CHAPTER 13

Biodiversity and society

13.1 In order to integrate biodiversity effectively as part of sustainable development, it is important for all sectors of society to recognise the part they can play. This chapter looks at aspects of the contribution that society as a whole can make.

Business and biodiversity

13.2 Biodiversity provides the natural assets for many businesses and industries. Farming and food processing and retailing, distilling and brewing, petro-chemicals and pharmaceuticals, construction and engineering all derive economic benefits from the use of biodiversity. Wise and sustainable use of biodiversity is essential to the continued success and development of these industries. Businesses are increasingly recognising that conserving biodiversity should be an integral part of their business planning and policies.

13.3 As biodiversity is vital to many businesses, so the involvement of business should be an essential part of the work to conserve and enhance biodiversity. Even where businesses have no direct impact on biodiversity there are sound business reasons why it should be taken into account in their developing policies. These include the need to comply with environmental regulations on, for instance, pollution control, water abstraction and protection of special sites; fiscal measures, such as landfill tax; public and peer pressure for more open and accountable environmental reporting; and opportunities for competitive advantage and enhanced consumer reputation.

Clean water underpins the commercial success of several of Scotland's most distinctive products.

13.4 The adoption of sympathetic land use and management policies by businesses could considerably assist the achievement of biodiversity targets, particularly at the local level. Many businesses require or generate information on biodiversity in the normal course of their activities. Entering partnerships with local record centres and the National Biodiversity Network can offer cost-effective access and data sharing for these companies.

13.5 The 1995 Steering Group report suggested that private or voluntary sector champions should be invited to co-ordinate each species and habitat Action Plan and generally stimulate the appropriate action. The Government's response to the report recognised that for many of the species Action Plans the opportunity existed for the voluntary conservation organisations to take on this role and become the champion. But it also envisaged 'champions' being individuals or companies who might wish to be directly associated with species action through the provision of funds or 'in-kind' support. Table 13.1 shows the champions that have been associated with particular action plans.

Table 13.1: **Biodiversity Champions**

14 Species Action Plans have attracted support from corporate 'champions' with over £1.4 million being provided to support work for these species.

Species	Company
Large Blue Butterfly	ICI
Pearl bordered Fritillary Butterfly	ICI
Medicinal Leech	Glaxo Wellcome
Skylark	Tesco
Bittern	The Co-op Bank
Corncrake	Shanks
Early Gentian	Wessex Water
Stag beetle	Mileta Tog 24
Otter	Water UK, Regional Water Companies, Biffaward, Fina
Pool Frog	Anglian Water
Depressed River Mussel	Thames Water, Anglian Water
Roseate Tern	Northumbrian Water
Round Nosed Whorl Snail	Northumbrian Water
Marine Turtles	Cheltenham and Gloucester Building Society

The Limestone Pavement Habitat Action Plan is being supported by RMC who have given a 'no use' undertaking which, amongst other things, ensures that water-worn limestone is not sold in its Great Mills chain of stores. RMC are also helping the Limestone Pavement Action Plan Working Group's efforts to promote the importance of the resource through education and public awareness.

13.6 Several companies, including most of the major water companies, have developed company biodiversity action plans. But the majority of businesses need help in understanding why and how they should be involved in conserving biodiversity. For this reason the UK Round Table on Sustainable Development published 'Business and Biodiversity'[54] – a guide to UK Business on how to understand and integrate biodiversity into environmental management systems in 1998. The guide was reprinted in 1999 and so far some 28,000 copies have been distributed. A guide for small and medium-sized enterprises is currently being finalised and will be published in the Spring 2001.

54 'Business and Biodiversity', Earthwatch (1998)

13.7 To build on this interest DETR commissioned Earthwatch UK to prepare and publish a companion volume 'case studies'.[55] Published in March 2000, the booklet provides practical examples of the measures companies have taken to integrate biodiversity into their business planning and operations. It also identifies features of best practice that can be used as broad indicators of a company's commitment to biodiversity and its successful integration into their environmental management systems.

13.8 DETR continues to promote the use of environmental management systems to encourage business to address its environmental performance, including action on biodiversity. The Making a Corporate Commitment (MACC2) initiative was launched last year to help focus attention on performance in areas of national and international concern and can be pursued whether or not businesses have formal environmental management systems. The aim is to encourage businesses to publicly declare environmental performance targets – including biodiversity targets – and to report annually on progress. And Business in the Environment introduced trial questions on biodiversity into its 2000 survey of the FTSE 100 companies for its Index of Corporate Commitment.

Good biodiversity VIBES

The business and environment awards in Scotland were made on 4th December in Edinburgh and included several biodiversity examples.

Communicating internally and externally was considered vital to the business, in particular getting a work force signed up to overall objectives and standards.

ISO standards are an example – these may be significant to bring about action for biodiversity targets, including improving communication.

13.9 Integrating biodiversity thinking into any organisation is difficult. It requires planning, leadership and good communication. This is often lacking even in the greenest of organisations. The support of senior management is crucial and must be communicated down the line to help encourage more junior staff. DETR have given Earthwatch a grant under the Environmental Action Fund to help raise awareness among companies by establishing a Business and Biodiversity resource centre. The Business Sub Group established by the Scottish Biodiversity Group has produced advice to particular sectors of the business community.

