ENGLISH NATURE

Wildlife gain from agri-environment schemes

Recommendations from English Nature's habitat and species specialists

No. 431 - English Nature Research Reports

working today
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English Nature Research Reports

Number 431

Wildlife gain from agri-environment schemes: recommendations from English Nature's habitat and species specialists

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September 2001

ISSN 0967-876X

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Preface

The aim of this report is to provide a source of information about the priorities for England's wildlife habitats and species, and ideas and recommendations for future policy action to increase wildlife gain in the countryside. The information is the opinion of the English Nature's habitat and species specialists. Every effort has been made to provide up-to-date and accurate information. However opinions may change, and the information may become inaccurate over time.

The intention of the report is to stimulate discussion and ideas about priorities for nature conservation effort and about how agri-environment schemes and other policy mechanisms are used and developed to achieve nature conservation goals.

Comments on the report are welcomed. Please contact Christine Reid (Agri-environment Schemes Officer) at English Nature, Peterborough in the first instance.

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Acknowledgements

The information and ideas within this report were compiled (originally by Phil Grice) in discussion with the following specialists at English Nature, to whom a great deal of thanks is owed:

Sue Rees (coastal habitats); Chris Mainstone and Sarah Fowler (freshwater habitats); Richard Jefferson and Heather Robertson (grasslands); Christine Reid (hedgerows, wood-pasture, field margins); Isabel Alonso (lowland heathland); Roger Meade (lowland wetlands); Keith Kirby and Emma Goldberg (woodland and wood-pasture); Mick Rebane and Alistair Crowle (upland habitats); Jonathan Larwood (geology); Andy Brown (upland birds); Phil Grice (wetland and farmland birds); Martin Drake, Roger Key, Dave Sheppherd (invertebrates); Tony Mitchell-Jones (mammals); Jill Sutcliffe, Ron Porley, Carl Borges, Peter Lambley (plants, fungi and lichens); Jim Foster (reptiles and amphibians).

A number of others, including Local Team staff, provided comments and advice, and thanks is also due to them.

Abbreviations used

BAP	Biodiversity Action Plan = UK BAP
BTO	British Trust for Ornithology
cSAC	Candidate Special Area of Conservation
CSS	Countryside Stewardship Scheme
DEFRA	Department of Environment Food and Rural Affairs
DETR	Department for Environment Transport and Regions
ENRR	English Nature Research Report
ESA	Environmentally Sensitive Area
EU	European Union
EU Birds	European Union Birds Directive
EU H&S	European Union Habitats and Species Directive
FC	Forestry Commission
H&S	European Union Habitats and Species Directive
ha	hectare
HAP	Habitat Action Plan (under BAP)
HLF	Heritage Lottery Fund
IACS	Integrated Administration and Control System
JNCC	Joint Nature Conservation Committee
NBN	National Biodiversity Network
NCC	Nature Conservancy Council
NERC	Natural Environment Research Council
NGOs	Non-governmental organisations
PSA	Public Service Agreement
RDS	Rural Development Service
RES	Reserves Enhancement Scheme (English Nature)
RIGS	Regionally Important Geological Site
SAC	Special Area of Conservation
SAP	Species Action Plan (under BAP)
Section 15	Section 15 of the Wildlife and Countryside Act
SPA	Special Area of Conservation
SSSI	Site of Special Scientific Interest
THH	Tomorrow's Heathland Heritage
UK BAP	United Kingdom Biodiversity Action Plan
WES	Wildlife Enhancement Scheme (English Nature)
WLMP	Water Level Management Plan
WGS	Woodland Grant Scheme

Summary of findings

Agri-environment schemes have been developed in close collaboration with English Nature and other partners over the last 15 years. Prescriptions are available to meet the requirements of the majority of habitats and species, although there are significant gaps (for example, reedbed and fen creation, diffuse pollution control, dynamic and ecotone habitats, wildlife friendly options for intensive grassland, geological conservation). The effectiveness of agri-environment schemes is limited in part by their coverage (only about 7% of England's farmers have land within schemes). Increasing the number of farms within schemes is a key issue for all habitats and species - to reduce the effects of habitat fragmentation, stabilise populations of declining species and allow wide-ranging species the opportunity to move through the countryside. This will require many more resources to go into agri-environment schemes (eg to fund a broad and shallow scheme available to all farmers, a scheme which rewards on-going sustainable management, and encourages mixed farming), as well as wider policy reform to reduce the negative impacts of agricultural intensification and specialisation. The relationship between agri-environment schemes, other incentives (eg WES and HLF), other policy mechanisms (eg regulation or market mechanisms) and sectors (eg flood defence) will be key in developing sustainable agricultural systems which meet the needs of England's wildlife and natural features. Whilst this report recognises these wider needs, it's focus is on identifying the gaps in scheme structure and delivery at a more detailed level, with recommendations about how they might be filled. The following table summarises the most significant gaps, with further details of the issues and possible solutions being addressed in the main text.

Table: What are the significant *gaps* in agri-environment schemes and how can they be *filled*?

Feature	prescriptions	payment rates/ uptake	targeting	delivery/ implementation
HABITATS				
Coastal	Need to be flexible to reflect dynamic nature of coastal habitats and uncertainties of sea level rise; need to tackle diffuse pollution feeding into estuaries.	'Intertidal option' - limited uptake	Especially Saline lagoons. Link targeting to EU Marine Sites.	Relationship with Flood and Coastal Defence funds. Encourage applications from groups of farmers around estuaries.
Freshwaters	Need to tackle diffuse pollution as a specific objective of schemes. Encourage options for stream restoration.		Especially at river SSSI/ SAC catchments.	Encourage applications from groups of farmers in priority catchments (need a pilot project).
Geology	Need options to enhance geological/ geomorphological condition and access (physical and educational).		At SSSIs and Regionally Important Geological Sites.	Current advisers could be relatively easily trained in geological issues.
Grasslands	Outcome-based agreements (eg condition/ sward height/ composition) more suitable than prescriptive approach; re-creation options not always appropriate; new measures needed to get wildlife back into intensively managed grassland.	Low uptake of higher ESA tiers has limited wildlife gain; payments for annual and capital items limiting uptake in some areas.	Focus on Grassland Inventory sites (management) and reversing fragmentation of semi-natural resource (re-creation).	Promotion of higher ESA tiers; relationship with HLF/ Grazing Animals Project.
Hedgerows and field margins	Need to refine options to tackle margins in intensive grassland; need conditions which better protect veteran trees; need 2m margins (uncultiv/ unsprayed) round all field boundaries.	Scheme entry condition to manage field boundaries should receive a payment (based on field size); capital payments often too low - regional variation in costs is large.	Better on-farm targeting needed to maximise benefits eg as linking habitats.	Training in hedgerow management and restoration required.

Feature	prescriptions	payment rates/ uptake	targeting	delivery/ implementation
Lowland heathland	Extension of some ESA objectives to include heathland.	Review of management costs needed.	Use Heathland Inventory	Relationship with THH critical (especially funding of long-term management costs).
Lowland wetlands	No options for managing lowland raised bog, or re-creating wetland habitats (except grassland) like fen, bog, reedbed; address diffuse pollution issues.	Low uptake of higher ESA tiers has limited the wildlife gain (biodiversity losses continuing in some areas).	Make existing sites more sustainable by extending them to create fully functioning hydrological units.	Encourage applications from groups of farmers across whole hydrological units (to raise water levels); link to local wetland initiatives and WLMPs.
Uplands	Greater flexibility needed to cope with diverse upland conditions; outcome-based agreements (eg condition/ sward height/ composition) more suitable than prescriptive approach; encourage traditional breeds/ mixed farming.	Poor uptake of higher ESA tiers has limited the wildlife gain (biodiversity losses continuing in some areas); payment rates sometimes prohibitive.	Schemes should not exclude good quality 'maintenance' sites showing little 'enhancement'.	More effort needed to get agreements on Common Land and promote shepherding; link to WGS important.
Wood-pasture	Encourage grazing by traditional breeds/ organic systems.	Make veteran tree surgery payments reflect real costs.	Limited by lack of resource inventory (being compiled).	Active promotion in key areas. Link to 'regional grazing schemes'.
Woodland	Improved prescriptions for scrub management needed.		Integrate wet woodland creation with wetland creation.	Better links to WGS needed. Promote ghyll woodland options.

Feature	prescriptions	payment rates/ uptake	targeting	delivery/ implementation
SPECIES				
Birds - farmland	New measures needed to get wildlife back into intensively managed grassland, and to restore practices associated with more mixed farming. Arable measures available in CSS (2002).	Widespread measures needed across arable and grassland farms - requiring a scheme which is attractive and available to all farmers.	Focus on stabilising existing populations, before trying to expand/ increase range. On-farm options should provide for year-round species requirements.	Need trials to identify best VFM long-term solutions.
Birds - wetland	Reedbed/ fen creation tier essential.	Poor uptake of higher ESA tiers has limited the wildlife gain (biodiversity losses continuing in some areas); payment rates sometimes a barrier.	Make existing sites more sustainable by extending them to create fully functioning hydrological units.	Encourage applications from groups of farmers across whole hydrological units (to raise water levels); link to local wetland initiatives.
Birds - uplands	More flexibility eg in heather burning, scrub management, operations affecting ground nesting birds; introduce in-bye options.	As for upland habitats.	Introduce small areas of arable farming to uplands.	As for upland habitats.
Invertebrates (all)	More options for control of non-native plant species. Opportunities for special projects to meet specific needs of BAP species. Focus on scrub management rather than removal. Lengthen ditch clearance cycles.	Increase veteran tree, pond creation/ restoration rates.	Farm scale targeting important (micro-habitats often critical eg aspect, drainage, deadwood etc). Cliff-top arable reversion and pond restoration to create clusters important.	Improved advice available to farmers on special requirements to maximise benefits of options. Targeting at particular species can be a good way to sell scheme.
Mammals	Measures to reduce diffuse pollution would benefit otters. Options encouraging mixed farming (eg arable in pasture dominated areas and vice versa) will benefit brown hare.		Farm scale and landscape scale targeting important - bigger more useful blocks of habitat.	Targeting at particular species can be a good way to sell scheme eg greater horseshoe bat project. More active promotion of beneficial prescriptions in key areas needed.

Feature	prescriptions	payment rates/ uptake	targeting	delivery/ implementation
Plants and fungi	Importance of micro-habitats and 'ecotones' between habitats needs more emphasis. Create no-spray zones round trees to benefit lichens.		Location of options is critical as plants must find suitable habitat by chance.	Species specific on-farm advice on location/ implementation of standard options will help key plants.
Reptiles and amphibians	Need measures which reduce diffuse pollution. Option to create sand exposures in heathland.	Pond creation and restoration increase payment.	On-/ between- farm targeting to create networks between wetland and other semi-natural habitat.	Improved advice available to farmers on special requirements to maximise benefits of options.

Introduction

The significant increase in funding for agri-environment schemes in England over the seven years of the England Rural Development Programme (2000-2007) (particularly in Countryside Stewardship and Organic Farming Scheme funding[1]), provides a distinct opportunity to increase the contribution of these schemes to the delivery of our conservation targets for priority habitats and species. The information contained within this report represents a step towards developing English Nature's vision for the countryside and how it might be delivered. This will help generate and support our advice to DEFRA on the future development of the Agri-environment programme, in particular the major mid-term review of the schemes due in 2003, and wider goals for further CAP reform.

Our targets and objectives for the conservation of wildlife:

- government obligations under the **EU Habitats and Species Directive and the Birds Directive** (including designation of, and restoration to favourable condition, sites of European importance; and ensuring the 'favourable conservation status' - throughout the countryside - of those habitats listed in the directive. This includes obligations, for example, to increase connectivity between habitat fragments. 75% of our SSSIs are designated as 'European sites' ie SPAs or SACs).

- **DEFRA Public Service Agreement targets -** following the government's Comprehensive Spending Review 2000, DEFRA have eight Public Service Agreement (PSA) targets, which include:

  - **Farmland birds**: to reverse the long-term decline in the number of farmland birds by 2020, as measured annually against underlying trends; and
  - **SSSIs**: to achieve favourable (or recovering) condition on 95% of SSSIs, by area, by 2010.

- **UK Biodiversity Action Plan** targets;

- **EU wide strategies and commitments** like the EC Sustainable Development Strategy, the EU Biodiversity Strategy; the Water Framework Directive and the Nitrates Directive.

In essence, these targets necessitate:

- improved management of existing semi-natural habitats - like grassland, heathland wetland and woodland;

- the creation or restoration of semi-natural habitats, to replace past losses;

- reducing intensity of farming practice on non semi-natural habitats (eg arable land and pasture, field boundaries and disturbed ground), and encouraging sustainable farming

[1]Countryside Stewardship Scheme received £29M in 1999 which will increase progressively to £126M by 2006/7. Organic Farming Scheme received £7M in 1999, increasing to £23M in 2006/7. Source: England Rural Development Programme.

systems. This will increase the viability of semi-natural habitats and designated nature conservation sites (through buffering sites and providing habitat corridors for species to move through), and provide for those wild species now associated with managed farmland (like arable flowers, farmland birds etc).

In order to maximise gains for biodiversity in the countryside, English Nature needs to develop a clear idea of the role that agri-environment schemes have in the conservation of priority habitats and species; in particular, we need to consider how best to target the still limited funds available through the schemes, given the other resources currently and potentially available for habitat/species conservation in England (including English Nature's Wildlife Enhancement Scheme, Species Recovery Programme, EU funding like 'LIFE', Heritage Lottery Funding etc), and other policy mechanisms which could be used to achieve similar outcomes. Such targeting needs to operate at several scales (national, regional, Natural Area, catchment, farm etc) and be based on both national policy frameworks (eg UK BAP targets) and our knowledge and experience of the science and practice of nature conservation; the latter is derived from the many research and land and species management projects with which English Nature and its partners are involved (eg through Species Recovery Programme, National Nature Reserve, Wildlife Enhancement Schemes, current Agri-environment schemes etc) at both a national and local level.

Wider benefits

Wildlife gain in the countryside will, in many circumstances, contribute to the achievement of other Government objectives as well. For example, restoration of hedgerows and creation of wildlife rich field margins could improve landscapes and increase countryside access; measures to address diffuse pollution could help reduce drinking water clean up costs; skills needed for nature conservation tasks could help provide rural employment.

Outputs

There are three key outputs presented in this report:

1. ***An information source on the future development of agri-environment schemes to facilitate the delivery of conservation targets for priority habitats and species***

For each habitat or species, summary information has been collected on the:

- key conservation priorities/targets;
- the current state of the resource;
- major issues affecting the resource;
- current contribution of Agri-environment schemes to the delivery of conservation targets;
- potential future role of Agri-environment schemes and other current and potential conservation mechanisms

2. ***Proposals for 'special projects' (eg which might be 'special projects' under the Countryside Stewardship Scheme, or trial Wildlife Enhancement Schemes etc) that could:***

   - Deliver targets for geographically-limited species or habitats for which current conservation mechanisms are not delivering;
   - Facilitate visionary habitat creation projects to meet HAP targets (eg wetland and grassland creation); or
   - use novel approaches to land management in the countryside (eg restoration of habitats associated with low-intensity mixed farming).

3. ***Ideas to help define English Nature's vision for the countryside.***

Further work

Targeting

Ideas about where to target Agri-environment schemes geographically have been touched on within this report, but not in a comprehensive and consistent way. Work on improving the geographical targeting of schemes will be important in making decisions about allocation of agri-environment funding, as well as getting the right scheme in the right place. Information sources like the National Biodiversity Network will be critical here. Local and national BAP groups also have a role in establishing priorities.

Costings

Costing of the action required by Agri-environment schemes to meet their contribution to nature conservation targets is also desirable, but has not systematically been included in this exercise. Costing the contribution that Agri-environment schemes should make in delivering nature conservation targets would assist with:

- Deciding on the division of spend (targeting) between different environmental elements (eg grassland versus woodland, semi-natural versus intensively-farmed countryside) within the planned Agri-environment programme resource levels; and
- Making the case for additional resources for the Agri-environment programme or other initiatives which seek to deliver the conservation of priority habitats and species (eg application of cross-compliance/voluntary codes on farmland and additional resources for English Nature's Wildlife Enhancement Scheme or land purchase).

Local experience

Experience and knowledge from those working at a local and regional level (for example local BAP groups), will be critical in completing the picture presented here. In particular we would welcome ideas about the following:

- local and regional priorities for targeted action (especially mapped data);

- assessment of relative importance of priorities;
- key regional and local habitat or species issues to be addressed, and how best to do it;
- current successful or unsuccessful agri-environment scheme projects, and why;
- ideas for the potential development of agri-environment schemes.

Habitats

Development of Agri-environment schemes for

Coastal habitats

Priorities and targets determined by:

UK BAP: Priority coastal habitats are: (the priority species associated with, and recorded using (), these habitats are also given)

Maritime cliff and slope	36(59) priority species
Coastal sand dunes	27(56) priority species
Coastal vegetated shingle	9(16) priority species
Coastal saltmarsh	9(16) priority species

The Coastal HAP Co-ordination Group manages HAPs for these habitats.

Saline Lagoons 11(12) priority species.
This HAP is managed by the Saline Lagoon Working Group.

Littoral and sub-littoral chalk (no information on species)
Littoral and sub-littoral chalk has some issues in common with cliff habitats and is covered by UK Marine BAP Group.

Generic HAP targets are:

1. Prevent further net loss
2. Offset losses due to coastal squeeze by habitat creation/re-creation
3. Prevent further damage/loss from anthropogenic factors
4. Offset predicted losses to rising sea level
5. Restore habitat quality, including restoration from agriculture or forestry
6. Restore and maintain water quality
7. Maintain and restore dynamic coastal processes

EU H&S: Annex I habitats-15 occur in England.
Annex II species-petalwort and shore dock are exclusively associated with coastal habitats, a number of other species can occur e.g. great crested newt.

EU Birds: There are 45 SPAs which have a coastal element, often part of a larger complex with terrestrial habitats.
Ramsar sites can overlap with SPAs and cSACs.

PSA target for SSSIs. Many coastal SSSIs are also of importance for their Earth Heritage interest.

The policies of DEFRA and the Environment Agency on water resource management, coastal defence/coast protection, recreation and water quality are also major drivers. Port and harbour interests are also a key influence. EU Water Framework Directive may have an influence on estuaries and open coast.

State of the resource:

- A series of coastal directories covers the whole of the UK, which provides a useful summary of the state of the maritime resource (coastal and marine features). (*Coasts and Seas of the UK, JNCC)*

- A significant extent of the English coast (including estuaries) is covered by conservation designations. SSSIs can be complexes of habitats. Number of SSSIs with Maritime Cliff and slope-86; sand dunes and shingle-75; saltmarsh-58; earth science interest-204

- Inventories of saltmarsh, shingle and sand dunes are available, need some updating but information still relevant. National data on maritime cliff habitats needs to be collated.

- ENRR 317 provides an 'Overview of coastal sand dunes, saltmarsh and vegetated shingle by Natural Area'.

- An Environment Agency-funded study in Essex has demonstrated that over the last 25 years, 1000ha of saltmarsh has been lost, mainly as a result of 'coastal squeeze' (see Issues, below). Data is also available for Suffolk. Other areas are also being covered by similar studies (N Kent, Solent) being funded jointly by English Nature and the Environment Agency.

- 'Shoreline Management Plans' (SMPs), produced by Coastal Authorities using guidance from DEFRA, have the potential to deliver sustainable coastal defence. New guidance on SMPs is being produced by DEFRA in 2001 which has a greater BAP focus. SMPs will be reviewed from 2002 onwards.

