CHAPTER IV: BIOLOGICAL DIVERSITY AND ENVIRONMENTAL PROTECTION[1]

Introduction

The TBFRA-2000 differs from earlier enquiries in the extent to which it has sought information on forest condition, or forest quality, rather than just on the resource itself. This change does not signify an abrupt switch in emphasis, but is part of a continuing trend to broaden the scope of the enquiry. Decisions about the type of questions, and about their formulation, are based on discussions at an experts' meeting in Kotka, Finland in 1996 and further deliberations by two working groups, including representatives from conservation organizations. The inclusion of questions relating to biological diversity, the naturalness of forests and the extent and type of regeneration reflects increasing interest in biodiversity and environmental protection. It also provided a serious challenge to correspondents, who were faced with questions that required greater interpretation than has been the case in the past, and relied upon information that may not, until recently, have been collected by governments. These difficulties are reflected by the replies. Responses to the questions in this section have been both less complete and in some cases more ambiguous than for those relating to more traditional issues such as volume of wood extracted or area under trees.

The question of data quality requires some discussion. In a number of cases, due to both misinterpretation of questions and lack of information, data quality is suspect and some of the results will be controversial. Questions of forest naturalness have only really emerged in the last few years, and interest has until recently been confined to professional ecologists and some non-governmental organizations. Whilst a few governments have developed their own criteria and built up data sets, others have responded to the TBFRA questions as best they can, using very general categorization. In other cases, such as numbers of species at risk, most data sets are partial. Finally, the TBFRA has uncovered serious disagreements with respect to interpretation of some information, particularly with regard to what constitutes a protected area; indeed the current enquiry has to some extent opened up debates about the status of protected areas within parts of its member countries.

It is, therefore, particularly important to treat the following information with care. Nonetheless, the very considerable efforts made by many correspondents to address the questions, and the quality of many of the responses, is encouraging.

It should also be noted that due to the fact that many questions reported in this chapter are new to the TBFRA, there is no time comparison. Hopefully, time comparison data will become available in the future.

Given the more experimental nature of this section, the following chapter starts by introducing the reasons for inclusion of each question, outlines some of the definitions chosen to define the issue and then summarizes and discusses the results. Although full data tables are included at the end of the section, selected information has been extracted and presented in diagrammatic form below. All figures must be treated with caution because of the absence of data from some countries; however on the whole data gaps are from countries with relatively limited forest resources on a global scale and therefore unlikely to have a major impact on global proportions.

Forest and other wooded land by categories of naturalness (Main Tables 53 and 54)

Concern has been expressed that temperate and boreal forests, although expanding in area, are decreasing in "quality". One of the commonest elements mentioned, as contributing to quality is the degree of "naturalness" or "authenticity". In ecological terms, this refers to the degree to which a forest corresponds to the original forest in terms of species composition and ecological processes. However, these terms are difficult to define in an unambiguous and measurable way; in some cases it is by now difficult to determine the composition of an "original" forest and most forests in the region are to some extent altered by human activity, often over hundreds or thousands of years. For this reason, correspondents were invited to estimate the area of "forest undisturbed by man" as an approximation of "naturalness". The terms used by TBFRA "forest undisturbed by man" has a rigorous definition, as it implies no human disturbance at all or disturbance so long ago that natural processes have been completely re-established. Forests that do

[1] This chapter was prepared by Mr. Nigel Dudley (see Appendix V).

not satisfy this rigorous definition, even if they may well appear to be "natural" and have minimal silvicultural intervention, are considered "semi-natural". However, despite the rigorous definition, some uncertainties remain, including:

- How long must a forest remain untouched after an intervention to regain its status as "undisturbed"? (This is likely to vary between forest types and with respect to the degree of intervention.)
- What is the minimum size needed for an area to be classified as an "undisturbed forest"? Do small pockets of undisturbed trees fulfil the ecological roles of undisturbed forests?
- How are inventory crews going to identify undisturbed forests on the ground, given that long-term records often do not exist and knowledge of the ecology of undisturbed forests may be limited?

According to the replies by correspondents, 55 per cent of forest in the TBFRA area can still be classified as "undisturbed by man", with 41 per cent "semi-natural" and just 4 per cent of the area covered by plantations (Figure 4.1) (Note that these figures do not include data from Greece).

FIGURE 4.1

Proportion of TBFRA region forest graded by "naturalness"

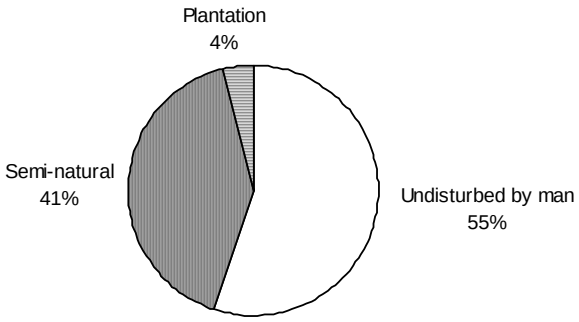
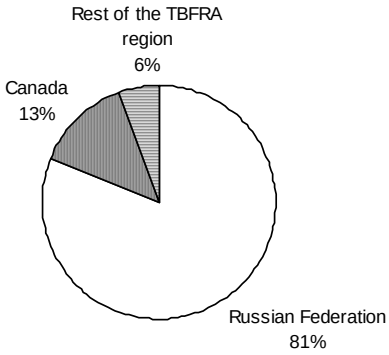


FIGURE 4.2

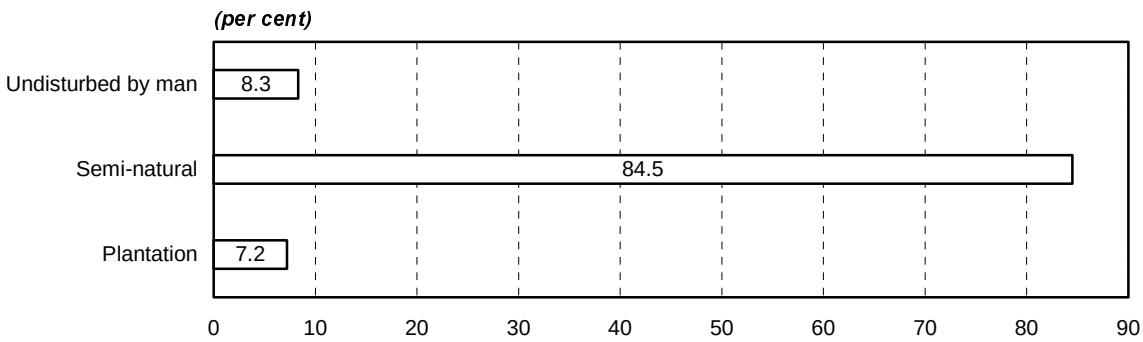
Forest in the TBFRA region undisturbed by man



The results suggest that the statistics for the TBFRA area on forest degree of naturalness are, not surprisingly, dominated by forest condition in the Russian Federation and Canada (and therefore on the accuracy of data from these two countries and on the ways in which they distinguish between "undisturbed by man" and "semi-natural") (Figure 4.2). However, if relative naturalness is analysed outside the Russian Federation and Canada, the figure for forest "undisturbed by man" drops to just 7 per cent of the total, as shown below (Figure 4.3).

FIGURE 4.3

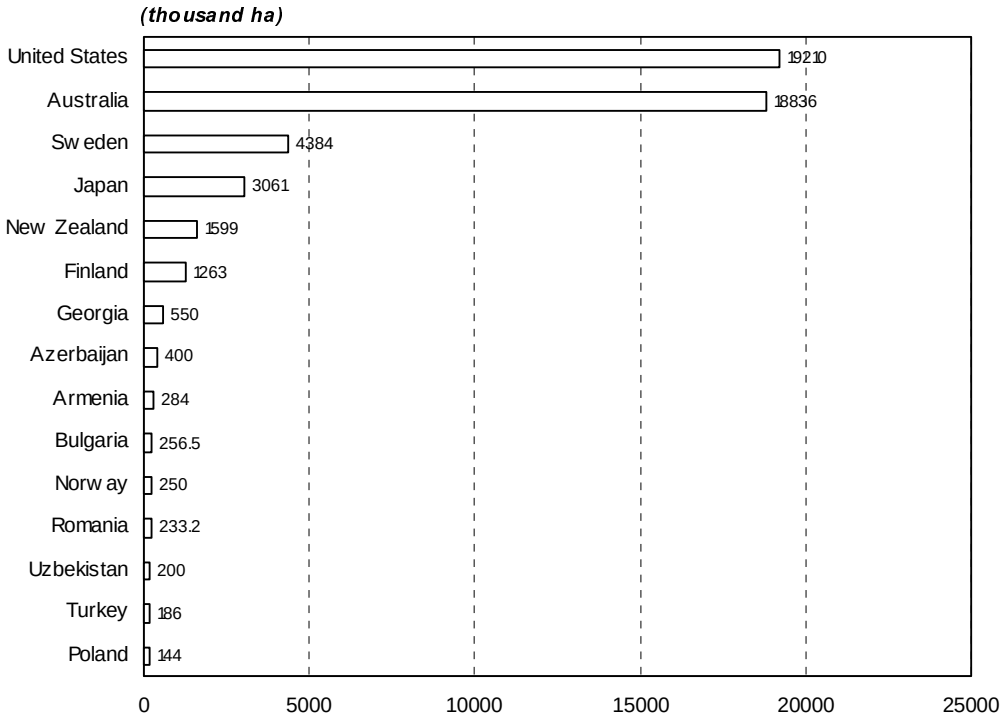
Percentage of forest graded by naturalness excluding Russian Federation and Canada



Closer examination of the data outside the two dominant forest countries shows further concentration. The bulk of the remaining forest "undisturbed by man" exists in the United States and Australia with smaller amounts in the Nordic countries, Japan and New Zealand; in the rest of Europe the proportion is usually from zero to less than one per cent. Nonetheless, in Europe as a whole, almost 9 million ha are defined as "undisturbed by man". While over half of this is in Sweden and much of the rest in Norway and Finland, many former Soviet states apparently contain important remnant areas (Figure 4.4).

FIGURE 4.4

Main forest areas undisturbed by man outside Russian Federation and Canada



Analysis of "naturalness" in "other wooded land" shows a similar concentration of the forest "undisturbed by man" with two countries dominating the statistics, although in this case Canada has recorded considerably more land than the Russian Federation (Figures 4.5 and 4.6). In general, boreal countries have the majority of other wooded land "undisturbed by man". Six of the seven countries in this category all have substantial boreal forests (in descending order: Canada, the Russian Federation, USA, Sweden, Finland and Norway) although the United States of America has substantial areas of other wooded land south of Alaska. The non-boreal country is Australia with a reported area of undisturbed other wooded land of over 23 million ha. In this category, substantially more other wooded land is recorded as "undisturbed by man" than "semi-natural".

FIGURE 4.5

Proportion of other wooded land in the TBFRA region classified by "naturalness"

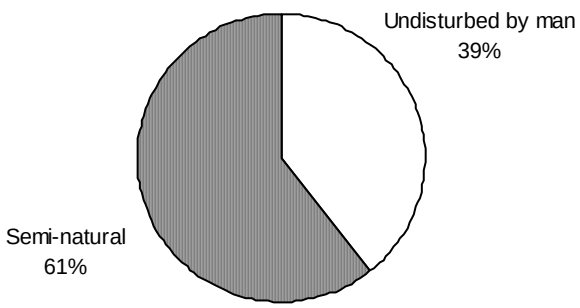
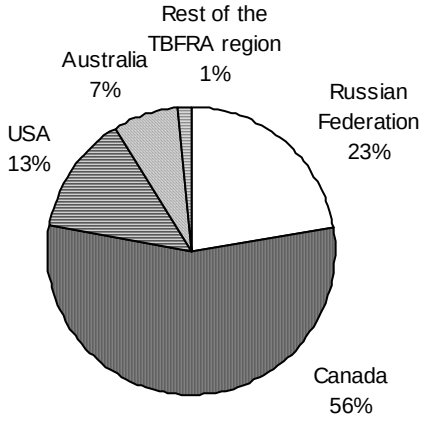


FIGURE 4.6

Proportions of other wooded land in the TBFRA region classified as undisturbed by man

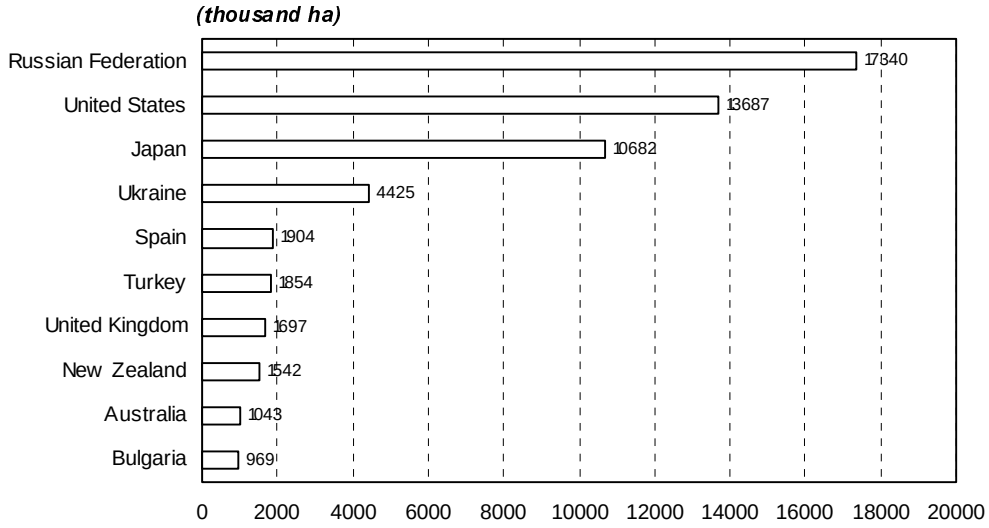


The dominance of Canada and the Russian Federation in terms of forest cover means that their estimations of "naturalness" inevitably have a major impact on total TBFRA figures and any errors would result in global distortion. Unfortunately, neither country has undertaken a comprehensive study of degree of naturalness within forests. The nearest equivalent found is the "frontier forest" study undertaken by the World Resources Institute (WRI). Comparison with WRI's figures found approximately similar proportions for Canada but less frontier forest (approximately equivalent to "forests undisturbed by man" in the Russian Federation[3].

Only 4 per cent of the total forest area in TBFRA countries is currently under plantations. 90 per cent of plantations in the area are found in just ten countries, dominated by the Russian Federation, the United States and Japan (Figure 4.7). This may reflect choices about forest management; for example Canada identified no plantations at all and defined all its managed forests as "semi-natural".

FIGURE 4.7

Area of plantations in ten countries



Tree species

One important information gap identified in the TBFRA planning discussions was a centralized set of data on presence and abundance of tree species in different countries. Such a data source would provide comparative information on biodiversity, commercial opportunities, conservation status and the broad geographical spread of species and families. Accordingly, correspondents were asked to provide information on tree species in these countries, including:

- scientific and common names of all tree species;
- an estimation of their abundance;
- an indication of whether they are native or introduced.
- Although most of the information should be fairly unambiguous, and well known in the majority of countries in the TBFRA, some questions remain open for interpretation by correspondents, including the following:
- How can correspondents be certain that a particular species has been introduced? In some cases where species have been present for many centuries it is now impossible to be certain if the species was originally native (for example this is true of the sycamore (Acer pseudoplatanus) in the UK). In other cases it remains very clear.
- What is the status of species that are native in one part of a country but have been spread into many other areas as a result of human activity? This is particularly significant in the larger countries, where species have in some cases been introduced into radically different habitats thousands of kilometres away from the original source.
- How can correspondents standardize estimations of abundance?
- How are naturalized species to be classified? (While the instructions were clear, these have not always been adhered to in replying to the enquiry.)

The full country replies are very voluminous and will be set out in a TBFRA-2000 accompanying discussion paper. They constitute probably the single largest comparison of country species lists assembled for the region and, in complete form, it will provide a unique data source.

[3] Dirk Bryant, Daniel Nielsen and Laura Tangley, "The Last Frontier Forests: Ecosystems and Economies on the Edge", World Resources Institute, Washington DC, 1997.

However, it has posed many problems for correspondents and there are relatively few countries in which data are unequivocal. Indeed in the large majority of cases the number of tree species listed in this section varied considerably from the total listed later in answer to the question summarized in Main Table 56.

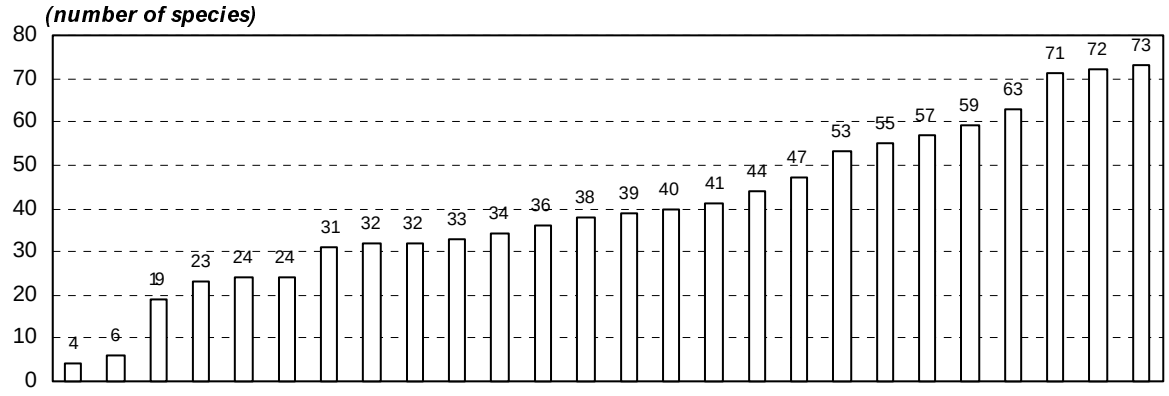
Some countries have also clearly included introduced species within their list of "natural" species and there is also some confusion about the status of naturalized species. The following summary of information is therefore necessarily selective and partial and further work is required to complete this compilation.

Any generalizations about speciation and relative biodiversity are very difficult to apply and any global patterns are heavily influenced by local anomalies. Nonetheless, some general conclusions can be drawn about numbers of tree species and levels of biodiversity.

The highest levels of biodiversity with respect to trees are found in the southern part of the Pacific Rim and Japan and the lowest levels occur in the northern boreal regions (Figure 4.9). In Europe and Central Asia (an area where small countries result in smaller sample units) tree diversity increases towards the south and the east (Figure 4.8).

FIGURE 4.8

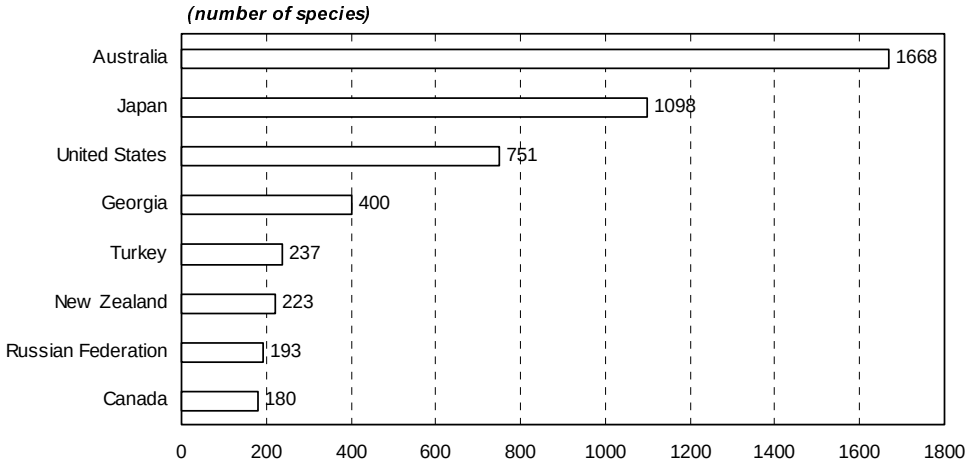
Number of native tree species in European countries



The analysis also includes itemization of threatened tree species. Currently the data are too sporadic to allow comparisons to be made – further work would allow greater analysis of trends. The unique value of the data already collected means that further work would be well rewarded.

FIGURE 4.9

Number of native tree species in "Other TBFRA" countries



Protection status: Forest and other wooded land (MainTable 55)

There is considerable interest in information relating to the amount of forest in protected areas and about the form that protection takes. Fears about a decline in natural forests have created a political momentum for an increase in forest protected areas, to protected biodiversity and also related ecological, social and cultural values. At the Fourth World Congress on National Parks and Protected Areas, in Caracas in 1992, IUCN/World Conservation Union suggested that around 10 per cent of the Earth's land surface should be in protected areas to conserve a full complement of biodiversity. This target was repeated in 1995 in a joint IUCN/WWF forest strategy. Some national governments have endorsed this figure, including for example those of Austria and Greece. The Australian government is committed to protecting 15 per cent of its pre-1750 forests and the Canadian federal and provincial governments are committed to a 12 per cent forest protection target. On the other hand a number of industry representatives have been expressing concern about the amount of forest being removed from productive use and questioning the amount of land put under protection. These issues are, in some countries, extremely emotive and there is a need for clear and accurate information on this subject. Many TBFRA countries are already collecting information for other purposes, including fulfilment of existing obligations (such as reporting to the Pan European and the Montreal Processes) and addressing national policy goals.

Correspondents were asked to collect and present information relating to forests and other wooded land in protected areas. Data were to be divided into the area under strict protection (as defined by IUCN categories I and II) and the area under more flexible forms of protection (i.e. forest and woodland in IUCN categories III-IV). Correspondents were also asked, where possible, to give an indication of trends in size and number of forest protected areas.

The definition used by TBFRA is based on that of IUCN – i.e. *an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means.* This is further subdivided into six categories depending on the degree of protection and the primary management objective, ranging from strictly protected areas where even human access is severely curtailed to working landscapes where protection takes place alongside human communities continuing their everyday lives. Protected areas falling into the more general categories, particularly Categories V and VI, are a long way from the popular concept of an uninhabited landscape set aside for wildlife.

Although IUCN and its World Commission on Protected Areas (WCPA) provide a detailed guide to distinguishing between the various categories, several ambiguities remain to provide a challenge for correspondents. The following questions remain to be answered:

- Does the current definition of the IUCN categories provide clear enough guidance to allow the development of data sets that are sufficiently standardized to allow comparison between countries?
- How do correspondents measure protected areas that are partly forested? More generally, how is a "forested protected area" defined from the perspective of whether or not it constitutes a forest?
- How do correspondents measure protected areas that can be subdivided into a number of different categories?
- How "official" do protected areas need to be? Can private lands (e.g. land owned by companies or charitable trusts) be included and if so how can it be determined?
- Should judgement about protection be made solely in terms of designation or should judgements be made about the effectiveness of protection? Protected areas are sometimes degraded through encroachment, illegal logging, hunting, mining and pollution; these may appear on official statistics but not provide real protection for biodiversity or other values. Currently very few countries have data on effectiveness of protected areas and this issue was therefore not addressed in the questionnaire.

The responses to this question are to some extent the least satisfactory in this section in terms of statistics, although very interesting in light of developments in thinking about protected areas. There was considerable confusion, and a measure of disagreement, amongst correspondents about when forest should be suitable for categorization under various IUCN protected area categories. In particular, there were differences in interpretation about the use of Category V, relating to *Landscape/seascape conservation and recreation.* This is defined as: *an area of land, with coast or sea as appropriate, where the interaction of people and nature over time has produced an area of distinct character with significant aesthetic, ecological and/or cultural value, and often with high biological diversity. Safeguarding the integrity of this traditional interaction is vital to the protection, maintenance and evolution of such an area.*

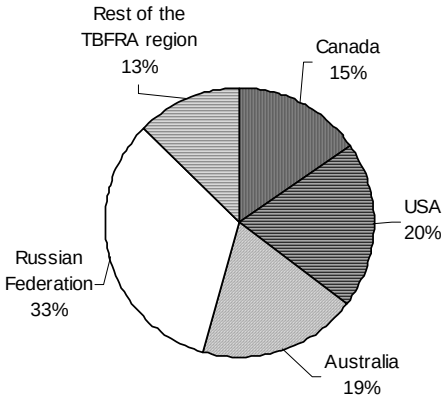
Some countries argued that most or all their forest fitted into this type of management category, and therefore listed all their forests as having protected area status. Others took a more traditional view of protection and listed only designated protected areas. Six countries listed *all* their forests in protected areas (Azerbaijan, Cyprus, Liechtenstein, Kazakhstan, Tajikistan and Yugoslavia). Several others argued that the majority of their forests corresponded to IUCN categories I to IV, including Uzbekistan (95.9 per cent), Denmark (95.5 per cent), Kyrgyzstan (86.3 per cent) and Germany (71.7 per cent).

To some extent, these discrepancies reflect changing attitudes towards protected areas. In the last twenty years, protected areas have become more flexible in terms of their aims, definition, size and approaches to management. Their role has become as much about the protection of processes—such as supply of water, prevention of erosion and

maintenance of human lifestyles—as about the protection of species. The integration of multiple functions within protected areas has resulted in changing attitudes amongst protected area managers. It has on the one hand encouraged formation of new protected areas, as a wider section of society appreciates the potential benefits, while it has also resulted in some serious challenges to traditional protected area functions in recent years. It has, for example, been suggested that clearcutting forests might be permitted within protected areas—the World Commission on Protected Areas rejected this. A number of the ambiguities could be addressed by giving greater prominence to the underlying IUCN definition, that protected areas should have biodiversity protection as their main aim. Areas that appear to correspond to one of the categories but do not meet this underlying criterion should not generally be included amongst the listed protected areas. The different interpretations of the questions in TBFRA-2000 are at least in part the result of the changing attitudes towards protected areas and some confusion about where a protected area starts and ends. However, this clearly makes comparisons between countries extremely difficult. Further work is needed in defining, or perhaps in better explaining, the categories if data can be used for international statistical analysis. Figures are less ambiguous for the more complete forms of protection, corresponding to Categories I to II (strict nature reserves, wilderness areas, national parks and natural monuments). For these categories, the TBFRA survey has provided an important overview of the status of protection within the biome. The large majority of the protected areas are found in the four major forest countries: Russia, the United States, Australia and Canada, with the remaining countries making up just 13 per cent of the total (Figure 4.10).

FIGURE 4.10

Main areas of IUCN Category I and II protected forest areas in the TBFRA region



These figures must be treated with some caution. European countries have traditionally put greater focus on the less strict protected area categories, and particularly on Category V protected landscapes, that relates closely to the west European national park model. This choice reflects in part the need to integrate conservation within a cultural and usually quite heavily populated landscape. The proportions are likely to change when the wider categories are taken into account, but this will require further analysis of the figures. Some countries, such as Denmark, are currently reassessing protected areas with respect to the IUCN categories. The proportion of forest under protection is of particular interest to many governments and NGOs. Figure 4.11 summarizes all the results not shown earlier, although some of these figures must be treated with extreme caution – they certainly do not signify strict protection.

Reported number of species (total and forest-occurring) including proportion endangered (Main Tables 56-64)

A number of scientists have expressed fears that we may be undergoing an extinction "pulse", during which a large number of species of plants and animals could disappear, largely as a result of human actions. This possibility has gained official recognition, for example through the Convention on Biological Diversity. Whilst the majority of forest-occurring species exist in the tropics, and these are also the areas where the greatest number of species are judged to be at risk or endangered, concern has also been expressed about the status of some forest-occurring species in temperate and boreal regions. Accordingly, the TBFRA invited correspondents to provide information on the number of forest-occurring plant and animal species that are judged to be endangered, thereby giving an indication of the state of biological diversity in forest and other wooded land.

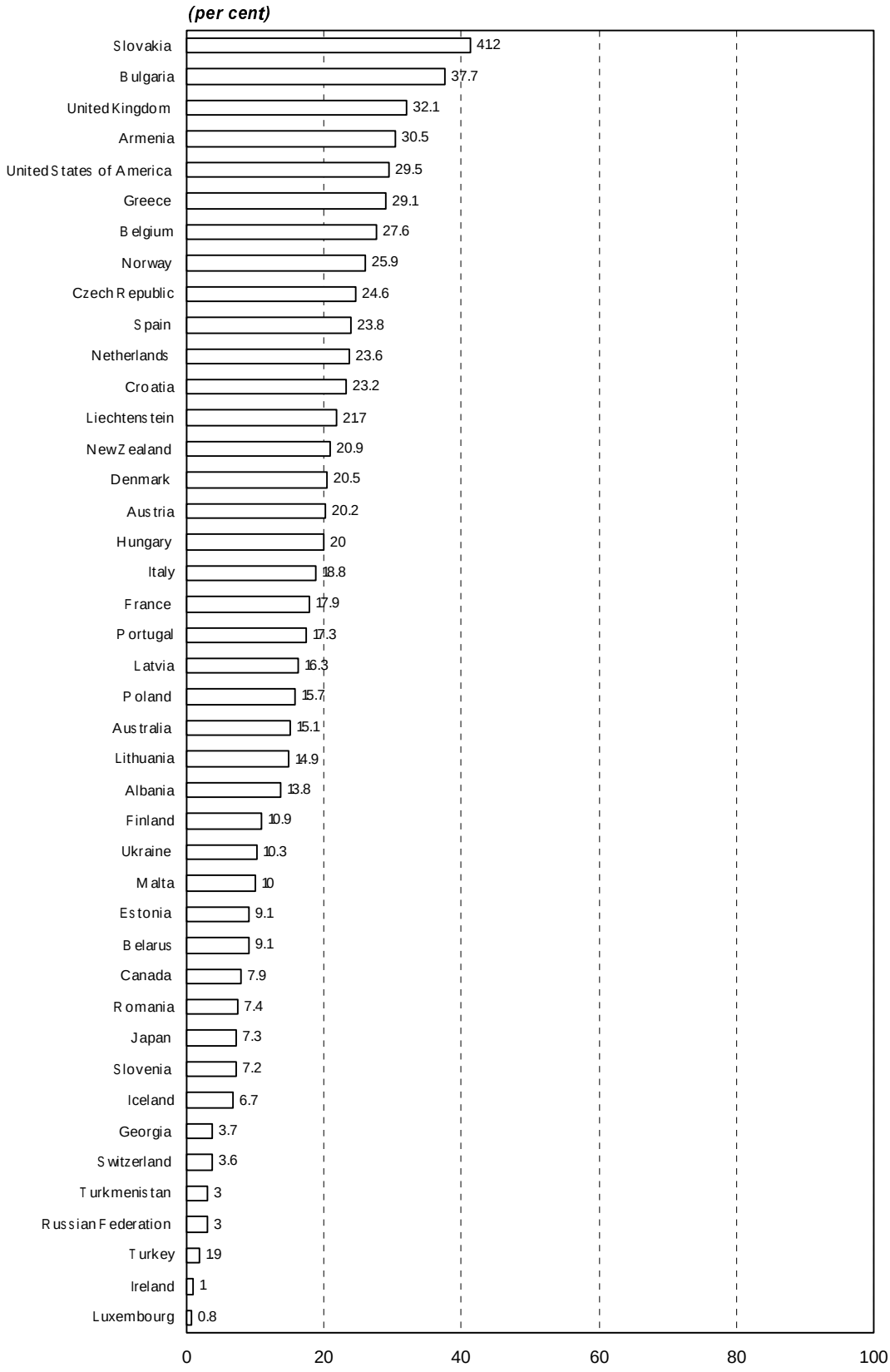
Data were sought on a range of plant and animal groups (trees, other vascular plants, ferns, mosses, lichens, mammals, birds, other vertebrates and butterflies and moths), both for the country as a whole and a subset referring specifically to forest-occurring species. In each case, questions asked for information on the following:

- total species
- of which: endangered
- endemic species
- of which: endangered

Information was also requested, as an annex to the table, on problematic introduced species.

