Environmental RTDI Programme 2000–2006

Preliminary Study of the Needs Associated with a National Ecological Network (2000-LS-4-4)

Synthesis Report

(Please note that the main report relating to this project can be downloaded from the Research and Development webpages of the EPA website www.epa.ie)

Prepared for the Environmental Protection Agency

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Table of Contents

Preliminary Study of the Needs Associated with a National Ecological Network

Summary and Implications for Policy

Introduction

This is the report on a background study for the National Spatial Strategy. The objective of the study was to examine the relevance of an Ecological Network approach to the conservation of biodiversity. An ecological network is a network of sites. Its constituents are:

'core areas' of high biodiversity value; and

'corridors' or 'stepping-stones', which are linkages between them.

In contrast to species- or site-based conservation, the ecological network approach promotes management of 'linkages' between areas of high biodiversity value, between areas of high and low biodiversity value, between areas used by species for different functions, and between local populations of species. 'Corridors' or linking areas can support species migration, dispersal or daily movements (see Fig. 1).

The brief for the study requested two specific outputs:

* a review of existing data;

* a proposed framework for a National Ecological Network (NEN).

As no previous studies have been carried out on the relationship between biodiversity and national spatial planning in Ireland, the study approach emphasised consultation and mutual learning between ecologists from various backgrounds and between ecologists and spatial planners. The research team looked at the current relationship between biodiversity and spatial planning policies, reviewed the experience elsewhere of developing ecological networks (including study visits to The Netherlands and Cheshire), and considered what benefits, if any, the ecological network approach could have for biodiversity conservation in Ireland.

The timescale and the brief confirm that it is a preliminary study. The results should be used principally to stimulate debate. It is recommended that the study topic should be revisited in 2 years to review its conclusions.

Criteria for an Ecological Network

The first task was to establish the value of an ecological network approach in the context of priorities for biodiversity management in Ireland. This was carried out by examining the policies and practices underpinning ecological network development, by analysing the impact of fragmentation on habitats and species in Ireland, and by reviewing how the ecological network approach could support the conservation of biodiversity. These reviews were carried out by a wide range of consultant ecologists and planners. This report interprets the results of these reviews, which are included in a separate volume of the final report.
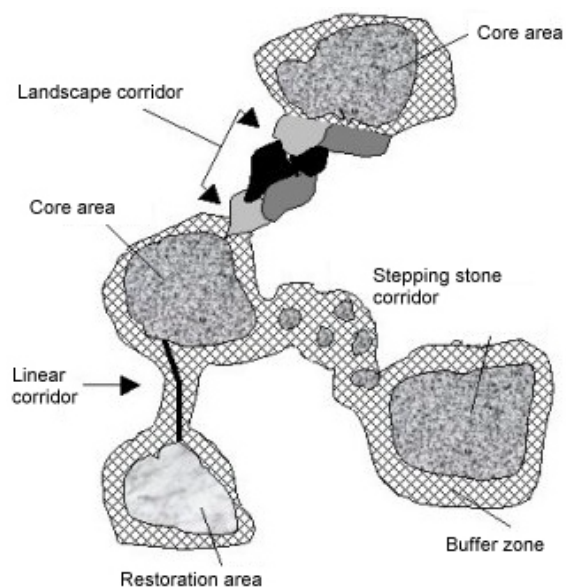
Figure 1. Schematic example of an ecological network. From ECNC (European Centre for Nature Conservation) (2000).

European spatial planning policies support the ecological network approach. It is part of the European Spatial Development Perspective and underpins the Pan-European Biological and Landscape Diversity Strategy (PEBLDS), which has been ratified by Ireland. Previous reviews of landscape management had recommended this approach for Ireland (Aalen, 1997). A Dúchas-sponsored review (Good, 1998) suggested that corridor development should be pursued at the local scale. Article 10 of the Habitats Directive refers to the value of typical corridor features, hedgerows, ponds or woodlands for the conservation of designated habitats and species. As all European sites must be protected under the Habitats Regulations (S.I. No. 94 of 1997 section 26 (c)) protection is also given to these features.

