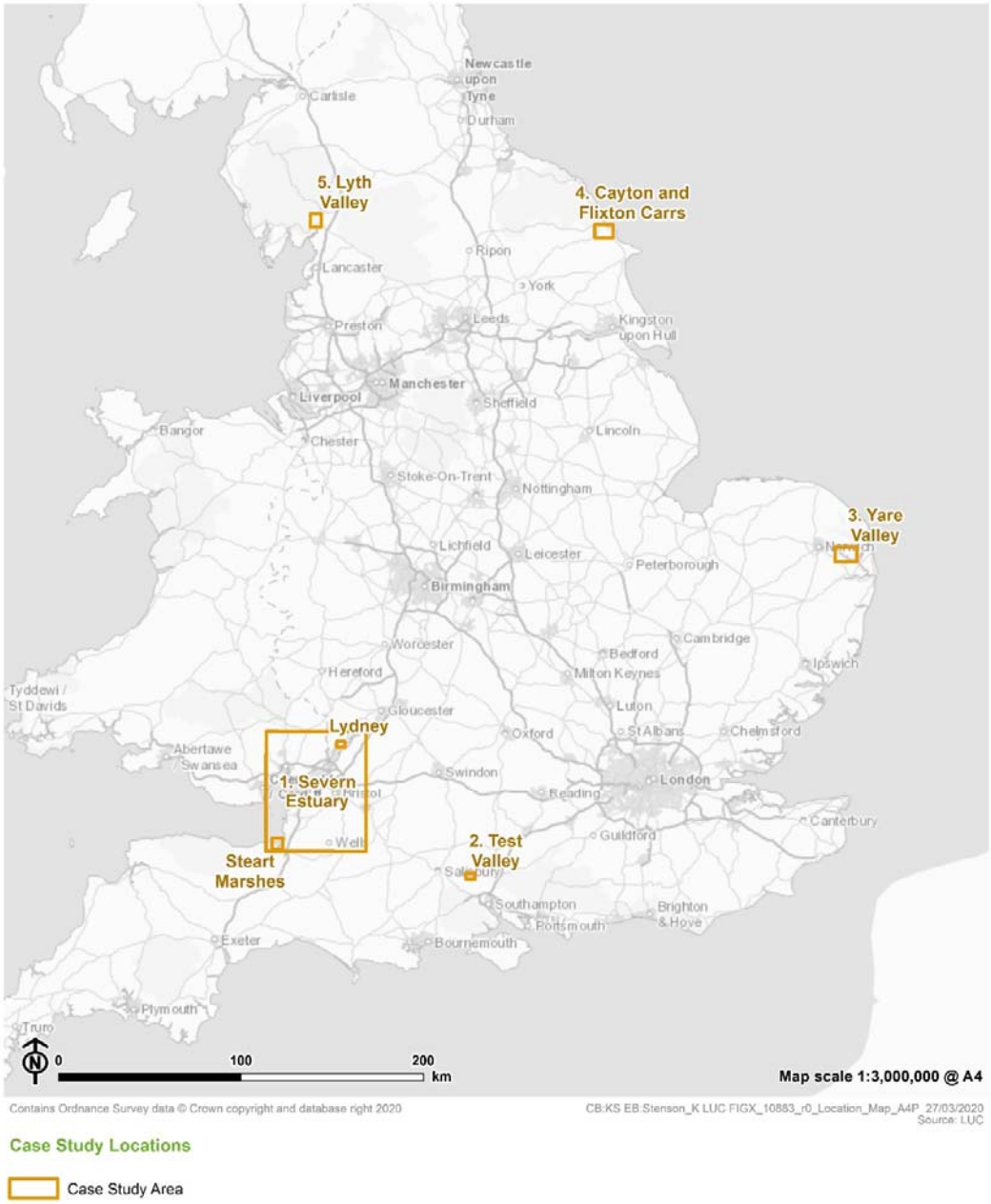


Figure 4.1 Location of the five case studies across England (numbered 1-5)

Sub-task 2: To confirm the AES options and capital items relevant to each of the case studies and analyse the level of uptake within each case study area.

Geographical Information Systems (GIS) mapping was used for desk-based identification of the AES options taken up within each case study location. These were summarised by scheme (ES or CS), the grading of beneficial options (1-5) as described in Chapter 3 (3.2, sub-task 1), and whether the option was classified as CFGM, FWM or both. This information facilitated a comparison between case studies of the location of options taken up, the type of options and their extent across the CFGM and individual land holdings.

The analysis flagged areas of interest that could be explored further in discussions with land managers and NE advisers. For example, areas of CFGM habitat that were identified as 'highly important' in Task 1 but had few or no options taken up and therefore, could signal a need for more refined spatial targeting of AES. Equally, areas outside the current CFGM habitat that had high levels of the most beneficial options taken up which could signal a need to change the current CFGM boundary.

Sub-task 3: To define the criteria that will be used to evaluate the influence of AES options on wildlife value and natural floodplain functioning.

All Environment Stewardship (ES) and Countryside Stewardship (CS) options taken up within the CFGM were reviewed in terms of their value for managing CFGM habitats during Task 2. Details of the method of analysis can be seen in Chapter 3 within the table of options included in Annex 3.

Sub-task 4: To agree and implement the assessment process. Site analysis will evidence the influence of AES options on the ground.

The uptake of options was analysed within each case study area and informed the selection of agreement holders for contact (see Annex 6). Interview questions were developed to ensure discussions with land managers and NE advisers were consistent and findings comparable (Annex 7). Questions were designed to explore:

- Agreement holders' understanding of the biodiversity importance of CFGM;
- The role of AES in maintaining or enhancing the biodiversity importance of CFGM;
- reasons for uptake or lack of uptake of beneficial options, particularly within SSSIs or areas identified during Task 1 as 'highly important';
- Practical and financial issues associated with option implementation, and the outcomes of specific option uptake for habitats and biodiversity value (positive, neutral and negative);
- Whether AES and specific options can be better targeted; and
- Suggestions from agreement holders and NE advisers on improvements to be adopted by the new ELM.

Local NE advisers were engaged for each region, and through discussion with them, local agreement holders were invited to participate in the project. Twelve interviews were undertaken in total, with interviews held with an agreement holder and a separate interview

with the local NE adviser undertaken for each case study area. As the case study for the Severn Estuary covered two separate areas with two different NE advisers, an agreement holder and an adviser were interviewed for each area.

Interviews with land managers and NE advisers were held over the telephone, with each interview adjusted slightly to cover land management issues specific to the area or issues pre-emptively highlighted by area advisers. For example, questions covering coastal realignment in Steart Marshes and Lydney, and questions covering the National Trust Park End Scheme in the Lyth Valley.

The five case studies reports include:

- A summary of the key issues raised,
- Justification for the choice of case study location,
- A summary table of the options taken up,
- An exploration of the issues, opportunities, and suggestions for the future through the views of the NE adviser and agreement holder interviewed for the case study.

Site photos of the CFGM within the case study areas are included where provided by the interviewees alongside figures detailing:

- CFGM PHI, CFGM 'highly important' areas, the HLS target area, SSSIs;
- CFGM PHI, ES and CS agreement areas, uptake of the most beneficial grade 1 options for ES and CS;
- CFGM PHI, ES and CS agreement areas, uptake of the least beneficial grade 5 options for ES and CS.

The aim of the case studies was to provide an insight into the experiences of agreement holders and advisers when managing CFGM with AES in various locations around England. **Table 4.1** summarises the numerous and sometimes contrasting factors influencing the management of the CFGM. The case studies highlight the shared and differing views of agreement holders and advisers, rather than a comprehensive assessment. Consequently, the views shared are those of individuals rather than being representative of all agreement holders and advisers.

4.2 Severn Estuary, Somerset and Gloucestershire

Key Findings

- Local hydrology: Two coastal realignment projects along the Severn Estuary; a highly engineered realignment project, and a breached sea defence creating coastal salt grazing marsh. In both cases, flooding appears to be working as intended, with the site at Steart Marshes held as an example of what could be achieved along the coast. The projects were both on EA owned land; whether the realignment and management would be achievable under different ownership and management conditions is debatable.
- Options taken up at Steart Marshes (ES agreement) within the CFGM habitat included **HK7** *Restoration of species-rich grassland*, **HK11** *Restoration of wet grassland for breeding waders*, **HR1** *Grazing supplement for cattle* which are three of the most popular ES options nationally for this habitat. Other most beneficial options are broadly creation and restoration options. At Lydney (also ES agreement), options are focused on management of the saltmarsh which were less popular at a national level.
- Importance of AES for management of CFGM: Both coastal realignment projects have relied on the financial benefits of AES to achieve the changes to both species and habitat.
- Effectiveness in increasing biodiversity: More broadly across CFGM in the Severn Estuary, AES have limited further degradation, but there have not been any widespread improvements.
- Thoughts on restoration of natural function: more naturally functioning floodplain management would be beneficial for CFGM protection as it quickly allows habitat to establish and stabilise. Greater input from the Environment Agency on strategic water management in the Severn Estuary area would be worthwhile.
- Suggestions for future ELM: land managers would like to see greater flexibility in prescriptions, particularly around timings, simple annotated map, pictorial explanations, limited word count, and include farmer / stakeholder inputs.

Site Context

A coastal case study to compare two coastal realignment projects along the Severn Estuary. Steart Marshes in Bridgwater, Somerset is a highly engineered coastal realignment managed by an NGO (Wildfowl and Wetland Trust (WWT)) under ES agreement, whereas Lydney in the Forest of Dean, Gloucestershire is a breached sea defence on Environment Agency owned land that is managed by tenant farmers under ES agreement. The case study will explore the role of AES in realising the work and how management has moved away from a heavily managed CFGM towards a more naturally functioning floodplain. Additionally, a 65ha area in the northern part of WWT land at Steart Marshes falls within the Bridgwater Bay SSSI which is currently in unfavourable recovering condition. The case study will explore whether management differs in and out of the SSSI and if AES have helped to maintain or improve SSSI condition.

Figure 4.2 shows the location of the two study areas. Figures 4.3 - 4.5 show the Steart Marshes area with the CFGM PHI, HLS target area, SSSI, CFGM 'highly important' areas marked, and the most and least beneficial options taken up. Figures 4.6 – 4.8 show the Lydney area with the CFGM PHI, HLS target area, SSSI, CFGM 'highly important' areas marked, and the most and least beneficial options taken up.

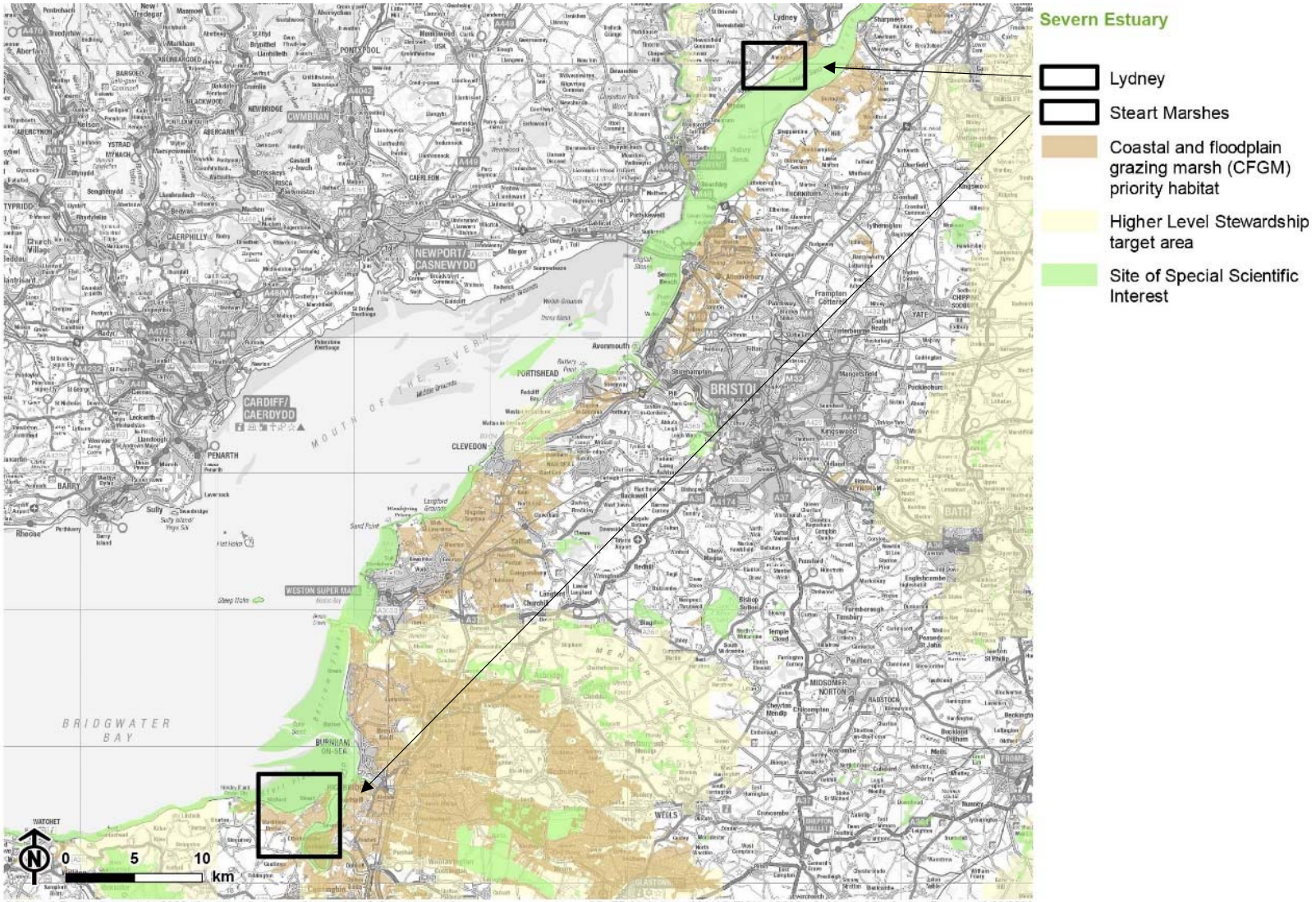


Figure 4.2 Severn Estuary Case study showing the two agreement holder areas, CFGM PHI, HLS target area

Options taken up – Steart Marshes

Table 4.2 shows options taken up in the Steart Marshes area. There is widespread uptake of **HP5**, **HP8** and **HP10**, all of which are saltmarsh options and could support a more natural functioning FWM approach. These do not appear as the most popular options nationally both in terms of number of agreements and area covered.

In terms of the grassland options taken up, the restoration options **HK7** and **HK11** both appear as popular options nationally, whereas, the creation options **HK8**, **HK13**, **HK14** and **HK17** are less popular. Creation options are likely to be less popular nationally given that there would be fewer agreements where habitat creation occurs as is the case with the realignment project here.

HR1 is also taken up which was the third most popular option under the national analysis. This option supports management of both CFGM habitat and could support a more natural FWM approach.

Table 4.2 Options taken up within the ES agreement at Steart Marshes

Option Grade	Options taken up inside CFGM PHI	Options taken up immediately outside CFGM PHI
1 – Most beneficial	**HK7** *Restoration of species-rich semi-natural grassland* **HK8** *Creation of species-rich, semi-natural grassland* **HK11** *Restoration of grassland for breeding waders* **HK13** *Creation of wet grassland for breeding waders* **HK14** *Creation of wet grassland for wintering waders and wildfowl* **HK17** *Creation of grassland for target features* **HK19** *Raised water levels supplement* **HP8** *Creation of inter-tidal and saline habitat on grassland* **HP5** *Maintenance of coastal saltmarsh* **HP10** *Supplement for extensive grazing on saltmarsh* **HR1** *Grazing supplement for cattle*	**HK7** *Restoration of species-rich semi-natural grassland* **HK11** *Restoration of grassland for breeding waders* **HK13** *Creation of wet grassland for breeding waders* **HK17** *Creation of grassland for target features* **HK19** *Raised water levels supplement* **HP8** *Creation of inter-tidal and saline habitat on grassland* **HP5** *Maintenance of coastal saltmarsh* **HP10** *Supplement for extensive grazing on saltmarsh* **HR1** *Grazing supplement for cattle*
2 – Quite beneficial	None	None
3 – Of benefit	None	None
4 – Less beneficial	None	None
5 – Least beneficial	**HF12NR** *Enhanced wild bird seed mix plots* **HF6** *Overwintered stubble*	None

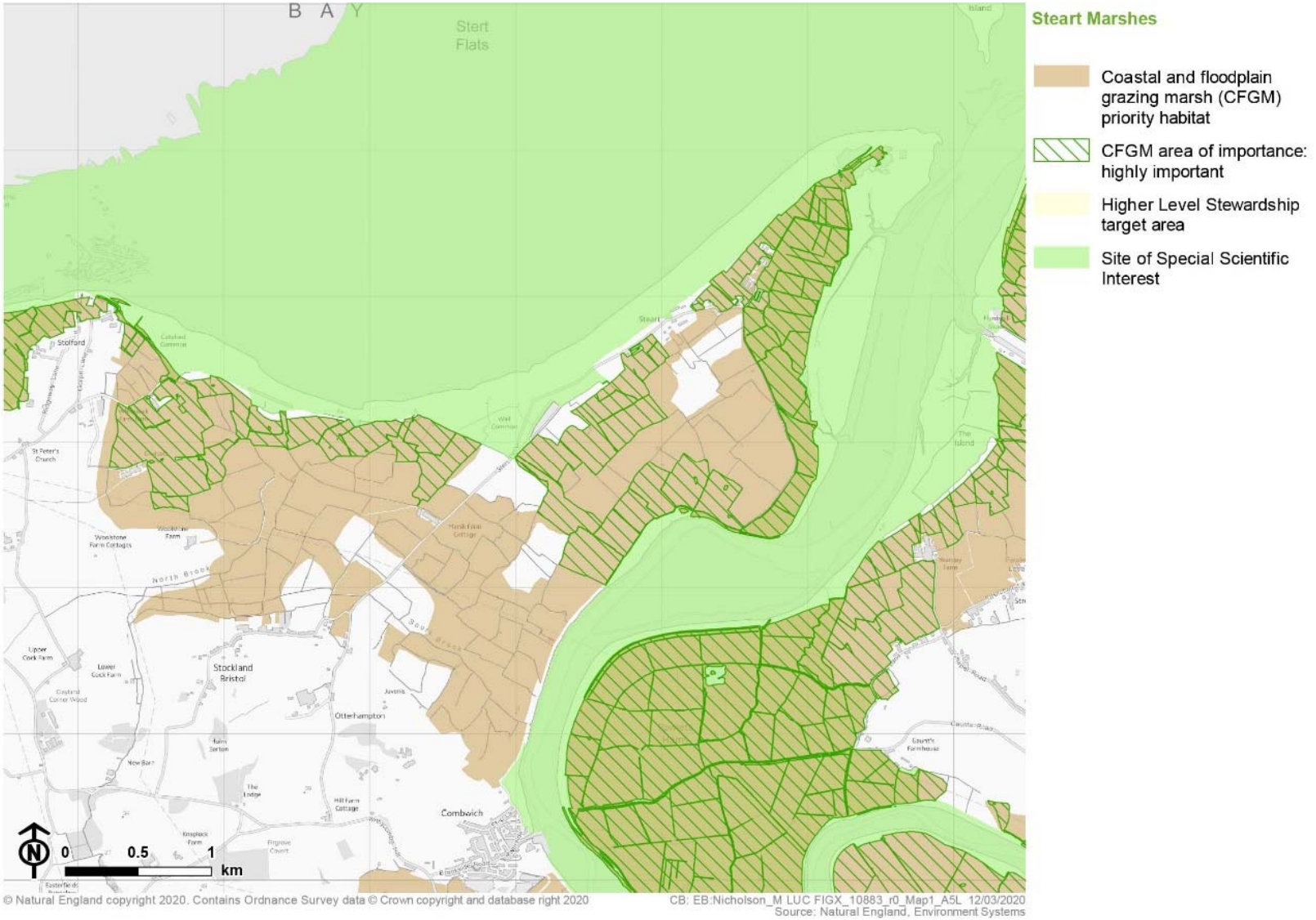


Figure 4.3 Steart Marshes location showing CFGM PHI, HLS target area, SSSI, CFGM 'highly important' areas

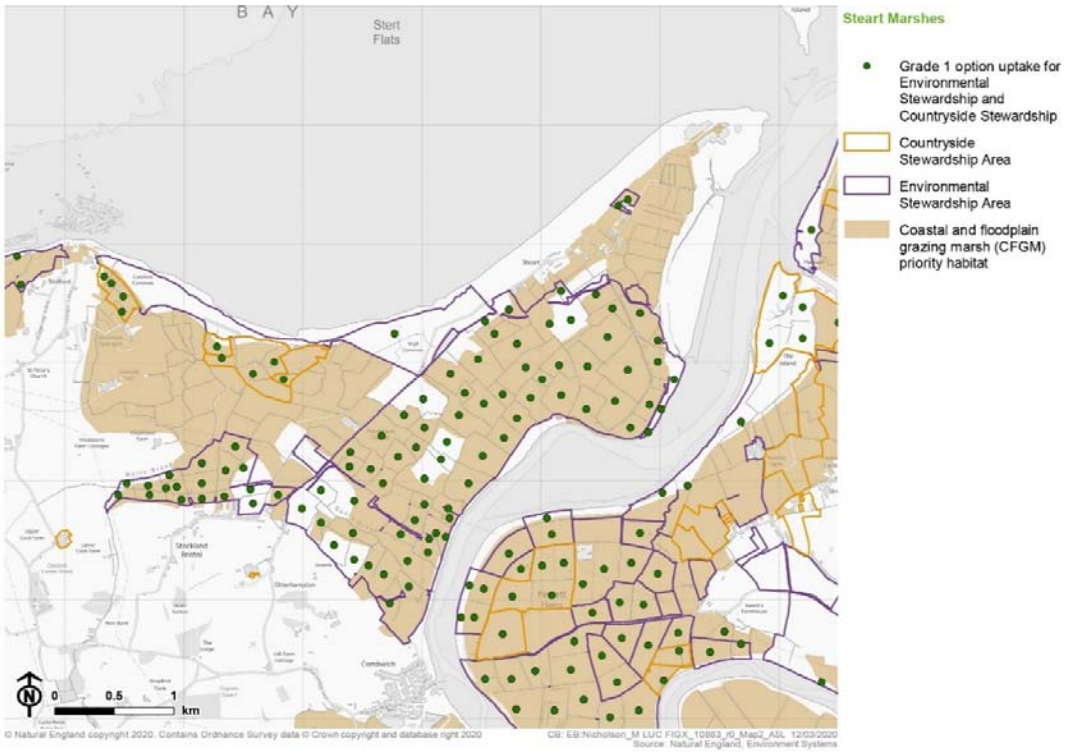


Figure 4.4 Steart Marshes case study area showing uptake of grade 1 options

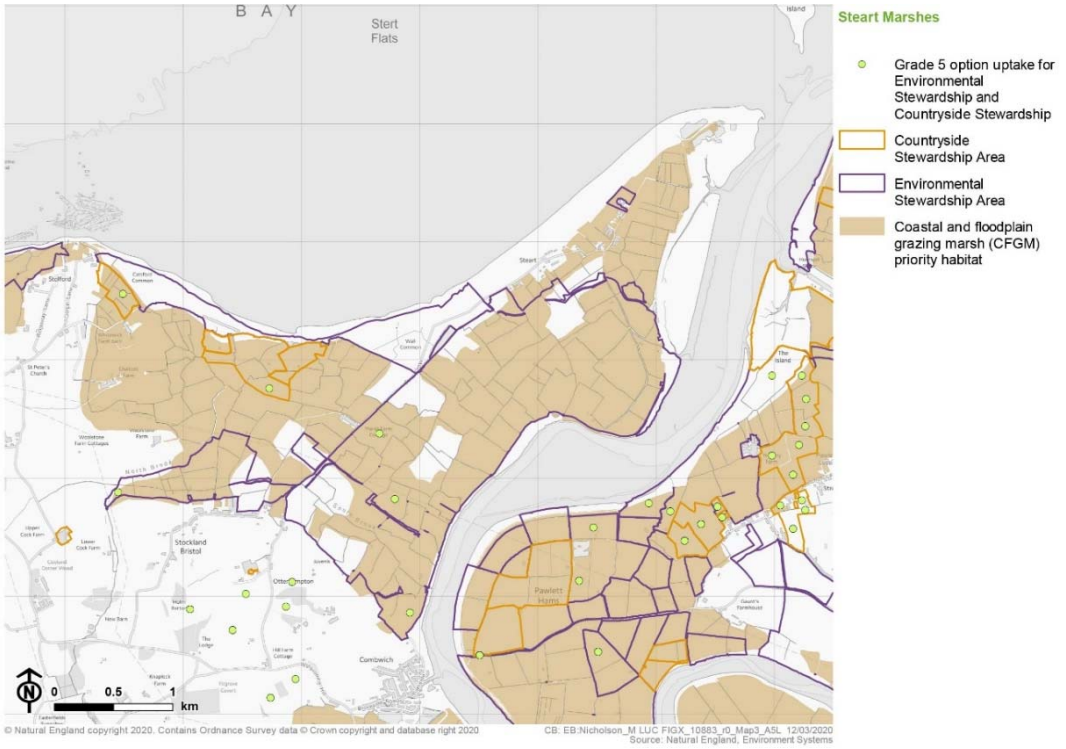


Figure 4.5 Steart Marshes case study area showing uptake of grade 5 options

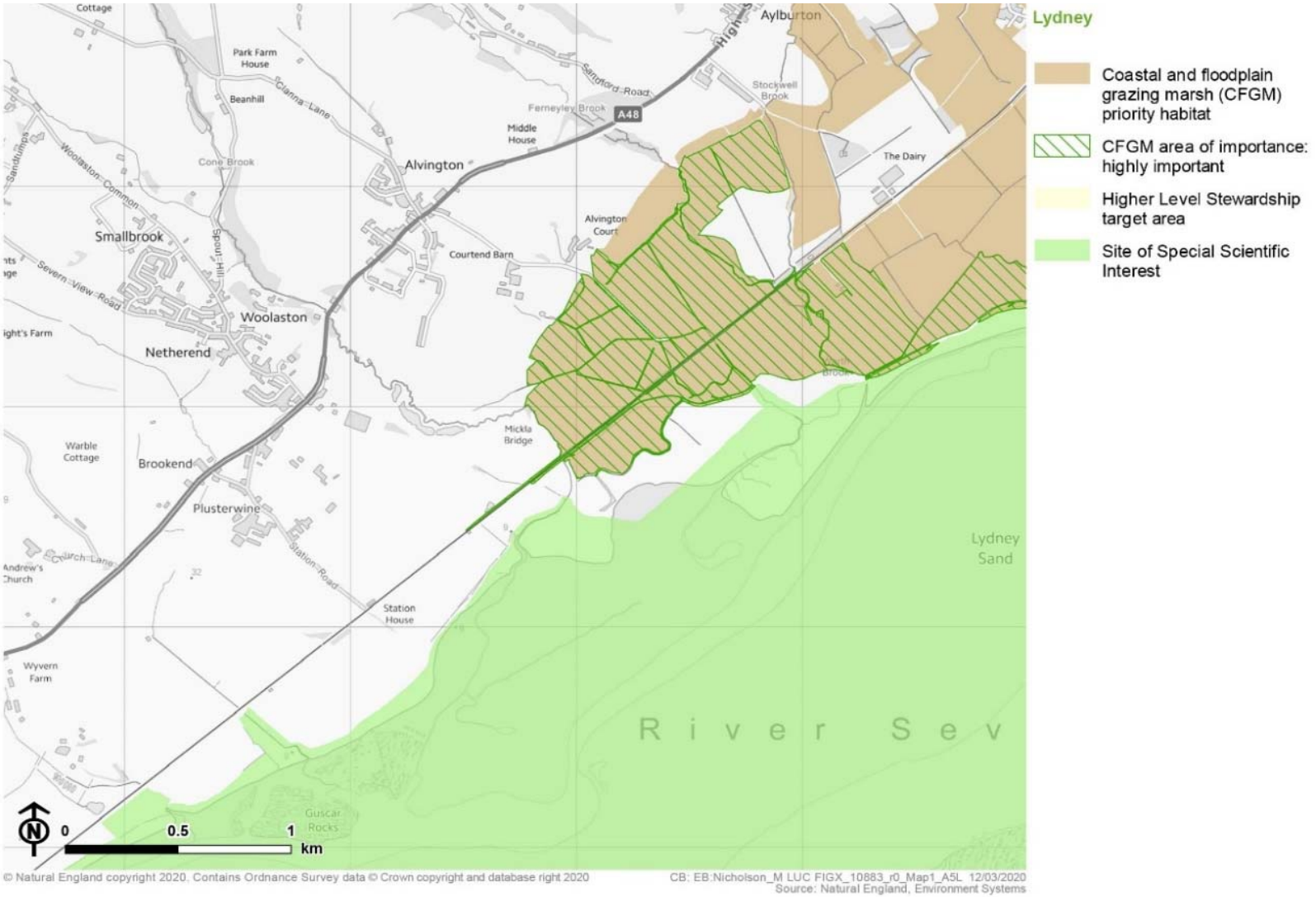


Figure 4.6 Lydney location showing CFGM PHI, HLS target area, SSSI, CFGM 'highly important' areas

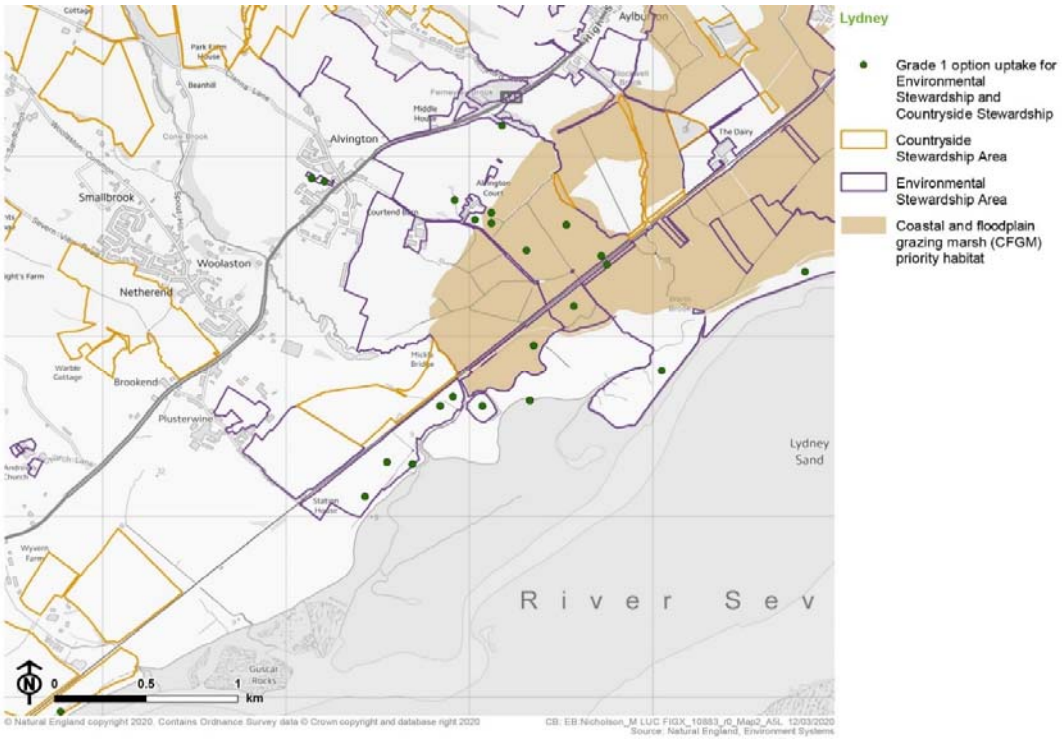


Figure 4.7 Lydney case study area showing grade 1 options

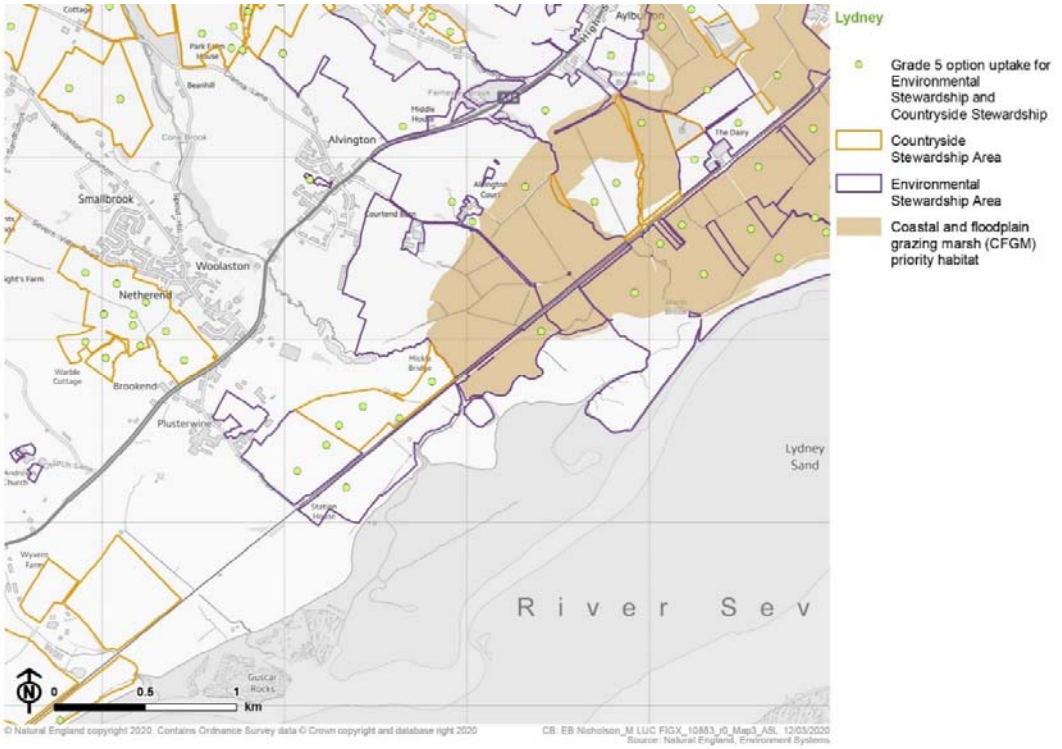


Figure 4.8 Lydney case study area showing grade 5 options

Options taken up - Lydney

Table 4.3 shows the options taken up within the Lydney case study area. Options **HP5**, **HP6** and **HP10** are for saltmarsh management, and so could support a FWM approach. These do not appear as the most popular options nationally both in terms of number of agreements and area covered. This low uptake is reflective of the lower proportion of coastal CFGM across the PHI, and therefore the limited opportunity for AES agreements to be secured to manage this habitat.

