PART I

INTRODUCTION

Chapter 1

INTRODUCTION TO IRELAND

The island of Ireland is situated in the extreme north-west of Europe between 51.5° and 55.5° north latitude and between 5.5° and 10.5° west longitude. The Irish Sea to the east, which separates Ireland from Britain, is from 17.6 to 192 km wide and has a maximum depth of about 200 metres. Around the other coasts the shallow waters of the Continental Shelf are rather narrow and depths increase rapidly into the Atlantic Ocean.

The total area of the Republic of Ireland is slightly less than 7 million hectares. The area under crops is some 4.7 million hectares and about 1 million hectares is rough grazing. The total population is estimated at some 3.7 million. About 60% of the population lives in cities and towns of 1,000 people or more. While the overall population density is 51 persons per square kilometre, there are major variations between the east and south, where densities are highest, and the less populous western parts of the country.

Ireland is a parliamentary democracy. The national parliament consists of the President and two Houses: a House of Representatives and a Senate. The President and the House of Representatives are elected by the direct vote of the people, according to a system of proportional representation. The majority of the Senate is elected from panels of candidates and by the universities. The functions and powers of parliament derive from the Constitution of Ireland and law. The sole power of making laws for the State is vested in parliament. The executive powers of the State are exercised by, or on the authority of, the Government. The members of the Government are generally members of the House of Representatives, although not more than two may be members of the Senate.

Members of local authorities are also elected according to a system of proportional representation. Each of the principal local authorities has a full-time chief executive and supporting administrative staff. The services provided by the major local authorities can be described under the seven general headings of housing and building, road transportation and safety, water supply and sewerage, development incentives and controls, environmental protection, recreation and amenity, and miscellaneous services.

The Constitution affirms Ireland's devotion to the ideal of peace and friendly co-operation amongst nations founded on international justice and morality. Ireland has been a member of the United Nations since 1955 and has been active in efforts to maintain international peace and security in accordance with the UN Charter. In 1949 Ireland was a founder member of the Council of Europe which brings together all European parliamentary democracies.

In 1973 Ireland joined the original six member states as a member of the European Community. The European Union was established in 1993 on the entry in force of the Treaty of European Union. Successive Irish Governments have favoured a progressive evolution to a closer union and in a number of referenda the Irish people have endorsed major steps leading

towards that goal. Membership of the European Union has contributed to rapid progress in a range of areas, including the development of agriculture, industry and services. Apart from economic benefits, membership of the European Union has had a major impact on social and cultural life.

The present biological diversity of Ireland is ultimately dependent on three factors:

- biogeographical factors - Ireland being an island located off the European mainland on the eastern edge of the North Atlantic Ocean, which governs its climate;
- its relief and geology; and
- the impact of human activity.

Climate

The climate of Ireland is largely determined by the frequent movement across the country of frontal depressions embedded in a warm, south-westerly airstream. Overall regional differences in climate are small, though they are biologically significant (e.g. blanket bog occurs at sea level in the west but not in the east). Annual rainfall averages 1000 mm, distributed over not less than 200 raindays over most of the country. Annual variation in temperature is not extreme, with average air temperatures of about 15 C for July and 4 - 5 C for January. The high cloud cover, high frequency of rainfall and low summer temperatures ensure a high relative humidity. Heavy snowfalls are rare and the number of days annually with air frost varies from about 10 in coastal areas to about 60 in midland and northern parts. This mild, moist climate favours the dominance of broad-leaved deciduous trees but is also eminently suitable for grass-based agriculture. The high rainfall also contributes to wetland formation and Ireland's climatic conditions have given rise to a number of unusual wetland types, such as turloughs and lowland blanket bogs.

Because of Ireland’s location off the north-west of Europe and near the tracks of the North Atlantic depressions, Ireland has a relatively windy climate. Western and upland areas are most affected by this; the mean annual wind speed along the west and north-west coasts is nearly twice that of the south midlands. On an annual basis, southerly winds are dominant but westerlies also have a high number of occurrences. The high winds limit the growth of trees in very exposed areas but they also contribute to the character of many important Irish habitats such as the machair plains of the west and north-west coasts, and soft coasts in general.

Relief and geology

Ireland is a relatively flat island with only 5% of the land rising above 300 m in height. It is "saucer-shaped", so that the inland part is relatively flat and low-lying, while most of the mountain ranges are located near the coast. In the Central Plain the bedrock consists mainly of carboniferous limestone. The coastal uplands, in contrast, consist mainly of older rocks. In

most islands a central backbone, more or less pronounced, causes the rivers to flow radially towards the sea, from near the centre to the margin. In Ireland, due to the peripheral position of most of the high ground, the streams that rise on the seaward side of the mountain masses have short and mostly steep courses. Those with sources lying on the inland side, on the other hand, travel far before they reach an outlet and, in some instances, have extensive flood-plains. The poor drainage is further aggravated by the pattern of deposition of glacial drift. Eskers and moraines, consisting mainly of gravels and sands, are a prominent feature of the lowlands that extend from Dublin to Galway. Within this area lie most of the raised bogs, as well as a number of large existing lakes.

At the western/southwestern edge of the Central Plain there is little or no drift cover and large exposed areas of almost bare limestone can be found with only shallow skeletal soils. In the Aran Islands, the Burren, and elsewhere these give rise to habitats of European biogeographic significance, e.g. limestone pavement, turloughs and marl lakes.

In many of the coastal counties and most of the upland areas, the bedrock is predominantly non-calcareous and usually has poorer drainage properties than limestone. As a result, blanket bogs - both upland and lowland - occur frequently in these areas, together with heathlands and other habitats characteristic of acid soils.

The island of Ireland as a whole has over 7,000 km of coastline. Its varied geology and topography has resulted in an exceptional diversity of marine and maritime habitats. The western coast is more broken and indented than the eastern and, as a consequence, more diverse in its range of habitat types. The area within the 200 mile zone is 465,000 sq. km. and the area of Ireland's Continental Shelf is 900,000 sq. km.

Human impact

The earliest confirmed human presence on the island dates from about 9,000 years ago. However, farming did not commence for some 2,000 years after that and it was with the advent of farming that significant alteration of the natural landscape began, with the introduction of new domesticated animals and plants and the clearance of the forests.

In historical times, the speed of that change has accelerated and, by the 1840's its effects had been drastic. At that stage, the population had reached 7 million and was still growing rapidly. However, the ten years between 1841 and 1851 saw the population fall by at least two million due to famine, disease and emigration. Some five million persons in total emigrated from Ireland in the course of the 19th century and the high rates of emigration continued into the present century. The overwhelming dependence of the population on a single food source - the potato - created an insatiable demand for land and potato patches replaced the natural vegetation farther and farther up the hill slopes. The demand for clear arable ground, together with the demands for timber and fuel, also resulted in the clearance of virtually all the remaining forests.

The Irish economy has traditionally been based on agriculture and up to the 1960's the population lived largely in rural areas. Since then, the natural environment has been affected by

policies to promote the establishment and expansion of modern industry, by a major enlargement of urban development, and by changed patterns of agriculture, including more intensive production. Despite increased pressures on the environment, late industrialisation and the predominance of clean modern industry have had the advantage of enabling major damage to be prevented or controlled. Ireland's location off the north-west coast of Europe, with high annual rainfall and prevailing south-west winds from the Atlantic, contributes to the quality of the environment. The country is largely free from air pollution and the watercourses are generally of a satisfactory to high quality. The low population density over much of the country has further helped to preserve the integrity of the landscape. The protection of the environment has been an objective of successive Governments. Generally speaking, legislation to protect and maintain the quality of the environment is implemented by local authorities and by the Environmental Protection Agency. With regard to biological diversity, and in particular the conservation of the natural heritage, this comes within the remit of the Department of Arts, Heritage, Gaeltacht and the Islands. General descriptions of the Government structures with responsibilities in regard to biological diversity are contained in Chapter 5.

PART II

BIOLOGICAL DIVERSITY IN IRELAND

Chapter 2

HABITATS

Ireland has a wide diversity of habitats for its small size. Habitats of particular significance because of their scarcity both in Ireland and Europe include limestone pavement, turloughs, active peatlands, and intact sand and machair systems. The legacy of centuries of deforestation has meant that native woodlands survive only as tiny fragments. Freshwater and coastal marine habitats are relatively well represented.

The inventory of habitats is this report is necessarily summarised, and therefore much detail is omitted. Individual habitats are grouped into a number of broad categories: coastal and marine; estuarine and brackish water; freshwater; peatlands; grasslands; native woodlands; artificial habitats.

1. Coastal and marine habitats

These include: -

Marine habitats
Marine islands and sea cliffs
Estuarine and brackish water habitats
Sand dunes and machair
Shingle beaches and sandy beaches

Marine habitats

Ireland's coastal marine environment is home to a wide variety of marine habitats and a corresponding diversity of marine plants and animals. Whales, dolphins, porpoises, grey and common seals and basking sharks frequently feed in inshore waters. Coastal bays and inlets are important nurseries for fish and habitats for many shellfish species. Rocky coastal sites support many marine invertebrates, particularly along the western coasts. Of particular conservation interest are maerl beds which support a high diversity of sponges and solitary sea squirts. Many waterfowl use sub-littoral habitats, including red-breasted merganser, scaup, eider, divers and grebes. Red Data book species include the common scoter, which dives for shellfish on sandy, open coastal sites.

Conservation and threats

Irish coastal waters have been occasionally polluted by oil spillages.Shellfish harvesting and aquaculture in shallow bays has damaged sub-littoral communities. Untreated sewage has led to excessive algal growth and eutrophication in bays and inlets adjacent to larger population centres. Submarine gravel extraction may also pose a threat to benthic communities. Marine habitat protection is of special economic concern because of the need to sustain the harvesting

of commercially important fish, crustaceans and molluscs. Currently, there are four marine sites in Nature Reserves, covering 245 hectares. A Whale and Dolphin Sanctuary exists within Ireland's 200 mile fishery limit.

Marine islands and sea cliffs
Rocky islands and sea cliffs are common around the coast and support many breeding seabird colonies of international importance. Typical species include auks, gulls, cormorants and gannet. Of the Red Data book species, storm petrel and manx shearwater breed in burrows on offshore islands, while the peregrine and chough use coastal cliffs as nest sites. Among the plants of sea cliffs, scot's lovage (*Ligusticum scoticum*) is listed in the Red Data book.

Conservation and threats
Sea cliffs and rocky islands are not considered threatened, except from possible oil spillages. Five sites are protected in Nature Reserves, with a total coverage of 273 hectares Twenty islands or groups of islands covering 5, 253 hectares, and 3 sea cliffs (331 hectares) are seabird sites designated as Special Protection Areas.

Estuarine and brackish water, including mud and sand flats, salt marshes and lagoons
Ireland has 32 important estuaries and coastal bays, and five major estuarine areas (Foyle, Boyne, Barrow, Lee and Shannon). Extensive stretches of salt marsh are confined to the vicinity of the larger estuaries. Irish Red Data book species using estuaries include the shads (*Alosa alosa, A. fallax fallax* and *A. fallax killarnensis*), the Atlantic salmon (*Salmo salar*) and the smelt (*Osmerus eperlanus*). Red Data book bird species feeding in estuaries include little and roseate Terns. Red Data Book plants of estuarine habitats include the dwarf spike-rush (*Eleocharis parvula*) and the triangular club-rush (*Scirpus triqueter*). Borrer's salt marsh grass (*Puccinellia fasciculata*) is a rare species of salt mashes. Intertidal mud and sand flats are rich in invertebrate life and provide vital winter feeding grounds for wildlfowl and waders, including Red Data book species such as brent goose, shoveller, pintail, golden plover and dunlin. Sand flats in some localities support eelgrass (*Zostera* spp.), while perennial glasswort (*Arthrocnemum perenne*) can be found on sheltered mud flats.

Conservation and threats
Many Irish estuarine sites are probably less degraded than those in Britain and mainland Europe. However, even in Ireland, threats include coastal infilling for industry, marinas and landfill; radioactive pollution (in the Irish Sea), heavy metals, hazardous organic chemicals, anti-fouling paints, oil, landfill leachate, untreated sewage, litter from ships and landfill sites; and resource exploitation, including overfishing of salmon, intensive bait digging and hunting in a few locations.

Six estuaries and mud flats are Nature Reserves, with a total coverage of 3,406 hectares. 26 estuaries are designated as Special Protection Areas, with a total area of 45,166 hectares. Four lagoons covering 3,297 hectares are Special Protection Areas. Saltmarshes are protected in three Nature Reserves.

Sand dunes and machair (Machair: sandy calcareous plain inland of dunes)
Irish sand dunes are species-rich habitats for plants and invertebrates and 168 sand systems have been catalogued. In south Kerry, dune pools and margins are important spawning and

feeding areas for the natterjack toad. Vulnerable Red Data Book plants include seaside centaury (*Centaurium littorale*) and lesser centaury (*C. pulchellum*). Machair is a rare habitat restricted to the north and west coasts. Machair is a mosaic of dunes, grassland and wetland, grazed by sheep and cattle, and is an important habitat for three Red Data Book bird species: corncrake, dunlin, and red-necked phalarope.

Conservation and threats
Sand dunes and machair are highly vulnerable to conversion to golf courses, caravan parks, football pitches, beach houses, agricultural intensification, and sand quarrying. Few pristine examples of sand dunes and machair currently exist, because so many have been degraded. A number of important sites is currently under threat. Irish sand dunes and machairs are listed in the EU Habitats Directive as 'priority' habitats. Since 1997, the best examples have been listed as candidate Special Areas of Conservation. Four sand dune systems are protected in Nature Reserves, covering 1,352 hectares

Shingle beaches and sandy beaches
Shingle beaches (including the strand line) are rare, and are significant invertebrate habitats. Characteristic plant species of vegetated sites include *Elymus* spp., *Atriplex prostrata, Tripleuropspermum maritimum, Rumex crispus, Glaux maritima* and *Beta vulgaris*. Red Data book plant species include the sea pea (*Lathyrus japonicus*) and oysterplant *(Mertensia maritima*). Another Red Data book plant species, purple spurge (*Euphorbia peplis*), is now extinct. Sandy beaches can be important feeding areas for waders because of the productive invertebrate populations. Tern species nest and roost on shingle beaches (e.g. little tern, a Red Data Book species). Common seals and harbour seals haul up on remote sandy beaches in southern and western areas.

Conservation and threats
Widespread and often illegal removal of shingle and sand for building is one of the main threats to this habitat.

2. Freshwater Habitats

These include: -

Lakes and ponds
Turloughs
Running water
Reedswamp and marshes

Lakes and ponds
Ireland has over 4,000 lakes and ponds, which account for about 2% of the area of the country. Most lakes are situated in Galway, Mayo, Donegal, Leitrim, Cavan and Monaghan. They range from nutrient poor (oligotrophic) lakes in upland, peaty areas to nutrient-rich (eutrophic) lakes in the north Midlands. Many Irish lakes are still capable of supporting salmonids (*Salmo salar* and *S. trutta*), and are frequently used for public water supplies. Red Data Book plants include *Hydrilla verticillata,* found in only one lake in Connemara, slender naiad (*Najas flexilis*) and pillwort (*Pilularia globulifera*). The arctic charr (*Salvelinus*

alpinus) is listed as a vulnerable fish species in the Red Data Book, and occurs mainly in cool, stony, oligotrophic lakes in western counties. The charr is thought to have become extinct in Lough Conn, Co. Mayo, probably due to pollution. The survival of sea trout is of particular concern in nutrient-poor, peaty, western lakes. Lakes are vitally important for breeding and wintering wildlfowl, including Red Data Book species, garganey, gadwall, pintail, shoveler and pochard.

Conservation and threats
Organic pollution, especially from diffuse agricultural sources, is the main threat. Poorly treated sewage is an additional threat, affecting some of the larger, Midland lakes. The most recent survey of 135 Irish lakes by the Environmental Protection Agency (EPA), indicated that about 60% were unpolluted (oligotrophic and mesotrophic), 32% strongly eutrophic and the remainder highly eutrophic and hypertrophic. Several larger lakes (Loughs Ree and Derg) were classified as strongly eutrophic. Some smaller lakes and ponds have disappeared due to drainage. Certain salmonid lakes in poorly-buffered, upland lakes in west Galway and Mayo have been affected by acidification from commercial conifer plantations.

Twenty eight lakes, covering roughly 75,000 hectares, almost half the total area of Irish lakes, are waterfowl sites designated as Special Protection Areas. A number of other lakes are listed as candidate Special Areas of Conservation. Two lakes in Kerry, the habitat of the endangered natterjack toad, are Nature Reserves, and some additional lakes are conserved in National Parks.

Turloughs
Turloughs (temporary lakes), which are unique to Ireland, are rare habitats mainly restricted to the limestone areas of Roscommon, Galway and Clare. Turloughs flood in winter, providing important feeding and roosting areas for wildfowl and waders. In summer, when the water recedes, they are grazed by livestock. The vegetation is characterised by aquatic, terrestrial and especially amphibious plants, usually forming a distinct, concentric zonation pattern. Alder buckthorn (*Frangula alnus*) and shrubby cinquefoil (*Potentilla fruticosa*) are some of the Red Data Book plants associated with turloughs.

Conservation and threats
Turloughs are listed as 'priority' habitats in the EC Habitats Directive. The main threat is arterial and field drainage for agriculture. Pollution from silage and slurry effluent, and septic tanks, are additional threats. Two turloughs are designated as Special Protection Areas, and one (Coole-Garryland, Co. Galway) is protected in a Nature Reserve. All the more important turloughs are listed as candidate Special Areas of Conservation since 1997.

Running water (rivers and streams)
There are 13,465 kms of main river channel, but no figures are available for the length of tributaries. The majority of rivers are salmonid quality, but the length of pristine, unpolluted rivers has steadily declined, from 84% in 1971 to 57% currently. Running water and the riparian zone assume greater importance for biodiversity when flowing through intensively managed terrestrial areas. The short, nutrient- and base-poor, spate rivers of the northern and western seaboard are vital spawning grounds for sea trout, the migratory form of the brown trout (*Salmo trutta*), while many rivers still provide spawning for the commercially important

Atlantic salmon. Three species of lampreys can also be found in Irish rivers. The slower flowing, nutrient-rich channels of the Midlands tend to be of cyprinid quality. The endangered *Margaritifera margaritifera durrovensis*, a sub-species of the freshwater pearl mussel, is unique to Ireland and is only recorded from the River Nore.

Conservation and threats
The major threat is steadily increasing nutrient enrichment from intensive agriculture, but poorly treated sewage is also a contributor. Drainage for flood relief, agricultural and other purposes has caused significant damage to aquatic systems and wetlands in Ireland and still continues to be a cause for concern. Localised gravel extraction has damaged some spawning beds. Commercial forestry operations have damaged some salmonid rivers in western areas. The recent accidental introduction of the bio-fouling zebra mussel (*Dreissena polymorpha*) is also a cause for concern.

Swamps and marshes
Reedswamp is often associated with lakes and large, slow flowing rivers (e.g. Shannon), providing habitat for waterfowl. Marshes are nutrient-rich wetlands over mineral soils and frequently found alongside fens. Irish fleabane (*Inula salicina*) and Irish lady's tresses (*Spiranthes romanzoffiana*) are among some of the Red Data Book plants associated with this habitat.

Conservation and threats
These habitats are vulnerable to infill for housing near population centres, drainage for agriculture, and marinas and other water-related facilities. Some sites receive limited protection as part of other designated aquatic habitats.

3. Peatlands

Raised bogs, blanket bogs and fens
Ireland is of international significance for peatlands. Irish raised bogs are assigned to the oceanic raised bog type which has a distribution restricted to parts of NW Europe and Ireland's oceanic raised bogs are the most important remaining in Europe. Ireland is the most important country in Europe for blanket bog and Ireland holds 8% of the world's blanket bog. Blanket bog shapes the character of much of the upland areas in Ireland. Peatlands in Ireland have suffered serious losses due to drainage, peat extraction, afforestation and overgrazing. In Ireland, bogs once covered approximately 1.3 million hectares, or 16% of the land area of the country. Presently, in Ireland, only 19% (220,000 ha) of the original area remains intact. There has been a 92% loss of raised bogs and an 82% loss of blanket bog.

Raised bogs are the most endangered peatland habitat in Ireland. An agreement was reached in 1990, whereby a number of ecologically important raised bogs owned by Bord na Móna were transferred to the National Parks and Wildlife Service, now part of the Department of Arts, Heritage, Gaeltacht and the Islands. This very positive measure for peatland conservation will be fully implemented and consolidated through the transfer of further sites, now recognised as being of ecological importance, to National Parks and Wildlife.

In recognition of the significance of Irish peatlands and of the serious losses they were undergoing, a number of surveys of peatlands have been undertaken. As a consequence, knowledge of the peatlands of conservation importance in Ireland is good, particularly for raised bogs and, to a lesser extent, for blanket bogs. However, further baseline surveys of fens and of upland mountain blanket bog are required, as well as ongoing monitoring of other peatland types. Cutover bogs resulting from traditional/private cutting are thought to provide important habitats for some species and also require investigation.

Large areas of commercially exploited cutaway bogs are now becoming available. This presents a considerable opportunity for the development of some of these areas to enhance biological diversity. Some of the commercially exploited bogs could be turned into diverse wetland or other habitats. The fact that some of these sites cover an extensive area would be a further advantage.

Active raised bogs, once common in the Midlands, are now rare habitats. Vegetation is dominated by sphagnum mosses, with some vascular plants such as heathers, sedges and grasses. Red Data book plants include the bog orchid (*Hammarbya paludosa*). Raised bogs are 98% water and are critically dependent on the maintenance of a high water table. Blanket bogs are situated in upland areas such as the Wicklow and Slieve Bloom Mountains, and in the western counties mainly in Donegal, Sligo, Mayo, Galway and Kerry. Most blanket bogs are used for rough grazing. Among the Red Data Book plants are slender cottongrass (*Eriophorum gracile*) and mackay's heath (*Erica mackaiana*). Red Data book bird species of bogs include the greenland white-fronted goose, dunlin, golden plover and merlin. Red grouse and curlew also use bogs and could decline if these habitats continue to be degraded. Fens are botanically species-rich peatlands fed by calcium-rich water, which are now uncommon because many have been drained.

Conservation and threats
Active raised bogs are most threatened by mechanical peat extraction. Only 8% of the original area remains of conservation interest. Just 18% of the original blanket bog area survives relatively intact. Blanket bogs are most threatened due to widespread overgrazing by sheep and mechanical peat extraction. Commercial afforestation has declined on active bogs because grant aid is no longer available. Twenty two raised bog sites are protected, covering just over 3,000 hectares and accounting for 32% of the total area of conservation interest. Forty blanket bog sites, covering over 27,000 hectares are now protected, accounting for 68% of the total area of conservation interest. Four fens, covering 204 hectares, are conserved in Nature Reserves, and just over 54,000 hectares of fens are of conservation interest. All raised and blanket bog sites considered to be of prime ecological importance were proposed as candidate Special Areas of Conservation in 1997.

4. Grasslands

Eskers, dry grassland, wet grassland

The bulk of the land area is occupied by grasslands of all types. However, most grassland is heavily modified for agriculture and semi-natural grassland habitats have declined significantly. Grasslands on eskers (sinuous ridges of sand and gravel) are found only in parts of the

Midlands. Hay meadows, critically important for the endangered corncrake (*Crex crex*) are mainly found in the north and west. Lowland wet grasslands can still be found in the Shannon, Blackwater and Moy catchments, but are uncommon elsewhere. They are also vital for the survival of the corncrake, and breeding and wintering wildfowl and waders. Low intensity pastures, including heaths and wet grasslands are mainly found in the Midlands and West. Good examples of species-rich dry limestone heath are found in the Burren and the Aran Islands. Species-poor acid grasslands are usually found in upland areas, where the soils are poor in nutrients and minerals.

Esker grasslands and meadows are highly threatened by quarrying and agricultural improvement. The remaining areas of lowland wet grassland are now less threatened by drainage and intensification. Other grasslands, such as pasture and heath, are regularly converted to intensive grassland or commercial forestry. Upland grassland is threatened by overgrazing and conifer afforestation.

Four lowland wet grassland bird sites are designated as Special Protection Areas, covering 6,101 hectares Many grasslands of conservation interest are listed as candidate Special Areas of Conservation.

5. Native woodlands

Semi-natural woods, scrub

The natural climax vegetation is considered to be deciduous, broadleaved woodland, but Scots Pine (*Pinus sylvestris*) was abundant on poorer soils. Deforestation began at least 5,000 years ago and by the beginning of the 20th century, Ireland had been substantially deforested. Only tiny pockets of native woodland remain. The total area of native woodland is estimated to be ess than 20,000 hectares The largest single area of native woodland is in Killarney National Park, while smaller amounts are conserved in Glenveagh and Wicklow Mountains National Parks. The only sizeable area of yew (*Taxus baccata*) woodland is in Killarney National Park. Scrub may cover over 50,000 hectares and includes hazel scrub (*Corylus avellana*), found in limestone areas such as the Burren.

Conservation and threats

Native oak woods in National Parks and some Nature Reserves are under some threat from invasive, exotic shrubs. Some other woods can be grazed by livestock, preventing natural regeneration. Road schemes have threatened several native woodlands. Clear-felling and conversion to conifer forests is now less likely to occur. Scrub is more vulnerable to clearance for agriculture, such as in the Burren.

About 5,200 hectares of native woodland is protected. Twenty six woodland Nature Reserves cover 1,948 hectares, and the remainder is in National Parks. Most native woodlands of conservation interest are listed as proposed Natural Heritage Areas or candidate Special Areas of Conservation.

6. Rocky habitats

Limestone pavement, inland cliffs, scree and caves
The most extensive area of limestone pavement occurs in the Burren, Co. Clare. This habitat type is found with dry limestone grassland, but limestone pavement has very little soil and a wide variety of plants grow in rock fissures. Inland cliffs and crags provide habitats for a variety of different plants where there is soil cover, and provide nesting sites for chough, raven and peregrine falcon. Natural caves provide habitats for a number of Red Data Book bat species. The ring ouzel, a Red Data Book species, nests in upland rock scree, while base rich scree can be important for alpine plant species.

Conservation and threats
Limestone pavement is threatened by, inter alia, land reclamation, quarrying, and use for gardening, wall building, etc.

7. Artificial habitats

These include: -

Hedgerows
Canals
Roadside verges
Commercial forest plantations
Quarries
Structures
Parks, gardens and golf courses
Arable farmland and intensive grassland
Cutover bog
Waste ground

Hedgerows
Field boundaries, mainly hedgerows, are a particularly prominent feature of the Irish countryside. Ireland's abundant hedgerows, which have become 'naturalised' over the last few centuries, act as linear strips of native woodland, providing niches for a number of common woodland plant and animal species. Hedgerows are especially important, given the small amount of remaining woodland in the country, and they act as linking corridors between habitat patches. Hedgerows forming townland boundaries (and roadside hedgerows) are likely to be particularly important from an ecological and cultural viewpoint. Hedgerows have suffered significant losses, largely due to hedgerow removal for agricultural purposes. The removal of hedgerows has impacted negatively on biodiversity in the wider countryside and it has also affected the cultural heritage and altered the visual landscape. The habitat quality of many remaining hedgerows may be adversely affected by 'maintenance' operations undertaken by Local Authorities and other bodies, as well as by private landowners. Hedgerows are most often removed in arable areas, and are regularly cleared in small amounts from farms throughout the country. Currently there is a number of controls in place which contribute to mitigating negative impacts on hegerows. For example, the Wildlife Act, 1976, prevents the cutting or destruction of hedgerows or other vegetation between the 15th April and 31st

August, and there is also guidance to ensure that the importance of roadside hedgerows for wildlife is taken into account.

