Northern Ireland Habitat Action Plan
Blanket Bog
Final Draft – April 2003

1. Current status

1.1 Biological status

1.1.1 Blanket bog is a globally restricted peatland habitat confined to cool, wet, typically oceanic climates. It is, however, one of the most extensive semi-natural habitats in the UK and the Republic of Ireland. Northern Ireland is particularly well suited to peat formation because of its high annual rainfall, topography and soils which are generally poorly draining glacial tills. The term blanket 'bog' strictly applies only to that portion of a blanket 'mire' landscape which is exclusively rain-fed, or ombrotrophic. However, for the purposes of this plan the terms 'bog' and 'mire' will be regarded as more or less synonymous.

1.1.2 Evidence from palaeoecological records suggest that blanket peat began to form in Ireland some 5000 years ago (Edwards and Warren, 1985), with climatic deterioration in the post-glacial period. However, differences between the basal peats throughout Ireland suggest considerable time differences in peat growth. Such variation is attributed to topographic and climatic factors and the activities of early man. In the UK, studies indicate that most blanket peat development began 5000-6000 years ago, but that the range extends from 9000-1500 years ago.

1.1.3 Blanket bog peat accumulates in response to the very slow rate at which plant material decomposes under conditions of waterlogging. It is not, however, confined to areas of poor drainage but rather can cloak entire landscapes, even developing on slopes of up to 30^{o}. Although most widespread in the wetter west and north, it also occurs in eastern upland areas, the Mourne Mountains, for example. The most extensive tracts of blanket bog tend to occur at altitudes in excess of 200m and are concentrated on the Antrim Plateau, the Sperrin Mountains and in County Fermanagh. In the north and west, where annual rainfall is much higher than in central and eastern regions of Northern Ireland, a number of blanket bogs occur in the altitude range 150m to 200m. In the extreme west, extensive blanket bogs have developed as low as 90m. Peat depth is also very variable, with an average of 0.5-3m being fairly typical. However, where peat has accumulated in depressions, depths in excess of 5m are not unusual. Although these deeper areas of peat often take the form of raised bogs, with classic domed profiles, they are an integral part of the blanket bog landscape. There is no agreed minimum depth of peat which can support blanket bog vegetation. It includes the European Community (EC) Habitats Directive priority habitat 'active blanket bog', the definition of 'active' being given as 'still supporting a significant area of vegetation that is normally peat forming'.

1.1.4 Within Northern Ireland, blanket bog encompasses a range of plant communities that are similar to those identified in the National Vegetation Classification (NVC) of Great Britain (Rodwell, 1991). NVC descriptions and codes are given to associations of plants that are characteristic of particular environmental and management conditions. Plant communities that are typical of natural blanket bogs include the bog

pool communities M1 to M3, M17 *Scirpus cespitosus - Eriophorum vaginatum* blanket mire, M18 *Erica tetralix - Sphagnum papillosum* raised and blanket mire and M19 *Calluna vulgaris - Eriophorum vaginatum*. A number of additional NVC communities are characteristic of the extensive areas of blanket bog which have been subject to some disturbance such as drainage or peat-cutting. These include M15 *Scirpus cespitosus - Erica tetralix* wet heath, M20 *Eriophorum vaginatum* blanket and raised mire, M25 *Molinia caerulea - Potentilla erecta* mire, together with their intermediates. Other wetland plant communities, such as flush M10 *Carex dioica-Pinguicula vulgaris* mire and poor-fen M6 *Carex echinata-Sphagnum recurvum*/*auriculatum* mire, are often closely associated with blanket bog. For the purposes of this plan, these are treated as an integral part of the blanket bog habitat. Many of the typical blanket bog species, such as Heather *Calluna vulgaris*, Cross-leaved Heath *Erica tetralix*, Deergrass *Trichophorum cespitosum*, Cottongrasses *Eriophorum* species and several of the bog moss *Sphagnum* species, occur throughout much of the range of the habitat, although their relative proportions vary across the country. Some other species have requirements which limit their distribution more dramatically. For example, Black Bog-rush *Schoenus nigricans* and the liverwort *Pleurozia purpurea* are more typical of the western bogs. In addition, the moss *Racomitrium lanuginosum* frequently takes precedence over *Sphagnum* bog mosses on the top of hummocks in the west.

1.1.5 The presence, extent and type of surface patterning is another important feature of blanket bogs. This can range from a relatively smooth surface, with ericoids, Hare's-tail Cottongrass *Eriophorum vaginatum* tussocks and *Sphagnum* hummocks, to the extreme patterning associated with bog pool complexes and the intervening ridges. As with floristic composition, there would appear to be a relationship between geographical location and the nature of the surface pattern. In general, the intensity and complexity of patterning increases towards the north and west. The range of erosion features associated with many areas of blanket bog, some of which appear to be natural in origin, is another aspect of this structural diversity.

1.1.6 The conservation value of blanket bogs can be determined by the condition of the habitat. Favourable condition is defined by setting targets or target ranges for a series of different attributes. These are components or characteristics of the vegetation that are relatively easy to measure, but which are reliable indicators of the 'health' of the habitat. For blanket bog, these include the cover of *Sphagnum* bog-mosses and dwarf-shrubs, the vegetation structure, the presence of certain key indicator species, and the absence of vegetation, species or factors associated with disturbance such as burning, overgrazing or drainage. The standards for assessing favourable condition of blanket bog, taking cognisance of the variability of the habitat across Northern Ireland, have still to be finalised for the purposes of this habitat action plan.

1.1.7 Blanket bogs support a very wide range of terrestrial and aquatic vertebrates and invertebrates. As with plant species, some of these are widespread and common, some are much more local, and quite a number are of international interest for either their rarity or for the densities of their breeding populations on blanket bogs, for example Golden Plover *Pluvialis apricaria*. Studies of the invertebrate fauna of blanket bogs are extremely patchy and merit collation and synthesis. Blanket bogs also fulfil an important role as repositories of archaeological and palaeoecological

material and have functional values as agricultural rough grazing, sporting estate and water catchments. In the context of climate change the role of blanket bogs as a carbon store is also now considered significant.

1.1.8 This plan encompasses all areas of blanket bog supporting semi-natural blanket bog vegetation, including intact surfaces, drained and cutover bog and whether or not it may be defined as 'active' (actively laying down peat). It excludes areas which no longer support such vegetation, except where the restoration of these areas is necessary for the protection and/or enhancement of adjacent bog. The total extent of blanket bog in the UK amounts to just under 1.5 million ha. In Great Britain, this is an estimate based on the national cover of blanket peat soil (> 0.5 m deep) rather than the extent of blanket bog vegetation, for which there is no agreed figure. It is estimated that England supports some 215,000 ha, Scotland approximately 1,060,000 ha, and Wales has around 70,000 ha of blanket peat. In Northern Ireland, it is the extent of blanket bog vegetation which has been estimated at approximately 140,000 ha (Cruickshank and Tomlinson, 1988). Comprehensive changes for this resource are lacking, but studies in Scotland (where most of the resource lies) suggest a 21% reduction in the extent of blanket bog between the 1940s and the 1980s. The greatest single cause of this reduction (51%) is afforestation. Similarly, in the Republic of Ireland, only 21% (c166,115 ha) of the original blanket bog habitat remains in a relatively intact condition today, from an original 775,000 ha.

