

**Stakeholders' Conference**  
**Biodiversity and the EU – Sustaining Life, Sustaining Livelihoods**  
**Grand Hotel, Malahide, Ireland**  
**25-27 May 2004**

**MALAHIDE/INF2**

**THE STATE OF BIOLOGICAL  
DIVERSITY IN THE EUROPEAN UNION**  
**Prepared by the European Environment Agency**

*There is considerable pressure from human activity on nature and biodiversity. Action is necessary to counteract pressures arising notably from pollution, the introduction of non-native species, potential risks from releasing genetically modified organisms and the way in which the land and sea are exploited.*

Preamble to decision 1600/2002/EC laying down the  
Sixth Community Environment Action Programme (2002)

The opinions expressed in this paper are not necessarily those of the European Commission



## The state of biological diversity in the European Union

*Biodiversity, which plays a critical role in overall sustainable development and poverty eradication, is essential to our planet, human well-being and to the livelihood and cultural integrity of people*

Johannesburg Plan of Implementation – paragraph 42 (2002)

This paper has been prepared for the EU stakeholders' conference on 'Biodiversity and the EU – sustaining life, sustaining livelihoods' as an update to the chapter on biological diversity in the EEA report 'Europe's environment: the third assessment' presented to the conference of pan-European ministers of environment in Kiev in May 2003.

Since the Kiev conference there have been major developments in policy and information relevant to Europe's biological diversity and the EU target to halt biodiversity loss by 2010. In particular, the Convention on biological diversity (CBD) at its seventh conference of the parties in Kuala Lumpur in February 2004 adopted a first list of indicators in seven focal areas for immediate testing or further development. On the basis of the agreed CBD list, the EU biodiversity expert group and its ad-hoc working group on monitoring, indicators and reporting has proposed to the EU stakeholders' conference for adoption a first set of EU headline biodiversity indicators (see paper *Malahide/5*). The EU set once adopted will therefore be in line with the CBD list and help ensure streamlining and avoid duplication of monitoring, indicators and international reporting by the European Community and its Member States.

This paper presents illustrative examples of indicators - published recently (or about to be published) in a range of EEA reports or under development for inclusion in future reports and factsheets by the EEA and others - which can be considered for testing and further development as part of this first EU set. The presentation of illustrative indicators and accompanying text is structured in the order of the agreed CBD focal areas. However, not all focal areas have been included in this paper, which focuses on status and trends, threats and pressures, sustainable use, and ecosystem integrity, goods and services. The other focal area indicators – status of access and benefit sharing, status of resource transfers and use, and public opinion - will require further consideration and involvement of a wider range of organisations and experts before specific indicators can be proposed.

As far as possible, indicators and information are presented for EU-25. However, in some cases, data from all EU Member States, in particular the 10 that joined the European Union on 1 May 2004 are not yet available in a consistent form and hence indicators and information available for EU-15 or selected countries are presented. In contrast to other environmental areas, the voluntary/NGO sector makes a major contribution to monitoring and data gathering on Europe's biological diversity. The value of this contribution is now being recognized and several of the indicators currently available and presented in this paper are based on voluntary/NGO data and developed by these organisations or in collaboration with them.

Gordon McInnes  
Deputy Director

## **Focal area 1: Status and trends of the components of biological diversity**

*Man has a special responsibility to safeguard and wisely manage the heritage of wildlife and its habitat, which are now gravely imperilled by a combination of adverse factors. Nature conservation, including wildlife, must therefore receive importance in planning for economic development.*

Stockholm Declaration - Principle 4 (1972)

The European Union has a rich biological diversity across its biogeographic regions and regional seas, across its inland, marine and coastal aquatic, wetland, mountain, forest, farmland and semi-natural ecosystems. However the biodiversity in these regions, seas and ecosystems is under threat from a range of human activities and climate change.

This focal area includes biomes, ecosystems and habitats, species, genetic diversity, and protected areas. Illustrative examples are presented for four of the five indicators listed in this area; the fifth on trends in genetic diversity of domesticated animals, cultivated, and fish species of major socioeconomic importance is not addressed.

First results are becoming available from the Corine Land Cover 2000 update, which enable comparisons to be made and trends to be calculated on changes in land cover and hence in the extent of certain ecosystems over the period from around 1990 to 2000 for the whole of EU-25 territory. The CLC database allows detailed analyses to be carried out and mapped on changes between each of the 44 land cover categories. The data can also be merged with other spatial data to provide the basis for detailed analysis of the state of Europe's environment and the pressures upon it. The database for most countries in 2000 is still being completed and validated. However, first (provisional) results and analyses are available and illustrative example presented here for Ireland and the Netherlands.

The first provisional species indicator at EU level for birds found in different ecosystems was produced recently by the Royal Society for the Protection of Birds, the European Bird Census Council, BirdLife International and Wetlands International with support from the Agency's topic centre on nature protection and biodiversity. Work is underway to develop indicators for other species at EU level and is most advanced for butterflies. Work is also progressing on the development of a biodiversity index aggregating data on ecosystems and species. However more data are required on species within each ecosystem and EU Member State before such an index can be published. Data to be provided as part of reporting on conservation status of Natura 2000 sites and the species they contain will also help in this process.

IUCN published an updated red list of threatened species in 2003. Analysis of changes since publication of the 2000 IUCN red list shows the changes in the status of globally threatened species which occur within EU in recent years.

EU-15 Member States are completing their proposals for sites of Community interest to be included in the Natura 2000 network under the habitats directive. New Member States will be completing their proposals in the coming months following their accession on 1 May.

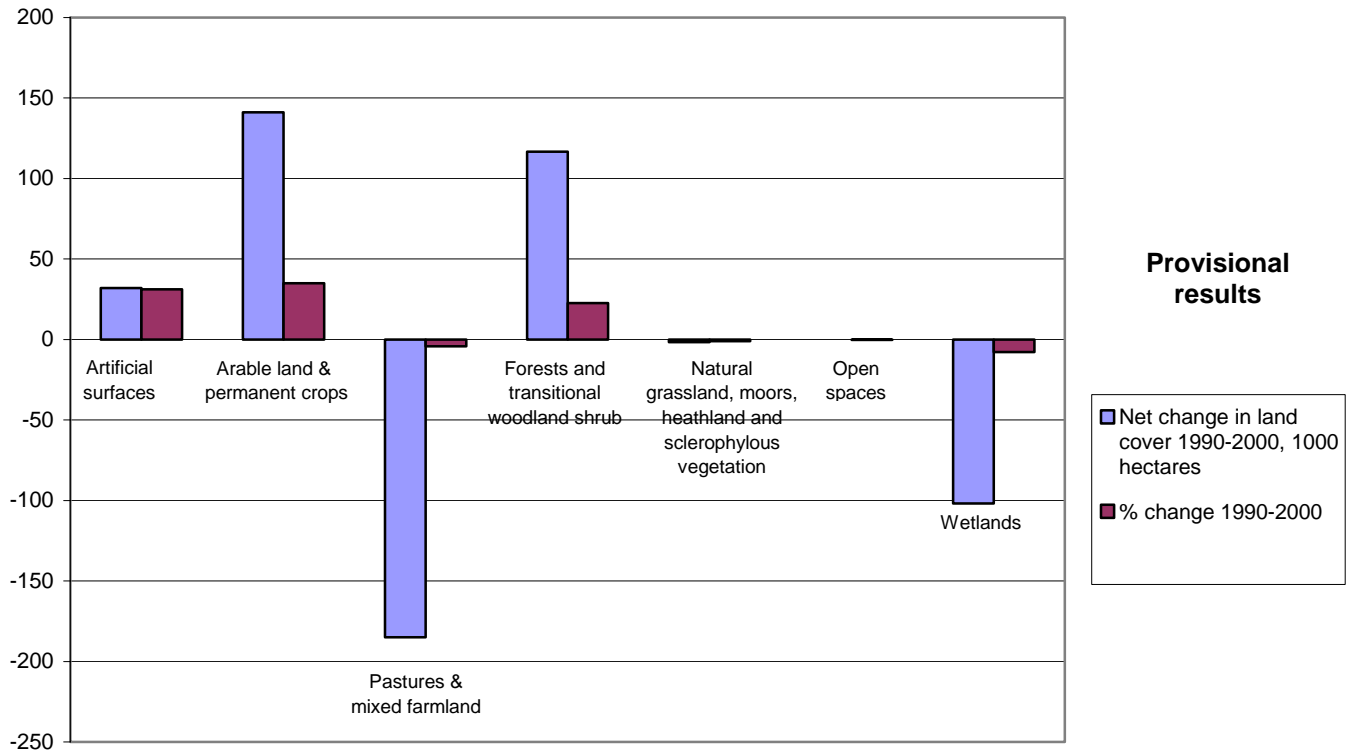
## **Trends in extent of selected biomes, ecosystems and habitats**