Canals
The canal network provides habitats for a wide variety of wildlife, and simulates natural lakes and ponds, supporting a variety of cyprinid fish, and bankside vegetation which can include some rare plant species. Responsibility for canals and the navigable inland waterways network comes within the remit of the Department of Arts, Heritage, Gaeltacht and the Islands.

Roadside verges
Roadside verges, because they are not intensively managed, provide a habitat for neighbouring agricultural land. Herbicides are rarely applied, except when planting trees.

Commercial forest plantations
The area under forest plantations is currently increasing by about 20,000 hectares per year, one of the highest rates of afforestation in Europe. Most of Ireland's 570,000 hectares of forest is plantation. Although plantations are poor substitutes for native woodland, they provide niches for a number of the more common mammal and bird species, some invertebrates and fungi.

Quarries
Redundant rock, sand and gravel quarries can provide niches for wildlife. Sand banks provide a habitat for sand martins, while rocky ledges offer nesting and roosting opportunities for bird species such as the kestrel and chough. Some rare ruderal plant species can also be found.

Man-made structures
Ruins, old buildings and bridges have become important for bats as natural roosts disappear, and for birds such as the barn owl, kestrel, house martin and dipper. High structures provide nesting and roosting space for the peregrine falcon and swift. Farmyards are important for birds such as the swallow, house sparrow and barn owl.

Parks, gardens and golf courses
As suburbia expands, parks and gardens are sometimes the only 'green space' for urban wildlife, particularly the more resilient species which have adapted to human activity. Mammals include the hedgehog, red fox, badger, some bat species, red squirrel and the introduced grey squirrel. Many common bird species are resident in gardens, while some duck species frequent artificial ponds. Golf courses and playing pitches near coastal areas provide grazing for light bellied brent geese, and roosting areas for waders.

Arable farmland and intensive grassland
Red Data Book plant species associated with traditional arable cultivation include the corn cockle (*Agrostemma githago*), cornflower (*Centaurea cyanus*) and darnel *(Lolium temulentum*). Red Data Book bird species feeding on intensive farmland include greenland white-fronted goose, barnacle goose and whooper swan. Two Nature Reserves (Wexford Wildfowl Reserve and Drumcliff, Co. Sligo) incorporate intensive farmland for this reason.

Cutover bog
In the past, many bogs were traditonally cut by hand. When extraction ceased, nature gradually reclaimed these areas, which are often species-rich habitats, especially for invertebrates. Cutover bogs often exist as small 'islands' amidst intensive farmland or industrial peatland. Many such areas exist in the Midlands, but are usually not protected, and are subject to renewed peat extraction, grant-aided afforestation, dumping or agricultural reclamation.

Waste ground
Even in areas often perceived as being unpromising, interesting species can be found. Rare ruderal plant species can often be found on old landfill sites and waste ground, while sewage treatment plants provide feeding for some rare vagrant gull species in winter.

Chapter 3

FLORA

Ireland is an island off the European continental landmass. The number of species of plants is considerably less than in mainland Europe. Many of the land-bound plants colonised Ireland after the final retreat of the ice sheets, about 10,000 years ago, probably via a land bridge with Britain, which in turn was linked to continental Europe for a limited period until sea level rose to its present level. Some other species colonised by sea or air, and some were introduced by man, either accidentally or deliberately.

This inventory of flora summarises the current knowledge of Irish wild fungi, lichens, algae, bryophytes (mosses and liverworts), and vascular plants (ferns and flowering plants). Also included is a summary of aliens, non-native plant species in gardens and arboreta, and commercial crop species. It should be noted that there is under-recording of the lower plants; therefore, the true picture of Irish floral diversity is unknown.

1. Fungi

Fungi are one of the largest groups of organisms in the world, second only to the insects. Approximately 3,500 species of fungi have been recorded in Ireland, although it is believed that the true figure is closer to 7,800 species. Using the latter estimate, Ireland could hold about 0.5% of the world's fungal flora.

Unlike higher plants, fungi are unable to photosynthesise; most are saprophytes, obtaining their food from dead and decaying matter, but some are parasitic on plants and animals. All fungi reproduce by spores. The fungi are divided into two main groups: the Lower Fungi (Phycomycetes), which include many familiar moulds, and the Higher Fungi, which include the Basidiomycetes (e.g. mushrooms and toadstools), the Gasteromycetes (e.g. puff-balls and stinkhorns), and the Ascomycetes (truffles and morels).

Conservation and threats
No Red Data Book exists for Irish fungi. Therefore, in the absence of a list of rare or threatened species, deductions have to be made using published information from Britain and Europe. In the opinion of some mycologists, even in many other European countries there is a lack of accurate data on fungal distribution and ecology for a reliable picture of threatened European fungi to be given. The major threats to fungal diversity in Ireland, on the basis of this limited information, include loss of old deciduous woodland and old grassland due to changes in farming and forestry, air pollution and site development.

Economic and social importance
Fungi have a variety of important roles: some are used commercially (e.g. yeasts in brewing and baking, moulds for producing antibiotics, such as penicillin, edible cultivated and wild mushrooms), while others are essential to the survival of many plants and ecosystems (e.g.

mychorrhyzal fungi, which fix atmospheric nitrogen). Commercial leguminous plants, such as peas and beans, are able to fix nitrogen because they have symbiotic mychorrhyzae in their root nodules. Certain fungi are pathogenic, causing plant diseases (e.g. potato blight, *Phytophthora infestans*, and Dutch Elm Disease, and animal diseases). Finally, fungi can perform important roles as indicators of environmental health - bioindicators. For example, certain species of ectomychorryzal fungi are sensitive to air pollution, similar to lichens.

2. Lichens

Lichens are plants which consist of a fungus in close association with an alga. This relationship is called symbiosis: both the fungus and the alga partners obtain benefits that each on its own is unable to achieve. Lichens have thus managed to colonise environmental niches which are hostile to many other plants, such as the tundra, where they form a major part of the diet of reindeer ranched in northern Fenno-Scandia. Ireland has 1,050 taxa, belonging to 223 genera, compared with 1,700 species in Britain and 5,000 in Europe. Ireland has 30% of the total number of European lichen taxa, which makes it important in an international context.

Conservation and threats
Of the 1,050 species, 34 are regarded as threatened in Europe. More research work is neededto establish the situation of the Irish lichen flora. A Red Data Book on Irish lichens is expected to be published shortly. Habitats of particular importance for lichens are broadleaved and yew woods, lowland wood pastures and parkland, calcareous grasslands, peatlands, rivers and streams, sand dunes, machair, limestone pavement and splash zones above the high tide mark on coasts. Air pollution, particularly from air-borne nitrogen inputs, is probably the greatest threat to the Irish lichen flora. Since Ireland has comparatively low amounts of air pollution, this could account for the greater abundance of certain species in Ireland relative to continental Europe.

Economic and social importance
In Ireland, lichens have been known to be sensitive to air pollution for many years; lichens have been used extensively as indicators of air quality.

3. Algae

Algae are a vast and diverse group of simple, flowerless plants, with no roots and no clear division between leaf and stem; many algae are aquatic. They are divided into the micro-algae, which include single celled plants such as diatoms and desmids, and the macro-algae, which include the more familiar seaweeds. Of the freshwater algae, the most familiar are the stoneworts (Charophyta).

The total number of Irish algal species is unknown. Ireland's long coastline with its variety of habitats has long been the subject of studies of marine algae, and there is reasonably reliable information on the seaweeds: green algae (Chlorophyta) account for 83 species, brown algae (Phaeophyta) 147, and red algae (Rhodophyta) 294. In total, 524 species of marine macro-algae and 181 species of marine phytoplankton have been recorded. There are 25

species of stoneworts, or about 10% of the global figure. There are an estimated 700-1,000 species of desmids (freshwater micro-algae).

Economic and social importance
The micro-algae form the phytoplankton, which has a vital role in marine and freshwater ecology; they provide the 'soup' of minute drifting plants on which marine animals depend for food. Phytoplankton in the oceans also has a vital role in climatic regulation as one of the world's largest carbon 'sinks'. The seaweeds have traditionally been used as an important aid to soil fertility in Ireland, especially on the western seaboard. Seaweeds are also used in medicine and in food. Micro-algae can form 'blooms' - explosions of populations - which can cause fish kills or contamination of shellfish if they are toxic. Algae can quickly respond to increasing nutrient levels in both fresh and salt water, leading to eutrophication (over-enrichment) and resulting loss of beneficial uses. Freshwater micro-algae, such as desmids, are regarded as key indicators of water quality.

Conservation and threats
Since there is no overall picture of species diversity in marine algae, their conservation status cannot be stated. However, the main threats, particularly to the micro-algae, are excessive UV radiation resulting from atmospheric ozone depletion and water pollution, and pollution and aquatic habitat destruction in the case of the stoneworts.

4. Bryophytes (mosses and liverworts)

Bryophytes - mosses and liverworts - have a simpler structure to ferns and flowering plants. They have stems and leaves, but instead of roots, they have modified stems, called rhizoids. Like ferns, fungi and algae, they reproduce by means of spores. Mosses and liverworts grow in almost every habitat and in many they play an important role. Irish moss species account for about 6% of the total global moss flora, while Irish liverworts account for 3%.

Ireland is particularly rich in mosses and liverworts because of its mild, wet climate and relatively unpolluted atmosphere. 533 species of mosses, and 226 species of liverworts have been recorded, giving a total bryophyte flora of 759 species. The British and Irish bryophyte flora combined account for some 1,000 species, or over 60% of the European flora, a much higher figure than for flowering plants and ferns.

Conservation and threats
Of the total number of 759 Irish bryophyte species, 146 mosses and 46 liverworts are listed in the Red Data Book of Britain and Ireland for Bryophytes - one third of the total bryophyte flora.

Threats to bryophytes include over-exploitation, damage and/or destruction of habitat, pollution, and removal of habitat suitable for colonising bryophytes by ecological succession (e.g. growth of scrub). Commercial peat exploitation is undoubtedly a serious threat to Ireland's few remaining intact sphagnum bogs - over 90% of the estimated original extent of raised bogs has been damaged or destroyed. Possible climatic changes could also have impacts on bryophytes of bogs, particularly if the change is towards warmer and drier conditions.

Botanists emphasise that the most important aspect of bryophytes is not so much in terms of numbers of species but of abundance. Bryophyte communities and species are important and often very evident components of Irish habitats. In raised bogs, for example, bryophytes account for a high proportion of the species present, especially in terms of the area covered. In woodlands on the oceanic west coast, mosses are abundant as ground cover and as epiphytes (plants attached to trees or other plants and not directly to the soil). Because of the abundance of bryophytes, Ireland has a special responsibility for their conservation. Bryophytes are potentially useful as bioindicators.

Economic and social importance

The most obvious socio-economic role of bryophytes in Ireland is in peat production. Bogs dominated by sphagnum moss species covered large areas of the Irish midlands, and have been a source of fuel for centuries. In the late 20th century, sphagnum bogs have been commercially exploited for domestic fuel supplies, power generation and for peat moss, a popular soil conditioner and potting compost in commercial horticulture and domestic gardening. Some liverworts produce cancer-inhibiting chemicals. The use of sphagnum moss for dressing wounds is re-emerging in cases of chemical allergy, which prevents the use of sterilised dressings.

5. Vascular Plants (flowering plants and ferns)

Vascular plants include the seed plants and conifers (Spermatophyta) and the ferns (Pteridophyta). All vascular plants have roots, stems and leaves and vessels through which water and nutrients are transported. The Spermatophyta are divided into the Gymnosperms (conifers, or cone-bearing plants) and the Angiosperms (flowering plants). Angiosperms are further divided into Dicotyledons (broadleaved plants) and Monocotyledons (e.g. grasses, orchids, lilies). Vascular plants are the most studied group of the Irish flora.

The total number of vascular plant species in Ireland is currently 1,309, and includes natives (815 species, although this figure could be higher) and those introduced species which are well-established in the wild. Ireland has slightly less species than Britain and considerably less than continental European countries such as France. Table 3.1 summarises the diversity of vascular plants.

Table 3.1. Numbers of genera and species of Irish vascular plants

CATEGORY	GENERA	SPECIES
Pteridophytes (ferns)	33	78
Gymnosperms (conifers)	3	3
Angiosperms (flowering plants)	493	1,228
Total number	**529**	**1,309**

Ireland's flowering plants account for less than 5% of the known species in the world and only 11% of the total number of European species. However, the value of Ireland's floral diversity lies with its plant communities which are ecologically highly significant.

About half the Irish vascular plants are widespread throughout Europe. The remainder, consisting of distinct groups and distributional elements, are listed in Table 3.2.

Table 3.2. Vascular plants in Ireland with limited distributions in Europe

Biogeographical Group	Number of species
Atlantic	30
Sub-Atlantic	12
Atlantic-Mediterranean	25
Arctic-Alpine	16
Plants with their northern limit in Ireland	27
Disjunctly distributed species	15

Conservation and threats

The main threats to vascular plants in Ireland arise from the trend away from traditional to intensive farming, housing and infrastructural development, and water pollution. The most widespread and serious impacts arise from changing farming practices such as conversion of old grasslands, drainage, and heavy applications of nitrogen fertilisers.

Table 3.3 lists the numbers of Red Data Book vascular plants in each of five threat categories by habitat group. 'Endangered' means that the species is likely to become extinct if the causes of decline continue to operate. 'Vulnerable' means that the species is likely to move into the 'Endangered' category in the near future if the causes of decline continue. 'Rare' means small populations not at present endangered or vulnerable. 'Indeterminate' means a species which is endangered, vulnerable or rare but there is not enough information to place it in a precise category. Appendix I list Irish Red Data Book vascular plant species and their status.

Table 3.3. Numbers of species of Irish Red Data Book vascular plants in each of four broad habitat types

Habitat Groups	Endangered	Vulnerable	Rare	Indeterminate	Extinct
Coastal habitats					
Estuaries		2			1
Sand dunes		3	6	1	1
Salt marsh		1	1		
Maritime cliffs and rocks			1		
Shingle beaches	1		1		1
Sub-total	**1**	**6**	**9**	**1**	**3**
Grassland habitats					
Pastures	1	4	4	1	
Meadows		1	1		
Heaths		5	8		
Eskers		3	1		
Mountains			17	1	
Sub-total	**1**	**13**	**31**	**2**	
Wetland habitats					
Bogs	2	3	6		1
Marsh and fen		1	5		
Rivers, lakes and canals		2	3		
Ponds and streams			5		
Marginal wetlands	1	5	15		1
Sub-total	**3**	**11**	**34**		**2**
Woodland habitats					
Woods on acid soils		3	1		
Woods on limestone soils		1	2	1	
Scrub		5			
Sub-total		**9**	**3**	**1**	
Artificial habitats					
Walls		3			
Arable farmland	1	2		1	3
Sub-total	**1**	**5**		**1**	3
Totals	**6**	**44**	**77**	**5**	**8**

The breakdown of plant species threatened in each habitat category gives an indication not only of the numbers of species at risk but also allows an assessment to be made of the general trends in species decline. Greater numbers of wetland and grassland species appear to be endangered or vulnerable, and are thus likely to become extinct in the short or medium term if the present trends continue. Sand dunes are subjected to heavy recreational pressure in the North and East, which has led to a decline in species such as *Epipactis phyllanthes* (green-flowered helleborine). Destruction of bog habitat has endangered *Saxifraga hirculus* (marsh saxifrage) and *Orthilia secunda* (ciliated wintergreen). Vulnerable species such as *Pseudorchis albida* (small white orchid) and *Orchis morio* (green winged orchid) are affected by gravel extraction and agricultural reclamation of esker grasslands. *Inula salicina* (Irish fleabane) is a vulnerable species likely to become endangered due to peat siltation in Lough Derg arising from commercial peat extraction along the River Shannon. *Stachys officinalis* (betony) has declined markedly due to scrub clearance in areas as such as the Burren in Co. Clare. Arable weed species such as *Centaurea cyanus* (cornflower) and *Lolium temulentum* (darnel), previously considered extinct, are threatened by the abandonment of traditional arable farming in areas such as the Aran Islands, Co. Galway.

Species of European importance
The nine Irish species listed as rare and threatened in Europe are:

Dryopteris aemula (hay-scented buckler fern)
Deschampsia setacea (Bog hair grass)
Eriophorum gracile (slender cotton grass)
Hammarbya paludosa (bog orchid)
Hypericum canadense (Irish St. John's wort)
Najalis flexilis (slender naiad)
Spiranthes romanzoffiana (Irish lady's tresses)
Pyrola rotundifolia ssp maritima (round leaved wintergreen)
Trichomanes speciosum (Killarney fern)

All but *Dryopteris aemula* is listed in the European Red Data Book because it is so common in Ireland. Ireland also has *Limonium paradoxum,* a listed species in the Berne Convention.

6. Aliens, Garden Plants and Commercial Plant Species

Aliens: There are approximately 800 taxa of alien vascular plant species; of these 300 are considered to be established in Ireland, and are included in the Census Catalogue of the Flora of Ireland. The remaining 540 species are regarded as casual aliens found, for example, at ports, waste ground and dumps, but also include species which have escaped from cultivation. An annotated check list of these species is currently in preparation.

Garden and arboretum plants: Gardens and arboreta play an important role in genetic conservation and developing new lines. For example, the National Botanic Gardens holds a living collection of 20,000 plant species and cultivars. Trinity College Botanic Gardens hold the Irish national plant seed and gene bank and they are also closely involved in research. The

JFK Arboretum in Wexford holds records of 4,500 forest tree and shrub taxa including species, varieties, cultivars and their provenance (i.e. site and country of origin); about 200 of these are grown in forest plots. 110 species are listed as cultivars (plants bred from original wild species) and those developed from non-native plants in Irish gardens. 7,000 species (including varieties and forms) of cultivated trees and shrubs are listed in "Trees and Shrubs Cultivated in Ireland", published in 1985. However, the figure in 1997 is estimated to have increased to about 10,000 species. There are no figures available for cultivated herbaceous species.

Ireland has three noteworthy National Plant Collections: *Garrya* (4 species and 4 cultivars); *Potentilla fruticosa* (60 cultivars); and *Olearia* (39 species and 9 cultivars). These collections are significant resources for genetic material internationally.

Commercial/crop species: Ireland's climate favours a wide range of commercial grasses, cereals and roots. The principal crops are barley, wheat and oats, potatoes and sugar beet. There is increasing interest in old varieties and breeds, some of which possess desirable qualities, such as resistance to disease. Ireland's climate is also favourable for forest trees, most of which are introduced. The main commercial tree species are sitka spruce, lodgepole pine, Norway spruce, Scots pine, Japanese larch, ash, oak and beech.

Genetic Resources: The International Conference and Programme for Plant Genetic Resources (ICPPGR) Country Report for Ireland, published in 1995, lists recommendations for plant genetic resource conservation. The report concludes that indigenous plant genotypes unique to Ireland may exist, due to its geographical isolation and westerly location from mainland Europe, and it states that a national programme will be undertaken to coordinate plant genetic resource activities.

The ICPPGR report lists species which are wild or wild relatives of economic plants currently threatened in Ireland. These include, for example, *Asparagus officinalis ssp prostratus* (wild asparagus) and *Crambe maritima* (sea kale). Organisations engaged in plant genetic conservation include the National Botanic Gardens and the National Parks and Wildlife within the Department of Arts, Heritage, Gaeltacht and the Islands, Trinity College Botanic Gardens, University College Dublin Department of Crop Science, Horticulture and Forestry, Coillte Teo (State Forestry Company), the Irish Branch of the Henry Doubleday Research Association, the Irish Genetic Resources Conservation Trust and the Irish Seed Savers Association.

Chapter 4

FAUNA

Ireland's fauna has been stated to be an impoverished version of Britain's. This is an over-simplification: Ireland is a smaller island on the western edge of continental Europe; it has a longer coastline than many other European countries and there is high marine faunal diversity. Also, Ireland has a relatively high diversity of terrestrial and freshwater habitats and fauna for its size, relative to some neighbouring countries. The reasons are partly climatic and partly due to the varied geology, combined with relatively low intensity resource use.

This inventory summaries the situation of Irish fauna, according to current knowledge. It should be noted that, similar to the situation of the flora, knowledge of many groups of the fauna is incomplete. The total number of species recorded is 14,616, divided between Protozoa (single celled animals) - 614 and Metozoa (many-celled animals) - 14,002. These species are distributed through 32 phyla (a major division of the animal kingdom). To illustrate the range of diversity in the animal kingdom, the vertebrates, including man, are classified in just one phylum, the chordates. Most Irish animal species are invertebrates, and many of these belong to the arthropod phylum (insects, crustaceans, spiders, etc.).

Appendix II lists the number of species, for which published records exist, in each of the major faunal groups. It should be noted that information on some of the groups was difficult to obtain (indicated by ++); information on some marine groups is taken from surveys of seas around Britain, Ireland and North-West Europe, and does not differentiate between Irish and other neighbouring countries (indicated by **); and some groups are likely to be under-recorded (indicated by +). Under-recording is a particular problem with some of the invertebrate groups. For example, the total recorded number of Diptera (Insecta) is 2,350 but the true figure is estimated at about 4,000. The numbers of species of Coleoptera and Hymenoptera are likely to be similarly under-recorded.

All life forms have a role in the biosphere. The roles and conservation needs of invertebrates are often neglected, but higher life forms, such as the mammals, depend on invertebrates for their survival. Most Irish animal species are invertebrates. Some groups are described below.

Protozoa are microscopic, single-celled animals generally restricted to wet or moist environments. They exist in a variety of forms: solitary, colonial, free-swimming, sessile, parasitic and symbiotic. Some, such as the Formaminifera and the Radiolaria, are important in marine zooplankton. Foraminiferans secrete shells of calcium carbonate; the 'rain' of these shells onto the ocean beds over many millions of years formed sediments that eventually became chalk rock. Other protozoa, such as the ciliates, are symbiotic with herbivorous mammals such as sheep and cattle, and wood eating insects, helping to digest other indigestible food.

Sponges are mainly marine and are found fixed to rocks or other substrates from where they filter feed to obtain nutrients; 219 marine species and 6 freshwater species are recorded from

Ireland. 81 species are recorded from Lough Hyne alone, a marine Nature Reserve in Co. Cork.

The Coelenterates include the free swimming jellyfish, the sessile sea anemones and hydrozoans and the corals (mainly tropical). These simple animals capture their prey and defend themselves with tiny stinging organs known as nematocysts. 258 species of marine coelenterates and 5 species of freshwater hydrozoans are recorded from Irish waters. The Cnidaria, or comb jellies, comprise 3 Irish species and are entirely marine and planktonic.

The Platyhelminthes are predominantly parasitic, soft-bodied, unsegmented worms. The Turbellarians are however, free-living. The tapeworms all exist within vertebrate intestines. The Trematodes (flukes) parasitise all the vertebrate and some invertebrate groups.

The Nemertea (ribbon worms) are common in marine ecosystems, where 37 species are recorded for Ireland. The Nematodes (roundworms) are very widespread, and include a vast number of free-living species in water and soil, and an even greater number of parasitic species. The Nematomorpha, Acanthocephala, Kinorhyncha and Priapulida are mainly aquatic, marine phyla not well represented in the Irish fauna. The Rotifera (wheel animalcules) include 315 Irish freshwater species. Most of the Chaetognaths (arrow worms) are found in tropical waters; 14 species are recorded from Irish marine plankton. The Gastrotricha are microscopic animals living in sediments, 3 species of which have been found in Ireland.

The Annelida include the familiar segmented worms (earthworms, lugworms) and the leeches. 342 polychaete species are recorded; these are exclusively aquatic and marine. Lumbricid worms (e.g. earthworms) comprise 23 Irish species and are common in freshwater and soil environments. 13 species of freshwater leeches are recorded.

The Pogonophora, Sipunculata, and Echiura are small marine groups. Pentastomida are a little known group of parasites. The Bryozoa are colonial and sessile, consisting of fine branching tubes which form encrusting or gelatinous structures; bryozoa are filter feeders. There are 192 marine and 7 freshwater species. The Entoprocta are tiny, stalked animals with a few marine species. The Phoronida are a small group of marine filter feeders. The Brachiopoda resemble bivavle molluscs and were more numerous in earlier geological periods. They are sessile, filter feeders, are all marine and 18 species are recorded around Irish waters.

The Molluscs are mainly large invertebrates which are often abundant in marine and freshwaters, while slugs and snails also inhabit terrestrial habitats. Some have commercial importance as edible shellfish and include the bivalves (e.g. oysters), cephalopods (e.g. squids and octopus), gastropods (e.g. slugs, snails) and chitons. The Kerry slug *Geomalacus maculosus* is a species of national and international importance. It is found elsewhere only in parts of Iberia. Other snails of conservation interest include *Pomatias elegans*, *Oxychilus helveticus*, *Cochlodina laminata*, *Arion lusitanicus*, *Ashfordia granulata* and *Catinella arenaria*. Ireland has one of the most extensive stocks of the genus *Margaritifera*, the freshwater mussel, remaining in Europe. *Margaritifera margaritifera durrovensis* is unique to Ireland, is only recorded from the River Nore and is on the verge of extinction.

Endemic species and sub-species

Endemics are species only found in a certain area and have evolved in geographical isolation from the main population. Ireland has a number of endemics:

Niphargus wexfordensis is an amphipod (Crustacea) only recently recorded from Co. Wexford.

As noted above, *Margaritifera margaritifera durrovensis*, which is unique to Ireland, is on the verge of extinction.

Protocephalus pollanicola ((Platyhelminthes) is the only known parasitic tapeworm of freshwater fish in Ireland and is an intestinal parasite of the pollan of Lough Neagh.

Among the endemic sub-species are *Alosa fallax killarnesis* or Killarney shad (Pisces), a unique, land-locked dwarf form of the twaite shad, only found in the Killarney lakes. *Coregonus autumnalis pollan*, known as the pollan (Pisces), is almost unique in Europe by being non-migratory.

There are a number of named sub-species of butterflies and moths (Lepidoptera). The butterflies include the Burren form of the dingy skipper *Erynnis tages baynesi*, the marsh fritillary forms *Euphrydes aurina scotica* and *E. a. hibernica*, the Irish wood white sub-species *Leptidea sinapsis juvernica*, forms of the green-veined white *Pieris napi fasciata* and *P. n. hibernica*, the orange-tip *Euchloe cardamines hibernica*, the meadow brown *Maniola juetina iernes*, and the large heath *Coenonympha tullia scotica* and *C. t. polydama*.

Among the moths are sub-species of the sandhill rustic *Luperina nickerlii knilli*, the Burren green moth *Calamis tridens occidentialis*, poplar lutestring *Tethea or hibernica*, the muslin moth *Cycina mendica rustica*, grey moth *Hadena caesia mananii*, the marbled green moth *Cryphia muralis westroppi*, and the transparent burnet *Zygaena purpuralis hibernica*.

Among the birds (Aves), there are sub-species of the red grouse, dipper, coal tit and jay.

Mustela erminea hibernica, the Irish stoat, is a sub-species found only in Ireland and the Isle of Man.

Species with limited distributions in Ireland or Europe

As mentioned above, the Kerry slug *Geomalacus maculosus* (Gastropoda) is a species of national and international importance found elsewhere only in parts of Iberia. Other gastropods of conservation interest include *Pomatias elegans, Oxychilus helveticus, Cochlodina laminata, Arion lusitanicus, Ashfordia granulata* and *Catinella arenaria*, and three species of *Vertigo*, which are listed in the EU Habitats Directive and the Berne Convention.

The freshwater crayfish *Austropotamobius pallipes* (Crustacea) is still common in Ireland but the species has declined seriously in Britain and continental Europe due to a fungal disease arising from the introduction of a North American crayfish species, and from water pollution.