FIGURE 4.11

Percentage of protected forest (IUCN categories I to VI) in total forest area in selected countries



Precise status categories were suggested for the term "endangered", drawing on a ranking system drawn up by IUCN's Species Survival Commission, with the opportunity of using either the pre- or post-1994 system. For countries with an existing red data book such information is relatively accessible; in other cases correspondents faced a challenging job of drawing together information from red data books referring to specific groups (such as *Threatened Plants of the World*) or drawing on judgements made by national experts.

Accuracy depends on the quality and coverage of data, on the way in which risk is assessed and on the ability to predict future trends. While some of the TBFRA countries have detailed species data (including paradoxically some of those that have undergone the most profound changes to their native wildlife), other correspondents will have only very rudimentary and fragmentary information to draw upon.

Data from the survey were extremely useful, but at this stage still very incomplete. The results nonetheless provide the most thorough survey of threats to forest species in the temperate and boreal biomes – the major 1992 survey of *Global Biodiversity* carried out by the World Conservation Monitoring Centre did not even consider non tropical forests.

Unfortunately, the number of serious gaps still remaining make it difficult to make justifiable statements about global numbers of threatened species in the various categories. In the following analysis, data are drawn from those countries providing the most detailed information. It should also be noted that assessment of risk would appear to differ between countries, with some adopting a more cautious approach (and thus listing a greater number of species as "threatened") than others. Some preliminary data are presented below (Figures 4.12 to 4.17).

FIGURE 4.12

Endangered forest-occurring mammal species

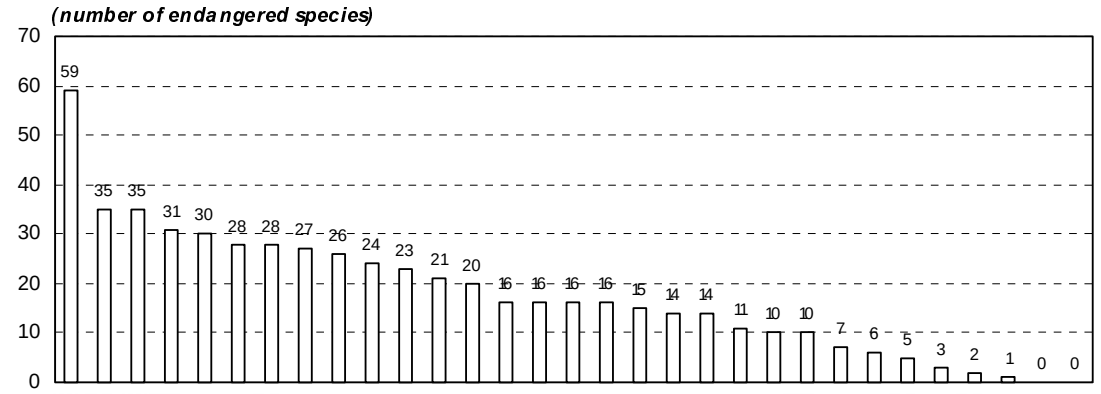


FIGURE 4.13

Endangered species of forest-occurring birds

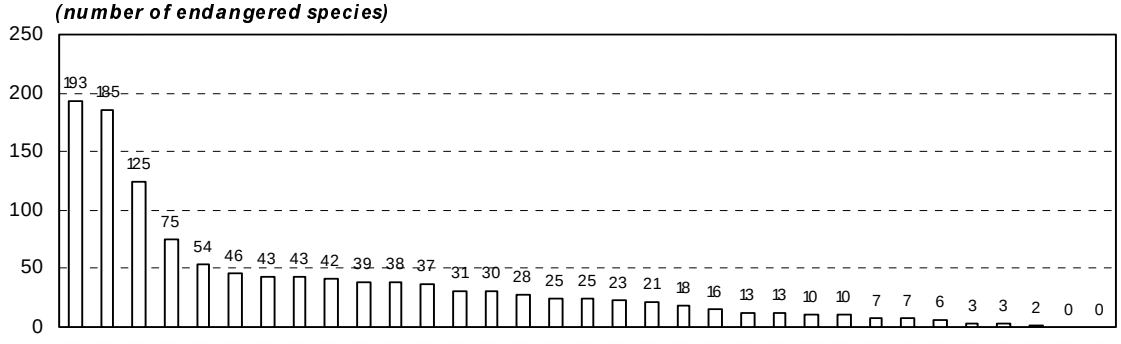


FIGURE 4.14

Other endangered forest-occurring vertebrate species (reptiles, amphibians and fish)

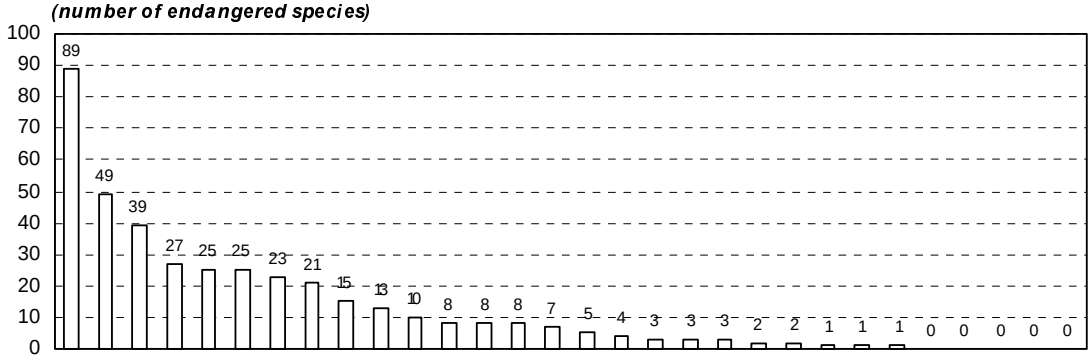


FIGURE 4.15

Endangered species of forest-dwelling butterflies and moths

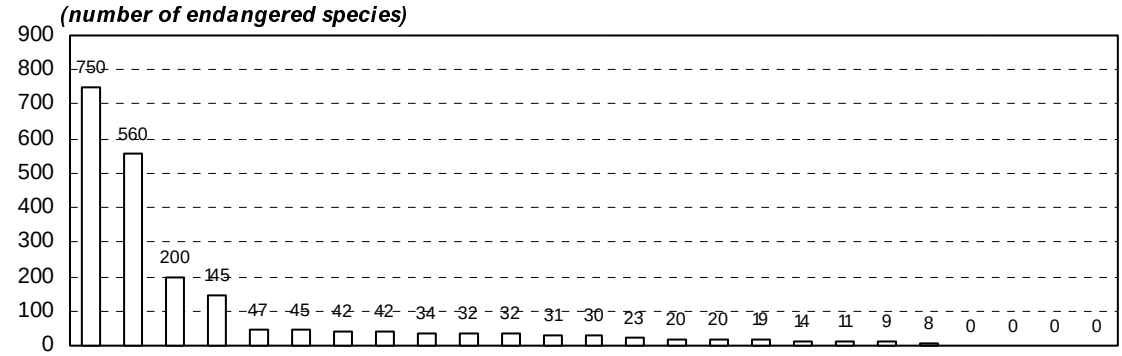


FIGURE 4.16

Endangered species of forest-occurring flowering plants

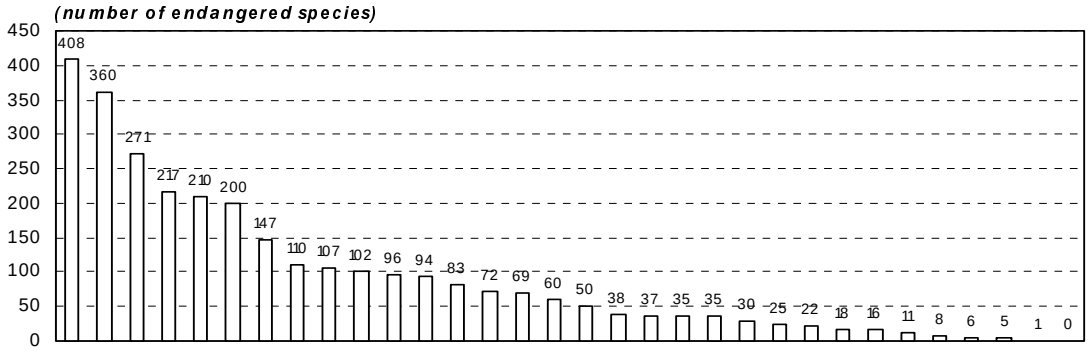
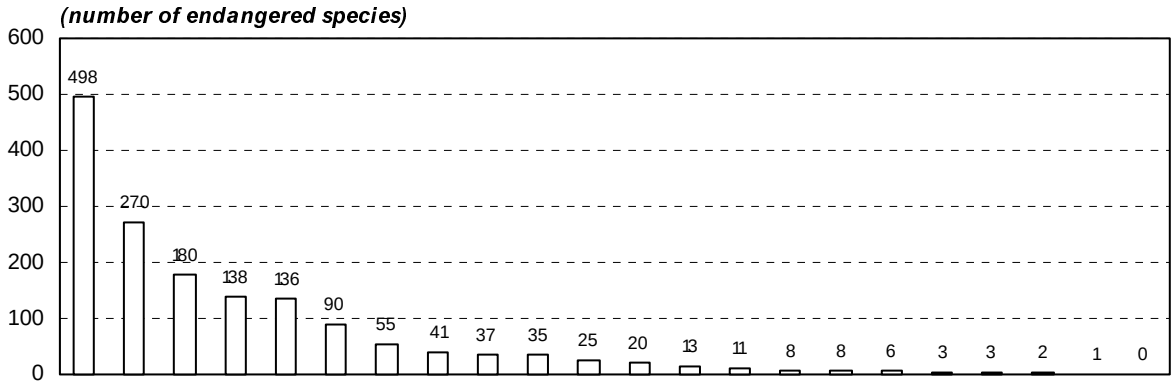


FIGURE 4.17

Number of endangered species of forest-occurring mosses



Despite the relatively incomplete nature of the data, a number of inferences can be drawn. First, there is clearly a perception that significant numbers of wild plant and animal species are endangered, despite the existence of a relatively stable forest estate. [Further analysis is needed of the links between area of natural forest and numbers of species endangered.] This includes significant numbers of endangered species in all the groups included: mammals, birds, other vertebrates, butterflies and moths, lichens, mosses, trees and other vascular plants.

Although data quality may be distorting results, larger animals (particularly mammals and birds) seem to be proportionately more endangered than smaller creatures. Some countries listed almost as many mammals as being endangered as butterflies and moths, although the diversity of the latter is far greater. It may be that the remaining area of forest that is semi-natural or undisturbed by man in many countries is sufficient to maintain populations of many small species but not large enough to maintain species requiring greater territory. (However, these figures may also reflect the fact that mammals are generally better studied and recorded than invertebrate groups.)

In the case of plants, the situation is reversed, with more lower plants (lichens and mosses) being listed as endangered than vascular plants and other trees.

There was no obvious correlation between loss of forest and threats to species. Although one forest-poor country (Israel) consistently appeared amongst those with the most endangered species in various plant and animal groups, other apparently “high risk” countries included many with large forest estates.

Amongst those recording high numbers of endangered species were Albania, Austria, the Czech Republic, Norway, Slovenia, Sweden, the United States of America and Yugoslavia.

There appears to be a slight tendency for greater threats to forest-dwelling species in western Europe than further east, although lack of data from some central and eastern European countries and Central Asian countries means that this apparent trend should be treated with caution.

There may well be differences in scoring between countries, i.e. some countries may be more willing to list a species as “endangered” than is the case elsewhere. This is an inevitable factor in what is, inevitably, a judgement that is partly subjective (and may also be influenced by political considerations).

As an adjunct to the analysis, countries were asked to list significant numbers of invasive species. Only 16 corresspondents answered this question—it was not clear whether the question had been ignored in other cases because there was no perception of problems with invasive species or because data were unavailable or time was lacking.

The results are nevertheless instructive. Invasive species are regarded as an important threat to biodiversity in New Zealand and Australia and as significant in Canada. Perceptions of threat are much lower in Europe. Although several countries (for example Belgium, Denmark, Ireland and Moldova) said that invasive tree and other species could inhibit natural regeneration, Estonia and Lithuania specifically stated that they perceived no significant problem from invasive species.

A summary table below lists the main invasive species identified.

Country	Problems with invasive species
Australia	There are 48 exotic plant species that are serious pests in native production forests, including blackberry (***Rubus vulgaris)***, gorse (***Ulex europaeaus***), lantana (***Lantana camara***), and pampas grass (***Cortaderia*** spp.) Cats, dogs, introduced deer, donkeys, horses, goats, hares, rats, mice and foxes all also represent a serious threat to forested ecosystems. Foxes are probably the most widespread exotic animal damaging these ecosystems and have severely limited ground-living mammals.
Belgium	Several invasive species are listed as preventing other tree species from regenerating, including ***Prunus serotina***, ***Rhododendron ponticum*** and ***Amelanchier lamarkii***. ***Eutamias sibiricus*** threatens populations of small songbirds and ***Psittacula krameri*** is out-competing indigenous species that have the same nesting sites.
Canada	In total, 25 exotic insect pests, 10 introduced fungi and 27 other exotic plant species are listed as problematic, along with the threats that they pose. Major invasive species include garlic mustard (***Alliaria petiolata***) which threatens the endangered wood poppy, Scotch broom (***Cytisus scoparius***) which is invading threatened Garry oak habitats in British Columbia, Tartarian honeysuckle (***Lonicera tatarica***) in Ontario.
Denmark	The sycamore (***Acer pseudoplatanus***) can sometimes inhibit natural regeneration of tree-species such as beech (***Fagus sylvatica***).
Estonia	Introduced species have not created problems for forest ecosystems.
Hungary	Three species were mentioned: the locust tree (***Robinia pseudaccacia***) is aggressive, outcompeting indigenous species; the box-elder (***Acer negundo***) is invasive and ***Asclepias syriaca*** hinders regeneration and afforestation.
Ireland	Two plant species were identified as invasives inhibiting regeneration: the rhododendron (***Rhododendron ponticum***) and the cherry laurel (***Prunus laurocerasus***). In addition, three invasive mammals cause direct damage to plantations: the sika deer (***Cervus nippon nippon***), rabbit (***Oryctolagus cuniculus***) and grey squirrel (***Neosciurus carolinensis***).
Israel	***Acacia cyanofila*** is invasive on agricultural lands and ***Hiteroteca subaxilaris*** is invasive in coastal sand areas.
Kazakhstan	One species mentioned.
Latvia	Three species are listed: Indian balsam (***Impatiens glandulifera***), small balsam (***Impatiens parviflora***) and ***Amelanchier spicata*** (rose family). Amongst the mammals, the North American mink (***Mustela vison***) is identified as an important pest.
Lithuania	Introduced species have not created problems for forest ecosystems.
Moldova	The box-elder (***Acer negundo***) is listed as a problematic invasive species.
New Zealand	116 problematic invasive plant species are listed, including 12 that are known to be affecting the dominant structure, species composition or regeneration of several high conservation sites within the country. These are: smilax (***Asparagus asparagoides*** and ***A scandens***), buddleia (***Buddleia davidii***), old-man's beard (***Clematis vitalba***), kahili ginger (***Hedychium gardnerianum***), hawkweed (***Hieracium*** spp.), Japanese honeysuckle (***Lonicera japonica***), lodgepole pine (***Pinus contorta***), wilding pine (***Pinus*** spp.), wandering willie (***Tradescantia fluminensis***) and gorse (***Ulex europaeus***). In addition, 14 problematic introduced mammals are listed, including cats, dogs, two species of rats, three species of mustelids, goats, tahr, deer, pigs and horses. The most serious pest, occupying more than 90 per cent of the country, is the possum (***Trichosurus vulpecula***).
Netherlands	(***Prunus serotina***) is invasive especially on poor sandy soils and is suppressing natural regeneration. Invasion is more or less under control through forest management. Red oak (***Quercus rubra***) is invasive in pine forests on sandy soils but does not compete with other species.
Slovenia	Fallow deer (***Cervus dama***) and mouflon (***Ovis ammon***) are causing damage in regenerating forests. Two other introduced species – the Alpine stainbock (***Capra ibex***) and the Alpine marmot (***Marmota marmota***) are not causing damage.

Annual averages of regeneration and extension of forest (Main Tables 65-68)

Throughout much of the TBFRA region, forest cover is currently expanding following past deforestation. The *type* of expansion changes from one country to another and can vary, for example, from establishment of plantations of introduced species to natural re-colonization of abandoned farmland. From both an ecological and a commercial perspective, the nature of regeneration is important. Correspondents were therefore asked to provide information on the extent of regeneration over a recent 10-year period by natural and artificial means, in order to assess types of management methods and likely changes in genetic composition.

The questionnaire was precise in distinguishing between three main ways in which forest cover can be extended, each of which has a number of management methods.

Way in which forest cover can be extended	*Explanation*
Regeneration of forest land	**Reforestation of land that has recently been forested**
– natural regeneration	Regeneration without planting through natural seeding (sometimes through preservation of seed trees)
– natural regeneration enhanced by planting	For example to change composition or to increase rate of growth or total biomass
– coppice sprouting	Regular cutting of trees and allowing them to re-grow from the base
– planting or seeding	Deliberate planting or seeding, often accompanied by suppression of natural regeneration
Extension of forest	Establishment of forest on land that has not recently been forested (afforestation) or conversion of other wooded land to forest
– Natural colonization	For example, natural regeneration on abandoned agricultural land
– Natural conversion of other wooded land to forest	For example, as a result of reduced grazing pressure
– Planting or seeding of non-forest land	For example, re-establishment on land that lost forest long in the past, reclamation of industrial sites, etc.
– Planting or seeding of other wooded land	Deliberate conversion of other wooded land to forest
Natural colonization of non-forest land to other wooded land	Development of other wooded land as a result of, for example, changes in agricultural practice or climatic variations

Correspondents were also asked to separate out data for introduced species.

Despite the detailed definitions, some ambiguity remains for correspondents, including for example:

- How are forests classified when several regeneration and extension systems are operating simultaneously?
- How long must land be free of forest cover to classify as afforestation rather than reforestation?

Figures 4.18 and 4.19 outline the main results. In general, forest and other wooded land area is continuing to be extended in the TBFRA countries, following historical deforestation. Although most of the extension is taking place in the Russian Federation and the United States, there is significant expansion in most European countries as well. (Note that these figures have been calculated by combining the extension of forest, including afforestation and the conversion of other wooded land to forest, and of other wooded land; there is the possibility that some small areas of land have been counted twice, so results should be treated with caution.)

FIGURE 4.18

Countries accounting for most of the annual average of extension of forest and other wooded land in the TBFRA region

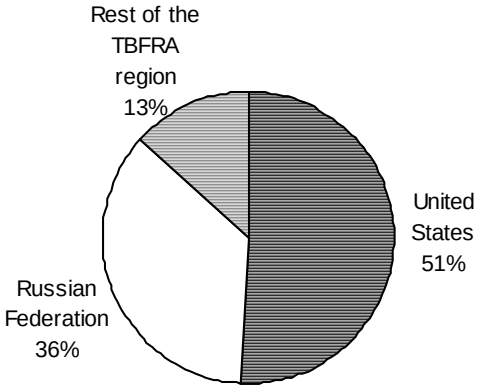
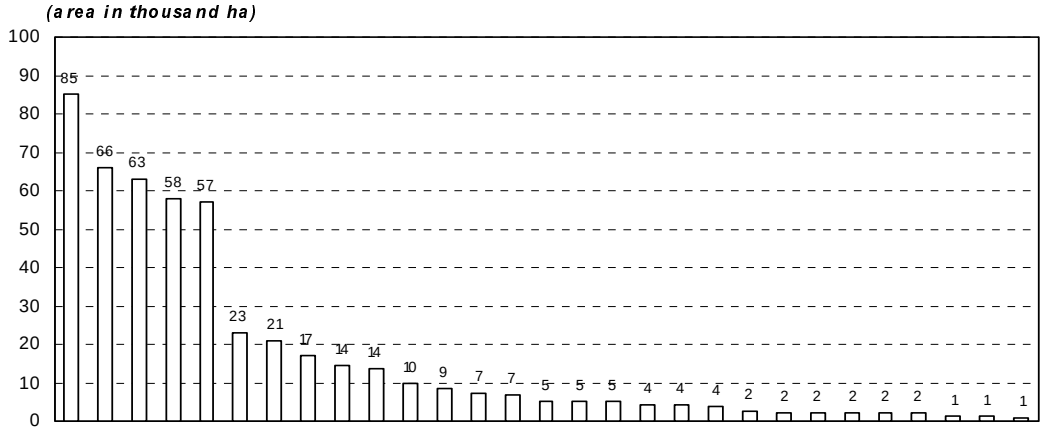


FIGURE 4.19

Countries (excepting the Russian Federation and the USA) with forests and other wooded land extension at over 1000 hectares/year



At the same time, most countries appear to be regenerating forests. Again, the main areas of regeneration are in the three major forest countries of the Russian Federation, the United States and Canada, but expansion is also taking place elsewhere as shown in Figures 4.20 and 4.21.

FIGURE 4.20

Countries accounting for most of the annual average of forest regeneration in the TBFRA region

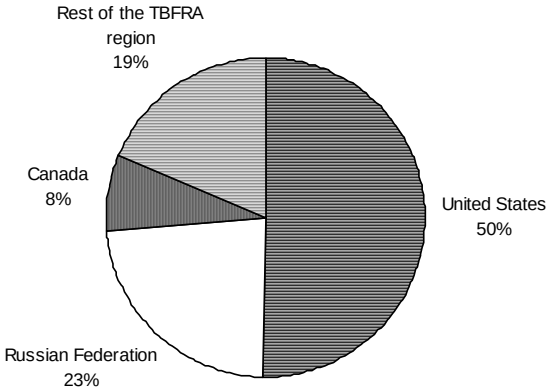
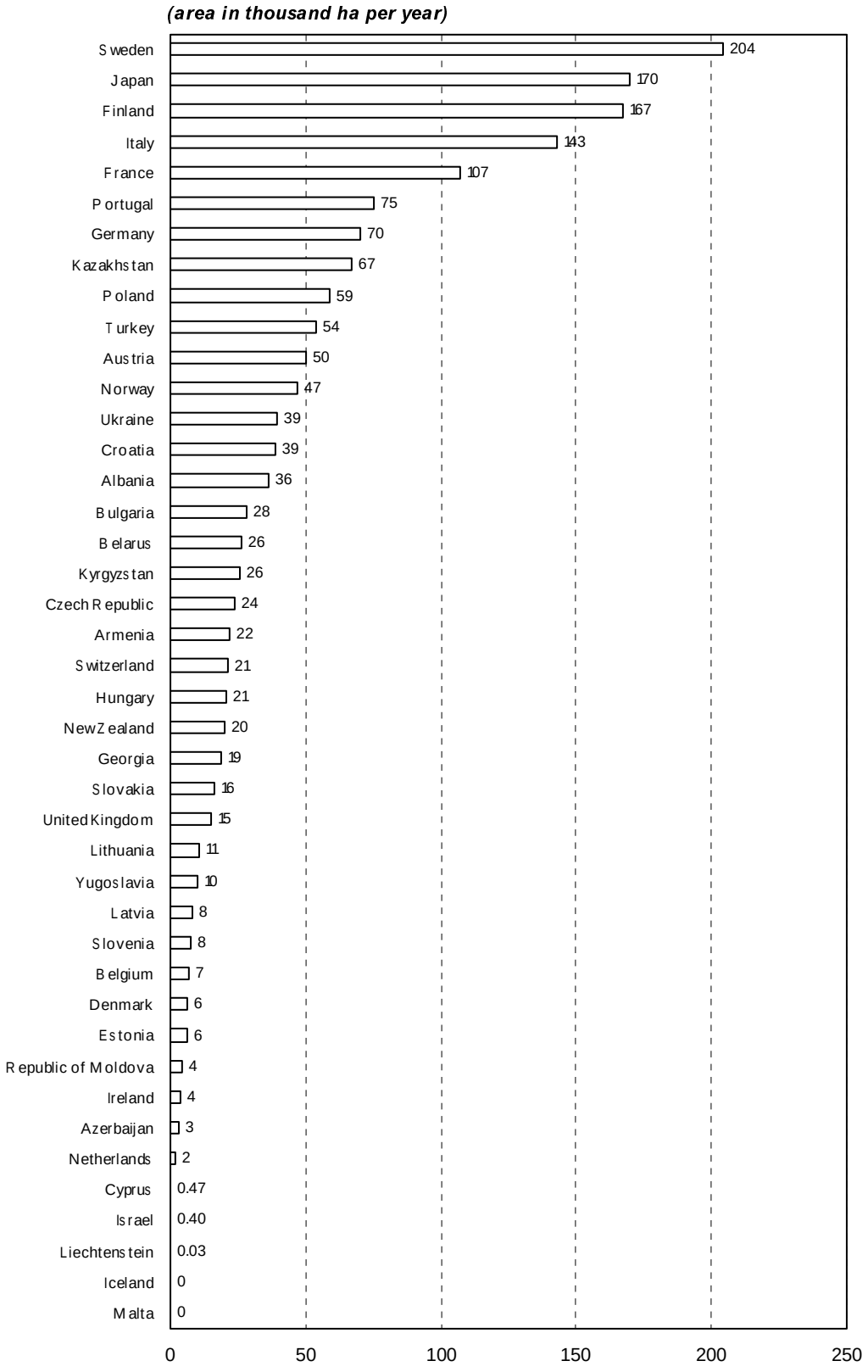


FIGURE 4.21

Forest regeneration in TBFRA countries other than USA, Russian Federation and Canada



Over one-fifth of this regeneration is with non-native species, and these are particularly important in Armenia, Denmark, France, Hungary, Moldova, New Zealand (100 per cent) Portugal, and the United Kingdom.

Finally in this section, the natural colonization of non-forested land to other woodland land was recorded. Although according to correspondents over 1.5 million hectares is recolonized every year, over 90 per cent of this is in

the Russian Federation (Figure 4.22). Other significant areas, including France, Norway and New Zealand, may reflect changing agricultural practices and abandonment of agriculture (Figure 4.23). The small amount of recolonization recorded, particularly in Europe, is significant when compared with claims made about the amount of land being removed from agriculture. From the responses to the TBFRA, it appears that most of this land is used for other purposes (including probably afforestation).

Origin of planting material used in the forest (Main Table 69)

Interest has been expressed in the provenance of planting material used in the forest although perspectives differ between interest groups. Forest managers are often interested in selecting the most efficient provenance for any particular set of environmental circumstances, to maximize productivity and minimize losses. People concerned with conservation of biological diversity, on the other hand, have expressed concern about the risk of losing local varieties and consequent loss of genetic diversity and evolutionary potential. The TBFRA sought to provide clear, factual data on the provenance of planting material, to provide information on trends in species diversity, genetic diversity and the origin of planting material used in managed forests.

Correspondents were asked to list all indigenous and introduced tree species planted over a recent ten-year period and to divide these into three categories:

- known local provenance,
- known non-local provenance,
- unknown provenance.

This question was generally poorly answered and it is clear that many correspondents were confused about what was being required. However, those that did supply information provide the beginnings of the first such survey to be attempted. Preliminary results, which must be treated with considerable caution because of the limited nature of the data, suggest that the large majority of trees being planted in the TBFRA catchment remain of local provenance. Further work, and perhaps further discussion with correspondents, is needed to verify this very preliminary conclusion.