### **Changes in main land cover categories to 2000**

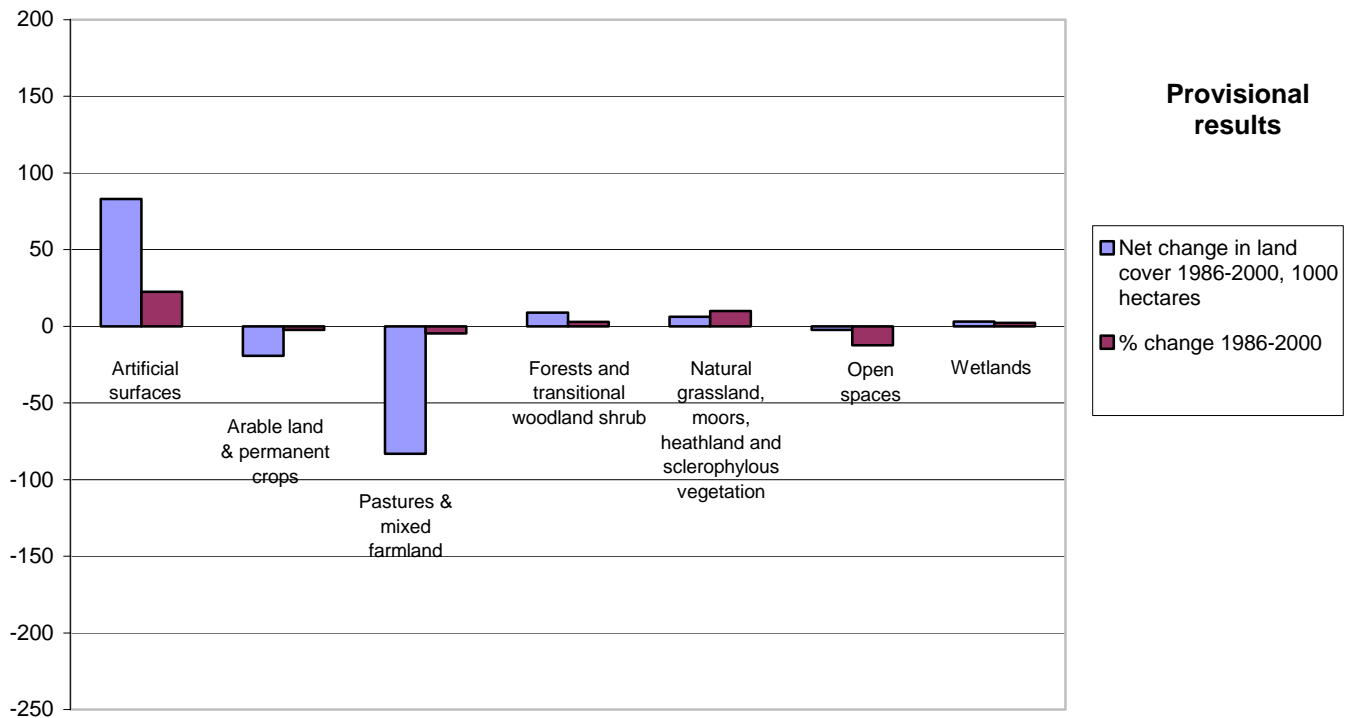
In Ireland there were major net losses of pastures/mixed farmland and wetland between 1990 and 2000 amounting to almost 5 % and 8 % of the 1990 total areas respectively. The loss of wetland was mainly to forest and transitional woodland shrub land. In contrast there have been net increases in artificial surfaces (mainly urban development/infrastructure), arable land/permanent crops and forest and transitional woodland shrub land within the 10-year period amounting to around 20-35 % in each case. The growth in arable land and permanent crops was mainly at the expense of pastures and mixed farmland, reflecting the intensification of agriculture occurring widely across EU. This conversion is partly explained by the increased practice of keeping livestock under cover and using the land for growing forage.

The changes in the Netherlands from 1986 to 2000 show some similarities and differences from Ireland. There was a slightly lower growth in artificial surfaces extending urban areas and infrastructure by more than 20 % beyond the 1986 area and hence still exceeding 1 % growth per year (in this case mainly at the expense of pastures and mixed farmland), and only small changes in the other main categories in this smaller, more heavily populated and intensively-managed country.

**Ireland**



**The Netherlands**



### Conversion of wetlands in Ireland





Wetlands cover 16 % of the surface of Ireland, peat-bogs representing 95 % of this total. The main peat-bog areas are concentrated on the Atlantic side of the country and more than one third of peat-bogs are located in areas dominated by agriculture. The density of bogs in the Irish landscape is highest in the dark blue shaded areas, more scattered in the green areas and absent in the yellow areas. Peat-bogs are natural ecosystems, which are often grazed or exploited for producing peat (the latter after drainage). Once drained, the land can also be used for other purposes. In particular, coniferous forests have replaced peat-bogs in many areas in Ireland since 1990 (presented in the map as hectares of coniferous forest planted on peat-bogs in squares of 3x3 km). Although moderate, at 2 % conversion to forest in ten years, the phenomenon is widespread in rural areas where it ranges up to 3.5 % as opposed to open semi-natural and natural landscapes where the conversion is 1 % in 10 years. There has also been a three times larger conversion of peat-bogs to transitional shrub land as a result of drainage. The fragmentation of peat-bogs into shrub land and forests will have contributed to the pressures on wetland species, including birds and butterflies (see next section), which shows the limits of conventional nature protection and suggests the need for other policy instruments to protect these unique ecosystems.

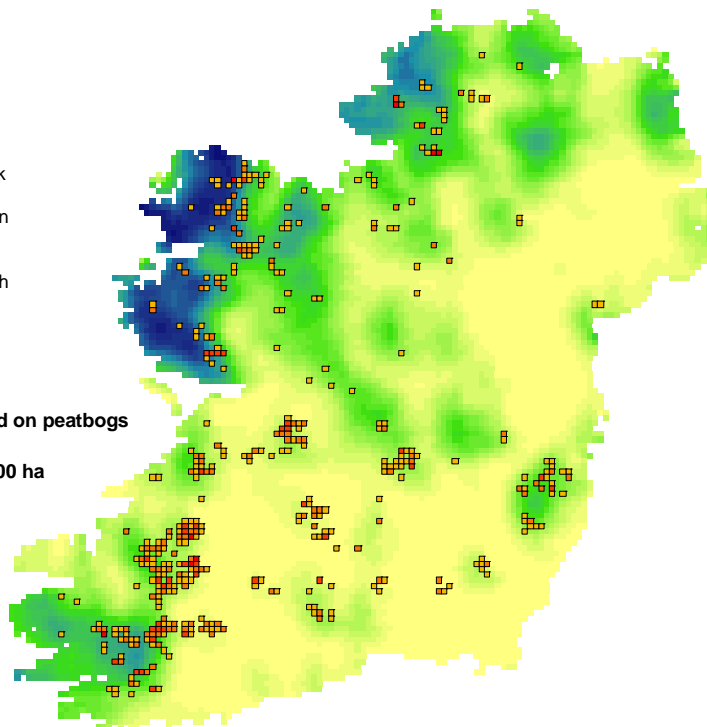
Wetlands concentrate in dark blue areas, are scattered when green and absent when yellow. Areas more concerned by plantation (orange to red) are those with few wetlands

#### Provisional results:

##### Coniferous forest planted on peatbogs 1990-2000

hectare in each grid of 900 ha

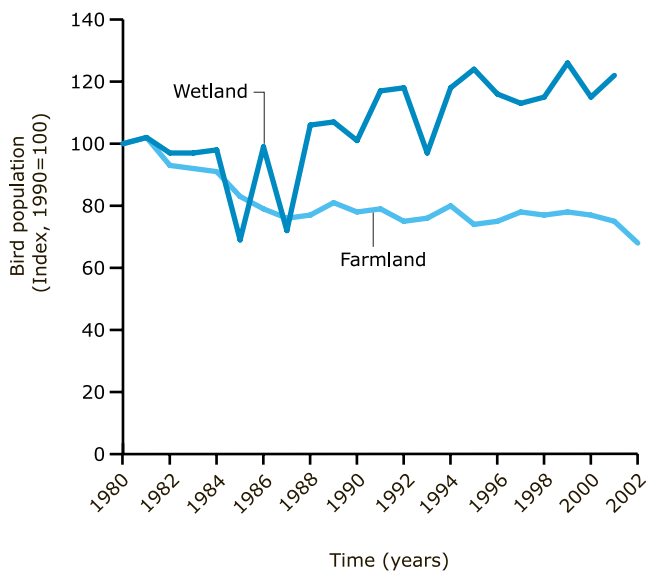
	6 - 54
	55 - 107
	108 - 197
	198 - 394



## Trends in abundance and distribution of selected species

### Bird populations

Provisional bird indexes show that farmland bird populations have fallen substantially in recent decades. These data start in 1980 but it is probable that rapid population decline also occurred in the 1970s. Farmland bird populations have not fallen as much in the 10 new Member States and the three candidate countries as in the EU-15, largely because of the lower intensity of farming in central and eastern Europe. Wetland bird populations appear to have risen in recent years although the data and spatial coverage are less well developed than for farmland birds. Wetland birds are migratory: their numbers often fluctuate in line with temperature, with fewer arriving in cold years. Wetland birds are also affected by hunting and by eutrophication of wetlands.

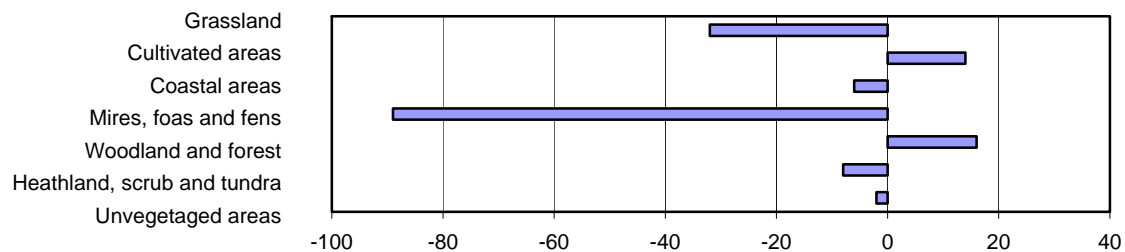


### Other species

Provisional results on trends over the period 1970-2000 for butterflies found in a range of ecosystems show that population size has decreased most for wetland butterflies in mires, bogs and fens where there has been a 90 % reduction over 30 years. This indicates that butterflies have suffered more in wetland areas than migrant birds over recent decades, probably as a result of a reduction in wetland areas and an increase in pressures in and around such areas, for example from nitrogen deposition/eutrophication.