Spiders (Aranae) with limited Irish distributions include *Hyptiotes paradoxus*, *Sitticus floricola*, *Dipoena melanogaster* and *Baryphyma duffeyi*. Millipedes (Myriopoda) with limited distributions include *Nanogona polydesmoides* and *Ophyiulus pilosus*.

The mayfly (Ephemeroptera) genera *Ecdyonurus* and *Rhithrogena* and the stoneflies (Plecoptera) such as *Perla bipunctata* and *Dinocras cephalotes* are used as indicators of unpolluted waters. The stoneflies *Capnia atra* and *Diura bicaudata* are glacial relict species.

The damselfly *Coenagrion lunulatum* (Insecta: Odonata) is a northern European species in decline due to pollution and drainage. The water bug *Sigara fallenoidea* (Hemiptera: Heteroptera) is not found in Britain but occurs in Canada, and is found in a number of Irish lakes.

Beetles (Coleoptera) with a limited distribution in Ireland include the relict species *Noterus crassicornis* and *Carabus clatratus*, *Pyopterus nigroruber*, part of the old forest fauna, the ladybird *Hippodamia tredecimpunctata*, possibly extinct in Britain, the machair click beetle *Selatosomus melancholicus*, which is not found in Britain, and five curculionid species that have limited European ranges.

Among the Diptera, the Irish populations of some of the species associated either with the karstic limestone areas of the west, or various types of wetland, are far removed from their nearest known populations elsewhere. Thus, the hoverfly *Cheilosia ahenea*, which occurs in machair and limestone pavement areas, is notable for being unknown anywhere between the Burren and the Vosges mountains of eastern France. Similarly, the wetland soldier fly *Oxycera falleni* is known from Wicklow and Denmark but nowhere else in between. It is now under threat in Ireland. In line with the high degree of endemism associated with tufa-spring faunas elsewhere, there is also the tufa-spring moth fly *Telmatoscopus (Panimerus) goodi*, which is so far only known from Ireland. Some threatened Irish Diptera are also regarded as under threat in other parts of Europe. Included in this group are the hoverfly species *Doros conopseus* and *Eristalis cryptarum*. The snail-killing fly *Tetanocera freyi* is an insect regarded as under threat elsewhere, but which is not infrequent in Ireland. The largest group of Diptera recognisably under threat in Ireland comprises species associated with old deciduous woodland. Examples are the large craneflies *Ctenophora ornata* and *C. pectinicornis*, the hoverflies *Xylota abiens*, *X. florum* and *X. tarda* and anisopodid *Mycetobia obscura*.

Three species of caddis flies (Trichoptera) are recorded in Ireland but are unknown in Britain, while *Limnephilus pati* is a very rare and threatened species in Europe.

The natterjack toad *Bufo calamita* is Ireland's rarest amphibian, found only in one small area of Co. Kerry, and the species is recorded as declining. Of the seven native bats, Ireland has the highest populations of lesser horseshoe bat *Rhinophus hipposideros* and leisler's bat *Nyctalus leiseri* in Europe.

Threats to Ireland's fauna

Vertebrate Red Data Book species

A Red Data Book has been produced for Irish vertebrates. Table 4.1 summarises the current situation of Irish vertebrates species by Red Data Book category. Appendix III lists Irish Red Data Book vertebrate species and their status.

Table 4.1. Summary table of current situation of Irish vertebrates species by Red Data Book category.

	MAMMALS	BIRDS	REPTILES	AMPHIBIANS	FISH	**TOTAL**
Extant Irish Species	31	168	1	3	27	**230**
Extinct	1	6	0	0	0	**7**
Endangered	0	8	0	1	3	**12**
Vulnerable	0	3	0	0	3	**6**
Rare	1	15	0	0	0	**16**
Indeterminate	2	3	0	0	3	**8**
Total Threatened	4	35	0	1	9	**49**
Internationally Important	10	7	0	1	1	**19**

A number of Irish species are listed in EU Directives, the Bonn and Berne Conventions. It should be noted that the main threats to listed species are indirect, i.e. from habitat loss and degradation, rather than from direct impacts such as shooting, trapping or nest collecting.

The majority of the Irish terrestrial fauna has suffered contractions in range and fragmentation due to habitat loss from agricultural clearance, drainage and land improvement over the centuries. This trend has accelerated dramatically in the latter part of the 20th century and especially over the last generation. Commercial forestry has accelerated since the 1950s, and has contributed to widespread habitat loss and damage to aquatic ecosystems, especially in the upper reaches of river systems.

A more recent trend is overgrazing, especially on the more vulnerable, semi-natural western peatlands and grasslands where the delicate ecological balance is easily upset. Since over 80% of the land is agricultural, changes in farming practices have the most important effects on habitats and species. Because of the concentration of intensive farming in some areas, and the increased use of fertilisers, there is a trend towards eutrophication (nutrient enrichment) of a number of freshwater rivers and lakes. Some species (such as certain aquatic insects and fish) are sensitive to water pollution and are under threat.

Large scale commercial peat harvesting since the Second World War has transformed the Midland bogs, causing a serious reduction in wild habitats. New roads, expansion of towns and cities and quarries have also taken their toll of habitats and species. Finally, disturbance

and noise from traffic, recreational activities and hunting can affect certain birds, bats and mammals.

Specific threats to animal groups or species
Examples of specific threats to groups or species include:

Echinodermata
e.g. *Paracentrotus lividus* (Purple Sea Urchin) - overfishing;

Ephemeroptera, Plecoptera, Odonata
Water pollution, drainage;

Diptera, Lepidoptera
Habitat loss, such as loss of old woodland and pasture, e.g. *Machinus cownii* - sand dune disturbance; drainage and conversion of old grassland;

Coleoptera
e.g. *Atheta picipes* - loss of dead trees and associated fungi; *Graptodytes* spp from drainage; *Calosana inquisitor*, disappeared due to loss of extensive oakwoods;

Crustacea
e.g. the isopod *Armadillidium pictum* - removal of rock; certain amphipods - ground water pollution;

Mollusca
e.g. *Vertigo* spp - drainage, habitat alteration: *Margaritifera* spp - river pollution, siltation, overfishing, dredging, loss of salmonid fish, poaching for pearls;

Bryozoa
e.g. *Lophopus crystallinus* - habitat loss and pollution of freshwater, increased turbidity, loss of submerged aquatic plants;

Pisces
Overfishing of commercial marine fish, such as Atlantic salmon; lampreys - freshwater pollution and arterial drainage; arctic charr, shads - deterioration of water quality; pollan -competition with introduced cyprinid fish; sea trout - mariculture activities;

Amphibia
e.g. natterjack toad - drainage and modification of sand dunes for recreational activities and farm intensification;

Aves
Habitat clearance, agricultural intensification, drainage, pesticide contamination, predation from introduced species (e.g. mink prey on ground nesting birds), previously egg collecting and hunting;

Mammalia
Bats - loss of woodland, chemical treatment of roof timbers, pesticides, modifications to bridges and exclusion from other roosting sites such as old trees; pine marten - deliberate extermination, loss of woodland habitat; badger - deliberate extermination; red squirrel -possible competition from introduced grey squirrel; deer - loss by interbreeding with introduced species.

Introduced species

Introduced species are important because of the possible effects they may have on native species, especially through competition. A number of wild species have been introduced to Ireland by humans. The most conspicuous of the introductions are mammals, six species of which have been introduced since the 18th century and five of which have become integral parts of the fauna. These are the grey squirrel from North America (*Sciurus carolinensis*), which can compete for space and food with the native red squirrel (*Sciurus vulgaris*); the feral mink from North America (*Mustela vison*) which is a predator of ground nesting birds and fish, but which has probably less negative impact than once believed; the Japanese sika deer, which can interbreed with the native red deer; the brown hare (*Lepus capensis*); and the bank vole (*Clethrionomys glareolus*), which provides food for some Red Data Book birds species, such as the short-eared owl and the hen harrier. The muskrat, introduced during the 1930's, has since been exterminated. Ireland's most numerous game bird is the pheasant, introduced from Asia to Britain and thence to Ireland in Norman times. Species which have arrived naturally to occupy created habitats, such as conifer plantations, are few in number compared with those lost through habitat destruction. Marine fouling organisms, introduced from ships, present a threat to marine ecosystems and may also represent a threat to sustainable aquaculture. The alien zebra mussel (*Dreissena polymorpha*) may impact on freshwater habitats.

Domestic Breeds

Goats, sheep and cattle were first introduced into Ireland by the Neolithic farmers. Many breeds of domestic animals are introduced but some are native to Ireland, and have adaptations to Ireland's topography and climate.

<u>Sheep</u>

The Galway sheep is the only indigenous sheep breed; a small flock of this endangered breed is being managed on the Aran Islands, Co. Galway. Distinctive regional variations of sheep imported long ago occur, such as the Wicklow cheviot. It is very likely that an Irish breed of mountain sheep once existed but the importation of Scottish, English and Welsh mountain rams have made their identification impossible. Breeds of sheep not indigenous to Ireland have been imported, many of which are rare or minority breeds. The Jacob sheep which was an endangered breed twenty years ago is relatively common. There are flocks of soay, Wiltshire horn, grey faced Dartmoor, Castlemilk moorit, Lincoln longwool and banwen in Ireland. A breed of seaweed eating sheep, probably similar to the north Ronaldsay, was once

found on the west coast. Other sheep breeds included in the Rare Breeds Directory are Kerryhill, Welsh badger face, Dorset down, Shetland, Dartmoor greyface, Portland, Rough fell, friesland, whiteface woodland, Hampshire down, Herdwick and Wensleydale. The Roscommon sheep and the Claddagh sheep are now extinct in Ireland. Other sheep breeds in the country are blackface, Suffolk, texel, lle de France, rouge de I'Oest, charollais, bleu du Maine, chevoits, vendeen, Oxford down, Hampshire down, bluefaced Leicester, and belclare.

Cattle

Cattle listed in the Rare Breeds Directory include Kerry, Maol, Dexter, Gloucester, shorthorn, highland, Jersey, Galloway, Shetland, whitepark and longhorn. The old Irish cow was a local race which became extinct before an interest in conserving livestock diversity arose. The shorthorn (beef and dairy, i.e. dual purpose) was the most common stock in Ireland about 50 years ago. The traditional Irish species of dexter is extinct in Ireland and the introduced form is not quite the same as the old Irish form. Some "droimeann" cattle are found at Muckross Park. This strain could be considered to be an Irish strain. There may also have been a breed of Tory Island cattle. Other cattle species in the country are: limousin, Aberdeen angus, friesian, continental, simmental, hereford, charolais, Belgian blue, blonde d'aquitaine, longhorn, Shetlands, highland cattle, Ayrshire, galaways, holstein, and meuse Rhine Issel.

Deer

The red deer *(Cervus elaphus)* is the largest species of deer being farmed in Ireland. Within the red deer species there are a number of different lines which can be bred pure or crossed with other lines resulting in what is called a type, for example English Park type, European red type, Scottish type and Waipiti type. The English Park type are deer that originated from some of the large private parks in England. The majority of red deer hinds on farms in Ireland are of the English Park type. Fallow deer, which were originally introduced into Ireland during the 1400's, are farmed also, with most of the stock coming from the wild or parks in Ireland. The Sika, which was introduced into Ireland in the 1800's, is also farmed but on a very small scale.

Pigs

The vast majority of pigs in Ireland today have been derived from two breeds, the landrace and the large white. The Irish pig is now extinct. The following breeds are listed in the Rare Breeds Directory: Gloucestershire old spot, Berkshire, British saddleback, British lop, Tamworth and large black. The Duroc has become popular in the last ten years.

Horses

Five breeds are included in the Rare Breeds Directory: Irish draught, Connemara pony, Kerry bog pony, Eriskay and Exmoor. The native Irish breeds of horses are the Irish Draught horse, the Connemara pony, and the Kerry Bog pony. Of these the recently documented Kerry bog pony, which may prove to be related genetically to the Icelandic horse, is by far the most rare, and less than 20 are known. The registered Irish draught horses have under 600 breeding

females which classifies the breed as "vulnerable" in The Rare Breeds Survival Trust lists. The Cushendall pony is now extinct. There are also representatives in Ireland of breeds of horses which are rare or minority breeds, but of which the main population is in Britain or other countries. These include Shetland, Exmoor, Fell, Dales and Highland ponies, Icelandic horse, Welsh cobs and ponies and Breton heavy horses. Other breeds include the coloured cobs (piebalds and skewbald) of the travelling community, which form another distinct race of horses with recognisable characteristics; the thoroughbred, Hackney pony and Clydesdale. The donkey *(Asinus asinus)* was formerly a relatively common species in Ireland, but the numbers are much reduced today. The piebald donkey is also very rare. The gennet is a sterile cross between the horse and donkey.

PART III

MEASURES FOR THE CONSERVATION AND SUSTAINABLE USE OF BIOLOGICAL DIVERSITY IN IRELAND

Chapter 5

GOVERNMENT STRUCTURES

General

At Government level, the primary responsibility for the conservation of the heritage, including the natural heritage, lies with the Minister for Arts, Heritage, Gaeltacht and the Islands. The Minister has statutory functions relating to the physical heritage of Ireland, including the protection and presentation of the natural heritage, the archaeological heritage, the architectural heritage and the inland waterways.

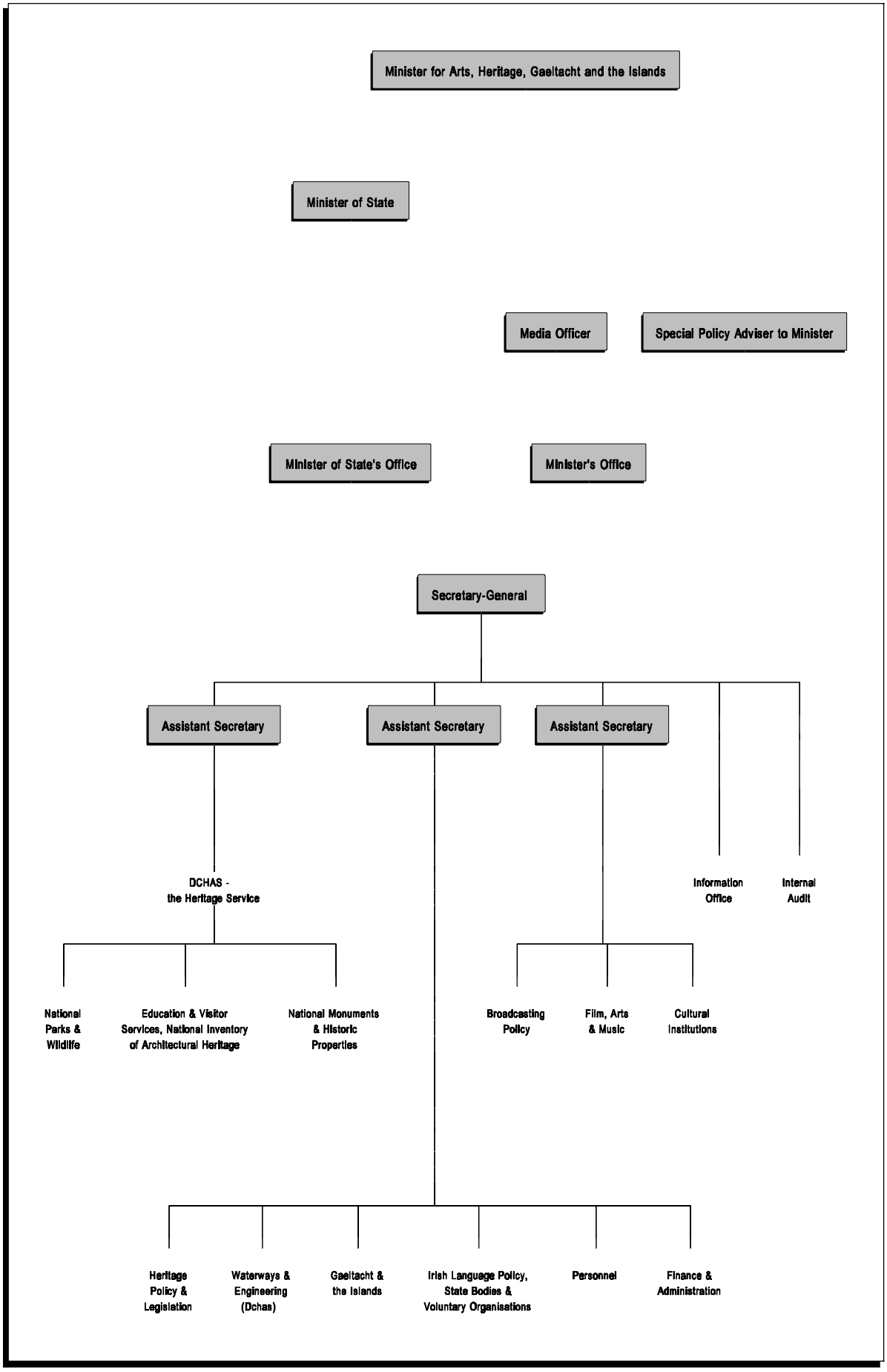
It is the **Department of Arts, Heritage, Gaeltacht and the Islands**, therefore, which has the lead and co-ordinating role in relation to the conservation and sustainable use of biodiversity. However, other Government Departments and agencies also have responsibilities in this regard. Departments with particularly important roles include the Department of the Environment and Local Government, the Department of Agriculture and Food, and the Department of the Marine and Natural Resources. Each Department and agency is responsible for ensuring that the sectors which come within its remit provide for the conservation and sustainable use of biodiversity.

This chapter is divided into two main sections. The first describes the Department of Arts, Heritage, Gaeltacht and the Islands (Figure 5.1) together with sections or bodies, both coming directly within the Department's structure, or under its aegis, that have specific biodiversity-related functions. The second part of the chapter briefly describes other Government Departments or agencies, the work of which impinges on biodiversity, mainly in the context of environmental protection.

The Department of Arts, Heritage, Gaeltacht and the Islands

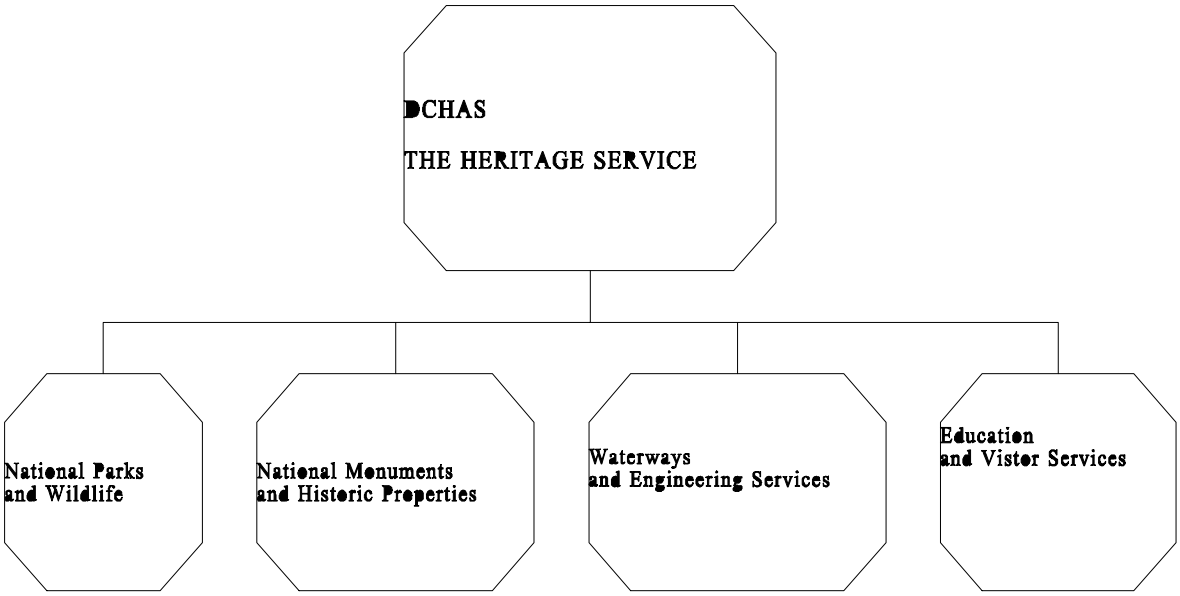
The mandate of the Department is to foster, promote, conserve and present culture and heritage in the broadest sense, and to provide institutional and other arrangements which will assist in their support, development, conservation and presentation. The Department's *Statement of Strategy 1998-2001* contains specific commitments in relation to the natural heritage, including

- the conservation of a representative range of ecosystems and the maintenance and enhancement of populations of flora and fauna in Ireland;
- the implementation of the Wildlife Act, 1976, and of the European Communities (Natural Habitats) Regulations, 1997;
- the designation, control and supervision of Special Areas of Conservation, Special Protection Areas and Natural Heritage Areas, having particular regard to the need to consult with interested parties;

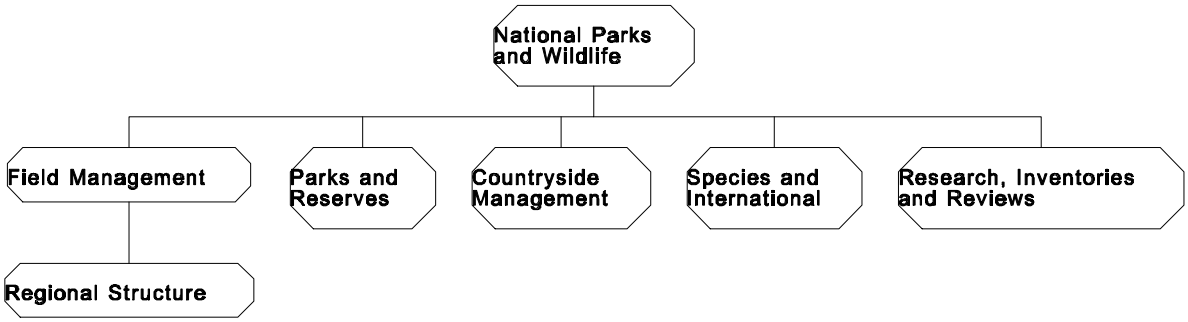

Minister for Arts, Heritage, Gaeltacht and the Islands
Minister of State
Media Officer
Special Policy Adviser to Minister
Minister of State's Office
Minister's Office
Secretary-General
Assistant Secretary
Assistant Secretary
Assistant Secretary
DCHAS -
the Heritage Service
Information
Office
Internal
Audit
National
Parks &
Wildlife
Education & Visitor
Services, National Inventory
of Architectural Heritage
National Monuments
& Historic
Properties
Broadcasting
Policy
Film, Arts
& Music
Cultural
Institutions
Heritage
Policy &
Legislation
Waterways &
Engineering
(Dchas)
Gaeltacht &
the Islands
Irish Language Policy,
State Bodies &
Voluntary Organisations
Personnel
Finance &
Administration

- the preparation of a National Plan under the Convention on Biological Diversity and the putting into effect of the necessary arrangements for ensuring its implementation; the management, maintenance and development of National Parks and Nature Reserves; and
- the development of policy in relation to issues such as protected areas, including national parks, and biodiversity related matters.

Within the Department, the management of the heritage is the responsibility of **Dúchas The Heritage Service,** which consists of four divisions (Figure 5.2). These are: **National Parks and Wildlife** (NPW), **National Monuments and Historic Properties** (NMHP), **Waterways and Engineering Services** (WES) and **Education & Visitor Services** (EVS), which includes the National Inventory of Architecture (NIA). The staff in these divisions currently totals some 1,400.



Within the structure of Dúchas, NPW is responsible for the conservation and management of the natural heritage. The Division is divided into a number of sections (Figure 5.3).



NPW has a staff complement of some 250 persons directly involved in nature conservation, including administrative, professional, technical and contract staff. The majority of the staff within the Field Management section are based in the regions. Steps are currently being taken to increase the staff complement of NPW to deal with the implementation of the NATURA 2000 network.

The general breakdown of staff is contained in Table 5.1 in relation to administrative and professional staff and Table 5.2 in relation to the regional distribution of field management staff.

Table 5.1 Number of administrative and professional staff in NPW

Section	Administrative	Professional
National Parks and Nature Reserves	5	-
Countryside and Habitats	9	-
Licensing, Species and International	8	-
Research, Inventories and Reviews	-	32

Table 5.2 Number of field management staff in NPW

Field Management	
Region	Staff
South West	64
Mid West	12
Eastern	23
Southern	13
Western	18
Northern	53
South East	11

Table 5.3 outlines the direct spending on nature conservation by NPW for the period 1993-97. The estimated figure for the current year shows a major increase over the 1997 figure and this reflects the financial commitment to the establishment of the NATURA 2000 network of protected sites. The figures do not include staff costs, which are met from the administrative budget of the Department as a whole.

Table 5.3 Direct spending on nature conservation by NPW for the period 1993-97

Year	Expenditure (IR£000)
1993	6,694
1994	8,544
1995	7,567
1996	6,874
1997	9,793
1998	24,950 (estimated)

The work of NPW receives considerable financial support from EU sources, including the ERDF, by way of the Operational Programme for Tourism 1994-99, and specific measures such as LIFE.

The activities of **NPW** are subdivided into three main administrative units:

- **Parks and Reserves Unit**
- **Species and International Unit**
- **Countryside Management Unit**

The **Parks and Reserves Unit** is responsible for the administration of all lands acquired by the State for nature conservation purposes. The Unit also deals with the preparation of estimates, forecasting and monitoring of ongoing expenditure for NPW. Its main objectives are

- to conserve nature within National Parks, Nature Reserve and other NPW properties; and
- to encourage public appreciation of natural heritage in National Parks, Nature Reserves and other NPW properties.

The Unit is responsible for the central administration of 5 National Parks, 76 Nature Reserves and other, as yet undesignated, properties acquired for nature conservation purposes. In January 1998 the total land portfolio administered by the Unit exceeded 80,000 ha.

The role of the **Species and International Unit** includes

- the administration of the system of licensing under the *Wildlife Act, 1976*;
- the designation of Special Protection Areas under the *EU Birds Directive* (79/409/EEC); and
- the servicing of relevant international agreements and implementation of EU Regulations and Directives, including:

- EU Directive 79/409 on the Conservation of Wild Birds *(Birds Directive);*
- EU Regulation 3526/82, which implements the provisions of the *Washington Convention on International Trade in Endangered Species of Fauna and Flora* (CITES);
- the *International Convention for the Regulation of Whaling* (International Whaling Commission);
- the *Convention on the Conservation of European Wildlife and Natural Habitats* (Berne);
- the *Convention on the Conservation of Migratory Species of Wild Animals* (Bonn); and
- the *Convention on Wetlands of International Importance especially as Wildfowl Habitat* (Ramsar).

The Unit also issues licences under the *Wildlife Act, 1976*.

The **Countryside Management Unit** is responsible for the designation of Special Areas of Conservation (SACs) under the *European Communities (Natural Habitats) Regulations, 1997*, and the protection of those areas. The Unit is also responsible for the protection of Special Protection Areas (SPAs) designated under the *EU Birds Directive* (79/409/EEC) and for the general protection of the wider countryside. Services delivered by the Unit include:

- furnishing of information on SAC and NHA designation proposals;
- processing of informal objections to SAC designation proposals;
- accepting, acknowledging, and logging of formal objections to the extent of designation proposals, which will in due course be passed on to the independent SAC Appeals Advisory Committee;
- processing of applications for compensation under the Department of Arts, Heritage, Gaeltacht and the Islands' compensation scheme from those affected by SAC/SPA conservation restrictions; and
- processing of applications for the Minister's consent for Notifiable Actions in proposed SACs/SPAs.

NPW is responsible for all stages of the designation process for SACs. This includes the initial selection of sites, notification of designation proposals and of the implications of inclusion to those affected, and processing of appeals against the extent of designation proposals.

