

Northern Ireland Habitat Action Plan
Lowland Raised Bog
Final Draft – April 2003

1. Current status

1.1 Biological status

- 1.1.1 Lowland raised bogs are peatland ecosystems, which develop primarily in lowland areas below 150 m and are generally surrounded by mineral soils. They are a particular feature of cool, humid regions. The climate in Northern Ireland, the Republic of Ireland and north-western regions of Britain is particularly well suited to peat formation with high rainfall, cool summers and high atmospheric humidity. These climatic factors, in conjunction with the geology, soil and physiography ensure that high groundwater levels are maintained throughout the growing season which is an essential factor for lowland raised bog development. In the UK and the Republic of Ireland, conditions conducive to the accumulation of peat have occurred over the last 10,000 years in the post-glacial period. Much of the lowland landscape in Northern Ireland is dominated by drumlins derived from glacial boulder clays resulting in poorly drained soils along the major river valleys and inter-drumlin hollows and around the Lough Neagh basin. The consequent waterlogging provides the anaerobic conditions that contribute to the formation and accumulation of peat. Therefore Northern Ireland has many lowland raised bogs, but because of the rolling topography they tend to be much smaller than the very large bogs of other parts of the UK and the central midlands of the Republic of Ireland (Hammond, 1981). However, although lowland raised bogs are well represented in Northern Ireland, much of the resource has been destroyed or damaged by a variety of means.
- 1.1.2 Lowland raised bogs may develop from fen or, if the climate is sufficiently wet, by peat formation directly onto a bare substrate. Continued accumulation of peat elevates the bog surface above groundwater levels to form a gently curving dome, from which the term 'raised' bog is derived. Peat depths are variable, but can exceed 12 metres. The dome of the raised bog may be totally or partly surrounded by an area of shallow peat or mineral soil subject to ground water influence or periodic flooding, most commonly referred to as the 'lagg'. The whole complex may then be termed as domed raised bog with marginal lagg (Bellamy, 1986).
- 1.1.3 The dome of the lowland raised bog ecosystem is exclusively rain-fed, or ombrotrophic. Consequently, the surface of a 'near natural' intact lowland raised bog is waterlogged, acidic and deficient in plant nutrients. This gives rise to a distinctive suite of vegetation types dominated by specialised plants including *Sphagnum* bog mosses and vascular plants adapted to waterlogged conditions, such as the cotton grasses *Eriophorum* spp. The intact bog surface may support a patterned mosaic of pools, hummocks and lawns, forming a microtopography of different species assemblages. *Sphagnum* mosses are the principal peat forming species on lowland raised bogs, and their dominance in the living vegetation layer gives a bog its characteristically 'spongy' surface. The ability of this layer to store water is important in keeping the bog surface wet during the summer. Lowland raised bogs also support rarer plants such as the bog mosses *Sphagnum pulchrum*, *S. austinii* and *S. fuscum* as

well as a number of higher plants which have become increasingly scarce, including Great Sundew *Drosera anglica*, Cranberry *Vaccinium oxycoccos* and Bog Rosemary *Andromeda polifolia*. The marginal lagg, where it still remains, is typically dominated by Purple Moor-grass *Molinia caerulea* with scattered scrub dominated by Willow *Salix* spp.

