Status of Biological Resources and Implementation of the Convention on Biological Diversity in the Czech Republic

First Report

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Content

1. Species Richness and Status of Nature and Landscape

The Czech Republic was established on January 1,1993, after splitting of the former Czech and Slovak Federal Republic into two independent states. The country covers the area of 78,866 km^2 and it is inhabited with the population of 10,282,784. (SOURCE: Czech Statistical Office www 1999)

In terms of basic land-use categories, 55 % of the total territory is agricultural land, of which as much as three-quarters are arable or permanent cropland (40.3 % of the total territory of the Czech Republic in 1998) and most of the remainder (11.1 %) is permanent grassland (meadows and pastures). The high percentage of arable lands remains as a negative factor with respect to maintenance of biodiversity in agroecosystems (see Chapter 8). Forests cover one third of the country area.

From the point of view of biogeography, the country is situated at the crossroads of Europe: that is why the territory of the Czech Republic is located in four biogeographical subprovinces. Most of the territory of the Czech Republic lies in the biogeographical province of the Central European Highlands, embracing two subprovinces (Hercynian in Bohemia and western Moravia, Carpathian in eastern Moravia). Because of the unique position, in quaternary period the territory of the present Czech Republic was situated between boundaries of continental and alpine glaciations. Therefore, it was a north-south and east-west European crossroads which resulted in crucial continental migration routes of biota, *e.g.* some main Eurasian bird flyways. Regardless relatively small size, internationally important protected area categories were established in the territory of the Czech Republic, namely six UNESCO Biosphere Reserves, ten Ramsar Sites (see Chapter 10), two Biogenetic Reserves and 16 Important Bird Areas, the last having been designated according to the new BirdLife International criteria.

In general terms, biodiversity has been well conserved in the Central Europe, perhaps better than in the western part of the continent. Diverse geological composition and geomorphology, together with diversity of geographical and climatic conditions resulted in a relatively high biological and landscape diversity in the Czech Republic, in spite of its small area. The following number of species can be found there: 369 vertebrate species, over 29,800 – 48,000 invertebrate species (of them 24,800 – 43,000 insect species), 2,520 vascular plant species, 848 bryophyte (moss) species, 1,400 lichen species, approx. 30,000 fungi species and 6,180 cyanobacteria and algae species, in total, 70,000 – 90,000 species (excl. viruses and bacteria) (Table 1). The flora represents approximately 25 % of the 11,000 species known from Europe. In total, 36 globally threatened animal species included into the 1996 IUCN Red List live in the Czech Republic (IUCN 1996a). In addition, 52 plant species threatened at the global level inhabit the territory of the country as appeared in the first IUCN Red List (IUCN 1997). A surprisingly high number of both endemic species and relics of almost all key taxa have resulted from relatively rich nature history. In addition to wild flora and fauna, also cultivated plants and domesticated animals deserve attention due to their centuries long cultivation, selection and breeding in the territory of the Czech Republic, including original ancient cultivars, varieties, breeds and races.

Table 1
Species Richness and Conservation Status of Main Taxa in the Czech Republic

	No. of Species	No. of Non-native Species	No. of Threatened Species	No. of Extinct Species
Cyanobacteria and Algae	6,180	[1]	[2]	ca 1, 900
Fungi	ca 30, 000	[1]	[3]	[3]
Mosses	848	3	364	63
Lichens	1,400	0	560	210
Higher Plants	2 ,520	710	1,100	110
Insects	24,800 [4] 43,000 [5]	[3]	[3]	[3]
Other Invertebrates	5,000 [5]	[3]	[3]	[3]
Fishes & Lampreys	65	13	15	9
Amphibians	21	0	11	0
Reptiles	11	0	5	0
Birds	186 [6] 390 [7]	11	97	3 [8]
Mammals	86	14	16	2
TOTAL	71,117 – 89,521			

Sources: CINC (1994a), HOLEC (unpubl.), HOLUB (unpubl.), HUDEC *et al*. (1995), KOMÁREK (unpubl.), LAŠTUVKA *et al*. (1996), LIŠKA (unpubl.), OECD (1998), PLESNÍK & HANZAL *(in prep.)*, RÉBLOVÁ (unpubl.), VÁNA (1993, 1995), VEZDA (unpubl.)

1) Number of algae and fungi species which has been described from the territory of the present Czech Republic
2) Rough estimation based on number of species, which have not been found during the last 30 years
3) Difficult to estimate because of low degree of field research
4) Number of species scientifically described
5) Rough estimation of the total number of species
6) Recently regularly nesting species
7) Found in the territory of the present Czech Republic since 1800
8) Extinct in the wild

According to the latest data, in the Czech Republic there are three European hotspots of plant, bird and mammal species with a narrow geographical distribution in Europe, 13 European hotspots of plants, birds and mammals from atlas records and the only (the White Carpathians Mts.) European hotspot of plant, bird and mammal diversity based on complementary richness (WILLIAMS *et al*. 1998).

On the other hand, historically intensive agriculture and industrial development, especially in the last decades have negatively affected the environment. Not only individual species, guilds,

assemblages and communities, but also the whole ecosystems and landscapes have been threatened as a consequence of negative human activities (*e.g.*, forest ecosystems due to emmissions, wetlands as an example of large-scale habitat loss, Black Triangle region). Industrial air pollution resulted in the fact that forests in the Czech Republic are among the most heavily damaged in Europe (EC-UN/ECE 1998, MLCOCH *et al*. 1998, more details in Chapter 9).

Therefore, the present situation requires effective measures aiming at conservation and appropriate remediation.

The whole system of large- and small-size Specially Protected Areas (SPAs) has been established since the 1830s (see Chapter 5.2). New legislation based on holistic or integrated approach has tried to deal with unprotected non-reserved agricultural and forest lands, using a national concept of the Territorial System of Ecological Stability of Landscape (TSES) at various levels, being one of the first ecological networks on the continent. The Czech National Council Act No. 114/1992 on Protection of Nature and the Landscape which came into force in June 1992 is in some parts fully comparable with the European Community legislation (Birds Directive, Habitats Directive).

2. History of Nature Conservation and Landscape Protection

Primeval forests in the South Bohemian mountains, protected for much longer than a century, are ranking among the oldest protected areas in Europe and in the entire world. Moreover, they precisely materialise the starting positions of European nature protection. In 1838 an enlightened nobleman gave up any commercial use of two virgin forest stands in the Novohradské hory Mts. for romantic, aesthetical and ethical reasons. Twenty years later, the famous Boubín (Kubany) Virgin Forest, at that time already studied as an open air laboratory, was declared protected by a good prince enlightened by his provident forest manager.

During the following decades, the growth of protected areas, both in numbers as well as in their total area, has continued, slowly at first, accelerating in the past eight decades. The land tenure reform after the World War I was one major reason or rather opportunity. Large estate owners could win some advantages by allowing ecologically valuable areas in their ownership to be declared nature reserves. With a keen co-operation of leading scientists, in particular botanists, the protected area system was growing gradually. In the late 1950s and early 1960s the ruling state power made an effort to reduce this system, as in its opinion the protected areas decreased land used for economic production. Fortunately, brave conservationists, both professionals and volunteers, turned that orientation. Their activities resulted in an enhancement of the Czech protected area system, gradually applying scientific criteria.

In 1955, the Czech Republic established its first Protected Landscape Area, a category equivalent to the international IUCN Category V (IUCN 1994), in the following year officially recognised by the first Czech State Nature Conservation Act No. 1/1956. The

intention was to establish a special territorial protection at a level allowing a sustainable use of resources and soft tourism. This category of protected areas should also serve as pilot areas for an ecologically sound management of countryside at large, even if not specially protected. This category in its Czech conception also formidably corresponded with the objectives of the UNESCO Biosphere Reserves (BR) and therefore the establishment of PLAs and BRs was in many cases a mutually supporting process.

The first Czech National Park was established in Krkonoše (Giant Mountains) in 1963. According to international classification, it belongs to the IUCN Category V, because of a strongly developed tourism, and during the last few decades also due to ecosystem (mainly forest) destruction caused by atmospheric emissions. Two more National Parks were established in 1991: the Šumava (Bohemian Forest) NP in South Bohemia, and the Podyjí (Thaya River Valley) NP in South Moravia. Both are adjacent to the frontier with "western" countries - Germany and Austria: paradoxically, the fact that their core zones were prohibited zones before the fall of the "Iron Curtain" essentially contributed to the preservation and even rehabilitation of their rich and unique biodiversity.

The geographical situation of the Czech Republic caused that many protected areas (not only the large-size ones of the PLA and NP categories) are located close or even adjacent to the state frontier, and most of them have their continuation in biological and landscape diversity as well as in conservation status across the border. Therefore the Czech Republic now plays an important role in transboundary biodiversity conservation.

At species or better taxonomic level, until the 1970s, specially legally protected plant and animal species were selected rather according to their rarity and attractivness than on a scientific base, taking into account complex integrated socio-ecological evaluation. Thus species protection (the first regional decrees date over a century ago) has not been very effective. Raise of public awareness is probably the greatest contribution to this effort.

An evident fast increase in species protection in the Czech Republic can be observed since 1970s, both among the conservation and scientific community, supported by conservation volunteers and their groups. The State Nature Conservancy and its bodies, the Academy of Sciences and its institutes and scientific societies organize conferences, establish commissions and committees, publish guidelines, and launch special projects and programmes. The "gene pool" becomes a popular term and slogan. The intention has been somehow also to emphasise the genetic level of biodiversity, although in those early stages there actually has not been done too much in that direction, neither in research nor in practice. One of the outcomes of those efforts has been the publication of the first Czech Red Lists of threatened species at the late 1970s and the early 1980s, with the objective to give a more comprehensive overview of the situation, and to identify the species deserving a special protection along threatened categories determined on a more scientific base than before.

In 1980-1981 the Czech State Nature Conservancy launched a special research-technical programme on *Theoretical and Practical Aspects of Threatened Plant and Animal Species Protection*, co-ordinated by the Conservation Section of the State Institute for Protection of Monuments and Conservation of Nature. This programme practically continues till present days, its co-ordination having been gradually taken over by the first co-ordinator successors: the Czech Institute for Nature Conservation and the Agency for Nature Conservation and Landscape Protection of the Czech Republic. The following publications are the outcomes of the programme: *Strategy of the Gene Pool Conservation in the Czech Republic* published in 1985, *Czechoslovak Red Data Book* ,after the splitting of the federal State in 1992 published as *Czech and Slovak Red Data Books* in 5 volumes (I - Birds, 1988, II - other Vertebrates, 1989, III - Invertebrates, 1992, IV - Low Plants, 1995, V - Vascular Plants, 1999, SEDLÁCEK *et al*. 1998, BARUŠ *et al*. 1989, ŠKAPEC *et al*. 1992, KOTLABA *et al*. 1995, CEROVSKÝ *et al*. 1999), and numerous short studies on individual species, habitats and areas, as well as practical measures resulting from their conclusions.

It has become clear that an active biodiversity conservation at all levels is a necessity. This has resulted in rich and manifold activities started in late 1960s and further developed during the following decades. The activities can briefly be characterised as monitoring and management of species, habitats, biotic communities and ecosystems. Many new methods, only half a century ago strictly rejected by scientists and conservationists, such as gene banks and cultivation *ex situ*, re-introduction and transfers (of species), rehabilitation, restoration (of habitats, communities and ecosystems), and some special facilities (such as centres for handicapped animals) have become current and generally accepted methods of conservation work.

During the 1980s, it was gradually becoming clear that only specially protected species and protected areas would not be enough for the preservation of biodiversity and for the optimum full use of its ecological-environmental functions in the countryside, as well as in urban environments. This led to the initiative of elaborating a Territorial System of Ecological Stability of Landscape (see Chapter 5.3), ranging the Czech Republic among the pioneering countries of the European Ecological Network (EECONET), also known as the Pan–European Ecological Network (PEEN).