55 'Case Studies in Business and Biodiversity', Earthwatch (March 2000)

Company Biodiversity Action Planning

Centre Parcs UK has three leisure villages in Sherwood Forest, Longleat Forest and Elveden Forest. Biodiversity is a central part of Centre Parcs 'product' : their guests relax among native flora and fauna.

Centre Parcs is accredited to ISO 14001 and biodiversity is a principal element of the environmental management system. The biodiversity action plan is implemented in each village through the forest management plan.

The UK BAP and relevant Local Biodiversity Action Plans were the principal documents in establishing Centre Parcs' biodiversity targets.

The company conducts an intensive ecological monitoring regime, identifying and developing action for species of conservation concern which are not covered by the local biodiversity action plans.

London Luton Airport Operations Ltd operate the international airport on approximately 300 hectares south east of Luton including secure grassland and other wildlife habitats.

The airport has compiled a management plan to maximise the value of the habitat for key BAP and protected species whilst deterring certain birds which can be harmed by and be a hazard to aircraft engines.

The site has one of the highest densities of Brown hares in the county and significant populations of Skylarks and Bee orchid. Focusing on these and other target species enables the company to contribute to national targets.

To mitigate recorded road casualties of Barn owls on the airfield the company sponsored a Barn owl conservation project in the nearby countryside.

13.10 We are encouraged by the work that many businesses are doing to take account of biodiversity and to integrate it more effectively into their operations. There are many examples of good practice and co-operation at national and local levels. The champions initiative has given rise to some successful partnerships and this should continue to be pursued as opportunities arise. However, much more needs to be done to ensure that business practice, long-term, incorporates biodiversity considerations as part of sustainable development and sustainable use of resources. We acknowledge the ETRA Committee's observation that business should be more involved in biodiversity. We recommend that representatives of industry should be invited to participate more comprehensively in the biodiversity process at all levels in order to develop a more effective strategy for business involvement and understanding.

13.11 The engagement of business will be essential if society is to be sustainable in the long-term. The quality and quantity of our biodiversity provides an important broad indicator of whether we are on a sustainable path. In 2000, the Energy and Natural Environment Panel of the Government's Foresight Programme identified loss of biodiversity as one of the current and future dangers of 'business as usual.' The Foresight Programme aims to develop visions for the future, looking at possible future needs, opportunities and threats and deciding what should be done now to make sure we are ready for these challenges. In doing so it builds bridges between business, science and government, bringing together players from all these sectors to look at the fundamental questions and develop a long-term strategy to increase national wealth and the quality of life. Biodiversity conservation and sustainable use is a clear case where the Foresight approach can begin to tackle the major issues which lie beyond our immediate concerns. The biodiversity process already provides a springboard for this through the established partnership.

13.12 We welcome the decision of the Energy and Natural Environment Panel of Foresight to consider biodiversity as part of its future programme. We look forward to co-operating with them to develop an approach to consider the long-term conservation and sustainable use of biodiversity.

Biodiversity in urban areas

13.13 For most people in the UK, towns and cities provide the environment where they are most likely to have daily encounters with biodiversity. Parks, woods, commons and other green spaces bring experiences of the natural world which can be all the more enjoyable for being familiar and unsung. Private gardens, which cumulatively amount to the greatest amount of urban green space, are especially important in this respect.

13.14 If our aim is to encourage everyone to appreciate biodiversity and incorporate it into changed behaviour, the BAP must reach into centres of human population – the boundary between town and country is not distinct. Many species are particularly important in an urban setting, others inhabit the fringes and visit from time to time. There are a number of BAP priority species which occur in urban areas, a few predominantly so, such as the Stag beetle. Priority habitats, such as heathland, chalk grassland, parkland and ancient woodland, have often become absorbed into towns and cities, acting as refuges for both rare and common species. More urban habitats, such as cemeteries, railway line sides and wastelands, often support unique biodiversity communities which can reflect the cultural dynamics of a particular town or city.

13.15 Some of the most valuable work in engaging the public in biodiversity has been in LBAPs in urban areas. This has included public garden surveys, and celebrations of biodiversity through art and other events. There is evidence that contact with biodiversity contributes to the well-being of urban life, and that innovative approaches within urban LBAPs can play a key role in implementing Community Strategies and successful regeneration.

Research has begun into the decline in the House Sparrow, a once-common urban species.

'Chalking up London's downs'

A project partnership of the London Boroughs of Bromley, Croydon and Sutton, the Corporation of London, London Wildlife Trust, English Nature and the Downlands Countryside Management Project.

Over £50,000 of HLF money will be focused on a range of activities over the next 2 years to promote the chalk grasslands on London's southern fringes.

Actions include site management, education, public questionnaires as to their feelings for such landscapes, and particular species work (such as Small blue and Greater yellow-rattle).

Recreational values of biodiversity

13.16 The relationship between recreation and biodiversity needs careful management to bring about a 'win-win' situation benefiting both.