1.1.9 The distribution and condition of Northern Ireland's bogs has been assessed through a combination of commissioned research and surveys carried out by Environment and Heritage Service (EHS) staff. In 1988, a major resource inventory was completed by The Queen's University of Belfast (The Northern Ireland Peatland Survey : Cruickshank and Tomlinson, 1988). Using aerial photographs, the distribution of different types of peatland (blanket bog and lowland raised bog) was recorded and mapped and an indication of the condition of each site was made. The Northern Ireland Peatland Survey defined peatland as wetland still covered with bog vegetation or with clear evidence of peat accumulation. It excluded land reclaimed for agriculture or under forest cover and hence, the overall figures for each category are to some extent an underestimate of the total resource. Although the most recent photographs were used, for some parts of Northern Ireland, coverage was only available from the 1960s making accurate assessment very difficult in those areas. However, the survey is the only one that gives a complete picture of the total peatland resource in Northern Ireland. Cruickshank and Tomlinson estimated that Northern Ireland has approximately 140,000 ha of blanket bog vegetation. About 15% of this area, 22,000 ha remains intact, with 10% (14,000 ha) having been drained and 46% (64,400 ha) hand-cut for fuel. The remaining 29 % (40,600 ha) of blanket bog vegetation is more severely degraded, by erosion for example and is considered too degraded to merit restoration. In addition, significant proportions of peat soil, probably in excess of 10%, no longer support semi-natural vegetation. These soils have not been included in the blanket bog inventory. Loss of blanket bog has also been attributed to afforestation which occupies approximately 20% of deep peat soils (Cruickshank, 1997), accounting for up to 40% (c30,000 ha) of the Forest Service estate.

1.1.10 Environment Service staff undertook a site survey of blanket bogs with a minimum intact surface of 50 ha in the late 1980s and 1990s. This survey was aimed at identifying the most important sites for nature conservation and suggested that although the intact blanket bog resource was largely retained, it was frequently in poor condition due to drainage, overgrazing and mechanised peat extraction. The Northern Ireland Countryside Survey (NICS) 2000 (Cooper and McCann, 2001), which was carried out to monitor land use change supports these findings showing a significant decrease of 25% in wet bog vegetation in the uplands (>150m) between 1992 and 1998. This wet bog category occurs on waterlogged, usually deep peat with *Sphagnum* bog moss and is generally peat forming and provides an indication of continued loss and degradation of the most natural blanket bog communities. Although a small proportion of wet bog was lost to afforestation and land reclamation, the majority is attributed to loss of *Sphagnum* bog mosses as a consequence of blanket bog degradation towards wet heath, dry bog and *Molinia* grassland.

1.1.11 Historically, blanket bogs in Northern Ireland have been used for fuel and rough grazing and to a lesser extent, reclaimed for agriculture. Hand-cutting blanket bog for fuel is the traditional method of extracting peat. It became particularly significant during the 17th and 18th centuries when rights to cut peat on small plots of land (known as turbary) were allocated to landowners. Peat cutting is concentrated at low to mid altitudes (below 240m), in close proximity to roads and tracks (Cruickshank and Tomlinson, 1988). A high proportion (c. 46%) of Northern Ireland's blanket bogs have been subjected to some hand-cutting. Grazing by cattle and sheep was low intensity and generally involved shepherding, periodic burning, and in some areas, fencing. Reclamation of the more accessible blanket peatlands dates back to the early 19th century (Large, 1991). Much of this land now supports grassland agriculture and shows little or no evidence of formerly being blanket bog. During the second half of the twentieth century there was an accelerated rate of blanket bog loss due to afforestation, agricultural intensification and more recently mechanised cutting with tractor-drawn auger machines for both domestic and commercial purposes. The introduction of mechanised peat extraction technology to Northern Ireland in the early 1980s changed patterns of fuel peat extraction in upland areas. In 1990, it was estimated that 2.9% of County Antrim, 5.4% of the Sperrin Mountains and 6.4% of Fermanagh peatlands were being machine cut (Cooper *et al*., 1991). Mechanised cutting occurs most frequently on peatland which was hand cut in the past – 77% of it by area, with the remainder on intact peatland (14%) and drained areas (4%) (Cruickshank et al. (Part 3), 1991).

1.2 Links with other action plans

1.2.1 This Blanket Bog Action Plan identifies specific targets and actions required to deliver Northern Ireland's contribution to the UK Blanket Bog Action Plan, published in 1999 (UK Biodiversity Group, 1999).

1.2.2 The extensive nature of the blanket bog landscape is such that certain other habitats, although distinctive, are probably most appropriately considered as integral components of the wider blanket bog assemblage of habitats for management purposes. This would include some areas of heath and grassland which occur on better drained slopes together with examples of spring, flush and poor fen, a range of

oligotrophic water bodies whose catchment is largely or entirely blanket bog, and many streams and rivers which drain areas dominated by blanket bog. Not only are all such areas in hydrological connection with the surrounding peat mass, they frequently contribute to the overall habitat requirements of the peatland fauna. These habitats include upland heath and fen which will be subject to their own Northern Ireland habitat action plans. The requirements of these habitats should be taken into account during the implementation of this plan.

1.2.3 Within Northern Ireland, blanket bog habitats, including intact surfaces and cutover bog, are important for a number of UK priority species identified as part of the UK Biodiversity Action Plan programme. These include the Yellow Marsh Saxifrage *Saxifraga hirculus*, the Whorl Snail *Vertigo geyeri* and the Honey Fungus *Armillaria ectypa* which are associated with base-rich flushes within the blanket bog. In addition, Skylark *Alauda arvensis* breeds on blanket bog as well as other open habitats. The requirements of these species should be taken into account during the implementation of this plan.

1.2.4 In addition to the UK priority species list, a number of additional priority species and species of conservation concern within a Northern Ireland context have been identified. Northern Ireland priority species associated with blanket bog include Red Grouse *Lagopus lagopus scoticus*, Curlew *Numenius arquata*, Hen Harrier *Circus cyaneus* and Irish Hare *Lepus timidus hibernicus* which is associated with a number of other open habitats in addition to blanket bog. The requirements of these species should be taken into account during the implementation of this plan. Action plans are currently being drafted for a number of Northern Ireland priority species, and a local Curlew Species Action Plan and Irish Hare Species Action Plan have been published (DOE, 2000).

2. Current factors affecting the habitat

2.1 There are three key conditions which have to be maintained if blanket bogs are to retain their characteristic features.

- hydrology - any increase in water loss will destabilise the system.
- nutrient inputs – because the intact bog surface is rain-fed, the nature of the peat is acid and nutrient-poor and supports a number of specialised plants. Significant increases in the base or nutrient-status of the system will alter the vegetation cover in favour of non-bog species.
- surface vegetation integrity - the living layer of vegetation acts as a ‘natural’ regulator for water loss. Destruction or alteration of the vegetation will have significant implications for the long-term stability of the ecosystem as a whole.

