



# Evidence-Based Conservation



Conservation of the natural environment is necessary to protect and enhance the UK's valuable natural resources. The use of scientific evidence to support conservation decisions can increase potential impacts and ensure cost-effectiveness. This POSTnote summarises the benefits of, and issues surrounding, an evidence-based approach to conservation management.

## Background

The natural environment is recognised as one of the UK's largest assets. The total value of the UK's natural resources to the economy was estimated at over £15bn in 2007.<sup>1</sup> The environment provides humans with a number of essential resources, known as ecosystem services, for example, food, fuel, clean water, clean air and waste decomposition (POSTnote 377). Globally, the economic impact of loss of environmental services is estimated at £2-5 trillion per year.<sup>2</sup>

Conservation of the UK's natural environment is essential to ensure that these ecosystem services are maintained and improved. The Natural Environment White Paper aims to "publish a bold and ambitious statement outlining the Government's priorities for the natural environment and set out a framework for practical action".<sup>3</sup> To achieve this, the current state of the UK's natural environment is being evaluated. The forthcoming National Ecosystem Assessment (NEA) aims to provide the necessary scientific evidence to define the value of the UK's ecosystem services.<sup>4</sup> The NEA will provide baseline data to allow the impacts of future conservation efforts to be reliably measured, and offer evidence to support future management practices.

## Overview

- Evidence-based conservation management requires the collection and analysis of valid, impartial data regarding conservation activities in the past and the application of this knowledge to future decision making.
- Evidence-based conservation has been generally recognised as being beneficial, yet to date, there is disagreement about how to maximise the positive effects of evidence-based approaches.
- Increased short and long term monitoring of the impacts of conservation measures would improve the evidence base, and allow their cost-effectiveness to be assessed.
- A large body of evidence regarding conservation practice exists, but communication of this information needs to improve to ensure that the information is accessible to all stakeholders.

Conservation practices supported by scientific evidence tend to lead to improvements in measurable impacts and value for money (Box 1). The majority of UK organisations with responsibility for conservation have recognised the importance of evidence-based decisions regarding management. For example, Natural England states that all its work "from strategy through to delivery, is underpinned by sound evidence".<sup>5</sup> However, conservation organisations disagree significantly about what constitutes adequate and reliable evidence.

## Problems with Current Conservation Practices

A 2004 study showed that up to 77% of conservation management actions are based solely on anecdotal evidence rather than on scientific data.<sup>7</sup> For many land managers, personal experience is a huge factor in the planning of future conservation. In many cases, the use of individual knowledge and experience can result in good conservation practice. However, it may be an issue where it leads to the implementation of inappropriate or inefficient management practices. For example, flooding of grasslands in the winter months was thought to provide a habitat for many wading birds. The practice was supported by government funding, yet research published in 2004 showed that flooding grasslands can damage the invertebrate

populations that birds feed on.<sup>7</sup> Despite government funding, wading bird populations in the UK have continued to decline.

#### Box 1. Reed Bed Management

Reed beds are wetland habitats that cover 5000 hectares in England. They provide a home for a number of rare or threatened bird species such as bitterns and bearded tits, and a number of important invertebrates. They are often designated as Special Protected Areas or Sites of Special Scientific Interest. In some cases, they are also commercially managed to supply raw materials for thatching. Their management for conservation has traditionally involved cutting or grazing reeds to prevent them drying out. Burning is an efficient method of removing dry reeds in the winter but the practice was avoided because of potential damage to soil invertebrate populations. In 1992, trial management of reed beds showed that controlled burning did not significantly affect invertebrate populations in the long term.<sup>8</sup> The widely-held assumption that burning had negative effects came from studies carried out on dry grasslands that bore little relevance to reed beds. Controlled burning of small areas is now recommended by Natural England as a management practice for commercial reed beds.<sup>9</sup> There is still some disagreement about the best management practices for reed bed habitats.