- Coastal dynamic processes are a vital factor in sustaining the interest of coastal habitats and biodiversity. The amount and rate of actual change is not fully understood, often leading to a 'preservationist' attitude. There is a joint English Nature/EA/DEFRA/NERC/ LIFE Nature funded project that will help to develop an approach to dealing with coastal change and coastal defence needs in complexes of Natura 2000 sites. This is due to be completed in 2003, the results will inform SMPs.

- Agricultural management of some coastal habitats is an important factor in maintaining some habitat attributes important for birds.

Key Issues:

1. 'Coastal Squeeze'-combined effects of sea level rise, maintenance of hard defences and pressure from development leads to progressive and sometimes irreversible habitat loss and damage. Demand for coastal defence is likely to increase as many sea walls are now >50 years old and will require maintenance in the near future. Other potentially damaging activities include development, agricultural reclamation and improvement, military training, aggregate extraction and forestry.

2. Policies for shoreline management.

3. Habitat management issues e.g. appropriate grazing of saltmarsh and sand dunes for nature conservation.

4. Ensuring that dynamic coastal processes are operating and that a 'sediment cell' approach is taken rather than a piecemeal approach. ('Sediment cells' are lengths of coast that are relatively self-contained as far as the movement of sediment (sand or shingle) is concerned).

5. Opportunities for habitat creation are constrained by policy and funding and require a number of consents and licences, including planning permission, land drainage consent, FEPA licence, consent form foreshore landowner (usually the Crown Estates), consent for works that may interfere with navigation, consent from English Nature if in/near designated site, footpath diversion order etc. In areas where there are freshwater SPAs to landward, there will be a need to ensure any schemes are compliant with the Habitats Regulations.

6. Public perception is a key factor-often seen as 'giving in' to coastal erosion. Recent media coverage of cliff falls etc has raised the profile.

7. Sustainable management of recreational activities- some habitats such as shingle are very fragile, cleaning of beaches by mechanical means can cause damage to embryo dunes and strandlines.

8. Pollution and eutrophication, including diffuse pollution.

9. Any intertidal habitat in a European Marine Site will be covered by English Nature Regulation 33 advice to Relevant Authorities and should be incorporated into Management Schemes which can be developed under Regulation 34 of the Habitats Regulations.

Current contribution of Agri-environment schemes:

- ESAs –coastal habitats are not covered by any current ESA, although there are ESAs, which include grazing marshes, that are protected by sea defence structures.

- Habitats Scheme (long-term set aside) closed in 1999, but the sites that did enter the scheme will run for 20 years. This involves conversion of arable land to saltmarsh. (This is likely to be a permanent change).

- The CSS Intertidal option covers re-creation of intertidal habitats. There has been limited uptake of the intertidal option; the contribution this option is making to HAP targets is therefore small. It is likely that land-owning NGOs will be most interested in this option - there are some possibilities in Essex, Suffolk and with National Trust.

- For cliff habitats, there are a number of sites already entered into CSS; to increase the applications may need more encouragement from DEFRA/others or modifications to prescriptions/payments. Current cliff top management prescriptions appear to be suitable.

Potential development of Agri-environment schemes:

Prescriptions/ guidance

- Habitat management guidance and prescriptions need to reflect the dynamic characteristics of coastal habitats. Therefore need to develop prescriptions to allow for dynamic changes in distribution of habitats, do not penalise those in scheme if this occurs as a result of natural processes. Long-term changes will occur in newly created habitats-for saltmarsh this may continue over 10+ years.

- *Saline lagoon* management handbook is due to be produced in 2001; this will include targeting strategic areas for habitat creation and management guidance for existing and created habitats.

- Grazing regimes for saltmarsh need to be flexible to allow better management for particular interests e.g. breeding redshank, and integrated with the needs of designated features.

- Develop prescriptions/ incentives to encourage the management and restoration of landward transitional dune habitats.

- Provide guidance on non-intervention practices.

- Ensure that schemes for coastal grazing marsh have a strategy for dealing with climate change and sea level rise and the likely impact on coastal defences.

- Take more account of regional variation in habitats in prescriptions.

Targeting

- Many of the water quality issues identified in English Nature's Regulation 33 advice for European Marine Sites relate to diffuse pollution e.g. run-off from agricultural land, agri-environment schemes could be targeted to areas that drain into coastal waters e.g. near The Fleet lagoon in Dorset.

- Target grassland creation around coastal areas for feeding /roosting waterfowl, but ensure that consideration is given in designing such projects to dynamic coastal processes.

- Promote cliff top grassland restoration on arable land to include reduction of fertiliser use, to avoid eutrophication of seepage into cliff slopes

- Link targeting with development of Management Schemes for European Marine Sites.

Administration

- There is a need to clearly set out the relationship between Countryside Stewardship work and Flood and Coastal Defence work and funding arrangements. Payment levels for Stewardship are likely to be a key factor in limiting uptake.

Special projects: target schemes at groups of farmers (landscape scale) in river/ estuary catchments to control diffuse pollution entering coastal habitats. May require new prescriptions - see Freshwaters form.

Key issues for vision:

- Coastal processes operating naturally (as a general philosophy - not always possible); and natural change accepted (vegetation succession, erosion, accretion etc) as part of the fundamental interest of coastal habitats.

- No exotic species (e.g. removal of Corsican pine in sand dunes).

- Habitat fragmentation reversed and whole functioning systems e.g. estuary scale, restored.

Development of Agri-environment schemes for

Freshwaters

***Priorities and targets determined by*:**

UK BAP: Priority habitats are: (priority species associated with, and recorded using (), the habitat are also given)

Mesotrophic lakes	12 (32) priority species
Eutrophic standing waters	9 (28) priority species
Aquifer fed naturally occurring water bodies	2 (9) priority species, (Restricted to Norfolk Brecklands in England)

These HAPs are taken forward by the Lakes HAP umbrella group, led by the Environment Agency.

Chalk rivers 4 (12) priority species
Environment Agency lead this HAP group.

Generic HAP targets:

1. Maintain characteristic plant and animal communities.

2. Improved management of special sites, especially with respect to water quality and quantity.

3. Habitat restoration; includes taking action to restore 'tier 2' eutrophic standing waters by 2005, restoring all aquifer fed naturally fluctuating water bodies which have been damaged by human activity by 2010, and implement action to address nutrient-enrichment in polluted mesotrophic lakes by 2010.

'Terrestrial' wetland habitats (fens, bogs, reedbeds, grazing marsh) covered by separate form.

EU H&S: Annex I habitats include (with number of proposed SACs) *Ranunculus* beds in rivers (6), natural eutrophic/mesotrophic-oligotrophic lakes (10) and hard oligotrophic lakes with *Chara* spp.(7).

Annex II includes high profile species such as Atlantic Salmon, Allis and Twaite Shad, lampreys and Pearl Mussel.

EU Birds: Three large reservoir SPAs (Abberton Reservoir, Chew Valley Lake and Rutland Water) and two gravel pit/reservoir complexes are pSPAs (Lee Valley and South-west London Waterbodies); selected for wintering wildfowl populations.

'Freshwater Agenda' (English Nature 1997) sets national context and priorities.

PSA target for SSSIs: eg most river SSSIs and some 60 lake SSSIs are suffering from an excess of phosphorus, which needs to be addressed if they are to return to favourable condition by 2010.

Various EU and national legislation are major drivers (eg waste water treatment directive, 1991 Water Resources Act, 1995 Environment Act, Water Framework Directive), together with policies of Environment Agency and DEFRA (notably on water resource management, flood defence, water quality, fisheries, navigation, recreation etc), and private water companies.

***State of the resource*:**

- SSSIs: 27 rivers (only c. 2.5% of total length of rivers); 83 lakes; 75 gravel pits and reservoir, 67 canals (only 0.5% of the resource which totals some 3,200km).

- Massive, and well documented, changes to England's rivers, streams and natural lakes resulting from human activities include huge habitat loss/degradation and worsening water quality - eg a recent River Habitat Survey found that <10% of sample river lengths on 4500km of rivers and streams in England and Wales were free from structural modification of their channel and banks.

- Loss and degradation of natural freshwater habitats have been in part compensated, in terms of extent, by massive increase in man-made freshwater habitats, notably canals, drainage channels, flooded mineral extraction pits and reservoirs. Many of these man-made habitats have some nature conservation interest but it is often different to natural habitats and typically of lower quality. Relict species of high nature conservation interest sometimes survive in these man made habitats, eg canal vegetation communities that are characteristic of natural lakes but no longer occur in the natural habitats due to habitat loss and poor water quality.

- 'Freshwater wetlands in England: a Natural Areas approach' (ENRR 204, Gardiner 1996) sets the context and priorities for freshwater habitats and species by Natural Area.

***Key issues*:**

1. Pollution, nutrient enrichment and siltation, especially diffuse pollution (including soil erosion and agro-chemical input) from agricultural sources.

2. Water abstraction from both surface and ground waters (for agriculture, industrial and domestic use).

3. Continued habitat loss and modification (to development, river channelisation etc).

4. Non-native species.

5. Management of fisheries, navigation and recreation in general.

***Current contribution of Agri-environment schemes*:**

- Reducing impacts of agricultural pollution on water quality is a specified objective of some ESAs (including Upper Thames Tributaries, North Kent Marshes, Test Valley, Avon Valley, Suffolk River Valleys, Clun), and a few prescriptions in CSS. Generally the prescriptions are either for buffer strips alongside water courses or reductions (or maintenance of current levels of) fertiliser applications. These prescriptions will lead to beneficial effects on freshwater quality *in some circumstances*, depending on how they are located and managed (eg buffer strips are ineffective if there is under-drainage and they are not well vegetated), and whether they can address all of the negative impacts operating at any particular site.

- Other prescriptions in both ESAs and CSS, largely aimed at improving *wetland* habitats and species, may sometimes benefit *freshwater quality*. These include wildlife strips, dyke management, ditch restoration, provision of various water control structures, fencing wet margins, coppicing bankside trees and general prescriptions which lower the intensity of land management.

- Organic farming (and therefore Organic Farming Scheme) can have beneficial impacts on water quality - although much will depend on how individual farms are managed.

***Potential development of Agri-environment schemes*:**

Diffuse pollution

- Agri-environment schemes need to have existing beneficial prescriptions targeted more effectively, and new prescriptions aimed specifically at tackling issues associated with diffuse pollution.

- Current joint research (English Nature and Environment Agency) is looking at management needed to reduce diffuse pollution and the different mechanisms that could deliver it. The research will trial different 'prescriptions' and make recommendations for those which would be feasible under agri-environment schemes. (Reporting 2002).

- Some of the ideas to be trialed include - nutrient management planning, re-siting field gates and blocking under-drainage (pollution pathways), different cropping patterns and crop tillage, stocking rates on pasture, rates of fertiliser application.

- Progress on tackling the widespread diffuse pollution of freshwaters from agricultural sources will depend on joined up solutions, using a range of policy measures, which are implemented at a catchment scale. Agri-environment schemes need to be linked with other measures (like cross-compliance, quality assurance schemes, nutrient budgeting and catchment management planning), in order to successfully contribute to combatting diffuse pollution and achieving favourable condition on freshwater sites.

Flood plain management/ restoration

- Low input farmland management could be encouraged, through agri-environment schemes, in flood alleviation projects (upstream of urban areas). This would help improve ecological water quality at a catchment scale. Other flood plain restoration projects should also have a water quality element.

Stream restoration

- Extend principles and practice of river restoration (Environment Agency responsibility) to streams (owner/occupier's responsibility)through agri-environment prescriptions, eg reinstate meanders, pool and riffles (ie reverse channelisation process), and integrate management of stream with field management; best guidance available is still *Rivers and Wildlife Handbook* (RSPB) and *Management of Drainage Channels* (NCC).

- These approaches should be targeted/trialed on river SSSIs.

***Special projects*:**

- Pilot local projects on the above; river restoration/catchment initiatives already set-up in some areas, eg Severn (contact Ledbury office), Wensum (Norfolk), Coquet (Northumberland). Diffuse pollution pilots should follow the ongoing research programme by English Nature/EA/DEFRA.

Key issues for vision: see before and after diagrams available from the R. Cole (Wiltshire) restoration project.

Development of Agri-environment schemes for

Geology

Background:

Geology is a key part of our environmental resource, it is central to understanding our changing world: the evolution of climate, environment and life are all locked in our geological history. Today our geological resource characterises our landscape, controls habitat diversity and the subsequent richness of biodiversity. Geology provides an intimate link between man and his environment, as a controlling factor for traditional agriculture, industrial development and the local built environment.

England's geology is among the most diverse in the world and has been central to the development of geological science. Today our geological resource remains central to the continued development of geological science and research, and is both an educational and recreational resource requiring sustained long-term access.

Priorities and targets determined by:

PSA targets for SSSIs: In England there are 1,450 SSSIs with a designated geological interest.

RIGS: Achieve sustained favourable condition for the expanding network of Regionally Important Geological/Geomorphological Sites (RIGS).

- Need to promote and raise awareness of geology as an important and underpinning environmental resource.
- Need to establish inclusive rural policies with clear policy targets for geological resources.

The EU Habitats and Species Directive, the EU Birds Directive and the UK Biodiversity Action Plan do not, directly, have targets or objectives associated with geology.

State of the resource:

The geological resource typically includes disused (and possibly active) quarries and pits, road cuttings, temporary exposures, coastal foreshore and cliff exposures, natural river exposures and upland exposures. Also included are 'green field' sites where a geological resource is know to be present but is normally not exposed (typically under a field).

Geomorphological features will include sensitive landscape features and natural processes.

Maps of geological SSSIs and RIGS are available.

The condition of the resource is currently not known - English Nature monitoring will provide a basic indication of the state of the geological SSSI resource.

Key issues:

1. Neglect - geological sites become overgrown and concealed by vegetation and scree.

2. Rubbish - disused quarries used for disposal of farm waste.

3. Development - development permanently concealing geological sections and features. Removal of sensitive landscape features.

4. Pollution - pollution of natural systems such as caves, pollution of hydrological systems.

5. General lack of awareness of value of geological resource and the need for conservation measures.

6. Lack of clear policy.

Current contribution of Agri-environment schemes:

Not known - likely to be negligible.

English Nature has developed and runs the 'Facelift' scheme, which provides payments for restorative work to achieve favourable condition on geological SSSIs.

Potential development of Agri-environment schemes:

There is a need for:

- Prescriptions designed to enhance geological and geomorphological sites (SSSIs and RIGS in particular) achieving favourable condition, eg scrub clearance, clearance of scree, removal of rubbish.

- Prescriptions designed to achieve long-term positive management of geological geomorphological sites, eg continued management of vegetation and scree build-up.

- Improved access to geological and geomorphological sites, eg construction of access paths, use of fencing to demarcate sites.

- Improved awareness of our geological resource and strengthened support for its conservation, eg provision for educational access (guided tours), interpretation signs, leaflets and trail guides.

Development of Agri-environment schemes for

Grasslands

***Priorities and targets determined by*:**

UK BAP: Enclosed, semi-natural grassland resource covered by 6 priority habitats (priority species primarily associated with and recorded using this habitat are also given):

Lowland dry acid grassland (LD)	16 (30) priority species
Lowland calcareous grassland (LC)	46 (66) priority species
Lowland meadows (LM)	1 (14) priority species
Upland hay meadows (UM)	0 (5) priority species
Purple moor grass and rush pastures (PM)	10 (15) priority species

Coastal and floodplain grazing marsh (GM) - covered by 'Wetlands' form.

HAPs for first 5 priority habitats are managed by an umbrella group led by Countryside Council for Wales. Generic HAP targets are:

1. Arrest depletion of resource.

2. Within SSSIs, initiate rehabilitation management for all significant stands of semi-natural grassland by 2005, achieving favourable conservation status by 2010 (ie PSA target for SSSIs).

3. Outside SSSIs, secure favourable condition of 30% of resource by 2005 and approach 100% of resource by 2015.

4. Attempt to re-establish 500ha of LD, 1000ha of LC, 500ha of LM and 50ha of UM in the UK by 2010, and 500ha of PM in the UK by 2005.

EU H&S: 4 Annex I habitats (35 cSACs selected for grassland habitats; a further 45 sites selected for other habitats or species (eg marsh fritillary) also contain Annex I grassland habitats)

EU Birds: 3 SPAs have been identified for lowland dry grassland birds (notably the Stone Curlew); Salisbury Plain, Porton Down and Breckland (the former two are already designated, the latter proposed).

***State of the resource*:**

- Semi-natural grasslands are amongst our most threatened habitats; the main threat is posed by changes in agricultural management, which is ironic given that these habitats were originally created by agricultural activities.

- Much of the *intensively managed* grassland resource (eg in dairy farming areas) is of very little benefit to wildlife and contributes to the fragmentation and ecological isolation of the remaining semi-natural grasslands.

- Reasonable knowledge of extent and distribution of the semi-natural resource thanks to Nature Conservancy Council/ English Nature's Phase II surveys and county-based inventories; total extent of 5 BAP priority habitats in England is estimated to be 61,000ha, representing 43% of UK resource. Little information on national trends or condition but little doubt that all semi-natural grasslands have suffered substantial declines since 1945; estimated 97% loss of resource between 1930 and 1984. Extent and trends of individual habitats as follows:

- *Lowland dry acid grassland*: guesstimated to be 15,000-22,000ha remaining in England, represents 58% of UK resource; little data on trends. 271 SSSIs (approximately 8,000 ha) primarily notified for lowland acid grassland; 36% of visited SSSIs are in unfavourable condition.

- *Lowland calcareous grassland*: <40,000ha remain in England (following estimated 20% loss in area between 1966 and 1980, though considerable losses pre-dated this), of which some 25,000ha occurs as pure stands, the remainder in mosaics. High coverage within SSSI series; 23,000-26,000ha of resource in 509 SSSIs; 26% of visited SSSIs are in unfavourable condition.

- *Lowland meadows*: 5000-10,000ha of species-rich neutral grassland remain in England (including 1500ha of unimproved flood meadows); represents 50% of UK total. Extremely rare and fragmented habitat with recorded losses continuing at 2-10% pa in some parts of England (eg Worcestershire and Dorset). 466 SSSIs primarily notified for neutral grassland, but a total of 771 SSSIs contain habitat. SSSI units are typically small (mean 6ha) with 28% of visited SSSIs in unfavourable condition.

- *Upland hay meadows*: <1000ha remain in England, all in northern England, representing 91% of UK resource; no data on trends. 500-1000ha occur within 75 SSSIs; 18% of visited SSSIs were in unfavourable condition.

- *Purple moor grass and rush pasture*: <11,000ha remain, largely in south-west England, including Culm Measures and Dartmoor; other important areas include Somerset Levels and East Anglia. Estimated 92% loss in Devon and Cornwall since 1900, with 62% of sites (48% of area) of Culm grasslands lost between 1984 and 1991. In Devon and Cornwall, 27 sites containing 1100ha of the resource are notified as SSSI; 28% of visited SSSIs are in unfavourable condition.

***Key issues*:** Generic across habitat types:

1. Re-seeding or ploughing-up of permanent pasture and meadows (whilst habitat loss due to ploughing-up is now a much reduced threat, there have been a few notable, high-profile cases in recent years, eg Clayton to Offham Escarpment SSSI).

2. Application of inorganic fertilizers and organic manures, including farm yard manure (Farm Yard Manure - research in progress on most sympathetic application regimes - a 6 year program begun in 1999).

