BIODIVERSITY AND CONSERVATION

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The passage of the Countryside and Rights of Way (CROW) Bill, and two recent select committee inquiries have focussed parliamentary interest on protecting wildlife. Concerns have been raised over the role that science plays in defining the goals of nature conservation.

This briefing note examines the basis for nature conservation and the role and application of science, and discusses the issues raised.

SUMMARY OF KEY POINTS

- Nature conservation is a cultural activity, involving many reasons why people value nature.
- Traditionally, nature has been viewed as a static collection of species present in particular places.
- Recent scientific understanding shows that change is an inescapable aspect of nature.
- Historically, conservation has been led by few 'experts' in Government, agencies and NGOs.
- A broader debate is needed to determine how nature conservation can take account of change.

WHY CONSERVE NATURE?

The Origins of Conservation

People have used plants and animals for millennia for food, clothing, and shelter, and have set aside areas to enable these resources to be exploited (e.g. ancient royal hunting forests such as the New Forest). From a western perspective[1] a sense that 'nature' was beyond purely economic value, and carried with it both a moral and aesthetic value crystallised in the 19th century, as three trends coincided: the rise of the Romantic poets and novelists; reaction to Blake's "*dark satanic mills*" of the Industrial Revolution; and a growing interest in 'natural history'[2,3]. Towards the end of the 19th century, Darwin developed the theory of 'evolution by natural selection', and this established the foundations for the emergence, in the early 20th century, of the science of ecology[4], that seeks to understand the interactions between organisms and their surroundings, and between organisms.

By the 1980s, this notion had spread to considering the interdependence of all life on earth, and that the diversity found in nature ('biological diversity' or 'biodiversity' - **Box 1**) plays a crucial role maintaining life support systems. In June 1992, this culminated at the UN 'Earth Summit' with the signing of the Convention on Biological Diversity (CBD) by 157 nations, including the UK.

BOX 1 WHAT IS BIODIVERSITY?

Biodiversity (or biological diversity) is often taken to mean 'variability within nature', or more simply 'Life on Earth'. It does not relate to the number of individual species, but to the differences within and between species and their surroundings ('ecosystems'). The UN Convention on Biological Diversity (CBD) defines it as follows:
"The variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems."

While it is relatively easy to understand what is 'biological' (i.e. animals, plants, fungi and micro-organisms) the concept of 'diversity' itself is less readily grasped. Essentially, there are three levels of biodiversity that come from the definition in the CBD:

- diversity between and within ecosystems and habitats (e.g. a dry heathland or a rainforest)
- diversity of species (e.g. a great crested newt or a red kite)
- genetic variation within individual species (e.g. differences in the genetic make-up of a single species)

The diversity of species within a habitat can be 'measured', using mathematical formulae, and it can be demonstrated that changing conditions within a habitat will often change the diversity of species within the habitat, and vice versa. Thus, the presence or otherwise of a wildlife community appropriate to an area is a test of the 'health' of a local environment. For example, the features and species of a 'good quality' lowland acid heath are well characterised. So, by monitoring the numbers and types of species present, it is possible to determine whether any adverse changes, beyond those of natural variability, are occurring.

Source: Biodiversity – The UK Action Plan. Cm 2428, 1994

People's Relationships with Nature

People relate to 'nature' in many different ways, depending on their own experiences, cultural background and systems of value. So it is not easy to untangle the reasons why nature is valued. As an example, a forest may be viewed as a stand of timber or as a place that holds some special personal value.

From such a range of relationships, it is possible to distil three non-exclusive sources of 'value for nature':

- **Scientific** - creating new knowledge is a cultural asset, and so natural history and ecology are seen to have merit for their own sake.
- **Economic** – society is dependent on the natural world as a source of raw materials and natural features, so maintenance of 'resources' that have

[1] Many of the world's major ethical frameworks show a complex interaction between values of nature that are either intrinsic or based on human use (instrumental).
[2] Some have suggested that this was significantly inspired by the expansion of the British Empire, and a particular Victorian obsession for collecting!
[3] Formal nature conservation began in the UK, with the establishment of the National Trust (1895), the Royal Society for the Protection of Birds (1904) and the Society for the Promotion of Nature Reserves (1912). The first government body for nature conservation, the Nature Conservancy Council, was set up in 1949.
[4] This is distinct from the interpretation of ecology as a political philosophy.