#### Current Conservation Funding

Public funds for conservation *research* are allocated by a range of sources, including the Research Councils, NGOs, universities and other agencies. However, there are rather few direct grants for such research. Spending on conservation practice tends to dominate, as NGOs and conservation organisations have limited funds, and prioritise conservation practice rather than research. This ensures that allocated funding is spent on conservation actions, however, a lack of research can lead to decisions and practices based on insufficient evidence.

#### Monitoring

Monitoring the outcomes of research grants is generally not funded; most research grants are funded for three to five years, which is often not long enough to measure reliably the impacts of specific practices. General monitoring of conservation sites produces good evidence of the impacts of specific actions but can be prohibitively costly for smaller conservation organisations. Despite this, many monitoring data are produced across the UK by a number of stakeholders. This information can provide invaluable evidence for future decisions.

Several organisations have attempted to improve the amount and quality of monitoring data that are collected and shared in the UK, the most significant of these being the Environmental Observations Framework (EOF). This is funded by the Living with Environmental Change partnership (LWEC) and aims to “change the way the UK perceives, values, archives and uses information from observation activities by working across public departments and agencies, the voluntary sector, industry and academia”.<sup>10</sup>

#### Communication Issues

Evidence from conservation research does not always lead to good decisions in conservation practice. Land managers do not always have the time, expertise or funding to access original scientific literature. Academic researchers publish almost exclusively in peer-reviewed journals, where the scientific content takes precedence over the communication of practical information. Although primary literature is used

by some stakeholders to provide guidelines, it is of little direct use to smaller NGOs and individual land managers.

Another problem with scientific publishing is that studies with negative results are published far less than those where the results are seen as positive. Evidence for this comes mainly from literature on clinical trials, where positive results for a particular treatment are more than three times more likely to be published than those where the treatment has negative or neutral effects.<sup>11</sup> The consultation summary of the Natural Environment White Paper has highlighted these issues about communication between conservation organisations. Part of this is related to perceived and real difficulties in accessing good evidence, and is likely to become more of a problem if decisions regarding the environment are made locally in the future, as proposed by the Localism Bill. The communication of research and monitoring data between stakeholders is generally poor, but improving.

## Evidence-Based Management

An increased awareness of the value of the natural environment and the costs of maintaining it has led to the adoption of evidence-based management in certain areas and organisations across the UK. A number of conservation organisations are examining ways to improve the scientific basis of their work by developing methods to build up an evidence base.

### Types of Evidence

Evidence from conservation research, trials and management practices takes many different forms. These include:

- **peer-reviewed scientific journal articles** These are standard for the publication of academic research and are reviewed by a panel of experts to ensure their quality.
- **expert understanding** The knowledge of individuals can be a useful addition to research, especially in cases concerning obscure species or complicated habitats.
- **grey literature** This is a broad term for data that have not been published in peer-reviewed publications. It can include records held by individual organisations, reports commissioned by statutory bodies and non-departmental public bodies and technical information notes produced by Natural England.

