Draft National Flood and Coastal Erosion Risk Management Strategy for England:

Draft Habitats Regulations Assessment Appendices

Consultation Draft

24 MAY 2019

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We help people and wildlife adapt to climate change and reduce its impacts, including flooding, drought, sea level rise and coastal erosion.

We improve the quality of our water, land and air by tackling pollution. We work with businesses to help them comply with environmental regulations. A healthy and diverse environment enhances people's lives and contributes to economic growth.

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Appendix 1: the Habitats Regulations in more detail

Appendix 1 to the HRA contains more detail on the legislation, known as the Habitats Regulations that drives the Habitats Regulations Assessment.

In England, the Conservation of Habitats and Species Regulations 2017 (SI 1012, 2017), termed the 'Habitats Regulations', implements the EU 'Habitats Directive' (Directive (92/43/EEC) on the Conservation of natural habitats and of wild flora and fauna, and certain elements of the 'Birds Directive' (2009/147/EC). SI 1012, 2017 consolidates various amendments made to The Conservation (Natural Habitats, &c.) Regulations 1994 (SI 2716, 1994), and also applies to Wales and Scotland. An amendment: The Conservation of Habitats and Species (Amendment) Regulations 2011 (SI 625, 2011), amends the 2010 Regulations to ensure certain projects are subject to the requirements of the Habitats Directive.

This legislation provides the legal framework for the protection of habitats and species of European importance in England. The protected sites comprise:

- Special Areas of Conservation (SAC)
- Special Protection Areas (SPAs, classified under the Birds Directive)
- candidate SACs (cSAC)
- Sites of Community Importance (SCIs)

As a matter of government policy, protected sites also comprise:

- potential Special Protection Areas (pSPAs)
- Ramsar sites (sites designated under the 1971 Ramsar Convention for their internationally important wetlands)
- sites identified, or required, as compensatory measures for adverse effects on European sites, potential Special Protection Areas, possible Special Areas of Conservation, and listed or proposed Ramsar sites (NPPF 2019).

These sites are referred to collectively in this report as 'European sites'.

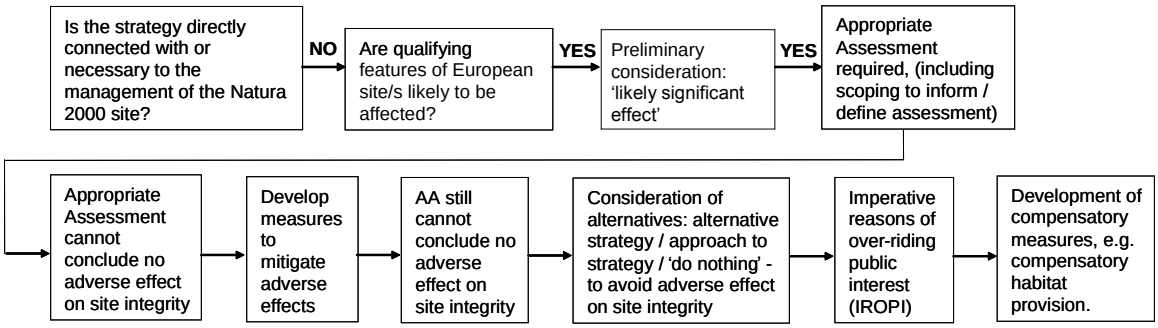
Regulation 9(3) of the Habitats Regulations requires that a competent authority must consider the requirements of Habitats Directive in exercising any of its functions.

Regulation 9(3) of the Habitats Regulations requires that a competent authority must consider the requirements of Habitats Directive in exercising any of its functions. Regulation 63 of the Habitats Regulations defines the requirements for assessment of plans and projects potentially affecting European sites. This requires that a competent national authority, before deciding to undertake, or give any consent, permission or other authorisation for a plan or project which is likely to have a significant effect on a European site, and is not directly connected with or necessary to the management of that site, must make an Appropriate Assessment of the implications for that site in view of that site's conservation objectives.

A1.1 Stages of Habitats Regulations Assessment

There are several stages to the carrying out of appropriate assessments required under the regulations (figure A1). We refer to this process as 'Habitats Regulations Assessment' (HRA).

Figure A1 Overview of the stages of the habitats regulation assessment process



The stages of the HRA are described in further detail below.

A1.1.1 Stage One: Screening

This is the process which identifies whether the draft strategy is directly connected with, or necessary to the management of European sites, the potential impacts upon European site/s of the draft strategy, either alone or in combination with other plans, and assesses the significance of those effects.

We have determined whether the draft national FCERM strategy may have a significant effect.

Likely significant effect is a term used in both the Habitats Directive 92/43/EEC and the Habitats Regulations. However, pursuant to case law (Waddenzee C-127/02), likely significant effect is interpreted as meaning that there may be (as opposed to is likely to be) a significant effect. This means that a precautionary approach is taken to ensure that no reasonable scientific doubt remains regarding the effects of a plan/project, which by themselves or in combination with other plans or projects, affect the site's conservation objectives.

A1.1.2 Stage Two: Appropriate Assessment

This involves the consideration of the potential impacts of the draft strategy on European site/s, either alone or in combination with other plans, with respect to the sites' conservation objectives.

Article 6(3) of the Habitats Directive states that in combination effects with other plans or projects need to be considered. In keeping with the high-level nature of the draft strategy, only key relevant high-level plans that could potentially result in in-combination effects have been considered.

The purpose of the Appropriate Assessment is to assess the effect on European site/s integrity. Where adverse impacts are identified, an assessment of the potential mitigation of those impacts is undertaken.

A1.1.3 Stage Three: Assessment of feasible alternative solutions

This is where it cannot be ascertained that the draft strategy will not adversely affect the integrity of a European site, the next stage is to examine alternative ways of achieving the

objectives of the draft strategy that better respect the integrity of the European sites affected.

A1.1.4 Stage Four: IROPI test and consideration of Compensatory Measures

This is where no feasible alternative solutions exist and adverse effect on site integrity remains, determination of whether the draft strategy should proceed by the test of imperative reasons of overriding public interest (IROPI). If there are imperative reasons of overriding public interest, compensatory measures must be taken to ensure that the overall coherence of the European network of European sites is protected.

A1.2 Identification of European sites

A1.2.1 European sites that could be affected by the draft national FCERM strategy

Significant areas are also designated as protected nature conservation sites under European and international legislation. These comprise:

- Special Areas of Conservation (SACs)
- Special Protection Areas (SPAs), candidate SACs (cSACs)
- Sites of Community Importance (SCIs)

They also comprise, as a matter of government policy, to potential Special Protection Areas (pSPAs) Ramsar sites and sites required as compensatory measures.

These are collectively referred to in the HRA as European sites.

SCIs are sites that are proposed by Member States to, and have been adopted by the European Commission, but not yet formally designated by the Member State. Once the European Commission approves, they can be designated as SACs. Defra policy extends the same protection at a policy level to listed Ramsar sites to that afforded to SACs and SPAs.

A1.2.2 Treatment of designated sites at the higher strategic level:

The draft national FCERM strategy for England effectively defines the new philosophy for managing all sources of flooding and coastal change. HRA of this highest tier of planning has been developed along the following principles:

1. The purpose of the HRA is to ensure that any potential for damage to the integrity of the European sites is identified

2. Opportunities to influence the plan to avoid, reduce or mitigate damage is recommended

3. Unavoidable damage is highlighted and a clear course of analysis undertaken to assess to determine whether there is an overriding need for that measure

4. Recommendations are made, based on the assumptions generated during the assessment, to inform the subsequent implementation of the plan

5. Monitoring is suggested to inform subsequent action where the initial conclusion includes uncertainty associated with specified assumptions

As previously mentioned, the plan is not spatially specific in terms of where the measures will be applied. It defines timescales. In relation to the latter we have considered whether the timescales associated with the measures, especially in relation to each other, could give rise to an effect.

To deal with the lack of spatial application we tested whether the usual format of HRA, used at strategy and project level, could be applied. It could not: actions that might be beneficial to one habitat type might be damaging to another. The best approach was deemed to be a consideration of the ecological requirements of the habitats themselves. These ecological requirements are both those operating within the site, and those outside of the site but with the capability to influence the integrity of the site.

The final component of the HRA consideration is the impact of climate change on the future integrity of the sites. We did not undertake literature review to determine what the predictions are relating to probable changes in distribution of protected species and habitats.

Given the high-level nature of this assessment, it is not practical to provide detailed information about each of the European sites in England. A precis of the European sites in England, including cross-border sites, is presented in the paragraphs below. Further information about the European site features is available on the Joint Nature Conservation Committee website (www.jncc.gov.uk), and interactive maps of European sites can be accessed from Defra's mapping service https://magic.defra.gov.uk/

The European site designations cover a significant proportion of the English coastline and its estuaries. Inland, many of the designations cover the full spectrum of terrestrial and aquatic habitats. For some dynamic sites, conservation of the processes is necessary to maintain their nature conservation value.

Special protection areas

Special Protection Areas (SPAs) are classified for the protection of areas which have been identified as being of international importance for the breeding, feeding, wintering or regularly occurring migratory birds. SPAs can comprise a variety of different habitat types, ranging from areas of fen, peat or moorland, to coastal and estuarine habitat and marshland. In England, many of the SPAs are associated with marine/ coastal or estuarine waters and associated areas of marshland, with these classified areas covering a substantial proportion of England's estuarine and coastal areas. Although less extensive, there are also a number of inland terrestrial and freshwater SPAs, comprising areas of upland / moorland, heath, and inland water bodies and associated habitats. These can be either natural or artificial water bodies, such as gravel pits, reservoirs or washlands.

There are 88 Special Protection Areas in England, of which three are cross-border between England and Wales (Liverpool Bay; Dee Estuary; and Severn Estuary) and one is cross-border between England and Scotland (Upper Solway Flats and Marshes).

Special areas of conservation

Special Areas of Conservation (SACs) are areas designated for the conservation of a variety of important or threatened habitats, animals and plant species, as defined by Annex I (habitats) and Annex II (species) of the Habitats Directive. England's SACs include extensive areas which cover marine / coastal (including offshore) and estuarine zones as well as a number of inland and terrestrial areas. Of the inland areas, the range of habitat types is diverse, including upland areas, areas of moors, peatland, woodland, forest, or grassland, and sites associated with water bodies, such as stretches of river valleys or floodplains.

There are 254 SACs, SCIs or cSACs in England, a number of which are cross-border between England and Wales (Dee Estuary; River Dee and Bala Lake; Severn Estuary; River Wye; Wye Valley and Forest of Dean Bat Sites; Wye Valley Woodlands; and Fenn's, Whixall, Bettisfield, Wem and Cadney Mosses). There are three cross-border SACs between England and Scotland (Berwickshire and North Northumberland Coast; River

Tweed; and Solway Firth). In addition, there are two cross-border England-Wales-Offshore SCIs (sites that have been adopted by the European Commission but not yet formally designated by the government.

Ramsar sites

Ramsar sites are designated wetlands of international importance for their ecology, botany, zoology, limnology or hydrology, and in particular include wetlands of international importance for their waterfowl, as designated under the Ramsar Convention. Ramsar sites can comprise areas of marsh, fen, peatland or areas of water that are static or flowing, fresh, brackish or areas of marine water. Ramsar sites may also incorporate riparian (banks of a river, pond or watercourse) and coastal zones adjacent to the wetlands. In England, many of the Ramsar sites are associated with marine/ coastal or estuarine waters and associated areas of marshland, with these designated areas covering a substantial proportion of England's estuarine and coastal areas. Although less extensive, there are also a number of inland and freshwater Ramsar sites, associated with river valleys and floodplains, heathland or fens, and also includes artificial water bodies and associated habitats such as gravel pits, reservoirs or washlands.

There are 72 Ramsar sites in England, of which three are cross-border between England and Wales (Midland Meres and Mosses Phase 2; Severn Estuary; and Dee Estuary) and one is cross-border between England and Scotland (Upper Solway Flats and Marshes The majority of the English Ramsar sites are either coincident with or substantially overlapping the boundaries of designated SACs or SPAs.

Further details about the Ramsar sites are available on the Ramsar website (http://www.ramsar.org).

A1.2.3. European sites unlikely to be affected by the draft national FCERM strategy

Because of the high-level nature of the draft national FCERM strategy and lack of a spatial framework, it is difficult to completely rule out any of the European sites to which this HRA may apply. However, there are a few notable exceptions, described below.

There are in English waters a couple of designated SACs that lie offshore from the English coastline; these sites are therefore considered unlikely to be affected by the draft national FCERM strategy. They comprise the Haisborough, Hammond and Winterton SAC and the Inner Dowsing, Race Bank and North Ridge SAC. Also the two offshore SCIs - Bristol Channel Approaches / Dynesfeydd Môr Hafren and Southern North Sea.

Many of the European sites within Scotland and Wales are considered unlikely to be affected by the draft strategy. However, it is not possible to rule out potential effects on designated sites close to the border in Scotland and Wales. Any cross-border European sites could potentially be affected; these cross-border SAC, SPA and Ramsar sites are specifically referenced in section 2.1 above. Potential influence on cross-border sites / sites close to the border in Wales or Scotland should be given consideration, by consulting with Natural Resources Wales (NRW), or Scottish Natural Heritage (SNH), where lower-tier strategies or projects in proximity to the national borders are being developed.

Upland designated European sites located away from urban locations and flood risk zones are in most instances unlikely to be affected by the draft strategy. However, given that the draft strategy considers the potential use of risk management tools, such as land management and natural flood management approaches to slow down the flow of water from the upland parts of a catchment, potential impacts on these sites has been included.

A1.2.4. Qualifying interests of European sites

Given the high-level nature of this assessment, it is not practical to provide detailed information about the qualifying interest features of each of the European sites in England. Further information about the European site features is available on the Joint Nature Conservation Committee website (www.jncc.gov.uk). Further details about the Ramsar sites are available on the Ramsar website (http://www.ramsar.org).

Special protection areas

SPAs are protected sites classified for rare and vulnerable birds, and for regularly occurring migratory species. The UK's geographic position – a north temperate island close to a major continental land-mass – results in its particular European importance for a number of groups of birds. The UK is particularly important for many populations of breeding seabirds, and is the wintering area for many waterbirds (ducks, geese, swans, waders) that breed throughout Arctic and sub-Arctic areas. Most of these waterbirds gather in winter in UK wetlands in dense aggregations. For many other waterbirds, the UK is not their final destination but is a stepping-stone on their migratory flyways to ultimate winter destinations in Africa. For many wading birds, such as Ringed Plover, Black-tailed Godwit, Redshank, Sanderling, Dunlin and Knot, the coast of the UK is of crucial importance during the spring and autumn passage periods.

For the purposes of this HRA we have assumed that the needs of the species will be provided for if the habitat conditions are met both within and outside of the European site boundaries. In expanding the scope of the HRA beyond the site boundaries we assume that the most mobile species are likely to spend appreciable amounts of time outside of the designated site, so requiring the appropriate habitat conditions for this.

Special areas of conservation

In England, the reasons for designation, or qualifying interests of SACs are varied, with a wide range of different habitats and species listed for each site's qualifying features and / or reasons for selection of the site. Details of the SAC site descriptions including details of qualifying interest features can be viewed from the JNCC website (http://www.http://jncc.defra.gov.uk/page-23).

For the purposes of this HRA we have reviewed all the 77 habitat accounts on the JNCC website (colloquially referred to as the Annex 1 habitats) and selected those features that have the capacity to be affected by the plan. This list is wide-ranging and inclusive, because of the planned use of working with natural processes (WWNP) and natural flood management (NFM). Whilst we did not assess the plan against all the site accounts, we did consult certain site accounts to inform our assumptions.

Ramsar sites

In defining sites that qualify as Ramsar sites, this is guided by the criteria set out in the Ramsar Convention, of which there are nine criteria in total. Of particular relevance for the Ramsar site designations in England, are the criteria of: a site regularly supporting 20,000 or more water birds; a site regularly supporting 1% of the individuals in a population of one species or subspecies of water bird. Ramsar sites may also be designated if a site contains a representative / rare / unique example of a natural or near-natural wetland type; if it supports populations of plant and / or animal species important for maintaining biological diversity; supports vulnerable / endangered species or threatened ecological communities; if it regularly supports 1% of the individuals in a population of one species or subspecies of wetland-dependent non-avian animal species. The initial emphasis for the designation of Ramsar sites in England was on selecting sites of importance to waterbirds, consequently many Ramsar sites are also SPAs. For more recent designations, non-bird features have increasingly been taken into account, both in the selection of new, and in

reviewing of existing sites. Further details and the full list of criteria for designation of Ramsar sites can be viewed on Natural England's website (www.naturalengland.org.uk/ourwork/conservation/designatedareas/ramsars/default.aspx)

We have not specifically focussed on Ramsar sites nor species in this assessment, on the basis that similar principles apply as to the Annex 1 habitats.

A1.2.5. Conservation objectives for European sites

All European sites have conservation objectives. The conservation objectives do not aim to prevent all change to a site's qualifying interests / interest features, but aim to maintain or achieve favourable conservation status. Any proposals that are likely to affect the conservation objectives of a European site are therefore also likely to affect the overall integrity of the site.

Information on status, condition and conservation objectives for European sites is available from Natural England (www.naturalengland.org.uk). Conservation objectives for Welsh sites can be accessed from: http://www.NRW.gov.uk/landscape--wildlife/protecting-our-landscape/special-sites-project.aspx and for Scottish sites from: www.snh.org.uk/snhi/

Whilst we have not tested the plan against the conservation objectives in this HRA, we did consult the conservation objectives to inform our summary of the potential effects of plan implementation.

Appendix 2: the Appropriate Assessment logic and data

THIS APPENDIX CONTAINS GREATER DETAIL ON THE SCIENTIFIC LOGIC SUPPORTING THE APPROPRIATE ASSESSMENT. APPENDIX 2 CAN BE READ AS A STANDALONE ACCOUNT OF THE TREATMENT OF THE DATA DURING STAGE 2 OF THE HRA.

A2.1 Introduction

At stage 1 we have screened in 25 of the 36 measures contained in the draft strategy as we are unable to be certain that those measures would not ultimately affect European sites. These measures are subject to further assessment to determine their implications for European sites. This is to determine whether any of the measures, alone or in combination with other measures and/or other plans or projects, could adversely affect the integrity of any European sites.

There are more than 250 European sites, the potential receptors, and 25 of the 36 measures were screened into the assessment. The appropriate assessment therefore had to be performed on a simplified number of receptors and a reduced number of measures, to be manageable and reportable.

The measures were therefore grouped, according to the potential type of impact, using assumed pathways. The European sites all support one or more of 77 Annex 1 habitat types, annex 2 species and/or bird populations of national significance. The assessment was therefore carried out on the habitats and species.

Figure 4.1 summarises how these two approaches converged to inform the appropriate assessment.

Figure 4.1 How the available information converged in order to achieve the appropriate assessment

The measures eventually lead to interventions. But they are very high level, so we made assumptions about the range of pathways that measures might eventually be realised as interventions.	The appropriate assessment considers the potential for interaction between the interventions and processes.	The integrity of the European sites depends on functioning natural processes; in this case a high level review of the processes that could be affected by FCERM management was the first step.

A2.2 the pathway from measure to intervention

The draft strategy is a high-level national strategy document and does not provide a sufficient level of detail regarding the specific flood and coastal erosion risk management outcomes of the strategy, neither the management interventions (e.g. schemes) nor where they will be implemented. Guidance will have a national application, by definition.

Objective 1.1 provides some indications of the range of FCERM interventions, referred to as 'tools' in the draft strategy. These are summarised in figure A2.2.

Figure A2.2 the range of management interventions that are referred to as tools in the draft strategy

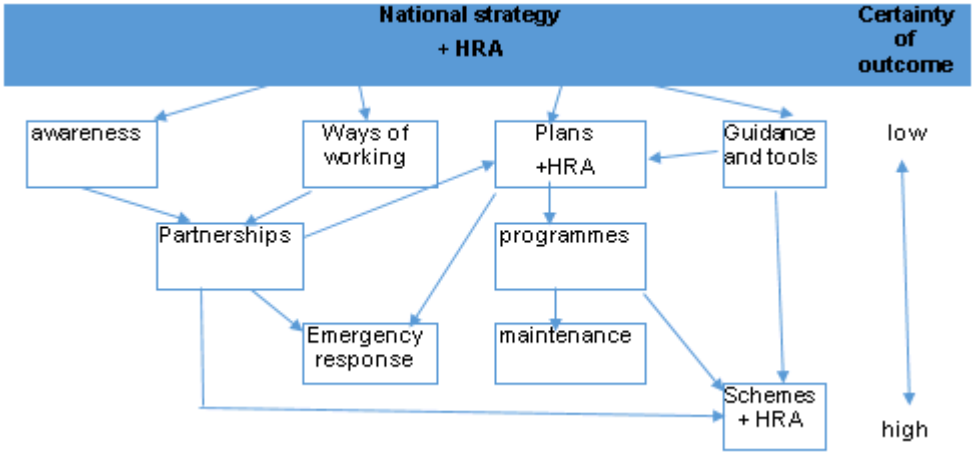
Section A2.6 provides a more detailed breakdown of these different approaches ('tools') and their application.

We considered the measures associated with each objective, making a subjective expert opinion on the likely pathway of their eventual implementation. We have extrapolated the pathway for the effect but at this stage we did not exclude the potential for any type of physical management consequences.

We developed and applied the following logic, specific to this HRA, to guide our considerations:

1. Whilst we assume that draft HRA associated with each level will ensure a compliant strategy or project, we cannot rely on that mechanism at this draft strategy stage. We need to be confident, despite the uncertainty inherent in high level strategic planning, that the draft strategy is not setting up situations that will create avoidable deleterious effects on European site integrity further down the hierarchy.
2. There should be a cascade of information from the plan, through strategies and eventually into projects, supplying sequentially greater certainty with each level to the issues and opportunities raised at the level above (figure A4.3)

Figure A4.3 relationship between the national strategy and subsequent tiers



3. If guidance and tools do not incorporate the appropriate emphasis on integrating the needs of nature conservation, then the risk of effects on integrity of European sites is increased when compliance with the regulations is restricted to assessment of the preferred option.
4. The wider countryside interacts with the European sites by many processes, such as lifecycle and behavioural movements, hydrology, nutrient input, pollution, for example, which we describe for each habitat type. And we are also uncertain about how species ranges may in future be affected by climate change, but we know that the places outside of the European site boundaries are going to be progressively more important to the future achievement of integrity, functioning and resilience.
5. FCERM solutions to manage flood and coastal risk can be inherently capable of providing nature conservation improvement. Examples include schemes that:

- create a more natural river form and function
- reconnect the river with the floodplain,
- retain or reinstate coastal processes,
- protect and enhance natural defences such as fringing reed, saltmarsh, mudflat, beaches and sand dunes,
- promote catchment processes, including holding water in the catchment, encouraging infiltration and slowing run-off rate,
- contribute to ecological networks
- create oases of functioning semi-natural habitat in urban areas, using SUDS techniques

The draft strategy specifically refers to the intention to promote positive outcomes. Adopting the necessary precautionary principle we have not relied upon this stated objective in forming our conclusions. We have undertaken high level analysis to identify potentially damaging unintended consequences.

6. Outcomes to benefit nature conservation in general, including European sites, does not have to include habitat creation, it can include actions that increase resilience to perturbation or facilitate species to increase their range. This includes the changes to environmental conditions that will happen as a consequence of climate change. All decisions will need to be informed by best available scientific understanding.

7. Damaging actions can occur outside of the boundary of the European site, where the natural processes are connected. There is cross-over with WFD assessment procedures in respect of the hydroecological relationships, which we have maintained awareness of in order to better inform our conclusions.
8. We have also assumed that habitat that has been created or restored will take time to develop full ecological quality; so conservation in situ is the preferred option to loss and mitigation habitat creation, but habitat restoration and creation is an important route to the achievement of resilience.
9. We have not taken into account condition assessments nor conservation objectives at site level, in order to determine whether particular habitats are in general more at risk than others of degradation, because this level of detail is more appropriate to lower tier planning, so we do not prioritise any habitat types in this assessment
10. The draft strategy ultimately informs all FCERM decisions, and these will be made in a way that conforms with the wider aspirations of the 25 Year Environment Plan.

We felt that there was an intermediate step that would help to streamline the appropriate assessment. There are 36 measures. Only some will impact management on the ground. Some measures share common impacts or pathways to realising those impacts. We reduced the measures down to a smaller set of groupings and subsets relating to the pathways, to take forward into the appropriate assessment.

Informed by the screening process outlined above, we have grouped the relevant strategic measures in relation to the probable pathway of their potential effects. The groupings were not pre-determined. The groupings evolved from consideration of each measures' potential impact once the chain of strategy implementation was completed. Application of this logic resulted in the following pathways, in bullets, and groupings, in italics. The caveat is that we have tried to keep this exceptionally simple and high level, and proportionate to the degree of detail of the draft strategy.

Measures can result in the following:

- Guidance and tools
- Further plans and strategies
- Frameworks

The further plans, strategies and frameworks can be used to derive programmes and projects for flooding and coastal change management interventions.Co-ordinated plans can give rise to a further range of combined effects outside of the scope of a standalone FCERM project.

Thus the objective of all guidance, tools, programmes, projects and the combined effects of co-ordinated plans should include *to promote and not to prejudice management of the achievement and maintenance of favourable condition* of the European sites. Measures were screened according to their capacity to contribute to this outcome. Measures in this grouping were more likely to have a direct mode of impact on the integrity of the European sites.

Measures can contribute to the following outcomes:

- Habitat creation, restoration and management
- Sustainable growth
- Coastal squeeze
- Distribution, frequency and extent of flooding

- Resilience to drought related and other negative hydrological impacts
- Climate change resilience

The above list is not exhaustive, pollution is not included, for example. These pressures are incorporated in the above list by implication; so floods can both transport and dilute pollutants, drought can concentrate pollutants. The draft HRA screening recognised such interactions exist. But the assessment to more detailed level for habitat types with specific hydroecological requirements was part of the next stage, appropriate assessment, not screening. The ecosystems rely upon water supply within certain limits, or tolerances, which we only considered qualitatively:

- flooding where it is beneficial e.g. fens, saltmarshes
- where intermittent inundation is an essential feature of ecosystem function e.g. winterbournes, washlands, saltmarshes
- where water supply is an essential feature of ecosystem function e.g. fens, wet grasslands, wetland SPAs.

The draft strategy measures relating to the indiect impacts on integrity of the European site, primarily in relation to resilence were grouped into those *capable of creating buffer zones, sub-optimal habitat, sustainable hydrology and water quality*. NFM, WWNP and SUDS all fall into this grouping.

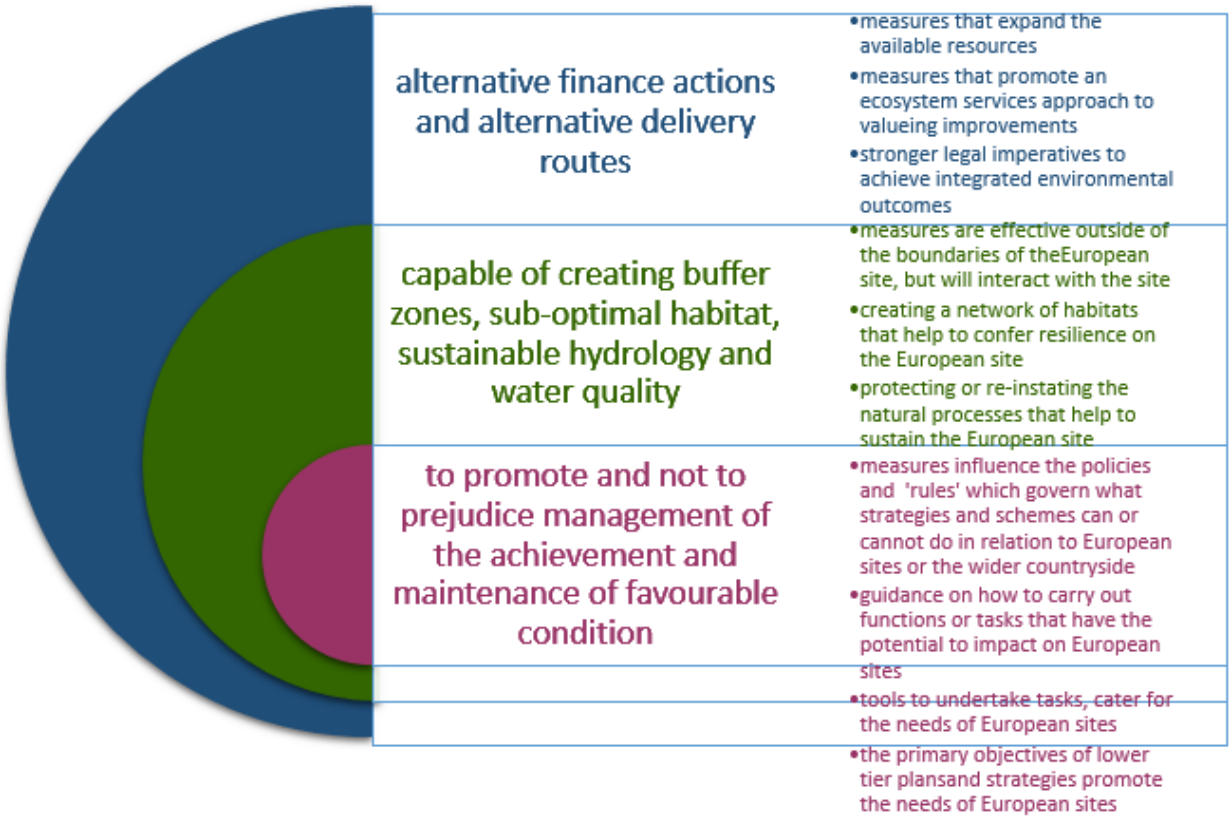
Some measures relate to mechanisms to achieve flood and coastal risk management outcomes. These measures were the most difficult to screen. We decided to focus on those that could be essential to achieving projects on the ground. We screened measures according to their capacity to contribute to the following broad headings:

- Biodiversity net gain
- Grants and payment mechanisms;
- Community led responses; these can be positive for nature, such as the community led projects or community participation in the operation of flood or coastal erosion risk management schemes.
- Development; again can be or negative.