(or may have) economic benefit to people (e.g. medicine, food, shelter, clothing and recreation) is seen as desirable.

- **Cultural** – people hold aesthetic values for particular organisms, habitats, and landscapes, and many feel a moral (sometimes spiritual) responsibility towards nature[5]. Indeed, in 1981, the UN General Assembly adopted the World Charter for Nature which stated "*all life warrants respect regardless of its usefulness to Man.*"

Reflecting this range of values, international, European and UK legislation has built up to conserve species and habitats. Each is framed (in varying degrees) in terms of the values described, so it can be seen that **nature conservation is pursued for a variety of socially directed reasons**.

THE PRINCIPLES OF CONSERVATION

Turning from philosophy to practice, once the reasons for conserving nature have been identified, it is necessary to establish:

- which features are to be conserved – primarily the species and habitats of interest;
- the importance to conservation of those features. Because there are many reasons for valuing nature, there are also many criteria for determining their conservation value (see later);
- how the area should be managed to maintain or enhance conservation values. This includes: establishing strategies to avoid damage to the features of interest; identifying the extent and assessing the significance of any changes; and responding to any changes that may occur.

An important point to note here is that much conservation activity in the UK is now driven by the requirements of the EU Birds and Habitats Directives, which require particular species and habitats to be conserved if present in Member States.

Knowing What to Conserve

The first task is to know which animals and plants exist in the UK, in what numbers, and where. The terrestrial and marine wildlife of the UK varies extensively, reflecting changing patterns of rock and soil types, climatic and maritime conditions and human activities. Many plants and animals found in the UK are also found elsewhere in Europe, but many are close to the edge of their natural ranges, and hence may appear in the UK as rarities (while they are abundant on mainland Europe). Nevertheless, in international terms, there are a number of features of the UK's wildlife that are either unique (e.g. the Scottish crossbill, a bird) or at least highly distinctive (e.g. the Caledonian pine forest, limestone pavements, and the Flow Country of northern Scotland).

The science of 'taxonomy' describes, names and classifies distinct organisms (species), and seeks to understand their relationships to one another. Historically, taxonomy has been based on observed variations in the physical form (morphology) of different organisms, but in more recent years, advances in molecular biology have led to a new way of distinguishing organisms, based on observed differences in genetic make-up.

The science of ecology extends this to understanding the interactions between organisms and their surroundings, and between species. Ecological sciences have shown that 'nature' is not a static collection of 'things' present in specific places, but is a complex, dynamic system of relationships and processes that operate over different scales of time and space[6]. An example is how nitrogen moves from the air, into soil bacteria, into plants and animals, and eventually back into the soil or air again to begin this 'nutrient cycle' again.

Determining Conservation Value

Once the pattern of the distribution of organisms has been established, the range of people's values for nature mean that some organisms, habitats and landscapes are more highly valued than others – whether for scientific, economic or cultural reasons. While value judgements cannot be described as 'scientific', scientific methods can be used to defend conservation value. Thus, a consistent means of identifying the relative priorities to be conserved is necessary to avoid arbitrary subjective preferences. To this end, criteria were developed in the late 1960s and early 1970s (and updated in 1989) by the (then) Nature Conservancy Council[7], to enable such a rigorous approach (**Box 2**). To some extent, these represent a *post hoc* rationalisation of the practices developed and used by the NCC up to that time. The NCC acknowledged at the time, that these criteria did not attempt to be wholly scientific, but

[5] The question as to whether this stems from nature having specific 'rights', or people having an obligation to avoid causing systematic or gratuitous injury is a matter of debate.

[6] A further insight in the last decade has been that many ecological processes operate in a 'chaotic' (or non-linear) fashion; where small changes in one part of a complex system lead to larger changes elsewhere – often referred to as the butterfly effect (i.e. a wing beat in China causes a hurricane in Bermuda). This means that predictions of ecological changes are inherently highly uncertain.