3. Lack of management in areas with arable-dominated farming systems (mainly due to problems of stock availability) leading, for example, to scrub encroachment on downland sites, fragmentation and isolation.

4. Changes in the timing, intensity and duration of cutting and livestock (including equines) grazing regimes.

5. Changes in hydrology, most notably falling water-levels (caused by both on- and off-site factors, such as gravel extraction).

6. Habitat creation/restoration is a priority to reduce effects of fragmentation, by linking and buffering existing sites, leading to more ecologically sustainable units which are more viable to manage.

***Current contribution of Agri-environment schemes*:**

- A very high proportion of grassland SSSIs are subject to Section 15/WES/Reserves Enhancement Scheme, ESA or CSS agreements.

- No gaps in coverage for semi-natural grassland types; prescriptions and management guidelines have been much-refined over the years (following English Nature advice) and are generally good.

- Key constraints to progress have been:

  1. lack of resources available for new CSS agreements;

  (ii). lack of wildlife gain achieved by 'Tier 1' prescriptions of ESAs (which tend to maintain status-quo rather than improve management), and lack of uptake of higher tiers;

  (iii) efficacy of current re-creation tiers (uptake, targeting, seed mixes etc).

***Potential development of Agri-environment schemes*:**

- *Targeting*: securing the management of the best sites (without current agreements) is a high priority. Agri-environment schemes should, in priority order:

  (i) Target new CSS/ESA agreements on sites included in the grassland inventories.

  (ii) Target habitat creation/restoration projects so that existing semi-natural sites are linked or extended, and existing sites are made more sustainable (ie reverse fragmentation and increase resource).

(iii) Restore mixed farming systems by recreating grassland habitats in arable-dominated areas; this has benefits for remaining semi-natural grassland in such areas (eg by increasing stock availability, restoring grazing/cutting infrastructure/culture etc.) as well for general farmland biodiversity. Care should be taken not to lose low intensity arable land of high biodiversity interest when creating new grassland habitat (eg South Downs experience).

- *Review payments* for annual management and capital items (eg fencing, water supply); evidence from some areas that payments rates are far too low to be attractive, eg Lancashire meadows. Greater uptake of higher tiers within ESAs should be encouraged by higher payments and more promotion.

- *Objective-led agreements* (eg specified condition, sward height), rather than prescription based could lead to more wildlife gain.

- *Single-objective applications* should be considered in certain high priority situations, notably small, highly vulnerable hay meadows.

- *Relationship with Heritage Lottery Fund:* HLF can support projects aimed at protecting, enhancing or improving the natural heritage provided there is some form of public access. English Nature has been developing a Grassland Framework jointly with HLF. This will provide guidance for applicants seeking funds for locally focussed grassland projects which aim to secure the sustainable management of important grasslands. HLF will provide resources for local project officers, promotional material and capital items, and Agri-environment schemes are seen as an important long-term land management mechanism. Project officers will seek to establish machinery and grazing networks to facilitate management of existing and newly-created/restored sites.

- *Special/ trial projects*: Less need as action for grasslands is required pretty much everywhere (widely distributed/dispersed habitats). There is, however, a clear need for extra promotion of certain grassland types in certain areas, for example, habitat restoration and creation along the chalk scarps (Chilterns, Wessex, North and South Downs) and on the Culm Grasslands, North Devon.

***Key issues for vision*:** Key features are:

- presence of the necessary infrastructure to maintain species-rich grasslands in the farming landscape (ie low-intensity agricultural systems);

- landscape mosaics in which grazing animals can range over a variety of habitats, thereby meeting their nutritional requirements (a possible constraint in poor grassland types);

- grazing animal systems that do not rely on high inputs, ie low-intensity cattle and sheep systems (Nb. Some organic systems, in their present form, may not be the complete answer as, for example, slurry can be just as damaging as inorganic fertilizers);

- restoration of hay-making as opposed to silage production;
- reinstatement of grazing on neglected grassland sites (eg downland);
- scrub management that meets the needs of both the grassland and the scrub habitats (eg combination of rotational cutting and grazing); and
- general reversal of fragmentation of grassland habitats, especially in arable-dominated areas, though extension and linkage of existing sites.

Development of Agri-environment schemes for

Hedgerows and field margins

***Priorities and targets determined by*:**

UK BAP: *Ancient and/or species-rich hedgerows* are a priority habitat (DEFRA is lead partner). 5 priority species primarily associated with habitat but many more regularly recorded in it (36); includes high profile species such as bats, dormouse and farmland birds.

Targets are to halt *net* loss of any ancient/species-rich hedgerows by 2005, achieve favourable management of 50% of resource by 2005 and maintain overall numbers of hedgerow trees at county/district level.

Cereal Field Margins are a priority habitat (DEFRA leads), largely identified for their importance to arable plants, farmland birds and invertebrates. 12 priority species are primarily associated with this habitat, and a further 32 have been recorded using it.

Targets are to maintain, improve and restore the biodiversity of 15,000 ha of cereal field margins in the UK by 2010.

Wet ditches, dykes and rhynes can also be very important for wildlife - issues and priorities associated with them are identified in the Lowland Wetlands chapter of this report.

EU H&S: Articles 3 and 10 provide strong support for the protection of field boundaries particularly where they improve the ecological coherence of our landscape.

Hedgerow Regulations 1997 prevent the removal of 'important' hedgerows. This regulation, in its current form, protects only 20 to 30% of hedgerows. A group, convened to review the regulations, has made recommendations to increase their effectiveness, but they have yet to be acted on.

There is little representation of hedgerows or field margins within the SSSI series; some are included incidentally as part of ecological/farm management units.

***State of the resource*:**

C There is no national inventory of hedgerows. Estimated 329,000km of hedgerow remained in England in 1993 of which some 40-50% may be ancient and/or species-rich (possibly higher); southern England and especially the south-west, are particularly important in a UK context.

- Huge loss in hedgerow resource since 1945; *net* loss in England estimated at 21% between 1984 and 1990 through combination of neglect and removal. Most recent data from 'Countryside Survey 2000' show that rates of hedge planting are similar to the '80's and '90's, but that rates of removal are significantly less. The survey also shows there has been up to 8% loss of hedgerow trees in some regions, 3% loss overall since 1990.

- Hedgerows are often the most species-rich feature of the farmed landscape; 600 plant species, 1500 insects, 65 birds and 20 mammals have been recorded living or feeding in hedgerows. They can fulfil vital connectivity function in landscapes with fragmented semi-natural habitats, and are a key constituent of farmland habitat mosaics.

- Estimated 400,000km of cereal field edge in the UK, but it is not known how much of this is in sensitive management. In England, 6,400 ha of arable land is under agri-environment agreement (including area of stubbles/spring cereals/undersowing, cereal field margins, conservation headlands and wildflower seed mix) which represents only around 1% of the total take-up of ESAs and CSS and only 0.03% of all arable farmland in England.

- State of resource inextricably linked to socio-economic and cultural factors; including hedgerow use/lack of use for stock control, farmer/public perceptions (including strong landscape lobby) and policy/regulatory frameworks (Agri-environment schemes and Hedgerow Regulations).

***Key issues*:**

1. Hedgerow loss, largely due to hedgerows no longer being a necessary part of the agricultural system. Loss of hedgerow trees, even where hedges remain, is also of concern.

2. Inappropriate hedgerow management, which takes several forms including:

    - neglect; leads to relict, dysfunctional hedges/tree lines which are then more likely to be removed;

    - cutting regimes (especially flailing); wrong time of year and too often;

    - pesticides/fertilizer application to hedge base; changes vegetation structure and composition;

    - ploughing too close to hedge; destroys roots of hedgerow trees and shrubs.

    Associated habitat (eg ditches, banks) are also often inappropriately managed.

3. Field margin biodiversity affected by intensification of agriculture; especially the increase in agrochemical inputs, changes to cropping patterns and the timing of agricultural operations (notably the reduction in spring cultivation), and increased mechanisation.

4. Restoration and re-creation - hedgerows affected by loss of traditional hedge management skills (laying).

5. Integration of hedge and field margin management.

6. IACS registration - the recently agreed EU rule that field boundaries greater than 3m wide (from their centre) cannot be included as part of the field area eligible for IACS claims may give some farmers an incentive to reduce them to less than 3m wide. It is not known how many boundaries this might affect.

***Current contribution of Agri-environment schemes*:**

- Agri-environment schemes, especially CSS, are the main incentive mechanism delivering hedgerow restoration and creation; 3,161km of hedgerows were restored by CSS between 1991 and 1994. National Park Authorities also provide incentives.

- Field boundary management is a condition of entry into agri-environment schemes, however there is no additional payment for this on-going management, which can be a significant cost, thus disadvantages those farmers who have a lot of field boundaries.

- CSS and ESAs have options to create uncropped field margins, alongside conservation headlands. There are also options for grass margins. The newly introduced arable options in CSS include low input spring sown cereals and other options which will benefit field margin biodiversity.

***Potential development of Agri-environment schemes*:**

Improved targeting and training would increase effectiveness of current schemes:

- improved on-farm targeting needed to promote integration of hedgerow management/creation with that for field margins (in both arable and pasture) and veteran trees (management and replacement);

- national/local targeting needed to benefit high priority species - the Greater Horseshoe bat project in Devon has been successful in focussing existing CSS prescriptions towards delivering habitat in the right place for the GHB;

- improved training of farmers in hedgerow management and restoration skills;

- improve links with local initiatives, typically county-based (eg Devon).

Encourage connectivity between existing hedgerows and semi-natural habitats through application process (ie more points for connectivity). *Payment rates*. The payment rate for hedgerow planting in CSS is worth on average only 57% of the total cost (although as it is a national rate, the % of costs covered will vary between regions). For hedgerow restoration the figure is 62%. In some areas these rates may not be enough to encourage farmers to plant and restore hedgerows. Hedgerows should benefit from an increase in area of organic systems due to the minimal use of inorganic fertiliser and pesticides. C *Special projects*: none needed
Key issues for *vision*: see woodland form

Proposed modifications to current CSS payments and management guidelines:

1. Consider introducing payment rates for hedgerow restoration and creation, which better reflect the costs associated with the different types of hedgerows.

2. Consider a payment to help with costs of hedgerow management for agreement holders with a high proportion of hedgerows and hedgerow trees.

3. It should be a condition on agreements holders that they should not plough beneath the canopy of hedgerow or other farmland trees.

4. Ensure grass margins are not located on field margins important for arable plants.

Development of Agri-environment schemes for

Lowland heathland

***Priorities and targets determined by*:**

UK BAP: *Lowland Heathland* is a priority habitat (English Nature is the lead partner; targets are to maintain, and improve by management all existing heathland, and create a further 5400ha in England by 2005).
57 priority species primarily associated with lowland heathland, and 79 have been recorded using it.

EU H&S: 5 Annex I habitats (around 50 cSACs).

EU Birds: 9 SPAs contain lowland heathland (designated for Nightjar, Woodlark, Dartford Warbler and Stone Curlew).

PSA target for SSSIs: 26% of heathland SSSIs are in unfavourable stabilised or declining condition.

***State of the resource*:**

- Good knowledge of resource thanks to English Nature/RSPB inventory; based on SSSI rather than heathland units but estimates will be refined through National Biodiversity Network database. Current 'official' English estimate is 32,000ha (some 55% of UK resource) though latest figures from ENSIS suggest that it is nearer 40,000ha. England supports >9% of the total European resource.

- Rare and threatened habitat; over 80% loss in England since 1800. Losses continue; heathland area in Dorset fell by 552ha (to 7373ha) between 1987 and 1996 but at same time, the number of heathland patches increased from 142 to 151 due to fragmentation.

- 268 SSSIs contain lowland heathland; 26% are in unfavourable maintained or declining condition.

***Key issues*:**

1. Lack of management, especially low-intensity stock grazing (lies outside modern farming systems).

2. Restoration (improve condition of existing habitat by controlling invasive and exotic species, eg birch, pine, bracken, rhododendron, Gaultheria or shallon).

3. Re-creation (re-establish heathland on land currently managed for agriculture or forestry).

4. Loss of heathland and fragmentation of remaining sites to built development (mainly houses and roads and mineral extractions.

5. Nutrient enrichment, particularly by nitrogen, mainly due to atmospheric deposition and also to intensive agricultural practices.

6. Management of forestry plantations for key remnant heathland species.

***Current contribution of Agri-environment schemes*:**

- Current key mechanisms are ESAs (Breckland, West Penwith, Exmoor, Blackdown Hills), CSS. [Also *Tomorrows Heathland Heritage* (THH) programme funded through the Heritage Lottery fund, and SSSI/WES].
- ESA agreement are currently only granted when grazing can be guaranteed, but in some cases grazing is not an option (terrain, livestock availability).
- By 1999 CSS had funded restoration work on 12,000ha of heathland.
- THH currently makes biggest contribution to meeting conservation targets; will spend £14m (+ nearly £12m from partners) on heathland restoration and re-creation over 5 years from 1998.
- A key constraint is that MoD, who own/manage much of the remaining resource, are not currently eligible for CSS.

***Potential development of Agri-environment schemes*:**

- Future relationship between THH and CSS is crucial in determining ability to achieve improved management of existing heathland blocks and targets for habitat creation.
- THH will ensure progress towards HAP targets for restoration and re-creation (by 2000, it had funded nearly 40% of the re-creation and more than 70% of the restoration targets). However, funding will not extend beyond 2002, and CSS is the obvious mechanism to secure long-term management of restored and newly-created areas.
- Map on English Nature's heathland position statement shows Natural Areas that should be targeted nationally for heathland management and re-creation; note, CSS resources are needed for viable projects in both the high priority areas and in other areas for which lowland heathland is a key feature, even outside the key heathland counties.
- Heathland Inventory maps and country re-creation plans can be used for targeting at the local level.
- *Suffolk River Valleys ESA* could be extended to include heathland in the Suffolk Sandlings. This area has an excellent heathland resource but the ESA is presently limited to the fen, grazing marsh and river valley habitats.
- *Special projects*: Trial of the effects of grazing under different circumstances (different livestock breeds, stocking rates, heathland types), backed up by R&D. A literature review of effects is due to be completed 2001.

Key issues for vision:

Before: Small patches of heathland encroached by scrub and exotic species, leggy gorse, extensive bracken cover and old heather stands.

After: Larger heathland blocks (existing ones linked/extended), predominantly covered by ericaceous species in a variety of growth stages, within a mosaic with the occasional tree, bare ground and gorse stands. This should be maintained by light summer grazing, preferably with traditional breeds of cattle, sheep and ponies.

Proposed modifications to current CSS payments and management guidelines:

1. Review annual management costs for existing heathland; the current £20/ha is based on English Nature's review of early 1990s (ENRR 101, 1994). Work is currently underway to give more details of real current costs of heathland management through liaison with THH project officers.

2. LH1: add the need to control problem weeds (eg ragwort, nettles and thistles) to the management measures needed.

3. LH2: specified bird nesting season should be extended to include Nightjar, ie until end of August.

4. LH2: should specify that rotational burning is not always necessary and it should be undertaken no more often than once in every 10 years (depends on site and growth stage of heaths and gorse; in others it could be once every 15 years).

5. LH3: consider the best method and options (or combination) for the sites when re-creating heathland; spreading of heather cuttings (6-10 tonnes/ha), capsules (5kg/ha) or seeds (c.0.1 kg/ha). Rotovate to expose seedbank.

6. Could add in a general section to the management guidance on the control of weeds (using techniques developed by the Forum for the application of conservation techniques (FACT), eg mechanical weedwipes etc).

Development of Agri-environment schemes for

Lowland wetlands

***Priorities and targets determined by*:**

UK BAP: Priority habitats and associated priority species (recorded priority species given in brackets) are:

Fens	26 (45) priority species
Coastal and floodplain grazing marsh	18 (28) priority species
Lowland raised bogs	4 (12) priority species
Reedbeds	3 (11) priority species

These wetland habitats are covered by an English Nature-led umbrella group.

Generic HAP targets:

(1) Identify and rehabilitate key sites.

(2) Secure long-term management of key sites.

(3) Create new habitats (UK figures); including 2500 ha of grazing marsh by 2000 and 1200 ha of reedbeds (in blocks of at least 20 ha) by 2010, and identify and initiate a programme of improved/ restorative management on lowland raised bogs by 2005.

Freshwater habitats (running and still waters) are covered by a separate form.

EU H&S: Annex I habitats include (with number of proposed SACs) active raised bogs (4), degraded raised bogs (5), transition mires and quaking bogs (8), alkaline fens (5), calcareous fens (3) and *Molinia* meadows (5).

EU Birds: 43 SPAs have been designated, or are proposed, in England for their freshwater wetland bird interest (at least in part). Most are large, composite coastal sites which include both inter-tidal and freshwater habitats (eg North Norfolk Coast); others include river valleys (eg Lower Derwent Valley) and man-made washlands (eg Ouse and Nene Washes).

C Requirements for site protection in Ramsar Convention largely covered by EU Birds and H&S directives.

PSA target for SSSIs.

C The representation within designated sites and 'wise use' of England's raised bogs is currently under review by English Nature. Preliminary estimates identify the need for reversion to undrained wetland habitat on approximately 6000 ha surrounding 22 raised bogs proposed as SACs.

- Also heavily affected (eg through abstraction of aquifers and surface water) by major policy drivers for the management of freshwater environment (national/EU legislation, DEFRA, Environment Agency and private water companies).

- Lowland raised bog priorities are heavily influenced by the policies and practices of the peat extraction industry.

***State of the resource*:**

- Huge loss and degradation of England's wetlands as a result of human activities (mainly agriculture) are well documented, eg the area of fenland habitat in East Anglia fell from an estimated 3380 km² in 1637 to just 10 km² in 1984.

- On the coast, losses have been, in part, compensated for by the flooding of extensive areas by the sea, either to prevent invasion during WWII (eg Leighton Moss in Lancashire) or by accident (eg floods of 1953). However, many of these sites are at risk, in the medium to long-term, from relative sea-level rise.

- 'Freshwater Agenda' (English Nature 1997) sets national context and priorities.

- 'Freshwater wetlands in England: a Natural Areas approach' (ENRR 204, Gardiner 1996) sets the context and priorities for freshwater habitats and species by Natural Area.

- Wetlands are arguably England's richest wildlife habitats, eg over 500 plants can be present on some alkaline fen sites. Many require management to maintain their interest; sensitive grazing, cutting, burning etc. Most of the best sites are SSSIs and many are managed as nature reserves. However, wetlands are very prone to off-site impacts (eg excessive abstraction and pollution) and the fragmented nature of the remaining resource can be a major constraint to effective management, so special sites often require sympathetic management of surrounding land to maintain their interest.

- Good knowledge of resource; all habitats have inventories (Dargie report on wet grassland, reedbed inventory, BogBASE, FenBASE, though latter refers mainly to designated sites).

***Key issues*:**

1. Lowering of water levels due to abstraction and drainage (need wider implementation of Water Level Management Plans).

2. Management issues, ie lack of management of fens and reedbeds, and peat cutting on bogs, maintenance of cattle on grazing marsh.

3. Habitat loss due to relative sea-level rise (as inter-tidal habitat retreats/coast are not defended, abutting freshwater wetlands are 'squeezed' if they cannot also retreat eg due to high land, new defences etc).