The review section of the research project concluded that planning for and realising an ecological network would contribute to the conservation of biodiversity. It would complement and support traditional approaches to biodiversity management. It would prevent conservation areas becoming isolated islands, give explicit recognition to the impacts of fragmentation on habitats and species, highlight the importance of different types of areas of biodiversity importance, and support multi-functional land-use planning.

The review identified a broad range of sites as potential cores and corridors and the following groups of plants and animals that would benefit from an ecological network approach:

- Habitat-specific species of plants and animals that are poor dispersers or require large home ranges

- All migratory species of birds, fish, butterflies, whales and dolphins

- All aquatic animals and plants that rely on freshwater or marine biotopes as 'commuting' and 'dispersal corridors'

- Species whose nesting/breeding areas are protected but whose 'commuting' corridors are not, e.g. hen harrier and chough, and mammals including bats

- Farmland-breeding birds, as these are not associated with rare protected habitats and whose numbers have declined due to changes in farming practices and habitat fragmentation.

Criteria were elaborated to classify the relative importance of areas within an ecological network (EcoNet). Five types of areas were defined on the basis of 'naturalness'.

Areas within EcoNet Class 1 should have the following characteristics:

1. support natural or near-natural vegetation types;

2. contain landscape features that act as corridors as well as core areas such as uplands, rivers, lakes and coastline;

3. contain flora and fauna that are specialists, i.e. typical of particular habitats, or support migratory species either as feeding, nesting or roosting areas, particularly species such as those listed in Annex I of the Birds Directive, Annexes II and IV of the Habitats Directive, and in the Red Data Books for plants, vertebrates, plants and stoneworts.

Class 2 areas should have the following characteristics:

1. support natural or near-natural vegetation types;

2. while an area has many of the species and characteristics that would be expected to occur in a natural or semi-natural area, the quality has been reduced due to development impacts. This is revealed by water quality analyses, examination of management impacts or field surveys. Therefore, the area does not support all expected species or functions;

3. potential to revert to Class 1 with management.

Class 3 areas should have the following characteristics:

1. do not contain natural or semi-natural vegetation types;

2. flora and fauna are dominated by native species. However, many non-native species of plants will be found;

3. be of little importance for rare or migratory species;

4. be unlikely to be designated;

5. be subject to low intensity management. Therefore, they are unlikely to change if management ceases; they have particular potential for improving biodiversity.

Class 4 areas should have the following characteristics:

1. habitats in the areas have appeared as a result of recent development (within the last 100 years);

2. support a mix of species (native and exotic) and the proportion of non-native plants is between 20 and 35%;

3. management is intensive and is contributing to their low biodiversity value;

4. habitats of little importance for rare or migratory species;

5. no designations.

Class 5 areas should have the following characteristics:

1. do not contain natural or semi-natural vegetation types;

2. support a mix of species (native and exotic) and the proportion of non-native plants is at least 35% or higher;

3. management is intensive and is contributing to their low biodiversity value;

4. habitats of little importance for rare or migratory species;

5. no designations.

A review of data to be used in elaborating the optimum network quickly revealed that there were few relevant sources of information on habitats or species. The best available source of information was CORINE (Coordination of Information on the Environment) Landcover 1990 (polygon size of 25 ha).

The Ecological Network for Ireland

The criteria were applied to CORINE in order to rank the different landcover types within it. While CORINE is not a habitat map, it was possible to link habitats to landcover type. This was supplemented by additional data on habitats and species, and Ordnance Survey data, in order to construct the ecological network GIS (Geographical Information System). The result is shown in Fig. 2.

Class 1 areas contained all examples of the following landcover types:

Natural grasslands

Moors and heathlands

Bare rock and sparse vegetation

Unexploited bog

Beaches and dunes

Intertidal flats

Coastal lagoons in the highest categories in a Dúchas survey of lagoons (Healy et al., 1998; Healy, 1999)

Estuaries

Sea and ocean (i.e. intertidal zone shown on 1:50,000 scale of Ordnance Survey of Ireland (OS*i*) mapping plus nearshore zone up to 5 km)

Class 2 areas include:

Broadleaf forest

Burnt areas

Watercourses

Canals

Inland marsh

Lakes

Coastal lagoons not in highest categories in a Dúchas survey (Healy et al., 1998; Healy, 1999)

Saltmarshes

Class 3 areas include:

Green urban areas

Sports and leisure

Low productivity grassland

Mix of high and low productivity grassland

Principally agriculture with significant areas of natural vegetation

Scrub

Mixed forest

Hedgerows

Class 4 areas include:

Discontinuous urban fabric

Road and railway

Airports

Mineral sites

Arable land

High productivity grass

Annual crops and permanent crops associated with agriculture

Complex cultivation patterns

Coniferous forest

Exploited bog

Class 5 areas include:

Continuous urban fabric

Industrial

Sea ports

Dump sites

Construction sites.