[7] The 1989 review concentrated on developing the more 'scientific' criteria and much more detailed guidance was given for major habitats and groups of organisms. Nevertheless, NCC acknowledged the importance of cultural values.

rather they sought to be consistent.

Thus some criteria (such as diversity or rarity) can be seen as more 'scientific' than others – i.e. they are more amenable to repeatable measurement with regard to data on the populations and distributions of species and habitats. Other criteria, however, are less grounded in 'scientific method', and more dependent on value judgements. For example, naturalness is a really a hybrid that judges how close a habitat is to its truly 'wild' state, related to subjective values of 'wilderness'. Finally, other criteria are entirely contingent or judgmental, such the criteria of 'potential value' or 'intrinsic value'.

Essentially, 'measurement' of a site's characteristics against these criteria **establishes a range of attributes for the site, but cannot establish its overall worth**. This requires judgements based on the relative weightings given to each criterion which reflects social values. For example, it is a matter of preference whether diversity is any more or less highly valued than rarity.

However, under the Habitats Directive, the extent to which judgement can play a part in determining what is to be conserved, and what value it holds, is severely limited. Here, annexes to the Directive specify comprehensive lists of particular habitat types and species that must be conserved.

CONSERVATION IN PRACTICE

The Call of the Wild?

The previous sections have described why nature is valued; how natural features are identified and their distribution and ecology determined; and how their relative value can be established consistently. The next step is to manage those features to maintain (or enhance) their conservation value. Ideally, in a true 'wilderness', there would be no need to intervene as the species, habitats and ecosystems would be fully self-sustaining (even in the face of change). However, in the UK, there are no land areas that can be described as 'wild[8]' – but they are not wholly artificial, and so are referred to as 'semi-natural'.

Conservation in the UK, then, invariably *requires* human intervention in natural processes to maintain and enhance conservation values. For instance, a lowland heath is a landscape created around 3-4000 years ago by people clearing the 'natural' forests on sandy acidic soils to provide grazing. Since then, these areas have developed characteristic plant and animal communities which are now highly valued. Many such areas are legally designated (or locally recognised) for their conservation value, and so are actively managed by scrub clearance and grazing to maintain those values. Without management, scrub and eventually forest would replace the heath. The question of whether this represents a more or less 'valuable' situation remains a matter of contention.

BOX 2 DESIGNATIONS FOR AREAS OF NATURE CONSERVATION IMPORTANCE

Criteria for Nature Conservation Value

- **'Size'** –there is a minimum acceptable size for areas which need to be safeguarded to maintain their conservation interest.
- **'Diversity'** – variety in the numbers of both communities and species, related to diversity of habitat, are important features.
- **'Naturalness'** – the distinction between natural, semi-natural and artificial cannot be rigidly defined and is arbitrary to some extent.
- **'Rarity'** – rare or local species and habitats are often most highly valued, but such rarity may be natural or human-induced.
- **'Typicalness'** – it is necessary to represent the typical and commonplace within the field of ecological variation.
- **'Recorded history'** – the extent to which a site has been used for scientific study and research is a factor of some importance.
- **'Position within a geographical or ecological unit'** – a site is more valued if it is close to another of high quality.
- **'Potential value'** – sites that could develop a nature conservation interest (either naturally or through intervention) are highly valued.
- **'Intrinsic appeal'** – Different kinds of organism do not rate equally in value, thus more weight is given to birds than spiders.
- **'Fragility'** – a complex criterion that reflects the sensitivity of habitats and species to change. Fragile sites are highly valued.

Protected Area Designations

- **International** –sites for the conservation of wetlands (Ramsar Convention); EU Special Protection Areas (SPAs) for the protection of birds; EU Special areas of Conservation (SACs) for the protection of certain species and habitats.
- **National** – National Nature Reserves (NNRs) to protect the most important areas of wildlife habitat (and also geological formations) in Britain; Sites of Special Scientific Interest (SSSIs) and Areas of Special Scientific Interest (ASSI's, in Northern Ireland) as areas representing the best examples of wildlife habitats (as well as geological features and landforms).
- **Local** – Local Nature Reserve (LNR) recognised by local authorities but have no specific legal protection.