Table 4.3 Options taken up within the ES agreement at Lydney

Option grade	Options taken up inside CFGM PHI	Options taken up immediately outside CFGM PHI
1 – Most beneficial	**HP6** *Restoration of coastal saltmarsh* **HP10** *supplement for extensive grazing on saltmarsh*	**HP5** *Maintenance of coastal saltmarsh* **HP6** *Restoration of coastal saltmarsh* **HP10** *supplement for extensive grazing on saltmarsh*
2 – Quite beneficial	None	None
3 – Of benefit	None	None
4 – Less beneficial	**EK3** *Permanent grassland with very low inputs*	**EK2** *Permanent grassland with low inputs*
5 – Least beneficial	**EB2** *Hedgerow management for landscape* *EB3 Hedgerow management for landscape and wildlife*	**EE3** *6m buffer strips on cultivated land*

Discussion

History of land management in the area

Steart Marshes was a very intensively managed area of farmland with a sea wall that included an area of saltmarsh SSSI. The decision was taken to breach the defences and permit some tidal inundation to create a new habitat and to protect 14 properties on the peninsula as well as relieve the pressure on flood defences further up the River Parrott. The farmland was intensively managed with maize and other arable crops right up to the edge of ditches and the flood defences.

In the Lydney area, the land is now under the ownership of the EA and managed by a tenant farmer. It was previously under ownership of the farmer, who sold it to the EA. The farm is mainly comprised of beef cattle, with arable crop to feed the cattle and any surplus going to market. There is only a small area of SSSI designated land which is rapidly being eroded.

Motivations for joining AES and barriers to joining

The HLS scheme agreed in 2013/14 funds the management of Steart Marshes covering the management, monitoring and related staffing costs. Without the HLS the project would not be viable. The only barriers really concerned the inclusion of options regarding grazing the saltmarsh. Some were not keen on grazing but the addition of this via the HLS supplement has been crucial in the eyes of the WWT as it enables the farmer to focus on quality of product and a more extensive system and the ability to claim Basic Payment Scheme (BPS).

Evidence from the interviews suggests that, for farmers, the motivation to join AES are principally financial, this is especially so for low agriculturally productive land. For some, there

is also the motivations to deliver public goods such as habitat for breeding and wintering birds, and buffer against flooding risk from higher tides.

Barriers include electronic applications and the amount of documentation required. Lots of older farmers prefer paperwork to electronic versions. In addition, the electronic agreement is very lengthy and does not use language easily understandable by the target audience. The critical prescriptions are difficult to extract.

Indeed, at Lydney, the main motivation to join the AES was financial and was the main opportunity to obtain income from the land which is managed by the EA. As the EA dealt with all the paperwork, there were no concerns about barriers to join.

More generally there is an issue of 'loss of land' when joining AES, in other words land released for coastal realignment cannot be 'restored' to intensive agricultural production.

Land released for coastal realignment cannot be 'restored' to intensive agricultural production. This loss of land can be a concern.

Changes to the species present as a result of management under AES

At Steart Marshes, all core species of flora and fauna have benefited from the current management and this is shown by annual NVC surveys. Sea Lavender has been recorded at the site for the first time, which is rare in man-made saltmarsh as it seems to prefer natural saltmarsh sites. It has not been purposefully introduced on Steart Marshes so must have come through natural colonisation and the quality of the habitat. Breeding birds are doing well as are dragonflies, eels, fish and great crested newts. The monitoring shows that the site has progressed very well in the past 6 years and surveys have found 15 key saltmarsh species that are expected to colonise. Only a small part of the site is designated as SSSI and this is in favourable condition, better than larger units elsewhere in the estuary. However, because it is a small part of the site the SSSI does not impact on the HLS agreement or the management of the site. There are some concerns that if the site was designated an SSSI then the restrictions might become more onerous. One issue that concerns WWT is once designation is achieved there might be less requirement to show changes and progress monitoring. This means not enough monitoring is being done resulting in limited data to assess whether improvements in species diversity have occurred.

There are occasional reports of otters, and it is known that eels use the pills and connecting tributaries upstream.

At Lydney, there has been a clear change in species observed in the CFGM managed under AES, particularly for bird species.

However, local teams surveying saltmarsh habitat in the Severn area have not recorded any change. In some areas, species have been adversely affecting by increased flooding and have lost breeding grounds. An example of this is the redshank, but others too appear to be declining.

Changes to habitat as a result of management under AES

The Steart Marshes areas of saltmarsh are increasing as is the overall mosaic of the holding. There are arable fields and these provide strong habitats for small farmland birds. The inclusion of the wild bird seed mix is for this purpose, to increase the habitat diversity. A crucial part of the project is the focus on natural function. The water levels are managed through tilting weirs, but this is to maintain levels for winter and summer rather than too much intervention. This is a core part of the system. There is also evidence that water quality has improved.

At Lydney, details are lacking, but the marsh is much improved in terms of habitat and biodiversity and the EA is pleased with the results. At Alyburton, high tide covers the new marshes infrequently meaning these new marshes are still in the transitional stage.

More generally in both areas, AES management has had neutral benefits. This is in part due to a lot of designated CFGM not really fitting the habitat definition. Nonetheless, where it occurs, realignment of flood defences by allowing increased periods of flooding has been most successful in protecting CFGM habitat.

Issues with option implementation or scheme, alterations in productivity

The main issue is one of mapping as the RPA have not paid the agreement holder for over 4 years due to discrepancies on the maps. There are examples of arable fields being designated as CFGM due to former presence but they are not CFGM anymore. As far as the farmer is concerned the land is more productive and suits the traditional breeds used on the site. This is likely to be marketed as saltmarsh lamb and beef in the future. Wetter CFGM is not easy to manage and against everything the farmer was taught to want (e.g. paid by MAFF to drain land).

In addition, CFGM is hard to manage compared to other habitats and also depends on the target outcomes of the CFGM management plan (e.g. for waterfowl, for breeding birds, for plant diversity). The time it takes for authorisation to make changes to the management of the land is an issue as the timing of management activities is time-specific. If a management activity falls outside the prescribed time window in a particular year, the current derogation process takes too long for this to be agreed. At Lydney this causes issues with planting, harvesting, hedge cutting being limited or cancelled due to the soil being too wet for the activities to take place. Moreover, to achieve the right habitat conditions for waders, very precise water level management is required meaning that biodiversity has to be the main objective with any farming activity, in certain situations, acting as the management tool to achieve the right habitat conditions.

In places, rapid erosion has made access to the foreshore trickier than it used to be.

Current schemes are too general and not based on local conditions.

A common issue within AES is that land managers want to get the livestock out as early as possible after winter but are unable to do so within the scheme. There was a consensus that current schemes are too general and not based on local conditions; in previous schemes there was sufficient manpower to assess individual fields on a case by case basis, but there is now a blanket ban on this.

Understanding of general experience in area (if known)

At Steart Marshes, the holding is not typical of the farming in the area, which is conventional and very dependent on inputs of fertiliser, herbicide and pesticide. Interviews in this case study revealed that there are not many HLS schemes taken up in the area in relation to CFGM, as is the case for all AES considered together. Sometimes this is due to size of habitat area within a particular holding not meeting the minimum requirements. Generally, where AES are taken up, the schemes seem to maintain a status quo and stop further degradation, but do not necessarily improve the CFGM habitat. Lydney is more conventional in farming approach and the CFGM is viewed as unproductive but can generate income through payments for environmental improvements. On the CFGM itself for example the cattle density is about half that outside the CFGM. Generally, there is relatively low uptake of AES in the Severn area.

Low uptake particularly of HLS as flood defence actions, means there is rather limited opportunity for coordinated realignment at present.

The whole Severn Estuary area would benefit from the approach taken at Steart Marshes. It is a demonstration site and many visitors, including farmers, come to see what is happening and how farming the CFGM works well here for the benefit of both farming and biodiversity. The best people to speak and share knowledge with other farmers are the farmers themselves. This mechanism is happening now and could be developed further to ensure widespread awareness. Obviously, some land managers are sceptical, but having the evidence and the practical knowledge helps to show that many preconceptions are mis-placed.

The best people to speak and share knowledge with farmers are the famers themselves. Some land managers are sceptical about coastal realignment, but having the evidence and the practical knowledge helps to show that many preconceptions are misplaced.

Overall, land managers are still learning from the experience. Farmers may have benefitted from the sale of land to the EA rather than AES per se, whilst also securing the long-term AES income. Whether farms, including farm buildings, might be better protected from flooding as a result of the realignment activities is unknown. Biodiversity in many areas seems to have been negatively affected with declining breeding waders for example, and the interviewees attributed this to changes in flooding regimes with nesting sites being no longer available. There is also an issue of disturbance to wildlife by visitors and local walkers.

Suggested changes to the CFGM PHI

There were no suggested changes raised by the WWT for the mapping at Steart Marshes and similarly at Lydney; the areas appear appropriately designated. However, there is a need to check the current CFGM PHI maps because of rapid erosion in many areas. A query was raised whether realignment of small foreshores is really the best way to deliver CFGM. One adviser pointed out that there needs to be clarity about what exactly CFGM means; the habitat needs to be clearly defined. This issue is linked to habitat mapping with some areas classed as CFGM actually being arable fields.

Is restoration of a naturally functioning floodplain feasible?

More naturally functioning floodplain management would be beneficial for CFGM protection as evidenced by the Steart Marshes project as it shows the speed at which the habitat can establish and become stable. Water levels are high but not highly maintained. The use of tilting weirs is critical in this regard. The design of the breach means that the inundation is largely through salt water, and this avoids too much upstream flood water entering the site.

At Lydney, the flooding of the CFGM seems to be working as intended, but there is an issue of allowing the water to rapidly leave the land again. A better managed ditch network would solve this issue.

There was a suggestion that more input from the EA on strategic water management in the Severn estuary area would be worthwhile.

Suggestions for changes to future scheme

The current schemes are overly prescriptive. Land managers would like to see a bit more flexibility; some of the dates for activities such as grazing and cutting are not appropriate in

some years. For example, for hay cutting where 14th July may be too late in some years with the grass ready earlier and the nesting birds fledged. If this is the case then it is deemed better to cut early rather then, as last year, to wait until the date and then the weather turns so the agreement holder is unable to cut until August. As a result, the hay is very poor and of no use for livestock. At Lydney, the key improvements suggested were around quicker decisions on changes to management approaches, more flexibility regarding timings and increased value of payments.

Ideally the new AES should have the following characteristics: limited use of prescriptions, simple annotated map, pictorial explanations, limited word count, and include farmer / stakeholder inputs.

How effective have AES been in conserving the biodiversity value of CFGM habitat?

The HLS on Steart Marshes has been very successful at conserving and enhancing the CFGM habitat. It is the only financial and practical mechanism for this management.

At Lydney, the management approach to the CFGM appears largely as a success, but it is important to note the land is EA owned and therefore managed as the EA prescribes. The targeting of small areas has been questioned, with some negative impacts on breeding waders a problem in terms of biodiversity value.

It appears that both areas have been successful largely due to EA ownership (and for Steart Marshes, with WWT oversight); whether this would be achievable under different ownership and management conditions is debatable.

Overall, AES seem to be limiting further degradation of CFGM, but there have not really been any widespread improvements across most of the Severn area, with the notable exception of these case studies.

How effective has the current HLS target area has been in targeting the delivery?

The Steart Marshes project is outside the HLS target area, but it is clear that it is eligible to be included in any revision to the boundaries. For the Severn Estuary more generally, the main HLS benefit would be limiting further degradation of CFGM rather than any improvements. The projects have been a success despite the lack of HLS targeting.

Photograph 1 Cattle grazing at Steart Marshes (Alys Laver, WWT)

Photograph 2 Longhorn bull and scrapes, Steart Marshes (Helen Davies, WWT)

4.3 Test Valley, Hampshire

Key Findings

- Local hydrology: Artificial structures along the River Test prevent most of the Test Valley from functioning as a natural floodplain. Although water meadow systems would allow water to come out onto the floodplain, river water levels are not designed for that at present; water meadows are much higher than the river and water cannot easily flood over the banks or be diverted back into the river. There is an ongoing restoration project to remove artificial structures, but this has progressed slowly.
- The ES agreement within CFGM included grassland restoration options, **HK7** *Restoration of species-rich, semi-natural grassland*, **HK12** *Restoration of wet grassland for wintering waders and wildfowl* and **HK16** *Restoration of grassland for target features*. These are within the ten most popular options taken up nationally, but are notably less popular than grassland maintenance options, perhaps indicating the poor condition of the grassland under this agreement. Other options taken up within the CFGM included management of ditches and grazing supplements for rare breeds of cattle.
- Importance of AES for management of CFGM: there has been a growing momentum for private farmers to want to manage their land in a way that benefits biodiversity. As payments tend to make up for the shortfall in productivity, AES enable land managers to achieve this.
- Effectiveness in increasing biodiversity: AES have not delivered in terms of restoring areas that need restoration, but they have been effective in helping to keep areas in management and maintain levels of biodiversity.
- Restoration of natural function: Artificial structures installed for fisheries mean the floodplain does not function naturally; there is an ongoing restoration project to remove these which could have impacts for managing CFGM of higher biodiversity value in future.
- Suggestions for future ELM: Schemes need to focus on biodiversity outcomes as opposed to prescriptions and have more flexibility, noting that there is limited information on the grazing marsh habitats.

Site Context

The Test Valley case study focusses on a linear stretch of CFGM near Mottisfont and Dunbridge, four miles north of Romsey in Hampshire. The land lies on the western valley of the River Test and is bordered to the south by the River Dun, a tributary of the River Test.

There is a mix of arable and grassland farming on loamy soils. The CFGM is mapped as 'potentially important' as opposed to 'highly important', as per Task 1 of this report.

Photograph 3 Meadows at Mottisfort, June 2013

There are no conservation designations except the River Test SSSI which covers the river channel itself. The case study is within the HLS target area, yet a large area of the CFGM is not managed under any AES. However, there are a few large ES and CS agreements which include land parcels containing CFGM habitat with options taken up for wet grassland, waders/wildfowl and ditches.

Figure 4.9 shows the case study location with the CFGM PHI, HLS target area, SSSI, CFGM 'highly important' areas marked. Figures 4.10 and 4.11 show the most and least beneficial options taken up within the area.

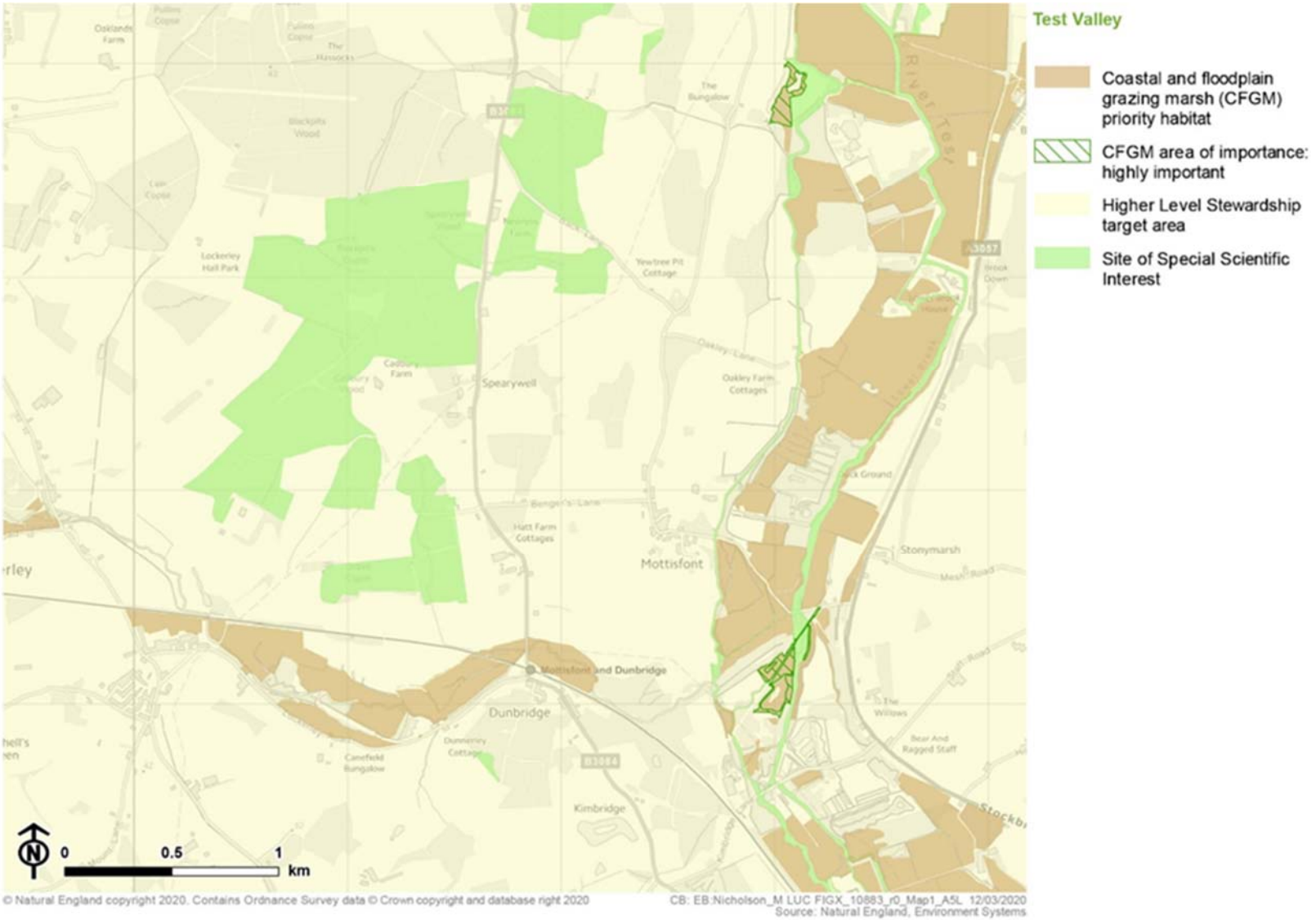


Figure 4.9 Case study location showing CFGM PHI, HLS target area, SSSI, CFGM 'highly important' areas

Options taken up

Table 4.4 includes the options taken up as part of the ES agreement reviewed for this case study. There is widespread uptake of Grade 1 grassland restoration options (**HK7**, **HK12** and **HK16**) which are important for managing the habitat as CFGM. These options are within the ten most numerous options nationally in terms of number of agreements, but are less popular than grassland maintenance options. Given that the case study area is largely not a SSSI or classified as 'highly important', it is surprising that there are targeted options for species including for wintering birds. However, the fact they are restoration options suggests the CFGM habitat is not at present high quality but has the potential to be of greater value to biodiversity with targeted management.

Other Grade 1 options taken up in this agreement include ditch management (**HB14**) and grazing supplements for native breeds at risk (**HR2**). These options will be effective at maintain the CFGM, but could also be used in a FWM approach to management. **HB14** tends to be more popular in SSSI and 'highly important' areas than in potentially important areas, so it is interesting to see that option as part of this agreement. **HR2** is not a popular option nationally: the more general grazing supplement option (**HR1**) is far more widespread.

Table 4.4 Options taken up within the ES agreement

Option Grade	Options taken up inside CFGM PHI	Options taken up immediately outside CFGM PHI
1 – Most beneficial	**HK16** *Restoration of grassland for target features* **HK12** *Restoration of wet grassland for wintering waders and wildfowl* **HK7** *Restoration of species-rich, semi-natural grassland* **HR2** *Grazing supplement for native breeds at risk* **HB14** *Management of ditches of very high environmental value*	**HK16** *Restoration of grassland for target features* **HK12** *Restoration of wet grassland for wintering waders and wildfowl* **HK7** *Restoration of species-rich, semi-natural grassland* **HR2** *Grazing supplement for native breeds at risk*
2 – Quite beneficial	None	**EB7** *Half ditch management*
3 – Of benefit	None	None
4 – Less beneficial	**EK3** *Permanent grassland with very low inputs*	**EK2** *Permanent grassland with low inputs* **EK3** *Permanent grassland with very low inputs*
5 – Least beneficial	None	**EB1/ EB2** *Hedgerow management* **HF14** *Unharvested, fertiliser-free conservation headland* **HF8** *Skylark plots* **EE2/EE3** *4m/6m buffer strips on cultivated land* **EC1** *Protection of in-field trees (arable)* **EF1** *Field corner management* **HF12NR** *Wild bird seed mix* **HF20NR** *Cultivated fallow plots of margins for arable plants*

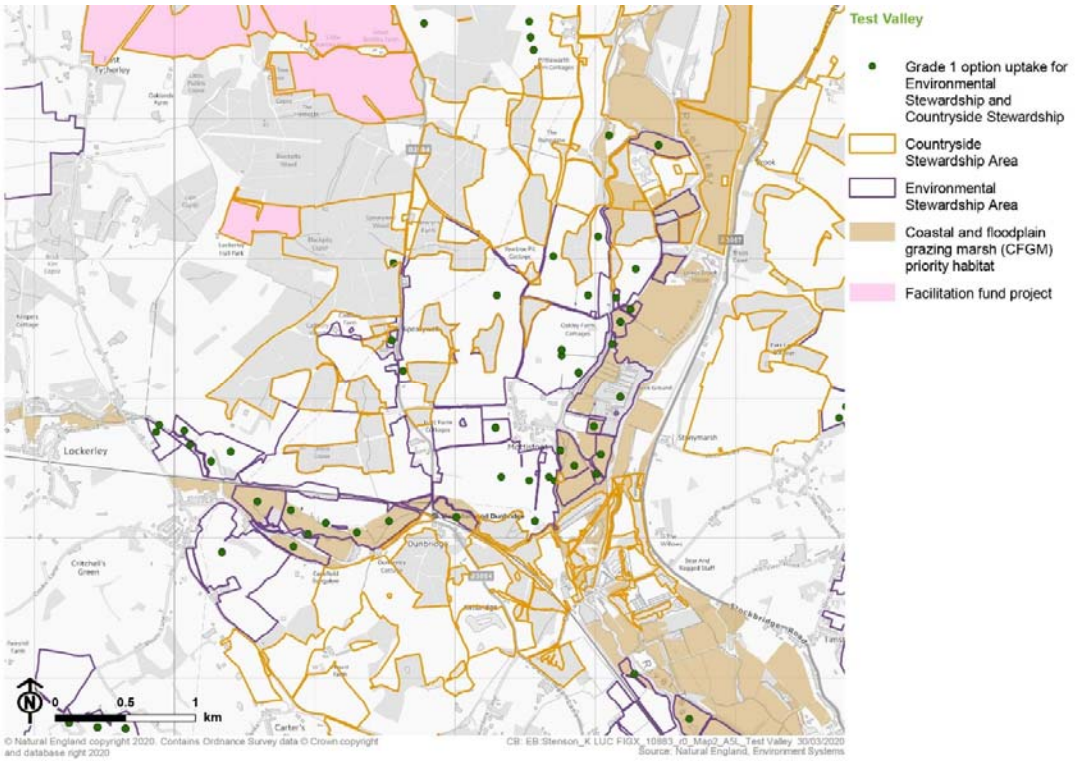


Figure 4.10 Case study area showing location of grade 1 options

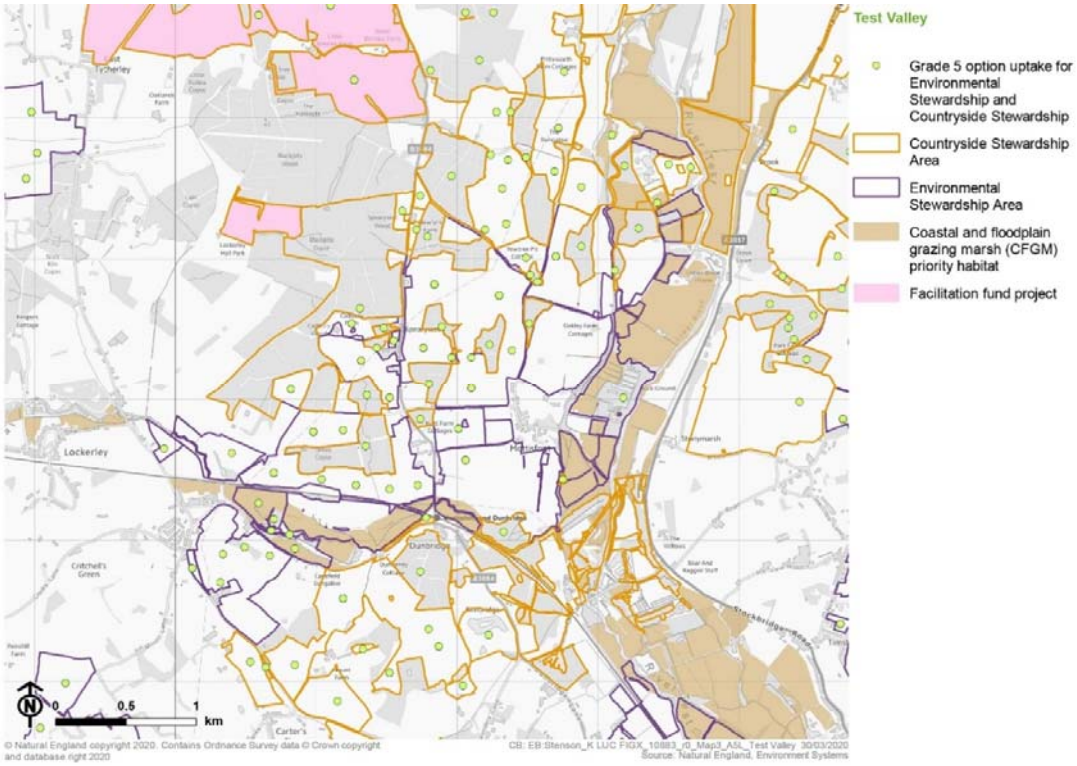


Figure 4.11 Case study area showing location of grade 5 options

Discussion

Condition of CFGM, and land management inside and outside of CFGM

The land has historically been farmed as a mixture of arable and grassland farming predominantly for beef cattle. This continues today with some rare breeds in the area including Ruby Reds and Herefords. A large area is owned by the National Trust and tenanted out. The management of the land inside and outside of CFGM varies only as a result of being in an AES. There are various wet grassland options taken up across the area with some options for biodiversity focused on management for wintering waders. Some areas of the river valley are not within agricultural management, but instead are managed for fly-fishing and salmon/trout fisheries.

Motivations for joining AES and barriers to joining

The motivations of agreement holders for joining AES are predominantly financial. It is through the financial support of AES that tenant farmers to the National Trust are able to manage the land within the conservation management expectations of the NGO. That being said, there is growing momentum for private farmers to want to contribute to management that benefits biodiversity and it is as a result of the advice, support and guidance available through being in a scheme which enables them to do so.

The barriers to joining include: the bureaucracy of joining a scheme; the draconian penalties for making of unintended mistakes (with some penalties being introduced after schemes have been agreed); the continued obligation to manage according to the agreement regardless of lengthy payment delays which impact cash flow; issues relating to accurate measurement of parcels especially if historical agreements have been in place and field parcels have altered in size since; and, limits on controlling certain weeds. It was noted that payment delays have been the largest contributor to reduced uptake of CS schemes in the Test Valley.

Changes to the species present as a result of management under AES

There has not been a notable change to species present in the study area. Breeding waders and wildfowl were the objective of AES here, and although some birds have been sighted there have not been the improvements to numbers as hoped. There have been no detailed species surveys to quantify changes to species including for plants and invertebrates, although the NE adviser felt that species have remained constant or improved slightly rather than showing a decline. AES have ensured nutrient inputs remain low and land is kept as grassland (not arable).

Breeding waders and wildfowl were the objective of AES but there have not been the improvements to numbers as had been intended.

Changes to habitat as a result of management under AES

Structural habitat changes have been easier to identify compared to changes in species. Where land is well-managed according to AES prescriptions, the habitat has improved in terms of structure and its ability to support the variety of species that may live within it. There has been an increase in scrub habitat and a reduction in rush dominance across the Test Valley. The most successful options to achieve these habitat changes have been under HLS grassland options for target features (HK15, HK16) and, in some areas, species-rich, semi-natural grassland options (HK6, HK7). There has been lower uptake of CS in the area and

therefore it is more difficult to determine which options have been successful for improving habitat.

Issues with option implementation or scheme, alterations in productivity

Overall, land managers have not experienced significant issues with implementing scheme options. However, the following issues were raised during discussions.

Those land managers who have had to take on stock as part of their agreement have found it difficult to stock the land themselves or find a reliable grazier. Grazier-land owner relationships have been problematic; either the landowner charges the grazier too much meaning the grazier cannot manage according to AES prescriptions whilst remaining productive or, the landowner has not given adequate information to the grazier on how to manage the land under AES prescriptions.

Implementing options has largely been unproblematic but there have been some issues with balancing stock numbers, landowner-tenant relationships and weed management.

Balancing stock numbers is an ongoing issue; stocking rates must vary each year depending on grass yields and the weather. In addition, many land managers are at the mercy of the availability of livestock given they need to increase stock numbers to keep on top of grass in the spring and summer, but reduce stock numbers prior to winter as they do not have sufficient overwinter housing. Incorporating rare breeds into their herds can help because many rare breeds can be over-wintered on the marsh.

There has been a problem with weed management. However, land managers expect these issues prior to joining a scheme and have found weeds fairly unproblematic to manage overall. Dry fields tend to be affected by ragwort and docks; farmers manage ragwort through hand picking or applying for derogations to spray, of which there were no apparent delays when applying for derogations. Rush is an issue in the wet, marshy fields; given the need for mechanical control here it has proven difficult to keep on top of rush as the marsh is often too wet for machinery to access the land.

In terms of productivity, the subsidy tends to make up for any shortfall in productivity. Given the nature of CFGM land, there tends not to be a significant dip in productivity anyway when taking up AES options. Any change in productivity was experienced when the land first went into AES under legacy schemes. Farmers typically accept production for what it is and manage the land accordingly to the prescriptions (for example, to achieve prescribed stocking numbers and sward height).

Suggested changes to the CFGM PHI

The PHI layer is not accurately mapped in this area. This is likely due to the reliance on old data, and the lack of resources to ground truth and make corrections. This reflects why there are several areas with wet grassland options typical to CFGM habitat (e.g. **HK7** *Restoration of species-rich, semi-natural grassland*, **HK16** *Restoration of grassland for target features*) taken up outside of the PHI layer. There are small areas scattered across the catchment that are mapped but are not visibly CFGM and vice versa. The mapping is used especially for mid-tier applications, but advisers tend to treat it more as a guide with ground validation to ensure specific land parcels are correct. Advisers do make amendments, but this is done for the requirement of a specific stewardship application as opposed to ground-truthing the whole catchment. There are several field parcels within the case study area that are classified as 'no

main habitat', 'unmarked' or 'good quality semi improved grassland' but should be classified as CFGM. It is typically only the higher, drier land that is not CFGM.

Is restoration of a naturally functioning floodplain feasible?

The land floods a couple of times each year. Artificial structures installed mainly for fisheries along the course of the River Test prevent most of the Test Valley functioning as a natural floodplain. Although water meadow systems would allow water to come out onto the floodplain, river water levels are not designed for that at present; water meadows are much higher than the river and water cannot easily flood over the banks or be diverted back into the river. There is an ongoing restoration project to remove artificial structures, but this has progressed slowly. In terms of land managers being able to farm the area with a more natural functioning river system and floodplain, many would suffer as there are no AES options which pay to flood the land. However, where land managers have a farm system with extensive grazing options there would be more scope to accommodate more regular flooding.

Artificial structures originally installed for fisheries mean the floodplain does not function naturally. An ongoing restoration project to remove these could see a higher biodiversity value in future but land managers may suffer if there are no AES payment options for flooding.

Suggestions for changes to future scheme

Any new scheme should place greater emphasis on biodiversity outcomes, and be measured by indicators of success rather than by implementation of prescriptions. Land managers would like to see more flexibility on option prescriptions particularly with regards to grazing timings; grazing needs to be more flexible to accommodate site-specific grass yields and weather changes. Additional guidance and assistance with area measurements would also be of benefit to ensure no problems are encountered later on. In terms of monitoring agreement success, there needs to remain some degree of follow up and continued guidance to ensure agreement holders achieve the desired biodiversity outcomes and do not mis-manage the land.

Photograph 4 Flooded meadows at Mottisfont, January 2014

How effective have AES been in conserving the biodiversity value of CFGM habitat?
The biodiversity value has largely been retained in the Test Valley through a long legacy of AES on agricultural land holdings. However, intended improvements to species numbers particularly of breeding waders has not been realised (although not quantified through surveys) and large areas of land under management for fisheries/fly-fishing remain out of AES management.

How effective has the HLS target area been in targeting delivery?
A large area of the CFGM PHI in this area is covered by an AES in one form or another, therefore it is suggested that targeting has been effective. However, whether the options implemented are the most beneficial ones for managing the CFGM is difficult to conclude from this analysis. It is also noted that much of the work relies on the local knowledge of NE advisers. The support and guidance provided to land managers through HLS has been beneficial for their motivation to join the AES and is reflected in the larger number of ES agreements in this area. Uptake of CS agreements by contrast has been low and where land managers have had the option to extend their HLS they have chosen to do so rather than enter into CS.