NPW is also responsible for protecting the ecology of proposed SACs, SPAs and the wider countryside. It achieves this through

- commenting on applications for planning permission, applications for Pollution Control Licences, the likely ecological impact of proposed forestry developments, Aquaculture Licences, and Foreshore Licences in ecologically sensitive areas, including the lodging of objections where this is considered necessary;
- the application of the powers to protect SACs and SPAs available to the Minister for Arts, Heritage, Gaeltacht and the Islands under the *European Communities (Natural Habitats) Regulations, 1997*; and

- the acquisition of land where appropriate.

The Department of Arts, Heritage, Gaeltacht and the Islands also has a **Heritage Policy & Legislation Division**, with a staff of 12 persons, which formulates policy and prepares legislation as required for the fulfilment of the Minister's heritage functions, including the natural heritage. The Division's broad functions include:

- the provision of an appropriate policy and legislative framework for the conservation and presentation to the public of all areas of the national heritage, including the natural heritage;
- working with Government Departments, State agencies and interested bodies in ensuring that heritage policy is taken into account in the preparation of their policies and legislation; and
- participation in international endeavours to conserve and protect the built and natural heritage.

The Natural History Museum

The Natural History Museum, as part of the National Museum of Ireland, comes within the structure of the Department of Arts, Heritage, Gaeltacht and the Islands. The Natural History Museum was established in 1795 and houses many fine examples of bird and animal species. In light of the diversity of the specimens it keeps on display, the Museum fulfils an important role in increasing awareness of biodiversity and encouraging an interest in nature. The Museum also serves as an important institution for scientific research. The Museum maintains the country's zoological and geological archives and the reserve collections, which now number more than two million specimens, continue to grow and to attract scientific interests from all over the world. In the area of research in the Natural Sciences, the Museum staff have published many scientific papers in journals on all aspects of Irish zoology. These include checklists of animals occurring in Ireland which are of great value in the area of environmental protection and conservation, together with information on birds and fish for the general public. Apart from its scientific importance, the Museum attracts a quarter of a million visitors each year and is one of the most popular tourist attractions in Ireland. The Natural History Museum has a staff of five persons.

The National Botanic Gardens (NBG)

The NBG comes within the framework of Dúchas The Heritage Service and is made up of three elements: a living plant collection, a herbarium of preserved specimens and a botanical and horticultural library. The living collection of some 20,000 plant species and cultivars represents a huge genetic resource and is the greatest concentration of plant diversity in Ireland. The herbarium of 500,000 preserved specimens represents all the plant groups and the fungi. It aims to be comprehensive in its record of the Irish flora and has significant samples of the flora of the temperate and tropical world. The library of some 30,000 volumes has a historical and developing collection of taxonomic and horticultural works.

The need to make sense of the complexity of the plant kingdom and to expand the use of plants for the benefit of the country caused the Gardens to be founded in 1795. It is considered that the NBG has an important role in implementing a Biodiversity Plan for Ireland. That role relates to the areas of plant identification, ex-situ conservation and public education.

(a) Identification

Plant identification is fundamental to the study of biological systems. The herbarium and library at NBG are essential resources for the identification of plants. Herbarium personnel provide specialist identification in some of the plant groups and assist with others by using established networks of herbaria and herbarium botanists.

(b) Ex situ

Ex situ conservation is an increasingly important part of the national conservation programme. The NBG propagates and grows a wide range of native Irish plants of known wild origin and co-operates with National Parks and Wildlife, Trinity College Dublin and the Genetic Resources Trust in a programme to conserve rare and threatened species, especially those protected under the Wildlife Act, 1976. A pilot programme to assist with the conservation of European wild orchids is being undertaken this year.

The network of other Gardens in State care assists the NBG with ex situ conservation by providing a range of soil and climatic conditions suitable for a wider range of species than can be conveniently grown at its own Gardens.

The NBG also acts for National Parks and Wildlife in implementing the CITES regulation in relation to plants.

(c) Education

The educational role of the NBG is being expanded to introduce the topics of evolution, biodiversity and genetic complexity to the general public. The relevance of the Botanic Gardens to the conservation of biological diversity is being built into new interpretative displays and educational leaflets. The use of the Gardens by schools and other groups is being expanded in the near future and this will greatly improve the effectiveness of the Gardens in education and lead to greater interaction with other Government Departments and with teachers' groups. Third level institutions use the Gardens with its plant collection as a teaching resource. The Teagasc course in Amenity Horticulture held at the NBG has an annual intake of 50 students and includes a module on the diversity of the plant kingdom.

A new purpose built herbarium/library has just been completed at the NBG that will provide secure appropriate housing for the valuable collections and make for easier access to specimens and literature for learners and researchers.

John F Kennedy Arboretum, New Ross, Co Wexford

The JFK Arboretum is a plant collection of international standing, containing some 4,500 types of trees and shrubs from all temperate regions of the world, planted in botanical sequence. There are 200 forest plots grouped by continent.

The Heritage Council

The Heritage Council is an independent State body which was established under the Heritage Act, 1995. Its funding is channelled through the Department of Arts, Heritage, Gaeltacht and the Islands and the provisional 1998 allocation is IR£4 million. The functions of the Council are to propose policies and priorities for the identification, protection, preservation and enhancement of the national heritage. In particular the Council is mandated to

- promote interest, education, knowledge and pride in, and facilitate the appreciation and enjoyment of, the national heritage;

- co-operate with public authorities, educational bodies and other organizations and persons in the promotion of the functions of the Council; and

- promote the co-ordination of all activities relating to the functions of the Council.

The Council has four statutory committees - on wildlife, archaeology, architectural heritage and inland waterways. It currently employs 12 full-time staff. The Council has drawn up a plan which identifies its mission and provides the framework within which its activities will be carried out until the year 2000.

Other Departments and bodies with environmental/biodiversity-related functions

Responsibility for the protection of the environment - with its implications for biodiversity - lies primarily with the Department of the Environment and Local Government, but many other Government Ministers and Departments also have general and specific responsibilities in this area. As a general rule Government Departments deal with overall policy matters at national level. The execution or administration of much environmental legislation is the responsibility of local or regional authorities. In addition, some statutory bodies exercise important environmental protection and control functions, and others provide information, research and other support services. A number of voluntary associations also play an important role in environmental protection and control, and in promoting environmental awareness.

Since 1987 all Government Ministers have been required to ensure that the environmental effects and implications of policies, programmes and projects prepared or undertaken by their Departments or by bodies reporting to them are fully considered before decisions are taken and that such decisions take due account of environmental considerations, including national

environmental policy. The EU Directive 851337/EEC on the assessment of the effects of certain public and private projects on the environment legally obliges certain Ministers to ensure that environmental impact assessment procedures are applied to a wide range of projects and developments before any decision is taken on whether or not to permit them.

The Fourth and Fifth EU Environment Action Programmes and the Regulation establishing the European Environment Agency envisage that environmental impact assessment procedures will be applied not only to individual projects but to policies, plans, procedures and programmes undertaken by public or private bodies, or mixed public-private bodies, as soon as possible.

The Department of the Environment and Local Government

Overall and primary responsibility for the protection and improvement of the environment rests with the Minister for the Environment and Local Government. The Department of the Environment and Local Government is the central control authority for local authorities in their various capacities. It guides and co-ordinates their activities on environmental matters at national level. It provides the bulk of local authority finances. This ensures that it has an influence over local authority activities, especially those relating to roads, sewage, water supplies, public housing and amenities, which are particularly dependent on central Government finances.

The Department is primarily responsible for securing the implementation of EU environmental legislation, for co-ordinating Irish policies on environmental matters and for presenting these policies at EU and international level.

As a general rule, the administration or enforcement of environmental legislation is a matter for local authorities in their various capacities and for the Environmental Protection Agency. The Minister for the Environment and Local Government has powers to prescribe national environmental standards, to approve and secure the co-ordination of various management plans relating to land use, water and air, and to give general guidance to local authorities and general policy directives to An Bord Pleanála and the Environmental Protection Agency in regard to the manner in which environmental legislation is to be administered and enforced.

The Department of Agriculture and Food is concerned with the effects of environmental pollution by agriculture, the promotion of EU agriculture policies for environmentally sensitive areas, farm development schemes, including pollution prevention schemes, the pollution implications of agricultural practices, the development of afforestation, including the management and development of State forests, and the promotion of private forestry and lately, the promotion of organic and other environmentally friendly farming methods. It operates a pesticides approval scheme and enforces legislation relating to fertilisers, feeding stuffs, mineral mixtures, pesticides and animal remedies.

The Department of the Marine and Natural Resources promotes the development of, and co-ordinates policies in relation to, sea and inland fisheries (including fisheries conservation), aquaculture and fish processing. The Minister has power to grant authorisations for developments on the foreshore, harbour developments, fish farming, discharges of deleterious

matter to waters and dumping at sea. The Minister also has responsibilities relating to marine pollution by oil and other substances, shipping and various other maritime activities, and the implementation of international conventions relevant to marine pollution control and shipping. The Minister has specific statutory powers to enforce water pollution controls. Copies of all applications to discharge effluents to waters and of draft water quality management plans are sent to the Department for its observations.

The Department of Public Enterprise covers the development of national policies on sources and supplies of energy, onshore and offshore exploration and development of minerals and petroleum, and the control of radioactive substances. The Geological Survey of Ireland are part of this Department.

The **Department of Health and Children** is concerned with public and environmental health problems and food contamination. It has overall supervision of Health Boards which are involved in monitoring water quality.

The **Department of Defence** has responsibilities concerned with the clearance of oil spillages at sea and fisheries protection.

Statutory Bodies

Short descriptions of statutory bodies with environmental functions are set out below.

The Environmental Protection Agency (EPA)

The EPA - the main statutory agency with responsibility for the protection of the environment - was established under the Environmental Protection Agency Act, 1992.

The EPA has a wide range of statutory duties and powers under the Act. Its main responsibilities include

- the licensing and regulation of large complex industrial and other processes with significant polluting potential, on the basis of integrated pollution control and the application of best available technologies for this purpose;

- the monitoring of environmental quality, including the establishment of databases to which the public will have access, and the publication of periodic reports on the state of the environment;

- advising public authorities in respect of environmental functions and assisting local authorities in the performance of their environmental protection functions;

- the promotion of environmentally sound practices through, inter alia, the encouragement of the use of environmental audits; the establishment of an eco-labelling scheme; the setting of environmental quality objectives; and the issuing of codes of practice on matters affecting the environment;

- the promotion and co-ordination of environmental research; and

- generally overseeing the performance by local authorities of their statutory environmental protection functions.

The EPA is an independent public body. Its sponsor in Government is the Department of the Environment and Local Government and its provisional 1998 allocation is IR£6.859 million. It is managed by a full-time Executive board consisting of a Director General and four Directors. The Executive Board is appointed by the Government following detailed procedures laid down in the Act. The EPA is assisted by an Advisory Committee of twelve members, who are appointed by the Minister and are selected mainly from those nominated by organisations with an interest in environmental and developmental matters.

An Bord Pleanála

An Bord Pleanála was established under the Local Government (Planning and Development) Act, 1976, and is an independent statutory corporation. It is responsible for dealing with appeals, references, and certain other matters under Acts relating to planning, water and air pollution, and building control. It has power to determine what constitutes "development" and what constitutes "exempted development". It considers applications *de novo* and is not obliged to have regard to Development Plans. There is a full-time chairman appointed by Government, a deputy chairman and four other full-time members appointed by the Minister for the Environment and Local Government. An Bord Pleanála has a staff complement in excess of 60 persons and is financed by a State grant and income from planning fees.

Coillte Teo

Coillte's objectives include carrying on the business of forestry and related activities on a commercial basis and in accordance with efficient silvicultural practices, developing leisure facilities associated with forestry, and managing eleven forest parks. Its principal business is supplying timber to the saw milling and panel board industries. The forest estate managed by Coillte amounts to about 475,000 hectares. Coillte has a general duty under the Forestry Act, 1988, to have due regard to the environmental and amenity consequences of its operations and to consult with the Minister for Arts, Heritage, Gaeltacht and the Islands concerning forestry development in areas of scientific interest.

Electricity Supply Board

As a result of its role in the operation of hydroelectric generating stations, the ESB owns extensive fisheries in its own right and has powers of control over these. Section 42 of the Electricity Supply (Amendment) Act, 1945, gives the ESB a measure of control over rivers and streams serving electricity generating stations, including the River Shannon where ESB

controls the water levels. The ESB diverts considerable resources to the preservation and development of amenity resources under its control and to fisheries.

Teagasc

The statutory functions of Teagasc - the Agriculture and Food Development Authority - are defined mainly in terms of promoting various aspects of agricultural research and development. This involves promoting environmentally sound practices and procedures in farming, training farmers in good agricultural practices, investigating soil fertility, testing for pesticide residues, assessing the effects on agriculture of potentially polluting industries, raising the level of environmental awareness in the agriculture sector and advising on the proper disposal of agricultural wastes. Teagasc has played a major role in campaigns undertaken since 1987 to reduce incidents of water pollution caused by agricultural activities. It also plays a role in advising on agri-tourism projects.

The Marine Institute

The Institute was established under the Marine Institute Act, 1991, to carry out marine research and development, and related services. It is a corporate body. Members are appointed by the Minister for the Marine and Natural Resources. It takes a strong interest in the development of marine tourism. Chapter 9 lists a number of marine research projects in which the Institute is involved.

Local authorities

Local authorities, as the planning authorities, have many powers with regard to environmental control. As well as their functions in relation to the formulation of Development Plans, the local authorities are involved in many direct works of an environmental nature. They are also increasingly involved in matters of local economic development, including tourism development.

Regional Authorities

Regional authorities were established in 1993 under Section 43 of the Local Government Act, 1991. Their primary functions are to co-ordinate the provision of public services at regional level and to monitor and advise on the implementation at regional level of the EU Structural Fund Programmes, including the Cohesion Fund, whose funds are partly directed towards environmental investment.

Central and Regional Fisheries Boards

The functions of the Central Fisheries Board and the seven Regional Fisheries Boards include

management and development of inland fisheries and sea angling resources; conservation and protection of fish stocks and their environment; and optimisation of the amenity, recreational and environmental values of fisheries.

The Boards enforce water pollution controls. Copies of all applications for licences to discharge effluents to waters and of water quality management plans are sent to the appropriate Board. Environmental Impact Statements for local authority and other developments which could give rise to appreciable discharges of polluting matters to waters, and copies of planning applications for developments which might give rise to water pollution problems, must also be sent to the appropriate Regional Fisheries Board.

Dublin Zoo

Dublin Zoo operates under the aegis of the Zoological Society of Ireland, the objectives of which are the maintenance, exhibition, study for educational purposes, breeding and conservation of all species of living animals, the promotion of the study and knowledge of zoology, and the cultivation of an interest in the conservation of animals. Dublin Zoo offers an education service to the educational sector and to the general public.

Chapter 6

INTERNATIONAL CONVENTIONS

Ireland participates in many activities related to biodiversity at the international level. Those Conventions, Agreements and Processes most directly related to biodiversity, which Ireland has ratified, signed or is a party to, are indicated in Table 6.1. In relation to CITES, it should be noted that, while Ireland has not yet ratified the Convention, the its provisions are implemented by Ireland in accordance with the relevant EU Regulations.

Ireland's contribution to the core budget of the Trust Fund for the CBD, which it ratified in 1996, was some IR£10,000 (US$14,797) in 1997 and some IR£8,900 (US$13,402) in 1998. In 1997, Ireland made an additional voluntary contribution of IR£30,000 (US$43,335) to the CBD to facilitate the participation in the Convention process of developing countries and countries with economies in transition.

Ireland also contributes to the Global Environment Facility (GEF). The contribution for the period 1994 to 1997 was IR£1.7 million. Ireland is committed to contributing a sum of IR£3.8 million to the GEF over the period 1998-2001.

Table 6.1 Biodiversity related Conventions, Agreements or Processes that Ireland has ratified, signed or is a party to

Title	Signed	Ratified
Convention on the Conservation of European Wildlife and Natural Habitats (Berne Convention)	**1979**	**1982**
Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)	**1979**	**1983**
Agreement on Conservation of Bats in Europe (Bonn Convention)	**1993**	**1995**
Convention on Wetlands of International Importance (Ramsar Convention)	**1971**	**1984**
International Convention for the Regulation of Whaling	**1946**	**1985**
Convention on Biological Diversity	**1992**	**1996**
Convention on International Trade in Endangered Species (CITES)	**1974**	**Awaits amendment of Wildlife Act, 1976**
Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) (Bonn Convention)	**1996**	**Awaits amendment of Wildlife Act, 1976**
International Tropical Timber Agreement 1994	**1996**	**Ratification expected shortly**
Pan-European Biological and Landscape Diversity Strategy	**--**	**Endorsed 1995**

Chapter 7

LEGISLATION

Introduction

The principal biodiversity-related legislation is that concerned with nature conservation. The most important of these are the Wildlife Act, 1976 and the European Communities (Natural Habitats) Regulations, 1997. The Wildlife Act superseded earlier legislation which, to a large extent, dealt with game conservation. The Act also provided a fairly adequate legislative base for nature conservation. The species protection provisions, including those regulating hunting, were in general quite comprehensive, to the extent, for example, that they largely foresaw similar aspects of the EC Birds and Habitats Directives. However, the habitat/site protection measures in the 1976 Act were relatively weak, and were almost completely limited to measures which could be introduced in agreement with landowners. There was very limited power to ensure protection, even in the case of outstanding habitats or sites, where agreement of landowners was not forthcoming.

The conservation of biodiversity in Ireland has been strengthened and expanded by EC law, most notably by the Birds and the Habitats Directives and also by the EIA Directive. In 1997, the EC Habitats Directive was transposed into national law and the relevant Regulations represent a fundamental shift in nature conservation policy and law.

While the existing legislation provides for much of what is required in order to conserve biodiversity, it is recognised that some further legislation is needed, most notably an amendment to the Wildlife Act, 1976, which is currently in the final stages of preparation.

The main provisions of the relevant nature conservation legislation, existing and planned, are outlined below.

Wildlife Act, 1976

The Wildlife Act, 1976, is the principal national legislation providing for the protection of wildlife and the control of some activities which may adversely affect wildlife. The Act came into operation on 1 June 1977. It was the only major legislation concerned with wildlife that was passed in the previous 45 years. It replaced the Game Preservation Act, 1930, and the Wild Birds (Protection) Act, 1930. The aims of the Wildlife Act, 1976, are to provide for the protection and conservation of wild fauna and flora, to conserve a representative sample of important ecosystems, to provide for the development and protection of game resources and to regulate their exploitation, and to provide the services necessary to accomplish such aims.

Under the Act, the Minister responsible for nature conservation may afford protection to all wild species of fauna and flora. However, the Act does not provide for the conservation of fish species nor of aquatic invertebrates in general, except insofar as species may be added in

agreement with the Minister for the Marine and Natural Resources. Presently all bird species, 22 other animal species or groups of species, and 68 species of flora are afforded protected status.

The Act also enables the possession, trade and movement of wildlife to be regulated and controlled. Hunting and falconry is controlled under the Act. Specific areas of importance for wildlife may be protected under the Act as Nature Reserves, Refuges for Fauna, or by way of management agreements.

Under the Act, the Minister may provide assistance and advice on wildlife matters, undertake the necessary research and promote public knowledge and understanding of wildlife.

The Wildlife Act is not concerned with animal welfare *per se*, as its primary purpose is the conservation of wildlife. Animal welfare is the responsibility of the Department of Agriculture and Food.

More than 6,000 licences, mainly concerned with hunting and import or export species, are issued by NPW under the Act every year (Appendix IV). Almost all licences and certificates are issued free of charge under the Act. The Minister has power to attach conditions to any licence granted under the Act and to vary them.

National legislation implementing European Directives

Within the European Community, the two most relevant Community legislative instruments are the Birds Directive, adopted in 1979, and the Habitats Directive, adopted in 1992. The Birds Directive, as the title suggests, is concerned with bird species. The Habitats Directive in many respects represents a broadening of the Birds Directive to the full range of fauna and flora, and also habitats. Both Directives contain two main groups of provisions for biodiversity conservation, for the direct protection of species and for the protection of habitats. Together, these Directives provide a framework for the conservation of fauna and flora and their habitats including, by the establishment of NATURA 2000, a network of sites for the conservation of species and habitats which are of Community importance.

The Birds Directive (Council Directive 79/409/EEC on the conservation of wild birds) requires EU Member States to provide for the conservation of all bird species, including by ensuring that the habitats of all species are adequately conserved. The Directive further requires that protected areas - Special Protection Areas (SPAs) - are established for Annex I species (species which are rare, vulnerable, in danger of extinction, or otherwise require special attention) and migratory species. Unlike the Habitats Directive, this Directive does not provide for a direct role for the European Commission in the selection and designation of the protected areas required by the Directive.

The aim of the Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora) is to "contribute towards ensuring bio-diversity" and it requires Member States to take measures to maintain or restore natural habitats and species at a favourable conservation status in the Community. Under the Directive, Member

States are required, inter alia, to designate protected areas - Special Areas of Conservation (SACs) - for certain natural habitats (being ones which are in danger of disappearance, are rare, or represent outstanding examples of their type) and for a more limited number of species which are listed in the Directive. In the Directive, certain habitats and species are defined, in view of the threats they face, as having 'priority' in order to favour the early implementation of measures to conserve them.

European Directives may be transposed into national law in Ireland either by statute (through Parliament) or, more commonly, by Ministerial regulations (which do not go through Parliament). Prior to Ireland joining the European Economic Community (as it then was) in 1972, the Constitution was amended and legislation passed enabling the implementation of European Directives by way of Ministerial regulations.

Both the Birds and the Habitats Directives have been transposed into Irish law by way of Regulations, introduced in 1985 (and subsequently), and 1997, respectively. The Regulations transposing the Habitats Directive (the European Communities (Natural Habitats) Regulations, 1997) are the more significant as they provide not only for the designation of SACs, but also for the protection measures that apply to SPAs as well as SACs.

As noted previously, both Directives contain measures for the direct protection of species as well as the establishment of protected areas, though the Directives are often thought of, at least in Ireland, as only concerning protected areas because of the far reaching implications, especially for landowners, of such designations. As noted above, Irish law largely anticipated both Directives in respect of direct species protection and the relatively minor adaptions required in respect of such species protection were either introduced under the existing Wildlife Act, in the case of the Birds Directive, or by way of the 1997 Regulations, in the case of the Habitats Directive. The background to the introduction of the protected areas required under the Directives and the protection provisions that apply are discussed in Chapter 8 in relation to SACs.

Whale Fisheries Act

Under the Whale Fisheries Act, 1937, the hunting of all whale species, including dolphins and porpoises, is totally banned within the fisheries limits of the State, i.e. out to 200 miles from the coast. The Whale Fisheries Act, 1937, also prohibits the hunting by Irish registered ships of certain whales, including right whales and female whales accompanied by calves, outside of the fisheries limits of the State. In 1991, Ireland declared its waters a whale and dolphin sanctuary, the first European sanctuary within the fishery limits of an entire country.

Wildlife Amendment Bill

A Bill is at present being drafted to amend many of the provisions of the Wildlife Act, 1976. It is expected that this Amendment will, inter alia, provide for

- the establishment of a national network of protected areas of both wildlife and geological importance (Natural Heritage Areas - NHAs);

- powers to acquire land both by agreement and compulsorily;

- the enhancement of species protection provisions, including ones relevant to hunting and trade;

- provisions to enable Ireland to ratify CITES and the AEWA; and

- updating penalties for the contravention of the Wildlife Act.

The Bill has been under consideration for a number of years and it has involved widespread and detailed discussion with other Government Departments and interested parties. Submissions have been received from, and meetings have taken place with, conservation and other sectoral NGOs. It is expected that the Bill will be ready for publication later in 1998.

National Parks Bill

A Bill is also under consideration to provide a legal basis for National Parks (and other heritage properties) which are currently managed under a number of other Acts, including the State Property Act, 1954. It is probable that this Bill will address the purpose of National Parks being for the conservation of wildlife and that Parks should provide for public use and education, insofar as this is compatible with the conservation of wildlife.

Local Government (Planning and Development) Acts, 1963-1993

The physical planning system in Ireland dates essentially from 1963. Under the Planning Acts, each Local Authority has a responsibility to determine policy in its area through the making of a Development Plan and for applying that policy, through planning control, in deciding on planning applications and enforcing planning decisions. The processes of drawing up Development Plans, and of development control, are open and allow for the involvement of third parties.

Most developments, with three key exceptions, namely agriculture, forestry and peat extraction, are subject to development control under the Planning Acts and the local authorities grant or refuse planning permission for these developments, including ones within protected areas. Agriculture, forestry and peat extraction - all three being activities which may have significant impacts on the conservation and sustainable use of biodiversity - were in general exempt from planning. Developments in respect of the latter two activities which are of a large scale have been brought within the planning system through the process of Environmental Impact Assessment (EIA). A review of developments presently exempted from development is currently being carried out. The Planning Acts also require EIAs for a number of listed developments.

Planning permission is required, inter alia, for:

- Most buildings and other man-made structures, except certain farm buildings;
- Forestry plantations over 70 hectares;
- Some drainage of wetlands over 50 hectares;
- Turf cutting projects over 50 hectares;
- Land reclamation projects over 100 hectares;
- Golf courses;
- Quarries over 5 hectares;
- Intensive pig installations;
- Intensive poultry installations; and
- Salmonid culture projects.

Under planning legislation, orders can also be made for the preservation of trees and woodlands, and Development Plans may contain objectives, inter alia, for

- reserving lands for game and bird sanctuaries,

- preserving caves, sites, features and other objects of archaeological, geological or historical interest,

- preserving features of natural beauty or interest and (d) preserving and protecting woods, trees, shrubs, plants and flowers.

Local Government (Water Pollution) Act and Fisheries Acts

The Water Pollution Acts, 1977 and 1990, (as well as the Fisheries (Consolidation) Act, 1959), contain extensive pollution prevention and control provisions. The legislation gives powers to local authorities and Regional Fisheries Boards to prosecute polluters and to require restoration of waterways and fisheries, if necessary. Under the 1977 Act, local authorities are required to prepare water quality management plans on a five year cycle. These plans provide for a system of licensing discharges to water and sewers. The 1977 legislation was essentially aimed at end of pipe discharges and failed to deal with discharges from diffuse sources. Amending legislation in 1990 extended the powers of local authorities to regulate agriculture practices.

Chapter 8

PROTECTED AREAS

The establishment of protected area networks are a fundamental first step for the conservation of biological diversity. However, it is also recognised that protected area networks alone, even if extensive, are insufficient to provide for the maintenance of adequate biological diversity. Outside of protected areas, biodiversity conservation will not generally be the dominant priority. Nevertheless, it is necessary to maintain, and where possible enhance, in so far as possible, biodiversity in the broader countryside irrespective of how intensively used it is.

About 10% of Ireland is considered to be of prime importance for nature conservation, and comprises habitats which are mostly the result of the interaction of man and nature over millennia, but which have, nevertheless, retained their value for wildlife. Ireland's protected areas programme aims to conserve the biodiversity in this residual 10% of the territory.

It is possible to distinguish two categories of protected areas:

- one comprising sites set aside primarily for nature conservation; and

- a much larger category of sites designated for their biodiversity importance, but where sustainable economic activities also take place.

Areas set aside for nature conservation

National Parks and Nature Reserves, designated and managed strictly for nature conservation and mainly State-owned, cover about 1% of Ireland. In general, the areas are unpopulated, with no significant economic activities. In 1997, there were 5 National Parks covering 47,000 hectares and 78 Nature Reserves covering 18,095 hectares, amounting to a total area set aside strictly for nature of 65,382 hectares There is an ongoing State acquisition programme to expand the reserves and parks areas.