- 1.1.4 The majority of the lowland raised bog resource has been damaged to some extent, with much of it drained, cutover or improved for agriculture. Cutover bog describes any site where some of the peat has been removed by hand or more recently by mechanical means, mainly for fuel, leaving some depth of peat behind. In Counties Down and Armagh, there is little intact bog remaining with the majority of the resource cutover and/or reclaimed. Further west and in County Antrim, mechanised peat extraction is more frequently associated with intact surfaces, the cuttings restricted to the periphery of the site where it is drier and easily accessible. These cuttings, especially those that have been cut by hand and gradually abandoned over the years, have a varied topography and generally support a range of habitats. Although many cutover lowland raised bogs have been reclaimed for agriculture or afforested, many areas retain semi-natural habitats of nature conservation importance. Whilst many former lowland raised bogs have regenerated with typical bog vegetation including *Sphagnum* mosses, others are now best considered as examples of fen, heath, swamp or wet woodland.
- 1.1.5 Within Northern Ireland, lowland raised 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 raised bogs include the M2 *Sphagnum cuspidatum/recurvum* and to a lesser extent M1 *S. auriculatum* bog pool communities, M17 *Scirpus cespitosus* - *Eriophorum vaginatum* blanket mire and M18 *Erica tetralix* - *Sphagnum papillosum* raised and blanket mire. A number of additional NVC communities are characteristic of the extensive areas of lowland raised bog which has 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, which may also be associated with the natural lagg and W4 *Betula pubescens* - *Molinia caerulea* woodland. In some instances, peat cuttings completely remove the acidic peat layer extending to a depth below the surrounding groundwater levels. Under these circumstances, ground water influence provides some nutrient enrichment and promotes the development of fen communities.
- 1.1.6 The conservation value of lowland raised 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 lowland raised 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 lowland raised 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 Lowland raised bogs also support a distinctive range of animals including breeding waders such as Curlew *Numenius arquata*, Skylark *Alauda arvensis* and a variety of invertebrates. Rare and localised invertebrates such as the Large Heath Butterfly *Coenonympha tullia* are found on some lowland raised bog sites.
- 1.1.8 Peat also preserves a unique and irreplaceable record of past human activity, ecology and climate. Archaeological research has revealed much evidence of human activity through the preservation of artefacts such as canoes, bog butter and even human bodies. The peat sequence also holds information on past ecology and climate in the form of sediments and pollen. Several lowland raised bogs are also of international importance for vulcanism over much of the Holocene (post 10,000 years before present) with volcanic glass shards (tephra) recorded in the peat column. These bogs are also of international importance for peat stratigraphy providing much of the dendrochronology for radiocarbon calibration (Pilcher & Hall, 1997).
- 1.1.9 As elsewhere across north-west Europe, there has been a dramatic decline in the extent of lowland raised bog since around the start of the nineteenth century. The area of lowland raised bog in the UK retaining a largely undisturbed surface is estimated to have diminished by around 94 % from c95,000 ha to c6,000 ha today (England 37,500 ha reduced to 500 ha, Scotland 28,000 ha to 2,500 ha, Wales 4,000 ha to 800 ha, Northern Ireland 25,000 ha to 2,000 ha). Similarly, in the Republic of Ireland there has been a loss of lowland raised bog habitat from its original 308,742 ha to 25,189 ha (8%) which still has a nature conservation value (Foss *et al*, 2001).
- 1.1.10 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, the *Northern Ireland Peatland Survey* was completed by The Queen's University of Belfast (Cruickshank & Tomlinson, 1988). This major resource inventory used aerial photographs to record and map the distribution of different types of peatland (lowland raised bog and blanket bog) and to indicate the condition of each site. 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 the original lowland raised bog resource was 25,196 ha and that only 2,270 ha, about 9%, was still intact.
- 1.1.11 A site survey of lowland raised bogs with an intact surface of 10 ha and over was undertaken by Environment Service staff in the late 1980s (Leach & Corbett, 1987). This was a preliminary survey, aimed at identifying the most important sites for nature conservation. Detailed work on a number of additional sites has been carried out since then. The revised area of 2,000 ha (1.1.7) is based on this additional information

from field survey by EHS staff. It is estimated that 1,600 ha of this intact lowland raised bog is in a near natural state supporting specialised plant assemblages typical of a waterlogged peat surface. This suggests that approximately 400 ha of intact lowland raised bog is in a degraded state supporting < 10% *Sphagnum* moss cover.