We grouped the measures capable of contributing these outcomes up into *alternative finance actions and alternative delivery routes*.

The grouping process is summarised in figure A2.4:

Figure A2.4: summary of how the measures combine to form groupings, developed for the HRA to simplify further analysis



Note: the converse of the above groupings indicates how impacts on the integrity of the European sites might occur. So damage to buffer zones, interference in the hydrology or coastal processes, for example, would constitute a damaging effect, just as direct damage within the site boundaries would.

Some measures are inherently capable of contributing to more than one pathway and more than one grouping, which we reflected in the summary of the iterative screening process.

A2.3 Summary of the groupings and pathways from screening the measures

In the absence of any defined actions the measures have been screened for their possible influence on SACs and SPAs. We have extrapolated the pathway for the effect by making a series of stated but otherwise unsupported assumptions. Assumptions are an accepted and essential part of the assessment of high level strategies.

We grouped the measures in groupings, with supporting pathways, in order to reduce the 36 measures to a more manageable number for the next stage of appropriate assessment.

Three groupings were identified, together with their supporting pathways, described in the previous section, can be summarised as follows:

1. **Promote and does not prejudice action to achieve and maintain favourable condition**

- Guidance and tools

- Plan and strategy level, that also inform programmes and projects
- Frameworks, that also inform programmes and projects
- Coordinated plans and combined effects

2. Create buffer zones, sub-optimal habitat, sustainable hydrology and water quality

- Habitat
- Sustainable growth
- Coastal squeeze
- Floods
- Droughts
- Climate change resilience
- Via:
- Sustainable drainage systems (SUDS)
- Natural flood management (NFM) and working with natural processes (WWNP).

3. Alternative finance actions and alternative delivery routes

- Biodiversity net gain
- Grants and payment mechanism
- Community led response
- Development

Note that the above classification of the measures into groupings was only done for the purposes of HRA, and is not part of the draft strategy.

A2.3.1 Grouping the measures

Note that the grouping of measures, subdivided into pathways does not constitute an absolute classification. It is intended to enable a simplified approach to assessing the large array of disparate measures

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Promote and does not prejudice action to achieve and maintain favourable condition

Guidance and tools

Measure : 1.1.1 By 2021 the Environment Agency will enhance the appraisal guidance for flooding and coastal change projects, so that investment decisions support a range of climate change scenarios

Measure: 1.1.2 By 2022 the Environment Agency will work with partners to explore and develop the concept of standards for flood and coastal resilience and will consider the pros

and cons of all options. This will feed into the government's flood policy statement in 2019. The Environment Agency will also develop a national suite of tools that can be used in combination to deliver flood and coastal resilience in places

Measure: 2.4.1 By 2025 the Environment Agency will work with government, insurers and financial institutions to review the legal, policy and behavioural changes needed to 'build back better and in better places' and improve the resilience of homes and business.

Measure: 2.5.1 By 2021 the Environment Agency will work with lead local flood authorities and other expert bodies to develop guidance setting out best practice on local flood infrastructure management and record keeping.

Measure: 3.3.3 By 2025 the Environment Agency will work with Government to better join up the organisations involved in providing incident response and recovery to provide a consistent and coordinated service.

Plan and strategy level, that also inform programmes and projects

Measure: 1.2.1 By 2021 the Environment Agency and risk management authorities will identify frontrunner places for developing adaptive approaches for a range of different scales and social contexts, working with local places and partners.

Measure: 1.2.2 By 2024 the Environment Agency will publish a new picture and evidence of current and future flood risk that will help places better plan and adapt for climate change.

Measure: 1.2.5 By 2026 lead local flood authorities will update their local flood risk strategies to incorporate adaptive approaches to planning for flood and coastal resilience in a place.

Measure: 2.4.2 By 2021 coast protection authorities and the Environment Agency will refresh the Shoreline Management Plans and keep them under review.

Frameworks, that also inform programmes and projects

Measure: 1.2.3 By 2024 the Environment Agency will develop a national framework to help risk management authorities, people, businesses and public bodies identify the steps and decisions needed to take an adaptive approach to planning for flood and coastal resilience in a place

Measure: 2.4.1 By 2025 the Environment Agency will work with government, insurers and financial institutions to review the legal, policy and behavioural changes needed to 'build back better and in better places' and improve the resilience of homes and business.

Coordinated plans and combined effects

Measure: 1.3.3 From 2020 risk management authorities will seek to better align long term planning for flood and coastal change with water company business planning cycles to identify opportunities for managing both floods and droughts.

Measure: 2.6.1 By 2021 the Environment Agency and risk management authorities will work with infrastructure providers to ensure all infrastructure investment is resilient to future flooding and coastal change.

Create buffer zones, sub-optimal habitat, sustainable hydrology and water quality

Habitat

Measure: 1.3.1 From 2021 the Environment Agency will use the lessons learned from the Defra £15 million natural flood management projects and other pilot projects to expand and mainstream working with natural processes by all risk management authorities.

Measure 1.4.1 From 2021 risk management authorities will contribute to improving the natural, built and historic environment through their investments in flood and coastal projects.

Measure 1.4.2 From 2021 we will work with government to identify how the Nature Recovery Network, the Northern forest and new woodland creation will be creating and restoring habitats that reduce flood and coastal change.

Measure: 1.4.3 From 2021 risk management authorities will help to ensure that 75% of all waterbodies are in natural or near natural condition within 25 years.

Measure: 2.1.2 From 2025 the Environment Agency and lead local flood authorities will advise local planning authorities on how adaptive approaches should inform strategic local plans.

Measure: 2.2.1 From 2021 all risk management authorities will achieve biodiversity net gain in all programmes and projects.

Measure: 2.2.2 From 2021 all risk management authorities will seek to work with developers and planners to achieve environmental net gain as part of strategic development proposals.

Sustainable growth

Measure: 2.3.1 From 2021 the Environment Agency will identify ways in which flood and coastal infrastructure projects can better contribute to local economic regeneration and sustainable growth.

Measure: 3.2.1 By 2022 government and risk management authority research programmes will identify how best to help people and businesses understand, accept and take responsibility for their risk to flooding and coastal change. This will help all risk management authorities better shape the way they work with people and businesses.

Coastal squeeze

Measure: 1.3.1 From 2021 the Environment Agency will use the lessons learned from the Defra £15 million natural flood management projects and other pilot projects to expand and mainstream working with natural processes by all risk management authorities.

Measure: 3.2.1 By 2022 government and risk management authority research programmes will identify how best to help people and businesses understand, accept and take responsibility for their risk to flooding and coastal change. This will help all risk management authorities better shape the way they work with people and businesses.

Floods

Measure: 1.3.1 From 2021 the Environment Agency will use the lessons learned from the Defra £15 million natural flood management projects and other pilot projects to expand and mainstream working with natural processes by all risk management authorities. 1.3.3 From 2020 risk management authorities will seek to better align long term planning for flood and coastal change with water company business planning cycles to identify opportunities for managing both floods and droughts.

Measure: 2.6.1 By 2021 the Environment Agency and risk management authorities will work with infrastructure providers to ensure all infrastructure investment is resilient to future flooding and coastal change.

Droughts

Measure: 1.3.1 From 2021 the Environment Agency will use the lessons learned from the Defra £15 million natural flood management projects and other pilot projects to expand

and mainstream working with natural processes by all risk management authorities. 1.3.3 From 2020 risk management authorities will seek to better align long term planning for flood and coastal change with water company business planning cycles to identify opportunities for managing both floods and droughts. **Measure**: 2.6.1 By 2021 the Environment Agency and risk management authorities will work with infrastructure providers to ensure all infrastructure investment is resilient to future flooding and coastal change.

Climate change resilience

Measure: 1.3.1 From 2021 the Environment Agency will use the lessons learned from the Defra £15 million natural flood management projects and other pilot projects to expand and mainstream working with natural processes by all risk management authorities.

Measure 1.4.1 From 2021 risk management authorities will contribute to improving the natural, built and historic environment through their investments in flood and coastal projects.

Measure 1.4.2 From 2021 we will work with government to identify how the Nature Recovery Network, the Northern forest and new woodland creation will be creating and restoring habitats that reduce flood and coastal change.

Measure: 1.4.3 From 2021 risk management authorities will help to ensure that 75% of all waterbodies are in natural or near natural condition within 25 years.

Measure: 2.1.2 From 2025 the Environment Agency and lead local flood authorities will advise local planning authorities on how adaptive approaches should inform strategic local plans.

Measure: 3.4.1 By 2022 the Environment Agency will continue to work with standards setting organisations to encourage flood resilience requirements to be incorporated into the building and materials standards for homes and businesses built in places at risk of flooding.

- Via:
- *Sustainable drainage systems (SUDS)*
- **Measure** 3.4.1 By 2022 the Environment Agency will continue to work with standards setting organisations to encourage flood resilience requirements to be incorporated into the building and materials standards for homes and businesses built in places at risk of flooding.

Natural flood management (NFM) and working with natural processes (WWNP).

Measure: 1.3.1 From 2021 the Environment Agency will use the lessons learned from the Defra £15 million natural flood management projects and other pilot projects to expand and mainstream working with natural processes by all risk management authorities.

Measure: 3.2.1 By 2022 government and risk management authority research programmes will identify how best to help people and businesses understand, accept and take responsibility for their risk to flooding and coastal change. This will help all risk management authorities better shape the way they work with people and businesses.

Measure: 3.4.1 By 2022 the Environment Agency will continue to work with standards setting organisations to encourage flood resilience requirements to be incorporated into the building and materials standards for homes and businesses built in places at risk of flooding.

Alternative finance actions and alternative delivery routes

Biodiversity net gain

Measure: 2.2.1 From 2021 all risk management authorities will achieve biodiversity net gain in all programmes and projects.

Measure: 2.2.2 From 2021 all risk management authorities will seek to work with developers and planners to achieve environmental net gain as part of strategic development proposals.

Grants and payment mechanism

Measure: 1.3.2 From 2021 the Environment Agency will work with farmers, landowners and others to identify opportunities for using agricultural practices (through funding, advice and regulation) to manage flooding and coastal change.

Measure: 1.5.1 By 2021 the Environment Agency will work with the government on its green finance strategy to explore new options for funding and financing flooding and coastal change that deliver more private funding in the future.

Community led response

Measure: 3.2.1 By 2022 government and risk management authority research programmes will identify how best to help people and businesses understand, accept and take responsibility for their risk to flooding and coastal change. This will help all risk management authorities better shape the way they work with people and businesses.

Measure: 3.2.2 By 2021 all risk management authorities will develop and use digital tools to better communicate flooding and coastal change. This will help achieve greater awareness and responsibility of the risks people face.

Development

Measure: 3.4.1 By 2022 the Environment Agency will continue to work with standards setting organisations to encourage flood resilience requirements to be incorporated into the building and materials standards for homes and businesses built in places at risk of flooding.

A2.4. The treatment of the natural environment in the draft strategy

A2.4.1. Managing flooding and coastal change provides a significant opportunity to improve and protect the natural, historic and built environments.

Risk management authorities through all their activities should minimise damage to and, where possible improve, the local natural, historic and built environments. Where it is not possible to avoid damage to protected features (for example designated sites, protected habitats and historic buildings) it may be necessary to provide compensatory measures to comply with legal requirements.

The objectives and measures in this draft strategy are intended to support the achievement of wider environmental objectives and the ambition. This is primarily in relation to supporting the 25 year environment plan which sets out the government's ambition to leave our environment in a better state than we found it. Specifically it will support the 25 year environment plan objectives to protect threatened species and provide richer wildlife habitats; reduce the risk from natural hazards; and adapt to and mitigate climate change. The strategy also takes account of the natural, built and historic environments that are valued by so many people and protected within different pieces of legislation.

All risk management authorities need to work with natural processes. Working with natural processes can include protecting and restoring the natural function of catchments, rivers, floodplains and our coast. Significant evidence of the benefits of working with natural processes already exists in the Environment Agency's natural flood risk management evidence base and case studies published in 2017. The maintenance and restoration of a range of ecosystem services, or natural functions of the environment, can provide valuable additional benefits including:

- water quality improvements through reductions in run-off and diffuse pollution
- water resource provision through aquifer recharge
- mitigation of and adaptation to climate change through, for instance, wetland creation and coastal and fluvial realignment
- the provision of urban biodiversity and amenity green spaces through sustainable drainage systems

All risk management authorities have a role to play in supporting sustainable development. Their choices and long term decisions should result in gains for our environment by:

- reducing carbon by considering the wider carbon costs or benefits of flood and coastal risk management projects both over their construction and operational life
- contributing to the achievement of sustainable development, balancing the needs of society, the economy and the urban, rural and natural environment, taking account of the cultural heritage and seeking to secure environmental benefits
- meeting legal requirements, to have regard to the purposes of conserving and enhancing the natural beauty, wildlife and cultural heritage and promoting opportunities for public understanding and enjoyment of national parks; have regard to biodiversity conservation; comply with the Water Framework Directive, Environmental Quality Standards Directive and the Groundwater Directive; regarding the marine environment, comply with the Habitats and Birds Directives and to preserve, maintain and re-establish wild bird habitat; regarding the terrestrial/freshwater environment, having regard to the Habitats and Birds Directives and taking appropriate steps to help achieve the preservation, maintenance and re-establishment of wild bird habitat

The government's 25 year environment plan: 'A Green Future: Our 25 Year Plan to Improve the Environment' sets out what the nation should do to improve the environment, within a generation. Risk management authorities have a part to play in helping to achieve those aspirations and should take opportunities to improve our natural, built and historic environment through their programmes, strategies and activities to manage flooding and coastal change.

We depend upon our environment for services such as clean water, air, food, climate mitigation and reducing flood and coastal change risk. Managing flooding and coastal change interacts with the environment in a number of ways, both positively and negatively. Intervening in the natural environment to reduce flood risk and coastal change can mean making changes to the physical water environment that can have impacts on some natural habitats and species. Risk management authorities have a key role to play in mitigating and compensating for those activities that are damaging whilst overall making a more positive contribution to the environment. This should include contributing to the achievement of statutory requirements relating to the protection of habitats, conservation and the water environment. But it should also include opportunities for enhancing the

health and ecology of our rivers and coastal waters through investments in flood and coastal projects. The 25 year environment plan aspires to return 75% of waterbodies to a natural or a near natural condition which may mean repairing some of the damage from past activities.

There are many examples around the country where we have seen the positive role creating or restoring natural habitats such as salt marsh, floodplain meadows and woodland can play in reducing flooding or where natural flood management measures that create or restore habitats can slow the flow of floodwaters. Risk management authorities should work with those seeking to create or restore natural habitats as part of the nature recovery network to help ensure the network can contribute to reducing risk.

Under the draft strategy ambition ‘today’s growth and infrastructure is resilient in tomorrow’s climate’, there are proposals for how risk management authorities can also contribute to wider objectives relating to delivering biodiversity and environment net gain in local places through the spatial and development planning process. It is also equally important that risk management authorities protect and enhance the built and historic environment for the benefit of future generations.

Taking an adaptive approach provides a long term framework for risk management authorities to identify opportunities for enhancing the natural, built and historic environments as part of delivering more climate resilient places.

Strategic objective 1.4: Between now and 2030 risk management authorities enhance the natural, built and historic environments so we leave it in a better state for the next generation.

To achieve our objective we have the following measures:

Measure 1.4.1: From 2021 risk management authorities will contribute to improving the natural, built and historic environment through their investments in flood and coastal projects.

Measure 1.4.2: From 2021 risk management authorities will work with partners and others to identify how the nature recovery network, the northern forest and other habitat improvements can help to manage flood risk and coastal change.

Measure 1.4.3: From 2021 risk management authorities will help to ensure that 75% of all water bodies are in natural or near-natural condition within 25 years.

A2.4.2. Sustainable growth

Enabling sustainable growth does not mean increasing flooding and coastal change or damaging the environment. ‘Net gain’ is a way of measuring whether we have left the environment in a better state even after losses from development, climate change and other pressures. Net gain can also help ensure that new development contributes towards managing the risk of flooding and coastal change. The net-gain approach has several advantages:

- it offers a degree of flexibility in improving the environment rather than requiring rigid like-for-like replacement for losses
- it could be a means of raising funding for investing in the environment through, for instance, placing a legal requirement on developers
- for developers, it could streamline the planning process and help them proceed more quickly

A2.4.3.Biodiversity net gain

The government has committed to mandating that certain new developments must achieve 'biodiversity net gain'. This should improve how the planning system addresses development's impact on habitats and allow new development to proceed without negatively affecting our wildlife. Developers and infrastructure providers will have a key role to play in achieving biodiversity net gain. This includes risk management authorities where they're constructing and delivering flood and coastal infrastructure projects. This obligation on risk management authorities is expected to take effect from 2021, which is the start date of the next flood and coastal risk management programme.

Biodiversity net gain is a positive step towards the wider opportunities offered by 'environmental net gain', a way of improving all aspects of resilient and sustainable development. Environmental net gain was identified in the government's 25 year environment plan as a key means of achieving its ambition 'to be the first generation to leave the environment in a better state than we found it.'

We know growth will not be sustainable if its net impact is to harm our natural environment – which includes geology, soil, air, water and all living things, or our cultural heritage – or ignore the risks posed by natural hazards. Establishing environmental net gain in the planning system would allow us to maintain and improve the nation's resilience to natural hazards such as flooding and coastal change as well as the effects of climate change. This could include more sustainable drainage systems in new development or retrofitted into existing, and the wider use of best practice land management techniques. Environmental net gain could also provide an opportunity to secure investment in flooding and coastal change benefits through new developments and funding partners.

Strategic objective 2.2: Between now and 2030 all new development will seek to support environmental net gain in local places.

To achieve our objective we have the following measures:

Measure 2.2.1: From 2021 all risk management authorities will achieve biodiversity net gain in all programmes and projects.

Measure 2.2.2: From 2021 all risk management authorities will seek to work with developers and planners to achieve environmental net gain as part of strategic development proposals.

A2.5. Assessment of the potential impacts of the draft strategy - our habitat based approach

The purpose of the Appropriate Assessment is to assess the potential impacts of the draft strategy, either alone or in combination with other projects or plans, to determine that it will not adversely affect the integrity of a European site or sites.

Assessment of the draft strategy's impacts (alone) is described in this section. Assessment of potential 'in-combination' effects is described in the following sub-section (4.3). As part of the appropriate assessment process, this also includes the assessment of mitigation measures to avoid or reduce any possible impacts (described in section 4.3).

There are inherent difficulties and uncertainties in carrying out an appropriate assessment for such a high level strategy. The high level nature of the draft national FCERM strategy, without a spatial basis, means that locations and impacts of lower-tier plans, strategies and actions arising as a result of the national strategy cannot be identified at this stage.

As a result, it has not been possible to provide detailed consideration of the impact on the integrity of a particular European Site with respect to the site's structure, function and conservation objectives.

Similarly, development of site-specific mitigation proposals is not possible, and instead generic mitigation principles are proposed, detailed in the following sub-section (4.2). This should be considered when carrying out HRAs, and developing mitigation associated with lower level strategies or projects.

Because of the limited level of detail, and degree of uncertainty over the potential effects, only an overview of the generic potential impacts, or impact types, has been considered. We have assumed that all flood and coastal erosion risk management works might ultimately be technically feasible. This means the usual matrices used to ascertain scheme level impacts on defined sites unsuitable, although we did trial these for the usual shortlist, and extended list, but we couldn't draw any conclusions from this exercise. Appendix 2 contains the original and expanded lists of FCERM actions, together with the original and expanded lists of the modes of impact.

We therefore adopted an alternative approach, based upon the habitat accounts for all 77 annex 1 habitat types listed on the JNCC website. Studying each account, we summarised those defining habitat features that could potentially be affected, directly and indirectly, by the operation of flood and coastal erosion risk management works, including WWNP and NFM interventions taking place in the catchment. If necessary we consulted designated site accounts, primarily to understand the scale and dynamics of habitat mosaics and other possible interdependencies.

We did not do the following in terms of the HRA, primarily because we are endeavouring to retain a high level of analysis:

- Consider the overall condition of the habitats, from the condition assessments, to provide a baseline and index of vulnerability
- Consult or analyse WFD data in relation to the aquatic habitats, nor RBMP pressures
- Refer to any other strategic level descriptions, such as Natural Area Profiles, to inform in combination effects
- Research climate change effects
- Incorporate site size into the analysis, though if necessary fragmentation is referred to as a pressure
- Devise and apply any form of priority rating or ranking to effects
- Devise and apply any form of relative significance rating to effects
- Undertake any aggregation of impacts to apply indices of relative significance.

Depending on how they are applied, FCERM interventions can have positive and negative effects, and we wanted to bring this aspect to the forefront of the analysis. Clearly it is not possible to predict what sort of FCERM interventions will ultimately be technically feasible, but this approach is sufficiently robust to also be used to inform strategy and project level HRA.

These impacts will actually arise as a result of lower level strategies, plans and activities later in the planning and implementation process. This highlights the importance of a tiered approach to Habitats Regulations Assessment (discussed in more detail in section 4), because the potential impacts of the draft strategy within a spatial framework cannot be fully determined, beyond generic consideration, until more detailed assessment has taken place. Assessment of the FCERM impacts on a European site or sites, and appropriate

site-specific mitigation to address it, can be developed in the most effective manner at this lower level of FCERM planning.

An important point to note, is that FCERM activities can also perform an important function in the protection and conservation of European sites. For example, some European sites in England rely on the continued presence of flood or coastal defence structures to maintain them in favourable conservation status. Many of the habitats that form part of the European site designations can also be functionally important in reducing flood or erosion risk. Working with natural processes, as advocated by the draft strategy, will therefore have potential benefits for European sites, as well as performing a flood or erosion risk management function. However, there may also be cases where sites can no longer be fully protected, or the decision is made to realign, or withdraw maintenance, which may lead to habitat change.

We were looking for possible irreconcilable, unavoidable damage - direct, indirect, cumulative etc. We also looked for direct and indirect benefit, particularly in relation to WWNP and NFM, and the provision of additional habitat outside of the designated sites that could confer resilience.

The draft national FCERM strategy presents the opportunity to work with natural processes in delivering flood and coastal erosion solutions, and thus deliver many benefits for European sites, such as habitat improvements or enhancements, improved ecological connectivity. This could for example include innovative land management solutions and creation of wetlands, which create ecologically valuable habitats and improve habitat connectivity for the benefit of European protected species. Such measures can therefore complement and help deliver the favourable conservation status of designated European sites, while at the same time reducing the risk of flooding and/or coastal erosion.

For every habitat type in England we used the list of FCERM activities developed for draft strategy and project level HRA, introducing additional interventions that are made possible by WWNP to this list. We subjectively decided whether the interventions would have negative or positive consequences on each habitat type. A caveat to this approach is that it we did not apply it at site level to accommodate the complexity of habitat mosaics.

We assumed that climate change will render it desirable to have additional habitat in ecological continuity with designated sites.

We also included data on the total UK number of sites, and a map of their distribution. Again this didn't form part of the assessment of significance, but is included to give the reader a further indication of probability of interaction. The caveat is that the number of sites is a poorer indicator than the type and location of the sites used in the discussion.

The first part of the assessment has been performed on the groupings of measures, based on the criteria used to derive them. The linking logic is based upon a subjective presumption that actions to implement the measures will ultimately lead to selection of those practical interventions listed in section A2.6. Once we had connected the management interventions to their habitat based effects we could consider how the measures might affect the habitats. Again we have to stress that the pathways for the effects are not a part of the draft strategy, they have been based on judgement and so remain subjective.

A2.6 what types of FCERM activities can give rise to likely significant effects

Our starting point was to apply the standard Environment Agency procedure for assessing likely significant effect. This method was originally based on the judgement of experienced staff, but was never intended to be comprehensive.

Table A2.1 summary of flood risk related activities and some of their potential hazards

	Impact Type									
FCERM Activity	J. Changes to water chemistry	I. Reduced surface water flooding	H. Changes to flow & velocity regime and improved drainage	G. Competition from non-native species	F. Disturbance (noise, visual presence)	E. Habitat and community simplification	D. Changes in turbidity	C. Physical damage	B. Changes in physical regime	A. Habitat loss
In-channel works and structures	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sea defence works and maintenance		✓	✓	✓	✓	✓	✓	✓	✓	✓
Bridgework					✓	✓	✓	✓		✓
Culverts		✓	✓		✓	✓		✓	✓	✓
Channel diversions		✓	✓	✓	✓	✓	✓	✓	✓	✓
Access tracks and spoil disposal				✓	✓	✓	✓	✓		✓
Construction of floodbanks		✓	✓	✓	✓	✓		✓	✓	✓
Maintenance of floodbanks		✓		✓	✓	✓		✓		✓
Construction phase activities	✓		✓		✓		✓	✓		✓
Weed cutting operations	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Herbicide applications	✓	✓	✓		✓	✓		✓		✓
Bank flailing and mowing regimes	✓	✓	✓	✓	✓	✓		✓		✓
Bank works (such as reprofiling)		✓	✓		✓	✓	✓	✓	✓	✓
Channel dredging and regrading	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Shoal and gravel removal		✓	✓		✓	✓	✓	✓	✓	✓
Tree management works	✓				✓	✓		✓	✓	✓
Operation of pumping stations		✓	✓		✓	✓	✓	✓	✓	✓
Shingle recycling and reprofiling		✓	✓		✓	✓	✓	✓	✓	✓

The list of interventions in table A2.1 all possess inherent capacity to be damaging if carried out without sufficient regard for the environment.

Certain habitats are more sensitive than others to the potential hazards posed by insensitive management interventions.

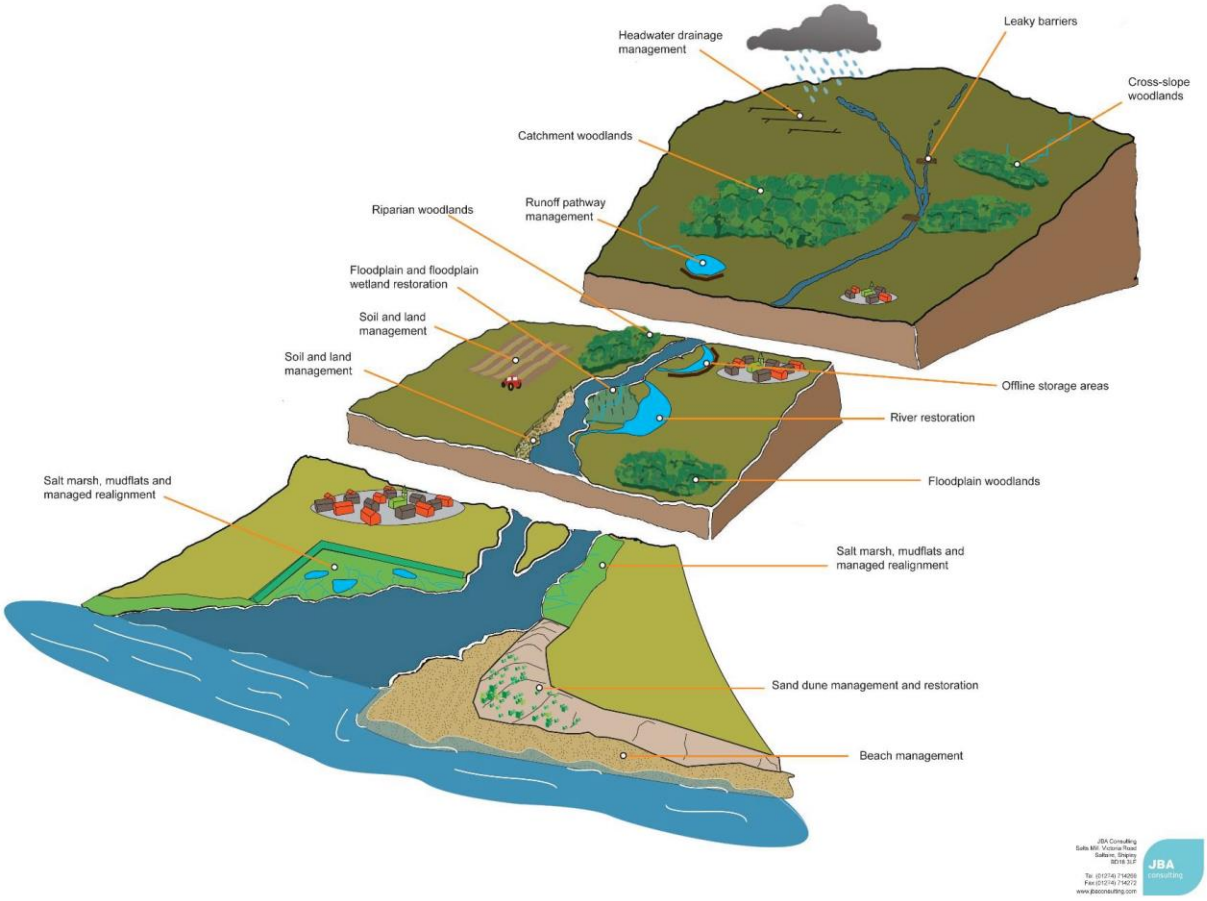
The test of likely significant effect confirms that the flood risk management activities have the potential to impact on a wide range of habitat types. Although the draft strategy does not specify that these management actions must occur, they are part of a logical eventual endpoint of FCERM interventions.