Factors which disrupt the balance of these conditions, or which lead more directly to the destruction of both intact and modified blanket bog habitat are described below.

2.1.1 Peat cutting – the extraction of peat, originally by hand, but more recently by machine is extensive and generally occurs in fairly accessible areas of the uplands where individuals have turbary rights to cut turf within small defined plots. The majority of

peat cutting is for domestic purposes, but commercial extraction for fuel, though relatively limited in extent, can have important local effects. In Northern Ireland, the complexity of land ownership and turbary rights sometimes makes the distinction between commercial and domestic cutting activity difficult to determine.

2.1.2 Drainage - extensive tracts of blanket bog have been drained in the past in an attempt to increase the stock carrying capacity of the land. These drainage programmes were grant-aided under the *Agricultural Act (Northern Ireland) 1949* through the 'Agricultural Development Scheme'. This scheme covered the construction of mole drains in the lowlands and high density, single furrow hill drains, known as 'moor-gripping' over large areas of blanket bog. However, in upland peat soils, the rate of movement of water through peat is slow, and as a result, virtually all the drainage is over the surface. Therefore, although these drains increased the rate of surface water removal, due to the high rainfall in most upland areas throughout Northern Ireland, the level of the water-table tends not to be affected (Coulson *et al*., 1990). Consequently, any improvement in grazing quality has been negligible at high altitudes and small at low altitudes. Indirectly, however, open drains do allow more rapid run-off of water and sediments, and thus contribute to flooding, erosion and may even result in bog bursts. However, these factors have become much less significant since withdrawal of improvement grants in 1985 (DOE, 1993).

2.1.3 Grazing - high stocking levels of sheep and, to a lesser extent cattle, currently have the most significant impact on blanket bog vegetation throughout Northern Ireland. High levels of grazing have a significant impact on Heather and other dwarf shrubs and can result in localised poaching and peat erosion. Drainage, burning, fencing, supplementary feeding and the absence or minimal use of shepherding all contribute to the problems associated with heavy grazing.

2.1.4 Burning - agricultural and sporting management both involve the use of fire to modify moorland vegetation for livestock, primarily sheep, and occasionally Red Grouse. Whilst occasional small-scale burning can be beneficial for maintaining the quality of the habitat, some areas experience uncontrolled and accidental fires. Large-scale and too frequent burning reduces the quality of blanket bog by causing a simplification of the vegetation structure and destroying sensitive species, especially *Sphagnum* bog mosses.

2.1.5 Agricultural improvement - drainage, fertiliser application and conversion to pasture have occurred frequently in the past and can be of local significance.

2.1.6 Forestry – in addition to the direct hydrological and physical impacts of existing plantations on deep peat, the hydrology of adjacent areas of blanket bog may also be impacted with a sharp increase in the rate of run-off from the catchment. In addition, aerial application of fertilisers can result in drift onto adjacent bog and mature trees can act as an invasive seed source. There is currently a presumption against new planting on blanket bog habitats (DANI, 1993).

2.1.7 Recreation - many popular walking routes, including parts of the 'Ulster Way', traverse blanket bog areas which are very sensitive to such pressure. The increased use of all-terrain vehicles for recreational, agricultural and sporting activities can also result in local disturbance.

2.1.8 Erosion – although some loss of habitat may be due to natural processes, blanket bog on some slopes in the Sperrin and Mourne Mountains, are being lost through erosion of the shallow peat soils due to overgrazing and recreational activities.

2.1.9 Planning developments - wind farms and communication masts, together with their associated infrastructure, are increasingly being proposed on areas of blanket bog, especially those at high altitude, with long-term repercussions on the stability of the ecosystem.

2.1.10 Nutrient enrichment - acidification and nitrogen enrichment caused by atmospheric deposition could potentially lead to vegetation changes, including loss of *Sphagnum* mosses and a reduction in other bryophyte and lichen interest. In Northern Ireland, atmospheric nitrogen deposition increases from west to east, and in areas of high relief (the Mourne mountains and Antrim Plateau) levels of ammonia (NH_4) are notably high (Jordan, 1997; Sutton *et al*, 1998). Elevated levels of ammonia can enhance the competitiveness of nutrient favourable plant species, especially grasses, at the expense of heather habitats (Sutton *et al*, 1997).

2.1.11 Climate Change - summary predictions for temperature and sea level rise as a result of global warming have been modelled by the 'MONARCH project' (Harrison *et al*, 2001). The prediction of higher summer temperatures and drought in southern and central England may lead to the remaining bogs drying out in that region, possibly extending as far as south east Ireland. This may be counterbalanced by increased rainfall further north. In Northern Ireland, it is predicted that conditions for blanket bog growth will be improved due to increased rainfall, especially in winter, which together with milder winters, will result in extended growth periods. However, although suitable climatic conditions will persist for the maintenance and restoration of blanket bog in Northern Ireland, the species composition of the plant communities may well change.

3. Current Action

3.1 Legal status

3.1.1 Statutory site designation plays an important part in the conservation of this habitat. Extensive areas of blanket bog are given legal protection both nationally as Areas of Special Scientific Interest (ASSIs) and National Nature Reserves (NNRs), and internationally as Ramsar sites, Special Protection Areas (SPAs) and candidate Special Areas of Conservation (cSACs).

3.1.2 Under the *Nature Conservation and Amenity Lands (Northern Ireland) Order 1985*, nine ASSIs are protected primarily for their blanket bog interest and a number of upland sites also contain additional expanses of blanket bog. These designated areas

represent around 9% (12,600 ha) of the total blanket bog resource, but incorporate over 30% (7,000 ha) of the remaining intact surface. Further declarations, which will be identified and declared by the Department of the Environment (DOE) through Environment and Heritage Service (EHS) are planned within the next ten years. A large proportion of the Garron Plateau, Cuilcagh Mountain and Slieve Beagh are in public ownership, but many areas within blanket bog ASSIs are privately owned with parts covered by management agreements between EHS and the landowners and occupiers. As a consequence, peat extraction for fuel has virtually ceased on all blanket bog ASSIs. EHS has recently launched a new Management of Special Sites (MOSS) Scheme for landowners and occupiers aimed at establishing the favourable management of designated sites to arrest, and if possible reverse, any negative trends in blanket bog condition.

3.1.3 A number of blanket bog ASSIs are owned, partially owned or leased by EHS and are managed for nature conservation. Several of these including Lough Naman, Meenadoan, Slieveanorra and Altikeeragh are also designated as NNRs. Where appropriate, positive management of these sites has been undertaken by EHS using best-practice management techniques. Altikeeragh in County Londonderry, for example, is currently undergoing a major restoration project, which demonstrates aspects of hydrological management including drain blocking.

3.1.4 Most international designations are underpinned by ASSI declaration. One of the earliest international nature conservation designations resulted from a gathering at Ramsar in Iran, where the *Convention on Wetlands of International Importance especially as Waterfowl Habitat*; the *Ramsar Convention*, was adopted at a meeting of countries concerned with wetland and waterfowl conservation in 1971. The UK government signed the Convention in 1973 and accepted a commitment to promote both the conservation of particular sites and the wise use of wetlands within its territory. Each country is required to designate wetlands in accordance with agreed criteria for inclusion in a list of Wetlands of International Importance, generally known as Ramsar sites. To date, Northern Ireland has listed four blanket bog ASSIs as Ramsar sites. It is likely that additional sites will be required in the future as the criteria for Ramsar designation have been reviewed (6th Ramsar Conference of Parties, 1996).