13.17 Overall, the opportunity for people to visit the natural environment and experience wildlife at first hand is vital in building interest, support and understanding of conservation. Visiting the countryside is popular for enjoyment, health, spiritual refreshment and mental well-being. Survey evidence shows that birds and wildlife are the primary reasons influencing the decision of 59% of visitors to the countryside. Birdwatching is most popular with up to 5 million people[56]. People's interest in wildlife brings public support for biodiversity policies. The membership revenue that the conservation bodies receive supports important conservation work. The interest of amateur wildlife watchers provides a source of data to assist the monitoring of species status. And visiting the countryside generates demand for local goods and services, which contributes to local economies, often outside the normal 'summer' tourism season. For example, the biodiversity-rich North Norfolk coast attracts some 7.7 million day and 5.5 million night visits per year, generating visitor spend of £122 million and supporting 2,325 FTE jobs so encouraging local communities to support conservation in their areas.[57]

13.18 However, if not carefully managed, such visitors can bring problems. Many popular destinations are located within priority habitats: lowland heath, woodland, upland moorland and down, for example. On some sites, there is a risk of disturbance to breeding or roosting birds, trampling of vegetation or nest sites, soil erosion, eutrophication from dog waste and uncontrolled fire. Examples of potential problem activities include birdwatchers trying to see the spectacular dawn display of Black grouse 'lekking', or organised tourist boats to see cetaceans resulting in the harassment of individual animals. Tourist-related development such as golf course construction may also be a problem in some places.

13.19 There is little evidence that recreational pressure is a major problem. The issue has proved difficult to research, but of the studies done, few suggest access is an important factor in the reduction of threatened species or habitats, although local pressure points can occur.

13.20 Although public access is generally not a major hazard to species or habitats it is nonetheless identified as a threat in 78 plans. Of the 98 access-related actions contained in plans, 59 require management work to reduce the impact of human and canine disturbance, 38 to improve visitor facilities for people to enjoy the wildlife concerned (sometimes as a positive management mechanism for absorbing pressure) and, one to provide eco-friendly tourism based around the Corncrake. Lead Partner reports show that reasonable progress towards implementation of these actions has been made: nearly 70% of the 70 actions reported on are underway.

56 Countryside Commission (1995) – Summary of the results of the UK Day Visits Survey 1994

57 RSPB (2000) – Valuing Norfolk's Coast (RSPB, East of England Development Agency, North Norfolk District Council, The National Trust, Borough Council of West Lynn and West Norfolk, Norfolk Coast Project)

The opportunity to enjoy wildlife at first hand is one of the main interests in recreational visits to woodlands.

13.21 A key area for future attention identified in Lead Partner reports is the fencing of common land. For several species, restoration of grazing by improving vegetation condition and reducing scrub invasion is a key to recovery. This often requires fencing which has been opposed by some access groups as detracting from the character of open country. Reform of common land legislation is seen as a mechanism to resolve some perceived conflicts between biodiversity and access, and we recommend that this be pursued.

13.22 In England and Wales, the Countryside and Rights of Way Act 2000 provides for access to open country mapped as mountain, moor, heath and down and registered common land (which embraces a wide spectrum of habitats including woodland and saltmarsh). There are no plans at present for similar legislation in Northern Ireland. In Scotland, a Bill is to be introduced which would give a statutory right of access to all land and inland water, underpinning the tradition of open access to the countryside.

13.23 This legislation will bring new challenges. The Countryside and Rights of Way Act provides for the restriction or exclusion of access to protect nature conservation, and we recommend that restrictions are imposed appropriately whenever it is necessary to conserve priority species. We also recommend that management measures such as information provision, wardening, sensitive location of car parks and footpaths are taken to avoid adverse effects from the new right of access in England and Wales.

13.24 So whilst the risk for local conflict between access and biodiversity conservation clearly exists, there are wide and far-reaching benefits from encouraging the recreational appreciation of biodiversity by the public as a significant contribution to awareness-raising. Our efforts should be concentrated on ensuring that these benefits are fully realised.

Public awareness and Education

13.25 Public awareness of environmental issues in general and biodiversity conservation in particular is essential if biodiversity is to be sustained in the long term.

13.26 Market research shows that there is considerable public awareness and concern about the health of our environment in general. Recent research shows that in the public mind the environment ranks alongside unemployment, crime, health and education as one of the significant problems facing our nation today, and an issue influencing voter intentions[58,59].

13.27 For instance, more than nine in ten of the GB population (96%) have heard of global warming[60]; a survey of leisure visitors to North Devon showed just over half (54%) perceived bird populations in the area to be declining[61]. Just over half of all gardeners (56%) believe the commercial extraction of peat could be detrimental to wildlife[62]. People are concerned about the fate of wildlife, particularly that local to them. More than eight in ten (84%) GB adults are concerned about damage to SSSIs and other wildlife sites caused by development and neglect[63]. There are at least 4.9m memberships of biodiversity conservation NGOs in the UK[64]. Nine per cent of the population in England and Wales believe the loss of rare species to be the environmental issue that would cause them greatest concern over the next 20 years – this rises to 18% for the 18-24 age group[65]. However, recognition of the specific term 'biodiversity' remains low: only a quarter (27%) of the GB public have heard of the term[60], and it follows that awareness of the UK Biodiversity Action Plan process itself is much lower.

13.28 But public awareness of the need to conserve our biodiversity continues to increase. Even the word 'biodiversity' is now more frequently heard on the media, for example in David Attenborough's recent television series on the *State of the Planet*. The ETRA Committee recommended that 'if the public imagination is to be fired and they are to be persuaded to pay for biodiversity actions through their taxes, biodiversity policy must be grounded in sound principles which are clearly set out'. We agree with this point of view.