The above lists are restrictive, particularly in relation to the emerging field of WWNP and NFM, as described in the WWNP Evidence Directory. We also needed to convey the potential for positive impacts, as well as negative ones. And we wanted to form a clearer prediction associated with indirect pathways for impact as well as direct impacts.

The first step of the appropriate assessment was to expand table A2.1.

We grouped the long list of management activities according to their position in the catchment, from source to sea (box A2.1). This reflects the layout in figure A2.5 copied from the WWNP Evidence Directory (although it doesn't reflect the sequence of Annex 1 habitat accounts used later)

Figure A2.5 diagrammatic catchment (copied from the WWNP Evidence Directory)



BOX A2.1 Simple list of potential range of FCERM interventions

FCERM Activity

catchment

- Tree planting
- Hedgerow and bank reinstatement
- Offline flood storage
- Very large reservoir
- Moorland restoration
- Rural SUDS

soil

- Improving permeability
- Compaction by machinery
- Compaction by livestock
- Farming practices

groundwater

- Holding up water to encourage infiltration

Informal flow path

- Formalise
- Slow the flow
- Leaky dams

Headwaters and higher order streams

- Stream restoration
- Naturalise
- Canalise
- Slow the flow - natural
- Slow the flow - hydrobrake
- Leaky dams
- Hydropower
- Introduce weirs
- Remove weirs
- Riffle reinstatement
- Dredging – deepen & widen
- Dredging - silt
- Cleanse gravels
- Natural erosion protection
- Green engineering

- Bed scour protection
- Artificial erosion protection
- Two stage channel
- Flood bypass channel
- Protect marginal vegetation
- Encourage or reinstate marginal vegetation
- Offline flood storage
- Online flood storage
- Flow management e.g. baffles
- Culverting
- Deculverting
- Weedcutting
- Herbicides
- Invasive species eradication
- Green infrastructure
- Surfacewater outfalls

Fluvial floodplain headwaters

- Flood bypass channel
- Protect river corridor vegetation
- Encourage or reinstate river corridor vegetation
- Offline flood storage
- Online flood storage
- Tree planting
- Reedbed and fen creation or restoration
- Realign flood defences
- Leaky flood defences
- Demountable defences
- Flood embankment construction
- Flood embankment maintenance
- Flood wall
- Flood gates
- Access tracks, compounds and spoil disposal
- Invasive species eradication
- Tree management
- Ponds
- Swales
- Operation of pumping stations

- Rural SUDS
- SUDS
- Surface water outfalls
- Green infrastructure

washland

- Control of flood regime
- Change of flood management
- Sluices
- Pumping station operation
- Invasive species eradication

Watercourse – lower order streams and main river

- River restoration
- Sluices
- Lock gates
- Naturalise
- Canalise
- Flow management e.g. baffles
- Slow the flow - hydrobrake
- Leaky dams
- Hydropower
- Introduce weirs
- Remove weirs
- Riffle reinstatement
- Dredging – deepen & widen
- Dredging - silt
- Cleanse gravels
- Natural erosion protection
- Green engineering
- Bed scour protection
- Artificial erosion protection
- Two stage channel
- Flood bypass channel
- Protect marginal vegetation
- Encourage or reinstate marginal vegetation
- Offline flood storage
- Online flood storage
- Culverting

- Deculverting
- Weedcutting
- Herbicides
- Invasive species eradication
- Green infrastructure
- Operation of pumping stations
- Sluice operation
- Surface water outfalls
- Pump

Fluvial floodplain

- Flood bypass channel
- Protect river corridor vegetation
- Encourage or reinstate river corridor vegetation
- Offline flood storage
- Tree planting
- Reedbed and fen creation or restoration
- Realign flood defences
- Leaky flood defences
- Demountable defences
- Flood embankment construction
- Flood embankment maintenance
- Flood wall
- Flood gates
- Bridges and bridgeworks
- Operation of pumping stations
- Mowing
- Online flood storage
- Access tracks, compounds and spoil disposal
- Invasive species eradication
- Tree management
- Ponds
- Swales
- Operation of pumping stations
- Sluice operation
- Rural SUDS
- SUDS
- Invasive species eradication

- Green infrastructure

Estuarine floodplain

- Flood bypass channel
- Protect river corridor vegetation
- Encourage or reinstate river corridor vegetation
- Tree planting
- Reedbed and fen creation or restoration
- Realign flood defences
- Leaky flood defences
- Demountable defences
- Flood embankment construction
- Flood embankment maintenance
- Flood wall
- Flood gates
- Bridges and bridgeworks
- Operation of pumping stations
- Mowing
- Realign flood defences
- Access tracks, compounds and spoil disposal
- Invasive species eradication
- Ponds
- Swales
- Operation of pumping stations
- Sluice operation
- Regulated tidal exchange
- Green infrastructure
- Winter and summer embankment systems
- Pumps

Estuary/tidal channel

- Dock and harbour wall management
- Surface water outfalls
- Invasive species eradication
- Regulated tidal exchange

Marine subtidal

- Dredging
- Offshore structures
- Reefs

- Rock placement

Intertidal

- Dredging
- Replenishment
- Protection
- Offshore structures

Beach:

- Dredging
- Replenishment
- Protection
- Offshore structures
- Groynes
- Sand engine
- Reprofiling
- Sea wall
- Niche inclusion
- Boulders
- Artificial revetment systems

Rocky shore:

- Sea wall
- Niche inclusion
- Artificial habitat

Mudflat:

- Dredging
- Replenishment
- Sea wall
- Niche inclusion
- Embankment
- Realignment

Saltmarsh:

- Erosion protection
- Replenishment
- Sea wall
- Niche inclusion
- Embankment
- Realignment

Coastal floodplain

- Sea wall
- Niche inclusion
- Embankment
- Realignment
- Protect river corridor vegetation
- Reedbed creation or restoration
- Realign flood defences
- Leaky flood defences
- Demountable defences
- Flood embankment construction
- Flood embankment maintenance
- Flood wall
- Flood gates
- Operation of pumping stations
- Mowing
- Realign flood defences
- Access tracks, compounds and spoil disposal
- Invasive species eradication
- Operation of pumping stations
- Sluice operation
- Regulated tidal exchange
- Green infrastructure
- Winter and summer embankment systems
- Pumps

Dunes

- Sea wall
- Niche inclusion
- Embankment
- Realignment
- Shingle bar
- Planting
- Fencing

cliff

- Erosion protection
- Beach maintenance at the toe

In-channel works and structures

- Bridgework
- Culverts
- Channel diversions
- Access tracks and spoil disposal
- Construction of floodbanks

- Maintenance of floodbanks
- Construction phase activities
- Weed cutting operations
- Herbicide applications
- Bank flailing and mowing regimes
- Bank works (such as reprofiling)
- Channel dredging and regrading
- Shoal and gravel removal
- Tree management works
- Operation of pumping stations
- Pumps

Box A2.2

We also reviewed the hazards to derive a longer list of **hazards**:

- Extent
- Form and structural complexity
- Processes
- Productivity
- Diversity
- Mosaic
- Connectivity
- Optimality/buffer zones
- Edaphic elements e.g. temperature
- Inundation
- Morphological diversity
- Natural morphological change e.g. headward migration, ephemeral shingle features
- Erosion - natural
- Deposition – natural
- Erosion – artificial
- Deposition - artificial
- Pollutants

- Chemistry
- Trophic status
- Temperature
- Turbidity
- Oxygenation/Redox
- Flow peaks
- Flow troughs
- Variation of in-stream velocity
- Organic input
- Substrate composition
- Substrate variation
- Connectivity with groundwater
- Continuity for migration/lifecycle completion
- noise
- Ecotone and transitions are deemed to be particularly at risk

The draft strategy is necessarily high level. Therefore we deliberately did not try to link measures to this list because that is not the purpose of the draft strategy.

A2.7 Habitat vulnerability to FCERM intervention

It would be impractical to apply this method to every European site. As an alternative we reviewed every Annex 1 habitat account, and selected those elements that are most likely to be affected by hazards arising from management actions from the list in box A2.2. We did not formally map the pathway from intervention through hazard to receptor. There is a risk of producing a false impression of precision by applying disproportionate detail to the high level of the draft strategy.

This informed the following assessment of whether each habitat type might potentially be affected by the activity, and what the indicative hazards might be. We assumed that SPA bird populations are likely to be reliant on the SAC habitat, and suitable habitats that they can disperse to.

The distribution maps don't affect the conclusion, but they do give an impression for the next tier of plans, which might be spatially specific, whether there is a risk or opportunity involved. The following grades apply to the maps:

A: outstanding examples of the feature in a European context

B: excellent examples of the feature, significantly above the threshold for SSSI/ASSI notification but of somewhat lower value than grade A sites

C: examples of the feature which are of at least national importance (using above the threshold for SSSI/ASSI notification on terrestrial sites), but not significantly above this. These features are not the primary reason for SACs being selected

D: Features below SSSI quality occurring on SACs. These are non-qualifying features (non significant presence) indicated by the letter D, but this is not a formal global grade

The accounts for each habitat are ordered as follows:

- Habitat description
- At risk from FCRM activity
- Benefits from FCRM activity
- Number of SACs and distribution

(including Wales, Scotland and Northern Ireland)

At the end of the account for each of the groups of annex 1 habitats we have assessed the impacts using the groupings of measures identified in the screening.

A2.8. Habitat accounts

Marine, coastal and halophytic habitats

1110 sandbanks which are slightly covered by sea water all the time

Sandbanks permanently submerged in up 20m of seawater can be categorised into 4 main types:

- Gravelly and clean sands
- Muddy sands
- Eelgrass *Zostera marina* beds
- Maerl beds

Edaphic features also determining the communities of burrowing and free living organisms include:

- Geography and water temperature
- Wave climate: exposure and degree of shelter
- Topographical structure
- Depth
- Tubidity
- Salinity

Their association with mudflats and sandflats is also important to their ecological function.

At risk from FCERM activity

Any activity which is capable of direct damage and disruption, such as:

- The footprint of offshore structures
- The passage of vessels or pipelines to shore during construction or maintenance
- Alteration to exposure from structures located nearby
- Dredging close enough to create a sediment sink or remove a sediment source
- Erosion protection of cliffs
- Beach management

Indirectly damage to form or function could result from:

- Changes to offshore and longshore drift of sediments, increasing, reducing or changing particle size
- Alterations to sediment borne in estuary currents

- Developments affecting intertidal sand and mudflats
- Stabilising activities on beaches, cliffs and dunes
- Offshore structures
- Coastal zone management
- Cliff erosion protection

Benefits from FCERM activity

The activities that maintain coherence of environmental process are usually associated with WWNP. In ascertaining risk or benefit at this level we have not undertaken any literature review of the ecological resilience of the flora and fauna, though types 3 and 4 are likely to be less resilient to change outside of ecological tolerances. This can include resilience to short term changes associated with storms, and recovery. Construction activities will have a longer though temporary period of perturbation.

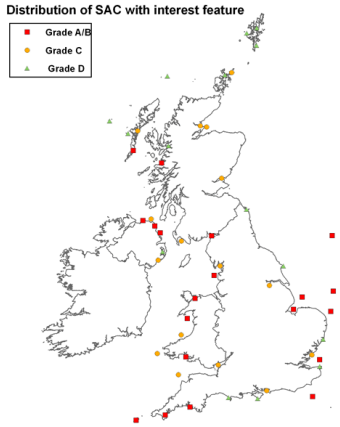
WWNP has the potential to introduce benefit to this habitat primarily by:

- Improving connectivity, especially in conjunction with managed realignment
- Maintenance of sediment distribution processes e.g. sand engine, beach recharge, especially relevant with rising sea levels
- Facilitate change at a slower pace, more conducive to adaptation by the biotic component

Ensuring the correct particle size reaching the designated site is important, and should form part of the modelling and sourcing if external supply is part of the WWNP solution

Number of sites and distribution

36



1130 estuaries

Mosaic of interdependent habitats, extending downstream from the limit of brackish water, and becoming progressively more marine. Some silt derives from fluvial origin.

25% by area of estuaries in north-western Europe occur in the UK

Habitats include:

- Mudflats and sandflats
- Sandbanks

- Reefs

The association with surrounding terrestrial habitats is important. The parts of estuaries furthest away from the open sea are usually characterised by soft sediments and the salinity is more strongly influenced by riverine freshwater. The upper reaches of estuaries often support saltmarsh at the top of the shore, whilst nearer the estuary mouth this may be replaced by sand dune systems.

In addition to sedentary and intertidal communities, the water column is an important conduit for free living species such as fish and juvenile stages of benthic plants and animals.

At risk from FCERM activity

Connectivity within the mosaic of habitat types is vital. This connectivity can be broken by:

- Embankments and walls breaking the transition zone from water to land
- Weirs, lock gates, sluices, tidal barriers in the main channel and tributaries
- Outfalls and flaps from tributaries

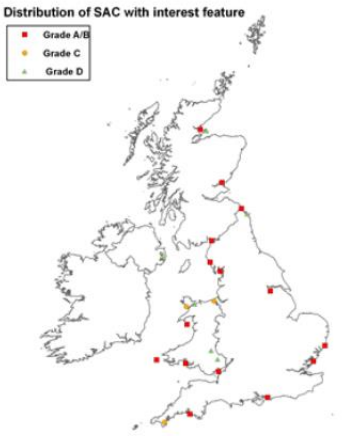
Often estuaries are not in equilibrium. Managed realignment can change the course of the channel as the flood and ebb deltas adjust to the increase in tidal prism, and sometimes this requires constraining.

Benefits from FCERM activity

- Managed realignment
- Permeable embankments and structures
- Regulated tidal exchange

Number of sites and distribution

18



1140 mudflats and sandflats not covered by seawater at low tide

Physically, these range from mobile coarse-sand beaches on wave exposed coasts to stable fine-sediment mudflats in estuaries and other marine inlets. There are three broad categories along a continuous gradation of:

- Clean sands
- Muddy sands
- Muds

Whose plant and animal communities are dependant upon:

- Sediment type
- Stability
- Water salinity

The fauna are quite different; from robust amphipods of clean sands through to the high biomass of polychaete worms and molluscs of mudflats, which in turn support an abundance of feeding waders and wildfowl.

Mudflat cohesion relies upon a mucilaginous film produced by micro-organisms which are intolerant of pollution. Without this the mudflats are more exposed to erosion from waves and boat wash.

The transition from mudflat to salt meadow is an important one that relates to stability.

At risk from FCERM activity

- Sea walls: land claim, wave reflection
- Groynes
- Beach recharge using wrong grade of sand

All are threats to this habitat

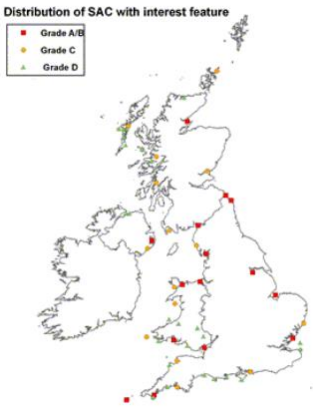
Benefits from FCERM activity

WWNP will benefit including:

- Beach management
- Sand engines, assuming that the right grade of sand is used and that the environmental conditions enable correct sorting
- Managed realignment

Number of sites and distribution

30



1150 Coastal lagoons* priority feature

These large shallow saltwater lagoons are completely or partly separated from the sea by sandbanks, shingle ridges and occasionally rock barriers. Sea water enters by percolation or over-topping, sometimes via a sluice, leading to the variety of conditions from brackish through to hyper-saline.

At risk from FCERM activity

Coastal lagoons are exceptionally vulnerable to:

- Flood defence works upstream in any feeder streams
- Interruptions to shingle supply of the barriers, or beach management
- Diffuse pollution

Benefits from FCERM activity

Coastal lagoons are inherently prone to filling with sediment. In theory it should be possible to create artificial lagoons using leaky structures and/or RTE, as part of managed realignment mosaic of habitats

Number of sites and distribution

20

1160 large shallow inlets and bays

A habitat complex comprising interdependent subtidal and intertidal features. Geographic location, size, shape and geology combine to determine the flora and fauna. Seaweeds, such as wrack (*Fucus* spp), kelp (*Laminaria* spp) and eelgrass (*Zostera* spp), or animal dominated rocky shore communities including soft corals, 59mussels and anemones etc characterise the great diversity.

At risk from FCERM activity

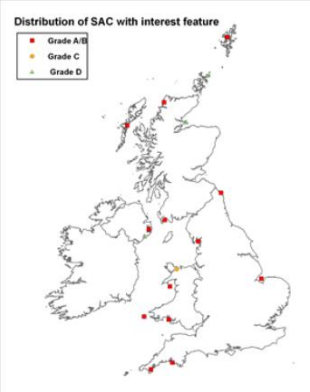
The considerations for shallow inlets and bays are similar to those of their component habitats

Benefits from FCERM activity

The considerations for shallow inlets and bays are similar to those of their component habitats

Number of sites and distribution

14



1170 reefs

Rocky reefs are predominantly subtidal, extending into the intertidal, and are very diverse in form, from cliffs to ledges to boulder field to aggregations of cobbles. Greater topographical diversity encourages greater biodiversity. Geology and turbidity are driving variables; higher turbidity limits the depth to which seaweeds can flourish but supports the filter feeding communities. There is strong vertical zonation of communities, which grade into rocky cliffs.

Biogenic reefs are created by the animals themselves.

At risk from FCERM activity

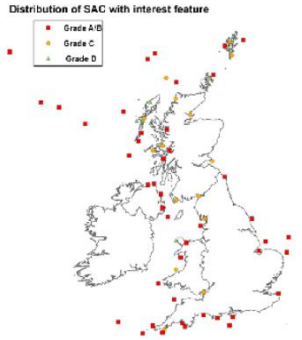
Impact would occur if artificial offshore rock structures are placed on top of rocky reefs

Benefits from FCERM activity

There is increasing interest in GI design of ecological niches within concrete and mass stone structures. Again this could be used to create a buffer around existing reefs, although the placement is more likely determined by the wave climate and the need to deflect sediment onto a beach. In which case there should be more research into designs that maximise the (suboptimal) artificial habitat availability

Number of sites and distribution

59



1180 submarine structures made by leaking gases

The small number and location of these features mean they are unlikely to be affected by the draft strategy

At risk from FCERM activity

Unlikely to be affected

Benefits from FCERM activity

Unlikely to be affected

Number of sites and distribution

3

1210 annual vegetation of drift lines

This is an ephemeral habitat of plant species which colonise the strandline of shingle beaches and structures and shell banks. They exhibit annual variation in response to the mobility of shingle foreshores and the ability of the plant species to recolonise following disturbance.

At risk from FCERM activity

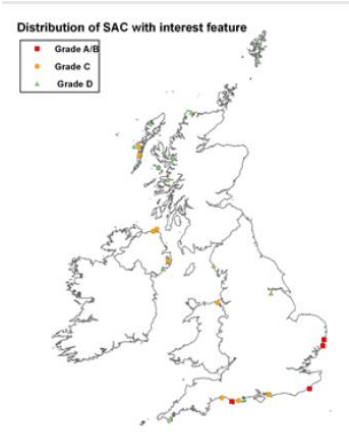
Affected by beach management

Benefits from FCERM activity

Could be affected by NFM measures to increase shingle supply

Number of sites and distribution

13



1220 perennial vegetation of stony banks

Stony banks are formed by storm waves throwing the pebbles from high tide shingle structures beyond the reach of the backwash. The vegetation of narrow and less stable

structures is different from that where several beaches have historically been piled up together creating a more stable structure. Driving variables also include the accumulation of fines in the voids, climate, the ridged pattern of wider structures and salt spray. The plant species have to be able to tolerate periodic movement and salinity.

Both management and natural cycles of senescence and regeneration influence the sequencing of plant communities.

At risk from FCERM activity

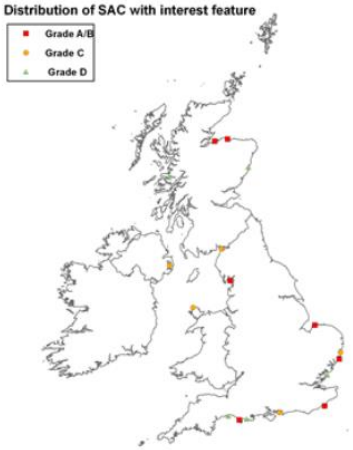
Unlikely to be affected

Benefits from FCERM activity

Unlikely to be affected

Number of sites and distribution

12



1230 vegetated sea cliffs of the Atlantic and Baltic coasts

Cliffs occur on hard and soft coastlines. Hard cliffs, comprising igneous, metamorphic and sedimentary rocks form vertical cliffs. Soft cliffs have a sloping or slumped profile, with the exception of chalk cliffs which are vertical. Exposure to sea spray is essential for sea cliff vegetation, though this is diluted in areas of higher rainfall.

The most specialised cliff species occur in the crevices of hard cliffs. The softer the cliff the correspondingly less specialised the community, and a mosaic may develop related to age since disturbance, and around springs and flushes.

At risk from FCERM activity

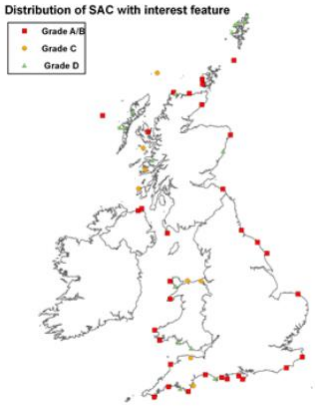
Soft cliffs would be affected by erosion protection measures and by the loss of any protecting beach at the toe

Benefits from FCERM activity

Unlikely to be any positive effect

Number of sites and distribution

40



1310 *Salicornia* and other annuals colonising mud and sand

Pioneer saltmarsh vegetation colonising sand and mudflats, and an essential precursor to subsequent saltmarsh development. Occurs on the leading fringes of expanding saltmarshes, and creeksides and pans. The vegetation can tolerate repeated lengthy tidal immersion. The location needs to be relatively free of strong wave action and the mudflat stable.

At risk from FCERM activity

- Sea walls: land claim, wave reflection
- Groynes
- Beach recharge using wrong grade of sand

All are threats to this habitat

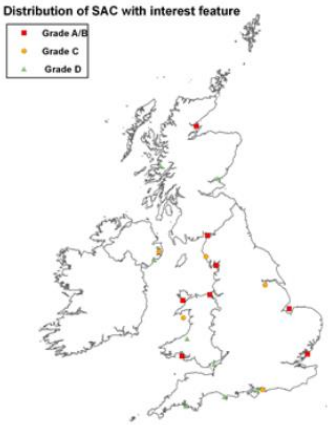
Benefits from FCERM activity

WWNP will benefit including:

- Beach management
- Sand engines, assuming that the right grade of sand is used and that the environmental conditions enable correct sorting
- Managed realignment

Number of sites and distribution

13



1320 *Spartina* swards

Although only 2 southern locations, *Spartina* has colonised a wide range of substrates on the seaward fringes of saltmarsh and creeks.

The situation is complicated because some planted *Spartina anglica*, intended to stabilise mudflats for subsequent land claim, has become invasive and threatens the intertidal feeding grounds for waders.

At risk from FCERM activity

- Sea walls: land claim, wave reflection
- Groynes
- Beach recharge using wrong grade of sand

All are threats to this habitat

Benefits from FCERM activity

WWNP will benefit including:

- Beach management
- Sand engines, assuming that the right grade of sand is used and that the environmental conditions enable correct sorting
- Managed realignment

Number of sites and distribution

2

1330 Atlantic salt meadows

Vegetated intertidal mud and sand through to transitional habitat to dunes, shingle ridges, freshwater marshes, coastal scrub and coastal grazing marsh. The saltmarsh vegetation develops where there is protection from strong wave action, and is very diverse. There are both regional variations in saltmarsh communities, and zonation and habitat mosaics within the marsh. The zonation of relatively species poor lower marsh, through middle marsh to upper marsh, which has the least tidal influence, is overlain by a finer mosaic network of small creeks and pools.

Anthropogenic influences on saltmarsh include:

- Livestock grazing
- Boatwash creating waves

- Flood defences to landward truncating the transition to terrestrial or reflecting historic land claim of salt marsh
- Reflection of wave energy from sea walls or embankments
- Protective or regenerative defences to seaward to break waves and trap sediment
- Managed realignment of flood defences extending the landward extent of marsh
- Regulated tidal exchange and other measures to permit a finite intrusion of sea water into freshwater systems

Sea level rise will compound the threat to saltmarsh. The species typical of each zone are physiologically unable to tolerate increased submersion. Coupled with increased exposure to waves, and increase in dimensions of the creeks, the saltmarsh quality, diversity and extent will decline without further intervention.

At risk from FCERM activity

Sea walls: land claim, wave reflection are threats to this habitat.

There can be problems with managed realignment if the land to the landward of the existing marsh is at lower elevation, so the design needs to encourage siltation.

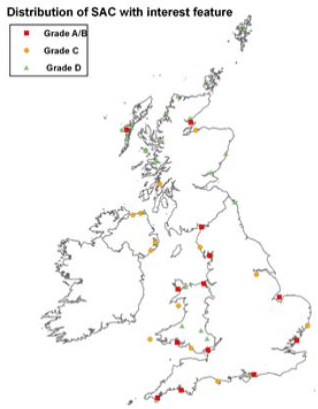
Benefits from FCERM activity

WWNP will benefit including:

- Saltmarsh protection
- Sediment supply, assuming that the right grade of sediment is used and that the environmental conditions enable correct sorting
- Managed realignment

Number of sites and distribution

26



1340 inland salt meadows* priority habitat

Saltmarsh vegetation away from the coast

Confined to East Anglia

At risk from FCERM activity

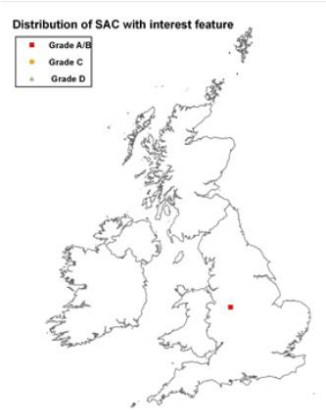
Occurring in one location in the country, it is highly unlikely that this habitat will be directly affected by flood defence activities.

Benefits from FCERM activity

There is always a possibility that NFM could influence this habitat type by altering patterns of infiltration and groundwater levels

Number of sites and distribution

1



1420 Mediterranean and thermos-Atlantic halophilous scrubs

The salt-tolerant scrub vegetation on the transition line from saltmarsh to dunes or where dunes overlie shingle, at the upper limit of tidal inundation. Confined to the east and south.

At risk from FCERM activity

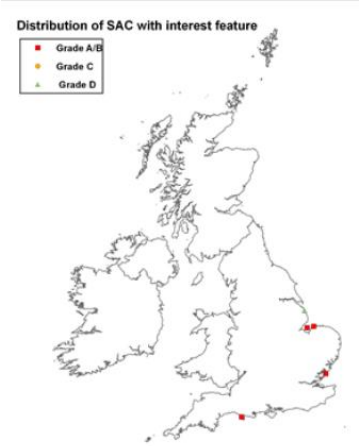
Affected by coastal squeeze

Benefits from FCERM activity

Managed realignment would benefit this habitat

Number of sites and distribution

4



Coastal sand dunes and continental dunes

2110 embryonic shifting dunes

Pioneer dune communities rely upon a dynamic state and therefore ephemeral. On prograding dune systems this vegetation is the precursor to marram grass.