3.1.5 SPAs are classified under the Europrean Community (EC) *Council Directive on the conservation of wild birds (79/409/EEC)*, more commonly known as the 'Birds Directive'. This was adopted in 1979 and requires member states to identify areas to be given special protection for rare or vulnerable species, and for regularly occurring migratory species. To date, Pettigoe Plateau is the only blanket bog that has been classified as SPA in Northern Ireland, but following a recent UK review, additional areas of blanket bog are currently under consideration.

3.1.6 In 1992, the EC adopted the *Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora*, known as the 'Habitats Directive'. The Habitats Directive requires member states to designate and manage SACs for habitats (listed in Annex 1 of the Directive) and species (listed in Annex 2). A small proportion of these habitats and species, which are considered to be most in need of conservation at a European level, are given priority status. Annex 1 contains 'active

blanket bog' which is afforded priority habitat status and includes areas which still support a significant area of vegetation that is normally peat forming, as well as those areas that are temporarily at a standstill (after fire for example). This definition includes both intact and regenerating cutover bog.

3.1.7 The original UK list of cSACs was submitted to the EC in July 1999 and included 21 cSACs from Northern Ireland, five of which were included for their active blanket bog interest. In 1999, this list was then assessed within the context of the relevant bio-geographical region and the EC as a whole - a process known as moderation. In common with many of the member states, the UK cSAC list was judged to provide insufficient coverage for a number of habitats (and species) including blanket bog.

3.1.8 As a result of moderation, EHS has listed a number of additional cSACs with active blanket bog interest. One of these sites, Carn and Glenshane Pass, was listed primarily for active blanket bog, whilst West Fermanagh Scarplands cSAC, a large complex upland site, listed active blanket bog as one of the SAC selection features. In addition, active blanket bog has been listed as an additional SAC selection feature under the moderation process for the Eastern Mournes cSAC already submitted to the EC, primarily for its heathland interest. By 2001, moderation had therefore resulted in a total of eight cSACs submitted to the EC from Northern Ireland with blanket bog interest. The reviewed UK list includes 74 sites in the active blanket bog category. In the Republic of Ireland, 47 cSACs (c 149,000 ha) have been submitted for blanket bog (Caitriona Douglas, personal communication, 2003). Sites designated under the Habitats Directive in addition to sites designated under the Birds Directive will eventually be part of an EC wide network of nature conservation sites known as the *Natura 2000* network.

3.1.9 In 2000, the Northern Ireland Biodiversity Group (NIBG) made its Recommendations to Government (NIBG, 2000). These were largely accepted by the Northern Ireland Executive in 2002, with the publication of the *Northern Ireland Biodiversity Strategy* (DOE, 2002). *The Regional Development Strategy 2025* (DRD, 2001), provides a framework for sustainable development in Northern Ireland which includes the full integration of the conservation of biological diversity and the Northern Ireland Biodiversity Strategy. At a local planning level, policies to protect and enhance biodiversity are being included as part of new Development Plans. These include the identification of Sites of Local Nature Conservation Importance (SLNCIs) for Planning Service. Planning Service is currently considering which SLNCIs will be formally identified in Development Plans. Where such sites are confirmed in adopted plans, specific planning policies will be applied to development proposals on those sites. The SLNCI network will include a significant number of blanket bog sites of substantive nature conservation interest, which are not designated as ASSI or NNR.

3.1.10 The development of Local Biodiversity Action Plans (LBAPs), probably based on District Council Areas and/or discrete landscape areas, will help to build on the SLNCI network by co-ordinating and informing local biodiversity action.

3.1.11 The date and conditions under which blanket bog can be burnt are defined by Law to protect breeding birds. The burning regulations as stated in the *Game Law Amendment Act (Northern Ireland), 1951* and amended in the *Wildlife (Northern*

Ireland) Order, 1985, make it unlawful in Northern Ireland to burn Heather and associated dwarf shrub vegetation between the 15th April and the 31st August.

3.2 Management, research and guidance

3.2.1 EHS, as part of the requirements of the Habitats Directive, has prepared conservation objectives for those sites submitted as cSACs. Common standards monitoring protocols are also being established across the UK to assess the condition of blanket bogs. The current monitoring programme for assessing the condition of blanket bog cSACs in orthern Ireland has been initiated. This programme will be extended to include all blanket bog ASSIs.

3.2.2 Management/rehabilitation plans exist for several areas of blanket bog managed by EHS as ASSIs and NNRs. In 1999, the DOE purchased a large area of intact blanket bog at Altikeeragh in County Londonderry. EHS has responsibility for this site and subsequently designated Altikeeragh as an ASSI and propose to declare it as a NNR. Other blanket bogs are protected and managed as part of a network of nature reserves owned by other government agencies and Non-governmental organisations. For example, an extensive area of blanket bog vegetation on the Garron Plareau is owned and managed as a catchment area for Dungonnell Dam by Water Service. In addition, Forest Service manages a number of blanket bog Forest Nature Reserves (FNRs) for nature conservation including Killeter Forest and Mullyfamore. Forest Service also own a large proportion of Slieve Beagh blanket bog and the area at Aghatirouke, Cuilcagh Mountain. Additional areas of blanket bog are managed as nature reserves by Non-governmental organisations (NGOs). The National Trust (NT), for example, manages Cushleake Mountain in County Antrim for nature conservation.

3.2.3 The area at Aghatirouke owned by Forest Service, is leased to Fermanagh District Council and managed in partnership with the Royal Society for the Protection of Birds (RSPB). This area of blanket bog forms part of the Cuilcagh Mountain Park which was established by Fermanagh District Council through funding from the EC *Life* programme. The funding was awarded as a joint project in association with the purchase by RSPB of a blanket bog in Sutherland, with a view to restoring damaged areas and managing the site to achieve its full nature conservation potential. This innovative natural history park fulfilled many of the *Life* Priority Actions for 1993 through the promotion of sustainable development, education, green tourism as well as safeguarding valuable areas of blanket bog by working with local farmers.

3.2.4 The Department of Agriculture and Rural Development (DARD), through its Countryside Management Division (CMD), has developed a series of agri-environment schemes including the Environmentally Sensitive Area (ESA) Scheme, the New Environmentally Sensitive Area (NESA) Scheme and the Countryside Management Scheme (CMS). These schemes are potentially the most successful mechanism of contributing to delivery of targets listed under action plans for many species and habitats. Their objective is to protect and enhance semi-natural habitats such as blanket bog by encouraging appropriate stocking levels and more sensitive management practices to allow the restoration of blanket bog vegetation. All three schemes are voluntary and apply to the whole farm.

