Improvement Programme for England's Natura 2000 Sites (IPENS)

Planning for the future

Programme Report – a summary of the programme findings

Life

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Contents

Foreword

The European Natura 2000 series of sites forms the world's largest network of protected areas for nature, supporting some of our most important species and habitats.

In England, we have 338 Natura 2000 sites covering over two million hectares in terrestrial and marine locations. These sites are critical in helping us to reverse the continuing decline in biodiversity.

The Improvement Programme for England's Natura 2000 Sites (IPENS) is one of a number of EU LIFE funded projects across Europe, which will inform a review of the Prioritised Action Frameworks for each EU territory, setting out strategic conservation priorities for the Natura 2000 series.

Thanks to this funding from EU LIFE+ Nature, we now have a shared understanding between Natural England, the Environment Agency and other key partners of what, how, where and when we can target our efforts to improve the management of Natura 2000 sites and areas surrounding them.

This Programme Report brings together the findings of the IPENS Programme. It highlights the need for action across the environment sector, from practical action on site, to join-up on priorities for funding and evidence.

IPENS recognises that the protected area network (of Natura 2000 sites, Sites of Special Scientific Interest and Ramsar sites) in England cannot alone prevent the continuing declines of many species of plants and animals. We need to look at offsite issues such as air pollution and work with other sectors across landscapes to secure a fully functioning protected areas network in England and to create more space for nature.

On behalf of Natural England and the Environment Agency, thank you to everyone who has contributed to IPENS. We look forward to working at a local and national level with delivery partners, landowners and managers to agree the priority actions and practical implementation required to improve our Natura 2000 sites and achieve our targets and outcomes for biodiversity.

Alan Law
Chief Strategy and Reform Officer,
Natural England

Alan Law

1 Background and context

Minsmere heathland © Natural England / Peter Wakely

Introduction

The Improvement Programme for England's Natura 2000 sites (IPENS) was officially launched in April 2013 with €1.8m of EU LIFE+ funding support and involving a partnership between Natural England and the Environment Agency. The aim of the Programme was to have a shared understanding between Natural England, the Environment Agency, and other key partners of what, how, where and when we will target our efforts to improve the management of Natura 2000 sites and areas surrounding them.

This document, the **programme report**, brings together the main findings of the IPENS programme.

The Natura 2000 series in England

England has a diverse range of habitats resulting in a wonderfully rich and varied wildlife. It hosts some of Europe's most threatened species and habitats which are protected by the Natura 2000 network.

England's Natura 2000 sites include some of the country's most cherished landscapes such as the Northumberland coast, the New Forest, the Norfolk Broads and the Cumbrian Fells.

There are 338 Natura 2000 sites in England, in both marine and terrestrial locations. The series comprises:

- 253 Special Areas of Conservation (SAC)
- 85 Special Protection Areas (SPA)

The sites cover 2,076,875 hectares. Of this, 883,077 hectares is underpinned by Sites of Special Scientific Interest (SSSI) under the Wildlife and Countryside Act 1981 (as amended) and 1,194,199 hectares on sites entirely below mean low water (usually termed marine sites).

The sites underpinned by SSSIs are usually termed terrestrial sites, but they do include a small number of estuarine sites where the boundary extends below mean low water.

Terrestrial Natura 2000 Sites

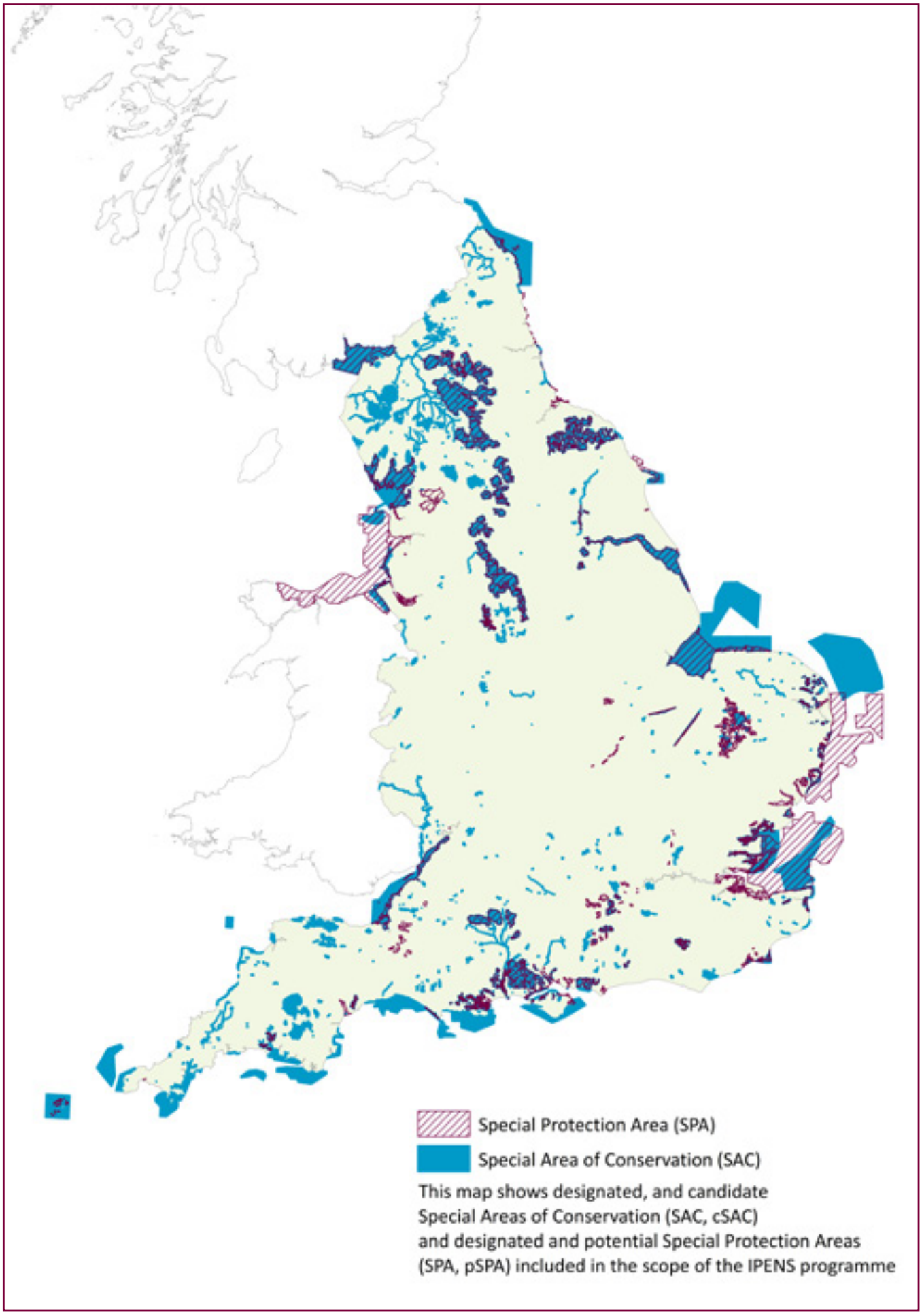
The terrestrial Natura 2000 sites included within the project encompasses nearly 800 individual Sites of Special Scientific Interest (SSSIs) in England. A number of the wetland sites are also sites of international importance designated under the Ramsar Convention 1971. Some Natura 2000 sites are also National Nature Reserves declared under the National Parks and Access to the Countryside Act 1949.

Approximately 40% of the terrestrial sites are in private ownership, primarily with an agricultural land use ranging from largely pastoral in the lowlands through to moorland grazing and game management in the uplands.

Over 20% of sites are in public ownership as part of commercial forestry plantations, Ministry of Defence training grounds, or land managed as National Nature Reserves. The water industry owns the largest commercial interest, largely as supply reservoirs and their catchments. Voluntary nature conservation organisations own less than 10% of sites.

Natural England records the condition of the Sites of Special Scientific Interest on a designated sites database called the Conservation Management System (CMSi). Information on terrestrial Natura 2000 site condition can therefore be derived from the condition data for the SSSIs. The original designated sites database is called ENSIS, from which IPENS data was sourced. CMSi is a new database for all designated sites information. Sites of Special Scientific Interest data has already been migrated from ENSIS to CMSi.

Figure 1 – Natura 2000 sites in England



Natura 2000 data will follow, including IPENS data.

Based on February 2015 data, 30,000 hectares of terrestrial Natura sites are in unfavourable, no change or declining condition with a further 536,000 hectares in unfavourable recovering condition (figure 2).

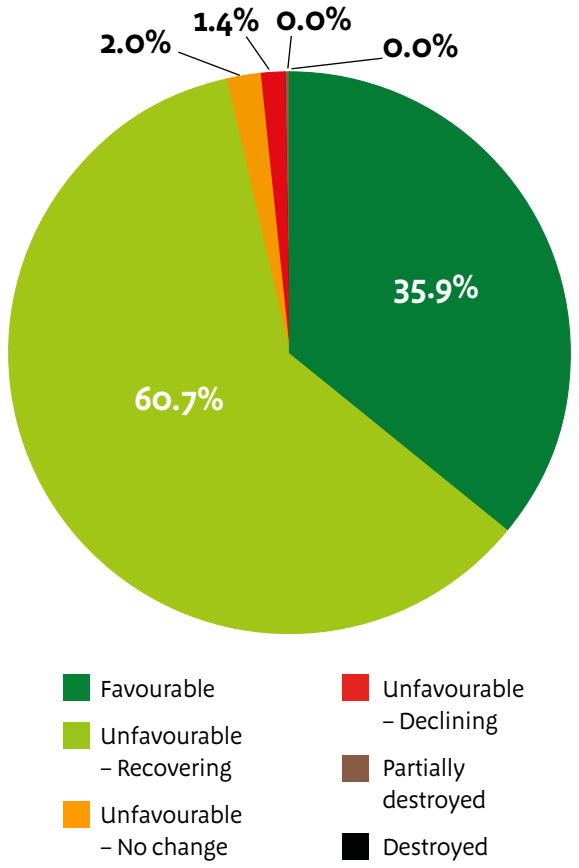
For the terrestrial Natura 2000 sites, the key habitats in poor condition are:

- Upland and lowland bogs
- Rivers
- Lakes
- Sand dunes
- Upland and lowland heathland
- Upland and lowland calcareous grassland
- Lowland neutral grassland

The top reasons by area for unfavourable no change or declining condition are:

- Diffuse pollution
- Water levels / drainage
- Grazing
- Invasive species (including deer and scrub)

Figure 2 – Condition of Terrestrial Natura Sites by Area as at February 2015



Marine Natura 2000 sites

Our seas are home to some of the best marine wildlife in Europe, with a wide diversity of underwater habitats and species. Over half (by area) of the Natura 2000 sites in England cover areas of the sea and foreshore. These are called European Marine Sites and they protect a range of seabed habitats along with marine species such as seals and seabirds.

Natural England has responsibility for providing advice on the management of European Marine Sites out to 12 nautical miles. From 12 nautical miles out, the Joint Nature Conservation Committee (JNCC) has jurisdiction. The IPENS programme has focused on the Natura 2000 sites for which Natural England has responsibility, including those few which cross the 12 nautical mile boundary.

Many of our marine habitats and species are particularly rare and therefore of international importance. There are 13 marine and coastal habitats and eight marine species present in the UK that are listed on Annexes I and II of the Habitats Directive, many of which occur frequently in English inshore waters.
A Natural England review in 2010 'The European Marine Site Risk Review' (Coyle & Wiggins 2010) of existing activities across 45 marine Natura 2000 sites assessed a number of activities as high and medium risk. This included:

- risks associated with fishing and harvesting of marine resources, ranging from cockle fishing, clam dredging, and scallop dredging, to fixed nets causing by-catches;
- recreational activity;
- the spread of non-native species;
- water pollution;
- coastal squeeze;

- changes to the fisheries discard policy under the Common Fisheries Policy;
- development pressure; and
- climate change.

A site activity inventory of current (2015) activities taking place on marine Natura 2000 sites is currently being compiled within Natural England, as part of the conservation advice review work to produce new conservation advice packages. Site Improvement Plans and subsequent action planning for marine Natura 2000 sites may need to be updated if relevant, in light of this work.

Highlights from the Article 17 Report of 2013 on the pressures and threats affecting the Natura 2000 habitats and their condition in the UK

Every six years European Member States are required (by Article 17 of the Habitats Directive) to report on the implementation of the Directive and the conservation status of individual habitats and species listed under the Annexes of the Directive. The latest report – 3rd Report (JNCC 2013a) covering the period 2007–2012 – highlighted the following (figure 3 & 4):

- Overall, there has been little change between the previous report in 2007 and the 2013 report.
- It needs to be recognised that it is difficult to get habitats and species into favourable conservation status, partly because of widespread pressures like **Nitrogen deposition** and the time that it takes for restoration action to take effect, but also because the evaluation method is comprehensive and exacting.
- The increased number of assessments in favourable status is mainly due to a reduction in the number of assessments that were classed as 'unknown' status in 2007, ie our ability to assess conservation status has improved.
- There has been no significant change in the proportion of unfavourable-bad assessments, which is of concern.
- For habitats, the proportion in favourable status has remained small, which reflects the many pressures upon UK habitats. **Notable amongst the pressures are:**
  - **over- and under-grazing;**
  - **hydrological changes;**
  - **invasive non-native species.**
- The proportion of habitats which are improving has decreased compared to 2007. Much of this is connected with declines in habitat condition, partly a result of the level of nutrient Nitrogen critical load exceedance. **Habitats whose status has gone from improving to stable or declining include:**
  - blanket bogs;
  - beechwood types;
  - calcareous grassland.
- There has been a small reduction in the number of habitats which were previously declining and are now stable. **Among the habitats whose status has become stable include:**
  - Atlantic salt meadows;
  - European dry heaths;
  - Large shallow inlets and bays.
- There has been an increase in the proportion of species in favourable condition. These include greater horseshoe bat, marsh saxifrage and brook lamprey.
- However, the proportion of species that are improving has shown a small decrease. **Among those that are now declining or stable are:**
  - southern damselfly;
  - creeping marshwort;
  - floating water-plantain.

Figure 3 – Chart showing the status, (by number) of habitats from the Article 17 Report 2013

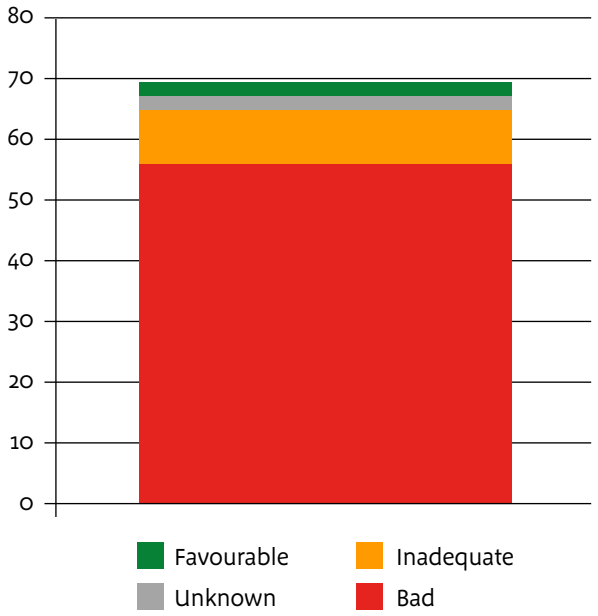
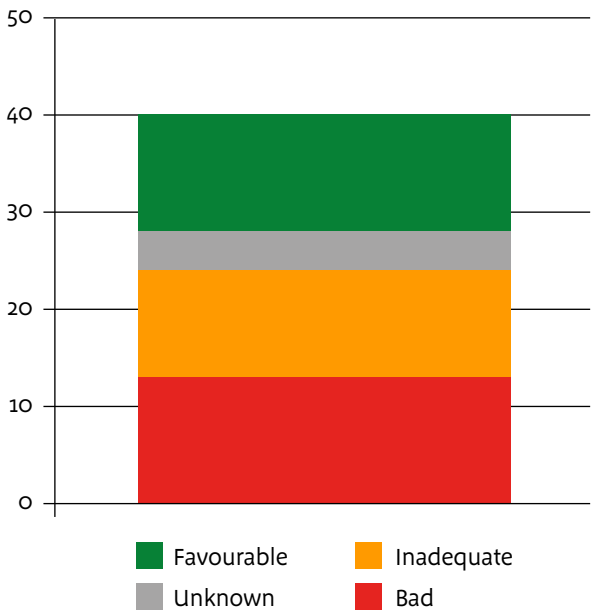


Figure 4 – Chart showing the status, (by number) of species from the Article 17 Report 2013



Article 12 Report

The 2013 article 12 report highlights threats and pressures affecting SPA bird species in the UK (JNCC 2013b).

The most commonly occurring threats and pressures are:

- Invasive Species;
- Climate Change;
- Predation;
- Recreational Disturbance;
- Fishing;
- Persecution;
- Hydrological changes.

2 The Improvement Programme for England's Natura 2000 Sites (IPENS)

Kittiwake © Natural England / Paul Glendell

Purpose

IPENS was set up as a programmed approach for achieving target conservation status on all Natura 2000 network sites in England.

In summary, the purpose of IPENS was to:

- Identify potential actions to improve the condition of our European sites.
- Help the UK to meet European Commission obligations under the Habitats and Birds Directives.
- Help us meet the EU and England Biodiversity 2020 targets for protected sites.

Managing the IPENS Programme

A team of ten nationally based staff in Natural England led on different aspects of the IPENS Programme, supported by two national team leads in the Environment Agency. Specialists from Natural England and the Environment Agency were called upon to input into the Programme at various stages, including in the development of the evidence projects and the theme plans.

A Steering Group was set up from the start of the programme to oversee and provide direction to the team. Membership of this group included the IPENS Programme Manager, the Environment Agency IPENS leads and representatives from Natural England's main national teams (external funding, conservation strategy, marine and biodiversity delivery). In addition there was membership from the Natural England Area Teams, to test and assure the practical application of the programme.

What IPENS has delivered

The programme has:

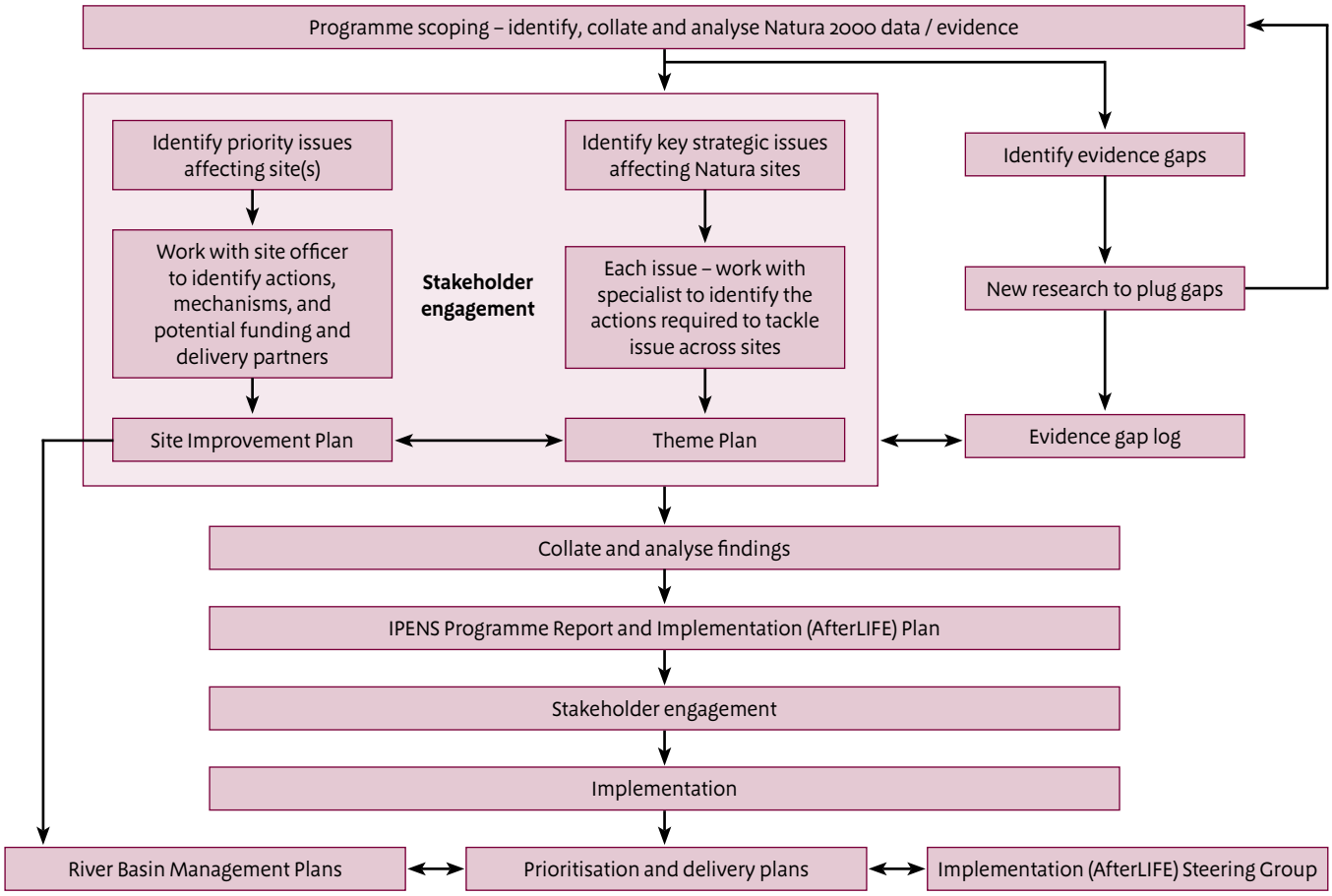
- Developed theme plans to improve the approach to issues (eg diffuse water pollution, invasive species) that affect multiple Natura 2000 sites.
- Produced a Site Improvement Plan for each Natura 2000 site, and for water dependent sites integrated them into the relevant River Basin Management Plans.
- Identified and where possible plugged gaps in our Natura 2000 evidence.
- Developed a strategic framework for the future management of Natura 2000 sites. This is the AfterLIFE Implementation plan.

This is the first time in England that this information has been drawn together for the entire suite of Natura 2000 sites. We now have a much improved understanding of the Natura 2000 series in England and its contribution to biodiversity outside the network and greater clarity of where further measures are needed to improve the network.

The most popular existing measure employed to improve the management of terrestrial sites is the Rural Development Programme for England, especially the Environmental Stewardship Scheme, which is discussed in the section below on the funding situation (page 132). The IPENS programme looks at the new mechanisms needed if we are to successfully improve the condition of sites and features.

The methodology applied in delivering the IPENS programme is shown in figure 5 overleaf.

Figure 5 – An overview of the project activities



Theme Plans

As part of the programme scoping (Rae 2013) IPENS identified 11 common and complex issues which affect many sites and are difficult to address on a site-by-site basis (see Table 1 below).

Table 1 – Theme plan topics

- Atmospheric nitrogen
- Climate change
- Diffuse water pollution
- Grazing
- Habitat fragmentation
- Hydrological functioning
- Inappropriate coastal management
- Invasive species
- Lake restoration
- Public access and disturbance
- River restoration

These were identified, and later tested with stakeholders, using existing information and data on the issues and threats affecting protected sites including:

- Natural England's designated sites system (CMSi).
- Habitats Directive Article 17 2007 report, which includes a detailed list of pressures and threats affecting each *Natura 2000* interest feature in the United Kingdom.
- Academic literature and specialist knowledge.

It should be noted that the Birds Directive Article 12 report was not available at the time of scoping and previous reports did not offer the detail of information required to enable their use; but the 2013 Article 12 report has subsequently been used in the development of the theme plans.

The selection was also based on an assessment of where the IPENS programme could usefully contribute to and complement existing work.

These issues are also cited in Natural England's Biodiversity 2020 Detailed Delivery Review, as the most significant generic risks to the achievement of the Biodiversity 2020 outcomes on protected sites.

(The Biodiversity 2020 Detailed Delivery Review was entitled 'Analysis of progress and challenges in meeting the Biodiversity 2020 Outcomes 1A and 1B'. This paper responds to Defra's Biodiversity Programme Board commission of the Terrestrial Biodiversity Group (TBG) for a detailed analysis of achievability of the Biodiversity 2020 Strategy Outcomes 1A and 1B. This commission resulted from the risks and issues raised by TBG and Natural England in achieving the Biodiversity 2020 outcomes. These risks and issues are under increasing Ministerial scrutiny, and progress against the Strategy is now included within a quarterly stock take of key policy areas within Defra's responsibility.)

For each of these issues theme plans have been developed by the IPENS team in collaboration with key stakeholders and partners and with lead roles played by specialists from Natural England and the Environment Agency. Theme Plans identify solutions to address these issues across England's Natura 2000 sites using a thematic, rather than a site-by-site approach, as the solutions to these problems may require mechanisms that operate on a large scale or at a national level. Solutions may then be customised and applied to a particular site as appropriate.

This new approach to finding solutions will, through addressing risks on Natura 2000 sites, also reduce the risks to achieving the Biodiversity 2020 outcomes. It also presents an opportunity to understand how this approach and the plans / solutions can be used across the wider SSSIs and Marine Conservation Zones (MCZ) network.

The Natural England Evidence Standard was applied to these documents. This involves a non-technical sign off (provided by the IPENS team and the senior management team of the Biodiversity Delivery Team in Natural England), a technical sign-off (provided by the principal specialists in the relevant subjects) and sign off by the Natural England Director of Evidence.

Site Improvement Plans (SIPs)

IPENS has developed a SIP covering each Natura 2000 site. The SIP is a single, short reference document that covers the whole site(s), complementing any existing plan(s) for the site. It is not a detailed habitat management plan, or a fully agreed and funded programme of specific measures ready for on the ground delivery. Overlapping Natura sites, or adjacent Natura sites with similar features / issues, were combined in the SIPs. The project has produced 267 SIPs covering the 338 Natura sites.

The SIPs:

- Outline the priority issues affecting the condition of the site.
- Identify the actions required to address them and who is responsible for taking them forward.
- Highlight potential delivery mechanisms and funding sources to action them.

The SIPs were produced by Natural England's local officers who co-ordinate effort on England's protected sites. The SIPs have been developed with the input from the key local delivery bodies who have been identified as being potentially responsible for the identified actions. The actions in a SIP will need to be delivered through a variety of other plans, programmes and interventions for which Natural England and its partners are responsible.

A quality assurance process was agreed with the IPENS steering group, whereby the SIPs were checked for consistency by the IPENS team and sign-off was provided by the relevant Natural England Area Manager.

CASE STUDY – IPENS methodology

Culm Grassland SAC is an unimproved marshy grassland site in Devon and is home to rare species including the largest population of the marsh fritillary butterfly in the UK. With the site being surrounded by intensive agriculture it is particularly susceptible to high nitrogen inputs (through ammonia deposition) from local agricultural sources.

The SIP identifies air pollution as the most critical issue affecting the site. Other issues include agricultural management practices and hydrological changes. The issues in SIPs have been prioritised by Natural England site officers, with input from stakeholders and partners where possible. The prioritisation took a systematic approach, taking account of:

- the condition of the European features;
- how certain we are of the issue;
- how severe the impact would be; and
- whether or not effective mechanisms are available or in place.

Through this approach, issues which are difficult to tackle because there are gaps in effective mechanisms, such as air pollution in this case, have been given a higher priority.

With atmospheric nitrogen deposition affecting a large number of Natura 2000 sites IPENS has developed a theme plan which outlines how to improve our approach to addressing this issue.

The **atmospheric nitrogen theme plan** identifies a gap in current delivery mechanisms to reduce agricultural ammonia emissions close to protected sites. Evidence suggests that targeting emission reduction measures close to protected sites can be a cost effective way of reducing nitrogen deposition. The theme plan proposes to use Site Nitrogen Action Plans (SNAPs) as a potential way to identify the most relevant local sources and potential measures. Site Nitrogen Action Plans could also indicate how existing national emission reduction measures contribute to the site and what local habitat management and restoration measures help to mitigate impacts. In this way it forms a comprehensive approach to addressing atmospheric nitrogen issues for protected sites.

To test this approach IPENS commissioned two **evidence projects** which used Culm Grasslands SAC as a case study site (Dragosits 2015 and others; Misselbrook 2014 and others). The projects trialled a method to identify the most relevant local emission sources and potential measures using national datasets, with local verification where possible. They also explored the potential to use Catchment Sensitive Farming (CSF) as a delivery mechanism to promote the uptake of low ammonia-emission techniques close to the site.

The evidence projects show that local dairy farming contributes substantially to the local

Figure 6 – Agricultural ammonia-emission sources in the 2km surrounding Bradworthy Common derived from 2012 agricultural census. (Ed Carnell, Centre for Ecology & Hydrology)

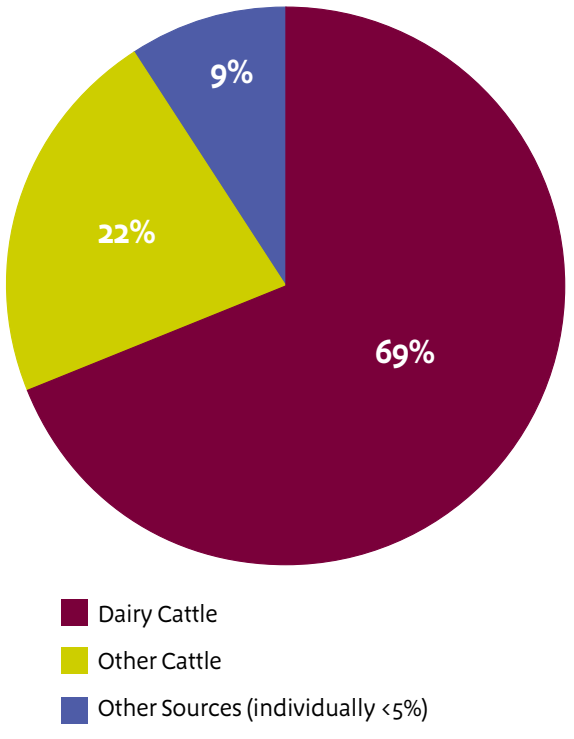
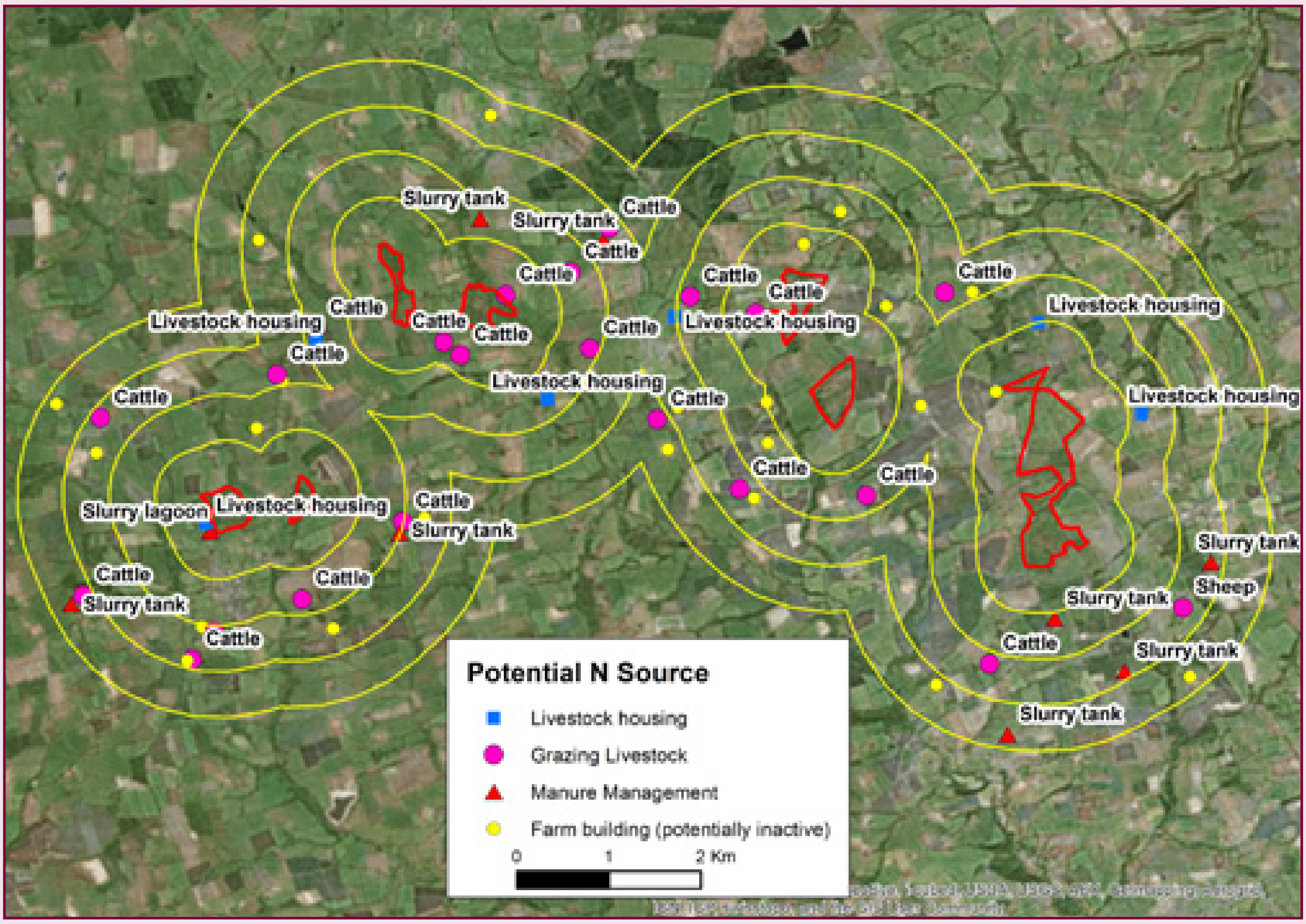


Figure 7 – Bradworthy Common – part of Culm Grasslands SAC, with potential atmospheric nitrogen sources identified from Google Earth imagery, during the desk-based study carried out July 2014 (Google imagery date 31/12/2010) (Ed Carnell, Centre for Ecology & Hydrology)



ammonia emissions (figure 6 & 7). Measures such as the covering of slurry stores and application of slurry to grassland via trailing shoe or shallow injection show the best potential to reduce emissions. Culm Grassland SAC is located in a target area for Catchment Sensitive Farming, therefore these measures could be promoted by CSF officers as part of a package to reduce diffuse water pollution and ammonia emissions through nutrient management. The atmospheric nitrogen theme plan has put Culm Grassland SAC forward as a priority site to establish a Site Nitrogen Action Plan. Measures that reduce ammonia emissions have also been included in the Rural Development Programme for England.

Integrating Site Improvement Plans into River Basin Management Plans

An important aspect of the SIPs is that those for water dependent sites form the Programme of Measures for the relevant Natura 2000 protected areas in River Basin Management Plans (RBMPs) under the Water Framework Directive.

The Water Framework Directive (WFD) provides the main framework for managing the water environment throughout Europe. Under the WFD a management plan must be developed for each river basin district.

Since the current RBMPs were published, new information has emerged on risks or impacts to Natura 2000 sites and some new measures have been identified which are being included in the update to the plans. A fundamental and new approach to capturing the priority and new measures for water dependent Natura 2000 sites is through the publication of Site Improvement Plans (SIPs).

The SIPs include the priorities and new measures needed to achieve water-dependent Natura 2000 objectives under the WFD, and provide important information to inform the RBMP consultation. The SIPs contain actions for all habitats on these sites, the measures for the non-water dependent habitats do not, however, form part of the RBMP and its consultation.

The SIPs, along with information on existing measures to maintain or restore site features (held in Natural England's designated site database), need to be considered together to understand the full range of issues and measures relevant to a Natura 2000 site.

IPENS project staff and the Environment Agency have worked closely together to ensure the full integration of the 174 SIPs that include water dependent habitats into the second round of RBMPs for English River Basin Districts. Discussions with the Environment Agency about this started early in 2013 and since then there has been effective partnership working to ensure that all opportunities for integration are taken. The SIPs are the vehicle by which actions identified by IPENS are embedded into the ten RBMPs which wholly or partly cover England.

Evidence Projects – using evidence to support IPENS

Developing an evidence base has been an important element of IPENS. In England there is no central data source for marine and terrestrial Natura 2000 sites. IPENS has pulled together evidence to understand the conditions, pressures and threats to the sites from various sources including:

- Natural England's site condition database for SSSIs, which underpin most of the terrestrial Natura 2000 sites in England.
- Habitats and Birds Directive reports.
- Academic literature and other relevant research reports.
- Specialist, site officer and stakeholder knowledge.

IPENS reviewed the gaps in knowledge that have been found from this evidence and ran 54 projects to plug the gaps. Topics include:

- investigating risks and issues affecting Natura 2000 sites;
- looking into potential management measures to alleviate risks and issues; and
- monitoring and mapping sites to provide baseline data.

The Natural England evidence standard was applied to these projects.

A full list of the evidence projects, their purpose and the SIPs and theme plans to which they apply is at Annex 2.

A strategic framework for the future management of Natura 2000 sites – the 'AfterLIFE Implementation plan'

The AfterLIFE Implementation plan sets out the scale of the challenge to improve England's Natura 2000 sites and how we will approach this.

In summary, this implementation plan proposes that a prioritisation exercise is carried out on the actions and measures that are recorded in the IPENS SIPs and theme plans. This exercise will be led by Natural England and the Environment Agency, with Defra, and the Joint Nature Conservancy Committee (JNCC). Our delivery partners will also be engaged in this.

A prioritisation methodology is proposed including:

- UK Priority habitats and species, including where the UK has special responsibility and those that are rare or localised.
- Evidence from the Article 17 and 12 reporting.
- Alignment with existing programmes and delivery priorities including the England Biodiversity Strategy 'Biodiversity 2020' the Rural Development Programme and the Water Framework Directive.
- Locally driven priorities.
- Other benefits, such as eco-system services or skills and capacity building potential.

The prioritisation, once agreed will inform an implementation plan, articulated at national and local levels and the aim is for this to be embedded in delivery plans across the environment sector. It will also be used to inform the review of the Prioritised Action Framework for England and the UK.

The AfterLIFE Implementation plan puts forward a strategy for funding for biodiversity and our protected sites and for filling the remaining evidence gaps.

Monitoring of progress and co-ordination of the implementation will be required. Appropriate levels of resource will be provided from Natural England and the Environment Agency to ensure the prioritisation and implementation planning is carried out and inserted into existing delivery plans. An AfterLIFE Implementation Steering Group Terms of Reference has been agreed, with membership including Natural England, the Environment Agency, the RSPB, Defra and the Marine Management Organisation. This Steering group will oversee the implementation of the priority actions.

3 A summary of the findings and key messages from IPENS

Dendles Wood, Dartmoor SAC © Natural England / Peter Wakely

The issue-specific messages are drawn out in the issues section below (page 29), this section provides a summary of the findings and an overview of the common and cross cutting messages.

Summary of findings

Issues affecting the condition of England's Natura 2000 sites

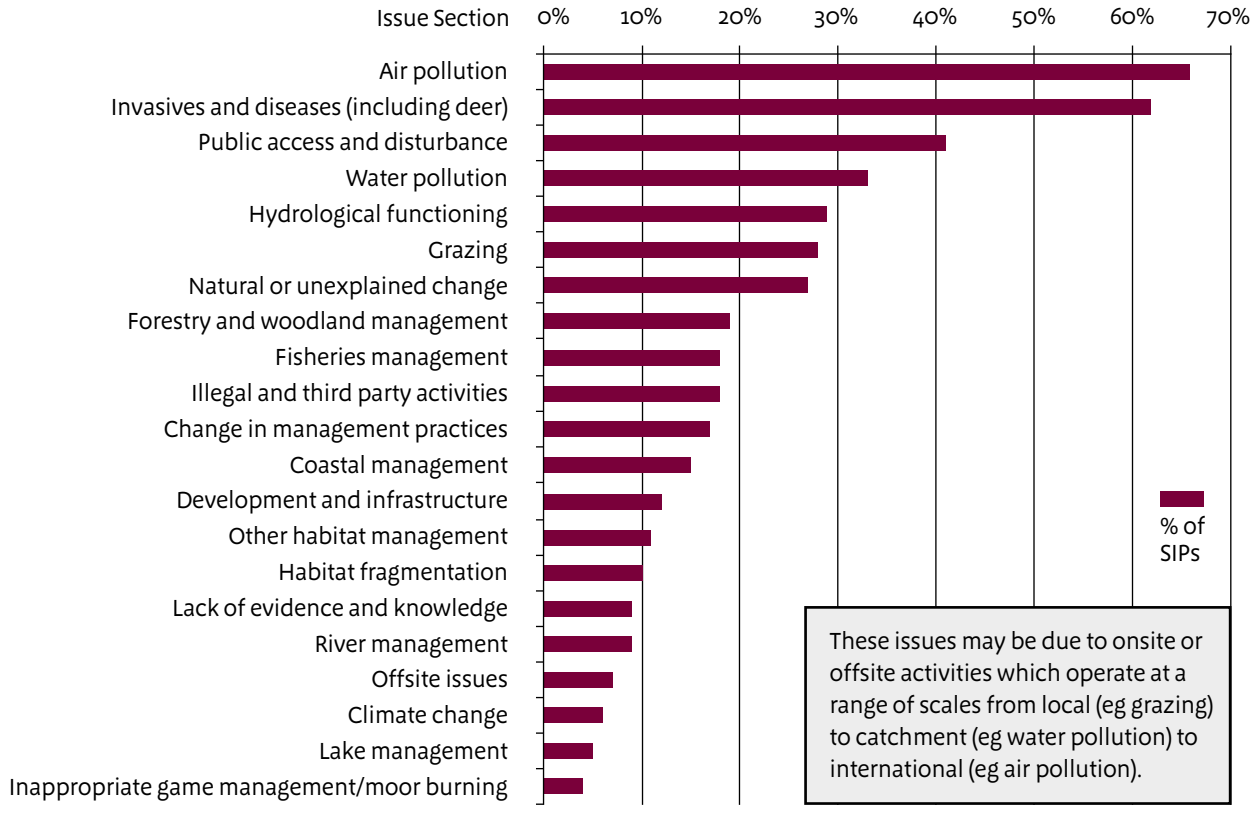
Most SIPs (96%), and therefore sites, are affected by at least one issue with only a very small number (less than 4%) of SIPs having no issue affecting the condition of the site. The SIPs with a large number of issues (11 or more) are large complex sites such as estuaries, upland sites or large lowland sites with multiple interest features. Whereas the SIPs (sites) with no issues reported are generally small lowland grassland sites, species sites or sites where the management is closely controlled (eg Richmond Park).

Table 2 – Number of issues in SIPs

Number of issues in SIP	Number of SIPs
over 15	9
11-15	26
6-10	81
1-5	141
0	10

The most frequently reported issues in the SIPs are **air pollution and invasive species and disease (including deer)**. These are not necessarily the issues affecting the largest areas but are the ones affecting the most SACs and SPAs across the country. Some issues such as inappropriate game management and moor burning, whilst only affecting a relatively small number of sites (10 SIPs), account for up to 38% of the Natura 2000 land area.

Figure 8 – Percentage of Site Improvement Plans (SIPs) where the issue has been recorded as affecting the site



Actions required to address the issues

There are over 3000 'priority actions' required (in addition to work already underway) to tackle these issues at an individual site level in order to achieve favourable condition of features on sites (contributing to favourable conservation status). These relate to:

- securing appropriate habitat management;
- reducing environmental pressures, such as pollution, invasive species or disturbance;
- adapting to a changing environment, whether a result of climate change, habitat fragmentation, or development;
- restoration of habitats, species populations and ecosystem processes.

Depending on the issue and the site(s) priority actions need to be taken at:

- a site or local level;
- catchment / landscape level;
- national or international level.

The SIPs and theme plans enable us to see which actions are best tackled at which level and where a combination of these might be required. Management of some issues in the wider environment (including on other protected sites) is vital for their successful management within the Natura 2000 network. Natura 2000 sites do not exist in isolation and issues such as invasive species, climate change, air pollution and habitat fragmentation all need to be addressed at a national or landscape scale. Further work is now required as part of an implementation plan to ensure the coordination of effort at the appropriate level. This is discussed in the IPENS AfterLIFE Implementation Plan, and mentioned in summary above.

On site management challenges

As well highlighting the importance of strategic and offsite issues, the SIPs have shown that there are still a lot of onsite habitat management issues to resolve. 640 issues in the SIPs highlighted that a change in on-site habitat management is required to maintain or restore the feature of interest. Issues like; grazing, scrub control or the risk of discontinued management are normally managed through existing mechanisms, but this not always possible. Despite our best efforts, factors such as; a lack of funding, insecurity of long term funding and practical problems such as difficult terrain are the reasons why management has not yet been secured or fully effective.

On some sites, we have been unable to secure favourable management with the landowner / occupier. Conflicting objectives for the site can make the use of voluntary or soft measures difficult (particularly where the incentives are not seen as big enough) and result in very long and drawn out negotiations and / or a failure to secure favourable on-site management.

The 'tools' to implement these actions

A wide range of 'mechanisms' (see Annex 4) that enable the implementation of actions exists; from advice and plans, to enforcement and regulation, to habitat creation or restoration. Difficult and complex issues (eg diffuse water pollution) will often require a combination of mechanisms, operating in an orchestrated and sequential way over a lengthy time period.

Whilst a range of mechanisms exists, in many cases these have either been partially implemented or in some cases not put in place at all (for example investigative actions to clarify the actions that need to be taken). This can be due to a lack of funding, staff time, a reluctance to use the regulatory mechanisms available, or lack of a strategic framework within which they can be applied consistently.

At the same time, voluntary approaches may be effective when applied appropriately, but they are not able to fully deliver the required results simply because they are optional. Better targeting of a mix of the available mandatory and voluntary mechanisms and the development of strategic frameworks to guide their use might help to overcome these barriers.

In some cases (such as on particular sites or for specific issues) there are no mechanisms available. This is true for air pollution, so the IPENS Atmospheric Nitrogen theme plan is proposing that Site Nitrogen Action Plans are developed (see Air Pollution issue section). In other cases even where mechanisms are available to tackle an issue they are not necessarily available on every site. An example of this is where partnership working is potentially an appropriate mechanism, but there is a lack of support or resource to put this in place. Another example is where grazing is an appropriate mechanism, but there are restrictions in place, such as no fencing allowed, due the site being Common Land.

Table 3 – New mechanisms and strategic approaches proposed by IPENS

New mechanism or approach	Description
Site Nitrogen Action Plans (SNAPs)	SNAPs will document the current status of the site in terms of nitrogen deposition and the attribution of this nitrogen to identify the most significant sources; the contribution of national and international measures to the deposition trends of the site; coordinated locally targeted measures to further reduce the deposition on the site; and habitat restoration and management measures that mitigate the impact of atmospheric nitrogen
Strategic principles for invasive species	Four overarching principles are proposed: i) consider the wider environment around Natura 2000 sites; ii) apply the prevention, rapid response and control hierarchy; iii) Natura 2000 requirements inform prioritisation; and, iv) shift to a strategic, proactive approach. These aim to enhance the management of invasive species in the Natura 2000 network, whilst complementing the existing GB invasive non-native species strategy.
Strategic framework for climate change	A national prioritisation exercise using the National Biodiversity Climate Change Vulnerability Assessment (NBCCVA), followed by site-level interpretation and detailed advice for the identification of climate change adaptation action.
Strategic framework for habitat fragmentation	A national prioritisation exercise using output from the NBCCVA model to identify which Natura 2000 sites are especially vulnerable to habitat fragmentation. This is accompanied by practical advice for the production of local 'connectivity plans'.
Long term hydrological restoration plans for SAC terrestrial wetlands	Develop with partners a programme of local hydrological restoration plans that focus on achieving natural hydrological functioning as far as possible (for sites where this is relevant only). Comparable to the approach for river restoration.