This habitat is of exceptional importance as an indicator of the general structural and functional health of the dune system. It relies upon the continued supply of new sand from the beach plain to the dunes, including sand that is cycling within the same system. This

community type may receive occasional tidal inundation; it is transitional between the strandline communities and marram dominated shifting dune habitat.

At risk from FCERM activity

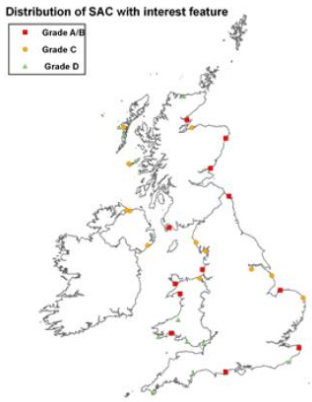
Affected by coastal squeeze, flood embankments and flood walls, and interruption of sand supply

Benefits from FCERM activity

Dune protection and managed realignment are beneficial. As is options that increase the sand supply. Care should be taken in re-establishing a natural regime when dunes have been significantly degraded, as they may require some interim assistance to function properly.

Number of sites and distribution

24



2120 shifting dunes along the shoreline with *Ammophila arenaria*

Unstable dunes where the actively moving sand is bound by marram. Dunes can be accreting or eroding, but not stable. This habitat does not receive tidal inundation. Marram will form a monoculture when the sand is very rapidly accreting. Otherwise a restricted assemblage of other species adapted to tolerate the harsh conditions are present.

Sometimes this vegetation forms a narrow strip in the coastal zone. It is found as part of the mosaic of and transition to fixed dune, dune heath and dune slack habitats.

At risk from FCERM activity

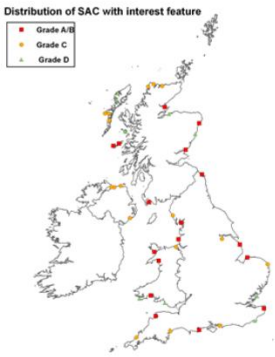
Affected by coastal squeeze, flood embankments and flood walls, and interruption of sand supply

Benefits from FCERM activity

Dune protection and managed realignment are beneficial. As is options that increase the sand supply. Care should be taken in re-establishing a natural regime when dunes have been significantly degraded, as they may require some interim assistance to function properly.

Number of sites and distribution

34



2130 fixed dunes with herbaceous vegetation* priority habitat

Fixed dune vegetation has developed on the largest dune systems, immediately inland from the shifting dunes. There is some organic matter that has formed, and the dune grassland communities that develop as a consequence are extremely variable. There is a recognisable regional variation in the community composition.

At risk from FCERM activity

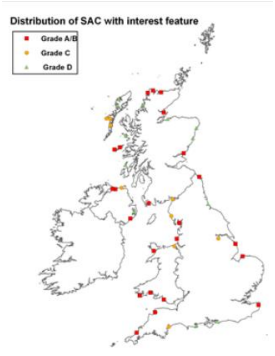
Affected by coastal squeeze, flood embankments and flood walls, and interruption of sand supply

Benefits from FCERM activity

Outside of designated sites this habitat is pivotal in terms of WWNP, because it may have been subject to historical landclaim, and not instantly recognisable as relict fixed dune. WWNP should endeavour to secure extension of fixed dune habitat by restoring it; this can require realignment of existing defences, or could be part of rural or coastal urban SUDS. As with any ecological restoration where the primary interest is botanical, increasing distance from the designated site reduces the value as sub-optimal habitat or buffer zone. But this should not preclude reinstatement of this habitat at remote sites because of the great uncertainty surrounding climate change and consequent sea level rise. Having a coastal network of sites will assist species in adjusting their ranges northwards, for example, and landwards respectively.

Number of sites and distribution

32



2140 Decalcified fixed dunes with Empetrum nigrum*

Scotland only 2

2150 Atlantic decalcified fixed dunes*

An acidic variant of fixed dunes where the sand is level of calcium carbonate in the sand is inherently low, exacerbated by leaching. The species, notably dune heath vegetation, is tolerant of warm, dry conditions. This habitat naturally grades to heathland further inland

At risk from FCERM activity

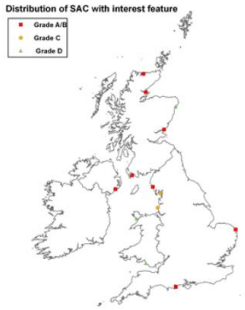
Affected by coastal squeeze, flood embankments and flood walls, and interruption of sand supply

Benefits from FCERM activity

Outside of designated sites this habitat is pivotal in terms of WWNP, because it may have been subject to historical landclaim, and not instantly recognisable as relict fixed dune. WWNP should endeavour to secure extension of fixed dune habitat by restoring it; this can require realignment of existing defences, or could be part of rural or coastal urban SUDS. As with any ecological restoration where the primary interest is botanical, increasing distance from the designated site reduces the value as sub-optimal habitat or buffer zone. But this should not preclude reinstatement of this habitat at remote sites because of the great uncertainty surrounding climate change and consequent sea level rise. Having a coastal network of sites will assist species in adjusting their ranges northwards, for example, and landwards respectively.

Number of sites and distribution

10



2160 dunes with *Hippophae rhamnoides*

Confined to two sites in eastern England; not to be confused with locations where sea-buckthorn has been planted and can become invasive

At risk from FCERM activity

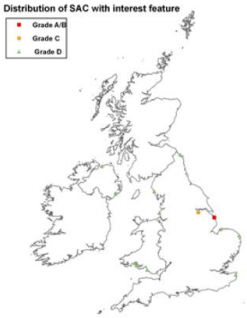
Any embankment or sea walls in close vicinity would affect this site

Benefits from FCERM activity

Unlikely to be affected

Number of sites and distribution

2



2170 dunes with *Salix repens* ssp *argentea*

Creeping willow dominant habitat marks a mature phase in dune development on calcareous sands. Ideally part of a mosaic of dune habitat, including wetter dune slacks.

At risk from FCERM activity

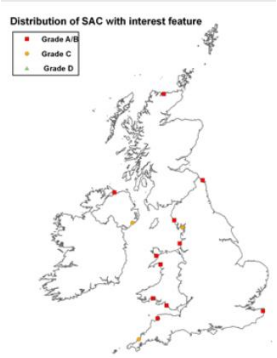
Any embankment or sea walls in close vicinity would affect this site

Benefits from FCERM activity

Would be positively impacted by managed realignment

Number of sites and distribution

14



2190 humid dune slacks

Dune slacks are low-nutrient, low lying areas within dune systems that are seasonally flooded. The range of species is determined by:

- Dune system structure
- Successional stage of the slack
- Chemistry of the sand
- climate

At risk from FCERM activity

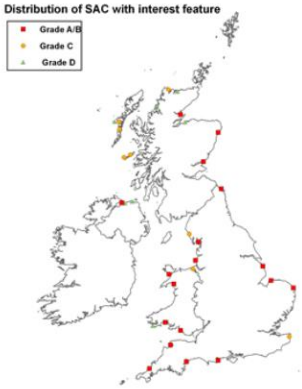
Any embankment or sea walls in close vicinity would affect this site

Benefits from FCERM activity

Affected in the same way as dunes

Number of sites and distribution

26



21A0 machairs

Scotland only

2250 coastal dunes with *Juniperus* spp*

Scotland only

2330 inland dunes with open *Corynephorus* and *Agrostis* grasslands

One example in East Anglia.

At risk from FCERM activity

Part of a mosaic of wetland and dry heath type vegetation so would only be at risk from inappropriately sited NFM, such as tree planting or holding more water in the catchment such as leaky woody dams

Benefits from FCERM activity

Unlikely to be affected

Number of sites and distribution

1

Freshwater habitats

3110 oligotrophic waters containing very few minerals of sandy plains

This rare low nutrient standing waterbody occurs on sandy plains

At risk from FCERM activity

Unlikely to be affected

Benefits from FCERM activity

Unlikely to be affected

Number of sites and distribution

4

3130 oligotrophic to mesotrophic standing waters with vegetation of the *Litorelletea uniflorae* and/or of the *Isoeto-Nanojuncetea*

The clear soft water standing containing moderate concentration of nutrients occurs in a very few English sites. The vegetation comprises amphibious short species.

At risk from FCERM activity

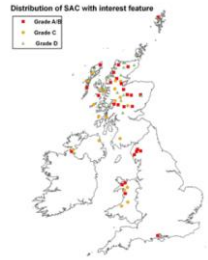
Unlikely to be affected

Benefits from FCERM activity

Unlikely to be affected

Number of sites and distribution

47



3140 hard oligo-mesotrophic water with benthic vegetation of *Chara* spp

The water in these lakes is base rich, which makes them unusual because the geology tends to be free-draining. Waterbodies include:

- Lakes on a predominantly limestone substrate.
- Lakes with nutrient inputs from other base-rich influences, e.g. serpentine and boulder clays
- Abandoned mineral workings and dammed river valleys.

In addition, such waterbodies are characterised by very clear water and low nutrient status. They are therefore largely restricted to situations where the catchment or aquifer from which they are supplied with water remains relatively unaffected by intensive land-use or other sources of nutrients, and they are most often found in areas supporting mosaics of semi-natural vegetation.

The abundance of stoneworts helps to maintain the water clarity as these species physically trap phytoplankton that are responsible for turbidity and blue-green algal blooms.

At risk from FCERM activity

Unlikely to be affected

Benefits from FCERM activity

Could be recreated as part of NFM measures

Number of sites and distribution

15

3150 natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation

Natural high nutrient lakes are also productive and support an abundant and diverse flora, submerged, emergent and littoral. They are mostly associated with soft rocks, and can be coastal. Excessive nutrient enrichment poses the most significant risk to these waterbodies.

At risk from FCERM activity

Could be at risk from managed realignment in a coastal context

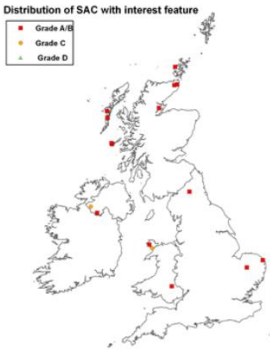
Benefits from FCERM activity

NFM measures could recreate these features offsite as suboptimal habitat.

Flood defences are essential in order to protect freshwater European sites in situ from tidal flooding

Number of sites and distribution

16



3160 natural dystrophic lakes and ponds

Dystrophic waterbodies, often an assemblage of ponds, which may be ephemeral, can be found in bogs or valley bottoms. They are acidic, nutrient poor and contain a limited flora and fauna. This habitat is very scarce and occurs in two sites in England. It has a more northerly distribution.

At risk from FCERM activity

This habitat type could be at risk from tree planting.

Benefits from FCERM activity

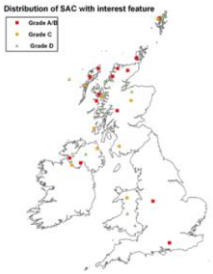
Most NFM type measures would assist this habitat type, associated with storing water in the catchment. Flood risk management measures could be used to try to extend the range of this habitat by creating the right conditions for the flora and fauna. It is unlikely that the

two English sites would ever be directly impacted by flood management works. But creating additional waterbodies to form a cluster or network would be beneficial, dependent upon the colonisation mechanisms of the flora and fauna

Flood defences are essential in order to protect freshwater European sites in situ from tidal flooding

Number of sites and distribution

23



3170 Mediterranean temporary ponds* priority habitat

One site in a coastal location in Cornwall

At risk from FCERM activity

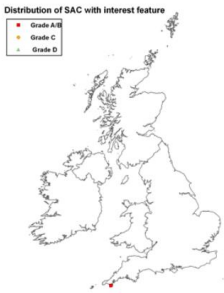
Unlikely to be affected

Benefits from FCERM activity

Application of NFM measures nearby could consider the creation of this habitat type

Number of sites and distribution

1



3180 turloughs* priority habitat

None in England

3260 water course of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

These rivers, streams and winterbournes are characterised by prolific growth of water crowfoots. The habitat type is widespread, especially on softer and more mineral rich substrates, and correspondingly absent where the underlying geology comprises acid rock.

It has been adversely affected by nutrient enrichment, mainly from sewage inputs and agriculture, and where agriculture has caused serious siltation. It is also vulnerable to artificial reductions in river flows and to unsympathetic channel engineering works.

Consequently, the habitat has been reduced or has disappeared from parts of its range in Britain.

At risk from FCERM activity

Could be affected by flood risk management works, including:

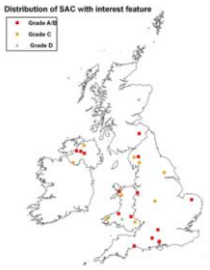
- Isolated from the floodplain by embankments and flood walls
- Isolated from their tributaries by sluices and flapped outfalls
- Weedcutting
- Weirs
- Dredging
- Widening
- Straightening
- Polluted water from CSOs
- Siltation from flood waters washing soil from the catchment
- Erosion protection
- River out of regime because of silt load creating an erosion problem
- canalisation

Benefits from FCERM activity

- Restoration
- Rehabilitation
- NFM in the catchment reducing siltation
- Flood defences are essential in order to protect freshwater European sites in situ from tidal flooding

Number of sites and distribution

23



Temperate heath and scrub

4010 northern Atlantic wet heaths with *Erica tetralix*

Wet heath usually occurs on acidic, nutrient-poor substrates, such as shallow peats or sandy soils with impeded drainage. Despite the name, this habitat has a ubiquitous distribution.

Certain heathland species have been shown to have a persistent seedbank, and there is plenty of published ecological research into the restoration, transplantation and recreation of heathland.

At risk from FCERM activity

Other than direct impact of footprint of flood defences this type of habitat would only be impacted by flood defences that intrude onto the site.

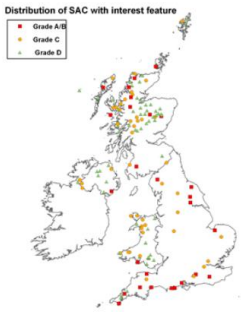
NFM tree planting would not be appropriate

Benefits from FCERM activity

NFM reinstatement of habitats in the catchment would be beneficial. The longevity of heathland seedbanks can make reversion of afforested sites to heathland a possibility. Agricultural land can be acidified to recreate heathland.

Number of sites and distribution

72



4020 temperate Atlantic wet heaths with *Erica ciliaris* and *Erica tetralix**

Restricted to the southwest, supporting the rare Dorset heath *Erica ciliaris*. This community grades into wetter heath, where it is found.

Certain heathland species have been shown to have a persistent seedbank, and there is plenty of published ecological research into the restoration, transplantation and recreation of heathland.

At risk from FCERM activity

Other than direct impact of footprint of flood defences this type of habitat would only be impacted by flood defences that intrude onto the site.

NFM tree planting would not be appropriate

Benefits from FCERM activity

NFM reinstatement of habitats in the catchment would be beneficial. The longevity of heathland seedbanks can make reversion of afforested sites to heathland a possibility. Agricultural land can be acidified to recreate heathland.

Flood defences are essential in order to protect freshwater European sites in situ from tidal flooding

Number of sites and distribution

4

4030 European dry heaths

Ericaceous dwarf shrubs dominate on the freely-draining, acidic to circumneutral soils with low nutrient content. There is some variation in community composition determined by climate. Dry heaths are characteristically species poor, except where the acid surface deposits overlie calcareous materials.

Certain heathland species have been shown to have a persistent seedbank, and there is plenty of published ecological research into the restoration, transplantation and recreation of heathland.

At risk from FCERM activity

Other than direct impact of footprint of flood defences this type of habitat would only be impacted by flood defences that intrude onto the site.

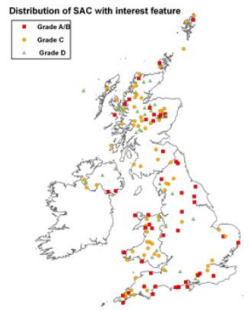
NFM tree planting would not be appropriate

Benefits from FCERM activity

NFM reinstatement of habitats in the catchment would be beneficial. The longevity of heathland seedbanks can make reversion of afforested sites to heathland a possibility. Agricultural land can be acidified to recreate heathland.

Number of sites and distribution

117



4040 Dry Atlantic Coastal heaths with *Erica vagans** priority habitat

One site in a coastal location in Cornwall on well drained , moderately base-rich soils and a warm oceanic climate

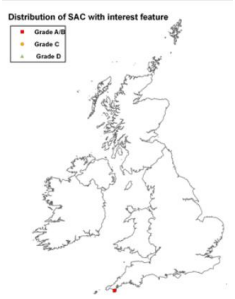
At risk from FCERM activity

Unlikely to be affected

Benefits from FCERM activity

Unlikely to be affected

1



4060 Alpine and Boreal heaths

Restricted in England to two very northerly sites, developing above the tree line, in the gaps between trees or as relict communities of lost sub-alpine woods.

Certain heathland species have been shown to have a persistent seedbank, and there is plenty of published ecological research into the restoration, transplantation and recreation of heathland.

At risk from FCERM activity

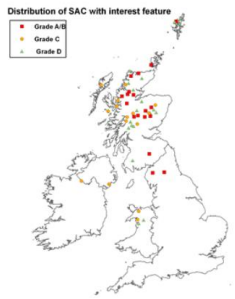
Unlikely to be affected

Benefits from FCERM activity

Unlikely to be affected

Number of sites and distribution

33



4080 sub-Arctic *Salix* spp scrub

Restricted to one lower grade example in northern England. It represents the UK's highest-altitude shrubby vegetation on moist base-rich soils in rocky situations on mountains.

It is one of the UK's most rare and endangered habitats.

This makes conservation of genetic integrity more challenging.

At risk from FCERM activity

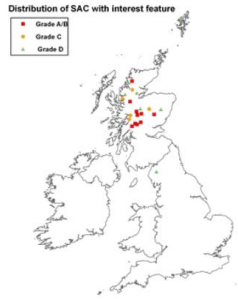
Unlikely to be affected

Benefits from FCERM activity

Unlikely to be affected

Number of sites and distribution

15



Sclerophyllous scrub (matorral)

5110 stable xerothermophilous formations with *Buxus sempervirens* on rock slopes

Only on this one southern site is box not part of a seral stage in the progression towards woodland

At risk from FCERM activity

Inappropriately sited cross-slope planting NFM measures

Benefits from FCERM activity

Unlikely to be affected

Number of sites and distribution

1

5130 *Juniperis communis* formations on heaths or calcareous grasslands

Heathland juniper communities tend towards a northerly distribution, in contrast with the calcareous grassland communities to the south.

At risk from FCERM activity

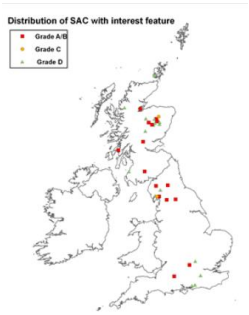
Unlikely to be affected

Benefits from FCERM activity

NFM interventions will likely avoid the designated sites and therefore impacting on this habitat type. However if catchment planting is part of a NFM plan near to such sites, then creating an approximation of this habitat type should be considered especially if there is evidence that such habitat once existed. It is possible that a viable heathland seedbank could persist for at least 100 years.

Number of sites and distribution

17



Natural and semi-natural grassland formations

6130 Calaminarian grasslands of the *Violetalia calaminariae*

This plant assemblage occurs on oils that have levels of heavy metals, such as lead, zinc, chromium and copper that are toxic to most plant species. The greatest extent of the habitat occurs on artificial sites associated with past mining activities.

At risk from FCERM activity

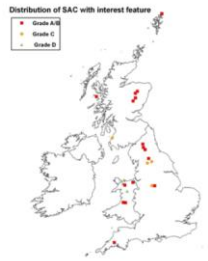
Because of the contamination, it is unlikely that any engineered flood reduction activities would focus on this habitat. Tree planting is the only potential activity that could be planned on or near such sites, but the contamination and skeletal soils would render this an unlikely scenario because of the poor prognosis for tree survival.

Benefits from FCERM activity

Containment of run-off is a possibility, since there are a number of locations where contaminated groundwater is pumped from abandoned mines for treatment. However we have not researched this issue further to ascertain whether achievement of flood defence benefit might be cited as an ancillary benefit to any water treatment, if required.

Number of sites and distribution

20



6150 siliceous alpine and boreal grasslands

Only 3 sites in northern England, of this habitat type which is nearer to natural than almost any other. It is a high altitude vegetation type >700m aod. Because of this it would not be an obvious location for tree planting or other flood defence activity.

At risk from FCERM activity

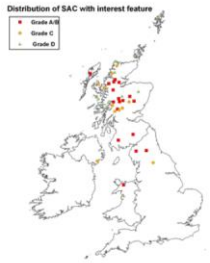
Unlikely to be affected

Benefits from FCERM activity

Unlikely to be affected

Number of sites and distribution

29



6170 Alpine and subalpine calcareous grasslands

Only in Scotland and Wales

6210 semi-natural dry grassland and scrubland facies: on calcareous substrates

Important orchid rich sites are a priority feature of this grassland type fund on thin, well-drained, lime rich soils associated with chalk and limestone. They occur at low to moderate altitudes and have a widespread distribution, geology permitting. Most sites are maintained by the appropriate grazing regime to encourage their high biodiversity supporting outstanding assemblages of rare plants.

At risk from FCERM activity

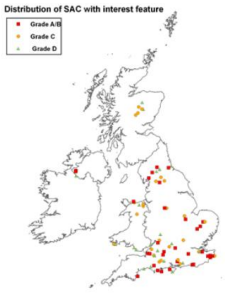
Unlikely to be affected except by inappropriate tree planting for NFM

Benefits from FCERM activity

Unlikely to be affected

Number of sites and distribution

59



6230 species rich *Nardus* grassland on siliceous substrates in mountain areas *priority habitat

Very restricted distribution to 3 sites in England. This species rich grassland tends to develop where there is flushing through base-rich strata on siliceous bedrock. Usually closely grazed and, in England, at altitude.

At risk from FCERM activity

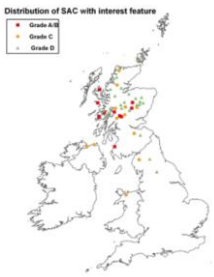
Unlikely to be affected because of altitude

Benefits from FCERM activity

Activity to undo the effect of past drainage in order to hold water up in the catchment could be beneficial.

Number of sites and distribution

22



6410 *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils

That are moist and moderately base rich peats or peaty gley with a fluctuating water table. Usually part of a mosaic of habitat types including wet pasture, fen and dry grassland and heathland.

At risk from FCERM activity

Because of the location in the catchment, this habitat type could be affected by flood defence activities. Unless close to settlement, these are more likely to be NFM measures to hold water up in the catchment. Tree planting would definitely be deleterious, and care would have to be taken if implementing drainage blocking measures to site the footprint of the works in non-damaging locations

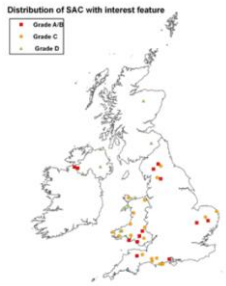
Benefits from FCERM activity

If drainage blocking is desireable, and could be sited on already compromised locations, it would have the benefit of contributing to the fluctuating water table and encourage springlines and seepage.

Flood defences are essential in order to protect freshwater European sites in situ from tidal flooding

Number of sites and distribution

33



6430 hydrophilous tall herb fringe communities of plains and of the montane to alpine levels

A montane plant community of cliff edges in two sites in the north of England.

At risk from FCERM activity

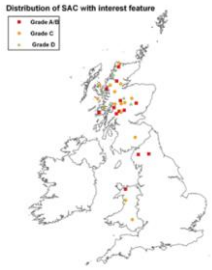
Unlikely to be affected

Benefits from FCERM activity

Unlikely to be affected

Number of sites and distribution

28



6510 lowland hay meadows

Although only 5 sites of sufficient quality to be designated, which in turn reflects vulnerability to loss of this habitat to intensive management, these sites are situated in alluvial floodplain locations.

Seasonal flooding provides nutrient input, with traditional management of a haycut followed by light grazing of the aftermath.

At risk from FCERM activity

This habitat is extremely vulnerable to flood risk management activity because of its location relative to settlement, and the hydrological continuity with the rivers, streams and ditches. Ideally any flood risk management proposals should make use of a prolonged period of hydrological monitoring to inform modelling. There should also be post implementation monitoring accompanied by a plan b if trigger levels are reached.

Flood defence works would need to take account of:

- direct impact
- hydrology, especially flood and low flow
- water quality change , including water quality during flood, carrying pollutants from urban areas via urban drainage, and concentration effects during low flows that might be used as irrigation.

This applies to the direct impacts on the plant communities themselves, and to retaining the right conditions for continued traditional management.

Benefits from FCERM activity

Reconnection of the river with its floodplain benefits this habitat

Flood defences are essential in order to protect freshwater European sites in situ from tidal flooding

Number of sites and distribution

5

6520 mountain hay meadows

Two sites in the north of England; these high altitude traditionally managed meadows form part of a mosaic of upland habitats

At risk from FCERM activity

Inappropriately sited tree planting, or any activity that precludes continuation of traditional management

Benefits from FCERM activity

Fencing of streams to reduce erosion from grazing animals

Number of sites and distribution

2

Raised bogs and mires and fens

7110 active raised bogs* priority habitat

Thousands of years of peat formation has created sufficient depth of peat isolating the surface from the groundwater. The bog is irrigated by rainwater, very acid and nutrient poor. The flora is not diverse.

The topography is characteristically hummocks and hollows supporting the vegetation characteristically capable of forming peat.

At the margins of the bog the vegetation grades into fen, this zone known as the lagg.

Peat digging has affected this habitat greatly, as has forestry and drainage.

At risk from FCERM activity

Working on the assumption that upstream habitats are unlikely to have been or will be affected by flood defence works that are directly damaging.

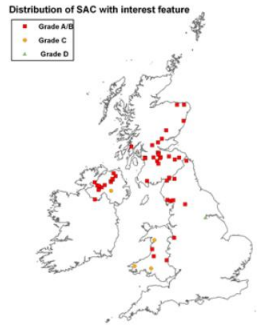
Tree planting on deep peat for NFM purposes is damaging.

Benefits from FCERM activity

The value of wetlands is better understood, both the hydrological benefits downstream of natural wetland water storage and release functioning, and the climate regulating activities of peatlands. Peatland degradation can release methane, a greenhouse gas, and the wetlands are an immense store of carbon. There is already a recent history, and ongoing projects within the Defra £15m NFM programme, alongside some big NERC research projects, to reverse damage caused by draining and forestry.

Number of sites and distribution

54



7120 degraded raised bogs still capable of natural regeneration

Human activity has changed the hydrology, vegetation and physical structure of the bog, leading to desiccation, oxidation and species loss. The definition of capable of natural regeneration refers to reversal of the hydrological change coupled with the potential for vegetation to re-establish peat formation in 30 years.

Present day land cover includes:

- conifer plantations
- improved pasture
- scrub and birch woordland
- bare peat
- impoverished bog vegetation.

English raised bogs have been particularly affected by these forms of degradation.

At risk from FCERM activity

Working on the assumption that upstream habitats are unlikely to have been or will be affected by flood defence works that are directly damaging.

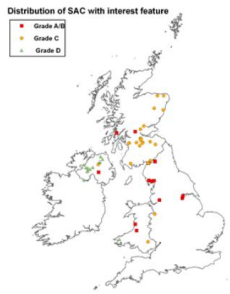
Tree planting on deep peat for NFM purposes is damaging.

Benefits from FCERM activity

The value of wetlands is better understood, both the hydrological benefits downstream of natural wetland water storage and release functioning, and the climate regulating activities of peatlands. Peatland degradation can release methane, a greenhouse gas, and the wetlands are an immense store of carbon. There is already a recent history, and ongoing projects within the Defra £15m NFM programme, alongside some big NERC research projects, to reverse damage caused by draining and forestry.

Number of sites and distribution

37



7130 blanket bogs* priority habitat

This habitat has been able to form over extensive tracts of undulating ground in a climate of high rainfall and low evapotranspiration.

There are many sub-types of this habitat, with a complex mosaic, related to climatic factors. The proportion of bog pool to terrestrial habitat is important.

Large areas of blanket bog have been modified by agriculture and afforestation.

At risk from FCERM activity

Working on the assumption that upstream habitats are unlikely to have been or will be affected by flood defence works that are directly damaging.

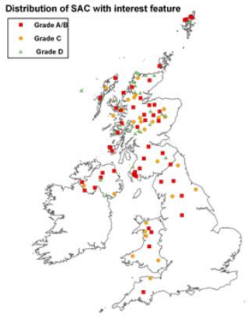
Tree planting on deep peat for NFM purposes is damaging.