Sources: *Strategy for Nature Conservation*, Nature Conservancy Council, 1976; *Guidelines for selection of biological SSSIs*, Nature Conservancy Council 1989; *National Nature Reserves*, English Nature, 1998; *SSSIs*, English Nature 1999

Planning for Conservation

In practice, conservation takes place within specific sites to 'maintain a favourable conservation status' for those features for which the sites have been designated. It is worth pointing out, however, that many species occur much more widely than on specific sites, and may range over very large areas (e.g. birds, fish, and marine mammals).

Since 1995, the dominant framework within which conservation has been pursued has been the UK Biodiversity Action Plan (UK BAP). Nearly 400 species and over 40 habitats have been identified as

[8] It is widely accepted however, that coastal and marine areas are more 'wild' than terrestrial areas.

being of particular importance, based on their rarity or rapidly declining status. The result of this process has been the preparation of hundreds of species and habitat action plans (SAPs and HAPs) which have set targets and identified costs to ensure the conservation value of the particular species and habitats are maintained. Also, around 100 local BAPs have been developed to focus implementation of the national plans.

A key feature of the BAP process has been that it has signalled a departure from the traditional approach to conservation which saw it as the responsibility of relatively few organisations – primarily the statutory nature conservation agencies[9], working alongside voluntary nature conservation organisations. The BAP process has extended involvement to many other organisations, including local authorities and businesses. These organisations now work together in a series of UK, national and local BAP steering groups, and groups for each of the plans – although there are concerns over a lack of 'leadership'.

While BAP has been successful in bringing together these interested parties to agree priorities and plans, evidence to the current Commons Environment Sub-Committee's inquiry into UK Biodiversity has revealed some concerns over the BAP process:

- insufficient political imperative, leading many to call for a statutory backing for BAP
- slow progress in implementing the HAPs (contrasted with good progress on SAPs)
- complex and bureaucratic, with too many plans, leading to calls for them to be consolidated
- poor coordination between local and national BAPs
- a lack of sufficient 'champions'[10] for many species (less than 10% have champions to date).

Dealing with Change

Identifying Change

As nature conservation seeks to maintain favourable conservation status for particular species and habitats on specified sites, it is necessary to establish the status at any given time and to observe how this may change. This requires a system for recording and monitoring species and habitats. The UK has had a long tradition of biological recording, but this has been skewed significantly in favour of particular groups of organisms: principally birds, mammals, reptiles, amphibians, some insects (butterflies) and flowering plants.

Recognising this imbalance, a National Biodiversity Network (NBN) has been set up, funded by a range of organisations (including public bodies and wildlife charities). The NBN aims to encourage schemes where local and national recording efforts can be coordinated to allow data to be shared easily. To record and monitor the status of every species across the country would be an enormous (if not impossible) task, and so gaps in data are inevitable. Therefore, within sites of nature conservation importance, organisations regularly monitor conservation status at a more pragmatic level. Thus, field staff concentrate on surveys that examine a site and note particular features that may 'indicate' the presence or absence of other features of conservation interest. An example is the presence of the woodland plant Solomon's seal, an indicator that the woodland has remained relatively undisturbed for many hundreds of years (i.e. 'Ancient Woodland'). However, recognition of Ancient Woodland does not necessarily guarantee its protection. Indeed, the Woodland Trust points out that 85% of Ancient Woodland currently carries no designation.

Another initiative in this area is the Environmental Change Network (ECN) managed by the Natural Environment Research Council (NERC). This provides a more extensive long-term monitoring of particular physical, chemical and biological indicators on a network of 54 established sites – e.g. wind speed and direction, soil chemistry, and vegetation cover. Data from the network have been used to monitor water quality and to track the effects of climate change. Examples include the abundance of the common blue butterfly; the numbers of wrens in farmland and woodland; the date of leafing of oak trees in Surrey; and central England air temperature.

Assessing Change

Recording and monitoring, although incomplete, can establish that change has occurred (or is occurring), and can help in predictions of the effects of future changes. While monitoring can show that change has occurred and the **extent** of that change (e.g. in terms of the size of populations of certain species), understanding its **cause** is more complex. Species numbers and distributions can change for many reasons, either naturally or through human influence. Causes of natural change include climate, food availability, disease prevalence and virulence, and predator numbers. Recognising the range of

[9] English Nature, the Countryside Council for Wales, Scottish Natural Heritage and the Department of the Environment, Northern Ireland.