In the 1990s some other projects and programmes started to emerge. Those ideas and suggestions received a full support by adoption of legal instruments, particularly the new Act No. 114/1992 on Protection of Nature and the Landscape.

3. Biological Diversity Conservation Structures

The Ministry of the Environment, a central body for environmental protection and management in the country, is also the main authority in biodiversity conservation, in a close collaboration with the Ministry of Agriculture. Some specialised institutions under these ministries play a significant role in biodiversity study and management, and district and local

authorities in implementation of biodiversity conservation measures. The Academy of Sciences of the Czech Republic and universities are other important centres of basic and applied biodiversity research. A relatively high number of Czech specialists have necessary skill for implementation of the Convention on Biological Diversity (IUCN 1995a).

Being aware of the importance of biodiversity conservation, the Government adopted the Convention on Biological Diversity (hereinafter CBD) on June 2, 1993 through its Decision No. 293. After deposition of the instrument of ratification at the Secretary-General of the United Nations in New York, the Czech Republic became a Party to the Convention on December 3, 1993 (the Convention came into force in March 1994).

The Czech Republic has become a Party to the majority of other international biodiversity-related conventions and agreements, such as:

- Convention on Wetlands of International Importance (UNESCO, Ramsar 1971, CR 1990)
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (UNEP, Washington 1973, CR 1992)
- Convention on the Conservation of Migratory Species of Wild Animals (UNEP, Bonn 1979, CR 1994)
- Agreement on the Conservation of Bats in Europe (UNEP, London 1991, CR 1994)
- Convention Concerning the Protection of the World Cultural and Natural Heritage (UNESCO, Paris 1972, CR 1990)
- Convention on the Conservation of European Wildlife and Natural Habitats (Council of Europe, Bern 1979, CR signature 1997, ratification 1998)
- Convention to Combat Deserticication in those Countries Experiencing Serious Drought and/or Desertification, particularly in Africa (UNEP, Paris 1994, CR 2000).

Recently, the Czech Republic has started to implement the *Pan-European Biological and Landscape Diversity Strategy* adopted by the *Third Ministerial Conference Environment for Europe* in Sofia, in October 1995 (COUNCIL OF EUROPE 1995). The responsible body is the Agency for Nature Conservation and Landscape Protection of the Czech Republic in Prague. Three priorities for implementation of the above-mentioned framework document were chosen among the Strategy Action Themes:

(a) Establishing the Pan-European Ecological Network (Action Theme 1)

(b) Integration of biological and landscape diversity protection principles into other sectors (Action Theme 2), not only in those traditionally connected with biodiversity, *e.g.* agriculture, forestry and fishery, but also such as trade, transport, energy etc.

(c) Raising awareness of both general public and decision-makers (Action Theme 3).

The Czech Republic is further Party to other important international conventions indirectly related to biodiversity. For example, in 1993 the Czech Republic became also a Party to the Framework Convention on Climate Change, which figures, similarly as the Convention on Biological Diversity, among the most important environmental conventions thanks to its global character. The Czech Republic closely co-operates with respective Secretariats in issues related to the implementation of conventions and with international organisations dealing with the environment, such as UNEP, Commission on Sustainable Development (CSD), IUCN –The World Conservation Union, BirdLife International or Wetlands International. (ROUDNÁ 1999)

As the implementation of environmental conventions have impacts to different sectors, special committees have been established at the Ministry of the Environment, enabling co-operation between different ministries and other supreme national bodies, such as the Czech Committee for the Convention on Biological Diversity, Czech Ramsar Committee and Inter-ministerial Committee for the Framework Convention on Climate Change. The Czech Committee for the Convention on Biological Diversity begun to develop its activities in 1997. Members of the Committee are representatives of different ministries (Ministry of the Environment, Agriculture, Foreign Affairs, Culture, Education, Industry and Trade, Health, Regional Development) and the Academy of Sciences of the Czech Republic. To ensure the scientific and technical co-operation, the Expert Panel was established within the Committee, composed of specialists from research institutes, universities, specialised agencies, NGOs and specialists from the Ministry of the Environment responsible for implementation of related conventions. Representatives of the Ministry of the Environment participate in activity of committees established under auspices of other ministries to support co-operation with some other international organisations dealing with environment, such as FAO (Ministry of Agriculture), UNESCO, Council of Europe or Economic Commission for Europe (Ministry of Foreign Affairs).

Also bilateral agreements, especially with neighbouring countries, support biodiversity conservation, mainly those developed in cross-border protected areas. It is important in this respect that all three National Parks of the Czech Republic are situated along the country boundary and two of them have already partners on the other sides of the border (Karkonoski Park Narodowy in Poland, Nationalpark Bayerischer Wald in Federal Republic of Germany). Within the IUCN project *Parks for Life*, the Czech Republic hosted two regional conferences dealing with cross border co-operation in nature conservation in the recent years – in 1995 in the White Carpathians and in 1996 in the Bohemian-Saxonian Switzerland.

In connection with the ongoing process of integration of the Czech Republic into European structures, the international co-operation aims at sharing experience with more advanced countries in this respect. It is reflected in programmes of bilateral co-operation with other European countries for the forthcoming period and in projects based on grants of international organisations. On the other hand, some projects linked with nature conservation have been prepared in the framework of *Development Assistance* offered by the Czech Republic to the East European countries.

The protection of biological diversity was set as one of the long-term priority areas of the *State Environmental Policy* adopted by the Czech Government of the Czech Republic in August 1995, without detailed analysis and proposed measures. As an integrated part of sustainable development and sectoral activities it is included also in the new *State Environmental Policy* based on a new situation in the Czech Republic and adopted in 1999. Application of biodiversity conservation is reflected in the *State Agricultural Policy* (PRAŽAN & ZÍDEK 1996, MINISTRY OF AGRICULTURE OF THE CZECH REPUBLIC 1999), as well as in *Basic Principles of the State Forestry Policy*, adopted in 1994 (MINISTRY OF AGRICULTURE OF THE CZECH REPUBLIC 1994). In June 1998 the Government of the Czech Republic adopted the *State Nature Conservation and Landscape Protection Programme of the Czech Republic* (MLCOCH *et al.* 1998). The document analyses the current situation, financial resources and defines priorities both in practical and legislative measures. The programme defines more than 40 medium- and long-term priorities for nature conservation and landscape protection in the Czech Republic and it is based on a cross-sectoral approach, integrating nature management issues in various sectors (agriculture, forestry, regional development, physical planning, transport, tourism, education, *etc.)*. In this respect it is closely connected with the above mentioned new *State Environmental Policy.*

Various programmes supported by the Ministry of the Environment and by the Ministry of Agriculture aim at conservation and sustainable use of agricultural and forest biological diversity.

In December 1993 a GEF grant was approved for the Biodiversity Protection Project in the Czech Republic. Three priority regions of threatened biodiversity were selected for the project: *Pálava Protected Landscape Area, Krkonoše National Park and Šumava National Park*. This project was related with similar activities in four other countries with economy in transition (Slovakia, Poland, Belarus, and Ukraine), forming thus the model for co-operation in transboundary conservation. The programme, originally launched for the period 1994 – 1996, continued until June 1998. The funds of GEF (2.0 million USD) were administered by the World Bank. The Ministry of the Environment of the Czech Republic, as the recipient of grant funds, co-ordinated implementation of the project in co-operation with the Ministry of Agriculture. A special Project Management and Co-ordination Unit was established. The project was evaluated at the end of November 1998. Some results can be used in conservation practices and planning, especially those regarding sustainable development strategies, management of floodplain forest in the Pálava Protected Landscape Area, research and monitoring activities, viticulture biological protection, public awareness, transboundary co-operation and certain aspects of NGOs activities. Experience gained in the project represents a part of know-how transfer in the framework of the Development Assistance of the Czech Republic to the Central and East European countries, offered since 1997 (THE WORLD BANK 1999).

In 1994, the IUCN European Programme started, through the Czech IUCN Project Co-ordination Unit, Prague, an extensive project entitled *National Nature Plan*, funded by the

Dutch Government, which was officially declared as a pre-preparation of the *National Biodiversity Strategy in the Czech Republic*.

4. Biological Diversity Strategy and Action Plan

The first steps to prepare the *National Biodiversity Strategy* were made in the former Czechoslovakia as early as in 1992. Under the supervision of the Federal Committee for the Environment, the *National Report of the Czech and Slovak Federal Republic* was compiled by leading experts of the Czechoslovak Academy of Sciences for the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro, in June 1992 (MOLDAN 1992). The process to prepare the *National Biodiversity Conservation Strategy* started in September 1992, but it was stopped in January 1993, when two sovereign countries were established.

In 1997, the Ministry of the Environment began to prepare both the *First National Report* as well as the *National Biodiversity Conservation Strategy of the Czech Republic*. The Agency for Nature Conservation and Landscape Protection of the Czech Republic was charged by co-ordination of both documents. The documents should deal with biological diversity at all three generally recognised levels (*i.e.*, genes, populations/species, habitats/ecosystems) and they should be based on an integrated approach, joining both biodiversity protection and maintenance of life-supporting ecosystem functions.

The objectives of the *National Biodiversity Conservation Strategy*, which should include both a national strategy and a more detailed action plan, is to implement the principles of the CBD in the Czech Republic in more details through national planning in various sectors, to contribute significantly to a long-term protection of country natural heritage and to its sustainable use and to stop and reverse the degradation of biological and landscape diversity in the Czech Republic, using *e.g.* the framework of the *Pan-European Biological and Landscape Diversity Strategy*.

In the course of the project, all relevant data on biodiversity, namely at the population level, should be gathered in target groups or taxa (number of described, endemic, keystone, flagship, rare or threatened and extinct species) and analyzed, using new IUCN criteria for Red List categories (IUCN 1995b), experience from other countries (WRI/UNEP/IUCN 1995) and SBSTTA and the Conference of the Parties resolutions and recommendations (UNITED NATIONS 1997, 1998). In addition, the same process should be applied for communities and habitats. Consequently, biodiversity hot spots should be identified within the country. The same inventory will be done for cultivated plants and domesticated animals. Threats to the Czech Republic biodiversity will be in details reviewed including factors threatening genetic diversity of organisms in human care, namely of domesticated species.

A concept of a comprehensive biodiversity programme for the country entailing a wide variety of activities should be then developed. The *"scenario analysis"* will aim at land and resources management, protected areas, non-reserved lands including Territorial System of Ecological Stability of Landscape as a basis for the European Ecological Network (EECONET, BÍNOVÁ *et al.* 1995) and sustainable resources management. For areas, which have been severely degraded or even destroyed, proposals for their restoration should be prepared with

respect to biodiversity conservation, using restoration ecology principles. The *National Biodiversity Conservation Strategy* should also deal with the legislation, conservation administration and policy, environmental education and eco- and agro-tourism. The *Action Plan* should identify both priorities for immediate actions and effectively support and develop biodiversity conservation national policy for a long-term period.

In addition to the governmental sector actions, some NGOs, *e.g.* the Czech Union of Nature Conservationists and the Society for Sustainable Living, as leading voluntary conservation bodies in the country, are supposed to be significantly involved in the process of preparing the *National Biodiversity Strategy in the Czech Republic* (MINISTRY OF THE ENVIRONMENT OF THE CZECH REPUBLIC 1996).

Preparation of the *National Biodiversity Conservation Strategy* has been funded by the Government of the Czech Republic through a special grant from the Council for Research of the Government of the Czech Republic to the Agency for Nature Conservation and Landscape Protection of the Czech Republic. In 1998 – 1999 some parts of the project were financed by the GEF through the World Ban

5. In-situ Conservation

5.1 Legal Framework of Nature Conservation and Landscape Protection

The main idea of the *Czech National Council Act No. 114/1992 on Protection of Nature and Landscape* is that not only specially protected parts of nature should be conserved for the future but that it is also extremely important to maintain basic natural processes in landscapes, stressing both diversity and stability of various biological systems. Therefore, the Act is based on a relatively modern integrated approach stressing both diversity and importance of life-supporting processes in various biological systems (UNEP 1995, PLESNÍK 1998). In addition, it also reflects new ownership relations after November 1989.