4. Pollution, both water and atmospheric (acid rain/nitrogen deposition).

5. Reversing habitat fragmentation through wetland creation.

6. Knowledge of restoration techniques and long-term management of bogs to restore/maintain their interest.

***Current contribution of Agri-environment schemes*:**

- English Nature staff have played a major role in developing and refining ESA and CSS prescriptions for wetland birds (although there are still some gaps in coverage, for example, no creation options for wetland habitats other than grassland). Uptake of appropriate prescriptions remains an obstacle to recovery of wetland biodiversity (see below).

- Lowland wetland habitats are a prominent feature of a significant number of ESAs: Broads, South Downs, Somerset Levels and Moors, Suffolk River Valleys, Test Valley, Avon Valley, Upper Thames Tributaries, North Kent Marshes and Essex Coast.

- Beneficial ESA prescriptions mainly involve the management/restoration/creation of wet grassland (mainly timing and intensity of grazing, management of water levels and fertilizer inputs). Supplements are often available for more beneficial management (eg higher water levels, hay-making, delaying stock grazing etc), with capital payments available for water control structures, fencing etc. A specific tier for the management of fens and reedbeds is available in the Broads ESA

- Within 'wet grassland' ESAs, the vast bulk of the resources goes on lower tier prescriptions which maintain the status quo (usually intensive grassland management) rather than deliver gains for biodiversity. Apart from land owned/managed by VCOs, there has been very little uptake of higher tier prescriptions which deliver wetter grassland, managed at a lower intensity. Therefore, in most cases the ESA has merely preserved the area under intensively managed grassland and encouraged sympathetic management over relatively small areas. This means that biodiversity losses have continued - exemplified by breeding wader surveys in many ESAs where declines have continued on all but the higher tier land (see wetland birds form). ESAs make a negligible contribution to conservation of other lowland wetland habitats like fens and bogs.

- With the exception of bogs, *management* of lowland wetland habitats is well catered for in CSS. The key prescriptions are the water level management option for meadows and pastures (GX), arable reversion (R1), restoring water meadows (P5), buffer and wildlife strips (R5 and R6), reedbeds (R) and fens (F). Capital payments are also available for ditch restoration, fencing and gates, water control structures, scrapes and scrub management. Prescriptions for freshwater habitats are also beneficial.

- CSS has no provision for *managing* lowland raised bogs or *re-creating* wetland habitats other than grassland.

- A key constraint within both ESAs and CSS is that raising water levels requires either that agreements are made across the whole hydrological unit or that individual agreement areas are made into their own hydrological units (ie at field/farm scale). The former can be very difficult to achieve (necessitates that the scheme is 'sold' to several farms) and the latter can be very expensive (bunding, water control structures etc).

- To date, lowland wet grasslands have been the main wetland beneficiary of agri-environment schemes. Fen and bog habitats have mainly been managed through SSSI/WES agreements, whereas reedbed management has mainly been driven by species recovery initiatives for the Bittern (through English Nature's Species Recovery Programme, RSPB and EU Life). Very little wetland *creation* has been funded through agri-environment schemes (some has been funded by English Nature, RSPB, HLF, or through agreements with the peat industry).

***Potential development of Agri-environment schemes*:**

A radical re-think is required if we are to maximise the contribution of agri-environment schemes to the conservation of lowland wetlands in England. The key areas for development are:

- Prescription for management of lowland raised bogs should be introduced into CSS - a proposal is being developed by English Nature.

- Reedbed/fen creation tier/prescription should be introduced into appropriate ESAs and CSS (techniques are now well established).

- Greatly improved incentives, targeting and promotion of higher tiers of wetland management and creation within ESAs and CSS. High priorities are to secure management of sites outside the SSSI series (and so not eligible for WES) and to target habitat restoration and creation in key areas of country (maps available from English Nature), so that existing sites are extended or linked (ie existing sites are made more sustainable - resource is increased and fragmentation reversed).

- Improve links to local wetland initiatives, which can give advice on targeting and action required - 'Wet Fens for the Future' (fens), 'Valuing Wetness' (Humberhead Levels), Meres and Mosses (Shropshire/Cheshire), Severn and Avon Vales (Shropshire, Hereford and Worcester) and Avalon Marshes (Somerset).

- Improve links with Water Level Management Plans, to provide opportunities to raise water levels to help achieve the Plans' objectives.

- Review payments for annual management and capital items, especially higher management and creation/restoration payments - perceived as a barrier to uptake in many areas.

***Special projects*:**

- Trial new prescriptions for management of lowland raised bogs, and creation of reedbed and fen.
- Link with local wetland initiatives to promote agri-environment schemes as delivery mechanisms for wetland management, restoration and creation (could link with trials of new prescriptions).
- Introduce floodplain options within CSS - linked to Catchment Flood Management Plans.

Key issues for vision:

(1) Water management; enough of it, at the right quality.

(2) Restore beneficial agricultural management practices like cropping of natural products (fen, reed, hay), and low intensity grazing (+ some burning).

(3) Habitat restoration/creation; link, extend and buffer existing sites to increase the resource and make semi-natural sites more sustainable and help compensate for losses on the coast due to relative sea-level rise.

(4) More sustainable flood management that works with natural systems.

Development of Agri-environment schemes for:

Upland habitats

***Priorities and targets determined by*:**

UK BAP: Unenclosed habitats above the moorland wall are covered by 3 priority habitats:

Upland heathland (English Nature lead);
Blanket bog (Scottish Natural Heritage lead)*;*
Upland calcareous grassland (Countryside Council for Wales lead).

The above HAPs are managed by an umbrella group which Scottish Natural Heritage lead. Work on an additional priority habitat - *Montane* - is to be started soon.
Juniper scrub is covered under a Species Action Plan..

HAP targets are:

1. Maintain current extent and overall distribution of all three priority habitats.

2. Achieve favourable management of 340,000 hectares of degraded **blanket bog** by 2005, a further 280,000 hectares by 2010, and a further 225,000 hectares by 2015.

3. Achieve favourable management of 75% of **upland calcareous grassland** by 2005.

4. Achieve favourable condition of all **upland heathland** SSSI by 2010, and favourable management of 50% of resource outside SSSI.

5. Initiate pilot to recreate 200 hectares of **upland calcareous grassland** by 2005.

6. Increase **dwarf shrub cover** to at least 25% on 50-100,000 hectares by 2010 and recreate 5000 hectares by 2005 where lost to forestry and agriculture improvements.

EU H&S: 15 Annex 1 habitats

- Northern Atlantic wet heaths with *Erica tetralix*
- European dry heaths
- Alpine and boreal heaths
- Sub-Arctic *Salix* spp. scrub
- Siliceous alpine and boreal grasslands
- Alpine and subalpine calcareous grasslands
- Species-rich *Nardus* grassland, on siliceous substrates in mountain areas

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

- Blanket bogs
- Petrifying springs with tufa formation
- Alpine pioneer formations of the *Caricion bicoloris-atrofuscae*
- Siliceous scree of the montane to snow levels
- Calcareous and calchist screes of the montane to alpine levels
- Calcareous rocky slopes with chasmophytic vegetation
- Siliceous rocky slopes with chasmophytic vegetation

There are 12 proposed and candidate SACs in the uplands representing the above communities and covering some very large areas including the Border Mires, Lake District High Fells, Asby Complex, Morecambe Bay Pavements, Moor House-Upper Teesdale, Ingleborough Complex, The Stiperstones and the Hollies, Exmoor Heaths, Dartmoor, North Pennine Moors, North York Moors and South Pennines.

EU Birds: 4 SPAs selected for upland birds; Bowland Fells, South Pennine Moors, North Pennine Moors & North York Moors (the latter is still under consultation). Key SPA species are breeding raptors and waders. Together, these four sites cover a large proportion of the northern English uplands. See Upland Birds entry for more details.

***State of the resource*:**

Information on the national extent of many upland habitats is dated but a current assessment of the major upland habitats will commence in 2002. More accurate estimates of habitat extent exist for upland calcareous grassland and limestone pavement. Detailed information on the extent of most of the other fragmented vegetation communities is incomplete.

Upland heathland: This habitat is present on an estimated 270,000 ha, large areas of which are registered as common land. 27% of upland heathland in England and Wales was lost between 1947 and 1980, including 36% of Cumbria's heather. It is also estimated that 440,000 ha of land in the uplands of England and Wales now have less than 25% cover of heather. There are 87 SSSIs with upland heathland, the heathland component of these sites covering approximately 179,000 ha. 72% of this area has been assessed as being in unfavourable condition.

Blanket bog: A globally restricted peatland habitat confined to cool, wet, typically oceanic climates. It is, however, one of the most extensive semi-natural habitats in the UK. It includes the EC Habitats Directive priority habitat 'active' blanket bog. England supports some 215,000 ha of peat soil although probably in excess of 10% of this no longer supports blanket bog. There are 51 SSSIs containing in excess of 100,000ha of blanket bog. 60% of this area is in unfavourable condition.

Upland calcareous grassland: It is estimated that there are 10,000ha of upland calcareous grassland in England with the North Pennines and Cumbria being particularly important areas, although few data are available on loss or change to this habitat. In addition there are areas of a more lowland type of calcareous grassland (CG2) within upland Natural Areas, particularly the Peak District. There are 39 SSSIs containing an estimated 7,500ha of CG9 and CG10 upland calcareous grassland, and a further 40 SSSI with other calcareous grassland within Upland Natural Areas.

Montane: The British montane zone is of international significance due to the good representation of Arctic-alpine species and communities at the southern most end of their range and to the presence of local ecotypes. Within England, there are 33 SSSIs with an estimated 26,000 ha of land above 600m, with true montane habitats making up a small proportion of this. The key areas are the North Pennines and the Lake District High Fells which contain a range of alpine and sub-alpine habitats (H13, U10, U13, CG11). Available data shows a decline in quality and quantity of these habitats through overgrazing and trampling (by humans as well as livestock).

Limestone pavement: The area of limestone pavement in England is 2,340 ha, comprising 80% of the UK resource. Limestone pavement has been quarried for garden features and it is estimated that only 3% of the UK resource remains undamaged. The resource in England is confined to the north-west and the Yorkshire Dales with representation in 30 SSSIs.

Acid grassland: This is one of the most extensive semi-natural habitats in the uplands with dwarf shrubs often present as suppressed plants, indicating a fairly recent derivation from dwarf shrub heath. It is unlikely to be specifically notified as a feature of interest in its own right, but can be an important element in the overall assemblage of habitats as part of a mosaic, where it can form an significant foraging resource for birds.

Other habitats: The other upland habitats are both geographically and physically fragmented and restricted within England, but many are of international importance and can form important components of an upland topographic unit. These include a number of rarer grassland types, springs and flushes, screes and rocky slopes. The most important are listed above and form important parts of a number candidate SACs.

***Key issues*:**

- Historic and continuing overgrazing, and lack of shepherding to foster environmentally sustainable grazing.
- Livestock policy reform (in particular the need to move away from headage-based subsidy payments which encourage overstocking).
- Unsuitable supplementary feeding practices.
- Lack of mixed livestock farming (hill cattle) in northern uplands, and lack of traditional breeds suited to the environment.
- Pollution incidents through inappropriate disposal of sheep dip.
- Loss of vegetation structure, creation of short swards and heavy trampling and poaching contributing to increased run-off and flooding incidents downstream.
- Erosion of peat soils through trampling and sheltering by sheep, and contamination of watercourses with run-off from these areas.
- Inappropriate burning regimes of heathland (both dry and wet) and blanket bog.
- Drainage of wet heath, blanket bog and in-bye land.
- Agricultural improvement of upland calcareous grassland & in-bye land including fertiliser use, herbicide application, ploughing and reseeding.
- Physical damage to montane habitats through trampling.
- Over-zealous control of scrub and bracken and a general lack of trees and scrub in upland landscape.

***Current contribution of Agri-environment schemes*:**

- A significant proportion (21%) of the uplands (LFA) is covered by ESAs, with take-up at about half that area (ie c 220,000ha). There are however some major gaps including most of the North Pennines, North York Moors, Cheviots and Bowland Fells.
- Countryside Stewardship Scheme covers the whole of the English uplands (but is not used inside the ESAs). Uptake is around 2.5% of the LFA (ie c 50,000ha). Applications for upland items on land designated as LFA must be accompanied by an upland survey for the whole farm.
- The bulk of the land entered into ESA agreements is in Tier 1 prescriptions which preserve the status-quo. While this may have slowed the decline and prevented further loss of habitats, it has not helped to restore land to favourable condition.

- CSS prescriptions which benefit upland habitats relate to sustainable grazing of in-bye pasture, rough grazing pastures, limestone grassland and heather moorland. Lower stocking rates and temporary stock removals payments are also available to recover areas of suppressed heather moorland. Further prescriptions relate to options to regenerate former moorland; heather burning supplements and commons management supplements.

- One of the main constraints to CSS delivery has been an insufficient budget and lack of promotion, although budgets have increased dramatically recently and will continue to do so in the next few years.

- A difficulty for both ESAs and CSS has been securing applications for upland common land - this is partially due to the resource implications of co-ordinating individual commoners requirements to produce an application for the whole common. The higher payment of £5/ha for these agreements does not appear to be a sufficient incentive.

- Costs of shepherding can be offset through a special project, but this option does not appear to have been sufficiently promoted or taken up to co-ordinate grazing (across single or multiple holdings).

- The low level of outcome monitoring of agri-environment schemes has made it difficult to accurately evaluate effectiveness.

***Potential development of Agri-Environment schemes*:**

- More flexibility in prescriptions (eg for stocking levels/ timings of grazing) which tailors them to local conditions, would mean desired outcomes, like appropriate vegetation structure, are achieved on a larger scale.

- Scrub and bracken should be *managed* rather than controlled (see UPLAND BIRDS for detailed recommendations)

- Upland schemes should include an agreed moor burning plan (where appropriate) as a condition of entry to the scheme. Without such a plan, many of the benefits of the scheme could be lost. The plan should aim to create a mosaic of vegetation structure of different ages (including areas of dry heath that are unburnt or are in longer rotation, and no burning on areas of wet heath or blanket bog).

- Incentives are required for small-scale creation of extensively managed arable/root crop production for bird interest.

- Attractiveness will depend on payment levels and how they relate to stronger production support incentives. Payment rates should better reflect all the real costs of the work required. For example, some ESA Tier 2 payment rates do not provide sufficient incentive for adjustments required to farming systems and the 'hassle factor' of meeting more demanding prescriptions.

- Incentives should be provided for more mixed livestock farming with increased cattle ratio, and encouragement of traditional (environmentally suitable) hill breeds of both cattle and sheep.

- Stronger links with Woodland Grant Scheme should be established, so that new native woodland creation is promoted along with agri-environment schemes.

- In general, there should be greater promotion of habitat diversity within the uplands, with an increase in the proportion of wet areas, unburnt and taller areas of dwarf shrubs, scrub and open woodland within the landscape.

***Special projects*:**

Should remain available within CSS to provide opportunities for innovative land management and environmental initiatives. The use of special projects for activities such as shepherding needs to be promoted. A list of special projects that have been approved in past years should be available to project officers/ partners/ scheme policy makers to consider opportunities for wider applicability.

Key issues for vision:

The most important changes needed for the uplands is a significant reduction in grazing pressure across both enclosed and unenclosed land, and a large increase in the amount of scrub and open woodland. We should also seek to restore small areas of arable/root crop production and ensure that naturally treeless vegetation cover (montane, blanket bog & wind-clipped summit ridges) is subject to no/minimal grazing pressure. Areas of dry heath should be burnt in a sustainable way to allow some areas to become part of a longer burning rotation or excluded form burning rotation.

Development of Agri-environment schemes for

Wood-pasture (including parkland and orchards)

***Priorities and targets determined by*:**

UK BAP: *Lowland wood-pasture and parkland* is priority habitat (English Nature is lead partner; targets are to restore 2500ha by 2010 and initiate expansion of resource by 500ha by 2002)

27 priority species primarily associated with lowland wood-pasture and parkland and many more recorded using it (56); includes some high profile species, notably beetles and lower plants.

Currently no HAP for orchards, although some may be considered within the wood-pasture HAP. Many BAP priority species are associated with the old trees of traditional orchards.

EU H&S: None specific to this habitat, but many examples of Annex I oak and beech woodland have a wood-pasture structure. Some Annex 2 species (eg violet click beetle) are associated with wood-pastures.

PSA target for SSSIs.

***State of the resource*:**

- No reliable figures on extent of resource; HAP suggests 10,000-20,000ha of wood pasture and parkland in UK. English Nature is leading a countryside agencies project to prepare a site database/ inventory. Many sites are private estates so access can be difficult. No figures on condition of resource, yet.
- Most of UK resource is in England; England probably has more ancient trees than any other European country.
- The English Nature-led *Veteran Trees Initiative* has produced reference material, including the, now standard, management text 'Veteran Trees: a guide to good management' (available from English Nature's web site).

***Key issues*:**

1. Conflicting interests to biodiversity; ie landscape, historic features, culture of estate management.
2. Knowledge of resource; information lacking on extent, condition and relative importance of sites.

3. Management issues, including:

   - grazing regimes, which can be too intensive at some sites (high stocking rates, re-seeding, fertilizer application), and abandonment of grazing (leading to scrub encroachment) at others, eg in former commons and Royal Forests such as Epping Forest;
   - tree management; lack of planting of replacement trees and lack of re-pollarding/surgery leading to tree loss and colonisation problems for sedentary species living on trees;
   - vandalism at sites with public access.

4. Development pressures, especially from golf courses and car parks.

5. Complete loss, or agricultural/horticultural development, of old orchards.

***Current contribution of Agri-environment schemes*:**

- Current prescriptions are appropriate but payments rates attached are inadequate; eg tree surgery typically costs £500-£1000 for a complex, large tree but CSS only pays £50 per tree for 'major' works.
- Requirement to have management plan is beneficial, but may be costly if work to be supported is relatively small.
- Woodland Grant Scheme (Woodland Improvement Grant) can be used for some types of work, and provides 50% of costs. The WGS is currently under review.

***Potential development of Agri-environment schemes*:**

- Appropriate CSS targeting is required but hampered by lack of knowledge of resource, which will be improved by site database.
- Proposed bid for HLF funding will require that the relationship between HLF and CSS payments are complimentary; for example, HLF could fund expensive, short-term restoration work (eg tree surgery and plantings) and CSS secure long-term management of sites (cf with lowland heathland).
- Active promotion with owner/occupiers is essential, for example using dedicated project officers to promote uptake of CSS in key areas (eg Wyre Forest, Kent and Welsh Marches for orchards).
- Organic livestock grazing in parklands could have significant benefits, protecting trees and their associated biodiversity (particularly for maintaining fungal and invertebrate interests) from the effects of intensive grassland and veterinary products.

C	***Special projects*:** potential for geographically-limited projects, supported by dedicated project officers, for example using joined up HLF and agri-environment scheme funding approach. Development of 'grazing rings' and 'regional grazing schemes' is being promoted by the Grazing Animals Project, and should be linked to agri-environment scheme funding.
Key issues for *vision*: (see woodland)	

Proposed modifications to current CSS payments and management guidelines:

1. Review of payments rates for major tree surgery (TS2).

Development of Agri-environment schemes for

Woodland

***Priorities and targets determined by*:**

UK BAP: Complete coverage of England's semi-natural woodland and parkland by 5 HAPs:

- Wet woodlands — 12 priority species
- Lowland beech and yew woodland — 7 priority species
- Lowland wood pasture/parkland — 27 priority species
- Upland oakwoods — 11 priority species
- Upland mixed ash woodland — 2 priority species
- Lowland mixed broadleaves — (No figures)

Forestry Commission leads all woodland HAPs - except wood pasture/parkland (led by English Nature and considered on separate form).