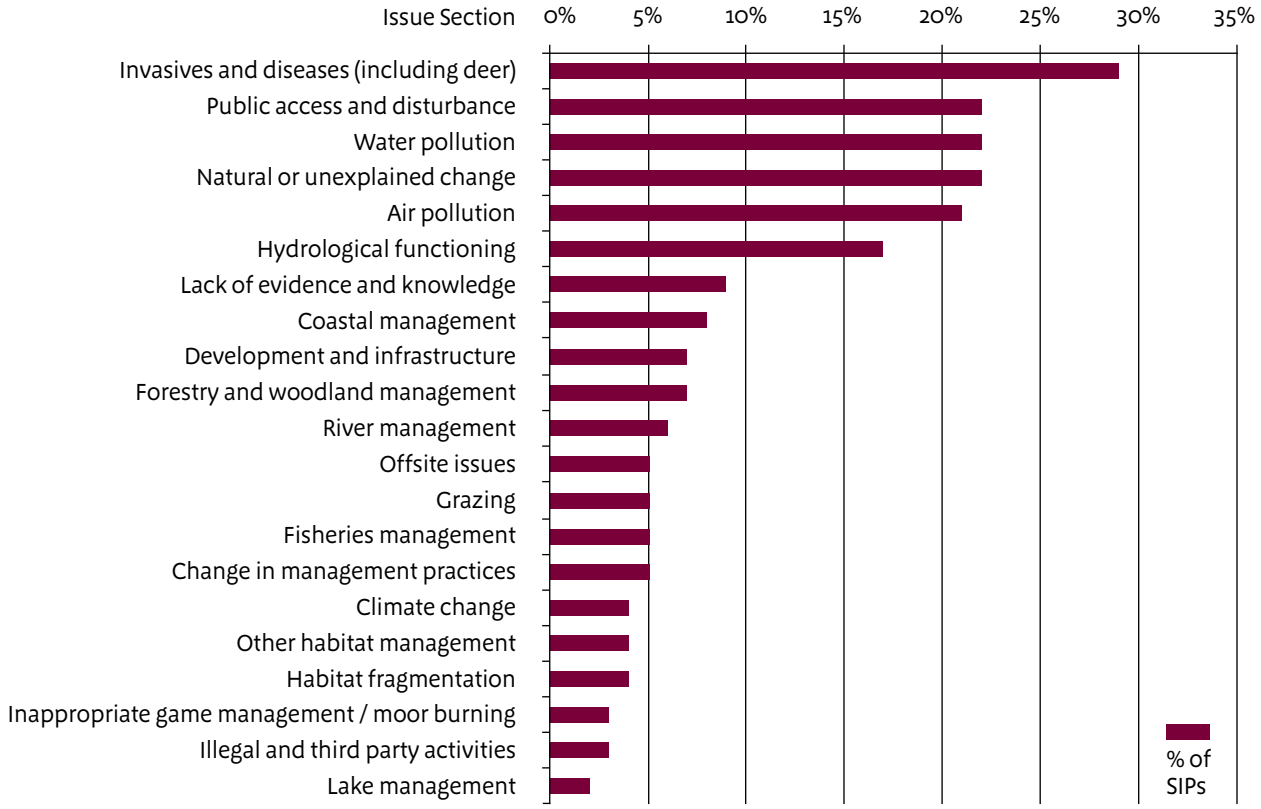
At this point the resource requirements of these new mechanisms and strategies have not been calculated. This will be looked at as part of implementation.

Evidence

IPENS has invested over £1 million to help plug gaps in our knowledge about Natura 2000 sites and the issues affecting their features. The site and theme plans, however, highlight that a lot more is still required, particularly for issues such as **invasive species and disease (including deer); public access and disturbance; water pollution; natural or unexplained change; and air pollution**.

In some cases the gaps in our knowledge are at a site level (with over 500 gaps identified in the SIPs), whilst for issues such as climate change, air pollution and invasive species the gaps in our knowledge relate to more strategic issues such as predicting future trends (eg arrival of new invasive species), so we can prepare appropriately to tackle them. The evidence gaps are shown at Annex 5.

Figure 9 – Percentage of Site Improvement Plans (SIPs) where an evidence gap has been identified



How much will it cost?

It has been reported by numerous SIP authors as a real challenge to estimate a cost for some actions, due to a need for further investigation or evidence. SIPs contain cost estimates for approximately 48% of actions (with a further 8% stating no cost or staff time only) totalling over £800 million. By extrapolating these cost estimates to the whole range of actions identified, a cautious estimate of around £1.6 billion has been made for implementation of SIP actions. The estimate includes a high proportion of short-term, low-cost actions (eg to implement enforcement action or develop an invasive species strategy), with a much smaller number of larger and more expensive actions for long term implementation,

including actions to address river management, water pollution and hydrological functioning . This figure does not include the additional costs of implementing the priority actions identified in the theme plans. Further work will be needed to calculate the resource requirements of the priority actions during an implementation planning phase.

A range of funding sources exist (such as the Rural Development Programme for England, the budgets of Defra and its environmental agencies, and EU and UK grants eg EU LIFE+ and Heritage Lottery Fund) that will help finance a significant proportion but not the full extent of the work required. A prioritisation exercise will be carried out to look at which of the actions from IPENS will be delivered, by whom, by when and how. This will include a more accurate assessment of the funding gap. It is however clear that additional investment in Natura 2000 management, on top of the current and planned funding, will be required.

Who needs to be involved?

Over 650 organisations, from government departments and agencies, to conservation NGOs and private companies, have been recorded in SIPs as delivery partners and / or have engaged in the theme plan development and are likely to have a role in helping to take forward the priority actions identified by IPENS. A list of stakeholders is included at Annex 3.

During this information gathering stage, there has been minimal engagement with landowners and managers; this will need to increase as we move to prioritisation and practical implementation.

Cross-cutting and strategic key messages

A range of cross-cutting issues have emerged in developing IPENS products, including factors which affect many sites or have strategic implications for the delivery of improvements on site. These are captured in the following section as key messages and are of relevance for those with responsibility for the oversight of the Natura 2000 network in England and wider.

Data Issues

For terrestrial Natura 2000 sites, more and different issues were recorded in the SIPs than have been recorded for their underpinning SSSIs on Natural England's reporting system for designated sites. Public access disturbance and air pollution, for example, have been identified as an issue far more frequently in the SIPs. This may be a result of the protocols for assessing the condition of SSSIs, where condition is reported against a limited list of indicators using cost-effective monitoring techniques. Production of SIPs has allowed staff to think more widely about what is required to enable each site to make a full contribution to favourable conservation status, resulting in other issues being highlighted. CMSi also does not include data relating to marine Natura 2000 sites. So, through the development of SIPs, for the first time we have been able to capture on a single database the issues affecting marine and terrestrial Natura 2000 sites.

Some issues have been recorded inconsistently in SIPs, for example climate change and habitat fragmentation. Site officers have a good general understanding of these issues, but in many cases have not reported their effects at the site level. This is likely to be because there is no consistent

Marsh fritillary *Euphydryas aurinia*

assessment method available currently. The theme plans on these topics will help to address this for future SIP updates. Issues relating to development and infrastructure are also reported inconsistently, but this is usually because the majority of issues will be dealt with via existing regulatory processes and so do not need to be recorded on SIPs.

Conflicting objectives

The SIPs and theme plans have identified some perceived conflicts between objectives, driven either by different European policy and legislation or the requirements of different interest features, which are causing issues for onsite management and favourability of European features. This may relate to conflicting management objectives under different legislation eg where a site is both a SAC and a SPA, with requirements under both the Habitats and Birds Directives, but the management objectives for one interest feature may have negative consequences to others. Alternatively, there may be conflict between the objectives of different drivers eg the Habitats Regulations and Water Framework Directive, the latter of which requires reductions in heavy metal concentrations in water, yet the former protects calaminarian grasslands which are dependent on an input of heavy metals to sustain their typical plant assemblage.

Conflicts have also been highlighted between European and domestic legislation, for example legislation which enables access to the natural environment (Countryside and Rights of Way Act 2000 and Marine and Coastal Access Act) which may be difficult to reconcile with the Habitats and Birds Directives, where access may be a key reason why features do not achieve a favourable condition.

The need to find solutions for the management of mosaic habitats has been highlighted, particularly on sites where localised interest features (eg arctic alpine plant species or high altitude base-rich

flushes / fens) exist within other larger-scale protected habitats. It cannot be assumed that appropriate management for the larger habitat type will meet the specific requirements of rare species or localised habitat types within it.

Care needs to be taken with perceived conflicts between legislation, as in reality a lack of join up across policy agendas and disparate views among those involved may be the real source of the problem. Where this is the case, a facility to make high level decisions about the issues and a process to resolve them, may be the solution.

Use of regulatory and enforcement mechanisms

The development of SIPs and theme plans has highlighted that in some cases regulatory and enforcement mechanisms such as enforcement of SSSI legislation are the way to resolve a longstanding problem, once all efforts to secure voluntary solutions have been exhausted.

Flexibility of designations

An issue, cited in 54 SIPs and some theme plans is the need for flexibility in protected sites designations given the changing climate, the need to better reflect ecological processes and to acknowledge and prepare for the effects of rising sea levels and coastal erosion / squeeze.

Changing the boundaries or interest features of designated sites introduces uncertainty to stakeholders and places a significant administrative burden on statutory conservation bodies and so it is not a task that is undertaken lightly. A SSSI designation review is currently underway, which will benefit some Natura 2000 sites. Over time bird populations change in response to climate and other developments and the UK has conducted periodic reviews to ensure that it continues to include the most suitable territories, which may in some cases require site boundaries to be extended.

New approaches to designation may also need to be considered; ensuring designations are ecologically appropriate and facilitate flexibility and change over time. Following recent comments by the UK in regard to updated EC Habitats Directive Article 6 guidance, there is now a helpful acknowledgement that there should be some flexibility for naturally dynamic situations and changes linked to climate change (eg sea level rise, disappearing or newly arriving species), to be assessed case by case. In some cases it may be appropriate to adopt a managed adaptation approach for dynamic sites (eg the managed transition of a freshwater coastal SPA to brackish and / or intertidal) where it is clear that this is the most sustainable long-term option, following agreement with stakeholders, (which in this case would likely be undertaken through the shoreline management process).

Additionally, the ability to protect land specifically for its function within the wider landscape may be required if habitat fragmentation is to be adequately addressed, for example 'stepping stone' or linear habitats which make significant contributions to connectivity.

Investigation and closer monitoring

The need for additional information is a common message coming out of IPENS (see the Evidence Gap section below at page 127), including baseline survey, condition monitoring and post-implementation monitoring.

Examples include investigation of:

- Site / feature condition, for example to put in place more frequent monitoring of very

vulnerable / changeable habitats than the standard monitoring regime.

- Small / localised / specialised / mobile features that are not well monitored by Natural England's current processes, such as some SPA bird populations.
- Improvements as a result of IPENS implementation - including things like gene flow to monitor increases in habitat connectivity.
- Post restoration or mitigation to provide evidence / feedback on whether measures are achieving desired outcomes and if necessary to inform additional actions which might be required (eg lake restoration, mitigation of public access disturbance effects).
- Site feature extent (particularly in the marine environment), where in some sites extent is not fully mapped, and also to reflect changes in extent or quality of the feature(s).

Skills / capacity

From the range of issues and actions recorded in the SIPs, it is clear that successful management of the Natura 2000 network relies in large part on the skills, knowledge and capacity of staff in the environment sector as a whole. In delivering IPENS SIPs, site responsible officers have spent time developing a much deeper understanding of the features on their sites, which will help greatly as we look at which actions need to be addressed, by whom, how and when. There remains a concern however about the patchy nature of that knowledge and the risks around loss of key knowledgeable staff from the sector.

Beast Cliff-Whitby (Robin Hood's Bay) SAC

Communication (including awareness raising, sharing information)

The SIPs and theme plans suggest that improved communication is needed, both across Natural England and the Environment Agency and between all bodies involved. This includes being clear on the issues, the priorities for delivery and having a coherent and shared narrative on what are the priorities for funding.

Making evidence and good practice more widely and easily accessible is proposed in the SIPs and theme plans, including for some issues the development of national networks to share knowledge and expertise and to seek consensus on direction of travel. This approach is already in place for some issues (eg river restoration and invasive non-native species) but would be beneficial to address other issues such as lake management and public access and disturbance.

Coordination

Implementing the measures required to improve Natura 2000 sites is a shared responsibility. As shown in the SIPs and theme plans, there are many organisations and people involved. In delivering IPENS it has been made even clearer that there needs to be improved co-ordination across the organisations and individuals involved on site and at a policy level.

4 IPENS findings by issue

Solent Maritime SAC / Solent and Southampton Water SPA © Natural England / Peter Wakely

This section sets out the detailed findings of IPENS from the SIPs, theme plans and our work on mechanisms, evidence and funding. There were many possible ways to present the findings (such as by feature, mechanism or issue) but we decided the most comprehensible way was to do so by issue. The findings are set out in 21 issues sections. 11 of these relate very closely to the 11 issues covered by the IPENS theme plans. The other sections cover issues affecting multiple Natura 2000 sites, but are ones that do not lend themselves to a strategic approach or are a lower priority which is why they weren't selected as theme plan topics.

Air pollution

There is a wealth of evidence that atmospheric nitrogen deposition is changing ecosystems, including sensitive habitats in Natura 2000 sites. 80% of all Special Areas of Conservation and 83% of all Special Protection Areas (SPAs) are estimated to receive amounts of atmospheric nitrogen above their critical loads. It leads to nutrient imbalances associated with eutrophication and acidification, favouring fast growing species that can exploit conditions of increased nitrogen supply. Because many European habitats and associated species are adapted to low nutrient conditions, the pressure of nutrient loading can lead to loss of species and irreversible change. Air pollution also increases the susceptibility of plants to other environmental factors such as drought, frost and attack by pests or pathogens. There are also direct toxic effects to vegetation (especially lower plants) of high concentration of in particular ammonia in the air.

Nitrogen deposition occurs both over short distances in the vicinity of emission sources; and over much greater distances as a result of long distance transport within the atmosphere. Deposition is likely to decline as a result of national and international policy, but is expected to remain above the safe thresholds (critical loads) for many sites in the foreseeable future. Effective delivery of mitigation measures has not, to date, resulted in the full protection of designated sites from atmospheric nitrogen impacts, as demonstrated by the widespread occurrence of critical load exceedance. In particular, there is a gap in delivery mechanisms to reduce the contribution of diffuse agricultural sources. There is also currently a lack of co-ordination of measures across sectors to achieve an integrated approach for a sensitive locality.

Due to a combination of lack of staff expertise and the difficulty in apportioning observed effects as being due to nitrogen, the issue is significantly under-reported in Site of Special Scientific Interest site condition assessments.

Features (or feature group) affected

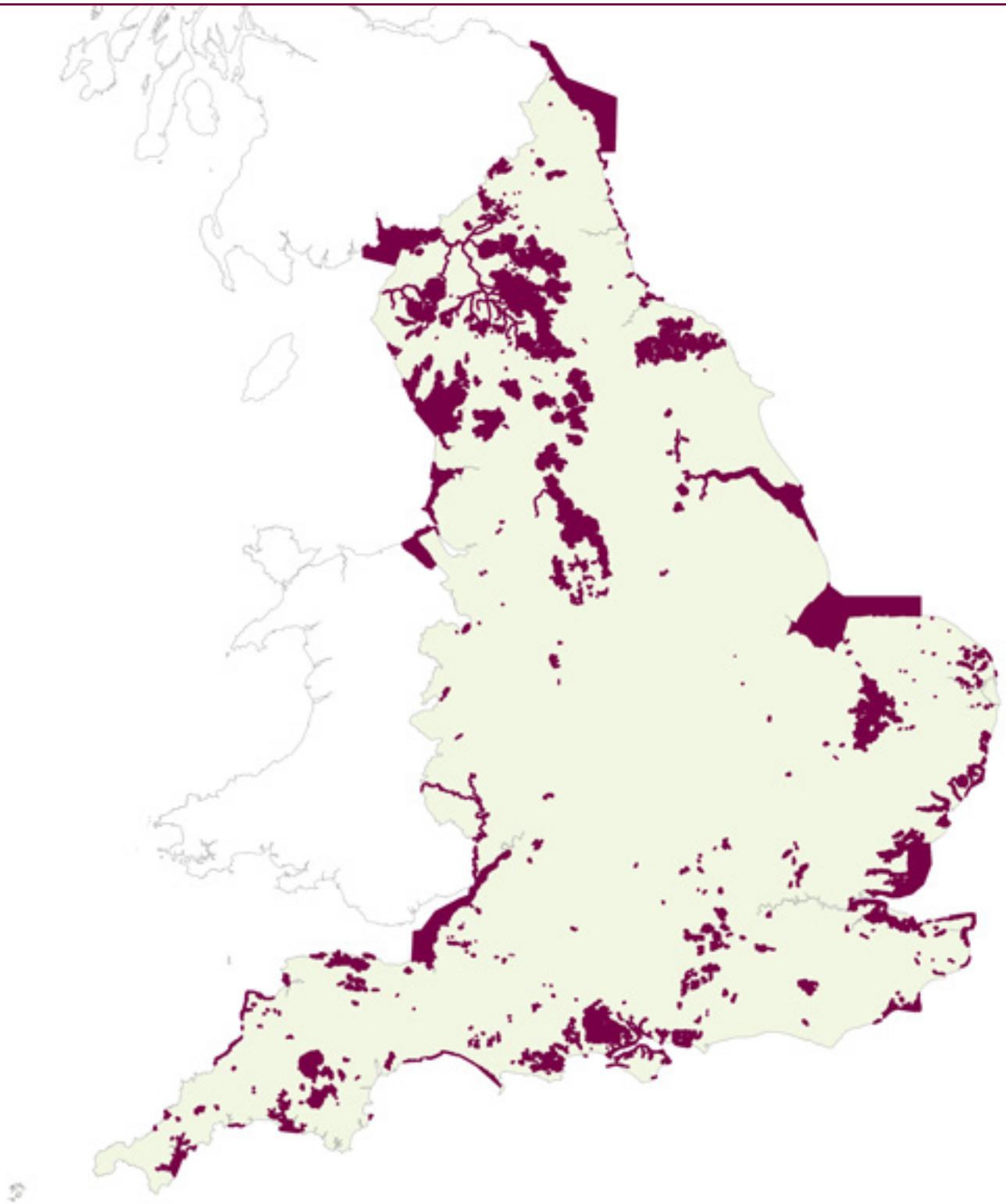
All terrestrial features are affected and some aquatic habitats and their dependent species (although some to a greater extent than others, as below).

Types of sites affected

Bogs, sand dune systems and lower plant communities are particularly vulnerable. In general, habitats (and any dependent species) which are characteristic of peat, or of shallow soils with low nutrient content, tend to be more vulnerable than those which occur on deeper and naturally more fertile soils.

This issue is at a national scale, but the degree of vulnerability of sites depends on habitat type (as described above) and also other factors such as proximity to large point sources of pollution and existing site management and condition.

Figure 10 – Natura 2000 sites where air pollution is recorded as an issue



Issue type	Number of SIPs
Pressure	98
Pressure / Threat	18
Threat	58
Total	**174**

Evidence

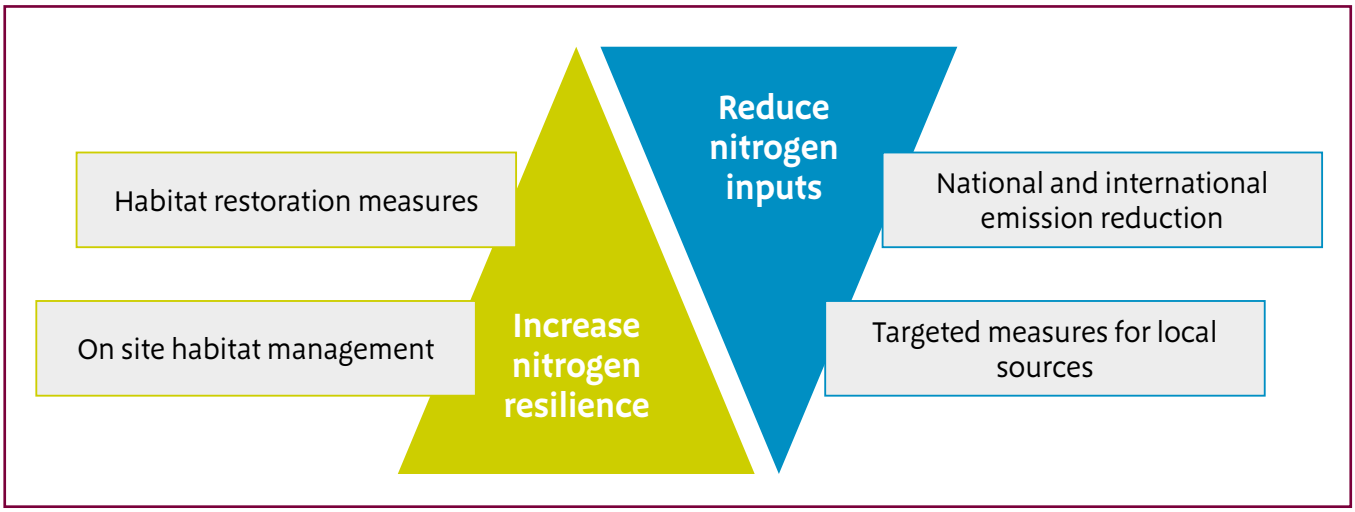
Two evidence projects relating to air pollution were commissioned under IPENS. The evidence projects were 'Site categorisation for nitrogen measures' (Dragosits 2015 and others) and 'Case studies for delivering ammonia measures' (Misselbrook 2014 and others). They looked at how to improve the targeting and delivery of measures, in particular for diffuse agricultural sources. Some of the actions listed below originate from these. However there remains a level of uncertainty in our knowledge and evidence as follows:

- Uncertainties relating to the accuracy of atmospheric dispersion modelling, including the lack of reliable source attribution that distinguish between the contribution of long range and shorter range deposition.
- Uncertainties relating to the sensitivity of some Natura 2000 features and rates of recovery.
- Uncertainties relating to the effectiveness of some mitigating measures.
- Uncertainties and availability of information about local emission sources and local trends in deposition (and restrictions on the usage of such information).
- A lack of skills and tools for local officers to assess and address atmospheric nitrogen impacts.

As a result of the findings from the IPENS SIPs, the atmospheric nitrogen theme plan and relevant evidence projects, recommended actions to address this issue on Natura 2000 sites are summarised in Figure 11:

- Nitrogen deposition occurs over both short and long distances, therefore actions to address this issue need to include both local measures and national / international measures.
- Substantial reductions in nitrogen oxide deposition have been achieved over the past decades as a result of (regulatory) policy measures. Some reduction of ammonia was also achieved, but targeted delivery mechanisms for diffuse sources were generally lacking and need to be put into place.
- The atmospheric nitrogen theme plan recommends a targeted approach to addressing specific local sources, as this can be up to 7 times more cost-effective than a generic, nationwide approach.
- Local actions include appropriate targeting and promoting uptake of ammonia reduction measures in agriculture. Some options available under the new Countryside Stewardship and Countryside Productivity schemes are likely to contribute to this and should be used to reduce air pollution impacts. The limited funding means these should be strictly targeted in order to achieve concerted

Figure 11 – Air pollution summary of approach



effort through the best possible benefit / cost ratio. Locally targeted measures for transport emissions and industry can also help. Screening of sources or sensitive sites by woodland planting shows potential under specific conditions.

- Reduction of deposition on Natura 2000 sites is also dependent on national / international actions that reduce the background deposition, including the implementation of emission reduction measures under the National Emissions Ceilings Directive, Industrial Emissions Directive, Large Combustion Plants Directive; through such measures as further improvements to vehicle engine technology and through improved abatement measures for industrial processes and large intensive farms. The contribution of confirmed national and international measures to declining future deposition trends should be calculated for individual sites because they are part of the package of measures that help sites recover and enable to show a balanced approach to local and generic sources.
- Habitat management and restoration measures on affected sites need to address remaining impacts while deposition remains too high, in order to increase resilience to the effects of nitrogen deposition. On some sites there may be a need for additional habitat restoration measures to address accumulated nitrogen.
- It is recommended that Site Nitrogen Action Plans (SNAPs) are produced in order to document:
  - the current status of the site in terms of nitrogen deposition and the attribution of this nitrogen to identify the most significant sources;
  - the contribution of national and international measures to the deposition trends of the site;
  - coordinated locally targeted measures to further reduce the deposition on the site; and
  - habitat restoration and management measures that mitigate the impact of atmospheric nitrogen.
- In order to trial the SNAPs approach, SNAPs should initially be produced for about 5 sites. Following this trial, the production of SNAPs could be extended to all affected Natura sites
- In addition to the approach to individual (trial) sites, there is a need for wider awareness-raising of the issue and possible actions within different sectors and among conservation practitioners. The limited funding to support uptake of low emission techniques also means these should be promoted through other means such as communication and sector initiatives. It is proposed to establish a national task group with relevant sector partners to harness these potentials.

Delivery partners

During the IPENS project, the focus of engagement has been on the organisations that will need to be active in supporting and delivering the plans and actions to address air pollution. This has included Defra, the Environment Agency, the Forestry Commission, the Highways Agency, Non-Governmental Organisations, Farming representatives (particularly the livestock sectors) and the Electricity Supply Industry. This engagement has mostly been at national level. As we move to prioritisation, more detailed planning and practical application there will need to be ongoing steers and measures put in place from a national level, but also local implementation and measures involving local level engagement with the same organisations and including landowners and local authorities.

Funding

At this stage the cost and timing of the measures proposed is not known, although the work needed for the theme plan actions includes:

- staff time to trial the SNAP approach;

- staff time to produce SNAPs for all sites;
- implementing local agricultural measures near sensitive SACs;
- farm advice visits to approximately 9,000 holdings;
- local measures for other sectors; and
- habitat management and restoration measures.

Potential sources of funding are:

- staff resource from Natural England and other statutory bodies (for SNAP production and project co-ordination with delivery partners);
- Countryside Stewardship Scheme;
- Countryside Productivity Scheme;
- Highways Agency designated funds;
- LIFE (for associated habitat restoration measures); and
- Heritage Lottery Funding (for habitat restoration measures).

There are limitations to these funds:

- There are currently insufficient national / international-level delivery mechanisms or funding to bring long-range deposition down to safe levels.
- The amount of money currently allocated under the Countryside Productivity Scheme is sufficient only to achieve ammonia reductions for a very limited number of sites.
- Countryside Stewardship funding is insufficient to address all relevant local sources.
- There is a gap in funding for large scale site restoration actions that mitigate nitrogen impacts.
- No single source of resource / funding will be sufficient, so a range of (existing and new) approaches will need to be considered.

Water pollution

Water pollution is identified as a priority issue (ie a pressure or threat) in 87 Site Improvement Plans equivalent to 32% of all SIPs and 63% of SIPs that cover water dependent Natura 2000 sites (referred to in River Basin Management Plans). Water pollution affects mainly terrestrial Natura 2000 sites (71 SIPS) though marine and coastal sites are also affected (16 SIPs).

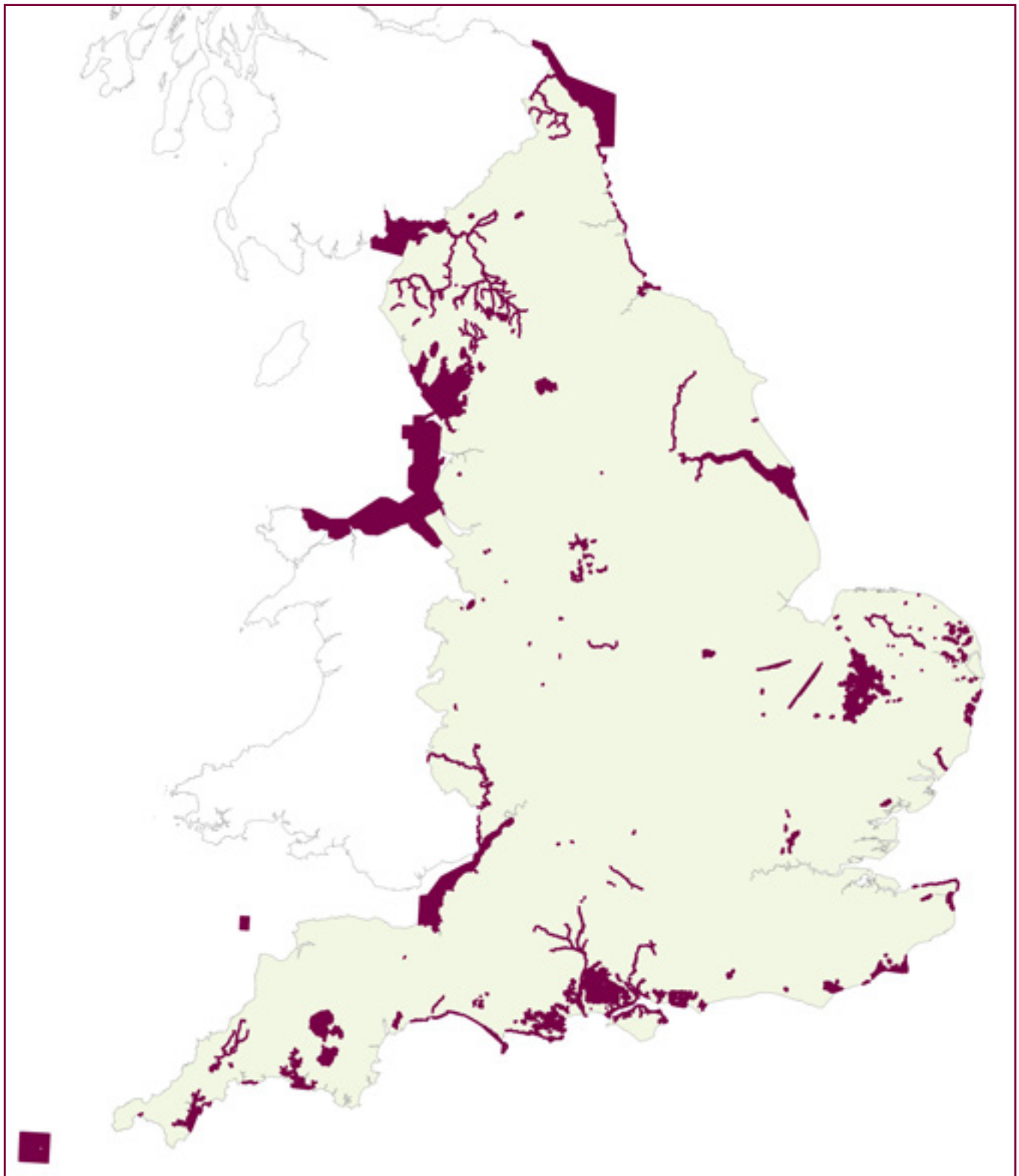
Water pollution (including siltation) is identified as a top three prioritised site issue in 51 SIPs including all Natura 2000 rivers. It is considered the highest priority issue in 26 SIPS.

92% of SIPs that feature water pollution as an issue identify diffuse pollution as a problem. Point source pollution is the sole issue described in 8% of SIPs. Both diffuse pollution and point source pollution problems are referred to in 30% of SIPs. These findings re-affirm the previous view that diffuse water pollution is the main issue that needs to be tackled to achieve improvements and confirms the reasons for its selection as a theme plan topic.

In contrast with terrestrial SIPs a relatively high proportion of marine and estuary SIPs (9 out 13) make reference to point source pollution.

Diffuse water pollution is the subject of one of the IPENS theme plans and is also identified as an issue in numerous SIPs. Diffuse pollution is the release of potential pollutants from a range of activities that individually may have little or no discernable effect on the water environment, but at the scale of a catchment can have a significant cumulative impact. The sources of diffuse water pollution are varied and include agriculture, urban run-off, highways drainage and non mains sewage discharges. The impacts caused by diffuse pollution include eutrophication, loss of biodiversity and silting of fish spawning grounds.

Figure 12 – Natura 2000 sites where water pollution is recorded as an issue



Issue type	Number of SIPs
Pressure	24
Pressure/Threat	23
Threat	40
Total	**87**

Often sites are affected by multiple sources of pollution, many of which have proved difficult to tackle in the past. However the inclusion in River Basin Management Plans (RBMP) of the water dependent Natura 2000 sites as 'Protected Areas' under the Water Framework Directive (WFD) provides an added driver for understanding the sources of diffuse pollution and progressively addressing these using a range of measures.

In Natura 2000 freshwaters, eutrophication due to phosphorus enrichment and the adverse effects of excessive siltation are the principle concerns, whilst in Natura 2000 coastal waters the issue is chiefly one of eutrophication due to excess nitrogen loading. Acidification is identified as issue on Dartmoor and the River Tweed.

Features (or feature groups) affected

This issue is mainly recorded on water dependent lakes, rivers, aquatic features, fens and bogs.

Types of sites affected

This issue is a nationwide one, affecting a wide range of sites with water dependent habitat and species features, including coastal and marine sites.

Evidence

In the main, the evidence collected on this issue by IPENS was to meet local needs and to enable Natura 2000 Diffuse Water Pollution Plan Delivery (see below). This has included:

- GIS mapping of Natura 2000 surface water catchments (Martin 2015).
- Teesmouth and Cleveland Coast SPA Intertidal Project: Nutrient Level and Benthic Habitat Monitoring (Field 2013).
- Setting the standard for Natura 2000 Diffuse Water Pollution Plans (Atkins, 2014a; Atkins, 2014b).
- Water quality / velocity monitoring - Dubbs Beck (River Kent SAC) (PBA Applied Ecology, 2014).
- River Mease SAC Diffuse Water Pollution source identification and Phosphate bio-availability (Comber 2014 and others).
- Sediment fingerprinting -the River Mease (Blake 2014 and others).

Research and investigation is the most frequently identified action where water pollution features as an issue; featuring in 58 out of 87 SIPs signalling that there remains a large gap in our evidence and knowledge.

Description of Actions Required
As mentioned in the evidence summary above, in many cases a better understanding is required of the pollution issue to inform and guide the actions required. Consequently 'research and investigation' is the most frequently identified action where water pollution features as an issue.

Whilst some mechanisms are available to tackle water pollution and actions are underway or planned, implementation often involves complex and costly measures with habitat responses uncertain, and the timescales for recovery often lengthy or unknown. To tackle it effectively also requires a range of off-site coordinated actions in the wider catchment.

A Diffuse Water Pollution (DWP) Plan is the most frequently identified mechanism for seeking to improve water pollution. A DWP Plan is a joint Natural England and Environment Agency tool used to plan and agree strategic action in relation to diffuse pollution at the catchment-scale. Such plans are often complex and require long-term continued investment of resources (time and funding) to deliver the individual outcomes and projects included within an agreed DWP Plan. Typically a DWP plan identifies a range of mechanisms that are necessary in order to

reduce the effects of diffuse water pollution such as investigation, agri-environment scheme promotion and advice and grants via the Catchment Sensitive Farming programme.

In many cases (30 out of 40 SIPs) DWP plans have been developed or are under development and their inclusion in the SIPs reflects that they either may only be partially developed or that there is uncertainty regarding the availability of the resources and means to deliver the plans. 8 SIPs include proposals for new DWP plans.

An Integrated Nutrient Management Plan is recorded in some SIPs. It provides a mechanism for tackling water pollution where excessive nitrogen and / or phosphorus loading requires a combined approach that addresses diffuse sources AND point discharges (notably sewage treatment works). It is particularly relevant to sites where significant population growth pressures mean increased waste water discharge but where diffuse pollution also contributes to the nutrient pressure. The number of signing partners is likely to extend beyond Natural England and the Environment Agency, and may include Water Companies, and Local Authorities.

The main mechanism recorded for improving sizeable point discharges is through the water industry Asset Management Plans. Every five years Ofwat carry out a review of the prices that the appointed monopoly water and sewerage and water only companies can charge their customers. This includes taking decisions on the services customers receive and the investment companies can carry out, including those needed in relation to designated sites attaining favourable condition.

Below is a table of the main mechanisms recorded against the actions to address the water pollution issues in the SIPs.

For 14 SIP actions, the mechanism was recorded as 'not identified' which will require further work by local teams, depending on the priority of the actions.

Table 4 – Main mechanisms recorded against water pollution actions

	Number of SIP Actions	Number of SIPS with mechanism	% of all Water Pollution related SIP actions (number 372)
Investigation	102	58	27%
DWP Plan	60	40	16%
Catchment Sensitive Farming grants and advice	29	26	7%
Rural Development Programme (eg Countryside Stewardship Scheme)	28	24	7%
Asset Management Plan	24	14	6%
Advice	23	17	6%
Regulation or enforcement	22	16	5%
Partnership	16	13	4%
Integrated Nutrient plan	13	8	4%
Designation Strategy – Notification amendment	5	5	2%

Strategic actions identified in the Diffuse Water Pollution Theme Plan:

Diffuse Water Pollution Plans – Detailed, well evidenced and spatially specific catchment based plans have a fundamental role to play in tackling diffuse water pollution pressures impacting Natura 2000 sites, by enabling the effective targeting of measures, by providing transparency relating to the evidence of problem, and by tracking the progress and effectiveness of measures.

Water Framework Directive related funding – It will be important to maintain a funding support mechanism for diffuse water pollution actions that cannot be delivered through conventional agri-environment routes which includes work on non-agricultural sources. WFD Grant-in-Aid has for example proved to be very effective at improving evidence to support local targeting, enabling local partnership initiatives and delivering collaborative solutions on the ground eg with local highways.

Regulatory Compliance – There is a need to understand better the contribution that non-compliance with basic (regulatory) measures makes to diffuse water pollution pressure and the extent to which dealing with non-compliance can help bridge the pollution gap. It is likely that improved compliance will require an enhanced enforcement presence prioritised at Natura 2000 catchments. This must be done without undermining trust and so must be coordinated carefully with advice and support services.

The overall efficacy of the existing regulatory framework to support reduction of diffuse water pollution needs to be kept under review in order to address key gaps (eg with regard to phosphorus and sediment). Statutory Management Requirements (SMRs) & Good Agricultural and Environmental Conditions (basic measures), may need to be adjusted in future to achieve Natura 2000 site objectives and avoid over-reliance on the limited budget available through agri-environment incentive schemes.

Greater use of other regulatory measures may be required in future to secure environmental performance that goes beyond current SMR and GAEC requirements.

Advice delivery – There is a critical ongoing role for advice services to tackle diffuse water pollution impacting Natura 2000 sites as demonstrated by the success of the Catchment Sensitive Farming programme (Environment Agency, 2014).

Rural Development Programme grant provision – It is anticipated that schemes such as Countryside Productivity, Countryside Stewardship and Catchment Sensitive Farming style capital grants will continue to make an important contribution towards tackling diffuse water pollution in Natura 2000 catchments.

Addressing the 'Pollution Gap' – Model predictions for the effectiveness of the main mechanisms indicate that whilst current approaches will secure a margin of improvement, progress will not be sufficient to fully address the pressures from DWP on Natura 2000 sites. DWP Plans can be used as a vehicle for providing greater clarity at the catchment scale of the predicted pollution gap and the additional change required to close it. Where the limits of measures currently deployed can be identified with reasonable confidence, a transparent process is needed by which the gap is acknowledged and addressed in accordance with WFD Protected Area requirements. This response might include enhancement of existing measures, use of available measures not currently deployed or the development of new measures.

Engagement with the Water Framework Directive Catchment Based Approach – Catchment Partnerships provide a valuable forum for exploring evidence with local communities and identifying synergies between Natura 2000 outcomes and other stakeholder

objectives. This can also help identify innovative approaches and funding mechanisms to help tackle diffuse water pollution.

Funding

In order to tackle this wide ranging and challenging issue, there will need to be increased join-up across various agendas, including Water, Biodiversity, Regulation, and Rural Development. Partnership working, such as Catchment Partnerships will be critical, including joint approaches to funding sources. These partnerships are likely to involve (as suggested by the SIPs) Natural England, the Environment Agency, Defra, the Water Companies, Local Authorities, Landowners and others.

Mechanisms to tackle Diffuse Water Pollution from agriculture such as agri-environment advice and incentive schemes heavily rely on voluntary participation. Consequently, without concerted effort to encourage positive engagement, achieving uptake of advice and measures at the requisite scale and in the critical locations can be challenging, thereby limiting overall effectiveness.

Existing programmes that have been recorded for their potential to provide additional resource are the Water Framework Directive Grant in Aid, The Catchment Sensitive Farming grants and advice, the Rural Development Programme (eg the Countryside Stewardship Scheme) and Asset Management Planning.

CASE STUDY – Fenn's, Whixall, Bettisfield, Wem and Cadney Mosses Special Area of Conservation

Situated on the England / Wales border within the Meres and Mosses Nature Improvement Area, Fenn's, Whixall, Bettisfield, Wem and Cadney Mosses Special Area of Conservation: (SAC) covers 948 hectares. It forms the third largest lowland raised bog SAC in Britain, two thirds of which is publicly managed as a National Nature Reserve (NNR) by Natural England and Natural Resources Wales (NRW).

Severely drained to enable past peat cutting, agricultural improvement and afforestation, the centre of the Mosses were rescued from near-destruction in 1990. Since then massive strides have been taken to repair the damage. Impressively, over the central part of the SAC, bog plants and animals have returned and peat is forming again. The water quality in the core of the site is improving following a major project in 2010 that diverted nutrient-rich water carried in the Whixall Manor drain to the edge of the site. Despite this progress, the SAC continues to face a range of issues such as in appropriate water levels, atmospheric nitrogen deposition and excess scrub that need tackling to enable the Mosses to approach favourable condition.

Deepening a ditch as part of project to divert enriched polluted water away from the core of the SAC.

Aerial view of Fenn's and Whixall Mosses showing the pattern of historical close cut drains caused by peat cutting. By blocking these more favourable water levels have been restored allowing the bog habitat to recover.

Developed in conjunction with the Life Natura 2000 Programme for Wales, the IPENS Site Improvement Plan provides an agreed high level 'route map' of the main actions necessary to bring the site into a favourable condition. In practice, the most pressing issue for the Mosses is expanding the area under favourable hydrological management. This is needed to increase the extent of recovering bog habitat beyond the core NNRs, a difficult issue as little progress has been made on the remaining parts of the SAC over the last 20 years. The Fenn's and Whixall SIP covers a range of costed actions needed to achieve this. These include:

- Significant further investment in reconfiguring the complex historic drainage network through the development and implementation of a Water Level Management Plan.
- Additional work to divert diffuse water pollution water around the edge of the site to so that the bog habitats once more only receive clean rainwater.
- Increasing the uptake of suitable agri-environment schemes in combination with effective regulation.
- Reverting areas back to bog, such as those covered by secondary woodland or planted with conifers, is also a priority and this may involve expansion of the NNR where appropriate.

Undertaking this scale of improvement will require new and different sources of funding and an application for EU LIFE funding is actively being explored by local partners.

Improving air quality

The widespread occurrence of nitrogen tolerant purple moor grass and young birch across the restored areas of bog (at the expense of more desired Sphagnum species) is a concern. Evidence suggests this may relate to a high regional background concentration of atmospheric nitrogen and additional loading from more locally based emissions eg poultry and dairy units.

Excess atmospheric nitrogen deposition is a challenging issue affecting a large number of Nature 2000 sites and is one of the 11 issues that IPENS identified as needing to be tackled at a strategic level - through the development

of an Atmospheric Nitrogen Theme Plan - as well as at a site level through SIPs. This SAC is one of five locations that have been suggested in the theme plan to pilot a Site Nitrogen Action Plan (SNAP), a new mechanism to improve the way air quality is addressed. As well as documenting the contribution of national and international measures to the deposition trends of the site, the SNAP will cover coordinated locally targeted measures to further reduce the deposition on the site and (where possible) site specific habitat restoration measures that help mitigate the impact of atmospheric nitrogen.

Hydrological functioning

The English landscape has a long history of anthropogenic intervention in the hydrological functioning of (semi-) natural habitats through intensive land drainage, water level management and abstraction. Significant conservation efforts have gone into reversing historic modification of naturally-functioning hydrological systems of designated sites, in recognition that this is one of the main causes of their unfavourable condition. For example:

- Flood authorities working in conjunction with Natural England have implemented Water Level Management Plan measures on 12,750 hectares of protected sites, including 11,050 hectares on Natura 2000 sites as part of the national remedies programme to restore England's protected sites to favourable or recovering condition.
- Considerable progress has been made with the restoration of active peat-forming conditions on some previously cut-over and drained raised bogs, through the blocking of drains, reprofiling and raising water tables. These actions have been supported by (sometimes EU-funded) conservation projects or land management agreements with landowners.
- Reductions in groundwater abstractions through the 'Restoring Sustainable Abstraction' programme has significantly improved hydrological conditions on Natura 2000 calcareous fen sites.

As a result of these efforts, the majority of Natura 2000 sites where hydrological functioning has been identified as an issue are now considered to be in unfavourable-recovering condition.

Sites have been assessed as recovering where the need for pro-active measures has been identified and implementation of these measures has started. As such, there is a range of outstanding actions that still need to be implemented across the Natura 2000 network to achieve favourable condition. In addition, changes to the hydrology of sites may be expected as a result of climate change. There is an increased recognition that for long term sustainable hydrological functioning, restoration of natural hydrological processes would be beneficial and should be considered where possible. Achieving a favourable conservation status for some SAC terrestrial wetlands is likely to be largely dependent on restoring natural hydrological processes.

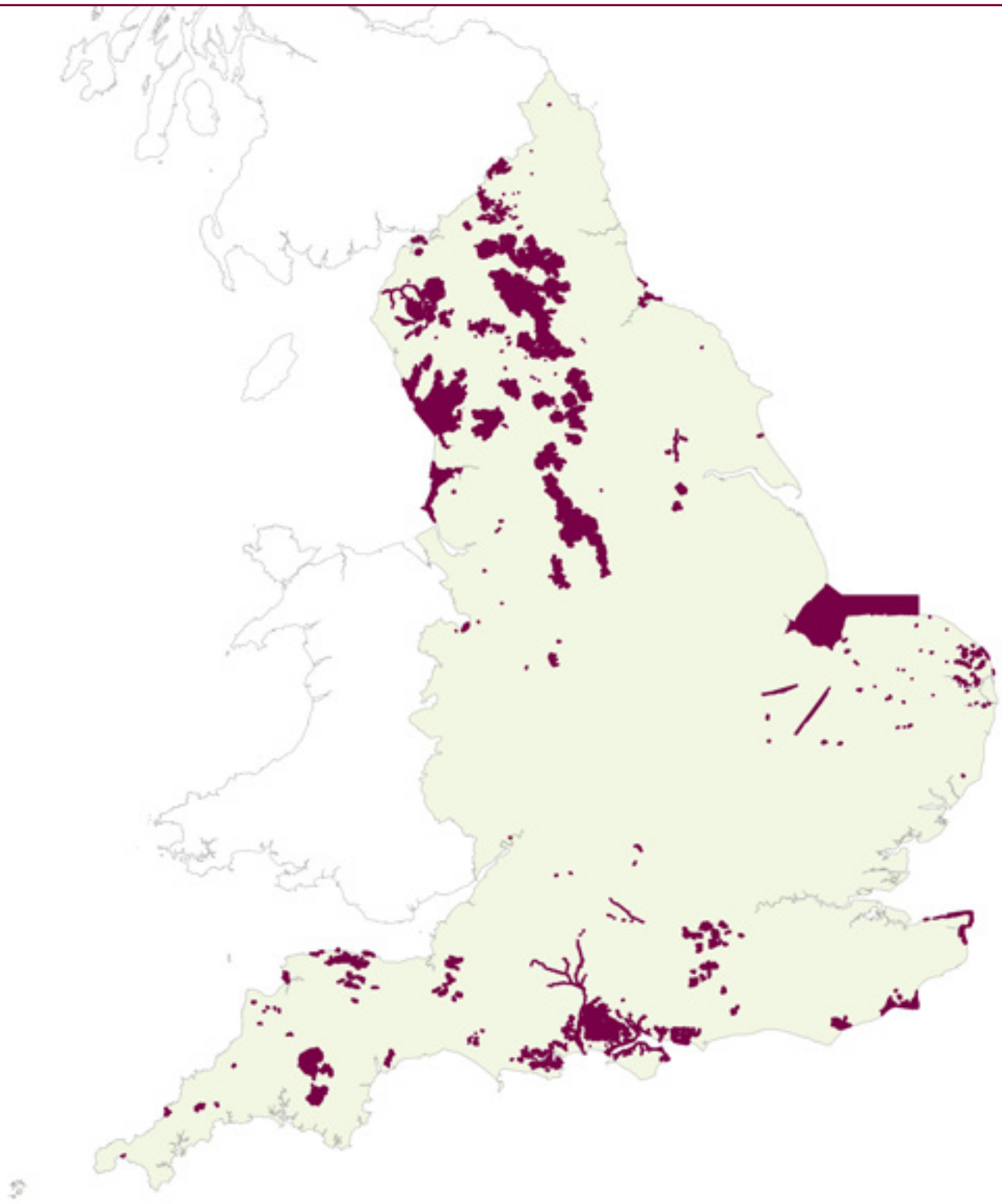
This issue is reported in 77 SIPs and is the subject of an IPENS theme plan and evidence project.

The issues described in the SIPs can be grouped as follows:

- water level issues;
- drainage;
- lack of knowledge of the hydrology;
- abstraction; and
- ditch management.

The issues are mostly current pressures (affecting the sites as we speak), but there are also a range of threats associated with hydrological functioning. The table below shows the instances and the nature of the issue from the SIPs, with more detail following.

Figure 13 – Natura 2000 sites where hydrological functioning is recorded as an issue



Issue type	Number of SIPs
Pressure	27
Pressure / Threat	21
Threat	29
Total	**77**

Table 5 – Breakdown of hydrological issues recorded in SIPs

Number of SIPs	Water levels	Drainage	Lack of knowledge hydrology	Abstraction	Ditch management	Other
Pressure	22	20	7	5	2	4
Pressure / Threat	6	7	5	2	1	3
Threat	16	10	6	4	2	8
Total	**44**	**37**	**18**	**11**	**5**	**15**

Water levels:

- At sites with actively controlled water systems, issues relate to operation and maintenance and of water control structures, disagreement over control or operating protocols, uncertainty over who's responsible and lack of funding for continued management.
- In some cases, there is a long history of unfavourable water levels, resolution of which is complex due to competing interests. Adjusting the water levels may be required at a catchment scale with potentially wider socio-economic impacts.
- Excessive winter flooding of some sites affects features such as lowland hay meadows, wintering birds and other species. It leads to nutrient loading of some sites and impedes appropriate management by delaying grazing or hampering reedbed management and through damage to infrastructure.
- Water levels which are too low on sites or in a wider catchment, leads to sites drying out with effects on Annex I habitats or newt breeding ponds and creates unsuitable habitat for wintering or breeding birds.
- Where water levels are too high, this can lead to erosion of adjacent habitats such as bogs or wet woodland.
- Dysfunctional tidal sluices affect the hydrology of coastal habitats such as lagoons, causing changes to water chemistry (salinity) threatening specialist communities.
- In some situations there is a risk of future changes to water levels due to adjacent unregulated development, a dependency on continued water supply from industrial sources or impacts of climate change.