Officially, the purpose of the Act is to contribute to the preservation and restoration of the natural equilibrium in the landscape, to the protection of the diversity of all forms of life, natural values and beauty, and to the sustainable management of natural resources (CINC 1994b).

The fact that all animals and plants are in all their stages generally protected, with the exceptions of species important from the point of view of economy and epidemiology ("pests"), should also be mentioned.

Decree No. 395/1992 of the Ministry of the Environment aims at implementation of the Act.

5.2 Specially Protected Parts of Nature

A relatively well-managed system of Specially Protected Areas (Table 2) based on ecosystem approach has been mentioned above. Large-size Specially Protected Areas (*i.e.*, National Parks, NPs and Protected Landscape Areas, PLAs) cover 1,151,869 hectares, *i.e.* 14.61 % of the whole territory of the Czech Republic. On January 1, 2000, the fourth NP – the Bohemian Switzerland – was declared. As much as 561 small-size Specially Protected Areas covering 46,546 hectares have been established within the NPs and PLAs. 1,366 small-size Specially Protected Areas covering 39,751 hectares (0.47 % of the territory of the CR) are situated outside NPs and PLAs. In total, the Specially Protected Areas cover 15.07 % of the whole territory of the Czech Republic.

Under the Czech National Council Act No. 114/1992 on Protection of Nature and the Landscape, the management and development of all Specially Protected Areas (in both large-size and small-size ones) is controlled by their management plans. These plans include instructions for regulation of natural development and human activities, particularly in specially protected parts of nature. The State Nature Conservancy authorities, as a rule, approve the management plans for the period of ten years. These plans are used as a binding source for other types of spatial planning documents, especially for forestry plans and landscape planning documentation.

Table 2
Specially Protected Areas in the Czech Republic, 1999

Category	Number	Area in hectares	% of territory
Large-size Specially Protected Areas			
National Parks (NP)	3	110,304	1.40
Protected Landscape Areas (PLA)	24	1,041,565	13.21
Total	**27**	**1,151,869**	**14.61**
Small-size Specially Protected Areas			
National Nature Reserves (NNR)	117	27,147.90	0.34
National Nature Monuments (NNM)	100	2,686.82	0.03
Nature Reserves (NR)	653	30,152.56	0.38
Nature Monuments (NM)	1,051	26,310.59	0.33
Total	**1,921**	**86,297.87**	**1.08**
Small-size Specially Protected Areas within NPs and PLAs	561	46,546	0.53
Small-size Specially Protected Areas outside NPs and PLAs	1,366	39,751	0.47

Sources: Agency for Nature Conservation and Landscape Protection of the Czech Republic (unpubl.)

For the management of small-size SPAs and PLAs, 60 mil. CZK (1,82 mil. USD) were spent in 1998, funded by the Landscape Management Programme (see Chapter 4). National Parks Administrations allocated substantially greater amounts of funds for this purpose, as the forests on the NPs territory are directly managed by these administrations.

In total, 527 species are specially protected, being listed in three categories according to the level of threat (46 fungi, 436 vascular plants, 147 invertebrates, 17 fish, 28 amphibians/reptiles, 115 birds and 38 mammals).

The Czech National Council Act No. 16/1997 on Conditions of Import and Export of Endangered Species of Wild Animals and Plants (”CITES Act”) sets conditions for the import and export of endangered species of wild flora and fauna.

5.3 Nature and Biodiversity Conservation Outside Specially Protected Areas

Although the whole system of large- and small-size protected areas has been developed since the 1830s, the new legislation based on holistic or integrated approach has tried to deal with unprotected agricultural and forest lands, using the national concept of the Territorial

System of Ecological Stability of Landscape (TSES) at various levels. The concept of TSES started in the 1970s, being a pioneering ecological network at national, regional and local levels in Europe (MÍCHAL & PLESNÍK *in prep*). TSES is conceived as an ecological network of biocentres (core areas) and biological corridors. Most of the country (in 1998, approx. 98 % of the whole territory of the Czech Republic) has been classified using biogeographical, ecological and landscape criteria, and TSES elements of local, regional and supra-regional importance have been identified. In addition, the European Ecological Network (EECONET), consisting of similar elements of at least Central European importance was proposed for the Czech Republic in the framework of the IUCN European Programme project funded by the Dutch Government (MINISTRY OF THE ENVIRONMENT OF THE CZECH REPUBLIC 1998).

Under the Act, significant landscape elements must be protected against damage and destruction. They shall be solely used in a manner which does not impair their renewal and does not endanger or weaken their stabilising function. A significant landscape element, as an environmentally, geomorphologically or aesthetically valuable part of the landscape, creates the typical character of the landscape, or contributes towards its stability. Significant landscape elements are forests, peat bogs, watercourses, ponds, lakes or floodplains. Other sites can be designated as significant landscape elements by State Nature Conservancy authorities (incl. geological sites or historical parks and gardens). Specially protected parts of nature are excluded from this definition.

For enhancing both ecological processes and diversity in a non-protected landscape, special landscape management programmes have been launched in the last years. The *River System Restoration Programme* started in 1992 and aims at re-establishing a near-nature drainage regime of water streams in the landscape. A joint *Landscape Management Programme* of the Ministry of Agriculture and Ministry of the Environment was adopted to support non-productive functions of agriculture and maintain biological and landscape diversity. The programme entitled *Programme for Small Water Management Facilities* is also dealing with landscape protection, management and use. In 1998, the Ministry of the Environment allocated in total 650,000,000 CZK (19,7 mil. USD) for these three programmes (MLCOCH *et al.* 1998) and in 1999 this sum was 790 mil. CZK (24 mil. USD).

The Ministry of Agriculture supports some other activities aiming at conserving the country biodiversity heritage, *e.g.* grassland management, biological control, organic farming, care for genetic variability of domestic plants and animals (see Chapters 6.3, 6.4, 7.2, 7.3).

The draft of the *State Agricultural Policy* (PRAŽAN & ZÍDEK 1996) includes in the chapter dealing with environmental protection also basic guidelines for maintaining the agrobiodiversity.

Forestry operations are planned for both short-term and long-term periods based on a very detail system of forest classification (probably one of the most complex worldwide). For their implementation, the owner of a forest is fully responsible. The owner who has more than 500 hectares of forests has to prepare *Forest Plan* for a ten-year period, which can be improved after five years. For less than 500 hectares of forests, the owner has to prepare only *Management Guidelines* as a framework for his further activity.

The Ministry of Agriculture subsidies forest management under certain conditions (in 1997, 744 mil. CZK = 22,6 mil. USD). The subsidies aimed at restoration of forests affected by air pollution, fertilisation and liming of forests, afforestation of the forest land, environmentally friendly technologies in forestry practices and extra-production functions of forests incl. maintaining the forest biodiversity (see Chapter 9).

5.4 Invasive Species

Invasive plant and animal species are studied in the Czech Republic by specialized institutions and organizations in environmental and agricultural sector, in Academy of Sciences of the Czech Republic and in universities.

Institutions under the Ministry of the Environment:

- Agency for Nature Conservation and Landscape Protection of the Czech Republic

  At the present, the Agency is preparing in co-operation with institutions mentioned below the review on invasion of *Heracleum mantegazzianum*, *Impatiens glandulifera* and *Reynoutria* spp in the Czech Republic. In addition, the publication on management of these invasive plant species, including prevention of them, is under preparation.

- Administration of Protected Landscape Areas of the Czech Republic

  Administration Offices of Protected Landscape Areas are responsible for invasive species management. Depending on their capacities, they also develop research and public awareness activities regarding invasive species.

- District Offices, Departments of the Environment

  According to their capacities, they deal with invasive species management and raising public awareness.

- Research Institute of Ornamental Gardening

  Some projects of the Institute study invasive species issues, especially their impact to ecosystems.

Institutions under the Ministry of Agriculture:

- State Phytosanitary Service

  The Service monitors pathogens in co-operation with District Offices. Among others, it issues the decision on plague of relevant invasive species, which allows controlling or eradicating the species by issuing a District Office regulation.

- River Basin Administrations and Forests of the Czech Republic

  These bodies deal with invasive species management and control in lands which they directly manage (riparian growths, managed forests).

In the framework of various projects, several institutes of the Academy of Sciences of the Czech Republic (Institute of Botany, Institute of Experimental Botany, Institute of Entomology) and universities (Charles University, Prague, Masaryk University, Brno, Czech University of Agriculture, Prague, Mendel University of Agriculture and Forestry, Brno) study invasive species.

Neither general nor special detailed plan of the Government of the Czech Republic on invasive species control and management exist. Therefore measures of the State Nature Conservancy authorities are based on present legislation on nature conservation, landscape management and protection of the environment.

Generally, it is possible to receive financial subsidies for invasive species management from two sources: the Ministry of the Environment Landscape Management Programme and from the State Environmental Fund, based on their rules.

5.5 EU Accession Process and Nature Conservation in the Czech Republic

Since the late 1990s the environmental policy development has been driven by the prospect of future membership of the Czech Republic in the European Union and the need to harmonise Czech laws with EC legislation. A comprehensive process aiming at approximation of the environmental legislation of the Czech Republic to EU was officially started. Since 1995, preparatory work has been under way to harmonise Czech nature conservation laws with EC directives, especially with the Birds and Habitats Directives. During this time, comparison of both legislative systems has been carried out for nature management and biodiversity protection. The overlap between the EC and Czech legislation in nature conservation is about 70 %: in some aspects, the nature conservation legislation in the Czech Republic is even better developed. A special attention has been paid to establishing the EC NATURA 2000 Network. For this purpose, establishing of the EMERALD Network under the Bern Convention can be used. The screening process started in January 1999, at the European Commission in Brussels.

6. Plant Diversity

6.1 Present Status of Flora

Table 1 demonstrates a striking threat to many wild plant species. Habitat deterioration and destruction due to an unsustainable development is the main cause of this situation. The impacts can be direct (construction of houses, roads, dams and water reservoirs, regulation of rivers, drainage, changing natural or seminatural habitats into cultivated plots, such as arable lands, monotonous species-poor grasslands or plantations of non-native trees etc.), or indirect (transmitted) from a sometimes very distant source (environmental pollution and contamination, change of hydrological situation of whole regions – watersheds, invasion of unwanted species, etc.). Some species disappear when traditional land-use has been abandoned, *e.g.* critical situation of the Spring Gentian (*Gentiana vernalis*) or two rare Pasque Flowers (*Pulsatilla*):

the Spring Pasqueflower (*Pulsatilla vernalis*) and the Eastern Pasqueflower (*Pulsatilla patens*).

Native species are generally protected by the law (Act No. 114/1992 on Protection of Nature and the Landscape), specially by the Decree No. 395/92 in categories according to their threat category (as determined by the Red List), and in Specially Protected Areas. In the protected areas a particular attention is paid to the endemic and threatened taxa which often have motivated the establishment of certain protected areas. Many small-size Nature Reserves and Nature Monuments are being specially managed with the objective to preserve or even to enhance the populations of those species of special interest.

Several institutions (scientific-research institutes, botanical gardens, universities, museums, National Parks and Protected Landscape Area Administrations) also practise ex-situ protection by establishing seed banks and/or tissue cultures, and by cultivation. The final aim of the above efforts is always to bring the respective species back into wild, either to the original or to a substitute habitat.

Some measures are being experimented (or rather suggested) to use environmentally beneficial functions of some rare and threatened plants to creative nature conservation and landscape protection: in the process of reclamation of derelict devastated places, such as open cast mines, quarries and pits, as components of anti-erosion plantations, for water course restoration etc, thus also creating new habitats of those plants in the cultural landscape.