FIGURE 4.22

Natural colonisation of non-forest land to other wooded land in the TBFRA region

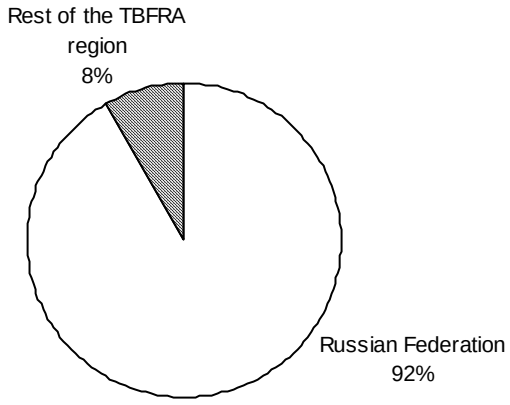


FIGURE 4.23

Natural colonization of non-forest land to other wooded land in TBFRA countries other than the Russian Federation

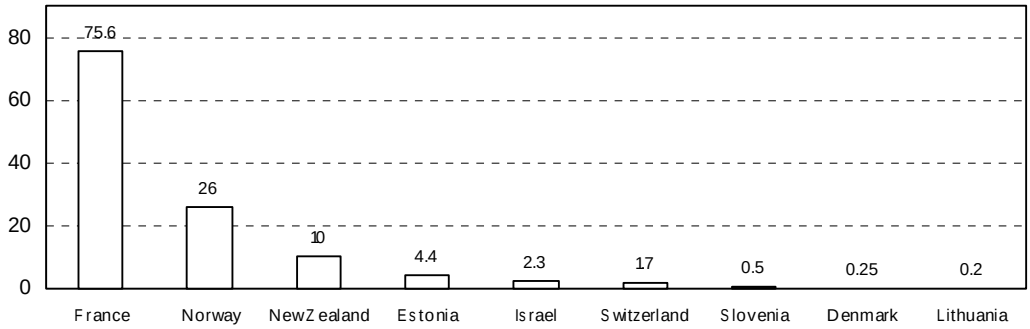


FIGURE 4.24

Major TBFRA countries with significant planting of non-local provenance

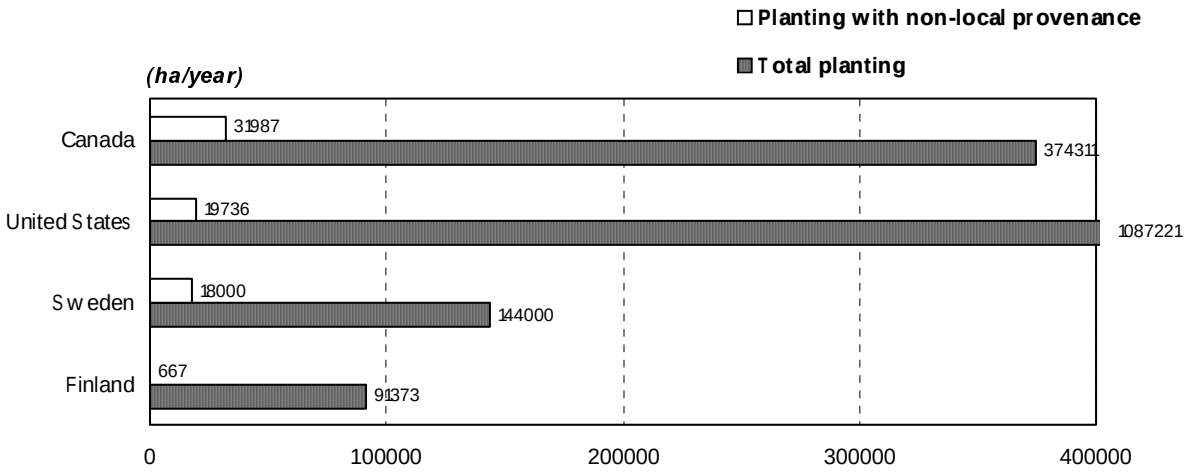


FIGURE 4.25

Proportion of non-local provenance planted in some selected countries

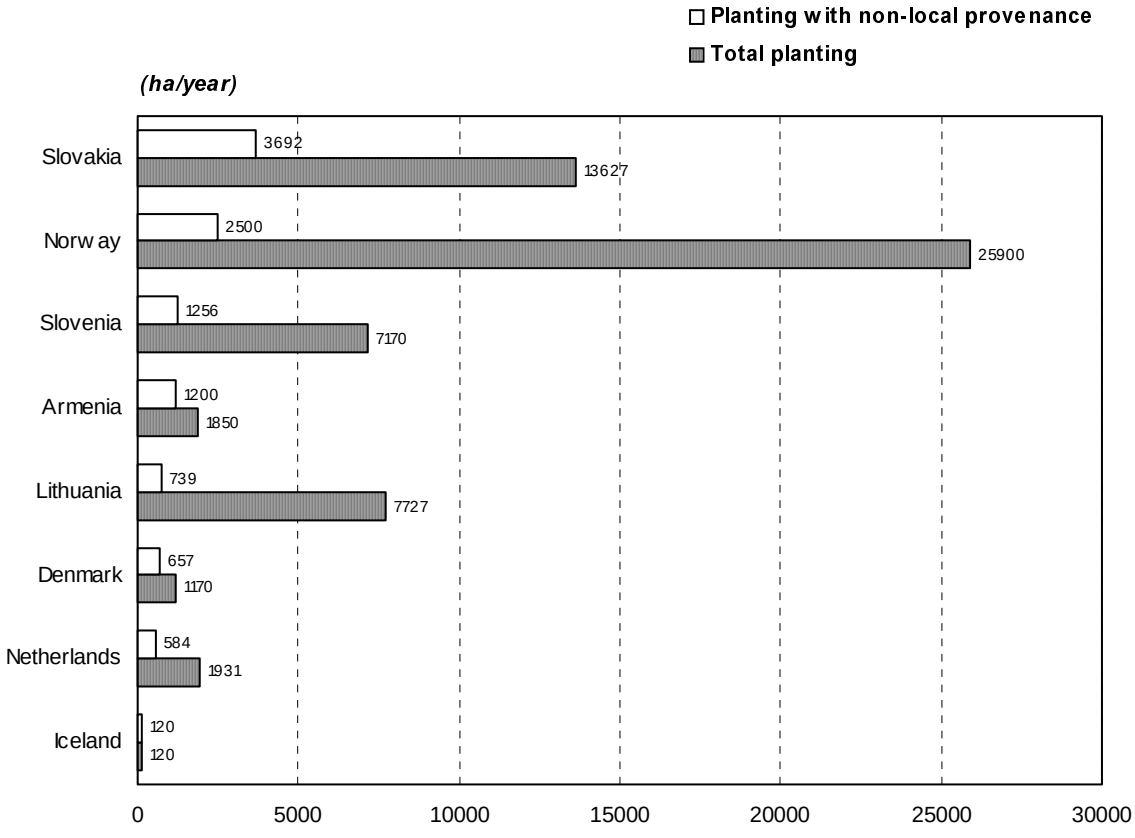


TABLE 53

Forest and other wooded land by categories of "naturalness"

Country	Reference period	Forest			Other wooded land	
		Undisturbed by man	Semi-natural	Plantations	Undisturbed by man	Semi-natural
		(1000 ha)			(1000 ha)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Albania ©	1995	84.8	843.2	102.0	0.0	0.0
Austria ©	1992-96	34.0	3,806.0	0.0	84.0	0.0
Belgium ©	1997	0.0	351.7	294.2	0.0	26.0
Bosnia and Herzegovina ©	1995	0.0	2,219.3	56.9	0.0	433.6
Bulgaria	1995	256.5	2,364.6	968.5	0.0	313.8
Croatia ©	1996	2.4	1,725.7	47.0	33.0	297.0
Cyprus	1996	0.0	90.0	27.0	0.0	163.0
Czech Republic	1995	0.0	2,630.0	0.0	0.0	0.0
Denmark ©	1990	0.4	104.2	340.7	10.0	
Estonia ©	1996	2.0	1,709.0	305.0	0.0	146.0
Finland ©	1991	1,263.0	20,620.0	0.0	408.0	477.0
France ©	1997	30.0	14,165.0	961.0	0.0	1,833.0
Germany ©	1997	0.0	10,740.0	0.0	0.0	0.0
Greece	1992			120.0	0.0	3,154.0
Hungary ©	1996	0.1	1,674.7	136.2	0.0	0.0
Iceland ©	1998	0.0	18.0	12.0	0.0	100.0
Ireland	1996	1.0	0.0	590.0	0.0	0.0
Israel ©	1997	0.0	31.0	91.0	0.0	48.0
Italy	1995	6.0	9,718.0	133.0	197.0	788.0
Latvia ©	1997	4.0	2,737.0	143.0	0.0	111.0
Liechtenstein	1995	1.5	5.1	0.3	0.3	0.2
Lithuania ©	1996	12.0	1,682.0	284.0	0.0	72.0
Luxembourg	1994	0.0			0.0	2.8
Malta ©	1996	0.0	0.0	0.3	0.0	0.0
Netherlands ©	1992-96	0.0	239.0	100.0	0.0	0.0
Norway ©	1994-96	250.0	8,160.0	300.0	329.0	2,961.0
Poland ©	1992-96	144.0	8,758.0	39.0	0.0	0.0
Portugal	1995	55.0	2,494.0	834.0	44.0	40.0
Romania ©	1990-97	233.2	5,977.4	90.6		
Slovakia ©	1996	20.0	1,981.0	15.0	0.0	15.0
Slovenia ©	1996	50.0	1,048.0	1.0	0.0	67.0
Spain	1990	5.0	11,600.0	1,904.0	3.0	12,472.0
Sweden ©	1992-96	4,384.0	22,311.0	569.0	2,854.0	141.0
Switzerland ©	1997	7.0	1,162.0	4.0	0.0	61.0
The FYR of Macedonia ©	1995	0.0	876.0	30.0	0.0	82.0
Turkey ©	1996	186.0	7,914.0	1,854.0	144.0	10,615.0
United Kingdom ©	1995	0.0	772.0	1,697.0	0.0	20.0
Yugoslavia ©	1995	3.6	2,851.4	39.4	11.7	573.8
Total: Europe						
of which: EU 15					**3,600.0**	**18,963.8**
Armenia ©	1996	284.0	37.0	13.0	41.0	17.0
Azerbaijan ©	1988	400.0	515.5	20.0	15.0	39.0
Belarus	1994-97	43.5	7,626.5	194.8	0.0	1,071.3
Georgia ©	1995	550.0	2,238.4	200.0	0.0	0.0
Kazakhstan	1993	0.0	10,499.0	5.0	0.0	6,169.0
Kyrgyzstan ©	1988	100.0	572.0	57.0	0.0	68.0
Republic of Moldova ©	1997	0.0	322.8	1.3	0.0	30.8
Russian Federation ©	1993	749,198.0	50,000.0	17,340.0	70,000.0	0.0
Tajikistan ©	1995	21.0	369.0	10.0	18.0	312.0
Turkmenistan ©	1995	0.0	3,742.0	12.4	0.0	0.0
Ukraine	1996	59.0	4,974.0	4,425.0	6.0	30.0
Uzbekistan ©	1988	200.0	1,409.0	300.0	0.0	261.0
Total: CIS		**750,855.5**	**82,305.2**	**22,578.5**	**70,080.0**	**7,998.1**
Canada ©	1994	123,947.0	120,624.0	0.0	173,013.0	0.0
United States of America ©	1992	19,210.0	184,436.0	13,687.0	41,884.0	38,918.0
Total: North America		**143,157.0**	**305,060.0**	**13,687.0**	**214,897.0**	**38,918.0**
Australia ©	1990-94	18,836.0	136,999.0	1,043.0	23,429.0	398,161.0
Japan ©	1995	3,061.0	10,321.0	10,682.0		
New Zealand ©	1996	1,599.0	4,799.0	1,542.0	0.0	1,100.0
Total: Other TBFRA		**23,496.0**	**152,119.0**	**13,267.0**		
Grand total						

© See notes and comments in Chapter IV.

TABLE 54

Forest and other wooded land by categories of "naturalness": comparative data

Country	Forest			Other wooded land	
	Undisturbed by man	Semi-natural	Plantations	Undisturbed by man	Semi-natural
	(per cent of total forest)			(per cent of total other wooded land)	
(1)	(2)	(3)	(4)	(5)	(6)
Albania	8.2	81.9	9.9		
Austria	0.9	99.1	0.0	100.0	0.0
Belgium	0.0	54.4	45.6	0.0	100.0
Bosnia and Herzegovina	0.0	97.5	2.5	0.0	100.0
Bulgaria	7.1	65.9	27.0	0.0	100.0
Croatia	0.1	97.2	2.6	10.0	90.0
Cyprus	0.0	76.9	23.1	0.0	100.0
Czech Republic	0.0	100.0	0.0		
Denmark	0.1	23.4	76.5	10.8	10.8
Estonia	0.1	84.8	15.1	0.0	100.0
Finland	5.8	94.2	0.0	46.1	53.9
France	0.2	93.5	6.3	0.0	100.0
Germany	0.0	100.0	0.0		
Greece			3.6	0.0	100.0
Hungary	0.0	92.5	7.5		
Iceland	0.0	60.0	40.0	0.0	100.0
Ireland	0.2	0.0	99.8		
Israel	0.0	25.4	74.6	0.0	100.0
Italy	0.1	98.6	1.3	20.0	80.0
Latvia	0.1	94.9	5.0	0.0	100.0
Liechtenstein	21.7	73.9	4.3	60.0	40.0
Lithuania	0.6	85.0	14.4	0.0	100.0
Luxembourg	0.0			0.0	100.0
Malta	0.0	0.0	100.0		
Netherlands	0.0	70.5	29.5		
Norway	2.9	93.7	3.4	10.0	90.0
Poland	1.6	97.9	0.4		
Portugal	1.6	73.7	24.7	52.4	47.6
Romania	3.7	94.9	1.4		
Slovakia	1.0	98.3	0.7	0.0	100.0
Slovenia	4.5	95.4	0.1	0.0	100.0
Spain	0.0	85.9	14.1	0.0	100.0
Sweden	16.1	81.8	2.1	95.3	4.7
Switzerland	0.6	99.1	0.3	0.0	100.0
The FYR of Macedonia	0.0	96.7	3.3	0.0	100.0
Turkey	1.9	79.5	18.6	1.3	98.7
United Kingdom	0.0	31.3	68.7	0.0	100.0
Yugoslavia	0.1	98.5	1.4	2.0	98.0
Total: Europe					
of which: EU 15					
Armenia	85.0	11.1	3.9	70.7	29.3
Azerbaijan	42.8	55.1	2.1	27.8	72.2
Belarus	0.6	97.0	2.5	0.0	100.0
Georgia	18.4	74.9	6.7		
Kazakhstan	0.0	100.0	0.0	0.0	100.0
Kyrgyzstan	13.7	78.5	7.8	0.0	100.0
Republic of Moldova	0.0	99.6	0.4	0.0	100.0
Russian Federation	91.8	6.1	2.1	100.0	0.0
Tajikistan	5.3	92.3	2.5	5.5	94.5
Turkmenistan	0.0	99.7	0.3		
Ukraine	0.6	52.6	46.8	16.7	83.3
Uzbekistan	10.5	73.8	15.7	0.0	100.0
Total: CIS	**87.7**	**9.6**	**2.6**		
Canada	50.7	49.3	0.0	100.0	0.0
United States of America	8.8	84.9	6.3	51.8	48.2
Total: North America	**31.0**	**66.0**	**3.0**	**84.7**	**15.3**
Australia	12.0	87.3	0.7	5.6	94.4
Japan	12.7	42.9	44.4		
New Zealand	20.1	60.4	19.4	0.0	100.0
Total: Other TBFRA	**12.4**	**80.5**	**7.0**		
Grand total					

TABLE 55

Protection status: Forest and other wooded land in IUCN protection categories I to IV and forest not available for wood supply for conservation/protection reasons

Country	Forest		Other wooded land		Percent of IUCN categories I to VI in total		Forest not available for wood supply	
	IUCN I and II	IUCN III to VI	IUCN I and II	IUCN III to VI	Forest	Other wooded land	Protected for conservation/ protection reasons	Per cent of forest
	(1000 ha)				(per cent)		(1000 ha)	(per cent)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Albania ©	24	118	0	0	13.8		29	2.8
Austria	2	773	0	0	20.2	.0	488	12.7
Belgium ©	4	174	6	20	27.6	100.0	7	1.0
Bosnia and Herzegovina								
Bulgaria	290	1,064	0	0	37.7	.0	265	7.4
Croatia	65	346	0	78	23.2	23.6	85	4.8
Cyprus	1	116	0	163	100.0	100.0	11	9.0
Czech Republic	109	537	0	0	24.6		71	2.7
Denmark ©	5	86	0	11	20.5	11.3	5	1.1
Estonia ©	52	131	1	7	9.1	5.5	61	3.0
Finland	979	410	36	102	6.3	15.6	1,208	5.5
France ©	39	2,677	75	555	17.9	34.4	0	.0
Germany ©	105	7,100	0	0	67.1		83	.8
Greece ©	55	921	14	230	29.1	7.7	142	4.2
Hungary ©	62	299	0	0	20.0		68	3.8
Iceland	2	0	3	9	6.7	12.0	2	6.7
Ireland	0.5	5.7	0	0	1.2		6	1.0
Israel							10	8.2
Italy	1,105	750	110	75	18.8	18.8	1,855	18.8
Latvia	106	365	4	13	16.3	15.3	471	16.3
Liechtenstein	2	0	0	0	21.7	100.0	2	21.7
Lithuania	112	184	3	6	14.9	13.3	249	12.6
Luxembourg	0	1	0	0	.8	14.3	0	.0
Malta	0	0	0	0	10.0		0	100.0
Netherlands ©	3	77	0	0	23.6		3	.9
Norway ©	114	2,140	86	2,215	25.9	69.9	114	1.3
Poland ©	173	1,232			15.7		398	4.5
Portugal	541	44	2	0	17.3	2.4	76	2.2
Romania	397	72	0	0	7.4	.0		
Slovakia ©	373	458	1	0	41.2	7.4	310	15.4
Slovenia ©	22	56	2	3	7.2	8.1	52	4.7
Spain ©	216	2,995	0	0	23.8	.0	2,727	20.2
Sweden ©							5,180	19.0
Switzerland ©	9	33	1	2	3.6	3.6	7	.6
The FYR of Macedonia								
Turkey ©	177	9	139	5	1.9	1.3	1,319	13.3
United Kingdom ©	30	762	0	2	32.1	10.0	75	3.0
Yugoslavia ©	137	2,757	29	557	100.0	100.0	515	17.8
Armenia	35	67	22	10	30.5	55.2	102	30.5
Azerbaijan ©	72	864	15	39	100.0	100.0	633	67.6
Belarus	209	511	3	60	9.1	5.8	1,719	21.9
Georgia ©	111	0	0	0	3.7			
Kazakhstan	29	10,475	15	6,154	100.0	100.0	590	5.6
Kyrgyzstan ©	120	509	18	50	86.3	100.0	600	82.3
Republic of Moldova	44							
Russian Federation ©	23,691	1,060	0	0	3.0	.0	23,691	2.9
Tajikistan ©	21	379	18	312	100.0	100.0	360	90.0
Turkmenistan ©	14	100	0	0	3.0		104	2.8
Ukraine ©	173	800	1	1	10.3	5.6	3,445	36.4
Uzbekistan ©	330	1,500			95.9			
Canada ©	11,106	8,197	5,676	5,661	7.9	6.6	19,664	8.0
United States of America ©	13,904	50,197	4,819	46,974	29.5	64.1	19,210	8.8
Australia ©	13,758	9,896			15.1			
Japan ©	1,260	491			7.3		788	3.3
New Zealand ©	1,599	64	0	0	20.9	.0	5,573	70.2

© See notes and comments in Chapter IV.

TABLE 56

Reported number of species (total and forest-occurring), of which endangered: Trees

Country	All species				Forest-occurring species			
	Total	of which: Endangered	Endemic species		Total	of which: Endangered	Endemic species	
			Total	of which: Endangered			Total	of which: Endangered
	(Number)							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Albania ©	330	27	0	0	120	21	0	0
Austria ©	58	9	0	0	58	9	0	0
Belgium ©	68	11	0	0	38	3	0	0
Bosnia and Herzegovina								
Bulgaria ©	3,750	728	470		210			
Croatia ©	305	14	5					
Cyprus ©	82	1	2	1	47	1	2	1
Czech Republic ©	277	14	3	3	277	14	3	3
Denmark ©	98	7	0	0	63	7	0	0
Estonia ©	74	13			62	13		
Finland ©	33	8	0	0	33	8	0	0
France ©	136	0	0	0	104	0	0	0
Germany ©	66	0	6	0	63	0	6	0
Greece								
Hungary ©	140	6	22	1	79	4	1	1
Iceland ©	27	0	0	0	27	0	0	0
Ireland ©	130	0	0	0	85	0	0	0
Israel ©	60	17	2	0	50	10	0	0
Italy					86	1		
Latvia ©	47	2	0	0	47	2	0	0
Liechtenstein ©	39							
Lithuania ©	84	7	0	0	32	2	0	0
Luxembourg								
Malta ©	3	1	2	1	2	0	1	0
Netherlands ©	78	30	0	0	74	27	0	0
Norway ©	43	2	1	1	43	2	1	1
Poland ©	81	1	5	1	81	1	5	1
Portugal	63	5	12	5	63	5	12	5
Romania								
Slovakia ©	57	7	0	0	57	7	0	0
Slovenia ©	73	5	0	0	73	5	0	0
Spain ©	8,500	1,020	1,500	0				
Sweden ©	32	6	0	0	30	6	0	0
Switzerland ©	44	4	0	0	44	4	0	0
The FYR of Macedonia								
Turkey	287	36	32	27				
United Kingdom ©	140	1	7					
Yugoslavia ©								
Armenia	100	4			90	3		
Azerbaijan ©	110	15	1	1	80	12	1	1
Belarus	33	2	0	0	33	2	0	0
Georgia ©	400							
Kazakhstan ©	23	0	2	0	23	0	2	0
Kyrgyzstan ©								
Republic of Moldova	47	7	20		47	7	20	
Russian Federation ©	283	4			283	4		
Tajikistan								
Turkmenistan ©								
Ukraine ©	210	14		4	148	14		4
Uzbekistan								
Canada ©	180	8	0			8		
United States of America ©	833	4	216	4	833	4		4
Australia ©								
Japan	1,825	75						
New Zealand ©	400	0	223	0	400	0	223	0

© See notes and comments in Chapter IV.

TABLE 57

Reported number of species (total and forest-occurring), of which endangered: Vascular plants other than trees

Country	All species				Forest-occurring species			
	Total	of which: Endangered	Endemic species		Total	of which: Endangered	Endemic species	
			Total	of which: Endangered			Total	of which: Endangered
	(Number)							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Albania ©	2,920	103	30	30	1,460	38	0	0
Austria ©	2,873	1,081	59	22	1,049	271	21	11
Belgium ©	1,202	463	0	0	131	37	0	0
Bosnia and Herzegovina								
Bulgaria ©								
Croatia ©	3,566	265	255					
Cyprus ©	1,828	22	139	18	1,500	22	127	18
Czech Republic ©	2,692	771	19	19	655	83	8	8
Denmark ©	1,200	33	1	0	256	50	0	0
Estonia ©	1,363	175			240	69		
Finland ©	1,211	202	0	0	213	35	0	0
France ©	4,428	457	103	103	611	11	10	10
Germany ©	3,170	116	88	12	601	6	0	0
Greece								
Hungary ©	2,206	34	62			5		
Iceland ©	468	46	0	0		1	0	0
Ireland ©	1,100	134	1	1	130	8	0	0
Israel ©	2,721	714	148	33	1,506	408	37	15
Italy	6,190	776	322	50				
Latvia ©	1,622	336	0	0	480	94	0	0
Liechtenstein ©	1,600							
Lithuania ©	1,270	184	6	3	713	102	0	0
Luxembourg								
Malta ©	9	2	8	1	6	0	0	0
Netherlands ©	1,326	388	0	0	317	72	0	0
Norway ©	1,300	234	15	0	700	60	0	0
Poland ©	2,254	156	71	16	524			
Portugal	4,600	299	567	275	490	16	44	14
Romania								
Slovakia ©	2,434	901	156	92	1,500	360	30	30
Slovenia ©	3,027	309	66	12				
Spain ©								
Sweden ©	1,900	425	0	0	360	96	0	0
Switzerland ©	2,600	884	3	0	442	110	1	0
The FYR of Macedonia								
Turkey	8,663	2,975	3,040	19				
United Kingdom ©	1,500	198	43					
Yugoslavia ©	4,282	217	87		4,282	217	87	
Armenia	3,400	387	120	20	1,400			
Azerbaijan ©	4,500	105	0	0	380	35	0	0
Belarus	1,575	186	5	1	850	107	2	0
Georgia ©	4,500		405					
Kazakhstan ©	4,407	218	535	218	3,085	147	393	147
Kyrgyzstan ©	4,630	300	125		300			
Republic of Moldova	1,752	83	527	57	130	18	71	23
Russian Federation ©	17,000	69			12,000	30		
Tajikistan								
Turkmenistan ©	2,499							
Ukraine ©	4,500	400		150	730	200		50
Uzbekistan								
Canada ©	2,800	92	75			25		
United States of America ©	14,729	638	3,645	512		210		203
Australia ©	18,000	235			13,622			
Japan	5,262	425						
New Zealand ©	4,000	180	1,900	180				

© See notes and comments in Chapter IV.

TABLE 58

Reported number of species (total and forest-occurring), of which endangered: Ferns

Country	All species				Forest-occurring species			
	Total	of which: Endangered	Endemic species		Total	of which: Endangered	Endemic species	
			Total	of which: Endangered			Total	of which: Endangered
	(Number)							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Albania ©								
Austria ©	54	22	0	0	36	11	0	0
Belgium ©	29	15	0	0	16		0	0
Bosnia and Herzegovina								
Bulgaria ©								
Croatia ©	75	10	2					
Cyprus ©	20	0	0	0	20	0	0	0
Czech Republic ©	68	22	0	0	60	15	0	0
Denmark ©	48	22	0	0	24	8	0	0
Estonia ©	42	23			23	6		
Finland ©	59	13	0	0	29	3	0	0
France ©	110	29	4	4	13	0	0	0
Germany ©	83	2	0	0	50	2	0	0
Greece								
Hungary ©	60	1			42	1		
Iceland ©	17	6	0	0		0	0	0
Ireland ©	78	11	0	0	21	3	0	0
Israel ©	25	6	0	0	21	4	0	0
Italy		27						
Latvia ©	48	22	0	0	41	17	0	0
Liechtenstein ©	35							
Lithuania ©	21	6	0	0	18	5	0	0
Luxembourg								
Malta ©	0	0	0			0	0	0
Netherlands ©	32	5	0	0	18	1	0	0
Norway ©								
Poland ©	69	12						
Portugal	114	7	26	6	34	3	13	3
Romania								
Slovakia ©	63	27	7	7	42	15	1	1
Slovenia ©	75	16	0	0	950	47		
Spain ©								
Sweden ©	50	14	0	0	40	12	0	0
Switzerland ©	84	36	0	0	29	8	0	0
The FYR of Macedonia								
Turkey	78		1					
United Kingdom ©	80	2						
Yugoslavia ©	57				57			
Armenia	30	19						
Azerbaijan ©	71	36	0	0	71	36	0	0
Belarus	24	10	0	0	20	3	0	0
Georgia ©								
Kazakhstan ©	46	3	6	3	46	3	6	3
Kyrgyzstan ©								
Republic of Moldova								
Russian Federation ©	600	2			400	0		
Tajikistan								
Turkmenistan ©								
Ukraine ©	55	11		0	34	2		0
Uzbekistan								
Canada ©	100	3				1		
United States of America ©	546	28		25		7		6
Australia ©								
Japan								
New Zealand ©	219	15	193	15	219	15	193	15

© See notes and comments in Chapter IV.

TABLE 59

Reported number of species (total and forest-occurring), of which endangered: Mosses

Country	All species				Forest-occurring species			
	Total	of which: Endangered	Endemic species		Total	Endemic species		
			Total	of which: Endangered		of which: Endangered	Total	of which: Endangered
	(Number)							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Albania ©								
Austria ©	959	498	1	1	959	498	1	1
Belgium ©	502	39			97		0	0
Bosnia and Herzegovina								
Bulgaria ©								
Croatia ©	638	38	11					
Cyprus ©								
Czech Republic ©	868	187	2	2	800	180	0	0
Denmark ©	400		0	0			0	0
Estonia ©	525	50			125	25		
Finland ©	870	160	0	0		37	0	0
France ©	13,000							
Germany ©	1,121	28	0	0	300	3	0	0
Greece								
Hungary ©	589	32				20		
Iceland ©	456	44	0	0		3	0	0
Ireland ©	759	192	0	0	150		0	0
Israel ©	260							
Italy								
Latvia ©	504	203	0	0	270	41	0	0
Liechtenstein ©								
Lithuania ©	325	13	0	0	310	13	0	0
Luxembourg								
Malta ©	20	20						
Netherlands ©	547	250	0	0	203	55	0	0
Norway ©	1,100	222		0	600	90		0
Poland ©	910	131			800			
Portugal	451	211	6	5	92	11	2	1
Romania								
Slovakia ©	902	540	3	3	720	270	3	3
Slovenia ©	755	261	0	0				
Spain ©	1,012	264						
Sweden ©	1,050	241	1	0	300	138	0	0
Switzerland ©	1,030	401			390	136	0	
The FYR of Macedonia								
Turkey	234							
United Kingdom ©	1,000	100	20					
Yugoslavia ©	565	8	7		565	8	7	
Armenia	347	102			308			
Azerbaijan ©	400	35	0	0	400	35	0	0
Belarus	430	9	0	0	290	6	0	0
Georgia ©								
Kazakhstan ©	11	3	4	3	10	2	3	2
Kyrgyzstan ©								
Republic of Moldova	10		10				10	
Russian Federation ©	1,000	0			700	0		
Tajikistan								
Turkmenistan ©								
Ukraine ©	800	28		0	40	8		0
Uzbekistan								
Canada ©	965	1				1		
United States of America ©	1,320							
Australia ©								
Japan	1,800	184						
New Zealand ©	524		514					

© See notes and comments in Chapter IV.

TABLE 60

Reported number of species (total and forest-occurring), of which endangered: Lichens

Country	All species				Forest-occurring species			
	Total	of which: Endangered	Endemic species		Total	of which: Endangered	Endemic species	
			Total	of which: Endangered			Total	of which: Endangered
	(Number)							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Albania ©								
Austria ©	200	200	100	100	200	200	100	100
Belgium ©	168	85	0	0			0	0
Bosnia and Herzegovina								
Bulgaria ©								
Croatia ©	900		82					
Cyprus ©								
Czech Republic ©	1,400	560	0	0	1,200	500	0	0
Denmark ©	900	634	0	0	500	218	0	0
Estonia ©	800	95			390	55		
Finland ©	1,500	132	0	0		62	0	0
France ©	5,000							
Germany ©	1,691	252	0	0			0	0
Greece								
Hungary ©	800	68	12	5	250	31		
Iceland ©	600	67	0	0	60	15	0	0
Ireland ©	1,050				190			
Israel ©	235							
Italy								
Latvia ©	500	34	0	0	350	17	0	0
Liechtenstein ©	58							
Lithuania ©	106	13	0	0	106	13	0	0
Luxembourg								
Malta ©	195		12					
Netherlands ©	694	241	0	0			0	0
Norway ©	1,800	69	10	0	1,000	50	1	1
Poland ©	1,619	460						
Portugal								
Romania								
Slovakia ©	1,468	583	2	2	1,180	480	2	2
Slovenia ©	600	88	0	0				
Spain ©	2,000							
Sweden ©	2,000	238	2	2	800	198	2	2
Switzerland ©	960				465			
The FYR of Macedonia								
Turkey								
United Kingdom ©	1,500	86						
Yugoslavia ©	516	12	174		516	12	174	
Armenia								
Azerbaijan ©	500	56	2	1	500	56	2	1
Belarus	477	14	0	0	320	12	0	0
Georgia ©								
Kazakhstan ©	10	1	3	1	7	1	2	1
Kyrgyzstan ©								
Republic of Moldova	16		16				16	
Russian Federation ©	1,000	0			700	0		
Tajikistan								
Turkmenistan ©								
Ukraine ©	1,000	27		1		12		0
Uzbekistan								
Canada ©	2,000	4				4		
United States of America ©	3,750	2		2				
Australia ©								
Japan	1,000	62						
New Zealand ©	1,300		1,300					

© See notes and comments in Chapter IV.