Drainage:

- A widespread legacy of historic and active drains (on site and around sites or in a wider groundwater body catchment) affects the hydrology of mainly bog systems and valley mires, but also wet heaths, wet grasslands, lowland hay meadows. Drainage affects the hydrological functioning of sites leading to the loss of Annex I vegetation and habitats of Natura 2000 species. In bog systems for example, surface channels (present as a result of land use, historic peat cutting, fire, erosion or access tracks) result in drying of peat leading to surface cracks which, in turn, can cause further hydrological change by lowering the water tables and encourages scrub growth.
- Programmes of ditch blocking have resulted in significant improvements over the past decades (eg through EU life funded projects, or capital grants through HLS), but there are some remaining areas of upland bogs and lowland mires that still require restoration. This represents a major funding gap.
- Hydrological restoration is often complex and costly due to valid other interests in water management, for example where agricultural and transport infrastructure require continued drainage on surrounding land. Ditch blocking can also lead to unintended adverse effects (eg increased erosion, flooding with polluted water) and needs to be carried out carefully, requiring on-going management

and monitoring costs which is sometimes not budgeted for.

Lack of knowledge in hydrology:

- A better understanding of the eco-hydrological functioning of sites is needed to identify the degree of degradation and its causes, the potential for restoration and the appropriate restoration measures.
- Dependency on hydrological buffer zones and interaction with water quality is sometimes not well understood.
- Reasons for observed changes in water levels or vegetation are unclear at some sites, also where sites don't fully recover after hydrological restoration actions.

Abstraction:

- Most abstraction issues have been addressed through the Review of Consents process. There are however instances where mitigation measures identified through this process haven not yet been fully implemented.
- There are concerns about the combined impact of multiple licensed abstractions at a catchment scale, also in light of climate change. Potential impacts include saline incursion and lack of water during dry summers.
- There are also concerns about the impact of abstractions that are currently exempt from licensing.

Ditch management:

- Some sites require a specific ditch maintenance regime, either to support species needs that are dependent on the ditches themselves (eg southern damselfly, little ramshorn whirlpool snail, waterbirds) or to prevent sensitive habitats from flooding or drying out.

Other issues:

- In a number of cases the increased evapotranspiration due to scrub, woodland and other vegetation is thought to exacerbate hydrological problems.
- On a few sites on-going peat extraction affects the hydrology of bog systems.
- Climate change is reported as a threat to changing hydrological condition (causing flooding or drought)
- A range of hydrology issues are very site specific, such as: exploratory digs for caving leading to hydrological changes, or a power station shut down leading to changed water temperature and salinity.

Features (or feature groups) affected

In total 80 different Natura features are reported in SIPs to be affected by hydrological functioning issues. These can be summarised as:

- SAC terrestrial wetland habitats (upland and lowland bogs, fens, mires, wet heaths, wet grasslands, dunes and wet woodlands).
- Coastal lagoons, ponds and lakes. Note that hydrology issues for open freshwater habitats have been included in other issue sections (river management, lake management) SAC species that are dependent on sufficient wet conditions in their terrestrial habitats (SAC snails, marsh fritillary and southern damselfly, great crested newt, Bechstein's bat, otter, mosses and SAC higher plants).
- Habitats of breeding birds of upland moors, breeding birds of coastal and inland marshes and wintering waterbirds of grazing marsh.

Water Levels issues are reported for:

- Breeding birds of coastal and grazing marshes: such as bittern, avocet, shoveler, teal, marsh harrier, ruff, spotted crake, common tern, little tern, gadwall, garganey and mute swan.
- Wintering waterbirds: such as wigeon, Eurasian teal, golden plover, ruff, bittern, Bewick's swan, whooper swan, pink-footed goose, Icelandic greylag goose, gadwall, pintail, shoveler, aquatic warbler, northern lapwing and common redshank.
- Lake habitats, fen habitats and hay meadows, bog habitats both uplands and lowland, woodlands.
- SAC species: including Desmoulin's whorl snail, great crested newt, creeping

marshwort, otter, and little ramshorn whirlpool snail.

Drainage affects the following features:

- wintering waterfowl on Somerset levels and moors (eg Bewick's swan, wigeon, Eurasian teal, shoveler and northern lapwing);
- breeding birds of blanket bogs and heather moorland on Bowland Fells and in the Pennines (eg hen harrier, merlin, peregrine, golden plover, lesser black backed gull, short-eared owl, dunlin, breeding bird assemblage);
- dunes;
- wet heath;
- fen, mire and grassland habitat in lowlands, calcium rich fens, very wet mires, hard water springs as well as some uplands sites;
- bog habitats both uplands and lowland ;
- bog woodland and floodplain woodlands in the new forest;
- SAC butterflies and damselflies of heathland and grassland ; and
- SAC species such as great crested newt and floating water plantain.

A Lack of knowledge of features including:

- upland moorland and blanket bogs and associated breeding birds;
- lowland valley mires and depressions on peat;
- dunes, heathlands and grasslands; and
- specific SAC species such as marsh fritillary butterfly, Bechstein`s bat, petalwort, shore dock, early gentian and floating water-plantain.

Abstraction relates again to a wide range of features including coastal and dune habitats, open water lakes and ponds, fens and mires, and a range of SAC Species such as Geyer`s whorl snail, Desmoulin's whorl snail, slender green feather-moss, shore dock, early gentian, otter and fen orchid.

Types of sites affected

This is a widespread national issue, affecting most sites with terrestrial wetlands. (Note that this excludes river SACs and lake SACs and most SPA lakes / reservoirs which are covered in other issue groups).

The 77 SIPs which record this issue represent a wide variety of systems including:

- coastal marshes, lagoons and dunes;
- lowland fens, valley mires, spring fed fens, and lowland raised bogs;
- rivers floodplains, river valleys, wet grasslands, grazing marshes, hay meadows and riparian woodlands;
- lowland and upland heathlands, extensive moorlands, upland bogs and raised mires;
- open water sites including disused quarries and water reservoirs; and
- limestone pavements.

Hydrological functioning issues are particularly prevalent for SAC terrestrial wetlands. As an indication of the scale of the issue, for the table overleaf shows the number of SACs by feature affected by hydrological issues. The hydrological functioning theme plan focusses on the issues and strategic solutions for these habitats.

Evidence

Eco-hydrological characterisation and investigation of hydrological function and impacts on priority wetland SACs

A lack of knowledge of the hydrological functioning of sites was reported for 18 sites as a major issue. The IPENS evidence project 'The Norfolk Valley Fen project' (Shaw and Tratt 2014) addressed one of these sites.

Evidence gaps relate primarily to the need to better understand the eco-hydrological functioning of sites to:

- identify the degree of degradation and it's causes;
- identify the potential for restoration and the appropriate restoration measures;
- understand dependency on hydrologically important areas outside the boundary; and

Table 6 – Proportion of SACs affected by hydrological functioning

Feature	Number of SACs	Number where Hydrological functioning is an Issue
Active Raised Bogs	8	8
Degraded Raised Bogs	10	10
Depressions on Peat Substrate	7	7
Blanket Bog	10	9
Wet Mire	15	13
Calcareous Fen	9	6
Purple Moor Grasslands	17	9
Alkaline Fens	16	8
Wet Heath	25	12
Petrifying Springs	7	3
Allvial Woodland	12	5
Dune Slacks	13	4
Bog Woodland	4	1

- understand the interaction with water quality.

The knowledge gaps are particularly prevalent for dune systems, wet heaths and lowland raised bog and mires as well as the specific hydrological needs of SAC plant species.

Description of actions required

Hydrological restoration measures are required for a wide range of sites. Primarily:

Water levels:

- Implement actions identified in Water Level Management Plans processes, review Water Level Management Plans where necessary and establish new ones where there's a need. For example where waterlogging causes adverse effects.
- Inspect, repair and enhance exiting water control structures, agree required water levels and operating arrangements. Install new structures where needed.
- Reinstatement of drainage where water logging causes adverse effects.
- Agree appropriate ditch maintenance though management agreements.
- Consider alternative flood storage where excessive waterlogging affects sites.
- Habitat creation of wet grasslands.

Drainage:

- Develop comprehensive hydrological restoration plans.
- Hydrological restoration of bog, mire and heath systems, through;
  - raising water levels;
  - removal of drains, ditch / grip blocking, bunding;
  - gully re-profiling;
  - sometimes tree and scrub removal; and
  - re-vegetation.
- Reduce the impacts of on-going peat cutting activities.
- Agree the implementation of measures with relevant landowners. Where

voluntary approaches fail, other approaches should be taken to secure long term favourable management of the land.
- Establish sympathetic management of hydrological connected areas around sites. Habitat creation of marginal fens. This potentially needs inclusion of adjacent land in the site boundaries.
- Enforcement of SSSI regulations in case of drainage events.
- Engagement and awareness raising activities to foster better understanding of optimal hydrological functioning and the wider benefits.
- Secure on-going management and monitoring post restoration.

Abstraction:
- Investigate the contribution of (cumulative) abstractions to hydrological issues and take measures as appropriate through the Restoring Sustainable Abstractions programme.
- Implement outstanding actions identified through review of consents.

Lack of knowledge:
- Investigate the hydrological functioning of sites, including dependency and extent of hydrological buffer zones or catchment hydrology, also in light of climate change.
- Investigate management measures needed to achieve favourable condition and restoration options and techniques.
- Survey of habitats / distribution of species.
- Monitoring of water levels, groundwater levels, also to inform year-on-year water level management.
- Post restoration monitoring.

Other:
- Restore functional hydrology of dune systems.
- Agree appropriate ditch management.
- Consider reviewing the boundaries of SAC coastal lagoon designations.
- Prevent caving impacts on hydrology.

Given the prevalence of hydrology issues for SAC terrestrial wetlands, the theme plan sets out strategic issues for these habitats in more detail and suggests an improved approach to their restoration. Whilst implementing the outstanding actions identified in SIPs is a first priority, in the long term an approach to achieving more natural hydrological functioning could usefully be developed with partners for sites where this is appropriate. Efforts to date have not always focussed on achieving natural hydrological functioning in the long term, due to strategic barriers such as:

- remaining knowledge gaps of hydrological functioning;
- a tendency to accept the status quo;
- reliance on short term and voluntary measures; and
- constraints of land use and budgets.

It is recognised in the theme plan that substantial effort may still be required to resolve outstanding hydrological issues for Natura 2000 sites. Achieving a natural hydrological functioning may be the most sustainable long term solution for some sites, whilst at other sites an actively managed hydrological regime is more appropriate.

Whilst implementing actions identified in SIPs as a first priority, the theme plan envisages for the long term the establishment of local, hydrological restoration strategies for some sites that focus on achieving a natural hydrological functioning as far as possible, in a process with stakeholders and partners, driven by a coordinated national programme. Local hydrological restoration plans would analyse the potential of a site based on a good understanding of a natural eco-hydrology and setting appropriate hydrological targets taking account of local constraints as well as the need to maximise a site's contribution to a Favourable Conservation Status. Comparable to the approach for river restoration, hydrological restoration of Natura 2000 terrestrial wetlands can be planned consistently across the Natura 2000 network using evidence-based and transparent decision making, with the involvement of

those interested or impacted by restoration proposals.

It is suggested that a future programme of hydrological restoration of terrestrial wetlands will be developed in a process with stakeholders and partners, preferably starting with a limited number of habitats across a limited number of sites, building on the work that is already underway.

Delivery partners

The Environment Agency and the water industry for abstractions; flood risk authorities (Environment Agency, local Flood Authorities, Internal Drainage Boards) for the further implementation of Water Level Management Plans.

Local partnerships for developing hydrological restoration plans.

Funding

Investigation actions are identified in 44 SIPs with a total cost estimate of £2.4million (with 7 actions not costed).
Other hydrology related actions indicate a total funding need of £86 million (including over £2.7million per year for the Ouse Washes; based on 114 costed actions, with 80 uncosted actions remaining).

If one considers the evidence of other LIFE projects on hydrological issues, it is possible to put an estimate on the cost of hydrological restoration of all 9000 hectares of active and degraded raised bogs in England's SACs. This is around £9million (assuming average cost of £2000 per hectare and an assumption that 50% of the area would need to be restored).

Restoration initiatives could be delivered through National Nature Reserve management plans, agri-environment schemes such as Environmental Stewardship and the new Countryside Stewardship scheme; externally funded projects via Heritage Lottery or LIFE funding; partnership funding and the Conservation and Enhancement Scheme.
The SIPS and the theme plan identify large gaps in the funding available including:

- Hydrological restoration requires one-off restoration projects for blocking of drains and raising water levels on site and surrounding sites, to be funded through external funding.
- The cost of post restoration on-going management is sometimes not budgeted for.
- Gaps to fund a programme of hydrological investigations to close evidence gaps with regard to the functioning and potential and costs of restoring sites.
- Some land acquisition will be required to enable the required land use change
- Capital grants available for reducing drainage are limited.
- Addressing drainage issues can be more costly than available funding through HLS within one year.

Lake management

17 SIPs include lake management issues and / or contain a proposal for a Lake Restoration Plan. There is also an IPENS theme plan covering this issue at a strategic, cross cutting scale.

A diversity of lakes is found within England's Natura 2000 series – 185 lakes occur across 23 Special Areas of Conservation (SACs) and 24 Special Protection Areas (SPAs). A high proportion of Natura 2000 lakes particularly SACs are in unfavourable, no change or declining condition. Lakes are some of the most damaged habitats within the designated sites series. Out of 72 SAC lake habitat units, approximately a third (numerically) are in 'favourable' condition, a third in 'unfavourable recovering' condition and the remaining third are in 'unfavourable no change' or 'unfavourable declining' condition. By area the proportion in 'unfavourable no change' or 'declining' condition is in fact higher at 42%.

The restoration of this habitat type has been identified as a priority for IPENS to consider. The Water Framework Directive includes specific requirements to meet the ecological and water quality objectives of Natura 2000 lakes within set timescales (ie December 2015 or 2027 at the latest where the criteria for extension are met).

The primary reason for unfavourable condition is habitat degradation due to eutrophication. The restoration of lakes is strongly dependent on catchment based sources of nutrient enrichment being effectively controlled. Even though many of the larger point source discharges affecting lakes have been progressively addressed there remain a few large discharges that still contribute disproportionately to eutrophication on SACs. Agricultural sources of nutrients inevitably affect all SAC lakes in England to some extent, as at least parts of most catchments are agricultural. Recent source apportionment modelling identified agriculture as the greatest contributor to the diffuse component of phosphorus and nitrogen affecting Natura 2000 catchments (UK Water Industry Research 2014).

The current lack of progress in adequately reducing catchment sources of pollution represents the most significant barrier to restoring lake habitats, including progressing in-lake restoration work which may be required. There is a need to identify Natura 2000 lakes where the use of existing mechanisms is unlikely to adequately address diffuse and non-diffuse pollution to achieve the water quality required for favourable condition.

The primary non-native invasive species recorded as a reason for unfavourable condition on SAC lakes is New Zealand pygmy weed. Initiatives exist and control attempts have been trialled, but the species is particularly difficult to eradicate. To date, control involves early detection and catchment wide eradication where possible, but ongoing management is all which can currently be achieved once populations are already established and beyond removal. There are other invasive species which are present and potentially impacting SAC lakes, but these are rarely reported. The most common examples include Canadian and Nuttall's pondweed, zebra mussel and several species of invasive crustacean (eg killer shrimp and signal crayfish).

Fish community imbalances, fish stocking and fishery management practices are suspected of contributing to unfavourable condition in the case of several SAC lakes, but little systematic information on fish communities and their potential impact at lake sites exists. In some situations, fishery management may be contributing to an eutrophication problem (eg by over-stocking, an unbalanced fish community or excessive use of ground bait). In others, recovery from eutrophication may be hindered by positive feedback mechanisms

Figure 14 – Natura 2000 sites where lake management is recorded as an issue

Issue type	Number of SIPs
Pressure	2
Pressure / Threat	4
Threat	7
Total	**13**

associated with the fish community (which may or may not be a fishery).

Hydrological issues affect a range of lake features. This covers a wide selection of related issues, from over-drainage to impacts of abstraction. Where a drainage authority operates (eg a local council, Environment Agency or Internal Drainage Board), they have a responsibility to work with Natural England, landowners and other partners to agree and put in place a 'Water Level Management Plan' to ensure levels are appropriately managed to support the interest features of the SSSI / SAC. In other situations (eg where no drainage authority operates, or where work is small scale) a formal agreement may not be required and it may be sufficient to work with partners and landowners to block ditches to restore more natural water levels.

Whilst Lake Restoration plans are being developed for many Natura 2000 lakes, the interventions required are often costly, technically challenging, and take a long time to have effect. The main factors that restrict lake restoration measures from being undertaken include:

- The availability of sustained funding (high cost per unit area compared with other habitats).
- Expert and specialist capacity at the local level.
- Long-term commitment of effort and resources required to achieve successful restoration.
- Uncertainties as to the importance of in-lake intervention in improving conditions.

Features (or feature groups) affected

Habitats: oligotrophic waters, oligotrophic to mesotrophic standing waters, hard oligo-mesotrophic waters with benthic vegetation of algae species, natural eutrophic lakes with magnopotamion or hydrocharition-type vegetation, natural dystrophic lakes and ponds and Mediterranean temporary ponds.

Species: including floating water-plantain, great crested newt, Desmoulin's whorl snail, birds species / assemblages under the Birds Directive.

Types of sites affected

Main aggregations of lake sites are located in the Broads and Cumbria with the remainder of sites scattered across the country. Lakes covered by the Natura 2000 series include SACs supporting Annex 2 lake habitat types; a number of SPA reservoirs and lakes that support bird species / assemblages under the Birds Directive and SACs supporting Annex 2 species such as the floating water-plantain, great crested newt, and Desmoulin's whorl snail.

Evidence

IPENS funded two projects on Lake Restoration:

- 'Humber Estuary SAC Clay Pits – Water Quality Briefing' (Metcalfe 2014).
- 'An investigation into the nutrient levels of Breckland SAC fluctuating meres' (Dobson, Webb & Riddick 2015).

The theme plan and SIPs make clear that effective before and after monitoring should be included as part of any restoration project so that the scientific evidence base for lake restoration can be improved and disseminated. This is an area which is often compromised due to budgetary constraints (especially beyond the life of a project) and the lack of experienced staff resource during the designing of restoration projects. A potential way of overcoming these issues is to develop stronger links with academic institutions that have an interest in lake restoration. Researchers may be interested in helping develop the scientific foundation for projects and in studying the effects of management interventions.

The SIPs and theme plan showed that there is a lack of understanding of the effectiveness of various lake restoration activities. This gap has partly been addressed by a project in the Broads. The Broads Authority, Natural England and partners, commissioned a major review of ecological and chemical data, and past management activity in The Broads National Park. This review examines trends in relation to management activity and includes dossiers for each Broad with recommendations on management (Phillips 2015 and others). These dossiers provide the basis for deciding what work should be carried out over the next decade. The review also provides a greater understanding of the effectiveness of various lake restoration activities, which will influence future activity carried out in the Broads National Park and across the SAC and SSSI series. This review will inform future iterations of relevant SIPs.

Description of actions required

There are a variety actions contained in the SIPs related to SAC lake features. They include as well as the preparation of Lake Restoration Plans, actions at the catchment-scale to reduce water pollution and siltation such as the implementation of diffuse water pollution plans, advice provided by Catchment Sensitive farming (CSF) and the promotion of Countryside Stewardship agreements.

A number of SACs also have actions related to the control of invasive species and the improvement of their hydrological regimes e g. use of Water Level Management Plans and investigation of abstractions. A small number of sites contain fish management actions usually entailing an initial investigatory phase.

The detail on the strategic approach to catchment management of pollution is in the IPENS theme plan on Diffuse Water Pollution. In the field of lake restoration it is however very important that any in-lake management work is undertaken with full acknowledgement of the ongoing pollution sources, and that strategies to address these are at the forefront of any work so that in-lake work is sustainable. Where lake restoration projects are initiated, they need to focus on lake catchments as much as in-lake management, and the latter needs to be suitably sequenced to ensure sustainable results. It may be that lake restoration plans focus almost entirely on reducing external loads, at least in the first instance.

The **Lake Restoration Theme Plan** proposes a strategic approach to improving lakes that comprises of five key elements involving a series of actions:

- **Development of a strategic partnership** – it is recommended that the current Lake Restoration Officer post, jointly supported by Natural England and the Environment Agency, is extended and the scope of the Lake Restoration Project' work is widened from 'in-lake' work to include catchment management. Consideration should be given to the development of a more formal and targeted strategy to improve lakes, and opportunities to better link national and local partnerships should be explored.
- **Building the evidence base** – it is important that effective before and after monitoring of any restoration project is undertaken so that the scientific evidence base for lake restoration can be improved and disseminated. Dissemination of the findings of a major review of past lakes related activity in the Broads should improve the understanding of the effectiveness of various lake restoration activities.
- **Better skills and knowledge** – identifying and developing capability and knowledge amongst key staff who are able to act as 'lake champions' is advocated. There is potential for a network to facilitate greater communication between restoration projects, and those producing guidance and evidence, as the River Restoration Centre does for river restoration projects. The River Restoration Centre is the UK's 'expert information and advice' centre for

all aspects of best-practice river restoration and catchment management.

- **Sustained and intensive activity to reduce diffuse and point source pollution at the catchment-scale** – there is a need to align and integrate Diffuse Water Pollution plans, and Lake Restoration plans and associated delivery activities.
- **Availability of funding** – it is proposed that a strategic programme of improvements to Natura 2000 lakes and their catchments is developed with partners including funding bodies such as the Heritage Lottery Fund and EU LIFE. It is important that the new SSSI lakes restoration option under Countryside Stewardship is promoted and its roll-out supported.

Delivery partners

In order to address these issues Natural England will need to work closely with the Environment Agency and Defra as well key local and regional organisations like The Broads Authority, Lake District National Park, National Trust, funding bodies and local landscape-scale and catchment partnerships. Harnessing the specialist knowledge and expertise of universities and research bodies will also be important.

Natural England and the Environment Agency share a SSSI lake restoration programme which is overseen by a joint steering group and a jointly funded project officer. This has the national oversight of the lake restoration projects being carried out within these organisations and provides support to projects which are delivered locally by area team staff and local partnerships. The theme plan makes clear that it is important that this continues, to maintain progress and monitoring of lake restoration activity, informed by the findings from IPENS.

Although there is partnership working at a local level, there may be potential to integrate this better at a national level, so that expertise can be shared and a consensus on direction agreed across potential delivery bodies. The steering group may be able to help with this.

Half of the SAC lakes requiring lake restoration are within the Norfolk Broads. The strategic overview of restoration priorities and progress in the Broads are captured in The Broads Lake Restoration Strategy (The Broads Authority 2008). Again, IPENS and this strategy will inform each other.

A strong partnership, information sharing and joining-up of resources would go some way to addressing issues of limited expertise, as staff working in the area of lake restoration would be working within a framework where they are supported and can seek advice. However there still needs to be an acknowledgement and commitment within individual organisations contributing to set aside staff and budget resources over the longer term in order to carry out the lake restoration required. Identifying and securing the resource of key staff with lake interest / experience (lake champions) could provide a more effective way of securing and developing the specialist skills required within organisations.

Funding

The existing funding sources are unlikely to change much so a strategy to manage lakes needs to be developed within these broad funding constraints.

Sharing of resource and experience between organisations will lead to efficiency savings which will ensure that the existing resources are well prioritised and go further.

The IPENS theme plan has also proposed that a strategic programme of improvements to Natura 2000 lakes and their catchments is developed with partners including funding bodies.

Of note is that there is a new option under Countryside Stewardship for the restoration

of large water bodies. This will hopefully be taken up by applicants and contribute to the improvement of Natura 2000 site condition.

Potential sources of funding recorded in the SIPs and theme plan include Heritage Lottery Fund, LIFE, Landfill tax, Conservation and Enhancement Scheme, Countryside Stewardship. In addition resource via the Water Framework Directive Grant in Aid is mentioned, including the use of the WFD as a driver to bid for additional relevant funding.

River management

Rivers are a priority habitat and river management issues are recorded on 23 SIPs. There are multiple issues within this section. The SIPs have particularly picked up the following:

Hydrological change – a range of issues related to changes in the seasonality or degree of flooding and drought are noted. Stress from high groundwater levels, high rainfall and drought potentially affects floodplain vegetation and bird populations and specialist species such as southern damselfly and Desmoulin's whorl snail.

Inappropriate weirs, dams & other structures – Many rivers have artificial structures which affect natural flow regimes and morphology, thus affecting flows, siltation levels, fish spawning and fish migration. This issue is closely related to physical modification.

Physical modification – Most SAC rivers require river restoration to deal with historic physical changes to the river corridor, including channelisation, channel re-alignment, bank works, channel widening / deepening, clearance of trees and woody debris, physical barriers and agricultural floodplain drainage. They reduce connectivity between the river channel and its floodplain, change flow regimes and impede fish migration.

Water abstraction – There are still concerns about water abstraction on many SAC rivers (this is despite the Environment Agency's Review of Consents process and significant water company investment). Abstraction results in flows which are different to the natural flow regime, thus affecting a range of habitat factors including: velocity, depth, substrate, dissolved oxygen, temperature and wetted area. It can also impede the movement of migratory fish and cause very low flows in some reaches. There is a risk that Drought Orders could lead to more abstraction from sensitive sites during drought periods (although these would be assessed under the Habitats Regulations).

Riparian management – Stock poaching in riparian areas due to inappropriate grazing levels affects several sites, leading to increased siltation. Also of note are the impacts of fisheries management on bankside areas.

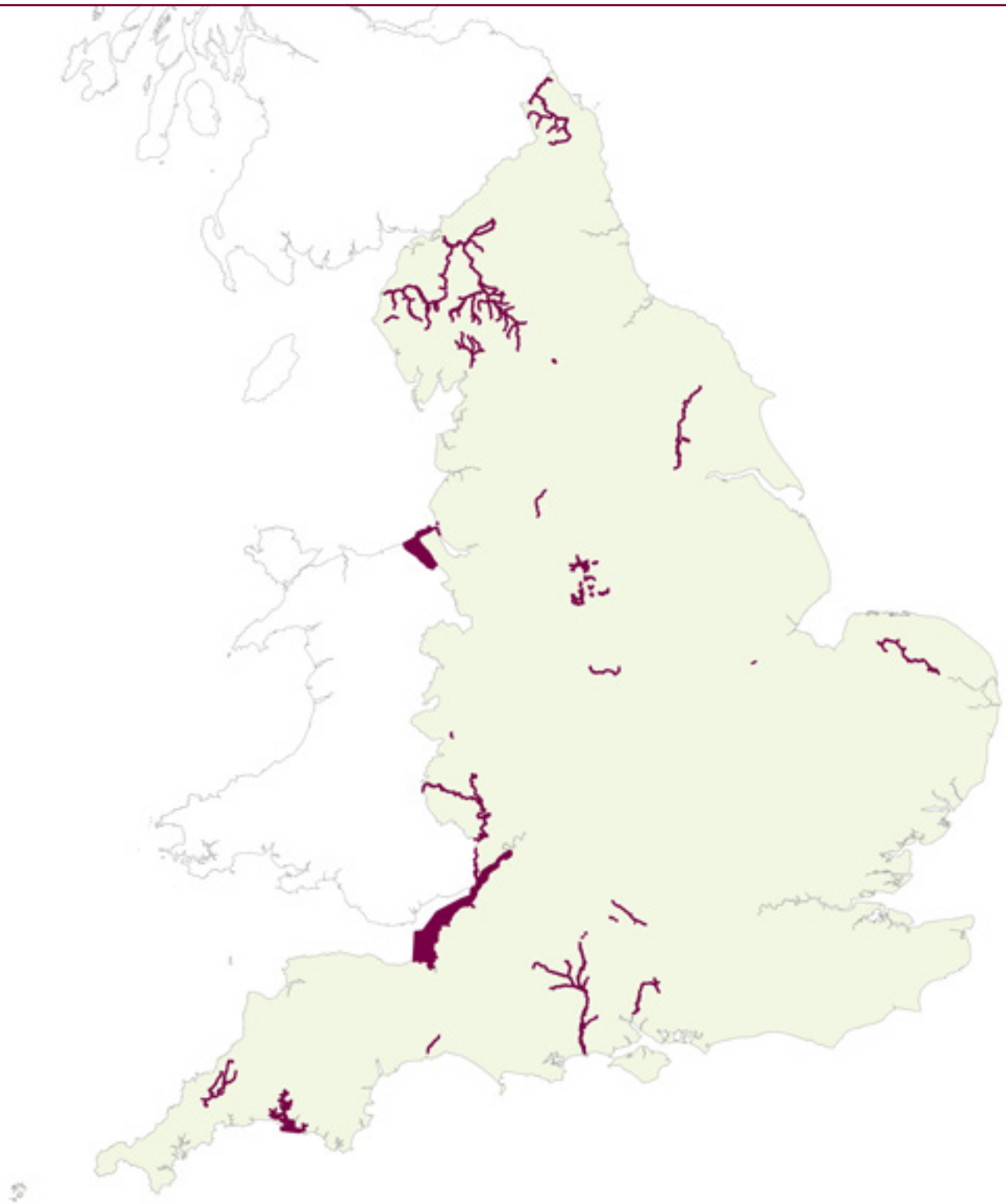
Features (or feature group) affected

Habitats: marine, coastal & halophytic habitats; freshwater habitats; natural & semi-natural grass formations (floodplain grasslands and calaminarian grasslands); forests (alluvial forests)

Species: molluscs, arthropods, fish, higher plant species, waterfowl, waders, herons bitterns and egrets; gulls, terns and skuas.

The sites that are affected by these issues are predominantly rivers but there are also a few estuary sites with migratory fish, river floodplains, canal and ditch sites and terrestrial sites with some dependency on rivers.

Figure 15 – Natura 2000 sites where river management is recorded as an issue



Issue type	Number of SIPs
Pressure	8
Pressure / Threat	11
Threat	4
Total	**23**

Evidence

The four evidence projects under IPENS relating to this theme were site specific, such as the Lower Avon Valley macrophyte survey (Lake 2013 and others).

There are currently no major evidence gaps as the issues and their management are generally well understood. There is however always the possibility of needing extra evidence for site specific purposes.

As a result of the SIPs, the relevant evidence projects and the river restoration theme plan under IPENS, the following actions have been identified to address river management issues:

- Full implementation of river restoration plans over a medium-long time period – including addressing blockages to progress outlined in the river restoration theme plan.
- Removal of barriers to migration eg inappropriate weirs.
- Focussed use of agri-environment (eg the Countryside Stewardship Scheme) payments for management of floodplain grasslands and riparian areas.
- Surveys and monitoring – including monitoring the results of river restoration; freshwater flushing rates in estuaries; fish population surveys; impacts of bankside management; causes of gravel starvation and improvements to public access points.
- To address water abstraction issues, a range of investigation and regulatory actions are needed, often including implementation of Review of Consents findings via the Environment Agency's Restoring Sustainable Abstractions programme or Abstraction Management Planning. Other more innovative actions suggested include encouraging farmers to build winter storage reservoirs and promotion of positive water management practices.
- Investigations are required to determine the effects of hydrological change, particularly in the floodplain areas, and habitat restoration works to mitigate the effects.

A variety of other actions are listed in individual SIPs, including implementation of water level management plans and producing good practice guidelines for weed cutting.

The river restoration theme plan makes clear that the physical restoration of rivers is fundamental to delivering improvements in the condition of riverine habitats and their characteristic biological assemblages, and to generating multiple ecosystem service benefits.

Delivery partners

In order to address these issues and achieve the recommended actions, Natural England will need to work with Defra, the Environment Agency, Forestry Commission, Water companies, Non-Governmental Organisations including the River Trusts, the Wildlife Trusts, and The Royal Society for the Protection of Birds (RSPB) – these will be a combination of local and national partnerships.

Funding

The scale of funding to address these issues is potentially very large and over long time periods, especially for river restoration and water abstraction. There is a funding gap for such long term funding large projects.

The Environment Agency have collated overall estimates for river restoration in the SAC rivers, which are in the Water Framework Directive Regulatory Impact Assessment (up to £300m+), but there is huge uncertainty about the figures. Natural England and Environment Agency experience in Cumbria on river projects suggests actual costs may be only 30% of the most recent estimates. For this reason, cost estimates in the SIPs must be used with caution, and we have not included the overall estimate in the River Restoration theme plan.

Water company related abstraction issues would need to be funded via the Asset Management Planning and Periodic Review

(process by which water companies set their 5 yearly budgets). There could also be imperative reasons of overriding public interest for additional abstraction required under Drought Orders, although these are themselves subject to Habitats Regulations assessment.

Potential sources of funding and resource to address this issue have been cited in the SIPs and the River Restoration theme plan and include: LIFE, Heritage Lottery Fund, Asset Management Plans and the Periodic Review Process, the Rural Development Fund for England (particularly the Countryside Stewardship Scheme), Water Framework Directive Grand in Aid and developer contribution schemes.

We will also need to consider new and innovative sources of funding. For example, the theme plan suggests the potential to secure investment from local or national companies in return for improvement of their brand and reputation, due to their investment in the environment.

CASE STUDY – Cumbrian rivers and lakes

The links between ecology, physical habitat and water quality are of primary importance in river and lake management. Lakes and rivers are impacted by diffuse water pollution from the surrounding catchment and rivers have been subject to a long history of modification, including straightening and bank revetments. Naturalised systems provide a more diverse aquatic habitat and support the natural processes that specialist freshwater species need.

Cumbria holds one of the most important freshwater resources in England, with four river and lake Special Areas of Conservation (SACs) designated for a wide range of freshwater species, including Atlantic salmon, bullhead, three lamprey species, freshwater pearl mussel, white-clawed crayfish, otter and floating water plantain. Site improvement plans for these sites, the River Eden SAC, River Kent SAC, River Derwent and Bassenthwaite Lake SAC and River Ehen SAC, identify action to address diffuse water pollution and physical modifications as their highest priorities. Natural England and the Environment Agency have been working with Rivers Trusts and landowners to improve catchment management and restore natural processes on sections of these rivers. This is helping not only the river and lake ecosystems but also local communities through improved ecosystem service benefits.

On the River Eden, a 1500m straightened stretch of the River Lyvennet is now meandering through 1900m with a wide river bank zone for the river to move within. Work completed in September 2014 and salmon have already built redds (nests) in this section of river. These restorations, incorporating Environmental Stewardship Scheme agreements, show how space can be made for the river within farmland. The River Leith, another Eden tributary, has been returned to its old meandering channel increasing the length by 25%. Water Framework Directive Grant in Aid has provided the funding for the capital works, with Higher Level Stewardship improving the management of the river corridor on the restored sections. The new Countryside Stewardship scheme will support similar schemes in the future.

Embankments are a common feature along rivers, disconnecting them from their floodplain, losing valuable flood storage areas and wetland habitats. Work on the River Gowan, a tributary of the River Kent SAC, has removed 270 metres of flood bund from the river bank. On the Whitbeck, a tributary of the River Derwent and Bassenthwaite Lake SAC a 350m

Remeandered river channel, River Eden SAC

straight, perched channel has been meandered to form a 1200m length of diverse channel. Flood risk assessment has shown that the project will benefit the nearby village with reduced flood return periods. Other projects on the River Derwent include removal of old railway bridge piers that were affecting the geomorphology of the lower river.

Bassenthwaite Lake in the Derwent catchment is a large shallow lake with a catchment of 350km2, and suffers from eutrophication and algal blooms. Phosphorus sources in the catchment include surface runoff from fertilisers applied to farmland, septic tanks and sewage treatment works effluent. Research has investigated ecological responses to altered nutrient load and the lake is part-way through a long-term effort to reduce diffuse pollution using a variety of mechanisms. This includes reductions in phosphate runoff from farms facilitated by Catchment Sensitive Farming grants, installation of tertiary sewage treatment and a 'Love Your Lakes' campaign which worked with businesses, residents and visitors to encourage uptake of phosphate-free products. Annual mean total phosphorus concentrations have fallen from about 30µg l-1 in the mid- 1990s to about 16µg l-1 in 2010, and efforts to make further improvements continue.

IPENS Theme Plans for river restoration and diffuse water pollution will support ongoing activity to reduce diffuse nutrient input and restore physical habitat in Cumbria and other freshwater SACs in England. The river restoration theme plan sets out priority actions for improving the evidence base, funding and delivery mechanisms that are required for effective physical restoration. The diffuse water pollution plan identifies as priority actions the continued development of detailed catchment plans to drive local delivery (eg Diffuse Water Pollution Plans) and where possible the improved application of existing available mechanisms. It also proposes that the gap between reductions in diffuse pollution that can be reasonably achieved using existing mechanisms and the level of reductions required to meet favourable condition is determined for sites like these to inform the consideration of whether or not additional mechanisms and measures may be necessary in the future in order to meet the water quality objectives.

Climate change

In the Site Improvement Plans local knowledge of the Natura 2000 sites in England confirms that climate change is happening with noticeable effects on species and habitats. Adaptation to address the impacts of climate change is developing, but is not consistently applied or reported.

This is not new information as we already have strong evidence of impacts on UK and international biodiversity. What is new is that under the IPENS programme, we have focussed on the Natura 2000 network and now have a better understanding on the threats to this series in England.

IPENS has also put forward a proposal for a more consistent approach to assessing vulnerability to climate change and a framework for planning adaptation measures for the Natura 2000 network to help secure and maintain favourable conservation status.

The SIPs have identified the following impacts of climate change:

- species shifting to higher latitudes and altitudes to track changes in climatic conditions;
- declines in species unable to move quickly enough;
- advances in phenology in the spring;
- changes in seasonal phenomena (eg breeding or flowering) and how this relates to other ecological associations;
- risk to wetlands from hotter and potentially drier summers;
- increased coastal erosion with sea level rise and increased storminess;
- risk that non-native species (including pests and pathogens) may establish and spread; and
- flooding.

All sites are likely to be affected to some degree, although threats are known to be the greatest for coastal, wetland and montane habitats due to their direct dependence on coastal processes, hydrology and temperature.

Description of Actions Required from the Site Improvement Plans:

- Monitoring and investigating likely impacts and identifying and implementing actions to help the site adapt to a changing climate.
- Establishing mitigation measures, such as creating refugia or seedbanks.
- Raising awareness with the public of the effects of climate change and how sites can adapt.

Looking at the SIPs alone, it is not possible to get a clear picture of the impacts or threats of climate change, as the reporting is not consistent. Natural England has made a commitment in delivering the England Biodiversity 2020 Strategy that we will consider the impact of climate change on protected sites and the IPENS climate change theme plan helps to deliver this by proposing a consistent approach.

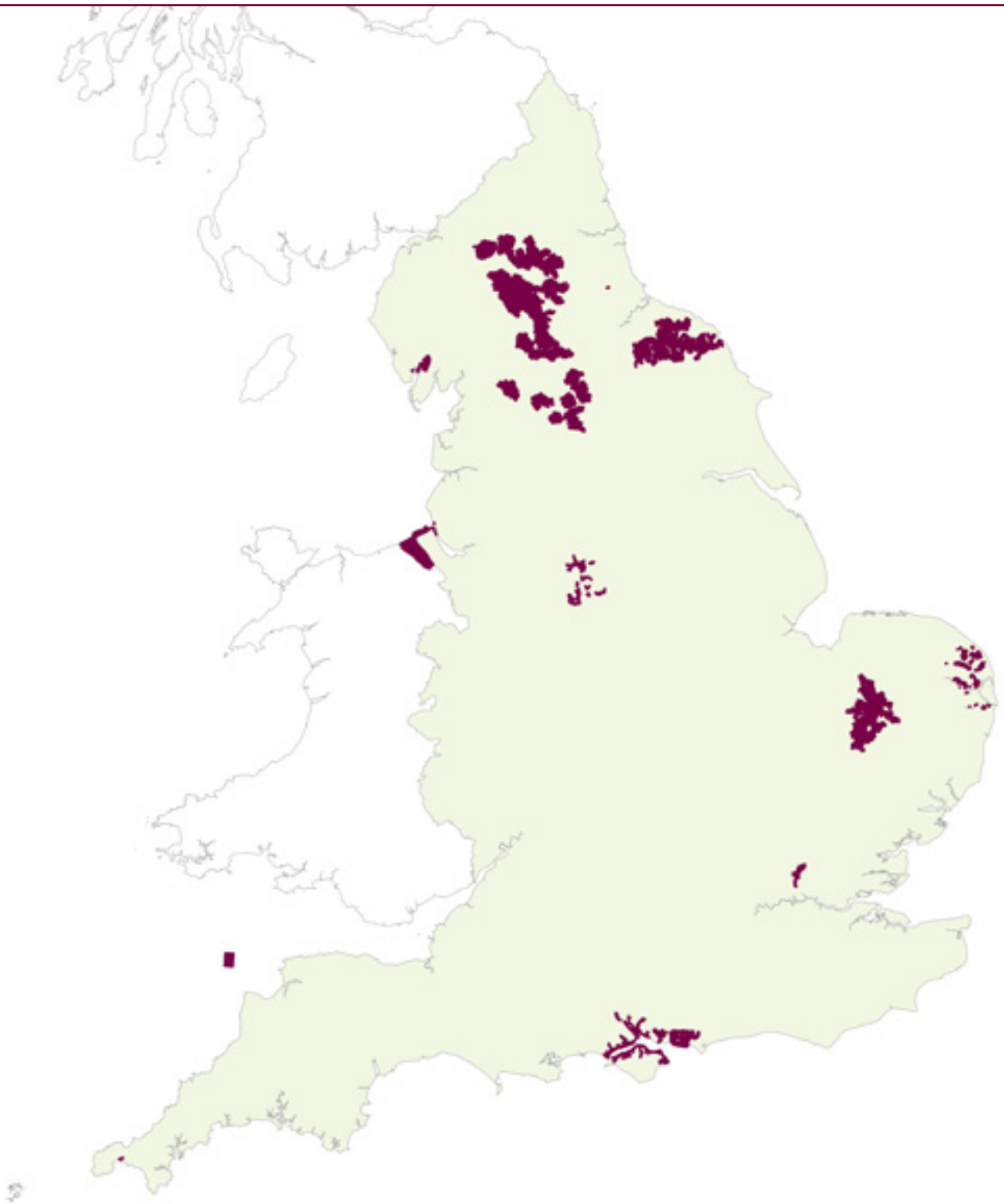
Climate Change Theme Plan proposed strategy

The theme plan recommends a framework for prioritising action to address climate change and then developing adaptation plans. This will be led by Natural England.

The prioritisation method will be the National Biodiversity Climate Change Vulnerability Assessment model (NBCCVA). It is recognised that there are some limitations to this model, so the output will need to be ground-truthed.

A process for site based assessment is proposed which is based on the methodology piloted on five NNRs in 2014. It entails taking short term action to reduce the adverse impacts of climate chance whilst taking advantage of the opportunities such as from adaptation.

Figure 16 – Natura sites where climate change is recorded as an issue



Issue type	Number of SIPs
Pressure	1
Pressure / Threat	4
Threat	10
Total	**15**

Elements of the proposed process include a vulnerability assessment, building ecological resilience, preparing for and accommodating inevitable change, improving the evidence base and considering the value of the wider benefits that the natural environment can deliver.

The priority actions proposed in the climate change theme plan are:

- Implement the proposed strategy, starting with high priority sites, then lower priority as resources allow.
- Consider establishing some demonstration sites if practical and achievable.
- Investigate the potential for development of an approach for marine sites.
- Build a more flexible approach to designations and work with the Long-Term Monitoring Network.

In terms of timing, it would be beneficial to apply the process before 2020 in order to benefit the development of UK conservation plans beyond Biodiversity 2020.

Delivery partners

At site level, there needs to be a partnership approach to delivering the climate change related actions identified in the SIPs including Natural England, other conservation agencies, conservation Non-Governmental Organisations, local and national park authorities land managers and volunteers.

For the theme plan actions, implementation of the national prioritisation would be mainly led by Natural England. Once the prioritisation work has reported, the practical, local implementation will be at site level, involving Natural England and other delivery partners.

Evidence

There is not currently a comprehensive dataset available of the sensitivity of all Natura 2000 interest features in England to climate change. The current model is therefore based on priority habitats. The theme plan indicates that improving sensitivity data for Natura 2000 features is a priority action.

Funding

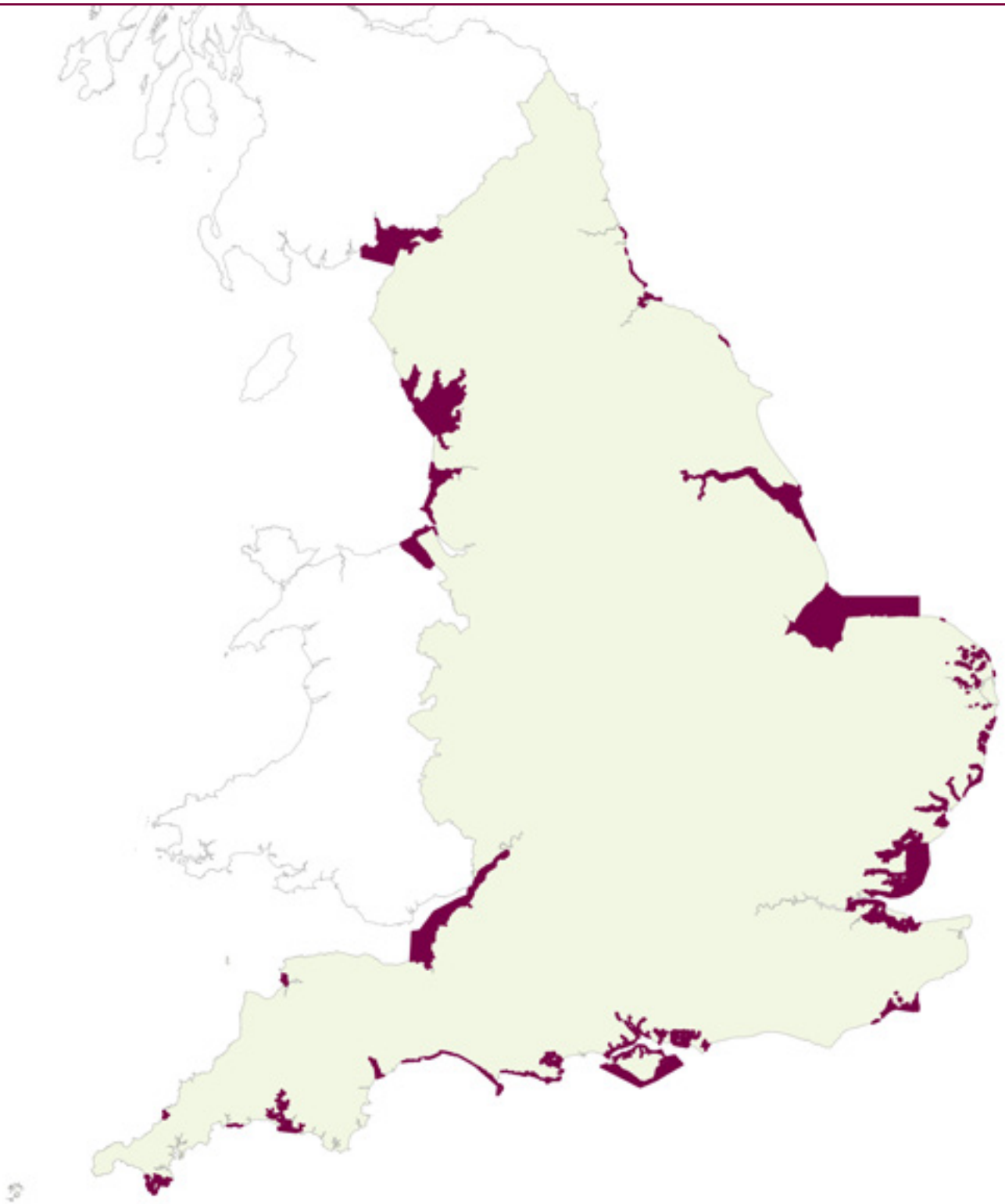
It is clear that the under-reporting of the nature and impact of climate change on our protected sites is an issue and that this is something that is needed to inform biodiversity planning, especially beyond 2020. Initially, in order to put the recommended actions from the theme plan in place, Natural England staff resource will be required, but this will not be sufficient to ensure full coverage of all of our protected sites and to consider adaptation and the opportunities arising. New and innovative projects and bids to support this work are needed, potentially including bids to LIFE and Heritage Lottery funding for example.

Coastal management

34 SIPs record either 'inappropriate coastal management' or 'coastal squeeze' as an issue, although in many there is more than one issue recorded under coastal management (105 separate records). Inappropriate coastal management and coastal squeeze are also discussed under Offsite Issues, Development and Infrastructure, Illegal and Third Party Activities, and Other Habitat Management. This goes some way to showing what a wide range of issues are covered in this section.