Decline of intensive agriculture, much lower application of toxic chemicals in agriculture and forestry, as well as an evident reduction of pollution (the atmospheric one in particular) have brought some changes and ameliorate the present situation. This is for example documented by a slightly increasing occurrence of such sensitive and vulnerable plants as the Orchids (*Orchideaceae*). One of the rarest and most carefully monitored European orchid – the Lady's slipper Orchid (*Cypripedium calceolus*), now in the Czech national category C 2, shows in some parts of the country rather considerable improvements in the status of its populations: this is partly due to the above mentioned general environmental changes, partly thanks to a successful site management.

However, the case described above, does not allow to tackle the problems and tasks of wild plant conservation less seriously. One of great new emerging dangers are non-native species, particularly the invasive ones. They suppress the native flora and vegetation, and sometimes even threaten the human health. As the most striking case can be mentioned the fast spreading (particularly in West Bohemia) Giant Hogweed (*Heracleum mantegazzianum*). The fact that even creation of ecological networks can have an adverse result in facilitating the spreading of some invasive species, gives a clear evidence of complexity of this problem. Therefore, the conservation has to be dealt in relation to the plant life.

In recent years the Agency for Nature Conservation and Landscape Protection of the Czech Republic started a pilot study on the identification of Important Plant Areas (IPAs) in the Czech Republic, as recommended by the European protected area action plan *Parks for Life*. This project is co-ordinated by the PLANTA EUROPA with the aim to conserve wild plants in Europe.

6.2 Plant Communities and Degree of their Endangerment

As a result of a long years investigation, an inventory of plant communities of the Czech Republic was published in 1995 (MORAVEC *et al*. 1995). This includes category of communities, degree and nature of their endangerment and information on their distribution at the end of this century. Plant communities are arranged in a hierarchical phytocoenological system, which is divided into 44 classes, 74 orders and 150 alliances. In total it includes 665 associations. The results are summarized in Tab. 3, where the total number of associations in individual classes and their percentage distribution into categories of endangerment can be found.

Table 3
Representation of Associations of Individual Classes in Categories of Endangerment (in %)

Class	Category of Endangerment				Number of ass.
	1	2	3	4	
A. Primary (natural) communities					(316)
Forests and Woods					(86)
Rhamno-Prunetea	0	11	78	11	9
Salicetea purpureae	0	0	100	0	5
Alnetea glutinosae	0	0	100	0	6
Querco-Fagetea	0	11	87	2	45
Quercetea robori-petraeae	0	33	67	0	6
Erico-Pinetea	0	100	0	0	1
Vaccinio-Piceetea	0	36	57	7	14
Alpine and subalpine communities					(29)
Juncetea trifidi	0	0	71	29	7
Salicetea herbaceae	0	0	50	50	2
Mulgedio-Aconitetea	0	0	33	67	18
Betulo carpaticae-Alnetea viridis	0	0	100	0	2
Mire communities					(24)
Oxycocco- Sphagnetea	0	60	40	0	10
Scheuchzerio-Caricetea fuscae p.p. (*Scheuchzerietalia pal*.)	7	57	36	0	14
Fresh-water communities					(66)
Lemnetea	0	36	28	36	14
Charetea fragilis	0	29	42	29	7
Potametea	3	37	26	34	35
Isoeto-Littorelletea	14	58	14	14	7
Utricularietea	0	100	0	0	3
Reed-sedge swamps, littoral and spring communities					(71)
Phragmito-Magnocaricetea p.p. (excl. *Caricion rostratae* et *Caricion gracilis*)	0	44	36	20	36

Isoeto-Nanojuncetea	0	62	23	15	13
Galio-Urticetea (*Convolvuletalia sepium* et *Petasito-Chaerophylletalia*)	0	22	45	33	9
Montio-Cardaminetea	0	8	46	46	13
Rock-ledge and scree communities					(38)
Asplenietea trichomanis	0	33	67	0	12
Thlaspietea rotundifolii	0	25	75	0	4
Festuco-Brometea p.p. (excl. *Festucion valesiacae* et *Brometalia erecti*)	0	32	64	4	22
Psammophytic communities					(2)
Koelerio-Corynephoretea	0	0	100	0	1
Festucetea vaginatae	0	100	0	0	1
B. Secondary (substitute) communities					(349)
a) Seminatural communities					(221)
Halophytic communities					(6)
Crypsietea aculeatae	50	50	0	0	2
Thero-Suaedetea	100	0	0	0	1
Thero-Salicornietea strictae	100	0	0	0	1
Festuco-Puccinellietea	0	100	0	0	2
Communities of hay meadows, pastures (meso- and hygrofilous), sedge-fens and healths					(122)
Molinio-Arrhenatheretea	9	43	39	9	66
Nardo-Callunetea	0	43	57	0	23
Phragmito-Magnocaricetea p.p. (*Caricion rostratae* et *Caricion gracilis*)	0	46	54	0	13
Scheuchzerio-Caricetea fuscae p.p. (*Caricetalia fuscae*)	10	80	5	5	20
Communities of xerophilous grasslands and hedges					(79)
Sedo-Scleranthetea	4	20	76	0	25
Festuco-Brometea p.p. (*Festucion valesiacae* et *Brometalia erecti*)	0	39	61	0	46
Trifolio-Geranietea sanguinei	0	13	87	0	8
Communities of woodland clearings					(14)
Epilobietea angustifolii	0	0	29	71	14
b) Anthropogenic communities					(128)
Robinietea	0	0	0	100	3
Bidentetea tripartitae	0	0	33	67	6
Chenopodietea	0	15	26	59	39
Artemisietea vulgaris	0	9	36	55	11
Galio-Urticetea p.p. (*Lamio albi-Chenopodietalia boni-henrici*)	0	0	14	86	22
Agropyretea repentis	0	0	14	86	7
Plantaginetea majoris	0	19	54	27	26
Secalietea	0	17	66	17	12
Parietaritea	0	0	100	0	2

Source: MORAVEC *et al.* (1995)

Classes are divided into the following major groups:

A. Primary (natural) plant communities, i.e. communities of spontaneous origin occupying natural habitats, the existence of which does not depend on human activity.

B. Secondary (substitution) plant communities which replaced primary plant communities due to human activities, and the existence of which depends on these activities. This group can be divided further into:

a) seminatural communities developed spontaneously mostly from indigenous species (therefore sometimes also called natural or near-natural communities) on soils created through natural processes, with natural surface,

b) anthropogenic communities developed with participation of synanthropic species on soils strongly influenced or even created by man, mostly without natural surface (fields, ruderal places, building plots, road and railway embankments, etc.).

The classes of natural and seminatural vegetation are grouped in physiognomic-ecological groups, which correspond to similar biotope-types. Some classes share both natural and seminatural communities (e.g., *Scheuchzerio-Caricetea fuscae, Phragmito-Magnocaricetea, Festuco-Brometea, Galio-Urticetea*). The mire communities, followed by some meadow, fresh-water and littoral communities, as well as by subcontinental psammophilous communities belong to the most threatened communities. Among the fresh-water communities a relatively high percentage of associations without endangerment can be found, the expansion of which is supported by eutrophication of water. Natural woodland communities prevailing in the country in the past belong (with one exception) to the less endangered communities (mostly category 3), but only very few communities are not endangered at all. Alpine and subalpine communities as well as rock ledge and scree communities are also only slightly endangered. The highest percentage of plant communities not endangered in the group of anthropogenic communities where no extinct associations are known and only small number of associations immediately endangered (category 2) can be found.

The following category of endangerment are used:

1 association already extinct or probably extinct

2 association immediately endangered through human activity and in danger of extinction
- a rare
- b enough frequent

3 association disappearing due to human activity
- a rare
- b enough frequent

4 association not endangered by human activity
- a rare
- b enough frequent

Extinct or probably extinct associations are as follows:

Class

Association

Potametea

Potametum colorati

Isoëto-Littorelletea

Pilularietum globuliferae

Crypsietea aculeatae

Crypsietum aculeatae

Thero-Suaedetea

Spergulario marginatae-Suaedetum prostratae

Thero-Salicornietea strictae

Salicornietum prostratae

Scheuchzerio-Caricetea fuscae

Amblystegio scorpioidis-Caricetum limosae

Sphagno-Caricetum appropinquatae

Carici chordorrhizae-Sphagnetum apiculati

Molinio-Arrhenatheretea

Veronico longifoliae- Filipenduletum

Lathyro palustris-Gratioletum

Cnidio-Violetum elatioris

Juncetum atrati

Lysimachio-Filipenduletum picbaueri

Veronico longifoliae-Euphorbietum lucidae

Sedo-Scleranthetea

Acetosello tenuifoliae-Festucetum valesiacae

Number of extinct (category 1) or immediately endangered associations (category 2) according to vegetation classes is demonstrated in Table 4.

Table 4

Number of Extinct and Immediately Endangered Associations in Individual Vegetation Classes

Category of endangerment	**1**	**2**
Class		
Molinio-Arrhenatheretea	6	28
Scheuchzerio-Caricetea fuscae	3	24
Festuco-Brometea	0	25
Phragmito-Magnocaricetea	0	22
Potametea	1	13
Nardo-Callunetea	0	10
Isoeto-Nanojuncetea	0	8
Sedo-Scleranthetea	1	5
Oxycocco-Sphagnetea	0	6
Chenopodietea	0	6
Isoeto-Littorelletea	1	4
Vaccinio-Piccetea	0	5

Lemnetea	0	5
Plantaginetea majoris	0	5
Querco-Fagetea	0	5
Asplenietea trichomanis	0	4
Utricularietea	0	3
Crypsietea aculeatae	1	1
Festuco-Puccinellietea	0	2
Quercetea robori-petraeae	0	2
Charetea fragilis	0	2
Secalietea	0	2
Galio-Urticetea	0	2
Thero-Suaedetea	1	0
Thero-Salicornietea strictae	1	0
Erico-Pinetea	0	1
Festucetea vaginatae	0	1
Thlaspietea rotundifolii	0	1
Trifolio- Geranietea sanguinei	0	1
Rhamno-Prunetea	0	1
Artemisietea vulgaris	0	1
Montio-Cardaminetea	0	1
TOTAL	15	196

Source: MORAVEC *et al*. (1995)

The coenodiversity of the Czech Republic has been influenced mainly by the following factors:

1 large-scale agricultural and forest management which resulted in the biotop diversity of the landscape;

2 global eutrofication as well as acidification of soils and waters not only due to higher nitrogen and sulfur-oxide content in atmospheric precipitations but also due to large-scale application of mineral nutrients from the air;

3 expansion of some aggressive plant species (supported by global eutrofication), both indigenous (as *Urtica dioica* or *Arrhenatherum elatius*) and neophytic (as *Impatiens parviflora*) into natural and seminatural plant communities, followed by suppression of indigenous species of low competitive ability in these communities.

Changes in economy as well as in ownership of agricultural and forest land in the Czech Republic after the 1989 revolution lead to new management practices and promise to have favourable consequences to the environment and its components, including plant communities.

6.3 History of Protection and Use of Agricultural Plant Genetic Resources – Gene Banks

Activities in the field of agricultural plant genetic resources have a long and successful tradition in the Czech Republic. They have been developed in various research and selection stations since the beginning of this century. Important collections of crop plants were conservated especially in the Agricultural and Botanical Research Station at Tábor (1880 -

1919), in Chemical and Physiological Research Station of the Technical University at Jenec near Prague (1898 - 1920), in Moravian research institutes in Brno and State research institutes in Prague (since 1919, but especially during 1930s and 1940s). The Research Farm at Uhríneves (founded in 1920, to which *e.g.* collections from Tábor were transferred) and Moravian Institute for Selection of Crop Plants contributed greatly to conservation and study of genetic resources. Many valuable regional varieties and old selected cultivars were conserved there, especially of wheat, barley, oats, legumes, hop, feed crops, fruit trees and vegetables. Number of them were later used for selection. During the World War II a great collection of flax was established and completed at Šumperk.