There has also been a 50 % reduction in population size of grassland butterflies over this period, also likely to be due to reduction in the area of grassland and increased pressures from nitrogen deposition etc.

**Provisional results:  
Percent change in butterfly population size  
1970-2000**



## Change in status of threatened and/or protected species

### Change in status of threatened species, 2000-2003

971 globally threatened taxa in the 2003 IUCN red list of threatened species occur in EU-25. A comparison between IUCN global status in 2000 and the 2003 IUCN red list shows that:

- 902 taxa remain with the same status
- 2 taxa are given better status – including the **Bavarian vole** and **Short-snouted seahorse**
- 3 taxa are given worse status – including **Iberian Lynx** which has moved from the *Endangered* to the *Critically endangered* category, the most threatened category short of extinction, **Erebia christi** which has moved from *Lower risk* to *Vulnerable* and **Root vole** which was *Lower risk* and is now split in two subspecies, one being *Critically endangered* and the other *Vulnerable*



69 taxa found in Europe have been added to the IUCN 2003 red list:

- 42 as *Least concern*, *Lower risk*, *Near threatened* or *Data deficient*
- 17 as *Vulnerable* (including Cod)
- 5 as *Endangered* (including some species which used to be common and exploited, for example Red Porgy)
- 4 as *Critically endangered*: (including **Saw fish** and a **lichen**, *Erioderma pedicellatum*)
- 1 as *Extinct in the wild*: **Wild horse**.

There are only two remaining populations of Iberian Lynx remaining in the wild, in Spain and Portugal. The number of lynx has reduced from thousands to fewer than 150 in 40 years, due to pressures from hunting, damaging developments in its breeding areas including traffic and diseases in rabbits. The survival of this big cat species will be a major challenge in meeting the target to halt biodiversity loss by 2010 within the European Union.



## Coverage of protected areas

*The making of gardens and parks goes on with civilization all over the world, and they increase both in size and number as their value is recognized. Everybody needs beauty as well as bread, places to play in and pray in, where Nature may heal and cheer and give strength to body and soul alike.*

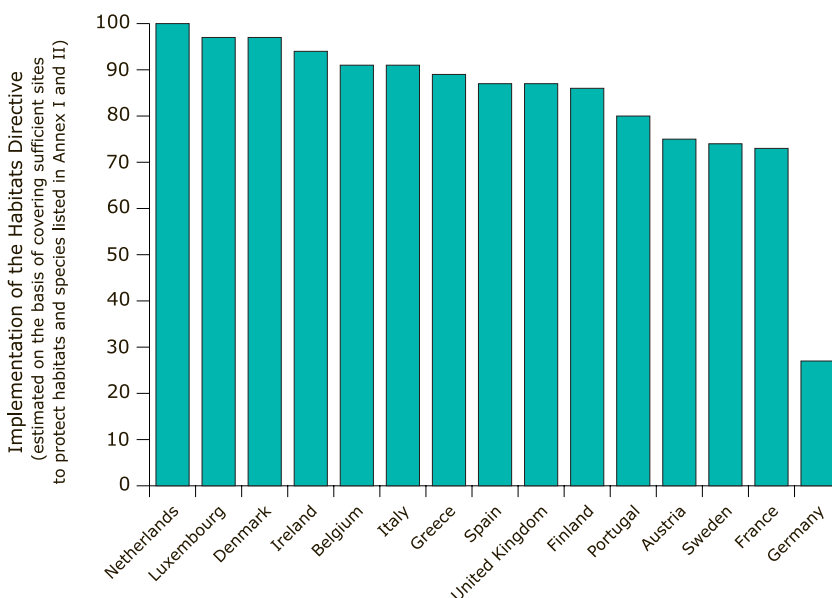
John Muir – The Yosemite (1912)

### Implementation of the habitats directive

As of November 2003, more than 80 % of the land and freshwater habitats and species listed in the EU habitats directive were sufficiently covered by sites proposed by the Member States. Moreover, sites for the protection of marine species and habitats should be designated. Generally progress is now good: the Netherlands, for example, has reached 100 % sufficiency. Germany reached only 27 % sufficiency by November 2003, but draft proposals have since been received which, if officially confirmed, are expected to double the number of sites and increase the sufficiency level.

The indicator charts progress in proposing terrestrial sites for the protection of the targeted habitats and species of the directive. Information on the extent of these protected areas and on the conservation status of the habitats and species of Community interest within the habitats to be provided by Member States in the coming years will be developed into additional indicators.

Discussions are underway on the management, funding, and reporting on the conservation status of Natura 2000 sites. It will be important to ensure adequate funding for management in and around these sites and for providing information on progress and to help target action to ensure that these sites contribute to the achievement of the 2010 target and the objectives of the habitats directive.



## Focal area 2: Sustainable Use

*Conscious also of the importance of biological diversity for evolution and for maintaining life sustaining systems of the biosphere*

Preamble to the convention on biological diversity (1992)

### Area of forest, agricultural, fishery and aquaculture ecosystems under sustainable management

Sustainable use of the components of biological diversity is defined in the Convention as use “in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations”. CBD has listed forest, agriculture and aquaculture for consideration in developing indicators of sustainable use. The EU biodiversity expert group has proposed to add fisheries to this list. This section presents indicators from the EEA core set and elsewhere as illustrative examples of the types of indicators currently available.

Forest covers 1.4 million km<sup>2</sup> of the EU-25 territory and has expanded by over 4000 km<sup>2</sup> or nearly 0.3 % per year in recent years. The annual increment in growing stock currently exceeds the annual felling. A large and increasing area of forest is subject to management plans and guidelines, which should contribute to sustainable forest management. Forests are also the source of a wide range of non-wood forest products, for example mushrooms, berries, medicinal plants and game meat, which enhance the value and use of the forests and will benefit from sustainable forest management. Forests and forest management can contribute to the protection of soil, water and other ecosystem functions.

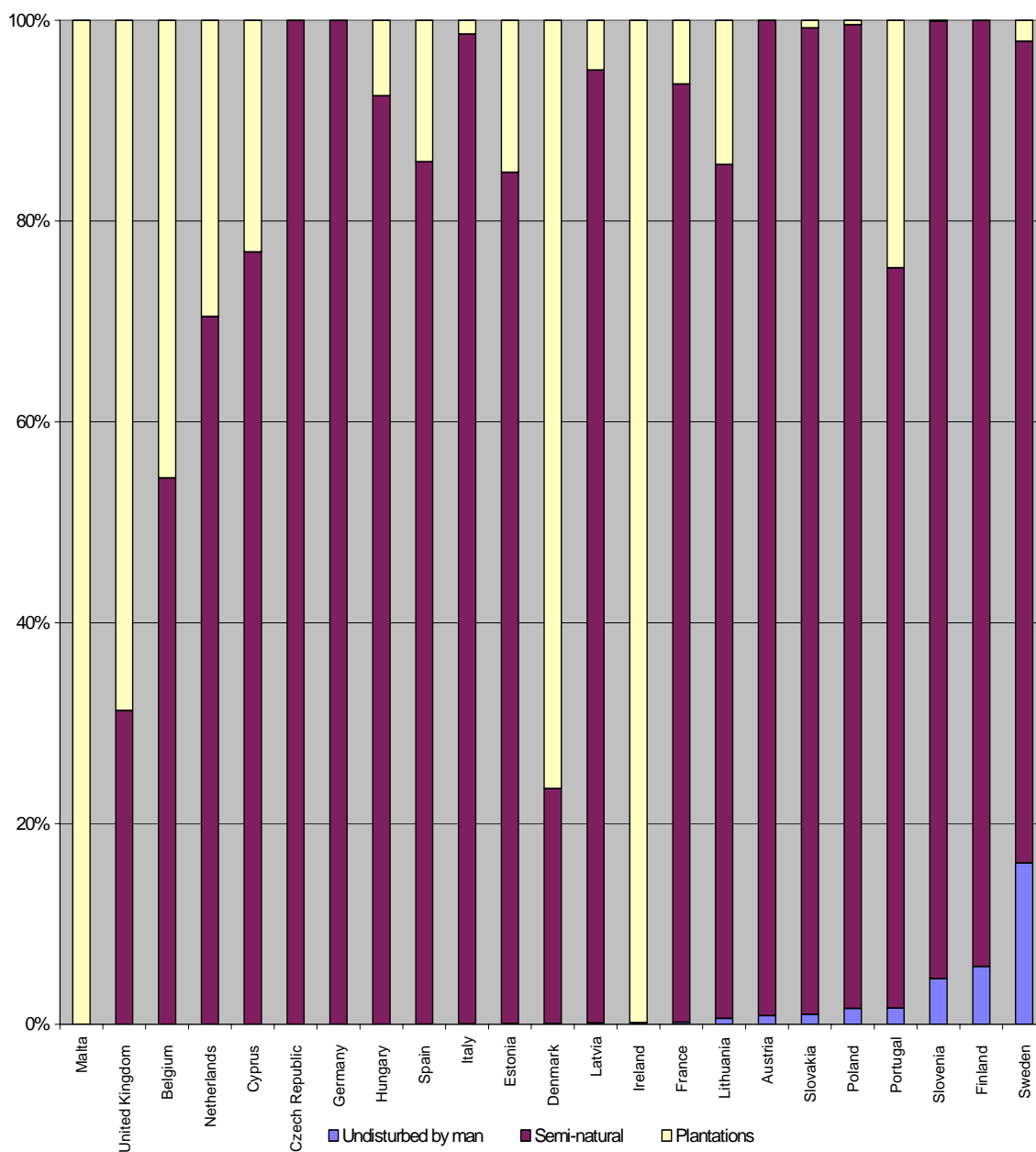
European agriculture is extremely diverse, ranging from large, highly intensive and specialised commercial holdings to subsistence farming using traditional practices. Consequently impacts on the environment in general, and biodiversity in particular, vary in scale and intensity and may be positive or negative. The EU common agricultural policy accounts for about 50 % of the total EU budget and influences how farmers manage land and livestock. Past subsidies encouraged intensive agricultural production by paying per tonne of wheat or per head of livestock produced. Since the early 1990s, however, income support payments have taken over and more rural development measures have been introduced, including measures for the environment such as agri-environment schemes and support for less favoured areas. These help to fund the protection of high nature value farmlands, underpinning the activities of the LIFE (Nature) programme. The share of the rural development budget in total common agricultural policy spending has risen slowly since 1991, from 9 % between 1991 and 1993 to 13 % in 2000-2002. Some 30-40 % of rural development funding is used for agri-environment schemes but levels of spending vary widely between countries. More than 70 % of farming area in Finland and Austria is covered by agri-environment schemes but only about 5 % in Spain and Greece. Agriculture is very important for the 10 new Member States and the three candidate countries. Large areas of farmland of high nature value are present in these countries and will require attention and protection to ensure that they are not damaged or lost through intensification or abandonment as these countries adapt to EU policies and more open markets.