[10] Organisations committed to undertaking specific conservation of nominated species or habitats (e.g. Anglian Water champions the 'depressed river mussel').

natural variability helps to identify whether changes result from, or are exacerbated by, human influence.

Once a change has been recorded, it is necessary to establish its **significance** and its cause (if possible), before responses are made (see next section). Assigning the significance of any changes is fraught with difficulty. As discussed earlier, decisions over the importance of particular features are essentially value judgements that can be informed (but not defined) by science. Therefore, the assessment of the significance of any change is a matter of judgement set against the objectives for conservation at a particular location. Similarly (and perhaps even more intractably), assessing changes in conservation status alongside other changes (e.g. landscape value, amenity value, water quality, economic wellbeing, etc.) makes the task even more complex.

Ultimately, then, the significance of any change is a value judgement, but the question arises "*whose judgement counts?*". As nature conservation objectives are framed by economic, aesthetic, cultural and moral values, agreeing what constitutes significant change is often politically sensitive.

Responding to Change

In spite of these difficulties, decisions are made, and responses to change are sometimes required. The response undertaken, however, is highly dependent on the cause and the extent of the change. Mostly, the closer the cause of the change is to the site where the change occurs, the easier it is to deal with. For example, deliberate damage or neglect on a SSSI (Box 2) is more readily dealt with than changes in land use stemming from structural changes in agriculture that in turn arise from changes in subsidy and support schemes. Also, pollution from dispersed sources distant from the site[11] can be more difficult to deal with. Perhaps the most intractable of all is responding to the effects of climate change (whether natural or human-induced)[12].

The Government has acknowledged the scope and potential scale of possible effects of climate change in the UK, and raised issues of how society might need to adapt. In May 2000, the Government published a report on adaptation to climate change (**Box 3)**. On nature conservation, the report concluded that "*respect for the dynamic nature of natural and semi-natural ecosystems is the key to future adaptation*."

BOX 3 NATURE CONSERVATION AND CLIMATE CHANGE

In 1999, the Department of the Environment, Transport and the Regions (DETR) commissioned a review of possible impacts of climate change, considering adaptation options and defining priority responses. Protection of designated species and habitats was among the adaptation priorities. The consultants concluded that climate change could significantly affect nature conservation. Similarly, adaptation in other areas (e.g. water resources and agriculture) could also affect biodiversity.

The most critical adaptation response identified was to maintain the network of designated areas, because of their legal status and accompanying international obligations. The consultants also recognised that actions will need to be considered that protect and enhance biodiversity in the wider countryside. Three response options were identified:

- Relying on natural migration processes
- A facilitated colonisation process involving removal of barriers to natural ecological processes
- Wholesale recreation or restoration of habitats which are under serious threat

The analysis indicated that adaptation costs could range from £150 million to £1,400 million over the next 30 years, of which the costs of recreating mudflats would be the largest component. In the face of such uncertainty, a number of no-regrets actions were identified (i.e. action that would help to minimise costs for future adaptation, while improving current management):

- Improve protection and management of existing designated areas
- Ensure policy builds on the natural dynamics of ecosystems and incorporates buffer zones in designated areas
- Incorporate opportunities to facilitated colonisation in agri-environment and flood defence schemes and coastal planning.

Source: *Potential UK adaptation strategies for climate change*. Environmental Resources Management, May 2000

In general terms, a key issue in guiding necessary responses, is whether changes actually impact on a site's conservation objectives. This will define the 'latitude' that land managers and conservation agencies have in responding. On internationally designated sites (e.g. SPAs and SACs - see Box 3), the legal requirement to maintain a definitive list of features of importance limits the latitude for response - effectively obliging managers to keep sites in a constant condition, with the same species.

Other sites are designated more flexibly - i.e. with reference to conservation interests but not with the express requirements to maintain exactly those features come what may. Thus for a SSSI, the conservation objectives for a site are more important than ensuring that a defined list of particular species is maintained. Nevertheless, despite there being no legal requirement to maintain specific features, agencies and land managers report that they come under considerable pressure from interest groups and individuals effectively to manage sites with a view to safeguarding the species on the list.