Designated natural areas where economic activities also take place

A larger proportion of private and State-owned land and water, designated for nature conservation, covers about 6% of Ireland. People may live and work within these areas, mostly engaged in farming, forestry, mariculture, fishing and tourism. However, population density is usually low and land use is extensive.

Ireland's protected area network began to expand in the early 1980's, when the first statutory Nature Reserves and several new National Parks were established. The network has grown very significantly in the 1990's.

The Irish Constitution guarantees strong protection to the property rights of individuals and legislation may be found unconstitutional. This must be taken into account in devising protective mechanisms for sites of importance for biodiversity. The property rights of individuals may be limited in the 'common good'. Such limitation would require the payment of compensation where owners suffer losses as a consequence of a designation.

There are a number of types of protected areas in Ireland (Table 8.1) and these are outlined in this chapter.

Table 8.1. Categories of protected areas in Ireland, 1998

Category	Objectives	Area covered (ha.)	Number of sites	Protective measures
Nature Reserves	Conservation of flora and fauna and habitats	18,095	78	Statutory protection; generally State ownership; wardening
National Parks	Nature conservation and public use and appreciation	47,287	5	Non-statutory protection; State owned; wardening
Special Protection Areas [SPAs]	Conservation of bird species and habitats of European importance	230,000	109	Statutory protection to prevent habitat damage
Special Areas of Conservation [SACs]	Conservation of flora, fauna and habitats of European importance	Approx. 650,000	400	Statutory protection to prevent habitat damage
Natural Heritage Areas [NHAs]	Protection of flora, fauna, habitats and geological sites of national importance	Approx. 750,000	1,100+	At present, Non-statutory; grant assessment, financial incentives: planning laws
Wildfowl Sanctuaries	Hunting of birds prohibited	n/a	68	Statutory enforcement of hunting controls
Refuges for Fauna	Conservation of the habitat of named species of animals	n/a	7	Statutory protection for named species
Ramsar Sites	Conservation of wetlands of international importance under Ramsar Convention	70,550	47	Statutory protection through national legislation or State ownership
UNESCO Biosphere Reserves	Nature conservation and sustainable use	11,500	2	Statutory protection through national legislation or State ownership
Biogenetic Reserves	Conservation of biodiversity in sites recognised by Council of Europe	6,587	14	All protected either as Nature Reserves or through ownership

Category	Objectives	Area covered (ha.)	Number of sites	Protective measures
Salmonid Waters	Maintenance and improvement of water quality for salmon and trout	n/a	22	Power to maintain water quality standards
Sensitive areas for Urban Wastewater	Improvement of water quality in areas suffering from pollution by installation or upgrading of sewage treatment	n/a	10	Power to maintain water quality standards
Sensitive areas for forestry and fisheries	Protection of salmon and trout fisheries from effects of commercial forestry	n/a	n/a	Non-statutory measures: grant assessment
Areas of Special Control in County Development Plans	Maintenance of scenic qualities and amenity value on a county basis	n/a	n/a	Statutory protection via planning system. No control over exempted developments
Special Amenity Area Orders [SAAO]	Strict controls over development in areas of high scenic and amenity value	< 2,000	2	Statutory protection via planning system
Tree Preservation Orders [TPO]	Protection of trees and woods of special amenity value	n/a	178	Statutory protection
World Heritage Sites	Conservation of sites or features of global environmental and/or heritage value recognised by UNESCO	803	2 (cultural heritage sites)	Statutory protection
Environmentally Sensitive Areas [ESA]	Promotion of environmentally sensitive farming by means of grants to farmers	7,653	2	Incentive measures now superseded by REPS
Areas farmed under the Rural Environment Protection Scheme [REPS]	Promotion of environmentally sensitive farming by means of grants to farmers. Special measures apply in designated areas	n/a	n/a	Incentive measures

n/a = figure not available

Natural Heritage Areas (NHAs)

Natural Heritage Areas (NHAs) are the national framework to provide for protected areas in Ireland. All other nature conservation designations overlap with NHAs. At present, areas cannot be formally or legally designated as NHAs, though their importance is recognised for most administrative purposes. Existing protective measures include the use of planning

legislation to prevent certain damaging activities, refusal of State/EU grants for damaging activities, and financial incentives for environmentally sound farming. Details of proposed NHAs are supplied to all planning authorities, who normally take them into account in considering developments (although there is no strict legal obligation on them to do so). However, developments which are exempt from planning cannot be controlled, except, in some cases, indirectly through the refusal of grants or provision of incentives. It is expected that NHAs will be given a legal basis by way of an amendment of the Wildlife Act which is likely to be introduced to Parliament later this year.

The NHA network (Figure 8.1) is the result of ecological surveys extending from the late 1960's through to the 1990's. The NHA system evolved from the previous Areas of Scientific Interest (ASI) system. ASIs were first surveyed and mapped in the 1970's and by 1989 almost 1,500 ASIs were mapped and listed. However, in 1992, the ASI system was replaced by the NHA system because the Irish High Court found that a particular ASI was in fact a designation, and not merely an identification. This was found to be unconstitutional and was quashed because it was made without due notice to the landowners, who had no opportunity to object. The changeover to NHAs included a major re-survey from 1992 to 1994 of over 80% of listed sites. Currently there are over 1,100 individual proposed NHAs, covering approximately 750,000 hectares, or 10% of the territory. The forthcoming NHA legislation will provide for notification to landowners and for objections to proposed designations.

A large but unquantified proportion of Ireland’s biodiversity is estimated to lie within the NHA network. NHAs cover sites of national or higher importance for wildlife, and also geological interest. NHAs include peatlands, native woodlands, grasslands, wetlands, rivers, lakes, machair, limestone pavement, islands, cliffs and estuaries.

Special Areas of Conservation (SACs)

Based on the extensive survey of NHAs conducted from 1992-1994, candidate SACs that met the scientific criteria set out in the Habitats Directive were identified (Figure 8.2). It is expected that approximately 400 sites encompassing over 650,000 hectares of land and water will be designated as SACs in Ireland. SACs are being introduced in three phases. Many of the areas are located in the western part of the country. The first phase of proposed SACs were notified in March 1997, immediately following the introduction of the Habitats Regulations. That phase involved over 200 sites covering an area in excess of 550,000 hectares. It is expected that a second phase of proposed SACs, covering somewhere in the region of 50,000 hectares, will be notified later in 1998. The final round of sites, which will be largely coastal and marine sites, is likely to be notified in early 1999.

The first phase of proposed SACs concentrated on sites supporting habitats which are listed as 'priority' habitats in the EU Habitats Directive. Such priority habitats which occur in Ireland, and which have been proposed to date for designation as SACs, include peatlands (both raised bogs and blanket bogs), sand dunes, machair (sandy calcareous plain inland of sand dunes), turloughs (seasonally flooded lakes), lakes and other inland wetlands, limestone pavement, offshore islands, estuaries and mudflats. In total, 62 Annex I habitats occur in Ireland, of which 16 are priority habitats.

The initial step in the SAC process is to publicly announce the proposal to put the particular site forward as a candidate SAC. Under the Regulations there is also a legal requirement to notify individually landowners and others likely to be affected by the proposed designation and to, *inter alia*, inform them that they may object - but only on scientific grounds - to the proposed designation (either to the proposal to put the site forward or to the proposed boundaries or listed damaging activities) and that they may appeal any subsequent restrictions. In considering objections to proposed designations, in cases where agreement cannot be reached with the landowner/user, the issue will be referred to an SAC Appeals Advisory Committee (a non-statutory provision). Both conservation and sectoral (e.g. farming) interests are represented on the Committee, which has an independent chairperson. The notification also includes a map of the site, a description of the site indicating the reason it is being proposed, a list of likely damaging activities which cannot be carried out without the consent of the Minister, and information on procedures for objections and appeals as well as compensation.

The first round of SAC proposals involved over 10,000 individual notifications. Public announcements were also made in the national and local press and on local radio and details of the proposals were also displayed in a variety of local public offices throughout the country. In addition to these legal requirements to bring the proposed designations to the attention of persons likely to be affected, an extensive information campaign was also put in place. This involved a general letter drop of over 200,000 letters to rural households in the areas involved, the provision of a free-phone information line, advertisements in farming and other press, and the placing of videos in livestock marts and other locations giving basic details on SACs and informing people where they should obtain further information. Most importantly, numerous public meetings were arranged, often in collaboration with farming organizations, to explain what SACs involve and to discuss their implications on a one-to-one basis with landowners/users.

Prior to and during the introduction of the proposed SACs, there were a number of misconceptions which caused anxiety to some farmers and it was important that the accompanying information campaign clarified these. The Regulations do not

- affect the ownership of land;
- provide for compulsory purchase;
- allow for increased public access to lands (although there is provision for NPW staff to monitor SACs); or
- place a prohibition on farming in SACs, where only damaging activities are restricted.

Compensation

The introduction of the Habitats Regulations was accompanied by a compensation package. This package was agreed with farming organizations following intensive negotiations and agreed by Government, subject to the agreement of the European Commission. The package consists of two elements. Compensation *per se* is payable for any losses suffered as a consequence of the designation and such compensation is provided for in the Regulations. The second element of the compensation package is an incentive scheme for farmers to farm the land in accordance with a farm plan under the REPS scheme so as to protect the ecological interest of the site for which they will receive additional payments above the basic scheme. It is expected that most farmers will opt for this incentive scheme. The cost of the overall compensation package has been estimated at approximately IR£20 million annually.

The protection provisions applying to SACs under the Regulations include the following:

- protection applies from the date the site is notified as a candidate SAC (this is essential in order to ensure that the site is not damaged in the interval between the site being proposed and its eventual designation);

- notifiable operations may not be carried out without obtaining consent;

- an assessment must be carried out of all activities likely to affect the site;

- permission for damaging developments in non-priority habitats may only be given for imperative reasons of overriding public interest and if there is no alternative;

- permission for damaging developments in 'priority' habitats (e.g. peatlands, sand dunes, limestone pavement, turloughs) may only be given for reasons of human health, public safety, beneficial consequences of primary importance to the environment, or for other reasons which, in the opinion of the European Community, are imperative reasons of overriding public interest;

- where an activity is being carried out, either within or outside a site, which is likely to damage the site, there must be assessment of the implications for the site and a court injunction must be sought to prohibit continuance of the activity if it is considered damaging;

- sites damaged illegally must be restored;

- local authorities must assess developments prior to making decisions on planning applications;

- landowners will be compensated for loss of income arising from designation;

- management agreements may be made with landowners;

- the drawing up of conservation measures for SACs, including management plans where necessary;

- sites must be included in local authority Development Plans; and

- in the event an SAC is damaged, compensatory measures must be taken to ensure the overall coherence of the network.

The European Communities (Natural Habitats) Regulations, 1997, also allow the State to give the same protection to Special Protection Areas for birds.

The Regulations were introduced into Irish law in February 1997. As with all wildlife legislation of this nature, there was extensive consultation between Government Departments (in particular those responsible for wildlife, environment, agriculture, and marine) during the drafting of the Regulations. There was also extensive consultation with conservation NGOs and the sectoral interests. Intensive negotiations took place with the main farming organisations, especially with regard to compensation. On three occasions, the relevant Minister deferred introducing the Regulations in order to allow the negotiations to reach a successful conclusion.

The discussions, negotiations and controversy involved in the introduction of the Regulations arose almost entirely because of the stringent controls the Regulations introduced to provide for the conservation of protected areas, including, in particular, on farming, which up to then had been largely outside the regulatory system. The resultant Regulations not only incorporated the protective requirements contained in the Habitats Directive but also put in place a process with provisions for objections, appeals, arbitration, independent input and fair and proper compensation.

Special Protection Areas (SPAs)

Those NHAs which meet the criteria of the EU Birds Directive are designated as Special Protection Areas (SPAs). Ireland is important for a number of species of wildfowl and waders which migrate from their summer breeding grounds in the Arctic to spend the winter on freshwater lakes and wetlands, and coastal mudflats and estuaries. Ireland also has many breeding seabird colonies on cliffs and offshore rocky islands. Those seabirds, wildfowl and waders can be most effectively conserved at a number of discrete sites, and are the main focus of Ireland's SPA programme.

SPA designations began in 1985. In 1991, 20 SPAs covering 6,959 hectares had been designated. An independent report commissioned by the then National Parks and Wildlife Service in 1993 recommended a list of sites to be designated as SPAs, covering a total area of about 200,000 hectares This target has been achieved. In 1997, there were 109 SPAs covering 230,000 hectares, and a number of further sites are scheduled for designation. Figure 8.3 shows the location of existing SPAs.

Nature Reserves

Statutory nature reserves may be established and managed on State lands, or on private lands in agreement with the owner, which meet certain scientific criteria and comprise wildlife habitats worthy of conservation. Most nature reserves are on State owned lands. Ireland began its nature reserve acquisition programme in 1980. In 1997, there were 78 Nature Reserves covering 18,095 hectares, with a size range between 4 hectares (Lough Nambrackdarrig, Co. Kerry - natterjack toad habitat) and 2,300 hectares (Slieve Bloom Mountains, Co. Offaly - blanket peatland). National Parks and Wildlife continues to acquire land to create new reserves and expand existing reserves, in order to conserve a representative sample of natural habitats. The reserves contain a range of typical Irish wildlife habitat types (Table 8.2) The location of Nature Reserves in Ireland is indicated in Figure 8.4.

Nature reserves provide the strictest means in Ireland for the protection of wildlife sites. Nearly all damaging activities can be legally prevented in them. The Wildlife Act, 1976, gives the Minister the right of consultation in advance where certain activities of other State Departments, local authorities and certain State bodies might adversely affect nature reserves, refuges for fauna and lands subject to management agreements. These bodies must consult the Minister before deciding or doing anything which is likely to damage such areas and then take all practicable steps to avoid or minimise any possible damage to them.

Table 8.2. Broad habitat types conserved in Nature Reserves

Habitat	No. of Sites	Coverage (ha.)
Native woodland	26	1948
Blanket bog	11	8565
Raised bog/transition bog	7	943
Sand dunes	4	1352
Estuaries/mud flats	6	3406
Cliffs/offshore islands	5	273
Marine sites	4	245
Fens	4	204
Lakes	2	29
Eskers/esker woodland	2	29
Habitat complexes	3	515
Grassland/waterfowl	2	223
Reedswamp/wet woodland	2	363
TOTAL	**78**	**18,095**

National Parks

In the case of National Parks, these are established for the conservation of areas which hold considerable biodiversity interest, and for purposes of education and public amenity within the constraint of conserving the biodiversity interest. All are State-owned and are managed by National Parks and Wildlife.

Ireland currently has five National Parks (Table 8.3). The first park was established in Killarney in 1936, but four other parks were established from the 1980's onwards. As is clear from the Table, the area encompassed by the parks has increased steadily over the years (Table 8.3). A sixth park is proposed for North Mayo, which would encompass a large expanse of blanket bog and mountain. There has been considerable controversy in recent years relating to some National Parks and the siting of interpretative centres.

Table 8.3. Progress in land acquisition for National Parks

Location	1933	1972 - 1982	1983	1995	1997
Killarney, Co. Kerry	4,272	3,766	8,038	10,129	10,289
Glenveagh, Co. Donegal	-	9,667	9,667	12,343	16,548
Connemara, Co. Galway	-	2,699	2,699	2,699	2,957
Burren, Co. Clare	-	410	410	1,562	1,580
Wicklow	-	-	-	12,211	15,913
TOTAL	**4,272**	**16,542**	**20,814**	**38,944**	**47,287**

Ramsar Sites

The Convention on Wetlands of International Importance, especially as Waterfowl Habitat - the Ramsar Convention - was adopted at Ramsar in Iran in 1971. For bird sites, a wetland qualifies for international importance if it regularly holds at least 20,000 waterfowl, or at least 1% of the population of a species. The Convention notes the presence of rare, vulnerable, endemic or endangered plants or animals as a factor in determining international importance.

Ireland ratified the Ramsar Convention in 1984. An independent report commissioned by the then National Parks and Wildlife Service in 1993 recommended 49 bird sites for Ramsar designation. This target has almost been achieved. In 1997, there were 47 Ramsar Sites, covering an area of 70,550 hectares. All Ramsar Sites are either Nature Reserves, National Parks or Special Protection Areas.

Refuges for Fauna

Under the Wildlife Act, 1976, the Minister may designate areas as refuges for certain species of wild birds or wild animals and impose restrictive measures in order to protect the species and their habitat. Notice of a proposal to make such a designation must be served on the owner and published in the official State journal and in a newspaper circulating in the locality. Provision is made for objections and for compensation.

Ireland has seven Refuges for Fauna (Table 8.4). All the current Refuges have been designated on cliffs and islands to protect breeding seabirds. Protective measures include control on all potentially damaging activities that could take place in these inaccessible sites, such as cliff climbing and destruction of eggs and nests.

Table 8.4. Designated Refuges for Fauna

Name	Habitats protected	Species protected
Lady's Island, Co. Wexford	lagoon islands	Arctic, Common, Roseate, Sandwich and Little Terns
Bull Rock, Co. Cork	rocky marine islands and contiguous seashore	Guillemot, Kittiwake, Puffin, Storm Petrel and Razorbill
Cow Rock, Co. Cork	rocky marine island and contiguous seashore	Guillemot, Kittiwake, Puffin, Storm Petrel and Razorbill
Rockabill Island, Co. Dublin	marine island	Roseate Tern
Horn Head, Co. Donegal	marine cliff and contiguous 200 metre strip of sea	Common, Black-Headed and Herring Gulls, Cormorant, Chough, Fulmar, Guillemot, Kittiwake, Peregrine, Puffin, Raven, Razorbill, Rock Pipit, Shag and Twite
Old Head of Kinsale, Co. Cork	cliff top, marine cliff and 200 metre strip of sea	Chough, Fulmar, Guillemot, Kittiwake, Peregrine, Razorbill
Cliffs of Moher, Co. Clare	cliff top, marine cliff and 200 metre strip of sea	Chough, Fulmar, Guillemot, Kittiwake, Great Black-Backed and Herring Gulls, Peregrine, Puffin, Raven, Razorbill and Shag

Special Management Agreements

Under the Wildlife Act, 1976, the Minister may enter into a formal agreement with a landowner to ensure that the management of the land will not adversely affect wildlife. Six management agreements have been made to date.

Wildfowl Sanctuaries

Wildfowl Sanctuaries may be created on State or private land to protect ducks, geese and waders from hunting. There are 68 Wildfowl Sanctuaries. Figure 8.5 shows the location of the wildfowl sanctuaries.

Biogenetic Reserves

The European Network of Biogenetic Reserves was first introduced in 1976. Ireland, being a member of the Council of Europe, agreed to identify and protect the natural habitats which are specially valuable for nature conservation in Europe. Currently, there are 14 Biogenetic Reserves covering 6,587 hectares, all of which are statutory Nature Reserves.

UNESCO Biosphere Reserve

UNESCO has approved 324 Biosphere Reserves in 82 countries, representing the world's major ecosystems, of which 127 are in Europe. The main objective is to facilitate sustainable development, within certain zones, defined as 'core areas', for nature conservation. Biosphere Reserves combine conservation, research and education within a single site and link these sites up to an international network, which makes the biosphere concept different from more traditional means of protecting sites (such as reserves and parks). There is an implicit recognition of cultural identity, where human impact has a key role in maintaining biodiversity. Ireland's two Biosphere Reserves are Killarney National Park and North Bull Island, Co. Dublin.

Other Designations

There are a number of other designations which, though not primarily made for the direct protection of biological diversity, contribute to the conservation of biological diversity (Table 8.1).

Prior to and apart from the protection afforded to biodiversity sites in specific wildlife legislation, the planning laws allow for the conservation of certain wildlife sites, though these powers have been little used. Under planning law (specifically the Local Government (Planning and Development) Act, 1963), planning authorities may make Special Amenity Area Orders (SAAO) and Conservation Orders. An SAAO can be made on the grounds of

- outstanding natural beauty;
- special recreational value; or
- a need for nature conservation.

A planning authority can make a Conservation Order if it appears necessary to preserve from extinction or otherwise protect any flora or fauna. To date, only two SAAOs have been made and no Conservation Order has ever been made.

Chapter 9

NATURE CONSERVATION

In recent years, Ireland's nature conservation programme has focused on the identification, designation and conservation of protected areas. This has arisen from the recognition of the need to both establish a network of nationally important sites (NHAs) and to afford protection to those sites which are of importance within the European Community (SACs and SPAs). This focus was necessary as the measures previously in place to provide for the conservation of the remaining areas of greatest ecological interest fell short of those required as a fundamental step for the conservation of biodiversity. In addition to the measures detailed in other sections of this report pertaining to protected areas, species protection legislation and education, the State has pursued a number of other programmes in the field of nature conservation. Other bodies, including conservation NGOs and third level institutions, are also involved in programmes relevant to nature conservation. While various programmes have been carried out to date and considerable progress has been made, it is recognised that there are many gaps in knowledge and that much remains to be done particularly in relation to inventory, survey, monitoring, research and specific conservation programmes. Furthermore, it is necessary to pursue the integration of the concepts of biodiversity in all sectoral areas of Government.

ANNE VALLEY PROJECT: INTEGRATED LAND USE STRATEGY

The Anne Valley, located near the south coast of Co. Waterford, stretches from the sea for almost 7 km in a northerly direction. Twenty nine landowners own land in the catchment area of the Valley. The concept of developing an agreed integrated land use strategy was discussed with these landowners, as a means of realising sustained improvements in their land holdings and farm incomes, and at the same time enhancing biodiversity and environmental quality.

The strategy involves

- the creation of many small wetland areas for improved water quality, sport fishing and wildlife within the valley floor;
- the planting of diverse woodlands, both native and exotic, for timber, amenity and wildlife; and
- improving the landscape quality and the general amenities and attractions of the area.

The response to the strategy was one of positive interest from almost all of the landowners involved and from the local development association. A feasibility study, carried out with assistance from the Waterford County Enterprise Board, has produced a detailed map-based inventory of the natural and man-made resources of the area, which acts as a basis of the integrated development and management plans.

The integrated development of the Anne Valley is expected to establish a resource of considerable significance for the four different rural communities involved. The project is a way of demonstrating how a rural community initiative can develop its natural resources, while at the same time paying special attention to biodiversity and the enhancement of the environment.

Surveys

An extensive resurvey of sites previously identifed as being of special ecological significance was undertaken by NPW in the period 1992-1994. The primary objective of the survey was to delineate boundaries to these sites. As a result of the survey a number of sites were identified as having been destroyed and these sites were delisted. In other cases, it was found necessary to exclude severely damaged areas while retaining the remainder ot the site. The survey also resulted in the rationalisation of site names and boundaries, so that in many cases, adjacent but separately listed sites were merged. A number of surveys of habitat types which had not previously been systematically surveyed in earlier inventories (e.g. coastal sites, turloughs, and blanket bogs) have been carried out in recent years. A major programme to monitor the conservation status of protected areas is currently being drawn up.

A number of baseline surveys to establish the status and distribution on a national basis of a variety of species has been undertaken during the last twenty years. Frequently such surveys have subsequently led to the setting up of monitoring programmes. Such national surveys or monitoring programmes have been undertaken for a variety of bird species, though most have concerned wildfowl or other wetland species. Atlases of both the breeding and wintering birds of Ireland have been produced as part of surveys covering both Ireland and Britain. A national scheme to monitor breeding birds has recently been initiated by BirdWatch Ireland (a conservation NGO) with the support of NPW. A programme to monitor wintering waterbirds is already in operation, organised on a similar basis. A national survey of bats was launched by NPW in 1985 and population monitoring has continued since. A number of other mammal species have been the subject of national surveys.

Surveys and ongoing monitoring of Ireland’s protected and threatened flowering plants has been undertaken since the 1980's.

A major survey of the benthic marine fauna and flora of Ireland was carried out in the period 1993-1996 as part of the BioMar project which was part funded under the EC LIFE programme. The marine species and habitats at about 800 subtidal and 200 intertidal sites were recorded as part of that project.

An indicative list of inventories, surveys or partial surveys carried out or commissioned by NPW is provided in Table 9.1. The focus and depth of these research studies vary widely, depending on the rationale behind each study and on the resources available at the time. Most studies comprise, for a particular habitat or species, either the compilation of an inventory of the national resource or else a detailed study of a subset of this; in only very few cases has it been possible to investigate in detail the entire national resource.

RESTORATION ECOLOGY TRIALS AT KILLARNEY NATIONAL PARK

In 1993 the first tentative steps were taken to see if habitat restoration could be undertaken on a more systematic basis in Killarney National Park. The findings of the study are expected to have a much wider application, perhaps in all upland situations and where animal husbandry and habitat reinstatement are practised.

The primary goals of the project are to explore

- **the grazing regimes of past and present and to strive towards a sustainable system for the future;**
- **the dynamics of upland vegetation, with emphasis on the managing of tree species and associated dwarf shrubs and, in particular, their interaction with the deciduous grass *Molinia caerulea*.**

Cattle grazing was the primary human use of upland areas in Ireland since late Mesolithic/early Neolithic times. Their grazing, and the associated vegetation management, particularly the use of fire, were the main contributing factors which have given the uplands of Ireland their characteristic flora and fauna. In the last 100 years, and particularly the past 30 years, sheep grazing has replaced cattle almost totally in the upland areas of the country.

The reintroduction of cattle to Killarney National Park, using the local breed of Kerry cattle, is fundamental to the approach being taken in these trials. From the introduction of 10 head in 1993, the numbers have been increased on an incremental basis to 70 head in 1998.

The cattle have shown surprising adjustment to their transfer from level grassy fields in the lowlands to the rough, steep and often rocky terrain of the mountains. Results to date have shown that the cattle have actively sought out and fed primarily on the grasses, and particularly on *Molinia caerulea*. More work needs to be carried out to see if the 'highland' type cattle from Scotland, which probably lived in Ireland, would cope better with the uplands, especially in wintertime.

Commensurate with the upland trials, cattle are being used to see if 'foggage' (the conservation of fodder *in situ*), through the closing off of paddocks in autumn, can be used to replace silage in housed or feeding lots. This approach was the main over-wintering approach in Ireland until the present century.

A return to this form of management would impact positively on vegetation and nutrient transport within the Park. With more cattle on the mountain during the summer/autumn period, it is likely that 'foggage' would not be too difficult to accommodate, even if supplementary feeding with some silage is required. The first indications from the 96/97 and 97/98 winters are very encouraging.

Work has also been ongoing in the Park in relation to Woodland Reinstatement. 1996 saw the construction of the first conservation plant nursery to supply stock for planting a series of upland sites on a trial basis. Not only are trees, including pine, being reinstated but also many of the lost, and putatively lost, dwarf shrubs such as juniper and cowberry (*Vaccinium vitis-idea*), the berries of which are important for a large number of bird species and some mammals.

Restoring this type of vegetation in parts of the overgrazed and impoverished uplands of the Park will facilitate the locally threatened ecological keystone vertebrate species such as hares, red grouse and red deer.

The studies so far have shown that seed banks for many species likely to have occurred are either missing or so small that they are very limited in providing adequate capacity to establish themselves. Such losses are now considered as 'ecological cascades' and are likely to be more widespread than once thought.

Red Data Books

Another fundamental tool required to undertake appropriately targeted species conservation programmes are Red Data Books. These have been produced in Ireland for vascular plants, lichens, Bryophytes and Stoneworts. Faunal groups covered by Red Data Books are mammals, birds, amphibians and fish.

RAISED BOG CONSERVATION PROJECT

Raised bogs are a priority habitat under the EU Habitats Directive, and Ireland has the best remaining examples of this habitat type in western Europe. The European Commission recognised the importance of conserving this habitat type and consequently approved an NPW project under the Cohesion Fund aimed at conserving and restoring a number of Irish raised bogs. The total cost of the project is 2.5m ECU, of which 85% is refundable by the EU.