4.4 Yare Valley, The Broads

Key Findings

- Local hydrology: On the Broads the grazing marsh habitat is an unnatural system managed by the Independent Drainage Board (IDB). They set water levels at a level that is broadly suitable for most land managers. Upon entering an AES, some agreement holders then have to adjust water levels accordingly to suit options.
- The most beneficial options taken up are **HK9** *Maintenance of wet grassland for breeding waders*, **HK10** *Maintenance of wet grassland for wintering waders and wildfowl*, and **HK15** *Maintenance of grassland for target features*, three of the most popular options on CFGM for ES at a national level. Other options included within the CFGM are options for maintenance of reedbed and fen.
- Importance of AES for management of CFGM: AES suit the style of farming in the area, and payments support beef production which is struggling as a sector. Landowners upstream are not currently catered for as options for CFGM don't fit.
- Generally, AES have not been effective in increasing biodiversity. Improvements have been within reserves where NGOs manage beyond the AES prescriptions due to being guided by biodiversity objectives as opposed to operating a financially viable farm.
- The restoration of natural function is not appropriate in the Broads, but could be suited to areas upstream.
- Suggestions for the future ELM include simplification, the importance of good advice, and better access to capital work support.

Site Context

The Yare Valley stretches along the banks of the River Yare, between the villages of Brundall and Reedham in Norfolk. The majority of the CFGM in this area is mapped as 'highly important'. There is a long history of AES across the Broads and widespread uptake of both ES and CS.

Photograph 5 CFGM within The Broads, Norfolk

The agreement holder engaged for this case study was an NGO under ES agreement, RSPB Buckenham and Cantley Marshes. Given the reserve has land both inside and outside of SSSIs (Cantley Marshes SSSI mostly in favourable condition, Yare Broads and Marshes SSSI largely in unfavourable condition), the case study will explore whether management differs in and out of the SSSI and if AES have helped to maintain or improve SSSI condition. Furthermore, there will be a discussion of how various AES options have been targeted to manage land that is traditional CFGM habitat as well as areas that have a more natural floodplain function, such as fen and

reedbed restoration and maintenance options which have been taken up towards the western end of this case study area.

Figure 4.12 shows the case study location with the CFGM PHI, HLS target area, SSSI, CFGM ‘highly important’ areas marked. Figures 4.13 and 4.14 show the most and least beneficial options taken up within the area.

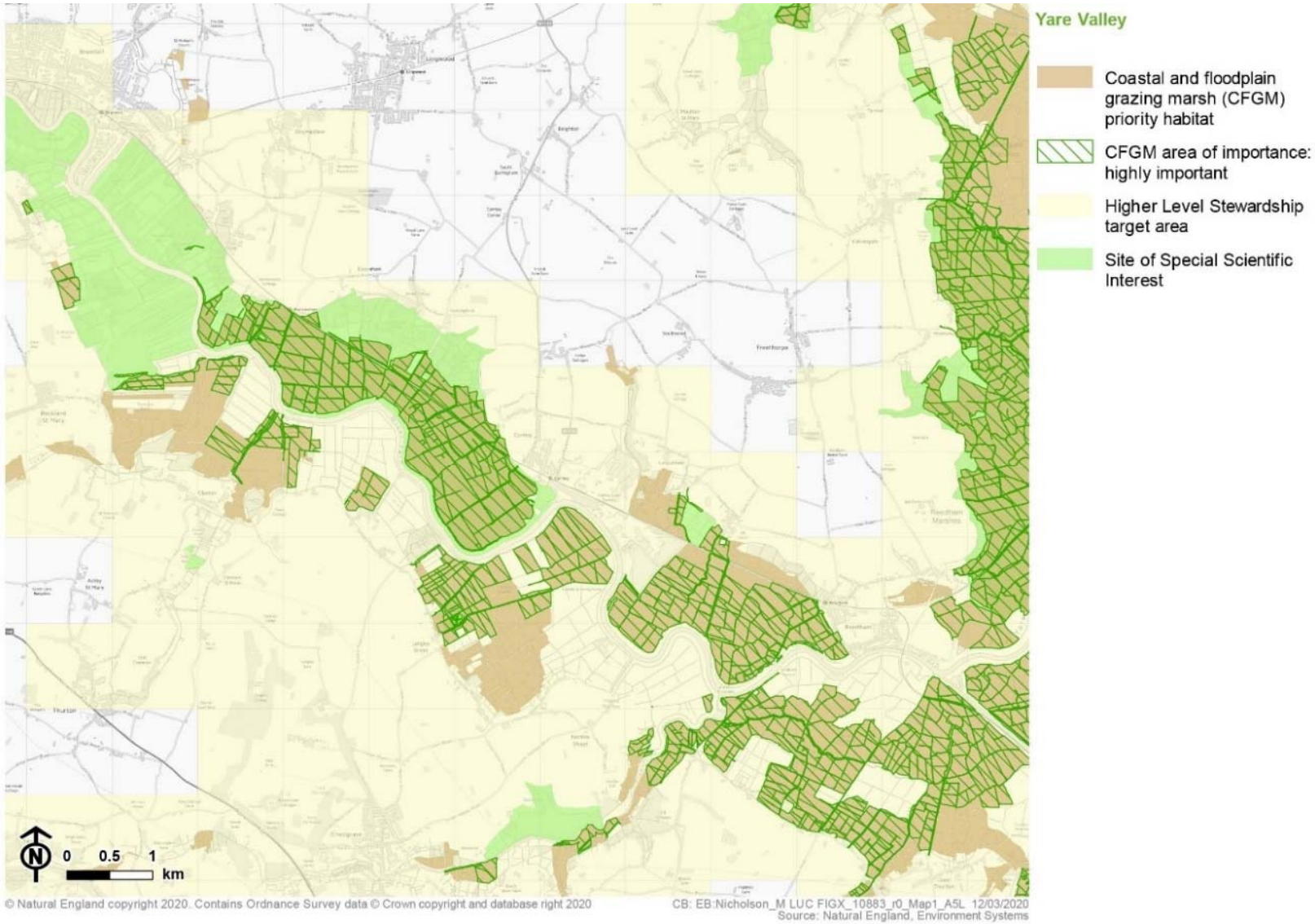


Figure 4.12 Case study location showing CFGM PHI, HLS target area, SSSI, CFGM 'highly important' areas

Options taken up

Table 4.5 includes the options taken up within the ES agreement reviewed. There is widespread uptake of **HK9**, **HK10** and **HK15,** which are amongst the most popular options featured in agreements for managing the CFGM. Given the case study area is a SSSI and classified as highly important, it is not surprising that these options are aimed at supporting particular species.

Immediately outside the area of the agreement that covers the CFGM, is the option **HC15**, an option that will maintain scrub within the CFGM, but could also be used to maintain a more natural functioning wetland mosaic. This is one of the most widespread options nationally in terms of hectarage covered and is typical of the national trend of uptake of this option within SSSIs and highly important areas.
Reedbed and fen options e.g. **HQ3, HQ6, HQ12** are taken up within the CFGM area, which suggests that there is greater variation in habitat in this area than the PHI presents. There is low uptake of these options nationally, and therefore their presence is not representative of the national analysis.

Table 4.5 Options taken up within the interviewed CS agreement

Option Grade	Options taken up inside CFGM PHI	Options taken up immediately outside CFGM PHI
1 – Most beneficial	**HK9** *Maintenance of wet grassland for breeding waders* **HK10** *Maintenance of wet grassland for wintering waders and wildfowl* **HK15** *Maintenance of grassland for target features* **HQ3** *Maintenance of reedbeds* **HQ6** *Maintenance of fen*	**HQ6** *Maintenance of fen* **HQ7** *Restoration of fen* **HQ3** *Maintenance of reedbeds* **HQ5** *Creation of reedbeds* **HK15** *Maintenance of grassland for target features*
2 – Quite beneficial	**HQ11** *Wetland cutting supplement* **HQ12** *Wetland grazing supplement*	**HQ12** *Wetland grazing supplement* **HQ11** *Wetland cutting supplement* **HC15** *Maintenance of successional areas and scrub*
3 – Of benefit	None	None
4 – Less beneficial	**EK3** *Permanent grassland with very low inputs*	**EK3** *Permanent grassland with very low inputs*
5 – Least beneficial	None	**HC7** *Maintenance of woodland*

Figure 4.13 Case study area showing uptake of grade 1 options

Figure 4.14 Case study area showing uptake of grade 5 options

Discussion

History of land management in the area

There has been a long history of NGOs in the area, with the particular reserve in question having been owned by the NGO for some time. There is also a long history of AES in the area; there was strong take up of ESA within the Broads, with most agreement holders continuing into the ES scheme. The major change in land management in the Broads occurred in the late 1980s with the introduction of payments to reduce stocking numbers, and so the shift to extensive grazing occurred some time ago.

The NGO is no exception to this long-standing, less intensive management approach. They held an ESA scheme for around 15 years, before moving into HLS. The ESA was mostly Tier 2 and 3 grassland options (for which the objectives were to enhance the ecological interest of grassland and dykes, with additional measures to increase ecological interest by the creation of wet winter and spring conditions on the CFGM). There were small areas of the most basic grassland options under Tier 1[4].

There has been low take up of CS in the area, mostly due to the fact that many ESA agreements expired in 2012/2013, and so many of the following HLS schemes will be expiring in 2022/2023.

Motivations for joining AES and barriers to joining

Agreement holders in the Yare Valley and Broads area are motivated by the financial benefits of joining AES, and by the free advice that they are able to receive as a result. The management prescribed under AES is ideal for the type of extensive suckler beef herd farming that is traditionally undertaken in the Broads, and so it fits well with existing management. Most farmers also enjoy managing their land in a way that is beneficial for wildlife.

The management prescribed under AES is ideal for the type of extensive suckler beef herd farming that is traditionally undertaken in the Broads, and so it fits well with existing management.

For the NGO, the motivation for joining the scheme was purely financial. The standards of management that the NGO aspire to exceed those of AES and SSSI requirements. The scheme enables the NGO to expand their conservation management work as it provides an integral proportion of their income. AES are an essential funding source for conservation charities, helping to fund this heightened quality of land management for nature conservation.

In terms of barriers to joining AES, the NGO felt there was a considerable change in level of constraints between ESA and ES. ESA was simple with fewer options and easy to follow rules and constraints, whereas the rules and regulations under ES are extensive, some of which are difficult to work with. This can be a deterrent for some.

The RPA inspection regime and issues with not receiving payments on time have acted as a barrier to signing up to a scheme for some farmers in the area.

[4] DEFRA (2003), Review of agri-environment scheme monitoring results and R&D (RMP/1596). Final Report – Par A (V45). Ecoscop/CPM/CJC Consulting 15/04/03. P.46
file:///C:/Users/roberts_v/Downloads/MA01001_3338_FRA%20(1).pdf

Changes to the species present as a result of management under AES

Generally, across the wider area it is felt that AES have not had the desired impact. NE has worked with NGOs and landowners with higher water levels where there have been improvements in breeding wader populations, but elsewhere there hasn't been a significant change in numbers to make populations sustainable in the wider countryside. Particular issues that have had an impact have been low levels of chick productivity, and predation by foxes, corvids, marsh harriers, and potentially mink and badgers.

Within the reserve, the NGO felt species numbers and variety has improved under AES. Records of brown hare and otter, increasing numbers of waders (attributed to the 25 year legacy of AES). Breeding duck populations in particular have increased under HLS, with 200 pairs of 6 different species now on the CFGM. The numbers of redshank continue to rise under their HLS agreement. Lapwing numbers have fluctuated since HLS. This was attributed to fluctuating food availability; when dry grassland is first wetted there is fluctuation of earthworms which later drops away. Cold weather mortality has also had an impact, as has predation on ground nesting birds. Improvements to management of surrounding land could also be encouraging lapwing to visit other land parcels. The increase in snipe has been a big success story, with the reserve now supporting the biggest population in Norfolk, despite the challenging habitat management required to support this species.

The ditches are an important feature of the CFGM in this area with most of the rare species found within this habitat. Nitrogen applied to the surrounding fields some 20 years ago is still leaching into the ditches and affecting the species found there. Projections indicate that this is likely to continue to be an issue for another 10– 15 years in this area. One of the major issues as a result of this has been the resulting abundance of water soldier suppressing molluscs and the rarer aquatic plants. Mechanical control has proven to be unsuccessful. Despite this, the reintroduction of the fen raft spider has been a huge success with the population now thriving, which indicates good numbers of invertebrates within the ditches.

Changes to habitat as a result of management under AES

Clay marshes across the Broads were not species-rich historically and have largely stayed the same since ESA agreements, so there has been little change in the diversity of the grasslands. The use of fertilisers and chemical spray has ceased since AES were introduced so the schemes have been effective in improving grassland management.

The greatest habitat changes have been within reserves. For the NGO, all habitat has been maintained and improved across the SSSIs. Areas of the reserves that remain in unfavourable condition are those areas affected by poor water quality due to historic nitrogen continuing to leach into the ditch system as mentioned above. In these circumstances there is little that can be done other than wait for the historic nitrogen to be exhausted.

Issues with option implementation or scheme, alterations in productivity

For the NGO, the main issues with option implementation have been around time constraints on the implementation of options.

For the NGO, the main issues have been down to time constraints on implementing options. For example, they are not permitted to undertake ditch management before mid-September. As they have 90km of ditches, this leaves 4-5 weeks of the year in which they can access the ditches before the area becomes flooded in October. If they

were able to begin earlier in mid-August that would help. This constraint also leads to conflict with contractor availability due to the arable harvest occurring at the same time.

Similarly, time constraints around grazing periods and grass topping have caused issues with weed control. For example, restrictions on grass topping beyond the end of October has meant that beneficial topping operations sometimes don't happen, as often the cattle are not taken off the grassland until the end of October or beyond leaving no time to undertake topping within the time constraints.

Thistle control has been a particular issue in this regard. The NGO would like to top thistles before they start flowering to avoid the use of herbicide, but as this plant grows up at the start of the bird breeding season there are restrictions on mowing or spot spraying. In contrast to local experience in the Test Valley, the derogation process to permit this activity is onerous, and approval can arrive too late to undertake management without causing undue disturbance. Overall, more flexibility with regards to weed control would be beneficial, particularly at the end of the season when many birds finish nesting earlier than the HLS prescriptions state.

More broadly, the NE adviser for the area felt that those farmers in HLS with more demanding options mostly have schemes that are tailored to their farms, and therefore they understand the value and structure of prescriptions. Issues tend to come from graziers and restrictions around timing of grazing. To mitigate this, some landowners reduce their rent or offer free grazing to encourage graziers, but it is felt that any tension between landowners and graziers is not due to AES.

The wet grassland options under HLS and grassland for target features are used most often. They have stopped a general decline in habitat condition, but they have not performed as effectively as intended. The struggle for the NE adviser is need to encourage agreement holders to manage the sward at the appropriate time – often sward management happens too late in spring when the grass has got away and grown too long.

Wet grassland options and grassland for target features under HLS have stopped a general decline in habitat condition, but they have not performed as effectively as intended.

Silage yields across the CFGM have declined and so agreement holders opt to not include all of their land under breeding wader options to retain areas where more flexible grazing and grassland management can be accommodated.

Understanding of general experience in area

Generally, the NE adviser feels AES fits well for the farming systems in this area, with agreement holders generally happy with the payments they receive. Applicants are encouraged to take up options that are within their capabilities and are not overly ambitious. However, management of CFGM is highly involved, with maintenance for breeding waders requiring continual management throughout the year. Without the added interest and determination from the farmer the benefits the AES achieve for waders are minimal.

For landowners upriver, where land is less wet throughout the year, the management options for wet grassland under AES are less suitable. These farmers tend to fall between the gaps of what AES currently offers, where their land is not suitable for wet grassland options, but where the low input grassland options do not support them in managing issues such as rush topping, or periods of wet.

Lowland beef production is struggling as a sector, with farmers largely dependent on schemes to be viable. Once the Basic Payments Scheme comes to an end, farmers in the Broads will struggle if they are not able to access a new scheme.

Suggested changes to the CFGM PHI

Although the CFGM mapping is not often referred to (only when needed for Higher Tier CS applications), the NE adviser for this area frequently finds anomalies with the CFGM mapping. This is often where areas are recorded as lowland fen but could equally be classified as species-rich grassland. In areas like this, it would be useful to classify them as both, or have a new category (i.e. fen meadow) to help identify the more interesting habitats. The NGO also mentioned areas of fen meadow within their land holding that appear as grazing marsh but that have rare fen meadow plant communities that require more sensitive management to retain. The NGO is aware of areas like this that aren't within reserves that have been abandoned as they are inappropriate for grazing. As a result, these habitats have turned into tall fen or woodland and been lost.

In addition, areas of arable reversion from 20 years ago are not recorded as CFGM and should be. When anomalies are found, errors are reported back to NE, but the NE adviser is not sure if the changes are being made.

Is restoration of a naturally functioning floodplain feasible??

The NGO doesn't think it is possible to restore natural function within the Yare Valley. It is an area strongly affected by tidal waters, fluctuating by two feet on a daily basis. If the flood banks were removed a more permanent wetland would be created, with areas flooded throughout the summer. Little grazing would be able to be undertaken, and the ditch systems which are key areas for wildlife would be lost.

Downstream work around the estuary to improve capacity to hold more water and prevent flooding upstream could be beneficial, although it would be likely to damage the fen SSSIs which are reliant on flood waters. Any such work would need to take into account impacts upstream and on the SSSIs.

There is greater capacity to restore natural function in the Yare Valley upstream. A previous project was not successful due to a lack of interested landowners.

Both the NGO and the NE adviser suggested there was greater capacity for restoring natural function further upstream, although this would be unlikely to create an area that could be commercially grazed, and more likely it would be managed as a reserve. It is likely that restoring natural function would be more appropriate to areas of fen or reedbed as opposed to on CFGM where rarities might be lost.

There was a project in this area called 'Making Space for Water' which proposed moving flood banks to the back of marshes to allow more natural function. This was unsuccessful due to a lack of landowners interested in the scheme, and issues impacting SSSIs/SPAs/fen reedbeds that need water. The consensus at the time was that it was not a good idea, particularly considering the Broads are in the driest part of the country.

Suggestions for changes to future scheme

The NE adviser feels simplicity in terms of scheme structure and administration with improvements with a streamlined application, payment and penalty process. Improving

agreement holders understanding of the schemes and how they operate should help reduce individual concerns over applying.

Designing a new tier structure based around the tier progression in the ESA scheme, but that includes the best options from the HLS scheme. Feedback from farmers has indicated that they favour the progression that was available under the ESA scheme, where they can progress once they feel confident. Any scheme will need to make management viable without the support of BPS payments.

Prescriptions should be outcome-focused so there is a clear reasoning for why agreement holders must undertake management, and what they are trying to achieve.

Advice is very important during the application stage; agreements must be tailored to each holding as there is so much variability in habitat, but also advice is crucial in providing support to farmers throughout their scheme. Farmers highly value the support and advice that is freely available from NE advisers, and prefer to seek NE advice as opposed to paying for it externally. Funding advice through any new scheme will also help ensure the quality of the advice given. The long-standing experience of the advisers in the region has also been an important part of retaining agreement holders on scheme expiry.

Under the current scheme payments for capital works are only available at the start of the agreement. Often, further work is required later in the agreement term to the maintain quality of habitat. The NGO suggested greater flexibility in the availability of capital works was required in order to achieve desired agreement outcomes. Similarly, the NGO felt there needed to be some flexibility during the schemes, particularly for conservation bodies to tweak management as thinking evolves and the habitat develops. The availability of bespoke options to achieve site-specific outcomes would be welcome.

Photograph 6 CFGM in the Broads, Norfolk

How effective have AES been in conserving the biodiversity value of CFGM habitat?
Despite localised improvements within reserves, generally, AES have not achieved the desired targets on conserving biodiversity value on CFGM. AES have been successful in preventing deterioration of the habitat with fair payments for management required.

How effective the current HLS target area has been in targeting the delivery?
The NGO was aware their agreement was within the HLS CFGM target area. The NE adviser did not use the HLS target layer to focus efforts for encouraging agreements. Instead, the focus was on attaining agreements on any wetland areas in the Broads.

It has not been used as a tool for targeting delivery. Local knowledge of wetland habitats from long-standing NE advisers has had a greater influence on focusing targeting efforts.

4.5 Cayton and Flixton Carrs, North Yorkshire

Key Findings

- Local hydrology: The areas of peat had significant drainage works carried out in the 1800s and are intersected by deep drainage ditches which link to the main drain, the River Hertford. After a period of flooding the groundwater levels can drop quickly as the peat is underlain by gravels. The area dries out with increasing frequency due to depletion of the underlying aquifer through drainage maintenance and abstraction elsewhere. Change from very wet to too dry is now fairly rapid.
- Options taken up: There are mainly options for management of grassland (**GS6** *Management of species-rich grassland* and **GS13** *Management of grassland for target features*) taken up in the CS agreement, with **GS13** being one of the most popular options nationally. Other options taken up, albeit just outside of the CFGM PHI, included fen management and wetland grazing supplements.
- Importance of AES for management of CFGM: Without schemes in place, it is likely the area would be ploughed for intensive arable production (as is the case on adjacent land) or more intensively managed grassland with higher inputs. Adviser advice and support has been fundamental for uptake and ongoing management of schemes.
- Effectiveness in increasing biodiversity: Despite localised improvements (most notably for flowering plants), AES have not been effective in improving numbers of species.
- Thoughts on natural function: CFGM is generally in a poor condition across the wider Vale of Pickering; retaining water on the land is difficult to achieve. Restoring natural function would likely be prevented by retaining the current drainage system and water abstraction elsewhere.
- Suggestions for future ELM: Continued advice by well-trained local advisers, tailored agreements with flexible prescriptions reflective of site-specific circumstances, simplicity in the agreement with clear, unambiguous terminology.

Site Context

The Cayton and Flixton Carrs case study is a peri-urban area six miles south of Scarborough in North Yorkshire. There is a mix of arable and grassland farming on the peat soils which are underlain by gravel. The CFGM is not covered by any national designations but there are some Local Wildlife Sites. The case study is not within the HLS target area and is mapped as 'potentially highly important' as opposed to 'highly important'.

Photograph 8 Greater Bird's-foot Trefoil

Photograph 7 Yellow Flag and Water Forget-me-not

There is a mix of ES and CS agreements across the study area, but there are only a few land parcels within the CFGM that are within an agreement. There are a range of options taken up in these parcels including wet grassland, raised water level supplements and ditch management (Annex 6). The case study will explore whether these scattered agreements have been successful in increasing biodiversity value in the CFGM and aim to understand reasons for low uptake of AES. For this case study, interviews were held with the NE area adviser and a private farmer.

Figure 4.15 shows the case study location with the CFGM PHI, HLS target area, SSSI, CFGM 'highly important' areas marked. Figures 4.16 and 4.17 show the most and least beneficial options taken up within the area.

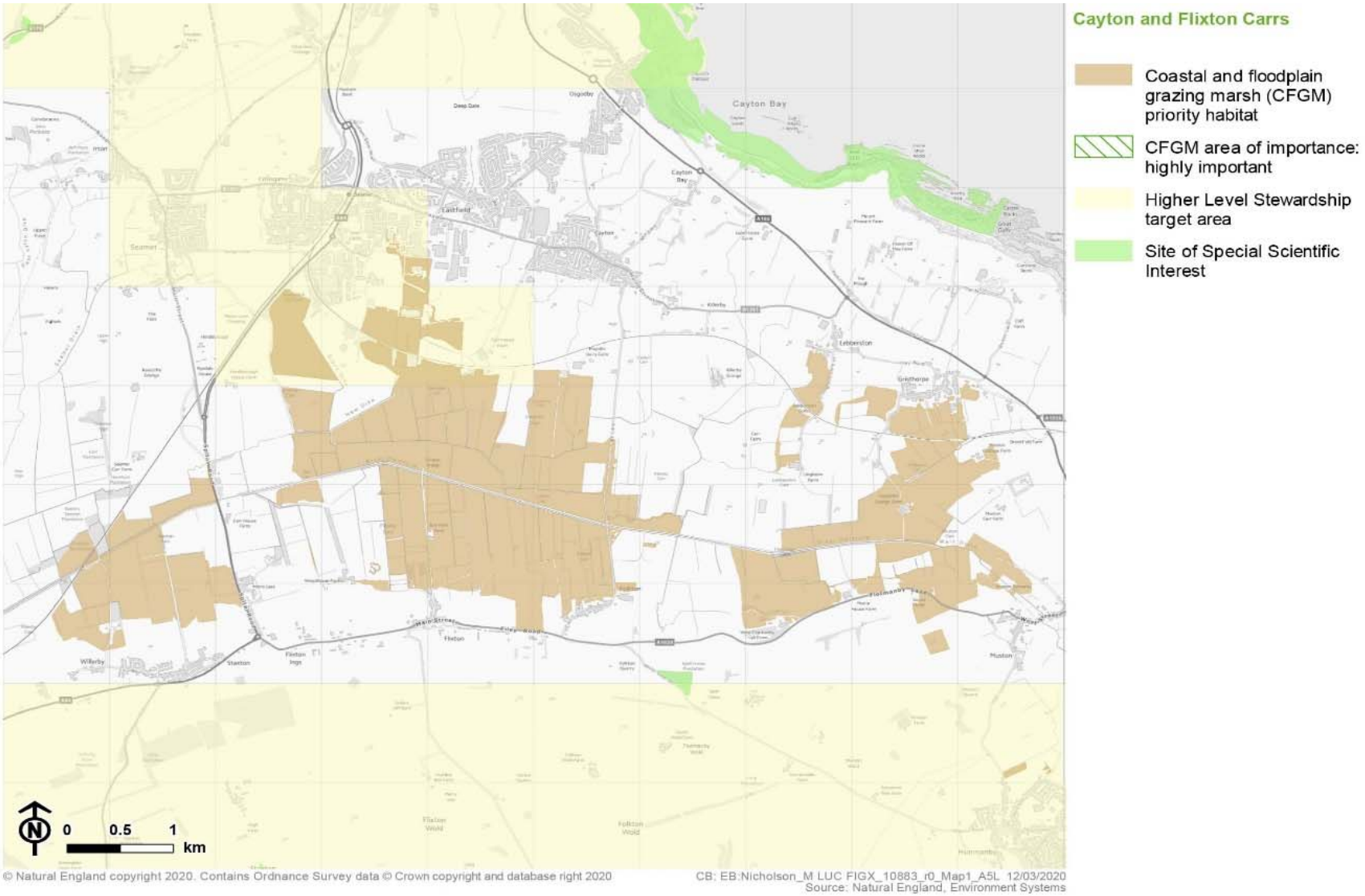


Figure 4.15 Case study location showing CFGM PHI, HLS target area and SSSI

Options taken up

Table 4.6 includes the options taken up within the CS agreement reviewed. Grade 1 options taken up were grassland options (**GS13** and **GS6**), both of which manage the habitat as CFGM. **GS13** is one of the most popular options nationally both in terms of number of CS agreements and area covered. Uptake of **GS13** here also reflects the national trend of being the more popular option in 'potentially' highly important areas, of which the whole Cayton and Flixton Carrs case study area is classified. **GS6** is a less popular option taken up nationally but still within the top 20 options. There are no options taken up for wildfowl and wintering and breeding waders (**GS10** and **GS9**) which appeared as both the most popular and widespread option nationally. This suggests the case study area is not having the species-specific influence that CS seems to have had nationally but could be due to the area not being a SSSI or a highly important area.

Table 4.6 Option take up within the CS agreement reviewed

Option Grade	Options taken up inside CFGM PHI	Options taken up immediately outside CFGM PHI
1 – Most beneficial	GS6 Management of species-rich grassland GS13 Management of grassland for target features	WT8 Management of fen WT12 Wetland grazing supplement GS13 Management of grassland for target features GS6 Management of species rich grassland
2 – Quite beneficial	None	None
3 – Of benefit	None	None
4 – Less beneficial	None	None
5 – Least beneficial	BE3 Management of hedgerows AB11 Cultivated areas for arable plants	BE3 Management of hedgerows AB11 Cultivated areas for arable plants

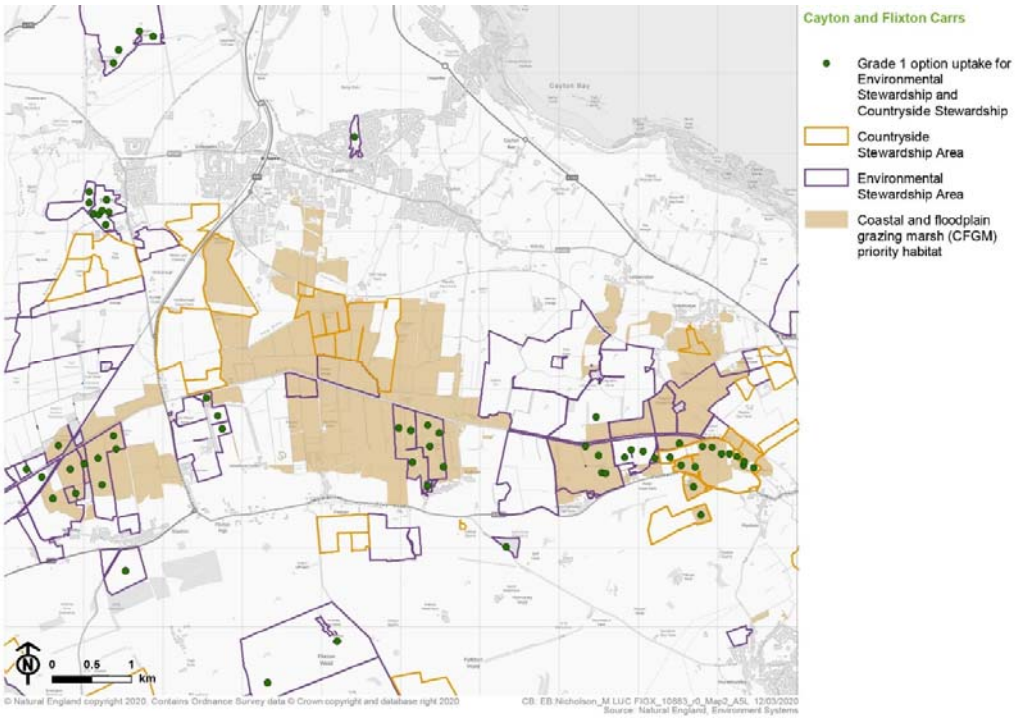


Figure 4.16 Case study area showing uptake of grade 1 options

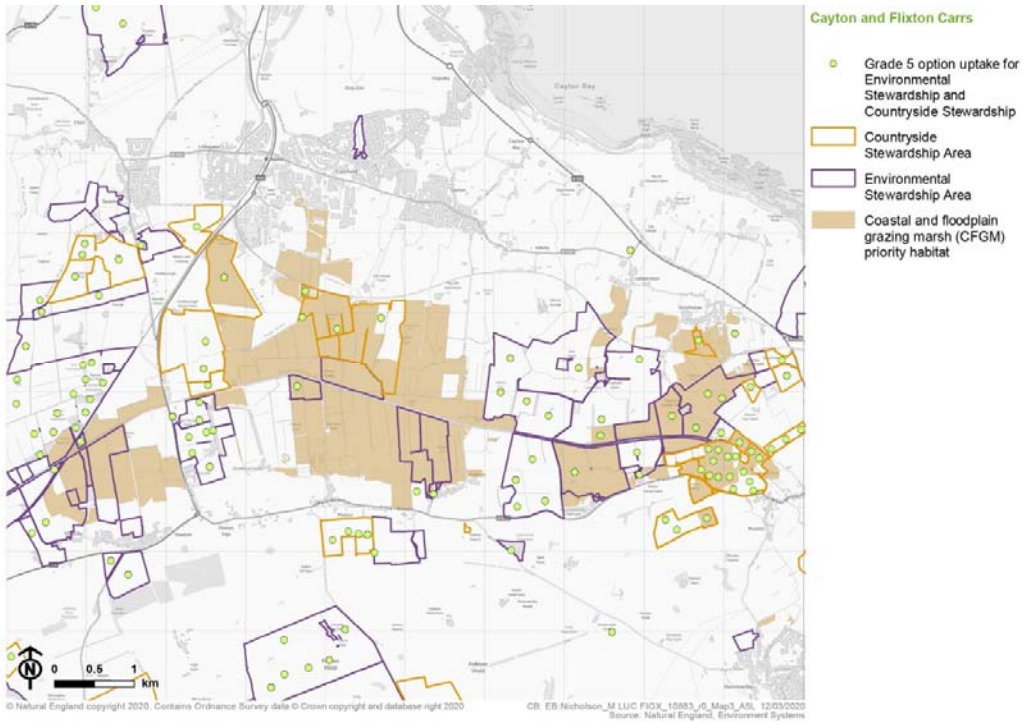


Figure 4.17 Case study area showing uptake of grade 5 options

Discussion

Condition of PHI, and land management inside and outside of PHI

Across the wider Vale of Pickering target area, the CFGM is generally in fairly poor condition. There are few AES taken up owing to the surrounding land largely being under intensive arable production. There are some localised agreements with wet grassland and wader options that have benefitted the habitat, most notably for flora. The floodplain does not function naturally due to drainage works carried out in the 1800s as well as the peat soils being underlain by gravel which causes a rapid change from land being too wet to too dry. These factors not only make land management difficult on the CFGM, but the variable ground conditions affect stability of the habitat and its associated biodiversity value.

The area is largely managed for intensive arable production. Localised AES agreements are typically in place on small pockets of mixed farming land.

History of land management in the area

Most of the peat land has at some time been in cultivation and most grasslands are improved and more akin to rush pasture. The area is largely managed for arable production with pockets of mixed farming, previously for dairy but more recently replaced by beef production. The areas of peat had significant drainage works carried out in the 1800s and are intersected by deep drainage ditches which link to the main drain, the River Hertford. After a period of flooding the groundwater levels can drop quickly as the peat is underlain by gravels. The area does flood in times of excessive rainfall due to fluctuations in the water table.

There is a legacy of AES in the area and AES option uptake was high when the Cayton and Flixton Carrs Project Officer was in place. However, uptake has declined because the CFGM does not receive the high payments that were being received in HLS and agreement holders with expiring agreements are moved towards Mid-Tier basic grassland options under CS. There are some small areas of arable reversion in the last 10-15 years as a result of legacy schemes which have subsequently been replaced with wet grassland options under CS.

Motivations for joining AES and barriers to joining

Local farmers in the area are largely motivated, and heavily dependent upon, the financial benefits provided by AES. It is felt the smaller scale land holdings in the study area are particularly reliant on funding from AES to sustain an income as the land has a naturally low productivity and value. A select few land managers have an interest in wildlife conservation management with shared objectives to Natural England to maintain and enhance long-established CFGM habitat and species.