The results are illustrated in Fig. 2 and Table 1.

CORINE and OS*i* data were adequate sources of information for the purpose of defining an Ecological Network. However, there were few supplementary sources and these only applied to some classes. Terrestrial and marine landcover types were difficult to assess in the absence of comprehensive surveys of water quality. The use of CORINE implies that the National Ecological Network emphasises spatially distinct areas, 'cores', rather than processes, which characterise corridor areas. However, inclusion of any area in the NEN implies recognition of both 'core' and 'corridor' functions. CORINE provides information on watercourses that are recognised as having important corridor functions for both migratory and aquatic species.

Figure 2 does not spatially represent all important habitat types. Hedgerows, which are listed as being in Class 3, are not mapped. The classification is necessarily simplistic as CORINE consists of units of 25 ha. Therefore, a CORINE landcover type shown in Fig. 2 may contain areas that belong to different classes.

The framework and analysis ascribed biodiversity values to all landcover types. It is concentrated in the West of Ireland and is lowest in areas affected by urbanisation. Class 1 areas exhibit the highest level of naturalness. They contain areas of primary importance for biodiversity. Some sites within this class are part of international ecological networks as a result of their significance for migratory species. Class 5 areas contain areas that are constituents of local ecological networks but are also likely to contain dispersal or commuting corridors of significance.

The proposed framework is compatible with the present system of designations, as designated and proposed areas are within Classes 1 and 2. However, it ascribes a value to other landcover types that are not recognised by the present designation system. These areas have the potential to act as 'cores' and 'corridors', maintaining and enhancing biodiversity values. There has been little research on the enhancement of biodiversity in areas belonging to Classes 3, 4 and 5.

With the exception of watercourses and the coast, the proposed system does not recognise specific areas for their 'corridor' function. The need for 'corridors' is recognised indirectly by including sites that are part of commuting and migratory routes for birds and fish, and considering issues such as buffering, and linkages in the analysis of the landcover types within the classes.

The analysis has provided for a broad review of the spatial distribution of biodiversity in the country. It reveals that biodiversity is an important resource in large areas of Ireland. This must have implications for spatial planning and sectoral policies.