At the beginning of 1950s new crop research institutes were established (such as the Cereal Institute at Kromeríž, Fodder Plants Institute at Troubsko near Brno, Grass Research Station at Rožnov and others), to which existing collections were gradually transferred. In 1951 the Research Institute of Crop Production Prague (RICP) was established, where at this time three thousand main agricultural crop selected varieties (and totally more than 6,000 selected varieties) were collected. Activities regarding plant genetic resources have been further developed and co-ordinated by the Research Institute of Crop Production Prague, where also *the National Information System on Genetic Resources* (EVIGEZ, now on web-site: http//www.vurv.cz) and the National Gene Bank have been established. Gradually 25 institutes and other institutions of the former Czechoslovakia had been involved in these activities. In 1992, after inventory of collections, 37,800 samples were registered. After splitting of the former Czechoslovakia, some collections were endangered (*e.g.*, the vegetable collection of the former Vegetable Institute in Olomouc, the sugar cane collection and others). Moreover certain specialized collections were only in Slovakia, with no representation in the Czech Republic. This critical situation was solved due to the initiative of the Ministry of Agriculture of the Czech Republic, which launched in 1993 so called *National Programme on Plant Genetic Resources Conservation and Utilization* as a long term expert activity programme. Within this National Programme ten institutes and institutions co-operate and co-ordinate collection, documentation, evaluation, conservation and use of genetic resources at a level comparable with international standards. Number of samples in collections reached 50,000. Collections were completed with formerly missing species, documentation and conservation level was improved and international co-operation developed.

6.4 National Programme on Agricultural Plant Genetic Resources Conservation and Utilisation

Genetic diversity existing within particular agricultural crops (gene pool) is maintained by research and breeding institutions of all countries in so-called *collections of plant genetic resources*. Usually registered or restricted cultivars, landraces, primitive cultivars, experimental lines (carrying significant genes) as well as wild relatives of cultivated plant are gathered in collections. Genes and gene complexes, which originate from these genetic resources, are utilised in the breeding of new, better adapted cultivars, with higher yield of products and tolerance (resistance) to stress.

Similarly to other countries, diversity of crops in agricultural systems has been decreased also in the Czech Republic. Diversity of local well-adapted landraces has been replace by a much narrower spectrum of not too genetically distant bred cultivars during the last century and especially during the last 40 - 50 years. In many cases, valuable and irreplaceable resources were lost.

The Food and Agriculture Organisation of the United Nations (FAO) is an important institution, which deals with plant genetic resources conservation and utilisation in agriculture. One of the tasks of FAO is to create and develop an international network of agreements, mechanisms and tools, which should support conservation and utilisation of plant genetic resources on a global scale. For example, the FAO organises the International Network of Base Collections, the Early Warning System on Plant Genetic Resources and other activities.

The International Plant Genetic Resources Institute (IPGRI) in Rome is another key organisation with a global mandate, which is involved in a co-ordination of international co-operation on plant genetic resources conservation and utilisation. This institute has close links to FAO, its activities are (besides others) oriented to projects in the particular regions. For Europe, the European Co-operative Programme on Plant Genetic Resources (ECPGR) was launched in 1980. Former Czechoslovakia joined the Programme in 1983.

The Czech Republic has a long tradition and skilled specialists in the sphere of plant genetic resources. *Operational Information System on Plant Genetic Resources* (EVIGEZ) is available as well as national gene bank for conservation of all seed-propagated collections, with technology meeting international standards. A crisis in plant genetic resource study and conservation came in the early 1990s due to strong cuts in the budget for agricultural research, privatisation of institutes supervising collections (or even their abolishment) as well as due to splitting of former Czechoslovakia into Czech and Slovak Republics. These unfavourable circumstances have been overcome by the decision of the Ministry of Agriculture of the Czech Republic in 1993 to launch the *National Programme on Plant Genetic Resources Conservation and Utilisation.*

This project covers all basic activities on plant genetic resources (PGR), namely collection of material (including land races and wild relatives), its characterisation, evaluation, documentation, conservation and services to users. At present, eleven institutions in the Czech Republic are involved in this project, three of them represent public sector and eight belong to private sector (firms dealing with agricultural research, breeding and services for agriculture). Project is guaranteed by the Department of Gene Bank in the Research Institute of Crop Production (RICP) Prague – Ruzyne, co-ordination and consultations are provided by the Czech Board on Plant Genetic Resources, of which representatives of the Ministry of Agriculture, Gene Bank, curators of collections, breeders and other specialists are members.

The RICP also provides services of the *National Information System on PGR (EVIGEZ)* and long-term maintenance of all seed propagated collection. At the end of 1997, 49,163 accessions of PGR were maintained in all collection in the country, among them 8,232 accessions of species propagated by a vegetative way (16.7 %). The Czech Board on Plant Genetic Resources serves as an advisory body to this project.

The programme has the following goals and main tasks:

1. Long-term conservation of plant genetic resources for future needs.
2. Gathering (including collecting missions), evaluation, documentation and long-term maintenance (in both active and base collections) of indigenous plant genetic resources.
3. Systematic and concentrated effort to increase collections that meets the needs of local breeders and researchers and gathering broad genetic diversity.
4. Systematic evaluation and study of collections and their description, aimed at the choice of convenient donors of important characters.
5. Documentation of plant genetic resources, creation of databases of passport and evaluation data, international exchange of data.
6. Widening of the spectrum of collections with new crops in co-ordination with the needs of farmers and breeders.
7. Gathering knowledge on plant genetic resources for the further development of breeding, and broadening the existing diversity of both crops and cultivars in plant production.
8. Access to plant genetic resources and relevant information for users within the country and abroad. International exchange of information.

Table 5

Status of Documentation of Plant Genetic Resources in Collections in the Czech Republic in the National Information System (EVIGEZ) - Number of Accessions Where Some Data Are Available

Institution	Number of Accessions	Crop Collections
RICP Praha – Gene Bank	15,191	selected cereals, sunflower, maize, beet, minor crops
RICP – Gene Bank Olomouc	9,677	vegetables, arom. and med. plants
RICP – RSV Karlštejn	857	grape vine
ARI Kromeríž	5,369	selected cereals
AGRITEC Šumperk	4,464	legumes, fibre plants
PRI Havl. Brod	1,485	potatoes
RIFC Troubsko	1,718	fodder crops, esp. legumes
GRS Zubrí	3,097	grasses
RIOC Opava	1,038	oil crops
HI Žatec	299	hop
RIFGB Holovousy	2,217	fruit plants
RIOG Pruhonice	1,474	selected ornamental plants
MAFU Brno – FH Lednice	1,253	selected fruit trees, vegetables and ornamental plants, grape vine (part of collection)

Source: DOTLACIL & ŠTOLC (1998)

In 1997 the collections increased by 2,756 newly arrived accessions. Most of them (1,685 accessions) were obtained through international exchange, 549 accessions were provided by local donors. Important materials were collected within the country (416 accessions) as well as abroad (106 accessions), most of them are wild relatives and land races of fodder crop, medicinal plants, vegetables and fruit trees. These activities are preferably oriented to endangered materials and natural localities. Extensive exchange of PGR between the Czech Republic and the Slovak Republic was aimed at filling gaps in those collections in both countries, which were located only in one of both parts of former Czechoslovakia.

Significant progress has been reached in PGR documentation in the last two years. Passport data are now available in more than 95% of accessions in collections. Also amount of evaluation data has almost doubled when compared to the previous year and reached 10,252 accessions (23.5% of all accessions in collections). Other relatively extensive files of evaluation data are under processing and will be soon included in information system.

Table 6
List of Collections in the Czech Republic at the End of 1998 (excluding duplications)

Crop (Group of Crops)	Number of Accessions
Cereals	15,058
Maize	1,643
Legumes	2,423
Oil Plants	664
Fibre Plants	1,898
Root Crops	236
Potatoes	724
Fodder Crops	2,322
Hop	239
Tobacco	200
Vegetables, Aromatic Plants	8,500
Fruit Crops	2,736
Grapevine	1,733
Tropical and Subtropical Crops	80
Ornamental Plants	4,350
Collections of Different crops in the State Institute for Testing and Control	300
TOTAL	43,106

Source: DOTLACIL & ŠTOLC (1998)

As it is obvious from this survey, whereas almost all collections are well documented in passport data, level of documentation as concerns evaluation data is very different according to institution. Evaluation data can increase the value of PGR for users, therefore fast progress in this field is one of the priorities.

Beside the databases of passport data and evaluation data also documentation of the seed store in the gene bank is an important part of information system EVIGEZ. In 1997 new activities in EVIGEZ have been initiated - technical and personal preconditions were created for approach to the Internet as well as for image analyses application within the system. Important activities in this respect are also carried out at international level. The Czech Republic has responsibility for European Wheat Database (in co-ordination with France, the counterpart in the Czech Republic is RICP Prague), European Flax Database (AGRITEC Šumperk) and databases of selected grasses (GRS Zubrí).

Study and evaluation of collections have been carried out by all institutions. Evaluation data are based on the National Descriptor Lists, which are now available for 29 species (or genera). In 1997 new Descriptor Lists for *Cicer, Linum, Cucurbita, Cucumis, Lactuca, Tulipa, Vitis* and for grasses were completed, what prepared precondition for further progress in evaluation of collections.

Basic task of the work on genetic resources is their maintenance for the next generations. Therefore, fast regeneration of endangered accessions and their conservation under standard conditions is very urgent, especially in seed propagated species, where part of collections is still maintained out of the gene bank and will have to be regenerated first. There were 7,163 accessions regenerated in 1997 and 4,160 of them were transferred into the active

collection in gene bank (-5°C), accessions of local origin also in duplication to base collection (-15°C). Institutions involved in the National Programme on Plant Genetic Resources distributed 2 807 samples to local users and 1,461 accessions were sent abroad (DOTLACIL *unpubl.*).

7. Animal Diversity

7.1 Present Status of Fauna

Table 1 shows that a lot of native animal species living in the Czech Republic are threatened. Similarly to other parts of the world, habitat fragmentation and loss is considered to be the most serious threat, following by invasive and alien species. Especially in the past, some animal species, namely large carnivores, disappeared as a result of overhunting or direct persecution by man. The European Suslik (*Spermophilus citellus*) is a good example of animal species affected by the change of the traditional agricultural production into industrial large-scale production in the 1970s. As consequence this species has drastically declined to the critical minimum. Results from 126 sites in the Czech Republic show that stream regulation and water pollution substantially affect the occurrence and distribution of freshwater fauna. This is particularly obvious in mechanically regulated watercourses. On the other hand, since the beginning of the 19th century, e.g. number of Red Deer (*Cervus elaphus*) has increased throughout the Czech Republic to such degree that this species has caused significant large-scale damage to forest ecosystems.

Habitat protection and ecologically sound management of ecosystems is the most cost-effective approach to preserve the diversity of species in a given territory. However, in many cases, species highly threatened with extinction require urgent measures of protection. Under the Czech National Council Act No. 114/1992 on Protection of Nature and the Landscape, all State Nature Conservancy authorities must establish Action Plans for Specially Protected Species listed in the Ministry of the Environment of the Czech Republic Decree No. 395/1992. Action Plan consists of proposal for and implementation of special conservation measures (*e.g.*, management *in situ*, captive breeding, re-introductions, translocations, transfers, *etc.*). Nevertheless, species recovery should be restrictive and considered only for crisis situations. Action Plans should be oriented first of all towards protection and stabilisation of the existing populations and then, to restore part of the historical distribution and to link isolated populations. Re-stocking and re-introduction may be taken into account.