Following an initial survey and subsequent consultations with the EU, a number of raised bogs were selected for inclusion in the project, all of which are proposed SACs. Those selected represent a cross section of the range of variation of this habitat in Ireland. They are situated in counties Galway, Longford, Offaly, Roscommon, Tipperary and Westmeath.

The project involves a combination of land acquisition, drain blocking, dam construction work and monitoring. Land acquisition is necessary before work can commence and to date over 800 hectares of raised bog have been acquired under the project with the agreement of the former owners. The planning and design phase determines what works need to be carried out on site in order to conserve the bog. In many cases this requires site investigation and research work.

Conservation and restoration work usually involves the blocking of existing drains on the bog surface, or the construction of peat dams on the periphery of the bogs to prevent excessive water loss due to drying out and shrinkage in the bog margins. Drain blocking is carried out either by hand or by machine, depending on the depth and width of the drains in question. Peat dams are constructed where drain blocking is not sufficient to prevent the bogs from drying out. Monitoring is carried out to evaluate the changes which occur to the ecology and hydrology of the bogs following completion of the works.

The project was commenced by NPW in 1994. A considerable amount of work has already been carried out and the project is on course to be completed by the end of this year. The individual bogs on which work has been carried out are

Lisnageeragh Bog, Co. Galway
Fisherstown, Co. Longford
Clara Bog, Co. Offaly(Nature Reserve)
Raheenmore Bog, Co. Offaly (Nature Reserve)
Sharavogue Bog, Co. Offaly
Ballinagare Bog, Co. Roscommon
Carrowbehy Bog, Co. Roscommon
Ballyduff Bog, Co. Tipperary
Clonfinane Bog, Co. Tipperary
Firville Bog, Co. Tipperary
Garriskill Bog, Co. Westmeath

Conservation programmes

An important conservation programme (see box) has been underway for a number of years on the corncrake (*Crex crex*), the only globally threatened bird species found in Ireland. This species was once an abundant, widespread and familiar species in Ireland but it has now, due to agricultural intensification, declined very seriously to the extent that only small numbers are found in a few areas. The species has been the subject of extensive surveys, research and a conservation programme involving payments to farmers.

SCHEME FOR THE CONSERVATION OF THE CORNCRAKE

The corncrake (*Crex crex*) is the only extant Irish bird which is classified as 'threatened' in a global context by the IUCN. The main reasons for its decline have related to the intensification of farming, changes in traditional framing practices and loss of habitat.

The main initiative for the conservation of the corncrake has been the Corncrake Grant Scheme, which involves payments to farmers for using corncrake-friendly farming practices. The Scheme, which is operated by Birdwatch Ireland, is jointly funded by the Royal Society for the Protection of Birds (RSPB) and Dúchas, the Heritage Service of the Department of Arts, Heritage, Gaeltacht and the Islands. As such, it is an excellent example of co-operation between the State, a conservation NGO and an overseas conservation body, the UK-based RSPB. Since 1992, the Scheme has attracted State funding through Dúchas of IR£333,000, including a grant of £64,000 committed for the current year. In addition, a sum of IR£2,500 is being provided this year to assist in the funding of a national Corncrake Census. Birdwatch Ireland supplies the relevant data in relation to Corncrake numbers occurring in core areas.

Overall the corncrake numbers in recent years have been disappointing and do not reflect the resources and commitment to the Scheme of the project partners - Dúchas, RSPB and Birdwatch Ireland. The project partners have agreed that the future strategy for Corncrake conservation will be based largely on SAC compensation measures operated through the Rural Environment Protection Scheme (REPS) managed by the Department of Agriculture and Food, and through the SAC scheme managed by Dúchas. Discussions are continuing with conservationists, farmers representatives, the Department of Agriculture and Food, and farm planners under the REPS scheme, to agree an appropriate prescription for Corncrake friendly farming. The measures principally relate to dates of closing of meadows, dates of cutting hay and silage and mowing from the centre out. Pending agreement on that prescription, the current funding of the Corncrake Grant Scheme will remain in place. Dúchas is also endeavouring to purchase and lease back by agreement suitable Corncrake habitat for management in a Corncrake friendly way. The scheme will again be reviewed at the end of the current year by the project partners to determine the best future strategy for the conservation of this important species.

Numbers of calling corncrake males recorded in core areas 1995-97:

Area		**1995**	**1996**	**1997**
Shannon Callows	63	54	54	
Donegal	49	69	45	
Tory Island	12	21	18-20	
Inishboffin	27	15	12	
Inishdooey	0	2	2	
Moy		8	5	2
Mullet		8	10	6
West Connaught		7	8	9
Cores Area Total	**174**	**184**	**148**	
% Change		**+34.9**	**+5.7**	**-19.6**

Specific conservation programmes have also been carried out for other species such as terns and the natterjack toad, on raised bogs (see box), on the eradication of alien species and on integrated land use in a river catchment (see box). Conservation NGOs have frequently been involved in such programmes.

Research

There are ongoing NPW research programmes on, *inter alia*, genetic research to establish long-term conservation strategies, restoration ecology (see box), aquaculture in SPAs, deer, invertebrates, seabirds and a number of individual species. A major research project on the ecohydrological management of raised bogs was carried out in the 1990's by NPW and its Dutch counterpart, in association with the Geological Survey of Ireland. Third level institutions are involved in a wide variety of research, some of which is directly concerned with the conservation and sustainable use of biodiversity.

Table 9.1. Indicative list of inventories, surveys or partial surveys of the national resource of rare or threatened habitats, plants and animals carried out or commissioned by NPW

MAMMALS	BIRDS
Pine martin ***Martes martes***	**Peregrine falcon** ***Falco peregrinus***
Badger ***Meles meles***	**Greenland white-fronted goose** ***Anser albifrons flavirostris***
Otter ***Lutra lutra***	**Brent goose** ***Branta bernicla***
Mink ***Lutreola lutreola***	**Barnacle goose** ***Branta leucopsis***
Common seal ***Phoca vitulina***	**Greylag goose** ***Anser anser***
Bats	**Chough** ***Pyrrhocorax pyrrhocorax***
	Terns
	Cormorant ***Phalacrocorax carbo***
	Gannet ***Sula bassana***
	Whooper swan ***Cygnus cygnus***
	Mute swan ***Cygnus olor***
	Bewick swan ***Cygnus columbianus***
	Seabird colony register
	Seabird monitoring programme
	Wetlands enquiry
	Corncrake ***Crex crex***
	Merlin ***Falco columbarius***
	Winter atlas
	New breeding atlas
	Breeding seabirds of the Blasket Islands

Table 9.1. (contd)

HABITATS
Submerged marine sandbanks **Estuarine intertidal sediment biotopes** **Salt marshes** **Sand dunes** **Machair** **Lagoons and other enclosed brackish waters** **Lakes** **Turloughs over 10 hectares** **Rivers and canals** **Wetlands (surveys of several catchments)** **Raised bogs - active** **Bog woodlands** **Blanket bogs - active** **Grasslands (preliminary inventory)** **Esker woodlands**
PLANT SPECIES
Killamey fern,*Trichomanes speciosum* **Marsh saxifrage,*Saxifraga hirculus*** **Slender naiad,*Najas flexelis*** **Petalwort,*Petalophyllum ralfsii*** **Shining sicklemoss,*Drepanocladus vernicosus*(status review)** **Protected and threatened vascular plants** **Rare bryophytes** **Rare lichens** **Rare charophytes** **Floral biodiversity**
HABITAT DIRECTIVE ANIMAL SPECIES
Kerry slug,*Geomalacus maculosus* **Narrow-mouthed whorl snail,*Vertigo angustior*** **Geyer's whorl snail,*Vertigo geyeri*** **Desmoulins' whorl snail,*Vertigo moulinsiana*** **Freshwater pearl-mussel,*Margaritifera margaritifera*** **Marsh fritillary,*Euphydryas aurinia*(review supported by NPW)** **Sea lamprey,*Petromyzon marinus*** **Brook lamprey,*Lampetra planeri*** **River lamprey,*Lampetra fluviatilis*** **Twaite shad,*Alosafailax***

Chapter 10

AGRICULTURE

Agriculture is the main land use in Ireland. Of the total land area of 6.9 million hectares, agriculture accounts for 4.9 million hectares. The agriculture sector is very significant in economic terms, accounting for 7% of GDP and over 10% of employment. Irish agriculture is predominantly based on livestock rather than tillage. Seventy percent of land use is devoted to pasture, hay and silage, while crops, fruit and horticulture account for 8%. Since 1970 the area under grass has remained fairly constant, while the area of arable land has decreased and that devoted to forestry has increased. The Common Agriculture Policy (CAP) has been the main factor influencing agriculture in Ireland since joining the European Community. Under the CAP, there have been substantial increases in animal and farm productivity and in farm incomes and a greater degree of specialisation. The Common Agriculture Policy has resulted in the intensification of agriculture in Ireland with detrimental effects on biological diversity.

The natural heritage present in Ireland today is largely the result of previous interactions between farming and the environment (which took place over thousands of years). Agriculture, being the main land use in Ireland, is still one of the primary determinants of the state of biological diversity in the country. Agriculture influences not only the farmed environment but also freshwater ecosystems through actions such as drainage, grazing or fertilisation. Farming is therefore a critical influence on biodiversity.

Agriculture can have negative impacts on the conservation and sustainable use of biological diversity, including through degradation and elimination of habitats, excessive use of fertilizers, use of pesticides, the change from traditional farming practices (e.g. from hay to silage feed), and unsustainable farming practices, such as overstocking, etc. For example, between 1975 and 1991, 500,000 hectares of land were drained or reclaimed under various EC-assisted schemes in Ireland. Two major negative impacts of agriculture at present are increasing water pollution, particularly eutrophication, and overgrazing. On the other hand, certain types of agriculture can be of benefit or indeed a requirement for the conservation of biological diversity. The best way to conserve semi-natural ecosystems is through the maintenance of appropriate extensive farming systems. In order to achieve the conservation of biological diversity, as well as for other social and economic reasons, it will be necessary to maintain extensive farming systems.

Overgrazing

Overgrazing by sheep is a serious problem at present, particularly in Disadvantaged Areas in the upland parts of Counties Mayo, Galway, Donegal and Kerry in the west of Ireland. Habitats most affected are uplands, peatlands, heaths and coastal habitats with consequence adverse impacts also on flora and fauna. The overstocking of sheep arose as a consequence of EU headage payments to farmers. Payments are based on the number of sheep carried and consequently farmers increased their sheep numbers considerably and in excess of sustainable

densities. The number of sheep in the country increased by more than 5 million animals between 1980 and 1992 from 3.3 million to 8.9 million. Since 1992, sheep numbers have decreased somewhat to 7.7 million animals in 1996. The overgrazing by sheep has not only had direct impacts on habitats and associated species but it has caused adverse effects in aquatic ecosystems due to erosion of peat resulting from the overgrazing.

The introduction of the Rural Environment Protection Scheme (REPS) was expected to assist in reducing the overgrazing problem. However, this did not prove to be the case and the scheme has since been modified in order to make it more effective in reducing sheep numbers. It is anticipated that these modifications, combined with the introduction of the SAC programme initiated in March 1997 and the introduction of further cross-compliance controls in 1998 should greatly assist in alleviating the serious overgrazing problem.

Water Pollution

The production and management of agricultural wastes is a significant factor influencing the environment and water quality in particular. Significant quantities of animal wastes are now produced indoors during the winter period. The management of these and other farm wastes and their disposal by land-spreading requires careful management if adverse impacts on the environment and biodiversity are to be avoided. A variety of measures have been introduced for the management of farm wastes and these are under ongoing improvement. Measures include:

- research on phosphorous levels, the main cause of eutrophication in Ireland, with a view to determining and encouraging the use of appropriate application rates;

- the introduction in 1996 of the Code of Good Agricultural Practice to Protect Waters from Pollution by Nitrates;

- the preparation of and adherence to individual farm nutrient management plans are a requirement of REPS;

- the use of nutrient management plans at the catchment level - measures include, the provision of a statutory basis, under the Waste Management Act, 1996, for Nutrient Management Planning. Under the Act, the local authority may require farmers to adopt nutrient management plans in areas where agriculture has been identified by monitoring as a significant cause of eutrophication;

- the provision of grant assistance to farmers for capital investment in pollution control measures;

- undertaking research by Teagasc and the EPA to improve pollution control.

Research on constructed wetlands is also relevant in this context. A number of appropriately scaled constructed wetlands have been built in the South County Waterford area under guidance from local government and state agencies. While these are relatively new, results to date indicate that they effectively control waste water quality at a reasonable cost.

Pesticides

The quantities of pesticides used in agriculture in Ireland are low compared to other EU Member States. Nonetheless, the estimated quantities of pesticides used in Ireland have more than doubled over the last 20 years (1166 tonnes in 1975 to 2,761 tonnes in 1994). The regulatory system for pesticide use is currently being improved. Also a voluntary code of good practice for the handling, application and storage of pesticides on farms has recently been produced by Teagasc. This code of practice is intended to avoid damage by pesticides to the health and safety of sprayer operators and to the environment.

Rural Environment Protection Scheme (REPS)

As part of the reform of the Common Agricultural Policy agreed in 1992, three accompanying aid measures were adopted. These were an agri-environment programme, an afforestation programme and an early retirement scheme for farmers. In Ireland the Agri-Environment Regulation is implemented through the Rural Environment Protection Scheme (REPS), which was launched in 1994. The scheme has a five year budget of £230 million, which is financed by the EU (75%) and the National Exchequer. In March 1997, 23,279 farmers were participating, at a cost of over £82 million and covering 773,232 hectares. It would appear that the target set in the National Sustainable Development Strategy, namely to have 30% of all farmers participating in the REPS by the year 2,000, will be achieved.

REPS is a horizontal (i.e. country-wide) rather than a zonal-programme (i.e. focused on certain areas). The scheme is voluntary and farmers from any part of the country can apply. The same uniform scheme applies across the country.

The objectives of the Rural Environment Protection Scheme are to:

- establish farming practices and controlled production methods which reflect the increasing concern with conservation, landscape protection and wider environmental problems;

- protect wildlife habitats and endangered species of fauna and flora;

- produce quality food in an extensive and environmentally friendly manner.

Farmers who wish to join the scheme must do so for five years, must have an agri-environment plan drawn up by an approved planner, and must comply with all the measures under the scheme and on the total area of the farm. The measures relate to waste management; grassland management; protection of watercourses; retention of wildlife habitats; maintenance of field boundaries; restrictions on the use of herbicides, pesticides and fertilisers near hedgerows, lakes and streams; protection of archaeological features; visual appearance of the farm;

production of tillage crops in a prescribed fashion; attendance at training courses; and the keeping of appropriate records.

There are six supplementary measures which are designed, *inter alia*, to take account of the need to resolve specific environmental problems, and to protect important habitats. These measures deal with NHAs/SACs; the rejuvenation of degraded areas; the rearing of specified local breeds of animals; long-term set aside; public access; and organic farming. Supplementary measures 1 and 2 are mandatory in proposed NHAs/SACs and Degraded Areas. Participants in REPS who have land within an NHA or SAC must comply with conservation prescriptions set out by National Parks and Wildlife for the NHA or SAC, as well as complying with the basis REPS requirements on the rest of the holding. Farmers receive additional payments for NHAs and SACs above those applying for the basic scheme.

Additional payments are also available to farmers for rearing registered animals of specified breeds which are in danger of extinction. The breeds involved are cattle (Kerry, Dexter, Irish Maol), horses (Irish Draught, Connemara Pony) and sheep (Galway Sheep).

Protected areas

Protected areas make a significant contribution to ensuring the conservation and sustainable use of biodiversity in the agricultural ecosystem. Most of the land area encompassed by the network of protected areas, including in particular SACs, is farmed. Within this extensive land area, it is a requirement that unsustainable farming practices be prevented or eliminated.

Conservation of Genetic Resources for Food and Agriculture

To date, in Ireland as elsewhere, the question of genetic diversity below the species level has received relatively little attention. The main activities in this area relate to genetic diversity and resources of importance for agriculture, including forestry. Genetic resources are a crucial input for both farming and food production. Maintaining the range of genetic diversity of wild relatives of crop plants is also important for agriculture. Other reasons for conserving genetic diversity are because of potential future uses (e.g. in medicine, for agriculture) and because genetic diversity is the basis of biological diversity and future evolution.

As agricultural development has occurred the use of a limited number of breeds and varieties of each of the most important animal and plant species has occurred. The breeds of animals and the varieties of plants that farmers use nowadays are quite different from those used in the past and they are likely to be different from those they will require and use in the future. Accordingly, management of genetic resource should be such as to ensure that appropriate genetic material will be available to meet future challenges arising from changes in the environment and in human preferences.

The co-ordination and integration of conservation strategies for plants and animals is desirable. With the limited financial resources that are available it is essential to avoid duplication or the development of conflicting strategies. Ideally national strategies should be designed which are

directed towards sustainable production. Priorities and programmes necessary to give effect to that integrated strategy should be developed. Attempts must be made to achieve a much clearer understanding of the combinations in each major type of environment. Since conservation of genetic resources includes both utilisation and preservation it should become an integral part of both national breeding policies and national conservation policy.

Animal genetic resources

A wide array of breeds is used for livestock production in Ireland. This is particularly true in the case of the bovine and ovine species. Increasing specialisation in livestock breeding and production in recent decades has led to significant changes in breed usage. For example, for milk production the Kerry and Shorthorn breeds were largely replaced by the dual purpose British Friesian breed during the 1960's and early 1970's and currently the British Friesian is being replaced by the North American Holstein Friesian which is a specialised dairy strain. In the case of beef production, Continental beef breeds like the Charolais, Limousin, Simmental and Belgian Blue are being widely used instead of the traditional Hereford and Angus breeds. Likewise in the case of sheep meat production there has been a significant increase in the use of Continental breeds at the expense of the Down breeds.

Also the Galway breed which was the predominant ewe breed used in lowland flocks has been largely replaced by other breed crosses. In the case of pig meat production hybrids produced by commercial breeding companies are now used to a significant extent instead of the traditional Large White and Landrace breeds.

Much of the change in breed usage has resulted from increased specialisation and intensification of livestock production. Indeed modern animal breeding increasingly promotes and otherwise facilitates the almost universal use of a limited number of "high input- high output" breeds or strains. The old indigenous livestock breeds and strains which evolved in low and medium - input environmental conditions are being superseded. These breeds may possess some valuable "fitness" traits such as disease resistance, high fertility, good maternal qualities, unique product qualities, longevity and adaptation to harsh conditions and poor quality feed. Generally these fitness traits are much more difficult to measure and change than one production trait.

There are a number of "in-situ" conservation schemes in operation for endangered livestock breeds. Under the Kerry Cattle Scheme a grant of £60 per calf registered in the Kerry herd book is paid where the herdowner has 5 or more breeding females which are all bred pure. Under REPS Supplementary Measure 3 for the rearing of animals of local breeds in danger of extinction 100 ECU per livestock unit is available to participating herdowners who rear Kerry, Dexter or Irish Maol cattle, Galway sheep, the Connemara pony and the Irish Draught horse. There is a need to complement these "in-situ" schemes with an "ex-situ" cryopreservation programme. This programme should include not only the above endangered breeds but also the other traditional breeds and strains which are being supplanted by Continental breeds. It is critical to ensure that secure cryopreservation arrangements at two locations are established soon.

The effective use of breeds is an essential component of conservation and is perhaps the most cost effective. Efforts should be made to enable the development and use of a wider array of

breeds in practice. Where possible the conservation and sustainable use of indigenous breed resources should be integrated into the national breeding programmes for the different species.

Plant genetic resources

While Ireland, in common with many of its European neighbours, is not rich in plant genetic resources those that are relevant to food and agriculture are being conserved. The Department of Agriculture and Food at its farm in Raphoe Co. Donegal maintains an extensive collection of potato varieties that are indigenous to Ireland together with the world collection of varieties. Many of these varieties are infected with viruses and efforts are being made using Meristem tip culture technique to produce virus free stocks that can be maintained as microtubers. Teagasc at Oak Park in Carlow also maintains a working germplasm collection in association with the potato breeding and improvement programme being conducted there.

A large proportion of the agricultural land area of Ireland is in grassland. Within these grasslands there are areas of old pasture/rough grazings which have never been re-seeded with bred cultivars. The conservation value of these pastures has been modified through the addition of fertilizer and grazing management. However, they still represent a large resource of indigenous genetic variation useful as a source of breeding material for the development of cultivars of agriculturally-useful herbage species. FAO in conjunction with Teagasc organised an expedition in 1983 to collect and store germplasm from some of these grasslands. Much of this collected material remains to be characterised and evaluated while some of it has been used in the herbage breeding programme conducted by Teagasc at Oak Park, Carlow. Many varieties of perennial ryegrass and white clover have been developed over the years at Oak Park and germplasm of these varieties is currently stored in a genebank there. However, for many herbage species which are not widely used in Irish agriculture there is little information on characterisation, evaluation or potential utility. There is little doubt that there are valuable resources for many herbage species (for example red clover, vetch, mustard species, *Vicia*, etc.) in our old pastures and hedgerows.

Working germplasm collections of varying size and scope are maintained by the Faculty of Agriculture, University College Dublin for spring wheat and by Department of Agriculture and Food at Ballinacurra Co. Cork for malting barley. In general, the collections being maintained are quite small, the regeneration procedures are less than ideal and storage conditions are unsuited for long-term viability. The closing down of many of the breeding programmes conducted by the Department of Agriculture and Food (wheat, oats and feeding barley), Teagasc and Greencore (sugar beet) has resulted in the loss of most of the germplasm collections associated with these breeding programmes. However, thirty nine samples of *Beta vulgaris ssp maritima* which were collected along the Irish coastline over the past thirty years are stored in the USDA genebank in America.

Though "in-situ" conservation may occur as an un-planned consequence of a wide programme for habitat conservation and agriculture, specific, state-supported measures for individual agriculture species have not been implemented in Ireland.

In a collaborative project between the ISSA (Irish Seed Savers Association) and the Department of Horticulture, University College, Dublin, efforts are being made to establish a reference collection of native Irish apple varieties no longer easily obtained in Ireland. This

collection will then be made available to any interested parties. The work is based on a survey carried out in the 1940's and 1950's which identified 75 native Irish varieties. About 40 of these varieties have been located to date for inclusion in the collection. The remainder are being sought in Ireland, in old orchards and corners of the countryside. Many of these old varieties were known for their disease resistant qualities and are therefore of scientific interest today.

With regard to indigenous species in the wild, all indigenous Irish plant species should be regarded as potential resources. Considering however what is immediately achievable, a number of species have been selected by the Irish Genetic Resources Conservation Trust (IGRCT) and the associated Irish Plant Genetic Resources Genebank (IPGRG) to represent an absolute minimum which should be targeted for conservation, characterisation and evaluation for the present.

Advisory committee on genetic resources for food and agriculture

The Minister for Agriculture and Food set up a representative Committee on Genetic Resources for Food and Agriculture in July 1996 to advise and aid in the development and implementation of plans aimed at the conservation of genetic resources for food and agriculture. A budget has been provided to fund programmes of work approved by this Committee.

Various organisations including the State, Universities, Teagasc, breed societies and other non-governmental organisations are involved in various conservation activities. There is a need for the development of a more co-ordinated approach to the management of genetic resources for food and agriculture with the following objectives in mind:

- to develop and properly utilise genetic resources to increase national and global food security and to meet demands for specific products;

- to promote public awareness and support for genetic resource management strategies, plans and programmes;

- to identify, evaluate and preserve unique genetic resources whose survival is being threatened or is endangered; and

- to participate in international programmes such as the European Community Programme under Council Regulation (EC) No. 1467/94 and FAO Global Programmes for Management of Genetic Resources and the Conference of the Parties to the Convention on Biological Diversity initiatives.

Genetically Modified Organisms (GMOs)

Under national Regulations (the Genetically Modified Organisms Regulations, 1994), various provisions of EU Directives 90/219/EEC (on the contained use of genetically modified micro-organisms) and 90/220/EEC (on the deliberate release of genetically modified organisms to the environment) are transposed into national law. The fundamental objective of the Regulations

is the protection of human health and the environment, and the Environmental Protection Agency (EPA) is the national competent authority.

The Regulations provide for various procedural matters in relation the contained use and deliberate release of genetically modified organisms GMOs. These include notification and consent requirements, application of principles of good microbiological practice, risk assessment, reviews of consents, accident procedures, a public register of notifications and enforcement procedures. Users of GMOs are required by the Regulations to ensure that all appropriate measures are taken to avoid adverse effects on human health and the environment. A consent to place a product, containing or consisting of GMOs on the EU market must include conditions on the labelling and packaging of the product. Provision is also made in the Regulations for the establishment of an advisory committee for the purpose of consultation by the EPA, and the payment of application fees and other charges to the Agency.

In anticipation of the amendment of Directive 90/220/EEC, and in recognition of increasing public awareness and concern regarding genetically modified products, the Minister for the Environment and Local Government has initiated arrangements for the preparation of a national policy position on the deliberate release of GMOs to the environment. A position paper is being prepared and will be made widely available in 1998 for the purpose of consulting and establishing the views of all interests, including the general public.

Chapter 11

FORESTRY

Background

When man first arrived in Ireland about 9000 years ago, the country was covered in mixed broadleaf forest, mainly of oak, with pine and birch on higher ground and on poorer soils. The early inhabitants cleared small local areas, but over the centuries forest clearance increased as a result of pressure from population increases, settlements, pasture, tillage and later colonisation and commercial exploitation. By the 1600's it is estimated that only about 12% of Ireland was covered in forest, and the exploitation intensified as the use of wood became increasingly important. It was used for ships, buildings, barrels and as firewood and charcoal for iron smelting and glass making. Oak bark was also used in large quantities for leather tanning. By the early 1700's Ireland had become a timber importing country.

From the 1700's to the late 1800's, some owners of the great estates began to improve their land and to plant trees. The forests again declined, however, with the passing of the Land Acts in the late 1800's and transfer of ownership to the tenant farmers. By 1905, the area under forest was just over 100,000 hectares, or about 1% of the land area. This was further reduced during the First World War due to fuel and timber shortages.

Current situation

Today only small amounts of woodland occur in the otherwise open landscape of Ireland. Of this woodland, the majority comprises plantation forestry of very recent origin. No primeval forest remains. Only a very small amount of semi-natural native woodlands still exists in Ireland, substantial areas of which are conserved by site protection. Over 5,000 hectares of semi-natural forests are included in State Nature Reserves and National Parks. Further areas are included in NHAs and in candidate SACs. However, Ireland has proportionally the smallest area of native woodland in Europe.

The total area of land under forests in Ireland is relatively small. Total forest cover, both public and private, at the end of 1995 in Ireland was 570,000 hectares, or 8% of the land area. This represents a considerable change from the situation at the beginning of the century, when the area of the country under forest was about 1%. Current Government policy, as outlined in the Strategic Plan for the Development of the Forestry Sector, published in July 1996, is to increase the forest estate to 1.2 million hectares, or 17% of the land area, by 2030. The proposed afforestation levels to the year 2000 are 25,000 hectares per annum and 20,000 hectares to the year 2030.

An increase in forestry is desirable on economic and, if properly undertaken, on biodiversity grounds. However, in order for the planned increase in forestry to be of benefit to biodiversity, account will have to be taken of biodiversity conservation needs in all stages, whether

planning, planting or management. In particular, it involves preventing any damage to the most important sites for biodiversity (i.e. areas of special ecological importance); avoiding damage to other sites, habitats and features which are important, where appropriate; and planting and managing forests in general so as to maximise as far as practicable their value for biodiversity.