13. 29 All the Action Plans have a section headed 'communication and publicity' where actions include the production of leaflets, the greater use of the media or the promotion of a species as a 'flagship' for its habitat or other species. 'Communication' actions represent 10% of all BAP actions and Lead Partners reported on around 78% of these. In a few cases actions have been fully accomplished but, by their very nature, many are 'on-going'. It is worrying, however, that 46% have not been commenced at all.

13.30 The Stag beetle (*Lucanus cervus*) provides a striking example of how the public can be successfully engaged in species recovery. Publicity and the help of volunteers have also improved our knowledge of the distribution of the Netted carpet moth in Cumbria.

58 1998 International Environmental Monitor/MORI survey. GB, n=943

59 2000. RSPB/BMRB survey. GB, n=1892

60 2000. RSPB/BMRB survey. GB, n=1060

61 2000. RSPB survey. North Devon, n=251

62 2000. RSPB/BMRB survey. GB, n=608

63 1998. RSPB/MORI survey. GB, n=1926

64 RSPB calculation, membership of biodiversity conservation NGOs

65 Social Trends 29, table 11.2. England and Wales

Peoples Trust for Endangered Species and Tog 24 successfully raised the awareness of the Stag beetle with fact sheets and schools packs. Over 4000 people responded to a recording campaign and a web site dedicated to sightings has been established.

13.31 It is vital that we connect and communicate with the public not only to create a greater awareness generally but also to enlist their support in conservation on the ground. The process of implementing BAP actions now provides many opportunities for the media to develop interesting news stories featuring not only the species in question, but also the actual people involved in this work and what they are doing. Clear communication, with illustrations by example, can let others see what conservation work involves and inspire them to participate.

13.32 There are growing signs that biodiversity considerations are a factor in consumer choice. For example, two-thirds (64%) of all gardeners said that they would prefer to buy peat-free compost in place of composts containing peat, provided its quality was satisfactory and it cost the same. Just over half (52%) were prepared to buy peat-free compost 'even if it costs a bit more'.

Going for Green: Biodiversity Theme Month

Going for Green's 3rd annual Biodiversity Theme Month took place in March 2001. Local biodiversity events were promoted throughout England and Wales. There have been three particular initiatives to increase public understanding and involvement.

- Encouraging gardeners to increase their use of non-peat growing mediums. The National Peat-Free Compost Week promoted reduced price compost with no-peat or low- peat content from major retailers such as Great Mills and B&Q. Consumer advice was provided on alternatives to peat-based composts.
- National Volunteers Weekend offered people the chance to get involved in a wide range of biodiversity related activities from web site development to pond creation and tree planting.
- The National Sea Life Survey, promoted in conjunction with WWF UK, offered people the chance to learn about and help record the marine life found around our shores.

13.33 People's understanding of the relationship between harmful environmental changes and other aspects of personal lifestyle should be strengthened. Maintenance of individual quality of life, product familiarity and inertia remain powerful barriers to the adoption of

greener lifestyles. But concern for biodiversity has also offered an important mechanism for engaging the public in sustainability issues. For example, the RSPB has found that birds and their habitats have been a means of explaining the potential impact of global warming to its membership, and encouraging members to switch to 'RSPB Energy' – a green energy product supplied from renewable sources by Scottish and Southern Energy at no extra cost to the consumer.

13.34 At any one time 7 million young people are attending schools and colleges to prepare them for adult life. The school curricula in all four parts of the UK promote sustainable living, the place of human beings in nature and the importance of preserving balance and diversity within nature. We consider that it is necessary to build on the references in the national curricula by working with the education community to develop the curriculum tools to reinforce the themes, including developing opportunities for young people to gain first hand experience of biodiversity.

13.35 More generally it will be for the Country Groups to explore ways in which the already strong public awareness of biodiversity can be further encouraged and channelled, perhaps through the identification of different possibilities for diverse sectors of the community

Education for biodiversity in Orkney

The Orkney LBAP aims to take biodiversity into schools, to find ways of integrating it into the curriculum, as well as promoting biodiversity in further education and in life long learning.

The project officer discovered on visiting schools that they did not know of all the resources available in Orkney. So, a 'Fact Pack' is being prepared to list them and where they can be obtained, local contacts who can help with specific projects and local suppliers.

Many of the identification keys being used in schools were not suitable for Orkney's unique biodiversity. The LBAP Steering Group hopes to find funding for a project to produce Orkney - based keys for schools. In the mean time any other more suitable keys will be included in the 'Fact Pack'.

The first inter- schools termly biodiversity newsletter, 'Bioschools', was produced in the summer term 2000. The newsletter helps children to share their biodiversity news: projects they have been doing in school, wildlife experiences they had in Orkney and on holiday, as well as telling them about any local events of interest. Each term a different school will provide the articles.

The first issue of 'Bioschools' was produced with the help of Firth Primary School and was a great success. It also has its own web site, so if you want to see it for your self and keep up with the biodiversity news from the children of Orkney then go to, www.bioschools.freeuk.com

CHAPTER 14

LARGE-SCALE INFLUENCES ON BIODIVERSITY

14.1 Most of this report describes the way in which we can hope to conserve biodiversity through direct conservation action or through changes in the way we relate to our surroundings through other policies and practices. This chapter considers the impacts of other man-induced impacts on biodiversity, climate change and control of air quality, which rely on much larger-scale and long-term adjustments.