3.2.5 The Countryside Management Scheme, launched in 1999 was developed with the primary aim to maintain and enhance biodiversity and is open to all farmers and landowners outside ESAs. Where funding is limited, entry into the scheme is competitive, being based on who can offer the greatest environmental benefits. DARD can provide area-based payments on blocks of 'heather moorland' >1 ha within the farm unit where it meets clearly defined criteria. Heather moorland is land with more than 25% heather cover and comprises five main habitats including blanket bog. Where more than 1 ha of blanket bog is identified on a participating farm, the bog must be brought under agreement and managed according to the specific objectives and prescriptions of the agri-environment scheme. In recognition of the value of small habitat areas, CMD are proposing that that from April 2003, the minimum eligible area for management and payment will be reduced to 0.1 ha. Within agri-environment schemes c 27,000 ha of moorland with a heather component of >25% cover is currently managed under ESA agreement with 7,315 ha managed under CMS. It is likely that the majority of heather moorland in both schemes will be blanket bog although a smaller proportion of upland and lowland heathland will also be included within this category. The management of habitat mosaics incorporating blanket bog, upland heathland, marginal hill pasture and other farmed land is also incorporated into agri-environment schemes. Future reviews of agri-environment schemes may permit 'fine-tuning' of habitat definitions to correspond with delivering targets listed in habitat and species action plans where appropriate.

3.2.6 The introduction of Good Farming Practice (GFP), which is applicable to farmers receiving Less Favoured Area (LFA) compensatory payments and those who enter any of the agri-environment schemes, provides protection for blanket bog. Farmers must comply with a list of verifiable standards in relation to GFP and adhere to the Codes of Good Agricultural Practice (COGAP). These standards and codes apply to the whole farm and are compatible with the need to safeguard the environment and maintain the countryside by sustainable farming. Over 70% of Northern Ireland is classified as LFA.

3.2.7 In addition to agri-environment schemes and other statutory requirements, semi-natural areas, which are likely to be of particular environmental importance, are further protected through the *Environmental Impact Assessment (Uncultivated Land and Semi-Natural Areas) Regulations (Northern Ireland) 2001*. These regulations, which came into operation in Northern Ireland in February 2002, are administered by DARD and seek to ensure that agricultural development of uncultivated land or semi-natural areas must first be assessed for environmental significance. This would include cases where there is currently a direct involvement of public bodies and also landuse changes aimed at restoring or enhancing blanket bog habitat.

3.2.8 Forestry is subject to the *Environmental Impact Assessment (Forestry) Regulations (Northern Ireland) 2000*, which state that afforestation of designated sites, nature reserves and parks and other sensitive areas may only be carried out with the consent of the Department of Agriculture and Rural Development. *Afforestation – the DANI statement on Environmental Policy* (1993) states that there should be a presumption against afforestation of oligotrophic blanket bog. This statement of policy is incorporated into the *UK Forestry Standard* (Forestry Commission and DANI, 1998), the government's approach to sustainable forestry.

3.2.9 The *UK Woodland Assurance Standard* (UKWAS Steering Group, 2000), a voluntary certification standard, requires that valuable semi-natural habitats which have been colonised, planted, or incorporated into plantations, but which have retained their ecological characteristics (or have a high potential to be restored) are being restored or treated in a manner that does not lead to further loss of biodiversity or cultural value. A strategy for prioritisation of restoration projects has been developed for the Forest Service estate. Deforestation is also subject to the *Environmental Impact Assessment (Forestry) Regulations (Northern Ireland) 2000*.

3.2.10 Complex grazing and peat cutting rights are frequently associated with these large upland areas, often in association with a highly fragmented ownership. Any proposals for changes in management, management schemes etc., must take this into account.

3.2.11 The Rivers Agency currently works closely and consults with EHS on their annual programme of works to maintain the effective drainage function of designated watercourses where this may have an impact on designated sites of nature conservation importance. This includes both localised operations such as the maintenance of outfalls for field drains and more significant river maintenance work.

3.2.12 Government policy for the protection and conservation of peatland was published in 1993 – *Conserving Peatland in Northern Ireland – A Statement of Policy* (DOE, 1993a). The policy objectives include opposition to exploitation of blanket bogs of conservation importance and reaffirming its commitment away from afforestation on deep peat.

3.2.13 Within Northern Ireland, planning control is administered by Planning Service (DOE). *Planning Policy Statement 2 (PPS2) - Planning and Nature Conservation*, contains policy for the protection of peatland sites against development. Policy regarding peat extraction is expressed in the Northern Ireland Peatland Policy (1993) and is supplemented by the mineral policies contained in *A Planning Strategy for Rural Northern Ireland* (DOE, 1993b). These policies are currently under review.

3.2.14 There is a significant amount of survey information currently available for some parts of the blanket bog resource, although its considerable extent has so far prevented comprehensive survey and evaluation. The blanket bog resource was assessed by the *Northern Ireland Peatland Survey* (Cruickshank & Tomlinson, 1988) and a detailed field survey of intact blanket bog > 50 ha was carried out by EHS staff. In 1991, EHS commissioned research to investigate the environmental effects of blanket peat exploitation and a survey of the scale, extent and rate of peat extraction from blanket bogs in Northern Ireland (Cooper *et al*, 1991; and Cruickshank *et al*, 1991). EHS also commissioned research on the effects of afforestation on blanket bog (Cameron, 1994). This research could be extended to include vegetation dynamics, hydrology, vertebrate and invertebrate populations and the peat archive.

3.2.15 The *Northern Ireland Countryside Survey* (NICS) is a sample survey of Northern Ireland vegetation communities used to estimate habitat extent and distribution (Cooper *et al*, 1997). Repeat surveys are used to assess land-use change. The first phase in the process was *A land classification and landscape ecological study of*

Northern Ireland carried out in the early 1990s (Murray *et al*, 1992). Subsequently, the botanical composition of upland heath and mire land cover types was analysed in relation to site management and environmental factors (Cooper & McCann, 1995). This can be used to assess heath and mire quality in relation to landscape, land cover, community composition, site management and peatland structure. *NICS 2000* (Cooper & McCann, 2001), repeated the survey in 1998, and the findings can be used to estimate the current area of blanklet bog in Northern Ireland. This repeat survey indicates a significant decline in blanket bog extent and quality (see above section 1.1.9). Future research projects could be extended to include topics not thoroughly studied to date, such as vegetation dynamics, vertebrate and invertebrate populations.

3.2.16 Many of the current projects to develop and improve the management of blanket bog are described in the UK Biodiversity Group Tranche 2 Action Plans (UK Biodiversity Group, 1999). In 1996, English Nature (EN) published a review of the historical effects of burning and grazing in upland environments (Shaw *et al*,1996). In addition, EN and Scottish Natural Heritage (SNH) have recently published guidance on the assessment of habitat condition in the uplands (Jerram & Drewitt, 1998; MacDonald *et al*, 1998) and EHS has adapted these techniques for blanket bog to make them more representative of conditions in Northern Ireland.

3.2.17 The *nineteenth report of The Royal Commission on Environmental Pollution* (1996), made over 90 recommendations on soil protection, management and policy, many of which were both directly and indirectly relevant to peatlands. Ten recommendations related specifically to peatlands including the prevention of overstocking, erosion control and a review of relevant planning policies. All of the recommendations will be carefully considered in the review of Government policy on peatland conservation.