Inappropriate Coastal Management (18 SIPs): This can be split into five broad manifestations of the issue:

Figure 17 – Natura 2000 sites where coastal management is recorded as an issue



Issue type	Number of SIPs
Pressure	7
Pressure / Threat	19
Threat	13
Total	**39**

- **Hard coastal defences** such as sea walls, rubble or rock armour, colliery spoil, and banks. There are several different (and in some cases opposing) issues within this category:
  - Inappropriate location of hard sea defences leading to prevention of natural erosion processes (including dune formation and sediment transport).
  - Shingle beach re-profiling as a defence leading to changes in natural shingle vegetation.
  - Failing sea walls threatening existing freshwater habitats which have developed behind them.
- **Coastal erosion of cliffs** (via slippages / slumping) leading to a loss of the narrow strips of sea cliff vegetation with little replacement occurring at the landward side.
- **Inappropriate removal of strandline material & vegetation** (by raking), affecting the formation of embryonic dunes and vegetation strandlines.
- **Inappropriate use of the area nearest the coast** (directly adjacent), including parking and driving, building of small structures such as beach huts and chalets, and fencing associated with rights-of-way.
- **Areas of qualifying SAC feature fall outside the designation** boundary in several locations, reducing the coherence of site management on more than one SAC.

There is also a lack of evidence on the extent composition and condition of Annex 1 coastal SAC habitats mentioned in a few SIPs.

Coastal squeeze (22 SIPs):
There are five manifestations of this issue, with three being caused by the presence of hard sea defences (coupled with rising sea levels), and two being caused (or potentially being caused) by the removal or failure of hard sea defences:

- **Hard sea defences** allow little scope for natural adaptation to sea level rise through roll back of habitats.
- **The sea defences are encroaching onto the foreshore** itself in some cases, thus directly reducing the intertidal habitat available. This is exacerbated by sea level rise.
- **A decline in the quality of saltmarsh** as a result of coastal squeeze has been found on one site (despite the extent remaining roughly similar) – thus showing that not only can extent (the more common indicator) be affected, but also quality and composition.
- **The removal of hard sea defences** (to allow a return to a more natural dynamic coastal environment) may pose risks to SAC / SPA features if sediment dynamics and coastal morphology are altered as a result of the removal.
- **Saline intrusion into freshwater habitats** behind hard sea defences, as a result of exceptional high tides or storm surges already occurs in at least one site, and this may start to affect freshwater habitats in other locations as hard sea defences fail.

In terms of bird features affected, both inappropriate coastal management and coastal squeeze cause loss of habitat for feeding, roosting and loafing. Other features affected include all intertidal habitats, as well as vegetated cliffs, dune systems and shingle beaches.

Features (or feature groups) affected

The features affected by inappropriate coastal management or coastal squeeze are wide ranging. Both breeding and non-breeding bird species are affected, as well as breeding and non-breeding bird assemblages. Numerous coastal habitats are also affected as well as 9 non-bird species.

Features affected by both inappropriate coastal management and coastal squeeze:
Breeding birds including bittern, marsh harrier, avocet and common tern
Non-Breeding Birds including bittern, Bewick's swan, whooper swan, wigeon and black-tailed godwit.

Habitats including coastal lagoons, Atlantic salt meadows, dune grassland and coastal dune heathland
Other species including petalwort and shore dock.

Features affected by inappropriate coastal management but NOT coastal squeeze:
Habitats: including vegetated sea cliffs, Calcium-rich nutrient-poor lakes, lochs and pools, naturally nutrient-rich lakes or lochs which are often dominated by pondweed, European dry heaths and purple moor-grass meadows.
Species: including Desmoulin's whorl snail, great crested newt, greater horseshoe bat, otter and early gentian

Features affected by coastal squeeze but NOT inappropriate coastal management:
Breeding Birds: including gadwall, common pochard, ringed plover and purple sandpiper
Non-Breeding Birds: including Slavonian grebe, little egret, pink-footed goose and goldeneye.
Habitats: including sub-tidal sandbanks, estuaries, intertidal mudflats and sandflats and reefs.

Types of sites affected

This issue affects estuarine and coastal sites. It is a nationwide issue, but is primarily focussed in the east and south east.

Evidence

There are several evidence projects funded by IPENS that relate to this issue: 'Healthy Estuaries 2020: Towards Addressing Coastal Squeeze in Estuaries' (Brew 2014); '*Spartina anglica* and its management in estuarine Natura 2000 sites: an update of its status and monitoring future change in England' (Lush 2014 and others). In addition there are 5 site specific estuarine or coastal evidence projects on the Alde-Ore and Butley Estuaries SAC (Abrehart Ecology 2013), the Minsmere-Walberswick Heaths and Marshes SAC (Norfolk Wildlife Services Ltd. 2013), the Ribble and Alt Estuary SPA (Hubble and Pinnion 2014), the Exe Estuary SPA (Stillman 2014 and others) and the Berwickshire and North Northumberland Coast SAC (Mieszkowska & Sugden 2014).

The Healthy Estuaries evidence project took forward and consolidated previous joint work between Natural England and the Environment Agency to implement remedies for coastal squeeze in six estuary complexes. It has made use of more recent evidence and will ensure that remedies address both past loss and predicted change. It has also developed clear and pragmatic guidance for advisors on how to assess condition once new habitat is in place.

Nevertheless, numerous evidence gaps still exist including the extent of features in specific locations, the effects of hard sea defence removal on coastal morphology and sediment dynamics, and habitat creation as compensation.

Description of actions required

There are several different types of actions in the SIPs to address coastal squeeze and inappropriate coastal management, but the most frequently occurring actions are around investigation, monitoring and research, and providing compensatory habitats (often freshwater) away from the risk of saline intrusion (due to failing / removal of sea defences).

From the SIPs it is clear that there is a lot of uncertainty around coastal issues. The Inappropriate Coastal Management Theme Plan should go some way towards helping inform front line delivery staff on coastal management, and how to deal with issues such as coastal squeeze on protected sites. The actions identified in the SIPs fall into seven main categories:

- **Investigation / monitoring / research** into the sustainability of sea defences, shingle recharging, saltmarsh adaptation methods,

and the potential for managed realignment programmes.

- **More effective plans** (both existing and anticipated), such as Estuary Plans, and Shoreline Management Plans. This is about more focus on implementation.
- **Development of new plans**, such as Beach Management Plans.
- **Use of the Environment Agency's Flood and Coastal Risk Management Investment Programme 2015-2021** (Environment Agency 2015).
- **Creation of freshwater habitats** away from the coast as compensation / mitigation, potentially using Land Management Schemes where appropriate.
- **Development of guidance** for emergency coastal repair works.
- **Increased flexibility of site boundaries**, to change the area covered by some coastal sites, to reflect feature retreat due to coastal squeeze, and to allow protection of features currently outside the site.

Delivery partners

Natural England, Environment Agency, Councils (County, District, City & Town), Coastal Partnerships, Estuary Associations, National Trust, Royal Society for the Protection of Birds, Areas of Outstanding Natural Beauty, Crown Estate, National Parks, Wildlife Trusts, Landowners, Standing Conference on Problems Associated with the Coastline, National Resources Wales, Welsh Government, Marine Management Organisation, Harbour Commissioners, Utilities.

Funding

This is highly variable with the majority of SIPs recording "not yet determined" for costs of the actions. However there are a number of small scale projects with costs in the £5,000-£80,000 range, and several more at £100,000+ for larger projects. There are also a few with very high costs associated with Shoreline Management Plan implementation (£747,000 for example), and one action with a cost of £10,000,000 (for implementation of report findings on coastal squeeze). Another type of cost recorded is "staff time", mainly around commenting on Shoreline Management Plans, and contributing to the next round of Shoreline Management Plans scheduled for 2017-2027.

The SIPs also record "not yet determined" in the majority of cases for the funding source. The Environment Agency is cited in several SIPs as the lead delivery partner, alongside their relevant programmes such as Flood and Coastal Risk Management Investment Programme.

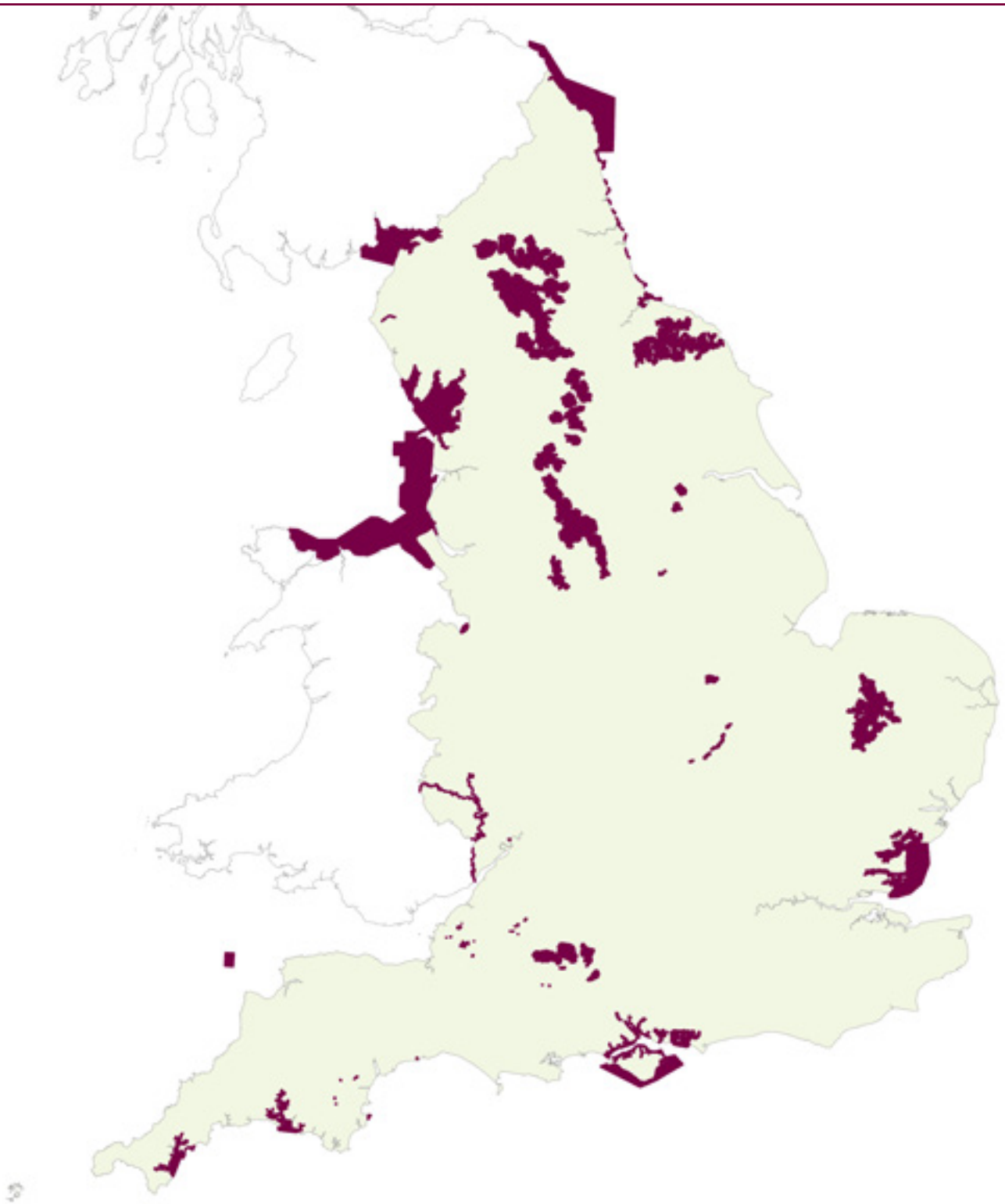
Other funding options listed include EU LIFE, Heritage Lottery Fund, Natural England resources, the Rural Development Programme (Countryside Stewardship), and potential input from developers and landowners, especially major landowners such as the National Trust and the Royal Society for the Protection of Birds. The Water Framework Directive is a programme with objectives that will help deliver priority actions on Natura 2000 sites, it is therefore considered as a driver for bidding for funds.

Development and infrastructure

The UK government has a variety of economic and sustainable development targets; and there is a policy presumption in favour of permitting sustainable development. There is demand for the provision of additional housing to address a shortfall in availability in comparison with the needs of the population.

Infrastructure development such as high speed rail, airport development and renewable energy are considered a high priority to help the economic recovery. Inevitably, some of the development which has occurred or is planned is likely to be in conflict with the objectives of Natura 2000 sites.

Figure 18 – Natura 2000 sites where development and infrastructure is recorded as an issue



Issue type	Number of SIPs
Pressure	6
Pressure / Threat	11
Threat	15
Total	**32**

The development and infrastructure element of the findings of the project encompass a wide range of issues relating to existing and new development and infrastructure in terrestrial, coastal and marine environments; and is recorded on 32 SIPs. Effects may be direct or indirect. Two key issues are listed:

- Development with the potential to affect mobile species (especially birds and bats but also grey seal) is a key concern. This is usually off-site development which affects foraging areas, flyways and routes used on transit between feeding and roost sites for example. It relates to habitat fragmentation and particularly affects coastal SPAs, lowland SPAs eg Breckland and lowland heaths, and bat SAC sites.
- The competent authorities' ability to assess and determine cumulative or 'in combination' impacts of development, under article 6 of the Habitats Directive, is a concern raised in the SIPs. The assessment itself should happen under the existing regulatory processes, but additional investigations, evidence and guidance may be needed to ensure the assessment is carried out consistently. This applies to terrestrial, coastal and marine sites.

A wide range of other issues are cited, including:

- Pressure or threat of bird strike with powerlines and wind turbines.
- Effects of shipping activity on birds and risks of shipping moving to new routes through estuaries which will lead to increased disturbance.
- Due to a lack of evidence, impacts have not been assessed eg ship anchoring on sensitive habitats
- Various issues relating to maintenance dredging and aggregate dredging have been recorded. This includes the impacts on habitats and species of the dredging itself and also the consequences of depositing the dredged material either on or off site.
- For sites which require restoration, (eg degraded lowland raised mire), the presence of historic development with planning permission can prevent restoration from happening (eg where bog water levels cannot be raised due to the risk of flooding property).
- Development in the marine environment threatens grey seals with collision, noise and visual disturbance.
- There is a general need for better consideration and awareness of marine and coastal habitats during planning permission assessment of cabling and pipelines.
- Various upland development activities are a risk to some features including tracks, quarrying and windfarms.

Features (or feature groups) affected

Species: waterfowl, waders, divers and grebes, gulls, terns and skuas, herons, bitterns and egrets, birds of prey and owls, birds of lowland heath, freshwater species (fish and otter), mammals (bats and grey seal) and coastal species of lower plants (petalwort).

Habitats: marine, coastal and halophytic habitats, coastal sand dunes and continental dunes, temperate heath and scrub, natural and semi-natural grassland formations, raised bogs, mires and fens and forests.

Types of sites affected

This is a nationwide issue and all SACS and SPAs may potentially be affected, but particularly coastal and marine, freshwater, lowland heath and grasslands, uplands, woodlands and bat sites.

Evidence

Several SIPs state that investigative actions are required to gather more evidence, although these vary in nature. Several mention the need for more evidence about the cumulative impacts of development. Also recorded is a

need for monitoring or research to gather evidence about impacts on particular species or habitat groups.

Description of actions required

- Horizon scanning to identify risks from new types of development.
- Improved joint working and coordinated advice between agencies.
- Appropriate management eg beneficial dredge protocols and management of railway network assets.
- Development of sector specific protocols to ensure compliance with the Habitats Regulations, or Supplementary Planning Documents for specific sites.
- Actions relating to compensation and mitigation, including habitat creation.
- Actions relating to cumulative impact, including implementation of agreed assessment methodologies or investigations to gather evidence.
- Ecological monitoring such as species distribution and behaviour in relation to development.
- Investigations and research including gathering evidence of impact, especially in the coastal and marine environment.
- Pro-active research to gather evidence in anticipation of future planning applications.
- Improved use of regulation and enforcement where unconsented activities occur, and the need to review consents where they constrain designated features.
- Within the planning process, encourage pre-application discussions with developers to seek mutually beneficial solutions.

Delivery partners

Local and National Park authorities, other regulators such as the Environment Agency and the Marine Management Organisation, developers and landowners, Defence Infrastructure Organisation, Defra, water companies, conservation Non-Governmental Organisations, consultants, Harbour Commissioners and Port Authorities.

Funding

The scale of funding is difficult to predict, as it may be possible to get a lot of work done by developers as part of the planning application process. Contributions will be needed from developers, Natural England, the Environment Agency and other regulatory and statutory bodies (staff time or investigations) and Non-Governmental Organisations. 33 actions report funding as 'not yet determined'. This relates to a variety of development issues, focussing on ecological monitoring and evidence gathering around cumulative impacts, where costs are not yet known or comparable.

CASE STUDY – Big estuaries

There are several big estuaries around England. This case study focuses on three of them: The Severn, The Humber and The Wash. These estuaries are in different geographic regions, and have numerous common estuarine issues and actions contained within their SIPs.

The Severn Estuary or Môr Hafren in Welsh is a cross border site, located between Wales and England in south-west Britain, and has extensive intertidal mud-flats and sand-flats which provide habitats for a high density of invertebrate food sources, supporting a wide range of waterbirds. It also has important saltmarsh and grazing marsh features as well as subtidal sandbanks and *Sabellaria alveolata* reefs (honeycomb worm), and the site is of particular importance to migratory fish species. Topographically, the estuary is funnel-shaped, which is unique within the UK and causes the Severn to have one of the highest tidal ranges in the world.

Severn Estuary

The Wash is located in the east of the England, and is the largest marine embayment in Britain, with the second largest expanse of intertidal sediment flats. The estuary is important for one of Europe's largest common seal populations, as a breeding and moulting site, and also for wintering waders and wildfowl. Subtidally, there are sandbanks which vary in composition and unusual subtidal communities present including large areas of dense brittlestar beds and small colonies of *Sabellaria spinulosa* (Ross worm).

The Humber Estuary is a macro-tidal coastal plain estuary with high suspended sediment loads, located in the north east of England. These loads feed a dynamic system of accretion and erosion of intertidal and subtidal mudflats, sandflats, saltmarsh and reedbeds. The site is important for migratory fish species such as river and sea lamprey. Grey seals also use the site to form large breeding colonies in autumn. Many species of waterbirds use the SPA habitats within the estuary and at high tide large mixed flocks congregate in key roost sites.

Issues:
These estuaries are large and complex, which is reflected in the numbers of priority issues that have been highlighted in the IPENS SIPs (12-14 per SIP). Several of the issues affect all three estuaries which can be seen in the table overleaf.

Declines in species distribution for bird species on estuaries is an issue that is not well understood currently. IPENS funded two evidence projects to look at this gap in knowledge on the Humber and the Wash (Woodward 2015a and others; Woodward 2015b and others). These projects looked at population change (for 22 species on the Humber and 15 species on the Wash), to identify the potential causes and drivers. Literature reviews were carried out in conjunction with stakeholder consultation, and the subsequent reports highlighted the many anthropomorphic activities on the estuaries, which are likely to be at least partly responsible for the present day numbers and distribution of waterbirds on the sites. Ongoing changes in flyway scale

Table 7 – Common issues affecting the three estuaries

Issues common to all three SIPs (and their related Theme Plan(s)	Common actions
Issue: Coastal squeeze **Related theme plan:** Inappropriate coastal management	Work with the Environment Agency to monitor the extent of the issue and to deliver compensatory habitat / managed realignment in line with Shoreline Management Plans. The IPENS Healthy Estuaries project evaluated estuary-scale evidence using selected case studies. If used more widely, this method of analysis could help understand where coastal squeeze is a risk and inform development of sustainable flood risk management strategies that will deliver effective habitat creation in the best places.
Issue: Fisheries: Commercial marine and estuarine **Related theme plan:** N/A	For 'Red' activities, compliance with bye-law and provision of an appropriate level of reporting to ensure sites are well managed and to enable Natural England to provide advice on the condition of features and potential condition threats. For 'Amber / Green' activities, where the assessments indicate management is required, introduce appropriate measures.
Issue: Public access and disturbance **Related theme plan:** Public access and disturbance	Investigation and monitoring in order to better understand the levels and types of use and the access of the estuaries for recreational activities causing disturbance. Additionally, investigate the impact of recreational activities on bird species and their associated habitats, and gain an understanding of how bird populations use the site (identification of 'sensitive areas' such as feeding / roosting locations). Develop / review a strategic approach to visitor management including zonation of the sites. Put into place targeted education programmes, and install signage to manage user activities.
Issue: Invasive species **Related theme plan:** Invasive, non-native species	Investigation and monitoring to identify the risks, pathways and spread of invasive, non-native species, including the current abundance and impact within the estuaries. Control of identified invasive non-native species at specific locations through Invasive Control Plans and Conservation and Enhancement Schemes. Develop and implement biosecurity measures to reduce likelihood of introduction and spread of marine invasive non-native species which could lead to impacts on Natura 2000 features of sites.
Issue: Air Pollution: Impact of atmospheric nitrogen deposition **Related theme plan:** Atmospheric nitrogen	Control, reduce and ameliorate atmospheric nitrogen impacts through implementation of a Site Nitrogen Action Plan.

Issues common to all three SIPs (and their related Theme Plan(s)	Common actions
Issue: Changes in species distribution **Related theme plans:** Climate change and Public access and disturbance	Investigation, research and monitoring to understand the changes in extent and distribution of species supported by these estuaries, and the drivers behind the changes (eg climate change, public access and disturbance). Review underpinning SSSI boundaries and features, and any relevant conservation objectives as appropriate to reflect changes in species distribution. Also consider the options for habitat creation outside of SPAs, and notification amendments. Continue direct management intervention on specific sites (nesting for certain species for example) to maintain those particular populations. Take forward the recommendations from the outcomes of the two IPENS bird decline evidence projects (such as habitat creation / restoration strategy and wardening).

distribution are also likely to be responsible for differing background population trajectories between species. However, despite the accepted thinking that food availability affects the abundance and trends in waterbird species, the literature review found that there is little direct evidence available to show this on either estuary. Crucially, both reports identified the need for more information to be collected to allow trends in the whole and different parts of the sites to be correlated with environmental variables. This additional information includes fine-scale long-term monitoring of the existing anthropomorphic activities as well as the effects of habitat change.

The IPENS public access and disturbance theme plan discusses the decline in bird populations in more detail, and similarly to these evidence projects, highlights the need for further evidence to be collected on the activities and causes for species decline trends.

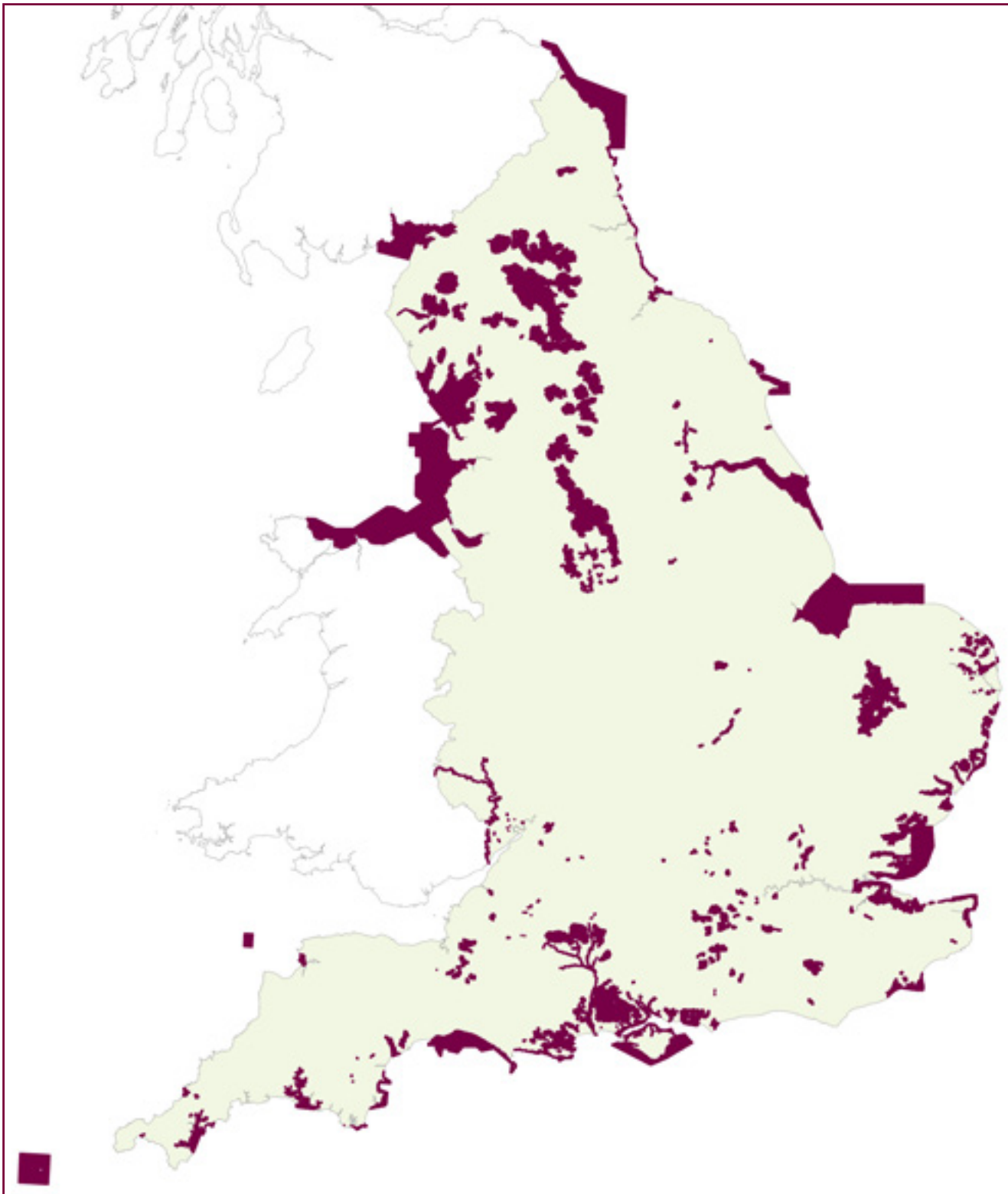
Public access and disturbance

Public use of the natural environment has changed in the UK in the last few decades, both in terms of the types of uses and level of use. This is as a result of a variety of social and economic factors, including increased human population, increased use of cars and increases in paid leave. 110 SIPs show public access and disturbance as a threat or pressure to features, with a wide variety of activities potentially generating this pressure or threat. Activities include dog walking (the most often reported activity relating to this topic on SIPs), walking and running (without dogs), water sports, recreational fishing, cycling, off road vehicles, climbing, ghyll scrambling, aerial craft (such as model aeroplanes) and horse riding.

Although for some Natura 2000 sites the effect of public access on features is well studied, in many instances this is not the case and the SIP is highlighting a possible pressure or threat which requires investigation to address this knowledge gap. Investigation is a necessary mechanism for around half of the SIPs where this issue is recorded (61 SIPs).

42 SIPs record public access and disturbance as a threat, rather than a pressure, which

Figure 19 – Natura 2000 sites where public access and disturbance is recorded as an issue



Issue type	Number of SIPs
Pressure	33
Pressure / Threat	35
Threat	42
Total	**110**

shows that in just under half of cases the issue isn't currently manifesting itself on the site, but is expected to in the future (please note that for some sites the expected manifestation of this issue is a perception that requires investigation to verify).

Examples include:

- The raising of the profile of the location as a visitor attraction, for example sites within the proposed extension area of the Yorkshire Dales National Park, may lead to increased or changes to use of the site by the public for recreation.
- The risk of increasing use of a site, for example as a result of nearby housing developments increasing the local population.
- A risk that a use which is currently well managed becomes a problem for the features in the future, due to a change in user behaviours (such as use of different parts of the site than has been used historically).
- A lack of understanding of the effects and impacts of activities on site features, meaning there is a perception that public access may begin to have adverse effects but whether this is a genuine risk is unknown.

This topic links to the Invasive species issue, as public access can be a vector for movement of invasive species and diseases both within and between sites. There is also a link to Grazing as public access to sites can reduce the potential for stock grazing due to restrictions on fencing and worrying of stock by dogs. It also links to Illegal and third party impacts, as some of the activities included relate to the effects of trespassing or unconsented activity.

Features (or feature groups) affected

SPA Species: herons, bitterns and egrets, waterfowl, birds of prey and owls, crakes and rails, waders, gulls, terns and skuas, other bird species, breeding bird assemblage, seabird assemblage, waterbird assemblage.

SPA Habitats: marine, coastal and halophytic habitats, coastal sand dunes and continental dunes, 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.

SCA Species: molluscs, arthropods, fish, amphibians, mammals, lower plant species, higher plant species.

Types of sites affected

This is a very widespread issue, potentially affecting all sites, but with a likely increase in frequency near to urban conurbations.

Evidence

There were two site specific evidence projects relating to this issue, *Humber Estuary Bird decline investigation* (Woodward 2015a and others) and *The Wash Bird decline investigation* (Woodward 2015b and others). In addition IPENS developed a Public Access and Disturbance Theme Plan, the findings of which have shown the following gaps in our knowledge and evidence on a national or multiple site scale (please note that a few sites and types of recreational use are well studied so the following will not apply in those cases):

Baseline and the effects of public access on features:

- A lack of baseline understanding of all recreational activities occurring on each SAC and SPA, to include their intensity and frequency, to enable understanding of current significant effects on features; and / or anticipation or management of change.
- Insufficient evidence to understand the scale, frequency and intensity of public access related disturbance and significance on features (species, including birds, and

habitats) in some cases. For example, there are still some significant evidence gaps in our understanding of disturbance distances and how disturbance events translate into population level effects. Likewise, habituation of birds to disturbance is not well understood. Where evidence does exist, it is found in individual research papers and grey literature, which needs to be brought together into a single source, in order for it to be fully accessible.

- Insufficient evidence to understand the cumulative disturbance effect of a number of water-based activities taking place in different parts of estuaries; and the in-combination effects of different types of public access on a site, and / or public access disturbance in combination with other effects on features.
- Insufficient evidence to quantify any predicted change in recreational use following the provision of coastal access.
- The impact of recreational disturbance arising as a result of housing development is very difficult to assess. There is inconsistency in how the evidence base is used, and lack of clarity as to what extent remaining uncertainties can be addressed, given that modelling and research is costly. The biggest concern is about fully understanding the impacts which arise cumulatively and in combination.

Effectiveness of existing mechanisms

- A lack of monitoring and assessment of the effectiveness of existing mechanisms, leading to a paucity of evidence to inform decisions on whether mechanisms already in place are effective; or which management solutions are most likely to successfully address disturbance effects. This includes a particular gap in understanding whether existing mitigation to address recreational disturbance impacts on coastal birds is successful. A better understanding is needed of whether the current preference for soft, voluntary measures (eg communication, codes of conduct, signage) is successful in terms of achieving improved feature condition.
- The motivations of people accessing sites are often not sufficiently understood to enable successful mitigation tactics to be applied and those likely to be unsuccessful to be ruled out.

Priorities for action

- Insufficient understanding of which SACs and SPAs should be prioritised for action on public access related disturbance effects. SIPs have provided updated information which should assist with development of a common understanding of this.
- The level of evidence or burden of proof to effect management interventions or change has not been fully established.
- Liley (2007) set out the priorities for future research on bird conservation and access to the countryside in England to address evidence gaps that were recognised at that time. Some of the research recommended in that report may already have occurred but there is a need to review and update the outcomes of that work to inform priorities for future evidence gathering.
- Relative significance of the effects of public access related disturbance compared with other issues affecting site condition is not well enough understood on some sites to enable prioritisation of action and funding, where resources are not sufficient to enable all issues to be addressed.

Gaps in evidence at a SAC or SPA level have also been identified on 59 SIPs, with 95 site specific actions to investigate or monitor the impact of public access on features, the options for mechanisms to address any impacts, or the efficacy of any mechanisms already deployed.

Description of actions required

Priority actions from the Theme Plan:

1. Further investigate where public access

related disturbance has been reported in SIPs, to develop a prioritised list of SACs and SPAs where action is required, identify any national or multiple site scale approaches that are required; and to inform a programme of further action to be taken.

2. Review existing evidence about the possible impacts of disturbance on sensitive features and the effectiveness of existing mechanisms. Where evidence gaps are identified, commission further work to address these. Where mechanism gaps are identified, develop new or refined mechanisms and test these in pilot projects.
3. Review available national guidance and support and identify how these could be improved and made more accessible to all interested parties. This review and any updates to guidance should be informed by the outcomes of the other Priority Actions and be carried out consistently with the requirements of the UK Government's Smarter Guidance initiative.

Other site-based actions required:
Where the issue is well understood on sites, or to be informed by investigation, actions are focussed on one or more of the following mechanisms:

- **Advice:** in the form of education and awareness raising through a variety of types of engagement with user groups (sometimes through development and implementation of a Public Engagement Plan), introducing signage and other forms of interpretation, wardening (voluntary and / or funded), maintenance of an Emergency Medical Services Officer, byelaws, sanctuary markers and buoys, codes of conduct and site-based good practice guides.
- **Access strategy:** development of an access strategy to enable a holistic approach to management of access on (and sometimes off) the site, often as part of a wider site management plan, sometimes including access restrictions to areas with very sensitive features, such as wintering / breeding birds.
- **Estuary management plans, National Nature Reserve Management Plans and non-Natural England funded Management Plans** can fulfil a similar role and are referred to as a mechanism in some SIPs.
- **Existing local projects:** often enabling access management to be included in site plans and funding to be accessed to enable delivery of the required actions.
- **Habitat creation / restoration:** to encourage users away from particularly sensitive areas. Creation of habitat to support sensitive species away from heavily used areas. Build resilience to disturbance by creating additional available habitat and restore habitats damaged by access.
- **Partnership agreements:** to implement and fund required management.

Delivery partners

This issue will require a huge range of existing and new involvement and partnerships, the SIPs record the following: EDF Energy, The National Trust, Ministry of Defence and Defence Infrastructure Organisation, Civil Aviation Authority, Joint Nature Conservation Committee, Environment Agency, Forestry Commission and Forest Services, Inshore Fisheries Conservation Agencies, Marine Management Organisation, European Marine Site Management Schemes, Crown Estate, Area of Outstanding Natural Beauty Partnerships, National Parks Authorities, Water Companies, site user groups such as climbing, caving and dive clubs, British Association for Shooting and Conservation, British Mountaineering Council, RSPB, Wildlife Trusts, site "Friends of" groups (local volunteers), local authorities, local historic buildings trusts, local partnerships such as Suffolk Little Tern Group, Network Rail, Bristol Zoo, Police, Natural Resources Wales, the Angling Trust, Bat Conservation Trust, Amphibian and Reptile Groups, Amphibian and Reptile Trust, British Trust for Ornithology, The Moorland Association, Woodland Trust, Game and Wildlife Conservation Trust, Royal Yachting Association, Harbour Commissioners, Local Government Association, Rivers Trusts, Commons Groups and local bat groups.

Funding

In many cases the costs are staff time only or not yet determined. This is often related to the need for investigation before the actions required can be determined. The scale of the complete funding requirement cannot therefore be estimated until the investigations are complete. From the costings which have been estimated, the funding requirement is already running at £millions.

Funding options listed in the SIPs include: Developer contributions, Conservation and Enhancement Scheme (CES), Rural Development Funding (Countryside Stewardship), Heritage Lottery Fund, EU LIFE+, Landfill Tax, existing Partnerships and Partnership Projects (such as Solent Disturbance and Mitigation Project, Industry Nature Conservation Association) and Community Infrastructure Levy. Also recorded are Natural England Grant in Aid, Environment Agency (including Water Framework Directive) Grant in Aid and other organisations' resources (including Forestry Commission, Defence Infrastructure Organisation, Area of Outstanding Natural Beauty Partnerships).

Due to the scale of funding likely to be required, a big gap is anticipated between this and what is available, although this cannot be accurately measured.

Lack of evidence and knowledge

A lack of evidence or knowledge has been identified as a specific issue in 25 SIPs covering the following issues:

- Inadequate evidence and baseline survey information to confirm the presence, location, size or trend of SAC habitats and species, including for trends in typical species associated with SAC habitats.
- The lack of fit-for purpose site monitoring is hampering site management.
- Insufficient coverage of SPA bird baseline monitoring (parts of sites are not covered). Moreover, detailed information about SPA birds (population, movements, habitat use) is sometimes required to understand population developments, to inform site management and to provide planning and consents advice.
- Lack of clarity on conservation objectives and what is needed for a favourable condition
- Lack of knowledge about the use of the wider landscape by bats.

There are further evidence gaps associated with sites and issues which are covered under other headings in this report.

Features (or feature groups) affected

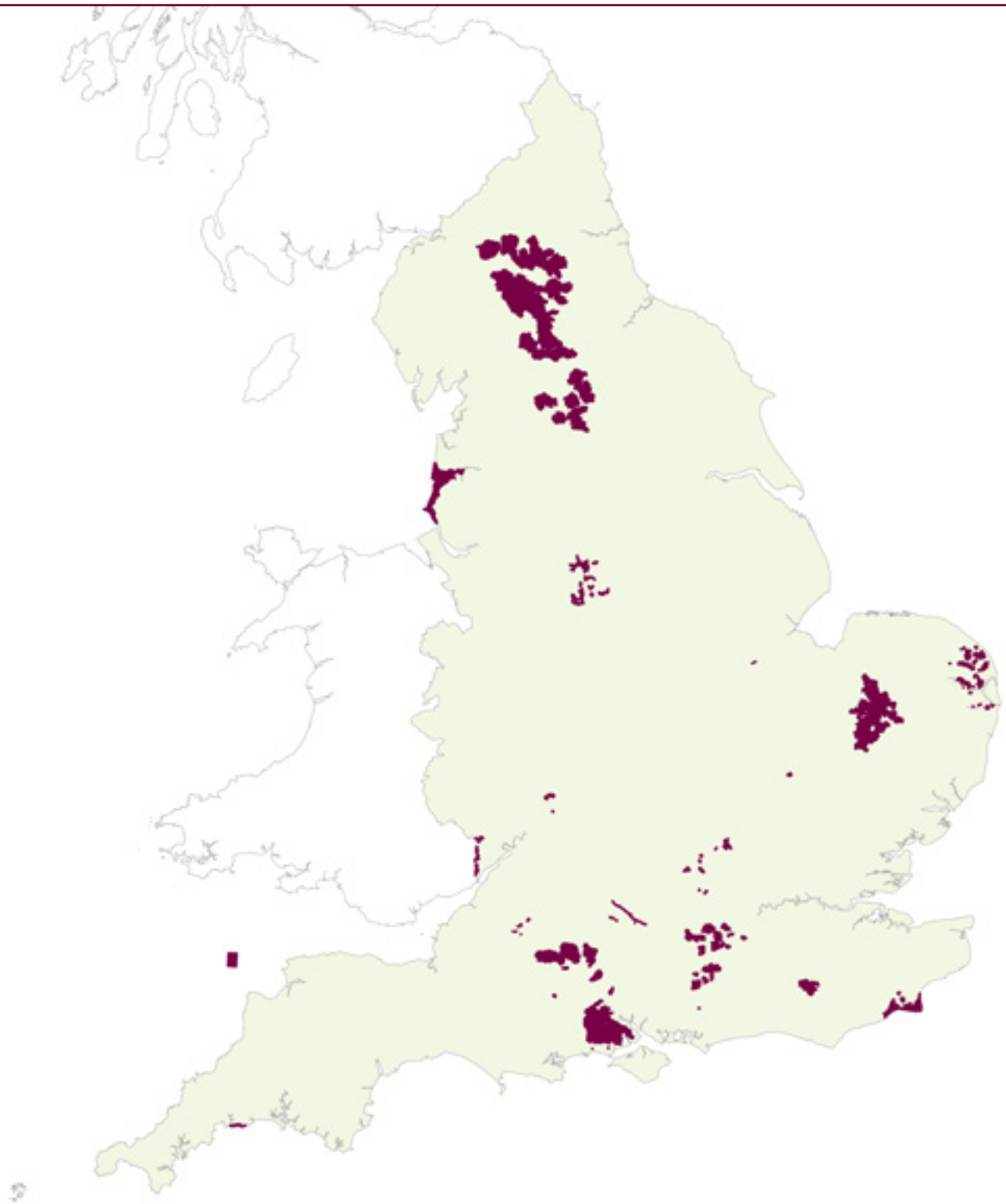
Non breeding birds, breeding birds, marine and coastal habitats, freshwater habitats, heaths, grasslands, bogs, mires, fens, rocky habitats and caves, forests, molluscs, fish, mammals and plants.

Monitoring gaps are particularly prevalent for specific SAC insect species and habitats where specialist assistance is required. Species include the stag beetle, violet click beetle, southern damselfly, marsh fritillary and molluscs. Habitats include calcareous and calcshist screes of the montane to alpine levels and calcareous rocky slopes with chasmophytic vegetation.

Types of sites affected

All SACs and SPAs across the country are affected to a greater or lesser degree by a lack of evidence or knowledge. Where there are experienced Natural England site officers and existing partnerships in local areas, the knowledge and evidence levels tend to be much better.

Figure 20 – Natura sites where lack of evidence and knowledge is recorded as an issue



Issue type	Number of SIPs
Pressure	4
Pressure / Threat	4
Threat	17
Total	**25**

Evidence

As described previously, there are 54 evidence projects under IPENS, but there is still a gap. Of particular note are the evidence projects which are related to feature surveys, such as on the River Wye SAC (Hill & Hill 2013). The lack of feature surveys remains one of the main gaps in our knowledge and evidence.

Description of actions required

Improve regular monitoring for:

- SPA breeding birds and their habitat use, in particular woodlark, nightjar, stone curlew and at some coastal sites.
- Bat usage of the landscape (on and offsite).
- Some small scale SAC features: tufa springs, alkaline fens, spined loach, stag beetle, violet click beetle, southern damselfly, marsh fritillary and rocky habitats.

Carry out specific investigations into causes of vegetation change, species composition change and SAC species habitat suitability at specific sites (ten sites).

Clarify conservation objectives including what favourable condition means, and establish management priorities where there are conflicting demands.

Delivery partners

Most actions for this group of issues are attributed to Natural England in the SIPs, supported by a wide range of partners. Some investigations will need to be led by landowning bodies such as the Ministry of Defence. Partnerships will also need to be enhanced for example with the Environment Agency, the Wildlife Trusts, the Broads Authority and Local Authorities to meet this challenge.

Funding

Based on the SIPs where this issue was costed (31 out of 39 actions) the estimated cost is approximately £1.8million.

Existing mechanisms have generally been recorded as options to deliver the actions, including Natural England resources and Grant in Aid budgets; Countryside Enhancement Scheme and Wildlife Enhancement Scheme funding, the Species Recovery programme, the Rural Development Programme and further evidence projects.

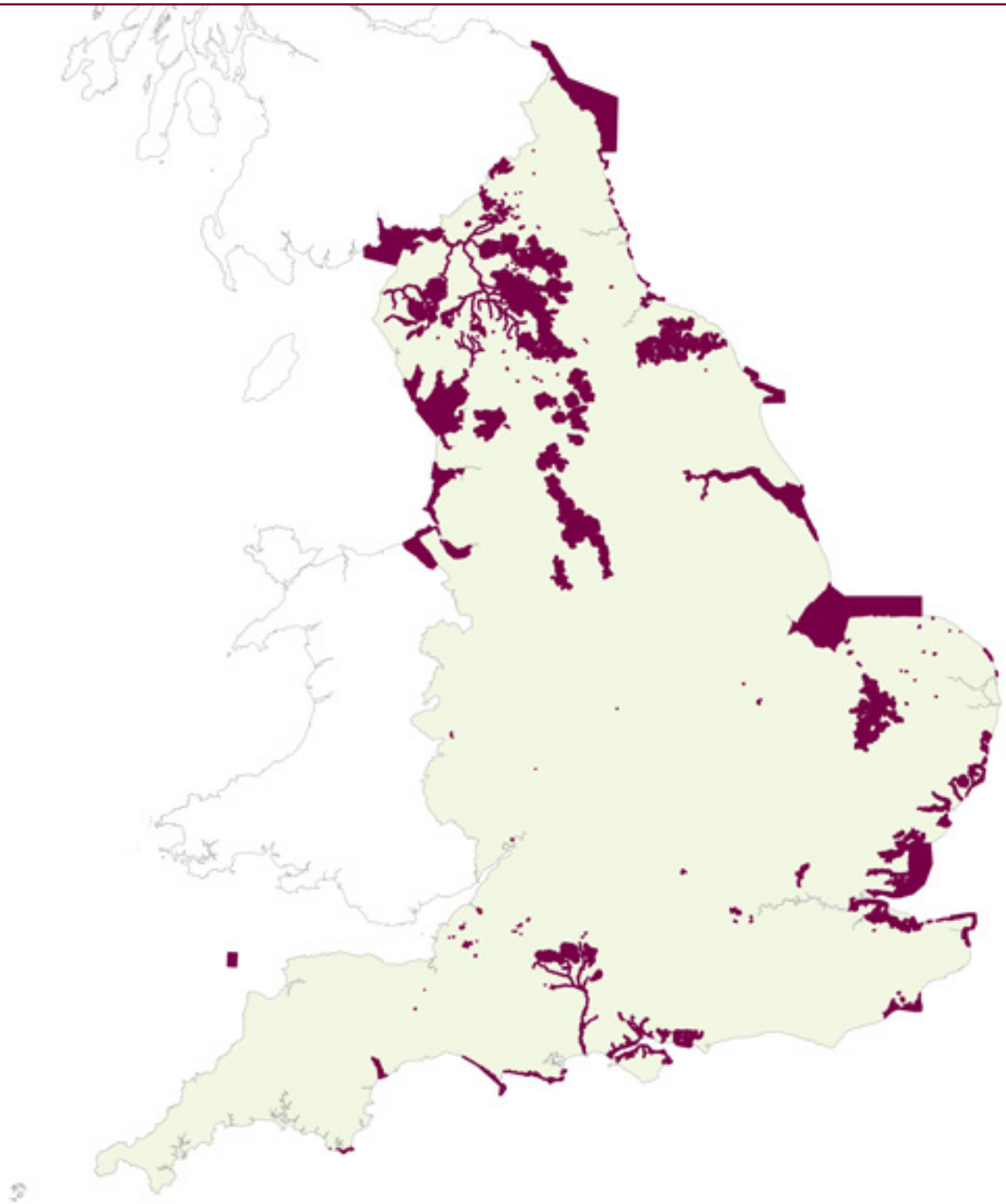
It is also recognised that external resource solutions (local and national) will need to be considered as there is a lack of funding for regular monitoring and site specific investigations.

Natural or unexplained change

Issues related to natural or unexplained change have been identified in 72 SIPs, summarised below:

- Observed declines in designated features with reasons unknown, poorly understood or unconfirmed:
  - Declines in estuarine and coastal SPA bird populations, sometimes in line with national trends.
  - Moorland bird (raptor) populations lower than would be expected based on habitat availability.
  - Changes in the estuarine and coastal geomorphology.
  - Annex I habitat quality loss through declines or loss of specific plant species or lichens, changes in species composition, poor recruitment (eg juniper or beech) and lack of early successional stages.
- Natural change and autonomous processes

Figure 21 – Natura 2000 sites where natural or unexplained change is recorded as an issue



Issue type	Number of SIPs
Pressure	17
Pressure / Threat	22
Threat	33
Total	**72**

threatening the long term survival of designated features:
  - Risk of collapse of abandoned mine entrances used by bats.
  - Coastal dynamic processes and sea level rise leading to loss of habitats (eg cutting off tidal inlet to SAC lagoon, spartina and reedbed encroachment on mudflats).
  - Maturation of gravel pits making them less suitable for designated features.
  - Gradual loss of available zinc from the mine spoil on which calaminarian grassland habitat is dependent.
  - Breeding colonies of Annex I habitats moving out of site boundaries due to natural dynamic processes and fixed site boundaries.
- Increased pressure of predation is considered a key factor for breeding birds at a large number of sites.
- Populations of SAC species declining, being critically low or with very low recruitment for various reasons (eg freshwater mussel, white-clawed crayfish, salmon, bats and newts).

Features (or feature groups) affected

A wide range of features (118 in total) are reported in SIPs. The most frequently reported are:

- Breeding birds in estuaries, coasts and cliffs in particular terns (little tern, common tern, sandwich tern, roseate tern), avocet, marsh harrier and Mediterranean gull.
- Non-breeding birds in estuaries, in particular waders (common redshank, dunlin, grey plover, golden plover, red knot, bar-tailed godwit, black-tailed godwit, ringed plover), and waterfowl (common shelduck and waterbird assemblage).
- Specific Annex I grassland habitats (dry grasslands and scrublands on chalk or limestone (important orchid sites); grasslands on soils rich in heavy metals; open grassland with grey-hair grass and common bent grass of inland dunes).
- Breeding birds in moorland SPAs (golden plover, merlin, hen harrier, peregrine falcon, short–eared owl).

Types of sites affected

A wide variety of sites are affected including estuaries, rivers, lakes, woodlands, grasslands, scrub, heathland, lowland mires, moors, bat caves, gravel pits, cliffs and coastal sites.

Evidence

The IPENS programme has funded 12 site specific evidence projects on this issue and in most cases, the SIPs highlight the need for further investigation (summarised in the actions below).

Description of actions required

The actions have been grouped as follows:

- where declines are observed with reasons unknown, poorly understood or unconfirmed;
- where there is a threat of natural change;
- where there is increased pressure of predation; and
- where there are low or declining populations of SAC species and changes in Annex I habitats.