Climate change

14.2 There is little doubt that the Earth's climate is experiencing exceptional changes. The rate of warming during the 20th century was the greatest in the last 1000 years, with the 1990s being the warmest decade and 1998 the warmest year. Average surface air temperatures are now between 0.4°C and 0.8°C higher than in the middle of the 19th century. Anthropogenic-driven changes to climate are being superimposed on the background of natural climatic variations, and the trend seems set to continue in the 21st century. Indeed, climate models estimate that average global surface temperatures may increase by 3°C (within the range 1-5°C) by 2100. In the same time period, global mean sea level is estimated to rise by 0.5 metres (within the range 0.1 – 0.9 metres). Our climate will remain in a state of flux for the foreseeable future.

14.3 Only 40 out of the 391 SAPs identify climate change as a threat, perhaps because some of the more direct effects of climate change on species (for example altering the flowering times of plants) are only now becoming appreciated. In contrast, 26 HAPs (58%) cite climate change as a threat, giving a better indication of the scale of the problem. For the SAPs, mention of the climate change issue is split evenly across the taxa, whereas for the HAPs over half are coastal and the remainder are divided between freshwater, lowland and upland habitats. Sea-level rise is seen as a major threat to coastal habitats. The effects are likely to be greatest in the South-East of the UK where rising sea levels are compounded by an isostatic effect caused by movements of the continental plate. Inland, impacts are related to temperature and precipitation changes and to extreme weather events, which are likely to become increasingly significant.

Increased storms could severely affect our woodlands.

14.4 The likely impact of climate change on our species and habitats has been, until recently, poorly understood. However, DETR and MAFF have recently completed a comprehensive review of this subject, including an assessment of how climate change may affect the delivery of current nature conservation policies[66]. The research shows that several habitats are particularly vulnerable: montane and raised bogs (loss of suitable climatic conditions), soft coastal sediments (vulnerable to altered coastal defences), and chalk rivers (vulnerable to climate-induced changes in water use and agriculture). For species, the management of non-native species and the spread of potential weeds were highlighted as significant issues for the future, since these may threaten native species.

14.5 More quantitative studies of the likely impacts of climate change on natural resources are underway, for example the MONARCH and REGIS projects that form part of the UK Climate Impacts Programme[67]. MONARCH (Modelling Natural Resource Responses to Climate Change) is funded by a consortium of 11 governmental and non-governmental nature conservation organisations in the UK and Ireland, led by English Nature. The study aims to use a modelling approach to evaluate direct impacts on a broad range of species and geological features in diverse environments in both Britain and Ireland.

14.6 REGIS (Regional Climate Change Impact and Response Studies) was commissioned by MAFF, DETR and UK Water Industry Research and is assessing climate change impacts on water resources, agriculture, coastal defence and biodiversity in two regions: North-West England and East Anglia. It involves developing a methodology for conducting integrated impacts assessments at the regional scale, including a new model for forecasting changes in species distribution (SPECIES).

14.7 The results from these studies are now being reviewed to make recommendations for policy development and further research. It is immediately apparent that the research not only

66 Climate Change and UK Nature Conservation (2000)

67 Ready for Impact: An Introductory Guide to the UK Climate Impacts Programme. (UKCIP, 2000)

provides information on the responses of wildlife and geological features to climate change but also makes some challenge to the site-based approach to nature conservation, on which domestic and European legislation has concentrated in the past. The current approach does not adequately accommodate or indeed acknowledge the dynamics of global environmental change; nor does it recognise that, under such conditions, the maintenance of the current scientific interest of some designated sites may prove difficult, or even impossible.

14.8 Whilst designated sites must continue to be protected and are likely to remain the best examples of semi-natural habitats, their species composition and features of interest may change in response to climate change. Landscape fragmentation and the potential for further climate-driven changes in land-use and water demand, together with over-riding geological and physiographic constraints, will limit the potential for species to move and habitats to adapt in response to climate change. Polices for the future will have to consider the importance of understanding and facilitating species dispersal around and between isolated sites and colonisation of new areas.

14.9 Detailed consideration of climate change implications in recent months has led to the conclusion that the issue must be more firmly incorporated into future research and policy planning both in the UK and in Europe. It may raise difficult questions about whether resources should continue to be devoted to certain species which will become increasingly vulnerable (e.g. montane species like the Snowdon lily). By contrast there may be new opportunities as some species expand their ranges in the UK (e.g. some butterflies, bats and birds). The biodiversity process provides a framework for the consideration of the long-term implications of climate change. Though there is still great uncertainty, it is clear that climate-induced responses must be a factor in the continuing management of the lists of priority species and habitats and in planning actions to conserve them. It must also be taken into account more systematically in wider policy considerations which influence biodiversity.

Air Quality

14.10 Emissions of pollutants to the atmosphere (e.g. sulphur dioxide, oxides of nitrogen and ammonia) can lead to increased levels of acidity (acidification), nutrient enrichment (eutrophication) and the formation of secondary pollutants such as ozone. Above certain thresholds, most of the major air pollutants have adverse effects on vegetation, animal species and ecosystem function. However, it can be difficult to discriminate these long-term impacts from other land use or ecological changes taking place and the effects may not be apparent to conservation managers.