TABLE 61

Reported number of species (total and forest-occurring), of which endangered: Mammals

Country	All species				Forest-occurring species			
	Total	of which: Endangered	Endemic species		Total	of which: Endangered	Endemic species	
			Total	of which: Endangered			Total	of which: Endangered
	(Number)							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Albania ©	84	33	0	0	58	27	0	0
Austria ©	96	47	86	47	57	28	57	28
Belgium ©	57	28	0	0		6	0	0
Bosnia and Herzegovina								
Bulgaria ©	94		6					
Croatia ©	100	46	3					
Cyprus ©	25	2	1	1	21	1	1	1
Czech Republic ©	76	31	0	0	71	31	0	0
Denmark ©	48	16	0	0	25	11	0	0
Estonia ©	65	18			40	14		
Finland ©	66	16	0	0	38	7	0	0
France ©	119	46	0	0	73	21	0	0
Germany ©	86	44	1	1	20	10	0	0
Greece								
Hungary ©	83	7						
Iceland ©	6	0	0	0	0	0	0	0
Ireland ©	29	0	2	0	20	0	1	0
Israel ©	116	75	0	0	85	59	0	0
Italy	105	38						
Latvia ©	69	24	0	0	50	15	0	0
Liechtenstein ©	56							
Lithuania ©	70	18	0	0	64	16	0	0
Luxembourg								
Malta ©								
Netherlands ©	65	14	0	0	24	5	0	0
Norway ©	76	22	0	0	50	16	0	0
Poland ©	93	27	5	4	69			
Portugal	70	25	8	6	35	16	5	5
Romania								
Slovakia ©	85	23	0	0	77	23	0	0
Slovenia ©	88	45	0	0	56	26	0	0
Spain ©	118	37	12	8				
Sweden ©	69	23	0	0	43	16	0	0
Switzerland ©	57	19	0	0	20	2	0	
The FYR of Macedonia								
Turkey	132	24	2	2				
United Kingdom ©	48	0						
Yugoslavia ©	96	35			96	35		
Armenia	74	18						
Azerbaijan ©	37	7	0	0	7	3	0	0
Belarus	74	14	0	0	74	14	0	0
Georgia ©		152						
Kazakhstan ©	158	40	20	20	107	28	17	17
Kyrgyzstan ©								
Republic of Moldova	67						11	
Russian Federation ©	230	22			97	10		
Tajikistan								
Turkmenistan ©								
Ukraine ©	108	41		1	60	24		0
Uzbekistan								
Canada ©	196	53				20		
United States of America ©	418	65	101	42	334	35		25
Australia ©		30						
Japan	106	34	48	28	81	30	42	26
New Zealand ©	77	6	4	4			2	2

© See notes and comments in Chapter IV.

TABLE 62

Reported number of species (total and forest-occurring), of which endangered: Birds

Country	All species				Forest-occurring species			
	Total	of which: Endangered	Endemic species		Total	of which: Endangered	Endemic species	
			Total	of which: Endangered			Total	of which: Endangered
	(Number)							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Albania ©	320	104	0	0	60	43	0	0
Austria ©	250	134	0	0	113	43	0	0
Belgium ©	167	99	0	0		7	0	0
Bosnia and Herzegovina								
Bulgaria ©	383	78						
Croatia ©	232							
Cyprus ©	365	0	7	0	209	0	7	0
Czech Republic ©	396	248	0	0	287	125	0	0
Denmark ©	185	11	0	0	94	3	0	0
Estonia ©	549	73			90	38		
Finland ©	240	33	0	0	105	13	0	0
France ©	284	78	1	0	90	13	1	0
Germany ©	255	84	0	0	53	10	0	0
Greece								
Hungary ©	370	21	1	1				
Iceland ©	100	24	0	0	3	0	0	0
Ireland ©	420	29	0	0	60	7	0	0
Israel ©	511	218	0	0	345	193	0	0
Italy	230	125						
Latvia ©	320	79	0	0	102	25	0	0
Liechtenstein ©	145	30						
Lithuania ©	321	67	0	0	195	42	0	0
Luxembourg	136	64	0	0	61	21	0	0
Malta ©	360	360	8	8				
Netherlands ©	172	48	0	0	37	2	0	0
Norway ©	220	59	0	0	115	18	0	0
Poland ©	360	57			160			
Portugal	350	10	15	4	122	3	9	2
Romania								
Slovakia ©	335	63	0	0	188	31	0	0
Slovenia ©	361	121	0	0	95	46	0	0
Spain ©	368	92	4	3				
Sweden ©	245	91	0	0	110	39	0	0
Switzerland ©	205	115	0	0	83	28	0	0
The FYR of Macedonia								
Turkey	450	39						
United Kingdom ©	390	0	1					
Yugoslavia ©	382	185	260		382	185	260	
Armenia	302	66						
Azerbaijan ©	65	36	0	0	15	6	0	0
Belarus	298	75	0	0	278	75	0	0
Georgia ©								
Kazakhstan ©	485	56	56	56	178	23	27	23
Kyrgyzstan ©								
Republic of Moldova	243						36	
Russian Federation ©	557	25			302	10		
Tajikistan								
Turkmenistan ©	372							
Ukraine ©	400	67	0	0	130	30	0	0
Uzbekistan								
Canada ©	435	47				16		
United States of America ©	776	90	70	50	698	54		37
Australia ©		26						
Japan	538	49	18	14	146	25	15	11
New Zealand ©	183	55	68	55	84	37	50	37

© See notes and comments in Chapter IV.

TABLE 63

Reported number of species (total and forest-occurring), of which endangered: Other vertebrates (fish, amphibians and reptiles)

Country	All species				Forest-occurring species			
	Total	of which: Endangered	Endemic species		Total	of which: Endangered	Endemic species	
			Total	of which: Endangered			Total	of which: Endangered
	(Number)							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Albania ©	365	111	0	0	42	27	0	0
Austria ©	33	33	0	0	25	25	0	0
Belgium ©	65	46	0	0	0	0	0	0
Bosnia and Herzegovina								
Bulgaria ©	259	78	17					
Croatia ©	600	150						
Cyprus ©	26	3	4	1	23	1	4	1
Czech Republic ©	88	47	0	0	44	25	0	0
Denmark ©	58	22	0	0	3	2	0	0
Estonia ©	87	14			8	2		
Finland ©	104	12	0	0	1	0	0	0
France ©	73	30	2	2	24	10	0	0
Germany ©	35	25	0	0	6	3	0	0
Greece								
Hungary ©	111	5						
Iceland ©	6	0	0	0	0	0	0	0
Ireland ©	19	10	4	4	2	0	0	0
Israel ©	152	68	6	6	115	49	2	2
Italy	140	98						
Latvia ©	118	16	0	0	20	8	0	0
Liechtenstein ©	39	13						
Lithuania ©	120	22	0	0	35	5	0	0
Luxembourg								
Malta ©		3						
Netherlands ©	23	15	0	0	3	1	0	0
Norway ©	35	10	0	0	10	4	0	0
Poland ©	139	15	4	4				
Portugal	46	5	17	3	12	0	3	0
Romania								
Slovakia ©	111	40	0	0	33	23	0	0
Slovenia ©	144	107	2	2	27	21	0	0
Spain ©	149	47	48	26				
Sweden ©	161	32	0	0	62	8	0	0
Switzerland ©	89	74	0	0	8	3	0	0
The FYR of Macedonia								
Turkey	635	22	8					
United Kingdom ©	50	3						
Yugoslavia ©	180	27	56					
Armenia	76	14	3	3				
Azerbaijan ©	24	4	0	0	4	3	0	0
Belarus	81	8	0	0	81	8	0	0
Georgia ©	13							
Kazakhstan ©	211	29	29	29	57	7	7	7
Kyrgyzstan ©								
Republic of Moldova							50	
Russian Federation ©	450	4			45	1		
Tajikistan								
Turkmenistan ©	60							
Ukraine ©	238	47		0		13		0
Uzbekistan								
Canada ©	1,175	79						
United States of America ©	1,342	158		126	1,179	89		79
Australia ©		21						
Japan	343	29	86	21	114	15	85	13
New Zealand ©	1,081	50	192	50	114	39	90	39

© See notes and comments in Chapter IV.

TABLE 64

Reported number of species (total and forest-occurring), of which endangered: Butterflies and moths

Country	All species				Forest-occurring species			
	Total	of which: Endangered	Endemic species		Total	of which: Endangered	Endemic species	
			Total	of which: Endangered			Total	of which: Endangered
	(Number)							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Albania ©	877	43	0	0	142	42	0	0
Austria ©	4,000	800	400	400	2,800	560	280	280
Belgium ©	50	43	0	0		11	0	0
Bosnia and Herzegovina								
Bulgaria ©	20,000	2,125	470					
Croatia ©	2,505							
Cyprus ©	52	0	9	0	44	0	9	0
Czech Republic ©	3,340	400	40	30				
Denmark ©	3,940	1,224		0			0	0
Estonia ©	897	34			568	34		
Finland ©	2,390	179	0	0		47	0	0
France ©	5,120							
Germany ©	185	112	0	0	51	32	0	0
Greece								
Hungary ©	3,570	180	25	25	2,356	20		
Iceland	51		0	0	11	0	0	0
Ireland ©								
Israel ©	5,140							
Italy		12						
Latvia ©	2,396	45	0	0	1,500	19	0	0
Liechtenstein ©								
Lithuania ©	1,200	58	0	0	700	20	0	0
Luxembourg								
Malta ©								
Netherlands ©	70	45	0	0	15	14	0	0
Norway ©	2,100	540	2	0	1,000	200	0	0
Poland ©	3,200	512	10					
Portugal	151	1	17	0	74	0	3	0
Romania								
Slovakia ©	3,949							
Slovenia ©	1,402	1,170	13	12	900	750		
Spain ©								
Sweden ©	2,700	333	6	2	439	145	2	2
Switzerland ©	182	108	0	0	128	32	0	0
The FYR of Macedonia								
Turkey								
United Kingdom ©	2,500	107						
Yugoslavia ©	4,000	45			4,000	45		
Armenia								
Azerbaijan ©	7,000	40	0	0	652	30	0	0
Belarus	1,590	31	0	0	1,420	31	0	0
Georgia ©								
Kazakhstan ©	0	0	0	0	0	0	0	0
Kyrgyzstan ©								
Republic of Moldova								
Russian Federation ©	9,000	9				8		
Tajikistan								
Turkmenistan ©								
Ukraine ©	5,000	58		1	2,000	42		1
Uzbekistan								
Canada ©	4,630	3						
United States of America ©	600	18		16		9		7
Australia ©								
Japan	237	43	15	7	152	23	13	5
New Zealand ©	1,490		11					

© See notes and comments in Chapter IV.

TABLE 65

Annual averages of area of regeneration and extension of forest and natural colonization of other wooded land over ten-year period

Country	Ten-year period from - to	Regeneration of forest		Extension of forest including afforestation and reforestation of other wooded land		Natural colonization of non-forest land to OWL	
		Annual average area over 10-year period total	of which: With introduced tree species	Annual average area over 10-year period	of which: With introduced tree species	Annual average area over 10-year period	of which: With introduced tree species
		(1000 ha)					
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Albania ©	1951-90	36.4	0.0	5.0	0.0	0.0	0.0
Austria ©	1986-96	50.0	0.0	2.0	0.0	0.0	0.0
Belgium	1988-97	7.0	4.9	0.1		0.0	
Bosnia and Herzegovina							
Bulgaria	1985-95	28.0	2.0				
Croatia	1986-96	39.0	0.6	2.0	0.0	0.0	0.0
Cyprus	1987-96	0.5 ①	0.0		0.0		0.0
Czech Republic ©	1986-95	24.0	1.0	1.0	0.0	0.0	0.0
Denmark ©	1990	6.4	5.2	2.2	1.3	0.3	0.2
Estonia ©	1987-96	6.1 ①		10.0		4.4	
Finland ©	1987-96	167.0	1.9	21.0	0.0		
France ©	1987-97	107.0 ①	33.0	9.5	4.5	75.6	0.0
Germany ©	1987-96	70.0	4.5	7.2	0.4	0.0	0.0
Greece	1986-95						
Hungary ©	1987-96	20.7	12.7	6.8	4.6		
Iceland ©	1987-97	0.0 ①	0.0	0.6	0.5		
Ireland	1987-96	4.0	4.0	17.0	16.0	0.0	0.0
Israel ©	1987-97	0.4	0.4	2.1	2.1	2.3	
Italy	1986-95	143.0 ①					
Latvia ©	1988-97	8.0	0.0	0.0	0.0	0.0	0.0
Liechtenstein	1975-95	0.0		0.0		0.0	
Lithuania	1987-97	10.7	0.0	1.8	0.0	0.2	0.0
Luxembourg	1987-97						
Malta	1986-96	0.0	0.0	0.0	0.0	0.0	0.0
Netherlands ©	1985-95	2.1 ①	0.4	1.2	0.2	0.0	0.0
Norway ©	1987-96	47.0	1.0	31.0	0.0	26.0	0.0
Poland ©	1987-96	59.1 ①	0.0	10.0	0.0		0.0
Portugal	1985-95	75.0	40.0	58.0	9.0	0.0	0.0
Romania							
Slovakia ©	1987-96	16.5 ①	1.5	0.3	0.0	0.0	0.0
Slovenia ©	1986-96	7.5 ①	0.0	3.6	0.0	0.5	0.0
Spain							
Sweden ©	1987-96	204.0 ①	16.0	2.0			
Switzerland ©	1985-95	21.4	0.0	6.9		1.7	
The FYR of Macedonia							
Turkey ©	1987-96	54.0		66.0	3.0		
United Kingdom ©	1986-95	14.8	11.4	22.8	15.5	0.0	0.0
Yugoslavia ©	1990-97	9.9	0.4	5.5	1.1	0.0	0.0
Armenia	1983-93	22.0	10.0	4.0	2.0	0.0	0.0
Azerbaijan	1987-97	3.0	0.0	2.0	0.0	0.0	0.0
Belarus	1988-97	26.2	0.1	0.6	0.0	0.0	0.0
Georgia ©	1985-94	19.1					
Kazakhstan	1987-97	67.0	0.0	0.0	0.0	0.0	0.0
Kyrgyzstan		26.0					
Republic of Moldova	1988-97	4.2	2.6	1.2	0.6		
Russian Federation ©	1983-93	2,026.0	0.0	0.0	0.0	1,316.0	0.0
Tajikistan							
Turkmenistan ©	1980-89						
Ukraine	1987-96	39.4	5.0	13.8	6.9	0.0	0.0
Uzbekistan	1988-95						
Canada ©	1986-97	692.9		0.0	0.0		
United States of America ©	1987-92	4,372.0	4.0	1,868.0			
Australia ©		①					
Japan	1990-94	170.0 ①		5.0			
New Zealand ©	1987-96	20.0	20.0	53.0	43.0	10.0	0.0

© See notes and comments in Chapter IV.

① Adjustment to achieve conformity with TBFRA definitions arrived at by the National Correspondent.

TABLE 66

Forest regenerated by natural regeneration, natural regeneration enhanced by planting, coppice sprouting and planting or seeding over ten-year period

Country	Natural regeneration		Natural regeneration enhanced by planting		Coppice sprouting		Planting or seeding	
	Annual average area over 10-year period	of which: With introduced tree species	Annual average area over 10-year period	of which: With introduced tree species	Annual average area over 10-year period	of which: With introduced tree species	Annual average area over 10-year period	of which: With introduced tree species
	(1000 ha)							
(1)	(2)	(3)	(4)	(5)	(6)	(7)		(9)
Albania ©	2.2	0.0	0.0	0.0	34.2	0.0	0.0	0.0
Austria ©	38.0	0.0	5.0	0.0	0.0	0.0	7.0	0.0
Belgium	1.7	0.8			0.0	0.0	5.3	4.1
Bosnia and Herzegovina								
Bulgaria	10.5		4.7	0.5	2.8		10.0	1.6
Croatia	28.0	0.0	3.0	0.0	5.0	0.0	3.0	0.6
Cyprus	0.0 ①	0.0	0.0 ①	0.0	0.0 ①	0.0	0.5 ①	0.0
Czech Republic ©	0.0	0.0	1.0	0.0	0.0	0.0	23.0	1.0
Denmark ©	0.2	0.0	0.2	0.0	0.1	0.0	5.8	5.2
Estonia ©	1.3 ①		0.7 ①		0.0		4.1	
Finland ©	49.0	0.0		0.0	0.0	0.0	118.0	1.9
France ©	7.3 ①	0.4	0.0 ①	0.0	70.9 ①	17.0	28.8 ①	15.6
Germany ©	28.0	0.3	0.0	0.0	0.0	0.0	42.0	4.2
Greece	22.4	0.0					4.0	
Hungary ©	1.6				6.0		13.1	
Iceland ©	0.0	0.0	0.0	0.0	0.0	0.0	0.0 ①	0.0
Ireland	0.0	0.0	0.0	0.0	0.0	0.0	4.0	4.0
Israel ©			0.1	0.1	0.1	0.1	0.3	0.3
Italy	65.0 ①		3.0 ①		63.0 ①		12.0 ①	10.0
Latvia ©	2.0	0.0	0.0	0.0	0.0	0.0	6.1	0.0
Liechtenstein	0.0		0.0		0.0		0.0	
Lithuania	2.9	0.0	0.0	0.0	0.0	0.0	7.8	0.0
Luxembourg								
Malta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Netherlands ©	0.6 ①	0.2	0.0	0.0	0.6	0.0	0.9 ①	0.3
Norway ©	20.0	0.0	0.0	0.0	0.0	0.0	27.0	1.0
Poland ©	0.7 ①	0.0	2.8 ①	0.0	0.0	0.0	55.6	0.0
Portugal	23.0	0.0	0.0	0.0	40.0	40.0	12.0	0.0
Romania								
Slovakia ©	1.6 ①	0.0	0.2 ①	0.0	0.0	0.0	14.6 ①	1.5
Slovenia ©	5.8 ①	0.0	0.2 ①	0.0	1.0 ①	0.0	0.5 ①	0.0
Spain								
Sweden ©	38.0	0.0	4.0	0.0	2.0 ①	0.0	160.0	16.0
Switzerland ©	18.8	0.0	1.7	0.0	0.0	0.0	0.9	0.0
The FYR of Macedonia								
Turkey ©	21.0				11.0		22.0	
United Kingdom ©	0.3	0.2	0.0	0.0	0.1	0.1	14.4	11.1
Yugoslavia ©	1.3	0.0	2.0	0.0	3.8	0.1	2.8	0.3
Armenia	7.0	0.0	2.0	0.0	0.0	0.0	13.0	10.0
Azerbaijan	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Belarus	2.8	0.0	0.0	0.0	1.2	0.0	22.2	0.1
Georgia ©	16.2		2.5				0.4	
Kazakhstan	0.0	0.0	13.0	0.0	0.0	0.0	54.0	0.0
Kyrgyzstan	16.0		7.0		0.0		3.0	
Republic of Moldova	1.3	0.6	0.0	0.0	0.8	0.8	2.1	1.2
Russian Federation ©	763.0	0.0	657.0	0.0	38.0	0.0	568.0	0.0
Tajikistan								
Turkmenistan ©	0.0	0.0	0.0	0.0	0.0		3.4	
Ukraine	1.1	0.0	1.0	0.0	1.0	0.0	36.3	5.0
Uzbekistan								
Canada ©	424.4						268.5	
United States of America ©	3,260.0		0.0		0.0		1,112.0	4.0
Australia ©								
Japan	88.0 ①		22.0 ①		1.0 ①		59.0 ①	
New Zealand ©	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0

© See notes and comments in Chapter IV.
① Adjustment to achieve conformity with TBFRA definitions arrived at by the National Correspondent.

TABLE 67

Extension of forest (afforestation and reforestation of other wooded land)

Country	Natural colonization of non-forest land to forest		Natural colonization of other wooded land to forest		Planting or seeding of non-forest land		Planting or seeding of other wooded land	
	Annual average over 10-year period	of which: With introduced tree species	Annual average over 10-year period	of which: With introduced tree species	Annual average over 10-year period	of which: With introduced tree species	Annual average over 10-year period	of which: With introduced tree species
	(1000 ha)							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Albania ©	0.0	0.0	0.0	0.0	5.0	0.04	0.0	0.0
Austria ©	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
Belgium	0.0		0.0		0.1		0.0	
Bosnia and Herzegovina								
Bulgaria								
Croatia	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0
Cyprus		0.0		0.0		0.0		0.0
Czech Republic ©	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
Denmark ©	0.2	0.2	0.1	0.0	1.9	1.1	0.0	0.0
Estonia ©	4.2		5.3		0.4		0.1	
Finland ©	4.0	0.0	8.0	0.0	9.0		0.0	0.0
France ©	0.2	0.0	0.1	0.0	8.0	3.9	1.2	0.6
Germany ©	3.0	0.0	0.0	0.0	4.2	0.3	0.0	0.0
Greece								
Hungary ©	0.5				6.3	4.6		
Iceland ©	0.0	0.0	0.0	0.0	0.6	0.5	0.0	0.0
Ireland	0.0	0.0	0.0	0.0	17.0	16.0	0.0	0.0
Israel ©	0.0	0.0	0.0	0.0	1.3	1.3	0.8	0.8
Italy								
Latvia ©	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Liechtenstein	0.0		0.0		0.0		0.0	
Lithuania	0.2	0.0	0.2	0.0	0.5	0.0	1.0	0.0
Luxembourg								
Malta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Netherlands ©	0.0	0.0	0.0	0.0	1.2	0.2	0.0	0.0
Norway ©	20.0	0.0	11.0	0.0	0.0	0.0	0.0	0.0
Poland ©		0.0	0.0	0.0	10.0	0.0	0.0	0.0
Portugal	0.0	0.0	29.0	0.0	28.0	9.0	1.0	0.0
Romania								
Slovakia ©	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0
Slovenia ©	0.3	0.0	3.3	0.0	0.0	0.0	0.0	0.0
Spain								
Sweden ©					2.0		0.0	0.0
Switzerland ©	5.0		0.9		0.9		0.1	
The FYR of Macedonia								
Turkey ©					18.0	1.0	48.0	2.0
United Kingdom ©	0.0	0.0	0.0	0.0	22.8	15.5	0.0	0.0
Yugoslavia ©	0.0	0.0	0.0	0.0	0.4	0.0	5.2	1.1
Armenia	0.0	0.0	2.0	1.0	1.0	0.0	1.0	1.0
Azerbaijan	0.0	0.0	0.0	0.0	0.8	0.0	1.2	0.0
Belarus	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0
Georgia ©								
Kazakhstan	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Kyrgyzstan								
Republic of Moldova	0.0	0.0	0.0	0.0	1.2	0.6	0.0	0.0
Russian Federation ©	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tajikistan								
Turkmenistan ©								
Ukraine	0.0	0.0	0.0	0.0	13.8	6.9	0.0	0.0
Uzbekistan								
Canada ©								
United States of America ©	1,140.0		323.0		405.0		0.0	
Australia ©								
Japan	5.0							
New Zealand ©		0.0	10.0	0.0	43.0	43.0		0.0

© See notes and comments in Chapter IV..

TABLE 68

Types of regeneration and extension of forest (share of annual average area over ten-year period)

Country	Regeneration of forest				Extension of forest			
	Natural regeneration	Natural regeneration enhanced by planting	Coppice sprouting	Planting or seeding	Non-forest land to forest (Natural colonization)	Other wooded land to forest (Natural conversion)	Planting or seeding of non-forest land	Planting or seeding of other wooded land
	(per cent of total regeneration)				(per cent of total extension)			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Albania	6.1	0.0	93.9	0.0	0.0	0.0	100.0	0.0
Austria	76.0	10.0	0.0	14.0	50.0	0.0	50.0	0.0
Belgium	24.4		0.0	75.6	0.0	0.0	100.0	0.0
Bosnia and Herzegovina								
Bulgaria	37.5	16.8	10.0	35.7				
Croatia	71.8	7.7	12.8	7.7	0.0	0.0	100.0	0.0
Cyprus	0.0	0.0	0.0	100.0				
Czech Republic	0.0	4.2	0.0	95.8	0.0	0.0	100.0	0.0
Denmark	3.5	3.5	2.0	90.9	9.1	4.5	86.4	0.0
Estonia	21.3	11.5	0.0	67.2	42.0	53.0	4.0	1.0
Finland	29.3		0.0	70.7	19.0	38.1	42.9	0.0
France	6.8	0.0	66.3	26.9	2.1	1.1	84.2	12.6
Germany	40.0	0.0	0.0	60.0	41.7	0.0	58.3	0.0
Greece								
Hungary	7.7		29.0	63.3	7.4		92.6	
Iceland					0.0	0.0	100.0	0.0
Ireland	0.0	0.0	0.0	100.0	0.0	0.0	100.0	0.0
Israel		25.0	12.5	62.5	0.0	0.0	61.9	38.1
Italy	45.5	2.1	44.1	8.4				
Latvia	24.6	0.0	0.0	75.4				
Liechtenstein	50.0	33.3	0.0	16.7	75.0	0.0	25.0	0.0
Lithuania	27.1	0.3	0.0	72.6	11.0	11.0	24.7	53.3
Luxembourg								
Malta					0.0	0.0	0.0	100.0
Netherlands	28.6	0.0	28.6	42.9	0.0	0.0	100.0	0.0
Norway	42.6	0.0	0.0	57.4	64.5	35.5	0.0	0.0
Poland	1.2	4.7	0.0	94.2		0.0	100.0	0.0
Portugal	30.7	0.0	53.3	16.0	0.0	50.0	48.3	1.7
Romania								
Slovakia	9.9	1.2	0.0	88.9	0.0	0.0	100.0	0.0
Slovenia	77.3	2.7	13.3	6.7	8.3	91.7	0.0	0.0
Spain								
Sweden	18.6	2.0	1.0	78.4			100.0	0.0
Switzerland	87.9	7.9	0.0	4.2	72.5	13.0	13.0	1.4
The FYR of Macedonia								
Turkey	38.9		20.4	40.7			27.3	72.7
United Kingdom	2.0	0.0	0.7	97.3	0.0	0.0	100.0	0.0
Yugoslavia	13.6	20.0	38.0	28.4	0.0	0.0	6.4	93.6
Armenia	31.8	9.1	0.0	59.1	0.0	50.0	25.0	25.0
Azerbaijan	100.0	0.0	0.0	0.0	0.0	0.0	40.0	60.0
Belarus	10.7	0.0	4.6	84.7	0.0	0.0	100.0	0.0
Georgia	84.8	13.3		1.9				
Kazakhstan	0.0	19.4	0.0	80.6				
Kyrgyzstan	69.6	30.4	0.0	13.0				
Republic of Moldova	31.0	0.0	19.0	50.0	0.0	0.0	100.0	0.0
Russian Federation	37.7	32.4	1.9	28.0				
Tajikistan								
Turkmenistan								
Ukraine	2.8	2.5	2.5	92.1	0.0	0.0	100.0	0.0
Uzbekistan								
Canada	61.2			38.8				
United States of America	74.6	0.0	0.0	25.4	61.0	17.3	21.7	0.0
Australia								
Japan	51.8	12.9	0.6	34.7	100.0			
New Zealand	0.0	0.0	0.0	100.0		18.9	81.1	

TABLE 69

Origin of planting material used in the forest

Country	Ten-year period	Indigenous species				Introduced species		
		Total	of which:			Total	of which:	
			Known local provenance	Known non-local provenance	Unknown provenance		Known non-local provenance	Unknown provenance
		(ha/year)						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Albania	1955-85	1,990	1,840	0	150	850	350	500
Austria	1988-97	6,835	6,835	0	0	150	150	0
Belgium ©	1988-97	693	0	0	0	3,456	0	0
Bosnia and Herzegovina								
Bulgaria	1985-95	8,440	8,440			2,150		
Croatia	1986-96	7,536	7,536			597	597	
Cyprus	1987-96	474	474	0	0			
Czech Republic ©	1989-96	30,879	30,879	0	0	0	0	
Denmark ©	1980-90	1,170	513	657		5,215	5,215	
Estonia	1987-96	4,290	4,290	0	0	4	4	0
Finland ©	1987-96	91,373	90,766	667	0	1,875	1,875	0
France	1995-96	46,859	0	0	0	24,108	0	0
Germany ©	1987-96	41,500	31,200			4,700		
Greece								
Hungary ©	1987-96	13,661				12,343		
Iceland ©	1987-97	120		120		490	490	
Ireland ©								
Israel								
Italy	1984-93	1,560	1,560	0	0	10,606	10,606	0
Latvia ©	1988-97	6,011	6,011			43		43
Liechtenstein ©	1975-95							
Lithuania	1987-97	7,727	6,786	739	202	30	4	25
Luxembourg								
Malta ©	1986-96							
Netherlands ©	1985-95	1,931	1,102	584	245	158	158	0
Norway ©	1987-96	25,900	23,400	2,500		1,100	1,100	
Poland ©	1987-96	91,711	91,711	0	0			
Portugal ©	1985-95	11,029			11,029	1,651		1,651
Romania								
Slovakia ©	1986-96	13,627	9,892	3,692	143	1,430	1,290	140
Slovenia ©	1986-96	7,170	5,119	1,256	795	100	0	100
Spain								
Sweden ©	1987-96	144,000	126,000	18,000		16,000	16,000	
Switzerland ©	1991-91				0			
The FYR of Macedonia								
Turkey	1987-96	83,878	83,878	0	0	2,586	2,586	0
United Kingdom ©	1986-95	10,534				26,646		
Yugoslavia	1985-95	5,632	5,632	0	0	566	0	0
Total: Europe								
of which: EU 15								
Armenia	1983-93	1,850	650	1,200	0	210	50	160
Azerbaijan	1987-97	7	7	0	0	23	23	0
Belarus	1988-97	22,154	22,154	0	0	38	0	6
Georgia								
Kazakhstan	1987-97	53,300	53,300	0	0			
Kyrgyzstan								
Republic of Moldova	1988-97	1,550	1,550			2,650	150	
Russian Federation	1987-96	357,945	357,945	0	0			
Tajikistan								
Turkmenistan								
Ukraine	1987-96	42,100	42,100	0	0	8,050	0	0
Uzbekistan								
Total: CIS								
Canada ©	1986-95	374,311	342,324	31,987		4,886	4,886	
United States of America ©	1987-97	1,087,221	1,067,486	19,736		3,572	3,572	
Total: North America		**1,461,531**	**1,409,810**	**51,723**		**8,458**	**8,458**	
Australia ©	1993-94	172,417				838,680		
Japan	1986-95	64,794	64,794			229	229	
New Zealand	1986-96					29,500		
Total: Other TBFRA						**868,409**		
Grand Total								

© See notes and comments in Chapter IV.

NOTES AND COMMENTS RELATING TO CHAPTER IV

Main Tables	Comments

Albania

53, 54

Enquiry Table 2: About 83.0 per cent of forest area is semi-natural forest originating from natural regeneration, conserving the main species composition, also there are about 8.2 per cent of virgin/primeval forests, mainly localised in the northern part of Albania; the plantations compose 8.8 per cent consisting mainly of indigenous species.

The trends in the area of the above classes over the last 100-200 years, particularly since 1950s, were as follows:

The forest undisturbed by man was reduced from 300,000 ha (or 22.5 per cent of forest area) in 1950 to 84,841 in 1995 (or 8.2 per cent of forest area).

The semi-natural forests were reduced from 1,328,700 ha (or 100 per cent of forest area) in 1957 to 843,160 ha in 1995 (or 83 per cent of forest area) but during the 1990s the area has begun to increase again.

The plantation area increased from nothing in the 1950s to 102,000 ha in 1995 (or 8.8 per cent of forest area). During the 1990s or transition period, reforestation was reduced.