Where declines are observed with reasons unknown, poorly understood or unconfirmed:

- Investigate the reasons for decline to inform management action in response.
- Investigations in SPA birds need to distinguish between site-level factors and larger scale factors (eg climate change, factors abroad along the flyway). This may need a national study.
- Increase monitoring and surveillance, eg for specific species.
- Work pro-actively with partners to improve the conservation status of raptors.
- Implement recovery programmes,

sometimes this needs innovative techniques.

Where there's a threat of natural changes:

- Identify and implement options to stabilise mine entrances for bats.
- Consider reviewing the conservation objectives where maintenance is unsustainable.
- Enable boundary flexibility where features are / will be located outside sites.

For increased pressure of predation:

- Investigate the impact of predation.
- Improve predator management.

For low or declining populations of SAC species and changes in Annex I habitats:

- Investigate the health of populations that are critically low.
- Improve active management and implement habitat creation and species recovery plans to mitigate declines.
- Review relevant management plans (eg for fisheries) to tackle possible causes.

Delivery partners

Although it has not always possible to record a delivery partner for this issue, many SIPs do suggest appropriate organisations and partnerships to take forward these actions. These include Natural England, the Environment Agency, Local partnerships, Local authorities, the Forestry Commission and Forest Enterprise, Natural Resources Wales, Defence Infrastructure Organisation (DIO), The Association of Inshore Fisheries and Conservation Authorities (IFCA), Defra, the Royal Society for the Protection of Birds (RSPB) and the National Trust.

Funding

Out of the 200 actions recorded against this issue in the SIPs only 86 have actually been costed and these alone amount to approximately £15million. Many of the actions require further refinement through discussions with partner organisations and landowners before detailed costings can be worked out.

There are existing and new mechanisms recorded in the SIPs which may contribute towards the actions to address this issue. Existing mechanisms are Natural England and the Environment Agency staff time, Countryside Enhancement Scheme, National Nature Reserve management plans, Catchment Sensitive Farming funding and advice, the Rural Development Programme for England (including the new Countryside Stewardship Scheme), the Water Framework Directive and Flood and Coastal Risk Management funding and advice.

New opportunities suggested in the SIPs are LIFE+, the Heritage Lottery Fund, landfill tax and associated initiatives such as the WREN biodiversity fund, INTEREGG / the European Regional Development Fund; industry funding (eg the water industry, United Utilities and the Industry Nature Conservation Association); partnerships with, for example The Royal Society for the Protection of Birds (RSPB), the National Trust, the Wildlife Trusts and Local Authorities.

The majority of the funding needed is unlikely to be available through existing mechanisms. Most funding is required for:

- habitat creation and restoration (£7.3million recorded in the SIPs);
- investigation / research / monitoring (£2.5million recorded in the SIPs);
- advice and awareness raising (£750,000 recorded in the SIPs);
- Rural Development Programme fundable actions (£650,000 recorded in the SIPs); and
- Conservation Enhancement Scheme fundable Actions (£360,000 recorded in the SIPs).

Note that 86 of the 200 actions in SIPs have no cost estimate so this is an indicative picture only.

Offsite issues

19 SIPs cover a variety of issues under this category, as follows:

Some mobile species and species which are part of a metapopulation in the wider environment are known to use offsite habitats and may also need to interact with offsite populations of their species as part of their life cycle. For example, most of the SACs which are designated for bats only include some of the habitats they need, such as the hibernaculum or maternity roost, so the bats must go offsite to use the other habitats necessary for their survival. Where they go and which habitats are most important to them is usually unknown, so appropriate management of these habitats cannot be secured. Lack of knowledge therefore compromises the ability to respond appropriately to threats such as development pressure; and opportunities such as the use of agri-environment schemes on offsite locations that will most greatly benefit the SAC / SPA population.

Linked to the issue above, the need to improve or secure functional connectivity of the SAC or SPA to other important sites for mobile species (some of which are also protected sites) is also raised on a number of SIPs, particularly with reference to bats.

Areas of qualifying SAC and SPA habitat have not been included within the boundary for some sites. Incorporation of these areas into the SAC / SPA would enable a more coherent and secure approach to site management, allowing dynamic hydrological, geomorphological and ecological process to be able to occur unhindered; and to ensure that features are fully protected. Currently there is no plan to change the designation as the focus is on appropriate management of the features covered by the current designation.

Disturbing or damaging activities offsite may be impacting the features onsite. This covers leachate and warming from a rubbish tip, wildfowling activities and consented culling of gulls.

Features (or feature groups) affected

SPA Species: herons, bitterns and egrets, waterfowl, waders, gulls, terns and skuas, seabird assemblage, waterbird assemblage.

SAC Habitats: marine, coastal and halophytic habitats, coastal sand dunes and continental dunes, freshwater habitats, temperate heath and scrub, natural and semi-natural grassland formations.

SAC Species: molluscs, arthropods, fish, mammals.

Types of sites affected

The SIPs show that this issue is mostly relevant to sites with mobile features, such as birds, bats and butterflies, and sites which are dependent on good offsite management to maintain favourable condition onsite (eg hydrology).

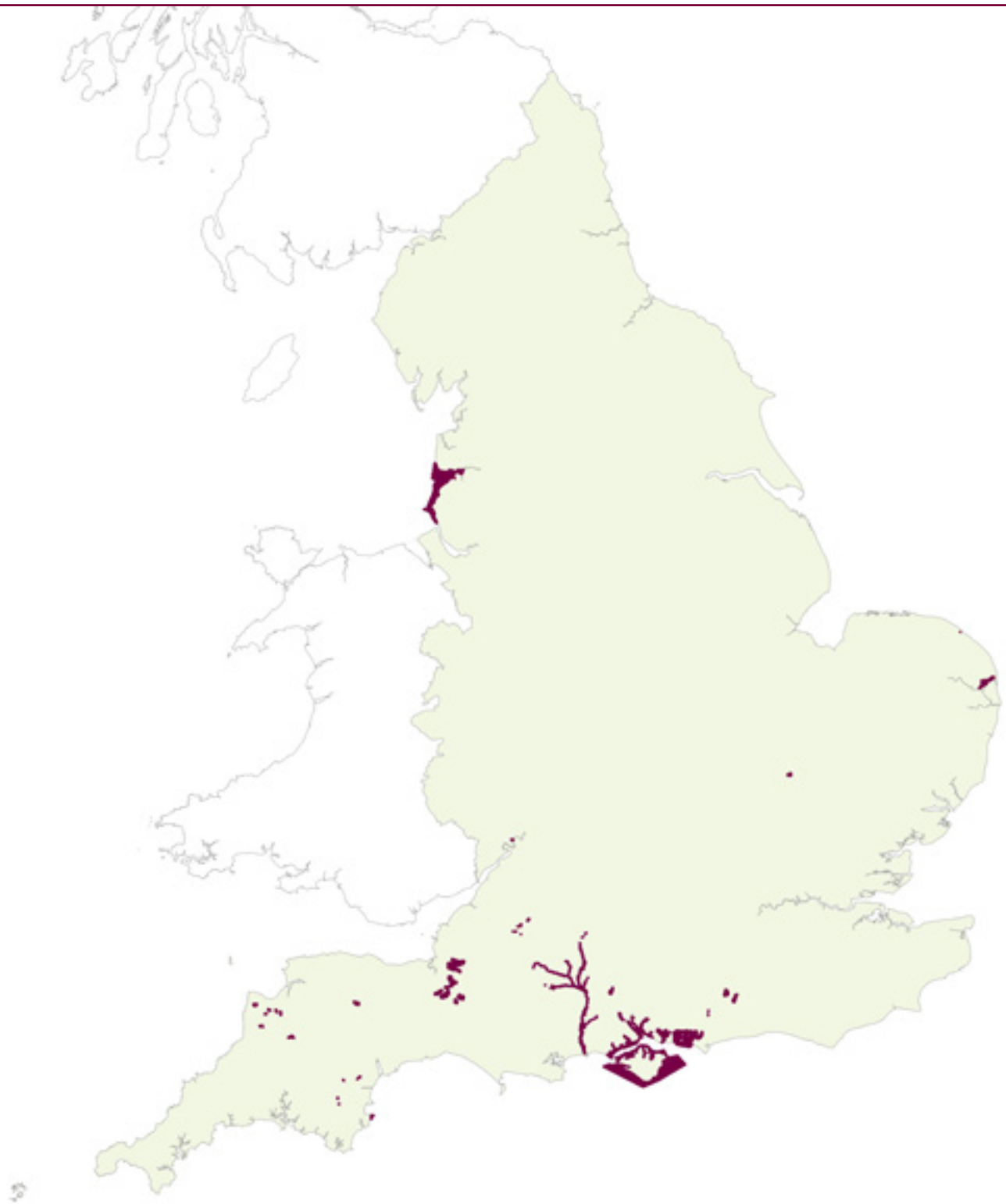
Evidence

There were no specific IPENS projects covering this issue. The evidence gaps are site-specific.

SIPs record the need for evidence on the use of offsite habitats by bats, birds and / or butterflies, to inform offsite habitat management and casework advice. The majority of this relates to offsite bat habitat which is essential to their life cycle and feeding behaviour but is not itself protected, so is vulnerable to factors such as damage, disturbance and inappropriate management.

In addition, there is a lack of understanding of the significance of disturbance or damaging effects of offsite activities, for example

Figure 22 – Natura 2000 sites where offsite issues is recorded as an issue



Issue type	Number of SIPs
Pressure	2
Pressure / Threat	9
Threat	8
Total	**19**

wildfowling and changes in site temperature and conditions caused by a rubbish tip.

There is also a lack of knowledge on the dependence of sites on offsite management, for example SAC features which are also present offsite, or a hydrological unit offsite. This evidence is needed to inform potential future designation boundary changes and offsite management solutions.

Description of actions required

Site-specific investigations to understand the use of offsite habitats and the effects of offsite activities are a strong theme making up the majority of the actions. Those investigations will then inform further action, so the existing actions are likely to be refined significantly once those investigations take place. Existing actions recorded in the SIPs are:

- The use of Rural Development Programme funding (Countryside Stewardship scheme) to secure appropriate management of important offsite habitats.
- Advice to landowners and managers on how to manage key offsite habitats for the species they support.
- Development of good practice guidance for wildfowlers.
- Closer monitoring of offsite gull culling to inform on site management planning.
- Consider designation reviews for some SACs and SPAs to incorporate key areas and habitats for their features, within the site boundary; to include qualifying habitats outside the boundary; and areas which require particular management to support the features (such as hydrological units) which aren't currently within the site boundary.
- Develop a Species Recovery Plan to investigate offsite bat activity and to secure good management of important habitats.

Delivery partners

Natural England, the People's Trust for Endangered Species, Local Nature Partnerships, Wildlife Trusts, Bat Conservation Trust, Local Authorities, Forestry Commission, Forest Services, The Royal Society for the Protection of Birds (RSPB), Local Records Centres, Butterfly Conservation, Areas of Outstanding Natural Beauty.

Funding

17 of the 19 SIPs have recorded estimated costs to address this issue, amounting to approximately £800,000 in total. However this figure is likely to change when investigations have taken place, as the outcomes of these will inform the extent of further action to be taken and the gap in funding.

Funding sources suggested in the SIPS are EU LIFE+, Natural England Grant in Aid, Heritage Lottery Fund, other stakeholder contributions including via new and existing partnerships, Rural Development Funding (Countryside Stewardship Scheme).

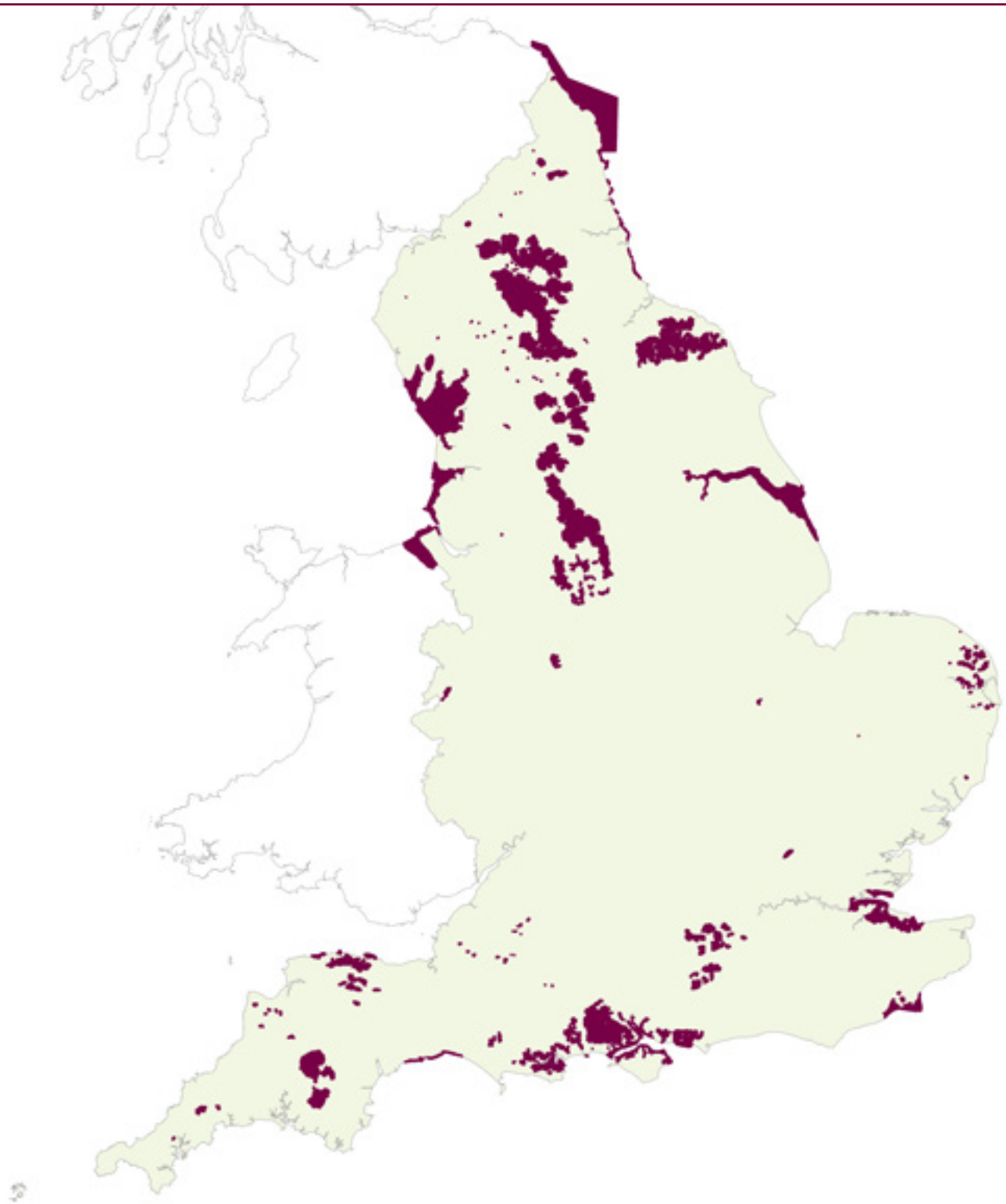
Illegal and third party activities

Natura 2000 sites and their features are affected by a range of illegal activities such as trespassing and arson. Legal third party activity such as military activities can, depending on circumstances can also have a detrimental effect on features.

47 SIPs record a wide variety of issues which sit under this heading, as follows:

Trespassers causing disturbance and damage. This issue often affects breeding or hibernating bats in caves or disused buildings. These sites are subject to noise, light pollution, campfires

Figure 23 – Natura 2000 sites where illegal and third party activities is recorded as an issue



Issue type	Number of SIPs
Pressure	8
Pressure / Threat	19
Threat	20
Total	**47**

and vandalism including removal of grilles designed to prevent entry to bat hibernation sites. In addition, trespassers with dogs are recorded as causing disturbance to amphibians or damage to their habitat.

Adjacent / nearby property owners using SAC land inappropriately. SIPs have recorded instances where neighbours have taken over SAC land, such as by installing driveways, using it for storage and planting and dumping waste (causing pollution, enrichment and / or introduction of invasive species).

Run off of nutrients from adjacent properties. SIPS have recorded run off from pig farms and leaking septic tanks for example, causing enrichment to Natura 2000 sites.

Burning in sensitive areas as a result of illegal, legal and accidental fire setting. Records in the SIPs include arson, trespassers setting campfires including in caves which are bat roosts, consented burning getting out of control, Military activity and sparks from steam trains . This issue has adversely affected and is threatening a very wide variety of habitats and species. The threat is thought to be increasing as a result of climate change, as drier, hotter conditions are likely to make some habitats more flammable. Effects on habitats can be long lasting as the seed bank can be completely destroyed.

Shooting. SIPs cite shooting, including authorised and unauthorised wildfowling, as a cause of disturbance to breeding or wintering birds.

Military and police activities both on and off Ministry of Defence land, are causing damage and disturbance to the features of some sensitive sites. This includes helicopters flying over SPAs, causing bird disturbance, and training activities taking place on land, causing disturbance or damage to features.

Removal of features. This issue covers the collection of plants, the removal of Salicornia (glasswort), egg collecting, beach combing and beach cleaning. This can result in the removal of the feature itself and also damage and disturbance to other features (such as breeding and / or wintering SPA birds).

Illegal and legal use of vehicles. This is recorded as the cause of damage to a wide variety of habitats by erosion, compaction and pollution, and disturbance to species such as breeding and wintering birds. Records include the use of off-road vehicles and motorbikes for recreation where their use is not permitted (both on and off byways), car parking on sensitive habitats, use of vehicles as part of moorland estate management and in a few instances the damaging effects of pedal cycles on wet habitat.

Mooring of motorboats on sensitive beach habitats. On some sites, this activity has caused damage by compaction and possible pollution from leaking oil / other fluids. In addition, unconsented houseboats have been recorded as potentially causing damage to intertidal habitats.

Unconsented sea defences are recorded as disrupting natural coastal processes and impacting cliff top habitats.

Features (or feature groups) affected

SPA Species: herons, bitterns and egrets, waterfowl, birds of prey and owls, waders, gulls, terns and skuas, other bird species, breeding bird assemblage, waterbird assemblage.

SAC Habitats: marine, coastal and halophytic habitats, coastal sand dunes and continental dunes, freshwater habitats, temperate heath and scrub, natural and semi-natural grassland formations, raised bogs and mires and fens, rocky habitats and caves, forests

SAC Species: arthropods, fish, amphibians, mammals, higher plant species

Types of sites affected

As with the features affected, third party activities affect a wide range of sites across England, with no real trends in location or type of site emerging.

Evidence

There remains an evidence gap on site level, detailed understanding of the effects of these activities on the features. Further assessments at relevant sites are needed to understand the impacts and the measures required to address them.

In addition, where mechanisms have already been put in place to address the impacts, (for example of car parking in sensitive locations), there needs to be analysis of this to inform further steps to be taken to address the issue.

Further evidence is also needed on whether licenses to shoot Brent geese for crop protection purposes are having an effect on the Solent SPA, to inform consideration of future licence applications.

Description of actions required

Advice and awareness-raising of the impacts of damaging activities and the legal framework is the most frequent type of action which has been put forward to address the issues. This includes direct advice to users and user groups, on-site signage and changes to site furniture, wardening (including working with wildfowling clubs) and development of access strategies (including possible changes to access routes).

Other actions recorded in SIPs are:

Enforcement, using a variety of mechanisms, such as Site of Special Scientific Interest (SSSI) legislation, the Road Traffic Act and byelaws (along with appropriate evidence).

Develop and improve local partnerships to enable more effective reporting and response to incidents.

Maintain and introduce security to prevent trespassing. Actions suggested include installing grilles on cave entrances, security fencing and closed-circuit television, setting up a system of local community involvement to report acts of vandalism and damage to mines / mine entrances and the use of wardens.

Introduce, review or update fire plans and wildfire prevention plans. Recommended actions include management plans, wildfire risk assessments, fire warning systems and / or maintenance of fire breaks to address fire-related risks. If these are to work, it is also suggested that they are embedded in Local Development Documents and Community Risk Registers for example.

Review designations to enable consideration of inclusion of cave entrances and other key habitats into the protected site, to enable new mechanisms to become available to address ongoing problems.

Develop mechanisms to use the planning system to provide more protection to verges when properties are improved or developed; and to use the relevant legislation to tackle the issue of fly-grazing (grazing horses on land without the landowner's permission).

Use National Nature Reserve Management Plans to implement the measures where the affected sites are also NNRs.

Delivery partners

These issues are varied and many, so a very wide range of partners and partnerships will be needed, including: Wildlife Trusts, Ministry of Defence / Defence Infrastructure Organisation, Police, Local Authorities, Parish Councils, Government bodies / departments (Natural England, Forestry Commission, Environment Agency, Defra, Natural Resources Wales), Crown Estate, Fire and Rescue Services, Commons Preservation Societies and associated groups, National Park Authorities, Areas of Outstanding Natural Beauty, Developers, Land owners and managers, The Royal Society for the Protection of Birds (RSPB), National Trust, Local partnerships, Marine Management

Organisation, interest groups (such as Amphibian and Reptile Trust, Froglife, Botanical Society of Britain and Ireland), Historic Buildings Trust, Moorland Association., the Association of Inshore Fisheries and Conservation Authorities, Trading Standards, British Association of Sporting and Conservation.

Funding

It is challenging to make an estimate of the scale of funding needed and the gap between that and what is already available or committed. In the majority of cases, the actions recorded in the SIPs are not costed. This is mainly because the cost for actions such as enforcement is unknown. Where costs are estimated (on 21 SIPs), this amounts to approximately £850,000.

Suggested funding streams and Programmes to address these issues are the Conservation Enhancement Scheme, Natural England grant in aid, other organisations' running costs (such as Local Authority, Police or Area of Outstanding Natural Beauty Partnerships) , the Rural Development Fund (Countryside Stewardship Scheme), the Species Recovery Programme.

Habitat fragmentation

The fragmentation of habitats is acknowledged as one of the main causes of habitat degradation and biodiversity loss in the European Union. Fragmentation may also lead to changes in the abundance, diversity and composition of species in a particular habitat or ecosystem.

This issue is recorded on 28 SIPs and also addressed in an IPENS theme plan as follows:

From SIPs:

- Protection of the metapopulation in an area is often important eg marsh fritillary.
- In some cases other habitat fragments in the area are protected (eg in a Site of Special Scientific Interest), but in many cases not.
- Fragmentation of foraging areas for bats and birds can reduce breeding success and thus the viability of populations.
- Impacts on bats and marsh fritillary are noted most frequently.

From the Theme Plan:

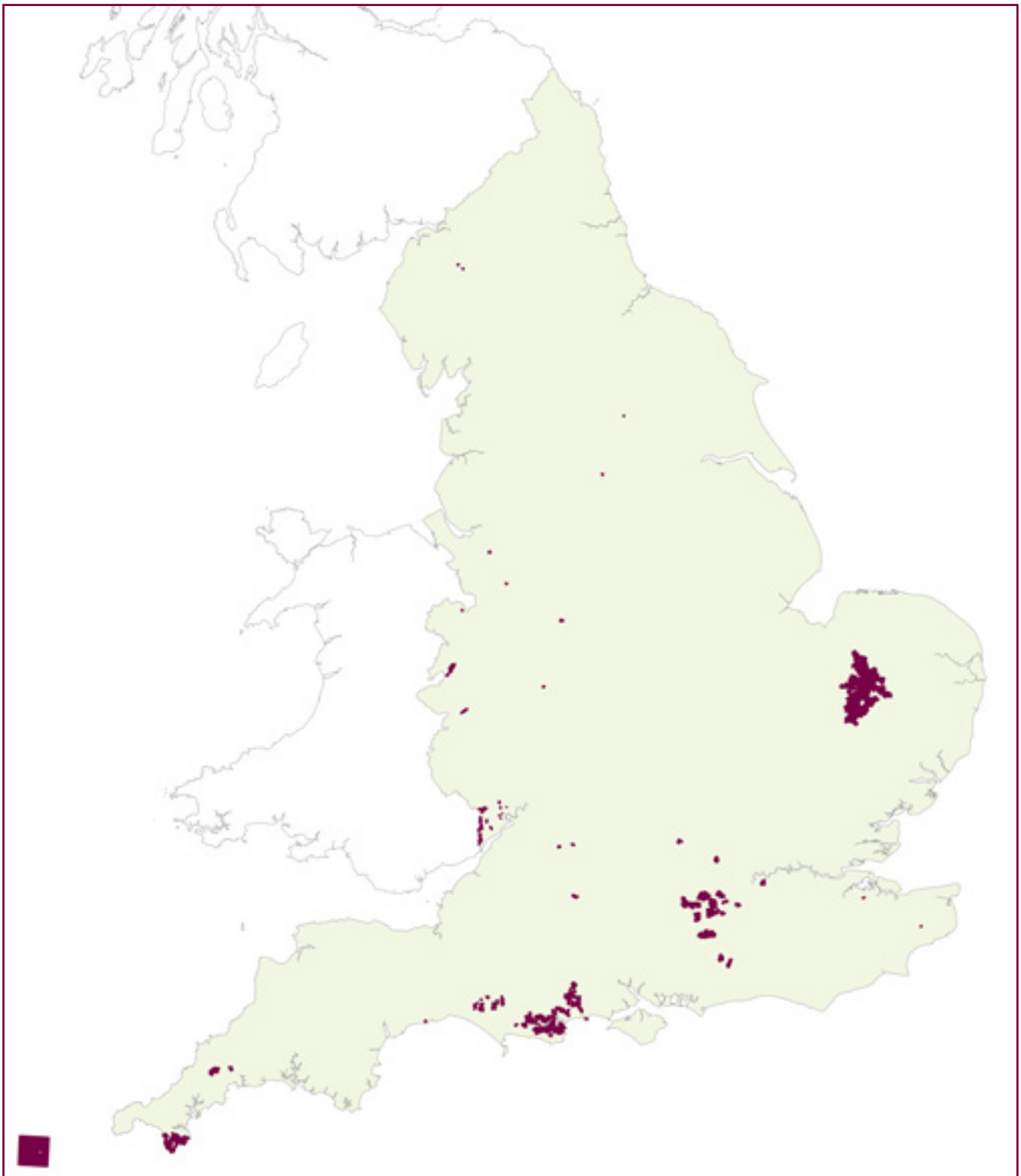
- Incremental breaking up of habitat patches for example as a result of land use change and development results in smaller and fewer natural habitats and increased 'edge' effects.
- Increased isolation of populations reduces their long term genetic viability, leading to changes in distribution.
- Fragmentation reduces the resilience of habitats and species to environmental pressures such as climate change.
- There is plenty of ecological evidence of the effects of fragmentation, but it is not picked up well by current recording, including SIPs. Fragmentation issues can be hidden under other headline issues. A consistent approach to assess vulnerability and plan activities to reduce fragmentation at the site or local area scale is needed.

Features (or feature groups) affected

Habitats: temperate heath and scrub (dry heath), forests (ancient woodland and associated invertebrates), natural and semi-natural grassland formations (species rich grasslands / orchid sites) and raised bogs and mires and fens.

Species: mammals (bats), amphibians (great crested newts), higher plants (shore dock), lowland heathland birds (Dartford warbler, nightjar), invertebrates (marsh fritillary).

Figure 24 – Natura 2000 sites where habitat fragmentation is recorded as an issue



Issue type	Number of SIPs
Pressure	7
Pressure / Threat	7
Threat	14
Total	**28**

Types of sites affected

Terrestrial, freshwater, and coastal sites and sites designated for species are the most affected.

Distribution of sites

Potentially, habitat fragmentation can be an issue on all sites however SIP recording of this issue seems to be predominantly southerly, extending up to the midlands, with the exception of two great crested newt sites in Yorkshire and two sites in Cumbria.

Evidence

Evidence about the effects of habitat fragmentation is improving. The biggest current gap is the lack of consistent assessment methodology across the Natura 2000 network, with an accompanying strategic plan to improve connectivity. The theme plan promotes this.

Description of actions required

SIPs

- Landscape scale approaches to support habitat management in the wider environment and initiatives to increase connectivity between protected sites.
- Surveys to establish metapopulation status (including genetic variability), which will inform landscape scale approaches to improve connectivity.
- Proactive involvement in future development planning, so that planners are aware of fragmentation / connectivity issues for Natura 2000.
- Encourage uptake of appropriate agri-environment scheme options.
- Planting to increase larval food resource for marsh fritillary.
- Pond creation to support great crested newts (within site and for metapopulation).
- Increase extent, quality and connectivity of habitat patches.
- Tailored habitat management to benefit bats eg along flyways.
- Seek opportunities to secure long term conservation management of adjacent land.
- Re-introduction plans (marsh fritillary).
- Partnership working.
- Maintain linear features, such as hedgerows.
- Raise awareness with relevant stakeholders.
- Consider revising Site of Special Scientific Interest designations to include other areas eg additional similar habitat / areas for metapopulation.

Theme plan

- Application of a consistent assessment methodology across the Natura 2000 network is needed, followed by development and implementation of management plans to improve connectivity (meeting the ambitions of the Biodiversity 2020 Strategy).

Delivery partners

The list of partners recorded in the SIPs is considerable and tells us that this issue is nationwide and addressing it is going to take commitment from across the environment sector, at national and local level. This includes: Local Authorities, Areas of Outstanding Natural Beauty, Plantlife, Wildlife Trusts, the Forestry Commission, Ministry of Defence, landowners, volunteers, Butterfly Conservation, Environment Agency, The Royal Society for the Protection of Birds (RSPB), Bat groups, Bat Conservation Trust, National Trust, Amphibian & Reptile Conservation Trust, Crown Estate, Natural Resources Wales, the National Farmers Union (NFU).

Funding

The scale of funding identified in the SIPs also varies widely as illustrated below:

- Small projects costing a few hundred to a few thousand pounds, including establishment of a management forum or

negotiating management plans.

- Medium scale projects, costing in the region of £10,000 - £90,000, such as for investigating and supporting options to improve connectivity, surveys and monitoring.
- Large scale projects costing in the region of £100,000 - £900,000, involving typically large landscape scale partnership projects working jointly to improve connectivity.
- Very large scale. Two projects exceed £1million (£1.5m and £10m) – both of these are likely to include money for land acquisition and / or conversion from farming in order to secure conservation management and improve connectivity.

The total cost given in the SIPs is £13.6million, although this is only indicative. Only nine out of 28 SIPs have recorded cost estimates. There are some existing mechanisms (programmes, staff resources and funding streams) which will go some way to addressing this issue including the Grant in Aid of Natural England and Natural Resources Wales (for cross border issues), Rural Development Funding in England and Wales (for cross border sites) Defra's Biodiversity 2020 Programme and the Species Recovery Programme.

We will also need to work together with our delivery partners to consider external funding sources such as LIFE, Heritage Lottery Fund, Landfill tax, especially for the larger scale projects.

CASE STUDY – Morecambe Bay Pavements

Morecambe Bay Pavements SAC is located in south Cumbria and Lancashire. It comprises a complex mosaic of habitats including extensive areas of upland calcareous grassland, limestone pavement, broadleaved woodlands (both ash and yew), an exemplar calcareous lowland lake and extensive juniper. It also has a population of narrow-mouthed whorl snail. The development of a SIP for this site has enabled the needs of these diverse features to be brought together, discussed with delivery partners and stakeholders and prioritised for action.

The issues affecting Morecambe Bay Pavements SAC illustrate the complexity of managing mosaic habitats well. Potentially conflicting requirements of different designated features poses a particular challenge. The top priorities highlighted in the SIP include:

- undergrazing and issues with scrub control on the calcareous grassland;
- development of the right balance of open and woodland habitat;
- deer browsing causing a lack of woodland regeneration and affecting the emergent vegetation of limestone grikes; and
- disturbance effects resulting from public access to the site.

Several IPENS theme plans have direct relevance to these issues; and the delivery of the SIP and theme plans will therefore support each other. One of the theme plans which supports some of the highest priority issues identified for this site is the grazing theme plan.

Links between the Morecambe Bay Pavements SIP and the Grazing theme plan

The calcareous grassland is under-grazed in places; and there is a need to introduce cattle grazing where dense swards have developed. Implementing appropriate management on calcareous grassland and limestone pavement is a challenge when land is registered Common Land, because of the need to establish Commons Partnerships and secure community agreement. The SIP for Morecambe Bay Pavements sets out actions to address these problems. It focuses on

introducing cattle grazing, on land which is currently ungrazed and land which is currently grazed by sheep under agri-environment schemes. The grazing theme plan supports the SIP by recognising the issue as common to many sites. It describes priority actions to address these issues at a national and multiple site level, including:

1. Assess site level grazing provision and deficiencies, consider alternatives and identify minimum acceptable management. Review grazing tool options such as fencing, shepherding, water supply and feeding.
2. Promote an 'adaptive management' approach, building flexibility into grazing systems to respond to monitoring and changing conditions and looking at the Countryside Stewardship scheme to achieve this;
3. Develop and advocate the case for agricultural and other rural development support measures for grazing dependent Natura 2000 sites, where farm businesses are considered in the round in order to sustain the required grazing systems;
4. Identify potential opportunities for piloting LEADER (European Union initiative for rural development) or EU LIFE type funding in co-ordination with agri-environment payments for livestock purchase and farm infrastructure. Consider and trial alternative ways to incentivise farmers to implement appropriate grazing;
5. Identify opportunities for better public engagement on sites where grazing changes are proposed, especially where there may be opposition or hostility to grazing.

Contribution to biodiversity delivery outside of the SAC

Morecambe Bay Pavements SAC also fits into a wider context of landscape scale delivery of biodiversity conservation, as it is part of the Morecambe Bay Limestones and Wetlands Nature Improvement Area (NIA). The NIA is a 20 year partnership project delivering nationally significant benefits for wildlife and people contributing to a sustainable future for the area. The NIA and the role of the SAC within it

Morecambe Bay Pavements SAC

illustrates how landscape scale approaches can be implemented and compliments the proposals made in the habitat fragmentation theme plan for delivering improved habitat connectivity.

Further information about this NIA can be found here: www.morecambebaynature.org.uk/nature-improvement-area

Grazing

This section covers under and over-grazing, inappropriate grazing and other linked issues (eg agricultural management covered under Other habitat management section below at page 121). An IPENS theme plan has been developed on grazing covering the cross cutting issues that affect many of the Natura 2000 sites and associated features.

Grazing is a key element that underpins the management of many of England's most important wildlife habitats encompassed by the Natura 2000 site series. It is frequently undertaken for commercial reasons by farmers linked to market demand. The recent Article 17 report lists inappropriate grazing as the second most frequently reported pressure or threat to the Natura 2000 habitats and species and a relatively high percentage of SAC / SPA sites are affected by grazing issues.

75 SIPs, equivalent to 28% of all SIPs, include grazing as a priority issue for improvement. Of these grazing features as a top three priority issue in 50 SIPS which represents 61% of the SIPs which record grazing issues. Under-grazing is identified as an issue in 45 SIPS and over-grazing in 24 SIPS.

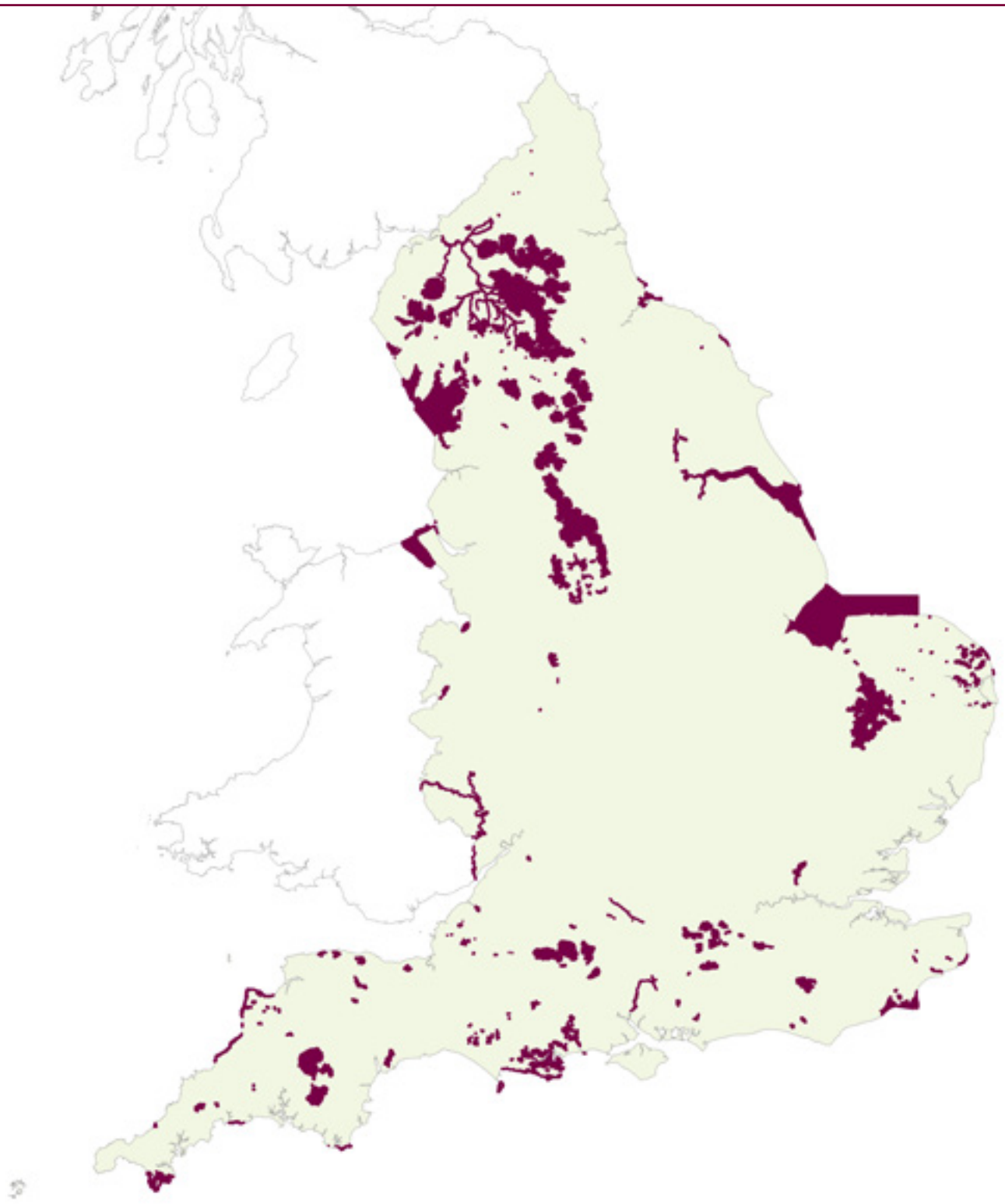
Strategic gaps / weaknesses in current mechanisms and approaches identified in the Theme Plan

- **Advice** – Greater support is required for local grazing partnerships to advise and support land managers in delivering Natura 2000 objectives. There needs to be recognition of the considerable time that advisers can spend on establishing grazing agreements on commons or introducing grazing and related infrastructure to abandoned sites, including managing complex and difficult relationships.
- **Incentives** – Currently there is a lack of incentives to support sustainable grazing livestock systems that deliver conservation grazing on Natura 2000 sites, especially with higher capital costs of changing to cattle. There needs to be greater complementarity of funding streams, including through different pillars and measures of CAP. This needs to include consideration of the individual farm and the farmers cultural considerations, such as commoning. This should seek to provide for infrastructure to support the enterprise through the year, including the times when grazing for conservation is not required; training and support for branding, marketing etc. Given that there is likely to be an increasing need for conservation grazing to fill the gap if grazing becomes a less commercially attractive option in significant parts of England, appropriate support for this kind of grazing will be important. Where it is adopted, it presents the opportunity to diversify the nature and type of grazing practiced.
- **Regulation** – The bureaucratic burden of moving from sheep to cattle requires much more paperwork, and is subject to more restrictions, for example Bovine Tuberculosis testing. The need for Secretary of State Approval for fencing on common land can add an extra time burden to setting up grazing schemes.
- **Improved evidence** – There is a need to identify, prioritise and address research needs that aim to improve the effectiveness of grazing and our understanding of grazing-related habitat change.
- Table 8 and 9 below give an overview of the range of specific issues grouped by topic that are highlighted in SIPs (where either, under-grazing, inappropriate grazing or over-grazing has been prioritised as an issue requiring improvement).

Features (or feature groups) affected

Grazing affects a wide variety of Natura 2000 species and habitat groups. These include wildfowl and waders, raptors, stone curlew,

Figure 25 – Natura 2000 sites where grazing is recorded as an issue



Issue type	Number of SIPs
Pressure	36
Pressure / Threat	18
Threat	21
Total	**75**

Table 8 – Digest of the main issues related to under-grazing featured in Site Improvement Plans (SIPs) prepared for Natura 2000 sites

Topic	The main issues identified in SIPs relating to under-grazing grouped by topic
Grazing infrastructure	Winter housing; cattle grids; fencing; bridges; mobile cattle crush; lose housing; troughs
Insufficient grazing animals stock and lack of suitable stock	Lack of grazing animals; lack of appropriate types of stock; help to 'match' graziers with grazing stock and site owners; support for landowners to acquire / lease traditional hardy breeds of stock; threat of Bovine TB deterring graziers and acquisition of stock.
Changes in farming systems	Owners lack of own stock leading to 'sporadic aftermath grazing'; inadequate incentives available to land owners to reverse the decline in cattle numbers in upland, coastal and lowland Natura 2000 sites
Local grazing projects & partnerships	Grazing Management plans; help to 'match' graziers with grazing stock and site owners; helping to introduce grazing to small grazing parcels; securing funding; specialised grazing management for species eg southern damselfly
Common Land	Secretary of State permission to fence Common Land and public support
Difficult locations	Risk of disturbance by dogs and the public; risk of stock loss on steep sided cliffs; difficulty grazing wet sites; need to increase the use of semi-feral goats or hardy sheep
Advice / guidance	Research to determine appropriate cattle grazing on limestone grasslands; complex grazing requirements to meet multiple sometimes conflicting conservation interests

Table 9 – Digest of the main issues related to over-grazing and inappropriate grazing featured in Site Improvement Plans (SIPs) prepared for Natura 2000 sites

Topic	The main issues identified in SIPs relating to under-grazing grouped by topic
Overstocking	Grazing levels exceed that required by the habitat; inappropriate seasonality of grazing eg overgrazing sensitive features in winter
Animal type	Issues caused by rabbits, deer, Canadian geese, tethered horses as well as sheep and cattle
Suitable Stock and Breeds	Sheep grazing where more cattle grazing is desirable
Changes in farming systems	Localised over-stocking in extensive upland situations; seasonality of grazing pressure eg uplands early spring stocking concentrations; inappropriate grazing in woodlands; inappropriate stock feeding
Boundaries	Stock-proof fencing to control access to woodlands, sensitive limestone habitats; Common Land; wetlands / rivers

Table 9 – continued

Topic	The main issues identified in SIPs relating to under-grazing grouped by topic
Agri-environment uptake	Increase coverage by agreements to achieve sustainable grazing; Environmental Stewardship, higher level scheme after-care advice; re-negotiate and amend existing agri-environment schemes where Natura 2000 outcomes are not being delivered
Advice / guidance	Advice to farming community; promote management agreements; co-ordination of rabbit control where excess numbers are a problem
Negotiation / Enforcement / regulation	Negotiate appropriate consents where grazing is unconsented; review tenancy; review inappropriate consents;
New funding	Non-Rural Development Programme funding for limestone pavement fencing
Specialist / Innovation	Pilot 'virtual' fencing projects (eg the use of electric cable laid underground around a grazing enclosure, combined with the wearing of collars by stock); support off-wintering of stock; introduce shepherding

heathland birds, southern damselfly, marsh fritillary, and early gentian. The most frequently affected habitats groupings, from highest to lowest, are natural and semi-natural grassland habitats, temperate heath and scrub, coastal and dune habitats, and raised bogs, mires and fens, forests, rocky habitats and caves, and freshwater habitats.

A high proportion of the grazing issues identified for forests and rocky habitats and caves relate to overgrazing eg scree and limestone pavements. Whereas a high proportion of those identified for coastal and dune habitats, for southern damselfly and marsh fritillary relate to under-grazing.

In summary, under-grazing is considered as the main problem in the lowlands where the availability of stock is an increasing problem, whereas for a range of upland sites excess grazing remains a significant pressure. This is closely linked with trends and ongoing structural changes in the agricultural economy and support payments under the Common Agricultural Policy. Marginal coastal habitats such as cliffs and slopes can benefit from grazing but this is often impractical as a part of modern farming systems.

Species include: common shelduck, wigeon, Eurasian teal, pintail, hen harrier, merlin, peregrine, Eurasian oystercatcher, stone curlew, golden and grey plover, curlew, common redshank, short-eared owl waterbird assemblage and breeding bird assemblage, Desmoulin's whorl snail, southern damselfly, marsh fritillary butterfly, white-clawed crayfish, sea lamprey, atlantic salmon, great crested newt, greater horseshoe bat and otter.

Habitats include: intertidal mudflats and sandflats, coastal shingle vegetation outside the reach of waves, vegetated sea cliffs, Mediterranean saltmarsh scrub, shifting dunes, coastal dune heathland, clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels and rivers with floating vegetation often dominated by water-crowfoot and montane acid grasslands.

Types of sites affected

This is a national issue covering a wide variety of terrestrial and coastal sites; often sites with large habitat complexes. SIPs in the lowlands feature most cases of under-grazing.

Evidence

The SIPs and the theme plan identify that there is a need to prioritise and address research needs that aim to improve the effectiveness of grazing and our understanding of grazing-related habitat change. This includes:

- Investigating the benefits and dis-benefits of different stock types on Natura 2000 habitat and species features.
- Investigating the ecological implications of cutting management versus grazing for Natura 2000 species and habitats.

Description of actions required

There are a variety of actions in the SIPs related to under-grazing however these can be broadly categorised as follows:

- a requirement for infrastructure to enable grazing;
- insufficient stock numbers;
- lack of a suitable stock type or breed;
- support to manage changes in farming systems;
- partnership working and local grazing projects;
- support, agreement and permission to graze commons;
- tailored solutions to enable the grazing on 'difficult' to access / manage locations; and
- provision of new or additional advice and guidance to grazing managers.

There are a variety of SIP actions related to over-grazing and inappropriate grazing. These include:

- addressing over-stocking where it is problematical;
- use of suitable stock types or breeds;
- support to manage / mitigate for changes in farming systems;
- provision of fences and boundaries;
- greater coverage by agri-environment agreements to support appropriate grazing;
- the provision of guidance / advice to grazing managers;
- negotiating appropriate consents where required;
- seeking additional non-agri-environment funding; and
- introduction of shepherding.

Delivery partners

Partnership working and a join up of resources will be critical to delivering the priority actions and for securing additional funding. This will include Natural England, Defra, the National Trust, the Royal Society for the Protection of Birds, the National Parks and the Wildlife Trusts and farming and livestock organisations including the National Farmers Union (NFU), the Country Land and Business Association (CLA) and Rare Breeds Trust. The development of Grazing Advice Partnership project (GAP) or a similar initiative to develop and disseminate enhanced advice and support tools for graziers is recommended.

In addition, the practical application of any actions will need the support of the landowners and managers.

Funding

It should be noted that in aggregate, SIPs identify a significant need to amend existing Higher Level Stewardship agreements (the higher tier of the Rural Development Programme, Environmental Stewardship Scheme) or introduce new Countryside Stewardship agreements and Conservation Enhancement Scheme agreements in order to address the grazing issues identified. As well as having implications in terms of the respective budgets for these schemes, the associated Natural England staff resource requirements also need to be factored in.

The IPENS grazing theme plan recommends the development and advocacy of a case for agricultural support measures for Natura 2000 sites which are dependent on grazing. It recommends a whole farm approach where

livestock farm businesses are considered alongside conservation grazing. The theme plan recommends that there should be adequate support for extensive livestock systems geared to conservation grazing, for example where the system includes off-wintering land, layback land and meadows. Any support measure would need to cover extra capital and incidental costs of cattle systems.

Inappropriate game management and moorland burning

There are only ten SIPs which record this set of issues as having a potential impact on habitats, species and the wider environment, however this includes a number of large upland sites, covering 333,000 hectares (approximately 38% of the total land area of terrestrial Natura 2000 sites)

Burning – the issues and impacts recorded in the SIPs:

- Damage to vegetation structure and composition through rotational burning.
- Damage to structure and function of some habitats through burning (ie affecting the ability of the habitat to support itself).
- The release of carbon, lowering of raw water quality and changing freshwater invertebrate communities as a result of rotational burning on peat.

Burning reduces and ultimately removes, the important peat forming species such as sphagnum and creates a hostile surface environment that prevents re-colonisation by sphagnum. Burning drives the vegetation towards a monoculture – usually common heather but also purple moor-grass. Burning releases carbon into the atmosphere through exposure of peat to oxygen (oxidative processes) and reduces the quality of raw drinking water through increasing the colour (dissolved organic carbon) that requires treatment to remove. Burning peat catchments also results in negative changes in freshwater invertebrate communities. The structural changes to the vegetation as a result of burning, reduces the ability of the blanket bog to develop resilience to climate change through the development of surface uniformity where the species all have the same environmental requirements. A bog with a topographic structure (unburned) contains a range of species that respond to wetter or drier conditions so that in periods of warming, the species that prefer drier conditions come to dominate. In colder / wetter conditions, other species dominate. The removal of key species and vegetation structure means that the bog has a reduced or no capacity to maintain itself.