Advice by way of the Cayton and Flixton Carrs Project Officer and NE adviser has been an important factor for scheme uptake, helping land managers to choose the best options for their holding. Most land managers are receptive to advice and keen to manage their land within an AES particularly if they have land that lies wet and is therefore unsuitable and unprofitable to crop or manage more intensively. The availability of advice for land managers hoping to enter into a CS scheme has been problematic because options for managing and creating wet grassland require advice which is not provided in mid-tier. Higher-tier schemes and the accompanying advice are being targeted in the uplands as opposed to lowland CFGM areas.

There are several barriers that may prevent land managers joining schemes or affect their management of land in the scheme. There are concerns over the inability to apply personal expertise relative to local conditions and circumstances without a derogation. The agreement

holder in this area has experienced delays to derogations being granted which has caused issues with adhering to prescribed timings. This could point to a need for further local tailoring of agreement options when first set-up to ensure local conditions and variability are accounted for. Alternatively, specific options for the CFGM habitat could better reflect the unique nature of the habitat and be of benefit for land managers to manage it effectively.

Changes to the species present as a result of management under AES

There has been no widespread change in flora, fauna, invertebrates or birds over the area. The surrounding intensively managed land does not favour protection of biodiversity value in the CFGM. However, there has been some localised and variable improvements over time likely as a result of AES although it is not possible to be certain that these changes are due to AES management alone, particularly in the case of invertebrates. In some areas, grassland options have benefitted flora with a spread of various flowering plant species already present accompanied by an increased frequency of butterflies and day-flying moths. Despite this, adjacent contiguous grassland outside of scheme options in some cases provide better habitat for flowers and butterflies than grassland options inside (e.g. GS13).

Despite targeting being aimed at birds and there being successful creation and management of suitable habitat for breeding birds as a result, there has been little, if any, change to species present on the CFGM managed within AES. Some monitoring surveys in years 2-7 of the Cayton and Flixton Carrs agreement showed signs of improvement to breeding lapwing but recently they have declined; a trend evident across North Yorkshire and similar for other bird species including Meadow Pipit, Reed Bunting, Sedge Warbler, Skylark and Cuckoo. Overall, there has not been the gains that AES had set out to achieve in the area. The reasons for this are unclear but seasonal factors affecting wetness of land are likely to have had an impact as well as the limited extent of land management within an AES.

Changes to habitat as a result of management under AES

The CFGM where managed within AES has generally been maintained well (see Figure 4.16). There has been no deterioration in habitat quality but the improvements originally hoped for have not been achieved mainly due to the dependency on rainfall.

Biodiversity and habitat improvements originally hoped in the area have not been achieved, mainly due to the dependency on rainfall and limited extent of AES uptake.

It is felt there has been more successful wet grassland creation, not on the CFGM habitat in the study area, but on clay and peaty land further inland. The area dries out with increasing frequency due to depletion of the underlying aquifer through drainage maintenance and abstraction elsewhere. Change from very wet to too dry is now fairly rapid.

There has been a notable increase and dominance of some weeds; some areas that are too wet to graze in summer has led to dominance of tussocky grasses and lesser pond sedge. Grass weed and creeping thistle can dominate but flowering plants respond well to continued topping and maintenance of the weeds.

Issues with option implementation or scheme, alterations in productivity

Option implementation was supported by the Cayton and Flixton Carrs Project Officer who helped with guidance on the implementation of options. Adviser support has been essential in implementing options particularly for restoration and habitat creation, e.g. for scrapes. In some areas where the floodplain is less affected by the artificial drainage system, prescriptions are

more easily interpreted and management is more successfully implemented without such a reliance on advice.

The most consistent issue with implementing options is the dependency on weather and associated water levels on the CFGM. Wet grassland options are very dependent on rainfall levels in spring which are highly unpredictable. Prescription timings on certain operations (e.g. grazing periods and hay-making) have in some years been problematic for land managers. Controlling sward height each year whilst keeping consistent stock numbers is difficult as there is either too much or not enough grass. Furthermore, hay-making is usually not possible with land often too wet for tractors and machinery to gain access. This means groundwater-fed scrapes do not retain water for long.

There were also issues concerning the additional staff and wages required for more intensive management of CFGM as well as the reliance on contractors for some works. Also, current levels of bureaucracy affect time available for other work with considerably more time allocated to this than in previous schemes. It was felt that time could be better spent in operational management on the CFGM.

Issues faced were the dependency on weather and water levels, the cost for more intensive management of CFGM, reliance on contractors and bureaucracy.

Adjustments to farm productivity for the benefit of improving biodiversity value were made during earlier legacy schemes, and so is generally felt that current schemes and their accompanying subsidy payments continue to balance any productivity shortfalls. Fitting options into the farming system tends not to be an issue where farmers have a long legacy of scheme involvement in the area.

Suggested changes to the CFGM PHI

Many areas of the CFGM has been removed from the PHI mapping over time, but further work is required to ensure this mapping layer reflects what is on the ground.

Is restoration of a naturally functioning floodplain feasible?

The Cayton and Flixton Carrs area does flood in times of excessive rainfall and is a groundwater-dependent landscape. However, the River Hertford has great influence over levels of groundwater in the surrounding landscape. It is difficult to retain water on the land because floodwaters drain rapidly due to the drainage system in place. Restoring the river's ability to function naturally could help to retain higher water in the landscape. However, this restoration is not feasible under the current management of water in the area.

Suggestions for changes to future scheme

- Continued advice by well-trained local advisers with an agricultural background.
- Tailored agreements with flexible prescriptions reflective of site-specific circumstances.
- Simplicity within the agreement, including more general guidelines for easier interpretation and ability to adhere to in practise.
- Clear, unambiguous terminology to ensure objectives and prescriptions mean the same thing to all.

How effective have AES been in conserving the biodiversity value of CFGM habitat?

There are only a few schemes within the CFGM habitat in Cayton and Flixton Carrs, and where they are in place there has been variable success in improving the biodiversity value of CFGM habitat. There are local pockets of improvement, particularly for flora and butterflies/moths but most bird species, despite still being present, have continued to decline. The lack of success reflects the physical factors and dependence on the weather more than poor implementation of options by agreement holders. However, the role of AES has helped to maintain the CFGM habitat in terms of maintaining it as low input wet grassland. Without schemes in place, it is likely the area would be ploughed for intensive arable production (as is the case on adjacent land) or more intensively managed grassland with higher inputs.

How effective has the current HLS target area been in targeting the delivery?

The study area is not within the HLS target area but the Cayton and Flixton Carrs project focussed on creating and managing wet grassland for breeding and wintering waders. The project has not achieved the desired improvements to the biodiversity value of CFGM. Targeting is now mostly focussed on the uplands for Higher Tier CS schemes. Land managers with CFGM habitat can join Mid-Tier but they need advice for wet grassland options which is not provided in Mid-Tier. Despite the good intentions behind AES targeting in the area, there has not been the gains to habitat and biodiversity as had originally been intended.

Photograph 10 Marsh marigold and rush emerging (March 2020)

Photograph 9 An unmaintained IDB ditch which formerly supported plants now gives a less effective corridor to the river

Photograph 11 Lesser Pond Sedge, an increasing problem in the area (March 2020)

Photograph 12 CFGM habitat with chalk spring (March 2020)

4.6 Lyth Valley, Cumbria

Key Findings

- Local hydrology: There is no naturally functioning floodplain within the Lyth Valley as it is artificially pump-drained by the Environment Agency. At times of heavy rainfall, the region suffers from major flooding events and due to the pumping, it takes a long time to drain the land.
- Options taken up within the CFGM that were of most benefit were confined to **HK11** *Restoration of wet grassland for breeding waders* (perhaps indicative of the local condition of the CFGM). Outside of the CFGM PHI however, **HK7** *Restoration of species-rich semi-natural grassland* was also taken up more widely, as well as creation of reedbed, and supplements for cattle and native breeds at risk.
- Importance of AES for management of CFGM: Farming productivity is generally reduced as a result of AES prescriptions so the financial incentive from payments is essential to farmer buy-in. However, in the Lyth Valley, there are few farmers with the skill and inclination to undertake this level of management. Farming operations in this area are largely supported by the Basic Payment Scheme, and when this ends (in 2027) it is likely that many farm businesses will struggle to be commercially viable without continued financial support.
- Effectiveness in increasing biodiversity: Low uptake of AES across the CFGM means AES have not contributed to improvements in species and any habitat improvements have been very localised. An exception has been a reedbed habitat creation project outside of the CFGM at Park End Moss, an NGO partnership project made possible through AES.
- Thoughts on restoration of natural function: land management within the Valley is unsustainable long-term and there is potential for a large-scale shift from productive farming to biodiversity enhancement which could focus on the restoration of a sustainable naturally functioning floodplain.
- Suggestions for future ELM: Ongoing capital works available for agreement holders for managing the CFGM, perhaps on rotation within a scheme to ensure long-term delivery of benefits; potentially some flexibility in option prescriptions at NE advisers' discretion; ongoing close adviser support for agreement holders in delivering CFGM management; large-scale contiguous land management is required to achieve targets for biodiversity, so encouraging farmers to work together to achieve large-scale uptake of AES.

Site Context

The Lyth Valley lies on the edge of the Lake District National Park in Cumbria. There is a large area of CFGM all of which is within the HLS target area. A large proportion of the CFGM is mapped as 'highly important', yet few AES are present in the area. This case study will explore why there has been so little uptake of AES and whether this has impacted the quality of the CFGM habitat and biodiversity value. For this case study, interviews were held with the NE area adviser and the National Trust. The Trust own land within and to the east of the PHI around Sizergh Castle and oversee several AES agreements delivered by tenant farmers.

Figure 4.18 shows the case study location with the CFGM PHI, HLS target area, SSSI, CFGM 'highly important' areas marked. Figures 4.19 and 4.20 show the most and least beneficial options taken up within the area.

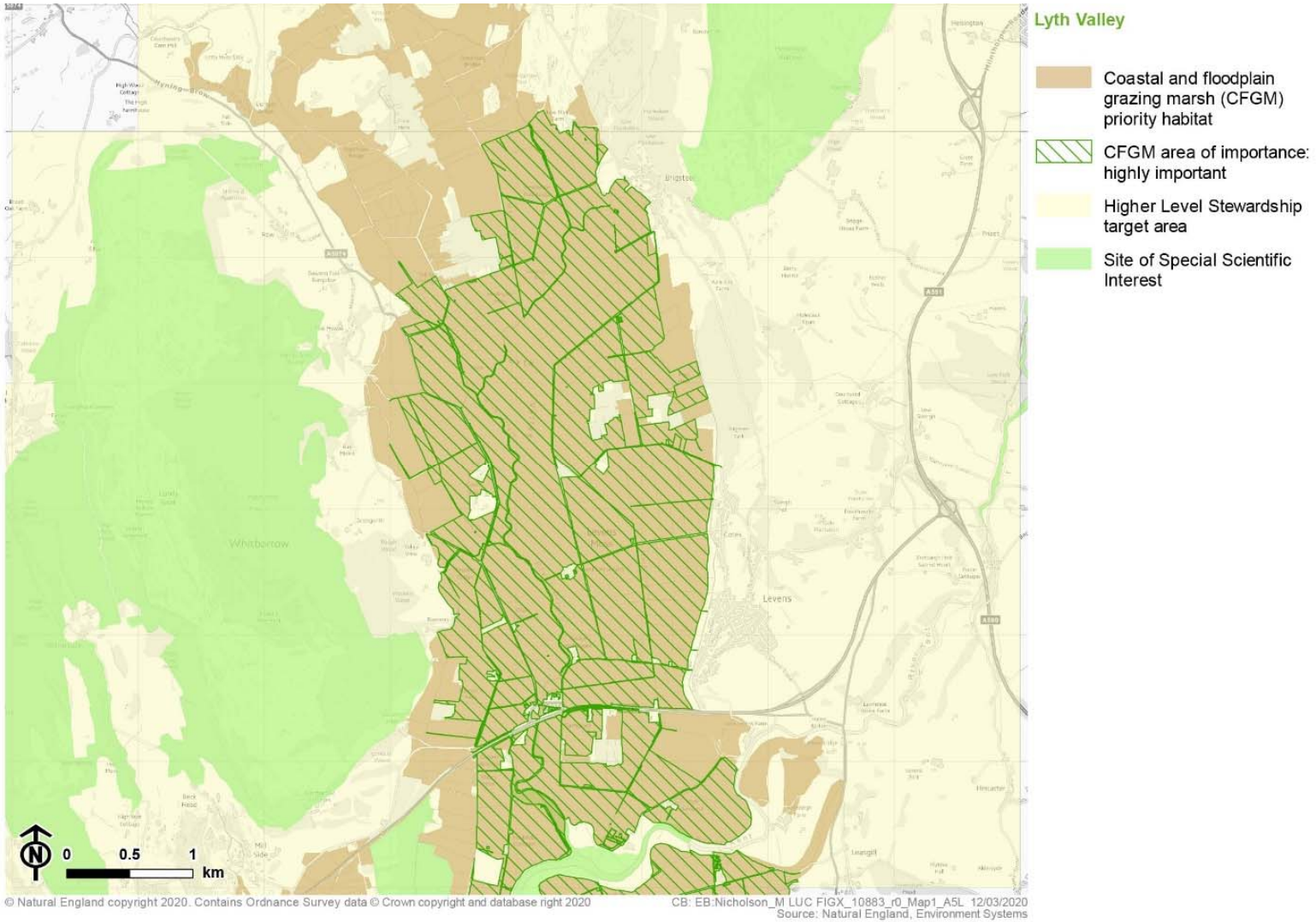


Figure 4.18 Case study location showing CFGM PHI, HLS target area, SSSI, CFGM 'highly important' areas

Options taken up

Table 4.7 includes the options taken up within the ES agreement reviewed. Within the CFGM PHI there is only a small area of four field parcels with **HK11** taken up, one of the most popular options nationally for management of CFGM. The fact that this option is to restore the grassland indicates that the CFGM in this area is in a poor condition.

Other options outside of the agreement and the CFGM PHI area include **HK7** another popular option nationally for restoring CFGM grassland habitats, and also the less popular option **HQ5** for the creation of reedbed. The low uptake of habitat creation options indicates the lack of opportunities for habitat creation nationally. **HQ5** has been identified as an option which could contribute towards a more naturally functioning wetland mosaic approach.

Table 4.7 Options taken up within the interviewed ES agreement

Option Grade	Options taken up inside CFGM PHI	Options taken up immediately outside CFGM PHI
1 – Most beneficial	**HK11** *Restoration of wet grassland for breeding waders*	On Park End Scheme agreement: **HQ5** *Creation of reedbed* **HK7** *Restoration of species-rich semi-natural grassland* **HK18** *Supplement for haymaking* On other areas: **HK7** *Restoration of species-rich semi-natural grassland* **HR1** *Grazing supplement for cattle* **HR2** *Grazing supplement for native breeds at risk*
2 – Quite beneficial	None	None
3 – Of benefit	None	None
4 – Less beneficial	None	**ED5** *Management of archaeological features on grassland* **EK2** *Permanent grassland with low inputs* **EK3** *Permanent grassland with very low inputs*
5 – Least beneficial	**EB1** *Hedgerow management for landscape on both sides of a hedge* **EB3** *Hedgerow management for landscape and wildlife* **EC2** *Protection of in-field trees (grassland)*	**HC7** *Maintenance of woodland* **HC18** *Maintenance of high value traditional orchards* **HC20** *Restoration of traditional orchards* **EC2** *Protection of in-field trees (grassland)*

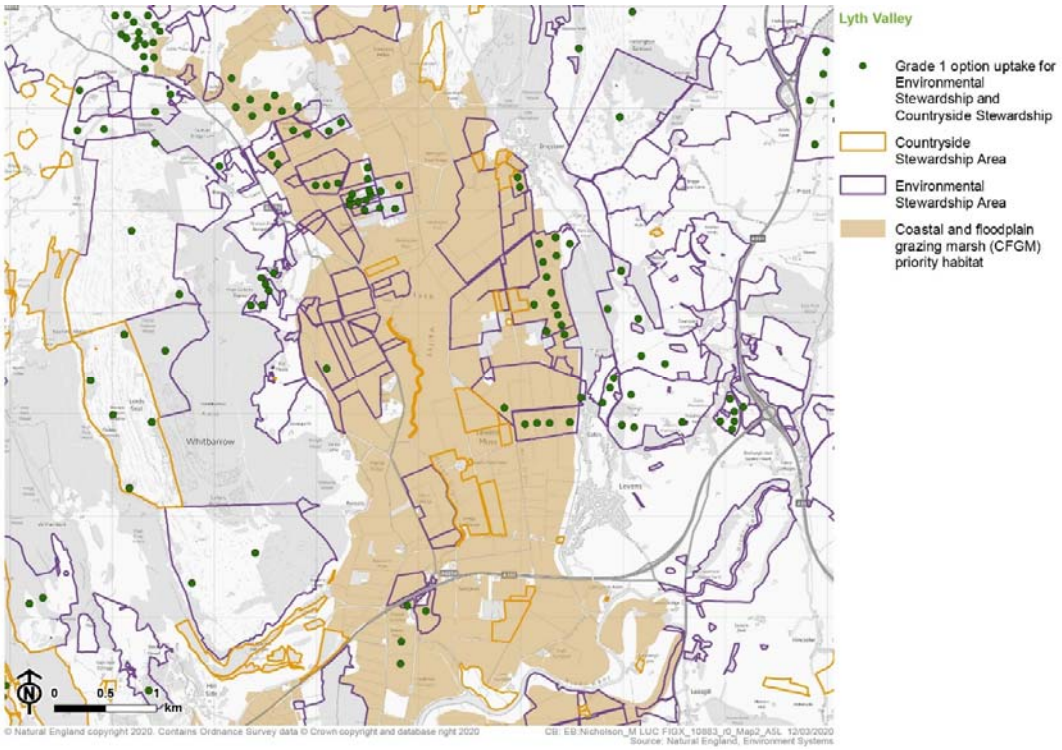


Figure 4.19 Case study area showing uptake of grade 1 options

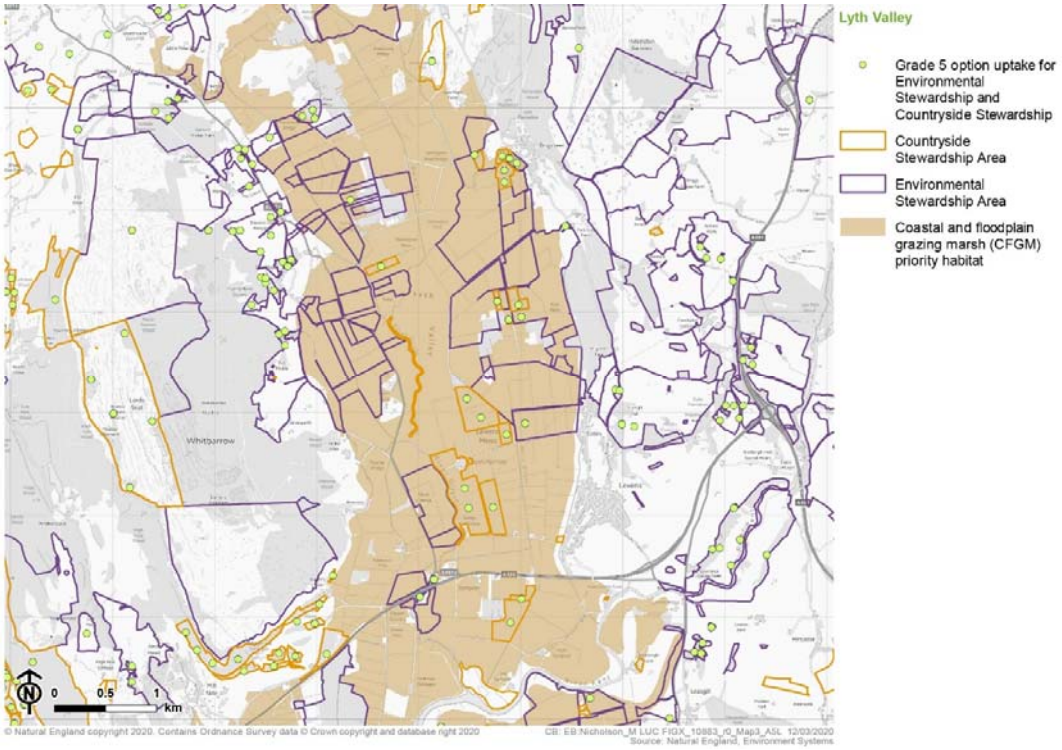


Figure 4.20 Case study area showing uptake of grade 5 options

Discussion

Condition of PHI, and land management inside and outside of PHI

The condition of the CFGM in this area is poor, with very few AES taken up. Where they are present, some agreement holders struggle to implement options effectively due to a lack of guidance. Areas managed under options beneficial to CFGM have a notably different structure to the surrounding more intensively managed land, and there are localised areas of improved habitat. However, overall low uptake of AES within the CFGM has meant that there has been little change to management in the area that has benefited biodiversity.

History of land management in the area

Historically, the area was mostly grazed intensively by dairy cattle. Management has altered slightly in recent years to being intensive silage cropping to feed dairy herds, with aftermath sheep grazing.

Motivations for joining AES and barriers to joining

The National Trust were encouraged to join the scheme as their objectives were aligned with those of the scheme. The funding enables the National Trust to deliver improved habitat management. Local private farmers appear to be largely motivated by the financial benefits of the schemes, although the interest in farming for nature is growing.

Farmers are deterred from entering AES by the quantity of information requested when joining, and the detailed prescriptions that govern the implementation of options once in a scheme. The amount of paperwork required in terms of the provision of evidence can be hard to keep up with, and is off-putting for farmers. AES also requires a cultural change in the agreement holders' approach to what farming; a shift from production of crops to production of biodiversity, from tidy intensively managed grass fields to a more 'unkempt' but diverse grassland structure. This change is highly evident on the ground, and so making this change within sight of neighbouring farmers can be enough to deter some farmers from joining a scheme altogether.

A cultural shift away from intensive production to management for biodiversity is required in the Lyth Valley to achieve meaningful results.

Changes to the species present as a result of management under AES

On a local level within the CFGM, there hasn't been the improvements in invertebrate numbers that the agreement holders hoped to see. Similarly, options undertaken within the CFGM to benefit breeding waders have not seen any great changes in abundance or diversity. Generally, across the Lyth Valley, there has been a continued decline in breeding birds, particularly with regards to numbers of curlew.

The exception to this has been a project for habitat creation outside of the CFGM at Park End Moss. Here, a partnership of NGOs (the RSPB, National Trust and Natural England) worked together to create a large area of reedbed on unproductive agricultural land; the only area of reedbed creation within the Lyth Valley in the last 10 years. The agri-environment scheme was essential for the realisation of this scheme; capital works funding helped to undertake the creation of bunds, scrapes, ponds and reedbeds, and without the annual payments for grazing management, it would be difficult to incentivise the tenant farmer to manage the habitat through grazing. This area has seen the greatest increase in target species present within the Lyth Valley.

Changes to habitat as a result of management under AES

Grazing options have generally improved the CFGM habitat, but the uptake of agreements has been so low within the CFGM that improvements are very localised. The dominance of rush has been an issue on some areas. Areas that have performed better in the region tend to have been where agreement holders have sustained guidance from an adviser such as the RSPB.

Issues with option implementation or scheme, alterations in productivity

Successful management of CFGM is difficult to achieve in this area. It requires intensive management throughout the year and a deep understanding of what is required to achieve biodiversity objectives. In the Lyth Valley, it is felt there are few farmers with the skill and inclination to undertake this level of management.

Successful management of CFGM is difficult to achieve. It requires intensive management throughout the year and a deep understanding of what is required to achieve biodiversity objectives. Few farmers in the Lyth Valley have the skill or inclination to undertake this level of management.

Rush has been an issue locally, particularly where fields hold water and therefore prevent machine access during periods where topping and weed-wiping could be undertaken to aid control. Elsewhere, controlling water levels as per the option prescriptions has been a struggle with the CFGM drying out quickly and not holding water.

Maintenance of foot drains, ditches and scrapes is required beyond the initial three-year capital works period allowed as part of ES. In reality, to be implemented successfully, these features require capital investment on an annual basis and therefore schemes have struggled in the latter years of their agreements to maintain the beneficial effects of these management options.

The quality of the implementation of options has also been variable, and this is likely to have had an impact on the success of options in maintaining biodiversity within CFGM. Areas that have seen the best results have been where farmers have had continued guidance throughout their scheme from a local area adviser, such as an RSPB project officer. However, whilst monitoring of schemes is important, this continued advice and relationship with agreement holders is the key to achieving objectives with regards to management of CFGM; management cannot be enforced if the agreement holder does not have an understanding of how to deliver options successfully.

The timing of operations as stipulated in the option prescriptions has been an issue in this area and can affect productivity for both the agreement holder and for wildlife, and in worst cases can act as a barrier to potential agreement holders entering a scheme. For example, spreading farmyard manure helps to increase the productivity of CFGM for agreement holders. Spring is the ideal time to undertake farmyard manure spreading operations as it is readily available following winter. If spread in spring, this can also lead to an increase in invertebrate numbers which in turn benefits breeding waders. However, AES place timing restrictions on the spreading of farmyard manure in late spring to prevent disturbance of ground-nesting birds, but as agreement holders often have to wait for the land to dry out before they can gain access, the window in which they can undertake any spreading is often missed. The result can have a negative impact on both the farmer's productivity and the availability of invertebrates for chicks. For some potential agreement holders, being unable to spread farmyard manure in late spring can be a barrier to entering an AES altogether. Some flexibility in prescriptions in this instance

could be beneficial; management of these schemes requires an in-depth local understanding of the land and how to achieve the objectives for CFGM.

Farm productivity is generally reduced as a result of option prescriptions for management of CFGM; reduced grazing, reduced cutting, and often reduced inputs all have an impact.

Understanding of general experience in area

Where schemes are in place they work well and benefit farm businesses, however, payments alone are not enough to persuade land managers to join schemes; payments for options are inadequate given the intensity of management and depth of knowledge required to implement options successfully.

Without AES, there might be localised impacts where grazing is either removed altogether or increased in intensity. As the uptake of AES has been so low, it was felt that generally, there would be little impact if AES was lost from this area.

Payments are not enough to persuade land managers to join schemes; payments for options are inadequate given the intensity of management and depth of knowledge required to implement options successfully.

Suggested changes to the CFGM PHI

Much of the CFGM recorded on the PHI in the Lyth Valley is in poor condition. The National Trust are currently undertaking a review of the PHI in the area which could prove a useful source of ground-truthing for Natural England.

Is restoration of a naturally functioning floodplain feasible?

There is no naturally functioning floodplain within the Lyth Valley as it is artificially pump-drained by the Environment Agency. At times of heavy rainfall, the region suffers from major flooding events and due to the pumping, it takes a long time to drain the land. Furthermore, the valley is almost entirely CFGM on peat which is not currently being managed to maximise carbon sequestration. Farming operations in this area are largely supported by the Basic Payment Scheme, and when this ends (in 2027), it is likely that many farm businesses will struggle to be commercially viable without continued financial support. As a result, land management within the Valley is unsustainable long-term and there is potential for a large-scale shift from productive farming to biodiversity enhancement. With carefully managed decline in financial support for farmers and appropriate planning and guidance, this money could be channelled into a project in the Lyth Valley which seeks to restore a naturally functioning floodplain for the benefit of flood management and biodiversity. A 2009 research paper[5] funded by Wetland Vision explores the potential for such large-scale land management change in the Lyth Valley. It's insights into feasibility would provide a useful starting point to consider the restoration of a complex wetland system within the valley.

[5] Options for biodiversity gain associated with water management in the Lyth Valley, Cumbria. 2009

Suggestions for changes to future scheme

- Ongoing capital works available for agreement holders for managing the CFGM, perhaps on rotation within a scheme to ensure long-term delivery of benefits.
- Potentially some flexibility in option prescriptions at NE advisers' discretion.
- Ongoing close adviser support for agreement holders in delivering CFGM management.
- Large-scale contiguous land management is required to achieve targets for wading birds. Small-scale agreements and improvements to habitat have little effect on biodiversity. For example, if a parcel of land is improved, ground-nesting birds are increasingly vulnerable to predation from surrounding land. Equally, if an area of improved CFGM is surrounded by silage fields, birds such as curlew are not selective about where they nest at the start of the season and those that choose to nest on the silage fields are later lost by farming operations. Encouraging farmers to work together to achieve this large-scale uptake could be incentivised by higher payments or scoring.

How effective have AES been in conserving the biodiversity value of CFGM habitat?
In the Lyth Valley, AES has largely been ineffective at conserving the biodiversity value of CFGM. Uptake has been low and schemes have not incentivised widespread uptake which has meant that local improvements have either been compromised or had little impact.

How effective has the current HLS target area been in targeting the delivery?
HLS targeting in this area has not been effective in effecting widespread uptake of schemes.

4.7 Key points from Case Studies

The case studies presented here provide a sample of sites across England that give some insight into the issues involved in the conservation of CFGM through AES. In this section, some key conclusions will be drawn from the case study findings, looking at the impact of agreement holders' motivation, outcomes for biodiversity, opportunities for a move towards a creation of a FWM and the kind of guidance that would be required to achieve this, and conclusions for future schemes, such as the Environmental Land Management Scheme (ELMS).

Motivation for joining AES

The overriding motivation for land managers to join AES was cited as financial. Conservation management was a secondary motivation and was most prevalent amongst NGO agreement holders. The conservation objectives of NGOs align with or exceed those prescribed under AES, so the positive management of the CFGM undertaken by these organisations would likely have been undertaken with or without AES. However, all NGOs remarked on the importance of AES in supporting the scale and success of their interventions.

For private land managers, there is a varied interest in conservation, ranging from those who are completely financially driven to those who are financially motivated but with a strong biodiversity interest. It was suggested in a number of the case study areas that there is a growing interest in conservation management and biodiversity, with a sense of satisfaction from farmers of knowing that certain management practices are benefitting nature. However, there were mixed responses on whether or not payments are sufficient to cover the cost of option implementation, and the shortfall in income due to loss in productivity. In areas such as the Broads where the management required for the maintenance of CFGM aligns well with the general management approach by farmers it was felt that payments were adequate. In other areas where intensive farming is highly productive such as in the Lyth Valley, it was suggested that AES payments are not sufficient to encourage take up of schemes. In other areas such as the Cayton and Flixton Carrs, the agreement holder was highly dependent on financial support from AES to remain in business.

It is likely land manager's motivation(s) for joining an AES also has an impact on the success of option implementation for conserving biodiversity. There is no specific option for the management of CFGM habitat and so upon entering an AES agreement, decisions need to be made about the desired outcome, for example, is the site to be managed for breeding waders, over-wintering waterfowl, for species rich grassland, or for water quality? Where motivation is purely financial and combines with a lack of awareness of the habitat/biodiversity value, and the challenges of undertaking such intensive year-round management required for this habitat, agreement holders may only marginally satisfy the option prescriptions. This can be reflected in minimal on-the-ground changes for both habitat and species. To ensure the benefits for both habitat and species are maximised, ongoing advice, training and information sharing events have been reported to be imperative.

Outcomes of current management for biodiversity value

The most effective options have been those that manage the grassland for target features (HK15 under ES, GS13 under CS), and those grassland options that focus on breeding waders (HK9, HK11 under ES, GS9 under CS), and wintering waders and wildfowl (HK10 under ES, GS10 under CS). Section 3 of this report concluded that these options were also the most frequently taken up. There have been some localised improvements to species and habitats, for example, where particular habitat creation projects have been undertaken (in the Lyth Valley by the National Trust, and as a result of the coastal realignment projects in the Severn Estuary), and particularly in reserves managed by NGOs. However, in most areas, AES have not brought about the improvements to biodiversity interest on CFGM that were intended, but rather have maintained species interest and prevented any further declines.

For individual farmers it has been more difficult to achieve notable improvements in biodiversity. The management for some species, particularly breeding waders is particularly onerous and requires knowledge and ongoing management interventions to maintain the specific habitat required to achieve the enhancements sought (such as increased breeding bird numbers). Furthermore, the size of the agreement and nature of land management around the holding are important factors that impact the extent of success. For example, where agreements are small and scattered amongst a landscape comprised mainly of intensive, agricultural production, as is the case in the Lyth Valley and in Cayton and Flixton Carrs, the improvements to habitat and species are not as notable. Further issues outside of the control of agreement holders, such as changing weather cycles and their impact on ground water, or the level of predation on ground nesting birds, have further hampered efforts.

To achieve sustainable changes in species populations of lapwing in the Yare Valley, or curlew in the Lyth Valley for example, large-scale contiguous management is required. This highlights the need for a landscape or catchment-scale approach to management of CFGM, through cluster farms and facilitation funding or area-based projects.

All agreement holders have noted the changes in the CFGM habitat over the course of the agreements having an impact on the species observed in any one year. Successful management of the CFGM habitat requires continual tweaking of prescriptions and a close guiding relationship with an adviser has been integral to the success of management.

Rush dominance part way through the term of agreement was a consistent issue across the case study locations and often leads to a reversal in the initial success of a scheme for biodiversity. The dominance of rush was often indirectly exacerbated by lack of knowledge and understanding of how to manage rush. A prevalence of rush and lack of ongoing maintenance means scrapes and foot drains close up, essentially losing the valuable habitat originally created for breeding birds/chicks. Under HLS, rush management was costed into the relevant base payments. The issue with rush could be down to inadequate planning on behalf of agreement holders, or it could be that agreement holders are not adequately being compensated for this level of management. Under CS, a direct option **GS16** *Rush infestation control supplement* is available (the 8th most popular option nationwide, see Annex 4, Table A4.2), although prescriptions may limit agreement holders' ability to get on top of infestations; issues with wet ground conditions restricting access to effectively undertake operations such as removing tips and weed wiping are a common occurrence.