Of the total forest cover of 570,000 hectares, forest termed as 'Productive or Planted Forest' accounts for 464,000 hectares. The remainder is assigned from a commercial forestry perspective to broadleaf scrub/undeveloped woodlands, unstocked woodlands and privately owned woodlands which are not regularly managed. The latter areas are generally more important for biological diversity than planted forestry, particularly where this consists of Sitka spruce or other conifer species. The State is the owner of the majority of Irish forests. Coillte, the State-owned commercial forestry company established in 1989, owns 70% of the forest estate. However, the situation is changing as private planting, in particular by farmers, has increased considerably since the end of the 1980s as a result of improved grants. In 1995, 73% of planting was carried out by the private sector.

In comparison to other EU countries, both the total area forested and the percentage of the land area of the country devoted to forestry is amongst the lowest. Eight percent of the land area of Ireland is under forestry, compared to the UK with 10% and an EU average of 34%.

Significance for Biological Diversity

Of particular significance in terms of biological diversity is the species composition of the forest estate. Non-native conifer species dominate. The original forests of Ireland were broadleaf but the percentage of broadleaves in Ireland today is 16%. This figure is the lowest within the EU, with the exception of Finland and Sweden, countries with naturally coniferous forest. The EU average for the percentage of the national forest estate which is broadleaf is 40%. Despite the low percentage of broadleaves in the Irish forest estate today, it represents a significant improvement as the broadleaf planting rate has increased from 2-3% in the early 1990s to 20% in 1995. While 20% of all planting in 1995 was with broadleaf species, the percentage of broadleaves planted by the private sector (27%; 4,671 hectares) was considerably greater than that planted by the Coillte. The current target for broadleaf planting, as set out in the Strategic Plan for the Development of Forestry, is 20% of total annual afforestation. From the perspective of biodiversity conservation, this is a modest target for broadleaf planting.

Until recently, as with other sectors, the level of environmental awareness was lower than it is now. As a consequence, and because forestry in Ireland has relied on the afforestation of new land in order to increase the forest estate, there have been adverse effects on particular habitat types, specific sites and biodiversity. These negative impacts have been considerably reduced in recent years by improved controls and consultation. Afforestation has also produced some benefits to biodiversity in Ireland.

In Ireland, a commitment has already been made to the principle of sustainable forest management. This is set out in the Strategic Plan for the Development of the Forestry Sector

in Ireland, the overall aim of which is to develop forestry to a scale and in a manner which maximises the contribution to national economic and social well-being on a sustainable basis and which is compatible with the protection of the environment. Government policy for the forestry sector thus provides for the planned increase in forest area, the recognition of the many roles of forests, and a commitment to sustainable forest management.

Ireland is a signatory to a number of instruments concerned with the conservation, management and sustainability of forests. The Rio Forest Principles set out a number of principles for the conservation, management and sustainable development of all types of forests. The 1990 Strasbourg Resolution commits Ireland to implementing a policy for the conservation of forest genetic resources. Through a resolution of the Helsinki Conference, Ireland is committed to recognising the conservation and appropriate enhancement of biodiversity as an essential element of overall sustainable forest management. Action in relation to these measures is either already taking place in Ireland, or relevant commitments have been made (e.g. the Strategic Plan for the Development of Forestry commits the Government to preparing Forests and Wildlife Guidelines) and some of these are outlined below.

Afforestation also plays a positive environmental role in the area of climate change. Ireland has ratified the UN Framework Convention on Climate Change. Developed countries are aiming to limit and reduce CO_2 and other greenhouse gas emissions and to enhance green house gas sinks and reservoirs. In this context, afforestation plays a particularly significant role in the national climate change strategy through the absorption of CO_2 from the atmosphere by acting as a sink for the gas. However, in the case of afforestation on peatlands, the amount of CO_2 released to the atmosphere as a result of drainage, etc. may exceed that fixed by the trees. It can be expected that the benefits of developing and expanding the national forestry assets, other than on peatlands, in a sustainable way will continue to be very significant in the period after the year 2000 as part of the national response to intensified action at a global level on climate change.

The compatibility of forestry with the conservation of biodiversity

Many environmental controls relating to forestry in Ireland are already in place or have recently been agreed. However, there is still room for improvement and further initiatives are underway to assist in further improving the conservation and sustainable use of biological diversity by Ireland's forest sector.

Current forestry legislation is set out in the Forestry Acts, 1946 to 1988. The European Communities (Natural Habitats) Regulations, 1997, provide for the control of forestry in many Special Areas of Conservation and Special Protection Areas.

The Local Government (Planning and Development) Acts and the European Communities (Environmental Impact Assessment) Regulations are also relevant. Presently initial afforestation above a threshold of 70 hectares, and the replacement of broadleaf high forest with conifers above 10 hectares, requires planning permission and an EIA. The 70 hectare threshold for initial afforestation, which will be reviewed in three years, is a reduction from

that of 200 hectares which applied until October 1996. In addition, planning permission and EIA is now required for 'add-on' forestry (afforestation within 500 metres of existing forestry by the same developer in a three year period) where the 70 hectare threshold would be exceeded. A non-statutory procedure has also been agreed whereby local authorities are notified of afforestation proposals in excess of 25 hectares. Draft Guidelines for Planning Authorities on Forestry Development were issued by the Department of the Environment and Local Government in January 1997. They proposed, *inter alia*, that Local Authorities may designate areas sensitive to forestry and that planning authorities consider preparing indicative forest strategies. Furthermore, the Minister for the Environment and Local Government has indicated that he intends taking more flexible powers in relation to forestry control in the next Local Government (Planning and Development) Act to enable planning permission to be required for plantations which would not warrant EIA.

Within proposed SACs, consent must be obtained from the Minister for Arts, Heritage, Gaeltacht and the Islands before certain activities can be carried out. In most SAC habitats, consent must be obtained from the Minister before trees can be planted and, in some habitats, before tree felling or the removal of timber is carried out.

Furthermore, with regard to the protection of sites of special ecological importance, it is already a specific provision of the forest grant scheme administered by the Forest Service that all areas designated or proposed for designation as SACs or Special Protected Areas (SPAs) are ineligible for grant aid where this would damage the ecological interest. National Parks and Wildlife is also consulted in relation to projects which might adversely affect NHAs or sites supporting species protected under Flora Protection Orders.

Outside of ecologically important sites, the conservation of biological diversity will rarely be the dominant priority. However, within all forests, existing and planned, consideration should be given to biological diversity. In the management of existing forests and the planting of all new ones, opportunities to maintain and enhance biological diversity should be encouraged and availed of. This objective of conserving and enhancing biodiversity within the forest estate will be pursued through a number of measures.

Controls in relation to forestry are also exercised via conditions applying to grant aid for forestry, which in practice covers virtually all forestry currently being undertaken. Guidelines have been developed by the Forest Service in relation to forestry development and certain aspects of the environment. The production in 1992 and 1993 of these guidelines on forestry and the landscape, forestry and fisheries, and forestry and archaeology were also positive developments. Compliance with these Guidelines is a condition of grant-aid. The Guidelines are currently being updated with a view to, *inter alia*, increasing their value for maintaining and enhancing biological diversity in forests.

Additional specific guidelines to take account of biodiversity conservation requirements in forests are needed and are planned under the Strategic Plan for the Development of Forestry. These will provide guidance on the maintenance and enhancement of biological diversity, including at the genetic level, in all types of existing forests, as well as requirements for new planting. Such guidelines would have to be observed by all owners and managers in proposals for grant approval. Further guidelines on forests and harvesting and clear felling; forests and

amenity and recreation; and forests and chemicals and herbicides are planned under the Strategic Plan for the Development of Forestry. In developing these, account will be taken of biodiversity conservation needs. In the Strategic Plan for the Development of Forestry, there is also a commitment to develop a Code of Best Forest Practice for the management of all forests over the full rotation.

Currently a number of studies concerning forests and biodiversity are being carried out in Ireland, in particular those supported by the Forest Service/COFORD. These include studies of bird populations in forests. In line with its commitment, not only nationally, but also at European and international level, to the multiple role of forests, the Government will further extend its forest and biodiversity research programme under the auspices of the Forest Service/COFORD.

Chapter 12

INLAND WATERS

Inland water ecosystems - both standing and flowing waters, as well as other wetlands, including peatlands, are abundant and of special importance for biological diversity in Ireland (see Chapter 2). Inland water ecosystems are vulnerable to a wide range of threats including pollution, especially eutrophication, drainage, alien species, translocation and introduction of fish stocks, erosion due to overgrazing, peat extraction, acidification and gravel extraction. Inland fisheries are of importance in Ireland, notably for recreational fishing for game (salmon, sea trout and brown trout) and coarse fish (pike, perch and cyprinids). Eels are commercially fished in rivers and lakes and a programme to further develop these eel fisheries has been put in place over the last number of years.

Water Quality

Wetlands and open water habitats are vulnerable to water pollution from industrial and domestic effluent and agricultural wastes. While the incidence of serious pollution in inland freshwaters in Ireland is gradually reducing and now affects only 0.6% of river channel monitored, the incidence of slight and moderate pollution has increased over the past twenty years, and now affects 28% of monitored river channel. While industrial and other point sources of pollution have been effectively controlled to a large degree, agricultural practices are now recognised as being a significant threat to water quality in some cases. The main problem resulting from agriculture in Ireland is eutrophication.

A primary objective of water quality management policy in Ireland is to ensure that freshwaters are capable of supporting salmonids, i.e., salmon and trout, species that demand particularly high water quality conditions. In general, water quality management plans made by local authorities under the Water Pollution Act, 1997, incorporate quality objectives sufficient for this purpose (as distinct from lower objectives which would be adequate for cyprinids/coarse fish). The objectives set in these plans guide local authorities in their implementation of pollution control legislation generally and must be taken into account by them when determining conditions attached to licences issued under the 1977 Act in respect of effluent discharges to water or to sewers.

The Water Pollution Acts, 1977 and 1990, as well as the Fisheries (Consolidation) Act, 1959, contain extensive pollution prevention and control provisions. A recent amendment gives power to local authorities to require farmers to prepare nutrient management plans for their farms where they consider this to be necessary so as to protect water quality. The provision is intended to strengthen controls on the land-spreading of slurries and the use of chemical fertilisers with the aim of reducing nutrient losses to waters and curbing eutrophication. This legislation is supplemented by the Environmental Protection Agency Act, 1992, the Waste Management Act, 1996 and requirements in relation to the preparation of EIAs for developments/activities above applicable thresholds.

The realisation of the objectives of pollution control legislation requires a responsible approach by all sectors and the public generally. To date, implementation of this legislation has brought about significant progress in eliminating pollution from industry, while pollution caused by sewage discharges is being addressed under a major capital investment programme (£1.3 billion over the period 1990-2005). Corresponding progress in respect of agricultural diffuse sources of pollution has proven more difficult to achieve and the situation is reflected in a continuing rise in the length of river channel affected by eutrophication. The situation is being addressed by strengthening pollution control legislation, i.e. provisions already mentioned concerning farm nutrient management plans, promoting awareness about environmentally friendly farm management methods, i.e. the Code of Good Agricultural Practice to Protect Waters from Pollution by Nitrates which was published by the Departments of the Environment and Local Government and Agriculture and Food in 1997, and by the operation of the later Department's REPS grants scheme.

In 1997, a catchment based strategy for the management of rivers and lakes was introduced. The key aims of the Strategy are

- no further deterioration in the quality of rivers and lakes
- setting interim targets for phased improvements in the condition of rivers and lakes currently polluted
- pursuance of the overall objective of eliminating pollution from all rivers and lakes

Drainage

Drainage, frequently undertaken for agricultural purposes but also for flood relief, has caused significant damage to aquatic systems and wetlands in Ireland and still continues to be a cause for concern. Arterial drainage has been of major significance in this regard. Even prior to the arterial drainage works of this century, turloughs were reduced in extent by about one third due to Nineteenth-century drainage. Between the Arterial Drainage Acts of 1945 and 1995, an estimated 250,000 hectares of land have been affected by drainage. The amount of arterial drainage being carried out has declined significantly over recent years.

In addition to, or in association with, arterial drainage, less extensive drainage operations, including local drainage schemes, drainage of individual waterbodies and field drainage have had and continue to have adverse impacts on aquatic systems, wetland habitats, fauna and flora and specific sites. The initial, often severe impacts of drainage can be reinforced or perpetuated by maintenance drainage.

Drainage can cause both direct and indirect effects on aquatic and wetland systems. Drainage normally results in a reduction in the physical heterogeneity of river systems and can result in a decrease in the number or extent of waterbodies. Habitats are reduced in extent and diversity with consequent effects on species. Significant adverse affects can accrue not only to aquatic and wetland associated plants and animals, such as fish, aquatic plants, invertebrates, mammals

and birds, etc., but also rather less obviously to other groups. For example, many river corridors, particularly lowland ones, contain significant amounts of trees and scrub. It is probable that in rivers which have been arterially drained, there has been a considerable reduction in such riparian tree and scrub cover and hence in associated non-wetland dependent species. In addition to impacts on the aquatic systems proper, associated wetlands (defined in a broad sense) may be affected by resultant changes in the hydrological regime, leading to changes in habitats and to the reductions or loss of species of flora and fauna. Important ecosystem functions or services of aquatic and wetland systems, such as nitrogen removal or flood attenuation capabilities, may also be damaged by drainage operations.

A number of controls have been introduced since the 1970s in order to reduce the negative impact of drainage on biodiversity and the environment. Under the Wildlife Act, 1976, the State authority responsible for major drainage works must consult with the State nature conservation authority before commencing a drainage scheme in an area protected under the Act (Nature Reserve, Refuge for Fauna) and the drainage authority must take all practicable steps, including, where appropriate, the limitation of the scheme to minimise or avoid damaging the conservation interest. In the case of European sites (SACs and SPAs), state authorities proposing to undertake drainage works must assess the implications of the scheme for the site and may normally only proceed if the ecological interest of the site will not be adversely affected. Similarly, private drainage activities, including those of a small scale, may not be carried out in an SAC if it is considered likely they will damage the site. In the case of large scale drainage schemes, an EIA is required irrespective of where they are located. There is a commitment to review the existing EIA thresholds for various types of drainage projects with a view to improving their role in the protection of wetlands.

Alien species

Introduced species account for nearly half of Ireland’s present day freshwater fish fauna. Some introduced fish species are a cause of some concern (e.g. roach *Rutilus rutilus*), as are other introduced species such as the hazardous giant hogweed (*Heracleum mantegazzianum*), originally introduced as an ornamental plant, and the zebra mussel (*Dreissena polymorpha*). Well established populations of the latter species were discovered in Lough Derg and the lower reaches of the River Shannon, Ireland’s largest river, in 1997. It is thought likely that the species was accidentally introduced on a boat brought on to the inland waterways network. This bio-fouling species has caused major environmental and economic damage in North America following its introduction there in the 1980's. There is a major concern over the potential impact dense populations of this species may have on inland water ecosystems in Ireland. A research and information campaign has been initiated in an attempt to limit the spread and impact of the species.

Chapter 13

MARINE AND COASTAL

General

As an island nation, Ireland's marine and coastal sectors are of great importance. The area of Ireland's Continental Shelf is some 900,000 sq km and its 200 mile fishery zone is some 465,000 sq km in area. Ireland has a diverse coastline of over 7,000 km and, with both its major cities and industries located on or near the coastline, almost 60% of the population resides in coastal areas. Accordingly, the coastline and seas around the country are particularly important as an economic resource and as a means of access to marine resources. While Ireland's coastal zone also hosts a large number of internationally important sites for nature conservation, it can provide economic and social support for coastal and island communities in accordance with the principle of sustainability, while conserving the natural resource for future generations.

The marine sector and the sustainable use of Ireland's natural resources make a valuable contribution to the economy of the State. The sector supports such industries as sea fishing, aquaculture, tourism, recreational and leisure and offshore gas and oil exploitation. As a method of transport 76 % of Irish trade is carried by sea, while 35% of its passenger traffic to other countries is by sea. Some Irish waters are rich in fossil fuels and represent the source of some 20% of the total Irish energy requirement through the production of natural gas.

Threats to Marine and Coastal Biodiversity

The main threats to biodiversity occur in the coastal zone as a result of pressure from the growth in human population and demographic change. The threats can involve the loss of habitat, pollution, eutrophication, over-exploitation of resources, tourism and the introduction of alien species. In some instances, estuaries and wetland areas are in danger of loss or destruction. In areas of the North Atlantic, the composition of fish stocks has undergone major change because of fishing, with a decline in major commercial fish species. Such changes in composition can have significant effects on fish-dependent species such as sea mammals and birds. Fishing methods such as trawling can also have deleterious effects on seabed habitats.

It is generally accepted that less attention is paid to marine conservation than to terrestrial conservation. However, in light of the threats to marine biodiversity, there can be little doubt about the need for a greater appreciation of the importance of such biodiversity and of its value both in ecological and economic terms.

Aquaculture

Aquaculture is a growing sector of the Irish marine industry, that has doubled its value to IR£49 million in the years 1989 to 1995. It now employs over 2,500 people and represents 25% of Ireland's fish production. Government policy is committed to supporting the sustainable development of the aquaculture industry, particularly in light of its contribution to rural and remote communities.

For aquaculture to be successful and sustainable, it requires a high quality environment and clean waters. However, the industry itself is the source of a number of concerns, including effects on wild stocks, the spread of disease and parasites and localised pollution. With a view to improving the interaction between the aquaculture industry and biodiversity conservation, codes of practice have been published and a number of further updates are at the drafting stage.

Sea Fisheries

Commercial sea fishing also makes a significant contribution to the Irish economy. It is of particular importance to remote and island communities. About 25 harbours service the bulk of the fleet. The number employed in the fleet was estimated at some 7,700 in 1994, while total employment in the fisheries industries is approximately 16,000. An analysis carried on the 1992 catch showed that 76% consisted of pelagic species, such as herring and mackerel; 13 % consisted of demersal species such as dogfish, monkfish and whiting; and the remaining 11% consisted of shellfish. It is internationally recognised that the long term preservation and improvement of fish stocks is vital for both the industry and the biodiversity of the marine sector. At European level, Ireland is a party to the Common Fisheries Policy (CFP) which imposes quotas on certain species based on total allowable catches. Those levels are assessed on the basis of ensuring the future sustainability of the various fish species. Ireland will support the development within the CFP of further measures to reduce the extent of juvenile catch. There is also a commitment outlined in the National Sustainable Development Strategy to monitor the by-catch of cetacea in fisheries. Such monitoring of cetacean by-catch is mandatory under the terms of the European Communities (Natural Habitats) Regulations, 1997.

Coastal Zone Management

The coastal zone sustains many sensitive ecosystems of considerable nature conservation, recreational and amenity value. However, as a resource it is under considerable pressure and faces competition for further development and use. Accordingly, the concept of Integrated Coastal Zone Management (ICZM) was developed as a response to the recognition that the coastal zone is a finite resource, to the apparent fragmentation of the existing management effort and to the belief that a more efficient and sustainable use of this resource can be achieved.

The objective of ICZM can be defined as a continuous process of administration which seeks through more efficient and holistic management

- to establish and maintain the sustainable use and development of the resources of the coastal zone so as to improve the quality of life and of human communities dependant on these resources; and

- to maintain the biological diversity and productivity of coastal ecosystems and to improve the quality of the coastal environment.

The Government, through the medium of the three relevant State Departments involved - the Department of the Marine and Natural Resources, the Department of the Environment and Local Government, and the Department of Arts, Heritage, Gaeltacht and the Islands - commissioned a consultancy report to provide a framework for the sustainable and co-ordinated management of the coast. Resulting from this report, a Discussion Document was published outlining a draft policy for ICZM and inviting the public and all interested bodies to make submissions to assist in the preparation of a National Coastal Zone Management Strategy. A public seminar was held earlier in 1998 at which the Discussion Document and the written submissions were debated. Some 100 written submissions were received and these, along with the views and opinions expressed at the public seminar, are now being studied by a working group, comprising officials of the three Departments, and will be considered in the process of finalising a National Strategy. This process is expected to be completed before the end of 1998. The strategy will have, as a core objective, the preservation of the best remaining areas of importance for biodiversity in the coastal context, which are an irreplaceable part of Ireland's heritage.

Marine and coastal nature conservation legislation

The Irish coast and the marine sector contains many sites of international importance for nature conservation. Legislation, both at national and international level, is in place to protect important coastal areas such as cliffs, sand dunes and estuaries. The legislative protection includes the Wildlife Act, 1976, the European Communities (Natural Habitats) Regulations, 1997, and the Whaling Act, 1937.

Ireland, as an island country and as a result of its geographical location, is open to the risk of maritime accidents and is also vulnerable to marine dumping. A number of legislative measures, including the Dumping at Sea Act, 1996, help to reinforce the protection of Irish waters. The Dumping at Sea Act extends Irish control in relation to dumping from 12 miles to 200 miles (and, depending on the extent of the Continental Shelf, to 350 miles in certain areas). The Act prohibits the incineration of substances at sea and the disposal at sea of radioactive wastes and toxic, harmful or noxious substances. Disposal at sea of sewage will be prohibited from the end of 1998. The strict regulation of dumping at sea under the Act gives effect in Ireland to the relevant provisions of the OSPAR Convention.

Cetacea

Irish waters are among the most important areas in Europe for Cetacea (whales, dolphins and porpoises) and contain important feeding and breeding areas for those species. Ireland acknowledged the significance of its waters for Cetacea by declaring them a Whale and Dolphin Sanctuary in 1991, the first such sanctuary in Europe. Ireland's commitment at international level to whale conservation is also recognised through its input into the International Whaling Commission. All whale and dolphin species are protected in Irish waters under the Whale Fisheries Act, 1937, and the Wildlife Act, 1976. However, there is a need for better information on the status of cetaceans in Irish waters and on the threats faced by them.

Marine Research

The Marine Institute is currently involved in funding some 50 research projects related to marine resource development. As the sustainable development of marine resources is a key objective of the Institute, a number of the projects will input directly into the current knowledge of marine biodiversity and conservation issues.

In the area of Fisheries and Aquaculture Research and Development, projects include

- development of a commercial brown squid fishery in Ireland
- investigation of the location and extent of the main herring spawning beds around Ireland
- a study of the age structure and demography of commercial species of ray in Irish waters
- the development of a computerised system for visualising and mapping shell fisheries data
- strain hybridisation field experiments and genetic fingerprinting of the edible brown seaweed
- qualitative and quantitative investigation of benthic invertebrate discarding by the Irish demersal fleet
- assessment of pelagic stocks.

In the context of the Irish National Marine Survey, projects include

- the distribution of maerl beds around Ireland and their potential for sustainable extraction
- mapping and assessment of exploitable algal biomass off the west coast of Ireland
- reconnaissance survey of the Irish Continental Shelf
- survey of bottle-nosed dolphin in the Shannon Estuary
- assessment of the potential for sustainable development of the edible periwinkle *Littorina littorea* industry in Ireland
- reconnaissance assessment of coastal seabed sand and gravel resources in the form of seabed mapping and quantification
- national coastline survey using aerial digital photography (ADP)
- hydrodynamic model of Irish coastal waters.

The Marine Research Measure of the Operational Programme for Fisheries 1995-99 is administered by the Marine Institute on behalf of the Department of the Marine and Natural

Resources. All projects funded under the Research Measure receive 75% financial assistance from the EU Regional Development Fund.

Irish marine scientists are also involved as collaborative researchers in over 60 EU funded marine research and development projects in Programmes such as MAST-III, FAIR and Maritime INTERREG, a number of which have marine biodiversity/conservation aspects.

In the context of the Marine Science and Technology MAST-III Programme 1994-98, projects include

- automated identification and characterisation of marine microbial populations (AIMS)
- coastal region long-term measurements remote sensing development and validation (COLORS)
- advanced RDV package for automatic mobile inspection of sediments (ARAMIS)
- assessing the biological and physical dynamics on intertidal sediment systems: a remote sensing approach (BIOPTIS)
- ocean colour for the determination of water column biological processes
- testing monitoring systems for risk assessment of harmful introductions by ships to European waters
- high resolution temporal and spacial study of the benthic biology and geochemistry of a north-eastern Atlantic abyssal location (BENGAL)
- integrating environmental and population variation: a model for biodiversity
- interactions of physical and biological factors in the surf and swash zone of European rocky shores
- autonomous Lander instrument packages for oceanographic research.

In the context of the Agriculture and Fisheries Research (FAIR) Programme 1994-98, projects include studies on

- commercial fish and European estuaries: priorities for management and research
- improvements of tagging methods for stock assessments and research
- aquaculture of the edible red seaweed *Palmaria palmata*: development of techniques and economic analysis
- influence of competitive interaction on the abundance of early benthic stage European lobster and on the carrying capacity of lobster habitats
- cephalopod resource dynamics: patterns in environmental and genetic variation
- assessment and reduction of the by-catch of small cetaceans
- developing deep-water fisheries: data for their assessment and understanding their interaction with an impact on fragile environment
- a calibration of different molecular markers for use in discrimination and management of stocks of commercially important fish species.

In the context of the EU Maritime (Ireland/Wales) INTERREG Programme 1994-99, projects include

- the South West Irish Sea Survey (SWISS)

- sensitivity mapping of inshore marine biotopes in the southern Irish Sea (SensMap)
- Grey Seals: status and monitoring in the Irish and Celtic Seas
- the Collaborative Celtic Marine Mammal Project
- the Roseate Tern: the natural connection.

Chapter 14

PUBLIC AWARENESS & EDUCATION

State and State-sponsored involvement in biodiversity education and awareness raising

A variety of State or State-supported institutions are involved in education and awareness raising related to biodiversity, including a number of Divisions of the Department of Arts, Heritage, Gaeltacht and the Islands, or bodies associated with the Department.

The *Education and Visitor Service* (EVS) of Dúchas The Heritage Service of the Department of Arts, Heritage, Gaeltacht and the Islands has a number of objectives in relation to biodiversity education and awareness raising, including:

- the presentation of parks, gardens, nature reserves and waterways to the public through the training of guides (some 300 guides at 55 natural and cultural heritage sites) and the provision of on-site interpretation;

- the promotion of the work of conservation undertaken by Dúchas by providing an information service;

- the deepening of the appreciation of heritage among the public, and especially young people, by undertaking public awareness projects, co-ordinating an educational programme aimed mainly at first and second level students, focussing attention on teacher training, and co-ordinating on-site informal educational programmes.

As an illustration of the greatly increased role of heritage sites in public education and awareness, it is worth noting that in 1969 there were some 65,000 visitors to 2 sites with guide services in Ireland, whereas today there are over 2 million fee-paying visitors to more than 50 such sites throughout the country.

EVS annually produces and distributes a Newsletter to all national schools. The Newsletter features historical information on many of Ireland's archaeological and architectural properties, as well as wildlife and environmental issues. Art competitions and crosswords which have an environmental theme are also featured.

EVS is currently working on the development of a new web site that will provide information on all aspects of Ireland's built and natural heritage. It is hoped to have this service in place by the end of 1998.

Each year, in line with the Council of Europe, *Dúchas* organises an open day known as "National Heritage Day" at many of the State heritage properties, in partnership with heritage properties in both semi-State and private ownership. The purpose of National Heritage Day is to encourage Irish people, both young and old, to visit and enjoy their unique natural and built heritage. Additional lectures, walks, and exhibitions are organised at many of these sites to

celebrate this Day with special activity events such as painting competitions organised for children. This event is widely advertised and all media coverage is handled by Dúchas.

The *National Parks and Wildlife* Division (NPW) of Dúchas also manages and provides public information on biodiversity in National Parks, Nature Reserves and other natural heritage sites. NPW Wildlife Rangers are involved in public and school education, in addition to their regulatory functions. NPW also produces a number of educational publications each year.