However, it may not be possible (or practicable) to ensure the permanent survival of the features of interest. For example, under climate change, the

[11] Including sources from overseas (e.g. low-level ozone from the industrial activity in the Rhur valley).

[12] Reductions in greenhouse gas emissions will take hundreds of years to have any effect in reversing any changes occurring now. So some change is 'inevitable'. See POST Report *Living in the Greenhouse*, December 1998.

location of the optimum temperature for the common blue butterfly may move, but unless other aspects of the butterfly's ecological requirements are able to move as well (e.g. soil type for dependent food plants, etc), then the insect may well die out. But, creation of new habitat elsewhere may not always be possible or practicable.

This example highlights a particular **concern over the current European system for nature conservation that focuses on maintaining conservation interest on particular species in designated areas with fixed boundaries**. As described earlier, however, a scientific consensus is growing around the idea that change is a constant factor in all ecosystems, and that ecological processes occur over many scales of time and space. Thus, many now recognise limitations to current systems. Indeed, in 1998, the Parties to the CBD agreed to adopt an 'ecosystem approach' to nature conservation, which expressly recognises the principle that (among others[13]) "*management must recognise that change is inevitable*".

In the UK, while the BAP process pursues nature conservation beyond the boundaries of designated sites, concerns still remain that current systems require specific species and habitats to be conserved according to predefined targets, and hence are static.

ISSUES

Science in Nature Conservation

The above analysis points out that nature conservation is essentially a 'philosophy', constructed from a social process that seeks to place value upon, and hence take action to protect, particular features of the natural world present in particular places. Thus many people perceive and value 'nature' as essentially "*something other than human*". This can be manifested as economic values, such as the ability to produce commercial goods and services such as food or building materials. Similarly, cultural values include as a 'sense of place', visually attractive landscapes, and feelings that could be described as emotional or even 'spiritual'. Lastly (and essentially a subset of cultural values) there is also value in creating new knowledge about the workings of the natural world.

Stemming from the goals of nature conservation, rather than driving them, science still plays a number of crucial roles:

- identifying features present (e.g. organisms, soil types, landforms, hydrology, and climate)
- describing interactions between features and ecological processes (e.g. water purification)
- monitoring and recording features, and measuring changes (e.g. skylark decline)
- understanding the causes and consequences of changes (e.g. the effects of sea level rise)
- defining management practices to meet the conservation objectives (e.g. grazing regimes).

Limits of the Traditional Approach

Recognising that **organisms exist within complex dynamic ecological systems where the constancy of change is a defining characteristic** raises a fundamental question over the role of nature conservation - i.e. whether to concentrate efforts on maintaining populations of particular species within specific sites, or to adopt a broader view to acknowledge and value ecosystem processes that work over larger areas. The choice is ultimately a social one, but science has a role to play in informing the debate. It should be remembered, however, that SSSIs (in Britain) and ASSIs (in Northern Ireland) are considered to be the 'jewels in the crown' of the UK's wildlife. So, even as change occurs, they would remain the best examples, although the particular mix of species present on the sites may be different.

The above discussion has shown that, while some efforts (e.g. BAP) are being made to recognise that biodiversity is not solely restricted to sites with fixed boundaries, **current systems for nature conservation need to be amended to allow for dynamic adjustment in response to climate change**. Indeed, English Nature is keen for a debate to commence, to tackle the inflexibility of EU conservation policy.

The Wider Countryside

The UK BAP, produced in 1995, expressly recognises the value of biodiversity beyond designated sites. Nevertheless, there are concerns over both the scientific rationale, and organisational issues related to the BAP process itself. Scientifically, there are concerns that the focus of BAP may not be appropriate, as it concentrates on rare or declining species, rather than on a broader range of organisms within their ecological settings. This reflects the earlier discussion of the range of reasons why people value nature. Thus, in the case of BAP priorities, the primary values are rarity, fragility and the need to maximise diversity. Less attention is paid to the more esoteric scientific ideas of maintaining ecosystem processes and integrity, or the more

[13] Others recognise that conservation of ecosystem structure and functioning should the priority target (rather than just species protection), and that conservation is a societal choice, so all relevant sectors should be involved.

cultural values such as a sense of place[14].