Some of the experiences in relation to AES

- Options that are most frequently used and have achieved the best results are those that manage the grassland for target features (HK15 under ES, GS13 under CS), and those grassland options that focus on breeding waders (HK9, HK11 under ES, GS9 under CS), and wintering waders and wildfowl (HK10 under ES, GS10 under CS). Any future scheme should include these options.
- Experience across the case studies with regards to applying for and receiving derogation approval differed. In some areas (at Lydney, Yare Valley, Cayton and Flixton Carrs), derogation agreement often arrived too late for the desired management to be implemented. A simplified and fast-tracked derogation process should be designed.
- For the experience and knowledge of the land manager to be taken into account where agreements are developed.
- For greater availability of capital work funding throughout the term of the agreement to accommodate the continual adjustment of management required for good CFGM management.
- Collaborative scheme at the landscape scale. This would have the advantage of having a stronger investment in advice, support and knowledge exchange amongst all potential agreement holders.

Opportunities for a Floodplain Wetland Mosaic (FWM) approach

All landscapes within the case study areas are subject to highly engineered hydrological systems; interventions such as engineered flood defences (Severn Estuary, Test Valley, Yare Valley), with water levels set by Internal Drainage Boards (IDBs) (Cayton and Flixton Carrs, Yare Valley), or pump-drained by the EA (Lyth Valley), and with land managers in all areas artificially adjusting water levels on their land through use of water control structures.

The suggestion of restoring natural hydrological systems was met with mixed responses during the case study interviews. In the Cayton and Flixton Carrs area, the combination of the underlying geology leading to rapid drainage of flooded areas, the current approach to management of the River Hertford as a drainage channel and other factors such as water abstraction impacting water levels, are considered insurmountable issues when considering the introduction of a more naturally functioning FWM.

However, it seems such an approach could be feasible in the other case study areas. Locating more naturally functioning floodplain mosaics upstream was suggested by NE advisers. The case studies have highlighted the fact that whilst there are similarities in the issues that arise, each area is unique when considering a return to natural function of waterbodies. It is clear that the consideration of any return to natural function would require a catchment-level feasibility study to fully explore the impacts on farm businesses, biodiversity, water quality, flood management, and production. In addition, the following issues would need to be addressed:

- The engagement of landowners willing to accept such an approach is a fundamental issue to overcome; the successful coastal re-alignments in the Severn Estuary were both on EA owned land, and elsewhere concerns over irreversible loss of land for production have been raised.
- Successful management of CFGM requires a cultural shift in farm management away from production. In some areas where there is a long legacy of AES, this shift has already been achieved (Yare Valley), but for areas such as the Cayton and Flixton Carrs and the Lyth Valley where there hasn't yet been a widespread shift, acceptance of the measures required to restore natural function to the landscape could be a step too far for some.
- The impact on the current biodiversity value of the highly important areas of CFGM, and other SSSI habitats within the catchment. Areas where water quality is currently poor could have a negative impact on ditch species assemblage.
- That this approach should look beyond the existing CFGM PHI. The case studies have supported the suggestion in Section 1 that there are areas beyond the PHI that could be considered highly important. For example, the successful wetland creation project undertaken by the National Trust in the Lyth Valley.

Analysis of FWM option take up

Uptake of options identified during Task 2 as suitable for creating FWM was low under ES. In terms of area taken up by FWM options, there were three options identified in the top 3 that could be highly beneficial to FWM if undertaken on coastal habitats; **HC15** *Maintenance of successional areas and scrub*, **HC16** *Restoration of successional areas and scrub*, **HC17** *Creation of successional areas and scrub*. Scrub is likely to be detrimental on CFGM, but it could form an important part of a mosaic of floodplain wetland habitats. Despite the absence of these successional scrub options from the case studies presented here, it is notable how widespread these options have been used across the CFGM PHI. Uptake was greatest in the

areas identified under Task 1 as highly important. The prevalence of this option could be in response to high levels of scrub threatening the CFGM or an indication that they form an important part of the wetland mosaic of habitats. This could be investigated in more detail.

Under ES, none of the options considered beneficial for creating a FWM focusing on the restoration / creation / maintenance of specific habitats (coastal saltmarsh, reedbed, fen) were taken up in any significant quantity. In contrast, whilst uptake of equivalent options under CS were lower in terms of spatial coverage, they had greater coverage proportionally than under ES.

Of the CS options that appeared in the top 20, **WT8** *Management of fen*, **WT6** *Management of reedbed* and **CT3** *Management of coastal saltmarsh* all had the greatest uptake within SSSIs and the highly important areas identified in Task 1. **CT3** was notably absent from the potentially important areas.

SW16 *Flood mitigation on permanent grassland* was also included in the top 20 options by spatial area. It is perhaps the most interesting of all options in terms of restoring natural hydrological function in a floodplain. This option was notably absent from SSSIs and highly important areas with uptake only present within potentially important areas. There is no ES equivalent option to make comparison between schemes. It's absence from those areas identified as most important areas for biodiversity indicates that so far, restoration of natural function by allowing grassland areas to become flooded has been limited to CFGM which is either of poor quality or has not been identified as highly important. It would be of interest to engage an agreement holder with **SW16** within their agreement to understand how this option has delivered for biodiversity and for the agreement holder.

Towards a more naturally functioning wetland mosaic

The case studies have highlighted the need to approach management of both the current CFGM and consideration of any future restored natural functioning habitat at a catchment level. The intensive management required to maintain the biodiversity value of CFGM is influenced by the wider hydrological conditions, surrounding land management and climate. To create landscape-scale sustainable changes in species present on this habitat, this management needs to be undertaken *en masse* as opposed to on isolated holdings. Equally, the consideration of suitable areas for the return to a hydrological system that functions naturally must consider impacts on the wider catchment. It would require a catchment-level approach to restore a sustainable functioning system, with potentially large-scale engineering in the initial phases to enable the land to take flood waters once again. However, the benefits of this approach could provide a more sustainable method of approach to land management, help combat flooding (Lyth Valley), and even, as is the case of the Severn Estuary, be beneficial to the management of the CFGM by protecting this habitat.

Achieving this landscape-scale delivery is a challenge which could be addressed through the engagement of land managers working in partnership and/or as part of a larger scheme where putting in an application together results in a higher payment rate or scoring. Individual studies such as the Hampshire Wetland Habitats Project (2007) and the restoration of lowland peatlands (Morris et al 2010) provide important insight into the complexity of CFGM management. They also highlight the enormous potential for these landscapes to deliver changes in land management which could reduce land-based emissions of greenhouse gases while continuing to produce food, adapt to climate change and improve biodiversity.

Further exploration is required for successful re-naturalisation of river floodplains, both in the UK and abroad. Drawing on experience elsewhere to fully appreciate the issues, opportunities and management required for inland FWM will help inform the desired outputs and approach that should be taken to see this achieved in ELMS.

The examples of coastal realignment presented by the case studies along the Severn Estuary, although very recent in their realisation, have so far proved to be successful. Further monitoring of the progress of these two schemes will help understand the wider impacts of these projects. Further partnership working with the EA to explore other possible areas for realignment projects could be beneficial for both the CFGM and flood mitigation along the coast and inland.

5. Conclusions and next steps

5.1 Conclusions

Coastal and floodplain grazing marsh (CFGM) is an important priority habitat distinguished by a mosaic of habitats and species interests that are driven by specific hydrological regimes. The land is dependent on periodic inundation. CFGM can either be a managed hydrological regime with flooding and water levels controlled by a series of ditches, or areas subject to natural flooding either through natural coastal or riverine floodplain processes. It is the combination of different types of habitats which are in turn predicated on the varied hydrology of the area that, at its best, provide a FWM of extremely high biodiversity value. Many areas of the priority habitat have, however been drained and used for high intensity agriculture. The land is inherently fertile and rarely dries out due to drought events.

This project sought firstly to identify the areas of the CFGM that had a 'high biodiversity value. Following on from this initial mapping task the role of agri-environment schemes protecting the interesting features of the current CFGM was considered as well as evaluating how well AES have been used to contribute towards improving natural floodplain functioning and establishing a FWM. Finally, a series of five case studies was carried out to understand how farmers and land managers interacted with the habitat and the schemes to protect and enhance biodiversity, and ensure the maintenance of the hydrological regime. The motivation and experience of land managers was also investigated.

The high biodiversity of CGFM is driven by the mosaic of habitats. Ditches with year-round open water can support a very large number of plants, insects, fish and animals. The native grasslands and wetland habitats associated with CGFM support 47 UK BAP/Section 41 species. Between the different types of habitats, the most diverse type of marsh can hold over 500 plant species. Perhaps the most important species group supported, largely by the hydrological regimes, are the wintering waders, many high biodiversity grazing marshes support internationally significant populations of these birds.

Task 1 identified and mapped those areas of 'high biodiversity value grazing marsh from those areas of more intensively managed land. Within this initial project it was not possible to suggest which areas were supported by natural hydrological processes and which are supported by managed ditch systems, although how further progress could be made in this modelling is suggested in the next steps (Section 5.2).

Task 2 of the work explored the role of agri-environment schemes in conserving and enhancing the biodiversity value of CFGM. This was based on a national analysis of the uptake of agri-environment scheme options within the CFGM Priority Habitat Inventory (PHI) area. It explored differences in the spatial pattern of AES option uptake, particularly within Sites of Special Scientific Interest (SSSIs), within the Higher Level Stewardship (HLS) Target Area, within the highly important and potentially highly important areas identified in Section 1. AES were shown to be contributing to the conservation of existing biodiversity value of CFGM. This contribution is concentrated amongst a relatively small number of options, including grassland management with some options which offer potential benefit having low levels of uptake. CS

does appear to be more targeted than ES, while both schemes show an emphasis on conservation within the areas of highest habitat value and restoration/management in areas of lower value, or potential value. Many of the options with the greatest coverage support more naturally functioning FWM.

Finally, a series of case studies were undertaken. These considered how the AES are working on the ground looking in more detail at the hydrological regime, the biodiversity value and the perceived barriers and opportunities the schemes offer farmers and land managers. The case studies were deliberately chosen to cover a range of different hydrological regimes and farming practices as well as geographic areas. The common themes emerging included the fact that AES schemes within the area are valued for their financial contribution to the farm income. This in turn could have an effect on the quality of option implementation depending on the agreement holder's interest in the habitat and its potential for biodiversity. Agreements are particularly valued where the land is being managed as part of a SSSI or protect sites as a high biodiversity area CFGM. The funding was seen to be helping with the cost of managing such areas and particularly the cost of capital works. Where the land was not already supporting high biodiversity, the schemes were viewed as a way of restoring high biodiversity value to the area. However, there were barriers, both in that the regulation did not always allow management in a timely manner for all areas, and in the loss of potential income from a potentially high fertility area. Complexity of schemes and whether a project officer was available to give advice also were potential barriers.

Mapping CFGM

Mapping during Task 1 involved designing a system of modelling that utilised national data sets, so could be strategically run for the whole of the country, and supported both the hydrological regime and species assemblages indicating inclusion as a 'high biodiversity' area. Data was sourced to describe each of the key factors: hydrology, landscape, habitats, and species and a large number of stakeholders were consulted to obtain suitable data and to ensure the definitions worked to were robust.

A reductive approach was taken with the mapping, with the first level including NVC classes and any known SSSIs in good ecological condition, areas that fell without this definition then went forward to subsequent tests including appropriate habitats, bird species records and other stationary and non-stationary species. The system was designed in a geographic information package (FME) which allows each input dataset to be tagged and queried. Its logical structure means it forms the basis of a tool going forward that can be further enhanced and developed as required.

In total, 28.2% of the existing PHI has been classified as highly important for biodiversity. The large majority of the rest of the PHI (71.6%) either has no evidence of high biodiversity or is known to be in intensive management. This land still retains the hydrological attributes necessary to function as CFGM and could be restored with appropriate management, this has therefore been tagged as 'potentially important'. Conversely these areas might also provide an opportunity for increasing natural function in line with the proposed FWM approach without unduly impacting on existing areas of high biodiversity value.

A number of data gaps were identified, both within data sets and in the collection and application of the data. Other techniques for refining the area of potential 'high biodiversity'

CFGM including use of remote sensing, field survey and water quality data have been suggested in order to refine this mapping further.

Within this part of the study the project had the resources to concentrate on identifying the 'high biodiversity' element of the CFGM. Considering whether the hydrological regime was artificial, artificial with managed flooding or natural was not within the scope of this project. However, data does exist within the EA and other DEFRA bodies, such as WFD datasets, that could help quantify this as part of a future project.

Gaps in data and understanding that limit the current modelling of areas highly important for biodiversity with the CFGM are as follows:

- The lack of a standard approach to surveying that includes noting absence as well as presence;
- Limited central access to national datasets, without requiring individual local record centre permissions;
- Streamlining and prioritising the number of invertebrates classified as important in relation to CFGM;
- The optimal ditch density for CFGM is not understood or agreed and might vary regionally.

Effectiveness of AES in conserving existing biodiversity value of CFGM

The analysis of AES (ES and CS) option uptake within Section 3 demonstrates that a large number of possible options are present within the CFGM PHI area. Not all of these options are directly related to CFGM habitat or the creation of FWM, reflecting wider patterns of land management within holdings. Nevertheless, a relatively small number of both ES and CS options accounts for a significant share of uptake. The eight most frequent ES options, and eight most frequent CS options both account for 60% of uptake within the CFGM area, and, under both schemes, the two most frequent options account for around a quarter of uptake. For both schemes, these two most frequent options focus on management of grassland for target features and wet grassland for wintering waders and wildfowl.

The analysis suggested that there was greater targeting under CS and that options that would be good for CFGM were under-utilised in ES. Uptake of appropriate AES options was higher in SSSIs and in areas deemed by Task 1 to be important for high biodiversity CFGM. This suggests that AES are successfully targeting conservation of the highest value habitats and work to improve biodiversity value elsewhere.

A future scheme would need to build on the approaches taken in ES, to develop good options for CFGM and to also target functional restoration through options suitable for FWM. Accurate targeting will also be important. AES are contributing to the enhancement of CFGM and, when combined with the model outlined in Section 2, would become more effective and efficient. Revisiting any options deemed to be potentially contributing, but with a low uptake, would be a priority so they can be more attractive to farmers and land managers in the areas of highest

CFGM potential for restoration or enhancement. Consideration should be given to the development of a bundle of options with clearly defined CFGM and FWM priorities and desired outcomes for each.

Findings from the CFGM Case Studies

The five case studies provide an early indication as to how AES is implemented on CFGM sites. These are not a representative evaluation of the role of AES or of CFGM but the main points arising are:

- For both farmers and NGOs, the motivation is largely financial, mostly due to the complex and challenging nature of managing CFGM. However, there is a growing interest amongst private agreement holders in management for biodiversity and other benefits.

- The scale of agreements is important and CFGM projects work best at the landscape-scale, especially in terms of managing water levels.

- Currently, based largely on anecdotal evidence, the habitat and biodiversity value of CFGM is maintained but not enhanced (although it should be noted that in some areas, a lack of species monitoring suggests that the impact of management is not fully understood). There needs to be some motivation towards and knowledge of the management of CFGM, so that farming practices can be aligned to achieve this. Ongoing advice, training and knowledge exchange is critical in maintaining both interest and in resolving complex challenges.

- Prescriptions can hamper management success, and even deter some farmers from applying for a scheme. Many of those spoken to asked for more flexibility on the dates within AES prescriptions to, for example, cover rush management, grazing in spring or autumn, weed control, applications of farmyard manure and dates for hay cutting.

- CFGM occurs within highly engineered hydrological systems that can often be unique to an area. A catchment-based approach is required, that takes into account landowner interest, cultural change, impacts on the highly important areas identified in Task 1 and any SSSIs, and looks beyond the existing CFGM PHI.

- Further detailed exploration of those options under CS that encourage FWM approach (such as **SW16** *Flood mitigation on permanent grassland*) to understand how they perform for biodiversity and agreement holders would provide important evidence in the development of ELM.

- Further exploration of the restoration of successful FWM approaches in the UK and abroad should be undertaken to learn from experience to date and influence the approach taken for ELM.

5.2 Next steps and future schemes

The work in this project has helped towards creating and mapping a definition of high biodiversity CFGM, clearly confirming 27.8% of the current PHI as of high biodiversity value. The case studies confirmed these areas but also suggested that land outside the existing PHI should be considered as there is a high possibility of CFGM with high biodiversity value outside the current PHI. This was supported by options uptake for habitats and actions that support this habitat that were outside the PHI reported in Section 3.

Suggestions for potential next steps to utilise and implement the key findings from this project are as follows:

- A phased approach to improving the data available;
- Disseminating the key findings to key catchments; and
- Considering the findings for future schemes such as ELMS.

Phased approach to improving the data

A phased approach to improving the data available for mapping and defining the extent and biodiversity value of CFGM would be a valuable step, targeting relevant stakeholders and the individual limitations of existing data by improving data collection protocols and accessibility.

Task 1 highlighted the following actions as possible next steps to enhance the mapping of highly important wetland wildlife refuges of CFGM further:

- Using the methodology developed in this project it could be possible to look outside of the existing CFGM boundary to see if any land not currently in the PHI qualifies for inclusion. The inaccuracy of the current CFGM PHI was highlighted across all case studies without exception, and therefore advisors did not rely on the mapping but used it instead as a reference document with on the ground verification taking precedence.
- Local information, using IHS level data on habitats could be collated to test the 'highly important' categorisation on the ground. This would allow local case studies to validate national data and increase the robustness of the CFGM dataset.
- The methodology could be expanded to include datasets that could not be accessed as part of this project to expand and refine the mapping.
- Remote sensing could be used on the land contained in the 'potentially important' category to help split this further into intensively managed land very unlikely to have high biodiversity, and areas much more likely to be considered to support high biodiversity. This could feed into a prioritisation for field survey for a future project.
- A project considering the land that fell in to the 'potentially important' category could be carried out to ascertain if this land could be restored through management action to high

biodiversity CFGM. This could include considering regional differences and field work checking.

- The hydrology of these areas could also be the subject of further research with possible data available on hard engineering on river and coasts and how this connects with any proposed move towards the FWM approach.

Dissemination the findings to key catchments

The project has shown that CFGM habitat is not evenly spread across the country and the location of the highly important areas is equally unevenly spread. In many cases these CFGM habitats are located at the end of a water catchment, therefore any interventions that restore natural processes or improve water quality and hydrological regimes contribute towards restoring wetland habitats. In this respect the condition of CFGM depends of factors outside the habitat itself. As a result, it makes sense to take a landscape-scale perspective regarding CFGM and highlight the benefits to existing catchment partnerships, especially those where there is a high concentration of CFGM, both 'potential' and 'highly important'. In particular:

- Dissemination of the project findings in key catchments so the new model and key outcomes can be incorporated into catchment management plans and appropriate projects developed and implemented across the partnership.

- Potential agreement holders would benefit from knowing that they are supported and acting together in a collaborative scheme at the landscape scale. This would have the advantage of having a stronger investment in advice, support and knowledge exchange amongst all potential agreement holders. Such projects could test the success of different options in different locations, as the case studies suggest that a 'one size fits all' is not the right approach to take with CFGM. CFGM sites are a complex interlinking of issues such as the habitat and biodiversity present, as well as physical factors including topography, soils and water levels.

Considerations for future schemes

The experiences of the agreement holders and advisers in the case studies, together with the national analysis resulted in some findings to be considered in the development of future land management schemes. Suggestions included:

- Simplicity in application process, agreement, option prescription and monitoring are beneficial, especially concerning complex habitats such as CFGM.
- Ongoing guidance and training for agreement holders throughout the term of their agreement is required by appropriately trained NE staff or suitably knowledgeable local advisers. Encouraging knowledge exchange opportunities between farmers for peer-to-peer learning was also seen as highly beneficial.
- Greater flexibility in option prescriptions for grazing and the balance of livestock on the land year-round, the spreading of farmyard manure and weed control operations, and to allow for external factors such as weather, site-specific issues, and the availability of farming contractors to be accommodated.

Future scheme(s) will need to be clear on the purpose of managing CFGM in terms of the public goods generated and the services the habitat provides. Outcomes rather than a prescriptive approach and focused at a landscape or catchment scale could benefit CFGM which relies on a mosaic of different habitats and can therefore be complex to manage as a whole. High density uptake of appropriate options is important to achieve desired outcomes for target species on CFGM. High quality advice, clear regionally relevant targets backed up by nationally robust inventory data sets, collected in a spatial manner and held centrally accessible would underpin and strengthen scheme outcomes.

Currently there is a lack of scheme delivery that considers natural floodplain function and future schemes need to more clearly define and target the approach to increase natural functions in the accordance with the FWM approach.

It is notable that almost all case study agreements contain, or have in close proximity, options that are part of a more varied mosaic of wetland habitats, that could support a FWM approach to management. This highlights the importance of considering the management of CFGM in the context of the surrounding habitats, and not in isolation.

A move towards an outputs-based payment scheme under ELM could help focus management on the biodiversity outcomes desired rather than maintenance of a specific habitat. This could allow greater flexibility in how habitats are managed, and provide space for agreement holders to bring their own knowledge and understanding of management techniques to create the desired outcomes. Monitoring of AES will need to be mindful of the natural fluctuation in species populations, climatic conditions that affect management of these wetland habitats, and local conditions. NE advisers will be instrumental in ensuring this approach is successful for both biodiversity and the agreement holders delivering the schemes.

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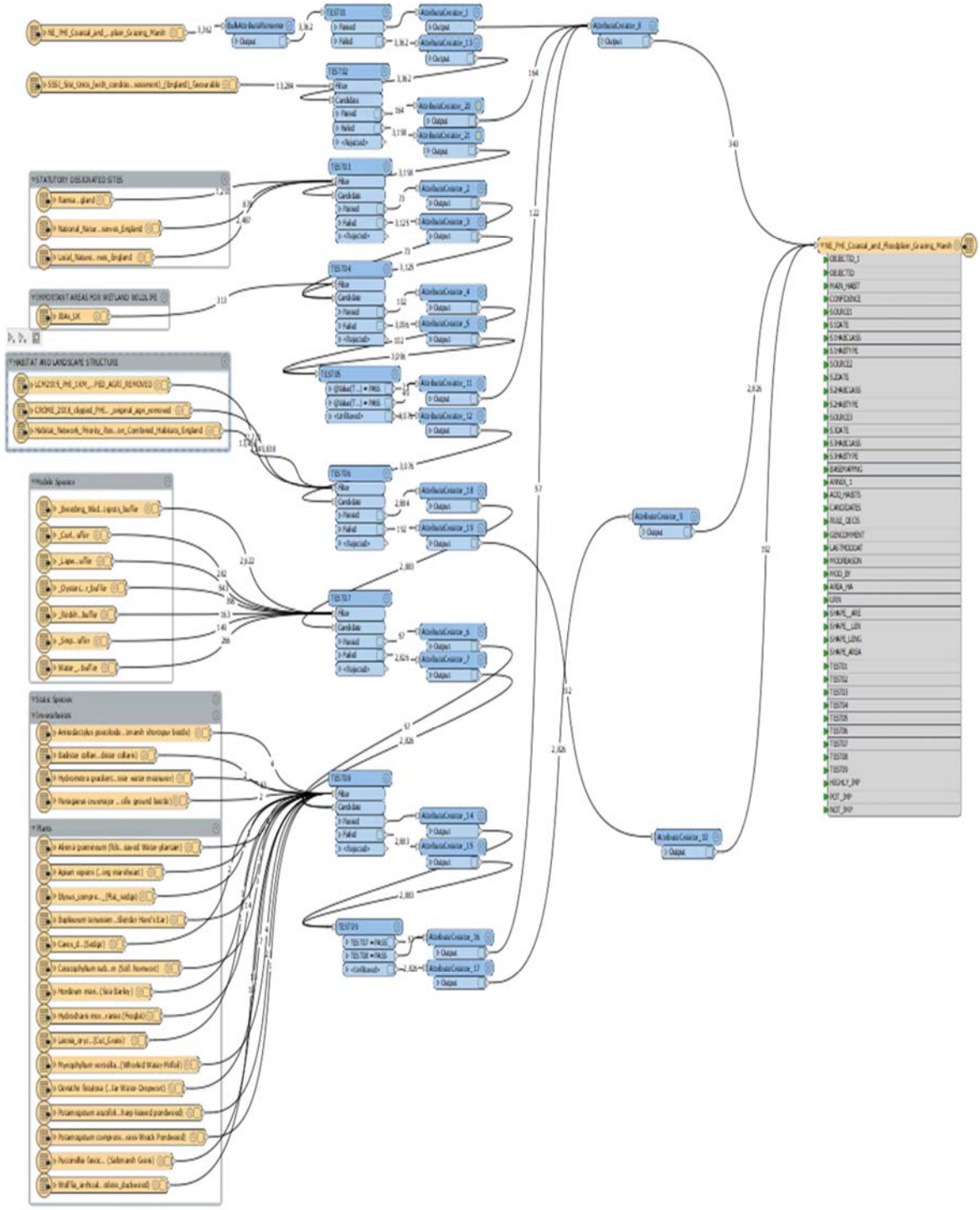
Annexes

Annex 1: Data Sources

Name	Source	Exploration reason	Format	Date accessed
Sites of Special Scientific Interest (England)	Natural England	Natural England data set	.shp polygon	25/11/2019
Local Nature Reserves (England)	Natural England	Natural England data set	.shp polygon	22/11/2019
National Nature Reserves (England)	Natural England	Natural England data set	.shp polygon	22/11/2019
Ramsar (England)	Natural England	Natural England data set	.shp polygon	22/11/2019
RSPB Important Bird Areas	RSPB OpenData	RFQ 2.9 Important Areas	.shp polygon	05/12/2019
IntStonewortIPA	Shapefile in email from Beth Newman at Plantlife	Natural England data set	.shp polygon	17/01/2020
CROME England	Data.gov.uk	Natural England data set	.shp polygon	05/12/2019
Land Cover Map 2015	Cloud link	Natural England data set	.shp polygon	
Ditch Density	OS MasterMap 1km grid squares	Natural England data set	.shp polygon	
Breeding waders of wet meadows (BWWM)	Excel CSV in email from Allen Drewitt	Natural England data set	.shp point	20/11/2019
Oystercatcher	NBN Atlas	RFQ	.shp points	03/12/2019
Wet Grassland Waders - Curlew	NBN Atlas	Natural England data set	.csv	25/11/2019
Wet Grassland Waders - Lapwing	NBN Atlas	Natural England data set	.csv	25/11/2019
Wet Grassland Waders - Redshank	NBN Atlas	Natural England data set	.csv	25/11/2019
Wet Grassland Waders - Snipe	NBN Atlas	Natural England data set	.csv	25/11/2019
Water vole	NBN Atlas	Literature review & RFQ	.csv	20/12/2019
Anisodactylus poeciloides (Saltmarsh shortspur beetle)	NBN Atlas	Literature review & RFQ	.csv	25/11/2019
Badister collaris (Badister collaris)	NBN Atlas	Literature review & RFQ	.shp point	25/11/2019

Hydrometra gracilenta (Lesser water measurer)	NBN Atlas	Literature review & RFQ	.csv	25/11/2019
Panagaeus cruxmajor (Crucifix ground beetle)	NBN Atlas	Literature review & RFQ	.csv	25/11/2019
Alisma gramineum (Ribbon-leaved Water-plantain)	NBN Atlas	Literature review	.csv	19/12/2019
Apium repens (Creeping marshwart)	NBN Atlas	Literature review	.csv	19/12/2019
Blysmus compressus (Flat sedge)	NBN Atlas	Literature review	.csv	19/12/2019
Bupleurum tenuissimum (Slender Hare's Ear)	NBN Atlas	Literature review	.csv	19/12/2019
Carex divisa (Sedge)	NBN Atlas	Literature review	.csv	19/12/2019
Ceratophyllum submersum (Soft hornwort)	NBN Atlas	Literature review	.csv	19/12/2019
Hordeum marinum (Sea Barley)	NBN Atlas	Literature review	.csv	19/12/2019
Hydrocharis morsus-ranae (Frogbit)	NBN Atlas	Literature review	.csv	19/12/2019
Leesia oryzoides (Cut Grass)	NBN Atlas	Literature review	.csv	19/12/2019
Myriophyllum verticillatum (Whorled Water-Milfoil)	NBN Atlas	Literature review	.csv	19/12/2019
Oenathe fistulosa (Tubular Water-Dropwort)	NBN Atlas	Literature review	.csv	19/12/2019
Potamogetum acutifolius (Sharp-leaved pondweed)	NBN Atlas	Literature review	.csv	19/12/2019
Potamogetum compressus (Grass-Wrack Pondweed)	NBN Atlas	Literature review	.csv	19/12/2019
Puccinellia fasciculata (Borrer's Saltmarsh Grass)	NBN Atlas	Literature review	.csv	19/12/2019
Wolffia arrhizal (Rootless duckweed)	NBN Atlas	Literature review	.csv	19/12/2019

Annex 2: FME Workbench Diagram



Annex 3 Categorisation of Environmental Stewardship and Countryside Stewardship options

The tables in this annex refer to option codes and titles which do not always describe the associated management actions nor the relevant indicators of success. More information is available in the Higher Level Stewardship: Environmental Stewardship Handbook and the Countryside Stewardship grants website.

Environmental Stewardship

Table A3.1: ES Options taken up within the CFGM area, classified by relative value to CFGM habitat, and application to CFGM or FWM (1=most beneficial option and 5=least beneficial option)

Option	Value for CFGM	CFGM / FWM	Reasons for grading
HP11: Saltmarsh livestock exclusion supplement	1	FWM	Management of a non-CFGM habitat
HP5: Maintenance of coastal saltmarsh	1	FWM	Management of a non-CFGM habitat
HP6: Restoration of coastal saltmarsh	1	FWM	Management of a non-CFGM habitat
HP7: Creation of inter-tidal and saline habitat on arable land	1	FWM	Management of a non-CFGM habitat
HP8: Creation of inter-tidal and saline habitat on grassland	1	FWM	Management of a non-CFGM habitat
HP9: Creation of inter-tidal and saline habitat by non-intervention	1	FWM	Management of a non-CFGM habitat
HQ3: Maintenance of reedbeds	1	FWM	Management of a non-CFGM habitat
HQ4: Restoration of reedbeds	1	FWM	Management of a non-CFGM habitat
HQ5: Creation of reedbeds	1	FWM	Management of a non-CFGM habitat
HQ6: Maintenance of fen	1	FWM	Management of a non-CFGM habitat
HQ7: Restoration of fen	1	FWM	Management of a non-CFGM habitat
HQ8: Creation of fen	1	FWM	Management of a non-CFGM habitat
HQ10: Restoration of lowland raised bog	1	FWM	Management of a non-CFGM habitat
HP10: Supplement for extensive grazing on saltmarsh	1	FWM	Management of a non-CFGM habitat
HC15: Maintenance of successional areas and scrub	2	FWM	Contributing to a mosaic of habitats. Can be for control of coastal scrub
HC16: Restoration of successional areas and scrub	2	FWM	Contributing to a mosaic of habitats. Can be for control of coastal scrub
HC17: Creation of successional areas and scrub	2	FWM	Contributing to a mosaic of habitats. Can be for control of coastal scrub
HQ13: Inundation grassland supplement	2	FWM	To allow river floodplain inundation, only on HK10, 12 14, 17
HQ11: Wetland cutting supplement	2	FWM	Available on reedbed / fen / lowland raised bog
HQ12: Wetland grazing supplement	2	FWM	Available on reedbed / fen / lowland raised bog
DR: Ditch, dyke and rhine restoration	1	CFGM	Maintains CFGM
HD10: Maintenance of traditional water meadows	1	CFGM	Maintains CFGM
HD11: Restoration of traditional water meadows	1	CFGM	Maintains CFGM
HK10: Maintenance of wet grassland for wintering waders and wildfowl	1	CFGM	Maintains CFGM
HK11: Restoration of wet grassland for breeding waders	1	CFGM	Maintains CFGM
HK12: Restoration of wet grassland for wintering waders and wildfowl	1	CFGM	Maintains CFGM
HK13: Creation of wet grassland for breeding waders	1	CFGM	Maintains CFGM
HK14: Creation of wet grassland for wintering waders and wildfowl	1	CFGM	Maintains CFGM

Option	Value for CFGM	CFGM / FWM	Reasons for grading
HK15: Maintenance of grassland for target features	1	CFGM	Maintains CFGM
HK16: Restoration of grassland for target features	1	CFGM	Maintains CFGM
HK17: Creation of grassland for target features	1	CFGM	Maintains CFGM
HK19: Raised water levels supplement	1	CFGM	Maintains CFGM
HK4: Management of rush pastures	1	CFGM	Maintains CFGM
HK6: Maintenance of species-rich, semi-natural grassland	1	CFGM	Maintains CFGM
HK7: Restoration of species-rich, semi-natural grassland	1	CFGM	Maintains CFGM
HK8: Creation of species-rich, semi-natural grassland	1	CFGM	Maintains CFGM
HK9: Maintenance of wet grassland for breeding waders	1	CFGM	Maintains CFGM
OB6: Ditch management	1	CFGM	Maintains CFGM
OB7: Half ditch management	1	CFGM	Maintains CFGM
OK4: Manage rush pastures: outside SDA & ML (organic)	1	CFGM	Maintains CFGM
WDC: Creation of ditches (rhines and dykes)	1	CFGM	To manage water levels
WGC: Creation of gutters	1	CFGM	To manage water levels
WPS: Construction of water penning structures	1	CFGM	To manage water levels
EB6: Ditch management	2	CFGM	Maintains CFGM
EB7: Half ditch management	2	CFGM	Maintains CFGM
EK4: Manage rush pastures: outside SDA & ML	2	CFGM	Maintains CFGM
C: Culvert	2	CFGM	To manage water levels
CBT: Coppicing bankside trees	2	CFGM	Maintains CFGM
SW: Management of scrub on wet sites	2	CFGM	Maintains CFGM
TS1: Tree surgery minor to include minor pollarding	2	CFGM	Can be used for bankside trees
TS2: Tree Surgery major to include major pollarding	2	CFGM	Can be used for bankside trees
UHJ12: Winter livestock removal next to streams, rivers and lakes	2	CFGM	Maintains CFGM
SA: Scrub management < 25% cover	2	CFGM	Maintains CFGM
SC: Scrub management > 75% cover	2	CFGM	Maintains CFGM
SS: Scrub Control - Base Payment	2	CFGM	Maintains CFGM
HK18: Supplement for haymaking	2	CFGM	Maintains CFGM
S1: Soil bund	2	CFGM	To manage water levels
S2: Timber sluice	2	CFGM	To manage water levels
S3: Brick, stone or concrete sluice	2	CFGM	To manage water levels
OE10: 6m buffer strip on organic grassland next to a watercourse	3	CFGM	Of neutral benefit
OE5: 4m buffer strip on organic grassland	3	CFGM	Of neutral benefit
OE6: 6m buffer strip on organic grassland	3	CFGM	Of neutral benefit
OHK2: Permanent grassland with low inputs	3	CFGM	Of neutral benefit
OHK3: Permanent grassland with very low inputs	3	CFGM	Of neutral benefit
OK2: Permanent grassland with low inputs: outside SDA & ML(organic)	3	CFGM	Of neutral benefit
OK3: Permanent grassland with very low inputs: outside SDA&ML (organic)	3	CFGM	Of neutral benefit
HQ1: Maintenance of ponds of high wildlife value <	2	Both	Beneficial on both CFGM and FWM
HQ2: Maintenance of ponds of high wildlife value >	2	Both	Beneficial on both CFGM and FWM
PR: Pond restoration - first 100 sq. m	2	Both	Beneficial on both CFGM and FWM
PRP: Pond restoration > 100 sq. m	2	Both	Beneficial on both CFGM and FWM
SCP: Creation of temporary ponds > 100m sq.	2	Both	Beneficial on both CFGM and FWM
SCR: Creation of temporary ponds - first 100m sq.	2	Both	Beneficial on both CFGM and FWM
EK5: Mixed stocking	1	Both	Beneficial to both
HB14: Management of ditches of very high environmental value	1	Both	Beneficial to both