3.2.18 Biological records are currently stored in the Museum and Galleries of Northern Ireland (MAGNI) at the Centre for Environmental Data and Recording (CEDaR). CEDaR was established in 1995 in partnership with EHS, MAGNI and the biological recording community. There are currently over 1.4 million records held by CEDaR and there are developments underway to make these records more accessible through the Internet. This will be achieved through the National Biodiversity Network, a union of organisations throughout the UK working together to create an information network of biological data providing an accessible data source for biodiversity information.

4. Action plan targets

4.1 Maintain the current extent and overall distribution of blanket bog currently in favourable condition.

4.2 Improve the condition of those areas of blanket bog which are degraded but readily restorable so that the total area in or approaching favourable condition by 2010 is 36,000ha.

4.3 Introduce management regimes to improve the condition of a further 38,000ha of degraded blanket mire by 2015, resulting in a total of 74,000ha (i.e. around 75% of the

total extent of favourable or restorable blanket mire) in or approaching favourable condition. Blanket bog targeted for restoration or improvement will include extensive areas cutover for fuel and in some instances areas used for agriculture and forestry.

5. Proposed action with lead agencies

5.1 Policy and legislation

5.1.1 By 2004, initiate a review of peat consumption in all sectors and for all purposes.
(ACTION: EHS)

5.1.2 By 2004, initiate discussions with other government departments to ensure appropriate consultation mechanisms exist for proposed changes in land-use.
(ACTION: DARD, EHS, Planning Service, Roads Service, Ministry of Defence (MOD), Department of Enterprise Trade and Investment (DETI))

5.1.3 By 2004, review *Planning Policy Statement 2 (PPS2) – Planning and Nature Conservation*, taking cognisance of the experiences gained in the rest of the UK, the Republic of Ireland and where appropriate, best practice in environmentally sensitive planning in other countries.
(ACTION: Planning Service, EHS)

5.1.4 By 2005, produce a Planning Policy Statement (PPS) on mineral development to incorporate up-dated policies and guidance on peat extraction.
(ACTION: Planning Service, EHS)

5.1.5 Seek through the next amendment of the Planning Order to bring mechanical peat cutting operations within the remit of planning control.
(ACTION: DOE)

5.1.6 By 2005, produce a Planning Policy Statement (PPS) on the countryside to incorporate the conservation of blanket bog.
(ACTION: DRD)

5.1.7 By 2005, produce Northern Ireland guidelines, through a cross-sectoral steering group, on the requirements of blanket bog conservation, including issues of land use and drainage, in a wider landscape context.
(ACTION: EHS, DARD, Rivers Agency, Forest Service)

5.1.8 By 2005, review the Northern Ireland Peatland Policy for the protection and conservation of peatland habitats incorporating all issues identified in the blanket bog and lowland raised bog HAPs.
(ACTION: EHS, DARD, Planning Service, EPD)

5.1.9 By 2006, ensure that important blanket bogs not already identified are recognised and, where appropriate, site protection policies are included in Development Plans and other strategic plans including Local Biodiversity Action Plans (LBAPs).
(ACTION: Planning Service, EHS, DARD, District Councils)

5.1.10 By 2007, monitor and review the effectiveness of agri-environment schemes, GFP and woodland initiatives to ensure that blanket bogs are being maintained and enhanced across Northern Ireland.
(ACTION: DARD, Forest Service, EHS)

5.1.11 Continue to establish appropriate stocking levels in upland areas by promoting agri-environment schemes and implementing the environmental cross-compliance conditions including GFP.
(ACTION: DARD, EHS)

5.1.12 By 2009, ensure that the *Water Framework Directive* (WFD) and the development of River Basin Management Plans address the conservation of sites designated for their blanket bog interest.
(ACTION: EHS, Rivers Agency, DARD)

5.1.13 By 2010, review and modify where necessary, proposed policy relating to heather burning to ensure appropriate management of blanket bog.
(ACTION: DARD, DOE, EHS)

5.2 Site safeguard and management

5.2.1 By 2004, produce conservation objectives for all statutory designated blanket bogs including cSACs, ASSIs and NNRs.
(ACTION: EHS)

5.2.2 By 2004, develop agreed methods for describing and assessing favourable condition for blanket bog habitats.
(ACTION: EHS)

5.2.3 By 2004, promote the uptake of long-term management agreements with landowners and occupiers on statutory designated sites aimed at creating or maintaining favourable condition.
(ACTION: EHS, DARD, Forest Service)

5.2.4 By 2006, seek to identify further examples of blanket bogs as SLNCIs in Development Plans.
(ACTION: Planning Service, EHS)

5.2.5 By 2006, prioritise areas, timescales and targets, based on designation status and restoration potential, for the conservation, improvement and expansion of blanket bog.
(ACTION: EHS, DARD, Forest Service, Rivers Agency)

5.2.6 By 2006, identify designated blanket bog habitats, including the SLNCI network, adversely affected by drainage schemes.
(ACTION: EHS, Rivers Agency, DARD)

5.2.7 By 2007, begin measures to secure favourable management on sites prioritised in 5.2.5 according to agreed timescales.
(ACTION: EHS, DARD, Forest Service)

5.2.8 By 2008, review the coverage of blanket bogs within both the ASSI and NNR series, and notify further sites as necessary to fill significant gaps in the range of variation throughout Northern Ireland.
(ACTION: EHS)

5.2.9 By 2008, identify locally important blanket bog sites (including SLNCIs) to target positive management through the LBAP process, agri-environment schemes, grant aid for biodiversity and restoration management.
(ACTION: EHS, DARD, Forest Service, Rivers Agency)

5.2.10 By 2010, designate as SACs those areas of blanket bog approved by the EC under the Habitats Directive and classify, as appropriate, blanket bog SPAs under the Birds Directive.
(ACTION: EHS)

5.3 Advisory

5.3.1 By 2005, provide information to landowners and occupiers on the conservation importance of blanket bogs through the production, promotion and dissemination of literature.
(ACTION: EHS, DARD)

5.3.2 By 2005, develop guidelines which identify those circumstances under which degraded blanket bog restoration should be actively encouraged.
(ACTION: EHS, DARD, Forest Service)

5.3.3 By 2005, develop guidance on restoration practices for blanket bog.
(ACTION: EHS, DARD, Forest Service)

5.3.4 By 2005, develop and promote awareness and training programmes on the conservation, management and rehabilitation of blanket bog through key organisations/individuals involved in the delivery of advice to farmers and land managers.
(ACTION: DARD, EHS)

5.3.5 By 2006, encourage applications from potential partners to obtain funding to bring areas of blanket bog into favourable management.
(ACTION: EHS, DARD, Forest Service, Water Service, District Councils)

5.3.6 By 2008, provide advice on the use of alternatives to peat as a fuel, to achieve the long-term safeguard of peatlands.
(ACTION: EHS, DARD, DETI)

5.3.7 By 2010, further develop demonstration sites including Altikeeragh, Lough Naman and Slieveanorra to reflect the range of ecological variation and applied management techniques throughout Northern Ireland.
(ACTION: EHS, Forest Service, DARD)