Benefits from FCERM activity

The value of wetlands is better understood, both the hydrological benefits downstream of natural wetland water storage and release functioning, and the climate regulating activities of peatlands. Peatland degradation can release methane, a greenhouse gas, and the wetlands are an immense store of carbon. There is already a recent history, and ongoing projects within the Defra £15m NFM programme, alongside some big NERC research projects, to reverse damage caused by draining and forestry.

Number of sites and distribution

77



7140 transition mires and quaking bogs

Transition mires support vegetation that is intermediate or transitional between acid bog and alkaline fen. This reflects the mosaic of acid and alkaline conditions, either because they occur at the transition zone from bog to fen, or because the fen is becoming more bog-like through natural succession.

Transition mires and quaking bogs can occur in a variety of situations, related to different geomorphological processes: in flood plain mires, valley bogs, basin mires and the lagg zone of raised bogs, and as regeneration surfaces within mires that have been cut-over for peat or areas of mineral soil influence within 7130 Blanket bogs (e.g. ladder fens).

At risk from FCERM activity

Working on the assumption that upstream habitats are unlikely to have been or will be affected by flood defence works that are directly damaging.

Tree planting on deep peat for NFM purposes is damaging.

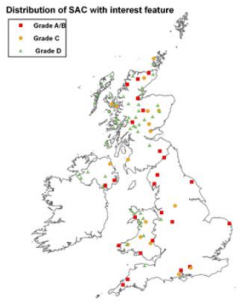
Benefits from FCERM activity

The value of wetlands is better understood, both the hydrological benefits downstream of natural wetland water storage and release functioning, and the climate regulating activities

of peatlands. Peatland degradation can release methane, a greenhouse gas, and the wetlands are an immense store of carbon. There is already a recent history, and ongoing projects within the Defra £15m NFM programme, alongside some big NERC research projects, to reverse damage caused by draining and forestry.

Number of sites and distribution

41



7150 depressions on peat substrates of the Rhynchosporion

This habitat occurs in complex mosaics with lowland wet heath and valley mire vegetation, in transition mires, and on the margins of bog pools and hollows in both raised and blanket bogs.

On lowland heaths in southern and eastern England this habitat occurs on humid, bare or recently exposed peat in three distinct situations:

- in and around the edges of seasonal bog pools, particularly on patterned areas of valley mire,
- in flushes on the edges of valley mires in heathlands, and
- in areas that are artificially disturbed, such as along footpaths and trackways and in old peat-cuttings and abandoned ditches.

In the north and west this habitat type is usually part of the transition between bog pools and the surounding bog. It is a rare habitat type in the UK that exhibits a narrow range of ecological variation and has a restricted geographical distribution. This habitat type has a very discontinuous distribution, being found in largest quantity on heaths in southern England and on blanket and raised bogs in western Britain.

The SAC series includes the small number of sites supporting extensive vegetation mosaics in which this habitat type can be found. The sites selected reflect the discontinuous distribution of the habitat, and include examples from lowland valley mires and wet heath in the south and east, and from blanket bogs in the north and west.

Small fragmentary stands occur in a range of disturbed contexts, often covering less than 10 m2, but are not designated as SACs because of their poor quality

At risk from FCERM activity

Working on the assumption that upstream habitats are unlikely to have been or will be affected by flood defence works that are directly damaging.

Tree planting on deep peat for NFM purposes is damaging.

On lowland sites there is greater risk to these wetland habitats from direct damage and indirect hydrological effects

Benefits from FCERM activity

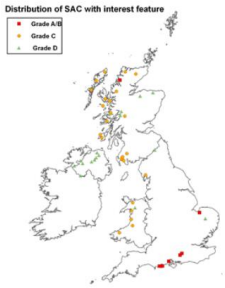
The value of wetlands is better understood, both the hydrological benefits downstream of natural wetland water storage and release functioning, and the climate regulating activities

of peatlands. Peatland degradation can release methane, a greenhouse gas, and the wetlands are an immense store of carbon. There is already a recent history, and ongoing projects within the Defra £15m NFM programme, alongside some big NERC research projects, to reverse damage caused by draining and forestry.

On lowland sites restoration and hydrological connection, as a part of WWNP, is beneficial. It could be made more so if an ecologically meaningful strategic approach is made to restoring the opportunity for wetland species to colonise, especially if the propagules are transported on flood water. For particularly rare species, whose distribution has become so restricted to designated sites, autecological knowledge needs to be included to refine the site preparation.

Number of sites and distribution

32



7210 calcareous fens with *Cladium mariscus* * priority habitat

This habitat comprises the more species-rich examples of great fen-sedge *Cladium mariscus* fen, occuring in the following situations:

- sites with a mixture of closed, species-poor *Cladium* beds, which at their margins have transitions to species-rich small-sedge mire vegetation;
- sites where *Cladium* beds retain their species-richness owing to management; and
- situations where *Cladium* fen is inherently species-rich, possibly owing to the fact that conditions do not allow the *Cladium* to grow vigorously and dominate the vegetation.

At most sites several of these types are found as complex mosaics with other fen types, and in most cases the species-rich stands are less extensive than species-poor Cladium vegetation.

Calcareous fens are rare in the UK, having a restricted and discontinuous geographical range

Small, isolated, species-poor habitat fragments where *Cladium* is found, for example drainage ditches in grassland sites and in heathlands (where stands are more extensive than at grassland sites, but are more species-poor) have not been selected.

At risk from FCERM activity

On lowland sites there is greater risk to these wetland habitats from direct damage and indirect hydrological effects

Benefits from FCERM activity

On lowland sites restoration and hydrological connection, as a part of WWNP, is beneficial. It could be made more so if an ecologically meaningful strategic approach is made to restoring the opportunity for wetland species to colonise, especially if the propagules are transported on flood water. For particularly rare species, whose distribution

has become so restricted to designated sites, autecological knowledge needs to be included to refine the site preparation.

Flood defences are essential in order to protect freshwater European sites in situ from tidal flooding.

Number of sites and distribution

13

7220 petrifying springs with tufa formation * priority habitat

Tufa formation is associated with hard-water springs, where groundwater rich in calcium bicarbonate comes to the surface. On contact with the air, carbon dioxide is lost from the water and a hard deposit of calcium carbonate (tufa) is formed. These conditions occur most often in areas underlain by limestone or other calcareous rocks, and particularly in the uplands of northern England.

At risk from FCERM activity

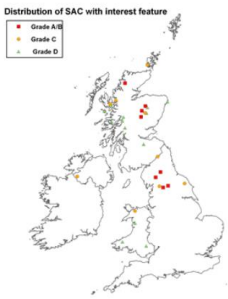
On lowland sites there is greater risk to these wetland habitats from direct damage and indirect hydrological effects

Benefits from FCERM activity

On lowland sites restoration and hydrological connection, as a part of WWNP, is beneficial. It could be made more so if an ecologically meaningful strategic approach is made to restoring the opportunity for wetland species to colonise, especially if the propagules are transported on flood water. For particularly rare species, whose distribution has become so restricted to designated sites, autecological knowledge needs to be included to refine the site preparation.

Number of sites and distribution

17



7230 alkaline fens

These fens consist of a complex assemblage of vegetation types characteristic of sites where there is tufa and/or peat formation with a high water table and a calcareous base-rich water supply. There are well-marked transitions to a range of other fen vegetation and swamp.

The scattered distribution of SAC designated sites reflect the limited survival of alkaline fens, lost to drainage and hydrological change resulting in a wide but very fragmented and impoverished network of undesignated sites

At risk from FCERM activity

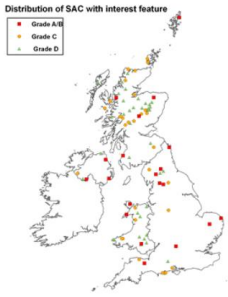
On lowland sites there is greater risk to these wetland habitats from direct damage and indirect hydrological effects

Benefits from FCERM activity

On lowland sites restoration and hydrological connection, as a part of WWNP, is beneficial. It could be made more so if an ecologically meaningful strategic approach is made to restoring the opportunity for wetland species to colonise, especially if the propagules are transported on flood water. For particularly rare species, whose distribution has become so restricted to designated sites, autecological knowledge needs to be included to refine the site preparation.

Number of sites and distribution

49



7240 alpine pioneer formations * priority habitat

High altitude flush mire from two English sites.

At risk from FCERM activity

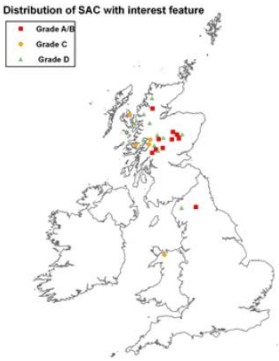
Unlikely to be affected

Benefits from FCERM activity

Unlikely to be affected

Number of sites and distribution

15



Rocky habitats and caves

8110 siliceous scree of the montane to snow levels

A very few sites in northern England comprising siliceous scree with a specialised flora, particularly ferns

At risk from FCERM activity

Unlikely to be affected

Benefits from FCERM activity

Unlikely to be affected

Number of sites and distribution

29

8120 calcareous and calcshist screes of the montane to alpine levels

Base rich scree, restricted to a few English sites, supporting a specialised flora of pioneer species

At risk from FCERM activity

Unlikely to be affected

Benefits from FCERM activity

Unlikely to be affected

Number of sites and distribution

11

8210 calcareous rocky slopes with chasmophytic vegetation

Plants colonising the cracks and fissures of rock faces

At risk from FCERM activity

Unlikely to be affected

Benefits from FCERM activity

Unlikely to be affected

Number of sites and distribution

35

8220 siliceous rocky slopes with chasmophytic vegetation

Plants colonising the cracks and fissures of rock faces

At risk from FCERM activity

Unlikely to be affected

Benefits from FCERM activity

Unlikely to be affected

Number of sites and distribution

33

8240 limestone pavements * priority habitat

Limestone pavements are outcrops of rock, typically horizontal or gently inclined, although a few are steeply inclined. The surface has been dissolved by water over millions of years into ‘paving blocks’, known as clints, with a complex reticulate pattern of crevices, known as grikes, between them. A range of calcareous rock, heath, grassland, scrub and woodland NVC types can occur on limestone pavement. The vegetation of limestone pavements is unusual because of the combinations of floristic elements, including woodland and woodland edge species. On the clint surfaces or the upper walls of the grikes there are plants of rocky habitats.The grikes provide a shady, humid environment favouring woodland plants.

Grazing pressure is a key factor in determining ecological variation in limestone pavements. Where grazing pressure is low, woodland may cover the pavement and woodland vegetation may mask the limestone surface. Here only the massive areas of pavement may be exposed as clearings. Where there is heavy grazing pressure, vegetation may be found only in the grikes, but, where grazing is lighter, dwarf trees, herbs and ferns may protrude from the grikes. Grikes that are about 60 cm deep provide shelter without unduly limiting light and are usually the best floristically.

At risk from FCERM activity

Unlikely to be affected

Benefits from FCERM activity

Unlikely to be affected

Number of sites and distribution

11

8310 caves not open to the public

At risk from FCERM activity

Unlikely to be affected

Benefits from FCERM activity

Unlikely to be affected

Number of sites and distribution

6

8330 submerged or partially submerged sea caves

At risk from FCERM activity

Unlikely to be affected

Benefits from FCERM activity

Unlikely to be affected

Number of sites and distribution

17

Forests

9120 atlantic acidophilous beech forests

South East England

The typical species assemblage is of terrestrial species, but this habitat does occur in a coarse scale complex with other habitats, including wetlands. Epiphytes are a feature,

except where pollution has caused their decline. Whilst creating buffer planting is unlikely to effectively filter the air reaching the woodland, it could in time provide additional sub-optimal habitat for key invertebrate species

At risk from FCERM activity

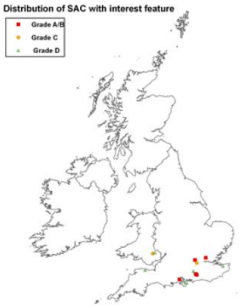
Actions to implement NFM, primarily leaky woody dams would have to be approached with care, and it is very unlikely that fixed dams would be acceptable

Benefits from FCERM activity

Extending the planting, as a NFM measure floodplain planting, with the appropriate tree species of local provenance adjacent to the sites could provide buffering capacity and so improve resilience. Ground flora typical of ancient woodlands is unlikely to colonise, unless the planting is on a location that was once wooded within the last 100 years, and there is a viable extant seedbank.

Number of sites and distribution

7



9130 *Asperulo-Fagetum* beech forests

Associated with slopes on neutral and calcareous soils with associated woodland flora reflecting the southerly distribution of this habitat.

At risk from FCERM activity

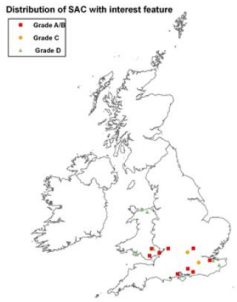
Actions to implement NFM, primarily leaky woody dams would have to be approached with care, and it is very unlikely that fixed dams would be acceptable

Benefits from FCERM activity

Extending the planting, as a NFM measure cross-slope planting, with the appropriate tree species of local provenance adjacent to the sites could provide buffering capacity and so improve resilience. Ground flora typical of ancient woodlands is unlikely to colonise, unless the planting is on a location that was once wooded within the last 100 years, and there is a viable extant seedbank.

Number of sites and distribution

11



9160 sub-Atlantic and medio-European oak or oak-hornbeam forests

At risk from FCERM activity

Actions to implement NFM, primarily leaky woody dams would have to be approached with care, and it is very unlikely that fixed dams would be acceptable

Benefits from FCERM activity

Extending the planting, as a NFM measure floodplain planting, with the appropriate tree species of local provenance adjacent to the sites could provide buffering capacity and so improve resilience. Ground flora typical of ancient woodlands is unlikely to colonise, unless the planting is on a location that was once wooded within the last 100 years, and there is a viable extant seedbank.

Number of sites and distribution

2

9180 *Tileo-Acerion* forests of slopes, screes and ravines * priority habitat

Found on calcareous scree, cliffs and ravines in scattered patches amongst other woodland types, and as narrow strips along stream sides

At risk from FCERM activity

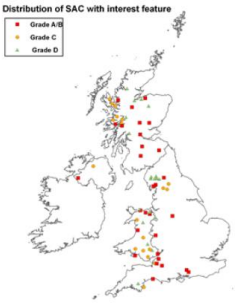
Actions to implement NFM, primarily leaky woody dams would have to be approached with care, and it is very unlikely that fixed dams would be acceptable

Benefits from FCERM activity

Extending the planting, as a NFM measure floodplain or catchment planting, with the appropriate tree species of local provenance adjacent to the sites could provide buffering capacity and so improve resilience. Ground flora typical of ancient woodlands is unlikely to colonise, unless the planting is on a location that was once wooded within the last 100 years, and there is a viable extant seedbank.

Number of sites and distribution

48



9190 old acidophilous oak woods with *Quercus robur* on sandy plains

Ancient lowland oak woodland

At risk from FCERM activity

Any form of artificial drainage or increased flood regime would damage this habitat.

Benefits from FCERM activity

Maintaining the wetness via NFM measures could be made to complement the habitat objectives, if there is evidence that this habitat is under threat of drought. Extending the planting, as a NFM measure floodplain or catchment planting, with the appropriate tree species of local provenance adjacent to the sites could provide buffering capacity and so improve resilience.

Number of sites and distribution

7

91A0 old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

Base poor soils experiencing moderately high rainfall

At risk from FCERM activity

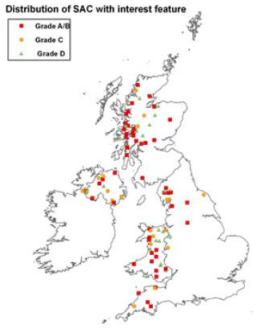
Any form of artificial drainage or increased flood regime would damage this habitat.

Benefits from FCERM activity

Maintaining the wetness via NFM measures could be made to complement the habitat objectives, if there is evidence that this habitat is under threat of drought. Extending the planting, as a NFM measure floodplain or catchment planting, with the appropriate tree species of local provenance adjacent to the sites could provide buffering capacity and so improve resilience.

Number of sites and distribution

71



91C0 Caledonian forest * priority habitat

Scotland only

Number of sites and distribution

12

91D0 bog woodland * priority habitat

Principally scots pine and birch, these are ancient woodlands, not secondary or plantation woodlands

At risk from FCERM activity

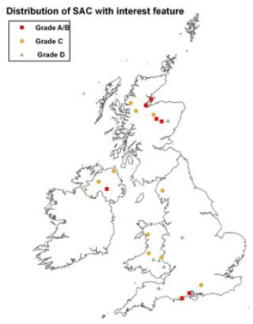
Any form of artificial drainage would damage this habitat.

Benefits from FCERM activity

Maintaining the wetness via NFM measures could be made to complement the habitat objectives, if there is evidence that this habitat is under threat of drought. Extending the planting, as a NFM measure floodplain or catchment planting, with the appropriate tree species of local provenance adjacent to the sites could provide buffering capacity and so improve resilience.

Number of sites and distribution

17



91E0 alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* * priority habitat

Alder and sallow woodlands on floodplains, part of the dynamic successional series of habitats associated with periodic inundation, usually on base rich soils or fen peat. The associated mosaic of habitats includes fen though to dry woodland. The groundflora tends to comprise wetland species so is more mobile than ancient woodland indicator species

At risk from FCERM activity

Any hard flood defence works that impose a footprint on these habitats or isolate them from flooding will have a direct impact.

Indirectly the habitat could be affected if periodic inundation is reduced, so large areas of upstream flood storage would require to release sufficient water throughout the year to maintain wetness. Insufficient water supply could be a risk if the woodlands are in hydrological continuity with an area at flood risk to be managed.

Benefits from FCERM activity

These woodlands also develop in response to rivers which are geomorphologically active, as part of a seral stage of development from exposed riverine gravels through fen to wet woodland. So actions to constrain the river or reconfigure it after flood events would impact on this habitat type. If the river geomorphology is less stable because of significant inputs of soil from the catchment then WWNP could impact by reducing the sediment burden on the river and hence reducing the resulting erosion, which would require some modelling to ensure that ultimately the return to more natural conditions would be a good thing.

Floodplain planting of this habitat close to existing habitat would need to be mindful of biosecurity and tree diseases.

Management of riparian trees could impact on this habitat, the aim should ultimately be for a stand of mixed age and structure. Flood defence activities can benefit this habitat. River restoration is the most obvious solution. Properly located SUDS and designed can assist with water quality improvement, assuming there is hydrological continuity.

Floodplain tree planting can extend this habitat, provided it is not replacing fen or grassland of value to nature conservation.

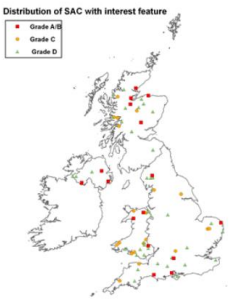
NFM measures in the catchment should be planned to ensure that this habitat is not ultimately deprived of water, but instead will benefit from improved water storage resulting in improved supply in times of drought.

It is likely that creating this habitat type will form part of an NFM solution in several instances.

Flood defences are essential in order to protect freshwater European sites in situ from tidal flooding

Number of sites and distribution

36



91J0 *Taxus baccata* woods of the British Isles * priority habitat

Chalk or limestone slopes with shallow soils, dominated by yew with an impoverished shrub and groundflora layer. Frequently forms mosaics with calcareous grassland

At risk from FCERM activity

Unlikely to be affected

Benefits from FCERM activity

Extending the planting, as a NFM measure floodplain or catchment planting, with the appropriate tree species of local provenance adjacent to the sites could provide buffering capacity and so improve resilience. However planting should never be contemplated on grassland of high conservation value or potential

Number of sites and distribution

13

A2.6. Assessment

A2.6.1. Assessment of Annex 1 habitats

Introduction

The full Annex 1 habitat accounts can be found here: http://jncc.defra.gov.uk/protectedsites/SACselection/SAC_habitats.asp

For each of the Annex 1 habitats the following information in presented in Appendix 2 of the HRA:

- habitat description
- features at risk from flood and coastal risk management
- benefits from flood and coastal risk management
- number of UK sites and distribution maps

The assessment for each of the Annex 1 habitats has been carried out under the headings derived from the screening of the strategic objectives and measures as outlined in section 3.3.

The following sections provide a summary of the assessment for each of the Annex 1 habitats.

Marine, coastal and halophytic habitats

1110 Sandbanks which are slightly covered by sea water all the time

1130 Estuaries

1140 Mudflats and sandflats not covered by seawater at low tide

1150 * Coastal lagoons

1160 Large shallow inlets and bays

1170 Reefs

1210 Annual vegetation of drift lines

1220 Perennial vegetation of stony banks

1230 Vegetated sea cliffs of the Atlantic and Baltic coasts

1310 *Salicornia* and other annuals colonising mud and sand

1320 *Spartina* swards (*Spartinion maritimae*)

1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

1340 * Inland salt meadows

1420 Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*)

Note: * indicates Priority feature

Promote and does not prejudice action to achieve and maintain favourable condition

Guidance and tools:

Marine and coastal habitats are significantly at risk from sea level rise, and associated climatic change effects of storminess encouraging erosion. The organisms themselves will be affected by temperature changes to the water. And the water column will experience change to its pH, further stressing the ecosystem.

The draft strategy will benefit these habitats if they put ecosystem sustainability at the heart of the tools and rules.

There is research and consultation ongoing about defining coastal squeeze by the Environment Agency. Current practice is to conserve the freshwater interest of European sites behind sea defences in situ where it is sustainable to do so. Where it is not, and there is an adverse effect then the solution is to provide compensatory freshwater habitat.

If the guidance misses this opportunity to be informed by evidence from research and monitoring, into both environmental and ecological processes and tolerances, then the guidance and tools risk favouring FCERM solutions that do not accord with the longer term requirements of designated sites. Or at very least fail to capitalise on the opportunities to improve their resilience and consequent ecosystem services.

Plans and strategies:

RBMPs and SMPs are critical to the effective management of coastal habitats. Coastal and estuarine management approaches to date almost always have involved a predicted negative impact on European sites. The Defra SMP process requires that these are compensated for through habitat creation programmes, and that compensatory habitats are created in advance of these impacts.

Plans and strategies will be taking us into the next epoch of the shoreline management plan timeframe. Whilst it is likely that many plans will comprise an update or refresh of the previous iterations, should involvement be confined to the same partnerships then the plans risk repeating the same perceptions. Science, in the form of data review and emerging research will be critical to expanding each plan's relevance to both designated sites and the ecological contribution that non-designated fragments might make to the future survival in an uncertain climate.

This data would have greatest influence at the plan level. Strategies can develop any themes as geographical constraints and opportunities permit.

The concept of the application of epochs needs further explanation in terms of the applicability of FCRM solutions at project level, in order to avoid the risk that solutions to hold the line are not promoted preferentially in the short term. Plans also enable a clear policy level approach to be taken towards the management of the integrity of coastal processes of erosion, sediment movement and accretion. If the contentious decisions are left solely to the local level, then the debate about individual homes falling into the sea will delay the action required for designated sites.

Frameworks:

The value of having frameworks lies in the repeatability of methodologies. Those that appear to be successful in coastal management need to be codified, repeatable and auditable if the ecological future of the coast and estuaries is to be assured. As with plans and strategies, if conservation of the ecological heritage is not central to the framework, it risks being overwhelmed by other considerations, with assessment being the only opportunity to ensure conservation, which will then only be applicable to designated sites. With the uncertainty associated with climate change we need to pose the question whether undesignated locations, fragments or degraded former habitats, will be essential as the dynamics of our soft coast and estuaries adapt. The relevance of these sites needs to be better understood to inform robust frameworks.

Co-ordinated plans:

Although these measures are intended to apply to co-ordination with other sectors outside of FCERM, with water companies, it certainly applies in the context of marine and coastal habitats. There are a host of sectors beyond those associated with effluent management that need to be co-ordinated, as sea chemistry changes with the changing climate. Some of these are better understood than others, such as shipping and mudflat and saltmarsh loss. If this opportunity to take scientific review of the range of potential impacts, and their cumulative effects is not taken, then we risk only considering the most obvious threats to coastal sites. Project level HRAs will be constrained because the threats will still be coming from sectors outside of the project.

The outputs of the pioneer projects focussed on conversation with the communities of vulnerable coastal zones will provide essential information. Lack of sufficient incorporation of the socio-environmental dimension at the plan and draft strategy level again forces the decisions to project level and project HRA, losing the opportunity for the project to operate successfully in a more favourable strategic context.

The RBMP is critical to the future of designated sites and all other plans and strategies need to be able to demonstrate accordance with the RBMP as well as WFDA.

Create buffer zones, sub-optimal habitat, sustainable hydrology and water quality

Habitat:

Estuaries are the gateway to the hinterland; for fish and birds. The assumption relating to the relative importance of undesignated habitat or potential habitat in ensuring the integrity of the designated sites needs to be understood.

Sustainable growth:

Sustainable growth in the coastal zone should be flexible and no regrets; current models will be damaging to designated sites if they are too static. Sustainable growth is reliant upon the sustainability component being at the forefront of those living and working within the area; if the socio-environmental expectation is related to permanence and inflexibility, and that is supported at the policy and plan level, there will be negative consequences for designated sites.

Coastal squeeze:

The subject of research which must inform the plans and policies as well as local implementation at project level. Coastal squeeze represents a key area of uncertainty in this HRA. Virtually all English coastal habitat is constrained to landward. The transitions from saltmarsh to terrestrial missing because of the super-imposition of flood embankments and walls. Tributary rivers and streams have sluices or other barriers.

Floods:

The contribution of flood waters to marine pollution has to form part of the strategic problems to be addressed, in order to avoid impacts on designated sites. There are also changes to the tidal regime that we might not think of as floods, but to immersion intolerant upper saltmarsh species they could be vital. Ditto to SAC bird species feeding on mudflats and roosting above the high tide level.

Droughts:

Potentially less of an issue to these habitat types of the coast; could see them moving upstream in the absence of barriers

Climate change resilience:

Requires more research in the coastal context; probably very vulnerable without adequate strategic intervention as described above. Saltmarsh and the oceans have a significant role to play as a sink for CO2

SUDS:

Requires more research in the coastal context

NFM:

Requires more research in the coastal context

Alternative finance actions and alternative delivery routes

Biodiversity net gain:

Plan and strategy level specification is the only viable way forward because of the scale at which coastal processes operate. There are some emerging examples of sustainable urban planting, the use of GI, and structural modifications to the finish of coastal structures that help the biodiversity, but not to the significant effect required to emulate a naturally functioning coastline.

Grants and payment mechanism:

Requires more research in the coastal context

Community led response:

Needs to be informed by ongoing research, but community co-operation will be essential to the integrity of designated sites

Development:

Sustainable development requires more research in the coastal context. As does coastal GI.

Summary

The geographical scale, and the scale of the problems on the coast, means that strategic level influence is disproportionately critical to designated site integrity. Coastal squeeze, and coastal erosion typify the expansive scale of the problem and the headline news of homes falling into the sea from the clifftops illustrates the scale of the socio-environmental disconnect. The need to re-zone the coast in relation to human use and expectations of the coastal strip is not impossible and will require exceptionally innovative financing to move it towards acceptability.

Coastal sand dunes and continental dunes

2110 Embryonic shifting dunes

2120 Shifting dunes along the shoreline with *Ammophila arenaria* (`white dunes`)

2130 * Fixed dunes with herbaceous vegetation (`grey dunes`)

2150 * Atlantic decalcified fixed dunes (*Calluno-Ulicetea*)

2160 Dunes with *Hippophae rhamnoides*

2170 Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*)

2190 Humid dune slacks

2330 Inland dunes with open *Corynephorus* and *Agrostis* grasslands

Note: * indicates Priority feature

Promote and does not prejudice action to achieve and maintain favourable condition

Guidance and tools:

Marine and coastal habitats are significantly at risk from sea level rise, and associated climatic change effects of storminess encouraging erosion. The draft strategy will benefit these habitats if they put ecosystem sustainability at the heart of the tools and rules.

There is research and consultation ongoing about defining coastal squeeze by the Environment Agency. Current practice is to conserve the freshwater interest of European sites behind sea defences in situ where it is sustainable to do so. Where it is not, and there is an adverse effect then the solution is to provide compensatory freshwater habitat.

If the guidance misses this opportunity to be informed by evidence from research and monitoring, into both environmental and ecological processes and tolerances, then the guidance and tools risk favouring FCERM solutions that do not accord with the longer term requirements of designated sites. Or at very least fail to capitalise on the opportunities to improve their resilience and consequent ecosystem services.

Plans and strategies:

RBMPs and SMPs are critical to the effective management of coastal habitats. Coastal and estuarine management approaches to date almost always have involved a predicted negative impact on European sites. The Defra SMP process requires that these are compensated for through habitat creation programmes, and that compensatory habitats are created in advance of these impacts.

Plans and strategies will be taking us into the next epoch of the shoreline management plan timeframe. Whilst it is likely that many plans will comprise an update or refresh of the previous iterations, should involvement be confined to the same partnerships then the plans risk repeating the same perceptions. Science, in the form of data review and emerging research will be critical to expanding each plan’s relevance to both designated sites and the ecological contribution that non-designated fragments might make to the future survival in an uncertain climate.