This has led some organisations to raise questions over whether the BAP process is the optimum approach, and whether its focus should shift from species and habitat protection to maximising the 'integrity of ecosystems'. For example, in evidence to the Environment Sub-Committee, the Woodland Trust suggested that the 6 separate habitat plans for broadleaved woodland should be combined into one. This would recognise that (as with all ecosystems) broadleaved woodland exists in a permanent state of flux; with the dominant species in the ecosystem changing over time.

Similarly, concerns over BAP have also focussed on organisational issues, such as complexity, bureaucracy, a lack of a recognised 'command structure' and a lack of engagement by business and the general public (even among the 5 million members of the conservation organisations[15]). Recognising these limitations, English Nature (among others) have called for a statutory underpinning of the BAP process, arguing that this would raise its political profile among key decision-makers, leading them to give a higher priority to biodiversity. The UK Government's final position on this is has not been announced.

Marine Nature Conservation

Some estimates suggest that as much as half of the UK's biodiversity is present in the marine environment. Yet, at present, the UK has only two marine nature reserves, and the seaward limit of terrestrial sites is the low water mark. A court decision early in 2000 established that the EU habitats directive must apply to the limit of UK waters, out to the median line or 200 mile limit (whichever is furthest offshore). Biological recording in the marine environment is practically more difficult and more costly than on land, and so records are not as comprehensive, and marine nature conservation policies not as advanced.

Consequently, a broad consensus has emerged that current systems for the protection of marine biodiversity are inadequate. Hence, some have called for specific legislation and a separate agency for marine nature conservation. Others have suggested, however, that this would create further bureaucracy, and would not be workable, given the complex interactions between land, coast and sea. An opportunity exists therefore, for **a UK-wide debate to begin as to how best to ensure the protection of marine biodiversity**.

TOWARDS A NEW APPROACH

A New Vision for Conservation?

The above discussion highlights long-held concerns that current systems for nature conservation are limited in their recognition of the dynamics of ecosystems. Three main points arise. The first is that ecosystems are more than just collections of particular species arranged within fixed patterns in particular places. Second, high nature conservation value is often much more widely distributed across the countryside[16]. Third, conservation value lies beyond concern about rare or rapidly declining species and habitats.

This analysis suggests, therefore, that biodiversity might best be conserved within a more scientifically informed system operating under the 'ecosystem approach' adopted by the Convention on Biological Diversity in 1998. One such attempt to promote this agenda in the UK has been the '*Lifescapes*' project run by English Nature (**Box 4**).

Within such a new vision, there is greater recognition of the scientifically established principles of ecology, but it is important to recognise that choices still have to be made about priorities. Given the range of perceptions and values of nature that people hold, these choices cannot be made by science, only informed by it. Thus, ultimately, it will be a matter of social debate to establish the priorities. This has led to calls for a process of wide consultation and deliberation, open to a broader range of interests than has been the case[17].

Current political interest in nature conservation is high. So, the opportunity now exists for the Government and the devolved administrations **to begin a process of broadly based consultation and deliberation[18] to determine how nature conservation policies and practices should adapt in the coming decades, recognising current ecological understanding alongside the broad range of**

[14] For example, many people enjoy seeing a buzzard flying, but how many would value it for its role as a top predator in an ecosystem, as opposed to it being a beautiful and rarely seen animal which can inspire feelings of awe and majesty?

[15] This figure includes 2.6 million members of the National Trust, many of whom have not joined solely for nature conservation reasons.

[16] This is not the case everywhere – e.g. the intensively farmed areas of East Anglia have been described as "*ecological deserts*".

[17] This follow the recommendations of *Science and Society* report from the House of Lords Science and Technology Committee (February 2000), which concluded that it was necessary to broaden the scope and participation of traditional consultation methods and develop processes that create meaningful dialogue between a wide range of parties: including government, business, NGOs, academia and members of the public.