- 1.1.12 Historically, the greatest decline of lowland raised bog has occurred through peat cutting, with 77.5% lost to hand-cutting for fuel (Cruickshank *et al*, 1993). However, during the second half of the twentieth century there was an accelerated rate of peat loss due to drainage to improve the productivity for agriculture and forestry. More recently, mechanised peat extraction both for horticultural purposes and as a fuel has further increased the rate of peat loss. In the 1980s and 1990s, planning permission for the extraction of horticultural peat was granted for approximately 650 ha of lowland raised bog. In addition, the early 1980s saw the introduction of tractor-drawn auger machines that changed patterns of fuel peat extraction on lowland raised bogs with cutting taking place for both domestic and commercial purposes.
- 1.1.13 The Northern Ireland Countryside Survey (Cooper, McCann & Meharg, 2002) which aimed to monitor land use change, shows a significant decrease of 8% in wet bog vegetation in the lowlands (< 150m) between 1992 and 1998. This indicates a decline in the condition of lowland raised bog (which is largely included in this broad habitat category). In the future, it is possible that some bogs may gradually dry out as a result of prolonged cutting and past drainage activities resulting in a general lowering of groundwater tables.

1.2 Links with other action plans

- 1.2.1 This Lowland Raised Bog Action Plan identifies specific targets and actions required to deliver Northern Ireland's contribution to the UK Lowland Raised Bog Action Plan, published in 1999 (UK Biodiversity Group, 1999).
- 1.2.2 Although lowland raised bogs throughout Northern Ireland are generally surrounded by mineral soils intensively managed for agriculture, many areas of cutover bog now support other habitats of nature-conservation importance. These habitats include localised fen communities and more extensive areas of wet woodland which form an integral part of many lowland raised bog systems. These habitats are hydrologically linked to the lowland raised bog and often act as a valuable buffer between the active raised bog and the agricultural land beyond. Both fen and wet woodland will be subject to their own Northern Ireland action plans. The requirements of these habitats should be taken into account during the implementation of this plan.
- 1.2.3 Within Northern Ireland, lowland raised bog habitats, including both intact surfaces and regenerating cutover bog, are important for a number of UK priority species identified as part of the UK Biodiversity Action Plan programme. These include Skylark which breeds on lowland raised bog in addition to a number of other open habitats. The requirements of this species should be taken into account during the implementation of this plan. In addition, Marsh Clubmoss *Lycopodiella inundatum*, which in Northern Ireland is restricted to the old shore and bed of Annagarriff Lough (which was drained in 1913) is closely associated with the lowland raised bog habitats

at Peatlands Park. Re-wetting of cutover bog at the Park may threaten the continued existence of Marsh Clubmoss in Northern Ireland.

- 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 primarily associated with peatlands including lowland raised bog are breeding Curlew, Red Grouse *Lagopus lagopus scoticus*, the Bordered Grey moth *Selidosema brunnearia* and Irish Hare *Lepus timidus hibernicus* which is associated with a number of other open habitats in addition to lowland raised 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 lowland raised peat 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 the adjacent cutover lowland raised bog habitats are described below.

- 2.1.1 Peat cutting - the extraction of peat by hand and more recently by machine for fuel.
- 2.1.2 Peat milling - the extraction of peat for horticulture.
- 2.1.3 Mineral extraction - the extraction of underlying minerals beneath the peat deposits.
- 2.1.4 Drainage - lowland raised bogs drained either directly or indirectly (eg via historical domestic peat cutting).
- 2.1.5 Burning - lowland raised bogs are frequently subjected to burning on an *ad hoc* basis. Fires on raised bog habitats frequently burn out of control, destroying sensitive species, especially the cover of *Sphagnum* bog mosses.
- 2.1.6 Regional drainage pressures - lowland raised bogs frequently occur in drained agricultural landscapes. Perimeter drainage and subsequent agricultural

intensification may disrupt the hydrological integrity of lowland raised bogs causing the surface layers to dry out and may also limit rewetting potential of certain sites.