A complex set of driving forces has resulted in overexploitation of most of the capture fisheries of Europe, leading in turn to increased catches of, and pressures on, compensating species. Many stocks are now considered to be outside safe biological limits, and some are in a critical state.

## Forest

### Distribution of forest type in EU-25

The Ministerial Conference on the Protection of Forests in Europe classifies forest as 'undisturbed by man', semi-natural and plantations. EU-25 forests are mainly semi-natural with the largest areas of 'undisturbed by man' forests located in northern Sweden and northern Finland. However, these remnants of 'undisturbed' forests are of high importance for nature protection and the conservation of biological diversity. Countries with large proportions of plantations are Ireland, Denmark, Malta and the United Kingdom. The degree of naturalness of forest ecosystems reflects the intensity of human intervention. Different levels of utilisation intensity are characterised not only by changing structures but also by different species communities and thus influence the biological diversity of an area. Work will continue to further develop indicators relating to the sustainable management of forest.

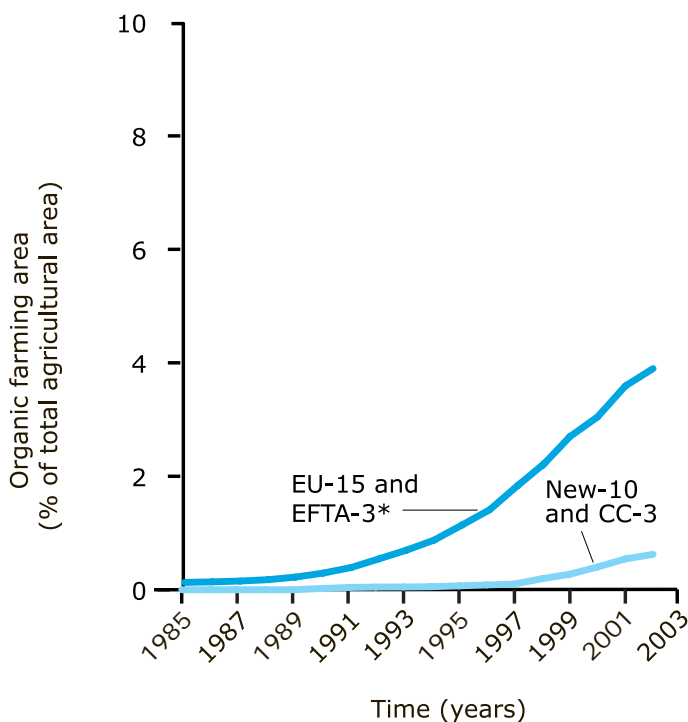


Note: No data available for Belgium and Luxembourg.

## Agriculture

### Organic farming area

Organic farming does not use chemical fertilisers and pesticides (apart from copper and sulphur in vineyards). It relies instead on animal manure, crop rotation and appropriate soil cultivation practices for building up soil fertility and combating pests and plant diseases. Organic agriculture has lower yields than conventional farming systems but reduces the risk of nitrate pollution of water and generally promotes more wildlife. The share of organic land remains far below 1 % in most of the 10 new member states and the three candidate countries due to little or no state support and low consumer demand for organic products. Across the 31 EEA member countries as a whole (including the 10 new EU Member States, new-10, and the three candidate countries, CC-3), however, organic farming area increased by around four fifths between 1997 and 2000, to 4.4 million hectares from 2.4 million.



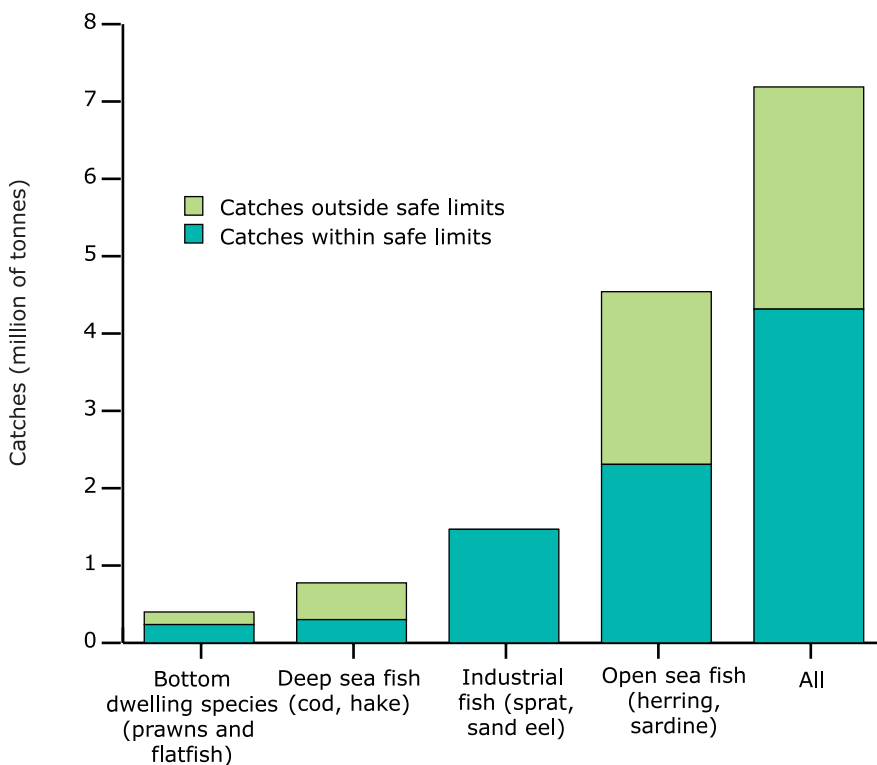
\* EFTA-4 without Switzerland

## Fisheries

### Fish catches above safe limits

Overall 60 % of European fish catches exceed safe limits, i.e. levels above which the biomass removed by fishing is no longer replaced by population growth. Catches of open sea fish account for almost two thirds of all catches; about half of these catches are outside safe limits. Industrial fishing catches account for another 20 % of the total. Fish play an integral role within the wider marine environment, which is experiencing pressures from shipping, pollution, coastal eutrophication and climate change. The continuation of present trends of over-fishing will therefore probably lead to substantial changes across the entire marine ecosystem.

Work continues to develop an indicator or indicators to reflect the condition of fisheries and the extent of sustainable management in the various seas around EU.



### Focal area 3: Threats to Biodiversity

*"...what we have to face is not an occasional dose of poison which has accidentally got into some article of food, but a persistent and continuous poisoning of the whole human environment..."*

Rachel Carson – Silent Spring (1962)

There are many threats to Europe's biological diversity, which vary in intensity and relevance across regions, ecosystems and species. These threats include changing land use, land fragmentation and degradation, freshwater shortages, watercourse modifications, invasive alien species, overharvesting, pollution, stratospheric ozone depletion, and climate change. Many of these threats are inter-connected. Some are addressed by indicators in other focal areas, listed by CBD and presented in this paper. Three have been listed for immediate testing or further development by CBD and/or EU: nitrogen deposition, impact of climate change and number and costs of invasive alien species. The first two of these are considered here.

Excess nitrogen in the environment causes acidification and eutrophication (over-fertilisation) and subsequent pressures and impacts on sensitive ecosystems and species. Nitrogen is released into the atmosphere through fossil-fuel combustion, and the application of fertilisers and spread of manure in agriculture. It returns to land in dry and wet deposition as oxidized or reduced nitrogen. Nitrogen is also transferred directly into water bodies – rivers, lakes and groundwater – from manure and the application of fertilizers in agriculture. Often the effects of eutrophication and acidification occur far from the sources of pollution due to transfers through the atmosphere and water bodies. Grassland, forest, marine and coastal and other aquatic ecosystems are all sensitive to eutrophication. While environmental damage by many other air and water pollutants has been reduced in Europe in recent years, releases and deposition of nitrogen compounds have not reduced noticeably and eutrophication has become a widespread issue - both globally and within Europe. Indicators of both surplus nitrogen in agricultural soils and atmospheric deposition of nitrogen are presented here. The EEA will be developing assessments of the environmental effects of nitrogen on the environment and biodiversity of Europe in the coming year, bringing together information from the atmospheric, aquatic, biodiversity and sectoral monitoring and research communities to track nitrogen from its sources through transfer in air, water, soil and agricultural products to its impact on terrestrial and aquatic ecosystems often far from the original sources.