No HAP covering scrub habitats, which should however be considered within other HAPs eg grassland.

EU H&S: 8/9 Annex I habitats, mostly concerned with beechwoods, wet woods and upland woods. Also some Annex 2 species.

EU Birds: Woodland occurs in some SPAs but these tend to be designated for heathland birds (eg New Forest, Ashdown Forest, Breckland).

PSA target for SSSIs: c.21% of ancient semi-natural woodland is designated as SSSI.

Forestry Acts and Regulations control felling licences, TPOs and need for impact assessment for planting schemes.

England Forestry Strategy, which incorporates requirements of UK BAP, is major driver of policy.

***State of the resource*:**

- Excellent knowledge of ancient woodland thanks to English Nature's county-based Ancient Woodland Inventory.
- All woodland >2ha has been mapped by Forestry Commission to a level equivalent to *Phase 1*; a GIS-based data set, incorporating English Nature's Ancient Woodland Inventory, will be developed by end 2001.

- Woodland cover is c.7.5% of England's land area (c.986,000ha); c.340,000ha is ancient, ie believed to have been continuously wooded since at least 1600AD, but only some 198,000ha is still semi-natural (the remainder being plantations, mostly established since 1930 and consisting of coniferous trees).

- Of the remaining, 'non-ancient' resource, c.45% is recent plantation and 20% recent semi-natural.

- c.7% loss of ancient woodland between 1930 and 1985. Losses to agriculture have largely stopped, but some evidence of continuing small scale attrition; more obvious threats from road/rail, housing and quarry developments.

***Key issues*:**

1. Creation of new woodland; target for BAP habitats is 2000-3000ha of new broad-leaved woodland pa over the next 10-15 years (larger areas of mixed/conifer woodland will also be planted to meet forestry objectives, and this will have conservation objectives). Conservationists can be unwilling to include woodland within habitat creation schemes.

2. Management of sheep (in uplands) and deer (in lowlands).

3. Habitat fragmentation (many characteristic species are highly sedentary).

4. Introduced species; rhododendron, grey squirrel and pheasant management.

5. Forestry management systems; intensity of management can be inappropriate. Too little management often an issue for farm woods.

***Current contribution of Agri-environment schemes*:**

- The Farm Woodland Premium Scheme for woodland creation on farmland, is funded by DEFRA, is administered by the Forestry Commission through the Woodland Grant Scheme, though it is promoted by Rural Development Service (DEFRA) project officers.

- Management of very small woods (<1ha) can be secured by CSS in the Uplands (UW1) and in ESAs.

- Woodland Grant Scheme gives grants for woodland creation and management.

***Potential development of Agri-environment schemes*:**

Vital to link on-farm advice for WGS and Agri-environment schemes, facilitated by:

- culture change on part of RDS advisors so that woodland is viewed as a valuable part of the farm (though still have WGS run by FC);

- sharing of GIS-based data by RDS and FC; and

- potential use of FC advisor as a broker for agri-environment schemes to promote linkage of wooded habitats (eg along watercourses and field boundaries), though this could be inhibited by current requirement to be whole-farm and multi-objective;

- Also need woodland management training for farmers.

Other potential development opportunities are:

- conversion of upland farmland to woodland/scrub;

- integration of wet woodland within wetland habitat creation schemes (typically, priorities are for open wet habitats but UK BAP target is for creation of 6750ha of wet woodland to be initiated in UK by 2015; half of this by 2010). Narrow strips of riverine woodland should also be promoted in intensive agriculture areas to act as buffer strips (reducing pollution);

- promotion of agri-environment schemes for ghyll woodlands (often very species-rich/important for priority species, eg Black Grouse); agri-environment prescriptions are good but need extra promotion in key areas, ie Cumbria, North Pennines and Peak District;

- Scrub management initiatives - a scrub management handbook is being produced, which could be used to help develop appropriate agri-environment proscriptions.

***Special projects*:** Local projects could trial special promotion of the creation of upland woods/scrub and wet woodland.

***Key issues for vision*:** (apply to all wooded habitats, including hedgerows, scrub and wood-pasture)

- Linkage between woods provided by woodland strips, hedgerows and semi-natural grassland.

- Signs of woodland management, especially high forest management (rides, glades/open areas/clear fells, wood piles etc).

- Veteran trees are restored, maintained and, as necessary, new trees planted/ tended where more veterans will be needed in future (parks, orchards, hedgerows, watercourses etc).

- Scrub is actively managed to promote age/structural diversity as opposed to being neglected and 'bashed'/otherwise controlled.

- Hedgerows and their associated features (ditches, banks, verges and field margins) are managed sympathetically, and new hedges facilitate connectivity between semi-natural habitats (especially woodlands).

- Productive conifer woods are integrated with other elements of the countryside and seen as a positive contribution to the landscape.

Species

Development of Agri-environment schemes for

Birds
(i) Lowland farmland

***Priorities & targets determined by*:**

UK BAP: 9 priority species are wholly or largely dependent on lowland farmland: Grey Partridge, Stone Curlew, Turtle Dove, Skylark, Tree Sparrow, Linnet, Reed Bunting, Cirl Bunting & Corn Bunting. Targets include stabilising populations (short term), increasing range and abundance (long term).

Note: A further 3 farmland species now probably qualify for UK BAP priority status due to 50% declines in the last 25 years: Lapwing, Yellowhammer & House Sparrow.

EU Birds: The following Annex I species make significant use of lowland farmland during the breeding (b) and/or non-breeding (nb) season: Bewick's Swan & Whooper Swans (both nb), Red Kite (b/nb), Marsh Harrier (b), Hen Harrier (nb), Montagu's Harrier (b), Merlin (nb), Peregrine (b/nb), Stone Curlew (b), Golden Plover (nb) & Short-eared Owl (nb). The Brecks pSPA was identified in part for its breeding Stone Curlews, of which c.60% nest on arable land - as a precursor to the SPA designation, an unprecedented 14,000ha of arable land was notified as SSSI in November 2000 (due for confirmation in July 2001).

PSA target for farmland birds:

Government has signalled its commitment to farmland bird conservation by adopting the 'farmland bird index' as a headline biodiversity indicator for both sustainable agriculture and the general *quality of life* in the UK. In addition, following the government's Comprehensive Spending Review 2000, MAFF adopted as one of its eight Public Service Agreement (PSA) targets *to reverse the long-term decline in the number of farmland birds by 2020, as measured annually against underlying trends*. This is now a DEFRA PSA target.

***State of the resource*:**

- The marked decline in farmland bird populations is a pressing issue for UK nature conservation; the issue has received much media coverage and is of genuine concern to the general public who have noticed declines in once common species in the countryside.

- The farmland bird index clearly illustrates the massive declines that have affected the populations of a suite of bird species closely associated with lowland farmland. The index is derived from the trends of 20 relatively common species and between the mid-1970s and 1998, their combined populations declined by some 40% (Figure 1). Annex I summarises the population trends of individual farmland birds in the UK and their status with respect to the UK Biodiversity Action Plan.

- 13 of the 20 species included in the 'farmland bird index' have experienced major declines in abundance since the early 1970s. A further 8 farmland bird species have undergone significant declines.

- 24 farmland birds experienced a contraction in their breeding range between the first and new BTO breeding atlases (ie between the periods 1968-72 and 1988-91); 11 of these underwent declines of more than 10%. In recent years, there have been an increasing number of cases of local extinction in once-common and widespread species, such as the Tree Sparrow and the Corn Bunting, especially in the west of Britain.

- Breeding waders such as in Lapwing, Redshank, Snipe and Curlew have declined massively on both lowland and upland farmland.

- Other species, such as the Cirl Bunting, Stone Curlew, Red-backed Shrike, Black Grouse and Corncrake have become extinct in England or are now confined to a fraction of their former range.

- The BTO's Common Bird Census and breeding atlases provide arguably the best long-term data sets on the population trends (abundance and distribution) of common and widespread birds possessed by any country. This data provides the scientific justification for the high conservation priority now afforded to what are still, in many cases, comparatively common species.

- The plight of farmland birds has prompted considerable research effort in recent years, both in the statutory and voluntary sectors. As a result there is a growing body of evidence linking the declines in farmland birds with changes in farming, in particular, the intensification and specialisation of agricultural practices. No one factor is responsible for the declines in farmland birds. A combination of factors is more likely (probably acting synergistically) and these may differ between species and geographically. The most likely are:

    - *great reduction in the spring sowing of cereal crops and the consequent loss of weedy crop stubbles over winter and bare ground in spring;*
    - *loss of mixed farming due to simplification of crop rotations & regional specialisation;*
    - *more efficient harvesting and storage of crops;*
    - *increased use of pesticides and inorganic fertilizers;*
    - *intensification of grassland management (drainage, re-seeding, fertilization, switch from hay making to silage production and increased stocking rates); and*
    - *loss or degradation of semi-natural/boundary/non-farmed habitats such as field margins, hedges, ponds and scrub.*

- Research has shown that farmland birds are affected by these changes in three main ways: through loss of nesting habitat, loss of food for chicks and loss of food for adults. The result is that farmland birds have less places to breed, produce fewer offspring and survive the winter less well.

***Key issues*:**

1. Lowland agricultural systems continue to intensify (eg development of GM crops).

2. High costs of meeting farmland bird targets due to the need for Agri-environment prescriptions to 'compete' with intensive agriculture, and the large scale of sensitive land management needed.

3. Relative contribution of Agri-environment schemes compared to other policy mechanisms (regulation, cross compliance, assurance schemes including organic etc.) in delivery of targets.

4. Trialing of Agri-environment prescriptions and on-farm targeting requires effective R&D and monitoring programmes to ensure value-for-money.

5. Need for effective on-farm advice on targeting and incorporation of arable prescriptions into farming system.

Unless urgent measures are taken there is every prospect that the farmland bird index will continue to show a downward trend in future years and we will fail to meet the published targets for the individual species given in their respective UK Species Action Plans.

***Current contribution of Agri-environment schemes*:**

- Excellent progress has been made in stemming the declines of two rare and localised species (Cirl Bunting and Stone Curlew) thanks to RSPB/English Nature-funded species recovery projects with good support from MAFF (in the form of tailored set-aside management and 'special projects' under Countryside Stewardship). For each species, field-based studies of their ecological requirements identified the measures needed to facilitate population recovery and the limited resources available have been able to affect a change in national population status.

- These case studies show what can be achieved when the results of good research is applied through good advice, good land management schemes and good cooperation with farmers. However, achieving the medium- to long-term UK BAP targets for both these species presents real challenges as measures now need to be applied at a wider geographical scale. Annex II provides more details of these two case studies.

- The common and widespread farmland birds species will have benefited to a limited extent by the existing prescriptions for hedgerows, improved grassland and arable available within selected ESAs and, recently, through CSS and the Arable Stewardship pilot scheme. Arable prescriptions are available in the Breckland (Field Margins & Conservation Headlands), South Downs (CH and Winter Stubbles), Cotswolds (Winter Stubbles and CH), West Penwith (WS and 1m FM) and South Wessex Downs (CH only) ESAs. The field margin options recently introduced into CSS (R3, R5, R6, R7 & R8) will benefit farmland birds. The Arable Stewardship pilot scheme trialed some 14 prescriptions in two areas, in East Anglia and one in the West Midlands. By the end of the 1990s only some 6400 ha arable land management prescriptions were in place as a result of Agri-environment scheme agreements.

- Through the Arable Stewardship pilot scheme, we have moved into a new phase of trialing solutions. Unfortunately, the pilot scheme monitoring undertaken to date as not been able to quantify the value of the various prescriptions to different species.

- However, there is no indication of a turn around in the fortunes of the more common and widespread farmland birds. Indeed, the situation for some once numerous species in some parts of the country is so desperate that species recovery measures are now justified; eg down to the last 50 or so pairs Corn Buntings in Cornwall and only two Tree Sparrow colonies remaining in the south-west resulting in a number of local projects (some co-funded by English Nature eg Wiltshire and Dorset) to provide 'emergency measures' (notably in the form of food provision) for these two species.

***Potential development of Agri-environment schemes*:**

- A combination of prescriptions is necessary in order to provide the varied nesting and year-round feeding requirements of the declining species (as shown in Annex II). Therefore, in order to reverse the declines, we must seek to:

  - *provide spring-sown arable crops with no/minimal pesticide and fertilizer application;*
  - *promote a more cautious and targeted use of pesticides and fertilizers in general;*
  - *create summer fallow areas on arable land, for example, through improved management of set-aside land;*
  - *provide weed-rich crop stubbles over winter;*
  - *restore limited arable cropping in the pasture-dominated regions;*
  - *create sympathetically-managed permanent pasture and some grass leys in arable-dominated regions;*
  - *promote sympathetic management of existing pasture, including raising water-levels on wet grassland for breeding waders, delaying and prolonging the period between silage cuts, using bird-friendly mowing techniques and employing appropriate grazing levels;*
  - *implement targeted land management measures for certain rare species (such as nesting plots for Stone Curlew and Lapwing);*
  - *promote sympathetic management of both arable and grass field margins;*
  - *promote sympathetic management of non-crop habitats (such as hedges); and*
  - *create new non-crop habitats on farms (such as scrub).*

- The dispersed and mobile nature of farmland bird populations means that measures will need to be applied at much larger spatial scales (ie at landscape scale) than traditional approaches to nature conservation, which are based on the management of special sites and species protection. The amount of the different options needed for farmland bird recovery is presently unknown. It is therefore vital that we establish appropriately monitored land management trials in order to identify the best value-for-money, long-term solutions.

- Implementing these measures across the country will be extremely costly so it is critical that they are effectively targeted to maximise the benefits to wildlife and minimise the costs to the government, the farming industry and the consumer.

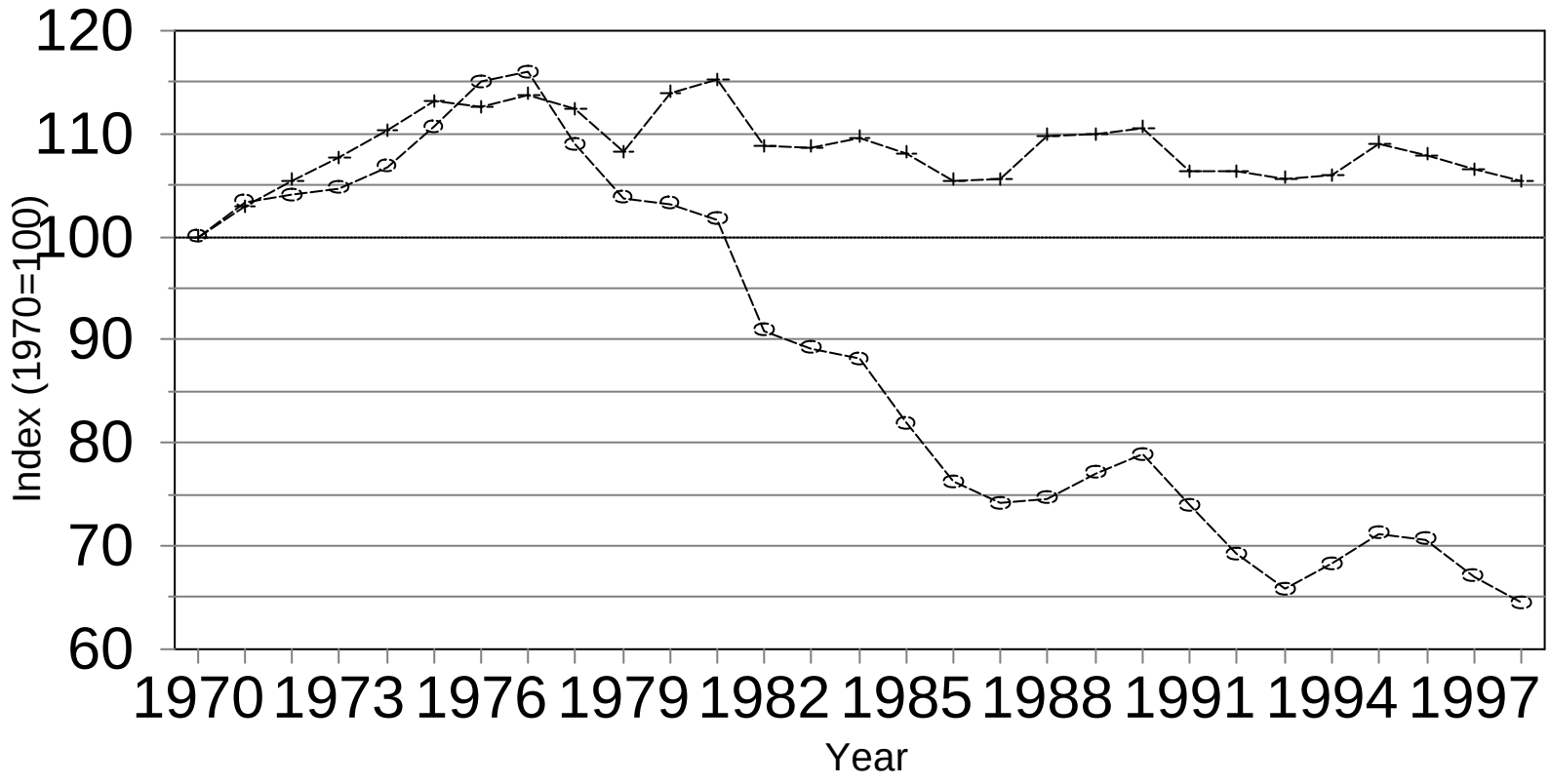
- The decision by DEFRA (summer 2001) to include a subset of the arable prescriptions trialed in the Arable Stewardship pilot within CSS represents a major step forward - when added to the field margin prescriptions already included within the scheme, there is now the potential to provide the year-round requirements for most farmland bird species within arable fields. However, given the limited projected CSS budget until 2006/07, such measures will need to be highly targeted with respect to both the choice of the farm and choice of the prescriptions on it, if the greatest returns are to be achieved. Such measures should also be available within existing lowland ESAs as many of these are important for farmland birds in a national context.

- The introduction of a more widely applied Basic Stewardship Scheme incorporating some of the lower cost prescriptions for arable and improved grass fields and boundary habitats (eg hedges and ditches), could be of great benefit to farmland birds. This would push the reach of beneficial Agri-environment schemes into areas dominated by intensive managed grassland and would enable the more expensive CS prescriptions to be targeted more effectively.

***Special projects*:** A pilot scheme needs to be developed that introduces small amounts of arable land into grass-dominated areas (ie much of western England) where several farmland species are experiencing severe range contractions.