5.4 International

5.4.1 Further develop links with Great Britain, the Republic of Ireland and other European and international organisations and programmes to promote the exchange of information and experience in research, management techniques, education and conservation strategies.
(ACTION: EHS)

5.4.2 Seek to encourage change in the European policy framework through reform of the Common Agricultural Policy (CAP), for example, by reviewing livestock support mechanisms and promoting sustainable agricultural management of blanket bog.
(ACTION: DARD, EHS)

5.5 Monitoring and research

5.5.1 By 2004, set standards for assessing favourable condition of blanket bog throughout Northern Ireland.
(ACTION: EHS, DARD, Forest Service)

5.5.2 By 2004, establish the degree of compliance with the *Northern Ireland Peatland Policy*, including a surveillance programme to monitor the use of peat as a fuel in the management of government estates.
(ACTION: EHS)

5.5.3 By 2004, initiate a programme to monitor the total extent and condition of the blanket bog resource to include intact and drained surfaces, cutover bog and areas that are severely degraded (for example, through erosion).
(ACTION: EHS)

5.5.4 By 2004, establish surveillance and monitoring programmes to assess the condition of the blanket bog habitats within designated sites to aid site management.
(ACTION: EHS)

5.5.5 By 2004, encourage access throughout the UK to the records held at CEDaR by contributing to the National Biodiversity Network www-based catalogue of survey information.
(ACTION: EHS)

5.5.6 By 2005, continue to commission applied research to help develop beneficial and practical management techniques (including appropriate stocking levels and burning

regimes) for the enhancement, restoration and re-creation of blanket bog and populations of associated characteristic species.
(ACTION: DARD, EHS, Forest Service)

5.5.7 By 2006, encourage the dissemination and the use of existing research in Northern Ireland, Great Britain, the Republic of Ireland and the rest of Europe and commission new research where necessary, to improve the understanding of blanket bog diversity.
(ACTION: EHS, DARD, Academic Partners)

5.5.8 By 2008, investigate the feasibility of restoring the hydrological integrity of selected blanket bog sites.
(ACTION: EHS, Rivers Agency, DARD)

5.5.9 By 2008, commission and undertake cross-disciplinary research into the impact of major land uses on the condition of the blanket bog resource.
(ACTION: EHS)

5.5.10 By 2010, review the requirement for further research on the effects of pollution and climate changes on blanket bogs, and promote research needs accordingly.
(ACTION: EHS)

5.6 Communications and publicity

5.6.1 Promote the conservation of blanket bog through the scientific press and popular media.
(ACTION: EHS, DARD)

5.6.2 By 2004, produce a simple web-page and attractive booklet and CD-ROM for the public and schools which explains the conservation importance of blanket bogs in Northern Ireland.
(ACTION: EHS, Department of Education)

5.6.3 By 2004, further promote Peatlands Park as the flagship for achieving environmental education through school visits.
(ACTION: EHS)

5.6.4 By 2006, aim to achieve a minimum of 25,000 visitors to the Biodiversity and Education Centre at Peatlands Park annually and 200 school groups attending education programmes each academic year.
(ACTION: EHS)

5.6.5 Encourage appropriate access as well as interpretative and educational provisions on blanket bog to increase enjoyment and public awareness of this sensitive habitat.
(ACTION: EHS, DARD, Forest Service, Water service, District Councils, DCAL, DETI, DRD)

6. Costing

6.1 A table showing the global costs for this and other HAPs is available on the EHS/Biodiversity web page.

7. References

Blackstock, T.H., Stevens, D.P. & Howe, E.A. (1996). Biological components of Sites of Special Scientific Interest in Wales. *Biodiversity and Conservation* 5, 897 - 920.

Cameron, A. (1994). *The effect of afforestation on the physical and biological characteristics of blanket bog*. PhD thesis, The Queen's University of Belfast.

Cooper, A. & McCann, T. (1995). *The botanical composition of upland heath and mire land cover types in Northern Ireland*. Environment and Heritage Service. Belfast.

Cooper, A., McCann, T. & Murray, R. (1991). *The environmental effects of blanket peat exploitation*. Department of the Environment for Northern Ireland (Countryside and Wildlife Branch). Belfast.

Cooper, A. & McCann, T. (2001). *The Northern Ireland Countryside Survey 2000*. Environment and Heritage Service. Belfast.

Cooper, A., McCann. T. & Meharg. M. (2002). *Habitat Change in the Northern Ireland Countryside: summary report of the Northern Ireland Countryside Survey 2000*. Environment and Heritage Service. Belfast.

Cooper, A., Murray, R. & McCann, T. (ed. Warnock, S.). (1997). *The Northern Ireland Countryside Survey*. Environment and Heritage Service. Belfast.

Coulson, J.C., Butterfield, J.E.L. & Henderson, E. (1990). The effect of open drainage ditches on the plant and invertebrate communities of moorland and on the decomposition of peat. *Journal of Applied Ecology* 27, 549-561.

Cruickshank, J.G. (1997). *Soil and Environment: Northern Ireland*. Agricultural and Environmental Science Division, DANI and The Agricultural and Environmental Science Department, the Queen's University of Belfast.

Cruickshank, M.M. & Tomlinson, R.W. (1988). *Northern Ireland Peatland Survey*. Department of the Environment for Northern Ireland (Countryside and Wildlife Branch). Belfast.

Cruickshank, M.M., Tomlinson, R.W., Bond, D., Devine, P., Cooper, A. & Murray, R. (1991). *Socio-economic factors affecting peat extraction from blanket bogs in Northern Ireland and an assessment of likely future trends. Part 3*. Department of the Environment for Northern Ireland (Countryside and Wildlife Branch). Belfast.

Cruickshank, M.M., Tomlinson, R.W., Dunwoody, C., Bond, D. & Devine, P.M. (1993). A peatland database for Northern Ireland: Methodology and Potential Resource. *Royal Irish Academy* 93b, Volume 1; 13-24.

Department of Agriculture for Northern Ireland (1993). *Afforestation - The DANI statement on environmental policy*. Department of Agriculture for Northern Ireland (Forest Service). Belfast.

Department of Agriculture for Northern Ireland (2000). *The Environmental Impact Assessment (Forestry) Regulations (Northern Ireland) 2000*. Department of Agriculture for Northern Ireland (Forest Service). Belfast.

Department of the Environment for Northern Ireland (1993a). *Conserving Peatland in Northern Ireland – A Statement of Policy*. Department of the Environment for Northern Ireland (Environment Service). Belfast.

Department of the Environment for Northern Ireland (1993b). *A Planning Strategy for Rural Northern Ireland*. Department of the Environment for Northern Ireland (Town and Country Planning Service). Belfast.

Department of the Environment for Northern Ireland (1998). *Planning Policy Statement 2: Planning and Nature Conservation*. Department of the Environment for Northern Ireland (Planning Service). Belfast.

Department of the Environment for Northern Ireland (2000). *Northern Ireland Species Action Plans: Irish Hare, Chough, Curlew*. Environment and Heritage Service. Belfast

Department of the Environment for Northern Ireland (2002). *Northern Ireland Biodiversity Strategy*. Environment and Heritage Service. Belfast

Department of Regional Development. (2001). *The Regional Development Strategy 2025*. DRD. Belfast.