This data would have greatest influence at the plan level. Strategies can develop any themes as geographical constraints and opportunities permit.

The concept of the application of epochs needs further explanation in terms of the applicability of FCRM solutions at project level, in order to avoid the risk that solutions to hold the line are not promoted preferentially in the short term. Plans also enable a clear policy level approach to be taken towards the management of the integrity of coastal processes of erosion, sediment movement and accretion. If the contentious decisions are left solely to the local level, then the debate about individual homes falling into the sea will delay the action required for designated sites.

Frameworks:

The value of having frameworks lies in the repeatability of methodologies. Those that appear to be successful in coastal management need to be codified, repeatable and auditable if the ecological future of the coast and estuaries is to be assured. As with plans and strategies, if conservation of the ecological heritage is not central to the framework, it risks being overwhelmed by other considerations, with assessment being the only opportunity to ensure conservation, which will then only be applicable to designated sites. With the uncertainty associated with climate change we need to pose the question whether undesignated locations, fragments or degraded former habitats, will be essential as the dynamics of our soft coast and estuaries adapt. The relevance of these sites needs to be better understood to inform robust frameworks.

Co-ordinated plans:

Although these measures are intended to apply to co-ordination with other sectors outside of FCERM, with water companies, it certainly applies in the context of marine and coastal habitats. If this opportunity to take scientific review of the range of potential impacts, and their cumulative effects is not taken, then we risk only considering the most obvious threats to coastal sites. Project level HRAs will be constrained because the threats will still be coming from sectors outside of the project.

The outputs of the pioneer projects focussed on conversation with the communities of vulnerable coastal zones will provide essential information. Lack of sufficient incorporation of the socio-environmental dimension at the plan and strategy level again forces the decisions to project level and project HRA, losing the opportunity for the project to operate successfully in a more favourable strategic context.

The RBMP is critical to the future of designated sites and all other plans and strategies need to be able to demonstrate accordance with the RBMP as well as WFDA.

Create buffer zones, sub-optimal habitat, sustainable hydrology and water quality

Habitat:

Estuaries are the gateway to the hinterland; for fish and birds. The assumption relating to the relative importance of undesignated habitat or potential habitat in ensuring the integrity of the designated sites needs to be understood.

Sustainable growth:

Sustainable growth in the coastal zone should be flexible and no regrets; current models will be damaging to designated sites if they are too static. Sustainable growth is reliant upon the sustainability component being at the forefront of those living and working within the area; if the socio-environmental expectation is related to permanence and inflexibility, and that is supported at the policy and plan level, there will be negative consequences for designated sites.

Coastal squeeze:

The subject of research which must inform the plans and policies as well as local implementation at project level. Coastal squeeze represents a key area of uncertainty in

this HRA. Virtually all English intertidal habitat is constrained to landward. The transitions from saltmarsh to terrestrial missing because of the super-imposition of flood embankments and walls. Tributary rivers and streams have sluices or other barriers.

Floods:

The contribution of flood waters to marine pollution has to form part of the strategic problems to be addressed, in order to avoid impacts on designated sites. There are also changes to the tidal regime that we might not think of as floods, but to immersion intolerant upper saltmarsh species they could be vital. Ditto to SAC bird species feeding on mudflats and roosting above the high tide level.

Dune habitats require space, and a source of material if they have been depleted by storms. Shifting dunes are dynamic habitats and cannot be conserved in situ in the face of rising sea levels. There are a few schemes in designated sites looking at how we can give the process a helping hand because dunes have an accepted flood defence function, and if they are to continue this ecosystem service then they do have a de minimis size and stability. This conflicts with the requirement for natural and sustainable geomorphological processes. However if the coastline is already impacted by unfavourable geomorphological conditions of anthropogenic origins, compromising supply or fixing a dune to place, then modelling is essential to inform whether a natural geomorphological process is achievable without intermediate management actions intended to reinstate natural form and function.

Droughts:

Potentially less of an issue to these habitat types of the coast; could see them moving upstream in the absence of barriers

Climate change resilience:

Requires more research in the coastal context; probably very vulnerable without adequate strategic intervention as described above. Saltmarsh and the oceans have a significant role to play as a sink for CO2.

SUDS:

Requires more research in the coastal context

NFM:

Requires more research in the coastal context

Alternative finance actions and alternative delivery routes

Biodiversity net gain:

Plan and strategy level specification is the only viable way forward because of the scale at which coastal processes operate. There are some emerging examples of sustainable urban planting, the use of GI, and structural modifications to the finish of coastal structures that help the biodiversity, but not to the significant effect required to emulate a naturally functioning coastline.

Grants and payment mechanism:

Requires more research in the coastal context

Community led response:

Needs to be informed by ongoing research, but community co-operation will be essential to the integrity of designated sites

Development:

Sustainable development requires more research in the coastal context. As does coastal GI.

Summary

The geographical scale, and the scale of the problems on the coast, means that strategic level influence is disproportionately critical to designated site integrity. Coastal squeeze, and coastal erosion typify the expansive scale of the problem and the headline news of homes falling into the sea from the clifftops illustrates the scale of the socio-environmental disconnect. The need to re-zone the coast in relation to human use and expectations of the coastal strip is not impossible and will require exceptionally innovative financing to move it towards acceptability. The need to maintain a de minimis size of dune or shingle bar for flood defence purposes can be at odds with the desire for natural processes

Freshwater habitats

3110	Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)
3130	Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*
3140	Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.
3150	Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation
3160	Natural dystrophic lakes and ponds
3170	* Mediterranean temporary ponds
3260	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

Note: * indicates Priority feature

Promote and does not prejudice action to achieve and maintain favourable condition

Guidance and tools:

The HRA guidance is set up to deal with impacts on SAC watercourses, and is very robust. This is backed up by all the hydroecological information to support achievement of WFD status. There is also a wealth of river management and river restoration guidance. Inclusion of river and wetland restoration into the family of NFM interventions strengthens the integration of nature conservation aims into flood risk management solutions. Fisheries management, especially in relation to salmonids, and more recently the focus on ensuring eel passage through structures, provide further examples of good practice. The Defra Appraisal Guidance for FCERM (2010) which is to be refreshed as part of the national FCERM strategy already contains numerous references to the importance of having an environmentally preferred option shortlisted during scheme level appraisal of the alternative solutions. Applying a natural capital approach will strengthen the case.

There are important new tools being trialled to both identify the potential for biodiversity net gain and improved ecosystem services, prior to scheme design, and to objectively measure the improvements once the scheme is operational.

Plans and strategies:

Again well developed hierarchy of plans and strategies, with accompanying SEAs, WFDAs and HRAs. These have been discussed in section 4.3.1. In many instances there is an additional layer of strategy between SMP or CFMP and schemes. This approach is promoted when there are a series of linked flooding or coastal erosion problems which would benefit from a more efficient combined investigation into their solution.

The suite of information relating to RBMP planning and monitoring should also inform the FCERM response.

This would or should all work to the benefit of European sites. The assumption is that improved management of the whole water environment will improve European sites because of the high degree of connectivity.

Plans and strategies are essential in order to protect freshwater European sites in situ from tidal flooding.

Frameworks:

This area is being better developed; but would benefit from greater definition of what frameworks mean in relation to the freshwater environment. For example, what would a framework for WWNP involve and how would it relate to more heavily engineered solutions? In many cases NFM solutions are being developed alongside the identification and assessment of engineered options, rather than being integrated into one project. This relates to the degrees of uncertainty associated with the former, and how it can be catered for within the current frameworks for design and construction services.

The current status probably doesn't increase the risk to European sites.

Co-ordinated plans:

Plans with the water industry and other RMAs could be better co-ordinated, particularly in relation to surface water flooding. This would benefit flood regimes, the management of drought, and accompanying pollution risk associated with these conditions. Co-ordinated planning would bring significant further benefit to European sites within remit of the RMAs.

In terms of other pressures, for example air quality, or disturbance, the links will probably be very site specific and habitat dependant.

Create buffer zones, sub-optimal habitat, sustainable hydrology and water quality

Habitat:

Habitat is well understood and monitored for WFD compliance. There are many decades worth of fisheries, water quality and macroinvertebrate monitoring. There are also river habitat surveys, river corridor surveys and now net gain metric surveys. The interaction between ecology, hydrology and geomorphology is well understood, and usually incorporated into scheme design. It is unlikely that the draft national FCERM strategy will result in a return to unsustainable river management practices, and the draining of wetlands.

Sustainable growth:

Wise use of water is at the heart of all sustainability plans.

Coastal squeeze:

Only an issue for coastal freshwater habitat that would be at risk from managed realignment. This is a conundrum that hasn't really been solved.

Floods:

Flooding is part of the essential natural cycle that has been disrupted by flood risk management. Initiatives such as Making Space for Water have sought to address this. The draft national FCERM strategy is seeking to address this component in the most holistic and sustainable way. Flood defences are essential if the management objective for a European site is to protect a freshwater resource from tidal flooding. This applies also to SAC and Ramsar features.

Droughts:

A common failing of flood risk management schemes of the past is a failure to consider the morphology of the water course and how it will respond to drought. Thanks in part to WFD targets that is less of an issue for recent schemes.

Climate change resilience:

Climate change resilience is going to be increasingly difficult to achieve. It is unlikely that flood risk will increase in a linear fashion with rising temperature. Achieving climate change resilience within the aquatic environment will be the most significant challenge that the draft national FCERM strategy will have to face, and could result in future risk to European sites. Should this prove to be the case then many more strategic and scheme level HRAs might be forced to evoke IROPI, if the environmentally preferred solution in so financially non-viable.

SUDS:

SUDS definitely have a place to attenuate the flood peak and improve water quality

NFM:

Thanks to the Defra 25YEP NFM needs to be a part of flood risk management solutions, with all the attendant ecosystem service benefits (as researched and summarised in the WWNP Evidence Directory), if viable. Uncertainties mean that at present NFM is being run alongside schemes however.

Alternative finance actions and alternative delivery routes

Very much a focus of RMAs to work in partnership and to secure external funding.

Biodiversity net gain:

The development of net gain metric surveys will inform net gain directly.

Grants and payment mechanism:

Currently well established grant mechanism, with the potential to join up better with revised agricultural payment systems

Community led response:

Communities are already participating in the Defra £15m NFM programme. Communities also operate simple flood defence systems such as gates.

Development:

The development in the floodplain or in areas that will increase flood risk via runoff, and the lack of capacity of CSOs, is always an area of friction. However there are now SUDS in many urban locations.

Temperate heath and scrub

4010	Northern Atlantic wet heaths with *Erica tetralix*
4020	* Temperate Atlantic wet heaths with *Erica ciliaris* and *Erica tetralix*
4030	European dry heaths
4040	* Dry Atlantic coastal heaths with *Erica vagans*
4060	Alpine and Boreal heaths
4080	Sub-Arctic *Salix* spp. scrub

Note: * indicates Priority feature

Promote and does not prejudice action to achieve and maintain favourable condition

Guidance and tools:

There isn't anything that specifically needs to be incorporated in the higher level guidance and tools beyond the generic requirement to avoid damage to the integrity of designated sites, and the desirability to create habitat outside of designated sites particularly in locations that will add resilience to the site processes and ecology.

Plans and strategies:

Heathlands have been historically vulnerable to forestry and agriculture. In many regions these effects can be reversed but it could take some inventive landscape scale planning, such as the reinstatement of strips of heathland to create buffer zones alongside streams or along hill slope contours, to create catchment roughness and encourage infiltration.

Frameworks:

Frameworks to encourage terrestrial habitats as part of the NFM solution would need to be developed. At present restoration focus, and the current outcome measures, tends to focus on wetland and aquatic habitat restoration.

Co-ordinated plans:

Particularly with forestry and agricultural plans

Create buffer zones, sub-optimal habitat, sustainable hydrology and water quality

Habitat:

This habitat is vulnerable to eutrophication. Despite this it would be helpful to create buffer zones around extant habitat of high quality. Edge effect is potentially noticeable, however further research will inform whether creating corridors of heathland will confer greater ecological resilience.

Sustainable growth:

Heathlands are popular for recreation.

Coastal squeeze:

Applicable in a small subset of heathlands, concerned with the rollback of maritime habitats onto terrestrial habitats of value. Coastal erosion is also affecting some coastal sites

Floods:

Possible role in NFM. Would be lost to inappropriate tree planting

Droughts:

Dry heath is naturally drought resistant. Wet heath would provide a similar role to wetlands

Climate change resilience:

Part of the mosaic, but potentially a lesser player than some others. However if it is the most typical habitat for the location and climate then restoration and re-instatement of this habitat type should be encouraged.

SUDS:

This habitat would make good SUDS introduction

NFM:

Opportunities for heathland reinstatement to create buffer zones. This habitat would be damaged by tree planting.

Alternative finance actions and alternative delivery routes

Biodiversity net gain:

Ability to recreate heathlands, especially species poor heath, makes this a suitable habitat

Grants and payment mechanism: Generic applicability

Community led response:

Generic applicability

Development:

Generic applicability

Sclerophyllous scrub (matorral)

5110	Stable xerothermophilous formations with *Buxus sempervirens* on rock slopes (*Berberidion* p.p.)
5130	*Juniperus communis* formations on heaths or calcareous grasslands

Note: * indicates Priority feature

Summary:

Could be damaged by inappropriately sited tree planting for NFM. Creating connectivity and buffer zones with appropriate tree planting for NFM could be beneficial

Natural and semi-natural grassland formations

6130	*Calaminarian* grasslands of the *Violetalia calaminariae*
6150	Siliceous alpine and boreal grasslands
6210	Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*), (note that this includes the priority feature "important orchid rich sites").
6230	* Species-rich *Nardus* grassland, on siliceous substrates in mountain areas (and submountain areas in continental Europe)
6410	*Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)
6430	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels
6510	Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*)
6520	Mountain hay meadows

Note: * indicates Priority feature

Promote and does not prejudice action to achieve and maintain favourable condition

Guidance and tools:

There isn't much guidance in relation to grasslands and flood risk management. Very compacted grasslands in the catchment can contribute significantly to runoff. Whilst this doesn't apply to the designated sites, it could be a reason to implement soil management improvements in buffer zones, and attempt to encourage the desired grassland habitat. There is always a threat of genetic contamination if bought in seed is used, so seed should be harvested locally.

Plans and strategies:

Plans need to take greater account of soil vulnerability, as this data already exists, and plan WWNP with the agricultural community accordingly.

Frameworks:

A framework is essential especially if this measure is reliant upon farmer payment, which is always complex

Co-ordinated plans:

Co-ordinated plans are less of an issue

Create buffer zones, sub-optimal habitat, sustainable hydrology and water quality

Habitat:

WWNP can be targeted to create buffer zones, and also to facilitate the spread of any mobile species as range adjusts in relation to climate change. For example the fritillary butterfly is doesn't disperse far, so would require a corridor.

Sustainable growth:

The significance arises from the relative ease with which species rich grasslands can be created, and moderate soil fertility issues overcome, and more so species poor grasslands whose productivity makes them attractive to SPA bird assemblages.

Coastal squeeze:

Managed realignment could be an issue for grasslands to the landward of flood defence assets

Floods:

The management of traditional floodplain hay meadows is an issue that could impact upon flood risk management. The management of the Somerset Levels and Moors and other washland systems highlights the challenges of balancing, as opposed to integrating, conflicting demands of FCRM and wetland grassland management

Droughts:

Probably not a significant issue in this context

Climate change resilience:

Ideally future FCRM plans should consider how to improve resilience of vulnerable grassland systems

SUDS:

SUDS can create islands of grassland habitat, but this is likely to be of no significance in relation to designated site integrity

NFM:

Tree planting would be deleterious, whilst soil husbandry and lack of compaction, with attendant increase in infiltration, would be a positive thing

Alternative finance actions and alternative delivery routes

Alternative finance to switch to traditionally managed meadow and pasture system, bringing benefit to wildlife and improving infiltration would require further change to agri-payments, of continued funding for WWNP, though there are grants available.

Biodiversity net gain:

Could be significant

Grants and payment mechanism:

See above

Community led response:

Likely to be favourable, except in wetland systems where wet grassland is deemed to reduce flood storage capacity in relation to washland function

Development:

SUDS in particular can be used to extend the network of grasslands. Grasslands that have a dual function as designed washland and flood storage can for part of a network of green infrastructure.

Raised bogs and mires and fens

7110 * Active raised bogs

7120	Degraded raised bogs still capable of natural regeneration
7130	* Blanket bogs
7140	Transition mires and quaking bogs
7150	Depressions on peat substrates of the *Rhynchosporion*
7210	* Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*
7220	* Petrifying springs with tufa formation (*Cratoneurion*)
7230	Alkaline fens
7240	* Alpine pioneer formations of the *Caricion bicoloris-atrofuscae*

Note: * indicates Priority feature

Promote and does not prejudice action to achieve and maintain favourable condition

Guidance and tools:

Thanks to some of the pioneer wetland restoration projects of recent decades, some of which are showcased in the Defra 25YEP, the science and practice of restoration is better understood. This understanding will improve further thanks to monitoring of the Defra £15m programme when those projects undertaking upland NFM management activities report in 2021, alongside the NERC funded research.

Also important is the margins or buffer zones; it is likely that additional guidance and tools are required to aid practitioners to be able to extend the techniques learnt in the upland and lowland national parks and designated sites into the wider mosaic of the countryside. The importance of the transitional habitats are understood, but less so the value of networks. This includes the potential of offline and online storage areas to benefit from a hydrological regime that enables wetland ecological processes to establish. Or the same at an even smaller scale behind leaky woody dams.

Plans and strategies:

Plans have to provide sufficiently robust policies to facilitate change on established agricultural and afforested sites outside of the EUROPEAN network to support restoration of exceptionally degraded sites and riparian fragments.

Frameworks:

As for plans and strategies, links with the WWNP Evidence Directory especially the science informing the benefits wheel.

Co-ordinated plans:

Coordination with the water supply industry is already influencing wetland restoration. Wetlands as purification is understood and could be more widely applied.

Create buffer zones, sub-optimal habitat, sustainable hydrology and water quality

Habitat

See above;

Sustainable growth:

Part of water purification and SUDS

Coastal squeeze:

Dealt with under coastal habitats; the ecotone from saline habitats transition to freshwater has been lost in the majority of places. It needs to feature in all FCRM schemes, even as small pockets like the Thames Estuary Edges, and not just be restricted to the large managed realignment projects.

Floods:

Floods are beneficial to this habitat, the WWNP Evidence Directory explains the science

Droughts:

Also dealt with in the WWNP benefits wheel; the case study material about the protective effect of a healthy wetland storing water for slow release during drought is described. Further research is needed on the transpiration losses associated with woodland planting as part of NFM.

Climate change resilience:

Wetlands form an essential part of climate change resilience. The question is also the extent to which a network of small imperfect off site wetlands is capable of benefitting the designated wetlands

SUDS:

Could be an essential provider of wetland habitat in a series of small pockets, although note that many urban SUDS and GI comprises xeric species that can withstand long periods of drought

NFM;

Definitely playing a big part in extending wetland creation outside of the designated sites. We need to better understand whether there are ecological benefits at the meta-scale of a scattered network of small wetlands; these are likely to benefit several bird species. Strategic research into beaver re-introduction could also help to inform the answers.

Alternative finance actions and alternative delivery routes

Likely to be achievable given our experience already of partnership projects to retain, restore and recreate wetland function

Biodiversity net gain:

Wetland creation is a possible beneficiary because of the multiple benefits, especially SUDS, in a development context

Grants and payment mechanism:

If a natural capital valuation based system becomes more widely applicable then wetlands would benefit especially if designed for multiple purposes, especially purification of diffuse pollution

Community led response:

Wetlands aren’t immediately amenable to recreation, although the bird species they support are a bonus. Some local bad press expressing fear of mosquitoes, stagnation etc. may become apparent

Development:

SUDS should definitely enable win:win outcomes. Development is a risk; development in the floodplain has long been an issue for the EA and predecessors, requiring additional flood risk management and removing space for water.

Rocky habitats and caves

8110	Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*)
8120	Calcareous and calcshist screes of the montane to alpine levels (*Thlaspietea rotundifolii*)
8210	Calcareous rocky slopes with chasmophytic vegetation
8220	Siliceous rocky slopes with chasmophytic vegetation
8240	* Limestone pavements
8310	Caves not open to the public
8330	Submerged or partially submerged sea caves

Note: * indicates Priority feature

These habitats are unlikely to be affected by the plan.

Forests

9120	Atlantic acidophilous beech forests with Ilex and sometimes also *Taxus* in the shrublayer (*Quercion robori-petraeae* or *Ilici-Fagenion*)
9130	*Asperulo-Fagetum* beech forests
9160	Sub-Atlantic and medio-European oak or oak-hornbeam forests of the *Carpinion betuli*
9180	* *Tilio-Acerion* forests of slopes, screes and ravines
9190	Old acidophilous oak woods with *Quercus robur* on sandy plains
91A0	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
91D0	* Bog woodland
91E0	* Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)
91J0	* *Taxus baccata* woods of the British Isles

Note: * indicates Priority feature

Promote and does not prejudice action to achieve and maintain favourable condition

Unlikely to be negatively affected at the plan level, except if woodland planting for NFM acts as a corridor for tree disease. Extensive woodland planting for NFM will encourage connectivity for the fauna of woodlands, but not necessarily the flora unless there is a viable seed bank. The selection of sites for tree planting for flood defence benefit should include the historic environment dimension to look to reinstate woodland that has been lost.

Guidance and tools:

See above in relation to informing the criteria for the best site selection for tree planting.

Plans and strategies:

Must include NFM and the multiple ecosystem services that woodlands typically provide.

Frameworks:

Should tie together guidance, tools and plans

Co-ordinated plans:

Vital to ensure that the right tree species are selected. And that new NFM woodland location is informed by the multiple ecosystem services that woodlands can provide, to relieve the pressure experienced by designated ancient woodlands. Hedgerows as connectors to ancient woodlands should not be neglected, since these too can be used in NFM.

Create buffer zones, sub-optimal habitat, sustainable hydrology and water quality

Habitat:

See above.

Sustainable growth:

The new woodlands can deliver ecosystem benefits taking the pressure off designated sites

Coastal squeeze:

n/a

Floods:

The role of NFM tree planting and hedgerow re-instatement

Droughts:

Needs further investigation, especially in relation to carr woodland and riparian trees

Climate change resilience:

Trees and the relationship with greenhouse gases is well known. The change in range of species with climate change should also start to form part of our strategic planning for woodlands

SUDS:

Woodland currently not a component of SUDS so requires further investigation

NFM:

Tree planting in the right places could provide a significant benefit to designated sites

Alternative finance actions and alternative delivery routes

The commercial value of woodlands for extractive purposes suggests a correlation. The wellbeing and health benefits will also aid woodland creation, and this is well evidenced in

the Defra 25 YEP. FCERM plans need to ensure that this theme is given sufficient prominence otherwise the opportunity to support designated woodland sites will be missed

Biodiversity net gain:

Would need to be considered,

Grants and payment mechanism:

Are already in place for some woodland and widen in the future

Community led response:

Usually favourably received

Development:

The NFM link makes the development of woodlands an obvious win: win situation.

Woodland creation and tree planting should not be at the expense of other better placed habitats

A2.9. Summary of the appropriate assessment

Linking the measures to the effects comprised a qualitative exercise. We have not tested whether this output is repeatable or reproducible. The link is that we considered whether each measure would be likely to ultimately direct or influence the application of one or more interventions from box A2.1. Following consultation the information presented in Table A2.3 and 2.4 may be subject to changes.

To try and summarise the analysis the following tables were produced for two scenarios:

- That the draft strategy implementation is consistently implemented with the requirements of European sites as part of the core objectives
- The converse scenario.

We set out our conclusions based on these scenarios in tables A2.3 and A2.4. Whilst the first scenario is more probable, given the stated intentions of the draft strategy, for the purposes of HRA we have adopted a precautionary approach. It is therefore the second of these scenarios (table A2.4) that informs our conclusions for appropriate assessment. The key to the symbols used is shown in table A2.2.

Tables A2.2 (a) and (b): Key for interpreting interactions between the measures and the Annex 1 habitats.

(a)	Highly certain	Moderately certain	Uncertain
Highly positive	✓✓✓✓	✓✓✓	✓✓
Moderately positive	✓✓✓	✓✓	✓
Slightly positive	✓✓	✓	0
neutral	000	00	0

(b)	Highly certain	Moderately certain	Uncertain
Highly negative	XXXX	XXX	XX
Moderately negative	XXX	XX	X
Slightly negative	XX	X	0
neutral	000	00	0

It should be noted that wherever the symbol 'X' is used this indicates that we consider a measure has the potential for negative effects for a habitat type. Where a single '0' is used, our conclusion is that effects are at least neutral but that this is uncertain.

n/a is entered for all measures that were screened out before appropriate assessment.