Figure 1 'Quality of Life' indicator:

Populations of wild birds



Annex I Population trends and UK BAP status of farmland birds in the UK

Species	CBC abundance trend on farmland (1972-1996)	Breeding atlas range trend (1970-1990)	Priority species under BAP	UK Species Action Plan targets
Turtle Dove	-85	-25	Yes	Halt decline; recover to 1996 population levels by 2003; increase numbers to 50% higher than 1996 levels by 2008.
Grey Partridge	-78*	-19	Yes	Halt decline by 2005; ensure population is >150,000 pairs by 2010 and maintain/enhance current range.
Tree Sparrow	-76	-20	Yes	Halt decline; recover to 1996 population levels by 2003; increase numbers to 50% higher than 1996 levels by 2008.
Skylark	-75	-2	Yes	Halt decline; maintain present numbers and distribution; reverse population decline on lowland farmland.
Corn Bunting	-74*	-32	Yes	Halt decline; recover to 1996 population levels by 2003; increase numbers to 50% higher than 1996 levels and increase range by 2008.
Lapwing	-46	-9	No	n/a
Reed Bunting	-40	-12	Yes	Halt decline; recover to 1996 population levels by 2003; increase numbers to 50% higher than 1996 levels by 2008.
Linnet	-40	-5	Yes	Halt decline; recover to 1996 population levels by 2003; increase numbers to 50% higher than 1996 levels and restore 1968-72 range by 2008.
Yellowhammer	-37	-7	No	n/a
Starling	-32	-4	No	n/a
Yellow Wagtail	-25*	-9	No	n/a
Kestrel	-24*	-4	No	n/a
Barn Owl[1]	-	-39	No	n/a
Goldfinch	+18	+5	No	n/a
Greenfinch	+19	-3	No	n/a
Rook[2]	+39	0	No	n/a

Species	CBC abundance trend on farmland (1972-1996)	Breeding atlas range trend (1970-1990)	Priority species under BAP	UK Species Action Plan targets
Woodpigeon	+55*	-2	No	n/a
Whitethroat	+105	-7	No	n/a
Jackdaw	+118	-3	No	n/a
Stock Dove	+185	-7	No	n/a
Spotted Flycatcher	-78	-25	Yes	Halt decline; recover to 1996 population levels by 2003; increase numbers to 50% higher than 1996 levels by 2008.
Song Thrush	-66	-2	Yes	Halt decline; maintain range & population levels and, where possible, restore to 1970 levels.
House Sparrow	-64*	-5	No	n/a
Bullfinch	-62	-7	Yes	Halt decline; recover to 1996 population levels by 2003; increase numbers to 50% higher than 1996 levels by 2008.
Mistle Thrush	-48	-2	No	n/a
Cirl Bunting	n/a	-83	Yes	Maintain upward trend in numbers and distribution, with 550 territories by 2003 and range expansion in long-term.
Corncrake	n/a	-76	Yes	Maintain numbers and range at 1993 levels (achieved), recover range to 1988 levels by 1998 & re-establish populations in parts of former range in the long-term.
Stone Curlew	n/a	-42	Yes	Increase to 200 pairs by 2000 (achieved), & 3000 pairs by 2010; encourage re-colonisation of past range; increase population on semi-natural habitats to 120 pairs by 2000 (not achieved).

Notes: *all habitats CBC trend given rather than farmland trend.

[1] Barn Owl population index interpolated from range change between 1970 and 1990.

[2] Rook population index interpolated from estimates of 1975 and 1996 national surveys.

Species above heavy line are those included in the 'farmland birds index'; species below lines are rare farmland specialists (ie <500 pairs) and relatively common species which occur widely in other habitats (notably woodland and built-up areas) in addition to farmland. Species in italics are on general licence issued by MAFF allowing control to prevent serious damage to agriculture.

Sources: Crick *et al.* (1998) *BTO Research Report No. 198,* Gibbons *et al.* (1993) *New Atlas of breeding Birds, Biodiversity: The UK Steering Group Report* (1995) and *UK Biodiversity Group Tranche 2 Action Plans, Volume 1 - vertebrates and vascular plants* (1998), David Noble (BTO) *pers comm.*

Annex III The benefits of different land management prescriptions to selected farmland bird species

Species / *Management prescription*	P	TN	L	K	TD	BO	S	ST	TS	LI	Y	CL	RB	CB
Low input, spring-sown cereal crops	**TT**	**TT**	**TT**		**TT**		**TT**		**T**	**T**	**T**	**T**	**T**	**TT**
Over-winter crop stubbles	**TT**						**TT**	**T**	**TT**	**TT**	**TT**	**TT**	**TT**	**TT**
Bare fallow nesting plots within arable crops		**TT**	**TT**				**TT**							
More targeted use of pesticides and fertilizers	**TT**	**T**	**T**		**TT**	**TT**	**T**	**T**	**T**	**T**	**T**	**T**	**T**	**TT**
Improved management of set-aside	**TT**	**TT**	**TT**	**TT**	**TT**	**TT**	**TT**	**TT**	**TT**	**TT**	**TT**	**TT**	**TT**	**TT**
Field margins (headlands, cover crops, wild flower/grass margins & beetle banks)	**TT**	**T**		**TT**	**TT**	**TT**		**T**	**T**	**TT**	**TT**	**T**	**T**	**TT**
Restoration of limited amounts of arable into pasture-dominated areas	**TT**	**TT**	**TT**		**TT**		**TT**		**TT**	**TT**	**TT**	**TT**	**TT**	**TT**
Restoration of limited amounts of grassland into arable-dominated areas	**T**	**TT**	**TT**	**TT**	**T**	**TT**	**T**	**T**	**T**	**T**	**T**	**TT**	**T**	**TT**
Permanent pasture (appropriate grazing, mowing & water levels)	**T**	**TT**	**TT**			**T**	**TT**	**TT**				**TT**		**T**
Hedgerows & scrub	**TT**			**T**	**TT**	**T**		**TT**	**TT**	**TT**	**TT**	**TT**	**TT**	**T**

TT good evidence that species benefits from prescription
T probable benefit to species

P = Grey Partridge, TN = Stone Curlew, L = Lapwing, K = Kestral, TD = Turtle Dove, BO = Barn Owl, S = Skylark; ST = Song Thrush; TS = Tree Sparrow, LI = Linnet, Y = Yellowhammer, CL = Cirl Bunting, RB = Reed Bunting, CB = Corn Bunting

Annex II Case studies

- Excellent progress has been made in stemming the declines of two rare and localised BAP priority species, the Stone Curlew and Cirl Bunting, thanks to a partnership between English Nature, RSPB, DEFRA (formerly as MAFF) and farmers/ landowners. These case studies show what can be achieved when the results of good research is applied through good advice, good land management schemes and good cooperation with farmers.

- The **Cirl Bunting** is a small, resident songbird which, in the 1930s, was widely distributed across southern Britain. Between then and the 1960s, its population declined slowly before collapsing in the 1970s. In 1982, there were less than 170 pairs, confined to south-west England, and by 1989 just 118 remained on a narrow coastal strip of South Devon.

- An RSPB study found that the birds need, in close proximity, unkempt hedges (nest sites), invertebrate-rich pasture (food for chicks) and weedy winter stubbles fields (food for adults). English Nature/RSPB field officers, tailored land management measures (notably set-aside and a 'special project' under CSS to provide stubbles) and work by local farmers have led to a near four-fold increase in Cirl Bunting between 1989 and 1998 (c.450 pairs), approaching the UK BAP target of 550 pairs by 2003.

- Between 1992 and 1998, numbers increased by 82% in those squares with Countryside Stewardship agreements compared to only 2% in those sited in adjacent countryside not within the scheme - a convincing case for effectively targeted and implemented agri-environment schemes.

- The **Stone Curlew** is a largely nocturnal, migratory wader of dry, open habitats whose historical distribution extended over much of the dry soils of lowland England. There were c.1000-2000 breeding pairs in the 1930s but this had fallen to 300-500 pairs in 1970. In 1991 only 150 pairs were breeding and the species was restricted to Breckland and Salisbury Plain. The population is split between nesting on semi-natural habitats (Breck heath and chalk grassland) and spring-sown arable crops. Loss of semi-natural habitats and mixed farming has forced 50% of Stone Curlews to nest on arable land, where their eggs and young are extremely vulnerable to destruction from agricultural operations.

- Thanks to a combination of nest protection (achieved by the combined efforts of field officers and farmers), improved habitat management (eg through the Brecks ESA) and habitat creation (through provision of special nest plots on set-aside and through CSS), we have made great steps towards the recovery of the Stone Curlew, such that the year 2000 target in its UK biodiversity action plan (200 pairs) was achieved two years ahead of schedule. In 2000 the number of breeding pairs had risen to 254.

Development of Agri-environment schemes for

Birds

(ii) Freshwater wetland

***Priorities and targets determined by*:**

UK BAP: 5 priority species (Aquatic Warbler, Corncrake, Bittern, Marsh Warbler, Reed Bunting).

EU Birds: 43 SPAs (over half the total) have been selected, wholly or in part, for their freshwater wetland birds. Most are large, composite coastal sites where freshwater habitats abut inter-tidal areas (eg North Norfolk Coast); others include river valleys (eg Lower Derwent Valley), man-made washlands (eg Ouse and Nene Washes), and large individual reservoirs (eg Rutland Water) and/or complexes of flooded gravel pits and reservoirs (eg Lee Valley). Key species are wintering wildfowl (ducks, geese and swans) and the breeding birds of reedbeds (Bittern and Marsh Harrier).

The policies of Environment Agency and DEFRA (notably on water resource management, flood defence/IDBs, water quality, fisheries, navigation, recreation etc) are also major drivers.
Private water companies have a major influence on management of reservoirs in their ownership.

***State of the resource*:**

- Freshwater wetlands are arguably England's richest bird habitats. The key assemblages are:

  1. Breeding waders and ducks of lowland wet grassland (eg Snipe, Redshank, Lapwing, Garganey).

  2. Breeding birds of reedbeds, fens and associated habitats (Bittern, Marsh Harrier, Bearded Tit, Spotted Crake).

  3. Wintering/passage waterfowl of coastal fringe and inland freshwater wetlands; often species forage on adjacent inter-tidal and farmland habitats; eg Bewick's and Whooper Swans foraging on stubbles, root crops and other agricultural 'waste' and roosting on open water/floodlands.

- The huge loss and degradation of England's wetlands as a result of human activities (mainly agriculture) means that many of the characteristic species have historically suffered large declines in numbers and/or range. Locally, the populations of some species have recovered in recent decades due to site protection, reserve management and habitat creation (eg Holkham NNR in north Norfolk).

- Excellent knowledge of numbers, distribution and population trends of wetland birds.

- Local breeding wader surveys have shown dramatic declines in species such as Lapwing, Redshank and Snipe (eg total number of waders in the Avon Valley declined by nearly 37% between 1990 and 1996). A repeat of the 1982 national survey of waders on lowland wet grassland will take place in 2001/02 and is expected to show significant national declines in these species and will probably result in some being added to the UK BAP priority species list.

- The number of booming male Bitterns is monitored annually and following a steady decline from the 1950s, a low-point was reached in 1996 when just 11-12 'boomers' were recorded, but numbers have increased every year since with a minimum of 22 'boomers' in 2000 (in response to reedbed rehabilitation and creation projects, often with English Nature funding).

- *Non-breeding* wetland birds are monitored on a monthly basis by the Wetland Bird Survey (WeBS); with the exception of the Mallard, all freshwater wetland (non-breeding) species have shown stable or increasing population trends in recent decades, with some increasing spectacularly. These increases have resulted mainly from the increase in man-made wetlands and increased suitability of agricultural land as feeding habitat.

- On the coast, losses in habitat have been, in part, compensated for by the flooding of extensive areas by the sea, either to prevent invasion during WWII (eg Leighton Moss in Lancashire) or by accident (eg floods of 1953). However, many of the most important sites are at risk, in the medium to long-term, from relative sea-level rise.

- The widespread loss and degradation of natural freshwater habitats has been part compensated, in terms of extent, by a massive increase in the area of man-made wetlands, notably canals, drainage channels, flooded mineral extraction pits and reservoirs. Many of these new habitats have some bird conservation interest but this is often different to natural habitats; the vast majority of England's 75 gravel pit and reservoir SSSIs are notified, all or in part, for their wetland birds.

***Key issues*:**

1. Lowering of water levels due to abstraction and drainage (including draw-down regimes on reservoirs).

2. Management issues; lack of management of fens and reedbeds, maintenance of cattle grazing on grazing marsh.

3. Habitat loss due to relative sea-level rise (as inter-tidal habitat retreats/coast are not defended, abutting freshwater wetlands are 'squeezed' if they cannot also retreat eg due to high land, new defences etc).

4. Pollution, both water and atmospheric (acid rain/nitrogen deposition).

5. Reversing habitat fragmentation through wetland creation.

6. Recreational disturbance.

***Current contribution of Agri-environment schemes*:**

- English Nature staff have played a major role in developing and refining ESA and CSS prescriptions for wetland birds (although there are still some gaps in coverage, for example, no creation options for wetland habitats other than grassland). Uptake of appropriate prescriptions remains an obstacle to recovery of breeding wetland bird populations (see below).

- Wetland birds are a key objective of a significant number of ESAs: Broads, Somerset Levels and Moors, Suffolk River Valleys, Test Valley, Avon Valley, Upper Thames Tributaries, North Kent Marshes and Essex Coast.

- Beneficial ESA prescriptions mainly involve the management/restoration/creation of wet grassland (mainly timing and intensity of grazing, management of water levels and fertilizer inputs), dyke management and buffer strips. Supplements are often available for more beneficial management (eg higher water levels, hay-making, delaying stock grazing etc), with capital payments available for water control structures, fencing etc. A specific tier for the management of fens and reedbeds is available in the Broads ESA.

- Within 'wet grassland' ESAs, the vast bulk of the resources goes on lower tier prescriptions which maintain the status quo (usually intensive grassland management) rather than deliver gains for biodiversity. Apart from land owned/managed by VCOs, there has been very little uptake of higher tier prescriptions which deliver wetter grasslands, managed at a lower intensity. Therefore, in most cases, the ESA has merely preserved the area under intensively managed grassland and encouraged sympathetic management over relatively small areas. This means that biodiversity losses have continued - exemplified by breeding wader surveys in many ESAs where declines have continued on all but the higher tier land (see table below).

Declines in the number of breeding waders on key areas of wet grassland with ESAs

Area	*Period*	*% decline in numbers*
Arun Valley (in South Downs ESA)	1991-96	-24.2
Avon Valley	1990-96	-36.8
Somerset Levels and Moors	1992-97	-11.9
Broads	1988-95	-10.7
Suffolk	1988-97	-22.9

(*Source*: Langston *et al*. 1998 *Land for Life: Technical Support Document*. RSPB, Sandy.)

- Outside wet grasslands, ESAs make a negligible contribution to the conservation of wetland birds.

- Wetland birds are well catered for in CSS. Beneficial prescriptions include the water level management option for meadows and pastures (GX), arable reversion (R1), restoring water meadows (P5), raised water levels in dykes and ditches (GW), buffer and wildlife strips (R5 and R6), reedbeds (R) and fens (F). Capital payments are also available for ditch restoration, fencing and gates, water control structures, scrapes and scrub management.

- More widespread application of the existing CSS prescriptions is necessary to help widespread recovery of wetland bird populations. There is also negligible provision for creating wetland habitats other than grassland within CSS. An exception is a special project on the Avalon Marshes where fen re-creation was included.

- A key constraint within both ESAs and CSS is that raising water levels requires either that agreements are made across the whole hydrological unit or that individual agreement areas are made into their own hydrological units (ie at field/farm scale). The former can be very difficult to achieve (necessitates that the scheme is 'sold' to several farms) and the latter can be very expensive (bunding, water control structures etc).

- To date, lowland wet grasslands have been the main wetland beneficiary of agri-environment schemes. Reedbed management has mainly been driven by species recovery initiatives for the Bittern (through English Nature SRP, RSPB and EU Life). Wetland creation has been largely funded through English Nature, RSPB and HLF projects.

***Potential development of Agri-environment schemes*:**

- A radical re-think is required if we are to maximise the contribution of agri-environment schemes to the conservation of wetland birds in England. The key areas for development are:

    - *Reedbed/fen creation tier/prescription should be introduced into appropriate ESAs and CSS* (techniques are now well established - see management handbooks).

    - *Greatly improved targeting and promotion of higher tiers of wetland management and creation within ESAs and CSS*. High priorities are to secure management of sites outside the SSSI series (and so not eligible for WES) and to target habitat restoration and creation in key areas of country (maps available from English Nature) and so that existing sites are extended or linked (ie existing sites are made more sustainable - resource is increased and fragmentation reversed).

    - *Improve links to local wetland initiatives* such as 'Wet Fens for the Future' (fens), 'Valuing Wetness' (Humberhead Levels), Meres and Mosses (Shropshire/Cheshire), Severn and Avon Vales (Shropshire, Hereford and Worcester) and Avalon Marshes (Somerset).

    - *Review payments for annual management and capital items*, especially higher management and creation/restoration payments - perceived as a barrier to uptake in many areas.

***Special projects*:**

- Link with local wetland initiatives to promote agri-environment schemes as delivery mechanisms for wetland management, restoration and creation (could link with trials of new prescriptions).

Key issues for vision:

1. Water management; enough of it, at the right quality.

2. Restore traditional agricultural management practices like cropping of natural products (fen, reed, hay), and low intensity grazing (+ some burning).

3. Habitat restoration/creation: link, extend and buffer existing sites to increase the resource and make semi-natural sites more sustainable, and help compensate for losses on the coast due to relative sea-level rise. Such efforts should be targeted in key Natural Areas to recreate some vast wetland areas in England (rather than merely creating more fragmented sites).

Development of Agri-environment schemes for

Birds
(iii) Upland

***Priorities and targets determined by*:**

UK BAP: 2 priority species - Black Grouse and Skylark, targets (for Black grouse) include:

- stabilising populations by 2005,
- increasing their range and abundance, over the long term (by 2020),
- preventing further fragmentation of populations,
- promoting recolonisation of formerly occupied areas.

(For Skylark, see farmland birds form)

EU Birds: 4 SPAs selected for upland birds - Bowland Fells, South Pennine Moors, North Pennine Moors and North York Moors (the latter is still under consultation). Key SPA species are breeding raptors and waders. Together, these four sites cover a large proportion of the English uplands.

PSA target for SSSIs: A significant proportion of upland birds are found on SSSIs, and recovery of these sites to favourable condition will significantly affect achievement of BAP targets. eg Of the upland heathland SSSI resource, over 70% is classed as being in unfavourable condition.

***State of the resource*:**

- Britain supports an internationally important assemblage of upland breeding birds, of which England supports a highly significant element.

- Some species nest at higher densities in the English uplands than anywhere else in the world (eg Red Grouse, Golden Plover and Merlin), some breed at the southern-most edge of their world range (eg Golden Plover, Dunlin and Red Grouse on Dartmoor), while some have geographically distinct or isolated populations (eg Twite).

- Key communities are:

  1. Breeding waders (Dotterel, Golden Plover) on a small area of montane habitat.

  2. Breeding waders (especially Golden Plover, Dunlin) and Red Grouse nesting on blanket bog and managed heather moor.

  3. Birds of prey nesting in mature heather (Merlin, Hen Harrier and Short-eared owl) or on cliffs (Peregrine).

  4. Breeding waders (Snipe, Redshank, Lapwing, Curlew) and Yellow Wagtail nesting on in-bye grasslands.

5. Passerines (Twite, Stonechat, Whinchat and Ring Ouzel) nesting in bracken, heather, scrub and open woodland, and in semi-natural habitats along the upland fringe.

C Most species make use of more than one habitat type within the upland landscape in order to satisfy their requirements for nesting, feeding and shelter; the prime example is Black Grouse which nests on moorland, require wet areas for chick rearing, feeds in flower-rich meadows in summer and seeks shelter and food in scrub and woodland during winter. Other examples are: raptors, which typically require large home ranges for hunting prey; Golden Plover, which nest and rear their chicks on moorland but rely on invertebrate-rich areas on enclosed farmland for feeding; and Twite, which nest in heather and bracken on unenclosed moorland but fly several kilometres to feed in flower-rich meadows. Consequently, managing the uplands for their breeding birds requires a holistic approach.