14.11 Long-range transport of air pollution between the countries of Europe was identified as an important ecological and political issue during the 1970s. The UNECE Convention on Long-range transboundary Air Pollution (CLRTAP 1979) was the first international agreement to tackle both human health and environmental problems caused by transboundary air pollutants. The Convention established a framework for reducing the emission of primary pollutants and the formation of secondary pollutants. CLRTAP protocols have established significant cuts in air pollution. As a result, emissions of sulphur dioxide have fallen by about 70% and of nitrogen dioxides by 30% since 1970. Sulphur deposition has halved in the last 12 years. In 1999 the UNECE agreed emission ceilings for sulphur dioxide, nitrogen oxides and volatile organic compounds and for the first time agreed to reduce ammonia emissions. The ceilings are to be met by 2010. An EU Directive is currently under negotiation for emission ceilings for the same pollutants.

14.12 Acidification is specifically identified as a threat or constraint to action in 14 SAPs and 2 HAPs. In upland areas with naturally acidic soils, excess acid deposition has had severe impacts, especially on freshwater ecosystems. Studies have shown increasing levels of acidity in lakes from the mid-nineteenth century up to the 1970s and little evidence of recovery since then. However recent results from Countryside Survey 2000 do show a slight reduction in acidity in more acidic soils from 1978 and 1998. Currently it is estimated the levels of acid deposition exceed the buffering capacity of soils over more than two-thirds of the area of sensitive ecosystems in the UK.

14.13 Eutrophication is identified as an important factor in 51 SAPs and 17 HAPs, although in some cases the source may be agricultural rather than atmospheric. Semi-natural habitats are particularly vulnerable to deposition of nitrogen. Nitrogen is a major plant nutrient and can be a limiting factor on vegetation associated with low fertility soils such as heaths, bogs and grasslands. Studies have shown that even low levels of nutrient inputs can lead to loss of diversity in species-rich grasslands, and shifts from heath to grassland species in heathlands. Results from Countryside Survey 2000 show widespread changes in vegetation, indicating a general increase in nutrient availability. Currently it is estimated the levels of nitrogen deposition exceed the critical loads for sensitive ecosystems over more than one-third of the UK.

Atmospheric pollution is a major threat to lichens.

14.14 Ecosystems are dynamic and complex and are heavily influenced by management practices (e.g. grazing or burning). The effects of management will often override the pollution signal. Many of the earlier Action Plans did not consider air pollution as a threat or indeed even an issue. This suggests that the problems associated with air pollution may be significantly under-reported by Lead Partners.

14.15 Further reductions in emissions of these pollutants will be costly to achieve. It is crucial that the impacts on biodiversity of future emissions scenarios are fully understood and quantified so that these consequences can be properly considered in setting future emission targets.

14.16 We recommend that research be commissioned to determine the extent to which future emission scenarios will affect the delivery of targets for SAPs and HAPs and the achievement of favourable condition of SSSI features as well as biodiversity as a whole.

CHAPTER 15

Knowledge for biodiversity

15.1 This Chapter considers the information, survey, monitoring and research needs that are essential to provide a sound and well-informed basis to take our aims and objectives forward.

Information

15.2 Monitoring, research and survey all provide information about biodiversity. Information is critical in ensuring the early detection of problems, defining appropriate actions, setting good targets, assessing progress and in reporting. Consequently, it is perhaps not surprising that all but 2 of the Action Plans require monitoring, research or survey, which together amount to 26% of all actions listed in the plans. The actions are primarily to identify biological status and to establish how and why it is changing.

15.3 While good information is vital to the success of the Action Plans, it is just as important for biodiversity as a whole. Whole landscapes and ecosystems can lose their important life support functions, such as buffering pollution, reducing flooding, responding to climate change and increasing the potential for sustainable development. All this can happen without a single species or habitat becoming an apparent priority. Ideally we would like to know about the biological status of all biodiversity in the UK and how it is changing, especially for the priority species and habitats, but sufficiently for other species and habitats to prevent the priority list from needing to expand in the future.

Narrow–bordered bee hawk moth is one of a number of species on which there is a need to improve information.

Monitoring of freshwater fish

The freshwater fish have rarely been the subject of long-term monitoring despite their immense popularity with anglers. Action to improve information is a high priority. The Action Plans have a total of 32 'information' actions across only 5 species.The Allis Shad (*Allosa allosa*) and Twaite Shad (*Allosa fallax*) have 11 and 12 'information' actions respectively. JNCC and the Environment Agency in their project to prepare an Atlas of Freshwater Fish are now addressing the lack of information about freshwater fish.

15.4 A framework for surveillance and monitoring of biodiversity is currently being developed by JNCC. The guiding principles are to make maximum use of the National Biodiversity Network, to take full advantage of the network of willing amateurs and recorders, to utilise and improve co-ordination of established monitoring schemes and to further develop biodiversity indicators. As part of the framework, new survey and monitoring schemes to cover poorly surveyed groups are being developed as well as more comprehensive habitat inventory and survey. The framework aims to incorporate a range of scales from highly targeted and site specific surveys of rare species and protected sites, to inventories of priority habitats and complete national coverage of broad habitats and widely occurring species such as birds and soil biota, taking into account future Countryside Surveys in Great Britain and Northern Ireland and Land Cover Maps. It will be designed to help assess impacts and threats to biodiversity by, for example, linking to schemes for assessment of agriculture, pollution and climate change such as the Environmental Change Network and will contribute to European and global assessments. The framework needs to be linked with the standard condition assessment of protected sites developed by JNCC.