Table A2.3: Potential effects of the draft strategy upon habitat types in the event it is consistently implemented with the requirements of European sites taken into account as part of the core objectives

habitat	Marine, coastal and halophytic habitats	Coastal sand dunes and continental	Freshwater habitats	Temperate heath and scrub	Sclerophyllous scrub (matorral)	Natural and semi-natural grassland formations	Raised bogs and mires and fens	Rocky habitats and caves	Forests
ambition									
1	Ambition 1: Climate resilient places								
objective									
1.1	Between now and 2050 the nation will be resilient to future flood and coastal risks. Over the next year the Environment Agency will work with partners to explore and develop the concept of standards for flood and coastal resilience								
measure									
1.1.1	✓✓✓	✓✓✓	✓✓✓	✓✓✓	0	✓✓✓	✓✓✓	000	✓✓✓
1.1.2	✓✓✓	✓✓✓	✓✓✓	✓✓✓	0	✓✓✓	✓✓✓	000	✓✓✓
objective									
1.2	**Between now and 2050 risk management authorities will help places plan and adapt to flooding and coastal change across a range of climate futures**								
measure									
1.2.1	✓✓	✓✓	✓✓	✓✓	0	✓✓	✓✓	000	✓✓
1.2.2	✓✓✓	✓✓✓	✓✓✓	✓✓✓	0	✓✓✓	✓✓✓	000	✓

habitat	Marine, coastal and halophytic habitats	Coastal sand dunes and continental	Freshwater habitats	Temperate heath and scrub	Sclerophyllous scrub (matorral)	Natural and semi-natural grassland formations	Raised bogs and mires and fens	Rocky habitats and caves	Forests
1.2.3	✓✓	✓✓	✓✓	✓✓	0	✓✓	✓✓	000	✓
1.2.4	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1.2.5	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	000	✓✓✓
objective									
1.3	**Between now and 2030 all those involved in managing water will embrace and embed adaptive approaches to enhance the resilience of our environment to future flooding and drought**								
measure									
1.3.1	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	000	✓✓✓✓
1.3.2	✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓✓	✓✓✓✓	000	✓✓✓
1.3.3	✓✓✓	✓✓✓	✓✓✓✓	0	0	0	✓✓✓	000	0
objective									
1.4	**Between now and 2030 risk management authorities enhance the natural, built and historic environments so we leave it in a better state for the next generation**								
measure									
1.4.1	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	000	✓✓✓✓
1.4.2	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	000	✓✓✓✓
1.4.3	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓	✓✓	✓✓	✓✓✓✓	000	✓✓
objective									
1.5	**Between now and 2030 risk management authorities will use funding and financing from new sources to invest in making the nation resilient to flooding and coastal change**								
measure									
1.5.1	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	000	✓✓✓
1.5.2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
ambition									
2	**Today's growth and infrastructure – resilient to tomorrow's climate**								
objective									

habitat	Marine, coastal and halophytic habitats	Coastal sand dunes and continental	Freshwater habitats	Temperate heath and scrub	Sclerophyllous scrub (matorral)	Natural and semi-natural grassland formations	Raised bogs and mires and fens	Rocky habitats and caves	Forests
2.1	**Between now and 2030 all new development will contribute to achieving place based resilience to flooding and coastal change**								
measure									
2.1.1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2.1.2	✓✓	✓	✓✓	0	0	0	✓	000	✓
objective									
2.2	**Between now and 2030 all new development will seek to support environmental net gain in local places**								
measure									
2.2.1	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	000	✓✓✓✓
2.2.2	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	000	✓✓✓✓
objective									
2.3	**Between now and 2030 all risk management authorities will contribute positively to local economic regeneration and sustainable growth through their investments in flooding and coastal change projects**								
measure									
2.3.1	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	000	✓✓✓
objective									
2.4	**Between now and 2050 places affected by flooding and coastal change will be 'built back better' and in better places**								
measure									
2.4.1	✓	✓	✓	0	0	0	0	000	0
2.4.2	✓✓✓✓	✓✓✓✓	0	0	0	0	0	000	0
objective									
2.5	**Between now and 2030 all flooding and coastal infrastructure owners will understand the responsibilities they have to support resilience standards for places**								
measure									
2.5.1	✓✓	✓✓	✓✓	0	0	0	0	000	✓
2.5.2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2.5.3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
objective									

habitat	Marine, coastal and halophytic habitats	Coastal sand dunes and continental	Freshwater habitats	Temperate heath and scrub	Sclerophyllous scrub (matorral)	Natural and semi-natural grassland formations	Raised bogs and mires and fens	Rocky habitats and caves	Forests
2.6	**Between now and 2050 the Environment Agency and risk management authorities will work with infrastructure providers to ensure all infrastructure investment is resilient to future flooding and coastal change**								
measure									
2.6.1	✓✓	✓✓	✓✓	0	0	0	0	000	0
2.6.2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
ambition									
3	**A nation of climate champions, able to adapt to flooding and coastal change through innovation**								
objective									
3.1	**Between now and 2030 young people at 16 should understand the impact of flooding and coastal change, but also recognise the potential solutions for their place, and opportunities for career development**								
measure									
3.1.1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
objective									
3.2	**A nation of climate champions, able to adapt to flooding and coastal change through innovation**								
measure									
3.2.1	0	0	0	0	0	0	0	000	0
3.2.2	0	0	0	0	0	0	0	000	0
objective									
3.3	**Between now and 2030 people will receive a consistent and coordinated level of support from all those involved in recovery from flooding and coastal change**								
measure									
3.3.1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
3.3.2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
3.3.3	✓	✓	✓	✓	✓	✓X	✓	000	0
objective									

habitat	Marine, coastal and halophytic habitats	Coastal sand dunes and continental	Freshwater habitats	Temperate heath and scrub	Sclerophyllous scrub (matorral)	Natural and semi-natural grassland formations	Raised bogs and mires and fens	Rocky habitats and caves	Forests
3.4	**Between now and 2030 the nation will be recognised as world leader in managing flooding and coastal change, as well as developing and attracting talent to create resilient places**								
measure									
3.4.1	✓	0	✓	0	0	0	0	000	0
3.4.2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
3.4.3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table 4.3: Potential effects of the draft strategy upon habitat types in the event that the requirements of European sites are considered only at future HRA (if applicable) or at an equivalent stage

habitat	Marine, coastal and halophytic habitats	Coastal sand dunes and continental	Freshwater habitats	Temperate heath and scrub	Sclerophyllous scrub (matorral)	Natural and semi-natural grassland formations	Raised bogs and mires and fens	Rocky habitats and caves	Forests
ambition									
1	Ambition 1: Climate resilient places								
objective									
1.1	Between now and 2050 the nation will be resilient to future flood and coastal risks. Over the next year the Environment Agency will work with partners to explore and develop the concept of standards for flood and coastal resilience								
measure									
1.1.1	0	0	0	0	0	0	0	000	0
1.1.2	0	0	0	0	0	0	0	000	0
objective									
1.2	**Between now and 2050 risk management authorities will help places plan and adapt to flooding and coastal change across a range of climate futures**								
measure									

habitat	Marine, coastal and halophytic habitats	Coastal sand dunes and continental	Freshwater habitats	Temperate heath and scrub	Sclerophyllous scrub (matorral)	Natural and semi-natural grassland formations	Raised bogs and mires and fens	Rocky habitats and caves	Forests
1.2.1	0	0	0	0	0	0	0	000	0
1.2.2	00	00	00	00	00	00	00	000	00
1.2.3	✓X	✓X	✓X	0	0	0	0	000	0
1.2.4	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1.2.5	✓X	✓X	✓X	✓0	✓0	✓0	0	000	0
objective									
1.3	**Between now and 2030 all those involved in managing water will embrace and embed adaptive approaches to enhance the resilience of our environment to future flooding and drought**								
measure									
1.3.1	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓X	✓✓X	✓✓XX	✓✓XX	000	✓✓✓✓
1.3.2	✓	✓	✓✓✓	✓✓	✓✓	✓✓✓✓	✓✓✓✓	000	✓✓✓
1.3.3	✓✓✓	✓✓✓	✓✓✓✓	0	0	0	✓✓✓	000	0
objective									
1.4	**Between now and 2030 risk management authorities enhance the natural, built and historic environments so we leave it in a better state for the next generation**								
measure									
1.4.1	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	000	✓✓✓✓
1.4.2	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	000	✓✓✓✓
1.4.3	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓	✓✓	✓✓	✓✓✓✓	000	✓✓
objective									
1.5	**Between now and 2030 risk management authorities will use funding and financing from new sources to invest in making the nation resilient to flooding and coastal change**								
measure									
1.5.1	0	0	0	0	0	0	0	000	0
1.5.2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
ambition									
2	**Today's growth and infrastructure – resilient to tomorrow's climate**								

habitat	Marine, coastal and halophytic habitats	Coastal sand dunes and continental	Freshwater habitats	Temperate heath and scrub	Sclerophyllous scrub (matorral)	Natural and semi-natural grassland formations	Raised bogs and mires and fens	Rocky habitats and caves	Forests
objective									
2.1	**Between now and 2030 all new development will contribute to achieving place based resilience to flooding and coastal change**								
measure									
2.1.1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2.1.2	0	0	0	0	0	0	0	000	0
objective									
2.2	**Between now and 2030 all new development will seek to support environmental net gain in local places**								
measure									
2.2.1	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	000	✓✓✓✓
2.2.2	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	000	✓✓✓✓
objective									
2.3	**Between now and 2030 all risk management authorities will contribute positively to local economic regeneration and sustainable growth through their investments in flooding and coastal change projects**								
measure									
2.3.1	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	000	✓✓
objective									
2.4	**Between now and 2050 places affected by flooding and coastal change will be 'built back better' and in better places**								
measure									
2.4.1	0	0	0	0	0	0	0	000	0
2.4.2	✓✓X	✓✓X	0	0	0	0	0	000	0
objective									
2.5	**Between now and 2030 all flooding and coastal infrastructure owners will understand the responsibilities they have to support resilience standards for places**								
measure									
2.5.1	0	0	0	0	0	0	0	000	0
2.5.2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2.5.3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

habitat	Marine, coastal and halophytic habitats	Coastal sand dunes and continental	Freshwater habitats	Temperate heath and scrub	Sclerophyllous scrub (matorral)	Natural and semi-natural grassland formations	Raised bogs and mires and fens	Rocky habitats and caves	Forests
objective									
2.6	**Between now and 2050 the Environment Agency and risk management authorities will work with infrastructure providers to ensure all infrastructure investment is resilient to future flooding and coastal change**								
measure									
2.6.1	X	X	X	0	0	0	0	000	0
2.6.2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
ambition									
3	**A nation of climate champions, able to adapt to flooding and coastal change through innovation**								
objective									
3.1	**Between now and 2030 young people at 16 should understand the impact of flooding and coastal change, but also recognise the potential solutions for their place, and opportunities for career development**								
measure									
3.1.1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
objective									
3.2	**A nation of climate champions, able to adapt to flooding and coastal change through innovation**								
measure									
3.2.1	0	0	0	0	0	0	0	000	0
3.2.2	0	0	0	0	0	0	0	000	0
objective									
3.3	**Between now and 2030 people will receive a consistent and coordinated level of support from all those involved in recovery from flooding and coastal change**								
measure									
3.3.1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
3.3.2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
3.3.3	XX	XX	XX	0	0	XX	0	000	0

habitat	Marine, coastal and halophytic habitats	Coastal sand dunes and continental	Freshwater habitats	Temperate heath and scrub	Sclerophyllous scrub (matorral)	Natural and semi-natural grassland formations	Raised bogs and mires and fens	Rocky habitats and caves	Forests
objective									
3.4	**Between now and 2030 the nation will be recognised as world leader in managing flooding and coastal change, as well as developing and attracting talent to create resilient places**								
measure									
3.4.1	0	0	0	0	0	0	0	000	0
3.4.2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
3.4.3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

As set out in table 4.3, the worst case scenario is that the draft strategy could give rise to some possible adverse effects upon Annex 1 habitat types in relation to 6 measures (measures 1.2.3, 1.2.5, 1.3.1, 2.4.2, 2.6.1 and 3.3.3).

Uncertainty exists as to whether a measure is at least neutral in terms of its effects upon Annex 1 habitats in 11 cases (measures 1.1.1, 1.1.2, 1.2.1, 1.3.3, 1.5.1, 2.1.2, 2.4.1, 2.5.1, 3.2.1, 3.2.2 and 3.4.1). Since we must adopt a precautionary approach, and be certain (with no reasonable scientific doubt remaining) before ruling out the possibility of adverse effects, we consider these measures must also be treated as potentially giving rise to adverse effects upon Annex 1 habitat types.

A2.10. SPAs, Ramsar Sites, annex 2 species and compensatory habitat

The assessment of the annex 1 habitats can also be applied to the other European site designations and protected species. Appendix 3 contains more detail on how these other designations were approached.

A preliminary review was undertaken of the habitat requirements of all the bird species for which SPAs have been designated. All habitats were screened into the assessment, not least because birds are extremely mobile and move in and out of the designated sites, including onto arable farmland. So the assessment for birds follows all the annex 1 habitats in the previous section, with the caveat that bird populations are even more likely to benefit from conservation management outside of the European sites.

Of the annex 2 species, again listed in appendix 3, all species except two specialised ancient woodland species were screened into the assessment. They all require the habitats that are part of the appropriate assessment.

As they are wetlands, Ramsar sites by definition fall into all of the wetland and aquatic categories in the appropriate assessment. All were screened into the appropriate

assessment, but we have not sought to distinguish their requirements from those of the relevant annex 1 habitats.

And compensatory habitats are also annex 1 habitat types, and so the same considerations apply.

A2.11 Avoidance and mitigation of impacts

It is not possible at this national scale to provide specific proposals for avoidance, reduction or mitigation of the draft strategy's impacts, since the nature of any mitigation necessary will depend on the type of impacts and the conservation features of a site, or sites affected. It is therefore not possible at this national level to specify anything other than generic mitigation approaches, but it is critical that these approaches, and any site-specific mitigation necessary, be tailored to the impacts that may arise from lower-tier plans, strategies and projects.

The Habitats Regulations Assessment has adopted a different approach, and worked through all 77 of the Annex 1 habitats, summarising the generic potential for negative and positive effects. The aim is to see if there are any habitats at risk from irreconcilable demands.

The draft strategy doesn't have the answers some of the critical issues on the coast, such as coastal squeeze and loss of freshwater habitat to managed realignment, or those in relation to river hydrological regimes with climate change. These remain the two highest risks to designated site integrity. In all other instances direct damage can be avoided.

There needs to be more guidance on avoidance of indirect damage.

NFM is a good thing, apart from tree planting on open habitats. Further guidance is required on how to site NFM interventions that will maximise the ecosystem services. In the case of designated sites this pertains to habitat creation outside of the boundary that confers resilience to the designated site.

Plans, strategies and frameworks must put the needs of designated sites, which include the species that they support, as a primary objective. And the outcome must be to confer resilience to climate change for the designated site and its species. If this does not happen then the emphasis will remain on assessing the preferred option in relation to the potential for negative effects. More preferable is to aim to expand the distribution of quality habitats out from the designated sites. Flood risk management solutions can look outside of wetlands in terms of opportunities for strategically placed habitat restoration and (re) creation.

Through the development of the draft strategy, and the lower-tier strategies and plans that will arise as a result, the draft strategy has required that the consideration of the principles of sustainable development are incorporated into the draft strategy document, including the protection of important habitats and species. These aim to provide sufficient guidance to applicants and decision-makers to avoid or mitigate for any potential adverse effects.

Specific draft strategy measures which will help to ensure that the strategy, and all subsequent lower-tier plans, strategies and activities, avoid / reduce / mitigate the adverse impacts on European sites. The draft strategy states that in all instances, flood and coastal risk management should avoid damaging the environment and, wherever possible, work with natural processes and always seek to provide environmental benefit, as required by the Habitats, Birds and Water Framework Directives.

To manage flood and coastal erosion risk effectively, a number of different organisations may have to carry out a wide range of tasks. These tasks require careful design and assessment so that the right options are selected and to make sure that they are

sustainable and implemented in the right way. As a result, it is essential that action is planned effectively, for the long-term, providing a clear picture of what will be done to manage risk and provide multiple benefits, for example, in supporting biodiversity, habitat creation or improving water quality.

A range of measures can be taken to reduce the likelihood of a flood or erosion event causing damage. The use of these measures will depend on local circumstances and it is essential that all options are considered in planning action. Key measures to be taken forward through the strategy include:

Innovative approaches to managing risk may be undertaken alongside more traditional defences. These may be co-ordinated across catchments or along the coast and may include property level protection measures, land management options to slow down the flow of water from the upland parts of a catchment, promoting flood storage or creating inter-tidal habitats to store tidal flows and dissipate wave energy to reduce risks. FCERM systems are interlinked and their development and management should be carried out collaboratively to ensure these links are maintained effectively.

WWNP and NFM has the capacity to introduce positive elements such as connectivity, and more natural hydrological and geomorphological function into the wider landscape, indirectly benefitting designated sites. A principle exception is ancient woodland. Other habitat types such as heathland have a greater natural capacity to recover from historic perturbation. NFM and WWNP can also benefit sites in danger of eutrophication, with some caveats; the science is summarised in the WWNP Evidence Directory. It would be beneficial to understand more about how to appraise location better to inform siting of NFM measures in relation to benefit for designated sites. This includes reducing the natural supply of soil and silt in run-off to watercourses.

River restoration is obviously positive for the environment, and there is already a wealth of information to that effect, especially within the UK River Restoration Centre. We have deliberately avoided replication of this subject area in this HRA, because we would be unable to do the subject matter justice in the space available.

Woodland or tree planting should always avoid open habitat of high nature conservation quality.

Transition zones, also called ecotones, are a vulnerable but essential component of ecosystems that has been largely eradicated for a number of habitat types. Future focus should not only be on the designated site boundary, but also maintaining the quality inside of that line. The future focus must be on allowing habitats space to move and adjust to the myriad pressures that will accompany climate change. It must also ensure that mosaics and viable patch sizes are provided, and that habitats can transition spatially from one type to another. There must be no unnatural bias towards any one seral stage. And that early seral stages retain the right conditions to for colonisation by specialist species rather than ruderal 'weeds'.

Wherever possible, measures will work with natural processes and be based on partnership working with local communities. In doing this, they should build links and use wider sources of alternative funding, for example from agri-environment schemes and with business and industry. Projects should minimise damage to and, where possible improve, the function of the local natural and cultural environment. Obligations set out through the EU Water Framework, Habitats and Birds Directives and other domestic commitments need to be met. The role of FCERM schemes in reducing the impacts of climate change should also be considered, for example in providing new coastal and wetland habitats that may be more resilient to future change.

In cases where the RMA cannot continue to justify or afford continuing maintenance activity, potential options include taking a decision to withdraw maintenance from flood risk management assets that the Environment Agency has previously maintained, and allowing the area to return to its natural state. In some cases this will deliver improved biodiversity and other environmental outcomes.

A suite of guidance and advice will be developed to help those involved in implementing the national and local FCERM strategies. In some instances, for example where it is essential that a nationally consistent approach is adopted, this may take the form of statutory guidance (i.e. there is a legal requirement for risk management authorities to follow the guidance). However, wherever possible it will be provided as non-statutory advice. Provisional list of guidance and advice to include: producing local FCERM strategies; sustainable development and FCERM; Climate change and FCERM; surface water management planning; Shoreline management plan guidance; FCERM project (and strategy) appraisal; the use of natural features and habitats (and the contribution that FCERM can make to them); objectives for water quality, the historic environment and creation of woodland.

Of critical importance to avoiding and mitigating impacts on European sites, is the co-ordinated, catchment-based (and sediment cell / sub-cell in the coastal context) approach advocated by the draft strategy. It is however important that the further down the FCERM planning hierarchy, the greater the level of detail of measures to avoid, reduce and mitigate adverse effects should be, and this should be built upon and refined at each subsequent stage. It is not possible at this national level to specify anything other than generic mitigation approaches, but it is critical that these approaches to be tailored to the individual situations, and discussed and agreed with the appropriate nature conservation body (Natural England, and also NRW or SNH where there are cross-border issues).

The application of the measures is equally applicable to the area within the border of the European site and outside. The provision of habitat in networks for biodiversity and the preservation of the sustainable water cycle, of which flood risk management is a contributory part, is essential. The urgency of climate change underlines this imperative.

A2.11. Relating the appropriate assessment outputs to the European sites

Appendix 3 lists all the European sites and annex 2 species that could possibly be affected by the draft strategy. Only 5 English SPAs are excluded from this list, and 3 Annex 2 species (of ancient woodland).

Appendix 3 Lists of European sites and species

The distribution of all the habitats and species is available in a JNCC spreadsheet http://jncc.defra.gov.uk/page-1461

A3.1 introduction to the species and sites screened into the appropriate assessment

This section A3 simply lists the European species and sites screened into the appropriate assessment by virtue of them relying on or containing the annex 1 habitats assessed in Appendix 2.

Annex 1 habitats are assessed in Appendix 2.

Annex 2 species are assessed in A3.2

SAC sites are listed in A3.3

SPA sites are listed in A3.4

Ramsar sites are listed in A3.5

We have not included compensatory habitat that enjoys the same protection in this appendix

A 3.2 Annex 2 species occurring in England

Geyer's whorl snail *Vertigo geyeri*

Narrow-mouthed whorl snail *Vertigo angustior*

Round-mouthed whorl snail *Vertigo genesii*

Desmoulin's whorl snail *Vertigo moulinsiana*

Freshwater pearl mussel *Margaritifera margaritifera*

Ramshorn snail *Anisus vorticulus*

Southern damselfly *Coenagrion mercuriale*

Marsh fritillary butterfly *Euphrydryas (Eurodyas, Hypodryas) aurinia*

Violet click beetle *Limoniscius violaceus*

Stag beetle *Lucanus cervus*

White-clawed (or Atlantic stream) crayfish *Austropotamobius pallipes*

Fishers estuarine moth *Gortyna borelii lunata*

Sea lamprey *Petromyzon marinus*

Brook lamprey *Lampetra planerii*

River lamprey *Lampetra fluviatilis*

Allis shad *Alosa alosa*

Twaite shad *Allosa fallax*

Atlantic salmon *Salmo salar*

Spined loach *Cobitis taenia*

Bullhead *Cottus gobio*

Great crested newt *Triturus cristatus*

Lesser horseshoe bat *Rhinolophus hipposideros*

Greater horseshoe bat *Rhinolophus ferrumequinum*

Barbastelle *Barbastella barbastellus*

Bechstein's bat *Myotis bechsteinii*

Bottlenose dolphin *Tursiops truncatus*

Harbour porpoise *Phocoena phocoena*

Otter *Lutra lutra*

Grey seal *Halichoerus grypus*

Harbour seal *Phoca vitulina*

Western rustwort *Marsupella profunda*

Slender green feather-moss *Drepanocladus (Hamatocaulis) vernicosus*

Petalwort *Petalophyllum ralfsii*

Killarny fern *Trichomanes speciosum*

Shore dock *Rumex rupestris*

Marsh saxifrage *Saxifraga hirculis*

Creeping marshwort *Apium repens*

Early gentian *Gentianella anglica*

Floating water-plantain *Luronium natans*

Lady's-slipper orchid *Cypripedium calceolus*

Fen orchid *Liparis loeselii*

All the above species are connected with aquatic habitats except for:

- Violet click beetle
- Stag beetle
- Bats, excepting barbastelles which favour wooded river valleys
- Western rustwort
- Early gentian
- Lady's-slipper orchid

All the list of Annex 2 species, with the exception of those that are not connected with aquatic habitats could be affected by FCERM activities, and by the draft strategy. The bats, western rustwort and early gentian are all open grassland species and so could be affected by inappropriately sited NFM tree planting.

A3.3 Sites supporting annex 1 habitats or Annex 2 species that coud be affected by the draft strategy

The following sites all support Annex 1 habitats screened into the HRA and/or Annex 2 species screened into the HRA. Cross-border SACs have been highlighted. However a number of the Annex 2 species are highly mobile too, so the amount of interaction could be greater for those species.

EU Code	Name	Country	Area (ha)	Status
UK0030076	Alde, Ore and Butley Estuaries	E	1632.63	SAC
UK0030142	Arnecliff and Park Hole Woods	E	52.39	SAC
UK0030366	Arun Valley	E	487.48	SAC
UK0014778	Asby Complex	E	3134.01	SAC
UK0030080	Ashdown Forest	E	2715.88	SAC
UK0030082	Aston Rowant	E	124.89	SAC
UK0012734	Avon Gorge Woodlands	E	151.07	SAC
UK0030031	Barnack Hills and Holes	E	23.54	SAC
UK0030085	Baston Fen	E	2.12	SAC
UK0012584	Bath and Bradford-on-Avon Bats	E	106.45	SAC
UK0030086	Beast Cliff - Whitby (Robin Hood`s Bay)	E	265.48	SAC
UK0030087	Bee`s Nest and Green Clay Pits	E	14.7	SAC
UK0012585	Beer Quarry and Caves	E	31	SAC
UK0013104	Benacre to Easton Bavents Lagoons	E	326.7	SAC
UK0017072	Berwickshire and North Northumberland Coast	ES	65226.12	SAC
UK0012740	Birklands and Bilhaugh	E	270.5	SAC
UK0030091	Blackstone Point	E	7.81	SAC
UK0013697	Blean Complex	E	522.89	SAC

EU Code	Name	Country	Area (ha)	Status
UK0030362	Bolton Fell Moss	E	381.13	SAC
UK0012923	Border Mires, Kielder - Butterburn	E	11811.42	SAC
UK0012745	Borrowdale Woodland Complex	E	669.43	SAC
UK0030095	Bracket`s Coppice	E	53.75	SAC
UK0012570	Braunton Burrows	E	1339.74	SAC
UK0019865	Breckland	E	7543.5	SAC
UK0030098	Breney Common and Goss and Tregoss Moors	E	824.05	SAC
UK0030328	Briddlesford Copses	E	165.44	SAC
UK0030396	Bristol Channel Approaches / Dynesfeydd Môr Hafren	EWO	584994	SAC
UK0030100	Brown Moss	E	31.64	SAC
UK0030034	Burnham Beeches	E	383.71	SAC
UK0030103	Butser Hill	E	237.36	SAC
UK0030106	Calf Hill and Cragg Woods	E	34.43	SAC
UK0030107	Cannock Chase	E	1244.2	SAC
UK0012672	Cannock Extension Canal	E	5	SAC
UK0012795	Carrine Common	E	46.44	SAC
UK0012836	Castle Hill	E	114.53	SAC
UK0030115	Cerne and Sydling Downs	E	371.75	SAC
UK0017076	Chesil and the Fleet	E	1634.91	SAC
UK0016373	Chilmark Quarries	E	10.16	SAC
UK0012724	Chilterns Beechwoods	E	1285.86	SAC
UK0030035	Clints Quarry	E	12.56	SAC
UK0012889	Cothill Fen	E	43.39	SAC

EU Code	Name	Country	Area (ha)	Status
UK0013658	Cotswold Beechwoods	E	590.2	SAC
UK0014776	Craven Limestone Complex	E	5326.09	SAC
UK0030349	Crookhill Brick Pit	E	4.64	SAC
UK0030329	Crowdy Marsh	E	92.53	SAC
UK0012679	Culm Grasslands	E	774.21	SAC
UK0030126	Cumbrian Marsh Fritillary Site	E	22.55	SAC
UK0012929	Dartmoor	E	23158.64	SAC
UK0030130	Dawlish Warren	E	58.69	SAC
UK0030131	Dee Estuary/ Aber Dyfrdwy	EW	15805.27	SAC
UK0030036	Denby Grange Colliery Ponds	E	18.34	SAC
UK0030037	Devil`s Dyke	E	7.68	SAC
UK0030133	Dew`s Ponds	E	6.59	SAC
UK0019857	Dorset Heaths	E	5719.54	SAC
UK0030038	Dorset Heaths (Purbeck and Wareham) and Studland Dunes	E	2230.53	SAC
UK0030330	Dover to Kingsdown Cliffs	E	184.54	SAC
UK0012735	Downton Gorge	E	68.88	SAC
UK0013031	Drigg Coast	E	1396	SAC
UK0019833	Duddon Mosses	E	311.42	SAC
UK0030138	Duncton to Bignor Escarpment	E	211.84	SAC
UK0013059	Dungeness	E	3241.43	SAC
UK0030140	Durham Coast	E	389.61	SAC
UK0012602	East Devon Pebblebed Heaths	E	1124.4	SAC
UK0012723	East Hampshire Hangers	E	561.69	SAC

EU Code	Name	Country	Area (ha)	Status
UK0012715	Ebernoe Common	E	234.93	SAC
UK0030039	Eller`s Wood and Sand Dale	E	4.22	SAC
UK0030147	Emer Bog	E	36.76	SAC
UK0012646	Ensor`s Pool	E	3.86	SAC
UK0012720	Epping Forest	E	1630.74	SAC
UK0013690	Essex Estuaries	E	46109.95	SAC
UK0030331	Eversden and Wimpole Woods	E	66.22	SAC
UK0030148	Exmoor and Quantock Oakwoods	E	1894.05	SAC
UK0030040	Exmoor Heaths	E	10670.3	SAC
UK0013112	Fal and Helford	E	6362.83	SAC
UK0030332	Fen Bog	E	26.98	SAC
UK0014782	Fenland	E	619.25	SAC
UK0012912	Fenn`s, Whixall, Bettisfield, Wem and Cadney Mosses	EW	948.84	SAC
UK0030150	Fens Pools	E	20	SAC
UK0013036	Flamborough Head	E	6403.01	SAC
UK0012835	Folkestone to Etchinghill Escarpment	E	187.02	SAC
UK0012550	Fontmell and Melbury Downs	E	263.09	SAC
UK0030151	Ford Moss	E	60.96	SAC
UK0012817	Gang Mine	E	8.26	SAC
UK0012549	Godrevy Head to St Agnes	E	128.39	SAC
UK0030043	Grimsthorpe	E	0.36	SAC
UK0030162	Hackpen Hill	E	35.57	SAC
UK0030369	Haisborough, Hammond and Winterton	EO	146759	SAC

EU Code	Name	Country	Area (ha)	Status
UK0030377	Hamford Water	E	50.34	SAC
UK0030333	Harbottle Moors	E	931.77	SAC
UK0030164	Hartslock Wood	E	34.16	SAC
UK0030165	Hastings Cliffs	E	182.47	SAC
UK0030166	Hatfield Moor	E	1359.45	SAC
UK0030167	Helbeck and Swindale Woods	E	136.9	SAC
UK0030168	Hestercombe House	E	0.06	SAC
UK0012883	Holme Moor and Clean Moor	E	7.43	SAC
UK0030350	Holnest	E	54.8	SAC
UK0030170	Humber Estuary	E	36657.15	SAC
UK0012782	Ingleborough Complex	E	5770.45	SAC
UK0030370	Inner Dowsing, Race Bank and North Ridge	EO	84514	SAC
UK0019861	Isle of Portland to Studland Cliffs	E	1441.75	SAC
UK0016254	Isle of Wight Downs	E	458.08	SAC
UK0013694	Isles of Scilly Complex	E	26848.62	SAC
UK0030044	Kennet and Lambourn Floodplain	E	112.24	SAC
UK0030175	Kennet Valley Alderwoods	E	57.73	SAC
UK0012767	Kingley Vale	E	200.94	SAC
UK0030178	Kirk Deighton	E	3.99	SAC
UK0012960	Lake District High Fells	E	27003.07	SAC
UK0030375	Lands End and Cape Bank	E	30203.63	SAC
UK0012832	Lewes Downs	E	146	SAC
UK0030184	Little Wittenham	E	68.65	SAC

EU Code	Name	Country	Area (ha)	Status
UK0030374	Lizard Point	E	13995.24	SAC
UK0030064	Lower Bostraze and Leswidden	E	2.34	SAC
UK0012844	Lower Derwent Valley	E	921.26	SAC
UK0013114	Lundy	E	3070.95	SAC
UK0012834	Lydden and Temple Ewell Downs	E	62.77	SAC
UK0030372	Lyme Bay and Torbay	E	31246.73	SAC
UK0030198	Lyppard Grange Ponds	E	1.09	SAC
UK0030200	Manchester Mosses	E	170.49	SAC
UK0030371	Margate and Long Sands	E	64876.85	SAC
UK0012658	Mells Valley	E	28.77	SAC
UK0030203	Mendip Limestone Grasslands	E	415.24	SAC
UK0030048	Mendip Woodlands	E	251.39	SAC
UK0012809	Minsmere to Walberswick Heaths and Marshes	E	1256.57	SAC
UK0012804	Mole Gap to Reigate Escarpment	E	892.3	SAC
UK0014774	Moor House - Upper Teesdale	E	38803.22	SAC
UK0013027	Morecambe Bay	E	61538.23	SAC
UK0014777	Morecambe Bay Pavements	E	2607.95	SAC
UK0030051	Mottey Meadows	E	43.69	SAC
UK0030334	Mottisfont Bats	E	196.55	SAC
UK0030335	Naddle Forest	E	362.67	SAC
UK0030222	Nene Washes	E	82.57	SAC
UK0012890	Newham Fen	E	13.46	SAC
UK0030065	Newlyn Downs	E	115.41	SAC