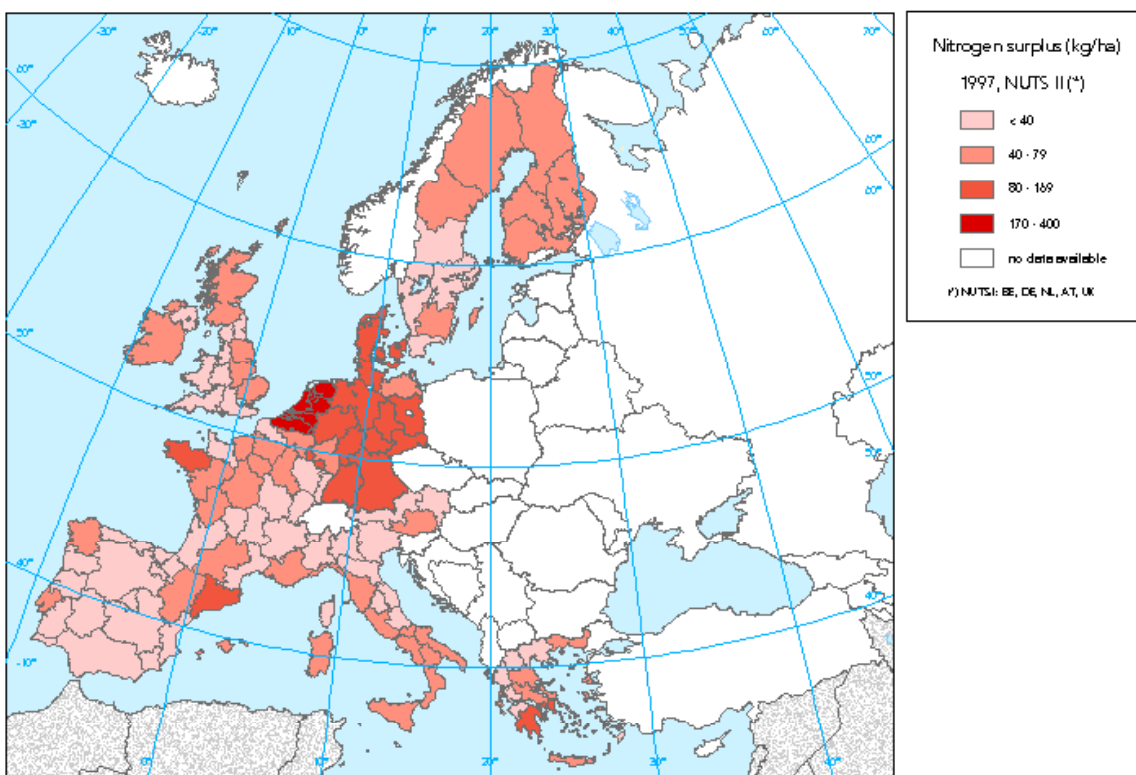
Agricultural practices are currently less intensive in the 10 new EU Member States than in the 15 older ones. However, if farming becomes more intensive in the new Member States, nitrate concentrations in surface and ground waters could increase. Good implementation of the European Union nitrates directive and the water framework directive (which requires an integrated approach to water management), supported by additional measures as necessary, will be essential to avoid creating an extensive, long-lived and costly pollution problem in these countries over the coming years.

Man-induced global warming and subsequent climate change is underway and starting to be detected in changes in the extent of glaciers and in the distribution and growth cycles of Europe's terrestrial and aquatic biodiversity. Europe has warmed more than the global average, with a rise in temperature of almost 1°C since 1900. The target set for reduction in greenhouse gases by 2010 under the Kyoto protocol is currently unlikely to be met since Russia has not yet ratified the protocol and USA has indicated that it will not do so. The European Union and its Member States are not yet on target to meet their joint and individual national targets and will need to take additional measures in the coming years to reach these targets. Due to the slow or limited rates of reduction in emissions and time lags in the climate system, pressures on the climate and hence on biodiversity in Europe and elsewhere are therefore set to increase for many years to come.

## Nitrogen deposition

### Nitrogen surplus in agricultural soils

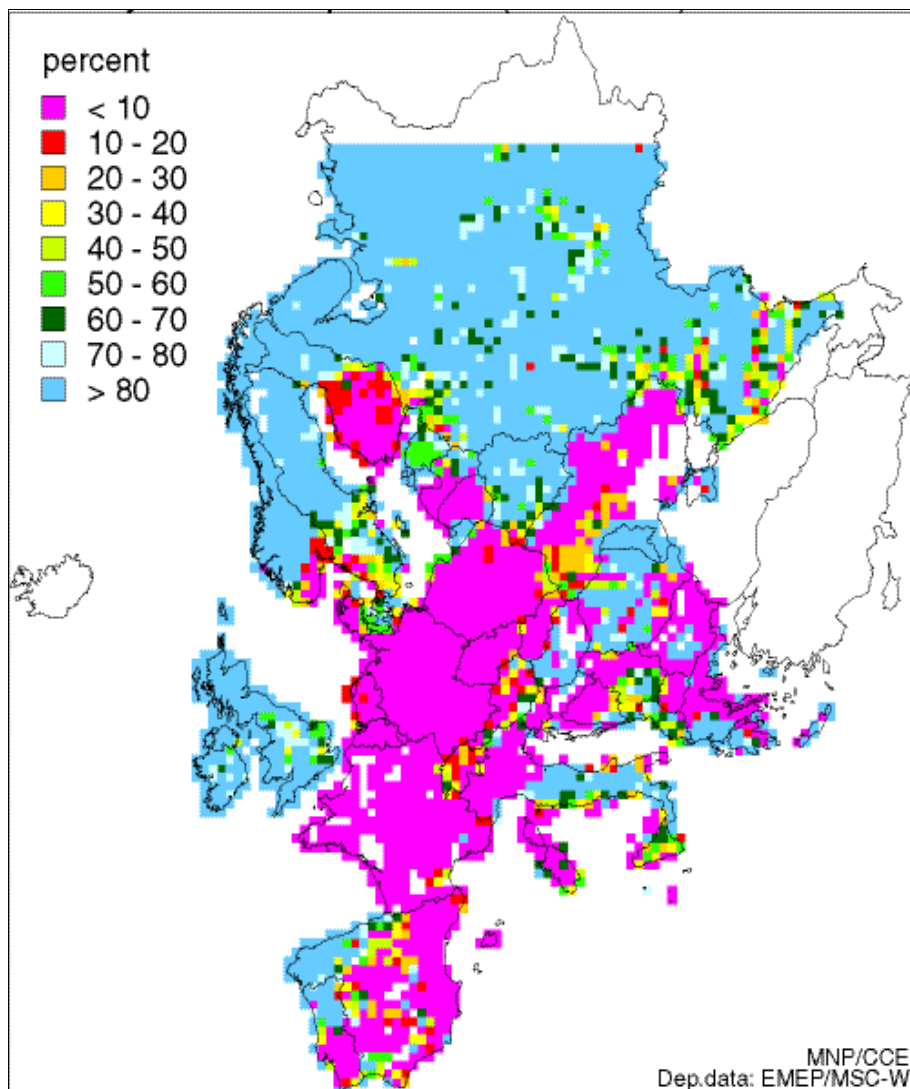
The nitrogen surplus is the difference between the input by mineral fertilisers, livestock manure, atmospheric deposition, biological nitrogen fixation and other inputs such as sewage sludge, and the output in the form of harvested crops. The nitrogen surplus indicates the nitrogen which potentially can be lost to groundwater and surface waters and cause eutrophication problems. The nitrogen surplus in EU-15 Member States (shown here for each of the NUTS II regions) is generally 50–100 kg N per hectare of agricultural area, but countries with very intensive agriculture such as the Netherlands have even higher surpluses. The nitrogen surplus in the period 1990–95 has remained almost constant. The total input has been reduced by around 5 %, but this is compensated by a decrease in the removal by harvested crops. The highest nitrate surpluses are found in areas with high densities of livestock breeding and also where there is intensive agriculture and inappropriate agricultural practices such as leaving bare soils in winter which increases nitrate loss.



### Atmospheric deposition of nitrogen

The calculated rates of nitrogen supply from atmospheric deposition has been compared with the estimated tolerance of ecosystems to eutrophication to give a picture of the degree of protection from further eutrophication experienced by terrestrial ecosystems. However it should be noted that the current calculation routines used in the collaborative programme for monitoring and evaluation of the long range transmission of air pollutants in Europe (EMEP) are under further development and hence that values presented here should only be taken as indicative. It can be seen from the map of ecosystem protection that most of EU-25 has less than 10 % of its terrestrial ecosystems protected. In other words, these calculations estimate that nitrogen deposition exceeds 'critical loads' set for more than 90 % of these ecosystems. Protection is estimated to be higher in the United Kingdom, Ireland, Sweden, southern Italy and north-west Spain, that is on the western and southern peripheries of Europe furthest from the main sources of atmospheric nitrogen.