Option	Value for CFGM	CFGM / FWM	Reasons for grading
HK5: Mixed stocking	1	Both	Beneficial to both
HR1: Grazing supplement for cattle	1	Both	Supports grazing management
HR2: Grazing supplement for native breeds at risk	1	Both	Supports grazing management
OHK5: Mixed stocking	1	Both	Beneficial to both
OK5: Mixed stocking	1	Both	Beneficial to both
CLH: Livestock handling facilities	2	Both	Supports grazing management
FPE: Permanent electric fencing	2	Both	Supports grazing management
GF: Wooden field/river gate	2	Both	Supports grazing management
LWW: Wooden wings for gates	2	Both	Supports grazing management
HR4: Supplement for control of invasive plant	3	Both	To support eradication of invasive
EK2: Permanent grassland with low inputs: outside SDA & ML	4	0	Neutral / low benefit
EK3: Permanent grassland with very low inputs:	4	0	Neutral / low benefit
HK2: Permanent grassland with low inputs	4	0	Neutral / low benefit
HK3: Permanent grassland with very low inputs	4	0	Neutral / low benefit
HBD: Hard base for livestock drinker	4	0	If these are necessary, suggests that ditches are fenced off and/or water levels not high enough
WS: Water supply	4	0	If these are necessary, suggests that ditches are fenced off and/or water levels not high enough
WT: Water trough	4	0	If these are necessary, suggests that ditches are fenced off and/or water levels not high enough
EC25: Hedgerow tree buffer strips on grassland	4	0	Not positive indicator for CFGM
ED4: Management of scrub on archaeological features	4	0	Historic environment option
ED5: Management of archaeological features on grassland	4	0	Historic environment option
HD5: Management of archaeological features on grassland	4	0	Historic environment option
HD9: Maintenance of designed/engineered water bodies	4	0	For designed or engineered water bodies
HJ5: In-field grass areas to prevent erosion or run-off	4	0	If this is necessary, suggests intensive management
HJ8: Nil fertiliser supplement	4	0	Neutral / low benefit
HJ9: 12 m buffer strips for watercourses on cultivated land	4	0	Arable option
OC2: Protection of in field trees - grassland	4	0	Not positive indicator for CFGM
OD5: Management of archaeological features on grassland	4	0	Neutral / low benefit
OH2: Otter holt - concrete pipe & chamber	4	0	Irrelevant option
OHC2: Protection of in-field trees on organic	4	0	Not positive indicator for CFGM
OHD5: Management of archaeological features on grassland	4	0	Neutral / low benefit
PAH: Professional help with an implementation plan	4	0	Standalone option, could be related to mgt of water
TSP: Planting tree and shrub/ whips and transplants	4	0	Irrelevant option
HC2: Protection of in-field trees on grassland	4	0	Not positive indicator for CFGM
OK1: Take field corners out of management: outside SDA & ML(organic)	4	0	Arable/grassland option, suggests intensive management
OE9: 6m buffer strips on rotational land next to a watercourse	5	0	Arable option
EB8: Combined hedge and ditch management	5	0	Hedgerows negative feature on
EB9: Combined hedge and ditch management	5	0	Hedgerows negative feature on
EE7: Buffering in-field ponds in improved grassland	5	0	Improved grassland negative for CFGM
EJ11: Maintenance of watercourse fencing	5	0	Not positive indicator for CFGM

Option	Value for CFGM	CFGM / FWM	Reasons for grading
HJ11: Maintenance of watercourse fencing	5	0	Not positive indicator for CFGM
OB10: Combined hedge and ditch management	5	0	Hedgerows negative feature on
OB8: Combined hedge and ditch management	5	0	Hedgerows negative feature on
OB9: Combined hedge and ditch management	5	0	Hedgerows negative feature on
FDS: Fencing supplement - difficult sites	5	0	Not positive indicator for CFGM
FSB2010: Sheep Fencing - newly restored boundary	5	0	Not positive indicator for CFGM
FSH2010: Sheep Fencing	5	0	Not positive indicator for CFGM
FW2010: Post and wire fencing	5	0	Not positive indicator for CFGM
FWB: Post and wire fencing - newly restored	5	0	Not positive indicator for CFGM
FWB2010: Post and wire fencing - newly restored	5	0	Not positive indicator for CFGM
EE10: 6m buffer strips on intensive grassland next to a watercourse	5	0	Intensive grassland negative for CFGM
EE4: 2m buffer strips on intensive grassland	5	0	Intensive grassland negative for CFGM
EE5: 4m buffer strips on intensive grassland	5	0	Intensive grassland negative for CFGM
EE6: 6m buffer strips on intensive grassland	5	0	Intensive grassland negative for CFGM
EE9: 6m buffer strips on cultivated land next to a watercourse	5	0	Arable option
HJ7: Seasonal livestock removal from intensively managed grassland	5	0	Intensive grassland negative for CFGM
EB1: Hedgerow management for landscape (on both sides of a hedge)	5	0	Hedgerows negative feature on CFGM
EB10: Combined hedge and ditch management	5	0	Hedgerows negative feature on
EB14: Hedgerow restoration	5	0	Hedgerows negative feature on
EB2: Hedgerow management for landscape (on one side of a hedge)	5	0	Hedgerows negative feature on CFGM
EB3: Hedgerow management for landscape and	5	0	Hedgerows negative feature on
HB11: Maintenance of hedges of very high environmental value (2 sides)	5	0	Hedgerows negative feature on CFGM
HB12: Maintenance of hedges of very high environmental value (1 side)	5	0	Hedgerows negative feature on CFGM
HF: Hedgerow supplement - removal of old fence	5	0	Hedgerows negative feature on
HR: Hedgerow restoration includes laying, coppicing and gapping up	5	0	Hedgerows negative feature on CFGM
HR2010: Hedgerow restoration includes laying, coppicing and gapping up	5	0	Hedgerows negative feature on CFGM
HSC: Hedgerow supplement - substantial pre- work	5	0	Hedgerows negative feature on
HSL: Hedgerow supplement - top binding and/or staking	5	0	Hedgerows negative feature on CFGM
OB1: Hedgerow management for landscape (on both sides of a hedge)	5	0	Hedgerows negative feature on CFGM
OB2: Hedgerow management for landscape (on one side of a hedge)	5	0	Hedgerows negative feature on CFGM
OB3: Hedgerow management for landscape and wildlife	5	0	Hedgerows negative feature on CFGM
EC2: Protection of in-field trees (grassland)	5	0	Not positive indicator for CFGM
HK1: Take field corners out of management	5	0	Arable / intensive grassland option
EC1: Protection of in-field trees (arable)	5	0	Arable option
EC3: Maintenance of woodland fences	5	0	Irrelevant option
EC4: Management of woodland edges	5	0	Irrelevant option
ED3: Low depth, non-inversion cultivation on archaeological features	5	0	Arable option
EE1: 2m buffer strips on cultivated land	5	0	Arable option
EE12: Supplement to add wildflowers to buffer strips	5	0	Arable option
EE2: 4m buffer strips on cultivated land	5	0	Arable option

Option	Value for CFGM	CFGM / FWM	Reasons for grading
EE3: 6m buffer strips on cultivated land	5	0	Arable option
EE8: Buffering in-field ponds in arable land	5	0	Arable option
EF1: Field corner management	5	0	Arable option
EF10: Unharvested cereal headlands for birds and rare arable plants	5	0	Arable option
EF13: Uncropped cultivated areas for ground-nesting birds - arable	5	0	Arable option
EF15: Reduced herbicide cereal crop preceding over-wintered stubble	5	0	Arable option
EF2: Wild bird seed mixture	5	0	Arable option
EF22: Extended overwintered stubbles	5	0	Arable option
EF23: Supplementary feeding in winter for farmland birds	5	0	Arable option
EF2NR: Wild bird seed mixture	5	0	Arable option
EF4: Nectar Flower mixture	5	0	Arable option
EF4NR: Nectar Flower mixture	5	0	Arable option
EF6: Over-wintered stubbles	5	0	Arable option
EF7: Beetle banks	5	0	Arable option
EF8: Skylark plots	5	0	Arable option
EF9: Cereal headlands for birds	5	0	Arable option
EG1: Undersown spring cereals	5	0	Arable option
EG2NR: ASD to Jan 2010 Wild bird seed mixture in grassland areas	5	0	Irrelevant option
EG4: Cereals for whole crop silage followed by over-wintered stubbles	5	0	Arable option
EG5: Brassica fodder crops followed by over-wintered stubbles	5	0	Arable option
EJ10: Enhanced management of maize crops to reduce erosion and run-off	5	0	Arable option
EJ13: Winter cover crops	5	0	Arable option
EJ2: Management of maize crops to reduce soil erosion	5	0	Arable option
EK1: Take field corners out of management: outside SDA & ML	5	0	Arable option
EK21: Legume- and herb-rich swards	5	0	Arable option
EL1: Field corner management: SDA land	5	0	Upland option
GS: Supp: Use of Native Seed	5	0	Arable option
HC10: Creation of woodland outside of the SDA & ML	5	0	Irrelevant option
HC11: Woodland livestock exclusion supplement	5	0	Irrelevant option
HC6: Ancient trees in intensively-managed grass fields	5	0	Irrelevant option
HC7: Maintenance of woodland	5	0	Irrelevant option
HC8: Restoration of woodland	5	0	Irrelevant option
HD2: Take archaeological features out of cultivation	5	0	Arable option
HD3: Low depth, non-inversion cultivation on archaeological features	5	0	Arable option
HD6: Crop establishment by direct drilling (non-rotational)	5	0	Arable option
HE1: 2 m buffer strips on cultivated land	5	0	Arable option
HE2: 4 m buffer strips on cultivated land	5	0	Arable option
HE3: 6 m buffer strips on cultivated land	5	0	Arable option
HE4: 2 m buffer strips on intensive grassland	5	0	Irrelevant option
HE5: 4 m buffer strips on intensive grassland	5	0	Irrelevant option
HE6: 6 m buffer strips on intensive grassland	5	0	Irrelevant option
HE8: Buffering in-field ponds in arable land	5	0	Arable option

Option	Value for CFGM	CFGM / FWM	Reasons for grading
HF1: Management of field corners	5	0	Arable option
HF10: Unharvested cereal headlands for birds and rare arable plants	5	0	Arable option
HF11: Uncropped, cultivated margins for rare plants	5	0	Arable option
HF12: Enhanced wild bird seed mix plots	5	0	Arable option
HF12NR: Enhanced wild bird seed mix plots	5	0	Arable option
HF13: Uncropped cultivated areas for ground-nesting birds - arable	5	0	Arable option
HF13NR: Uncropped cultivated areas for ground-nesting birds - arable	5	0	Arable option
HF14: Unharvested, fertiliser-free conservation headland	5	0	Arable option
HF15: Reduced herbicide cereal crops followed by overwintered stubble	5	0	Arable option
HF17: ASD to Dec 2008 Fallow plots for ground-nesting birds (setaside)	5	0	Arable option
HF2: Wild bird seed mixture	5	0	Arable option
HF20: Cultivated fallow plots or margins for arable plants	5	0	Arable option
HF20NR: Cultivated fallow plots or margins for arable plants	5	0	Arable option
HF2NR: Wild bird seed mixture	5	0	Arable option
HF4: Nectar flower mixture	5	0	Arable option
HF4NR: Nectar flower mixture	5	0	Arable option
HF6: Overwintered stubble	5	0	Arable option
HF8: Skylark plots	5	0	Arable option
HG1: Undersown spring cereals	5	0	Arable option
HG2NR: ASD to Jan 2010 Wild bird seed mixture	5	0	Arable option
HG4: Cereals for whole-crop silage followed by overwintered stubble	5	0	Arable option
HG5: Brassica fodder crops followed by over-wintered stubbles	5	0	Arable option
HG6: Fodder crop management to retain or re-create an arable mosaic	5	0	Arable option
HG7: Low input spring cereal to retain or re-create an arable mosaic	5	0	Arable option
HG7NR: Low input spring cereal to retain or re-create an arable mosaic	5	0	Arable option
HK21: Legume- and herb-rich swards	5	0	Arable option
OC1: Protection of in field trees - rotational land	5	0	Arable option
OC3: Maintenance of woodland fences	5	0	Irrelevant option
OD2: Take archaeological features out of cultivation	5	0	Arable option
OE3: 6m buffer strips on rotational land	5	0	Arable option
OF2: Wild bird seed mixture	5	0	Arable option
OF6: Over-wintered stubbles	5	0	Arable option
OHC1: Protection of in-field trees on rotational land	5	0	Arable option
OHD2: Take archaeological features out of cultivation (Org)	5	0	Arable option
OHE2: 4 m buffer strips on rotational land	5	0	Arable option
OHE3: 6 m buffer strips on rotational land	5	0	Arable option
OHF13: Uncropped, cultivated areas for ground-nesting birds	5	0	Arable option
OHF4: Nectar flower mixture	5	0	Arable option
OHG1: Undersown spring cereals	5	0	Arable option
OK21: Legume- and herb-rich swards	5	0	Arable option
STT: Planting standard parkland/hedgerow tree	5	0	Irrelevant option

Option	Value for CFGM	CFGM / FWM	Reasons for grading
HC18: Maintenance of high value traditional orchards	5	0	Irrelevant option
HC20: Restoration of traditional orchards	5	0	Irrelevant option
HC21: Creation of traditional orchards	5	0	Irrelevant option
UOX2: Grassland and arable	None	0	Arable option
UX2: Grassland and arable	None	0	Arable option
LHX: Major preparatory work for heathland re-creation or restoration	None	0	Irrelevant option
EL2: Permanent in-bye grassland with low inputs: SDA land	None	0	Upland option
EL3: In-bye pasture & meadows with very low inputs: SDA land	None	0	Upland option
EL4: Manage rush pastures: SDA land & ML parcels under 15ha	None	0	Upland option
HJ3: Reversion to unfertilised grassland to prevent erosion/run-off	None	0	Arable option
HJ4: Reversion to low input grassland to prevent erosion/run-off	None	0	Arable option
HL3: Permanent grassland with very low inputs in SDAs	None	0	Upland option
HP1: Maintenance of sand dunes	None	0	Irrelevant option
HP2: Restoration of sand dune systems	None	0	Irrelevant option
HP4: Creation of vegetated shingle and sand dune on grassland	None	0	Irrelevant option
UL20: Haymaking	None	0	Upland option
UL21: No cutting strip within meadows	None	0	Upland option
UL23: Management of upland grassland for birds	None	0	Upland option
EJ5: In-field grass areas	None	0	Arable option
EJ9: 12m buffer strips for watercourses on cultivated land	None	0	Arable option
HJ6: Preventing erosion or run-off from intensively managed grassland	None	0	Irrelevant option
EB11: Stone wall protection and maintenance	None	0	Irrelevant option
EB12: Earth bank management (on both sides)	None	0	Irrelevant option
EB13: Earth bank management (on one side)	None	0	Irrelevant option
EB4: Stone faced hedge bank management on both sides	None	0	Irrelevant option
EB5: Stone faced hedge bank management on one side	None	0	Irrelevant option
OB11: Stonewall protection and maintenance	None	0	Irrelevant option
OB12: Earth bank management (on both sides)	None	0	Irrelevant option
OB13: Earth bank management (on one side)	None	0	Irrelevant option
OB4: Stone faced Hedge bank management on both sides	None	0	Irrelevant option
UB11: Stone wall protection and maintenance on/above the moorland line	None	0	Upland option
UB17: Stone wall restoration	None	0	Upland option
WR: Stone wall restoration	None	0	Irrelevant option
WR2010: Stone wall restoration	None	0	Irrelevant option
WRQ: Stone wall supplement - stone from quarry	None	0	Irrelevant option
A13: Non-payment option - permanent grassland for Article 13	None	0	Irrelevant option
HE10: Floristically enhanced grass margin	None	0	Arable option
E: Removal of eyesore	None	0	Irrelevant option
EA1: Farm Environment Record (FER)	None	0	Irrelevant option
ED1: Maintenance of traditional farm buildings	None	0	Irrelevant option
ED2: Take archaeological features out of cultivation	None	0	Irrelevant option

Option	Value for CFGM	CFGM / FWM	Reasons for grading
FEP: FEP Payment to Party	None	0	Irrelevant option
FP: Fruit tree pruning and restoration	None	0	Irrelevant option
HAP: Historical & archaeological feature protection	None	0	Irrelevant option
HC12: Maintenance of wood pasture and parkland	None	0	Irrelevant option
HC13: Restoration of wood pasture and parkland	None	0	Irrelevant option
HC14: Creation of wood pasture	None	0	Irrelevant option
HD1: Maintenance of weatherproof traditional farm buildings	None	0	Irrelevant option
HD4: Management of scrub on archaeological features	None	0	Irrelevant option
HD7: Arable reversion by natural regeneration	None	0	Irrelevant option
HF24: Supplementary feeding in winter for farmland birds	None	0	Irrelevant option
HL16: Shepherding supplement	None	0	Irrelevant option
HN1: ASD to Nov 2010 Linear and open access base payment	None	0	Irrelevant option
HN2: ASD to Nov 2010 Permissive open access	None	0	Irrelevant option
HN3: ASD to Nov 2010 Permissive footpath access	None	0	Irrelevant option
HN4: ASD to Nov 2010 Permissive bridleway / cycle	None	0	Irrelevant option
HN5: ASD to Nov 2010 Access for people with reduced mobility	None	0	Irrelevant option
HN7: ASD to Nov 2010 Upgrading access - people with reduced mobility	None	0	Irrelevant option
HN8CW: Educational access - base payment	None	0	Irrelevant option
HN9CW: Educational access - payment per visit	None	0	Irrelevant option
HO1: Maintenance of lowland heathland	None	0	Irrelevant option
HO2: Restoration of lowland heath	None	0	Irrelevant option
HO5: Creation of lowland heathland on worked mineral sites	None	0	Irrelevant option
HR6: Supplement for small fields	None	0	Irrelevant option
HR7: Supplement for difficult sites	None	0	Irrelevant option
HR8: Supplement for group applications	None	0	Irrelevant option
HR8WF: Supplement for group applications	None	0	Irrelevant option
MT: Planting fruit trees	None	0	Irrelevant option
OA1: Farm Environment Record (FER)	None	0	Irrelevant option
OD1: Maintenance of traditional farm buildings	None	0	Irrelevant option
OES: Special Projects	None	0	Irrelevant option
OU1: Organic Management	None	0	Irrelevant option
SBB: Bat / Bird box	None	0	Irrelevant option
TO: Orchard tree guard (tube and mesh)	None	0	Irrelevant option
TOF: Orchard tree guard (cattle proof)	None	0	Irrelevant option
TP: Parkland tree guard (post and rail/wire)	None	0	Irrelevant option
TRE: Tree removal	None	0	Irrelevant option
UD12: Maintenance of remote weatherproof traditional farm buildings	None	0	Upland option
UL18: Cattle grazing on upland grassland and moorland	None	0	Upland option

Countryside Stewardship

Table A3.2: CS Options taken up within the CFGM area, classified by relative value to CFGM habitat, and application to CFGM or FWM (1=most beneficial option and 5=least beneficial option)

Option	Value for CFGM	CFGM / FWM	Reasons for grading
CT3 - Management of coastal saltmarsh	1	FWM	Management of a non-CFGM habitat
CT5 - Creation of inter-tidal and saline habitat by non-intervention	1	FWM	Management of a non-CFGM habitat
WT6 - Management of reedbed	1	FWM	Management of a non-CFGM habitat
WT7 - Creation of reedbed	1	FWM	Management of a non-CFGM habitat
WT8 - Management of fen	1	FWM	Management of a non-CFGM habitat
WT9 - Creation of fen	1	FWM	Management of a non-CFGM habitat
SW12 - Making space for water	1	FWM	The site forms a natural hydrological unit
SW15 - Flood mitigation on arable reversion to grassland	1	FWM	To enable reconnection of the river with the floodplain
SW16 - Flood mitigation on permanent grassland	1	FWM	To enable reconnection of the river with the floodplain
FM2 - Major preparatory work for Priority Habitats (creation and restoration) and Priority Species	1	FWM	Allows for both natural and modified management of habitat
WT12 - Wetland grazing supplement	1	FWM	Supports non-CFGM habitat mgt
WT11 - Wetland cutting supplement	2	FWM	To support management of reedbed/fen
CT6 - Coastal vegetation management supplement	2	FWM	Management of a non-CFGM habitat
GS11 - Creation of wet grassland for breeding waders	1	CFGM	Maintains CFGM
GS12 - Creation of wet grassland for wintering waders and wildfowl	1	CFGM	Maintains CFGM
GS13 - Management of grassland for target features	1	CFGM	Maintains CFGM
GS14 - Creation of grassland for target features	1	CFGM	Maintains CFGM
GS10 - Management of wet grassland for wintering waders and wildfowl	1	CFGM	Maintains CFGM
WT3 - Management of ditches of high environmental value	1	CFGM	Maintains CFGM
GS17 - Lenient Grazing Supplement	1	CFGM	Controlling sward height for invertebrates on permanent grass
GS6 - Management of species-rich grassland	1	CFGM	Maintains CFGM
GS7 - Restoration towards species-rich grassland	1	CFGM	Maintains CFGM
GS9 - Management of wet grassland for breeding waders	1	CFGM	Maintains CFGM
HS7 - Management of historic water meadows through traditional irrigation	1	CFGM	Maintains CFGM
WN2 - Creation of scrapes and gutters	1	CFGM	Maintains CFGM
WN3 - Ditch, Dyke and Rhine Restoration	1	CFGM	Maintains CFGM
WN4 - Ditch, Dyke and Rhine Creation	1	CFGM	Maintains CFGM
GS15 - Haymaking supplement	2	CFGM	Maintains CFGM
GS16 - Rush infestation control supplement	2	CFGM	Rush control
OT2 - Organic Land Management - unimproved permanent grassland	2	CFGM	Low input grassland management
RP9 - Earth banks and soil bunds/unit	2	CFGM	To raise water levels for habitat mgt
SP1 - Difficult sites supplement	2	CFGM	Enabling grazing
SP2 - Raised water level supplement	2	CFGM	To support water level control
TE10 - Coppicing Bank-side Trees	2	CFGM	Streamside or riverbank trees
WN10 - Construction of water penning structures	2	CFGM	To support raised water levels

Option	Value for CFGM	CFGM / FWM	Reasons for grading
WN8 - Timber sluice/unit	2	CFGM	For water level control
WN9 - Brick, Stone or Concrete Sluice	2	CFGM	For water level control
LV2 - Livestock handling facilities	2	CFGM	Infrastructure to support grazing
SW11 - Riparian management strip	2	CFGM	Prevents livestock access to watercourse. Not on SSSIs
OR2 - Organic conversion - unimproved permanent grassland	3	CFGM	Beneficial although value reduced as in conversion
FG12 - Wooden Field Gate	2	CFGM	Infrastructure to enable grazing
FG3 - Permanent electric fencing	2	CFGM	To control livestock and manage habitats
FG7 - Anti-predator combination fencing for vulnerable ground-nesting birds.	2	CFGM	Breeding wader presence in conjunction with GS9 and GS11
FG8 - Anti-predator temporary electric fencing	2	CFGM	On lowland wet grassland/coastal habitats
RP3 - Watercourse crossing/unit	2	CFGM	Only in areas to reduce water pollution
RP6 - Installation of piped culverts and ditches	2	CFGM	Only in areas to reduce water pollution/mgt of habitats
GS2 - Permanent grassland with very low inputs (outside SDAs)	4	CFGM	Neutral/low benefit to CFGM
LV3 - Hard bases for livestock drinkers	4	CFGM	If these are necessary, suggests that ditches are fenced off and/or water levels not high enough so these could be a negative indicator
LV4 - Hard bases for livestock feeders	4	CFGM	If these are necessary, suggests that ditches are fenced off and/or water levels not high enough so these could be a negative indicator
LV5 - Pasture pumps and associated pipework/unit	4	CFGM	If these are necessary, suggests that ditches are fenced off and/or water levels not high enough so these could be a negative indicator
LV6 - Ram pumps and pipework/unit	4	CFGM	If these are necessary, suggests that ditches are fenced off and/or water levels not high enough so these could be a negative indicator
LV7 - Livestock troughs	4	CFGM	If these are necessary, suggests that ditches are fenced off and/or water levels not high enough so these could be a negative indicator
LV8 - Pipework for livestock troughs	4	CFGM	If these are necessary, suggests that ditches are fenced off and/or water levels not high enough so these could be a negative indicator
HS5 - Management of historic and archaeological features on grassland	4	CFGM	Historic environment option
BE6 - Veteran Tree Surgery	4	CFGM	For general tree surgery
TE11A - Tree surgery	4	CFGM	For general tree surgery
TE11B - Tree surgery	4	CFGM	For general tree surgery
WT1 - Buffering in field ponds and ditches in improved grassland	5	CFGM	Improved grassland – not a positive indicator of grazing marsh
OR1 - Organic conversion - improved permanent grassland	5	CFGM	Improved grassland – not a positive indicator of grazing marsh
OT1 - Organic land management - improved permanent grassland	5	CFGM	Improved grassland – not a positive indicator of grazing marsh
SP6 - Cattle grazing supplement	1	Both	Supports grazing management

Option	Value for CFGM	CFGM / FWM	Reasons for grading
SP8 - Native breeds at risk supplement	1	Both	Supports grazing management
WN5A - Pond Management - creation (first 100 sq. m)	2	Both	Beneficial on both CFGM and FWM
WN5B - Pond Management - restoration - first 100 sq. m	2	Both	Beneficial on both CFGM and FWM
WN6A - Pond Management - creation - (areas more than 100 sq. m)	2	Both	Beneficial on both CFGM and FWM
WN6B - Pond Management - restoration - (areas more than 100 sq. m)	2	Both	Beneficial on both CFGM and FWM
WT4 - Management of ponds of High Wildlife value (100 sq. m or less)	2	Both	Beneficial on both CFGM and FWM
WT5 - Management of ponds of High Wildlife value (more than 100 sq. m)	2	Both	Beneficial on both CFGM and FWM
SP4 - Control of invasive plant species supplement	3	Both	To support eradication of invasive non-native species
PA1 - Implementation Plan/Unit	4	Both	Standalone option
PA2 - Feasibility Study	4	Both	Standalone option
SB3 - Tree removal	4	Both	Available on priority habitats
SP9 - Threatened species supplement	4	Both	Management for brown hairstreak butterfly (hedgerow/woodland boundary species) or corn bunting (arable/mixed farmland)
SB1A - Scrub Control and Felling Diseased Trees	4	Both	Focus is not just on scrub control
SB1B - Scrub Control and Felling Diseased Trees	4	Both	Focus is not just on scrub control
SB1C - Scrub Control and Felling Diseased Trees	4	Both	Focus is not just on scrub control
SB1D - Scrub Control and Felling Diseased Trees	4	Both	Focus is not just on scrub control
SB1E - Scrub Control and Felling Diseased Trees	4	Both	Focus is not just on scrub control
SB1F - Scrub Control and Felling Diseased Trees	4	Both	Focus is not just on scrub control
SP10 - Administration of group managed agreements supplement	4	Both	Focus is not on habitat management
GS1 - Take small areas out of management	5	Both	To create habitat mosaic on permanent grassland. Not compatible with CFGM
FG1 - Fencing	5	Both	Negative indicator – fencing ditches
FG2 - Sheep netting	5	Both	Negative indicator – fencing ditches
FG5 - Fencing supplement - difficult sites	5	Both	Negative indicator – fencing ditches
RP4 - Livestock and machinery hardcore tracks	5	0	Not an indicator of good site management
BE3 - Management of hedgerows	5	0	Not positive indicator for CFGM
TE1 - Planting Standard Hedgerow Tree	5	0	Not positive indicator for CFGM
BN10 - Hedgerow Supplement - Top Binding and Staking	5	0	Not positive indicator for CFGM
BN11 - Planting new hedges	5	0	Not positive indicator for CFGM
BN5 - Hedgerow laying	5	0	Not positive indicator for CFGM
BN6 - Hedgerow Coppicing	5	0	Not positive indicator for CFGM
BN7 - Hedgerow Gapping	5	0	Not positive indicator for CFGM
BN8 - Hedgerow Supplement - Casting Up	5	0	Not positive indicator for CFGM
BE2 - Protection of in-field trees on intensive grassland	5	0	Not positive indicator for CFGM
AB12 - Supplementary winter feeding for farmland birds	5	0	Only on arable/temporary grassland/bush orchards
AB5 - Nesting Plots for Lapwing	5	0	Arable option/temporary

Option	Value for CFGM	CFGM / FWM	Reasons for grading
HS2 - Take historic and archaeological features currently on cultivated land out of cultivation.	5	0	Arable option
OP3 - Supplementary feeding for farmland birds	5	0	Only in combination / close proximity to arable options
SW2 - 4-6m buffer strip on intensive grassland	5	0	Intensive grassland option
SW8 - Management of intensive grassland adjacent to a watercourse	5	0	Intensive grassland option
SW9 - Seasonal livestock removal on intensive grassland	5	0	Intensive grassland option
AB1 - Nectar Flower Mix	5	0	Arable option
AB10 - Unharvested cereal headland	5	0	Arable option
AB11 - Cultivated areas for arable plants	5	0	Arable option
AB13 - Brassica fodder crop	5	0	Arable option
AB14 - Harvested low input cereal	5	0	Arable option
AB15 - Two year sown legume fallow	5	0	Arable option
AB16 - Autumn Sown Bumblebird Mix	5	0	Arable option
AB2 - Basic overwinter stubble	5	0	Arable option
AB6 - Enhanced overwinter stubble	5	0	Arable option
AB7 - Whole crop cereals	5	0	Arable option
AB8 - Flower rich margins and plots	5	0	Arable option
AB9 - Winter bird food	5	0	Arable option
BE1 - Protection of in-field trees on arable land	5	0	Arable option
GS3 - Ryegrass seed-set as winter food for birds	5	0	Not on permanent grassland
GS4 - Legume and herb-rich swards	5	0	Not on permanent grassland
HS3 - Reduced depth, non-inversion cultivation on historic and archaeological features	5	0	Arable option
OP1 - Overwintered stubble	5	0	Arable option
OP2 - Wild bird seed mixture	5	0	Arable option
OP4 - Multi species ley	5	0	Arable option
OP5 - Undersown cereal	5	0	Arable option
OR3 - Organic conversion - rotational land	5	0	Arable option
OT3 - Organic Land Management - rotational land	5	0	Arable option
PA3 - Woodland Management plan/per ha	5	0	Irrelevant option
SW1 - 4-6m buffer strip on cultivated land	5	0	Arable option
SW10 - Seasonal livestock removal on intensive grassland	5	0	Intensive grassland option
SW3 - In-field grass strips	5	0	Arable option
SW4 - 12-24m watercourse buffer strip on cultivated land	5	0	Arable option
SW5 - Enhanced management of maize crops	5	0	Arable option
SW6 - Winter cover crops	5	0	Arable option
SW7 - Arable reversion to grassland with low fertiliser inputs	5	0	Arable option
TE2 - Planting Standard Parkland Tree	5	0	Irrelevant option
TE3 - Planting Fruit Trees	5	0	Irrelevant option
TE4A - Woodland Tree Planting - Biodiversity	5	0	Irrelevant option
TE4B - Woodland Tree Planting - Improving water quality or reducing flood risk	5	0	Irrelevant option
TE4C - Woodland Tree Planting - Restock after a tree health issue	5	0	Irrelevant option
TE4D - Woodland Tree Planting - Hedges and clumps	5	0	Irrelevant option
TE5 - Woodland Tree Planting - Tree shelter Supplement	5	0	Irrelevant option
TE6 - Tree guard (tube and mesh)	5	0	Irrelevant option
TE7 - Tree guard (Wood post and rail)	5	0	Irrelevant option
WD1 - Woodland creation - maintenance payments	5	0	Irrelevant option

Option	Value for CFGM	CFGM / FWM	Reasons for grading
WD2 - Woodland improvement	5	0	Irrelevant option
WD3 - Woodland edges on arable land	5	0	Irrelevant option
WD4 - Management of wood pasture and parkland	5	0	Irrelevant option
WD7 - Management of successional areas and scrub	5	0	Irrelevant option
WD8 - Creation of successional areas and scrub	5	0	Irrelevant option
WD9 - Livestock exclusion supplement - scrub and successional areas	5	0	Irrelevant option
BE4 - Management of traditional orchards	5	0	Irrelevant option
BE5 - Creation of traditional orchards	5	0	Irrelevant option
CT1 - Management of coastal sand dunes and vegetated shingle	None	0	Not relevant
FG4 - Rabbit fencing supplement	None	0	Irrelevant option
GS5 - Permanent grassland with very low inputs in SDA	None	0	Irrelevant option - uplands
BN1 - Stone-faced bank repair	None	0	Irrelevant option
BN12 - Stone Wall Restoration	None	0	Irrelevant option
BN13 - Stone Wall - Top Wiring	None	0	Irrelevant option
BN14 - Stone wall supplement - Stone from quarry	None	0	Irrelevant option
BN3 - Earth bank creation	None	0	Irrelevant option
BN4 - Earth Bank Restoration	None	0	Irrelevant option
WB1 - Small Wildlife Box	None	0	Irrelevant option
WB2 - Medium Wildlife Box	None	0	Irrelevant option
WB3 - Large Wildlife Box	None	0	Irrelevant option
APO - Additional Parcel Option	None	0	Unknown
ED1 - Educational Access	None	0	Irrelevant option
FG14 - Badger Gates	None	0	Irrelevant option
FG9 - Woodland Fencing - Deer	None	0	Irrelevant option
HE2 - Historic building restoration	None	0	Irrelevant option
HE3 - Removal of eyesore	None	0	Irrelevant option
HS1 - Maintenance of Weatherproof Traditional Farm Buildings	None	0	Irrelevant option
RP1 - Resurfacing of gateways	None	0	Irrelevant option
RP13 - Yard - underground drainage pipework	None	0	Irrelevant option
RP14 - Yard inspection pit	None	0	Irrelevant option
RP15 - Concrete yard renewal	None	0	Irrelevant option
RP16 - Rainwater goods	None	0	Irrelevant option
RP28 - Roofing (sprayer washdown area, manure storage area, ...)	None	0	Irrelevant option
SW14 - Nil fertiliser supplement	None	0	Supplement to arable/intensive grassland options
TE12 - Stump Grinding	None	0	Irrelevant option
WT2 - Buffering in-field ponds and ditches on arable land	None	0	Arable option

Annex 4 Environmental Stewardship and Countryside Stewardship options analysis

The tables in this annex refer to option codes and titles which do not always describe the associated management actions nor the relevant indicators of success. More information is available in the Higher Level Stewardship: Environmental Stewardship Handbook and the Countryside Stewardship grants website. Note the colour shading is on per column basis, the darker the shading the more important this option is for that column.