The issues and impacts of intensive grouse management, as recorded in SIPS:

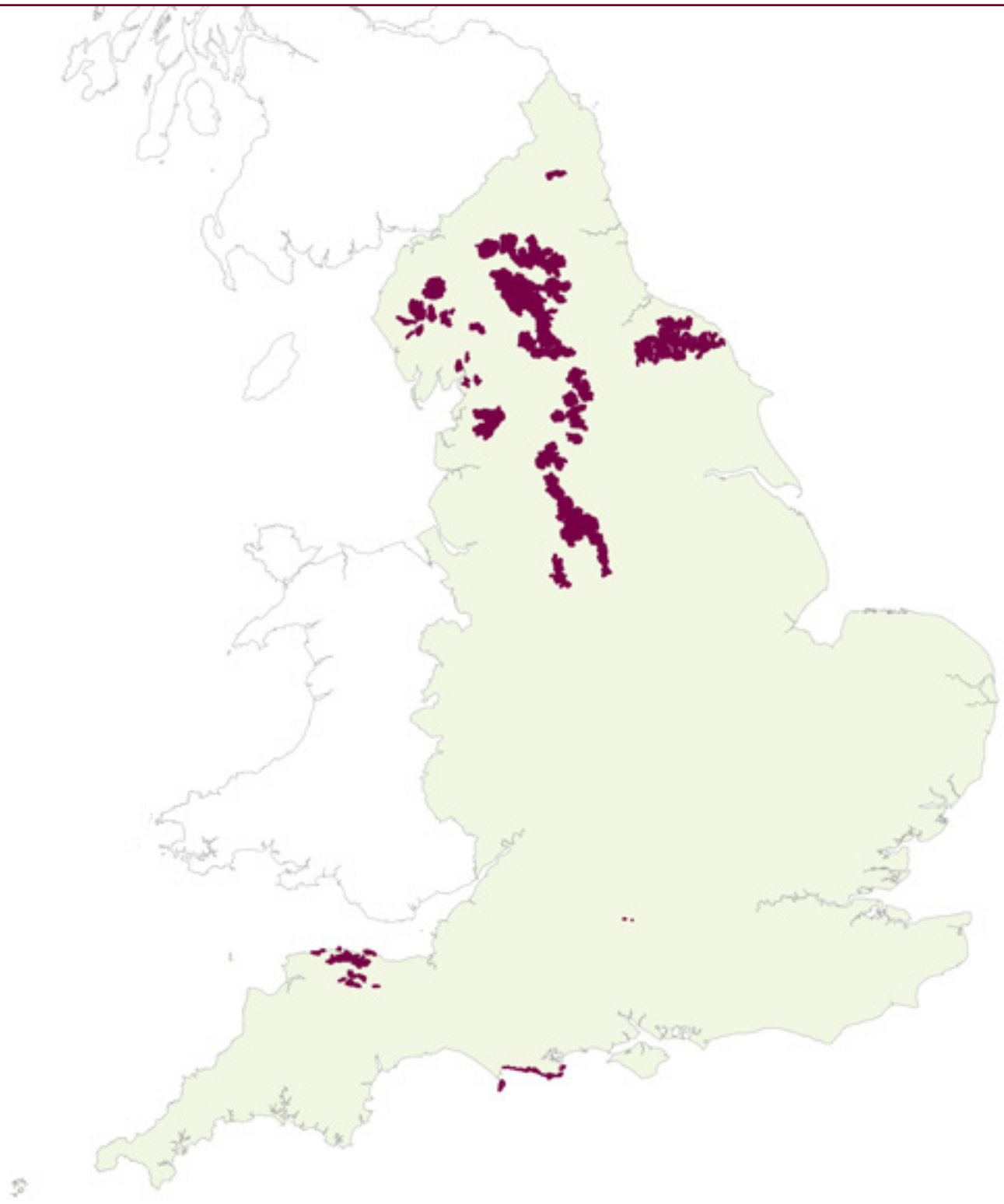
- Damage to vegetation through vehicle use associated with intensive grouse management.

This can be a loss of an interest feature as a result of consented and unconsented track, car park and grouse butt construction. In the absence of tracks, vehicle use can result in damage to vegetation and where on peat, to the surface peat itself.

- Changes in SPA species populations associated with grouse moors.

Suitable habitat for hen harrier and peregrine falcon exists on the sites to support the required populations, but the numbers successfully breeding remains very low. The reasons for this remain unclear but the role of illegal persecution and disturbance both on and off site is highlighted as a potential issue in the SIPs.

Figure 26 – Natura 2000 sites where inappropriate game management and moorland burning is recorded as an issue



Issue type	Number of SIPs
Pressure	3
Pressure / Threat	5
Threat	2
Total	**10**

Merlin populations are also in decline on all four upland SPAs in England. The causes are not yet known but are being investigated.

- Culling of gull species to benefit grouse management.

The culling of lesser black-backed gulls is highlighted as issue in the SIP for Bowland Fells. Some moorland managers believe the gulls have an adverse impact on grouse numbers. The effect of the gulls on grouse numbers, and on drinking water, needs to be investigated. The numbers of gulls breeding at the site need to be monitored closely, to ensure the culls are not having an adverse impact.

- Gamebird releases (mainly pheasant) adjacent to SPAs and SACs.

This includes physical damage to habitats and associated insect species along with the potential risk of disease transmission between released and wild birds.

The potential physical damage and associated insect issues were mainly recorded in the SIP for Morecambe Bay limestones, where there are a range of important habitats that also support important butterfly species. The transmission of disease to SPA species is under-studied and requires further investigation to understand the risks and issues.

- The wide-scale introduction and long term presence of anti-biotic into the environment through medicated grit (and associated vegetation damage caused by vehicles whilst replenishing grit).

There is very little science on this and it is currently the subject of a grant bid to the Natural Environment Research Council. Greater understanding is needed on any threats or pressures from this activity, including for example on the potential effect on habitats or species from the active ingredients in the substances used and the vehicle use associated with re-charging grit stations.

Features (or feature groups) affected

There are some site specific features recorded in the SIPs, such as for Morecambe Bay which are not detailed here. SIP recording includes the following:

Rotational burning: blanket bogs, wet heathland with cross-leaved heath, European dry heaths, juniper on heaths or calcareous grasslands, high-altitude plant communities associated with areas of water seepage.

SPA features: hen harrier, merlin, peregrine, golden plover, lesser black-backed gull, short-eared owl, dunlin, breeding bird assemblage.

Wider environment / Game-bird releases: blanket bogs, wet heathland with cross-leaved heath, European dry heaths, calcium-rich nutrient-poor lakes, lochs and pools.

Types of sites affected

Potentially, these issues could affect all sites where intensive grouse management takes place. Most upland massifs such as the North York Moors, Bowland and the North and South Pennines, are also subject to some game-bird releases on their periphery. As discussed below in the evidence section, further evidence is required in some areas to understand and address this issue better for each site.

Distribution of site affected

The rotational burning of blanket bog and wet heath is confined to Northern England. The rotational burning of dry heath is recorded across upland sites from the south-west to north-east England. Occasional burning into juniper stands is confined to the North Pennines. The SPA bird issues relate to the North and South Pennines, North Yorkshire Moors and Bowland Fells. Game-bird releases occur from south-west to north-east England.

Evidence

Evidence projects have been carried out under IPENS to address some gaps in knowledge. This has included 'The effects of managed burning on upland peatland biodiversity, carbon and water'; 'the Impacts of tracks on the integrity and hydrological function of blanket peat' and 'Burning in the English Uplands' (Thacker 2014 and others).

The projects also included The Bowland Fell Gull Survey (Coyle 2013a and 2013b and Coyle 2014a and 2014b) and the North York Moors Merlin project (Yallop & Thacker 2015). The gull survey in 2013 and 2014 has provided up to date population trend information to help inform the review of the cull. The Merlin project has provided a methodology to carry out an analysis of the changes in moorland burning and establish the effect this may have had on merlin numbers.

There remains a lack of knowledge and evidence in:

- the population trends and the status of non-raptor SPA species;
- the longevity and toxicity of flubendazole in the environment following its use in medicated grit for grouse;
- the damage caused by released game-birds to Natura 2000 habitats and associated insects such as butterflies;
- the risk of disease transmission between released-game-birds and wild bird populations.

SIPs have also identified that there needs to be a review of evidence around optimal burn rotations for dry heath and on the impact of structural changes of vegetation through management upon SPA species and assemblages.

Description of actions required

- Review and where appropriate potentially revoke consents that allow rotational burning upon blanket bog and wet heath habitats.
- Following a review of optimal burn rotations on dry heath, review consents along with ensuring that vulnerable habitats eg juniper, are mapped properly and protected.
- Review the scale of Natura 2000 interest features lost to moorland management infrastructure development.
- Enhanced engagement with stakeholders and landowners to help prevent illegal persecution of birds of prey on moorland SPAs and elsewhere.
- The establishment of baseline population data for all SPA qualifying species that are not already subject to routine monitoring.
- Review the scale and intensity of use of medicated grit including compliance with good practice and protocols for consenting its use by Natural England.
- Review the impacts of game-bird releases on Natura 2000 interest features (habitats and species).
- Secure the population of lesser black-backed gulls including by reviewing the scale of culling.
- Following establishment and review of the evidence around the impacts of game-bird releases on limestone flora and fauna, seek to review the consents.

Delivery partners

This issue will require join-up across a number of organisations including: Defra, Water Utilities, major land owners, non-governmental organisations including the Royal Society for the Protection of Birds, the National Trust and the Moorland Association.

Funding

The main funding required will be for the recommended reviews and evidence gathering and the SIPs have not attempted to estimate this cost. There are also costs associated with reviewing and revoking consents and in the establishment of SPA population baselines. Natural England staff time will make up a large proportion of what is required, although if the

revocation of consents is required this may require significant additional funding.

The agri-environment schemes (eg Countryside Stewardship) can potentially support changes in land management.

As mentioned above the Natural Environment Research Council is being considered with a bid for an investigation into the impacts of the introduction of antibiotics into the environment on grouse moors.

Funding estimates in the SIPs against the actions vary widely, as illustrated below:

- Zero cost – some actions just require staff time or there is no cost.
- Low cost (a few hundred or thousand pounds) for specific actions such as to implement diversionary feeding where hen harriers are breeding on grouse moors.
- Medium cost (tens of thousands) – such as for investigations, evaluation or reviews for specific activities and the implementation of management plans.
- High costs (hundreds of thousands) – for larger scale research, evaluation or monitoring, habitat improvement through review of management plans and consents.
- Very high costs (millions – just two actions one million each, on large sites) – research and implement alternative management, ensure compliance with existing plans and guidance, review consents.

Forestry and woodland management

50 SIPs record 'Forestry and woodland management' as an issue. This manifests itself in a number of ways, but can be split into three broad categories:

1. **General woodland management:** This relates to inappropriate (or lack of) management, both within SAC woodland sites, as well as in woodland adjacent to other SAC habitats, such as rivers or grassland. This category also includes inappropriate game management as it relates to pheasant rearing.

   The resulting effect on woodland features includes:

   - a lack of structural diversity and range of age classes within woodland;
   - a lack of natural regeneration;
   - a change in species composition; and
   - impacts on Annex II species, such as bats or invertebrates that have specific habitat requirements.

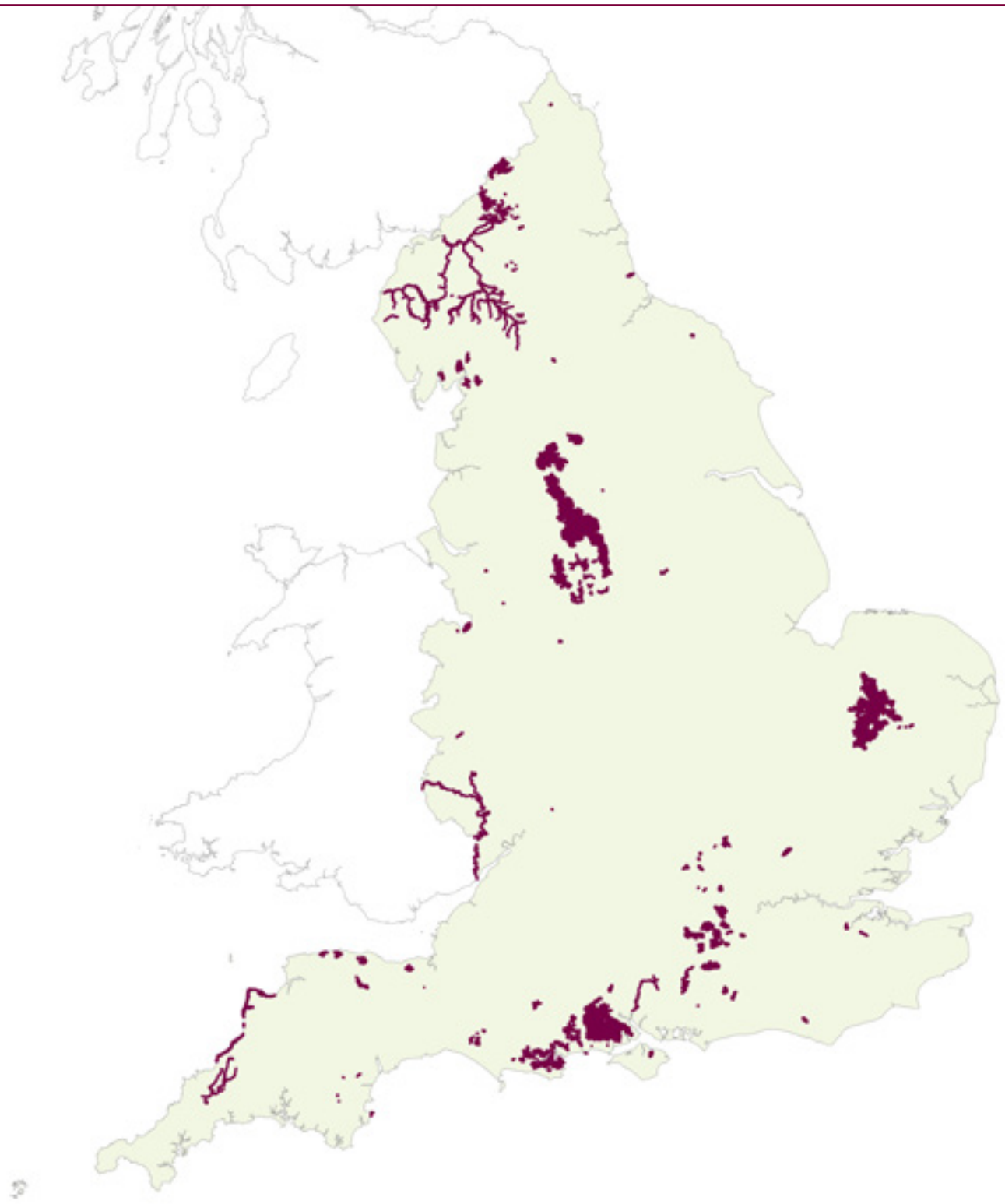
   This issue is thought to be partly due to a lack of motivation / incentive for land managers to manage the woodland, such as a lack of economic incentives for traditional management like coppicing.

2. **Competitive native and non-native trees and scrub:** ***Please note this issue is also discussed under "Invasives and diseases" and is included in the Invasive Species theme plan.***

   This includes the inappropriate presence of plantations, trees or scrub on habitats such as bog, moorland or heathland, which can impact on hydrology and nutrient cycling, produce shade and leaf litter and cause loss of extent of feature (this is also picked up in the 'Hydrological functioning' issue section). This category also covers the presence of non-native (or inappropriate species) plantations / trees / scrub within woodland, which can affect structural diversity, shade out other native species, suppress regeneration and affect species composition.

3. **Veteran trees and the species they support:** Veteran trees and the species they support often require specific management. This issue is partly caused by a lack of

Figure 27 – Natura 2000 sites where forestry and woodland management is recorded as an issue



Issue type	Number of SIPs
Pressure	20
Pressure / Threat	19
Threat	11
Total	**50**

understanding of the veteran tree resource within some woodlands, which can result in gaps in age classes and ultimately the loss of future veteran trees. This also impacts on the species that ancient / veteran trees support, such as saproxylic beetles, as any gap in the availability of veteran trees would be likely to result in local extinction of the species which rely on them for stages of their life cycle.

Deer and tree disease are also recorded as an issue in a number of woodland SIPs, however, these are covered within the 'Invasives and diseases (including deer)' section of this report.

A more detailed breakdown of the forestry and woodland management issues listed in the SIPs and their impacts is below, in order of frequency:

- **Inappropriate (or a lack of) management of woodlands:** this can cause a lack of structural diversity and range of age classes, and can lead to changes in species composition and a lack of natural regeneration.
- **Presence / establishment of plantations, trees or scrub on habitats such as bogs, mires, moorland, heathland, grassland:** This can impact on hydrology and nutrient cycling, produce shade and leaf litter, and cause loss of extent of feature.
- **Suitability of habitat for Annex II species supported by woodland:** species such as bats, great crested newts, invertebrates, fungi and lichen have specific habitat requirements that need to be considered when planning and implementing management. This includes investigation and monitoring to assess potential impacts.
- **Lack of or inappropriate management of veteran trees, both for the habitat itself and the species they support:** for some sites there is a lack of understanding of veteran tree resource within woodlands as well as a loss of ancient / veteran trees due to gaps in age classes with the next generation of future veteran trees. This makes it difficult to establish appropriate management measures, such as the planting or 'promotion' of trees in the right locations. This can also impact on species they support such as invertebrates and fungi.
- **Presence of non-native plantations, trees or scrub within native woodlands:** This can affect structural diversity, shade out other native species, suppress regeneration and affect species composition.
- **Inappropriate game management:** this can lead to direct damage of ground flora and understorey and nutrient enrichment. Associated management can also lead to inappropriate cutting of vegetation and creation of woodland tracks. High numbers of pheasants can also have an impact of invertebrate communities.
- **Lack of economic incentives for traditional woodland management:** in parts of the country this can impact on securing long-term active management such as coppicing. In the future this can result in a lack of structural diversity and can create a closed canopy.
- **Climate change:** can cause threats to regeneration and affect species composition.
- **Inappropriate (or lack of) management of woodlands adjacent to other habitats ie rivers:** this can lead to shading of macrophytes or increase in siltation and run off.

For the majority of SIPs with Forestry and Woodland Management recorded as an issue, they have been given a higher priority rating as they can have significant impact on the conservation status of the features.

Features (or feature groups) affected

The features affected are mainly forest habitats, recorded in approximately 28 SIPs (all SAC forest habitat features are recorded except one). 'Mixed woodland on base-rich soils associated with rocky slopes' is the most frequently recorded woodland feature, followed by 'Western acidic oak woodland'.

Other habitats groups with issues recorded against them, in order of frequency, include raised bogs, mires and fens; grassland; freshwater habitats; heathland; and rocky habitats.

Approximately 19 SIPs record this issue affecting species, including where woodland habitat supports the species, as well as where the issue impacts on species found in neighbouring habitat, such as rivers or grassland.

Habitats affected by this issue, as recorded in the SIPs are: forests and woodlands; raised bogs, mires and fens; natural and semi-natural grassland formations; freshwater habitats; temperate heath and scrub; rocky habitats and caves; and sclerophyllous scrub.

Species affected by this issue as recorded in the SIPs Fish, mammals (bats and otter), amphibians (great crested newt), anthropods (violet click beetle, white-clawed crayfish), molluscs (freshwater mussel), higher plant species (Killarney fern, early gentian, floating water-plantain), birds (nightjar, woodlark, Dartford warbler, merlin, hen harrier).

Types of sites affected

In addition to the predominant woodland sites, the other sites where this is an issue are heathlands, bogs, fens and rivers with a woodland fringe. This is a nationwide issue.

Evidence

We have not carried out any evidence projects under IPENS connected to this issue. Woodland sites are generally assessed internally by Natural England site responsible officers through standard condition monitoring (an integrated site assessment) and do not, in general, require specialist surveys.

Some SIPs identify site specific gaps in knowledge and evidence, related to tailoring management requirements within sites. These sites have identified investigation and monitoring actions to target these specific gaps.

Description of actions required

A range of actions have been identified for addressing forestry and woodland management issues and the breakdown of the priority issues are detailed below in points one to seven. The actions can be grouped into three broad types of actions.

- **Securing and maintaining appropriate woodland management:** this includes securing management for the woodland itself, as well as the species it supports, to improve / maintain structural diversity, species composition and habitat connectivity. This also includes investigating and tailoring management for specific species and veteran trees.
- **Restoring habitat:** this includes the restoration of other habitats, such as bogs, moorland, heathland, through the removal of plantations / trees / scrub, and the planting of trees within woodlands to restore habitat connectivity, restore areas to natural broadleaf, or to provide future veteran trees.
- **Control / removal of invasives / non-natives:** this refers to actions to assess and implement control / removal of non-natives such as sycamore, rhododendron and conifers. Control / removal of invasives will be picked up in more detail in the 'invasives and diseases (including deer)' section.

1. **Securing appropriate woodland management** – This action will involve improving and restoring structural diversity, species composition and habitat connectivity and the removal of non-natives. It will be achieved through a wide range of mechanisms including Rural Development Programme for England (RDPE), Conservation and Enhancement Scheme (CES), habitat restoration, National Nature Reserve (NNR) management plans, investigation and

monitoring, and other non-Natural England management plans.

2. **Plantation, tree and scrub removal from habitats** – This action includes the study and removal of areas of plantation / trees / scrub on inappropriate habitats such as bogs, mires, moorland, heathland and grassland. It will be achieved through mechanisms including investigation and monitoring, regulation, RDPE, NNR management plans, advice, habitat restoration and direct management.
3. **Securing appropriate woodland management for Annex II (SAC) species** – Action in this case will include investigation and monitoring in order to tailor management to woodlands that support Annex II species such as bats, invertebrates and great crested newts, as well as implementing management through mechanisms including habitat restoration, advice, regulation, the Rural Development Programme and partnership agreements.
4. **Securing appropriate management for veteran trees** – This requires the investigation and implementation of appropriate management for veteran trees (including using experimental approaches to 'veteranise' younger trees to address gaps in age class, as pioneered at sites such as Hatfield Forest Site of Special Scientific Interest), including identifying and mapping next generation veteran trees, halo-thinning around, planting and promoting future veteran trees, management and creation of new pollards. Mechanisms include Rural Development Programme, Conservation and Enhancement Scheme, investigation and monitoring and habitat connectivity.
5. **Control and removal of non-native species** – This involves the assessment and implementation of control and removal of non-native species such as sycamore, rhododendron and conifers. Mechanisms to deliver include working with the Major Landowners Group (MLG) in their existing and planned activity to tackle invasives, Rural Development Programme, investigation and monitoring and National Nature Reserve management plans.
6. **Secure improved management of pheasant rearing** – This action is about minimising damage and impact. This should be achieved through investigation and monitoring, advice (negotiation), regulation, and where necessary, enforcement.
7. **Tree planting** – This will involve an assessment of the need for, and implementation of tree planting to restore habitat connectivity, restore areas to natural broadleaf, or to provide future veteran trees. Mechanisms include habitat restoration (restoration and connectivity), non-Natural England funded management plans, investigation and monitoring.

Overall, for Forestry and woodland management issues, the necessary actions can be clearly identified, although some of these require investigation and monitoring first in order to tailor appropriate management at an individual site level.

Delivery partners

There are several key players who will need to be involved in tackling this issue at a national strategic level but most importantly at local site level. These partners include Natural England, the Forestry Commission, Forest Services, Forest Enterprise, the Environment Agency, Ministry of Defence and Defence Infrastructure Organisation, the Rural Payments Agency, local partnerships, the National Trust and the Crown Estate.

Funding

In the SIPs, the funding estimate for sites varies widely from in the £1000s / £10,000s for tree planting works, improving structural diversity, and monitoring and investigation; up to the £100,000s and above for more specialised works such as for veteran trees and bats.

Restoration work, including restoring woodland and removing trees and scrub to restore bogs and fens is generally in the £100,000s but

ranges up to millions of pounds (albeit there are only a couple cases at the higher range).

For sites where further investigation and monitoring is recommended, the cost is not able to be determined.

As mentioned above, there are available mechanisms to deliver many of these actions, predominantly through Rural Development Programme or Conservation Enhancement Scheme funding and National Nature Reserve management plans, but also through advice, regulation, and partnership agreements and existing activities of the major landowners.

Despite the existence of some mechanisms, many woodlands have been neglected in recent years which is likely to be due to a lack of budgets and economic incentives in traditional woodland management.

EU LIFE funding should be considered as a way of tackling some of the issues.

Change in management practices

This heading covers multiple issues and mainly concerns changes in land management over time for example levels of grazing, cutting, and clearing, which are having or have the potential to cause negative impacts on habitats or species. We have included in this section some significant but site specific issues which don't fit well into other groups.

Change in land management – this is the main issue in this group and affects 45 SIPs. It records changes, or threat of change, in appropriate management due to a range of factors including

- lack of, or change in ownership of land;
- ending agri-environment agreements (such as Environmental Stewardship) or agreements not meeting their objectives;
- lack of a management plan;
- neglect / land abandonment; and
- difficulties achieving appropriate management due to a range of factors such as inaccessible terrain or loss of funding.

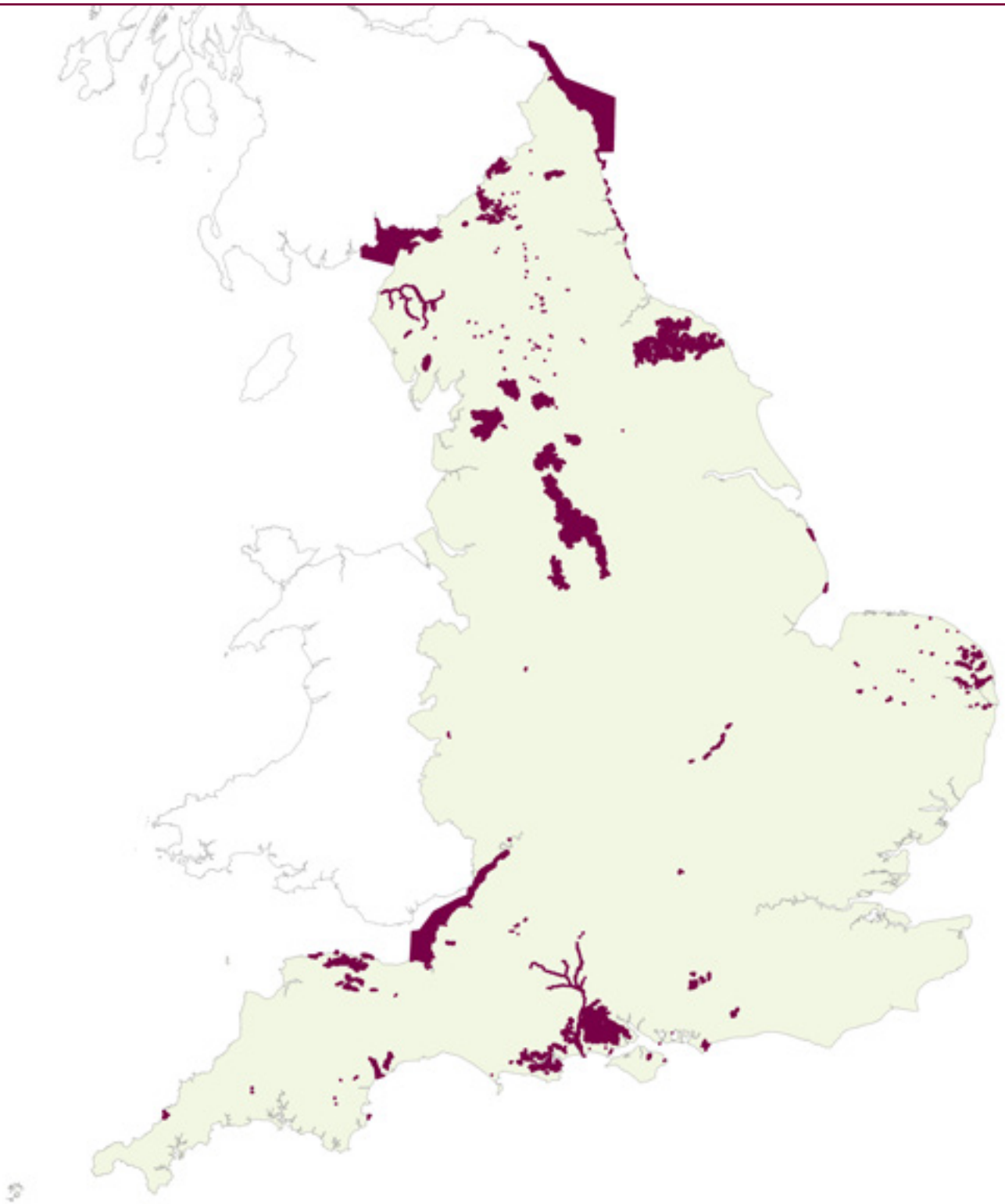
This issue can affect habitats by changing species composition and structural features and reducing habitat suitability and availability for protected species. This includes land outside protected area boundaries with potential effects on availability of suitable habitat for example for the great crested newt.

Conflicting conservation objectives –this problem manifests itself where there are several habitats or species within a site which require different management practices. Examples are: where the conservation priorities require grazing with negative impacts on juniper establishment and spread; where cattle grazing is beneficial for calcareous grassland but can have negative impacts on flushes and mires; and where heathland management to maintain open heathland is not benefiting rare species that require more specific management measures.

Inappropriate management practices – one large site records this issue (South Pennine Moors). In this case, the condition of blanket bog habitat is under pressure from changes in recreational use, land management (including commercial grouse moor management, agriculture and restoration practices) and some illegal activity. This also has the potential to effect bird species and other habitats.

Agriculture: other – one large site records this issue (North York Moors). Sustainable moorland management to protect interest features can be affected by various issues, including socio-economic factors. An ageing population of land managers and changes to agricultural and conservation support mechanisms can affect the economic viability of farm holdings. Changes to management practices need monitoring.

Figure 28 – Natura 2000 sites where change in management practices is recorded as an issue



Issue type	Number of SIPs
Pressure	7
Pressure / Threat	9
Threat	29
Total	**45**

Inappropriate ditch management – this is an issue recorded in the Arun Valley, but which could affect other sites. The problem is the cessation or changes in the method and frequency of ditch management and clearance with potential effects on little ramshorn whirlpool snail.

Inappropriate weed control – this issue was recorded on the Solent and Isle of Wight Lagoons. The problem here has been caused by algaecide application to lagoons during the management of a golf course. The algaecide can have detrimental effects on the lagoonal vegetation and associated specialist fauna.

Features (or feature groups) affected

33 habitat types occurring within all interest feature groups are affected, including eight priority habitats. Most species groups are affected.

Habitats: Marine, coastal and halophytic habitats, coastal sand dunes and continental dunes, freshwater habitats, temperate heath and scrub, sclerophyllous scrub, natural and semi-natural grassland formations, raised bogs and mires and fens, rocky habitats and caves, forests.

Species: including molluscs (eg freshwater mussel) arthropods (eg southern damselfly, marsh fritillary butterfly), fish (four species), mammals (eg bats, otter), amphibians (great crested newt), higher plant species, lower plant species, divers and grebes, gulls, terns and skuas, herons, bitterns and egrets, birds of prey and owls, seabirds, waterfowl, waders.

Types of sites affected

This is a nationwide set of issues affecting many sites and features.

Evidence

There were no evidence projects commissioned under IPENS to deal specifically with this issue. There remains a lack of knowledge of the effects of changes in management on some species.

Description of actions required

Most actions are related to ensuring appropriate management is put in place and continues, by reviewing current management, providing advice and promoting agri-environment schemes, and monitoring outcomes for habitats and species.

Actions from SIPs:

- Ensure appropriate management is put in place and continues, through existing mechanisms eg putting in place and promoting the uptake of agri-environment schemes such as Countryside Stewardship, especially when changes in land tenure occur.
- Provide advice and grants to farmers.
- Further research is required on the impacts of changes in management on some species.
- Increase public engagement on the issues and impacts.
- For actions related to grazing levels, ensure stocking levels are maintained, or have contingency plans in place in the event that graziers withdraw from the site.
- Revise management strategy and implement a management plan.
- Improve habitat connectivity.
- Habitat protection, for example via an agri-environment agreement or through the planning process outside protected areas.
- Investigate socio-economic means of supporting sustainable management.
- Monitoring and advice to raise awareness of the potential impact of surrounding habitat change on interest features, including monitoring of species which may be affected by changes (eg little ramshorn whirlpool snail).

- Investigate and promote opportunities for more sustainable agricultural land use.
- Review the Conservation Objectives for complex sites, and possibly restrict access.
- Review agricultural management and existing consents.
- Habitat restoration.
- Re-establish the Management Advisory Committee and fund planned works through the Conservation and Enhancement Scheme.
- Replace Site Management Statements with time-limited consents.

Delivery partners

Defra, Natural England, Forestry Commission, Environment Agency, Defence Infrastructure Organisation, Local Authorities, Areas of Outstanding Natural Beauty, Internal Drainage Boards, National Park Authorities.
Non-Government Organisations including the Amphibian and Reptile Conservation Trust, Royal Society for the Protection of Birds, British Trust for Ornithology, Game and Wildlife Conservation Trust, Moors for the Future, Wildlife Trusts, Bat Conservation Trust, Wildfowl and Wetlands Trust, Plantlife, Commons groups, local groups and volunteers, the National Trust, Universities, Landowners and managers.

Funding

Funding estimates vary widely:

- Zero cost – some actions just require staff time or there is no cost, such as reviews of current management or conservation objectives.
- Low cost (a few hundred or thousand) – small scale ecological monitoring, developing management programmes, localised control work.
- Medium cost (tens of thousands) – survey or monitoring programmes, implementing management plans or carrying out control work, negotiating or promoting the uptake of schemes, habitat restoration.
- High costs (hundreds of thousands) – longer term funding for more extensive survey or monitoring programmes, implementing management plans or carrying out more extensive control work, negotiating or promoting the uptake of schemes, habitat restoration.
- Very high costs (millions – five actions) – funding for long-term, large scale management, purchasing land, trialling new management approaches, addressing pollution inputs.

Funding sources recorded include grant in aid from Natural England and the Environment Agency, and Areas of Outstanding Natural Beauty.

Funding streams include the Conservation and Enhancement Scheme, Rural Development Programme, (Countryside Stewardship Scheme and existing Environmental Stewardship Schemes), EU LIFE, Heritage Lottery Fund and Landfill tax.

There is evidence through existing projects that partner working and a pooling of resources can achieve actions for these and other issues. Examples include the Working Wetlands project, the Magnificent Meadows Project, the West of England B-Lines Project and the Horsecombe Vale Project. It is therefore suggested in the SIPs that resources will also be needed from Local Authorities, Non-Government Organisations, Voluntary conservation organisations, Academic institutions, National Trust, the RSPB, and Local Partnerships.

CASE STUDY – White-clawed crayfish

White-clawed crayfish *Austropotamobius pallipes* (S1092) is the only crayfish species native to the UK and is a designated feature of nine SACs in England, favouring hard water habitats. A major threat to the species is the introduced American signal crayfish *Pacifastacus leniusculus* which out-competes the native species and carries 'crayfish plague', a virulent fungal disease fatal to white-clawed crayfish. Since its first introduction to the UK in the 1970's, many native populations have been eliminated (Holdich 2003). The situation is similar across mainland Europe, but less severe in Ireland. Plague is spread directly by signal crayfish, but indirectly by plague spores carried in or on water, mud and fishing or other equipment. Biosecurity measures are therefore of the utmost importance to protect white-clawed crayfish populations, but are difficult to implement effectively.

IPENS site improvement plans highlighted that new crayfish investigations were required for two SACs:

- **Ensor's Pool SAC**, an abandoned clay pit in Warwickshire which held the largest population of white-clawed crayfish in England, but where a rapid population decline was suspected very recently.
- **Peak District Dales SAC** where recovery from known refugia sites in the River Dove had failed following devastating outbreaks of plague in 2005 and 2008, but where there has been a recent anecdotal sighting.

These surveys were undertaken between July and October 2014, using standard techniques, including manual searches, traps, sweep nets and night torch surveys.

White-clawed crayfish *Austropotamobius pallipes*

No evidence of white-clawed crayfish was found at Ensor's Pool SAC, although the habitat was suitable and no change in fish or other invertebrates was recorded (David Rogers Associates 2014). It seems that the population crashed after October 2013 when the last observations were made, and that crayfish plague is likely to be the culprit. Appropriate management measures in the form of biosecurity advice and a fishing prohibition were in place, but unauthorised angling and a high level of public use around the site made it vulnerable when plague infected waters are nearby in the Coventry Canal and River Anker. A subsequent study completed a risk assessment and recommended further survey and bioassay work.

In the Peak District Dales SAC, limited but positive signs of crayfish were identified, with a single adult female recorded (Mott 2014). No evidence of signal or other non-native crayfish species were noted. The habitat was found to be good to excellent, although with some negative indicators such as siltation and a lack of in–channel woody debris limiting hiding places from predatory brown trout. These encouraging results give some hope that future reintroductions may be possible, or that the population may eventually be able to recover and spread naturally from refugia areas.

Future versions of the Site Improvement Plans will address recommendations made by the surveys. In addition, the IPENS Invasive Species theme plan sets out four strategic principles which should guide the approach to managing native crayfish in the Natura 2000 network:

1. **Natura 2000 site sit in a wider context** – Crayfish plague and signal crayfish are present in the wider environment, so native crayfish in Natura 2000 sites cannot be protected unless action is taken beyond the boundaries of protected sites.
2. **Apply the 'prevent / early detection and rapid response / control and mitigate' hierarchy** – prevention through effective biosecurity is essential and is the first line of defence for disease free white-clawed crayfish populations. More effective means of raising awareness and influencing public behaviour are clearly required. Actions to control and mitigate the effects of plague may give some success, as indicated by the Peak District Dales survey, where habitat improvements and ongoing biosecurity may aid population recovery.
3. **Natura 2000 requirements inform prioritisation** – awareness of protecting Natura 2000 crayfish populations is important to ensure that action is prioritised and funding secured amidst competing demands.
4. **Shift to a strategic, proactive approach** – at a national scale, a strategic approach to crayfish protection is important to ensure that action for the benefit of protected sites is taken in the wider environment and to secure funding. Favourable Conservation Status (FCS) for white-clawed crayfish needs strategic consideration at a biogeographic scale as in the long term, the remaining population strongholds may be restricted to other parts of the UK and Ireland, where plague is less prevalent or absent. Development and implementation of a strategy to deliver FCS for crayfish may form a good cross-Member States project in the future.

Invasives and diseases (including deer)

This issue is one of the most frequently recorded in SIPs, with a total of 165 SIPs having a pressure or threat related to invasive species or disease. This issue is typically recorded in one of the following ways:

- There is a problematic species present on site that is outside of its natural range (invasive non-native species, disease);
- the population size of a species is too high (deer, native species): or
- there is a threat of something arriving (disease, non-native invasives).

The main issues which affect many sites are:

- **Invasive species** – Many sites have issues caused by the presence of invasive species, mainly invasive non-native plants and animals and also competitive native plants. Problems include out-competition of native species, loss of biodiversity and changes to composition and structure of vegetation communities. For some invasive species there are issues with a lack of effective eradication or control methods. There are also many sites where invasive species are present in the surrounding area and considered a potential threat. 81 different species of invasive plant, animal or disease have been reported on SIPs. The species most frequently recorded are:
  - Himalayan balsam (*Impatiens gladulifera*) (34 SIPs);
  - Japanese knotweed (*Fallopia japonica*) (26 SIPs);
  - Rhododendron (*Rhododendron ponticum*) (22 SIPs);
  - New Zealand Pigmyweed (*Crassula helmsii*) (18 SIPs);
  - Signal crayfish (and / or plague) (*Pacifastacus leniusculus*) (15 SIPs); and
  - Pacific oyster (*Crassostrea gigas*) (10 SIPs).
- **Inappropriate scrub control** – This mainly covers issues with the presence of native scrub species (eg blackthorn, sea buckthorn, willow), potentially resulting in succession and negative effects on interest features due to lack of appropriate management. Habitats affected are mainly grasslands, dune systems, heathlands and wetland habitats (fens, mires, reedbeds).
- **Deer** – High deer numbers are mainly causing problems in woodlands, by selectively browsing tree seedlings and ground flora resulting in negative effects on natural regeneration. This causes a decline in the diversity of woodland age and physical structure. There are also problems with deer presence in some other habitats eg heath, mire and reedbed habitats, where they can cause damage leading to erosion and reduced structural diversity and nutrient enrichment.
- **Disease** – The presence or threat of fungal diseases affecting plants (Phytophthora spp. eg on juniper, alders and bilberry; ash dieback and box blight) and bacterial disease (acute oak decline) have the potential to lead to loss of native trees and shrubs at many sites. Other diseases of concern include crayfish plague affecting White clawed crayfish, necrotic disease affecting Pink sea fan; and Bovine tuberulosis, causing possible indirect problems due to reductions in grazing.

Issues affecting a small number of sites:

- Inappropriate weed control is considered an issue on a few sites, relating to a lack of control or effective methods for invasive native species such as wood small-reed, spear thistle, ragwort, nettles and bracken on grassland and dry heath.
- Fish stocking is considered a potential threat on one site (River Derwent & Bassenthwaite Lake) as unlicensed stocking has the potential to introduce diseases and invasives which would affect many of the notified features.
- Agricultural management practices is shown as an issue on one site (Braunton Burrows), with lack of management and grazing leading to scrub encroachment

Figure 29 – Natura 2000 sites where invasives and diseases (including deer) is recorded as an issue

Issue type	Number of SIPs
Pressure	33
Pressure / Threat	73
Threat	59
Total	**165**

(willow, birch, privet).

- Forestry and woodland management shown as an issue on four sites, with effects on bog, limestone pavement and woodland habitats. This includes control required of regenerating non-native (and native) tree species, previous planting of non-native tree species, high proportions of non-native tree species in woodlands and dense bracken affecting tree regeneration.
- A few sites have problems with heather beetle, a native insect which can cause extensive damage to heather stands. The larval stage browses heather causing dieback or death of individual plants, leading to increases in other less desirable plant species (eg *Molinia*) and reducing the condition of dry and wet heaths. There are currently no effective control methods.
- Inappropriate vegetation management is considered a problem on one site, with bracken preventing regeneration of juniper at Yewbarrow Woods.
- Predation of great crested newts, particularly their eggs, by fish is shown as a potential problem on one site (Orton Pit). Numbers of fish-free ponds have decreased, which could have implications for longer term great crested newt populations.

Features (or feature groups) affected

55 habitat types occurring within all interest feature groups are affected, including 13 priority habitats. In addition, most species groups are affected, including all bird groups.

Types of sites affected

Potentially, this is a nationwide issue affecting all Natura 2000 sites.

Evidence

The subjects covered by the four IPENS evidence projects on this issue have been a combination of national strategic level, site specific and species specific projects.

One of the gaps identified in our evidence is the need for ongoing horizon scanning to prepare for the arrival of new invasives. In addition, there needs to be more evidence on methods of eradication and control for some species. For some non-native species and diseases, little is known of their distribution and this would greatly assist in the action planning to tackle the issues.

Description of actions required

The actions for this issue noted in SIPs tend to be very practical, focussing on monitoring, eradication, control and adaptation. The Invasive and Non-Native Species theme plan and evidence projects try to draw together this need for practical action on individual sites, with overarching strategic principles that will help ensure that on the ground action is better coordinated and sits in the context of action required nationally or at the landscape scale.

Actions from the SIPs:

- Monitoring (of encroachment and impacts and for infestations).
- Develop and implement management plans.
- Removal, eradication and control measures on individual sites and at the landscape scale.
- Implement biosecurity plans to prevent new invasives arriving or spreading.
- Advise and support landowners and raise awareness.
- Support infrastructure, machinery for management and control measures.
- Undertake risk assessments and horizon scanning.
- Be prepared for rapid response action.
- Measures to investigate or increase genetic / species diversity to increase resilience;
- Management of native species including scrub control, appropriate grazing levels and use of exclosures.
- Research, for example into ash dieback.

- Regulation and enforcement such as management schemes and notices.
- More specific use of the Countryside Stewardship scheme to secure appropriate management.
- Measures to aid adaptation of habitats to the presence of an invasive species or disease.

Theme plan priority actions:

- Encourage the use of the recommended invasive species overarching strategy (from the theme plan) on Natura 2000 sites.
- Establish a relationship between the central Natural England Invasive Non Native Species (INNS) network and Natural England Area Teams to help provide advice on prioritisation and sharing best practice, helping to strategically coordinate funding.
- Contribute to the development of a clear biosecurity policy and approach across England.
- Ensure that all relevant Defra agencies are in a position to make use of species control orders.
- Build a better understanding of the control work on established invasive non-natives that Natural England and others are doing or contributing to.
- Undertake work to determine how best to increase the resilience of Natura 2000 interest features to disease and pest outbreaks, particularly focusing on diseases affecting trees such as ash and juniper. As part of this, consider ways to establish an inventory of genotypic diversity present in the United Kingdom.
- Build on the work of the INNS Secretariat and collaborate with partner organisations to produce a clear list of priorities for invasive species control in relation to Natura 2000 sites.
- Investigate opportunities and implement the wider use of novel technologies and public participation or 'citizen science', particularly for alerting agencies to the location of invasive species on Natura 2000 sites and in the wider environment.
- Raise awareness of biosecurity measures such as cleaning of boots, tools and vehicles at public entry points (eg car parks) to Natura 2000 and other protected sites.
- Explore the possibility of implementing a venison marketing strategy linked to control of problem deer populations.
- Use horizon scanning as the basis for increasing proactive planning for new invasive species likely to arrive in the United Kingdom.
- Undertake a survey of local action groups to identify and disseminate best practice techniques for invasive control.

Delivery partners

This issue is prevalent and potentially affects all of our protected sites. It also covers many specialist subjects and thus will require the joint effort of multiple organisations to make a difference. The SIPs and theme plan record the following delivery partners at a national and where appropriate local level: Defra, Natural England, the Environment Agency, the Forestry Commission, Food and Environment Research Agency, Animal Health and Vetinerary Laboratories Agency, Ministry of Defence and Defence Infrastructure Organisation, the Scottish Environment Protection Agency, Scottish National Heritage, the Rural Payments Agency, the Invasive non-native species secretariat; Local authorities, Internal Drainage Boards, the National Authority for Areas of Outstanding Natural Beauty (and individual AONB), National Park Authorities, Inshore Fisheries Conservation Authorities, Port and Harbour authorities, Queens Harbour Master, the Centre for Ecology and Hydrology, English Heritage, Water companies, developers, Non-Governmental Organisations including the Amphibian & Reptile Conservation Trust, Wildlife Trusts, Plantlife, Butterfly Conservation, The Royal Society for the Protection of Birds, Rivers Trusts, Commons groups, Deer Initiative, local partnerships and volunteers.

Funding

One of the recommended actions in the IPENS theme plan is that a relationship is established

between the central Natural England Invasive Non Native Species (INNS) network and the Natural England area teams to help provide advice on prioritisation and sharing best practice, helping to strategically coordinate funding for this issue.

Funding estimates in the SIPs against the actions vary widely, as illustrated below:

- Zero cost – some actions just require staff time or there is no cost.
- Low cost (a few hundred or thousand pounds) – eg for monitoring, developing strategies or management plans, minor control work.
- Medium cost (tens of thousands) – eg for implementing management plans (possibly with project officers appointed), supporting infrastructure for control, supporting & advising partnership groups, more significant control work or investigations.
- High costs (hundreds of thousands) – eg for complex eradication projects, long-term management funding, machinery costs, projects involving genetic testing, Countryside Stewardship agreements to secure positive management, large scale scrub control, biosecurity measures.
- Very high costs (millions – just two actions) – for large or catchment scale eradication / management projects for multiple invasive species or involving significant habitat management over several years.

There are certain existing mechanisms which are dealing with this issue and have the potential to deliver more to address this issue. For example those owned or administered by Defra and relevant Agencies, such as the Water Framework Directive Grant in Aid, Environmental Stewardship and the new Countryside Stewardship Schemes, Environment Agency and Forestry Commission initiatives, management plans and regulatory tools and the Invasive non-native secretariat. We will also need to work with others such as developers and landowners to secure real action.

To tackle many of the actions recommended by IPENS, there needs to be long term control measures put in place, with appropriate long-term funding secured. This is likely to require external funding as internal resource and funding generally works to a short term planning cycle.

External funding sources such as LIFE, Heritage Lottery Funding, and INTERREG have also been suggested in the SIPs and will be investigated as part of the AfterLIFE planning and implementation.