The nature and driving forces of these structural trends and underlying circumstances were as follows:

1. Exploitation
2. Thinnings
3. Grazing
4. Fires
5. Illegal cuttings
6. Deforestation and reforestation
7. Pest and diseases
8. Pollution
9. Climate changes

Because of forest exploitation and thinnings there have been many difficulties to conserve the composition and structure of nature forest species. Construction of roads, buildings or other structures, etc., cutting and conservation or collection of fruits of certain species have favoured other species to occupy more territory.

Grazing favours livestock at the expense of other browsing species. Fire changes everything and favours growth of the most resistant species under the new more difficult conditions.

As a result of illegal cuttings, the most important species disappear and the least important species or individual tree survive. Deforestation causes the natural forest ecosystems to disappear and reforestation always replaces a different kind of ecosystem.

Pests and diseases, pollution and climate change allow those species that resist them or adjust better to the new conditions to survive.

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Enquiry Table 8: There is the increasing trend in protected areas, because the Albania is a montainous-hilly country (the average elevation above sea-level is 691.2 m) placed on the boundary of Mediterranean and central European climate zones with very rich biodiversity and landscape. These are very important resources to include in regional or European worknets of research.

56-64

Enquiry Table 10: Of the 3250 plant species that compose the flora of Albania about 10.2 per cent (or 330 species) are trees while the remaining part are other vascular plants (flowers) or 89.8 per cent (or 2920 species), from which are:

- Endangered tree species 0.8 per cent (or 27 species)
- Endangered other vascular plant species (flowers) 3.2 per cent (or 103 species)
- The rare species are about 6.1 per cent (or 199 species)

The endemic species are 0.9 per cent (or 30 species) of the total plant species.

There are Balkanic and sub-endemic species which are as follows:

- Plants 13.8 per cent (or 450 species)
- Mammals 2.5 per cent (or 2 species)
- Amphibians and reptiles 23.1 per cent (or 12 species)
- Butterflies and moths1.3 per cent (or 11 species)

The number of forest-occurring species, respectively, for trees is 3.7 per cent (or 120 species) and other vascular plants (flowers) is 44.9 per cent (or 1460 species); this last is specialist estimation. Of them there are endangered species respectively, 0.5 per cent (or 15 tree species) and 9.4 per cent (or 305 other vascular plant species (flowers)).

The ferns, mosses and lichens have not been studied.

Also, for forest occurring species there are mammals 69.0 per cent (or 58 species), birds 18.8 per cent (or 60 species), other vertebrates 7.4 per cent and 11.5 per cent (amphibians and reptiles) (or 42 species) and butterflies and moths 16.2 per cent (or 142 species) of each total.

Out of them, the endangered species are mammals 32.1 per cent (or 27 species), birds 9.7 per cent (or 31 species), other vertebrates 7.4 per cent (or 27 species) and butterflies and moths 4.8 per cent (or 42 species).

There exists supportive information on the "Endangered status categories" in tabular form in the reply to the enquiry which is available at the secretariat.

65-68

Enquiry Table 11: The high forests are treated with successive cutting systems and selective cutting systems based on natural regeneration by seed of remaining trees while the coppice forests are treated with clearing cutting system based on natural regeneration by sprouts of the remaining stumps.

From the figures provided, it is clear that the larger part of the forest area was regenerated as coppice; the annual average area during the forty-years period (1951-1990) was 34,150 ha (or 93.9 per cent of the total regenerated forest area). In the second place, there is planting of non-forest lands using introduced species about 0.8 per cent (or 40 ha annual average area) and thirdly, there is natural regeneration in high forests.

Armenia

53, 54

Enquiry Table 2: Four categories of "Especially Protected Nature Areas" are defined by law (1992): state preserves (arghelotz), national parks, state protected areas (arghelavaire) and nature monuments. These differ from internationally adopted IUCN Protection Status categories. The status of the protected areas was defined mainly in the late 1950s and the early 1970s. The protected areas cover in total about 311,600 ha. Sevan National Park, which is the only national park, counts for 151,100 ha of which 124,100 is water.

It should be noted that out of the total forested areas of the country (334,100 ha) present protected areas cover over 100,000 ha, which is a high percentage in international comparisons. The management of the protected areas is shared between the Ministry of Agriculture, Hayantar, and the Ministry of Nature Protection. Hayantar is responsible for 17 protected areas, including two major preserves (Khosrov, Dilidjan) and especially Shikaghogh.

Australia

53, 54

Enquiry Table 2: The figure of 18,836 in row "Forest undisturbed by man" is derived from the total area of forest in conservation reserves plus old growth forest in multiple use forests. Source: State of the Forest Report (1998).

Comments to the adjustment table:

Enquiry Table 2: Native Forest: forest undisturbed by man and semi-natural forest.

No areas have been recorded for items 2.2 and 2.3, as 'naturalness' is a difficult quality to quantify. Australia has developed a method of wilderness assessment that can be applied in practice, at an appropriate data scale.

Wilderness is defined in the National Forest Policy Statement (1992) as: land that, together with its plant and animal communities, is in a state that has not been substantially modified by, and is remote from, the influences of European settlement, or is capable of being restored to such a state; is of sufficient size to make its maintenance in such a state feasible; and is capable of providing opportunities for solitude and self-reliant recreation.

The National Wilderness Inventory (Australian Heritage Commission. 1995) assesses wilderness quality across Australia using four indicators:

- remoteness from settlement - distance from the nearest house or town;
- remoteness from access - distance from the nearest track or road;
- apparent naturalness - distance from the nearest permanent structures associated with modern human society (including fences, powerlines, transmission towers and the like); and
- biophysical naturalness - the extent to which an area's plant and animal communities have remained undisturbed by modern technology.

Incorporation of relevant data in the calculation of these indicators for particular environments is based on data availability. Potential wilderness quality is calculated by summing the four indicators, each of which can contribute a maximum of 5 units. Potential wilderness values range between one and twenty, e.g. urban areas have low values and pristine environments receive high values.

Data from the National Wilderness Inventory have been incorporated into the National Forest Inventory database to generate information on the wilderness status of native forests. Forest environments with a potential wilderness value (PWV) of 12 or greater, cover approximately 55 per cent of the native forest estate; with approximately 32 per cent of native forest having a PWV of less than 12 ; and approximately 13 per cent having an unknown wilderness value (State of the Forest Report (1998) Table 29).

Designation as wilderness however also depends on areas with high values of PWV existing as contiguous spatial units. For example, in some regions, the National Wilderness Inventory method has been applied to high resolution spatial data and wilderness areas have been reserved where :

- the PWV is 12 or more and
- forest patches are at least 5000 ha to 8000 ha in size.

Native Forest, trends: According to the State of the Forest Report (1998), determining the historical rate of forest cover change is a difficult task, given the pre-European forest cover can only be estimated from information available today. Current information at the national level only allows approximations to be made, but it seems likely that about 40 per cent of Australia's forests were converted to agricultural land between 1788 and 1980 (State of the Forest Report (1998) table 32).

Forests may change in character while retaining their status as forests. The estimated area of forest in which density has decreased since European settlement (1788) as a result of forest management practices is 7.5 million ha (State of the Forest Report (1998) table 34).

Information is not available at the national level for the assessment of current changes in forest cover. In 1995 the Commonwealth Government committed AUS $3.4 million to a joint project between the Commonwealth and the States and Territories to develop a national land clearance database using high-resolution satellite information. This project is now under way (State of the Forest Report (1998) and data will be available at the end of 1998.

Plantations: According to the National Plantation Inventory (1997, page 10), the area of standing plantation estate in 1997 was:

- 10,010 ha (93 per cent softwood), planted prior to 1940;
- 51,210 ha (96 per cent softwood), planted to the end of 1959;
- 531,810 ha (91 per cent softwood), planted to the end of 1979;
- 862,500 ha (90 per cent softwood), planted to the end of 1989;
- 1,042,600 ha (85 per cent softwood), planted to the end of 1994.

The plantation expansion between 1960 and 1980 was driven by Commonwealth softwood plantation loans. The softwood planting rate peaked in 1975-1979. Since then it has been declining, especially since 1990, due to commercial and tax reasons as well as competition for land. The hardwood planting rate has increased from the mid-1970s through to 1994.

The Commonwealth Vision 2020 Initiative proposes to treble the total 1997 plantation estate by the year 2020.

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Enquiry Table 8: Not all forest in Australia has IUCN value. About 15 per cent of forest has determined IUCN value. IUCN includes all National Parks, Nature Reserves and domestic water supply, where available. It also includes dedicated reserves in State forest except for Queensland.

The figure of 9,896,000 for "Forest--in IUCN categories III to VI" includes 3,605,100 ha of State Forest and Timber Reserve with IUCN value.

Differences with Australia's First Approximation Report for the Montreal Process, 1997 data is due to different data sources – Montreal from State Agencies, TBFRA-2000 data from NFI.

Data Source: National Forest Inventory, 1997 and State Government Agencies.

56-64

Enquiry Table 10: The data for "Other vascular plants" include all vascular plants, including data for "Trees".

The data for "Trees--Total species" are (468 + > 1200) which are incomplete. However, they are the best available.

Data for "Other vertebrates--endangered" are composed of 7 Amphibians, 8 Fish, and 6 Reptiles.

Data source: State of the Forest Report (1998), and after Commonwealth of Australia 1992 Endangered Species Act 1992.

Problematic introduced species: Determining the extent to which pests and diseases affect the forest is of considerable importance in assessing the state of the forests, but it is also an extremely difficult task. Currently, there are no quantitative national data on the pests and diseases that occur in Australia's forests, or of the damage they cause. Due to the climatic range across Australia very few pests and diseases are nationally distributed. Many of the pests and diseases are significant at a sub-continental scale. Foxes and blackberries (*Rubus vulgaris*) are the most widespread animal and plant pests in forests, and are responsible for limiting ground dwelling animals and displacing understorey species respectively.

Detail:

Weeds: There are 220 plant species that have been declared noxious in Australia. Most of these are exotic (not native to Australia), and almost half (46 per cent) were introduced deliberately, often as garden plants but also for agriculture. On average, one or two plants a year become recognised as weeds, often decades after their introduction into Australia or a specific region.

Exotic species that invade native forests can significantly alter forest ecosystems. In production forests and plantations they may also cause economic damage by stunting, deforming or destroying trees, often by competing with forest seedlings for nutrients and water during the establishment phase.

Nation-wide, there are 48 plants that are widespread or serious pests in native production forests and plantations. Of these, blackberry (*Rubus vulgaris*) is the most extensive and damaging, occurring in every State and Territory except the Northern

Territory. Other problem pest plants that compete with native flora in forests include gorse (*Ulex europaeus*), lantana (*Lantana camara*) and pampas grass (*Cortaderia spp*) which can all become locally dominant.

Exotic pine species can colonise native forests adjacent to pine plantations: *radiata pine* is considered widespread in Victorian native forests. Unwanted pines are a serious but limited problem in South Australian plantations and a serious and extensive problem in ACT plantations.

Mammalian pests: Like their plant kingdom counterparts, exotic animals can invade native forests, displacing native species and altering forest ecosystems, and they can cause economic damage in commercial forests and plantations. Economic damage is not limited to exotic species - some native animals are costly pests in production forests and plantations.

Feral animals may also spread disease. Pigs, for instance, are known to spread Phytophthora cinnamomi and may act as a feral 'reservoir' of potentially devastating animal diseases such as footrot. Cats, dogs, deer, donkeys, horses, goats, hares, rats, mice and foxes are all widespread in Australian forests and represent a serious threat to forest species and ecosystems. Foxes are the most widespread exotic animals adversely affecting forested ecosystems. They occur across mainland Australia and have severely limited populations of ground-dwelling mammals.

Data source: State of the Forest Report (1998).

Australia's First Approximation Report for the Montreal Process, 1997.

65-68

Enquiry Table 11:

A. Regeneration of forest (reforestation*), total for 1990-1994

(There exists supportive information on "Regeneration and extension of forest--Area of native forest under multiple-use forest tenure harvested annually, by State and Territory" in tabular form in the reply to the enquiry which is available at the secretariat.)

(Data source: State of the Forest Report (1998)).

B. Extension of forest **, including afforestation and reforestation, total (1981-1991): Annual average area: 36,000 ha.

(Data Source: Based on Plantation Establishment figures, Australian Forest Resources, Australian Bureau of Agricultural & Resource Economics 1981-1991).

C. Natural colonization of non-forest land to other wooded land: No data.

Notes:

Changes to TBFRA-2000 definitions:

* Regeneration methods:

– Natural regeneration

– Natural regeneration enhanced by planting

– Coppice sprouting

– Planting or seeding

** Extension methods:

– Planting or seeding of non-forest land

– Planting or seeding of forested land

Comments:

(1) For Part A the National Correspondents have based the response on the assumption that any forest that has been harvested will have also been regenerated. All States and Territories have a Code of Forest Practice that requires post-harvest regeneration of native forest to produce the same timber species and timber species composition as before harvest.

(2) On average, less than one per cent of the native forest area available for harvesting nationally is logged in any one year. This figure is based on data covering the years 1989/90 - 1993/94.

(3) The concept of harvested area is made complex by the variety of harvesting techniques used, which range from clearfelling to light selective logging. States utilising different techniques cannot be directly compared e.g., Queensland and NSW use selective harvesting where a large area is harvested lightly. This cannot be compared to Victoria where the area harvested is done by clearfelling which harvests almost the entire area.

(4 In many areas where selective logging takes place it is impossible to map from satellite and difficult and expensive to map from API. These technical difficulties have been identified as research priorities and are being funded in relation to implementing the Montreal Process Criteria and Indicators at regional scales.

(5) There is currently a national programme underway to map across the continent changes in landcover and forest cover using Landsat TM for the period 1990-1995. This programme is due to report at the end of 1998. Programmes are also being established to monitor national revegetation initiatives.

69

Enquiry Table 12: There exists supportive information on "common forest-dominant eucalypt and Callitris species" in tabular form in the reply to the enquiry which is available at the secretariat.

Euc. sp.—multiple use forests: For native forest in multiple use forests, there is tendency to use onsite material for regeneration and if unsuccessful to use local material.

Data source: National Plantation Inventory, 1997 and State of the Forests Report (1998).

Austria

53, 54

Enquiry Table 2: In 1997 a study on "The Hemeroby (Naturalness) of Austrian Forests", published by the Institute of Ecology—University of Vienna, in co-ordination with the Federal Ministry of Agriculture and Forestry and in close collaboration with the Austrian Forest Inventory assessed that 3 per cent of the Austrian forest and other wooded land can be considered as natural.

56-64

Enquiry Table 10: Data for Lichens are estimates.

Data provided for Mosses under "All species and Forest-occurring species"—"endemic species" and "of which endangered" are estimates.

Source: Museum of Natural History Vienna; Federal Forest Research Centre Vienna

65-68

Enquiry Table 11: The yearly forest area "under regeneration" is 57 kha +/- 6 kha (285 / 5 = 57). This figure fits with the figure "regeneration of forest" (50 kha +/- 5 kha) in *Enquiry Table 11* "Regeneration and extension of forest".

Usually the "planting and seeding" area (areas from 0,5 ha to 2 ha [2 ha is the maximum size of a felling area according to the Forest Act 1975]) as well as "natural regeneration enhanced by planting" areas (area from 0,1 ha to 0,5.ha) are afforested with 3 or more indigenous tree species (see also *Enquiry Table 12* "Species diversity and origin of planting material used in the forest"). Introduced species could be supplementary to indigenous tree species in some regeneration areas.

This small sized silvicultural management of forests produces semi-natural forests but not plantations.

Azerbaijan

53, 54

Enquiry Table 2: Initial data unadjusted for lack of sufficient material and information. Further to *Enquiry Table 2,* we would add that forest and other wooded land has long been subject to modification. According to the Azerbaijani Forestry Research and Development Planning Institute, the country's forests and woodlands have shrunk by 2.4 million hectares—almost two thirds—over the past 150 to 200 years. Before 1920 they were shrinking by 0.9-1.0 per cent of their total area every year, but after 1920 (up to 1950) the forests shrank at 0.4 per cent per year. Over the last 40 to 45 years there has been no further significant decrease in forest area, although there is a tendency for them to shrink and for forest quality to decline – i.e. density is decreasing and the average height of stands is diminishing, the proportion of valuable indigenous species is falling and that of low-value trees and bushes is rising.

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Enquiry Table 8: According to sources in the literature and national evaluation survey data, forest and other wooded land and other woodland areas have increased by roughly 80,000 hectares over the past 20 to 30 years.

56-64

Enquiry Table 10: Fourteen of 97 of the mammalian species are on the Red List.

There are 357 species and subspecies of birds, of which 36 are endangered.

Altogether 134 species of vertebrate live here; 18 are on the Red List.

Azerbaijan has many butterflies and insects - over 7,000 species. Of these, 40 are on the Red List.

Of the country's 4,500 plant species, around 400 are in need of protection. Of the 380 species of trees and shrubs growing in its forests and other woodlands, around 45 need protecting.

Belgium

53, 54

Enquiry Table 2: Plantations include blocks of clonal poplars, but not poplars planted in lines.

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Enquiry Table 8: The categories I and II have only existed since 1973 and their areas are obtained on the basis of precise parcellaires (Cadastral survey).

56-64

Enquiry Table 10:

Belgium (Flanders): The reference period for flora 1975 and for fauna 1994.

Tree species endangered: *Malus sylvestris, Pyrus pyraster,* and *Mespilus germanica.*

Lichens: only *Corticolons*.

The number of species corresponds with the species encountered in a natural state and does not include those in aa and botanical gardens.

This table also exists for Wallonia and Brussels regions of Belgium as supportive information in the reply to the enquiry which is available at the secretariat.

Problematic introduced species:

- *Prunus serotina*: preventing the other tree species from regenerating;
- *Rhododendron ponticum*: preventing the other tree species from regenerating;
- *Amelanchier lamarkii*: preventing the other tree species from regenerating;
- *Eutamias sibiricus*: is a threat for the population of small songbirds;
- *Psittacula krameri*: is out-competing indigenous species which have the same nesting places.

69

Enquiry Table 12: 1) The data are available for the Walloon region which has 80 per cent of the forest. 2) Local provenance specially used are Beech, Wild cherry, Norway spruce and Red oak.

Bosnia and Herzegovina

53, 54

Enquiry Table 2: The data for "Forest undisturbed by man", "Semi-natural forest" and "Plantations" are secretariat estimates based on the assessment of the situation in neighbouring countries.

Bulgaria

56-64

Enquiry Table 10: The figures for all species in "Trees" include other vascular plants. All figures relate to species living in natural conditions.

Canada

53, 54

Enquiry Table 2:

Source: Canada's Forest Inventory.

"Forest undisturbed by man": Non-accessed timber productive forest + reserved accessed timber productive forest + 18.8 per cent of nonreserved accessed timber productive forest to account for policy constraints on harvest (except Nova Scotia).

"Semi-natural forest": This value is not available from CanFI. The reported value was computed (Forest—Forest undisturbed by man = Semi-natural forest).

"Plantations": There is no basis for estimating this value.

"Other wooded land undisturbed by man": Forest land + timber unproductive land (CanFI land classes 2 and 3).

"Semi-natural other wooded land": There is no basis for estimating this value.

55

Enquiry Table 8: Canad's Green Plan, adopted by the federal government in 1990, set the target for protected space as 12 per cent of Canada's total territory. The National Forest Strategy stated in 1992 that "all members of the forest community will work towards completing, by the year 2000, a network of protected areas representative of Canada's forests, to provide ecological benchmarks, protect areas of unique biological value and ensure wilderness experience."

The estimates reported under items 8.2 and 8.5 of *Enquiry Table 8* were calculated by proportionate attribution of "strictly protected forest land" as derived from the Canada Conservation Areas Database and the National Atlas AVHRR database, Canada, Vegetation Cover. The estimate includes IUCN category III, which is a very small area in Canada.

The estimates reported in items 8.3 and 8.6 were calculated by proportionate attribution of "other protected forest land" (IUCN categories IV, V, and VI) from the same sources.

Harvesting is restricted on IUCN category IV, V and VI lands in Canada. In 1995, about 7.6 per cent of Canada's forest land was protected by legislation, in addition to the forests protected by provincial policies and operating guidelines.

Please see below for trend information:

	Area (1000 ha)	
	1975	***1985***
Forest	244571	224571
– In IUCN categories I and II	8373	9420
– In IUCN categories III and IV	6562	8102
Other wooded land	173013	17303
– In IUNC categories I and II	3939	4345
– In IUCN categories III and IV	3344	5623

56-64

Enquiry Table 10: The information source for total species is Mosquin, T.R., Whiting, P.G., and McAllister, D.E., 1995, Canada's biodiversity, Canadian Museum of Nature, Ottawa, Ontario. Information on species at risk is from the Committee on the Status of Endangered Wildlife in Canada, 1997, Canadian species at risk, Canadian Wildlife Service, Ottawa, Ontario.

There is no means to separate forest-occurring and non-forest species in Canada. A more detailed definition of "forest occurring species" than is currently provided by TBFRA-2000 will be needed to decide, for example, which fish could be included in this category. There is also no authoritative list of endemic species in Canada. A preliminary list of endangered species that are forest-occurring is available, as reflected in the numbers provided in this *Enquiry Table 10* "Forest-occurring species at risk or endangered".

The most problematic introduced species in Canadian forests are insects pests and disease-causing fungi. There exists supportive information on the following topics (in tabular form) in the reply to the enquiry which is available at the secretariat:

Information on "Problematic introduced species of insects and fungi" which lists some that are presently causing economic losses of timber species. Invasive introduced plants are shown.

Information on "Problematic introduced plant species". Invasive introduced plants tend to have a more limited occurrence in Canadian forests, and mostly threaten the conservation of native vegetation.

Problematic introduced species: The most problematic introduced species in Canadian forests are insects pests and disease-causing fungi. There exists supportive information on the following topics (in tabular form) in the reply to the enquiry:

"Problematic introduced species of insects and fungi" which lists some that are presently causing economic losses of timber species. Invasive introduced plants are shown.

"Problematic introduced plant species": Invasive introduced plants tend to have a more limited occurrence in Canadian forests, and mostly threaten the conservation of native vegetation.

65-68

Enquiry Table 11: "Natural regeneration enhanced by planting": Much of the planting and seeding activity in Canada results in "natural regeneration enhanced by planting," but our data do not allow us to distinguish between "Natural regeneration enhanced by planting" of forest and "Planting or seeding" of forest . There exists in the reply to the enquiry in detailed form the supportive information from one province for which data are available, where "Full" planting can be equated to "Planting or seeding" and "Fill" planting can be equated to "Natural regeneration enhanced by planting." This supportive information is available at the secretariat.

"Coppice sprouting": Natural regeneration by coppice sprouting of poplar species is very common in mixedwood boreal forests, but our data do not allow us to quantify the area that could be categorized as "Coppice sprouting" rather than "Natural regeneration" or "Natural regeneration enhanced by planting."

The introduced species listed in *Enquiry Table 12* "Species diversity and origin of planting material used in the forest" are more generally used for afforestation of marginal farm land or other special purposes than for regeneration of forest land that has been recently harvested or subject to natural disturbances.

There exists supportive information on "description of the source of the data presented in this table" in the reply to the enquiry which is available at the secretariat.

69

Enquiry Table 12: The totals in *Enquiry Table 12* "Provenance" do not equal totals in *Enquiry Table 11* "Regeneration and extension of forest" which presents data on all tree planting, whereas *Enquiry Table 11* reports only on planting of harvested areas.

An impression could be gained from *Enquiry Table 12* that thousands of hectares are planted with a single species, resulting in extensive monoculture plantations. In fact, species are matched to the site and may be planted together on the same site where appropriate. An example (British Columbia) of the extent of mixed species is presented in the table (this supportive information exists in tabular form in the reply to the enquiry which is available at the secretariat).

Croatia

53, 54

Enquiry Table 2: There exists supportive information on "trends over the period 1947-1997 in the area of forest and other wooded land in the IUCN protection categories" (in tabular form) in the reply to the enquiry which is available at the secretariat.

Data on forest cover share within protected area are not available.

Data adjustment: Croatian protection categories are re-grouped according to the UN-ECE/FAO definitions.

56-64

Enquiry Table 10: "Trees": Trees (coniferous and broadleaved species) and other vascular plants - data on shares of trees or other vascular plants are not available.

"Birds": Includes breeding too.

"Other vertebrates": Estimations.

Cyprus

56-64

Enquiry Table 10: Other vertebrates: Information is given for amphibians, reptiles, snakes and fresh water fish, only.

Czech Republic

56-64

Enquiry Table 10: New ranks are shown here. Data are based on the national Red List [vol. 1,2 & 3 (in manuscript)], 1997.

Endemic species: "Trees": *Sorbus bohemica, Sorbus eximia, Sorbus sudetica*. "Other vascular plants (flowers)": *Campanula bohemica, Campanula gelida, Cerastium alsinifolium, Hieracium corconticum, Epipacticum albensis, Galium sudeticum, Pedicularis sutetica, Poa riphaea*.

Butterflies = *Lepidoptera* (Butterflies and Moths) / Butterflies only.

"Tree" species include those in special collections (arboreta and parks).

65-68

Enquiry Table 11: Introduced species [mainly *Picea pungens*] were planted in the pollution damaged areas mostly before 1990.

69

Enquiry Table 12: Main groups of tree species are recorded only. Recording system before 1989 is not compatible. *Picea pungens* [and a variety of introduced species in small areas] has been planted before 1990.

Denmark

53, 54

Enquiry Table 2: "Forest undisturbed by man": very few forests of this kind remain. The total area of 200 ha is an estimate of the areas of very few forests such as Draved Forest in South Jutland, Suserup Forest in West Zealand, Varsøe at East Jutland and a few more. The forests are protected intensively by a declaration in accordance with the nature protection act.

"Semi-natural forest": the estimate is made by The National Forest and Landscape Institute in connection with the Dobris-assessment (1995). The semi-natural forests (approximately 35,000 ha-200 ha (forest undisturbed by man)) must not have been subject to regeneration by artificial sowing or planting.

"Plantations": equivalent to the rest of the forest area. It can be mentioned that approximately 86,000 ha of this area consists of elderly stands of native tree-species of natural or foreign provenance in which no bond-structure can be seen and in which natural regeneration can be and in many cases will be undertaken.

"Other wooded land undisturbed by man" and "Semi-natural other wooded land": (please again note the remark on the check-calculation !): No statistic exists on this item – anyhow undisturbed and semi-natural other wooded land may exclusively be found in the part "shrubs along slopes etc. (see comments under E*nquiry Table 1*, shrubs, etc.: 20,000 ha) and is here estimated to be half undisturbed, half semi-natural.

Trends and driving forces in the structural trends and the underlying circumstances:

The background is that Denmark about the year 1800 was more or less deforested. Almost the whole present forest area is therefore first, second or in some cases third generation after afforestation of non- wooded land. Anyhow natural conditions in

natural tree-species (and some introduced tree-species) sets in after a few decades and these forests are regarded in the mind of most of the population as 'natural'.

Since the beginning of the last century afforestation has more or less continuously been carried out by the state or by private owners or companies subsidized by the state.

In 1989 a Parliament decision stated as a part of the Danish follow-up of the European Community common agriculture policy that the Danish forest area should be doubled within a "tree-generation" (80-100 years), that this afforestation should be undertaken by the state and private land-owners half and half, and that the afforestation should consist of equal parts of conifers and broadleaved. The latter conditions have later been altered. As a consequence state and private-subsidised schemes have been settled.

The result of these schemes up to now can be seen from *Enquiry Table 11* "Regeneration and extension of forest". The afforestation rate is considered likely to increase.

Besides the public and the public-funded private subsidized afforestation, non-public-funded private afforestation takes place. The amount of this can only be estimated very roughly but is included in the figures in *Enquiry Table 11*.

This private afforestation has besides other means been encouraged by various different alterations to the legislation on agriculture, cadastral conditions and tax-systems.

Part of this afforestation consists of unsuccessful plantings of Christmas-trees growing up.

In the 1980s another trend appeared: As a consequence of the Rio–, Helsinki- and other international agreements and national policies much more emphasis is being put on various kinds of natural forest types, natural (tree-) species, natural regeneration-systems, etc.

Regarding *Enquiry Table 2* this trend will have the consequence in few decades that the amount of forests or other wooded land undisturbed by man or semi-natural forests will increase (in 1996 the following areas have been laid out as strict nature reserves:

Private forests: 46 reserves, 1147 ha.

Public owned forests: 246 reserves, 3937 ha

Total: 292 reserves, 5086 ha.

The number of reserves and the total area of these strict-nature-reserves will increase.

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Enquiry Table 8: IUCN categories III to VI: Secretariat estimates based on comments received from the National Correspondent.

Note: The official IUCN categories for protection status have not been used in this table for Denmark.

The reason is that protection categories like "strict nature reserve","'wilderness area", "national park", "national monument" etc. are not used in Denmark.

In the scheme showed above the following description is used:

Protection category	*Area of forest, ha*	*Similar IUCN-categories*
Strict nature protection areas	5,086	I
Bird-protection areas	1,000	IV
EU-Habitat-areas	24,000	IV
Protected by nature protection law	70,000	V
Designated for forestry by forest law	330,500	VI
Not protected	19,891	other
Total	**445,391**	

This is a rough estimate. An area which would be present in a higher category will not also be present in a lower category. In this connection it is assumed that all bird-protection-areas and EU-protection-areas also are protected by the nature-protection-law, and that all areas protected by the nature protection-law also are protected by designation to forestry according to the forest law.

The data provided in January, 1998 by WCMC (World Conservation Monitoring Center, UK) through the FAO/ECE-secretariat will give the following figures:

Forests in IUCN-categories I and II:20 ha

Forests in IUCN-categories III to VI:16,000 ha

This description is not considered to be valid concerning the protection status of Danish forests. For instance the forest law settles tight obligations for the forest owners to manage the forest closely to sustainability which must be considered as a very high degree of protection.

56-64

Enquiry Table 10: Main source: "Rødliste '90. Særligt beskyttelseskrævende planter og dyr i Danmark" Miljøministeriet, Skov- og naturstyrelsen, 1991.

Source concerning especially other vascular plants: verbal communication, Peter Vind, Danish Agency for Environmental Research.

Data for Butterflies represent the number of insects and not butterflies.

There exists supportive information on “Endangered species in Denmark” in tabular form in the reply to the enquiry which is available at the secretariat.

Problematic introduced species: Endagered forest tree-species: Ulmus laevis (skærm-elm, naturalised), Ulmus carpinifolia (småbladet elm), Tilia platyphyllos (storbladet lind), Taxus baccata (taks), Sorbus terminalis (tarmvrid-røn), Sorbus hybrida (finsk røn), Salix myrcinifolia (sort pil).

65-68

Enquiry Table 11: No statistics exist on these matters for Denmark.

All the figures are estimates brought into a proper correlation with the rest of the tables. No special assumptions which have not been mentioned in the other tables have been made here.