Table A4.1: Number of ES agreements by spatial area (top 20 CFGM PHI options only)

	ES OPTION	CFGM PHI	CFGM PHI + SSSI only	PHI + CFGM Important area only	PHI + CFGM Potential area only	PHI + SSSI + CFGM Important area	PHI + SSSI + CFGM Potential area	HLS Target area only	HLS Target area + PHI	HLS Target area + PHI + SSSI	HLS Target area + CFGM important area	HLS Target area + CFGM potential important area
CFGM	HK15: Maintenance of grassland for target features	751	197	315	512	178	25	2622	532	158	246	351
CFGM	HK10: Maintenance of wet grassland for wintering waders and wildfowl	701	294	389	400	275	26	732	515	221	299	289
FWM + CFGM	HR1: Grazing supplement for cattle	378	168	205	221	152	24	1735	262	142	167	132
CFGM	EB6: Ditch management	351	78	125	226	67	11	1535	260	68	106	154
CFGM	HK9: Maintenance of wet grassland for breeding waders	316	173	205	139	158	17	423	207	124	156	76
CFGM	HK7: Restoration of species-rich, semi-natural grassland	294	55	98	216	42	15	3243	182	44	70	123
CFGM	EB7: Half ditch management	233	52	87	146	47	5	741	181	48	75	106
CFGM	HK11: Restoration of wet grassland for breeding waders.	233	57	103	154	54	3	232	148	44	74	92
CFGM	HK12: Restoration of wet grassland for wintering waders and wildfowl	197	39	70	151	35	6	170	128	29	50	96
CFGM	HK16: Restoration of grassland for target features	175	35	63	128	29	9	1301	100	22	30	75
FWM + CFGM	EK5: Mixed stocking	143	25	58	102	22	3	850	88	15	39	60
FWM + CFGM	HR2: Grazing supplement for native breeds at risk	142	37	58	101	32	8	860	86	24	36	62
CFGM	HK6: Maintenance of species-rich, semi-natural grassland	139	40	55	95	27	16	1998	90	29	40	55
CFGM	HK18: Supplement for haymaking	127	33	52	87	22	12	1277	82	25	36	52
CFGM	HK19: Raised water levels supplement	107	58	73	47	56	3	171	88	54	67	33
FWM + CFGM	HB14: Management of ditches of very high environmental value	94	25	41	62	18	8	105	56	17	18	40
FWM	HQ12: Wetland grazing supplement	89	29	31	62	22	8	308	59	21	24	38

FWM + CFGM	HQ2: Maintenance of ponds of high wildlife value > 100 sq. m	89	30	45	47	26	5	435	39	15	22	19
FWM	HQ6: Maintenance of fen	67	24	28	42	19	6	274	46	20	22	27
FWM + CFGM	HQ1: Maintenance of ponds of high wildlife value < 100 sq. m	56	16	24	32	14	2	295	27	8	12	15

Shaded cells represent highest values by column

Table A4.1 shows the 20 most popular options taken up by the number of ES agreements they feature within. Columns 3 – 11 show the number of agreements these options feature in under the different permutations of geographic areas as described in 1.2 above. Column 1 indicates whether the option in question has been categorised as focusing on the management of CFGM (green), Floodplain Wetland Mosaic (FWM) (blue) or both (amber).

The table presents the 20 most numerous options within CFGM which accounted for 85% of all agreements in this area.

Table A4.2 Number of CS agreements by spatial area (top 20 CFGM PHI options only)

	CS OPTION	CFGM PHI	CFGM PHI + SSSI only	PHI + CFGM Important area	PHI + CFGM Potential area	PHI + SSSI + CFGM Important	PHI + SSSI + CFGM Potential
FWM + CFGM	GS10 - Management of wet grassland for wintering waders and wildfowl	198	104	124	95	100	8
CFGM	GS13 - Management of grassland for target features	119	27	54	77	26	2
CFGM	GS9 - Management of wet grassland for breeding waders	110	51	72	45	50	1
FWM + CFGM	FG12 - Wooden Field Gate	90	13	30	67	13	0
FWM + CFGM	WT3 - Management of ditches of high environmental value	82	56	63	31	54	5
CFGM	GS17 - Lenient Grazing Supplement	78	3	18	67	3	0
FWM + CFGM	SP6 - Cattle grazing supplement	54	32	31	25	29	3
CFGM	GS16 - Rush infestation control supplement	40	13	19	25	13	0
CFGM	GS6 - Management of species-rich grassland	39	15	20	22	13	3
FWM + CFGM	SP8 - Native breeds at risk supplement	39	20	25	19	19	1
FWM	WT8 - Management of fen	32	14	17	16	12	2
CFGM	WN2 - Creation of scrapes and gutters	30	10	22	9	10	0
CFGM	OT2 - Organic Land Management - unimproved permanent grassland	29	9	9	22	8	2
CFGM	WN3 - Ditch, Dyke and Rhine Restoration	27	16	18	11	13	3
FWM	WT12 - Wetland grazing supplement	21	10	7	15	7	3
CFGM	GS15 - Haymaking supplement	19	5	10	10	4	1
CFGM	GS7 - Restoration towards species-rich grassland	17	4	7	12	3	1
CFGM	TE10 - Coppicing Bank-side Trees	16	0	3	13		0
CFGM	SP2 - Raised water level supplement	14	7	8	7	6	1
CFGM + FWM	SP4 - Control of invasive plant species supplement	12	9	8	5	8	2

Shaded cells represent highest values by column

Table A4.2 shows the 20 most popular options taken up by the number of CS agreements they feature within. Columns 3 – 8 show the number of agreements these options feature in under the different permutations of geographic areas as described in 1.2 above. Column 1 indicates whether the option in question has been categorised as focusing on the management of CFGM (green), FWM (blue) or both (amber).

Table A4.3: Area (ha) covered by ES options by spatial area (top 20 CFGM PHI options only)

	ES OPTION	CFGM PHI	CFGM PHI + SSSI only	PHI + CFGM Important area only	PHI + CFGM Potential area only	PHI + SSSI + CFGM Important area	PHI + SSSI + CFGM Potential area	Target area only	Target area + PHI	Target area + PHI + SSSI	Target area + CFGM important area	Target area + CFGM potential important area
CFGM	EK4: Manage rush pastures: outside SDA & ML	14408	5366	7334	7074	5042	323	15244	11064	3946	5567	5497
FWM + CFGM	EK5: Mixed stocking	9486	2938	4363	5123	2773	165	42282	7153	2407	3440	3713
FWM	HC15: Maintenance of successional areas and scrub	9391	5877	7130	2260	5745	132	10201	6049	3816	4784	1265
FWM	HC16: Restoration of successional areas and scrub	7081	3072	3877	3203	2862	211	118289	4690	2418	2871	1819
FWM	HC17: Creation of successional areas and scrub	4498	1335	2546	1951	1302	33	4306	3086	1117	1997	1089
CFGM	HD10: Maintenance of traditional water meadows	3288	1072	1521	1764	1025	47	43309	2113	836	1104	1006
CFGM	HD11: Restoration of traditional water meadows	3168	653	1082	2086	581	72	2729	2173	445	763	1409
CFGM	HK10: Maintenance of wet grassland for wintering waders and wildfowl	2156	698	991	1165	642	56	39991	1480	543	700	780
CFGM	HK11: Restoration of wet grassland for breeding waders.	1874	787	1054	820	747	40	3076	1403	626	870	533
CFGM	HK12: Restoration of wet grassland for wintering waders and wildfowl	1789	376	603	1186	308	68	41654	1090	315	444	646
CFGM	HK13: Creation of wet grassland for breeding waders	1513	256	475	1038	135	120	21149	800	202	187	613
CFGM	HK14: Creation of wet grassland for wintering waders and wildfowl	948	300	382	533	292	8	1438	346	290	293	53
CFGM	HK15: Maintenance of grassland for target features	890	148	399	491	86	62	9143	506	114	222	284
CFGM	HK16: Restoration of grassland for target features	791	250	346	446	171	79	21294	530	206	252	278
CFGM	HK17: Creation of grassland for target features	535	1	313	216	1	0	3804	164	1	85	79
CFGM	HK18: Supplement for haymaking	510	312	339	170	312	0	3832	170	5	28	142
CFGM	HK19: Raised water levels supplement	476	204	220	256	152	52	2096	312	165	178	134
CFGM	HK4: Management of rush pastures	471	185	277	192	185	0	973	69	47	46	23
FWM + CFGM	HK5: Mixed stocking	411	126	144	267	97	29	659	229	60	67	163
CFGM	HK6: Maintenance of species-rich, semi-natural grassland	393	53	139	254	53	0	3941	194	20	98	96

Shaded cells represent highest values by column

Table A4.3 shows the top 20 ES options with the greatest take up in area in hectares. Columns 3 – 13 show the quantity of take up in hectares according to the different permutations of geographic areas as described in 1.2 above. Column 1 indicates whether the option in question has been categorised as focusing on the management of CFGM (green), FWM (blue) or both (amber). Together, the options account for just under 95% of the area covered by all agreements within the CFGM PHI area.

Table A4.4 Area (m^2) covered by ES options by spatial area

	ES OPTION	CFGM PHI	CFGM PHI + SSSI only	PHI + CFGM Important area only	PHI + CFGM Potential area only	PHI + SSSI + CFGM Important area	PHI + SSSI + CFGM Potential area	Target area only	Target area + PHI	Target area + PHI + SSSI	Target area + CFGM important area	Target area + CFGM potential important area
FWM + CFGM	PR: Pond restoration - first 100 sq. m	45642	44242	45642	0	44242	0	67616	45642	44242	45642	0
FWM + CFGM	PRP: Pond restoration > 100 sq. m	9707	9607	9707	0	9607	0	14227	9707	9607	9707	0
FWM + CFGM	SCP: Creation of temporary ponds > 100m sq.	4156	1878	300	3856	0	1878	10978	2178	1878	300	1878
FWM + CFGM	SCR: Creation of temporary ponds - first 100m sq.	777	200	100	677	0	200	2661	300	200	100	200

Shaded cells represent highest values by column

Table A4.4 shows the ES options in order of the greatest take up in area in m^2. Columns 3 – 13 show the quantity of take up in m2 according to the different permutations of geographic areas as described in 1.2 above. Column 1 indicates whether the option in question has been categorised as focusing on the management of CFGM (green), FWM (blue) or both (amber).

Table A4.5 Length (m) covered by ES options by spatial area

	ES OPTION	CFGM PHI	CFGM PHI + SSSI only	PHI + CFGM Important area only	PHI + CFGM Potential area only	PHI + SSSI + CFGM Important area	PHI + SSSI + CFGM Potential area	Target area only	Target area + PHI	Target area + PHI + SSSI	Target area + CFGM important area	Target area + CFGM potential important area
CFGM	DR: Ditch, dyke and rhine restoration	109979	385138	611599	488192	367794	17344	330224	920578	364925	571095	349483
CFGM	EB6: Ditch management	462038	124890	230872	231166	117023	7867	112284	352377	118842	216262	136015
CFGM	EB7: Half ditch management	131002	38994	75189	55813	33296	5698	133361	68904	33551	37384	31520
FWM + CFGM	FPE: Permanent electric fencing	29446	5072	5072	24374	5072	0	97621	13908	0	0	13908
FWM + CFGM	HB14: Management of ditches of very high environmental value	11240	3996	3996	7244	3996	0	20290	4095	0	0	4095
CFGM	OB6: Ditch management	4548	2475	2118	2430	1378	1097	37826	3285	2475	2118	1167
CFGM	OB7: Half ditch management	1451	1451	0	1451	0	1451	2172	1451	1451	0	1451
CFGM	WDC: Creation of ditches (rhines and dykes)	1233	1113	520	713	400	713	2433	1233	1113	520	713
CFGM	WGC: Creation of gutters	120	0	120	0	0	0	1630	120	0	120	0

Shaded cells represent highest values by column

Table A4.5 shows the ES options measured in linear metres in the order of greatest uptake. Columns 3 – 13 show the quantity of take up in m according to the different permutations of geographic areas as described in 1.2 above. Column 1 indicates whether the option in question has been categorised as focusing on the management of CFGM (green), FWM (blue) or both (amber).

Table A4.6 Number of items implemented under ES options by spatial area

	ES OPTION	CFGM PHI	CFGM PHI + SSSI only	PHI + CFGM Important area only	PHI + CFGM Potential area only	PHI + SSSI + CFGM Important area	PHI + SSSI + CFGM Potential area	Target area only	Target area + PHI	Target area + PHI + SSSI	Target area + CFGM important area	Target area + CFGM potential important area
CFGM	HQ2: Maintenance of ponds of high wildlife value > 100 sq m	285	129	164	121	120	9	1256	141	76	89	52
CFGM	CBT: Coppicing bankside trees	209	108	0	209	0	108	1581	114	108	0	114
FWM + CFGM	HQ1: Maintenance of ponds of high wildlife value < 100 sq m	109	40	44	65	27	13	895	56	22	26	30
CFGM	TS1: Tree surgery minor to include minor pollarding	56	0	44	12	0	0	617	3	0	0	3
FWM + CFGM	GF: Wooden field/river gate	41	23	6	35	5	18	531	33	23	5	28
CFGM	TS2: Tree Surgery major to include major pollarding	40	4	0	40	0	4	892	16	4	0	16
CFGM	S1: Soil bund	11	2	11	0	2	0	19	11	2	11	0
CFGM	C: Culvert	10	7	0	10	0	7	54	9	7	0	9
CFGM	S2: Timber sluice	9	5	9	0	5	0	28	3	3	3	0
FWM + CFGM	LWW: Wooden wings for gates	5	0	0	5	0	0	16	0	0	0	0
CFGM	SS: Scrub Control - Base Payment	5	3	3	2	3	0	200	4	3	3	1
CFGM	S3: Brick, stone or concrete sluice	1	0	0	1	0	0	15	0	0	0	0

Shaded cells represent highest values by column

Several ES options are measured in terms of the number of items implemented on the ground. Table A4.6 shows the take up of these options according to the different permutations of geographic areas. Columns 3 – 13 show the quantity of take up in m according to the different permutations of geographic areas as described in 1.2 above. Column 1 indicates whether the option in question has been categorised as focusing on the management of CFGM (green), FWM (blue) or both (amber).

Table A4.7 Area (ha) covered by CS options by spatial area (top 20 CFGM PHI options only)

	CS OPTION	CFGM PHI	CFGM PHI + SSSI only	PHI + CFGM Important area only	PHI + CFGM Potential area only	PHI + SSSI + CFGM Important area	PHI + SSSI + CFGM Potential area
FWM + CFGM	GS10 - Management of wet grassland for wintering waders and wildfowl	5274.43	3314.07	3711.7	1562.73	3173.56	140.51
CFGM	GS9 - Management of wet grassland for breeding waders	3611.07	2565.65	3089.58	521.49	2552.8	12.85
FWM + CFGM	SP8 - Native breeds at risk supplement	1521.49	1099.72	1193.09	328.4	1083.98	15.74
FWM + CFGM	SP6 - Cattle grazing supplement	1484.83	1084.05	1106.97	377.86	1073.26	10.79
CFGM	GS13 - Management of grassland for target features	1432.36	392.92	719.99	712.37	375.7	17.22
CFGM	GS17 - Lenient Grazing Supplement	788.96	21.57	170.27	618.69	21.57	0
CFGM	OT2 - Organic Land Management - unimproved permanent grassland	445.69	189.1	227.4	218.29	162.99	26.11
CFGM	GS16 - Rush infestation control supplement	371.95	139.56	203.51	168.44	139.56	0
CFGM	GS6 - Management of species-rich grassland	334.01	149.95	187.87	146.14	134.01	15.94
CFGM	SP2 - Raised water level supplement	268.57	173.94	185.72	82.85	170.36	3.58
CFGM	GS15 - Haymaking supplement	196.86	68.13	113.58	83.28	59.48	8.65
FWM	WT8 - Management of fen	171.89	105.21	99.95	71.94	93.23	11.98
FWM	CT3 - Management of coastal saltmarsh	168.23	20.65	168.23	0	20.65	0
FWM	WT12 - Wetland grazing supplement	128.46	87.15	72.4	56.06	71.59	15.56
CFGM	GS7 - Restoration towards species-rich grassland	127.26	30.51	45.12	82.14	29.59	0.92
CFGM	HS7 - Management of historic water meadows through traditional irrigation	88.27	19.31	6.75	81.52	1.43	17.88
FWM	SW16 - Flood mitigation on permanent grassland	81.11	0	0	81.11	0	0
CFGM	SP1 - Difficult sites supplement	58.18	8.91	9.58	48.6	0	8.91
FWM	WT6 - Management of reedbed	46.55	30.76	30.76	15.79	30.76	0
FWM	WT11 - Wetland cutting supplement	42.21	31.62	35.29	6.92	31.62	0

Shaded cells represent highest values by column

Table A4.7 shows the top 20 CS options with the greatest take up in area in hectares. Columns 3 – 13 show the quantity of take up in hectares according to the different permutations of geographic areas as described in 1.2 above. Column 1 indicates whether the option in question has been categorised as focusing on the management of CFGM (green), FWM (blue) or both (amber). Together, the options account for just under 99% of the area covered by all agreements within the CFGM PHI area.

Table A4.8 Length (m) covered by CS option agreements, by spatial area

	CS OPTION	CFGM PHI	CFGM PHI + SSSI only	PHI + CFGM Important area only	PHI + CFGM Potential area only	PHI + SSSI + CFGM Important area	PHI + SSSI + CFGM Potential area
FWM + CFGM	WT3 - Management of ditches of high environmental value	308527.1	233415.1	251875.1	56652	225307.1	8108
CFGM	WN3 - Ditch, Dyke and Rhine Restoration	44607	26052	22659	21948	13551	12501
FWM + CFGM	FG3 - Permanent electric fencing	10601	580	580	10021	580	0
FWM + CFGM	FG7 - Anti-predator combination fencing for vulnerable ground-nesting birds.	3747	0	1997	1750	0	0
FWM + CFGM	FG8 - Anti-predator temporary electric fencing	1152	952	1152	0	952	0
CFGM	WN4 - Ditch, Dyke and Rhine Creation	1132	500	1132	0	500	0

Shaded cells represent highest values by column

Table A4.8 shows the CS options measured in linear metres in the order of greatest uptake. Columns 3 – 8 show the quantity of take up in metres according to the different permutations of geographic areas as described in 1.2 above. Column 1 indicates whether the option in question has been categorised as focusing on the management of CFGM (green), FWM (blue) or both (amber).

Table A4.9 Number of items implemented under CS options by spatial area

	Number of items	CFGM PHI	CFGM PHI + SSSI only	PHI + CFGM Important area only	PHI + CFGM Potential area only	PHI + SSSI + CFGM Important area	PHI + SSSI + CFGM Potential area
FWM + CFGM	FG12 - Wooden Field Gate	282	46	91	191	46	0
FWM + CFGM	WN5B - Pond Management - restoration - first 100 sq. m	33	8	6	27	6	2
FWM + CFGM	WN5A - Pond Management - creation (first 100 sq. m)	30	14	23	7	14	0
FWM + CFGM	RP6 - Installation of piped culverts and ditches	28	17	22	6	15	2
CFGM	WN8 - Timber sluice/unit	17	5	12	5	5	0
CFGM	RP9 - Earth banks and soil bunds/unit	17	0	17	0	0	0
CFGM	WN9 - Brick, Stone or Concrete Sluice	3	0	2	1	0	0
FWM + CFGM	RP3 - Watercourse crossing/unit	3	0	0	3	0	0

Shaded cells represent highest values by column

Several CS options are measured in terms of the number of items implemented on the ground. Table A4.9 shows the take up of these options according to the different permutations of geographic areas. Columns 3 – 8 show the quantity of take up in m according to the different permutations of geographic areas as described in 1.2 above. Column 1 indicates whether the option in question has been categorised as focusing on the management of CFGM (green), FWM (blue) or both (amber).

Table A4.10 Proportion of total area covered by ES options by spatial area (top 20 CFGM PHI options only)

	ES OPTION	CFGM PHI	CFGM PHI + SSSI only	PHI + CFGM Important area only	PHI + CFGM Potential area only	PHI + SSSI + CFGM Important area	PHI + SSSI + CFGM Potential area	Target area only	Target area + PHI	Target area + PHI + SSSI	Target area + CFGM important area	Target area + CFGM potential important area
CFGM	EK4: Manage rush pastures: outside SDA & ML	6.55	16.88	11.82	4.50	16.97	15.62	0.32	9.48	18.00	13.42	7.32
FWM + CFGM	EK5: Mixed stocking	4.31	9.24	7.03	3.26	9.33	7.98	0.90	6.13	10.98	8.29	4.95
FWM	HC15: Maintenance of successional areas and scrub	4.27	18.49	11.49	1.44	19.34	6.36	0.22	5.18	17.40	11.53	1.68
FWM	HC16: Restoration of successional areas and scrub	3.22	9.67	6.25	2.04	9.63	10.17	2.51	4.02	11.03	6.92	2.42
FWM	HC17: Creation of successional areas and scrub	2.05	4.20	4.10	1.24	4.38	1.60	0.09	2.65	5.09	4.81	1.45
CFGM	HD10: Maintenance of traditional water meadows	1.50	3.37	2.45	1.12	3.45	2.28	0.92	1.81	3.81	2.66	1.34
CFGM	HD11: Restoration of traditional water meadows	1.44	2.05	1.74	1.33	1.96	3.48	0.06	1.86	2.03	1.84	1.88
CFGM	HK10: Maintenance of wet grassland for wintering waders and wildfowl	0.98	2.20	1.60	0.74	2.16	2.71	0.85	1.27	2.47	1.69	1.04
CFGM	HK11: Restoration of wet grassland for breeding waders	0.85	2.48	1.70	0.52	2.51	1.94	0.07	1.20	2.86	2.10	0.71
CFGM	HK12: Restoration of wet grassland for wintering waders and wildfowl	0.81	1.18	0.97	0.75	1.04	3.26	0.88	0.93	1.44	1.07	0.86
CFGM	HK13: Creation of wet grassland for breeding waders	0.69	0.80	0.77	0.66	0.46	5.81	0.45	0.69	0.92	0.45	0.82
CFGM	HK14: Creation of wet grassland for wintering waders and wildfowl	0.43	0.95	0.62	0.34	0.98	0.39	0.03	0.30	1.32	0.71	0.07
CFGM	HK15: Maintenance of grassland for target features	0.40	0.47	0.64	0.31	0.29	3.00	0.19	0.43	0.52	0.54	0.38
CFGM	HK16: Restoration of grassland for target features	0.36	0.79	0.56	0.28	0.58	3.80	0.45	0.45	0.94	0.61	0.37
CFGM	HK17: Creation of grassland for target features	0.24	0.00	0.50	0.14	0.00	0.00	0.08	0.14	0.00	0.20	0.11
CFGM	HK18: Supplement for haymaking	0.23	0.98	0.55	0.11	1.05	0.00	0.08	0.15	0.02	0.07	0.19
CFGM	HK19: Raised water levels supplement	0.22	0.64	0.36	0.16	0.51	2.53	0.04	0.27	0.75	0.43	0.18
CFGM	HK4: Management of rush pastures	0.21	0.58	0.45	0.12	0.62	0.01	0.02	0.06	0.21	0.11	0.03
FWM + CFGM	HK5: Mixed stocking	0.19	0.40	0.23	0.17	0.33	1.42	0.01	0.20	0.27	0.16	0.22
CFGM	HK6: Maintenance of species-rich, semi-natural grassland	0.18	0.17	0.22	0.16	0.18	0.00	0.08	0.17	0.09	0.24	0.13

Shaded cells represent highest values by column

Table A4.10 shows the relative proportion of each geographic area covered by ES options according to the different permutations of geographic areas as described in 1.2 above. Column 1 indicates whether the option in question has been categorised as focusing on the management of CFGM (green), FWM (blue) or both (amber).

Table A4.11 Area (m^2) covered by ES options, by m^2 per 100 ha

	ES OPTIONS	CFGM PHI	CFGM PHI + SSSI only	PHI + CFGM Important area only	PHI + CFGM Potential area only	PHI + SSSI + CFGM Important area	PHI + SSSI + CFGM Potential area	Target area only	Target area + PHI	Target area + PHI + SSSI	Target area + CFGM important area	Target area + CFGM potential important area
FWM + CFGM	PR: Pond restoration - first 100 sq. m	20.75	139.20	73.56	0.00	148.91	0.00	1.44	39.12	201.79	110.00	0.00
FWM + CFGM	PRP: Pond restoration > 100 sq. m	4.41	30.23	15.64	0.00	32.34	0.00	0.30	8.32	43.82	23.39	0.00
FWM + CFGM	SCP: Creation of temporary ponds > 100m sq.	1.89	5.91	0.48	2.45	0.00	90.66	0.23	1.87	8.57	0.72	2.50
FWM + CFGM	SCR: Creation of temporary ponds - first 100m sq.	0.35	0.63	0.16	0.43	0.00	9.65	0.06	0.26	0.91	0.24	0.27

Shaded cells represent highest values by column

Implementation of a number of ES options is expressed in m^2. Table A4.11 shows the relative proportion of each geographic area covered by ES options (expressed as m^2 per 100 hectares) according to the different permutations of geographic areas as described in 1.2 above. Column 1 indicates whether the option in question has been categorised as focusing on the management of CFGM (green), FWM (blue) or both (amber).

Table A4.12 Proportion of length (m per 100ha) covered by ES options by spatial area

	ES OPTION	CFGM PHI	CFGM PHI + SSSI only	PHI + CFGM Important area only	PHI + CFGM Potential area only	PHI + SSSI + CFGM Important area	PHI + SSSI + CFGM Potential area	Target area only	Target area + PHI	Target area + PHI + SSSI	Target area + CFGM important area	Target area + CFGM potential important area
CFGM	DR: Ditch, dyke and rhine restoration	500.09	1211.73	985.65	310.42	1237.94	837.26	70.09	789.04	1664.41	1376.37	465.54
CFGM	EB6: Ditch management	210.10	392.93	372.07	146.99	393.88	379.77	23.82	302.03	542.03	521.45	181.18
CFGM	EB7: Half ditch management	59.57	122.68	121.17	35.49	112.07	275.06	2.83	59.06	153.02	90.10	41.99
FWM + CFGM	FPE: Permanent electric fencing	13.39	15.96	8.17	15.50	17.07	0.00	2.07	11.92	0.00	0.00	18.53
FWM + CFGM	HB14: Management of ditches of very high environmental value	5.11	12.57	6.44	4.61	13.45	0.00	0.43	3.51	0.00	0.00	5.45
CFGM	OB6: Ditch management	2.07	7.79	3.41	1.55	4.64	52.96	0.80	2.82	11.29	5.10	1.55
CFGM	OB7: Half ditch management	0.66	4.57	0.00	0.92	0.00	70.04	0.05	1.24	6.62	0.00	1.93
CFGM	WDC: Creation of ditches (rhines and dykes)	0.56	3.50	0.84	0.45	1.35	34.42	0.05	1.06	5.08	1.25	0.95
CFGM	WGC: Creation of gutters	0.05	0.00	0.19	0.00	0.00	0.00	0.03	0.10	0.00	0.29	0.00

Shaded cells represent highest values by column

Table A4.13 Proportion of items per 100 ha implemented under ES options by spatial area

	ES OPTION	CFGM PHI	CFGM PHI + SSSI only	PHI + CFGM Important area only	PHI + CFGM Potential area only	PHI + SSSI + CFGM Important area	PHI + SSSI + CFGM Potential area	Target area only	Target area + PHI	Target area + PHI + SSSI	Target area + CFGM important area	Target area + CFGM potential important area
CFGM	HQ2: Maintenance of ponds of high wildlife value > 100 sq. m	0.130	0.407	0.264	0.077	0.405	0.434	0.027	0.121	0.348	0.214	0.069
CFGM	CBT: Coppicing bankside trees	0.095	0.340	0.000	0.133	0.000	5.214	0.034	0.098	0.493	0.000	0.152
FWM + CFGM	HQ1: Maintenance of ponds of high wildlife value < 100 sq. m	0.050	0.126	0.071	0.041	0.091	0.628	0.019	0.048	0.100	0.063	0.040
CFGM	TS1: Tree surgery minor to include minor pollarding	0.025	0.000	0.071	0.008	0.000	0.000	0.013	0.003	0.000	0.000	0.004
FWM + CFGM	GF: Wooden field/river gate	0.019	0.072	0.010	0.022	0.017	0.869	0.011	0.028	0.105	0.012	0.037
CFGM	TS2: Tree Surgery major to include major pollarding	0.018	0.013	0.000	0.025	0.000	0.193	0.019	0.014	0.018	0.000	0.021
CFGM	S1: Soil bund	0.005	0.006	0.018	0.000	0.007	0.000	0.000	0.009	0.009	0.027	0.000
CFGM	C: Culvert	0.005	0.022	0.000	0.006	0.000	0.338	0.001	0.008	0.032	0.000	0.012
CFGM	S2: Timber sluice	0.004	0.016	0.015	0.000	0.017	0.000	0.001	0.003	0.014	0.007	0.000
FWM + CFGM	LWW: Wooden wings for gates	0.002	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CFGM	SS: Scrub Control - Base Payment	0.002	0.009	0.005	0.001	0.010	0.000	0.004	0.003	0.014	0.007	0.001
CFGM	S3: Brick, stone or concrete sluice	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Shaded cells represent highest values by column

Several ES options are measured in terms of the number of items implemented on the ground. Table A4.13 shows the relative proportion of the number of items per 100 hectares according to the different permutations of geographic areas as described in 1.2 above. Column 1 indicates whether the option in question has been categorised as focusing on the management of CFGM (green), FWM (blue) or both (amber).

Table A.14 Proportion of area covered by CS options by spatial area (top 20 CFGM PHI options only)

	CS OPTION	CFGM PHI	CFGM PHI + SSSI only	PHI + CFGM Important area only	PHI + CFGM Potential area only	PHI + SSSI + CFGM Important area	PHI + SSSI + CFGM Potential area
FWM + CFGM	GS10 - Management of wet grassland for wintering waders and wildfowl	2.40	10.43	5.98	0.99	10.68	6.78
CFGM	GS9 - Management of wet grassland for breeding waders	1.64	8.07	4.98	0.33	8.59	0.62
FWM + CFGM	SP8 - Native breeds at risk supplement	0.69	3.46	1.92	0.21	3.65	0.76
FWM + CFGM	SP6 - Cattle grazing supplement	0.68	3.41	1.78	0.24	3.61	0.52
CFGM	GS13 - Management of grassland for target features	0.65	1.24	1.16	0.45	1.26	0.83
CFGM	GS17 - Lenient Grazing Supplement	0.36	0.07	0.27	0.39	0.07	0.00
CFGM	OT2 - Organic Land Management - unimproved permanent grassland	0.20	0.59	0.37	0.14	0.55	1.26
CFGM	GS16 - Rush infestation control supplement	0.17	0.44	0.33	0.11	0.47	0.00
CFGM	GS6 - Management of species-rich grassland	0.15	0.47	0.30	0.09	0.45	0.77
CFGM	SP2 - Raised water level supplement	0.12	0.55	0.30	0.05	0.57	0.17
CFGM	GS15 - Haymaking supplement	0.09	0.21	0.18	0.05	0.20	0.42
FWM	WT8 - Management of fen	0.08	0.33	0.16	0.05	0.31	0.58
FWM	CT3 - Management of coastal saltmarsh	0.08	0.06	0.27	0.00	0.07	0.00
FWM	WT12 - Wetland grazing supplement	0.06	0.27	0.12	0.04	0.24	0.75
CFGM	GS7 - Restoration towards species-rich grassland	0.06	0.10	0.07	0.05	0.10	0.04
CFGM	HS7 - Management of historic water meadows through traditional irrigation	0.04	0.06	0.01	0.05	0.00	0.86
FWM	SW16 - Flood mitigation on permanent grassland	0.04	0.00	0.00	0.05	0.00	0.00
CFGM	SP1 - Difficult sites supplement	0.03	0.03	0.02	0.03	0.00	0.43
FWM	WT6 - Management of reedbed	0.02	0.10	0.05	0.01	0.10	0.00
FWM	WT11 - Wetland cutting supplement	0.02	0.10	0.06	0.00	0.11	0.00

Shaded cells represent highest values by column

Table A.14 shows the relative proportion of each geographic area covered by CS options according to the different permutations of geographic areas as described in 1.2 above. Column 1 indicates whether the option in question has been categorised as focusing on the management of CFGM (green), FWM (blue) or both (amber).