### Percentage of ecosystems protected from impact of further eutrophication through atmospheric deposition of nitrogen in 2000 – indicative results

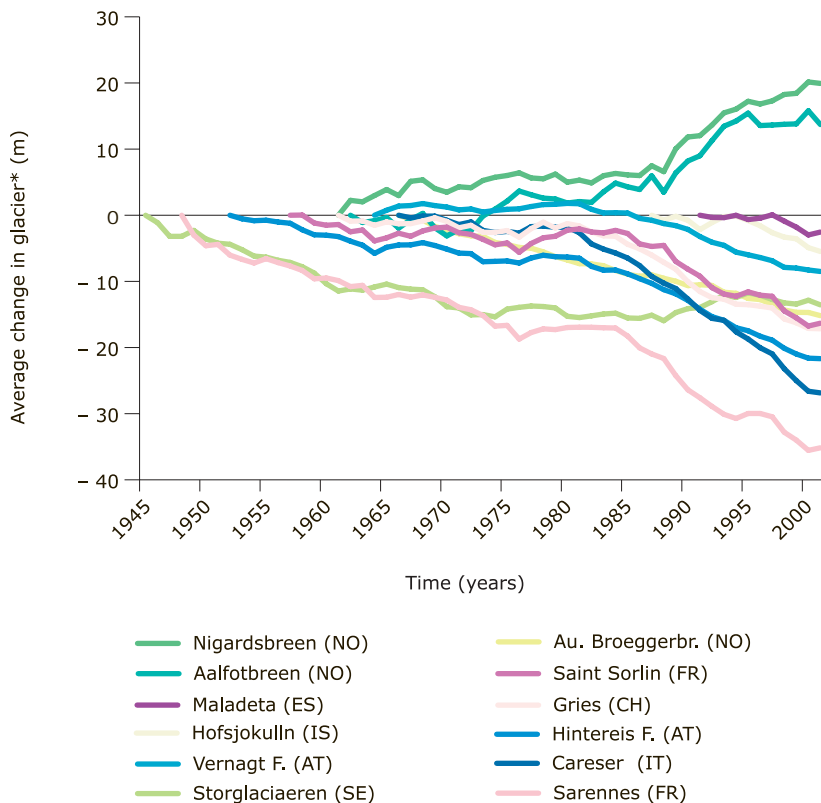




## Impact of climate change on biodiversity

### Average change in European glaciers

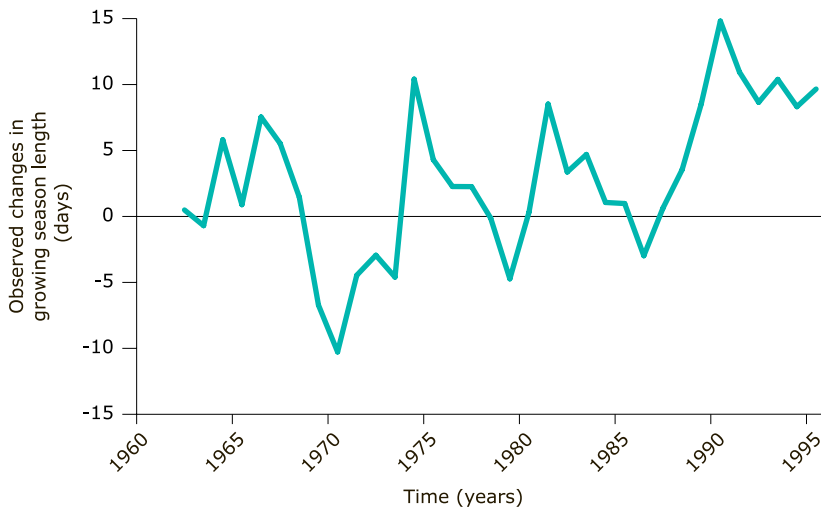
Glaciers in all European glacial regions except for Norway are in retreat, consistent with the global trend. Norwegian coastal glaciers are expanding due to increased snowfall in winter. From 1850 to 1970, glaciers in the European Alps lost approximately one third of their area and one half of their mass. Since 1980, another 20-30 % of the remaining ice has been lost. Current glacier retreat is now reaching levels exceeding those of the last 10,000 years. It is very likely that glacier retreat will continue. By 2050 about 75 % of the glaciers in the Swiss Alps are likely to disappear. The extent of Arctic sea ice is also decreasing by about 0.3 % per annum, a trend that has been recorded for the past 25 years.



\* Specific net mass balance (cumulative): i.e. the net change is glacial volume expressed as the equivalent amount of liquid water averaged over the surface of the glacier (m/year).

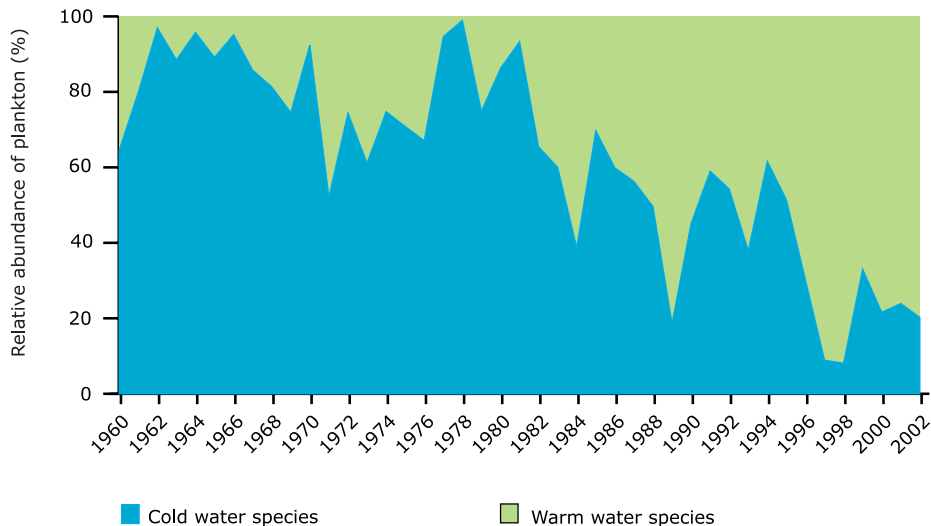
### Observed changes in growing season length

The average annual growing season in most areas of Europe has increased by about 10 days over the past 20 years and will further lengthen in the future. Green biomass (needles and leaves) of vegetation increased by 12 %, an indicator of enhanced plant growth. These positive effects of rising temperature on plant growth may be offset by an increased risk of water shortage that would harm vegetation. Some crops and trees need low temperatures in winter to trigger bud bursting in spring. These species can no longer grow in areas where winter temperatures are becoming too high. Further projected changes in the growing season length may require adaptation measures and changes in agriculture and nature protection strategies. This dataset does not cover France, Italy, Spain or Portugal.



### Zooplankton abundance

The past decade has seen a marked change in the relative abundance of zooplankton in the North Sea. The warm-water copepod *Calanus helgolandicus* has become more than twice as abundant as the cold-water species *Calanus finmarchicus*. These data are illustrative of a general trend for zooplankton populations to shift northwards in response to changing climatic conditions. The composition of the marine ecosystem has been changing since the mid 1980s in the North Sea, a trend that directly affects fish populations and consequently fisheries. Projections show that global warming will increasingly change the composition of the ecosystems in the oceans and cause a shift by warm-water species towards higher latitudes.



Data on two species of Copepod found in the Central North Sea  
 warm water: *Calanus helgolandicus*  
 and cold water: *Calanus finmarchicus*

## Focal area 4: Ecosystem integrity and ecosystem goods and services

*Conscious of the intrinsic value of biological diversity and of the ecological, genetic, social, economic, scientific, educational, cultural, recreational and aesthetic values of biological diversity and its components...*

Preamble to the convention on biological diversity (1992)

The value of ecosystem goods and services - providing for example food, medicines, clothes and shelter, protection of soil and water, sinks for greenhouse gases and pleasant places to visit and live in – is being increasingly recognized, in both quality and financial terms. The subsequent need to consider whole ecosystems and maintain their integrity rather than manage and exploit smaller parcels of land or coastal strips is also recognized and forms the basis for the ecosystem approach to the conservation and protection of biological diversity promoted by the convention on biological diversity.

The CBD and EU have listed three indicators for immediate testing in this focal area: marine trophic index, connectivity/fragmentation of ecosystems and water quality in aquatic ecosystems for immediate testing. Possible indicators relevant to the last two areas are presented here.

Connectivity and fragmentation relate to the opportunities and barriers for species to migrate as part of their normal development or in response to pressures including climate change. Animals can migrate more readily than plants but both may be constrained by fragmentation of land by urban development and by transport infrastructure development. It is therefore increasingly important that connections are maintained in the landscape through the retention and maintenance of 'corridors' and 'stepping stones'. Various studies are underway to define these requirements. The Corine land cover 2000 update when merged with other spatial data on the occurrence and movement of various species will enable the mapping and assessment of 'corridors' and 'stepping stones' and their contraction or growth over the period from around 1990 to 2000. In the meantime, fragmentation of landscapes has been assessed from the original CLC database and is presented here to show the extent of fragmentation across EU-25 during the 1990s.

The agricultural contribution to the release and deposition nitrogen (as nitrates) in water was highlighted under focal area 2 above. Here the trends in nitrogen concentration in surface and groundwaters are presented. Measures to reduce nitrate pollution can be effective. This can be done through changes in farming practice, including the allocation of an annual nitrogen 'budget' to each farm as done in Denmark, and through good implementation of the EU nitrates directive.