69

Enquiry Table 12: In Denmark it is only allowed either to use material to forestry produced on the ownership—and in this situation the provenance is called and known as local—or to use material from forest-nurseries—and in this situation the provenance should be known. Provenance in the nurseries is controlled by the Plant-directorate, Ministry for Food, Agriculture and Fisheries.

Some material may not be of known provenance, but that is considered as very rare. Seed– or plant-material from existing stands in Denmark is considered as local provenance either if the stand is of local or non-local provenance.

The area-figures mentioned are based on: Danmarks Statistik og Skov– og Naturstyrelsen: Skove og Plantager 1990, age classes 0 - 10 years. The State Forests Plant Breeding Station, which is a quite large part of the producers of plant material for forestry and other wooded areas, has the opinion that the use of plant material has been rather stable since and therefore it is the assumption that the re- and afforestation picture not have changed since.

In total an annual average of 513 ha has been planted with known local provenance and 5872 ha with known non-local provenance.

Estonia

53, 54

Enquiry Table 2: The forest area increased from 929,000 ha in 1940 to 2,016,000 ha in 1996 as a result of afforestation and natural colonization on non-forest land.

The area of forest undisturbed by man includes some old forest inside wetland areas and reserves. The area of plantations includes areas of afforestation and reforestation by planting or seedling.

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Enquiry Table 8: Due to changes in legislation the number and area of protection areas will increase during the next few years.

56-64

Enquiry Table 10: The group Butterflies includes *Lepidoptera* only. *Microlepidoptera* (about 1000 species) are not included.

65-68

Enquiry Table 11: The area regenerated with introduced tree species is only some hectares per year.

Finland

53, 54

Enquiry Table 2: Re-coding of the Finnish forest definition to the TBFRA-2000 definition was carried out by using measured basal areas for the plot stands and partly by interpretation of aerial photographs. Forests with mean age of growing stock higher than 160 years in Southern Finland and higher than 200 years in Northern Finland and with no signs of human activities (cuttings, drainage etc) during the past 30 years were regarded as undisturbed forests.

56-64

Enquiry Table 10: Number of species includes only native, indigenous species and established neophytes, definitely domesticated species. Ferns is taken to mean all *Pteridophyta*, including clubmosses (*Lycopsida*) and horsetails (*Equisetum*).

The numbers for ferns sensu stricto would be: 42 (total), 13 (endangered), 23 (forest occurring), and 2 (endangered forest occurring). For butterflies, we have reported all *Lepidoptera* species including moths.

For mosses, lichens, and butterflies we can not estimate the forest occurring (dependent) species.

65-68

Enquiry Table 11: The data for “Natural conversion of other wooded land to forest” include afforestation due to drainage of peatlands.

The data for “Natural colonization of non-forest land to forest” and “Natural conversion of other wooded land to forest” are not for the same 10-year period as other information.

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Enquiry Table 12: In recent years, planting of *Pinus contorta* has drastically decreased. Thus, the given period does not describe the current situation.

France

53, 54

Enquiry Table 2: "Forest undisturbed by man": Source: "Les indicateurs de gestion durable des forêts françaises", 1995, Ministry of Agriculture and Fisheries, Countryside and Forests Directorate.

"Plantations": Source: National forest inventory, data available as on 31 December 1997. The criteria selected for plantations are as follows:

* Afforestation and reforestation with introduced species (see *Enquiry Table 9*), less than 30 years old, in regular stands, stocked with not more than two strains, one of them covering more than 75 per cent.

* Private afforestation and reforestation of Maritime pine in the Landes de Gascogne, less than 30 years old, in regular stands, stocked with not more than two species, one of them being Maritime pine and covering more than 75 per cent.

* Poplar stands cultivated for their wood output.

Afforestation and reforestation as above but over 30 years old are not categorized as "plantations" because they are not normally intensively exploited. Moreover, an understorey tends to develop, and then they consist of more than two species.

"Semi-natural other wooded land": Apart from a narrow weather-beaten coastal strip, other wooded land undisturbed by man in France invariably tends to evolve into forest. As a result, the area of other undisturbed land in France is very small.

From a minimum area reached at the beginning of the 19th century, the area of forested land in France appears to have virtually doubled in two centuries. Semi-natural forest has long accounted for the bulk of wooded land. Since the Second World War, the area planted to trees has increased thanks to an active afforestation and reforestation policy.

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Enquiry Table 8: There are some 30 different kinds of protected status in France, but it has only been possible to use maps displaying seven of those statuses here.

Among the statuses for which no maps yet exist, mention should be made of 700 hectares of strictly protected biological reserves grouped under IUCN category I (source: National Forests Office) and 16,250 hectares of managed biological resources grouped under IUCN category IV (source: National Forests Office). These two figures have not been incorporated into *Enquiry Table 8* to avoid double counting.

Areas protected under international conventions have not been taken into account in *Enquiry Table 8*.

A comparison of *Enquiry Tables 1* "Total area by main classes" and 8 "Protection status" shows that there are 12,440,000 hectares of forests and 1,203,000 hectares of other wooded land that enjoy no protection within the meaning of IUCN.

For the past ten years or so, IUCN categories IV and V protected land has been increasing with the issuance of new orders protecting biotopes, nature reserves and regional nature parks.

There exists supportive information on "Protection" in tabular form in the reply to the enquiry which is available at the secretariat.

56-64

Enquiry Table 10: Source: National Museum of Natural History (SPN/IEGB/MNHN). For endangered species of vascular plants and ferns: Red List of endangered flora in France, vol. 1, 1995. For endangered species of mammals, birds, reptiles and anurans: Red List of endangered fauna in France, 1994.

Data for "Trees": The total number of tree species is the same as the total number of varieties shown *in Enquiry Table 9*.

Data for "Other vascular plants", "Ferns", "Mosses", "Lichens": These are "wild" species of French flora, i.e. indigenous species that have not been introduced deliberately or inadvertently by man.

Data for "Birds": Only nesting birds have been included; migratory and hibernating birds have been omitted.

Data for "Other vertebrates": Information relates to reptiles and amphibians only.

65-68

Enquiry Table 11: Source: Rows "natural regeneration" and "planting or seeding" of regeneration for forest, total: Assessment of stand growth from the national forest inventory, with figures broken down in accordance with National Forests Office data for public forests, and the document "Sustainable management indicators for French forests" [in French]...for private forests.

Row "coppice sprouting": area of coppices under 10 years old, according to the national forest inventory.

Rows "natural colonization of non-forest land to forest", "natural conversion of other wooded land to forest", "planting or seeding of non-forest land", and "planting or seeding of other wooded land": Assessment of stand growth from the national forest inventory, with figures broken down in accordance with land use survey (TERUTI) data for the period 1993-1997.

Row "natural colonization of non-forest land to other wooded land": land use survey (TERUTI) data for the period 1993-1997.

Areas of "natural regeneration enhanced by planting" are included under "natural regeneration".

Introduced species have been identified by reference to *Enquiry Table 9* "Tree species occurring on forest and other wooded land".

Given the difficulty of estimating how long natural regeneration takes, the likely ranges of error for the areas shown in *Enquiry Table 11* "Regeneration and extension of forest" are probably very broad.

Georgia

53, 54

Enquiry Table 2: Secretariat estimates.

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Enquiry Table 8: The information is from the WCMC database on protected areas.

There are 20 natural reserves in Georgia (administratively united with 14 State reserves, with a total area of 168,000 ha, or about 24 per cent of the total territory of the country. Reserves are formed on the basis of the state forest fund, and as a result they are mainly represented by forest vegetation formations (source: http://www.grida.no/prog/cee/enrin/htm...georgia/....biodiv/...htm).

56-64

Enquiry Table 10: "Trees", "Other vascular plants" and "Other vertebrates": Georgia is rich in biological diversity due to its highly varied climatic, geological, topographical and hydrological conditions. These conditions allow Gergia to support up to 4,500 species of vascular plants. Endemic plant species constitute about 9 per cent of the total flora.

Georgia has a number of unique and representative communities and ecosystems, including subalpine coniferous forests, meadows, wetlands, peat bogs and lakes; coniferous and beech forests; oak woodlands; etc. Amphibian research has been carefully updated: 4 species of Caudata and 9 species of Anura inhabit the territory of Georgia.

(Source: http://www.grida.no/prog/cee/enrin/htm...georgia/....biodiv/...htm)

"Mammals": Research on mammals has been increased during the last years. In 1982 there were 62 species listed in the Georgian Red Data Book, while in a new edition 152 species will be represented. Plans are under way for a re-introduction programme for threatened and extinct species of native mammals (source: http://www.grida.no/prog/cee/enrin/htm...georgia/ ....biodiv/...htm).

65-68

Enquiry Table 11: The information as received by the secretariat from the Ministry of Environment of Georgia, Department of Biodiversity Protection, in 1996.

Germany

53, 54

Enquiry Table 2: "Forest undisturbed by man": Forests undisturbed by man cover 83,000 ha, but on a great part human intervention is not "long enough ago" according to the definition.

"Plantations": In principle, German forests are managed in a site adapted and ecologically compatible way with long rotation periods. Planted stands, too, also become close to nature in the course of their life-cycle. Furthermore, the data situation does not allow a separate designation of plantations.

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Enquiry Table 8: "In IUCN categories I and II" of Forest: Includes total forest area in National Parks plus strictly protected forest areas under various other German protection categories.

Protected area categories corresponding with IUCN categories III-VI. From the 7,600,000 ha of forests in protected area corresponding with categories III-VI, the landscape conservation areas hold the greatest share with 3,590,730 ha covered by forests followed by nature parks with 2,695,480 ha covered by forests, both together 6,286,210 ha or 83 per cent.

All other German protection areas under forest law, hunting law or nature conservation law (with the remaining 17 per cent of protected forest area) outside the criteria for I and II correspond more or less either with IUCN categories III or IV; category VI does not exist in Germany.

Likely range: In the case of the above mentioned protection area categories, a likely range below the given figure was used only due to the fact that there is overlap between categories (different from the areas under I and II) ensuring that no figure greater than the given one was realistic.

Note: The IUCN categories I to VI cover only forest areas with a special protection status. Therefore, the sum of Forest, in IUCN categories I and II + in IUCN categories III to VI will not equal to Forest, total.

56-64

Enquiry Table 10: Number not determined: Mammals—Forest occurring species, total species, and of which: endangered.

65-68

Enquiry Table 11: The data are estimates except for "Planting or seeding of non-forest land" which are based on assessment.

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Enquiry Table 12: Total: Vague estimation calculated from Federal Forest Assessment (1987/93) and Nursery Statistik (1992-96). Local provenance is in this case provenance from the same Region of Provenance.

Known local provenance: Very rough estimation. It is not possible to split up the difference between "Total" and "Known local provenance" to "Known not-local" and "unknown".

Acer, Fraxinus, Tilia, etc.: Mostly noble hardwoods.

Alnus, Betula, Sorbus, etc.: Other broadleaved.

Greece

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Enquiry Table 8: The data for IUCN categories I and II relate to virgin forests and National Parks. Those for categories III to VI include aesthetic forests and other specially protected areas. However, because of the special conditions in Greece, the whole of the area of forest and other wooded land is protected under 2 Articles of the Constitution and special laws. Some closely protected areas, such as mountain watersheds are not included in the data in *Enquiry Table 8.*

Hungary

53, 54

Enquiry Table 2: "Forest undisturbed by man" includes areas without known human intervention for at least one rotation period.

"Plantations" includes the total area of genetically improved poplar stands, plus area of stands where regular spacing was applied to enhance wood production.

Please refer to comments in *Enquiry Table 1* "Total area by main classes" for the definition of "Forest" and "Other wooded land".

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Enquiry Table 8: The area in IUCN category I is expected to increase by about 4000 ha after the official designation of the forest reserves network. The areas of two newly established national parks are listed in category V, but expected to become partly category II.

Please refer to comments in *Enquiry Table 1* "Total area by main classes" for the definition of "Forest" and "Other wooded land" and *Enquiry Table 3* "Forest and OWL according to availability of wood supply" for the definition of "Forest not available for wood supply".

56-64

Enquiry Table 10: Birds are never exclusively occurring in forests.

Lichen species living on wood, bark etc. Species living on rocks etc. in forest are not included.

65-68

Enquiry Table 11: Natural regeneration and natural regeneration enhanced by planting can not be separated, therefore both are classified as natural regeneration. Tree-species distribution of the regeneration methods could be computed from the raw data only, but not within the time frame of TBFRA 2000, due to the amount of work involved. Adjustment was not needed due to matching definitions with the exception of area limit.

Please refer to comments in *Enquiry Table 1* "Total area by main classes" for the definition of "Forest" and "Other wooded land" and *Enquiry Table 3* "Forest and OWL according to availability of wood supply" for the definition of "Forest not available for wood supply".

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Enquiry Table 12: * includes native and indigenous species as well.

Iceland

53, 54

Enquiry Table 2:

1. Trends: Forests undisturbed by man have probably not existed in Iceland since shortly after human settlement in the 9th century AD and definitely not since the 12th-13th century, when sheep farming became the major form of production. By 1900 the total area of forest and other wooded land had been reduced from an estimated 25-30 per cent of the land area at the time of settlement to about 1 per cent. The total area of semi-natural forest and other wooded land has apparently not changed much during the 20th century.

With the exception of a few very small plantings, plantation forestry did not commence in Iceland until around 1950. The level of planting was 200-500 ha per year from 1950 to 1989, increasing to 1000-1400 ha per year since 1990.

2. Driving forces: Forests were cut for fuel, charcoal and fodder, while sheep grazing prevented regeneration. Forests were already rare by the 13th century and finally exterminated as an important resource by the end of the 18th century.

The remnant birch woodlands in 1900 had somehow managed to regenerate from repeated cutting, despite sheep grazing. The semi-natural woodlands probably continued to decline slightly during the early decades of the 20th century but changes in

agriculture during the 1940s and 1950s led to a reduction and finally virtual elimination of winter grazing. However, a sharp increase in sheep numbers followed, leading to very heavy summer grazing well into the 1980s. The number of sheep in Iceland has been halved during the last 20 years and the positive effects of this on birch regeneration are becoming more obvious all the time. However, 2 surveys of all birch woodlands in Iceland, one during the early 1990s, failed to show any increase in the total area of semi-natural woodlands in Iceland despite decreased grazing pressure and no wood harvesting. It will take a longer time for the birch woodlands to reclaim a large enough area to be measurable, but if sheep numbers remain low a gradual increase in forest and other wooded land (mostly OWL) should occur.

Between 1950 and 1990, afforestation by planting was mostly carried out by volunteers in forestry societies and the Iceland Forest Service. This "experimental period" proved that trees would indeed grow in Iceland. The increase in planting since 1990 consists of 1) increased planting for land reclamation and erosion control and 2) grants for commercial afforestation on farms, both supported by the state, and 3) increased amenity planting around urban areas, mostly supported by the communities themselves and forestry societies. Increased funding by the state beginning in 1997 will bring total planting up to 2000 ha/year by the year 2000, with the greatest increase in farm afforestation (with fewer sheep, farmers now perceive that they have land that can be afforested). This increase in support is due to the national strategy of using CO_2 sequestration in new forests as part of the effort to reduce net emissions, that has recently been accepted in the Kyoto Protocol.

56-64

Enquiry Table 10: Reference: Iceland Institute of Natural History, Iceland Forest Service. Mammals--Total species (10.6): land mammals; Other vertebrates--Total species (10.8): fresh water fish. The number of species include only native species and introduced species that have become established as self-sustaining populations, not species found only in collections or only where cultivated. In addition to the 27 tree species listed in *Enquiry Table 9*, there are about a further 50 found only in gardens and arboreta.

65-68

Enquiry Table 11: The extent of natural colonization is not well known.

69

Enquiry Table 12: Fifteen other species are planted on less than 10 ha/year each.

Ireland

56-64

Enquiry Table 10: The number of tree species is estimated and excludes those in special collections; the same is true for those of other species shown in the table. The total number of tree species including those in special collections is estimated to be around 1,000.

69

Enquiry Table 12: Scots pine, Oak, Ash and Beech come under the category of "known local provenance" as well as "Known non-local provenance. The rest of the species are only "known non-local provenance".

Israel

53, 54

Enquiry Table 2: The main trend in natural forests in Israel:

1) Overgrazing and over-harvesting in natural forests areas over the decades until the end of World War I.

2) Since the 1920s and especially after the declaration of the state of Israel, there came limitations on grazing and harvesting by rules and regulations, and enforcement of these has allowed a recovery of natural forests.

56-64

Enquiry Table 10: The numbers of "forest-occurring species" were estimated as the numbers of species occurring in the Mediterranean area of the country, because of difficulty in strict differentiation between forests and non forests in this area, and the dynamic relation between them.

The number of freshwater fish (48) was included in both columns: "All species in country" and "Forest-occurring species".

This was according to the rule mentioned above - to include species occurring in the Mediterranean part of the country.

65-68

Enquiry Table 11:

1) Regeneration: Mixed local with introduced species and plantation .

2) There are no data for natural regeneration

3) Data for "Natural colonization of non-forest land to other wooded land": Estimation by the national correspondent.

Japan

53, 54

Enquiry Table 2: Natural forest of more than 100 years old is classified under forest undisturbed by man. Plantation includes bamboo forests.

55

Enquiry Table 8: It is not possible to separate protected area into forest and other wood land.

Kazakhstan

56-64

Enquiry Table 10: Endangered species status categories:

Fish: EN - 7; CR - 7; VU - 1; NE - 1: total 9 species

Amphibians: CR - 1; VU - 1; NE - 1: total 3 species

Reptiles: VU - 6; NE - 4: total 4 species

Birds: EN - 15; CR- 15; VU - 18; LR - 4; NE - 4: total 56 species

Mammals: EN - 9; CR - 5; VU - 23; NE - 3: total 40 species (Source: Kazakhstan Red List, 1997)

Vascular plants, ferns, mosses, lichens: CR - 20; VU - 238; LR - 48: total 306 species (Source: Kazakhstan Red List, 1981)

Source for total number of species: "Kazakhstan" encyclopaedia, "Plants" section (Moscow, 1969). Forest-occurring species arrived at by adjustment (70-75 per cent of the total).

Kyrgyzstan

53, 54

Enquiry Table 2: Information on Forest and other wooded land undisturbed by man, Semi-natural forest and other wooded land, and Plantations: Information is the secretariat estimates based on literature sources and analysis of the situation in neighbouring countries.

55

Enquiry Table 8: Source: Secretariat estimate based on literature sources of the information; All the forests and other wooded land of the country belong to the first group, i.e. all the forests and other wooded land implement the protection functions.

56-64

Enquiry Table 10: The data for "Other vascular plants" includes trees, the break down is as follows: "Trees": 130, "Other vascular plants": 4500. The information is based on literature sources, including the article "Forest biodiversity and forest genetic resources in the Kyrgyz Republic", T. S. Mussuraliev, FAO, 1997.

Latvia

53, 54

Enquiry Table 2: The forest area in 1925 was 1,845,000 ha, in 1961 was 2,063,000 ha and in 1997- 2,884,000 ha. The increasing forest area is a result of afforestation and natural conversion of other land to forest covered land. The area undisturbed by man has increased since the 1950s. It includes old forests in strict nature reserves and national parks. There are no forests specially grown as plantations in Latvia. This category has been adjusted to show artifically regenerated forest stands, where forest management is so intensive that only one tree species with regular spacing is present.

56-64

Enquiry Table 10: The data for Total number of "Forest occurring species" for butterflies are 1000-1500.

Problematic introduced species: *Impatiens glandulifera, Impatiens parviflora, Amelanchier spicata, Mustela vison.*

65-68

Enquiry Table 11: Data before the year 1991 represent only state forests (about 2/3 of all forests), but since 1991—represent all forests. The extent of natural regeneration in recent years has significantly increased due to changes in management methods. A more important role is assigned to deciduous species.

69

Enquiry Table 12: Data before the year 1991, represent only state forests (about 2/3 of all forests), but since 1991 represent all forests.

Liechtenstein

56-64

Enquiry Table 10: The whole forest area enjoys the strictest protection and conservation status; accordingly forest-living species are considered to be the least endangered ones.

69

Enquiry Table 12: The area planted with introduced species is insignificant, all planted species of known local provenance total to 0.007 ha/year.

Lithuania

53, 54

Enquiry Table 2: The forest area increased from 1,450,000 ha in 1956 to 1,978,000 ha in 1996 as the result of afforestation and regeneration of forest land and natural colonization of non-forest land. The area of plantations in this period increased from 30,000 ha to 284,000 ha. There are no forests specially grown as plantations in Lithuania. This category has been adjusted to include planted forest stands, where forest management is so intensive that only one tree species is left with regular spacing. The area of forest undisturbed by man is stable and contains old and poor pine stands on wet soils swamps as well as in strict nature reserves.

56-64

Enquiry Table 10: Source for endangered species: "Red Data Book of Lithuania, 1992, Vilnius" (Included species IUCN ranks Ex/E, E, V and R). Endangered tree species in Lithuania—*Taxus baccata* (Ex/E), *Betula nana* (E), *Myrica gale* (E), *Salix lapponum* (V), *Salix myrtilloides* (R), *Quercus petrea* (R), *Prunus spinosa* (R).

Data on "Butterflies" include only daily moth *Lepidoptera.* Besides, there are 1017 *Microlepidoptera.*

Problematic introduced species: Introduced species have not created any problems for forest ecosystems.

Malta

53, 54

Enquiry Table 2: Not applicable as woodlands are in the main for amenity purposes and watershed management.

56-64

Enquiry Table 10: Data source: Based on Red Data Book for the Maltese Islands - 1989. Environment Division, Ministry of Education.

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Enquiry Table 12: All woodland is on a mixed species basis. In coastal area, T*amarix* is predominant while inland *Pinus halepensis* and olives are dominant.

Local provenance used for planting.

Netherlands

53, 54

Enquiry Table 2: No specific data on the management system used are available. However data on method of forestation (planted/seeded or otherwise) are available.

Out of 308,000 ha high forest about 252,000 ha is planted with a known age-class and an originally regular spacing. Up to the age-class of 40 years the regular spacing is obvious. In total 100,000 ha is planted with an age-class of less than or equal to 40 years, which is considered as 'plantation'.

Sources:

– HOSP-database.

Lit 1: Daamen, W.P. 1996. Velling en oogst HOSP-cyclus 2: period 1992-1996. Daamen Schoonderwoerd & de Klein, Rapport 70.

Lit 2: Edelenbosch N.H.,1996. Ex-post evaluatie van bosuitbreidingsbeleid in Nederland over de periode 1990-1995. IBN-DLO rapport 230, Wageningen.

Likely range: As is explained in the chapter 'Trends', attached to *Enquiry Table 2* "Forest and other wooded land according to naturalness": a great part of the forests is planted with a regular spacing and one or two species in even-aged stands with wood-production as the only purpose. A rapid change towards forests for "multiple purposes" (e.g. nature, recreation) has an impact even on these pure stands: many of them are now changed into more age-classes, more species and so on even though the original purpose of wood-production remains. The given figures for 'plantations' are maximum estimates: many of the originally planted forests have changed in the last decade. There is no possibility to estimate a sampling error.

Appendix to *Enquiry Table 2*: TRENDS

The following table gives an overview of the change in forest area and other wooded land:

	Year			
	About 1800	*About 1900*	*About 1960*	*About 1996*
Population	2,080,000	5,180,000	11,600,000	15,600,000
Forested area (ha)	100,000	250,000	260,000	339,000

Sources: Buis, J. 1985. Historia Forestis. Wageningen; CBS, 1966. De Nederlandse bosstatistiek, deel 9 Nederland, 1952-1963

In the beginning of the 19th century, most of the forest land was managed as coppice or coppice with standards. Only a few relicts of undisturbed forest remained in the Netherlands. Tree species used were mostly indigenous species.

Exotic species were mostly used as curiosities in forest parks. The forest area was part of the common marches as was also waste land. There was little or no interest in long term investments for production of merchantable timber. Short term use of the forest took place: the forest area was devastated by intensive use of the forest .

Regulations on the common marches were ended in the period 1800-1810. In the period 1810-1850 former common marches were divided and sold to institutions and/or private individuals. Large scale plantations started in the period 1850-1900 by forestation of waste land (protection forest against sand drifts, introduction of artificial fertilizers) and establishment of high forest as long term investment. Mostly *Pinus sylvestris* is used and also a substantial area is afforested with introduced exotic species as *Pseudotsuga menziesii*, *Larix* species, *Pinus nigra*-species.

In the period 1900-1950 afforestation of waste land continued. During World Wars I and II the forested area diminished. The main part of the forest is in this period was managed as high forest. An important product is logs for the mining industry. Nearly all coniferous forests are managed as plantations.

After 1950 the mining industry lost its important role: the last mine was closed around 1968 and so the market for logs was lost. Economically important is roundwood production for paper, fibreboard and sawlogs. The forest area with exotic species has remained fairly constant in the last 40 years. As a result of greater emphasize on recreational, landscape and nature aspects of the forest area the deciduous forest area has rapidly increased in the last 40 years while the coniferous 'production' forest area has remained fairly constant.

Species in high forest (coverage >60 per cent)	***2nd Nat.Survey around 1960***	***4th Nat.Survey around 1980***	***HOSP 1992-1996 around 1996***
Pinus sylvestris	101278	98213	92057
Exotic coniferous species	53066	69132	67296
Deciduous species	28983	67279	85650
Total: high forest	183327	234624	245003

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Enquiry Table 8: In the last decade strict Nature Reserves (IUCN Protection category I) has been increasing rapidly. The State Forest Service (Staatsbosbeheer) is planning about 22500 ha as nature reserve ("Bos met accent natuu") in the next decade. Also is planned several thousands of hectares forest area as nature reserve on forest land ("Bosreservaten" and "A-locaties"). No exact figures are yet available on this subject since not all areas are located and formally established. It is not known yet if management plans are already dealing with the new status of the areas.

For this table the figures known to WCMC which are provided by WWF-Netherlands and IKC-N are presented.

Sources: WCMC, WWF-Netherlands and IKC-N.

Sources: HOSP 1993-1996, Staatsbosbeheer

In the light of international developments such as the process of the Ministerial Conferences on the Protection of Forests in Europe, the Netherlands is developing operational criteria for protected forest areas. It is therefore at this time not possible to give exact numbers as to the actual area of protected forests in the Netherlands. Although all forest in the Netherlands are protected by the Forest Law, and it therefore could be argued that 100 per cent of the forests in the Netherlands are protected, this is not considered realistic by the Dutch government. The law in fact only guarantees that all forest remains forests: it is in the first place a quantitative protection. Although there is a possibility of protection of the quality of forests this is not the main purpose of the law.

An important part of forests in the Netherlands however is owned by private nature conservation organisations. These organisations are subsidized by the government and have protection as a main goal, although sometimes harvesting is practised as long as it does not obstruct the protection goal. These (about 57000 ha) forests therefore are considered as protected in the sense of the 5th category of IUCN by the Netherlands government.

Staatsbosbeheer, the State Forest Service, manages the state owned forests. Of these a certain area is protected. At this time a review is under way to establish the exact area and location of these forests. The forest area under protection by the Forest State Service of about 20000 ha must be considered an informed estimate.

56-64

Enquiry Table 10: None of the species is endemic in the Netherlands

Other vascular plants: only flowers.

Birds: only breeding birds.

Butterflies: only diurnal butterflies

Sources: Red Lists, databases on habitat of the different species of IBN-DLO, CBS

Information on this table provided by J. Thissen, IKC-N, Wageningen. The sources are the 'red lists' of the different species-groups. The main problem is to distinguish the forest-occurring species. Other sources had to be consulted in which information on the habitat was available. As can be seen: on lichens no direct source on information of the habitat is available: the table is not filled in for this species-group.

65-68

Enquiry Table 11: Very little is known for the country as a whole about these issues. The HOSP database gives some information for the forests established since 1985 on planting or regeneration and also the proportion planted or regenerated naturally. The area with "Natural generation enhanced with planting" is unknown but considered as negligible.

No information on the regeneration of coppice is available. It is assumed that in a period of 10 years all coppice is harvested once and regenerated by sprouting.

There exists supportive information on "Total area planted and natural regeneration by age-class species for 10 year period" in the reply to the enquiry which is available at the secretariat.

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Enquiry Table 12: Sources NAKB, HOSP-database.

The "Nederlandse Algemene Keuringsdienst voor Bloemisterij– en Boomkwekerijgewassen" (NAKB) does not distinguish planting material used in the forest separately. An estimate on the planted area is made on the basis of HOSP-data. The subdivision into provenance is made on the basis of data provided by the NAKB.

New Zealand

53, 54

Enquiry Table 2: The sources for the data in this table are informed estimates made by the Ministry of Forestry using historical records and other current NEFD data. The forest undisturbed by man is largely in national parks and is within the IUCN categories I and II. It is considered to closely correspond to the TBFRA-2000 definition and hence no adjustment was required. Likewise for plantations as in the New Zealand context these are always of introduced species. There are small areas planted with indigenous species but as these are not considered to meet the intensive management criteria it was considered that the semi-natural forest category more correctly described these plantings of indigenous species. The semi-natural forest parameter includes previously cut-over indigenous forest because of the strict criteria applying to forest undisturbed by man and to plantations. The error ranges are estimates of the likely ranges and are not based on statistical sample error ranges. Where the ranges are large this reflects a lack of reliable measuring in the past for the parameter. The NZLCDB work when it is completed is expected to refine these estimates considerably.

Trends in the areas in the classes are described reasonably comprehensively as qualitative information in the publications listed under General comments above. The area in plantation has been increasing as former agricultural land becomes available and a time series of this is in tables 7 and 8 of National Exotic Forest Description as at 1 April 1996, (Ministry of Forestry, 1996). For semi-natural other wooded land this area is expected to have shown an increasing trend since the structural adjustment of the New Zealand economy from the 1980's but quantitative data are not available to demonstrate this until the NZLCDB work is completed.

In terms of whether "undisturbed areas" have been altered by man in past centuries, it is really difficult to be certain. Most of the forest land that was allocated to this category is in the remote Fiordland National Park in the south-west of the South Island. Certainly European explorers such as Captain James Cook in the 1700's, sealers and whalers and some Maori would have visited the region, but there is no evidence that the forests were used for timber extraction for housing and other significant purposes. However, there are introduced mammals in the forest - does this mean then that they cannot now be regarded as "undisturbed by man" because New Zealand has so few endemic mammals (see *Enquiry Table 10*) even though the mammals were not deliberately introduced into the forest? It needs to be noted that most of this area has been in a national park for nearly all this century and that the natural forest dynamic processes are well established.

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Enquiry Table 8: The source for this table was the information supplied by the WCMC and checked to the extent possible in New Zealand. Work within the NZLCDB project will enable a more comprehensive verification of the estimates at a later date and these will subsequently be notified to the WCMC. The error ranges are estimates of the likely range and are not based on statistical sample error ranges.