Table A4.15 Proportion of length (m per 100ha) covered by CS options by spatial area

	CS OPTION	CFGM PHI	CFGM PHI + SSSI only	PHI + CFGM Important area only	PHI + CFGM Potential area only	PHI + SSSI + CFGM Important area	PHI + SSSI + CFGM Potential area
FWM + CFGM	WT3 - Management of ditches of high environmental value	140.29	734.38	405.92	36.02	758.35	391.40
CFGM	WN3 - Ditch, Dyke and Rhine Restoration	20.28	81.97	36.52	13.96	45.61	603.47
FWM + CFGM	FG3 - Permanent electric fencing	4.82	1.82	0.93	6.37	1.95	0.00
FWM + CFGM	FG7 - Anti-predator combination fencing for vulnerable ground-nesting birds.	1.70	0.00	3.22	1.11	0.00	0.00
FWM + CFGM	FG8 - Anti-predator temporary electric fencing	0.52	3.00	1.86	0.00	3.20	0.00
CFGM	WN4 - Ditch, Dyke and Rhine Creation	0.51	1.57	1.82	0.00	1.68	0.00

Shaded cells represent highest values by column

Several CS options are linear in nature with implementation measured in metres. Table A4.15 shows the relative proportion of each geographic area covered by CS options (in metres per 100 ha) according to the different permutations of geographic areas as described in 1.2 above. Column 1 indicates whether the option in question has been categorised as focusing on the management of CFGM (green), FWM (blue) or both (amber).

Table A4.16 Proportion of items (in uptake per 100ha) covered by CS options by spatial area

	CS OPTION	CFGM PHI	CFGM PHI + SSSI only	PHI + CFGM Important area only	PHI + CFGM Potential area only	PHI + SSSI + CFGM Important area	PHI + SSSI + CFGM Potential area
FWM + CFGM	FG12 - Wooden Field Gate	0.13	0.14	0.15	0.12	0.15	0.00
FWM + CFGM	WN5B - Pond Management - restoration - first 100 sq. m	0.02	0.03	0.01	0.02	0.02	0.10
FWM + CFGM	WN5A - Pond Management - creation (first 100 sq. m)	0.01	0.04	0.04	0.00	0.05	0.00
FWM + CFGM	RP6 - Installation of piped culverts and ditches	0.01	0.05	0.04	0.00	0.05	0.10
CFGM	WN8 - Timber sluice/unit	0.01	0.02	0.02	0.00	0.02	0.00
CFGM	RP9 - Earth banks and soil bunds/unit	0.01	0.00	0.03	0.00	0.00	0.00
CFGM	WN9 - Brick, Stone or Concrete Sluice	0.00	0.00	0.00	0.00	0.00	0.00
FWM + CFGM	RP3 - Watercourse crossing/unit	0.00	0.00	0.00	0.00	0.00	0.00

Shaded cells represent highest values by column

Several CS options are measured in terms of the number of items implemented on the ground. Table A4.16 shows the relative proportion of the number of items per 100 hectares according to the different permutations of geographic areas as described in 1.2 above. Column 1 indicates whether the option in question has been categorised as focusing on the management of CFGM (green), FWM (blue) or both (amber).

Table A4.17 Number of agreements – Environmental Stewardship and Countryside Stewardship combined

		Options	CFGM PHI	CFGM PHI + SSSI only	PHI + CFGM Important area only	PHI + CFGM Potential area only	PHI + SSSI + CFGM Important area	PHI + SSSI + CFGM Potential area
CFGM	ES	HK15: Maintenance of grassland for target features	751	197	315	512	178	25
CFGM	ES	HK10: Maintenance of wet grassland for wintering waders and wildfowl	701	294	389	400	275	26
FWM + CFGM	ES	HR1: Grazing supplement for cattle	378	168	205	221	152	24
CFGM	ES	EB6: Ditch management	351	78	125	226	67	11
CFGM	ES	HK9: Maintenance of wet grassland for breeding waders	316	173	205	139	158	17
CFGM	ES	HK7: Restoration of species-rich, semi-natural grassland	294	55	98	216	42	15
CFGM	ES	EB7: Half ditch management	233	52	87	146	47	5
CFGM	ES	HK11: Restoration of wet grassland for breeding waders.	233	57	103	154	54	3
FWM + CFGM	CS	GS10 - Management of wet grassland for wintering waders and wildfowl	198	104	124	95	100	8
CFGM	ES	HK12: Restoration of wet grassland for wintering waders and wildfowl	197	39	70	151	35	6
CFGM	ES	HK16: Restoration of grassland for target features	175	35	63	128	29	9
FWM + CFGM	ES	EK5: Mixed stocking	143	25	58	102	22	3
FWM + CFGM	ES	HR2: Grazing supplement for native breeds at risk	142	37	58	101	32	8
CFGM	ES	HK6: Maintenance of species-rich, semi-natural grassland	139	40	55	95	27	16
CFGM	ES	HK18: Supplement for haymaking	127	33	52	87	22	12
CFGM	CS	GS13 - Management of grassland for target features	119	27	54	77	26	2
CFGM	CS	GS9 - Management of wet grassland for breeding waders	110	51	72	45	50	1
CFGM	ES	HK19: Raised water levels supplement	107	58	73	47	56	3
FWM + CFGM	ES	HB14: Management of ditches of very high environmental value	94	25	41	62	18	8
FWM + CFGM	CS	FG12 - Wooden field gate	90	13	30	67	13	0
FWM	ES	HQ12: Wetland grazing supplement	89	29	31	62	22	8
FWM + CFGM	ES	HQ2: Maintenance of ponds of high wildlife value > 100 sq. m	89	30	45	47	26	5
FWM + CFGM	CS	WT3 - Management of ditches of high environmental value	82	56	63	31	54	5
CFGM	CS	GS17 - Lenient grazing supplement	78	3	18	67	3	0
FWM	ES	HQ6: Maintenance of fen	67	24	28	42	19	6
FWM + CFGM	ES	HQ1: Maintenance of ponds of high wildlife value < 100 sq. m	56	16	24	32	14	2
FWM + CFGM	CS	SP6 - Cattle grazing supplement	54	32	31	25	29	3

FWM	ES	HQ7: Restoration of fen	52	18	18	35	12	7
FWM	ES	HC15: Maintenance of successional areas and scrub	49	23	29	21	20	3
CFGM	ES	EK4: Manage rush pastures: outside SDA & ML	47	6	11	37	5	1
FWM	ES	HQ3: Maintenance of reedbeds	47	29	31	18	25	4
FWM + CFGM	ES	HR4: Supplement for control of invasive plant species	43	15	13	31	9	6
CFGM	CS	GS16 - Rush infestation control supplement	40	13	19	25	13	0
CFGM	CS	GS6 - Management of species-rich grassland	39	15	20	22	13	3
FWM + CFGM	CS	SP8 - Native breeds at risk supplement	39	20	25	19	19	1
CFGM	ES	HK13: Creation of wet grassland for breeding waders	39	5	8	30	4	1
CFGM	ES	HK14: Creation of wet grassland for wintering waders and wildfowl	34	8	13	24	6	2
CFGM	ES	OK3: Permanent grassland with very low inputs: outside SDA & ML (organic)	34	6	11	23	6	0
CFGM	ES	HK17: Creation of grassland for target features	33	1	9	30	1	0
CFGM	ES	OK2: Permanent grassland with low inputs: outside SDA & ML (organic)	33	4	8	27	4	0

Table A4.18 Area covered by agreements – Environmental Stewardship and Countryside Stewardship combined

		Options	CFGM PHI	CFGM PHI + SSSI only	PHI + CFGM Important area only	PHI + CFGM Potential area only	PHI + SSSI + CFGM Important area	PHI + SSSI + CFGM Potential area
CFGM	ES	EK4: Manage rush pastures: outside SDA & ML	14408.33	5365.87	7334.33	7074	5042.4	323.47
FWM + CFGM	ES	EK5: Mixed stocking	9486.19	2938.1	4363.43	5122.76	2772.8	165.3
FWM	ES	HC15: Maintenance of successional areas and scrub	9391.23	5876.81	7130.44	2260.38	5744.98	131.83
FWM	ES	HC16: Restoration of successional areas and scrub	7081.34	3072.21	3876.98	3202.77	2861.63	210.58
FWM + CFGM	CS	GS10 - Management of wet grassland for wintering waders and wildfowl	5274.43	3314.07	3711.7	1562.73	3173.56	140.51
FWM	ES	HC17: Creation of successional areas and scrub	4497.82	1334.77	2546.41	1951.41	1301.61	33.16
CFGM	CS	GS9 - Management of wet grassland for breeding waders	3611.07	2565.65	3089.58	521.49	2552.8	12.85
CFGM	ES	HD10: Maintenance of traditional water meadows	3287.9	1072.17	1520.68	1763.72	1025.01	47.16
CFGM	ES	HD11: Restoration of traditional water meadows	3167.85	653.01	1081.67	2086.18	580.89	72.12
CFGM	ES	HK10: Maintenance of wet grassland for wintering waders and wildfowl	2156.42	697.91	991.38	1165.04	641.69	56.22
CFGM	ES	HK11: Restoration of wet grassland for breeding waders.	1874.12	787.26	1054.24	819.88	747.01	40.25
CFGM	ES	HK12: Restoration of wet grassland for wintering waders and wildfowl	1789.3	375.66	603.44	1185.86	308.08	67.58
FWM + CFGM	CS	SP8 - Native breeds at risk supplement	1521.49	1099.72	1193.09	328.4	1083.98	15.74
CFGM	ES	HK13: Creation of wet grassland for breeding waders	1512.9	255.59	475.12	1037.78	135.24	120.35
FWM + CFGM	CS	SP6 - Cattle grazing supplement	1484.83	1084.05	1106.97	377.86	1073.26	10.79
CFGM	CS	GS13 - Management of grassland for target features	1432.36	392.92	719.99	712.37	375.7	17.22
CFGM	ES	HK14: Creation of wet grassland for wintering waders and wildfowl	947.71	300.46	381.62	533.09	292.4	8.06
CFGM	ES	HK15: Maintenance of grassland for target features	890	147.89	399.31	490.69	85.66	62.23
CFGM	ES	HK16: Restoration of grassland for target features	791.44	249.73	345.6	445.84	171.1	78.63
CFGM	CS	GS17 - Lenient grazing supplement	788.96	21.57	170.27	618.69	21.57	0
CFGM	ES	HK17: Creation of grassland for target features	534.74	0.95	312.61	216.44	0.95	0
CFGM	ES	HK18: Supplement for haymaking	509.55	311.64	339.19	170.36	311.64	0
CFGM	ES	HK19: Raised water levels supplement	475.97	204.34	220.34	255.63	151.9	52.44
CFGM	ES	HK4: Management of rush pastures	470.62	184.97	276.87	192.16	184.84	0.13
CFGM	CS	OT2 - Organic Land Management - unimproved permanent grassland	445.69	189.1	227.4	218.29	162.99	26.11
FWM + CFGM	ES	HK5: Mixed stocking	410.67	126.2	143.89	266.78	96.82	29.38
CFGM	ES	HK6: Maintenance of species-rich, semi-natural grassland	393.4	52.53	139.03	254.37	52.53	0

CFGM	ES	HK7: Restoration of species-rich, semi-natural grassland	377.94	169.98	257.54	118.81	169.85	0.13
CFGM	CS	GS16 - Rush infestation control supplement	371.95	139.56	203.51	168.44	139.56	0
CFGM	CS	GS6 - Management of species-rich grassland	334.01	149.95	187.87	146.14	134.01	15.94
CFGM	ES	HK8: Creation of species-rich, semi-natural grassland	329.91	188.9	201.1	128.81	165.91	22.99
CFGM	ES	HK9: Maintenance of wet grassland for breeding waders	314.19	46.37	89.7	224.49	46.37	0
FWM	ES	HP10: Supplement for extensive grazing on saltmarsh	268.84	84.38	239.93	28.91	84.38	0
CFGM	CS	SP2 - Raised water level supplement	268.57	173.94	185.72	82.85	170.36	3.58
FWM	ES	HP11: Saltmarsh livestock exclusion supplement	246.79	134.76	134.76	112.03	134.76	0
FWM	ES	HP5: Maintenance of coastal saltmarsh	242.07	90.92	76.56	165.51	52.9	38.02
FWM	ES	HP6: Restoration of coastal saltmarsh	231.91	30.09	48.18	183.73	28.3	1.79
CFGM	CS	GS15 - Haymaking supplement	196.86	68.13	113.58	83.28	59.48	8.65
FWM	CS	WT8 - Management of fen	171.89	105.21	99.95	71.94	93.23	11.98
FWM	CS	CT3 - Management of coastal saltmarsh	168.23	20.65	168.23	0	20.65	0

Table A4.19 Proportion of area covered by agreements – Environmental Stewardship and Countryside Stewardship combined

		Options	CFGM PHI	CFGM PHI + SSSI only	PHI + CFGM Important area only	PHI + CFGM Potential area only	PHI + SSSI + CFGM Important area	PHI + SSSI + CFGM Potential area
CFGM	ES	EK4: Manage rush pastures: outside SDA & ML	6.5517	16.8823	11.8199	4.4981	16.9720	15.6150
FWM + CFGM	ES	EK5: Mixed stocking	4.3135	9.2439	7.0320	3.2574	9.3328	7.9796
FWM	ES	HC15: Maintenance of successional areas and scrub	4.2703	18.4898	11.4913	1.4373	19.3368	6.3639
FWM	ES	HC16: Restoration of successional areas and scrub	3.2200	9.6659	6.2481	2.0365	9.6318	10.1654
FWM + CFGM	CS	GS10 - Management of wet grassland for wintering waders and wildfowl	2.3984	10.4268	5.9817	0.9937	10.6817	6.7829
FWM	ES	HC17: Creation of successional areas and scrub	2.0452	4.1995	4.1038	1.2408	4.3810	1.6007
CFGM	CS	GS9 - Management of wet grassland for breeding waders	1.6420	8.0721	4.9791	0.3316	8.5924	0.6203
CFGM	ES	HD10: Maintenance of traditional water meadows	1.4951	3.3733	2.4507	1.1215	3.4500	2.2766
CFGM	ES	HD11: Restoration of traditional water meadows	1.4405	2.0545	1.7432	1.3265	1.9552	3.4815
CFGM	ES	HK10: Maintenance of wet grassland for wintering waders and wildfowl	0.9806	2.1958	1.5977	0.7408	2.1598	2.7139
CFGM	ES	HK11: Restoration of wet grassland for breeding waders.	0.8522	2.4769	1.6990	0.5213	2.5143	1.9430
CFGM	ES	HK12: Restoration of wet grassland for wintering waders and wildfowl	0.8136	1.1819	0.9725	0.7540	1.0370	3.2623
FWM + CFGM	CS	SP8 - Native breeds at risk supplement	0.6918	3.4600	1.9228	0.2088	3.6485	0.7598
CFGM	ES	HK13: Creation of wet grassland for breeding waders	0.6879	0.8041	0.7657	0.6599	0.4552	5.8097
FWM + CFGM	CS	SP6 - Cattle grazing supplement	0.6752	3.4107	1.7840	0.2403	3.6124	0.5209
CFGM	CS	GS13 - Management of grassland for target features	0.6513	1.2362	1.1603	0.4530	1.2646	0.8313
CFGM	ES	HK14: Creation of wet grassland for wintering waders and wildfowl	0.4309	0.9453	0.6150	0.3390	0.9842	0.3891
CFGM	ES	HK15: Maintenance of grassland for target features	0.4047	0.4653	0.6435	0.3120	0.2883	3.0041
CFGM	ES	HK16: Restoration of grassland for target features	0.3599	0.7857	0.5570	0.2835	0.5759	3.7957
CFGM	CS	GS17 - Lenient grazing supplement	0.3588	0.0679	0.2744	0.3934	0.0726	0.0000
CFGM	ES	HK17: Creation of grassland for target features	0.2432	0.0030	0.5038	0.1376	0.0032	0.0000
CFGM	ES	HK18: Supplement for haymaking	0.2317	0.9805	0.5466	0.1083	1.0489	0.0000
CFGM	ES	HK19: Raised water levels supplement	0.2164	0.6429	0.3551	0.1625	0.5113	2.5315
CFGM	ES	HK4: Management of rush pastures	0.2140	0.5820	0.4462	0.1222	0.6221	0.0063
CFGM	CS	OT2 - Organic Land Management - unimproved permanent grassland	0.2027	0.5950	0.3665	0.1388	0.5486	1.2604
FWM + CFGM	ES	HK5: Mixed stocking	0.1867	0.3971	0.2319	0.1696	0.3259	1.4183
CFGM	ES	HK6: Maintenance of species-rich, semi-natural grassland	0.1789	0.1653	0.2241	0.1617	0.1768	0.0000

CFGM	ES	HK7: Restoration of species-rich, semi-natural grassland	0.1719	0.5348	0.4150	0.0755	0.5717	0.0063
CFGM	CS	GS16 - Rush infestation control supplement	0.1691	0.4391	0.3280	0.1071	0.4697	0.0000
CFGM	CS	GS6 - Management of species-rich grassland	0.1519	0.4718	0.3028	0.0929	0.4511	0.7695
CFGM	ES	HK8: Creation of species-rich, semi-natural grassland	0.1500	0.5943	0.3241	0.0819	0.5584	1.1098
CFGM	ES	HK9: Maintenance of wet grassland for breeding waders	0.1429	0.1459	0.1446	0.1427	0.1561	0.0000
FWM	ES	HP10: Supplement for extensive grazing on saltmarsh	0.1222	0.2655	0.3867	0.0184	0.2840	0.0000
CFGM	CS	SP2 - Raised water level supplement	0.1221	0.5473	0.2993	0.0527	0.5734	0.1728
FWM	ES	HP11: Saltmarsh livestock exclusion supplement	0.1122	0.4240	0.2172	0.0712	0.4536	0.0000
FWM	ES	HP5: Maintenance of coastal saltmarsh	0.1101	0.2861	0.1234	0.1052	0.1781	1.8354
FWM	ES	HP6: Restoration of coastal saltmarsh	0.1055	0.0947	0.0776	0.1168	0.0953	0.0864
CFGM	CS	GS15 - Haymaking supplement	0.0895	0.2144	0.1830	0.0530	0.2002	0.4176
FWM	CS	WT8 - Management of fen	0.0782	0.3310	0.1611	0.0457	0.3138	0.5783
FWM	CS	CT3 - Management of coastal saltmarsh	0.0765	0.0650	0.2711	0.0000	0.0695	0.0000

Annex 5 Long list of case studies for Task 3

Proposed site	Agreement holders (type)	CFGM High Importance (H) / Potential importance (P)	Coastal & Floodplain grazing marsh	Linear / group	SSSI	AES	Within HLS target area	Soils	Farm cluster /part of FF	Comments
Vale of Pickering	Private farmers	P	F	G	N	ES, CS	N	Loamy	N	
Cayton and Flixton Carrs (North Yorks) (tender suggestion)	All private farmers	P	F	G	N	ES, CS	N	Peaty	N	Note: The Carrs Wetland Project in action here. Mainly ES.
Humberhead Levels	Private farmers		F	G	N	ES	N	Sandy/ loamy	N	Very small sections/areas where there is PHI and AES options taken up. Along R Tome, R Idle.
Lyth Valley (tender suggestion) - R Gilpin	Private farmers, NGO, Estate	H / P	F	L	N	ES	Y	Peaty	N	ES uptake within CFGM, although more focused on potential areas of high importance than within high importance areas.
River Derwent (nr York)	NGO, private farmers	H	F	L	Y	ES, CS	Y	Sandy/ loamy	N	River corridor split between CFGM Priority Habitat and Lowland Meadow. ES and CS uptake of beneficial options across both habitats.
River Wharfe (nr York)	Private farmers		F	L	N	ES	N	Sandy/ loamy	N	
Lower Derwent Valley (tender suggestion)	All private farmers		F	L	Y	ES	Y	Sandy/ loamy	N	Very few CS options, mainly ES.
River Nene - Peterborough to Wisbech	NGOs, private farmers		F	L	Y	ES, CS	Y	Peaty	N	Mainly ES, some CS West (GS9, GS2). FF/Clusters to E of study area but not within.

Proposed site	Agreement holders (type)	CFGM High Importance (H) / Potential importance (P)	Coastal & Floodplain grazing marsh	Linear / group	SSSI	AES	Within HLS target area	Soils	Farm cluster /part of FF	Comments
New Bedford River - Huntingdon to Downham Market (Hundred Foot Washes)	NGOs, private farmers		F	L	Y	Mainly ES	N	Peaty	N	Mainly ES, few parcels CS only. HK9 main option.
River Trent - Newark to Gainsborough	Private farmers and ??		F	L	N	ES	Y	Loamy	N	GIS problem: ES options outside of ES areas.
Skegness	All private farmers		F	G	N	ES, CS	N	Loamy	N	Very sporadic patches of PHI with options across area.
The Broads	Private farmers	H / P	F	G	Partially	ES, CS	Y	Loamy	N	Large area outside PHI of arable reversion.
Halvergate Marshes, The Broads (tender suggestion)	Private farmers, NGO	H / P	F	G	N	ES, CS	Y	Loamy	N	
North Norfolk Coast - E and W of Wells-next-the-sea	Private farmers, NGO	H / P	C	L	Y	ES, CS	Y	Loamy	N	ES mainly, some CS E of Wells-next-the-Sea
River Waverney - Diss to Lowestoft	Private farmers, NGO, Estate	H / P	F	L	N	ES, CS	Y	Sandy / loamy / Clayey	N	ES mainly

Annex 6 AES option uptake in each case study area

Table A6.1: AES option uptake at Steart Marshes, Severn Estuary.

Grade	ES	CS
1	HP10 Supplement for extensive grazing on saltmarsh HP5 Maintenance of coastal saltmarsh HR1 Grazing supplement for cattle HK7 Restoration of species-rich semi-natural grassland HK17 Creation of grassland for target features HK13 Creation of wet grassland for breeding waders HK19 Raised water levels supplement HP8 Creation of inter-tidal and saline habitat on grassland *Immediately outside PHI:* *All the above options*	GS17 Lenient grazing supplement
2	HK18 Supplement for haymaking	None
3	None	None
4	EK3 Permanent grassland with very low inputs: outside SDA & ML	GS2 Permanent grassland with very low inputs outside SDAs
5	HF12NR Enhanced wild bird seed mix plots	BE3 Management of hedgerows

Table A5.2: AES option uptake at Lydney, Severn Estuary.

Grade	ES	CS
1	HP10 Supplement for extensive grazing on saltmarsh HP6 Restoration of coastal saltmarsh EX5 Mixed stocking *Immediately outside PHI:* *All the above options* *HP5 Maintenance of coastal saltmarsh*	None
2	None	None
3	None	None
4	EK2 Permanent grassland with low inputs: outside SDA & ML EK3 Permanent grassland with very low inputs: outside SDA & ML	GS2 Permanent grassland with very low inputs outside SDAs
5	EB2 Hedgerow management for landscape (on one side of hedge) EB3 Hedgerow management for landscape and wildlife EE3 6m buffer strips on cultivated land EE6 6m buffer strips on intensive land EF1 Field corner management	FG2 Sheep netting GS1 Take field corners and small areas out of management *Immediately outside PHI:* *Both the above options*

Table A5.3: AES option uptake at Test Valley

Grade	ES	CS
1	HK16 Restoration of grassland for target features HK12 Restoration of wet grassland for wintering waders and wildfowl HK10 Maintenance of wet grassland for wintering waders and wildfowl HK7 Restoration of species-rich, semi-natural grassland HR2 Grazing supplement for native breeds at risk HB14 Management of ditches of very high environmental value *Immediately outside PHI:* *HK7, HK16, HR2* *HK17 Creation of grassland for target features*	*Immediately outside PHI:* *WT8 Management of fen*
2	*Immediately outside PHI:* *EB7 Half ditch management*	None
3	None	None
4	EK3 Permanent grassland with very low inputs *Immediately outside PHI:* *EK2/EK3 Permanent grassland with (very) low inputs*	GS2 Permanent grassland with very low inputs
5	EC2 Protection of in-field trees (grassland) *Immediately outside PHI:* *EB1/EB2 Hedgerow management for landscape (one side/both sides of hedge)* *EC1/EC2 Protection of in-field trees (arable/grassland)* *HC7 Maintenance of woodland* *EF1 Field corner management* *HF14 Unharvested, fertiliser-free conservation headland* *EE2/EE3 4m/6m buffer strips on cultivated land* *HF12NR Enhanced wild bird seed mix plots*	GS1 Take field corners and small areas out of management *Immediately outside PHI:* *WD2 Woodland improvement* *AB1 Nectar flower mix* *BE3 Management of hedgerows* *SW7 Arable reversion to grassland with low fertiliser inputs*

Table A5.4: AES option uptake at Yare Valley

Grade	ES	CS
1	HQ3 Maintenance of reedbeds HK9 Maintenance of wet grassland for breeding waders HK10 Maintenance of wet grassland for wintering waders and wildfowl HK12 Restoration of wet grassland for wintering waders and wildfowl HK14 Creating of wet grassland for wintering waders and wildfowl HK15 Maintenance of grassland for target features *Immediately outside PHI:* *HQ6 Maintenance of fen* *HQ7 Restoration of fen* *HK15 Maintenance of grassland for target features*	GS10 Management of wet grassland for wintering waders and wildfowl GS13 Management of grassland for target features WT3 Management of ditches of high environmental value WT6 Management of reedbed WT12 Wetland grazing supplement *Immediately outside PHI:* *WT8 Management of fen*
2	None	WT11 Wetland cutting supplement SP2 Raised water levels supplement
3	None	None
4	EK2/EK3 Permanent grassland with (very) low inputs: outside SDA & ML *Immediately outside PHI:* *HJ9 12m buffer strips for watercourses on cultivated land*	GS2 Permanent grassland with very low inputs: outside SDAs
5	EB1/EB2 Hedgerow management for landscape (one side/both sides of hedge) EB3 Hedgerow management for landscape and wildlife HF12 Enhanced wild bird seed mix plots HF13 Uncropped cultivated areas for ground-nesting birds - arable HF14 Unharvested, fertiliser-free conservation headland HF12 Enhanced wild bird seed mix plots *Immediately outside PHI:* *All the above options* *EF4 Nectar flower mixture* *HC7 Maintenance of woodland* *EE3 6m buffer strips on cultivated land*	*Immediately outside PHI:* *BE3 Management of hedgerows* *AB11 Cultivated areas for arable plants* *AB9 Winter bird food* *AB8 Flower rich margins and plots* *GS1 Take field corners and small areas out of management*

Table A5.5: AES option uptake at Cayton and Flixton Carrs.

Grade	ES	CS
1	HK10 Maintenance of wet grassland for wintering waders and wildfowl HK11 Restoration of wet grassland for breeding waders HK13 Creation of wet grassland for breeding waders HK14 Creation of wet grassland for wintering waders and wildfowl HK15: Maintenance of grassland for target features HK16 Restoration of grassland for target features HK17 Creation of grassland for target features HK19 Raised water levels supplement HK5 Mixed stocking *Immediately outside PHI:* *HQ6 Maintenance of fen* *HQ5 Creation of reedbed*	GS6 Management of species-rich grassland GS13 Management of grassland for target features WT12 Wetland grazing supplement *Immediately outside PHI:* *WT8 Management of fen*
2	EB6 Ditch management EB7 Half ditch management	None
3	None	None
4	EK2 Permanent grassland with low inputs EK3 Permanent grassland with very low inputs ED5 Management of archaeological features on grassland	GS2 Permanent grassland with very low inputs
5	EB2 Hedgerow management for landscape EE3 Buffer strips on cultivated land *Immediately outside PHI:* *EB1 Hedgerow management for landscape (both sides)* *EB8/EB9 Combined hedge and ditch management* *EF6 Overwintered stubble* *EE9 6m buffer strips on cultivated land next to watercourse* *EC4 Management of woodland edges*	AB9 Winter bird food AB1 Nectar flower mix BE3 Management of hedgerows AB11 Cultivated areas for arable plants

Table A5.6: AES option uptake at Lyth Valley

Grade	ES	CS
1	HQ5 Creation of reedbed HK11 Restoration of grassland for breeding waders HK12 Restoration of wet grassland for wintering waders and wildfowl HK7 Restoration of species-rich semi-natural grassland HK9 Maintenance of wet grassland for breeding waders HQ8 Creation of fen HQ6 Maintenance of fen HK15 Maintenance of grassland for target features.	None
2	EB6 Ditch management HK18 Supplement for haymaking	None
3	None	None
4	EK3 Permanent grassland with very low inputs: outside SPA & ML EK2 Permanent grassland with low inputs: outside SDA & ML	GS2 Permanent grassland with very low inputs (outside SDAs) HS5 Management of historic and archaeological features on grassland LV3 Hard bases for livestock drinkers LV6 Ram pumps and pipework/unit LV7 Livestock troughs LV8 Pipework for livestock troughs
5	EB1 Hedgerow management for landscape (both sides) EB2 Hedgerow management (one side) EB3 Hedgerow management for landscape and wildlife EJ11 Maintenance of watercourse fencing EB9 Combined hedge and ditch management EC2 Protection of infield trees (grassland)	BN5 Hedgerow laying BN7 Hedgerow gapping BE2 Protection of in-field trees on intensive grassland SW2 4-6m buffer strip on intensive grassland FG2 Sheep netting

Annex 7 Land Manager/Local Adviser Discussion Proforma

Acronyms

CFGM: Coastal and Floodplain Grazing Marsh

HLS: Higher level stewardship

AES: Agri-environment scheme

ES: Environmental Stewardship

CS: Countryside Stewardship

ESA: Environmentally Sensitive Areas (1987-2005)

CSS: Countryside Stewardship Scheme (1991-2014)

Brief introduction to the project and its aims, and the objectives of undertaking this interview.

Project: The project evaluates the contribution of Agri-Environment Schemes (AES) in conserving biodiversity value in Coastal and Floodplain Grazing Marsh (CFGM) habitats.

Project aims: The aims of the project are to understand how effective AES are, or have been, in conserving the biodiversity value of coastal and floodplain grazing marsh habitat, and how effective the current HLS target area has been in targeting the delivery. We are considering the type of options taken up and where these are located. This will help us to understand the effects on CFGM habitat and the biodiversity as a result of AES.

Objectives of interviews: The objective of this interview is to discuss your AES agreement(s), the reasons for joining or barriers to joining, the type of options taken up and where, whether there have been notable changes (positive, neutral, negative) to the CFGM habitat as a result of the options taken up or other management you have undertaken, and what changes you would like to see from a new scheme (if any).

Questions to start discussion:

About the land holding:

1. Are you the land owner?
2. What is the type of farming undertaken?
3. Are you part of any farm discussion or information sharing groups?

   If yes, please explain who is involved and the aims.

4. Do you have land that is designated as a SSSI, nature reserve, other conservation area?

   If yes, how does this affect your management of the land?

About the project

5. Does your holding contain any grazing marsh habitat? (Y/N)

   If yes, what is your understanding of this habitat and the value it has for biodiversity?

6. Do you have land both inside and outside of CFGM? (Y/N)

   If yes, how does the management of the land differ?

7. Is your land holding within the HLS CFGM target area? (Y/N/Don't know)

8. Do you have an AES at present? (Y/N)

   If yes go to next question, if no go to question 17

Legacy scheme:

9. Have you had any AES agreements in the past e.g. Environmentally Sensitive Areas (ESA)/Countryside Stewardship Scheme (CSS)? (Y/N)

   If yes,

   a. Please specify the type and length of agreement?

   b. Options implemented?

   c. Any changes to habitat as a result of the agreement/what impact did the AES have on the farm?

   d. What happened when this agreement ended?

Current scheme:

10. What type of agreement do you currently have and how long does it run for?

11. What were your reasons for joining this current AES?

12. Were there any concerns/barriers to you joining the AES?

13. Management options:

    a. What management options have you taken up within the agreement?

    b. What were your reasons for taking up these options? Did you receive guidance from a NE advisor/or other?

    c. Only ask if interviewee has land in SSSI: Has the uptake of management options differed on land inside and outside of SSSI?

14. Changes to the habitat and species:

    a. Have you noted any changes to the species present, these may be positive, neutral or negative changes to the number of species or the range of species present?

    b. Have you noted any changes to the habitat as a result of the management? These may be positive, neutral or negative changes e.g. t? Prompt the interviewee to compare land inside and outside of AES.

    c. Only ask if interviewee has land in SSSI: Has your agreement helped you to undertake management that has improved or maintained the SSSI in favourable condition? (Y/N/Don't know)

15. Have there been difficulties implementing any options, for example with fitting into the farming system or getting options established? (Y/N)

    If yes, please explain what these are.

16. Are there any constraints to AES that you feel compromise management? This could be constraints to do with the timing restrictions on certain operations, environmental constraints due to weather affecting option implementation, any conflicting constraints imposed by other regulatory bodies such as Environment Agency.

17. Has the farming system and overall farm productivity been adjusted to benefit CFGM?

    If yes, has this been temporary or permanent?

18. How has being in AES altered the way you manage your land? If you no longer had an AES would you alter your land management practices?

19. Additional management:

    a. Do you have any land parcels that are managed according to the AES prescriptions but are not within your agreement? If yes, why?

    b. Only ask if there is non-uptake of grade 1 (highly beneficial) options for natural floodplain functioning (a list of these options will be provided for each case study interview prior to the interview). What are the reasons for not taking up options X, Y, Z?

    c. Are you aware of the presence of any rare/designated/Section 41 species (e.g. otter, water vole) present on land beyond the CFGM boundary as shown on the map?

20. In terms of a naturally functioning floodplain, has your land flooded and if so, how often? Do you think that the floodplain needs to be better managed to take account of flooding in the future?

21. What changes would you would like to see from a new scheme, if any?

A COLLABORATION BETWEEN

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