Butterfly Monitoring in Britain

Butterflies are one of the best monitored groups in the UK, with the internationally recognised *Butterfly Monitoring Scheme* (BMS) developed by the Institute of Terrestrial Ecology (now CEH) and the Joint Nature Conservation Committee.

The BMS is able to detect trends in butterfly abundance at a range of sites across the UK and determine the effects of site habitat management on butterfly populations. The BMS was established in 1976, and covers around 115 sites with an emphasis on nature reserves and designated sites.

The BMS has proved an outstanding success providing much valuable new information on butterfly ecology including population trends, the effects of habitat management, changing distribution patterns, phenology, population dynamics, migration and the effects of weather.

In the UK, more than 550 monitoring transects have been established independently of the BMS, bringing the total number in the UK to approximately 700. The methodology has proved equally popular abroad, with around 400 established within the Dutch Butterfly Monitoring Scheme, and in several other European countries.

Butterfly Conservation (BC) has recently developed new user-friendly software to collate the data from 400 sites monitored or co-ordinated by BC Branches.

These data are being used in a project with MAFF to assess the impacts of new conservation management works, undertaken through agri-environment schemes on farmland butterfly populations.

These schemes will continue to harness volunteer effort to provide vital information on the health of the environment and the sustainable use of the countryside.

15.5 The UK has an enormous legacy of biodiversity information starting with the great Victorian collections, epitomised by the Natural History Museum and the botanic gardens at Kew and Edinburgh, and continuing today with the large numbers of amateur naturalists recording biodiversity all over the country. Building on this cultural background, there are many opportunities to engage the public in survey and monitoring work which should be fully explored. But much of the existing information is underused, a fact recognised by the Lead Partners: 80 reports mention the importance of reviewing existing data. To facilitate full and multiple use of this information it needs to be accessible, searchable and of standard format. For this reason there are many important information networks e.g. the Biodiversity Website that develop and promote the standards necessary to facilitate data search, exchange, use and reporting.

15.6 The culmination of the information networking activities will be the National Biodiversity Network (NBN). The raison d'etre for biodiversity information networks is that the same information is needed many times. HAP and SAP implementation, UK biodiversity reporting, research, prioritisation, policy and much more, all require the same information but summarised, presented and interpreted in different ways. NBN provides the standards, technology and partnerships necessary for easy transfer and integration of information from one format or use to another.

15.7 NBN is currently in prototype form and will be further populated with information over the next few years but examples are available to illustrate how NBN might work and what benefits it will give. One such pilot exists for threatened plant species. Another notable early achievement of NBN is the 'Recorder 2000' software. This software allows records of biodiversity to be collected, stored and collated in a standard way. No less than 420 separate actions in the HAPs and SAPs propose to design and populate an information storage system. All could be assisted, if not completely discharged, through use of Recorder 2000 to provide the model on which to base the design of their information collection systems. This is just one example of the sorts of economy of scale that could be achieved through the consideration of larger, broader solutions to information needs.

15.8 Successful information and research network activities rely on partnership and sharing between the collectors, collators and users. As the early success of the National Biodiversity Network shows, the partnership of the UK BAP is a valuable forum from which to build such collaboration.

15.9 Development of a comprehensive survey and monitoring programme is essential to the effective operation of the target-led approach in the UK BAP. Responsibility for co-ordinating the implementation of survey, monitoring and autecological work must be clearly established.

15.10 The National Biodiversity Network is an essential mechanism for mobilising biological information and should continue to be developed as quickly as possible, consistent with building a sustainable structure.

National Biodiversity Network

The National Biodiversity Network provides a means of accessing the multitude of survey, monitoring, and record sources available in the UK. The NBN Trust (a voluntary/public sector consortium) was established as a response to the UK Biodiversity Steering Group's recommendation for a national biodiversity database to improve access to and management of biodiversity information in the UK. The NBN aims to bring the sources together to meet a wide range of conservation, research, education and public participation needs. The NBN:

- Encourages all the appropriate local and national organisations to prepare their biodiversity information for access. Local partnerships are finding ways of sharing and managing information through 'local records centres'.
- Develops and agrees codes of practice and standards for sharing, integrating and using the information. An early priority has been to establish a common approach to access terms and conditions and technical standards.
- Provides an Internet service to deliver access to the dispersed information sources. The service, www.searchNBN.net currently an advanced prototype, provides geographical, species, habitat and thematic ways of accessing and integrating information.

15.11 Actions in the HAPs and SAPs to improve the information-base remain essential and must be progressed. Collective approaches to support these actions can be provided by NBN, the developing biodiversity surveillance framework, the UK BAP and Country Group web sites and the new HAP/SAP database. Common mechanisms should be sought wherever possible to help implementation of the UK BAP.

15.12 An integrated framework for surveillance and monitoring of biodiversity is urgently required. This should build on existing programmes for particular species groups and biodiversity-based approaches such as CS2000, condition assessment of SSSIs and the Environmental Change Network.

Research for biodiversity

15.13 The species and habitat action plans include a total of 327 actions that call for specific autecological research to improve understanding of the ecology of the species or habitat and its position in the ecosystem. The Lead Partners also drew attention to this need; 116 Lead Partner reports said that additional autecological research is required for effective Action Plan implementation. A need for more general research, such as to understand the effects of climate change or to develop new management techniques is identified by 115 Lead Partner reports, indicating that cross-cutting research is also important.