- 2.1.7 Agricultural improvement – cutover bog in-filled and topped with soil has frequently been converted to pasture in the past and can be of local significance.
- 2.1.8 Grazing - rough grazing occurs on some lowland raised bogs and is frequently accompanied by drainage, trampling, burning and surface contamination with feed and dung.
- 2.1.9 Forestry - in addition to the direct hydrological and physical impacts of existing plantations on deep peat, mature trees act as an invasive seed source in neighbouring lowland raised bog areas. There is currently a presumption against new planting on undisturbed raised bog and cutover raised bog capable of natural regeneration as raised bog. (DANI, 1993).
- 2.1.10 Scrub encroachment - Downy Birch *Betula pubescens* scrub and woodland which frequently develops in cuttings around the periphery of lowland raised bogs can encroach onto the intact surface, especially where the hydrological integrity of the bog has been damaged resulting in drying of the surface peat.
- 2.1.11 Recreation and game management - such as clay pigeon shooting or pheasant rearing is usually very limited in extent and confined to the margins of the raised bog. Localised surface trampling and contamination with lead, feed and droppings can occur.
- 2.1.12 Waste disposal – cutover bogs have been used as designated waste disposal sites in the past and are frequently used for illegal dumping of agricultural and domestic waste. This can be of local significance.
- 2.1.13 Pollution - contamination from adjacent landfill or agricultural drainage, fertiliser drift during its application, or localised dumping or fly-tipping, may be significant at certain sites.
- 2.1.14 Nutrient enrichment - nitrogen enrichment caused by atmospheric deposition could potentially lead to vegetation changes, especially bryophyte and lichen interest. Any change to *Sphagnum* mosses in particular, would have wider implications for the whole bog.
- 2.1.15 Planning developments - land reclamation for urban expansion, rural dwellings and development of the road network, may affect some lowland raised bogs with long-term repercussions on the stability of the ecosystem.
- 2.1.16 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 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 lowland raised 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. Many of the best examples of lowland raised bog are given legal protection both nationally as Areas of Special Scientific Interest (ASSIs) and National Nature Reserves (NNRs), and internationally as Ramsar sites and candidate Special Areas of Conservation (cSACs).
- 3.1.2 Under the *Nature Conservation and Amenity Lands (Northern Ireland) Order 1985*, 22 lowland raised bogs are protected as ASSIs representing around 10% (>2000 ha) of the total lowland raised bog resource, but incorporating over 45% (c 910 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 five years. Most of the 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 lowland raised 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 lowland raised bog condition.
- 3.1.3 A number of lowland raised bog ASSIs are owned, partially owned or leased by EHS and are managed for nature conservation. Several of these including Garry Bog, Black Bog and Ballynahone Bog are also designated as NNRs. Where appropriate, positive management of these sites has been undertaken by EHS using best-practice management techniques. Ballynahone Bog, 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 lowland raised 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 In 1992, the European Community (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 two lowland raised bog habitats; 'active raised bog' and 'degraded raised bog'. The active raised bog category 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 includes both intact and regenerating cutover bog. Degraded raised bogs are areas where there has been a widespread disruption to the hydrology of the peat body leading to pronounced surface desiccation or peat wastage. This results in the loss of species and/or changes to the composition of species assemblages.
- 3.1.6 The original UK list of cSACs was submitted to the EC in July 1999 and included 21 cSACs from Northern Ireland, four of which were included for their active raised bog interest. In 1999, this list was then assessed within the context of the relevant biogeographical 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 lowland raised bog.
- 3.1.7 As a result of moderation, EHS has processed a further 5 lowland raised bog cSACs. Four of these are included in the active raised bog category and the fifth, Peatlands Park, includes both active and degraded raised bog interests. By 2001, moderation had therefore resulted in a total of nine lowland raised bog cSACs submitted to the EC from Northern Ireland - a total of 1,537 ha of active raised bog (nine sites) and 117 ha of degraded raised bog (one site). The revised UK list includes 43 sites in the active raised bog category interest and 33 sites in the degraded raised bog category.
- 3.1.8 A second moderation meeting in 2002 found the UK still insufficient for a few habitats (and species), including active lowland raised bog. EHS was required to submit a number of additional cSACs in Northern Ireland to address this insufficiency. Six additional active lowland raised bog sites are currently being considered by EHS and will shortly go out to public consultation.
- 3.1.9 In the Republic of Ireland, 29 cSACs have been submitted for lowland raised bog in the active category. Similarly to the UK, the EC indicated that this is insufficient to adequately represent the resource in the Republic of Ireland and in response 22 additional active lowland raised bog sites have been notified, but not yet formally sent to Brussels (Jim Ryan, personal communication, 2003). The total area of intact lowland raised bog conserved in these cSACs is approximately 9,690 ha (c 54% of the intact resource). In addition, 53 raised bogs have been submitted in the degraded raised bog category including all of the above sites and an additional two sites which are submitted for Bog Woodland. Sites designated under the Habitats Directive will eventually be part of an EC wide network of nature conservation sites known as the *Natura 2000* network.