Econet Classes

Econet Classes
- Class 1
- Class 2
- Class 3
- Class 4
- Class 5
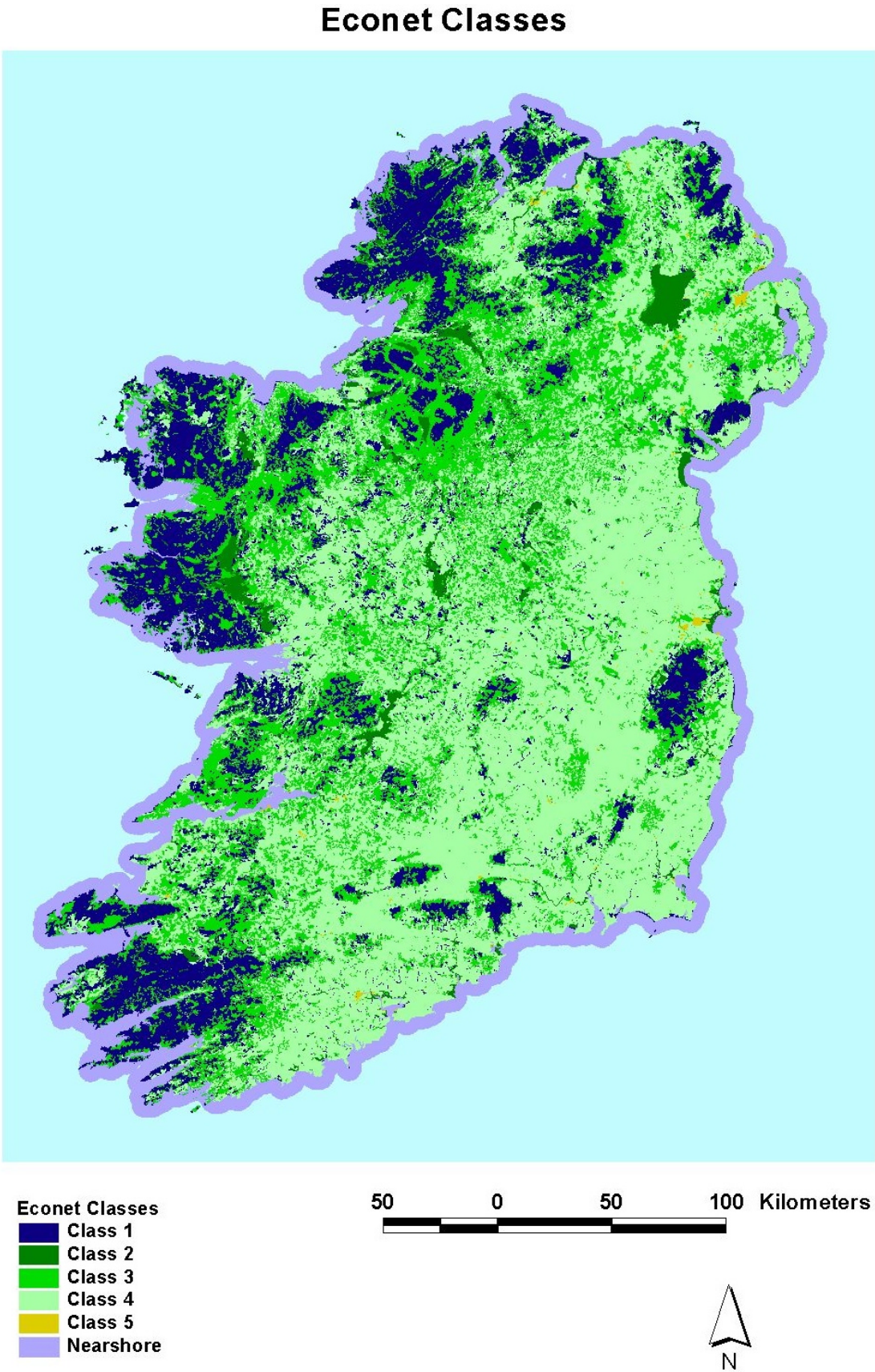- Nearshore

50   0   50   100 Kilometers

N

Figure 2. Framework National Ecological Network for Ireland. Note that sea and ocean, and nearshore are included in EcoNet Class 1.

Table 1. CORINE Landcover classes in each EcoNet class along with area covered under each class.

CORINE code	CORINE Landcover description		Hectares	% of total area
EcoNet Class 1				
321	Natural Grasslands		256,960	3.07
331	Beaches, Dunes, Sands		12,979	0.15
332	Bare Rocks		14,895	0.18
322	Moors & Heathlands		296,693	3.54
4121	Unexploited Bogs		947,541	11.31
333	Sparse Vegetation		18,751	0.22
423	Intertidal Flats		12,229	0.15
521	Coastal Lagoons		613	0.01
522	Estuaries		2359	0.03
523	Sea & Ocean		16,203	0.19
		Total:	1,579,223	18.86
EcoNet Class 2				
421	Salt Marshes		1,927	0.02
411	Inland Marsh		18,323	0.22
334	Burnt Areas		313	0.00
311	Broadleaf Forest		42,820	0.51
512	Water Bodies		183,008	2.18
511	Watercourses		6,613	0.08
–	Canals		–	–
		Total:	253,004	3.73
EcoNet Class 3				
2313	Mix of High & Low Productivity Grasslands		819,290	9.78
243	Principally Agriculture with Significant Areas of Natural Vegetation		408,306	4.87
141	Green Urban Areas		3021	0.04
142	Sports & Leisure		12,383	0.15
2312	Low Productivity Grasslands		564,574	6.74
324	Transitional Wood–Scrub		147,268	1.76
313	Mixed Forest		19,844	0.24
–	Hedgerows		–	–
		Total:	1,974,686	23.57
EcoNet Class 4				
242	Complex Cultivation		249,384	2.98
312	Coniferous Forest		301,325	3.60
112	Discontinuous Urban		82,628	0.99
122	Road & Railway		1222	0.01
124	Airports		3390	0.04
131	Mineral Sites		8394	0.10
211	Arable Land		380,444	4.54
231	Pastures		719	0.01
2311	High Productivity Grasslands		3,361,885	40.13
241	Annual Crops Associated with Permanent Crops		6386	0.08
4122	Exploited Bogs		151,673	1.81
412	Peatbogs		1527	0.02
		Total:	4,548,976	54.30
EcoNet Class 5				
111	Continuous Urban		11,110	0.13
121	Industrial		8139	0.10
123	Sea Ports		877	0.01
132	Dump Sites		360	0.00
133	Construction Sites		683	0.01
		Total:	21,169	0.25