Suitable forest and other land areas have been gazetted as national park lands over the last twenty years but no time series of this has been derived.

56-64

Enquiry Table 10: Sources: "The Native Trees of New Zealand", T. J. Salmon 1980 A. H. & A. W. Reed Ltd., Wellington.

"Indigenous vascular plants of New Zealand", compiled by A. P. Druce. Revised September 1993. Unpublished. "The State of New Zealand's Environment - The State of Our Biodiversity", the Ministry for the Environment 1997. NZIF 1995 Forestry Handbook. Editor - Don Hammond. The New Zealand Institute of Forestry (Inc.) 1995. "The New Zealand Biota—what do we know after 200 years?", edited by P. J. Brownsey and A. N. Baker. National Museum of New Zealand 1983. New Zealand Botanical Society: Threatened and local plant lists (1995 Revision). Cameron et al. 1995. New Zealand Botanical Society Newsletter 39: pp. 15-28 for threatened species. New Zealand Official Yearbook 1997. Statistics New Zealand 1997.

Other vascular plants: No compiled figures for other vascular plants (flowers) have been located in this format and this would require further research and contact with scientists before reliable estimates could be supplied.

Lichens: Lichens could be assumed as only endemic species.

Birds: The data for birds include both land and freshwater birds and seabirds.

Butterflies, endemic species of all species in country of butterflies/moths: 11 endemic butterflies.

The data for "mammals" include both land based and marine mammals.

"Forest occurring species"—"endemic species": The long and short-tailed bats are the only two endemic terrestrial mammals in New Zealand, both of which are endangered.

The problem with marine mammals—for example: seals, dolphins, whales - coming with the table is because the sea surrounding the country is also viewed as part of the country's ecosystem in terms of the international conventions.

The correct name should be "possum"—not "opossum". There is some confusion between writers but "opossum" should strictly be reserved for the North American animal and "possum" for the major forest pest which New Zealand has gained from Australia. Some further facts on this pest are given to show the extent of the problem: "Brushtail possums were among the earliest animals introduced into New Zealand by European settlers. They were first brought from Australia in 1837 to establish a fur industry. By 1922, 36 batches of possums had been imported, mostly from Tasmania where possums were larger and most had the black fur preferred by furriers. These possums and their descendants were liberated at more than 450 places around New Zealand by 1930. At the time, these introductions and liberations were considered entirely beneficial, but after 1900 a number of reports of possum damage to crops, orchards, and forests prompted the Government to commission investigations by two of the country's leading botanists, Professor HB Kirk and Dr L Cockayne. They both concluded that damage to New Zealand's forests was negligible. Kirk went so far as to state that "opossums (sic) may, in my opinion, with advantage be liberated in all forest districts except where the forest is fringed by orchards or has plantations of imported tree species in the neighbourhood". However, from 1921 to 1947, the Government attempted to stop any further liberation of possums, which was prohibited by the Department of Internal Affairs. Both hunting and selling skins were regulated. The regulations merely provoked a flurry of illegal liberations. During the 1940s, evidence of damage by possums to New Zealand's forests increased, and in 1947 all restrictions on possum hunting were removed and penalties for releasing them were increased. The need for action against possums on a national scale was recognised, and in 1951 a bounty of 2/6d (25c) per head was introduced for animals whose skin were not sold. During the following 11 years, more than 8 million bounties were paid, but this did little to control the increasing and expanding populations of possums. In the late 1940s the first survey of possum distribution in New Zealand showed that possums had occupied about half of New Zealand. By 1961-63 they had spread to 84 per cent of the country. Within the last five years Northland and the Coromandel Peninsula have been colonised, leaving few areas yet to be occupied. The number of possums in New Zealand has been estimated at 70 million. Because there are no predators or competitors here in New Zealand, and suitable habitats are readily available, possums occupy most habitats – all types of native and exotic forest, mountain shrublands and tussock grasslands; swamps, farmland, orchard and cropping areas; and areas in and around towns and cities. Possums tolerate habitats with a wide range of climates - from arid plans to areas with high rainfall, and from temperate coastlands to harsh alpine slopes at more than 1800m altitude in the North and South Island ranges. Today possums are considered the major animal pest in New Zealand. In farming areas, they spread bovine tuberculosis to beef and dairy cattle, and to farmed deer, damage crops and orchards, kill poplars and willows planted to control hill-country erosion and stabilise riverbanks, and eat pasture. In exotic forest plantations they kill young trees and stunt the growth of older trees by ring-barking them or breaking the uppermost branches. In conservation areas, possums cause severe damage by altering habitats important to native animals. Tree species that are palatable to both possums and native birds (e.g. rata, kamahi, and pohutukawa) become much reduced or locally extinct, and are replaced by plants that are less palatable such as tree ferns and pepperwood. As well as altering the composition of native forests and competing with native fauna, possums also prey directly on native insects and birds." Source: Landcare Research. "Tahr" are an animal introduced for hunting purposes and originally from the Himalayan region of Asia. They are similar in appearance to a cross between a long-coated goat and a deer. "Mustelid" is the generic term for stoats, ferrets and weasels and they were introduced to control yet another introduced pest, the rabbit.

Problematic introduced species: Information on the problematic introduced species and the degree of impact on the forest ecosystem:

Flora

Local name	*Scientific name*	*Degree of impact*
sycamore	*Acer pseudoplantanus*	3
monkey apple	*Acmena smithii*	2
Mexican devil	*Ageratina adenaphora*	2
mist flower	*Ageratina riparia*	3
onion weed	*Allium triquetrum*	2
elephant's ear	*Alocasia brisbanensis*	1
Madeira vine	*Anredera cordifolia*	2
moth (kapok) plant	*Araujia sericifera*	3
aristea	*Aristea ecklonii*	3
Italian lily	*Arum italicum*	1
giant reed	*Arundo donax*	2
smilax	*Asparagus asparagoides*	4
climbing asparagus	*Asparagus scandens*	4
Darwin's barberry	*Berberis darwinii*	3
barberry	*Berberis glaucocarpa*	3
buddleia	*Buddleja davidii*	4
Mysore thorn	*Caesalpinia decapetala*	1
heather	*Calluna vulgaris*	3
Australian sedge	*Carex longebrachiata*	3
climbing spindleberry	*Celastrus orbiculatus*	1

Local name	*Scientific name*	*Degree of impact*
orange cestrum	*Cestrum aurantiacum*	1
red cestrum	*Cestrum elegans*	1
bone seed	*Chrysanthemoides monilifera*	3
clematis	*Clematis flammula*	1
old man's beard	*Clematis vitalba*	4+
cathedral bells	*Cobaea scandens*	2
convolulus/ field bindweed	*Convolvulus arvensis*	2
purple pampas	*Cortaderia jubata*	3
pampas grass	*Cortaderia selloana*	4
cotoneaster	*Cotoneaster glauophyllus*	3
Khasia berry	*Cotoneaster simonisii*	2
hawthorn	*Crataegus monogyna*	3
montbretia	*Crocosmia x crocosmiiflora*	2
broom	*Cytisus scoparius*	3
mile-a-miunte	*Dipogon lignosus*	3
pyp grass	*Ehrhata villosa*	1
elaeagnus	*Elaeagnus x reflexa*	3
Spainish heath	*Erica lusitancia*	3
Mexican daisy	*Erigeron karvinskianus*	2
loquat	*Eriobotrya japonica*	1
spindleberry	*Euonymus europeaus*	2
Japanese spindleberry	*Euonymus japonicus*	2
hakea, downy	*Hakea, gibbosa*	2
hakea, willow leaved	*Hakea, saliciflora*	2
hakea, prickly	*Hakea, sericea*	2
ivy	*Hedera helix*	3
yellow ginger	*Hedychium flavescens*	3
kahili ginger	*Hedychium gardnerianum*	4
hawkweed	*Hieracium spp.*	4
hops	*Humulus lupulus*	1
tutsan	*Hypericum androsaemum*	2
blue morning glory	*Ipomoea indica*	2
stinking iris	*Iris foetidissima*	1
yellow jasmine	*Jasiminium humile*	2
jasmine	*Jasiminium polyanthum*	2
Japanese walnut	*Juglans ailantifolia*	2
heath rush	*Juncus squarrosus*	2
lantana	*Lantana camara var. aculeata*	2
Himalayan honeysuckle	*Leycesteria formosa*	3
tree privet	*Ligustrum lucidum*	2
Chinese privet	*Ligustrum sinense*	2
Japanese honeysuckle	*Lonicera japonica*	4
lotus	*Lotus pedunculatus*	3
Russell lupin	*Lupinus polyphyllus*	2
boxthorn	*Lycium ferocissimu*m	3
Cape honey flower	*Melianthus major*	2
Chinese ladder fern/tuber sword fern,	*Nephrolepis cordifolia*	2
African olive	*Olea europeae subsp. cuspidata*	2
oxylobium	*Oxylobium lanceolatum*	2
wonga wonga vine	*Pandorea pandorana*	2
brush wattle	*Paraserianthes lophantha*	2
Mercer grass	*Paspalum distichum*	3
black passionfruit	*Passiflora edulis*	1
northern banana passion fruit,	*Passiflora mixta*	2
banana passionfruit	*Passiflora mollissima*	3

Local name	*Scientific name*	*Degree of impact*
Kikuyu grass	*Pennisetum clandestinum*	3
African feather grass	*Pennisetum macrourum*	2
inkweed	*Phytolacca octandra*	2
lodgepole pine	*Pinus contorta*	4
cluster / maritime pine	*Pinus pinaster*	2
wilding pine	*Pinus spp.*	4
sweet pea bush	*Polygala myrtifolia*	3
poplar, white	*Populus alba*	2
sweet cherry / wild cherry,	*Prunus avium*	1
Douglas-fir	*Pseudotsuga menziesii*	3
dally pine	*Psoralea pinnata*	2
orange firethorn	*Pyracantha angustifoli*a	1
silver wattle	*Racosperma dealbatum*	2
Sydney golden wattle	*Racosperma longifoliu*m	3
kangaroo acacia	*Racosperma paradoxum*	2
Japanese knotweed	*Reynoutiria japonica*	2
giant knotweed	*Reynoutria sachalinensi*s	1
evergreen buckthorn	*Rhamnus alaternus*	2
sweet briar	*Rosa rubiginosa*	3
blackberry	*Rubus fruticosus agg.*	3
climbing dock	*Rumex sagittatus*	2
elder / elderberry	*Sambucus nigra*	2
African club moss	*Selaginella kraussiana*	3
Cape ivy	*Senecio angulatus*	3
German ivy	*Senecio mikanioides*	3
buttercup brush	*Senna septemtrionalis*	1
potato vine	*Solanum jasminoides*	2
apple of Sodom	*Solanum linnaeanum*	2
woolly nightshade	*Solanum mauritianum*	3
rowan	*Sorbus aucuparia*	3
nassella tussock	*Stipa trichotoma*	2
brush cherry	*Syzgium australe*	2
Montpellier broom	*Teline monspessulana*	2
wandering willie	*Tradescantia fluminensis*	4
nasturtium	*Tropaeolum majus*	1
Chilean flame creeper	*Tropaeolum speciosum*	3
gorse	*Ulex europaeus*	4
blueberry	*Vaccinium corymbosa*	1
periwinkle	*Vinca major*	3
watsonia	*Watsonia bulbillifera*	2
arum lily	*Zantedeschia aethiopica*	2

Degree of impact in the country (Adapted from Owen, 1997):

4. Known to affecting the dominant structure, species composition, or regeneration of several high conservation value sites within the country.

3. Known to be present on several high conservation value sites within the country. Impacts unknown, but suspected of having a significant impact.

2. Present distribution and/or numbers are not yet affecting high conservation value sites within the country, but species is thought to have the potential to do so.

1. Known to be present in the country, but distribution and impacts are unknown.

Problematic introduced species—mammals

Species	*Scientific name*	*Problem posed*
Horses	*Equus caballus*	Feral populations can damage native plants by eating and trampling.
Goats	*Capria hircus*	Goats, tahr, and deer have wide food preferences, and thin out .
Tahr	*Hemitragus jemlahicus*	Forest understoreys preventing regeneration.
Deer	*Cervus spp. and Dama dama*	
Pigs	*Sus scrofa*	An omnivore but populations are regionalised.
Possums	*Trichosurus vulpecula*	Occupy more than 90 per cent of the country. The most serious pest to the forest ecosystem. An opportunistic omnivore, its main food is vegetation, and it is estimated that the population consumes approximately 20,000 tonnes of plant matter per night.
Mustelids	*Mustela spp.*	Predators of ground and hole-nesting birds.
Stoats	*M. erminea*	
Ferrets	*M. putorius*	
Weasels	*M. nivalis*	
Rats	*Rattus spp.*	Eat eggs, chicks and lizards, and compete with birds for food.
Ship rats	*R. rattus*	
Norway rats	*R. norvegicus*	
Cats	*Felis catus*	Predators of ground-living birds.
Dogs	*Canis familiaris*	Predators of ground-living birds.

Source: The State of New Zealand's Environment—The State of Our Biodiversity. The Ministry for the Environment 1997.

Ecological weeds on conservation land in New Zealand: a database. Compiled by S. J. Owen. Department of Conservation 1997.

Forest Weed Control Manual. Revised by N.A. Davenhill. New Zealand Forest Research Institute Ltd. 1997.

65-68

Enquiry Table 11: The source for this table was Ministry of Forestry using historical records, current NEFD data and informed judgement. Work when completed from the NZLCDB project should enable refinements of the estimates to be made.

Norway

53, 54

Enquiry Table 2: None of the area groups in the table is being assessed directly, and the data have been derived from the available data sources by making some assumptions:

"Forest undisturbed by man" (data are estimates) is given as a very rough estimate of forest assumed not to be affected by any significant human intervention in several hundred years. This estimate is somewhat low, and the area showing natural forest dynamics is expected to be considerably higher.

"Plantations" have been interpreted as forest stands of introduced species established by planting in the process of afforestation or reforestation. This also includes tree species naturally occurring in Norway, but which have not evolved in the particular region where the forest stand is growing. The management regime of these areas is the same as for semi-natural forest, and the stand structure will often approach that of a semi-natural forest as the stand grows older.

"Semi-natural forest" (data are estimates) is assumed to be the rest of the forest area.

Area of "other wooded land" is distributed into the classes "undisturbed by man" or "semi-natural" by 10 per cent and 90 per cent, respectively. The percentages should be regarded as rough estimates, and are not based on an inventory. Commercial harvesting of wood is not taking place on any of these areas today, and the possible influence by man is rather limited. It is assumed that the area "undisturbed by man" is a rather low estimate.

Quantitative estimates of the long-term trends of the classes are not available. Most of the plantations are located in the coastal districts of western and northern Norway. The main part of these was established in the 1960s and 1970s, while planting activity has been decreasing during the recent decades. One reason for this decrease is a reduction in subsidies for afforestation purposes. The underlying circumstances may be a realization that maximum volume production is no longer a goal, together with a discussion on timber quality and environmental impacts from the plantations.

As regards "forest undisturbed by man", the trend is not so obvious. One aspect is that access to the forests has been continuously improved by road building, implying a possible decrease of such areas. On the other hand, forest area seems to expand especially on low-productive sites, and these areas are little utilized for wood production. At the beginning of the 20th century, the standing volume was only half of what it is today, indicating a rather intensive utilization of the forests in the late 1800s. 100-200 years ago the utilization of the Norwegian forests was in general rather heavy due to timber export, mining industry etc.

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Enquiry Table 8: The area of protected forest has been increasing over the last 10-20 years. When reporting to FRA-1990, the protected area was estimated at 68,000 ha.

In IUCN categories III-VI, protected landscape and "protection forest" (managed resource protection area) are included.

56-64

Enquiry Table 10: Only the 400 macro lichens have been taken into consideration when assessing the endangered species of lichens.

Total number of endangered species:

1839 (Red List from 1992)

~ 3000 (Revised Red List from 1996)

Source: Norwegian Forest Research Institute (Gundersen & Rolstad, in press), information mainly provided by the Directorate for Nature Management.

65-68

Enquiry Table 11: Data listed under "Extension of forest, including afforestation and reforestation of OWL, total" and "Natural colonization of non-forest land to other wooded land" are informed estimates and not inventory results.

69

Enquiry Table 12: Tree species mainly used for Christmas trees, decorative foliage etc. are excluded.

Poland

53, 54

Enquiry Table 2: The existing Polish statistics do not divide forests from the naturalness point of view. Data presented is the result of interpretation of TBFRA definitions.

Forest undisturbed by man (2.2): Following forest categories are included:

– strictly protected forests,

– forests in the timberline zone and other inaccessible forests,

– forest reservations greater than 100 hectares.

The categories listed above generally meet TBFRA criteria, with one exception – there is no data about the last or recent human interventions. The reason for including them was the stated purpose – to conserve or to re-create the natural state.

Plantations (2.4): In the Polish conditions, where forests occupy often very poor sites, and single species stands could be natural, the delineation between semi-natural forest and plantation is difficult.

Following categories are reported as plantation:

– stands, where one introduced species is dominating,

– artificially planted and maintained stands of poplar (usually hybrids) and other fast growing species, with short rotation period (30-40 years).

The most serious problem was connected with young stands, which had been planted with one or two tree species, even-age structure and regular spacing. Because of their relatively long rotation period (at least 80 years), similarity to their natural (potential) forest type, and the fact that regular spacing disappears during clearings and thinnings, we decided to include these stands into semi-natural forest.

General comments:

There are no statistical data describing the trends in the area of the categories mentioned above. According to expert information, one can state a decrease of undisturbed forest area in the last two centuries. The reasons were non-limited exploitation during the period of intensive industrial development, damage connected with wars (direct destruction and enlarged cuttings for military purposes). In the last decades, air and water pollution and general weakness of forest (pest outbreaks etc.) could have an influence on the present acreage of undisturbed forests. On the other hand the growing amount of strictly protected area can be observed. A part of that growth concerns the remaining undisturbed forest, while the rest is semi-natural forest left to natural succession.

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Enquiry Table 8: In the first group (8.2) "IUCN categories I and II" the forest area of National Parks, which meet the requirements of ICUN category II, are reported. Two National Parks classified as the ICUN category V are included in the next item.

The second group (8.3) "IUCN categories III to VI" was matched with the IUCN definitions IUCN and it consists of:

– forest areas in landscape parks,

– forest areas in nature reservations,

– forest areas of two National Parks that possess the IUCN category V (10,600 ha).

The data were obtained from the official Forestry 1997 yearbook: and refer to the status in 1996.

56-64

Enquiry Table 10: In this table, the numbers of species living in freedom (also introduced) are presented.

For the construction of this table, beside expert opinion, the following sources have been used:

Andrzejewski R., Weigle A., 1993: Polskie studium róznorodnosci biologicznej (Polish study of biodiversity). Narodowa Fundacja Ochrony Srodowiska, Warszawa.

Glowacinski Z., 1992 (ed): Polska czerwona ksiega zwierzat (Polish Red Data Book of Animals). Panstwowe Wydawnictwo Rolnicze i Lesne, Warszawa.

Buszko J., Maslowski J., 1993: Atlas motyli Polski. Czesc I. Motyle dzienne (*Rhopalocera*). Warszawa.

Mirek Z., 1995 (ed.): Vascular plants of Poland a checklist. Szafer Institute of Botany, Polish Academy of Science, Kraków.

Comments:

"Ferns" are regarded as a vascular plant, therefore in item "other vascular plants (flowers)" the number of vascular plants other than trees and ferns is presented.

As to "other vertebrates", only fish, amphibians and reptiles are reported.

As to "Butterflies" the number of species of the whole order of *Lepidoptera* is presented.

The experts for the Trees, Other vascular plants, Mosses and Mammals have done the separation of the forest-occurring species from the total amount only. The result is not unequivocal, the basic criterion for plants is the real occurrence of a species in the forest ecosystem, for the Mammals and Birds it was the use of forest habitat for at least one life activity (e.g. refuges).

65-68

Enquiry Table 11: Regeneration and extension of forest:

In this table the source data were the official information from the ten-year period 1987 -1996.

Polish statistics about artificial regeneration and afforestation are reliable and conformable with TBFRA definitions. Natural regeneration (11.2) and natural regeneration enhanced by planting (11.3) are reported together in Polish statistics; therefore that area was divided with the use of expert assessment.

Natural succession of non-forest land into forest (11.7) is the class, which is difficult to assess. In the last years, agricultural plots (private or state owned) of low productivity were temporarily or permanently abandoned. On a part of those areas natural regeneration has appeared, but in so far as the cadastral (official) status (arable, meadow) is not changed, those areas are still regarded as non-forest. That informational gap will disappear after our present inventory system is operational.

According to the Polish silviculture rules, indigenous species are primarily used as planting material. Introduced species are planted too, mainly for amelioration and reclamation of degraded lands, but their amount is insignificant.

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Enquiry Table 12: The data is available for genus only, introduced species assumed as domesticated are planted but their amount is not significant. For each genus the most common species were listed. The total area of plantings is greater than the area reported in *Enquiry Table 11* "Regeneration and extension of forest", because it was enlarged by area of supplemental plantings. Generally planting material of known local provenance is used, planting of other material occurs occasionally.

According to Polish regulations, in the State Forests for the regeneration purposes seeds or seedlings of known and proper (local or regional) provenance must be used. In the private forests there are no such demands, but forest owners usually buy seedlings from local State Forests nurseries or they use natural regeneration.

Portugal

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Enquiry Table 12: The legislation concerning planting certification is recent and it's foreseen that still during this year, there will be a new law concerning seedling certification, which will allow knowledge about planting material provenance.

Republic of Moldova

53, 54

Enquiry Table 2:

Trends in forest and other wooded land, 1965-1977

	Area (1000 ha)				
	1965	***1975***	***1985***	***1988***	***1990***
Forest	253.9	252.5	279.5	317.6	332.9
Forest undisturbed by man	-	-	-	-	-
Semi-natural forest	253.9	252.5	273.4	331.6	329.6
Plantations	-	-	6.1	6.0	3.3
Other wooded land	23.4	29.9	30.6	30.6	31.4
OWL undisturbed by man	-	-	-	-	-
Semi-natural OWL	23.4	29.9	30.6	30.6	-

56-64

Problematic introduced species: Box elder *(Acer negundo)*.

Romania

53, 54

Enquiry Table 2: Plantations: Area covered by Euro-American poplars.

Russian Federation

53, 54

Enquiry Table 2: Forest plantations may be created by a variety of methods, including the establishing of forest crops, hence two meanings are given under "Plantations" in the original reply: 17340/13480 thousand ha, of which 13480 thousand ha are the planted forests, so called "forest cultures" which are not "real" "plantations" in the national classification.

The areas of "Semi-natural forest" are estimated on the basis of the clear cuts areas for the last 30 years.

The likely ranges for categories "Forest undisturbed by man" and "Other wooded land undisturbed by man" are the same as in *Enquiry Table 1*.

The likely range for category "Plantations" is estimated at +- 0.5 per cent, the area of this category being defined more precisely.

Bushes and shrubs are assigned to category "Other wooded land undisturbed by man" - the main areas falling under this category occurring in the forest tundra zone.

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Enquiry Table 8:

1. The Russian Specially Protected Forest Areas (SPFA) system does not have a category corresponding to IUCN category VI.

2. The statistics do not show the division of SPFA land among the various categories, including wooded and unwooded land. They only give overall areas.

3. Information on natural monuments cannot be given for 1977 or 1987 owing to a lack of reliable figures covering those periods.

56-64

Enquiry Table 10: Data for forest occurring total species: The figure for "Other vascular plants" is between 10,000 and 12,000; for "Ferns" between 350 and 400; and "Lichens" between 650 and 700.

Data for total species: The figure for "Ferns" is between 500 and 600; for "Mosses" between 950 and 1,000; and "Butterflies" between 7,500 and 9,000.

The figure given in row "Other vertebrates" for total species includes fish species; the figure for forest-occurring species does not.

The figures given in row "Other vascular plants" cover all orders of vascular plants: *lycopodiaceae*, *equisetaceae*, *pteridophyta, angiospermae* and *gymnospermae.*

There is the second version of the reply to this table based on the "Red Book of the Russian Federation" which exists as supportive information in the reply to the enquiry which is available at the secretariat.

65-68

Enquiry Table 11: Introduced tree species are used (being planted) on areas less than 500 ha.

Slovakia

53, 54

Enquiry Table 2: An estimate of forest area undisturbed by man was taken from the monograph: Korpel, S., 1989: Virgin forests of Slovakia. Veda, Bratislava, 329 pp.

The area of plantations as a qualified estimate was taken from the database of the Permanent Forest Inventory of SR, status at December 31, 1996 (Lesoprojekt Zvolen). An estimated area of intensive plantations of other broadleaved tree species, as well as a small part of coniferous tree species, was added to the area of Euramerican poplars.

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Enquiry Table 8: Data were adjusted to comply with TBFRA-2000 (to 1 January 1997). Data were obtained from the Centre of Nature and Landscape Protection of the Slovak Environmental Agency (SAP), Banská Bystrica.

In IUCN category I and II: The area of forest lands of PR (Nature reserve) and of NPR (National nature reserve) was included into the category I according to IUCN. The areas of forest lands of NP (National park) were included into the category II. The forest land area includes also the areas of protection zones in hectares.

Legend:

H = commercial forests

O = protection forests

U = special purpose forests

PPF = agricultural land resource

LPF = forest land resource

There exists supportive information on "IUCN categories" in tabular form in the reply to the enquiry which is available at the secretariat.

"Other wooded land": Information sources:

1. J. Durkovic, et al.: General plan of the rational arrangement and utilization of land resources, Lesnícky výskumný ústav Zvolen, Final report 1997, 55 p., 22 tab., 8 separate annexes.

2. B. Ilavská, et col.: Valuation of production potential of agricultural land resource for the purposes of afforestation of agriculturally non-usable non-forest lands. Final report Bratislava, 1997, 45 p. + annexes.

There are 6,427 N- areas recorded in SR with an area of 42,846 hectares and 9,017 "white" areas with an area of 28,000 hectares. Using the method of Overlay maps analysis- pic. 4, lit. 1, with coloured drawn N- areas (by the method of scalegram) according to the districts, and the maps of Protected Nature Regions of SR (Kranárik 1996, status to 1 September 1996) the areas of the above mentioned plots were found located in the cadastre regions of NP, VCHÚ and other plots on forest lands. Of the area of 42,846 ha of N plots we can include 6500 hectares and 5700 ha of the IUCN Category V into the IUCN category II. The area of N- areas located on forest lands close to NP (OP) (that could be added to NP and CHKO) is 1,500 hectares and on the forest lands close to CHKO is 1,100 hectares (as it follows from the Decree of the Government 319/1992: General plan of supraregional territorial system of ecological stability of Slovakia - G-NRÚSES). Of the area of "white" plots 4,300 hectares should be in IUCN category II and 5,000 hectares should be in IUCN category V. From 1998 to 2002, 5,500 – 7,000 hectares of "white" and ´N´ – areas are planned to be afforested annually.

56-64

Enquiry Table 10:

1) In the table, the TBFRA-2000 definitions were taken into account.

2) The number of endangered plant species was determined according to the IUCN categories 1994.

3) The heading of the Table refers to species at risk or endangered - but in the data columns only numbers of Endangered species are required—and in spite of this the "R" and "I" species (usually far from being endangered) are included in the pre-1994 Endangerment Categories IUCN.

The data for endangered plant species (trees, other vascular plants, ferns, mosses, lichens) correspond with the pre-1994 IUCN ranks "Ex/E", "E", "V", "R", and "I". The data for endangered animal species (mammals, birds, other vertebrates, butterflies) correspond with the new ranks "EW", "CR", "EN", and "V"—e.g. endangered species "sensu stricto".

4) Endemic species in Other vascular plants and Ferns (flowering plants and ferns) correspond with data for all Western-Carpathian region or Western-Carpathians & Sudetic Region.

5) Following the definition of "Forest-occurring Species", all species of mammals and amphibians and reptiles can be found in the forest. Therefore also the total number of mammals is provided in item 10.6.

6) Data for "mammals" and "birds" also include the domesticated exotic species

7) In "other vertebrates", fish was conditionally excluded from the forest-occurring species although small water-streams are constituents of a forest.

8) Butterflies: We provide data for all butterflies and separately for diurnal butterflies. Data concerning diurnal butterflies include only species with permanent occurrence in our country. With regard to a small territory and large migration ability of butterflies, occasionally migrating or temporarily occurring diurnal butterflies native to more southward regions were not considered.

9) Updated but unpublished data and expert estimates were kindly provided from the Institute of Botany (Dr. Maglocky, Dr. Lackovicova, Dr. Kubinska) and Institute of Forest Ecology (Dr. Kristin) of the Slovak Academy of Sciences, and from the Slovak Environmental Agency of the Ministry of Environment. Some information was taken also from the following publications:

Daphne, 1996: Rámcová štúdia národnej stratégie pre ochranu biodiverzity v Slovenskej republike [Framework for the National Biodiversity Strategy]. Daphne & National Secretariat for the Convention on Biological Diversity, Bratislava, 42 p.

I. Pisut, 1993 : List of extinct, missing and threatened lichens in Slovakia - the second draft. Biológia 48 (1): 19-26.

A. Kubinska, K. Janovicova, V. Peciar, 1996: The list of extinct, missing and threatened bryophytes (*Bryophyta*) of Slovakia (1st version). Biológia 51(4): pp. 373-380.

F. Maglocky, V. Ferakova, 1993: Red list of ferns and flowering plants (*Pterydophyta* and *Spermatophyta*] of the flora of Slovakia. Biológia 48(4): pp. 361-385.

A. Stollmann, P. Urban, J. Kadleeik, M. Uhrin, 1997: Proposal of (red) list of Mammal fauna of the Slovak Republic. Ochrana prírody – Nature Protection 15: pp. 201-218.

Problematic introduced species

Robinia pseudoacacia – its share in tree species composition is 1.8 per cent. It is expansive, regenerating by root suckers. In lower altitudes it forms continuous forest stands and expands to the detriment of the oak species. In medium altitudes it occupies especially forest margins. It nearly fully prevents regeneration of other species by its aggressive root system and heavy shading.

Euroamerican hybrid poplars (*Populus x euroamericana*) share 0.63 per cent in the tree species composition. They have been planted near rivers, on floodplains and other suitable sites in the lowlands. Thanks to their cultivation, production of wood had increased several times in the lowland forests in the post-war period. Spontaneous hybridization of these hybrid poplars with indigenous black poplar represents an acute danger for the gene pool of the latter, however. The first measures aiming conservation of the indigenous black poplar were taken in our country in 1996-1997.

The share of other introduced tree species (Austrian pine, red oak, Douglas fir, eastern white pine, black walnut, horse chestnut) is low and in any case not problematical.

No invasions of exotic herbal or animal species which would have any considerable influence on forests and their management have not been encountered up to now.