The *Natural History Museum* - which is a constituent part of the National Museum of Ireland within the Department of Arts, Heritage, Gaeltacht and the Islands - holds a collection of Irish fauna specimens on public display, in addition to its research function.

The *National Botanic Gardens* (NBG), which also comes within the overall framework of the Department of Arts, Heritage, Gaeltacht and the Islands, holds a living collection of 20,000 plant species and cultivars and 500,000 preserved specimens. The NBG has expanded its educational role to incorporate biodiversity into new interpretative displays and educational material.

The *Heritage Council* is an independent State body which was established under the Heritage Act, 1995, and its funding is channelled through the Department of Arts, Heritage, Gaeltacht and the Islands. In accordance with its statutory functions, the Council is mandated to

- promote interest, education, knowledge and pride in, and facilitate the appreciation and enjoyment of, the national heritage.

The Council has drawn up a plan which identifies its mission and provides the framework within which its activities will be carried out until the year 2000. "Promoting pride in Ireland's Heritage" is one of the three key themes which have been identified. Heritage education is one of its three priorities and the Council, inter alia, sponsors voluntary nature conservation projects and produces publications.

The National Conservation Education Centre has a throughput of about 4,000 people per year, 90% of which are primary schoolchildren, with the remainder consisting of secondary school students and members of community groups. The Centre teaches courses in Ecology for the second level Leaving Certificate and provides a third level European Diploma course in Conservation Management for up to 15 mature students annually. The Centre is managed by a charity, the Conservation Education Trust, on behalf of the Department of Arts, Heritage, Culture and the Islands. A cross-border biodiversity awareness programme is planned, to be organised jointly with the Ulster Wildlife Trust and the Irish Wildlife Trust.

ENFO - the Government Environmental Information Service - was established in 1990 and provides a wide variety of environmental information which is easily accessible. ENFO provides a library, exhibition space and a range of environmental publications for schools, colleges and the general public. Information is stored in a variety of media, such as books, journals, leaflets, videos, microfiche and computer databases. ENFO presents lectures and other activities for visiting groups and the public and has exhibition space for environmental groups and agencies. Many public libraries can now gain access to the ENFO database. All the

major local authorities have an Environmental Information Officer and ENFO provides them with a liaison and support service.

The *Department of the Environment and Local Government* funds, inter alia, voluntary nature conservation awareness projects and publishes "Environment Bulletin", which reports on national and international environmental policy issues. The *Department of the Marine and Natural Resources* is involved in awareness raising on issues such as water pollution and fisheries. The *Department of Agriculture and Food* and *Teagasc*, the State Agriculture and Food Development Authority are also involved in raising public awareness in relation to some issues concerning agriculture and biodiversity.

Dublin Zoo and *Fota Wildlife Park*, Co. Cork, have collections of mainly exotic and some native fauna on public display.

Non-government involvement in biodiversity education and awareness raising

Voluntary societies play an important role in awareness raising, through campaigns, political lobbying, projects, publications, competitions, field trips and properties.

The *Royal Irish Academy*, in addition to its scientific research role, organises conferences and produces publications on nature conservation, while the *Royal Dublin Society* promotes scientific research, and hosts events such as the annual "Young Scientists Competition".

There are a number of conservation NGOs which are involved with awareness raising relevant to biodiversity in addition to or complimentary to their conservation work. *Birdwatch Ireland* is concerned with awareness raising on wildlife conservation, focussing on birds. It organises projects such as the Corncrake Conservation Project, which has achieved a high public profile for this threatened species. The National Association of Regional Game Councils (NARGC) is involved in research and conservation of wildlife species and habitats and in education, particularly in relation to game species. The NARGC launched the Irish Habitat Conservation Stamp Programme 1997-1998. The purpose of the programme is to raise funds for the conservation of wildlife habitats in Ireland and Europe, in particular wetlands through the sale of a conservation stamp and limited edition artwork. The *Irish Wildlife Trust* (IWT) is concerned with conservation of native fauna and flora, and highlights threatened or vulnerable species and habitats. Examples of its work include its Grasslands Campaign, aimed at conserving semi-natural grassland ecosystems and the public information campaign on CITES (Convention on International Trade in Endangered Species). The IWT founded the National Conservation Education Centre, which holds field-based courses in nature conservation for schools and colleges. The *Irish Peatland Conservation Council* (IPCC) focuses on peatland conservation, and, in addition to its campaigning role, provides educational material for schools and is involved in teacher training. *An Taisce* - The National Trust for Ireland, while its focus is not primarily on nature conservation, organises field trips and campaigns for the protection of wildlife habitats. It currently runs the "Young Reporters for the Environment" project, which can include biodiversity issues. The *Irish Genetic Resources Conservation Trust* is involved with awareness raising in addition to its conservation role, as is *Genetics Concern*. *VOICE* and *Earthwatch* are involved in public information campaigns and *ECO* is

focussed on youth environmental activities. The *Irish Coastal Environment Group* and the *Irish Whale and Dolphin Group* concentrate on marine nature conservation issues. The *Speleological Union of Ireland* concentrates on, inter alia, subterranean nature conservation issues.

Regional and local organisations involved in education and awareness raising on biodiversity include the *Connemara Environmental Education Centre*, which organises seminars and field trips in the west of Ireland, the *Dublin Naturalists Field Club*, which caters for amateur naturalists, and the *Killarney Nature Conservation Group*. *Sherkin Island Marine Station* has an aquarium and produces a national newsletter concentrating mainly on marine issues, while the *Dingle Aquarium* is focussed on regional marine life.

Co-operation between private and State environmental bodies

There are numerous examples of co-operation between private and State environmental bodies. State agencies have given financial and/or logistical support for environmental awareness campaigns and conservation projects run by voluntary groups. Examples include Birdwatch Ireland's Corncrake Conservation Scheme and the Irish Wildlife Trust's CITES information campaign.

PART IV

BIODIVERSITY PLANNING

Chapter 15

IMPLEMENTATION OF THE CBD IN IRELAND

The CBD in Ireland

Ireland ratified the CBD in 1996. A general point to note about ratification of that Convention - and of Conventions in general - by Ireland is that almost invariably Ireland does not ratify a Convention unless the measures required under it, and most particularly any legislation required, are already in place. Therefore, when the Convention was ratified in 1996, the essential legislative and other measures required were already in place in this country. However, it is vital to ensure the implementation of the Convention on an ongoing basis and enhance Ireland's commitment to the Convention and its implementation in this country.

It is considered that there are four interrelated avenues through which the Convention can be advanced by Ireland:

- by Ireland's continued involvement with the CBD process at the international, and also the regional - and especially the EU - levels, thereby ensuring that Ireland continues to be aware of and to be guided by further developments under the Convention and, at the same time, is in a position to have Ireland's views fed into the CBD process, as appropriate.

- by heightening the awareness of and involvement of all sectors, including, most importantly in the first instance, Government Departments, with the Convention and its obligations.

- by ensuring that the objectives and obligations of the Convention (and further developments under it) are reflected in the development and implementation of policies, legislation, plans and programmes in the area of nature conservation and, equally crucially, in all other relevant sectors of Government.

- by the development of a National Biodiversity Plan.

With regard to the first point, Ireland is actively involved with the CBD process at all levels. At the international level, Ireland participates in meetings of the COP, SBSTTA, etc. and attempts to ensure that this involvement is not limited just to the Department with primary responsibility for nature conservation but that it extends to include all of the main Departments related to biodiversity. In the case of the last COP, Ireland held the Presidency of the EU and was responsible for coordinating EU preparations for and participation in the that meeting.

In order to make progress on the second avenue, an interdepartmental Steering Group on Biodiversity has been established. The main function of this group is to secure the involvement of the main Departments who are responsible for biodiversity, to provide for a point of direct contact between them, and to co-ordinate the response to and implementation of the Convention in Ireland.

With regard to the third point, the obligations of the Convention are already reflected to a large extent in nature conservation policies, legislation, etc, though there are some gaps and certainly much scope and necessity for improvement in relation to existing measures. In the case of the integration of biodiversity - or at least environmental concerns - into other sectors, this was already accepted in principle as part of both national and EU policy but the CBD has placed a very high emphasis on it. A particular focus of the Heritage Policy and Legislation Division of the Department of Arts, Heritage, Gaeltacht and the Islands is to try to ensure that measures for the conservation of the heritage, including biodiversity, are incorporated into the policies, legislation and programmes of other Departments. It could be argued that the effective realisation of the principle that each and all sectors/actors are responsible for the conservation of biodiversity will ultimately prove more productive than any other conservation measure such as the protection of sites or species conservation programmes.

The National Biodiversity Plan - the process to date in Ireland

The most important means of delivering the CBD at the national level is through the preparation of national strategies or plans. The obligation to develop national strategies or plans is contained in Article 6 of the Convention, which sets out the general measures for conservation and sustainable use. Article 6 deals with both the development of national plans and the integration of biological diversity concerns into other sectors.

With regard to Ireland's National Biodiversity Plan, the first step in the process was to consider the overall approach to be followed in implementing Article 6. Prior to Ireland's ratification of the Convention, the strategies, plans and programmes necessary to implement the Convention were being developed by Ireland in accordance with the provisions of the Wildlife Act, 1976, and of various EU Directives and international conventions which this country has ratified. However, it was decided that there was a need to draw all these strategies and plans into one coherent plan and strengthen Ireland's commitment to the Convention on Biological Diversity and also Chapter 15 of Agenda 21. The Department of Arts, Heritage, Gaeltacht and the Islands, as the Department with lead responsibility for the CBD in this country, is responsible for preparing the Plan. The Plan is being drafted in-house by the Heritage Policy and Legislation Division.

It was considered essential to secure the involvement of other Government Departments in the process - a plan based solely on the work of the Government Department with responsibility for nature conservation would be considerably different and more limited than one which dealt with all aspects of biodiversity.

It was also decided that it was necessary to produce a preliminary document as a basis for discussion and to stimulate a response from other Departments. A preliminary draft of the plan was prepared and circulated to the main Government Departments involved with biodiversity. It was also circulated to the Heritage Council. Departments and the Heritage Council were asked to comment on the preliminary draft and to come forward with views as to other issues and specific measures that should be included in the Plan.

It was agreed in principle that there should be the widest possible participation in the development of the Plan. In order to ensure this, public notices were placed in the national press last July announcing the preparation of the Plan and inviting submissions from interested parties, be they bodies, organizations, or individuals. Direct contact was also made with relevant organizations, third level institutions and NGOs, representative of both conservation and sectoral interests, inviting submissions. Approximately fifty submissions were received, quite a number of which were comprehensive. At this stage, these submissions have been reviewed and are being incorporated, as appropriate, into the second draft of the National Plan.

National Biodiversity Plan - the likely content

The draft Table of Contents, as set out below, indicates the general structure and likely contents of the Plan.

Draft Table of Contents

CONTEXT and INTRODUCTION
INVENTORY OF BIOLOGICAL DIVERSITY IN IRELAND
STRATEGIES AND ACTIONS
Themes
General considerations - integration across sectors
Legislation
Protected Areas
Species Conservation
Habitat Conservation
Country-wide Conservation
Conservation of Genetic Diversity
Public Awareness and Education
Knowledge
Resources
Structures
EU, Regional an International
Important Sectors
Agriculture
Forestry
Marine
DELIVERY, IMPLEMENTATION AND REVIEW

The Plan will review the state of biological diversity in Ireland (habitat, species and genetic diversity) and outline the measures which are currently in place for the conservation and sustainable use of biological diversity. Three background reports on biodiversity in Ireland (one dealing with flora, one with the fauna, and one with habitats and existing conservation measures) were commissioned. These were not intended to provide a comprehensive in-depth

review of the status of biodiversity in Ireland. The intention was to draw together material for the Plan which would provide a general overview of biodiversity in the country, our knowledge of it, and the measures already in place. The Plan is likely to include mention of the many lesser components of biodiversity and not be concerned solely with the better known and more 'popular' groups of organisms.

The main emphasis will be on setting out strategies and actions to be pursued under a number of themes and sectors. The Plan will address the main issues of concern, assess the adequacy or otherwise of existing measures and secure commitments for action. Ideally, it could also set targets, assign responsibilities and indicate costs. It will also provide an opportunity to indicate the many relevant measures and programmes which are already in place.

The National Biodiversity Plan - the next steps

At this stage, the second and what is hoped will be essentially the final draft of the Plan is nearing completion. It will be circulated to all Departments and the Heritage Council for discussion. It is anticipated that the Plan will be agreed by all Departments and approved by Government. The Minister for Arts, Heritage, Gaeltacht and the Islands has indicated her intention to have the Plan published in 1998.

LIST OF APPENDICES

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APPENDIX II	**Numbers of species of Irish Fauna in each of the major groups**
APPENDIX III	**Status of Irish vertebrate species by Red Data Book category**
APPENDIX IV	**The types and approximate number of licences and permissions issued per annum under the Wildlife Act, 1976**

APPENDIX I Status of Irish vascular plant species by Red Data Book category

EXTINCT SPECIES	*ENDANGERED SPECIES*
Agrostemma githago	***Colchicum autumnale***
Anthemis arvensis	***Orthilia secunda***
Carex divisa	***Otanthus maritimus***
Centaurea cyanus	***Papaver hybridum***
Euphorbia peplis	***Saxifraga granulata***
Lolium temulentum	***Saxifraga hirculus***
Matthiola sinuata	
Scandix pecten-veneris	
Scheuchzeria palustris	
Serratula tinctoria	

APPENDIX I (contd)

VULNERABLE SPECIES	*VULNERABLE SPECIES CONTD.*	*RARE SPECIES*	*RARE SPECIES CONTD.*
Acinos arvensis	*Trifolium glomeratum*	*Ajuga pyramidalis*	*Oenanthe pimpinelloides*
Adoxa moschatellina	*Trifolium subterraneum*	*Alchemilla alpina*	*Omalotheca sylvatica*
Arthrocnemum perenne	*Trollius europaeus*	*Allium schoenoprasum*	*Ornithopus perpusillus*
Asplenium billotii	*Vicia orobus*	*Arenaria ciliata*	*Orobanche rapum-genistae*
Calamagrostis stricta	*Viola hirta*	*Asparagus officinalis*	*Pilularia globulifera*
Campanula trachelium	*Viola lactea*	*Asplenium septentrionale*	*Poa alpina*
Carex pauciflora		*Astragalus danicus*	*Poa palustris*
Centaurium littorale		*Bromus racemosus*	*Polygonum maritimumPolystichum lonchitis*
Centaurium pulchellum		*Calamagrostis epigejos*	
Cephalanthera longifolia		*Callitriche truncata*	*Potentilla fruticosa*
Eleocharis parvula		*Cardamine amara*	*Puccinellia fasciculata*
Epipactis phyllanthes		*Cardamine impatiens*	*Pyrola media*
Erica ciliaris		*Cardaminopsis petraea*	*Pyrola rotundifolia*
Erica vagans		*Carex depauperata*	*Pyrola rotundifolia maritima*
Erigeron acer		*Carex magellanica*	*Ranunculus fluitans*
Galeopsis angustifolia		*Cirsium helenioides*	*Ranunculus tripartitus*
Geranium purpureum		*Cryptogramma crispa*	*Rorippa islandica*
Geranium rotundifolium		*Deschampsia setacea*	*Rumex maritimus*
Geranium sylvaticum		*Draba incana*	*Salix phylicifolia*
Groenlandia densa		*Elatine hydropiper*	*Salvia verbenaca*
Gymnocarpium dryopteris		*Epilobium alsinifolium*	*Saussurea alpina*
Gymnocarpium robertianum		*Equisetum pratense*	*Saxifraga aizoides*
Hordeum secalinum		*Erica mackaiana*	*Saxifraga hartii*
Hydrilla verticillata		*Eriophorum gracile*	*Saxifraga nivalis*
Hypericum hirsutum		*Filipendula vulgaris*	*Saxifraga oppositifolia*
Inula salicina		*Frangula alnus*	*Sibthorpia europaea*
Kickxia elatine		*Hammarbya paludosa*	*Silene acaulis*
Melampyrum sylvaticum		*Helianthemum canum*	*Spiranthes romanzoffiana*
Mentha pulegium		*Helianthemum nummularium*	*Taraxacum gotlandicum*
Misopates orontium		*Hierochloe odorata*	*Teesdalia nudicaulis*
Orchis morio		*Hottonia palustris*	*Trichomanes speciosum*
Pseudorchis albida		*Hyoscyamus niger*	*Tuberaria guttata*
Rubus chamaemorus		*Hypericum canadense*	*Vicia lathyroides*
Sanguisorba officinalis		*Juncus compressus*	*Viola persicifolia*
Scirpus triqueter		*Lamiastrum galeobdolon*	
Scrophularia umbrosa		*Lepidotis inundata*	
Simethis planifolia		*Ligusticum scoticum*	
Stachys officinalis		*Limosella aquatica*	
		Logfia minima	
		Lotus subbiflorus	
		Mertensia maritima	
		Minuartia recurva	
		Montropa hypopitys	
		Najas flexilis	

APPENDIX I (contd)

NON RARE OR THREATENED SPECIES	***INDETERMINATE SPECIES***
Andromeda polifolia	*Arenaria norvegica*
Carex elongatia	*Carduus nutans*
Crambe maritima	*Hordelymus europaeus*
Dactylorhiza traunsteineri	*Hypochoeris glabra*
Dryas octopetala	*Lathyrus japonicus*
Epipactis palustris	*Polygonum viviparum*
Lathyrus palustris	
Limonium binervosum	
Limonium paradoxum	
Limonium transwallianum	
Neottia nidus-avis	
Ophrys apifera	
Orobanche hederae	
Primula veris	
Prunus padus	
Sisyrinchium bermudiana	

APPENDIX II Numbers of species of Irish Fauna in each of the major groups

PHYLUM	MAJOR GROUPS (common names in brackets)	NUMBER OF SPECIES
1. Protozoa		
All groups		614++
2. Metazoa		
Porifera	(sponges)	225
Coelenterata	(sea anemones, jellyfish)	263
Ctenophora	(comb jellies)	3
Platyhelminthes	Turbellaria (planarians)	107
	Trematoda (flukes)	98+
	Cestoda (tapeworms)	49+
Nemertea	(ribbon worms)	39
Nematoda	(round worms)	579++
Nematomorpha	(horsehair worms)	2
Acanthocephala	(spiny-headed worms)	13+
Kinorhyncha		5
Priapulida		1**
Rotifera	(wheel animalcules)	315
Chaetognatha		14
Gastrotricha		3+
Annelida	Polychaeta (e.g. lugworms)	342
	Oligochaeta (e.g. earthworms)	162+
	Hirudinea (leeches)	14
Pogonophora		15+
Sipuncula		13**
Echiura		6**
Pentastomida		2
Bryozoa	(moss animals)	199

PHYLUM	MAJOR GROUPS (common names in brackets)	NUMBER OF SPECIES
Entoprocta		34**
Phoronida		4
Brachiopoda	(lamp shells)	4+
Mollusca	(e.g. squids, snails, bivalves, chitons)	688
Arthropoda (5 major groups)	1. Tardigrada(water bears)	41
	2. Chelicerata Arachnida (spiders, mites, ticks)	860
	Pycnogonida (sea spiders)	19+
	3. Crustacea Branchiopoda (fairy shrimps and water fleas)	82
	Ostracoda (seed shrimps)	207
	Copepoda (water fleas)	697
	Branchiura (fish lice)	2
	Cirripedia (barnacles)	29
	Malacostraca (shrimps, prawns, crabs)	767
	4. Myriapoda Diplopoda	38
	Chilopoda	21
	5. Uniramia Thysanura (bristle-tails)	3++
	Diplura (two-pronged bristle tails)	6**
	Protura	5
	Collembola (spring tails)	203
	Ephemeroptera (may flies)	34
	Plecoptera (stoneflies)	19
	Odonata (dragonflies)	22
	Orthoptera (grasshoppers, cockroaches)	15
	Dermaptera (earwigs)	2
	Psocoptera (book lice)	45

PHYLUM	MAJOR GROUPS (common names in brackets)	NUMBER OF SPECIES
	Mallophaga (biting lice)	98
	Anoplura (sucking lice)	10+
	Hemiptera (bugs)	843++
	Thysanoptera (thrips)	5+
	Neuroptera (lacewings)	31
	Megaloptera (alder flies)	1
	Coleoptera (beetles)	2100++
	Strepsiptera	1
	Siphonaptera (fleas)	40
	Diptera (true flies)	2,350+
	Lepidoptera (butterflies, moths)	821
	Trichoptera (caddis flies)	144
	Hymenoptera (ants, bees, wasps)	586++
Echinodermata	(sea urchins, starfish)	73
Hemichordata		12**
Chordata	Urochordata (sea squirts)	105**
	Agnatha (lampreys)	3
	Pisces (fish)	243
	Amphibia (frogs, toads, newts)	3
	Reptilia (lizards)	1
	Aves (birds)	161
	Mammalia (mammals) - excluding humans	55

Some groups are likely to be under-recorded (indicated by +).

Information on some of the groups was difficult to obtain (indicated by ++).

Information on some marine groups is taken from surveys of seas around Britain, Ireland and North-West Europe, and does not differentiate between Irish and other neighbouring countries (indicated by **).

APPENDIX III Status of Irish vertebrate species by Red Data Book category

English Names	*Latin Names*	*Red Data Book Category*
MAMMALS **Threatened or extinct**		
Whiskered bat	*Myotis mystacinus*	I
Natterer's bat	*Myotis natteri*	I
Ship rat	*Rattus rattus*	R
Grey wolf	*Canis lupus*	Ex (since 1786)*
Internationally important		
Hedgehog	*Erinaceus europaeus*	II
Lesser horseshoe bat	*Rhinolophus hipposidderos*	II
Daubenton's bat	*Myotis daubentoni*	II
Leisler's bat	*Nyctalus leisleri*	II
Pipistrelle	*Pipistrellus pipistrellus*	II
Brown long eared bat	*Plecotus auritus*	II
Irish hare	*Lepus timidus hibernicus*	II
Pine marten	*Martes martes*	II
Badger	*Meles meles*	II
Otter	*Lutra lutra*	II
BIRDS **Threatened or extinct**		
Red-throated diver	*Gavia stellata*	R
Black-necked grebe	*Podiceps nigricollis*	R
Bittern	*Botaurus stellaris*	Ex (since 19th c.)
Gadwall	*Anas strepera*	R
Pintail	*Anas acuta*	R
Garganey	*Anas querquedula*	R
Shoveler	*Anas clypeata*	R
Pochard	*Aythya ferina*	R
Common scoter	*Melanitta nigra*	R

English Names	*Latin Names*	*Red Data Book Category*
Goosander	*Mergus merganser*	R
White-tailed eagle	*Haliaetus albicilla*	Ex (since 19th c.)
Marsh harrier	*Circus aeruginosus*	Ex (since 19th c.)
Golden eagle	*Aquila chrysaetos*	Ex (since 19th c.)
Merlin	*Falco columbarius*	R
Capercaillie	*Tetrao urogallus*	Ex
Grey partridge	*Perdix perdix*	E
Corncrake	*Crex crex*	E
Golden plover	*Pluvialis apricaria*	V
Dunlin	*Calidris alpina*	V
Black-tailed godwit	*Limosa limosa*	R
Greenshank	*Tringa nebularia*	R
Red-necked phalarope	*Phalaropus lobatus*	E
Roseate tern	*Sterna dougalli*	E
Little tern	*Sterna albifrons*	V
Barn owl	*Tyto alba*	I
Short-eared owl	*Asio flammeus*	R
Nightjar	*Caprimulgus europaeus*	E
Woodlark	*Lullula arborea*	Ex
Ring ouzel	*Turdus torquatus*	R
Wood warbler	*Phylloscopus sibilatrix*	R
Bearded tit	*Panurus biarmicus*	R
Tree sparrow	*Passer montanus*	I
Twite	*Carduelis flavirostris*	I
Corn bunting	*Miliaria calandra*	E
Internationally important		
Storm petrel	*Hydrobates pelagicus*	II
Whooper swan	*Cygnus cygnus*	II
Greenland white-fronted goose	*Anser albifrons flavirostris*	II
Barnacle goose	*Branta leucopsis*	II

English Names	*Latin Names*	*Red Data Book Category*
Light-bellied brent goose	*Branta bernicla*	II
Peregrine falcon	*Falco peregrinus*	II
Chough	*Pyrrhocorax pyrrhocorax*	II
AMPHIBIANS		
Threatened		
Natterjack toad	*Bufo calamita*	E
Internationally important		
Common frog	*Rana temporaria*	II
FISH		
Threatened		
Sea lamprey	*Petromyzon marinus*	I
River lamprey	*Lampetra fluviatilis*	I
Brook lamprey	*Lampetra planeri*	I
Allis shad	*Alosa alosa*	E
Twaite shad	*Alosa fallax fallax*	V
Killarney shad	*Alosa fallax killarnesis*	E
Arctic char	*Salvelinus alpinus*	V
Pollan	*Coregonus autumnalis pollan*	E
Smelt	*Osmerus eperlanus*	V
Internationally important		
Atlantic salmon	*Salmo salar*	II

Key: Ex = extinct; E = endangered; V = vulnerable; R = rare; I = indeterminate; II = internationally important.

* Other native mammals made extinct by humans in prehistoric times include the aurochs, brown bear, beaver and wild boar.

 At least 19 bird species are considered to have been added to the avifauna since about 1600, and an estimated six species have been lost.

Source: Whilde, A. (1993) Threatened mammals, birds, amphibians and fish in Ireland: Irish Red Data Book 2: Vertebrates. HMSO, Belfast.

APPENDIX IV The types and approximate number of licences and permissions issued per annum under the Wildlife Act, 1976

TYPE	Approx. NUMBER
Taking of protected wild flora	14
Capture/killing of wild birds for educational, scientific or other purposes	2
Taking of eggs of wild birds for educational, scientific or other purposes	3
Ringing of wild birds	47
Capture/killing of wild animals, other than birds, for educational, scientific or other purposes	500
Control of protected species causing damage	120
Export of protected fauna	33
Import of wild animals and wild birds	76
Wildlife dealing	120
Certificates under EC Council Regulations on implementation of Convention on International Trade in Endangered Species (CITES)	100
Deer hunting	1,200
Hunting over State foreshore	600
Taking, possession and use of birds for falconry/captive breeding	125
Killing of pen-reared game birds	66
Hunting of game birds by out of state residents	3,000
Other hunting licences	7

GLOSSARY

An Bord Pleanála	Statutory body established to deal with appeals under the Local Government (Planning and Development) Act, 1976
Birds Directive	Directive 79/409/EEC of 6 March 1991 on the conservation of wild birds
Bord na Móna	Statutory body established to develop Irelands peatlands
Coford	The National Council for Forest Research and Development
Coillte	Statutory body established to manage public forests and related activities commercially
Dúchas	The Heritage Service of the Department of Arts, Heritage, Gaeltacht and the Islands
EIA	Environmental Impact Assessment carried out in accordance with the EIA Directive
EIA Directive	Council Directive 97/11/EC of 3 March 1997 amending Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment
EPA	The Environmental Protection Agency is a statutory body established to promote improved environmental protection in Ireland
Habitats Directive	Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora
Marine Institute	Statutory body with responsibility for promoting and co-ordinating marine research and development
NHA	Natural Heritage Area
NPW	National Parks and Wildlife is part of Dúchas The Heritage Service of the Department of Arts, Heritage, Gaeltacht and the Islands
SAC	Special Area of Conservation is a protected area designated under the Habitats Directive
SPA	Special Protection Area is a protected area is a protected area designated under the Birds Directive
Teagasc	The Agricultural and Food Development Authority is a statutory body which provides research, education and training services to the agricultural and food industry