C We have a detailed knowledge of the current distribution and abundance of birds breeding on many unenclosed upland areas as a result of Nature Conservancy Council, English Nature and RSPB moorland bird surveys (mainly in the late 1980s and early 1990s). We also have a sound knowledge of the most important areas of enclosed land (especially within ESAs). National surveys of certain key species take place every 10 years (eg Hen Harrier, Black Grouse, Peregrine, Twite and Ring Ouzel).

C There are currently few repeat upland bird surveys, but those available generally show declines in upland birds, eg 38% decline in wader populations on the North Staffordshire Moors between 1992 and 1996. Repeat surveys are in progress in several key areas.

C Guidelines given in leaflet *Land management for upland birds* (English Nature, 1996) are still valid. Management principles are to maintain/create:

1. a range of vegetation heights and types in a mosaic to provide varying nesting and foraging habitats for key species (both on moorland and in-bye);

2. flushes and other wet areas (the invertebrates they harbour are a key food source for grouse and wader chicks).

3. areas of bracken, scrub and open woodland to maximise habitat diversity.

***Key issues*:**

1. Overgrazing - leading to loss of habitat for many bird species;

2. Inappropriate burning regimes and over-zealous control of bracken and scrub.

3. Agricultural improvement of in-bye land; drainage, re-seeding, fertilisation etc.

4. Development of scrub and woodland.

5. Illegal persecution of raptors.

6. Recreational disturbance (un-researched but much-cited issue with potential to increase in importance with impending new rights of access on moorland).

***Current contribution of Agri-environment schemes*:**

- All the 'upland' ESAs have the potential to benefit upland birds but just three (Pennine Dales, North Peak and South West Peak) actually cite breeding birds as a key objective of the ESA.

- Existing ESA prescriptions that benefit uplands birds include specifying first cutting dates of hay meadows, the timing and intensity of grazing, limiting fertilizer inputs, the regeneration of wet areas, heather management/restoration on moorland and reducing disturbance to breeding birds (by limiting agricultural activities, such as rolling and harrowing, during the nesting season).

- A significant proportion of upland SPAs lie within ESAs, though the North York Moors and Bowland Fells are not covered.

- Upland ESAs are not, on the whole, delivering the improved habitat conditions required by upland breeding birds. The bulk of the land is entered into ESA agreements is in Tier 1 prescriptions, which preserve the status-quo (declining bird populations) rather than restore favourable habitat conditions. Most of the Tier 2 prescriptions will benefit birds but, in most cases, the required management measures need to be taken further and have a higher up-take.

- CSS prescriptions of benefit to upland birds cover rough grazing pastures (UP2/UP3), limestone grassland (UP4) and management/restoration of heather moorland (UM1, UXA, UM2, UXB, UM3, UM4). In addition, capital payments are available for scrub and bracken control, small-scale tree planting, fencing and upland grip blocking.

- Black Grouse Recovery Project has opportunistically used CSS and, where available, ESAs to deliver suitable management (eg creating scrub and small woodland for winter cover).

***Potential development of Agri-environment schemes*:**

- A radical re-think is needed if we are to increase the contribution of agri-environment schemes to the conservation of England's upland breeding birds. In summary, existing prescriptions need to be further refined to increase their benefit to the key species and these must be made available in all the key areas (including both enclosed and unenclosed land), with the appropriate promotion/targeting and advice. There needs to be greater links with Woodland Grant Scheme to create mosaics of farmed and forested habitats to benefit upland birds.

- Existing prescriptions should be modified to take account of the management recommendations in the English Nature leaflet *Land management for upland birds*. In

general, there should be greater promotion of habitat diversity within the uplands, with an increase in the proportion of wet areas, scrub and open woodland within the landscape. The key changes required are:

- The latest dates for agricultural operations on grassland likely to disturb ground-nesting birds (rolling, harrowing etc.) could say 'before the first Lapwing's nest and no later than the 1st April' as, in some years, the earliest nests may be in late March (and farmers generally know when the first eggs are laid).

- Scrub and bracken should be *managed* rather than *controlled* and, along with open woodland, encouraged in certain locations given the importance of these habitats for a number of upland birds (eg Black Grouse, Twite, Merlin, Ring Ouzel, Whinchat). Scrub such as gorse, juniper, hawthorn and rowan should be retained and encouraged on steep slopes and subject to rotational management by grazing and cutting on gentler slopes (eg on a 10- year cycle). In appropriate locations, scrub regeneration should be encouraged by scarifying the ground and fencing. Bracken should be retained on steep slopes and in gulleys, and only removed on gentler slopes where the underlying sward is intact and likely to recover. Native trees should be planted on areas of low wildlife interest (eg areas of dense bracken or steep slopes dominated by species-poor acid grasslands) to create open woodland.

- Heather burning rotations should be more flexible to allow tailoring to local conditions; for example, a rotation of greater than 20 years may be preferable on steep slopes whereas on flatter areas, rotations of less than 10 years may produce better habitat conditions (though check with SAC interest). Burning should only take place on patches of c 0.5 ha at a time and should not take place on blanket bog or wet heath. Some areas should be left unburnt to encourage the development of scrub and open woodland.

- Consider introduction of a 'Tier 3' or enhanced prescription within ESAs and CSS to benefit upland birds in in-bye pastures and meadows. This could include blocking drains and grips to create small wet areas for feeding waders; the shift from sheep grazing to use of cattle or horses; leaving an un-cut strip in meadows after 15 July to provide cover for late chicks and feeding sites for Twite; cut and graze rushes to achieve a scattered cover of no more than 10-20% of the field; and allow small areas of scrub to develop in field corners.

- Introduce an option which encourages sensitively managed arable land to be introduced to upland areas.

Key issues for vision:

The most important changes needed for upland birds are a significant reduction in grazing pressure across both enclosed and unenclosed land, and a large increase in the amount of scrub and open woodland vegetation. We should seek to restore small areas of arable farming to the English uplands and ensure that naturally treeless vegetation (montane, blanket bog and wind-clipped summit ridges) is subject to no/minimal grazing pressure.

Development of Agri-environment schemes for

Invertebrates
(i) Wooded, upland and coastal habitats

***Priorities and targets determined by*:**

UK BAP: c.70 BAP priority invertebrates associated with wooded habitats, notably beetles (especially in wood pasture) and moths.

c.20 BAP priority invertebrates associated with upland habitats, notably moths.

c. 70 BAP priority invertebrates associated with coastal habitats, notably bees, beetles and moths.

EU H&S: Annex II species include the violet click beetle and stag beetle.

PSA target for SSSIs: a significant proportion, although by no means all, BAP invertebrates of wooded, upland and coastal habitats are found on SSSIs.

Other priorities: many other invertebrates (which are not priority species under BAP), found throughout the countryside, are of concern due to widespread declines - *for example,* (uplands) Mountain Bumblebee, Scotch Argus butterfly, Mountain Ringlet butterfly, (hedgerows) Scare Blossom Weevil, Small Eggar moth, Scare Vapour moth.

***State of the resource*:**

- Most species of conservation concern tend to be either (i) rare/localised species associated with semi-natural habitats that are poor colonisers and therefore occur as isolated populations, or (ii) species associated with early-stage successional habitats which are rare because their habitats are in short supply.

- Invertebrates are typically associated with micro-scale habitat features and may require several such features in close proximity, ie in a mosaic (eg food plants/hosts, egg-laying sites, nectar sources, over-wintering sites).

- Reasonable general knowledge of distribution of some groups, poor information on others; little information on population sizes or trends for most groups. Populations may fluctuate widely through changes and knowledge of population sizes may not be all that meaningful.

- Invertebrate Site Register is a key information source for rare/localised species; suitable for use as a targeting tool for BAP priority/rare species. However it is not updated regularly, so may be out of date for some species. Biological Recording Centres and the National Biodiversity Network are further sources of information.

- *A review of invertebrate work within English Nature: 1995-2001* summarises survey, monitoring and research undertaken by English Nature.

***Key issues*:** As per habitats, but of particular importance are:

1. Habitat fragmentation.

2. Intensification of land management practices especially loss of weed species as nectar sources and food plants, and clearance of dead timber in woodland and general countryside.

3. Lack of management of semi-natural habitats, especially loss of open areas within woodland and loss of old/dead trees in various habitats.

4. Simplification of habitat structure/mosaics, especially loss of particular elements within a mosaic and the loss of structural diversity within grazed habitats, particularly on saltmarsh and intensively grazed grassland swards.

5. Scrub management is necessary, but complete removal is often detrimental.

***Current contribution of Agri-environment schemes*:**

- See habitat forms.

- In general, agri-environment schemes will help deliver most for the widespread but declining species, rather than the very rare specialised species.

***Potential development of Agri-environment schemes*:**

- Need *improved advice* to farmers on the implementation of standard prescriptions - location and 'micro' management is often critical for invertebrates, requiring only a little extra thought to greatly improve the contribution for invertebrates. Training courses for RDS staff by invertebrate specialists would be useful. *Habitat management for invertebrates* (Peter Kirby, 2001) is a key reference. Also, *Veteran trees: a guide to good management* (English Nature, 1999), has a useful invertebrate section.

- *Wood pasture/orchards*: encourage grazed pasture under trees and manage trees for their biodiversity; review costs of veteran tree management; encourage interception planting of bramble and thorny shrubs (as an alternative to branch removal) to manage public access around ancient trees on wood pasture. Encourage retention of older, larger orchard trees, with associated dead wood; plant larger fruit trees that will be allowed to grow into old age (post-mature).

- *Hedgerows*: encourage retention and sympathetic management of veteran trees in hedgerows; target arable field margins along hedgerows with ancient trees, and along woodland/scrub boundaries; maximise BAP delivery from local hedgerow management initiatives (eg old trees in Cotswold hedgerows for beetles *Gastrallus immarginatus* and *Ampedus refipennis*)

- *Ghyll woodlands*: reduce grazing levels whilst maintaining open structure needed by some key species.
- *Inter-tidal habitat creation*: ungrazed saltmarsh is better for invertebrates than grazed saltmarsh (but grazed saltmarsh is unlikely to revert).
- Encourage control/eradication of non-native invasive plant species such as rhododendron, Japanese knotweed, Himalayan balsam and giant hogweed.
- *Special projects*: see habitat forms

Key issues for *vision*: landscapes good for invertebrates will have the following features:

- connectivity between semi-natural habitats;
- diversity of vegetation structure and mosaics at all scales, from microscale to landscape;
- habitat associated with early successional stages (eg bare/disturbed ground, ruderal plants as nectar sources);
- old trees in hedgerows, wood pasture, orchards and on woodland margins; and
- scrub.

Proposed modifications to current CSS payments and management guidelines:

1. Costs of veteran tree management (see wood pasture and hedgerow form)

Development of Agri-environment schemes for

Invertebrates
(ii) Lowland grassland, heathland, arable and scrub

***Priorities and targets determined by*:**

UK BAP: c. 60 BAP priority invertebrates associated with grassland, notably bees, beetles, moths and butterflies.

c. 65 BAP priority invertebrates associated with lowland heathland and acid grassland, notably ants, bees, wasps, beetles, moths and butterflies.

21 BAP priority invertebrates associated with arable, mostly beetles and moths.

Scrub is recognised by BAP but only as a component of grassland and heathland habitats - 16 priority insect species are associated with scrub habitats (JNCC review).

EU H&S: Annex II species include the high profile marsh fritillary butterfly.

PSA target for farmland birds:

Although aimed at farmland birds, many of the measures required to meet this target will help a wide range of arable invertebrates like bumblebees and butterflies.

***State of the resource*:**

- Most species of conservation concern tend to be: (i) rare/localised species associated with semi-natural habitats that may be poor colonisers and therefore occur as isolated populations; (ii) species associated with early-stage successional habitats (eg with bare ground) which are rare because their habitats are short-lived or present in small areas.

- Invertebrates are typically associated with micro-scale habitat features and may require several such features in close proximity to complete their life-cycles, ie in a mosaic (eg food plants/hosts, egg-laying sites, nectar sources, over-wintering sites).

- Reasonable general knowledge of distribution; little information on population sizes or trends for most groups (butterflies are exception eg see *The State of Britain's Butterflies*, JNCC/ CEH/ Butterfly Conservation 2001).

- Invertebrate Site Register is key information source for rare/localised species; suitable for use as a targeting tool for measures to assist BAP priority/ Red Data Book[2] species. However it is not updated regularly, so may be out of date for some species.

[2]Red Data Book classifies species on basis of rarity and threat. To qualify for inclusion in the book species have to be present in less than 15 10x10km squares in UK.

- *A review of invertebrate work within English Nature: 1995-2001* summarises survey, monitoring and research undertaken by English Nature.

***Key issues*:** As per habitats, but of particular importance are:

1. Habitat fragmentation; leading to problems with geographically isolated populations.

2. Intensification of agricultural practices; especially increased use of agrochemicals, changes in tillage patterns and grazing and cutting regimes on grassland, drainage and the loss of semi-natural boundary features (hedgerows and field margins) and small-scale habitat patches.

3. Lack of management of semi-natural habitats.

4. Simplification of habitat structure/mosaics.

5. Scrub management (ie removal).

***Current contribution of Agri-environment schemes*:**

- Lowland grassland and heathland have featured heavily in Agri-environment schemes to date, both CSS and ESAs; impact on invertebrates currently limited by resources in the case of CSS and lack of uptake of higher tiers in ESAs.

- The introduction of beneficial arable prescriptions to CSS and ESAs (like conservation headlands, wildlife strips, low input cereals and winter stubbles) will greatly assist particularly the common, but declining, farmland invertebrates like bumblebees and butterflies.

- Reversion of arable to permanent grassland in intensive arable areas (payments available in CSS and ESAs) is beneficial for invertebrates.

- Payments for scrub removal are given as one-off capital payments; emphasis very much on removal to maintain interest of open habitats rather than on management of scrub communities themselves.

- Some targeting for priority species has taken place; *Butterfly Conservation* has liaised with DEFRA to target sites for Lepidoptera - in the case of the marsh fritillary, 30 colonies were on land with CSS agreements and 19 with ESA agreements by 1995. CSS also enabled natural recolonisation by field cricket at a site in Sussex - management involved tree and bracken clearance followed by pony grazing.

***Potential development of Agri-environment schemes*:**

- Need *improved advice* to farmers on the implementation of standard prescriptions - location and 'micro' management is often critical for invertebrates, requiring only a little extra thought to greatly improve the contribution for invertebrates. Training courses for RDS staff by invertebrate specialists would be useful. '*Habitat management for invertebrates'* (Peter Kirby, 2001) is a key reference.

- *Improved targeting* of extra resources for Agri-environment schemes on BAP priority species (where ecological requirements are known).

- *Arable*: greater resources and targeting of arable margin and in-field measures; re-introduction of arable land into intensive grassland systems would also beneficial;

- *Grassland:* Targeting restoration of small areas of grass into arable-dominated regions.

- *Scrub*: introduction of annual management payments to conserve and enhance scrub of high conservation value would benefit a wide range of its special invertebrates, including its specialist fauna.

- *Cliff tops and faces on land slips along south coast:* has a special invertebrate fauna (eg mining bees, spiders, beetles and flies); agricultural intensification of farmland abutting cliff tops means that improved pasture or arable land falls down cliff face rather than species-rich turf (link to plants). Target CSS (pasture management and arable reversion) along cliff-tops.

***Special projects*:**

- *Bumble bees in the Thames corridor*: for shrill carder bee and other BAP/RDB species; encourage provision of habitats rich in nectar and pollen throughout the summer, ie fields/margins with red clover based mixes (and only light grazing) juxtaposed with coastal grazing marsh - investigate supplement for appropriate mixes (research in progress by Writtle College) to be used in re-seeded pasture/arable reversion in CSS and relevant ESAs (North Kent and Essex Marshes).

- Trial restoration of landscapes associated with low-intensity mixed farming in east.

Key issues for vision: landscapes good for these invertebrates will have the following features:

- connectivity between semi-natural habitats; especially breaking-up large arable fields with field margins and within-field wildlife strips/ beetle banks;

- structural diversity/mosaics at a micro-scale; especially physical shelter (provided by hedgerows, ditches/banks and scrub);

- habitat features associated with early successional stages; especially bare/disturbed ground on chalk and acid, free-draining soils, and presence of ruderal plants (good nectar sources);
- grazing on permanent pasture; and
- scrub that is actively managed to promote age/structural diversity.

Development of Agri-environment schemes for

Invertebrates
(iii) Wetland habitats

***Priorities and targets determined by*:**

UK BAP: HAPs for *Ponds of high ecological quality*, and for *Dynamic shingle rivers* have been prepared and are awaiting endorsement by the Country Biodiversity Groups (winter 2001). These habitats hold a significant number of wetland invertebrates of conservation concern.

c. 45 BAP priority invertebrates associated with wetland habitats, mostly beetles, moths and snails.

c. 40 BAP priority invertebrates associated with lowland wet grassland (including brackish coastal marsh), mostly beetles, flies and molluscs.

Targets include maintaining known distinct populations and re-establishing populations via colonisation of, and translocation to, restored habitat.

EU H&S: 7 Annex II species.

Examples of species of conservation concern (includes BAP/ H&S/ Red Data Book etc): Southern Damselfly (found on lightly grazed heathland and chalk streams); Fen raft spider (fen pools and grazing marsh ditches); Lesser silver water beetle (farm ponds in Cheshire/ ditches in Somerset Levels); Black-bog ant (wet heathland); White-clawed crayfish, Pearl mussel (rivers/ streams); Shining ram's-horn snail, Little whirlpool ram's-horn snail (grazing marsh ditches).

PSA target for SSSIs:

around 70% of wetland invertebrate species of conservation concern are represented on SSSIs (however they may not be listed in the citation). It is therefore important that management to get sites into favourable condition takes account of their needs.

Other priorities: many other invertebrates (which are not priority species under BAP), found throughout the countryside, are of concern due to widespread declines. Management for BAP 'flagship' species will benefit many of these species as well, although there are some which may not have BAP 'equivalents'.

***State of the resource*:**

C Britain has around 30,000 species of macro invertebrates; 2,000 are Red Data Book species and a further 6,000 are nationally scarce (present in less that 100 10x10km squares in UK). About 3,000+ invertebrates are associated with wetlands, and 200+ of these are Red Data Book.

- Most species of conservation concern tend to be: (i) rare/localised species associated with semi-natural habitats that may be poor colonisers and therefore occur as isolated populations; (ii) species associated with early-stage successional habitats (eg muddy margins or river gravel shores) which are rare because their habitats are short-lived or present in small areas.

- Invertebrates are typically associated with micro-scale habitat features and may require several such features in close proximity to complete their life-cycles, ie in a mosaic (eg food plants/hosts, egg-laying sites, nectar sources, over-wintering sites).

- Reasonable general knowledge of distribution for popular groups (waterbeetles, hoverflies, ground beetles, snails), including mapped data, by species, from work undertaken for JNCC by CEH and Biological Records Centres.

- Invertebrate Site Register is key information source for rare/localised species; suitable for use as a targeting tool for BAP priority/RDB species. However it is not updated regularly, so may be out of date for some species.

- *'A review of invertebrate work within English Nature: 1995-2001'* summarises survey, monitoring and research undertaken by English Nature.