- 3.1.10 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 lowland raised bog sites of substantive nature conservation interest, which are not designated as ASSI or NNR.
- 3.1.11 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.
- 3.1.12 The date and conditions under which lowland raised 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 lowland raised bogs. The current monitoring programme for assessing the condition of lowland raised bog cSACs in Northern Ireland is almost complete. This programme will be extended to include all lowland raised bog ASSIs.
- 3.2.2 Management/rehabilitation plans exist for several areas of lowland raised bog managed by EHS as ASSIs and NNRs. In 1988, the DOE purchased a large proportion of the uncut, but drained, surface of Ballynahone Bog in County Londonderry, the second largest area of uncut lowland raised bog in Northern Ireland. EHS has responsibility for this site and subsequently declared it a NNR. It is currently leased to the Ulster Wildlife Trust (UWT) which is managing the restoration of the site. Other lowland raised bogs are protected and managed as part of a network of nature reserves owned and managed by Forest Service and non-governmental organisations (NGOs) such as The National Trust (NT) and the UWT.
- 3.2.3 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 lowland raised bog by encouraging more sensitive management practices to allow the restoration of lowland raised bog vegetation. All three schemes are voluntary and apply to the whole farm.

- 3.2.4 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 lowland raised bog >1 ha within the farm unit where the bog meets clearly defined criteria (smaller sites may be considered where they form part of an area of bog which is >1 ha within the farm unit). Where more than 1 ha of lowland raised 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 from April 2003, the minimum eligible area for management and payment will be reduced to 0.1 ha. Within agri-environment schemes, approximately 1,000 ha of lowland raised bog is currently managed under CMS. 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.
- 3.2.5 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 lowland raised 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.
- 3.2.6 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 and 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 lowland raised bog habitat.
- 3.2.7 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 undisturbed raised bog and cut-

over raised bog capable of natural regeneration as raised bog should not be afforested. This statement of policy is incorporated into the *UK Forestry Standard* (Forestry Commission and DANI, 1998), the government's approach to sustainable forestry.

- 3.2.8 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*.
- 3.2.9 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.
- 3.2.10 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 lowland raised bogs of conservation importance, encouragement for the use of peat alternatives in horticulture and the construction of a classroom for environmental studies at Peatlands Park.
- 3.2.11 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.
- 3.2.12 There is a significant amount of survey information currently available on lowland raised bogs in Northern Ireland. The lowland raised bog resource was assessed by the Northern Ireland Peatland Survey (Cruickshank & Tomlinson, 1988) and the survey of intact lowland raised bogs with a minimum intact surface of 10 ha (Leach & Corbett, 1987). In 1997 and 1998, EHS commissioned further research to undertake the basin profiling of a number of lowland raised bogs in Northern Ireland (Grant *et al*, 1997). This method gives an indication of the physical form of the bog, including peat depth and underlying topography, from which peat volume can be estimated. This provides a long-term monitoring baseline, for measuring peat growth/decline on a number of key sites. This research could be extended to include topics not covered well to date, such as vegetation dynamics, hydrology, vertebrate and invertebrate populations and the peat archive.
- 3.2.13 Many of the current projects to develop and improve the management of lowland raised bog are described in the UK Biodiversity group Tranche 2 Action Plans (UK Biodiversity Group, 1999). In 1995, the Scottish Wildlife Trust held an international Peatland Convention, the proceedings of which (*Conserving Peatlands*) were published in 1997 (Scottish Wildlife Trust, 1997). The Project also published

Conserving bogs: the management handbook (Brookes & Stoneman, 1997) which is a best practice guide on management and rehabilitation of lowland raised bogs.