In contrast to Management Plans for Specially Protected Areas, only a few Action Plans for Specially Protected Species have been officially launched and put into praxis for wild animals in the Czech Republic. Therefore, within the framework of the project *Biodiversity Conservation* the Agency for Nature Conservation and Landscape Protection of the Czech Republic prepared guidelines for action plans for animal species based on current home and foreign experience. Nevertheless, in case of 266 Specially Protected Species research or conservation measures in both their population and habitats have been carried out. Among successful stories, re-introduction of Lynx (*Lynx lynx*) in the Šumava/Bohemian Forest Mts.

and of the White-tailed Eagle (*Haliaetus albicilla*) in the Trebon Basin Protected Area and Biosphere Reserve in the 1980s should be mentioned.

7.2 History of Protection and Use of Farm Animals Genetic Resources

Protection and use of farm animal genetic resources has a long tradition in the Czech Republic. A new trend in the care of animal genetic resources developed since 1960s and 1970s within FAO was applied at the very beginning even in the former Czechoslovakia. Czechoslovak specialists participated in important international meetings, such as the FAO Meeting in Rome, in 1985 or in Warsaw, in 1986. Numerous national meetings were also organized on importance and methods of protection of endangered farm animal genetic resources by the Czechoslovak Academy of Agricultural Sciences and by the Ministry of Agriculture in Prague and in Bratislava. These efforts resulted in adoption of a new Act No. 240/1991 on Breeding and Reproduction of Farm Animals and its Decree No. 326 of May 15, 1992. The species and breeds of farm animals included in this Act became a basis of further development of directed protection and use of farm animal genetic resources.

In 1992 the Czechoslovak Academy of Agriculture Sciences published the book *Keeping and Use of Genetic Banks in Breeding of Farm Animals* (Textbook of CAAS No.159, Prague, 1992). *Project on Protection of Genetic Resources of Farm Animals* (MÁCHA 1994) was elaborated for the Ministry of Agriculture of the Czech Republic. In 1995 the Research Institute of Animal Production in Prague – Uhríneves was nominated the National Focal Point for co-operation with FAO.

The Research Institute of Animal Production prepared the *National Programme of Preservation and Utilisation of Animal Genetic Resources* (1995), organized discussion on methodology of protection and use of individual breeds (1996) and nominated the Council of Animal Genetic Resources (1997). Technical and organizational measures are continually taken in co-operation with the Ministry of Agriculture, breeding confederations, research institutes and agricultural universities within the FAO Global Programme.

7.3 Genetic Diversity of Farm Animals and its Management

Active high input – high output breeds usage/and development is in the Czech Republic very well organised due to a long-term breeding policy of all farm animal species accompanied by a high quality of selection and hybridisation programmes including breeding value estimation of individual animals, reproduction and production monitoring a permanent progress. Moreover, since 1991 the Act No. 240 on Breeding and Reproduction of Farm Animals has been in force, amendment of which is being prepared.

In accordance with the Convention on Biological Diversity, FAO began to develop activities regarding management of global animal genetic resources. In the Czech Republic, the Research Institute of Animal Production Prague-Uhríneves (RIAP) as designated National Focal Point (NFP) co-ordinates actions.

In 1995 RIAP organised the 46th Annual Meeting of EAAP (European Association of Animal Production) in Prague. The first workshop of the National Focal Points was an official part of the EAAP meeting, chaired by FAO. Also the EAAP Working Group on Animal Genetic Resources was presented in the workshop. The FAO representative demonstrated an emulated pre-test version of the first stage of FAO Domestic Animal Diversity Information System (DAD-IS), which was improved through revision and completion of given data in 1996. The Czech NFP elaborated new additional questionnaires about domestic farm animal breeds, which were published in the *World Watch List for Domestic Animal Diversity, 2nd edition* (FAO 1995).

Apart of the FAO Watch List, the EAAP Working Group on Animal Genetic Resources published the handbook on genetic diversity of European livestock breeds (SIMON & BUCHENAUER 1993). At the 3rd National Co-ordinator meeting in Vienna, it was decided to update the EAAP animal genetic data bank (EAAP-AGDB) and to transfer it to the FAO DAD-IS. The NC (NFP) organised the validation of all data published in 1993 and the filling in of the new questionnaires for all farm animal breeds kept in the Czech Republic (cattle 15, sheep 18, pigs 6, horses 6, goats 2). All questionnaires were sent to the Institute for Animal Breeding and Genetics, Hannover School of Veterinary Science, Hannover, Federal Republic of Germany, to continue the former collaboration with EAAP.

In all the breeds kept in the Czech Republic all farm animal of mostly autochthonous breeds with limited and declined numbers of animals for their utilisation, presentation and conservation are also included.

The Czech Republic (and former Czechoslovakia) devoted much effort to the conservation of animal genetic resources of small and mainly autochthonous breeds. Purposefully support and preservation of such animals cannot be omitted not only from the biological, but also from cultural and historical point of view.

The already mentioned Act No. 240 includes a separate article on farm animal genetic reserves, and the decree published later indicates the factual breeds. Already more than 400 years the Stud in Kladruby has existed, where in 1995 the breed of an autochthonous horse breed of Old-Kladruby horse was declared as Natural Cultural Monument under the name *National Stud in Kladruby*. The stud was founded in 1579, and at present includes approximately 130 fullblood mares of both colour varieties (white and black) with complete pedigree. The function of the National Stud in Kladruby is supported by the Ministry of Agriculture of the Czech Republic.

As it has been mentioned, the Research Institute of Animal Production in Prague-Uhríneves, in agreement and with assistance of the Ministry of Agriculture prepared in 1995 the *National Programme of Preservation and Utilisation of Animal Genetic Resources*. The National Programme includes methodical projects of the protection and utilisation of local animal genetic resources, elaborated by responsible supervisors (mostly scientists) under the leadership of the NC. It was reviewed by the Ministry of Agriculture of the Czech Republic, universities, breeding associations and research centres.

Most of the supervisors are members of the Council of Animal Genetic Resources, appointed by the Director of NFP as an advisory and consulting body of NFP and NC.

The list of breeds included into the *National Programme* covers all animal breeds indicated in the above-mentioned Decree No 326/1992 to the Act No. 240/1991 :

- Cattle: Czech Red
- Horses: Old-Kladruby horse
  Hutzul
- Pigs: Prestícke Black pied
- Sheep: Šumava sheep
- Goats: White and Brown shorthaired
- Poultry: Czech gold brindled hen
  Czech goose

and additionally selected species and breeds:

- Cattle: Czech Spotted Cattle
- Horses: Silesian Norik
- Fishes: Carp, Trout, Tench and others
- Rabbits: 6 local breeds
- Coypus (Nutrias): 3 local breeds
- Bees: Carnica bee

The breeders of the breeds included into the National Programme receive from the State (Ministry of Agriculture) annually the financial support according to precisely formulated conditions, yearly prepared by NFP and yearly published by Ministry of Agriculture of the Czech Republic as so called *Rules of Financial Support to Animal Genetic Resources*. Every year it is precisely determined for individual breeds and pertinent breeders, under which conditions it is possible to apply for subsidy to the sire, breeding dam etc. in the given year. Every breed project has its responsible supervisor and collaborating institution or breeders association (Table 7).

The defined amount of financial support from the state budget is every year distributed to the individual breeders of all species/breeds, NC and mainly to the collaborated organisations within the National Programme.

The *Annual Report*, which includes the description of NC and NFP activities, including the international ones, the budget distribution and reports of individual supervisors is prepared and discussed at the Council of Animal Genetic Resources. The cryoconservation is being solved in selected breeds of cattle and in fish. Genetic analyses (polymorphic protein and DNA microsatellites) have been carried out in fish (from blood samples of 525 carps, 42 tenches

and 50 other fishes), in Red cattle and Old-Kladruby horse. NFP is interested in a deeper research and use of cryoconservation and usage of methods of molecular genetics for monitoring, storage and cryoconservation of existing animal genetic diversity of the breeds included into the National Programme.

According to the *Primary and Secondary Guidelines for the Development of National Farm Animal Genetic Resources Management Plans*, the development of further activities is foreseen. This requires the permanent modification of all individual projects and their management, in co-operation with organisation of the cryoconservation of still existing genetic material of all in animal numbers limited populations and including DNA monitoring of the breeds for the studies of genetic diversity.

Table 7
Responsibility Division among Institutions Dealing with Farm Animal Genetic Diversity

SPECIES	BREEDS	RESPONSIBLE BODY	CO-OPERATION
Cattle	Czech Red	RIAP Uhríneves	Czech Agricultural University South Bohemian University
	Czech spotted	Czech–Moravian Breeders Association Hradištko	Assoc. of Czech Spotted Cattle Breeders
Pig	Presticke black and white	RIAP Uhríneves	Association of Pig Breeders
Sheep	Šumavka	RIAP Uhríneves	Association of Sheep and Goat Breeders
Goat	White shorthaired	RIAP Uhríneves	Association of Sheep and Goat Breeders
	Brown shorthaired	RIAP Uhríneves	Association of Sheep and Goat Breeders
Horses	Old Kladruby Hutzul Silesian Norik	NS Kladruby * NS Kladruby NS Kladruby	NS Kladruby–Slatinany Club of Breeders Club of Breeders Association of Horse Breeders
Poultry	Czech golden hen Czech goose	RIAP Uhríneves RIAP Uhríneves	Breeders Association Breeders Association
Fish	Carp Trout Tench etc.	RIFF Vodnany RIFF Vodnany RIFF Vodnany	Assoc. of Fish Breeders C. Budejovice
Rabbits	6 local breeds	CAU Prague	Breeders Assoc.
Nutrias	3 local breeds	CAU Prague	Breeders Assoc.
Bee	Krain bee	RIB Dol, Libcice nad Vltavou	Assoc. of Bee Keepers

*Apart of the National Stud in Kladruby

Source: VÁCHAL (unpubl.)

8. Agriculture Production Impact to Biodiversity

As in other European countries also in the Czech Republic agricultural activities have significantly modified landscape and its biodiversity. Natural landscape, without impacts of agricultural or forest activities, is hardly to be found in the territory of the Czech Republic. A high percentage of arable land represents an important feature of the landscape already for a long time (77.1 % before the World War II, 72.4% in 1997; KVÍTEK *et al*. 1997).

From a historical perspective, great differences can be found as regards land-use characteristics. In the past, a lot of stabilizing features existed in the landscape, such as field banks (grassland boundaries), solitary trees, disperse plots of shrubs and trees, etc. Quite different cropping pattern and land use characterize today the Czech landscape due to fundamental changes in the area of field plots (average field size in 1945 - 2.5 ha, 1995 - 10.0 ha, 1997 - 26.0 ha; PRAŽAN and KRÍŽ 1997, KVÍTEK *et al. l.c.*). Land consolidation in 1950s led to an extensive lost of stabilising elements in the landscape. During that period 240,000 hectares of filed banks, field roads and other features of landscape were ploughed up. From that time about 500,000 km of small streams were channelled and 1,081,534 hectares of lands drained (KVÍTEK *et al.* 1997). Table 8 shows the major impacts of agriculture on biodiversity in the Czech Republic.