[18] There are many techniques for eliciting the views and values of interested parties on an issue. A forthcoming POST publication (later in 2000) will summarise the 'state of the art' in this area.

reasons why people value nature.

The terms of reference for such a debate might be[19] *"to debate in depth how to evolve new means of evaluating the social implications of ecological understanding, the social preferences for different ecologically-feasible choices, and the best means of achieving widely held goals."*

Research Needs

The 'ecosystem approach' of the CBD suggests that conservation based on the protection of particular species is no longer appropriate, especially as climate change becomes more apparent. Indeed, this approach suggests that special sites need to be seen in the context of the wider countryside, as is intended in English Nature's *Lifescapes* project. Consequently, many have called for a realignment of current ecological research to address these issues. Some argue, for instance, that ecological science should focus on ecosystem processes operating over wider areas. Others have called for a narrowing of the focus of research, to concentrate efforts on BAP priority species and habitats. English Nature suggests that both approaches are necessary. Focusing only on ecosystem processes misses the small-scale interaction at the level of individual organisms, while focusing on BAP priorities misses wider processes that, ultimately, determine whether conservation will work in practice.

Underpinning the research agenda, there is a need to address the question of dealing with environmental change. Thus, it is necessary to recognise that research into complex, chaotic natural systems is not capable of resolving all questions, and that inevitably large gaps in knowledge will remain.

Acknowledging this, some have suggested that **ecological research could become more closely aligned with conservation practice in a process of 'learning by doing'** (or 'adaptive management'). This approach would produce a range of practical management strategies for particular ecosystems, each seeking to be flexible in meeting conservation objectives, but without prescriptive plans that reduce learning from experience. Clearly, ecological research is necessary at many different scales, but a rebalancing of priorities might be required. An opportunity arises for the Government, devolved administrations, nature conservation agencies, NERC and academics **to clarify the objectives and scope of ecological research, and to provide a coherent strategy**. Indeed, early in 2000, DETR began a series of meetings (to run until the end of 2001), bringing together the research community to improve research networks, provide coherence in research programmes, to identify research needs, and to encourage action.

Lastly, coming back to social issues, there is a lack of empirical evidence on how people relate to nature. This would be useful as it would lead to a better understanding of what is worth conserving, for what reasons, and how it should be conserved. However, there is no one single method, but a range of research techniques (such as group deliberation, questionnaires, surveys and interviews) can draw out, identify and characterise the nature of the relationships between people and nature. Thus, there is a need **to develop a broader basis for expressing 'value'** beyond the controversial approaches of 'environmental economics' that seek to place monetary values on species, habitats, and landscapes.

BOX 4 'LIFESCAPES'

Over the last 10 years, there has been growing acceptance that successful wildlife conservation cannot be achieved just through designated sites. The importance of land use and land management in the areas between and around SSSIs is also a critical influence. The effects of habitat fragmentation and isolation are now widely recognised. While much important activity is taking place to restore degraded habitat within SSSIs, there is still little effort directed towards improving the ecological quality and 'connectivity' of the landscapes between special sites.

English Nature's *Natural Areas* initiative was a step forward, helping to engage local support and awareness, and identify local action. EN now wishes to use Natural Areas as the way to target action onto specified areas of land where there is the greatest likelihood of achieving habitat and species targets over a long timescale. This leads to the need for 'landscape ecology' and incorporating nature conservation with the socio-economic agenda in rural development. The 'Lifescapes' project emphasises the need for action to deliver wildlife within landscapes, and to highlight that biodiversity is related to quality of life. There are two key components, environmental and socio-economic. The environmental element relates to habitat re-creation, and encouraging more environmentally sensitive land management around habitats. This includes creating buffer zones around, and corridors between, designated sites, and enabling the delivery of 'environmental services' such as flood plains. The socio-economic aspect relates to 'sustainable development' - widening the appeal biodiversity beyond its 'traditional' supporters. It aims to create more attractive countryside, and boost rural tourism in areas where it may not yet be significant, such as the new National Forest. It also allows for enhanced local distinctiveness and 'branding', especially for food and other products.

Source: English Nature

[19] Taken from a paper presented by Sir Martin Holdgate, at the National Trust/British Association for Nature Conservation Conference, November 1999.