- Lowland Pond Survey (undertaken for DETR by Pond Action and the Institute of Terrestrial Ecology in 1996) - showed that of the estimated 228,900 ponds in lowland Britain, a high proportion were ecologically degraded, often as a result of intensive agriculture practice. Ecological pond quality could be relatively easily improved with use of buffer zones stopping drainage of fertiliser into ponds, nutrient budgeting (minimising use in vicinity of ponds), and removal of fencing to allow low intensity cattle trampling of pond edges.

***Key issues*:** As per habitats, but of particular importance are:

1. Habitat fragmentation; leading to problems with geographically isolated populations, and small hydrologically unsustainable blocks of land.

2. Intensification of grassland management practices; especially grazing and cutting regimes, re-seeding, fertilisation application and drainage.

3. Lack of management of wetland habitats, eg need more grazing of fens/ reedbeds to manage scrub (neglect is a result of poor markets for withies and reeds); need more cattle grazing on wet grassland to avoid shading of ditches by vegetation build up, and provide poached margins; need to keep ponds at an early successional stage by bankside scrub management/ cattle poaching.

4. Poor water quality (due to nutrient enrichment from farmland) and quantity (due to drainage of agricultural land). Both problems are acute in eastern England.

5. Flood defence/coastal squeeze.

6. Pond management; very few are in SSSI series (not in guidelines) and too dispersed so no one takes responsibility for them - the new HAP, if agreed, should help to address this issue.

***Current contribution of Agri-environment schemes*:**

- as per wetland and freshwater habitats.
- CSS is a major funding mechanism for pond creation and management, and for providing buffer zones around them.
- No specific targeting on priority species to date.

***Potential development of Agri-environment schemes*:** as per wetland and freshwater habitats, plus:

- Need *improved advice* to farmers on the implementation of standard prescriptions - location and 'micro' management is often critical for invertebrates, requiring only a little extra thought to greatly improve the contribution for invertebrates. Training courses for RDS staff by invertebrate specialists would be useful. '*Habitat management for invertebrates'* (Peter Kirby, 2001) is a key reference.
- *Improved targeting* of extra resources for Agri-environment schemes on BAP priority species.
- *Ponds*: pond restoration projects can ruin good invertebrate habitat if poorly managed; invertebrate interest of swamp communities should be taken into account when considering pond restoration projects. CSS pond prescriptions should be promoted in key areas (such as Cheshire Plain, Weald) to encourage development of pond clusters.
- *Ditches*: have provision for longer duration ditch clearance cycles to benefit the special invertebrates associated with late successional stages (eg shiny ram's-horn snail). Raise water level closer to land level in a greater proportion of ditches.
- *Linkage of wetland sites* is crucial to provide sustainable hydrological units; improved targeting/incentives is needed to encourage all constituents of a hydrological units to enter into Agri-environment agreements (eg to raise water levels). Inability for Agri-environment schemes to pay for water control structures on main rivers and drains (Environment Agency responsibility) needs addressing.

***Special projects*:**

- Investigate mechanisms/management prescriptions to encourage the restoration of exposed riverine sediments in watercourses (requires restoration of natural dynamics of streams and rivers).

Key issues for vision: wetland/freshwater invertebrates will benefit from the following features in the countryside:

- appropriately managed ditches; ie high water levels, battered edges with swamp vegetation and all stages of vegetation development represented;
- ponds with swamp communities and buffer zones;
- meandering rivers, with pools, riffles, undercuts etc, and fenced margins (link with water vole);
- small-scale habitat mosaics/diversity and ecotones (especially need restoration in east); and
- cattle grazed fens (better than mowing or neglect).

Development of Agri-environment schemes for

Mammals

***Priorities and targets determined by*:**

UK BAP: 12 priority species (not including marine) including red squirrel, dormouse, water vole, brown hare, otter, and 6 species of bat (pipistrelle, greater mouse-eared, greater horseshoe, barbastelle, Bechstein's, Lesser horseshoe).

Targets include maintaining current range and populations and expand over longer term.

EU H&S: 5 species (4 bats and otter) on Annex II (not including marine).

PSA target for SSSIs:
many mammals are wide ranging therefore site protection is not usually appropriate. Bat roosts are the most notable exception.

Other priorities:
the pine martin, polecat and the other bat species are not BAP, but are of conservation concern.

***State of the resource*:**

- All species of wild mammal (native and non-native) constitute only 3% of the mass of mammals in the British countryside - domestic livestock constitute the other 97%. The loss of habitat to agriculture has had a huge impact on the mammal fauna.

- Knowledge of population status varies between species; a few rare species (eg some bats) have reliable population estimates but good general knowledge of distribution of most species (see Arnold 1993 *Atlas of British Mammals*). Populations trends known for selected species with repeated surveys (eg otter); see review by Harris *et al*. (1995).

- 38 native species of land mammal are extant in England of which 14 are thought to be declining (9 native species have become extinct in the last 2000 years); water vole experienced most dramatic decline - 95% during the 20th century.

- 16 species are bats, the remainder 'terrestrial' mammals (On the marine side, 2 species of seals and 16 cetaceans are regularly seen around Britain, with a further 11 occasionally).

- Large component of current mammal fauna is introduced; 19 species (+ temporary populations of other species); some are ancient introductions, eg fallow deer, rabbit and brown hare (which is a BAP priority species). Inevitably, introduced species have caused problems (agricultural damage, conflict with native species etc).

- Many species are dispersed and wide-ranging so site protection is generally

inappropriate; even highly localised species, such as the greater horseshoe bat (for which roosts/hibernacula can be protected), there is a need to secure appropriate management of the surrounding countryside that is used for foraging. Many species make extensive use of farmland, so a landscape-scale approach is essential.

***Key issues*:**

1. Habitat fragmentation; connectivity between habitat patches is crucial - typically provided by linear features such as hedgerows, field margins and ditches, all of which have suffered loss or degradation in recent decades.

2. Intensification of grassland management; especially changing cutting and grazing regimes, and changes from permanent pasture to grass leys. This has impacted particularly on the Greater horseshoe and Serotine bats, which feed on large insects.

3. Changing arable cropping patterns; especially switch from spring to autumn-sowing of cereals and consequent loss of winter stubbles (especially important for brown hares).

4. Increase uses of agrochemicals; pesticides, rodenticides (affecting polecats), veterinary products (affecting bats which feed on dung beetles) and fertilisers (affecting water mammals).

5. Loss of mixed farming; reduced habitat diversity/mosaics and juxtaposition between habitat patches.

***Current contribution of Agri-environment schemes*:**

- Mammals have undoubtedly benefited from a range of Agri-environment scheme prescriptions, notably hedge planting and management (benefiting dormice and bats), field margins (especially where these prescriptions connect woodland), pasture management and waterside land; new measures trialed in Arable Stewardship pilot are likely to benefit species in arable landscapes if widely applied.

- Special project for greater horseshoe bat (involving English Nature Species Recovery Programme -funded project officer promoting CSS in key areas) is playing a major role in the conservation of the species.

- English Nature Species Recovery Programme project officer also promoting CSS (and woodland management) to conserve red squirrel on the Isle of Wight.

***Potential development of Agri-environment schemes*:**

- Much greater gains from Agri-environment schemes could be achieved by increasing promotion of the most beneficial prescriptions, improving geographical targeting and taking a 'whole-farm' approach to ensure that the prescriptions are placed in the correct place with respect to the existing landscape features and other prescriptions; for example:

- *bats* will benefit most when the measures for permanent pasture, field margins and hedgerows are in close proximity;

- *water voles* require buffer strips along watercourses (even small streams and ditches within grazing marsh); it is vital that they are fenced to prevent grazing of strips (though only 3m width would be sufficient) and, ideally, there should be no more than a 100m gap between the strips. Greater uptake of fen/reedbed/water meadow options would also be of great benefit. See Water Vole Management Handbook (Wildlife Conservation Research Unit, Dept of Zoology, University of Oxford, 1999);

- *otters* would benefit from measures which will increase fish populations, notably those which reduce diffuse agricultural pollution and eutrophication of rivers; provision of bankside cover is probably not a priority.

- *dormice* uses hedgerows to move between woods but can also reside within hedgerows in well-wooded landscapes; 2m+ wide, species-rich hedgerows containing hazel and mature trees are required.

- *brown hares* will benefit from the wider application of the arable stewardship measures; does well in arable-dominated landscapes (largest population in east) but requires diversity, eg linear features, small woods, crop diversity and uncultivated open areas (eg set-aside). Restoration of small of amounts of arable land in the west will probably benefit hare populations in those areas (link with farmland birds).

- The approach adopted in the Greater horseshoe bat project in Devon, of focussing on a single species, with wide ranging and varied requirements, to 'sell' whole landscape regeneration to farmers, has been a great success. A similar approach is being used by the Forestry Commission under their JIGSAW scheme - encouraging groups of landowners to consider where to locate new native woodland by focussing on how dormice might spread through a landscape from a re-introduction site. So, rather than piecemeal uptake of habitat restoration/ recreation schemes, these projects are delivering bigger and more useful blocks of the required habitats at a landscape scale. This is a model which could be adopted much more widely (using other 'flagship' species), making much better use of existing schemes.

***Special projects*:**

- Trial restoration of mixed farming, by providing small areas of arable in the west and permanent pasture in the east.

Key issues for vision: Landscape features important for mammals include:

1. connectivity between habitat patches (eg provided by hedgerows and field margins);

2. habitat diversity (especially diversity of field types);

3. sympathetic watercourse management, including use of buffer zones;

4. increased area of wooded habitats; and

5. sympathetic management of permanent pasture to increase availability of large invertebrates.

Development of Agri-environment schemes for

Plants and fungi

***Priorities and targets determined by*:**

UK BAP: 168 priority species including 66 vascular plants, plus a range of fungi, lichens, liverworts, mosses and stone worts found throughout the range of habitats.

An Arable Plants Group is being set-up to co-ordinate implementation of the vascular arable plant SAPs.

HAP for Cereal Field Margins (led by DEFRA) has been largely developed for the protection of arable plants. Targets include expansion of the area of sensitively managed field margin.

EU H&S: 13 species on Annex II (+ orchid-rich habitat on Annex I).

***State of the resource*:**

Vascular plants

- Good knowledge of species distributions at broad scale but poor information on population sizes or trends. Developing ecological knowledge of key species. Key gap in knowledge is arable flora; Conference - *Fields of Vision: a future for Britain's arable plants* (July 2000 - proceeding available from English Nature) began to identify the issues and scale of problem for arable plants. The forthcoming management handbook (English Nature) is seeking to address these issues.

- Red Data Book published by JNCC in 1999 lists rare and threatened plant species. 221 vascular plants are listed for England (22 are facing high risk of extinction in near future) plus a further 234 nationally scarce species.

- Botanical Survey of the British Isles are developing a New Atlas of the Flora of Britain and Northern Ireland (due May 2002). The BSBI also holds the Threatened Plant Database funded by the Countryside Agencies and Plant Life (this maps records of threatened plants).

- 34 vascular plant species endemic to England of which 20 are threatened with extinction in the short to medium-term. 20 species have become extinct in the wild in England since 1800, all but 6 since 1930.

- Huge number of introduced species; represents perhaps a third of all vascular plants in wild.

Fungi

- Poor knowledge of species distributions. Red Data Book list for fungi is currently under review, and revised list should be available for use shortly. However, poor availability of records will continue to be a problem when assessing status.

- Main cause of declines include habitat destruction and pollution - nitrate pollution is likely to be one of the main threats.

Bryophytes

- Western England is especially important for bryophytes, contributing to Britain's international significance for this group; England supports 4 hornworts, 248 liverworts and 646 mosses (including 5 endemic mosses).

Lichens

- Western and southern England is especially important for lichens, contributing to Britain's international significance for the group; the UK flora supports about 1300 species of lichen of which around 75% occur in England. They grow in a variety of habitats, those of particular importance within the agricultural landscape are wayside trees, parkland, lowland and upland rock exposures, heathland and chalk grassland.

***Key issues*:**

1. Intensification of agriculture; especially the increase in fertiliser (as many vascular plants, mycorrhizal fungi and lichens require low soil or substrate nutrient status) and pesticide, changes to cropping patterns and the timing of agricultural operations (notably the reduction in spring cultivation), and increased mechanisation.

2. Loss and fragmentation of semi-natural habitats.

3. Inappropriate management of remaining semi-natural habitats (both neglect, such as lack of grazing animals puddling round pond margins, and too intensive management, such as overgrazing in the uplands). Some fungi need specific intensive management (eg waxcap is a grassland fungi which needs heavy grazing but no fertiliser application). Many species of lichen are particularly sensitive to inorganic fertiliser, slurry inputs, and other agrochemicals. Particularly sensitive to direct application and spray drift are lichens of wayside and parkland trees, rock outcrops, grassland and heathland.

4. Lack of knowledge of management needs of key species.

5. Climate change and atmospheric pollution (especially sulphur, ammonia and nitrates).

***Current contribution of Agri-environment schemes*:**

- Much conservation delivery to date for rare plants has been through targeted management actions on nature reserves, and through Species Recovery Programme and Wildlife Enhancement Scheme payments on SSSIs. Agri-environment schemes have played a role (eg pond management, parkland management (for fungi and lichens), and other prescriptions which reduce the intensity of land management).

- Arable flora will benefit from the field margin, and in-field options in CSS (especially the uncropped cultivated margins, conservation headlands and over-wintered stubbles followed by a low-intensity spring crop) and the arable measures in some ESAs; ie Breckland (FM and CH), South Downs (CH and winter stubbles), Cotswolds (WS and CH), West Penwith (WS and 1m FM) and South Wessex Downs (CH only).

***Potential development of Agri-environment schemes*:**

- Plants are the most demanding species group in terms of the location of agri-environment options because of their inability to move very far, and because they are restricted to finding suitable habitat by chance, unlike birds and invertebrates which can seek out the resources they need. Wind dispersal of plant seeds is influenced by seed size, weather conditions, relative height of plant to surrounding vegetation, and other potential barriers like hedgerows. For example, in the past many seeds of *arable* plants were dispersed accidentally within grain being sown, or on farm machinery. Increasingly effective seed cleaning techniques, and 'machinery hygiene' to prevent spread of pathogens, has reduced these avenues of dispersal. Options for arable plants should therefore be located, (in descending order of priority): where the species are known to be; directly adjacent to these areas; on areas of lower soil fertility; in sunny locations. With rotational options, try to ensure that land under the option is as close as possible to the previous years rotation.

- *Arable flora*: 15 vascular plant and 17 lower plant priority species are associated with arable land. Spring cultivated (6m+) margins are generally better than grass margins as most arable plants are annuals which need regular soil disturbance for germination and do not thrive in closed swards. Need much greater uptake beneficial arable options to create widespread benefits for once common arable plant species which are now rare. Prescriptions should be targeted in key Natural Areas (see advice given to DEFRA on arable stewardship targeting, available from English Nature).

- Importance of micro-habitat features, such as bare ground and ecotones between semi-natural habitats, needs more emphasis in Agri-environment schemes (these are often where rare species occur). This can in many cases be achieved through specific on-farm advice on the location and management of standard scheme options.

- *Lichens* on hedgerow and parkland trees must be protected from spray drift (pesticide or fertilizer) and slurry splash - zones of no-spray should be as wide as possible - the minimum recommended distance is 15 times the diameter of the trunk. This will also be beneficial for mycorrhizal fungi on tree roots. (See *Veteran Trees: a guide to good management*, English Nature, 1999).

***Special projects*:**

- Cliff tops and faces on land slips along south and east coast: agricultural intensification of farmland abutting cliff tops means that improved pasture or arable land falls down cliff face rather than species-rich turf (link to special invertebrates). Target CSS (pasture management and recreation) along cliff-tops.

Key issues for vision: Species-rich plant communities have a place in the landscape; of particular importance are:

- low-fertility situations;
- continuity of management;
- appropriate grazing and cutting regimes; and
- reductions in the use of fertilizers and pesticides, and more careful targeting of applications.

Development of Agri-environment schemes for

Reptiles and amphibians

***Priorities and targets determined by*:**

UK BAP: 3 priority species (great nested newt, natterjack toad and sand lizard).

EU H&S: great crested newt on Annex II and IV; natterjack toad, sand lizard and smooth snake on IV.

***State of the resource*:**

- 12 native species, natterjack toad, sand lizard and smooth snake highly localised, others largely frequent and widespread; recent research suggests that pool frog may be native (but now extinct).
- Good knowledge of species distributions at broad scale but poor information on population sizes or trends. Good ecological knowledge of key species.
- Evidence suggests declines for all species to a greater or lesser degree. Declines largely due to habitat loss, modification and fragmentation; intensification of agriculture has contributed to this and in some cases is the main factor (eg pond loss for amphibians).

***Key issues*:**

1. Ponds; type, density and management.
2. Intensification of agriculture; especially increase in agrochemical inputs, and loss of habitat diversity/mosaics and connections between habitats patches.
3. Area of semi-natural habitats and habitat diversity, especially structure, within them.
4. Availability of bare ground on lowland heathland.

***Current contribution of Agri-environment schemes*:**

- Common herps (ie reptiles and amphibians) have undoubtedly benefited from pond creation and management, field margin management and hedgerow creation and management resulting from CSS. Great crested newts may also have incidentally benefited, but most creation projects are concerned with larger duck/fish ponds that are unsuitable for newts.
- Heathland species (like sand lizard) will have benefited from CSS/ESA agreements covering this habitat, but targeted management measures are not part of management plans resulting in the conservation benefit not being optimised.

***Potential development of Agri-environment schemes*:**

Some modification to management prescriptions and improved targeting of CSS could make a huge contribution to reptile and amphibian conservation in England. Key priorities are:

- *Great crested newt*: manage existing ponds more sympathetically (eg by applying buffer zones to reduce pollution), restore neglected ponds (which can be >50% of resource in some areas) and create new suitable ponds, ie small, fish-free and in a connected network; reversing fragmentation by creation/suitable management of hedgerows and field margins is also crucial. GCNs occur across England (apart from Cornwall) but could be targeted at key areas (eg East Anglia and Cheshire); UK SAP target is to restore populations to 100 unoccupied sites per year. These measures will also benefit the common amphibian species.

- *Natterjack toad*: creation of shallow ponds, which dry out in summer, on heathland, sand dunes and upper saltmarsh; the species only occurs at around 50 UK sites, the vast majority in England and being SSSIs. UK SAP target is for five new populations to be established by translocations by 2005.

- *Sand lizard*: creation of bare sand areas (few m^2) for egg-laying on south-facing slopes on lowland heathland in stands of mature heather that receives little or no burning or grazing, and linkage between habitat patches to encourage recolonisation; could achieve by introducing a supplement to heathland management and/or restoration options (LH1/LH2).

- Adder: target key areas (on or near acid grassland, heathland, scrub and mire sites) for creation of grass margins, reversion of arable to permanent grassland, and careful scrub management as appropriate.

- *Grass snake*: creation of grass margins, ponds and vegetation piles/muck heaps.

- *Special projects*: Pond creation and management in reintroduction area for the pool frog (probably East Anglia) should this project go ahead.

Key issues for vision:

Appropriately managed, small ponds (no fish or ducks), buffered from agricultural chemicals, set in diverse landscape with woods, scrub and grassland and much connectivity provided by hedges, field margins etc. Bare sand areas present on heathland. Habitats generally with a variation in structure, especially in grassland and wetland.

Proposed modifications to current CSS payments and management guidelines:

1. Managing lowland heath: option to create sand exposure (10% max over site) - £100/ ha/yr.

2. Pond creation: revise payment to £10/m2 for first 100m2; restoration: revise payment to £5/m2.

3. Avoid burning and over-grazing in key reptile areas.