Table 8
An Overview of Main Impacts of Agriculture on Biodiversity

Impacts	Cause	How it is relevant
Eutrophication and water pollution	Nutrients flushed from fertilised arable cropland and effluents discharged from point sources of pollution	Drastically reduced biodiversity of water ecosystems both in still and running waters
Contamination by pesticides	Same as above	Not investigated enough, probably low impact
Change of use	Drainage, ploughing of grassland or grassland improvements	Large extend, major impacts on landscape and biological diversity (approx. 30 % of land)
Mechanical damages	Especially during crop harvesting	Not investigated, probably low impact, legislation is sufficient,
Loss of habitats (biotopes, ecotones)	Changes in water regimes, loss of field roads and banks,	Loss is significant, scattered trees disappeared
Loss of soil biodiversity	Soil degradation (pressure by heavy machinery, pesticides, nutrients etc.)	Impact not regional and important
Loss of biodiversity of crops	Loss of not so productive sorts	Well managed genetic diversity saves most of the relevant sorts
Loss of animal biodiversity in agriculture	Loss of regional breeds etc.	Well managed genetic diversity saves most of the relevant breeds

Source: PRAŽAN (1997)

The following comments on the current situation in the Czech Republic can illustrate threats to biodiversity by different agricultural activities and procedures:

- Mainly large-scale habitat fragmentation and loss affected biodiversity, in particular loss of wetlands, semi-natural meadows, solitary growing trees, small woodlands and ponds. In some regions semi-natural habitats have been preserved or restored, due to traditional farming systems (like the White Carpathian flowering orchid meadows) but proportion of such areas is relatively small. Significant part of valuable landscapes and habitats are managed in PLAs (see Chapter 3). As an indicator of habitat changes in the open landscape in the Czech Republic, a drastic decline in Partridge *(Perdix perdix*) numbers

from 6 mil. in 1935 to approx. 50,000 in 1997 can be used (IUCN 1996, MLCOCH *et al.* 1998).

- Another major impact is eutrophication and contamination of agroecosystems by pesticides. Use of nutrients significantly changed (see Table 9) and threat of eutrophication is limited to most productive regions. The use of chemical fertilisers and manure during the last 40 years was relatively high. In the mid- 1980s, the nitrogen balance was over 100 kg per hectare of agricultural land. Between 1989 and 1992, chemical fertiliser consumption declined by more than two thirds. The use of industrial fertilisers stabilised at about 1992 level. Only the use of nitrogen has increased slightly, but it still remains far below 1989 level. The use of manure is also decreasing, due to the decline in the farm animal number. As a result, the nitrogen balance decreased significantly from over 100 kg per hectare of agricultural land in the mid 1980s to 53 kg per hectare of agricultural land in 1998.
- Another cause of biodiversity loss is pesticides use. During the transition period the use of pesticides decreased substantially, with some delayed effect on pollution levels. However, in recent years slight upward trend in the use of plant protection substances can be seen, although it still has not reached 50% of the pre-transition use level. In 1996 nearly 4,000 tonnes of active substance of plant protection products were used in the Czech Republic, as compared to 9,928 tonnes in 1989. Risk of pollution and impacts to biodiversity is moderate nowadays (except accidents).

Table 9
Annual Consumption of Fertilisers (in kg per hectare)

Year	A	P	K	Total
1989	103.2	67.1	59.7	230.0
1990	86.3	52.5	47.2	186.0
1991	50.0	8.0	7.0	65.0
1992	50.0	8.0	7.0	65.0
1993	40.0	13.0	10.5	63.5
1994	57.6	10.3	13.0	80.9
1995	55.6	16.6	12.7	82.9
1996	61.3	11.8	8.0	81.1
1997	55.1	11.7	10.1	76.9
1998	53.3	12.6	7.3	73.2

Source: Ministry of Agriculture of the Czech Republic (unpubl.)

Table 10
Annual Consumption of Chemicals for Plant Protection
(in kg of active substances per hectare)

Year	Amount
1985	2.42
1990	2.01
1991	1.57
1992	1.09

1993	0.89
1994	0.88
1995	0.88
1996	0.91
1997	0.90

Source: Ministry of Agriculture of the Czech Republic (unpubl.)

9. Forest Biodiversity

9.1 Status of Forests

Forest land area has increased slightly in the last years – by 2,000 hectares over five years – and made up in total 2,634,812 hectares in 1999. High forest covers 99.9% and coppice only 0.1% of this area. Since 1950, the proportion of non-coniferous tree species has increased from 12.5% to 22.0% in 1999. Since 1950, average rotation period has increased by 13 years to the present 115.7 years. The proportion of stands older than 80 years continues to increase. Above all, this development results from a high proportion of incidental felling without subsequent afforestation. The development of growing stock volume is favourable (in 1999 growing stock volume increased at 615 million m^3) and it will be further increasing.

Air pollution damage to forests has been up to this time one of the decisive factors affecting condition of forests in the Czech Republic, in spite of its decreasing trend in the last several years. Industrial air pollution and inappropriate silvicultural systems (*e.g.*, inappropriate species composition focusing particularly on coniferous, especially spruce monocultures/plantations, inadequate prunning and thinning) have increased the vulnerability of the forests to extreme weather, insect pests, fungal diseases, and other types of damage with the results that forests in the Czech Republic figure among the most heavily damaged in Europe. Observations show that 50.0 % of forests has suffered moderate and 5.9 % severe damage (MINISTRY OF AGRICULTURE OF THE CZECH REPUBLIC 1994, MLCOCH *et al*. 1998, OECD 1998).

9.2 Forest Biodiversity Protection in the Czech Republic: Main Principles

In 1996 Ministry of Agriculture of the Czech Republic approved national guidelines *Forest Management Recommendations*, as a tool for the forest owners, their forest managers, the authors of forest management plans and forest management programmes as well as other professionals in forestry. They facilitate to make proper decisions differentiated by natural conditions and status of forests, for example a choice of silvicultural system, rotation age, regeneration period, target species composition, minimal proportion of soil-improving and stabilising species etc.

Regional management guidelines are included in regional forest development plans for particular natural forest areas (in total 41 Natural Forest Areas in the Czech Republic). Regional

forest development plan is the methodical tool of the state forest policy and recommends the principles of forest management differentiated according to natural conditions, status of forest and the fulfilment of forest functions. The plans started to be prepared in 1996 and by now they are completed for two thirds of forests, for the rest they are foreseen by 2002.

The Forests of the Czech Republic, state enterprise, published in 1997 *Programme of Sustainable Forest Management, Tending and Regeneration of Forest*, which summarises in guidelines the principles of differentiated, sustainable and efficient forest management, taking into account the requirements for the fulfilment of non-timber production functions.

Over the last five years, forest management planning and forest management practices have changed significantly and are oriented now (in sustainable conditions) to near-to-nature systems in management of forests, in the use of natural processes and enhancement of biodiversity. A share of natural regeneration is very low (up to 9.8% in 1999).

Forest conservation, reforestation and afforestation figure among the basic principles of the *State Forestry Policy*, approved by the Government of the Czech Republic on May 11, 1994 (MINISTRY OF AGRICULTURE OF THE CZECH REPUBLIC 1994).

A long-term extension of forest-land area has been considerably slowed down in the last years and merely insignificant changes in the area have been reported. Changes in the forest land area result from afforestation of non-forest land and losses caused through deforestation, mainly for investment construction and mineral mining. Afforestation of fallow lands (as ecologically suitable way of using and conserving this land) is subsidised by the State (500-600 CZK/hectares/year). A special programme for afforestation of 10,000 – 15,000 hectares of non-forest state land within the next 10 years, which will be subsidised by the Government, is under preparation.

Conservation and appropriate enhancement of biodiversity is incorporated in the above-mentioned *Basic Principles of the State Forestry Policy of the Czech Republic*. The requirement for increasing of species diversity in forests has been gradually incorporated in forest management plans and forest management programmes and has been applied in forestry practises as well.

Appropriate attention has been paid to maintenance of gene resources in tree species growing in the Czech Republic, as regards legislative, institutional and financial aspects. Strategies and programmes were prepared for conservation of gene resources of not only all major domestic tree species at particular ecotypes and local provenance, but more intensive attention is also paid to formerly neglected and commercially unused species, incl. shrubs.

Since 1983 gene banks for gene resources conservation in the Czech Republic have been constituted that corresponds to gene reserve forests. Certified seed stands (*in situ*) – 147,613 hectares, seed orchards and clone archives – 357,46 hectares, seed banks, testing plots and reproductive planting (so-called seed stands ex-situ), are established and 8,649 plus (elite) trees are selected and certified (as of December 1, 1999). The Czech Republic has been involved in the EUFORGEN programme since 1995. This European programme, co-ordinated by the International Plant Genetic Research Institute (IPGRI) in Rome, deals with forest genetic

resources conservation. Conservation of threatened forest species and ecosystems is implemented under national forestry policy.

The coherent system of climax, primary and other special forests consists in the Czech Republic of:

- **3 National Parks** in which special forest management is predominantly focused on the maintenance of biodiversity, ecological stability and promotion of natural processes in ecosystems.

  The forest area in NPs covers approx. 96,700 hectares (3.7% of total forest land area in the CR). (Note: Since January 1, 2000 – 4 National Parks)

- The First Zones of **24 Protected Landscape Areas** (14% of total PLA territory), in all covering area approx. 77,000 hectares (2.9% of total forest land area).

- **117 National Nature Reserves** (27,147 hectares).

- **653 Nature Reserves,** covering the area of 30,152 hectares.

- **Territorial System of Ecological Stability** (TSES).

- Pan-European Ecological Network (PEEN), also known as the European Ecological Network (**EECONET**). Recently 22 biocentres of European importance (approx. 3,080 km^2 with prevailing forest ecosystems) has been classified in the Prepared Pan-European Ecological Network (BÍNOVÁ *et al.* 1995).

Functional overlapping of the above-mentioned environment protection categories is common. Estimated total area of forest habitats having environment protection functions under the Czech National Council Act. No. 114/1992 on Protection of Nature and the Landscape is about 700,000 hectares (27 % of total forest-land area).

A concise programme on education and extension service, aiming especially at maintenance of forest biodiversity in the Czech Republic, has not been introduced yet. The numerous seminars on sustainable forest management, which included conservation and enhancement of biodiversity, were held. These seminars were organised both by the Ministry of Agriculture (for the forest owners and other interested participants) and the Forests of the Czech Republic, state enterprise, for its professional staff. The latter has established a network of demonstrating areas with complementary information. In co-operation with the Mendel University of Agriculture, Faculty of Forestry in Brno, Forests of the Czech Republic, state enterprise and Forest Management Institute, inventory of model areas of close-to-nature forest was carried out in 1995, in compliance with initiative organised by the European PRO SILVA Committee. These areas can be used for implementation of the planned programmes on education and public awareness in the coming years.

The establishment of the isoenzyme laboratory in the Research Institute of Forestry and Game Management at Jílovište-Strnady is the most successful example of the technical assistance. The laboratory was funded by the World Bank, within the GEF – Biodiversity Project (see Chapter 3).

National guidelines for maintenance and enhancement of forest biodiversity are incorporated in the above-mentioned *Forest Management Recommendations* and in the Programme implemented by the Forests of the Czech Republic, state enterprise.

Research projects were implemented in the last years on conservation and enhancement of forest biodiversity and on sustainable forest management. Forestry scientific and research institutions at national level participate in various research projects, among them Research Institute of Forestry and Game Management, Czech University of Agriculture in Prague - Faculty of Forestry, Mendel University of Agriculture and Forestry in Brno - Faculty of Forestry and Wood Technology. These projects are focused mainly on status and requirement for management of endangered, rare or representative forest ecosystems (*e.g.*, ecosystems in air-polluted areas, floodplain forests, spruce plantations of uplands, with special attention to the reconstruction of damaged forests and enhancement of their biodiversity, stability and multifunctionality), forest tree breeding, conservation and reproduction of gene resources, environment assessment and prognosis of further development based on the wildlife changes, economic impacts analysis of afforestation in agricultural land, implementation of environmental management systems in forestry sector, parameters of forest machinery based on ecological, energy and economic criteria, Territorial System of Ecological Stability of Landscape in agricultural landscape, *etc*. Other institutions, such as National Parks and Protected Landscape Areas Administrations, participate in similar research projects at regional level.

Biodiversity assessment is also included in the methodology of *National Large Area Forest Inventory of the Czech Republic* drafted by the Institute of Forest Ecosystems Research in 1997. The methodology of vegetation monitoring on the permanent sample plots within the ICP programme was completed in 1997.