65-68

Enquiry Table 11: Sources of data: Lesoprojekt, Permanent Forest Inventory (PIL) for the years 1987-1996, Lesoprojekt, average annual reforestation in SR (for the years 1987-1996), data of the Department for Non-Forest Lands Afforestation at the Forest Research Institute (LVU) Zvolen.

Part A. Forest regeneration (reforestation), total: The data were obtained from Lesoprojekt from permanent forest inventory for the years 1987-1996 and the annual average was calculated for the items as follows: (*a*) total regeneration; and (*b*) natural regeneration.

The data for root sprouts (Coppice sprouting) and combined regeneration (Natural regeneration enhanced by planting) cannot be separated out from the existing records as they are a part of recorded natural (Natural regeneration) and artificial regeneration (planting or seeding). Therefore the data in the table represent a qualified estimate.

The proportion of actually reforested introduced tree species within regeneration cannot be determined from existing records.

A qualified estimate was used with the help of the data of Lesoprojekt on planned reforestation, whereas the proportion of introduced tree species can be given only for artificial and total regeneration.

Part B. Forest expansion including afforestation and reforestation of other forest land; and Part C. Natural colonization of non-forest land to other wooded land: Based on available data, only the column "Planting or seeding of non-forest land" in Part B can be filled in, for other columns, it is supposed, the areas to be several hectares or tens of hectares per year respectively.

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Enquiry Table 12: Mean total regenerated area according to tree species was obtained from the database of Permanent forest inventory carried out by Lesoprojekt, Zvolen. Other data represent a qualified estimate calculated from the records and data of the Seed Production Control of the Forest Research Institute (LVU), the Research Station Liptovský Hrádok.

A reproduction stock originating in the particular seed-collection zone is considered as a known local provenance.

A transfer of reproduction stock between seed-collection zones, or an import of known origin which is also certified by reliable documents, is considered as a known non-local provenance.

In case of introduced tree species we have for Austrian pine, Douglas fir and eastern white pine certified stands for seed collection, and these species are considered domesticated. In last seven years an import of seed or plants of these species was not realized. False acacia is practically regenerated to 100 per cent by sprouts.

The timber supplies (growing stock) and forest functions are connected with carbon sequestration (*Enquiry Tables 13-17*).

Slovenia

53, 54

Enquiry Table 2: Other wooded land was assessed by special inventory. Forest undisturbed by man includes natural forest reserves and protection forest.

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Enquiry Table 8:

Forest: An area of 55,400 ha (IUCN: I/V) is not included in results. There are no data on the classification of this area attainable at the moment.

Other wooded land: As it is impossible to get the data on other wooded land according to IUCN categories at the moment, the area is estimated through the percentage comparison of forest land and other wooded land.

56-64

Enquiry Table 10:

Birds: Of the 361 bird species, known so far in Slovenia, 169 are traditional nesting species. In all, there are 207 nesting species in Slovenia. This number includes irregular or occasional nesting species (J.U Gregori, S.U Matvejev, 1992).

Butterflies: According to scientific estimate, more than 60 per cent of all butterfly species depend on forest influences. The figure of 900 for Butterflies "Total number of forest occurring species" is the superior limit of 850-900. The figure of 750 for Butterflies "endangered forest occurring species" is the superior limit of 700-750.

Mammals: The data include all mammalion species (88) of wild fauna in Slovenia, out of which there are 69 species autochthonous in the land and 4 species of whale in the sea (which are observed very rarely).

A further 6 species are extinct (Ex); one of them in the sea (*Monachus monachus* Hermann,1779), one of them was successfully recolonized (*Lynx lynx* L.) in 1973 and is not endangered.

Four game species were colonized and a further 4 species were colonized by human activities.

One species colonized in a natural way (*Canis aureus L.*) - and is not included in endangered. All 4 species of whale are included as endangered.

Mosses: The data for "Mosses" include also Liverworts (*Hepaticae*) the total number of which is 157, of which 49 endangered). The total number of mosses (*Musci*) is 598, of which 212 are endangered.

Other vertebrates: In the figure of forest occurring species, the fish and lamprey species are not considered.

Reptiles: So far, 21 species of reptiles have been presented, but at least 26 species are probably to be found (24 species are endangered (MRSIC 1992)).

Amphibia: 20 names (*Amphibia*) have been included in the Red List and 20 species are endangered (Sket 1992).

Fish: In fresh and brackish waters of Slovenia, 94 fish species are found, of which 59 are endangered (Povz 1992).

Cyclostomata: In fresh waters of Slovenia, 4 species of lamprey are to be found (Povz 1992).

The total number of 950 for Forest-occurring species of (*Pteridophytes* and S*permatophytes*) includes "Ferns" and "Other vascular plants (Flowers)".

The data for other forest-occurring species: Other vascular plants included in Ferns.

65-68

Enquiry Table 11: Regeneration of forests by planting or seeding includes 500 ha (only 10 ha by introduced tree species—*Quercus rubra*). Planting or seeding of non-forest land and of other wooded land is negligible.

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Enquiry Table 12: Last four years are representative index of species and quantity of reproductive material. All data for ten-year period were calculated from annual average over these years.

Spain

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Enquiry Table 8: Data source: For IUCN categories I and II: National inventory.

For IUCN categories III to VI: data from autonomous committees.

Area of forest and other wooded land without protection is 22,813,000 ha.

56-64

Enquiry Table 10: Data for "Trees" include data for "Other vascular plants".

There exists supportive information on "endangered species in Spain" in tabular form in the reply to the enquiry, which is available at the secretariat.

Sweden

53, 54

Enquiry Table 2: See *Enquiry Table 1* "Total area by main classes" for the definition of "Forest" and "Other wooded land".

Trends: The trend in Sweden over the last 100 years is that the forest area has grown due to two reasons: (1) large areas of low fertile farm land has either actively or passively been transferred to forest due to better productivity in the agriculture sector; and (2) large areas of other land and other wooded land have been transformed to forest land by draining swamps and low fertile (due to high groundwater levels) land. The exact areas which have been transformed from other land and other wooded land to forest are not possible to give due to lack of records and change in definitions. However, it is probably more than two million ha and less than four million ha. These are rough estimates of the gross figures, however, if net figures could be presented they would be significantly lower. The reason is that forest areas have also been transformed from forest to farmland, while both farmland and forest have given their share to public roads and other infrastructure development, etc.

The trends since the 1950s until about 1990 were as for the period above. Since 1990 the active transformation from other wooded land to forest (by draining swamps) has stopped due to nature conservation reasons. Still there is a slow trend in an active transformation of agricultural land to forest (about 3,000 ha/year in the last ten years).

Sweden has redefined the definition of "Forest undisturbed by man" which is as follows:

The old definition was:

National parks, nature reserves, all sub-alpine birch forests, the rest of the sub-alpine forest older than 100 years, all low productive forest with a production capacity less than 1 m^3 o.b./ha/year, and all other forest older than the lowest recommended final felling age where no treatments whatsoever have been conducted over the last 25 years.

The new definition is:

National parks, nature reserves, all sub-alpine birch forests, the rest of the sub-alpine forest older than 100 years, all low productive forest with a production capacity less than 1 m^3 o.b./ha/year, and all other forest older than the lowest recommended final felling age where no treatments whatsoever have been conducted over the last 25 years.

Excludes: (*a*) power lanes, roads, railways, agricultural land and urban land; (*b*) excludes areas influenced by ditching and (*c*) excludes areas influenced by fellings during the last 50 years.

(*a*), and (*b*) were actually excluded also in our previous answer, and now we have excluded also (c). This area (c) has been estimated as the area (on the previously reported area of "forest undisturbed by man") affected by cuttings the last 15 years times 50/15. This means that we deduct 238 000 ha * 50/15 = 793,333 from our previous figure and adds this figure to "semi-natural" forest instead.

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Enquiry Table 8:

See *Enquiry Table 1* "Total area by main classes" for the definition of "Forest" and "Other wooded land".

About five or six years ago the Swedish Environmental Protection Agency classified the Swedish national parks and nature reserves into IUCN classes. Unfortunately but naturally (as the new definitions were unknown at that time) these protected areas were not divided into forest, other wooded land and other land. Also, since then large areas have been formally protected by legislation in Sweden, but have not yet been classified. As the Swedish protection classes are poorly correlated to the IUCN classes, data cannot be easily retrieved on this from their National Forest Survey. Therefore Sweden chooses not to deliver any data for *Enquiry Table 8.*

Sweden knows that the World Conservation Monitoring Centre have figures on the IUCN areas in Sweden. These figures were delivered to WCMC by the Swedish Environmental Protection Agency some years ago, but were not classified in the new FRA-2000 classes "Forest" and "Other wooded land". As there is a possibility that the Swedish Environmental Protection Agency will start a new IUCN classification work this year, Sweden would like to ask ECE/FAO not to use the old figures on Sweden's IUCN areas. They would prefer to leave this table blank.

56-64

Enquiry Table 10: Only native species are included in this Table.

– Only regularly breeding birds are included.

– Endemic means only found and reported in Sweden, but the chance of existence in other countries is still there.

65-68

Enquiry Table 11: Source: National Board of Forestry.

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Enquiry Table 12: Source: National Board of Forestry.

Switzerland

53, 54

Enquiry Table 2: "Forest undisturbed by man": National parks and reserves. "Plantations": 5 per cent of young growth area.

Global trend (for the last 100 years): forest area is stable and amounts to about one fourth of the total area of Switzerland. During the second world war 12,000 ha of forest was clear-cut. Since 1950 an increase in forest area can be stated. It is however difficult to quantify these increases since the figures from Cantonal forest statistics are not comparable with results from the NFI due to different methods and definitions. The increase between 1986 and 1996, derived from the NFI results is about 40,000 ha. Reasons: Since about 1900 big clearcuts are forbidden by federal forest law and clearings have to be reforested. So, a man-caused decrease in forest area is impossible. The observed increase of forest area since 1950 is the consequence of increasingly extensive agricultural management.

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Enquiry Table 8: The data for OWL (in IUCN categories I and II) and (in IUCN categories III to VI) are raw estimates derived from the relationship of the data in Forest (in IUCN categories I and II) and (in IUCN categories III to VI). No other reliable data are available for the IUCN categories for other wooded land.

56-64

Enquiry Table 10: Data sources: different sources were used as e.g. red lists, expert guess, etc.

Trees (coniferous and broadleaved species)): total species, of which endangered: *Quercus cerris*, *Laurus nobilis*, *Sorbus domestica*, *Pyrus nivalis*.

Butterflies: The figure (182) for total number of species for butterflies is without moths.

Moths and butterflies: Total: 3,896.

65-68

Enquiry Table 11: The relationship of the area figures between natural and planting are derived from "Natural regeneration" of "Regeneration of forest (reforestation), total"—"Planting or seeding" of "Regeneration of forest (reforestation), total".

Enquiry Table 12: According to the Swiss National Forest Inventory, the proportion of natural regeneration amounts to about two thirds (pure natural regeneration 56 per cent, forest planting 21 per cent and mixed (that means natural and artificial)

regeneration 23 per cent). The use of plants for artificial regeneration has continuously decreased in the last ten years (1985: 8,8 Mio. plants; 1995: 4,4 Mio. plants).

– In Switzerland, the number of plants used in forest plantings was determined for the last 100 years. Thus, there are no values of the area. (Source: Swiss economy of forest and wood, yearbook 1995). Indications can only be given for the following tree “species": Norway spruce, others conifers, beech and other broadleaved trees.

– “unknown provenanc”: According to the forest law respectively the decree, article 21, paragraph 4, only forest reproductive material with proved provenance is allowed to be used for forest applications. The use of unknown provenance is thus not allowed.

– Known local provenance and known non-local provenance: There exists no information about this (The collecting of information would be fairly expensive).

The forest statistics in Switzerland provide only figures in “plants per year” but not figures for “ha/year”. In 1991, in total, 7,256,000 trees were planted.

Picea abies: 3,185,000

other coniferous: 954,000

Fagus sylvatica: 683,000

other broadleaved: 2,443,000.

Tajikistan

53, 54

Enquiry Table 2: Source: Information from the TBFRA-2000 National Correspondent Mr. G. A. Avsalov, Director General of the Forest Association “Tajikles", in reply to the Table of the TBFRA Essential Data, 20.11.1998.

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Enquiry Table 8: Source: Information from the TBFRA-2000 national correspondent Mr. G. A. Avsalov, Director General of the Forest Association “Tajikles", in reply to the Table of the TBFRA Essential Data, 20.11.1998.

The FYR of Macedonia

53, 54

Enquiry Table 2: The data for Forest area are secretariat estimates based on literature sources of information and the evaluation of the situation in neighbouring countries.

Turkey

53, 54

Enquiry Table 2: Virtually all of the forests in Turkey were originally natural forests. In the course of the history, those forests have been subject to human interference; therefore, they are considered to be semi-natural.

Plantations started in 1946. Planted area estimated by national coordinators taking into account the records of forest management plans and documents of Plantation and Erosion Control General Directorate.

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Enquiry Table 8: All forests (both high forest and coppice), that are not available for wood supply are protected forests. They are classified as nature parks, natural monuments, natural reserves, national parks, conservation forests, forests with conservative characters, gene protection areas, seed provenance. Four of these statutes match with IUCN categories:

Turkish category	***IUCN category***
Nature park	Protected landscape (V)
Natural monument	Natural monument (III)
Nature reserve	Strict nature protection area (I)
National park	National park (II)

65-68

Enquiry Table 11: Data for “Planting or seeding of non-forest land” and “Planting or seeding of other wooded land” are estimates.

Turkmenistan

53, 54

Enquiry Table 2: “Naturalness” is assessed by the secretariat on the basis of analysis of the situation in neighbouring countries, e.g. Kazakhstan, Tajikistan.

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Enquiry Table 8: Secretariat estimates are derived from the WCMC database of the protected areas. It is noted in the WCMC: there are 2 protected areas in Turkmenistan: *a*) Kaplangursky and b) Repeteksky, covering mainly non-forest areas.

56-64

Enquiry Table 10: The figure for other vascular plants is more than 2400.

The figure of 60 for other vertebrates is for fish.

The flora of Turkmenistan includes about 2600 species of plants where grass prevail. There are not so many tree and bush species . The fauna is several thousands of species of insects, 60 species of fish, 27 species of snakes (4 of which are referred to as poisonous snakes), 372 species of birds, 22 species of predators (source: http://www.iectm.org/turkmenistan.geogr/html).

65-68

Enquiry Table 11: Source for planting or seeding: Estimates are on the basis of the 1988 Forest Inventory results.

Ukraine

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Enquiry Table 8: Supplement to the Forest Survey Questionnaire—List of specially protected areas in Ukraine:

IUCN category I

1. Askania-Nova
2. Gorgany
3. Dneprovsko-Orelsky
4. Low-lying lower reaches of the Danube
5. Elanets steppe
6. Kanevsky
7. Karadagsky
8. Karpatsky
9. Krymsky
10. Lugansky
11. Medobory
12. Mys Martyan
13. Polessky
14. Rastochye
15. Ukrainian steppes
16. Yalta mountains/forests
17. Chernomorsky (Black Sea district)

IUCN category II

18. Azov-Sivashsky
19. Vyzhnitsky
20. Karpatsky
21. Podolskie Tovtry
22. Svyatye mountains
23. Sinovir
24. Shatsky

Note: A map showing the positions of these territories exists as supportive information in the reply to the enquiry which is available at the secretariat.

56-64

Enquiry Table 10: Source: Descriptor of higher plants in Ukraine (Kiev, 1987); Ukraine Red List. Plant World (Kiev, 1998); Ukraine Red List. Animal World (Kiev, 1996).

Problematic introduced species: *Quercus rubra, Robinia pseudacacia, Acer negundo, Fraxinus pennsylvatica, Fraxinus lanceolata, Amorpha fruticosa, Lutreola vison (mink).*

United Kingdom

53, 54

Enquiry Table 2: Trends and driving forces:

Late 18th century	Clearance of woodland to increase agricultural area, to feed growing urban population.
After 1815	Increased new planting, mostly small scale, but little systematic management.
1884-1914	Little change, about 4500 ha/yr. planting, mostly restocking.
1914-1918	Extensive conifer fellings; only best quality broadleaved much affected.
1920’s	Restoration of losses from 1914-18, replacement of felled oak with conifers.
1947-1980	50 per cent increase in woodland area, mostly state planting, for timber and rural employment.
1980-1997	Increasing proportion by private sector; more priority to environment and landscape.
All 20th century	Small amounts lost for roads and other developments; continuing decline in coppice.

The proportion of land area under forestry in Great Britain is shown in the following table, 1924--80 based on Woodland Censuses, adjusted to common definitions (excludes Northern Ireland):

1908	4.9 per cent	Increases: 1924 to 1996	Increases: 1924 to 1996
1924	5.3 per cent	GB total: Doubles	5.3 per cent to 10.6 per cent
1947	6.1 per cent	England: 50 per cent increase	5.1 per cent to 7.6 per cent
1965	7.6 per cent	Wales: More than doubles	4.9 per cent to 12.0 per cent
1980	9.4 per cent	Scotland: More than doubles	5.9 per cent to 15.2 per cent
	10.6 per cent		

Forest cover in Northern Ireland increased from less than 1 per cent in 1925 to 2.0 per cent in 1955 and 5.8 per cent in 1995.

The area of woodland has increased in Northern Ireland, from a very low base, with the most rapid increase being in the 1960s and early 1970s, but is still (in 1995) a lower percentage cover than any of the countries of Great Britain:

Northern Ireland

1925	< 1 per cent	Chairmont Report
1940	1.8 per cent	1939/40 Census
1950	1.7 per cent	CSO Annual Abstract of Statistics
1955	2.0 per cent	CSO Annual Abstract of Statistics
1960	2.4 per cent	
1965	3.1 per cent	CSO Annual Abstract of Statistics
1970	4.0 per cent	Same as above.
1975	4.6 per cent	Same as above.
1980	4.9 per cent	Same as above.
1085	5.2 per cent	Same as above.
1990	5.5 per cent	Same as above.
1995	5.8 per cent	Same as above.

Data for Forest undisturbed by man: Estimate corresponds approximately.

Data for Semi-natural forest: Data adjusted: Semi-natural (UK definition) plus some other areas of Scots Pine and broadleaved. Estimate corresponds approximately.

Data for Plantations: Data adjusted: Estimate = total less semi-natural. Estimate corresponds approximately.

Data for Other wooded land undisturbed by man: Estimate corresponds approximately.

Data for Semi-natural other wooded land: Data adjusted: wood pastures. Estimate corresponds approximately

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Enquiry Table 8: These estimates are considered to be better than estimates provided by WCMC in December 1997, but are subject to revision as the source is a draft paper that has not yet been subject to peer review.

Trends over the last 10-20 years in the area of FOWL in the IUCN protection categories:

Area of protected forest will have increased—no quantitative estimates available.

56-64

Enquiry Table 10: Figures not yet available for forest-occurring species.

Trees (10.1) include species in woodland, in parks and the countryside, but not those only in gardens and arboreta. Trees include more than 80 introduced naturalised species; endangered species is service tree.

Mammals & birds - none categorised as endangered in the Biodiversity UK Steering Group Report - to confirm.

Data for Other vascular plants include data for flowers (and shrubs and stonewort).

Data for Mosses include data for liverwort.

Data for Butterflies include data for moths.

Problematic introduced species: UK forests have been affected by a substantial number of invasive exotic species in recent decades. These include several mammals, notably the American grey squirrel (*Sciurus carolinensis*), muntjac deer (*Muntiacus reevesi*) and sika deer (*Cervus nippon*), and the more historically introduced European rabbit (*Oryctolagus cuniculus*). Invasive plants include the Rhodendron (*R ponticum*) in western upland native forests and Japanese knotweed in riparian areas. A few introduced trees are regarded as invasive in some circumstances, notably the sycamore in nature reserves and western hemlock which regenerates readily in shade. It is possible that other introduced species and shrubs could become more invasive in future as circumstances change. The UK tries hard to exclude harmful insect and fungal pests but some have become established in recent years, notably the Great Spruce Bark Beetle (*Dendroctonus micans*).

65-68

Enquiry Table 11: For introduced species, the percentage introduced for state and private was weighted by their shares of restocking and new planting.

Source: Annual averages from admin records: "Regeneration of forest (reforestation), total" and "Extension of forest, including afforestation and reforestation of other wooded land" from published statistics, "Natural regeneration & colonisation" from admin records, planting by subtraction. Proportions of introduced are species based on same data used for *Enquiry Table 12.*

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Enquiry Table 12: Source data are for GB (FC records and private sector production forecasts). State and private then each rated up to planting totals used for *Enquiry Table 11.*

Provenance recorded on different basis from this table, so cannot be reported.

United States of America

53, 54

Enquiry Table 2: Forest and other wooded land undisturbed by man (natural) - All legally designated Wilderness areas are assumed to be natural and relatively undisturbed by man as well as all wooded land located in interior Alaska.

Plantations—Based on data from the 1992 national assessment database. Considerable areas in the western U.S. have supplemental planting to enhance stocking for regeneration after harvest, but are not considered plantations.

Semi-natural forest and other wooded land - All forest and other wooded land not in the previous categories.

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Enquiry Table 8: The data reported here generally apply only to public lands. The various states and local governments within the United States have laws, statutes, and Best Management Practices (BMP) rules that provide protection in the form of restrictions or prohibitions of certain management activities aimed at improving water quality, forest health, soil conservation, wildlife habitat, or other broad land management goals that are in the general interest of the public.

The majority of forest land in the U.S. is in private ownership and is spread among some 10 million individuals and private corporations. In many cases this land has management restrictions based on State or local zoning or by preference of the owner. There are no accurate statistics available to quantify the private forest lands of the U.S. as 'protected' under current IUCN definitions. Thousands of hectares of land in the United States are also owned or managed by non-governmental conservation/ preservation organizations and are protected by organizational charter or written management plan but are not strictly protected by public law or statute. Complete data for these areas, which generally fall in categories IV-VI, are currently unavailable.

Trends in Protected Status - The area of forest and other wooded land in IUCN classes I and II has increased from 7.0 million hectares in 1970 (Forest Service report FRR-20, "The Outlook for Timber in the United States", 1970) to 19.2 million hectares in 1992 (Forest Service report GTR-NC-168, "Forest Resources on the United States, 1992 METRIC UNITS), an increase of 174 per cent. Historic data on IUCN classes III-VI unavailable.

There exists supportive information on "Publicly managed land encumbered for conservation purposes by legislative and administrative restrictions, 1993" (in tabular form) in the reply to the enquiry which is available at the secretariat.

56-64

Enquiry Table 10: Sources: Trees: The primary source for this is Little (Little, L. Elbert, Jr. 1979. Checklist of United States trees (native and naturalized). U.S. Department of Agriculture, Agriculture Handbook, page 541 and 375) and the PLANTS National Database/ ITIS Database located on the web at

http://rndhouse.nrcs.usda.gov/plantsproj/plants/project_database.html

Other vascular plants, ferns, mammals, birds, and other vertebrates: The Nature Conservancy (documentation available at the secretariat).

Butterflies, mosses, lichens: The National Biological Service (documentation available at the secretariat.)

Comments:

Exotic and introduced species: About 4000 exotic plant species and 2300 exotic animal species occur in the United States. About 15 per cent of those species cause significant problems. For example, exotics have contributed to the decline of 42 per cent of the T&E species in the United States. Recent article by The Nature Conservancy highlighted 12 of the most problematic exotic species. Six of those species affect forest ecosystems:

1) purple loosestrife (*Lythrum salicaria*) chokes wetlands and eliminates native plants and the species dependent on them.

2) Tamarisk (*Tamarix* spp.): outcompetes native vegetation in riparian forests, with negative effects on the aquatic and terrestrial habitat

3) balsam wooly adelgid (*Adelges picae*): has destroyed three-quarters of the spruce-fir forest of the south-eastern United States.

4) Miconia (*Miconia calvescens*): ornamental plant that invades native forest and eliminates native vegetation and associated species. Problem in Hawaii.

5) Chinese tallow (*Sapium sebiferum*): ornamental plant that displaces native species. Affects the south-eastern states.

6) Brown tree snake (*Bioga irregularis*): has eliminated most of Guam's native bird species. Current concern over whether it will succeed in invading Hawaii, and possibly the mainland.

Other problem species:

Cowbird: significant effect on neotropical migrants because of nest predation.

Total species for this table:

Every source seems to have a different count for species by taxonomic group. For most groups, the most recent data from The Nature Conservancy was used for consistency (they report native U.S. species). All sources are described below.

Tree species: Little (Little, L. Elbert, Jr. 1979. Checklist of United States trees (native and naturalized). United States Department of Agriculture, Agriculture Handbook, page 541 and 375) and the PLANTS National Database/ ITIS Database.

Other Vascular Plants: The Nature Conservancy lists 15,447 native flowering plants and 115 species of conifers. Assuming 833 total tree species, total other vascular plants is estimated to be (15,447 + 115) - 833 = 14,729.

Ferns: The Nature Conservancy lists 546 native fern species.

Mosses: The National Biological Service cited a total of 1,320 species for North America. It includes Canada, but not Hawaii, Puerto Rico, or Pacific Islands.

Lichens: The National Biological Service cited an estimated 3500-4000 species of lichens in the United States. The midpoint was used in the table. Not clear if the estimate includes species in Hawaii, Puerto Rico, and Pacific Islands.

Mammals: The Nature Conservancy lists 418 native mammal species in the United States.

Birds: The Nature Conservancy lists 776 native bird species in the United States.

Other vertebrates: The Nature Conservancy lists 278 native reptile species, 242 native amphibian species, and 822 native freshwater fish species.

Butterflies: The National Biological Service cited a total of 90,968 known insect species in the United States. Of the total, the *Lepidoptera* includes 11,300 species. Only about 12 per cent of *Lepidoptera* are butterflies. The Nature Conservancy lists 600 species of butterflies in the United States, which includes skippers.

Total Endangered Species by Taxonomic Group:

The United States Fish and Wildlife Service maintains a list of species federally protected as endangered or threatened. The species in *Enquiry Table 10* reflect information as of January 31, 1998 for United States species.

Other sources would suggest there are more species at risk than officially protected under the Endangered Species Act. The Nature Conservancy publishes an assessment of species at risk using five categories: presumed extinct, possibly extinct, critically imperiled, imperiled, and vulnerable. The total species count by taxonomic group using these designations is as follows:

Conifers:30 species

Flowering plants: 44 species (non-coniferous trees are not separated)

Birds: 93 species

Other vertebrates: 516 species (50 reptiles, 148 amphibians, 318 fish)

Butterflies:101 species

Endemic Species by Taxonomic Group: The only source found for number of endemic species was World Resources 1996-1997 (World Resources Institute). Estimates of endemic species in the United States were provided for plants, mammals, birds, reptiles, and amphibians.

Total endemic plants species was listed at 4,036. No information was provided on endemics by trees and other vascular plants. A rough estimate was made by assuming the same proportion of species is endemic for trees and other vascular plants. The WRI report estimated a total of 16,302 higher plant species. Therefore, approximately 25 per cent of all higher plants were considered endemic. Applying the same percentage to trees and other vascular plants results in an estimate of 216 endemic tree species and 3,674 endemic other vascular plants. It is likely that this approach overestimates endemic tree and underestimates endemic other vascular plants.

Endangered Endemic Species by Taxonomic Group: All numbers are based on counting endangered and threatened species that have a historic range only in the United States (including Hawaii, Puerto Rico, and the Pacific Islands- see table below). In some taxonomic groups, Hawaii, Puerto Rice, and the Pacific Islands contain a large proportion of the endemic species. (For those groups without endemic species, it may indicate a lack on information rather than the lack of endangered endemic species.)

Total Forest-occurring Species: The 1989 RPA Wildlife Assessment reported that about 90 per cent of resident or common migrant vertebrate species in U.S. use forested ecosystems. Generally, 90 per cent of bird, amphibian, and fish species, and 80 per cent of mammal and reptiles use forested ecosystems.

These percentages were applied to total species to provide rough estimates of forest-occurring species for mammals, birds, amphibians, fish, and reptiles. It was assumed that all tree species are forest-occurring.

Endangered Forest-occurring Species: Most recent list of federally listed species that occur in forest ecosystems:

35 mammals; 20 reptiles; 8 amphibians

54 birds; 61 fish; 9 butterflies

214 plants (2 conifers, 2 deciduous trees)

Endemic forest-occurring species: No estimates available

Endemic endangered forest-occurring species: Comparison of list of forest-occurring T & E species with range listing resulted in number of endemic species.

There exists supportive information on “U.S. endemic T & E species by geographic occurrence” (in tabular form) in the reply to the enquiry which is available at the secretariat.

65-68

Enquiry Table 11: Direct measures of regeneration are difficult to obtain from the current inventory system. However, annual planting records, conservation reserve programme data, and net change data from periodic inventories provide information for these estimates. Complete data for colonization and planting of other wooded land is not available and could not be reasonably estimated.

The only data for introduced species currently available are those from *Enquiry Table 12* “Species diversity and origin of planting material used in the forest”.

There exists supportive information on “Estimated average annual area of forest and OWL harvested in the United States, by ownership group, 1980-1990” and “Tree planting in the U.S. by major owner group, 1986-1995” (in tabular form) in the reply to the enquiry which is available at the secretariat. Most broadleaved harvest areas regenerate naturally.

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Enquiry Table 12: Sources: National forest land planted with seedlings from known seed sources, 1997.

State Nursery data: Personal communication, Ron Overton, USDA Forest Service, State & Private Forestry.

The balance of annually planted stock is predominantly commercial southern pine species in the Southern U.S. from private nurseries.

Data are primarily available from most public and private nurseries.

Data from forest industry nurseries are generally not available.

Source: National Forest information in Reforestation and Timber Stand Improvement Report: National Summary Fiscal year 1997.

Uzbekistan

53, 54

Enquiry Table 2: Source for Forest undisturbed by man, Semi-natural forest, Plantations: Secretariat estimates based on literature sources, including the article “Biological diversity and genetic resources of forest in Uzbekistan", A. K. Kayimov and E. S. Alexandrovsky, FAO 1997.

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Enquiry Table 8: Source: Secretariat estimates based on literature sources, including the article “Biological diversity and genetic resources of forest in Uzbekistan”, A. K. Kayimov and E. S. Alexandrovsky, FAO 1997.

Yugoslavia

53, 54

Enquiry Table 2: Source: “Mid-term Programme of Forestry Development of Serbia, 1996-2000".

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Enquiry Table 8: The category of National park sometimes includes strict nature reserve/wildness area. For instance, the National park “Ficusca Gora” (25,393 ha) includes the area of 62 ha of strict nature reserve. There exists supportive information on “The list of National parks and World Natural heritage sites & Ramsar sites” in the original reply to the enquiry which is available at the secretariat.

56-64

Enquiry Table 10: There exists supportive information on “Number of species, and the levels of protection” (in tabular form) in the reply to the enquiry which is available at the secretariat.

65-68

Enquiry Table 11: Source: The Middle-term Programme of Forestry Development of Serbia 1996-2000.