15.14 Many organisations are involved in research contributing directly or indirectly to the conservation of biodiversity in the UK. Co-ordinating this research effort and maximising the potential is a significant challenge. Following publication of the Steering Group Report in 1995, the Joint Nature Conservation Committee commissioned a review of the research requirements of the UK BAP (Pieda, 1997). The review considered the specific and often very practical needs of individual habitat and species Action Plans as well as the more generic, cross-cutting issues where there were gaps in scientific understanding. The review concluded that whilst the specific research needs identified in individual Action

Plans were generally well catered-for by Lead Partners, there were problems in organising and funding research on the bigger issues for which no organisation had a clear responsibility (see Table 15.1).

15.15 Such cross-cutting research tended to fall in the gaps between policy-focused research funded by government departments, practical management research sponsored by the conservation bodies and the more strategic ecological and biological research undertaken by the research councils and universities. In particular, there was a concern about a mismatch between the science-led priorities for academic research on ecology and biology and the urgent needs for conservation action.

15.16 Following this review, in 1998, the UK Biodiversity Group established the Biodiversity Research Working Group (BRWG) with the following aims:

- To identify and prioritise cross-cutting research to support the UK BAP;
- To facilitate exchange of information about biodiversity research;
- To explore mechanisms for co-operation; and
- To identify other relevant research co-ordination.

The BRWG includes representatives of the main funders and customers of biodiversity research in the UK as well as academic, voluntary sector and industry representatives. During 1999 and 2000 the BRWG organised a series of workshops to identify the research needs in five priority areas and a summary of the results is presented in Table 15.2.

15.17 A number of general research needs have emerged in each area, including:

- Better access to and application of existing information and scientific knowledge, technology transfer and decision support;
- Better tools for survey, assessment, indicators and forecasting of future trends;
- Better understanding of the biology and ecology of priority species and their role in ecosystem functions;
- Better understanding of the drivers of change, synergies between biodiversity and other policy or management objectives, mechanisms for delivery and economics.

15.18 The BRWG is taking into account the outcomes of other review exercises, such as the review of the MAFF biodiversity research programme, the review of climate change impacts on UK habitats and species (Hossell et al, 2000) and the European Platform on Biodiversity Research. The European Platform has identified a provisional analysis of research priorities which is broadly consistent with the BRWG's conclusions. The BRWG has also developed a prototype research information exchange mechanism – a web-based catalogue of biodiversity research projects funded by organisations represented in the BRWG. The BRWG was initially established for three years and will report its findings at a senior-level seminar in Autumn 2001.

15.19 Research is vital to help deliver BAP objectives both for individual Action Plans and to address cross-cutting issues. Though much is already being done, the work undertaken by the BRWG to identify biodiversity research priorities and facilitate co-operation remains essential and collective action is needed to take forward the research priorities already identified and arising as a result of the analysis of Lead Partner reports. We therefore recommend that a UK Biodiversity Research Group continues to act as a forum for co-ordination and promotion of research in support of the delivery of UK BAP objectives and to promote synergies with the European Platform on Biodiversity Research.

Table 15.1: **Initial cross-cutting themes identified in the JNCC review of UK Biodiversity Action Plan (after Pieda, 1997)**

Habitat loss and restoration
Climate change impacts
Atmospheric pollution – acidification and eutrophication effects
Water quality
Water abstraction
Monitoring methods and indicators
Sustainable agriculture
Agro-chemical impacts and biotechnology
Introductions and genetic conservation
Marine ecosystems
Species recovery

Table 15.2: **Priority research issues identified by the BRWG workshops.**

Biodiversity and agriculture

- Setting objectives and targets, using indicators
- Identifying mechanisms and institutional frameworks to deliver policy objectives
- Practical management techniques
- Understanding ecosystem dynamics
- Environmental accounting
- Market and product development

Introductions and genetic conservation

- Better understanding of ecology of species and their functional biology
- Fill information gaps on species and improve information exchange
- Priority-setting to select species for which new research is a priority
- Prediction, monitoring, impact and risk assessment
- Strategies and measures to reduce risks to biodiversity from introductions
- Socio-economic research, including environmental accounting and economic evaluation of goods and services that biodiversity provides

Marine and coastal processes

- Developing tools for biodiversity assessment survey and monitoring
- Improving understanding of ecosystem functions and processes
- Determining conservation status of species and biotopes
- Identifying the effects of human impacts on biodiversity
- Developing effective approaches for managing human impacts on biodiversity
- Socio-economic research, including evaluation of the impacts of marine protected areas and development of indicators and thresholds for sustainable use

Landscape ecology, habitat fragmentation and land use change

- Visions for biodiversity and landscape, analysis of viable options
- Species ecology at landscape scales
- Understanding socio-economic drivers, constraints and opportunities
- Application of integrated spatial decision support systems
- Techniques of stakeholder participation
- Monitoring change and indicators

Monitoring methods and indicators

- Maximising the value of existing and new data
- Good monitoring and programme design
- Data capture and effective use of indicators
- Defining and monitoring agents of change
- Linking biodiversity monitoring with other activities
- Auditing the effectiveness of monitoring in delivering the BAP