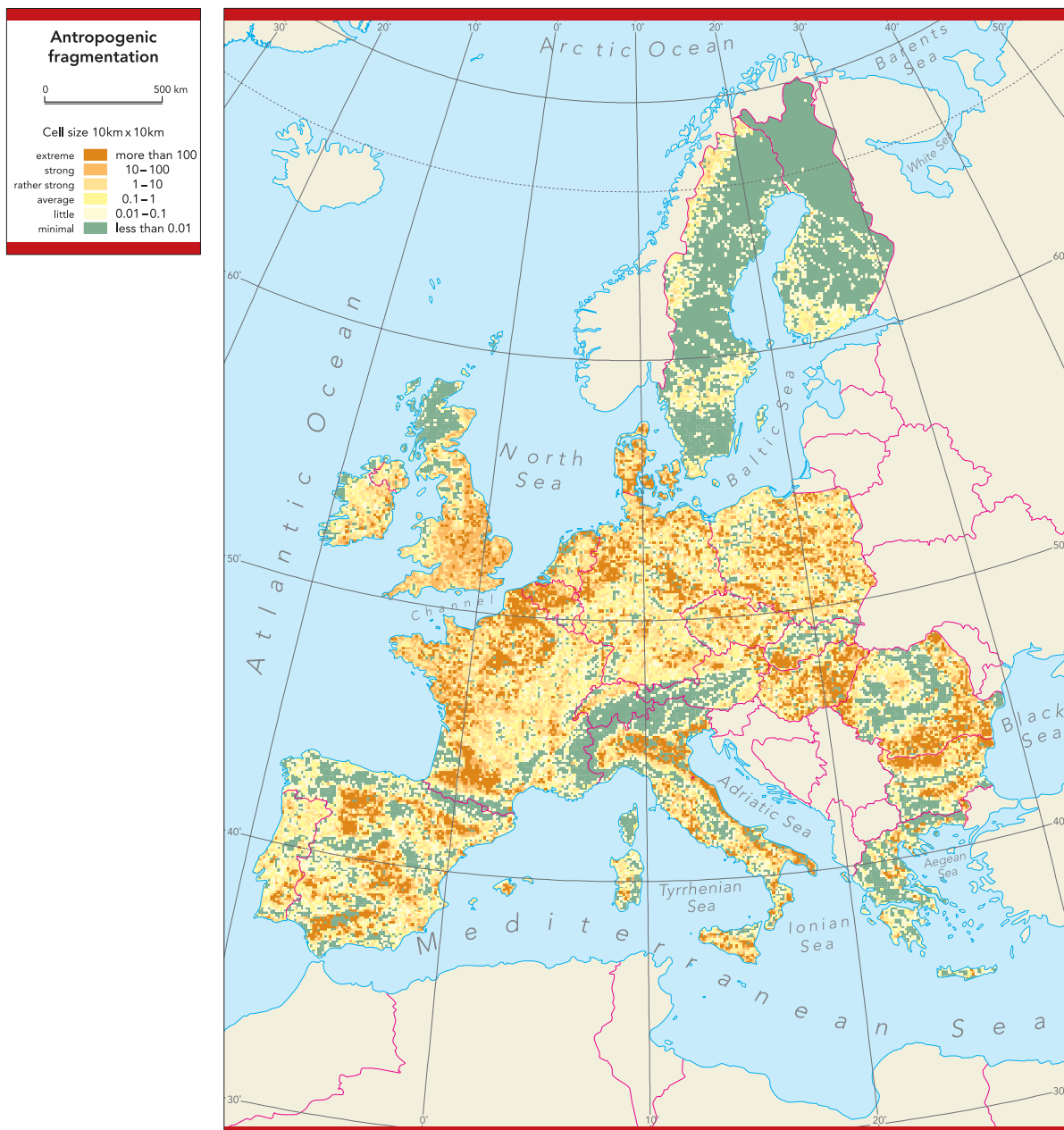
Substantial time lags can occur before changes in agricultural practices are reflected in groundwater quality, depending on the soil type and the specific hydrogeological conditions of the groundwater body and overlying substrate. As groundwater ranges in age from decades to millennia, current practices are in effect leaving a legacy of groundwater pollution for coming generations. Around one third of groundwater bodies now exceed nitrate guideline values.

## Connectivity/Fragmentation of ecosystems

### Anthropogenic fragmentation

The increasing demand for space (for uses such as agriculture, forestry, recreation, tourism, transport, housing, industry) leads to a human-induced fragmentation of ecosystems and habitats and to increased influences from adjacent intensively used areas on smaller and smaller semi-natural and natural areas. Even measures to create protected areas or to promote environmentally-friendly agricultural production cannot prevent impacts if the areas of land involved are small. The effects on biodiversity are: reduced habitats size and increased distance between suitable habitats for some species (barrier effect), with detrimental consequences on the sustainability of core characteristic species and of species requiring large areas to survive. Opening up areas of land also facilitates invasion of alien species.

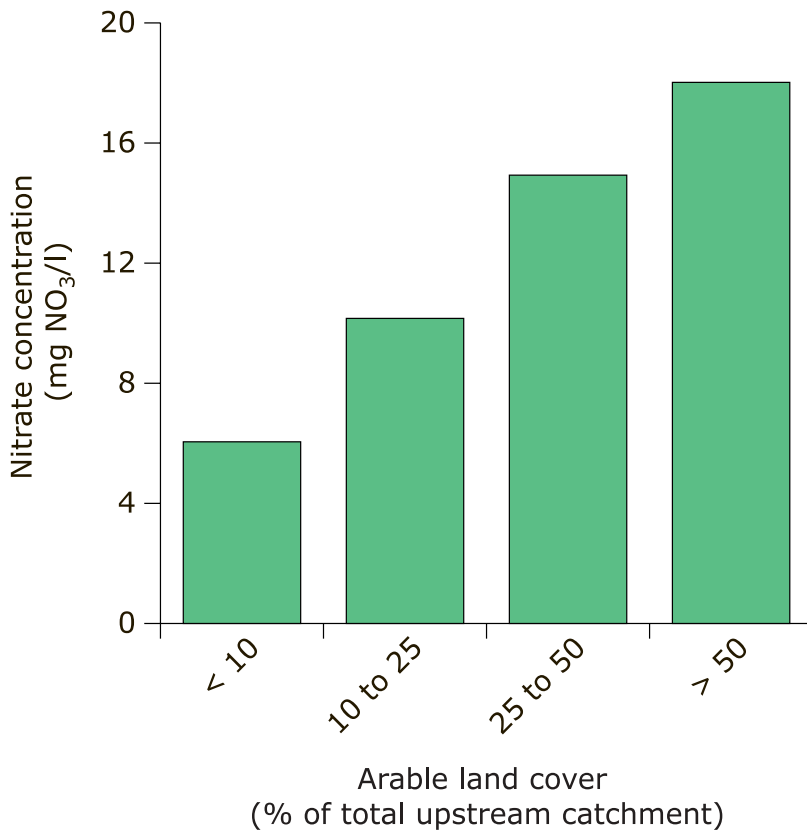
Extensive fragmentation occurs across most of EU-25 with limited fragmentation found only in mountainous and/or forested, low population areas, for example in Sweden, Finland, north-west parts of Scotland and Spain and the Alps, the Pyrenees and Carpathians.



## Water quality in aquatic ecosystems

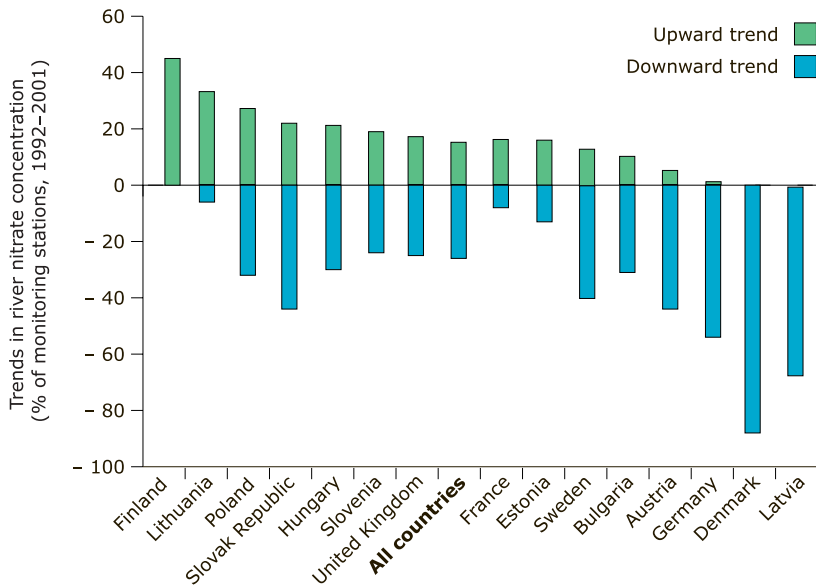
### Arable land in upstream catchments

Nitrate concentrations in rivers are linked to the proportion of arable land in the upstream catchment: highest levels occur where large amounts of nitrogenous fertilisers and animal manure are used. In 2001, nitrate levels in rivers where arable land covers more than 50 % of the upstream catchment area were three times higher than in catchments with arable land cover of less than 10 %. Member States are required to designate nitrate vulnerable zones and implement programmes of measures to reach the EU nitrates directive's objective of reducing water pollution caused or induced by nitrates from agricultural sources.



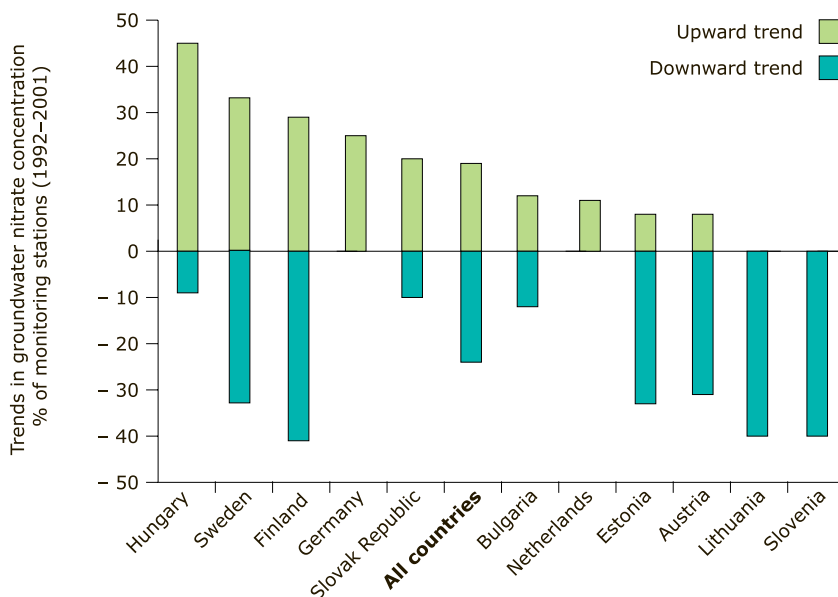
### Nitrate concentrations in rivers

Nitrate pollution in rivers is higher in the EU-15 than in the 10 new Member States (but lowest of all in the Nordic countries). This reflects differences in agricultural intensity and practices. In 2000/2001, rivers in 14 European countries (out of 24 with available information) exceeded the EU drinking water directive's guideline concentration for nitrate; five also exceeded the maximum allowable concentration. In general nitrate concentrations in rivers are declining: 25 % of monitoring stations on Europe's rivers recorded a decrease between 1992 and 2001, reflecting the success of the nitrates directive and national measures to reduce nitrate pollution. However, around 15 % of river monitoring stations showed an increasing trend in nitrate concentrations over the same period.