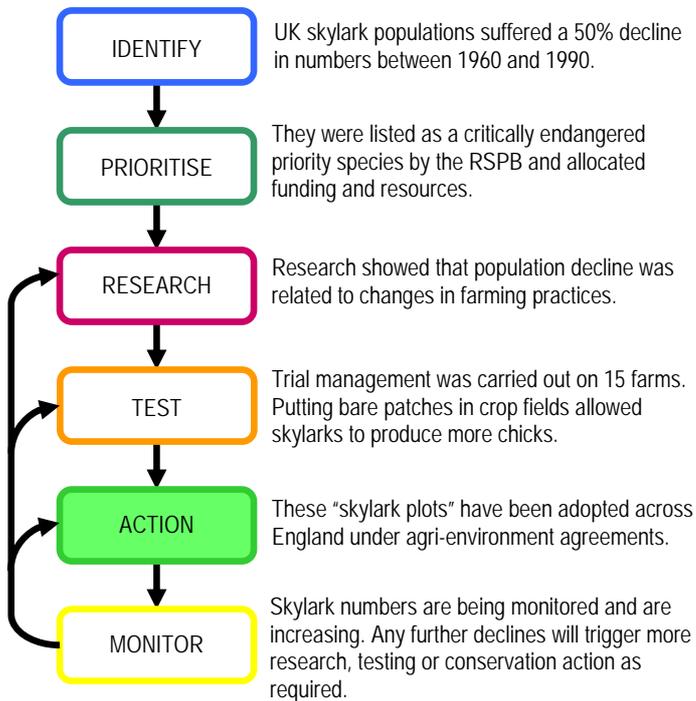
### Adaptive Management

Adaptive management involves the collection and analysis of data throughout the conservation process, ultimately leading to evidence-informed outcomes (Figure 1). Monitoring the outcomes of the decisions made allows practices to remain flexible and to continue to be refined. Many conservation organisations have a framework to guide this process, as well as any conservation science they may undertake.

In addition to adaptive management, area-specific research can ensure that practices lead to measurable impacts. A good example of the use of local evidence to inform practices can be seen in the conservation of the Breckland landscape of eastern England (Box 2). It is hoped that this approach will result in a greater understanding of how communities of species across large areas can be benefitted by conservation practices.

**FIGURE 1. FRAMEWORK FOR CONSERVATION.**

This scheme is adapted from the Royal Society for the Protection of Birds' (RSPB) approach and highlights its work on the conservation of skylarks in England.



**Box 2. Evidence Directed Management in the Breckland**

The Breckland is an area in the east of England, covering approximately 1000km<sup>2</sup> in one of the driest areas in the UK. The dry conditions and poor soils have given rise to populations of many species and habitats more characteristic of Mediterranean areas. In response to concerns about a loss of biodiversity in this unique area, the Breckland Biodiversity Audit was commissioned.<sup>12</sup> This showed that there are more than 12,500 species living in the Breckland, around 2000 of which are of national importance. 28% of all designated priority species are present, highlighting the need for good conservation practices in the area. The Breckland Audit and its recommendations are based almost entirely on 800,000 records provided by amateur and volunteer recorders. Gaps in the evidence collected have also been highlighted, with recommendations as to how they can be filled. Current conservation practices have been investigated and evaluated to produce a series of recommendations for the Breckland's land managers. Trial management will be carried out to reinforce the evidence base and to suggest long term management practices. The use of evidence has allowed the creation of a coherent framework to build on existing practices.

**Evidence Reviews**

Another approach to evidence-based conservation is to review all existing data surrounding a specific issue to inform any decisions about management. To do this, evidence needs to be available in a format that is easy to understand and use, and several organisations have set up websites and procedures to facilitate this. Standardised reporting procedures are not widely followed by the conservation community, although they have been developed in the US and the UK. An information resource for all conservation practitioners is being developed by the Conservation Evidence project at the University of Cambridge.<sup>13</sup> This aims to provide a format to share knowledge about conservation research and practices. It consists of an online journal where small scale studies and summaries from both academic and

non-academic organisations can be published. It also produces synopses of evidence regarding individual species and habitats. Synopses aim to collate all the available evidence relating to all conservation management schemes for a species group or habitat. The first synopsis summarises evidence about bee conservation by management practice and is freely available to all interested parties.<sup>14</sup>

**Systematic Review**

Currently, the evidence base is largely made up of data from research, case-studies and pilot schemes that were not designed to answer a specific question. As a result, their conclusions may be unduly influential. Systematic reviews aim to assemble all relevant data and records regarding a specific conservation issue. Information is classified and weighted according to its provenance and the rigour with which it was collected. In this way, systematic reviews can remove bias in a large amount of data (Box 3).