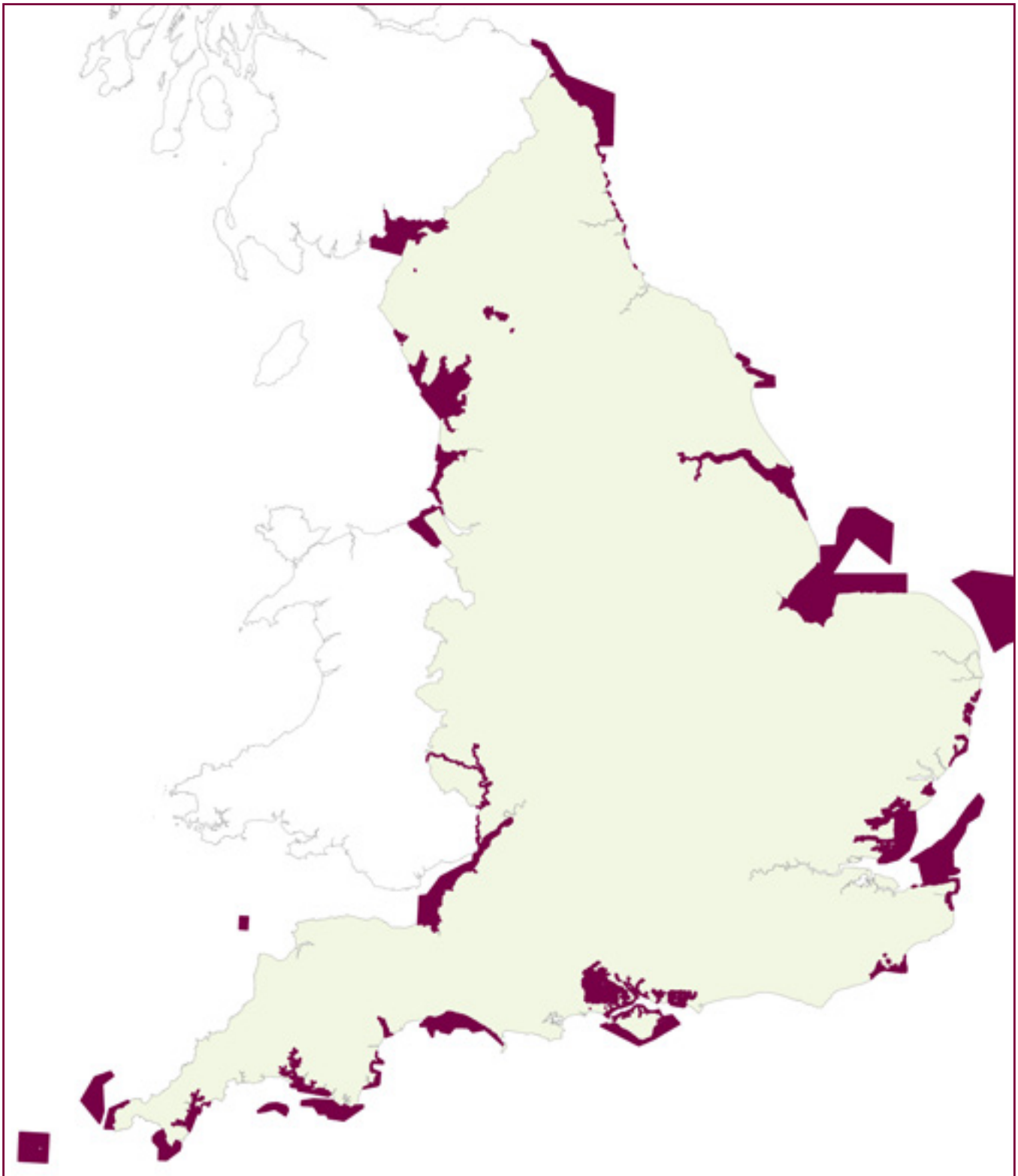
Fisheries management

(Note: these issues also appear occasionally under the issues sections of invasives and disease, public access and disturbance and river management)

This is a wide ranging issue included in 49 SIPs. It covers two different types of fisheries – marine for 40 SIPs and freshwater for seven SIPs, with one SIP, the Humber Estuary, including both marine and freshwater. Within marine and freshwater, there are several subgroups such as commercial, recreational, private and aquaculture for marine fisheries, fish stocking in lakes and rivers, private fisheries and aquaculture for freshwater fisheries.

Commercial marine fisheries are being addressed under Defra's revised approach to commercial fisheries management 2014 ('Revised Approach to the Management of Commercial Fisheries in European Marine Sites' Marine Management Organisation, Defra 2014), and as such have been included in the SIPs but with standard wording to indicate this.

Figure 30 – Natura 2000 sites where fisheries management is recorded as an issue



Issue type	Number of SIPs
Pressure	13
Pressure / Threat	24
Threat	12
Total	**49**

Marine: Commercial fisheries:

Most of the marine SIPs record red category commercial fisheries as an issue. The category 'red' is for specific interest features under Defra's revised approach to commercial fisheries management in European Marine Sites (EMSs), and requisite management mechanisms have now been implanted by local Inshore Fisheries and Conservation Authorities and the Marine Management Organisation. Also included are commercial fishing activities categorised as 'amber or green' under Defra's revised approach to commercial fisheries in European Marine Sites. SIPs have recorded that these activities require assessment and (where appropriate) management. Typical activities under the 'red' category are those that have abrasive effects on sensitive benthic habitats, such as reef or sandbanks.

Marine: Recreational fisheries

This section includes recreational bait digging and crab tiling, which both have the potential to impact features via direct competition for food sources with SPA birds, and additionally through disturbance. There are also concerns on some sites of direct damage to habitat features. The SIPs also record issues around pelagic recreational fishing and disturbance to SPA birds from fishing activities, and also the threat of reducing SPA bird food resources (fish stocks) when large scale recreational fishing takes place.

Marine: Private or several fisheries:

These activities are carried out under private rights, or under management defined in several or hybrid orders, and fall outside Defra's revised approach to commercial fisheries management in EMSs. SIPs include this issue as a potential threat, although the extent and impacts of these fisheries are often not fully known / understood.

Marine: Aquaculture

One SIP records a threat to SPA birds from large scale mussel farm proposals, and highlights a deficit of information to put into the Habitats Regulations Assessment. Another concern around marine aquaculture is the reduction of food sources for SPA birds. The use of Pacific Oysters (a non-native species) for aquaculture, if poorly managed, could lead to the species escaping onto surrounding reef habitats. Oyster farm activities in the intertidal zone may also cause disturbance to overwintering birds.

Freshwater: Fish stocking

Inappropriate fish stocking, inappropriate fish population and species composition, are recorded as threats to food resource and water quality which can impact on SPA bird species.

Over-stocking of native and non-native fish can be destructive to freshwater habitats and in some locations has a negative impact on water quality, which may affect water birds.

The threat of disease and invasives entering a SAC through unlicensed fish stocking is recorded.

Fisheries (general)

An issue at one site is the presence in pools of stone loach which are suspected to be affecting the breeding success of the great crested newt population.

The management of banks and vegetation by river users is recorded as an issue, as it is not always compatible with the SAC features eg digging steps and mowing banks. In addition, in channel management of gravels is listed as a potential threat to river habitat.

Features (or feature groups) affected

Marine

Breeding bird species: such as bittern, common pochard, marsh harrier, Montagu's harrier, avocet, arctic tern and puffin and breeding bird assemblage.
Non-breeding bird species: such as red-throated diver, Slavonian grebe, little egret, whooper swan, barnacle goose, goldeneye, hen harrier, Eurasian oystercatcher, avocet and curlew, seabird assemblage and waterbird assemblage.

Habitats: including subtidal sandbanks, estuaries, intertidal mudflats and sandflats, coastal lagoons, sea caves, dune grassland and shifting dunes.
Non-bird species: including sea lamprey, river lamprey, allis shad, twaite shad, great crested newt, grey seal and shore dock.

Freshwater

Breeding bird species: such as bittern, marsh harrier, avocet and little tern.
Non-breeding bird species: such as great crested grebe, bittern, mute swan, gadwall, shoveler, hen harrier, golden plover and dunlin.
Habitats: including nutrient-poor shallow waters with aquatic vegetation on sandy plains, clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels, calcium-rich nutrient-poor lakes, lochs and pools, and rivers with floating vegetation often dominated by water-crowfoot.
Non-bird species: including sea, river and brook lamprey, allis shad, twaite shad, atlantic salmon, bullhead, great crested newt, otter and floating water-plantain.

Types of sites affected

Marine fisheries issues occur in fully marine sites (ie sites with a boundary from mean low water, and not including the intertidal) as well as estuarine and coastal sites (which cover the intertidal and sub-tidal zones as well as terrestrial in some cases).

Freshwater fisheries issues seem to occur in inland sites, such as flooded quarries etc as well as in coastal sites where freshwater habitats exist. This is a nationwide issue of marine and terrestrial sites.

Evidence

SIPs record that further evidence is required on recreational marine fisheries to investigate the impacts on features and the scale of the issue for example. In addition, research is required to define the appropriate fish community targets for significant water bodies (freshwater, fish stocking) and to identify an effective way to remove particular species (fisheries, generally). It has also been proposed that there is complete coverage of the Wetland Bird Survey count across SPAs.

Description of actions required

Marine

Commercial fisheries:

- The actions recommended to address these issues are being taken by Inshore Fisheries and Conservation Authorities and the Marine Management Organisation, in accordance with Defra's revised approach to fisheries. For 'red' activities management was introduced by December 2014, and for 'amber / green' activities they are currently being assessed on a local level to establish whether management is required or not (deadline 2016). Information from the IPENS SIPs will complement these programmes of work, and highlight the ongoing Defra approach to fisheries to interested parties.

Recreational fisheries:

- All actions under the recreational fisheries sub-heading relate to investigation / monitoring / research – more specifically investigation of impacts on features, extent of issue, and levels of compliance with codes of conduct.

Private or Several fisheries:

- Provision of advice by Natural England to owners of fisheries, the Association of Inshore Fisheries and Conservation Authorities (IFCA) and Defra as appropriate.

Aquaculture:

- Development of aquaculture biosecurity measures to reduce the potential spread of non-native species.
- Provision of advice on larger scale projects.

Freshwater

Fish stocking:

- Monitor fish stocking.
- Develop and implement plans (eg lake restoration plans).
- Provision of advice (eg to owners).

- Research - define the appropriate fish community targets for significant water bodies.
- Control influx of unwanted species into waterbodies via communication and patrolling.

Fisheries (general):

- Production of a fishery management strategy.
- Communication and education to control unlicensed fish stocking, positive riverside management etc.
- Research – identify an effective way to remove particular species; complete coverage of Wetland Bird Survey count across SPAs.

Delivery partners

Marine – Inshore Fisheries and Conservation Authorities, Centre for Environment, Fisheries and Aquaculture Science (Cefas), National Parks, Environment Agency, Land Owners, Fisheries Associations, Welsh Government, Natural Resources Wales, Crown Estate, Wildlife Trusts, Local Authorities, Estuary partnerships, Marine Management Organisation, Defra, and Scottish Environmental Protection Agency.

Freshwater – Environment Agency, The Angling Trust, Forestry Commission, Royal Society for the Protection of Birds, Utilities (water companies), Rivers Trusts, local angling associations and clubs, and Natural Resources Wales.

Funding

In the main, the costs of the proposed actions are not recorded in the SIPs. For many of these actions it will require staff time and consideration of the actions within existing programmes and initiatives. It has not been possible to estimate the additional cost burden of this sort of work.

What is clear is that there are various organisations in these sectors, engaging in advice, research and management and that further discussions will be needed across these bodies to agree the priority actions and how to fund or support them. Relevant bodies required to work together to address the funding gap for marine include: Defra, Inshore Fisheries and Conservation Authorities, Natural England, Marine Management Organisation. EU LIFE is recorded as a potential funding stream.

Relevant bodies for Freshwater include the Environment Agency and Natural England. Funding streams recorded include the Conservation and Enhancement Scheme, Heritage Lottery Fund, Grant in aid, EU LIFE and the Rural Development Programme. The Water Framework Directive is also cited as a programme which can act as a driver to access additional funding.

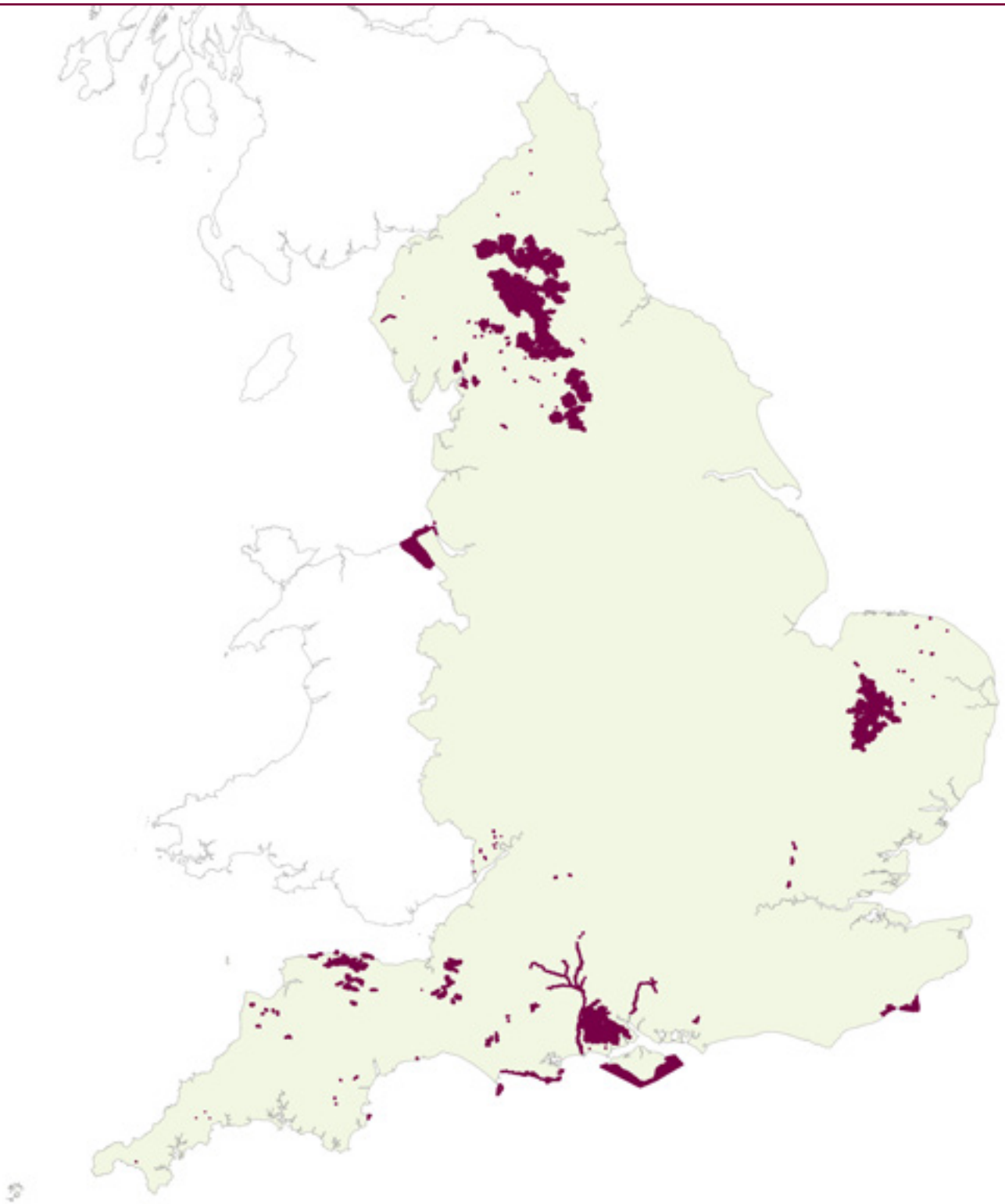
Other habitat management

This topic covers all of the issues which do not easily fit into the other categories above. It therefore encompasses a wide variety of scenarios, but there are some common themes as set out below. 29 SIPs record a wide variety of different issues under this section, as follows:

Agricultural management:
Issues associated with cutting regimes are the most frequently recorded issue, noted in around six SIPS. This includes:

- Sub-optimal cutting regimes for particular habitats (such as chalk grassland, fenland and upland hay meadows) impacting on structure and species composition.
- The switch from production of hay to silage or haylage reducing the variability in cutting date because the cutting date is earlier than for hay, and less influenced by weather.

Figure 31 – Natura 2000 sites where Other habitat management is recorded as an issue



Issue type	Number of SIPs
Pressure	8
Pressure / Threat	14
Threat	7
Total	**29**

Whilst grazing related issues in SIPS were mainly recorded under the Grazing category (refer to the Grazing section above) a small number were recorded under Agricultural management. This included for example instances of grazing management or associated effects of grazing not delivering favourability due to:

- inappropriate seasonality of grazing (such as overgrazing sensitive features in winter):
- the type of livestock: and
- on-site feeding causing localised enrichment and suppression of habitat.

A lack of grazing, where grazing is necessary to deliver favourability is also an issue in a few cases, mainly in the lowlands. Reasons for this include:

- physical difficulties putting grazing in place (such as steep-sided sites); and
- the threat of bovine TB leading to a reluctance to have stock to begin with.

Loss of traditional land management skills and / or the will to carry out traditional management practices has been recorded, particularly in upland hay meadow management. This appears to be associated with transferring land to new ownership and also a lack of appropriate equipment to produce hay. In some cases there has been a loss of traditional hay cutting, grazing and scrub management in privately owned meadows and heathlands, leading to loss of or change to habitats.

Farmland manure or other fertilisers being applied offsite is recorded as an issue. This activity can cause soil enrichment on sites or water pollution in rivers as a result of leaching, runoff or direct spreading. Herbicides and pesticides used adjacent to or on the edge of sites (such as hay meadows) leading to spray drift onto the site, causing species-poor vegetation communities and loss of invertebrate fauna is also an issue.

Fertilisers applied to SAC grasslands onsite is recorded as a problem. This is occurring for example because the boundary is indistinct, or for hay production in the uplands. This causes a loss of species richness and prevents favourability where it is applied directly to a feature. The effects of historical fertiliser application can also be seen on some sites even where application has ceased.

Less frequently recorded issues relating to agricultural management are as follows:
The inappropriate timing of in-field operations or infield operations being necessary during bird breeding season is impacting nesting SPA birds.

Agricultural intensification has been recorded as an offsite issue, adversely affecting important habitats for mobile species which are not within the boundary of a SAC or SPA (such as feeding areas for SPA birds).

On Commons, the SIPs are noting some difficulty in setting up effective Commons Partnerships and achieving community agreement to management practices. There are also issues in some locations with stock straying offsite due to a lack of fencing by adjacent landowners.

Agricultural practices close to rivers causing damage, is noted in one SIP. Examples referred to are ploughing close to river banks leading to increased erosion and siltation of the river, or hay bales falling into the river and causing physical damage to mussel beds.

On at least one SIP, land within the European site or outside of it (but where management impacts the features) is not covered by an agri-environment agreement (a Rural Development funded agreement such as under the Countryside Stewardship Scheme), and may not be eligible for one. This can lead to the land being unmanaged or managed inappropriately for biodiversity.

Typical issues related to lack of, or inappropriate, specific management interventions (not agriculture) recorded in the SIPs are:

A lack of grazing or other management and the drainage of land, leading to succession of open habitats to scrub and woodland, are the most commonly reported issues in this section, affecting at least seven SIPs.

The following issues affect slightly fewer SIPs but are still fairly commonly recorded issues: A lack of habitat disturbance, scrub management and bare ground creation to create / maintain habitat for lichen and bryophyte species, often as a result of changes in management of a site (for example ceased quarrying on the SAC sites). This is a particular issue for the SAC priority species for the UK Western rustwort, which is rare and threatened throughout its range and has a very restricted distribution in the UK (found in Cornwall only). This species is reliant on exposed weathered granite or china clay waste produced by quarrying.

A lack of management of structures for roosting bats, including blocking draughts in caves, tunnels and buildings to ensure suitable conditions are maintained for hibernating bats or maternity roosts (sensitively to ensure that this work does not itself negatively impact the bats), clearing encroaching vegetation around bat access / exit points, maintenance of grilles. Roosting bats have precise microclimate requirements and are sensitive to small changes in conditions such as temperature and humidity. The microclimate of roosts in buildings, bridges and caves can be adversely affected by structural deterioration, repair and renovation or other factors.

Less frequently recorded issues:
A lack of management of adjacent woodland leading to fallen trees, causing blockages in rivers, damage to mussel beds and erosion of river banks.

Ditch management regimes not taking account of the needs of all of the features, or management not taking place at all leading to loss of habitat for species such as southern damselfly.

Features (or feature groups) affected

SPA species: herons, bitterns and egrets, waterfowl, waders gulls, terns and skuas, other bird species, waterbird assemblage.

SAC Habitats: marine, coastal and halophytic habitats, freshwater habitats, temperate heath and scrub, natural and semi-natural grassland formations, raised bogs and mires and fens, rocky habitats and caves.

SAC Species: molluscs, arthropods, fish, mammals, lower plant species, higher plant species.

Types of sites affected

Agricultural management issues covered here predominantly affect the upland and lowland grasslands (both hay meadows and pasture), with adjacent agricultural practices also affecting rivers. Other issues included affect mostly sites designated for roosting bats, lower plant species (including the priority SAC species for the UK, Western rustwort, lowland grasslands and heathlands (including those which are part of mosaic sites), rivers, lowland wetland and fenland. Some coastal sites including dune systems, cliff habitat and coastal grassland are affected, but this is not a key issue on these.

Evidence

Evidence gaps identified in the SIPs for this suite of issues are site specific and are as follows:

- The influence of different nutrients and their application on northern hay meadows, particularly in the North Pennines.
- Site-specific based determination of an appropriate grazing regime to deliver favourability (Exmoor).
- Monitor spraying of adjacent land and gather evidence of spraydrift (Fontmell and

Melbury Downs).
- Test soil adjacent to land which is sprayed, to develop baseline evidence (Cerne & Sydling Downs).
- Survey cave system to identify draughts which may impact the bat roost (Beer Quarry).
- Undertake a survey to establish the extent of the problem of lack of grazing management for cliff edge habitat; and provide a detailed baseline for monitoring changes in vegetation composition (South Wight Maritime).
- Habitat mapping and assessment of the extent of molinia meadow and heathland habitat loss outside of the open forest (New Forest).
- Investigate the causes of declining rare bryophytes (Norfolk Valley Fens)
- Monitor the condition of buildings including microclimate changes at key roost sites to detect changes in conditions (Wye Valley and Forest of Dean Bat Sites / Safleoedd Ystlumod Dyffryn Gwy A Fforest Y Dena).

The gap in our evidence is likely to be more extensive than listed here.

Description of actions required

- Amendments to or additional guidance in support of existing Higher Level Stewardship agreements to resolve management issues on sites where the HLS agreement prescriptions are not addressing unfavourable management, such as allowing fertiliser use, unsuitable cutting and / or grazing regimes.
- Develop new Countryside Stewardship agreements within the SACs / SPAs to address a variety of site management needs which are currently lacking, such as scrub removal, provision of nesting habitat for SPA birds and hay making. This action usually relates to land which has not previously had an agreement on it but where one is considered necessary in order to secure appropriate management, although in some instances it is to replace a Higher Level Stewardship agreement which is due to expire, but which has not delivered favourability.
- Develop new Countryside Stewardship agreements on land outside of designated sites to secure appropriate land management to enable favourability on site, for example to address problems of leaching of fertilisers and spray drift of herbicides or pesticides.
- Encourage hay-making on relevant sites (as opposed to haylage and silage) using Countryside Stewardship as a lever for advice and funding.
- Implementation of Diffuse Water Pollution Plans to address offsite land management (or lack of it) causing water pollution problems in rivers.
- Provide advice and raise awareness of the effects of agricultural operations to influence future management of land. This is particularly relevant offsite where the options to incentivise or impose appropriate management are lacking, but is also an action onsite on some sites where this is considered a constructive approach likely to produce results or as part of a suite of measures to address site management problems.
- Enforcement of SSSI legislation, to achieve appropriate management, on sites where other options have failed to produce results. For example, this might be relevant to hay making, spray drift of herbicides and pesticides used offsite or securing appropriate grazing management.
- If other mechanisms fail, there may need to be a review of consents, for example where existing agri-environment scheme prescriptions and other consents are deemed to be having negative impacts on favourability.
- Modify or repair physical structures such as houses and caves to make them suitable for roosting bats. This includes development of a management plan and agreement of a maintenance programme for bat roost entrances.

- Put in place habitat creation and / or restoration strategies to enable a holistic approach to resolving site management issues and drawing in funding. Examples of the aims of this mechanism would be to improve habitat connectivity, implement scrub removal and build new bat roosting habitat on land which would be controlled and managed by conservation organisations.
- Provide advice to users of sites to influence behaviours. For example, advice to site owners of bat roosts to influence timing of activities to minimise impacts on the roost and promotion of "catch and release" to anglers to protect salmon stocks.
- Deliver appropriate management on Commons, including addressing inappropriate management directly through partnership agreements or enforcement.
- Develop and maintain areas of clear ground for the colonisation of Western rustwort.

For a few SIPs, mechanisms have not been identified or they need to be developed.

Delivery partners

Bat Conservation Trust, Butterfly Conservation, Defra, The Wildlife Trusts, National Trust, Farming and Wildlife Advisory Group, Estate owners, Environment Agency, Commons Associations, Angling Trust, Internal Drainage Board, Woodland Trust, Rivers Trusts, RSPB, National Parks, Areas of Outstanding Natural Beauty Partnerships, Water companies, Local Authorities, local partnerships, developers, Parish Councils, Natural England, local user groups, Rural Payments Agency, the Vincent Wildlife Trust, local charities.

Funding

Around £9 million, has been recorded in the SIPs against this issue, however some of the costs are unknown so this could increase as costs are clarified.

SIPs make suggestions as to the funds that might be appropriate and the partnerships that will be needed to work on specific issues together. This includes Environment Agency Natural Resources Wales and Natural England budgets and staff input. The Water Framework Directive is recorded as a programme which could be a driver for relevant funding bids. Funding streams are recorded, such as the Rural Development Programme (through Countryside Stewardship and existing Higher Level Stewardship agreements) Conservation and Enhancement Scheme, the Heritage Lottery Fund, Landfill Tax and LIFE+.

Strong working relationships will be needed for example with the Rural Payments Agency, Defra, the Moorland Association, the Heather Trust, National Park Authorities and the Internal Drainage Boards.

The SIPs note a likely shortfall in the amount of money available through Countryside Stewardship to fund traditional haymaking.

5 Evidence gaps

Survey for pacific oyster spat along coastline within the Sandwich Bay SAC and Thanet Coast and Sandwich Bay SPA

Evidence gaps that IPENS has been unable to fund have been recorded in:

- theme plans;
- individual SIPs; and
- the AfterLIFE Implementation Plan.

The evidence gaps are shown in a log, at Annex 5. A summary of the evidence gaps is below.

A common message is that we (the environment sector) need to be able to articulate the residual evidence gap clearly, including what needs to be done, by when and by whom.

The theme plans identify that a significant amount of more detailed investigation is required to better understand the condition of Natura 2000 sites and features issues and to inform action to be taken, not just in the SIPs but more widely.

There is a large funding gap in the evidence area, so strong links will need to be made with any funding strategy for protected sites and to the Prioritised Action Framework.

A common message is that there is a gap in our detailed knowledge of the location and extent of some Natura 2000 habitats and species within sites.

With regards data, there is a gap on our database of which SPA features link to which units, which is being addressed, but was not available to inform IPENS work.

All issue groups identify evidence gaps of some sort. Some issues such as river management and forestry and woodland management do not highlight any major gaps, whereas issues such as public access and disturbance and coastal management record numerous evidence gaps.

Issues such as river management; forestry and woodland management; illegal and legal third party access; off-site issues; other habitat management tend to be more site-specific gaps, often tied in with identifying and understanding the impact on a site or feature and identifying and tailoring the management requirements. Lack of feature surveys for individual sites is a common evidence gap.

The broader issues such as climate change; air pollution; invasives and disease; habitat fragmentation; development and infrastructure and public access and disturbance tend to have more strategic gaps.

Climate change highlights a lack of sensitivity data across all Natura 2000 features, whereas air pollution highlights uncertainties around current knowledge and evidence. Horizon scanning is highlighted as a need for a couple of issues such as invasives and disease; and development and infrastructure. For development and infrastructure and public access and disturbance there appears to be a lack of evidence of cumulative impacts.

There is also a clear need for some consolidation of existing evidence in order to review current status, identify remaining gaps and inform actions. There is also a gap in our knowledge of whether existing mitigation measures to address issues actually work.

The evidence gaps by issue

Climate change: A strategic gap has been identified on the need for sensitivity data for all Natura 2000 features.

River management: No major evidence gaps have been recorded, as it is thought that the issues and their management are generally well understood. There is likely to be extra evidence needed for site specific purposes.

Air pollution: Strategic gaps have been recorded. Two evidence projects have been run through IPENS, however there is still a level of uncertainty in our knowledge and evidence including:

- uncertainties on the accuracy of atmospheric dispersion modelling;
- uncertainties on the sensitivity of some Natura 2000 features and rates of recovery;

- uncertainties on the effectiveness of some mitigating measures;
- uncertainties and availability of information about local emission sources and local trends in deposition; and
- a lack of skills and tools for local officers to assess and address atmospheric nitrogen impacts.

Forestry and woodland management: No specific gaps have been identified in the SIPs, however it is likely that extra evidence will be needed for site specific purposes such as tailoring management requirements within sites.

Natural or unexplained change: The SIPs highlight a number of gaps, both strategic and site specific. Examples are investigating reasons for decline in a species on a site to inform management and investigating the decline in SPA bird populations.

Lack of evidence and knowledge: Lack of feature surveys remains one of the main gaps. The SIPs highlights the need for monitoring for SPA birds; bat usage of the landscape; and for specific SAC features (including tufa springs, alkaline fens, spined loach, stag beetle, violet click beetle, southern damselfly, marsh fritillary and rocky habitats).

Invasives and diseases (including deer): The evidence gaps cited here are generally strategic. There is a need for ongoing horizon scanning to prepare for the arrival of new invasives. Evidence is needed on methods of eradication and control for some species. There is also a lack of evidence recorded on the current distribution for some non-native species and diseases.

Habitat fragmentation: There is generally a strategic level evidence gap for this issue. A lack of consistent assessment methodology across the Natura 2000 network is the main gap identified, with the need for an accompanying strategic plan to improve connectivity.

Development and infrastructure: A number of SIPs state investigations are required to gather more evidence for this issue, including:

- There is a gap in our evidence on the cumulative impacts of development.
- Horizon scanning is needed to identify the risks from new types of development.
- Evidence is needed about impacts on particular species or habitat groups.
- There is a need for pro-active evidence gathering in anticipation of future planning applications.

Illegal and legal third party activities: The gaps identified here are generally site specific. The SIPs propose that there needs to be increased understanding of the effects of these activities on the features. In addition, it is highlighted that following implementation of mechanisms (such as advice, management, use of regulation), there needs to be some analysis to inform any next steps.

Offsite issues

Site-specific gaps are identified here including:

- The need for evidence on the use of offsite habitats by bats, birds and / or butterflies, to inform offsite habitat management and casework advice. (mainly relating to bats).
- Improved understanding is needed on the significance of disturbance or damaging effects of offsite activities (for example wildfowling and changes in site temperature and conditions caused by a rubbish tip).
- There is a lack of knowledge on the dependence of sites on offsite management, such as SAC features which are also present offsite, or a hydrological unit offsite. Evidence is needed to inform potential future designation boundary changes and offsite management solutions.

Public access and disturbance: There are a large number of gaps identified in the SIPs, many relating to coastal sites, although without further site level investigation we are not able to state at this point which the priority sites for action are.

- Evidence is needed to understand the impacts of some recreational activities on features (species, including birds, and

habitats); including an investigation into disturbance distances, such as how disturbance events translate into population level effects.
- Further evidence is required on the cumulative disturbance of a number of water-based activities taking place in difference parts of estuaries.
- There needs to be a consolidation of existing evidence.
- A lack of baseline understanding of all recreational activities occurring on SACs and SPAs, including their intensity and frequency, is preventing us from understanding fully the changes of use and informing management of change.
- The level of evidence or burden of proof to effect management interventions or change has not been fully established.
- There is a lack of quantitative evidence to show whether existing mitigation to address recreational disturbance impacts on coastal birds is successful.
- SIPs record that there is insufficient evidence to quantify any predicted change in recreational use following the provision of coastal access.
- A lack of evidence is recorded on the impact of recreational disturbance as a result of housing development. It is difficult to assess and there is inconsistency in how the evidence base is used. The biggest concern noted is about fully understanding the impacts which arise cumulatively and in combination.
- A review is needed of work following Liley, 2007, which set out the priorities for future research on bird conservation and access to the countryside in England.

Other habitat management: The majority of gaps identified were site specific, covering a variety of issues including:

- the influence of nutrients;
- the impact of grazing regimes or a lack of grazing;
- the effects of spraying of adjacent land;
- the need for surveys and investigations for bat related issues;
- the need for habitat and feature mapping; and
- the need for bryophyte investigations.

Coastal management: Numerous evidence gaps still exist including the extent of features in specific locations; the effects of hard sea defence removal on coastal morphology and sediment dynamics; and the use of habitat creation as compensation.

Inappropriate game management and moorland burning

There remains a lack of knowledge and evidence including in:

- the population trends and the status of non-raptor SPA species;
- the longevity and toxicity of flubendazole in the environment following its use in medicated grit for grouse;
- the damage caused by released game-birds to Natura 2000 habitats and associated insects such as butterflies;
- the risk of disease transmission between released-game-birds and wild bird populations.

SIPs have also identified that there needs to be a review of evidence around optimal burn rotations for dry heath and on the impact of structural changes of vegetation resulting from management upon SPA species and assemblages.

Water pollution

Research and investigation is the most frequently identified action where water pollution features as an issue; featuring in 58 out of 87 SIPs signalling that there remains a large gap in our evidence and knowledge.

Grazing

The SIPs and the theme plan identify that there is a need to prioritise and address research needs that aim to improve the effectiveness of grazing and our understanding of grazing-related habitat change. This includes:

- Investigating the benefits and dis-benefits of different stock types on Natura 2000 habitat

and species features.
- Investigating the ecological implications of cutting management versus grazing for Natura 2000 species and habitats.

Lake management
The theme plan and SIPs make clear that effective before and after monitoring should be included as part of any restoration project so that the scientific evidence base for lake restoration can be improved and disseminated.

The SIPs and theme plan showed that there is a lack of understanding of the effectiveness of various lake restoration activities.

Hydrological functioning
Evidence gaps relate primarily to the need to better understand the eco-hydrological functioning of sites to:

- identify the degree of degradation and it's causes;
- identify the potential for restoration and the appropriate restoration measures;
- understand dependency on hydrologically important areas outside the boundary; and
- understand the interaction with water quality.

The knowledge gaps are particularly prevalent for dune systems, wet heaths and lowland raised bog and mires as well as the specific hydrological needs of SAC plant species.

Changes in management practices
There remains a lack of knowledge of the effects of changes in management on some species.

Fisheries management
Further evidence is required on recreational marine fisheries to investigate the impacts on features and the scale of the issue. In addition, research is required to define the appropriate fish community targets for significant water bodies, and to identify an effective way to remove particular species. It has also been proposed that there is complete coverage of the Wetland Bird Survey count across SPAs.

6 The funding situation

Sea anemone (sunset cup-coral) *Leptopsammia pruvoti*

Access to sufficient quantities of funding continues to be cited as one of the most significant issues hampering the environmental sector's ability to fully contribute towards the desired outcomes for biodiversity. The pressure to reduce public expenditure remains high, with ongoing pressures to Defra and the Arm's Length Bodies' budgets.

The traditional source of funding and the most popular one cited in IPENS SIPs is the Rural Development Programme for England (RDPE). The RDPE was formally approved on Friday 13 February 2015 and it includes the Countryside Stewardship scheme, Countryside Productivity Scheme and Leader. It will invest £3.5 billion between now and 2020, including around £2.1 billion on existing environmental schemes and around £900 million on the new Countryside Stewardship scheme, to support rural businesses to improve the countryside environment. However, whilst RDPE does provide funding for protected sites, only a relatively small proportion of the overall budget is available for such, with the balance spent on delivery of wider biodiversity outcomes. Consequently, the lack of new money available for our protected sites remains a limiting factor to deliver real change.

In the context of these resource pressures, it is important to understand and be clear on:

- the priorities of what needs doing where and when on and around our protected sites;
- the current funding landscape and the subsequent gaps;
- the opportunities to look beyond the traditional funding streams;
- what partnerships and programmes and real join-up are needed to take this forward with the funders; and
- commitment of time and resources by all parties.

The IPENS programme has taken us forward in our understanding. In developing the SIPs and Theme Plans and in the implementation period, we will be able to:

- better match funding opportunities with delivery needs;
- provide greater clarity on the relative priority and use of existing funding streams such as Countryside Stewardship and Catchment Sensitive Farming for Natura 2000 actions;
- articulate a clearer set of priorities to funders across our protected sites in England;
- prioritise delivery partner efforts to increase funding;
- inform an update to the UK Prioritised Action Framework; and
- influence follow-up initiatives on England's Natura 2000 sites, including future LIFE funded Programmes to address the funding gap.

The Site Improvement Plans included an estimation of the cost of the actions needed to achieve target condition for the sites. For each SIP this involved a desk exercise to estimate and record the costs of the individual additional actions (agreed, committed or ongoing expenditure was excluded from this exercise).

It has been reported by numerous SIP authors as a real challenge to estimate a cost for some actions, due to a need for further investigation or evidence. Nevertheless, costs have been estimated for 1568 out of 3268 actions totalling over £800 million. The IPENS SIPs thus provide us with an indication of the scale of funding needed to improve the condition of our Natura 2000 sites and features. Note that exact timescales are not given for the actions or the funding. Prioritisation will need to take place to ascertain what funding is needed, when and from where.

For some SIP actions where cost estimates have been included, approximate timescales were provided. The timescales are summarised overleaf in table 10.

Table 10 – Funding timescales

Timescale	Funding estimate	Number of Actions
Short term funding need (in the next 5 years)	>£200 million	1114
Ongoing funding need (starting in the next 5 years, but going beyond 2020)	>£150 million	285
Medium term funding need (for actions over the next 10 years)	>£190 million	78
Longer term funding need (for actions over greater than 10 years)	>£290 million	89

In summary, SIPs record a high proportion of low-cost actions in the short term and a much smaller number of bigger and more expensive actions in the longer term.

Assuming the costs of the actions where no estimate was recorded, are on average the same as the costed ones, this can be extrapolated out to a further £800m, giving a potential (cautious) funding scale of around £1.6 billion.

By mechanism the most expensive costs by some distance are to deliver river restoration projects (£329million recorded).This is followed by the records of agri-environment schemes funding such as Countryside Stewardship (£100million). This latter figure for agri-environment scheme expenditure represents an additional cost on top of the estimated £286 million projected to be required between 2014-2020 to renew existing agri-environment agreements on Natura 2000 sites.

By issue the most costly actions in the SIPs are concerning river management, water pollution and hydrological functioning.

IPENS SIPs and theme plans confirm that a clearer picture is needed of the requirements of habitats and species where existing funding streams will not be able to support the scale of delivery necessary to meet outcomes. Further work will be needed in liaison with Natural England's external funding team and delivery partners.

In addition to the estimated, indicative cost of the actions, IPENS SIPs suggest funding initiatives and organisations who might be involved. This does not commit any organisation to any payment, but shows the wide range of bodies who will need to engage.

Some of this funding will be required at site level and some at landscape scale. Securing the funding will require new and existing partnerships and programmes to be prioritised and focussed on the Natura 2000 series and the underpinning Sites of Special Scientific Interest, to achieve target condition and the associated outcomes for the sites and their features.

Defra is mentioned in many SIP records as a delivery partner and as one of the bodies who will need to work on the funding gap. This recognises the critical role that Defra plays in supporting research on topics like invasive non-native species and disease, climate change and air pollution. Defra also plays an integral part in policy changes for example on hen harriers and moor burning, which is recognised in some SIPs. In many cases, the reference is to Defra's role as the Department responsible for the Rural Development Programme for England (covering schemes such as Countryside Stewardship). Defra is also responsible for the Grant in Aid (GiA) awarded to its agencies such as Natural England and the Environment Agency, which is seen as an important factor in delivering actions (for example the GiA for the Water Framework Directive).

The SIPs have also included Defra as the delivery partner and funding source in recognition of its statutory role. *Under the Habitats Regulations 2010 (as amended), all Government Ministers have a duty to exercise their functions relevant to nature conservation so as to secure compliance with the requirements of the Habitats Directive. The Defra Secretary of State has a duty to secure all compensatory measures to ensure the coherence of the Natura 2000 network; where a competent authority is minded to consent a plan or project following a negative assessment under the Regulations and where in the absence of alternatives, there are imperative reasons of overriding public interest. Based on the advice of the country agencies and JNCC, Defra are also responsible for designating SACs and classifying SPAs based only on the scientific evidence on the presence of qualifying habitats and species specified in the Directives.*

Where SIPs record the need for major capital investment and high cost habitat creation schemes, there is no specific body identified to provide the funding. What is clear is that there will need to be commitment from across the whole environment sector to assess, prioritise and implement these actions.

Natural England is committed to achieving the UK Biodiversity 2020 targets and has given this priority in our corporate planning and associated workforce planning for the next 5 years. However, Natural England's staff and grant in aid budget alone will not fund the priority actions that are needed to improve the condition of Natura 2000 sites. There needs to be collective ownership of the priority actions and associated funding across the environment sector. Natural England will also be looking at new and innovative ways of drawing in additional funding to meet the challenge including from outside the sector.

Consequently, Natural England is currently working with Defra, Government Agencies and Non- Government Organisations to prioritise the development of projects aimed at addressing the needs of the Natura 2000 network through the Terrestrial Biodiversity Group (TBG), chaired by Natural England. The input from IPENS will be a crucial factor to ensure the effective decision-making of a 'Task & Finish Group', commissioned by the TBG, including representatives from organisations across the environmental sector, which will use this information to develop a pipeline of externally funded projects.

Traditional sources of external funding will be insufficient to meet the Biodiversity 2020 targets, including the Natura 2000 series. Therefore, the sector will also need to challenge general society to increase financial contributions, which may come from payments for ecosystem services and other innovative mechanisms.

7 Our partnership approach during the project and for the future

Farmer David Banwell demonstrates to the Major Landowners Group the qualities of drainage ditches at the Somerset Levels and Moors SPA

Collectively agreeing, and committing to deliver, the priority actions in the Site Improvement Plans and Theme Plans will be critical to helping to improve the condition of our Natura 2000 sites.

Due to their input and engagement on IPENS there is improved understanding amongst staff in Natural England and across our stakeholders of the priority issues affecting Natura 2000 sites and ways to address them. We hope that this will ensure ongoing commitment to work together to deliver the actions and outcomes we seek for the natural environment.

Partnership with the Environment Agency

A partnership agreement with the Environment Agency was set up early in the Programme. This has enabled us to work together not only for the delivery of IPENS objectives and the Habitats Regulations but for the environmental outcomes under the England Biodiversity 2020 Strategy and the Water Framework Directive which the Natura 2000 network will support.

The Environment Agency and Natural England are members of the AfterLIFE Implementation Steering Group and will continue to play an important role in:

- ensuring that target condition on our Natura 2000 sites is an integral part of our respective delivery priorities;
- that IPENS actions are prioritised and implemented in a co-ordinated way; and
- that there is clear communication to the right audiences of IPENS findings and the need for action.

Collaboration with other LIFE Projects

During the IPENS programme, we worked closely with other relevant LIFE Projects including 'THAT'S-LIFE', 'Cumbrian BogLIFE', 'The Little Tern Recovery Project' and 'The Stone Curlew Project'.

Where appropriate, IPENS has influenced the scoping and development of these projects and when they report, the outcomes and recommendations from these will influence the later iterations of relevant SIPs and associated actions and also the implementation of the Theme Plan priority actions.

In addition the IPENS team has shared its experience of running a LIFE Project, to help colleagues in Natural England and other partner organisations and to share good practice.

The IPENS team have also maintained a strong link to Natural Resources Wales, who have been running a similar LIFE funded programme on the Welsh Natura 2000 network: LIFE11 NAT/UK/385 'Developing a strategic programme to manage and restore Natura 2000 species, habitats and sites in Wales'. We participated in each other's workshops, and joined up the development of our respective Site Improvement Plans for cross border sites. We have also joined each other's team meetings to exchange experiences and calibrate approaches.

Close working and engagement with delivery bodies

The approach taken in the delivery of IPENS was to engage relevant delivery bodies in the development of the Site Improvement Plans at site and national level. The main aim of the engagement was to:

- Develop a shared understanding of the issues affecting the sites.
- Identify and agree the priority actions, appropriate delivery mechanisms and potential funding sources required to address them.
- Secure commitment where possible to deliver the actions.

As part of developing the SIPs, Natural England's Site Responsible Officers engaged local

stakeholders and partnerships (eg Estuary Partnerships).

The IPENS team engaged with key delivery bodies at a national level through the Major Landowners Group and the Marine Protected Areas Conservation Advice Advisory Group. This has included engagement on the SIPs and the Theme Plans.

The IPENS Programme has engaged stakeholders all along in our work on the theme plans. Initially this was through a series of workshops, held to inform the issues and threats which would form the list of theme plans under IPENS. Subsequently, in developing the theme plans, specialists from other organisations were given an opportunity to input or comment alongside Natural England specialists. For some of the theme plans, additional knowledge was sought from industry experts to shape the thinking and engage them in the challenges of these issues to the natural environment. An example of this is the Atmospheric Nitrogen theme plan where workshops and face to face sessions have been held.

In the development of the Site Improvement Plans approximately 650 delivery partners were involved. Over 100 stakeholder organisations have commented or inputted directly into the Theme Plans. A list of stakeholders involved and the most frequently recorded delivery partners in the SIPs is at Annex 3.

As part of the analysis of IPENS findings we have provided overviews of all the actions for each of the main delivery partners across all Natura 2000 sites. This has raised the profile of the project directly with those who will be delivering the actions and will also enable co-ordination during the prioritisation and implementation.

In addition, due to the availability of the data and evidence from IPENS, stakeholders (eg members of the Major Landowners Group), will be able to more easily access information on mechanisms to address issues on Natura 2000 sites and associated funding options. This will help result in more efficient use of the information available thus contributing to more effective delivery of favourable condition and other objectives including those of Biodiversity 2020, and Water Framework Directive.

It is recognised that due to time constraints, not every view or comment has been incorporated in the IPENS documentation, but they will influence site management decisions through on-going partnership working for Natura 2000 outcomes on the ground.

With regards the SIPs, the aim was to seek local agreement over the content of the SIPs, as far as possible. However it was not a public consultation with, for example, all owner occupiers or sea user groups. SIPs contain high level descriptions of issues and actions, which need further specification when going forward to implementing the actions. Relevant stakeholders will be approached as appropriate when the actions are implemented (eg negotiation over individual agri-environment agreements).

An overview of stakeholder feedback on IPENS

Stakeholders have been involved in several elements of IPENS, including in developing the SIPs, in commenting on the theme plans and at a national strategic level, providing input and steers through groups such as the Major Landowners Group and Marine Protected Areas Conservation Advice Advisory Group. A list of the stakeholders who have been involved is at Annex 3.

The engagement has been informative, providing helpful comments, technical input and healthy challenge.

When the theme plans were being developed, a record was kept of all the comments returned, a flavour of this is below, as well as some additional feedback received separately. Each of the comments received in the production of the

theme plans were reviewed and where appropriate, dealt with in subsequent re-drafts.

- The strategic view of issues provided by the theme plans is welcomed.
- Some criticism on the lack of time to comment on the theme plans.
- Range of comments on the appropriateness or otherwise of the detail included in the plans.
- Numerous offers of follow-up advice and participation (which will need to be co-ordinated).
- Suggestions given of relevant case studies to illustrate the issues being covered
- More thought is needed about the audience for the theme plans and how best to target messages.
- There is a need to engage the landowners and managers of these sites in the practical implementation of the actions as there has not been much direct engagement during IPENS.
- Suggestions were made to include the social value and aspects of Natura Sites in some of the theme plans.
- Useful prompts were made to ensure that marine environment is not neglected in the theme plans.
- Some concern was expressed that theme plans do not go far enough in setting out the actions needed, or do not adequately recognise existing thinking.
- The Major Landowner's Group (MLG) has commented that there is a lack of match funding and staff resource in some of their organisations to take on projects under LIFE for example.
- There is concern across the sector received during meetings such as the MLG and in responses to the theme plans, about the lack of skills and resource (internal and external) to address the scale of the issues.

IPENS delivery partners

In each SIP, the delivery partners were recorded. This citation by the SIPs is not itself a commitment to delivering the SIP actions, but shows where existing and new partnerships are needed. Further work will be required to agree priorities and commit to specific delivery plans, including engagement with landowners and managers.

8 IPENS – an innovative approach

Clearing willow scrub on Saltfleetby-Theddlethorpe Dunes and Gibraltar Point SAC

The IPENS programme has been innovative from the start, examples of where we are particularly proud of the approach and achievements are:

Alignment with the EU Water Framework Directive and the River Basin Management Plans.

Under the Water Framework Directive (WFD), there is an objective of establishing a framework for the protection of all surface waters and groundwater with the aim to reach good ecological status in all waters by 2015. In addition there is a requirement to achieve compliance with the standards and objectives of protected areas, which include Natura 2000 sites.

Defra has issued supporting guidance on this (England and Wales) which clarifies that the Agencies should use the river basin planning process to consider in a co-ordinated and transparent way the appropriate objectives and environmental conditions to be achieved for individual water bodies and water dependent Natura 2000 sites so that they fulfil the requirements of the EU Nature Directives and the WFD.