### Nitrate concentrations in groundwater

Nitrate pollution of groundwater appears stable at the European level. However, when the data are broken down by country, 24 % (out of 142) individual groundwater bodies show decreasing nitrate concentrations while in 19 % concentrations are increasing. The most marked rises are in Hungary, Sweden, Finland and Germany. Increases may either reflect the time-lag between changes in agricultural practices and their effects on groundwater quality or show a need for additional measures.



## Conclusions

The illustrative indicators presented in this paper show that:

- there have been significant changes in land cover (at least in the two Member States analysed to date) and hence in the extent of various ecosystems during the 1990s which will have added to the pressures on these and surrounding ecosystems and on the species they contain
- there have been major declines in farmland bird populations and in wetland and grassland butterfly populations over the past 20-30 years
- there was an increase in the number of threatened taxa/species between 2000 and 2003, with six taxa species now critically endangered
- there has been little or no progress in moving to more sustainable management of biological resources
- pressures from nitrogen are not decreasing and those from climate change are on the increase
- nitrate concentrations in surface waters and groundwaters are decreasing in some areas while increasing in others
- pressures from landscape fragmentation are generally high in Europe

It is therefore clear from the information and indicators available that the threats to EU biological diversity continue and hence much remains to be done to halt the loss of biodiversity by 2010.

However, most of the elements are now in place to address the EU target for 2010 and to monitor progress in an organised and consistent way across the EU and more widely at the global level.

Policy is in place through the convention on biological diversity, the Kiev biodiversity resolution and its action plans, the EU sustainable development strategy, the sixth Community environment action programme, the Community biodiversity strategy and its action plans, the EU habitats and birds directives, other EU directives that have a bearing on Europe's biodiversity, as well as national strategies and action plans. The newly expanded European Union of 25 Member States can now take leadership in implementing the policies and establishing the agreed indicators and in halting biodiversity. This leadership can be reinforced by the other pan-European countries which have adopted the Kiev biodiversity resolution and/or participate in the EEA work programme.

Countries have agreed (or are about to agree) at the global, pan-European and EU level on the first indicators to monitor and report on progress and to help achieve the 2010 target. Consistent data and information are becoming available at the global, pan-European and EU level to enable these indicators to be tested and developed from the wealth of previously fragmented and dispersed data available in countries in a wide range of monitoring and research programmes. More data, analyses and reports - for example from the Corine land cover 2000 update and the EEA core set of indicators - will become available in the coming year.

The role of the voluntary sector – individuals and NGOs with interests in particular aspects of biodiversity – in providing relevant information and indicators is now recognised and can supplement and complement the data collected and reported by national and international governmental organisations.

The EEA will continue to coordinate the testing and development of information and indicators for biodiversity with a wide range of Eionet partners, relevant NGOs and international organisations within its wider mandate to provide timely, targeted, policy-relevant and reliable information.



Additional funding will be required to further develop the necessary management and monitoring of the various components of biodiversity, to ensure the efficient flow of data from the various individuals and organisations involved to the relevant reporting authorities, and to ensure that the 2010 target is effectively addressed and finally achieved.

There is less than six years remaining to get the management, monitoring and reporting systems in place before 2010. There is no time to lose!

## Further reading

The following reports have been used in the compilation of this paper. Thematic factsheets can be downloaded from <http://themes.eea.eu.int/indicators/>

### EEA reports

EEA (1999); *Environment in the European Union at the turn of the century*; Environmental assessment report No 2  
 EEA (2003); *Europe's environment: the third assessment*; Environmental assessment report No 10  
 EEA (2003); *Europe's water: An indicator-based assessment*; Topic report No 1/2003  
 EEA (2004); *Air pollution in Europe 1990-2000*; Topic report No 4/2003  
 EEA (2004); *Agriculture and the environment in the accession countries - Implications of applying the EU common agricultural policy*; Environmental issues report 37  
 EEA / UNEP (2004); *High nature value farmland*; EEA report 1/2004  
 EEA (2004); *EEA Signals 2004 – A European Environment Agency update on selected issues*; EEA report (in press)  
 EEA (2004); *Climate change impacts in Europe: Today and in the future*; EEA report (in press)  
 EEA (2004); *First set of EU headline biodiversity indicators*; paper Malahide/5

### Other reports and papers

IUCN (2003); *2003 IUCN Red List of Threatened Species*  
 MCPFE (2003); *State of Europe's Forests 2003*  
 UNEP/CBD/SBSTTA/9/INF/26 (2003); Proposed biodiversity indicators relevant to the 2010 target  
 UNEP/CBD/COP/7/L.27 (2004); *Strategic plan: future evaluation of progress*

## Data sources

EU headline indicator	Illustrative indicator names	Information sources	Link to EEA core set of indicators
<i>Status and trends of the components of biological diversity</i>			
<b>Trends in extent of selected biomes, ecosystems and habitats</b>	Changes in main land cover categories to 2000	EEA: Corine land cover database	No
	Conversion of wetlands in Ireland		No
<b>Trends in abundance and distribution of selected species</b>	Bird populations	European Bird Census Council (EBCC); Wetlands International, International Waterbird Census	Species diversity
	Other species	UNEP-World Conservation Monitoring Centre, Butterfly Conservation	No
<b>Change in status of threatened and/or protected species</b>	Change in status of threatened species, 2000-2003	2003 IUCN Red List of Threatened Species	Threatened and Protected Species
<b>Coverage of protected areas</b>	Implementation of the habitats directive	DG Environment (Habitats and Birds Directives)	Designated areas
<i>Sustainable Use</i>			
<b>Area of forest, agricultural, fishery and aquaculture ecosystems under sustainable management</b>	Distribution of forest type	UNECE/FAO 2000 Forest Resources of Europe	No
	Organic farming area	Welsh Institute of Rural Affairs	Area under organic farming
	Fish catches above safe limits	European Commission, DG Fisheries	Status of marine fish stocks

<i>Threats to Biodiversity</i>			
<b>Nitrogen deposition</b>	Nitrogen surplus in agricultural soils	European Commission, DG Agriculture EMEP/MS-CW, MNP/CCE	No
	Atmospheric deposition of nitrogen		No
<b>Impact of climate change on biodiversity</b>	Average change in European glaciers	Fraunfelder, 2003 (World Glacier Monitoring Service)	No
	Observed changes in growing season length	Menzel 2002	No
	Zooplankton abundance	M. Edwards; Sir Alister Hardy Foundation for Ocean Science	No
<i>Ecosystem integrity and ecosystem goods and services</i>			
<b>Connectivity/Fragmentation of ecosystems</b>	Anthropogenic fragmentation	EEA; ETC/Nature conservation and ETC/Land cover	No
<b>Water quality in aquatic ecosystems</b>	Arable land in upstream catchments Nitrate concentrations in rivers Nitrate concentrations in groundwater	European Environment Agency (Eurowaternet)	Nutrients in freshwater Nutrients in freshwater Nutrients in freshwater

## Data quality

EU headline indicator	Illustrative indicator names	Coverage of countries	Latest data	Data quality
<i>Status and trends of the components of biological diversity</i>				
<b>Trends in extent of selected biomes, ecosystems and habitats</b>	Changes in main land cover categories to 2000	Ireland, Netherlands	2000	XXX
	Conversion of wetlands in Ireland	Ireland	2000	XXX
<b>Trends in abundance and distribution of selected species</b>	Bird populations	EU-15	2002	XX
	Other species	16 of EU-25	2000	XX
<b>Change in status of threatened and/or protected species</b>	Change in status of threatened species, 2000-2003	EU-25	2003	XXX
<b>Coverage of protected areas</b>	Implementation of the habitats directive	EU-15	2003	XX
<i>Sustainable Use</i>				
<b>Area of forest, agricultural, fishery and aquaculture ecosystems under sustainable management</b>	Distribution of forest type	EU-25	2000	XX
	Organic farming area	EEA-31	2002	XXX
	Fish catches above safe limits	EU-15		XX

<i>Threats to Biodiversity</i>				
<b>Nitrogen deposition</b>	Nitrogen surplus in agricultural soils	EU-15	1997	XX
	Atmospheric deposition of nitrogen	EU-25 + others	2000	XX
<b>Impact of climate change on biodiversity</b>	Average change in European glaciers	Selected countries	2001	XXX
	Observed changes in growing season length	Selected countries	1995	XXX
	Zooplankton abundance	Not applicable	2002	XXX
<i>Ecosystem integrity and ecosystem goods and services</i>				
<b>Connectivity/Fragmentation of ecosystems</b>	Anthropogenic fragmentation	EU-15 + others		XX
<b>Water quality in aquatic ecosystems</b>	Arable land in upstream catchments	12 countries	2001	XX
	Nitrate concentrations in rivers	24 countries	2001	XX
	Nitrate concentrations in groundwater	24 countries	2001	XX

stars: XXX=high, XX=medium, X=low quality