**Box 3. Systematic Reviews**

Systematic reviews focus on a specific research question, and try to identify and evaluate all the research evidence that is relevant to it. From the body of evidence, high quality data are appropriately weighted and assimilated to produce conclusions, which can be used to inform decisions. Recent thinking in conservation science has been influenced by examining an existing evidence base in the medical sciences. The Cochrane Collaboration prepares systematic reviews of evidence from clinical trials, and helps to disseminate them to the relevant healthcare providers. These systematic reviews have had measurable benefits for medical treatments. For example, a systematic review of the effects of using a steroid to treat women going into premature labour found that this treatment reduced the risk of death due to immaturity in babies by 30-50%.<sup>15</sup> An earlier recognition of these effects could have saved tens of thousands of lives. The Collaboration for Environmental Evidence (CEE) aims to be the conservation equivalent of the Cochrane Collaboration. The CEE applies strict criteria for the quality of the review process, and acceptance and publication of a completed review is dependent on these criteria being fulfilled. The process of systematic review (adapted from CEE guidelines) is as follows<sup>16</sup>

- generate a specific question
- gather all relevant data
- critically appraise of the quality of the method used to obtain the data
- synthesise data and interpret the evidence to form conclusions.

In medicine, systematic reviews have become the 'gold standard' for evidence-informed decisions. The Collaboration for Environmental Evidence (CEE), set up by researchers at the University of Bangor, aims to produce good quality systematic reviews surrounding conservation issues. These reviews can be commissioned by stakeholders to CEE guidelines, meeting strict criteria to ensure the review is useful, relevant and accurate. However, in conservation, systematic reviews are not widely used. Proponents of their use, including the CEE, attribute this to poor communication networks and a lack of funding for training, support and for the reviews themselves. The Department for the Environment, Food and Rural Affairs (Defra) believe that "their effectiveness within conservation is always likely to be limited by lack of data".<sup>17</sup> However, it is arguable that systematic reviews will be necessary to successfully address future conservation needs.

## Challenges for Evidence-Based Decisions

Every conservation management practice would ideally be based on high quality, peer-reviewed evidence. In practice, this is difficult because:

- the cost of producing good evidence is high, and must be weighed against the potential benefits of the proposed actions
- decision making should be separated from the process of gathering evidence in order to maintain a level of flexibility in decision making and avoid potential conflicts of interest
- a 'one-size-fits-all' approach can lead to the uptake of inappropriate practices, as every area or habitat will have different pressures. For this reason, the term 'evidence-informed' management is sometimes used
- economic considerations must be taken into account when considering conservation on commercially used land, for example, a trade-off between agricultural production and biodiversity on farmland is almost inevitable. The conflict between economic requirements and ecological outcomes will have to be acknowledged.

## Future Needs for Evidence in Conservation

A number of factors will need to be introduced or improved to enable a more widespread use of evidence in conservation planning. These include:

- **improvements in research design** Researchers and land managers need to plan studies and trials to produce useful evidence. Research needs to be based on specific questions, for example "what is the impact of x on y?", and carried out to allow outcomes to be measured.
- **increased publication and sharing of results** Land managers and academics need to be encouraged to share data from conservation research, and to do so in a way that is useful to all stakeholders.
- **databases of references** Citations and summaries of interventions and their results need to be accessible. Grey literature contains evidence which could be used in decision-making if it were made more accessible.
- **synopses and systematic reviews** Synopses of relevant data on an issue, in addition to systematic reviews, are an invaluable resource in allowing practitioners to find and analyse the evidence they require.

An overall picture of the condition of the UK's natural environment has been built up by the Natural England report on the State of the Natural Environment and will be augmented by the forthcoming NEA. These assessments, although not exhaustive, could provide a good baseline for monitoring the outcomes of conservation practices in the future. With the increase in evidence-based decisions, it has become clear that the evidence behind certain practices is constantly changing. Changes in climate, the economic situation or in social preferences in the UK can alter conservation priorities. Therefore, the evidence behind a specific decision must be reassessed periodically. For example, conservation measures on farmland are regularly reviewed to ensure they remain relevant and to improve their impacts (Box 4).