Implications for Spatial Planning Policy

There are a number of key policy implications arising from the proposed framework for a NEN.

•   Biodiversity is an important resource that is present throughout the country and is of high quality in many areas. The map of the Ecological Network is a map of Green Infrastructure. In the same way as society maintains and plans for grey infrastructure (roads, sewers, etc.), the future of Green Infrastructure should be debated within government, development sectors and the public, in order to arrive at strategic policy objectives.

•   The distribution of biodiversity has implications for regional development, for the allocation of resources to manage biodiversity and for the integration of biodiversity with other development sectors and land uses. In the west, along the coast and in the uplands there is a need to ensure that biodiversity values are protected by future development. In intensively managed agricultural areas and particularly in areas affected by urbanisation a proactive approach is required to restore biodiversity as it has declined to a low value.

•   Throughout the country, development should prioritise the maintenance and restoration of linkages between the patches of biodiversity value that have survived fragmentation. There is particular potential to integrate the ecological network approach with the support schemes for forestry development (under the Native Woodlands scheme) and catchment management, which will be required under the new Water Framework Directive.

The study has suggested particular priorities for biodiversity management, landscape planning and development sectors.

•   The preliminary national framework must be tested and elaborated through local area studies in different locations throughout the country. It could be elaborated in the context of landscape planning, such as a local landscape characterisation study. It should also be tested strategically by critically examining how important land-use sectors, agriculture, forestry and urbanisation affect the realisation of an ecological network. Integrated studies should involve Dúchas but must be carried out in the context of local or national spatial planning.

•   The preliminary national framework must be tested and elaborated through both local area studies and reviews of sectoral and land-use policies. A sectoral study should involve a practical demonstration of the requirements of the ecological network approach, i.e. the identification of the best quality core areas and the selective management and enhancement of other areas that could become part of a corridor. These could be easily elaborated for woodlands using existing information on the distribution of vegetation and soils. The restoration of connectivity would be monitored using a species that is known as an indicator of the target habitat type.

•   Research in urban ecology and landscape ecological planning should be supported, as both these areas have received little attention in Ireland. Pilot studies are needed in order to demonstrate models of development that will enhance biodiversity through the integration of strategic planning, development control, landscaping, protected area management, or parks management.

•   Research is needed on local ecological networks for vulnerable species. This will require studies integrating habitat management and species ecology.

The study suggests the following implications for agriculture, forestry and urban development.

•   *All* landowners and managers should be responsible for biodiversity management.

•   Resources for forestry development should be targeted at woodland patches of high biodiversity value to restore connectivity between surviving patches of natural-type woodlands and to re-establish natural-type woodlands in areas from which they have disappeared, i.e. the fertile lowlands.

•   Resources for wetland restoration should selectively target existing wetlands of high biodiversity value (including raised bogs).

- Landscaping practices in areas affected by urbanisation (settlements, roads, etc.) should focus exclusively on the restoration of natural habitats and processes.

Concluding Comment

This study is a first for Ireland as no previous studies have been carried out on the relationship between biodiversity and spatial planning. The timescale and the brief confirm that it is a preliminary study. Its findings are not definitive but must be seen as a means to inform and stimulate further research and debate.

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