Edwards, J.E. & Warren, W.P. (1985). *The quaternary history of Ireland*. Academic Press INC Ltd., London.

European Commission. (1996). *Interpretation Manual of European Union Habitats*. European Commission, Brussels.

Forestry Commission and the Department of the Environment for Northern Ireland. (1998). *The UK Forestry Standard*. Forestry Commission. Edinburgh.

Forestry Commission. (1999). (in press). *Forestry and Bogs*. FC Guideline Note. Forestry Commission, Edinburgh.

Foss, P.J., O'Connell, C.A. & Crushell, P.H. (1992). *Irish Peatland Conservation Council Policy Statement and Action Plan 1992-1997*. IPCC, Dublin.

Foss P. J., O'Connell, C. A. & Crushell P. H. (2001). *Bogs and Fens of Ireland Conservation Plan 2005*. Irish Peatland Conservation Council.

Hammond, R.F. (1981). *The Peatlands of Ireland*. Soil Survey Bulletin 35 (2nd Ed.). Dublin: An Foras Taluntais.

Harrison, P. A., Berry, P. M. & Dawson, T. P. (2001). *Climate Change and Nature Conservation in Britain and Ireland: Modelling natural responses to climate change* (the MONARCH project). Oxford, UKCIP Technical Report.

Jerram, R. & Drewitt, A. (1998). Research report 264. Assessing vegetation condition in the English Uplands. English Nature. Peterborough.

Jordan, C (1997). Mapping of rainfall chemistry in Ireland 1972-1994. *Royal Irish Academy*, Vol 97B, No1.

Large, A.R.G. (1991). The distribution, extent and causes of peat loss in central and north-west Ireland. *Applied Geography* 11, 309-326.

Lindsay, R.A. (1995). *Bogs: The ecology, classification and conservation of ombrotrophic mires*. Scottish Natural Heritage. Battleby.

MacDonald, A., Stevens, P., Armstrong, H., Immirzi, P. & Reynolds, P. (1998). *A guide to upland habitats*: *surveying land management impacts*. Scottish Natural Heritage. Battleby.

Mackey, E. (1998). *The Natural Heritage of Scotland: changes in Scotland's land cover from 1940s reconstruction to 1980s stewardship*. Scottish Natural Heritage. Edinburgh.

Murray, R., McCann, T. & Cooper, A. (1992). *A land classification and landscape ecological study of Northern Ireland*. Environment and Heritage Service. Belfast.

Northern Ireland Biodiversity Group (NIBG). (1999). *Northern Ireland Biodiversity Strategy : Proposals June 1999*. HMSO. Belfast.

Northern Ireland Biodiversity Group (NIBG). (2000). *Biodiversity in Northern Ireland: Recommendations to Government for a Biodiversity Strategy*. HMSO. Belfast.

Quarmby, N.A. Everingham, F. & Reid, E. (1997). *Scottish Blanket Bog Inventory: Lewis and Harris - characterisation of blanket bogs using Landsat Thematic Mapper*. Scottish Natural Heritage. Edinburgh.

Rodwell, J.S. (ed). (1991). *British plant communities. Volume 2 Mires and Heaths*. University Press, Cambridge.

Royal Commission on Environmental Pollution. (1996). *Sustainable use of soils*. 19th Report. CM3165. RCEP, London.

Shaw, S.C., Wheeler, B.D., Kirby, P., Philipson, P. & Edmunds, R. (1996). *Literature review of the historical effects of burning and grazing of blanket bog and upland wet heath*. English Nature Research Reports, No 172. English Nature. Peterborough.

Stoneman, R. & Brooks, S. (1997). *Conserving bogs*. *The management handbook.* The Stationery Office, Edinburgh.

Sutton, M.A., Milford, C., Dragosits, U., Place, C.J., Singles, R.J., Smith, R.I., Pitcairn, C.E.R., Fowler, D., Hill, J., Wilson, K., Brassington, D., Apsimon, H.M., Hill, R., Ross, C., Jarvis, S.C., Pain, B.F., Phillips, R., Harrison, R., Moss, D., Webb, J., Espenhahn, S.E., Dore, C., Lee, D.S., Hornung, M., Howard, D.C., Ullyett, J., Dyke, H., Bull, K.R., Emmett, B.A. & Lowe, J. (1997) *The Ammonia Distribution and Effects ProjecT (ADEPT): Distribution, deposition and environmental impacts of ammonia emitted by agriculture*. Summary Report, Contract WA0613 to MAFF (December 1997). CEH Edinburgh.

Sutton, M.A., Tang, Y.S., Miners, B.P., Coyle, M., Smith, R & Fowler, D. (1998). *Spatial and temporal patterns of ammonia concentration in the UK*. DETR. Centre for Ecology and Hydrology, Edinburgh.

Tallis, J.H., Meade, R. and Hulme, P.D. (1997). *Blanket mire degradation - causes consequences and challenges*. Mires Research Group & MLURI, Aberdeen.

UK Biodiversity Group. (1999). *UK Biodiversity Group Tranche 2 Action Plans: Volume VI - terrestrial and freshwater species and habitats*. HMSO. London.

UKWAS Steering Group. (2000). *The UK Woodland Assurance Standard*. UKWAS Steering Group. Forestry Commission. Edinburgh.

List of useful Acronyms

ASSI	Area of Special Scientific Interest
BTO	British Trust for Ornithology
CAP	Common Agricultural Policy
CEDaR	Centre for Environmental Data and Recording
CMD	Countryside Management Division
CMS	Countryside Management Scheme
DANI	Department of Agriculture for Northern Ireland
DARD	Department of Agriculture and Rural Development
DCAL	Department of Culture, Arts and Leisure
DETI	Department of Enterprise, Trade and Industry
DOE	Department of the Environment
DRD	Department of Rural Development
EC	European Commission
EHS	Environment and Heritage Service
EN	English Nature
ESA	Environmentally Sensitive Area
GFP	Good Farming Practice
JNCC	Joint Nature Conservation Committee
LBAP	Local Biodiversity Action Plan
LFA	Less Favoured Area
MAGNI	Museums and Galleries of Northern Ireland
MARPOL	International Convention for the Prevention of Marine Pollution from Ships
MOSS	Management of Sensitive Sites

NESA	New Environmentally Sensitive Area Scheme
NIBG	Northern Ireland Biodiversity Group
NICS	Northern Ireland Countryside Survey
NNR	National Nature Reserves
NT	National Trust
NVC	National Vegetation Classification
OSPAR	Convention for the Protection of the Marine Environment of the North East Atlantic
RSPB	Royal Society for the Protection of Birds
cSAC	candidate Special Area of Conservation
SAC	Special Area of Conservation
SLNCI	Site of Local Nature Conservation Interest
SNH	Scottish Natural Heritage
SoCC	Species of Conservation Concern
SPA	Special Protection Area
UWT	Ulster Wildlife Trust
WFD	Water Framework Directive
WWT	Wildfowl and Wetlands Trust