EU Code	Name	Country	Area (ha)	Status
UK0012892	Norfolk Valley Fens	E	616.48	SAC
UK0030225	North Downs Woodlands	E	288.58	SAC
UK0016372	North Meadow and Clattinger Farm	E	105.23	SAC
UK0019838	North Norfolk Coast	E	3148.6	SAC
UK0017097	North Northumberland Dunes	E	1127.27	SAC
UK0014775	North Pennine Dales Meadows	E	481.64	SAC
UK0030033	North Pennine Moors	E	103014.48	SAC
UK0030052	North Somerset and Mendip Bats	E	555.93	SAC
UK0030228	North York Moors	E	44053.29	SAC
UK0012970	Oak Mere	E	68.53	SAC
UK0014780	Orfordness - Shingle Street	E	888	SAC
UK0030053	Orton Pit	E	141.24	SAC
UK0013011	Ouse Washes	E	332.61	SAC
UK0030232	Overstrand Cliffs	E	29.82	SAC
UK0030234	Ox Close	E	141.07	SAC
UK0012845	Oxford Meadows	E	267.4	SAC
UK0030338	Parkgate Down	E	6.92	SAC
UK0030235	Paston Great Barn	E	0.96	SAC
UK0012789	Pasturefields Salt Marsh	E	7.8	SAC
UK0019859	Peak District Dales	E	2336.91	SAC
UK0012559	Penhale Dunes	E	621.95	SAC
UK0030237	Peter`s Pit	E	28.91	SAC
UK0030367	Pevensey Levels	E	3585.38	SAC
UK0012552	Pewsey Downs	E	153	SAC

EU Code	Name	Country	Area (ha)	Status
UK0030238	Phoenix United Mine and Crow`s Nest	E	48.65	SAC
UK0013111	Plymouth Sound and Estuaries	E	6386.95	SAC
UK0030241	Polruan to Polperro	E	210.24	SAC
UK0030054	Portholme	E	91.56	SAC
UK0012553	Prescombe Down	E	75.6	SAC
UK0030242	Quants	E	20.33	SAC
UK0012833	Queendown Warren	E	14.48	SAC
UK0019866	Rex Graham Reserve	E	2.65	SAC
UK0013016	River Avon	E	416.57	SAC
UK0030248	River Axe	E	22.94	SAC
UK0030056	River Camel	E	604.7	SAC
UK0030250	River Clun	E	14.64	SAC
UK0030252	River Dee and Bala Lake/ Afon Dyfrdwy a Llyn Tegid	EW	1271.32	SAC
UK0030253	River Derwent	E	397.87	SAC
UK0030032	River Derwent and Bassenthwaite Lake	E	1793.8	SAC
UK0012643	River Eden	E	2430.39	SAC
UK0030057	River Ehen	E	23.33	SAC
UK0012599	River Itchen	E	303.98	SAC
UK0030256	River Kent	E	88.9	SAC
UK0030257	River Lambourn	E	28.78	SAC
UK0030258	River Mease	E	23.03	SAC
UK0012691	River Tweed	ES	3742.65	SAC
UK0012647	River Wensum	E	306.79	SAC
UK0012642	River Wye/ Afon Gwy	EW	2147.64	SAC
UK0030265	Rixton Clay Pits	E	13.65	SAC

EU Code	Name	Country	Area (ha)	Status
UK0030266	Rochdale Canal	E	24.86	SAC
UK0012826	Rodborough Common	E	109.27	SAC
UK0030267	Roman Wall Loughs	E	683.1	SAC
UK0030058	Rook Clift	E	10.62	SAC
UK0012681	Rooksmoor	E	62.2	SAC
UK0019834	Roudsea Wood and Mosses	E	471.36	SAC
UK0012801	Roydon Common and Dersingham Bog	E	353.45	SAC
UK0012683	Salisbury Plain	E	21465.94	SAC
UK0030270	Saltfleetby-Theddlethorpe Dunes and Gibraltar Point	E	967.65	SAC
UK0013077	Sandwich Bay	E	1136.7	SAC
UK0013076	Sefton Coast	E	4591.59	SAC
UK0013030	Severn Estuary/ Môr Hafren	EW	73714.11	SAC
UK0030376	Shell Flat and Lune Deep	E	10567.49	SAC
UK0030275	Shortheath Common	E	58.53	SAC
UK0019864	Sidmouth to West Bay	E	895.58	SAC
UK0030336	Simonside Hills	E	2082.6	SAC
UK0030337	Singleton and Cocking Tunnels	E	1.88	SAC
UK0030276	Skipwith Common	E	294.6	SAC
UK0017073	Solent and Isle of Wight Lagoons	E	37.93	SAC
UK0030059	Solent Maritime	E	11243.12	SAC
UK0013025	Solway Firth	ES	43676.16	SAC

EU Code	Name	Country	Area (ha)	Status
UK0012749	South Dartmoor Woods	E	2159.06	SAC
UK0030060	South Devon Shore Dock	E	332.12	SAC
UK0012650	South Hams	E	126.87	SAC
UK0030280	South Pennine Moors	E	65024.32	SAC
UK0030310	South Solway Mosses	E	1956.23	SAC
UK0030061	South Wight Maritime	E	19866.12	SAC
UK0030395	Southern North Sea	EO	3695054	SAC
UK0019863	St Albans Head to Durlston Head	E	283.4	SAC
UK0030282	St Austell Clay Pits	E	0.6	SAC
UK0030373	Start Point to Plymouth Sound & Eddystone	E	34089.58	SAC
UK0012741	Staverton Park and The Thicks, Wantisden	E	84.28	SAC
UK0030283	Stodmarsh	E	563.27	SAC
UK0030284	Strensall Common	E	572	SAC
UK0030382	Studland to Portland	E	33184.28	SAC
UK0030285	Subberthwaite, Blawith and Torver Low Commons	E	1860.19	SAC
UK0030378	Tankerton Slopes and Swalecliffe	E	13.01	SAC
UK0030339	Tarn Moss	E	16.97	SAC
UK0013107	Thanet Coast	E	2815.95	SAC
UK0013577	The Broads	E	5889.43	SAC
UK0012799	The Lizard	E	3083.23	SAC
UK0012716	The Mens	E	204.69	SAC
UK0012557	The New Forest	E	29213.57	SAC

EU Code	Name	Country	Area (ha)	Status
UK0012810	The Stiperstones and The Hollies	E	602.18	SAC
UK0017075	The Wash and North Norfolk Coast	E	107718	SAC
UK0012915	Thorne Moor	E	1911.02	SAC
UK0012838	Thrislington	E	23.33	SAC
UK0012793	Thursley, Ash, Pirbright and Chobham	E	5154.5	SAC
UK0013047	Tintagel-Marsland-Clovelly Coast	E	2380.44	SAC
UK0012604	Tregonning Hill	E	5.42	SAC
UK0030292	Tweed Estuary	E	156.24	SAC
UK0012816	Tyne and Allen River Gravels	E	36.76	SAC
UK0030293	Tyne and Nent	E	37.74	SAC
UK0030295	Ullswater Oakwoods	E	123.37	SAC
UK0030093	Walton Moss	E	286.74	SAC
UK0012882	Waveney and Little Ouse Valley Fens	E	192.37	SAC
UK0030299	West Dorset Alder Woods	E	329.06	SAC
UK0013595	West Midlands Mosses	E	184.62	SAC
UK0030301	Wimbledon Common	E	351.38	SAC
UK0012586	Windsor Forest and Great Park	E	1680.18	SAC
UK0013043	Winterton - Horsey Dunes	E	426.96	SAC
UK0030302	Witherslack Mosses	E	486.71	SAC
UK0030304	Woolmer Forest	E	670.15	SAC
UK0013696	Wormley Hoddesdonpark Woods	E	336.47	SAC

EU Code	Name	Country	Area (ha)	Status
UK0012831	Wye and Crundale Downs	E	111.32	SAC
UK0014794	Wye Valley and Forest of Dean Bat Sites/ Safleoedd Ystlumod Dyffryn Gwy a Fforest y Ddena	EW	144.82	SAC
UK0012727	Wye Valley Woodlands/ Coetiroedd Dyffryn Gwy	EW	913.32	SAC
UK0030306	Yewbarrow Woods	E	112.7	SAC

A3.4 SPA

All SPAs are potentially affected by the draft strategy. We reviewed the bird species for which they have been designated. The habitats that the bird species rely upon could be affected by the draft strategy. The habitats include farmland that might be outside the site boundaries for other habitat or species based designations. Also, note that birds, being exceptionally mobile, may experience a greater amount of interaction across country borders. Cross-border sites have W for Wales and S for Scotland in the country column.

Site name	Site code	Country	Area (ha)
Abberton Reservoir	UK9009141	E	718.31
Alde-Ore Estuary	UK9009112	E	2403.5
Arun Valley	UK9020281	E	530.42
Ashdown Forest	UK9012181	E	3207.07
Avon Valley	UK9011091	E	1351.1
Benacre to Easton Bavents	UK9009291	E	470.6
Benfleet and Southend Marshes	UK9009171	E	2283.94
Blackwater Estuary (Mid-Essex Coast Phase 4)	UK9009245	E	4403.38
Bowland Fells	UK9005151	E	16007.64
Breckland	UK9009201	E	39432.75

Site name	Site code	Country	Area (ha)
Breydon Water	UK9009181	E	1203.05
Broadland	UK9009253	E	5508.88
Chesil Beach and The Fleet	UK9010091	E	747.37
Chew Valley Lake	UK9010041	E	575.94
Chichester and Langstone Harbours	UK9011011	E	5810.95
Colne Estuary (Mid-Essex Coast Phase 2)	UK9009243	E	2719.93
Coquet Island	UK9006031	E	19.78
Crouch and Roach Estuaries (Mid-Essex Coast Phase 3)	UK9009244	E	1745.11
Deben Estuary	UK9009261	E	981.08
Dengie (Mid-Essex Coast Phase 1)	UK9009242	E	3133.94
Dorset Heathlands	UK9010101	E	8184.96
Duddon Estuary	UK9005031	E	6779.9
Dungeness, Romney Marsh and Rye Bay	UK9012091	E	4010.29
East Devon Heaths	UK9010121	E	1124.4
Exe Estuary	UK9010081	E	2366.84
Falmouth Bay to St Austell Bay	UK9020323	E	25899.07
Farne Islands	UK9006021	E	101.23
Flamborough Head and Bempton Cliffs	UK9006101	E	207.17
Foulness (Mid-Essex Coast Phase 5)	UK9009246	E	10940.64
Gibraltar Point	UK9008022	E	422.2
Great Yarmouth North Denes	UK9009271	E	160.37
Greater Wash	UK9020329	E	24489.65
Hamford Water	UK9009131	E	3532.54
Holburn Lake and Moss	UK9006041	E	27.96
Hornsea Mere	UK9006171	E	232.25

Site name	Site code	Country	Area (ha)
Humber Estuary	UK9006111	E	37630.24
Isles of Scilly	UK9020288	E	394.01
Lee Valley	UK9012111	E	451.29
Leighton Moss	UK9005091	E	129.65
Lindisfarne	UK9006011	E	3671.03
Liverpool Bay / Bae Lerpwl	UK9020294	EWO	252177.00
Lower Derwent Valley	UK9006092	E	1090.87
Marazion Marsh	UK9020289	E	53.73
Martin Mere	UK9005111	E	119.75
Medway Estuary and Marshes	UK9012031	E	4686.32
Mersey Estuary	UK9005131	E	5023.35
Mersey Narrows and North Wirral Foreshore	UK9020287	E	2078.36
Minsmere-Walberswick	UK9009101	E	2019.11
Morecambe Bay	UK9005081	E	36985.47
Morecambe Bay and Duddon Estuary	UK9020326	E	66899.96
Nene Washes	UK9008031	E	1520.38
New Forest	UK9011031	E	27968.96
North Norfolk Coast	UK9009031	E	7862.27
North Pennine Moors	UK9006272	E	147276.1
North York Moors	UK9006161	E	44094.98
Northumbria Coast	UK9006131	E	1097.44
Northumberland Marine	UK9020325	E	88498.35
Ouse Washes	UK9008041	E	2493.49
Outer Thames Estuary	UK9020309	EO	393611.88
Pagham Harbour	UK9012041	E	629.01

Site name	Site code	Country	Area (ha)
Peak District Moors (South Pennine Moors Phase 1)	UK9007021	E	45300.54
Poole Harbour	UK9010111	E	4157.62
Porton Down	UK9011101	E	1562.32
Portsmouth Harbour	UK9011051	E	1249.6
Ribble and Alt Estuaries	UK9005103	E	12449.92
Rutland Water	UK9008051	E	1555.24
Salisbury Plain	UK9011102	E	19715.99
Sandlings	UK9020286	E	3405.72
Severn Estuary	UK9015022	EW	24487.91
Solent and Southampton Water	UK9011061	E	5401.12
Somerset Levels and Moors	UK9010031	E	6395.47
South Pennine Moors Phase 2	UK9007022	E	20944.46
South West London Waterbodies	UK9012171	E	825.1
Stodmarsh	UK9012121	E	481.32
Stour and Orwell Estuaries	UK9009121	E	3667.37
Tamar Estuaries Complex	UK9010141	E	1944.85
Teesmouth and Cleveland Coast	UK9006061	E	1251.51
Thames Basin Heaths	UK9012141	E	8311.06
Thames Estuary and Marshes	UK9012021	E	4802.47
Thanet Coast and Sandwich Bay	UK9012071	E	1880.85
The Dee Estuary	UK9013011	EW	14294.95
The Swale	UK9012011	E	6509.88
The Wash	UK9008021	E	62044.14
Thorne and Hatfield Moors	UK9005171	E	2438.46
Thursley, Hankley and Frensham Commons (Wealden Heaths Phase 1)	UK9012131	E	1879.83

Site name	Site code	Country	Area (ha)
Upper Nene Valley Gravel Pits	UK9020296	E	1357.68
Upper Solway Flats and Marshes	UK9005012	ES	43678.26
Walmore Common	UK9007051	E	53.41
Wealden Heaths Phase 2	UK9012132	E	2056.5

A3.5 Ramsar

By definition the draft strategy could affect all Ramsar sites because they are wetlands. All the following Ramsar sites could potentially be affected by the eventual implementation of the draft strategy.

Name	New Site Code	Country & Territories	Area (ha)
Abberton Reservoir	UK11001	England	726.2
Alde-Ore Estuary	UK11002	England	2546.99
Arun Valley	UK11004	England	528.62
Avon Valley	UK11005	England	1385.1
Benfleet and Southend Marshes	UK11006	England	2251.31
Blackwater Estuary (Mid-Essex Coast Phase 4)	UK11007	England	4395.15
Breydon Water	UK11008	England	1202.94
Broadland	UK11010	England	5488.61
Chesil Beach and The Fleet	UK11012	England	748.11
Chichester and Langstone Harbours	UK11013	England	5810.03
Chippenham Fen	UK11014	England	112.13
Colne Estuary (Mid-Essex Coast Phase 2)	UK11015	England	2701.43
Crouch and Roach Estuaries (Mid-Essex Coast Phase 3)	UK11058	England	1735.58
Deben Estuary	UK11017	England	978.93

Name	New Site Code	Country & Territories	Area (ha)
Dengie (Mid-Essex Coast Phase 1)	UK11018	England	3127.23
Dersingham Bog	UK11019	England	157.75
Dorset Heathlands	UK11021	England	6730.15
Duddon Estuary	UK11022	England	6806.3
Dungeness, Romney Marsh and Rye Bay	UK11023	England	6377.63
Esthwaite Water	UK11024	England	137.4
Exe Estuary	UK11025	England	2345.71
Foulness (Mid-Essex Coast Phase 5)	UK11026	England	10932.95
Gibraltar Point	UK11027	England	414.09
Hamford Water	UK11028	England	2187.21
Holburn Lake and Moss	UK11030	England	28.03
Humber Estuary	UK11031	England	37987.8
Irthinghead Mires	UK11032	England	792.08
Isles of Scilly	UK11033	England	401.64
Lee Valley	UK11034	England	447.87
Leighton Moss	UK11035	England	128.61
Lindisfarne	UK11036	England	3679.22
Lower Derwent Valley	UK11037	England	915.45
Malham Tarn	UK11038	England	286.26
Martin Mere	UK11039	England	119.89
Medway Estuary and Marshes	UK11040	England	4696.74
Mersey Estuary	UK11041	England	5023.35
Mersey Narrows and North Wirral Foreshore	UK11042	England	2078.41
Midland Meres and Mosses Phase 1	UK11043	England	510.88
Midland Meres and Mosses Phase 2	UK11080	England/Wales	1588.24
Minsmere?Walberswick	UK11044	England	2018.92

Name	New Site Code	Country & Territories	Area (ha)
Morecambe Bay	UK11045	England	37404.6
Nene Washes	UK11046	England	1517.49
North Norfolk Coast	UK11048	England	7862.39
Northumbria Coast	UK11049	England	1107.98
Ouse Washes	UK11051	England	2469.08
Pagham Harbour	UK11052	England	636.68
Pevensey Levels	UK11053	England	3577.71
Poole Harbour	UK11054	England	2439.2
Portsmouth Harbour	UK11055	England	1248.77
Redgrave and South Lopham Fens	UK11056	England	127.09
Ribble and Alt Estuaries	UK11057	England	13464.1
Rostherne Mere	UK11060	England	79.76
Roydon Common	UK11061	England	194.1
Rutland Water	UK11062	England	1360.34
Severn Estuary	UK11081	England/Wales	24662.98
Solent and Southampton Water	UK11063	England	5346.44
Somerset Levels and Moors	UK11064	England	6388.49
South West London Waterbodies	UK11065	England	828.14
Stodmarsh	UK11066	England	481.33
Stour and Orwell Estuaries	UK11067	England	3676.92
Teesmouth and Cleveland Coast	UK11068	England	1247.31
Thames Estuary and Marshes	UK11069	England	5588.59
Thanet Coast and Sandwich Bay	UK11070	England	2169.23
The Dee Estuary	UK11082	England/Wales	14302.02
The New Forest	UK11047	England	28002.81
The Swale	UK11071	England	6514.71

Name	New Site Code	Country & Territories	Area (ha)
The Wash	UK11072	England	62211.66
Thursley and Ockley Bog	UK11074	England	265.24
Upper Nene Valley Gravel Pits	UK11083	England	1357.67
Upper Solway Flats and Marshes	UK11079	England/Scotland	43636.73
Walmore Common	UK11076	England	52.85
Wicken Fen	UK11077	England	254.39
Woodwalton Fen	UK11078	England	208.13

Acknowledgements

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List of abbreviations

25YEP	25 Year Environment Plan (2018)
CAP	Common Agricultural Policy
CFMP	catchment management plan
CO2	carbon dioxide
cSAC	candidate Special Area of Conservation
Defra	Department for Environment, Food and Rural Affairs https://www.gov.uk/government/organisations/department-for-environment-food-rural-affairs
FCERM	Flood and Coastal Erosion Risk Management
GI	green infrastructure
HRA	Habitats Regulations Assessment
IROPI	Imperative reasons of over-riding public interest
JNCC	Joint Nature Conservation Committee http://jncc.defra.gov.uk/
MPS	Marine Policy Statement
N2K	Natura 2000 (abbreviation for European sites)
NE	Natural England https://www.gov.uk/government/organisations/natural-england
NERC	Natural Environment Research Council https://nerc.ukri.org/
NFM	natural flood management
NPPF	National Planning Policy Framework
NRW	Natural Resources Wales Cyfoeth Naturiol Cymru https://naturalresources.wales/?lang=en
pSPA	potential Special Protection Area
RBMP	River Basin Management Plan
RMA	risk management authority
SAC	Special Areas of Conservation http://jncc.defra.gov.uk/page-23
SCI	Site of Community Importance
SEA	strategic environmental assessment
SPA	Special Protection Area http://jncc.defra.gov.uk/page-162
SUDS	sustainable drainage system
SNH	Scottish Natural Heritage https://www.nature.scot/
SMP	shoreline management plan
UK	United Kingdom
WFD	Water Framework Directive
WWNP	working with natural processes

Glossary

Ambition: what the plan hopes to achieve

Assumptions: the effect on site integrity is one of "reasonable" scientific doubt rather than absolute certainty. It is not possible to demonstrate absolute certainty given that all assessments will rest on assumptions of what might happen in the future (DTA publications)

Buffer zone: an area of land or water whose characteristics minimise or eliminate adverse effects from impacting on the integrity of the European site

Carr woodland: wet woodland or swamp woodland, dominated by alder, sallow and birch

Coastal Squeeze: Narrowing of the intertidal zone due to the prevention of its natural landward migration in response to sea-level rise; in relation to this draft strategy for FCERM the landward boundary of the intertidal zone is a flood defence, or erosion management structure. Not only is the transitional habitat lost, but the intertidal habitat does not have access to the land of higher elevation and becomes drowned out by the rising sea levels, or at greater risk from erosion. In many locations the flood defences protect urban areas or communications infrastructure. In some locations farmland to the landward of the defences is at a lower elevation because it has not been able to accrete sediment. Where important freshwater habitats are present, and cannot be relocated, they may take precedence over the intertidal habitat. The proximity of roosting sites a to intertidal feeding areas are important for a range of birds associated with SPAs.

Compensatory habitat: habitat that is created to offset losses. Some habitat types are inherently quicker to establish, such as wetlands, and some species are quicker at colonising new habitat, such as dragonfly. There is a significant caveat, that our poor knowledge of the suite of conditions required to recreate specific habitat types, such as the annex 1 habitats, reduces probable success. Substantially greater hectarage of land is required in order to accommodate this. And location is critical in relation to the mobility of species. It is a form of offsetting damage within the mitigation hierarchy

Defra Appraisal Guidance: Appraisal guidance for flood and coastal erosion risk management published by Defra in March 2010, updated in 2018. It provides best practice implementation guidance on appraisal and supports the Defra Policy Statement on Appraisal (June 2009)

Defra £15m NFM programme: 60 projects around the country were allocated funding for natural flood defences, part of the government's drive to roll out innovative techniques to reduce flood risk in June 2017

Favourable condition: The designated feature(s) within a European site are being adequately conserved and the results from monitoring demonstrate that the feature(s) are meeting all the mandatory site specific monitoring targets in relation to the minimum standards for favourable condition for the designated features and there may be scope for the further (voluntary) enhancement of the features / unit. A unit can only be considered favourable when all the component designated features are favourable

Geomorphology: physical features, the landform or channel characteristics

Green infrastructure: the network of semi-natural features within the urban environment, creating connections with the countryside.

Grouping: the term used in this HRA to try to group measures according to their mode of possible impact on European sites

Hydroecology: the ecological interactions in the aquatic environment between the water, habitats and aquatic species

Hydrology: how water moves, especially in relation to the land

Integrity: integrity of a site is defined as the coherence of its ecological structure and function across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which the site is designated. It also refers to the quality or condition of being whole or complete; or in a dynamic ecological context, as having resilience and an ability to evolve in ways that are favourable to conservation. A site can be described as having a high degree of integrity where the inherent potential for meeting site conservation objectives is realised, the capacity for self-repair and self-renewal under dynamic conditions is maintained, and a minimum of external management support is required. (DTA publications)

Managed adaptive approach: an iterative process, especially helpful where there is uncertainty, in which the solution is designed to be monitored and can subsequently be adapted, informed by the monitoring data. Essentially a more flexible approach to providing solutions

Measure: in the strategy, the measures indicate what types of actions will be required to meet the objectives and achieve the ambitions

Mitigation: mitigation is a vital planned component of scheme design, construction and operation in order to reduce consequent damage. The mitigation hierarchy, in order of desirability, is avoid, minimise, rectify, reduce and offset

Monitoring: systematic, planned observation to check progress and success of something. In the case of the HRA we recommend monitoring to check on the degree of compliance with the objectives as the measures are implemented.

Natural capital: natural capital is the sum of our ecosystems, species, freshwater, land, soils, minerals, our air and our seas. These are all elements of nature that either directly or indirectly bring value to people and the country at large. They do this in many ways but chiefly by providing us with food, clean air and water, wildlife, energy, wood, recreation and protection from hazards (Defra 25YEP 2018)

Natural flood management and **working with natural processes:** natural flood management (NFM) and working with natural processes (WWNP) refer to actions to improve the natural processes in order to reduce the risk of flooding and coastal erosion. NFM is an important part of the mosaic, including complementing heavy engineering designs. It spans the spectrum from re-instatement of traditional land management through to innovative solutions. NFM projects provide fantastic opportunities for community involvement and leadership, as demonstrated by the Defra £15m NFM programme

Nature Recovery Network: a Nature Recovery Network is a joined-up system of places important for wild plants and animals, on land and at sea. It allows plants, animals, seeds, nutrients and water to move from place to place and enables the natural world to adapt to change. It provides plants and animals with places to lie, feed and breed. It can only do this effectively if it is treated as a joined up whole. (The Wildlife Trusts www.wildlifetrusts.org)

No regrets solution: in the FCERM sector involves providing solutions now that do not prejudice the ability of future generations to implement sustainable solutions in the future, nor commit future generations to having to deal with the negative consequences. Critical to this approach I the recognition that some resources are finite and irreplaceable, whilst

other receptors can be replaced in or moved to a more sustainable location. It operates at a societal level, not at the individual property level.

Objective: in the strategy the objectives define the desired status to be achieved, via implementation of the measures. Monitoring informs progress towards the objective

Outcome: outcomes are what happens on the ground as a result of management actions or decisions (including decisions to cease actions)

Outcome measures: outcome measures, which are basically counts of relevant things, are currently used in FCERM programmes to report on progress towards current targets

Output: outputs usually refer to reports, or the output from a computer model, or brainstorming at a meeting

Pathway: in the context of the HRA the pathway summarises the route by which an action can have an eventual effect on a European site. It can be a tangible pathway, such as water that is held in the catchment by NFM eventually reaching a watercourse. It can also be a virtual pathway, such as improved outcomes for designated sites because guidance has been written that includes European site integrity as one of the core objectives

Priority feature: habitats and species in danger of disappearance in a European context. Their needs override those of non-priority habitats and species. The IROPI test derogation is correspondingly more restricted.

Programme: a list of project to be undertaken, usually accompanied by some kind of priority ranking system. When mitigation or compensatory habitat is required, in relation to European sites, it is essential that this is in place and functioning before any losses as a result of management occur.

Project: a piece of planned work to achieve a purpose, so it could be a project to produce guidance, to undertake research, or to produce designs for new FCERM infrastructure (referred to as a scheme) for example.

Regulated tidal exchange: modifications to coastal flood defences to permit the ingress and egress of a predetermined amount of sea water. Creates saline habitat in previously freshwater environments

Resilience: the capability of the species to withstand adverse conditions. Resilience reduces where the population is already under stress from other causes

River Basin Management planning: river basin management plans set out how organisations, stakeholders and communities will work together to improve the water environment

Scheme: project that will result in improvements to FCERM infrastructure

Science, evidence and research: the implementation of the strategy will be improved immeasurably by the inclusion of evidence from scientific research

Screening: the process of deciding which components of the strategy might have significant effects and should therefore be the subject of assessment

SEA: SEA is applied to high-level decision-making to identify the major environmental effects of new policies, plans or programmes before they are approved. SEA helps to ensure that new proposals are:

- assessed for significant environmental impacts
- communicated to decision makers
- mitigated against

- monitored through a monitoring programme
- made known to the public

Suboptimal habitat: habitat that fulfils most of the criteria required by a species but not necessarily to the highest quality. If the population exceeds the carrying capacity of the optimal habitat then some individuals will be forced to move into the suboptimal habitats

SUDS: Sustainable drainage systems bring the processes of the water cycle into the urban environment, comprising small scale constructed and planted vegetated areas. Surface water can be stored, infiltrate the soil and experience bio-filtration. A better alternative than surface water overwhelming sewers during heavy rainfall

Surface water: surface water is the water above ground, resulting from rainfall. It is especially noticeable in urban catchments with impermeable surfaces, preventing the surface water from soaking into the ground

Water Framework Directive: this directive was transposed into national law through The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003. The purpose is to ensure the protection of inland waters, estuaries (transitional waters), coastal waters and groundwater.

Working with natural processes and **natural flood management:** working with natural processes (WWNP) natural flood management (NFM) and refer to actions to improve the natural processes in order to reduce the risk of flooding and coastal erosion. NFM is an important part of the mosaic, including complementing heavy engineering designs. It spans the spectrum from re-instatement of traditional land management through to innovative solutions. NFM projects provide fantastic opportunities for community involvement and leadership, as demonstrated by the Defra £15m NFM programme

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