A key aspect of IPENS is the integration of Site Improvement Plans (SIPs) with the second cycle of River Basin Management Plans (RBMPs). This affects 174 SIPs.

The SIPs themselves will be the vehicle by which actions identified by IPENS will be embedded into the ten RBMPs which wholly or partly cover England. So, rather than the development of a bespoke Natura 2000 protected areas section within RBMPs, this information has been provided by the IPENS SIPs which are signposted from the RBMPs. This approach will also offer greater clarity for stakeholders, with less chance of ambiguity between the RBMPs written by the Environment Agency and the SIPs written by Natural England.

Discussions between Natural England and the Environment Agency started early in 2013 and there has been close liaison since then to ensure that all opportunities for integration are taken.

SIPS and Theme Plans – A Country wide review of the Natura 2000 series

IPENS has delivered prioritised action plans for achieving or maintaining favourable condition on all the English Natura 2000 sites. The SIPS and theme plans collectively give us the risks and issues, the mechanisms to tackle them, who needs to be involved, how the mechanisms might be funded, and a proposed time line for their implementation.

This is the first time that this information will have been drawn together for the entire suite of Natura 2000 sites. It will enable the current Natura 2000 network and its contribution to biodiversity outside the network to be reviewed, and highlight where further measures are needed to improve the network.

9 Next Steps – prioritisation, implementation and monitoring

Otter *Lutra lutra* © Natural England / Michael Hammett

The IPENS Programme has recorded over 3000 actions in the SIPs to manage the pressures and threats affecting the Natura 2000 series in England.

With the existing funding and budget constraints it is clear that not all of these will be achieved in current corporate planning cycles. Natural England and the Environment Agency are recorded as the two main delivery partners for the majority of SIP actions and the scale of this is not achievable by these organisations alone.

A prioritisation exercise is needed to look at which of the actions will necessarily take precedence and over what timescale and by whom.

It is proposed that this prioritisation exercise is carried out by Natural England and the Environment Agency initially, and involving the existing IPENS Steering Group and the AfterLIFE Implementation Steering Group (see below at page 146). There then will need to be a planned and joined up approach to implementation. An outline of how this might look is below:

The prioritisation methodology will need to include:

- UK Priority habitats and species (from the EU Habitats Directive and section 41 of the Natural Environment and Rural Communities Act 2006), including those for which the UK has special responsibility and those that are rare or localised.
- Analysis of the condition of the features and their vulnerability, using existing information such as from the Article 17 Reporting of 2013, Natural England and JNCC data and supporting information held by other bodies.
- Review of existing priority programmes which may deliver actions and multiple benefits for Natura 2000 sites. This will include (more information on these programmes is below at page 144-145):
  - The Biodiversity 2020 Programme.
  - The Water Framework Directive Programme, River Basin Management Planning.
  - The Rural Development Programme for England.
  - The Marine Strategy Framework Directive.
- Analysis of existing locally driven priorities, which may also deliver actions for Natura 2000 sites.
- Stakeholder support, including capacity for participation.
- Wider benefits such as green jobs, training programmes and eco-system services provided.

The prioritisation will be cognisant of our statutory obligations under the Habitats and Birds Directives.

We will also look for any 'quick wins' ie actions or measures that can easily be put in place, where there is little or no impact on resources and which will achieve desired outcomes.

Implementation will need to involve:

- Influencing of planning cycles and alignment of resources where possible.
- Embedding the agreed priorities in local team delivery plans (Natural England, Environment Agency and others).
- Communication and engagement on the priority actions with the relevant environmental stakeholders, nationally and locally.
- A programmed approach to delivery, with commitment across the sector for action. This will involve working closely with the Major Landowners Group, the Marine Protected Areas Conservation Advice Advisory Group and the Terrestrial Biodiversity Group for example.
- Engagement with landowners and managers on practical implementation, alongside their farm businesses.
- As well as delivery of actions on site, a co-ordinated approach will be taken to agree priorities for evidence and further investigation needed for some features and pressures.
- Improved co-ordination in Natural England of the management, strategy, evidence needs, assessments and delivery on Natura sites. This will be led by a Protected Sites

Programme in Natural England.
- Monitoring of progress.
- Feeding priority actions and delivery information for the Natura series in to the review of the UK Prioritised Action Framework (see below at page 145) and future Article 12 and 17 reporting.
- Join up and co-ordination across the environment sector to agree a clear set of priorities for funding and articulate this in a co-ordinated way to funders.
- Natural England and the Environment Agency will continue to join-up to meet multiple outcomes and our responsibilities for protected sites. The SIP and RBMP link will continue and will be updated to ensure actions are relevant practical and achievable on the ground.

Skills / capacity

From the range of issues and actions recorded in the SIPs, it is clear that successful management of the Natura 2000 network relies in large part on the skills and capacity of staff in the environment sector as a whole. As the implementation phase of IPENS begins it will be important to look at the staff resource and skills available and plan how any constraints can be addressed collectively as a sector.

Natural England now has a new Field Unit of specialist ecologists who are contributing their capability and time to delivering Biodiversity 2020 across England and the IPENS findings will inform the priorities for this team.

Coordination

Implementing the measures required to improve Natura 2000 sites is a shared responsibility. As shown in the SIPs and theme plans, there are many organisations and people involved and each have their own objectives and ideas about what is needed, so clarity of requirements is vital, and where possible, shared objectives (eg with the Environment Agency). This feeds into existing work on European conservation objectives and supplementary advice, and highlights the need to inform and connect with policy development in Defra.

Many terrestrial and coastal SACs / SPAs cover multiple SSSIs and consequently have multiple officers working at the SSSI level. This can complicate the ability of Natural England and our partners to take a coherent approach to Natura 2000 management at the SAC / SPA level. Depending on the availability of resource (capacity and capability) Natural England will need to look at how best to improve this situation.

Not all Natura 2000 features are specifically included in the SSSI designations that underpin terrestrial sites, the most significant gaps being SPA birds. As many governance arrangements for protected sites are based on SSSI units and their objectives, the inclusion of all SAC and SPA features in the administration of the relevant SSSI units would greatly assist a coherent approach across the whole suite of protected sites.

The main purpose of the Natura 2000 network is to achieve favourable conservation status (FCS) for all interest features (article 3 Habitats Directive). Whilst FCS is evaluated across the natural range of a feature at UK or biogeographic level, the required contribution from individual Natura 2000 sites is currently implicit. There is potential for a mismatch between the strategic objectives for Natura 2000 that need to include habitat creation and restoration; and the condition targets of underpinning SSSIs which can be focussed on maintaining the state of interest features at the time of designation (http://jncc.defra.gov.uk/page-2275).

Delivering Biodiversity 2020

'Biodiversity 2020: A strategy for England's wildlife and ecosystem services' was published in 2011 after the publication of a new Natural Environment White Paper (NEWP) that same year. Biodiversity 2020 is the successor strategy to the

previous England Biodiversity Strategy and is one of the four devolved national strategies that collectively comprise the UK Post-2010 Biodiversity Framework. Biodiversity 2020 sets out a long-term vision for England together with a mission it is seeking to deliver by 2020.

Natural England is committed to delivering its contribution to achieving 'better' biodiversity. Our Board has confirmed the centre piece to demonstrating our ability to do this, is through increasing the area of favourable SSSIs. In support of this Natural England's Corporate Plan states that over the next five years we will increase the proportion of our best wildlife sites that are in favourable condition.

The focus of effort is on managing existing SSSIs to achieve an increase to 50% favourable. This is being made explicit in national and especially local delivery plans and programmes. The contribution of the Natura 2000 series is recognised and actions will be embedded in delivery plans, with IPENS findings directly informing the prioritisation and implementation. New information on the Natura 2000 sites from IPENS will also contribute to the review of delivery of the outcomes set out in Biodiversity 2020.

The Rural Development Programme for England

The Rural Development Programme schemes such as Environmental Stewardship and Countryside Stewardship, (administered in England by Natural England and the Forestry Commission) have been and will continue to be a primary mechanism for delivering the desired outcomes and priority actions on our protected sites including SSSIs and Natura 2000 sites.

The EU Water Framework Directive (WFD)

Implementation of the Water Framework Directive includes objectives for water dependent Natura 2000 sites, known as 'Natura 2000 Protected Areas'.

IPENS findings have not only increased our knowledge of the condition of the Natura 2000 Protected Areas, but they have helped clarify the priority actions needed to move these sites towards meeting their conservation objectives.

From now on, where possible, water related Natura 2000 and Water Framework Directive (WFD) objectives will be aligned, and actions in SIPs are being used as the 'programme of measures' for Natura 2000 Protected Areas within the updated River Basin Management Plans (RBMPs) for the period 2015-2021. Over this period it is envisaged that SIPs will guide the planning and delivery of WFD related measures.

Information within SIPS for issues which require medium to long term action will continue to be useful in informing the next update of RBMPs for the period 2021 to 2027.

The Marine Strategy Framework Directive

Defra is currently consulting on their proposals for a Programme of Measures to deliver Good Environmental Status (GES) for the Marine Strategy Framework Directive (Defra 2015). IPENS will contribute to the delivery of GES for a number of descriptors including marine mammals and non-natives. IPENS findings will also contribute to the protection of birds through improvements to SPA management.

Updating the Prioritised Action Framework

The Prioritised Action Framework for Natura 2000 (PAF) is a tool for EU Member States which aims to integrate financing for Natura 2000 into EU financial instruments for 2014-2020. Written at a national level, the PAF is used by the EU Commission to ensure that any allocated funds support the agreed priorities.

From the start of IPENS, Natural England and Defra made a commitment that the findings from the programme would be used to update the England section of the UK Prioritised Action Framework (PAF). Natural England will work with Defra to complete this exercise by the end of 2015.

The AfterLIFE implementation steering group

A steering group will be set up to take over from the existing IPENS steering group, once the IPENS Final Report is submitted and to take forward the agreed priority action delivery.

The role of this group includes:

- critically assess and agree implementation priorities;
- oversee management of the implementation, (according to the agreed priorities), and identify and manage risks and issues;
- identify dependencies and contribute to their management (for example the links with Article 17 Reporting and achieving Favourable Conservation Status; and identifying cross border synergies where collaboration needs to be focussed);
- help ensure the implementation is well coordinated and communicated in Natural England and within other organisations and relevant groups, internationally, nationally and locally, supporting the implementation lead within the Natural England Protected Sites Programme; and
- evaluate progress and outcomes.

Membership of this group (as this report goes to publication) includes Defra, the Royal Society for the Protection of Birds, the Marine Management Organisation, Natural England and the Environment Agency. We will confirm membership shortly.

To find out more
Information on all aspects of the project, including the Site Improvement Plans, theme plans and research are available on the IPENS website: https://www.gov.uk/government/publications/improvement-programme-for-englands-natura-2000-sites-ipens

10 A message from the IPENS Programme Team

IPENS site visit to Wistman's Wood, Dartmoor SAC

A message from the IPENS Programme team

We have reached the end of the programme and now have a chance to reflect on what has been achieved.

Due to the combined efforts of many, we have increased our knowledge and evidence base on and around Natura sites. This enhanced understanding will inform delivery of priority actions on the ground and help influence future funding. Critically we want IPENS to lead to achievement of biodiversity outcomes and to ensuring these sites contribute fully towards achieving a Favourable Conservation Status for the habitats and species.

We would like to thank all those staff in Natural England and the Environment Agency who have worked on the project over the past two and half years. There are nearly 700 of you and your contribution has been invaluable. Particular acknowledgement must be given to site officers in Area Teams for their work in producing SIPs and to national team staff specialist advice and for their efforts in quality assuring the SIPs and producing the theme plans.

We are very grateful to all the organisations listed in Annex 3 for their input to the SIPs and Theme Plans, and for their patience with tight timescales.

Throughout the programme, we have had the benefit of advice from our experienced external monitor John Houston. He has guided us through the challenges and shown us the opportunities. Thank you John.

The IPENS team:
Helen Rae, Frances Randerson, Rebecca Smith, Julie Erian, Stuart Masheder, Robert Duff, Susannah Haley, Lorraine Smith, Louisa Knights, Wilbert van Vliet, Sue Wells, Barbara Singh, Sam Somers

IPENS programme team

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Annex 1 – Definitions / Glossary of terms

Action: What is required on the ground to achieve the conservation objective (eg reduce fertilizer application to agricultural land within the catchment).

Article 12 Report: Article 12 of the Birds Directive requires Member States to report on the progress they have made with the implementation of the Birds Directive, and the national status and trends of bird species.

Article 17 Report: Every six years European Member States are required by Article 17 of the Habitats Directive to report on the implementation of the Directive and the conservation status of individual habitats and species listed under the Annexes of the Directive.

Biodiversity 2020: *Biodiversity 2020: A strategy for England's wildlife and ecosystem services* was published in 2011 after the publication of a new Natural Environment White Paper (NEWP) that same year. Biodiversity 2020 is the successor strategy to the previous England Biodiversity Strategy and is one of the four devolved national strategies that collectively comprise the UK Post-2010 Biodiversity Framework.

Birds Directive: In 1979, the European Community adopted Council Directive 79/409/EEC on the conservation of wild birds (EC Birds Directive), in response to the 1979 Bern Convention on the conservation of European habitats and species. The Directive provides a framework for the conservation and management of, and human interactions with, wild birds in Europe.

Conservation objective: The state we want to achieve to ensure an interest feature is in favourable condition and contributing to Favourable Conservation Status. Nutrient levels in the Natura 2000 lake to achieve a defined quantitative target.

Defra: Department for Environment, Food and Rural Affairs.

Destroyed: Lasting damage has occurred to all the special conservation interest of the site, such that it has been irretrievably lost. This land will never recover.

Favourable: The special conservation interest of a site unit is being adequately conserved and is meeting its 'objectives'.

Funding: How the mechanism will be paid for (eg Higher Level Stewardship).

Habitats Directive: In 1992 the European Community adopted Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora (EC Habitats Directive). The Directive requires Member States to introduce a range of measures including the protection of habitats and species listed in the Annexes.

Issue: An overarching term used for pressures and threats.

Measure: An overarching term for actions, mechanisms and funding.

Mechanism: An enabling structure for the implementation of actions (eg an option under an agri-environment scheme such as the Rural Development Programme funded Countryside Stewardship Scheme).

Major Landowners Group (MLG): a group of the major landowning bodies of Sites of Special Scientific Interest, many of whom are also therefore responsible for the management of parts of SACs and SPAs. The group includes the RSPB, the National Trust, the Wildlife Trusts, the National Parks, the Forestry Commission and Forest Services, Defence Infrastructure Organisation, the Crown Estate, plus Defra, the Environment Agency and Natural England.

Part destroyed: Lasting damage has occurred to part of the special conservation interest of a site unit, such that it has been irretrievably lost and will never recover. Conservation work may be needed on the residual interest of the land.

Pressure: Factors which are currently causing adverse impacts on Natura 2000 interest features (eg excessive fertilizer application is causing elevated nutrient levels in a Natura 2000 lake).

Prioritised Action Framework (PAF): Every country in the EU has developed a PAF which outlines their funding needs and priorities for Natura 2000 sites. This will help the European Commission direct European funding for biodiversity and nature.

Sites of Special Scientific Interest (SSSIs): Nationally important sites forming a network of the best and most representative examples of our wildlife and geodiversity features. Selected and designated by Natural England and afforded protection under the Wildlife and Countryside Act 1981 (as amended).

Site Improvement Plan: A plan, covering one or more Natura 2000 sites, which provides a high level overview of the issues (both current and predicted) affecting the condition of the Natura 2000 features on the site(s) and outlines the priority measures required to improve the condition of the features. It does not cover issues where remedial actions are already in place or ongoing management activities which are required for maintenance.

Site Unit (Unit): Each site (SSSI, SAC, SPA) is divided into smaller areas known as site units, or simply units, for the purpose of recording feature location, condition and management.

Special Areas of Conservation (SACs): are designated under European Communities Directive 92/43/EEC known as the 'Habitats Directive'. This requires the conservation of important, rare or threatened habitats and species across Europe.

Special Protection Areas (SPAs): are designated under the European Communities Directive 79/409/EEC, known as the 'Birds Directive', to conserve the habitats of certain migratory or rare birds.

Species Recovery Programme: There are 943 species that have been identified as being of principle importance for conservation activity in England under Section 41 of the 2006 Natural Environment and Rural Communities (NERC) Act. The Species Recovery Programme is identifying what conservation action is required to help these species and help prevent their threatened extinction.

Theme: A grouping of several related issues.

Theme Plan: A high-level plan which aims to improve the way in which a key issue for the Natura 2000 network is managed. Theme plans can provide an over-arching direction or outline approaches to achieve target conservation status of Natura 2000 sites in England, to complement work already underway on individual sites.

Threat: Potential factors which may in the future cause adverse impacts on Natura 2000 interest features (eg potential further loading of nutrients to river flowing into the Natura 2000 site resulting from new housing development).

Unfavourable bad: One of three classes of conservation status used in Article 17 reporting. Unfavourable bad is recorded where habitats or species are in serious danger of becoming extinct (at least regionally).

Unfavourable declining: The special interest of the site unit is not being conserved and will not reach favourable condition unless there are changes to site management or external pressures. The site condition is becoming progressively worse.

Unfavourable no change: The special interest of the site unit is not being conserved and will

not reach favourable condition unless there are changes to the site management or external pressures. The longer the unit remains in this poor condition, the more difficult it will be, in general, to achieve recovery.

Unfavourable recovering: Often known simply as 'recovering', site units are not yet fully conserved but all the necessary management measures are in place. Provided that the recovery work is sustained, the unit will reach favourable condition in time.

Unit: see Site Unit

Annex 2 – Evidence projects

No.	Project Name	Project Description	Links to SIPs	Links to Theme Plans
IPENS 001	Setting the standard for Natura 2000 Diffuse Water Pollution Plans	Good practice for Diffuse Water Pollution (DWP) Planning & delivery is best led by example. This project focuses on a small sample of Natura 2000 / SSSI sites which will be 'fast-tracked' to provide exemplar / model plans, which clearly identify actions needed backed up by evidence and set a clear plan of how to achieve favourable condition in relation to DWP.	Setting the standard for Natura 2000 Diffuse Water Pollution Plans	Informs the content of the Diffuse Water Pollution Theme Plan in terms of outlining good practice in creation of DWP plans
IPENS 002	Healthy Estuaries 2020: Towards addressing coastal squeeze in estuaries	Coastal squeeze is an issue affecting many estuaries in England, particularly in the south and east of the country. To address coastal squeeze much work has been done with the Environment Agency. The evidence needs to inform this are complex and challenging, and the approach to replacing extent of lost habitat needed to be reviewed in the light of a greater focus on achieving a more sustainable estuary form. This project works to develop a method that will enable the evaluation of estuary morphology in Natura 2000 sites and inform future planning for habitat creation.	Setting the standard for Natura 2000 Diffuse Water Pollution Plans	Informs the content of the Coastal Squeeze Theme Plan in terms of evaluating estuary morphology in Natura 2000 sites and informing future planning for habitat creation
IPENS 004	Lover Avon Valley macrophyte survey	This project assesses the response of the river macrophyte communities to the cessation of annual weed cutting by the Environment Agency in 2010. The survey focuses on the Lower Avon River, and uses a repeatable and robust methodology designed to produce baseline data to provide evidence for assessing changes within the site and to enable monitoring of any future changes. Details on any obvious problems with water availability or other issues, such as non-natives, excessive siltation, or impact of the plant community on the river's channel and flow were noted during the survey.	Setting the standard for Natura 2000 Diffuse Water Pollution Plans	N/A

No.	Project Name	Project Description	Links to SIPs	Links to Theme Plans
IPENS 005	Dubbs Beck Restoration Project. Water Quality and Substrate Monitoring (River Kent SAC)	Dubbs Beck, part of the River Kent SAC, contains the only population of freshwater pearl mussels on the SAC. Water quality monitoring is essential to help inform any future remedial action required to improve conditions in Dubbs Beck both for the remaining freshwater pearl mussels and before those in captivity can be returned	Provides an assessment on suitability of the site for both the remaining freshwater pearl mussels found there and for the suitability for re-introducing mussels from the captive breeding programme. Also makes recommendations for future monitoring and management requirements for this feature.	N/A
IPENS 008	Meeting local evidence needs to enable Natura 2000 Diffuse Water Pollution Plan Delivery	Using outputs from Diffuse Water Pollution (DWP) 2012 / 13 evidence review project, this project targets survey and modelling work across a suite of Natura 2000 / SSSI sites which have the DWP remedy where evidence gaps have been identified as a barrier to progressing achievement of favourable condition.	Fill evidence gaps identified across a suite of Natura sites / SIPs which have DWP as a mechanism	Inform the content of the Diffuse Water Pollution Theme Plan in terms of outlining evidence needs to enable DWP plan delivery
IPENS 009	Humber Estuary clay pits water quality monitoring	Within the Humber Estuary Special Protection Area (SPA), several of the Humber Clay Pit lakes are failing nutrient targets for phosphate, causing undesired effects such as blooms of toxic algae and reduced water quality. This study develops a conceptual model of the hydrological system in order to better understand the water and nutrient sources and pathways into the lakes within the study area. This is followed by a targeted monitoring programme assessing water quality and bed sediment quality.	Identifies the key drivers affecting the feature condition of the SPA and SSSI units. Also informs future management and monitoring recommendations.	N/A

No.	Project Name	Project Description	Links to SIPs	Links to Theme Plans
IPENS 010 and IPENS 037	Teesmouth and Cleveland Coast SPA Intertidal Project: Nutrient Level and Benthic Habitat Monitoring	The project investigates issues affecting the Teesmouth & Cleveland Coast SPA and the Tees Estuary Heavily Modified Water Bodies, which is currently failing to meet Good Ecological Status for a range of reasons including Dissolved Inorganic Nitrogen and the extent of algal mats on the designated intertidal. The project sought to provide an updated baseline on the quality of intertidal habitats and algal mat extent, and to assess these against historic data to determine any trends in water quality-related impacts. The surveys involved intertidal core sampling to assess benthic communities and particle size analysis, and measurements of algal mat extent, thickness and biomass. Work involved taking sediment cores and analysing them for water quality at previously unsurveyed mudflats within the SPA.	Provide up-to-date data to identify / confirm water quality related impacts affecting Teesmouth and Cleveland Coast SPA	N/A
IPENS 012	Alde-Ore and Butley Estuaries SAC	A National Vegetation Classification (NVC) survey of Alde-Ore and Butley Estuaries, and Orfordness-Shingle Street Special Areas of Conservation (SACs) to provide evidence for assessing changes within the site and to be able to monitor future changes. Details on management, habitat quality, and issues currently impacting on, or with the potential to impact on features were recorded.	Provide evidence to inform condition and identify / confirm threats for Alde-Ore Estuaries.	N/A
IPENS 013	Minsmere-Walberswick Heaths and Marshes SAC	A National Vegetation Classification (NVC) survey of part of Minsmere-Walberswick Heaths and Marshes Special Areas of Conservation (SAC) covering Walberswick National Nature Reserve (NNR) to provide evidence for assessing changes within the site and to be able to monitor future changes. Details on existing management regimes were noted in order to assess whether current management is appropriate. Any management issues currently impacting on, or with the potential to impact on features were recorded and recommendations made for addressing these.	Provide evidence to inform condition and identify / confirm threats and management recommendations for Minsmere to Walberswick Heaths and Marshes	N/A

No.	Project Name	Project Description	Links to SIPs	Links to Theme Plans
IPENS 014	River Wye SAC native crayfish survey	A native crayfish survey of reaches of the River Wye Special Area of Conservation (SAC), which is underpinned by the River Wye and River Lugg Sites of Special Scientific Interest (SSSI) was carried out in order to provide information on the presence and current status of white-clawed crayfish populations. Habitat appraisals of suitability for white-clawed crayfish were carried out and existing or potential barriers to upstream migration within the watercourse were recorded.	Provide an up-to-date White Clawed Crayfish survey to inform current condition of the site and identify current management and any issues.	N/A
IPENS 016	Dark Peak (Peak District Moors SPA)	Produces an ArcGIS tool that allows interrogation of feature interest or geographic (SSSI) unit to display specific conservation objectives in order to help identify "management headlines" on a unit by unit basis.	Enables interrogation of feature interest or geographic (SSSI) unit to display specific conservation objectives in order to help identify "management headlines" on a unit by unit basis.	N/A
IPENS 017	Bowland Fells SPA Lesser black-backed gull survey 2013	The project carried out a census of lesser black-backed gull bird number in order to provide data on population levels, consistent with previous surveys, in order to monitor population trends and provide evidence on the need to introduce reductions or temporary moratoria on culling in order to achieve favourable condition.	An up-to-date census to provide population trend data which will inform management requirements for Bowland Fells SPA	N/A
IPENS 018	Fal and Helford SAC Maerl bed surveys	Fal and Helford monitoring and mapping of maerl beds. The project looked at the extent and distribution of maerl bed communities and the species composition.	Provide evidence to inform condition and identify threats such as invasives or anthropogenic impacts for Fal and Helford	N/A
IPENS 021	Drigg Coast SAC intertidal surveys	An intertidal survey was commissioned for Drigg Coast Special Areas of Conservation (SAC) in order to gather data on the distribution, extent and range of communities in the intertidal mud and sand flats habitats within the site to provide evidence for assessing changes within the site and to be able to monitor future changes. Anthropogenic influences on the site's features were also recorded.	Assesses extent and condition of intertidal sediments in the Drigg Coast SAC to provide a baseline to assess whether there is a difference in the condition of particular attributes over time and where subject to differing pressures. The survey identifies, where relevant, anthropogenic influences impacting on features.	N/A

No.	Project Name	Project Description	Links to SIPs	Links to Theme Plans
IPENS 022	Ribble and Alt Estuary SPA. Intertidal sediment condition monitoring	An intertidal survey was commissioned for sections of the Ribble and Alt Estuaries Special Protection Area (SPA), in order to gather data on the distribution and extent of sediment types and faunal communities within the intertidal flats, and to record any anthropogenic pressures observed which could potentially impact on features within the intertidal zones. Data gathered will provide evidence for assessing changes within the site and should be used to monitor future changes.	Provides an assessment of whether there is a difference in the condition of particular attibutes over time and where subject to differing pressures. The survey identifies, where relevant, anthropogenic influences impacting on features.	N/A
IPENS 023	Wetland Natura 2000. Norfolk Valley Fens SAC The Broads SAC	Baseline survey to map location of features and management interventions.	Provide evidence to inform condition and management requirements	N/A
IPENS 024	Breckland SAC Norfolk Valley Fens SAC	Baseline survey to map location of features and management interventions.	Provide evidence to inform condition and management requirements	N/A
IPENS 025	Exe Estuary SPA. Predicting the mussel food requirements of oystercatchers in the Exe Estuary	This project assesses the mussel food requirements of oystercatcher in the Exe Estuary SPA. The overwintering oystercatcher population of the Exe Estuary has been well-studied, and the birds are known to feed predominantly upon mussels in intertidal areas. There have been recent declines in the population size of oystercatcher in the Exe Estuary, the reasons for which are unknown. The project developed an individual-based model to predict the food requirements of oystercatchers; and whether there is / could be any effect on oystercatcher survival of the current / potential future ways of managing the mussel fishery on the Exe Estuary.	Within the Exe Dawlish SIP the project provides evidence for mussel food requirements for Oystercatchers. Informs Actions around regulation work for fishery operations and management requirements for managing fisheries in a sustainable way.	N/A
IPENS 026	The Wash and North Norfolk Coast SAC saltmarsh surveys	A National Vegetation Classification (NVC) survey of the North Norfolk Coast to provide evidence for assessing changes within the site and to be able to monitor future changes. Details on management, habitat quality, and issues currently impacting on, or with the potential to impact on features were recorded.	Provides an up-to-date map of saltmarsh plant communities within the SAC and identify any issues impacting on the site, such as trampling, rabbit grazing.	N/A

No.	Project Name	Project Description	Links to SIPs	Links to Theme Plans
IPENS 027	The Wash & North Norfolk Coast SAC saltmarsh surveys	A National Vegetation Classification (NVC) survey of The Wash to provide evidence for assessing changes within the site and to be able to monitor future changes. Details on management, habitat quality, and issues currently impacting on, or with the potential to impact on features were recorded.	Provides an up-to-date map of saltmarsh plant communities within the SAC and identify evidence of management / grazing / pollution / landward constraints and drainage.	N/A
IPENS 030	Berwickshire and North Northumberland SAC Impact of potting activity	This project adds to the evidence base by investigating the long-term impacts of parlour potting on epibenthos and habitat within the Berwickshire & North Northumberland Coast European Marine Site	Explores the relationship between the intensity of potting activity effects on biotopes / substrates at selected sites within the SAC, mainly focused on the sublittoral rocky reef features with the aim to inform fisheries management on the site.	May have wider applications to other sites where similar activities are taking place. May feed into Coastal recreation and disturbance Theme Plan
IPENS 031	Berwickshire and North Northumberland Coast SAC Intertidal rocky reeds survey	A survey of the littoral reefs within the Berwickshire and North Northumberland Coast SAC to provide evidence for assessing changes within the site and to be able to monitor future changes. Details on issues currently impacting on, or with the potential to impact on features were recorded.	Provides up-to-date data on the intertidal rocky reefs and to identify potential changes which may be linked to climate change or other impacts.	N/A
IPENS 032	An investigation into the nutrient levels of Breckland SAC fluctuating meres	Following aquatic and terrestrial surveys in 2011 elevated nutrient levels were detected in some of the Breckland meres. Nutrient enrichment is widely acknowledged to be the most significant pressure affecting lakes in England. This study was commissioned to assess the scale of the nutrient problem and possible causes, and to put forward management options for resolving the issue. As variations in nutrient levels within the meres may simply form part of the natural cycle, a further outcome from the study was to gain a better understanding of how the system functions.	Assesses elevated nutrient levels and informs possible management options. In addition gain a better understanding of the natural variations in nutrient levels within the meres.	N/A

No.	Project Name	Project Description	Links to SIPs	Links to Theme Plans
IPENS 034	River Mease SAC Diffuse Water Pollution source identification and Phosphate bio-availability	Project investigates sediment sources and pathways in the River Mease SAC and its tributaries, in terms of broad land-use types. This includes catchment walkover to identify specific source locations, and assessment of bioavailability of Phosphate within the sediment. Recommendations for impact mitigation; land management actions; and further investigations and surveys were noted.	Provides evidence regarding water pollution source identification and phosphate bio-availability in the River Mease SAC. Informs recommendations for impact mitigation; land management actions; and further investigations and surveys.	N/A
IPENS 035	North East Kent (Thanet Coast SAC) Distribution of selected non-native species within the intertidal zone	This project monitors the distribution of non-native species within the intertidal zone and records the impact on native species and habitats. The work included the monitoring of established Pacific oyster transects, and well as monitoring the interaction between this species with common mussels and *Sabellaria spinulosa*. The project also reviewed a one-year Pacific oyster control trial and assessed the feasibility of controlling wild Pacific oysters at selected locations within the inter-tidal zones using volunteer labour.	Provides distribution and recruitment data for pacific oysters and other invasive species within Thanet Coast SAC, which informs where monitoring / management efforts need to be focused for future years. Assesses feasibility of control methods.	N/A
IPENS 038	Deben Estuary SPA	A National Vegetation Classification (NVC) survey was commissioned for Deben Estuary Special Protection Area (SPA) to provide evidence for assessing changes within the site and to be able to monitor future changes. Details on existing management regimes were noted in order to assess whether current management is appropriate.	Provides evidence to inform condition and identify / confirm threats for Deben Estuary SPA	N/A
IPENS 039	Minsmere-Walberswick Heaths And Marshes SAC	A National Vegetation Classification (NVC) survey was commissioned for part of Minsmere-Walberswick Heaths and Marshes Special Areas of Conservation (SAC) and Minsmere-Walberswick Special Protection Area (SPA). The survey, covering SSSI units 35, 107 and 108, aimed to provide evidence for assessing changes within the site and to be able to monitor future changes. Details on existing management regimes were noted in order to assess whether current management is appropriate.	Provide evidence to inform condition and identify / confirm threats for Minsmere to Walberswick Heaths and Marshes	N/A

No.	Project Name	Project Description	Links to SIPs	Links to Theme Plans
IPENS 041	*Spartina anglica* and its management in estuarine Natura 2000 sites: an update of its status and monitoring future change in England	This project aims to improve the understanding of the role of *S.anglica* and potential negative or positive impacts on other intertidal Annex I habitats or their sub-features. It focuses on assessing the current extent of *S.anglica* in different Natura 2000 sites where it is thought to be either expanding, dying back, undergoing conservation or amenity management, or where it appears to be stable.	Provides site specific information of estimates of the extent and distribution of *Spartina anglica* across Natura 2000 sites within England.	Inappropriate Coastal Management Theme Plan. Provides an understanding of the role of Spartina and under what circumstances its presence may pose a risk to the achievement of favourable condition for other features of Natura 2000 sites. Also provides updated guidance on monitoring and the types and appropriateness of management measures.
IPENS 042	The extent of vegetation burning in the English uplands Natura 2000 sites	The assessment of the extent of rotational burning of vegetation in the English uplands to inform decision making following Evidence Review of burning on blanket bog.	Provide up-to-date data of extent of rotational burning for upland Natura 2000 sites.	N/A
IPENS 043	The intensity of rotational burning in the North Pennines Natura sites	Identifying in detail, the extent of rotational burning of habitats in the North Pennines.	Provide up-to-date data of extent of rotational burning for SIPs covering the North Pennines	N/A
IPENS 044	Eco-hydrological characterisation and investigation of hydrological function and impacts on Norfolk Valley Fen SAC	The purpose of this project is to review existing information, identify pressures and threats, recommend critical short-term management actions (eg drain in-filling), identify where further investigation is required, and consider the longer-term actions necessary to sustain the wetland features in the long-term, such as boundary extension and linking of existing sites.	For Norfolk Valley Fen, it provides a review of existing information; identifies pressures and threats; recommends management actions and identifies further investigations required to sustain the wetland feature in the long-term.	Links with Hydrological Functioning Theme Plan. Report is In line with the theme plan approach.

No.	Project Name	Project Description	Links to SIPs	Links to Theme Plans
IPENS 045	Vulnerability of freshwater Natura 2000 sites to invasion from invasive non-native species	This project looks at the vulnerability of protected sites to the introduction, establishment and spread of invasive non-native species (INNS) and (potential) impact on site condition and develops a decision making tool to identify priority actions to safeguard and improve freshwater designated sites threatened or currently affected by INNS.	The database created can be used to identify potential transmission routes and known distribution of high risk species for all N2K sites where invasive species are recorded as an issue.	Informs Invasives theme plan. Looks at the vulnerability of protected sites to the introduction, establishment and spread of INNS and (potential) impact on site condition and develops a decision making tool to identify priority actions to safeguard and improve freshwater designated sites threatened or currently affected by INNS
IPENS 046	Understanding the impacts of invasive non-natives species (INNS) on protected sites	The aims of this project were to:	Provide up-to-date data of extent of rotational burning for SIPs covering the North Pennines	N/A
IPENS 047	Investigating changes to bird populations on the Humber Estuary SPA	There is increasing evidence suggesting that populations of many of the nationally and internationally important wintering and passage bird species within the Humber Estuary Special Protection Area (SPA) are in decline. With a few exceptions, the reasons for these declines are not clear cut. The Humber Estuary Bird Decline project was commissioned to bring together findings from a wide range of studies to identify drivers of waterbird population change on the Humber Estuary, where possible, and to make recommendations about measures that could be taken to halt or reverse these trends.	Provides up-to-date data for Humber Estuary SPA and should be used to inform management requirements on the site.	May have wider applications for other coastal sites by identifying drivers of waterbird population change, and to make recommendations about measures that could be taken to halt or reverse these trends. Feeds into the Public access / disturbance theme plan.

No.	Project Name	Project Description	Links to SIPs	Links to Theme Plans
IPENS 048	Investigating changes to bird populations on The Wash SPA	There is evidence suggesting that populations of several species of concern within The Wash Special Protection Area (SPA) are in decline. With a few exceptions, the reasons for these declines are not clear cut. This project was commissioned to bring together findings from a wide range of studies to identify drivers of waterbird population change on The Wash, where possible, and to make recommendations about measures that could be taken to halt or reverse these trends.	Provides up-to-date data for The Wash SPA and should be used to inform management requirements on the site.	May have wider applications for other coastal sites by identifying drivers of waterbird population change, and to make recommendations about measures that could be taken to halt or reverse these trends. Feeds into the Public access / disturbance theme plan.
IPENS 049	Natura 2000 site categorisation for nitrogen measures	The project aimed to evaluate a draft framework for source allocation of atmospheric N pollution and to assess how a more detailed source attribution can contribute to better targeting of measures. The application of this more detailed approach to different types of case study sites under this project aims to give insight into the detail needed for appropriate targeting of measures.	Will provide site specific information for Natura 2000 sites covered by the case studies	Informs the content of the Atmospheric nitrogen Theme Plan. Tests part of the approach developed within the Theme Plan.
IPENS 050	Case studies for effective delivery of nitrogen measures on Natura 2000 sites	Atmospheric nitrogen deposition is considered a key threat to Natura 2000 sites and to the reaching of biodiversity objectives. Ammonia (NH_3) emissions from agriculture can represent a significant local source of atmospheric nitrogen for protected sites, and encouraging changes in local agricultural practices could lead to substantial reductions in N deposition at these sites. However, there is currently no delivery mechanism specifically aimed at encouraging those changes in the vicinity of Natura 2000 sites. Catchment Sensitive Farming (CSF) represents a potential delivery mechanism for the targeted identification and implementation of mitigation measures aimed at reducing atmospheric nitrogen deposition at Natura 2000 sites, in tandem with efforts for water quality. The aim of this project was to assess the suitability of the CSF approach as a delivery mechanism for potential NH_3 abatement measures, by investigating its potential at four case study Natura 2000 sites.	Will provide site specific information for Natura 2000 sites covered by the case studies	Inform the content of the Atmospheric nitrogen Theme Plan. Tests part of the approach developed within the Theme Plan.

No.	Project Name	Project Description	Links to SIPs	Links to Theme Plans
IPENS 051	A desk-based study to consolidate existing data and literature to help inform the conservation status of Annex II features (migratory fish species) within the Severn Estuary river catchment	In an effort to clarify the nature and location of existing data concerning the migratory fish of the Estuary, this project was commissioned to undertake an extensive a data collation exercise of all available quantitative and qualitative information, to inform future condition assessments. The study also contains an up to date literature review of the ecology and distribution of the three fish species in the River Severn catchment, a discussion of the attributes used to monitor them, threats and pressures on them and suggestions of management measures and monitoring methods.	Will provide site specific information for Natura 2000 sites covered by the case studies	Informs the content of the Atmospheric nitrogen Theme Plan. Tests part of the approach developed within the Theme Plan.
IPENS 052	Bowland Fells Lesser black-backed gull survey 2014	Repeat of last year's survey to provide up to date population trend data to provide evidence on the need to introduce reductions or temporary moratoria on culling in order to achieve favourable condition.	An up-to-date census to provide population trend data which will inform management requirements for Bowland Fells SPA	N/A
IPENS 053	River Mease SAC Road Runoff. Bioavailability of metals and water quality	This project looked at assessment of the impact of road networks on the ecological integrity of the River Mease through establisting a baseline of a suite of metals entering the River Mease channel above and below the main A42 crossing point with the river at Packington, and establishing the bioavailability of metals in these baseline samples.	Provides evidence on the impact of the road networks on the River Mease in order to inform management measures.	N/A
IPENS 054	A desk-based study to determine the condition of and feasibility of management measures for Annex II features (migratory fish species) within the Tamar river catchment	This project was commissioned to appraise the options to improve the passage of Allis shad over Gunnislake Weir on the Tamar Estuary. The study reviews the different options to improve passage over the weir, make recommendations on practicality and likely success of these options and providing costings and steps to progress the preferred option.	Provides details for actions required to improve the passage of Allis shad over Gunnislake Weir on the Tamar Estuary.	N/A

No.	Project Name	Project Description	Links to SIPs	Links to Theme Plans
IPENS 055	Burning in the English Uplands	This report covers IPENS 042 and 043 and has two objectives. The first is to provide a summary of the history of rotational burning in the English uplands going back 60 – 70 years. This is to help provide historical context from data on the intensity and scale of rotational burning since World War 2 which can then be compared with rotational burning as is currently practised. The second objective is to interpret the GIS products from the work and place them in a form that can be readily understood by the non-specialist reader.	Provide evidence relating to scale of rotational burning for SIPs covering the English uplands	N/A
IPENS 058	Crayfish survey (Peak District Dales SAC)	A crayfish survey on the upper River Dove, which falls within the Peak District Dales Special Area of Conservation (SAC), was commissioned in order to confirm presence of white-clawed crayfish, a notified feature of the SAC, following crayfish plague outbreaks in 2005 and 2008, which were believed to be 100% fatal.	Feed into the peak district dales SIPs for issues relating to white-clawed crayfish, including management recommendations. (survey was recorded as an Action in the SIP)	N/A
IPENS 060	Border mires 1 - long term monitoring tool	This project looked at designing a long-term, repeatable monitoring tool for Border Mires through designing a Bog Quality Index. This uses a robust, repeatable methodology that will allow long term trends in habitat change to be statistically monitored by all partner organisations and future graduate studies in a comparable way. The methodology has wider implications for the monitoring of other blanket / intermediate mire sites.	Provides a tool to enable long-term repeatable monitoring of the site.	N/A
IPENS 061	*Vertigo moulinsiana* surveys on SAC sites	Assessment of *Vertigo moulinsiana* to further strengthen the case for action, based on the observed (in many cases) declines. Will bring together previous reports to seek to demonstrate the scale, nature and extent of observed declines of the species so that the remedies are clearer about the problem they are addressing. It should, for example, more accurately influence the water level monitoring models if losses from particular areas of sites have been noted.	Inform the current status of V. moulinsiana for Stodmarsh SAC; The Broads SAC; Waveney and Little Ouse Valley Fens SAC; and the River Avon SAC. Also includes management recommendations where appropriate.	N/A

No.	Project Name	Project Description	Links to SIPs	Links to Theme Plans
IPENS 063	GCN project	This project looks to: 1. Compile examples of best practise site management and issue handling in relation to great crested newts to inform management on the SAC series. 2. To understand the barriers to implementation of best practise and identify solutions to inform management on the SAC series. 3. Assess the status of great crested newts in the New Forest SAC with predictive mapping and the use of remote sensing data.	Provides best practice guidance for all SIPs with GCNs as a feature. Also provides up-to-date data for the New Forest SAC.	N/A
IPENS 065	Ensor Pool SAC Crayfish Survey	The aim of this project is to determine presence and provide an indication of the size and health status of the white-clawed crayfish *Austropotamobius pallipes* population in Ensor's Pool SAC	Provides up-to-date data for white-clawed crayfish in Ensor's Pool.	N/A
IPENS 066	North York Moors Merlin project: An analysis of changes in moorland management	This project looks to investigate a potential link between changes in moorland management, particularly rotational burning of vegetation and changes in the distribution of nesting pairs of Merlin within the North York Moors SPA.	Will provide evidence as to the impact of changes in moorland management on Merlins within the North York Moors. Will be used to inform future research / monitoring requirements.	N/A
IPENS 067	Mapping catchment boundaries for N2K sites with Diffuse Water Pollution (DWP) plans	This project is to review and produce where needed accurate surface water catchment boundaries for SSSIs underpinning 38 N2K sites which currently have DWP issues. 1. Review the current surface water catchment boundaries and determine which are accurate and which need to be further modified to ensure they are accurate. 2. For those which are not considered accurate, produce an accurate surface water catchment for that designated site.	Provides accurate surface water catchment mapping for a number of SIPs which have DWP as an issue.	N/A
IPENS 070	Border mires 2 - mapping active ditches	To map remaining active drains within specific mires within the Border Mires, in order to inform future ground works as soon as funds become available within any of the Border Mires deliver partner organisations.	Provides up-to-date mapping of remaining active ditches within Border Mires. Informs actions required to restore mire hydrology.	Links to Hydrological Functioning Theme Plan where it is included as an example approach.

No.	Project Name	Project Description	Links to SIPs	Links to Theme Plans
IPENS 071	Water quality catchment assessment	The water quality model SAGIS has recently been used to help understand the relative importance of different sources of phosphate to N2K catchments. This has been based upon discharges operating at their permit limits rather than at the volumes they are currently discharging. This project will run the SAGIS model for a select 10 catchments using MCERTS discharge monitoring data to allow us to identify where utilisation of permit headroom through growth presents a significant risk to water quality.	Provides data about water quality risks for a number of sites.	N/A
IPENS 072	Border Mires 3 - priority habitat mapping	Baseline vegetation maps were commissioned for 4 priority mires within the SAC complex in order to identify the extents of pristine, degraded and restored interest features. These maps will allow long term monitoring to withstand statistically robust analysis.	Provides up-to-date baseline map for 4 priority mires within the SAC.	N/A
IPENS 073	West midland mosses eco-hydrology investigation (Chartley Moss)	The purpose of the project is to review the ecohydrological status of Chartley Moss through: • review of existing reports • mapping of surface drainage and other hydrological features • any necessary re-development of conceptual model • review of impacts on unmodified state & likely necessary restoration measures to achieve something approaching pre-modification state. • Brief comments on possible side-effects of restoration measures	Provides up-to-date information regarding Chartley Moss. Informs management measures required for restoration work.	Links to Hydrological Functioning Theme Plan where it is included as an example approach.
IPENS 074	Ensor Pool SAC. Crayfish follow up survey	During the winter months, further research to investigate the suitability of Ensor's Pool for White-clawed Crayfish. Examine the feasibility (or not) of a possible re-introduction of white-clawed crayfish to Ensor's pool.	Informs possible options available for management of this site for White-clawed crayfish.	N/A

Annex 3 – List of stakeholders involved in IPENS

This is not an exhaustive list, but illustrative of the cross section of stakeholders who have been involved in the development of the SIPs, theme plans and evidence projects.

SSSI Major Landowners Group (MLG) members:
Crown Estate
Environment Agency
Forest Enterprise
Ministry of Defence
National Parks
National Trust
Natural England
RSPB
Water Companies
Wildlife Trusts
Association of Internal Drainage Boards
Association of British Ports

Marine Protected Areas Conservation Advice Advisory Group members:
Marine Management Organisation (MMO)
Natural Resources Wales
Defra
Association of Inshore Fisheries and Conservation Authorities
Marine Protected Areas Coalition
Seabed Users Development Group
New Under Ten Fishermen's Association
Environment Agency
RSPB
JNCC
Local Government Association
European Marine Site officers
Natural England

Other national stakeholder and / or delivery partners:
Academics (for example from Liverpool University / Sheffield University)
Aggregate Companies
Amphibian & Reptile Conservation trust
Angling Trust
Association of River Trusts
Bat Conservation Trust
British Association for Shooting & Conservation
British Marine Federation (leisure / small commercial)
British Ports Association (ports)
British Trust for Ornithology
Broads Authority
Buglife
Butterfly Conservation
Canal & River Trust
CEFAS
Centre for Ecology and Hydrology
Country Land & Business Association (CLA)
Deer Initiative
Department of Energy & Climate Change (DECC)
European Commission
Fisheries Marine Protected Areas Coalition
Food & Environment Research Agency (FERA)
Forest Research
Government Ministers
Invasive Non Native Species Secretariat
Marine and Coastguard Agency
Moorland Association
National Association of AONBs
National Farmers Union (NFU)
National Sheep Association
NFFO (fisheries)
Northern Ireland Environment Agency (NIEA)
NUTFA (fisheries)
Plantlife
Project Monitor
River Restoration Centre
Royal Yachting Association
Salmon & Trout Association
Scallop Association (fisheries)
Scottish Natural Heritage (SNH)
Shellfish Association GB (fisheries)
Tenant Farmers Association
The Rivers Trust
UK Major Ports Group (ports)
Wildfowl & Wetlands Trust
Wildlife & Countryside LINK
Woodland Trust

Local delivery partners (examples):
European Marine Site relevant authority groups
Management Groups
Local Authorities
Nature Improvement Area Partnerships
Local NGO groups (eg Sea Torbay)
Harbour Authorities
Industry Nature Conservation Association (INCA) – Humber & Tees
Local Nature Partnerships

List of delivery partners recorded in SIPs

Delivery Partner	Number of SIPs in which delivery body is recorded
Natural England	252
Environment Agency	127
Forestry Commission	71
Landowners / Managers	75
Local partnership	55
RSPB	52
National Trust	49
Defra	29
Local Authorities	27
Marine Management Organisation (MMO)	21
Volunteers	19
Ministry of Defence (MoD)	18
Defence Infrastructure Organisation (DIO)	11
Universities	17
Lake District National Park Authority	14
Wildlife Trust(s)	12
Yorkshire Wildlife Trust	12
British Trust for Ornithology (BTO)	11
United Utilities Water Plc	11
Butterfly Conservation	10
Eastern Inshore Fisheries and Conservation Authority (IFCA)	10

Annex 4 – Mechanism directory

This spreadsheet is available from the IPENS publications catalogue:
http://publications.naturalengland.org.uk/category/4878851540779008

Annex 5 – Evidence gap log

This spreadsheet is available from the IPENS publications catalogue:
http://publications.naturalengland.org.uk/category/4878851540779008

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Front cover
Grey seal *Halichoerus grypus*

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