Communication issues may need to be addressed, especially in light of the proposed Localism Bill. Decisions

about the natural environment and conservation are more likely to be made locally in the future. This may cause problems if the relevant skills and expertise to make evidence-based decisions are not available to every local authority. A system for accessing information easily on a large scale would ensure that relevant information is available to local decision makers.

### Box 4. Agri-environment Schemes

Agri-environment schemes aim to preserve or improve the natural environment, while maintaining production and sustainable agriculture (POSTnote 254). In 2009, £222million was paid to English farmers to implement conservation measures on their land.

The state of the evidence base behind agri-environment schemes is generally regarded as robust; all of the original conservation options for farmers were informed by evidence. The impact of agri-environment schemes is regularly reviewed to ensure that they deliver valuable biodiversity benefits.

A review of progress in 2008 assessed the uptake of agri-environment options and the conservation outcomes.<sup>18</sup> It highlighted that uptake of options was skewed towards those which were easier to implement and had the least impact on productivity. Defra and Natural England are currently working with partners to improve the effectiveness of the major agri-environment scheme in England (Environmental Stewardship), improving the targeting and focus of agreements to boost their delivery of environmental outcomes. UK agri-environment schemes will be reassessed in 2011 to ensure that progress is being made and to increase the impacts of specific options.

The focus for conservation has moved towards attempts to understand and value the benefits that the natural environment provides to society. The conservation of these ecosystem services and large or 'landscape' scale conservation is important for human wellbeing, as will be highlighted by the NEA. In 2010, a review commissioned by Defra and chaired by Professor Sir John Lawton, recommended the introduction of ecological restoration zones (ERZs).<sup>19</sup> These large conservation areas, managed by local landowners, organisations and communities, are estimated to cost £27million over 5 years. Building up the evidence base behind landscape scale conservation will be important to ensure money is spent wisely and potential benefits are maximised.

### Endnotes

- <sup>1</sup> <http://www2.defra.gov.uk/environment/natural/ecosystems-services/>
- <sup>2</sup> TEEB, 2009, *The Economics of Ecosystems and Biodiversity for National and International Policy Makers*, European Commission, Brussels. [www.teebweb.org](http://www.teebweb.org)
- <sup>3</sup> Defra, 2010, *An invitation to shape the Nature of England: Summary of responses to the Discussion Document*, Report for Defra. <http://goo.gl/MUTqj>
- <sup>4</sup> UK National Ecosystem Assessment, <http://uknea.unep-wcmc.org/>
- <sup>5</sup> [http://www.naturalengland.org.uk/information\\_for/researchers/default.aspx](http://www.naturalengland.org.uk/information_for/researchers/default.aspx)
- <sup>6</sup> Sutherland, W, *et al*, 2004, *Trends in Ecology and Evolution*. **19**, 305-308
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- <sup>8</sup> Dillhogo, M, *et al*, 1992, *Journal of Applied Ecology*. **29**, 265-276
- <sup>9</sup> Natural England, 2007, *Best Practice Guide 5: Use of fire to manage reed beds and saw-sedge*.
- <sup>10</sup> <http://www.lwec.org.uk/>
- <sup>11</sup> Crowley, P, *et al*, 1990, *BJOG*. **1**, 11-25
- <sup>12</sup> Dolman, PM, *et al*, 2010, *First Report of the Breckland Biodiversity Audit*
- <sup>13</sup> <http://www.conservationevidence.com>
- <sup>14</sup> Dicks, L, *et al*, 2010, *Conservation Evidence Synopses: 1*
- <sup>15</sup> Dickerson, K & Min, Y-I, 1993, *Annals of the NY Acad. of Sciences*. **703**, 135-146
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- <sup>17</sup> Defra, pers. comm.
- <sup>18</sup> Defra & Natural England, 2008, *Environmental Stewardship: A Review of Progress*.
- <sup>19</sup> Lawton, J, *et al*, 2010, *Making Space for Nature: a review of England's wildlife sites and ecological network*. Report to Defra.