- 3.2.14 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 development of substitutes for peat used in horticulture, the prevention of overstocking and a review of relevant planning policies. All of the recommendations will be carefully considered in the next review of Government policy on peatland conservation.
- 3.2.15 Biological records are currently stored by 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.
- 3.2.16 Research into alternatives to peat composts by both government and other agencies has produced acceptable mulches and soil conditioners. Under the Northern Ireland Peatland Policy, there is a government commitment to phase out the use of peat in open ground situations in the management of its estate and to exclude the use of peat in all contracts (DOE, 1993a). To date, there is little information available on current practices regarding the use of peat in government properties.
- 3.2.17 The National Trust has recently resolved to eliminate the use of peat from its gardens (except in exceptional circumstances) and are currently producing a peatland protection policy. However, no one product matching peat in its suitability as a compost substrate for a wide variety of uses has been established. Consequently, as suitable alternatives are not widely available, peat is still widely used in market gardening and the mushroom industry. The introduction of financial incentives to encourage the use of peat alternatives for horticultural purposes and to encourage council/community composting or anaerobic digestion facilities may help to reverse this trend. In Northern Ireland, the use of peat alternatives has not been monitored, but research in the Republic of Ireland suggests peat alternatives have made only a minimal impression with the professional sector and gardeners (Foss *et al*, 2001). Further research is required to produce an acceptably good and predictable peat alternative for the professional grower and amateur gardener.
- 3.2.18 Peatlands Park in County Armagh is an educational and visitor facility administered by EHS, aimed at increasing public awareness of both historical and present day peatland issues. A series of leaflets and educational literature has been produced and is readily available at the Information Centre. Guided tours and special events are also organised on a frequent basis to further increase awareness of the threat to peatland conservation by continued peat use, both for horticulture and as a fuel. In response to the Northern Ireland Peatland Policy (DOE, 1993a), a classroom to facilitate education groups was opened in 1995. To enhance this facility, the first

education officer was employed at Peatlands Park in 1996, to lead and teach school groups. The preparation and launch of the Northern Ireland Biodiversity Strategy highlighted the urgent need to address biodiversity decline. To further promote the importance of peatland conservation, a new Biodiversity and Education Centre at Peatlands Park is currently under construction and is due to be opened in 2003. This centre will seat 160 people in two classrooms. It will be used by school groups on week days during term-time and will be open to the general public at weekends and during school holidays.

4. Action plan targets

- 4.1 Maintain the current extent and overall distribution of near natural intact lowland raised bog in Northern Ireland, estimated at 1,600 ha.
- 4.2 Ensure that the condition of the current near natural intact lowland raised bog is maintained where favourable. Improve the condition of those areas that are unfavourable through the establishment of appropriate management regimes and hydrological conditions.
- 4.3 Establish where practicable, appropriate hydrological and management regimes for intact areas which are in a degraded state (< 10 % *Sphagnum* Cover), but still retain nature conservation interest (c400 ha). By 2015, aim to achieve management conditions that are conducive to the restoration of degraded intact lowland raised bog towards favourable condition.
- 4.4 By 2005, identify areas, timescales and targets for the conservation, improvement or restoration of significantly altered lowland raised bog, including those areas formerly cutover for fuel, improved for agriculture or planted with trees.
- 4.5 By 2006, initiate restoration projects for priority sites according to the agreed timescales.

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 lowland raised bog.
(ACTION: DRD)
- 5.1.7 By 2005, produce Northern Ireland guidelines, through a cross-sectoral steering group, on the requirements of lowland raised 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 lowland raised bog and blanket bog HAPs.
(ACTION: EHS, DARD, Planning Service, EPD)
- 5.1.9 By 2006, ensure that important lowland raised 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 and GFP initiatives to ensure that lowland raised bogs are being maintained and enhanced across Northern Ireland.
(ACTION: DARD, EHS)
- 5.1.11 By 2010, aim to have a minimum of 40% of the peat product market requirements based on non-peat material and 90% by 2015.
(ACTION: EHS, DARD, District Councils, DOE)
- 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 lowland raised 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 lowland raised bog.
(ACTION: DARD, DOE, EHS)

5.2 Site safeguard and management

- 5.2.1 By 2004, produce conservation objectives for all statutory designated lowland raised bogs including cSACs, ASSIs and NNRs.
(ACTION: EHS)
- 5.2.2 By 2004, develop agreed methods for describing and assessing favourable condition for lowland raised 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 lowland raised 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 lowland raised bog.
(ACTION: EHS, DARD, Forest Service, Rivers Agency)
- 5.2.6 By 2006, review the coverage of lowland raised 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)
- 5.2.7 By 2006, identify designated lowland raised bog habitats, including the SLNCI network, adversely affected by drainage schemes.
(ACTION: EHS, Rivers Agency, DARD)
- 5.2.8 By 2006, identify locally important lowland raised 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)
- 5.2.9 By 2007, begin measures to secure favourable management on sites prioritised in 5.2.5 according to agreed timescales.
(ACTION: EHS, DARD, Forest Service)

- 5.2.10 By 2010, designate as SACs those areas of lowland raised bog approved by the EC under the Habitats Directive.
(ACTION: EHS)

5.3 Advisory

- 5.3.1 By 2005, provide information to landowners and occupiers on the conservation importance of lowland raised 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 significantly altered lowland raised bog restoration should be actively encouraged.
(ACTION: EHS, DARD, Forest Service)
- 5.3.3 By 2005, develop guidance on restoration practices for lowland raised 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 lowland raised 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 lowland raised bogs into favourable management.
(ACTION: EHS, DARD, Forest Service, District Councils)
- 5.3.6 By 2006, provide advice on the development and marketing of peat alternatives to reduce amateur and professional demand for peat-based horticultural products and peat used for fuel, to achieve the long-term safeguard of peatlands.
(ACTION: EHS, DARD, DETI)
- 5.3.7 By 2010, further develop demonstration sites including Peatlands Park, Ballynahone Bog and Black Bog 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, the development and promotion of peat alternatives, education and conservation strategies.
(ACTION: EHS)

5.5 Monitoring and research

- 5.5.1 By 2004, set standards for assessing favourable condition of lowland raised 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 products (both for fuel and horticultural purposes) 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 lowland raised bog resource to include intact surfaces (both near-natural and in a degraded state) and those areas that have been significantly altered (eg by peat cutting).
(ACTION: EHS)
- 5.5.4 By 2004, establish surveillance and monitoring programmes to assess the condition of the lowland raised 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 for the enhancement, restoration and re-creation of lowland raised bog and populations of associated characteristic species.
(ACTION: EHS, DARD, 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 lowland raised bog diversity.
(ACTION: EHS, DARD, Academic Partners)
- 5.5.8 By 2006, promote research and development of sustainable horticultural peat alternatives to speed up the reduction of peat used in both amateur and professional markets.
(ACTION: EHS, DARD, DETI)
- 5.5.9 By 2008, investigate the feasibility of restoring the hydrological integrity of selected lowland raised bog sites.
(ACTION: EHS, Rivers Agency, DARD)

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

5.5.11 By 2010, review the requirements for further research on the effects of pollution and climate changes on lowland raised bogs, and promote research needs accordingly.
(ACTION: EHS)

5.6 Communications and publicity

5.6.1 Promote the conservation of lowland raised 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 lowland raised 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 By 2006, through the centre at Peatlands Park, actively promote composting and the use of peat alternatives, and provide advice on their performance and availability.
(ACTION: EHS)

5.6.6 Consider developing interpretative and educational provisions at appropriate sites for the observation, enjoyment and increased public awareness of lowland raised bog.
(ACTION: EHS, Forest Service, DARD)

6. Costings

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

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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

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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