9.3 General Measures to Promote Sustainable Forest Management Including Biodiversity Conservation

9.3.1 Legal / Regulatory Framework

The Act No. 289/1995 on Forests (Forest Act), in force since 1 January 1996, is the essential law of new legislation that addresses the political changes after 1989. The act respects both the fundamental rights of the owner and state interest in continuing forest management, in a manner safeguarding that all forests are permanently able to fulfil all their functions.

The Forest Act regulates, *inter alia*, conservation of forest and forest land, treatment of forest stands, general use of forest, forest management planning, sustainable forest management, licences in forestry, subsidies for forest management and state administration.

The Czech National Council Act No. 114/1992 on Protection of Nature and Landscape regulates, *inter alia*, forest management in National Parks, Protected Landscape Areas, National Nature Reserves and Nature Reserves, that follows from particular plans of care of relevant areas. Plans and projects within the Regional Territorial Systems of Ecological Stability are elaborated.

All laws will be gradually harmonised with the EC legislation. Principles of international conventions, to which the Czech Republic is a Party, are incorporated in respective legislation.

9.3.2 Institutional Framework

The central body of state administration in forestry is the Ministry of Agriculture, except forests in National Parks and military areas. Ministry of Agriculture within its legal competencies controls state administration through legal regulations and instructions. It revises the decisions made by the District Authorities and inspects their state administration in forestry. District Authorities are the first level of the State Administration and they are charged with decision-making as well as with other issues connecting with approving, granting permission and inspection.

The central body of administration of forest management in National Parks is the Ministry of the Environment and of forests in military areas it is Ministry of Defense.

Besides these supreme bodies, many other institutions are active in the field of forestry and the environment, *e.g.* Forests of the Czech Republic, state entreprise, Forest Management Institute, and others subordinated above mentioned Ministries, such as General Directorate of Military Forests, National Parks administrations, Czech Environmental Inspection, Administration of Protected Landscape Areas of the Czech Republic, Agency for Nature Conservation and Landscape Protection of the Czech Republic.

The *National Forest Programme* has been prepared in co-operation with NGOs to implement the strategic goals of the State Forestry Policy.

9.3.3 Economic Policy / Financial Instruments

Financial commitments of the State subject to the Forest Act include partial reimbursement of planting of soil-improving and stabilising species, as well as measures in forest protection, reclamation of forest, torrent control, activities of professional forest managers and contribution for elaboration of forest management plans.

State subsidies were granted for the four following groups of activities:

- solution of consequences of internal impacts on forest management,
- selected activities of owners of a forest area less than 250 hectares,
- other non-productive functions of forests,
- water regime and construction works.

Afforestation of agricultural land is also subsidised. Forests of special purpose, protective forest and forest affected by significant load of air pollution are not subject to the State taxation.

10. Wetlands

In 1990, Czechoslovakia became a Party to the *Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar Convention*) and thus assumed the obligation to create adequate conditions for the conservation of its wetlands. Inventory of wetlands of respective country is one of the key tasks of Parties to the Convention. In the Czech Republic, an inventory begun already in 1987, as part of an evaluation of important landscape elements. The list of wetlands was largely based on ornithological research, which brought a somewhat simplified view into site evaluation. Therefore, this preliminary list was assessed consequently by specialists from other biological fields (botany, entomology, etc.). The survey of important wetland sites was further updated and modified in 1989 and 1990. In 1991, the Ministry of the Environment of the Czech Republic and the Federal Committee of the Environment of the former Czechoslovakia allocated certain funds for wetlands activities which resulted in the Survey of Aquatic and Wetland Biotopes of the Czech Republic (HUDEC *et al.* 1993). In 1997-1999, the survey was repeated and up-dated, now funded by the Ministry of the Environment and the Agency for Nature Conservation and Landscape Protection of the Czech Republic (CHYTIL *et al.* 1999).

Ten sites in the Czech Republic were designated as **internationally important wetlands** according to the Ramsar Convention. The area of these sites is 38,876 hectares, of which bogs cover 4,701 hectares, wetlands associated with fishpond biotopes cover 11,753 hectares, and wetlands associated with river floodplains cover 22,422 hectares.

Table 11
Wetlands of International Importance

Name	**Area (hectares)**
Šumava Peatlands	3,371
Trebon Fishponds	10,165
Brehyne a Novozámecký Fishponds	923
Lednice Fishponds	665
Litovelské Pomoraví	5,122
Poodří	5,450
Krkonoše Mountain Mires	230
Libechovka and Pšovka Brook	350
Trebon Peatlands	1,100
Floodplain of the Lower Dyje River	11,500

Source: CHYTIL *et al.* (1999)

In addition, 37 **wetlands** of almost 1,000 wetland sites were evaluated as sites **of national** or rather Central European **importance**. The total area of wetlands of national importance is 10,533 hectares. Seventeen sites are peat bogs (3,324.5 hectares), nine are associated with river floodplains (4,480 hectares), and ten are fishponds (2,728 hectares). Wetlands in the Libava former military training area (about 130 km^2) have not yet been categorized. The Blanice Nature Reserve (294 hectares) is the most important biotope of the Freshwater Mussel *Margaritifera margaritifera* in the Czech Republic.

Most wetlands of national importance or their substantial parts are nowadays protected as National Nature Reserves or several of them as Nature Reserves (5 sites) (CHYTIL *et al.* 1999).

11. Collections of Microorganisms

Collections of microorganism cultures as biological resources in situ play an irreplaceable role due to the fact that they are located directly in places of research and other related activities. Erudite taxonomists and other scientists are using the most modern methods for common cherishing and conservation of gene pool of microorganisms. The collections represent gene bank of microoorganisms and they are serving to research, education and for use in industrial biotechnology. Unfortunately these collections have not still a legal protection, although each of them has its own status. This lack of legal protection is connected with inadequate funding needed for enhancing the quality of laboratory accessories and for maintaining the collections.

Table 12
A Survey of the Czech Collections of Microoorganisms in the Framework of the Federation of Czechoslovak Collections of Microorganisms (FCCM)

Name of collection	Address	Type of microorganisms	Number of microorganisms
Czech Collection of Microorganisms	Masaryk University Tvrdého 14 602 00 Brno	Fungi Yeast fungi Bacteria	200 700 2400
Czech State Collection of Type Cultures	State Health Institute Šrobárova 48 110 42 Prague 10	Bacteria Viruses other autotrophic organisms	5000 100 60
Collection of Autotrophic Organisms of the Czech Academy of Sciences	Botanical Institute of CAS Dukelská 145 379 82 Trebon	Algae and Cyanobacteria other autotrophic organisms	498 160
Collection of Cultures of Basidiomycetes	Microbiological Institute of CAS Vídenská 1083 142 20 Prague 4 – Krc	Fungi	700

Collection of Fungi Cultures of the Botanical Department of the FNS of the Charles University	Faculty of Natural Science of the Charles University Benátská 2 128 01 Prague 2	Fungi	2000
Collection of Macromycetes	Institute for Physiology and Court Chemistry of the First Faculty of Medicine National Reference Laboratory of Fungi Toxins Na bojišti 3 121 08 Prague 2	Fungi	400
Collection of Algae Cultures of Botanical Department of the Charles University	Botanical Department of FNS of the Charles University Benátská 2 128 01 Prague 2	Algae and Cyanobacteria	170
Collection of Yeast Fungi of Microbiology Department	Department of Genetics and Microbiology Vinicná 5 128 44 Prague 2	Yeast Fungi	500
Collection of Microorganisms of the Institute of Biochemistry and Microbiology of the Chemical and Technological University*	Chemical and Technological University Technická 5 166 28 Prague 6	Fungi Yeast Fungi Actinomycetes	74 194 75
LAKTOFLORA* Collection of Lactic Organisms	Milcom servis a.s. Belohorská 128 169 00 Prague 6	Fungi Yeast Fungi Bacteria	59 33 495
Collection of Brewery Yeast Fungi*	Brewery and Molt Research Institute Lípová 15 120 44 Prague 2	Yeast Fungi	114
Collection of Microscopic Fungi of the Institute of Soil Biology of the Czech Academy of Sciences*	Institute of Soil Biology of CAS Na sádkách 7 370 05 Ceské Budejovice	Fungi	670
Collection of Rhizobia*	Research Institute of Crop Production, Division of Phytomedicine, Drnovská 507 161 06 Prague 6	Bacteria	463
Collection of Industrially Used Microorganisms*	Grocery Research Institute Rádiová 7 102 31 Prague 10	Fungi Yeast Fungi Bacteria	8 124 17
Collection of	Research Institute of Veterinary	Bacteria	1,220

Zoopathogenic Microorganisms*	Medicine Hudcova 70 621 32 Brno	Viruses	415
Collection of Plant Pathogenic Viruses and Homologous Antibodies*	Research Institute of Crop Production, Division of Phytomedicine, Drnovská 507 161 06 Prague 6	Plant Pathogenic Viruses	25
Collection of Plant Pathogenic Bacteria and Homologous Antibodies*	Research Institute of Crop Production, Division of Phytomedicine, Drnovská 507 161 06 Prague 6	Plant Pathogenic Bacteria	1,067
Collection of Plant Pathogenic Fungi and Homologous Antibodies*	Research Institute of Crop Production, Division of Phytomedicine, Drnovská 507 161 06 Prague 6	Plant Pathogenic Fungi	582
Collection of Animal Pest of Crop Plants and their Antagonists*	Research Institute of Crop Production, Division of Phytomedicine, Drnovská 507 161 06 Prague 6	Coleoptera Lepidoptera Thysanoptera Hymenoptera	100,000
Cultures and Collections of Stored-Product Mites and Insects*	Research Institute of Crop Production, Division of Phytomedicine, Drnovská 507 161 06 Prague 6	Mites and Insects	89
Cultures of Rust and Powdery Mildew*	Research Institute of Crop Production, Division of Genetic and Plant Breeding	Rusts Powdery Mildews	72
Collection of Viruses Pathogenic for Potato and Homologous Antibodies*	Potato Research Institute Ltd. Havlíckuv Brod	Potato Pathogenic Viruses	442
Collection of Viruses of Fruit Woody Plants and Small Fruit*	Research and Breeding Institute of Pomology	Fruit and Small Fruit Pathogenic Viruses	35
Collection of Viruses Pathogenic for Ornamentals and Homologous Antibodies*	Research Institute of Ornamental Gardening Pruhonice	Ornamental Plant Pathogenic Viruses	13
Collection of Plant Pathogenic Microorganisms*	Palacký University, Faculty of Sciences, Olomouc	Fungi, Algae, Phytoplasma, PPV	219
Collection of Zoopathogenic Microorganisms*	Research Institute of Veterinary Medicine, Brno	Bacteria Viruses	1,665

Comment : Collections marked * are included in the National Programme of Microorganisms Gene Pool and Fairy Animals of Industrial Use Protection (co-ordinator J. POLÁK)

In 1996 the Ministry of Agriculture of the Czech Republic established the *National Programme on Protection of Genetic Resources of Economically Significant Microorganisms and Tiny Animals*. This programme is fully financed by the Ministry of Agriculture. The Research Institute of Crop Production (RICP) Prague-Ruzyne, Division of Plant Medicine was charged with the co-ordination and 14 collections were incorporated into the programme. Seven collections are maintained in the framework of RICP, a further seven collections of plant and animal pathogens and microorganisms of economical importance are maintained by other agricultural institutions (Table 12).

The collections are used in the framework of international co-operation and exchange of information. The cultures can be sent also abroad, on the basis of written order. In the Czech Republic the collections are used for research purposes, in agriculture, food industry, for pedagogical purposes at the universities and for elaboration of thesis. Most of collections are catalogued and a unified system of record is under development.

12. Biotechnology and Biosafety

Development of modern biotechnologies and questions related with their use represent one of the characteristic features of our era. In the Czech Republic in general term level of measures for handling, transport, use, transfer and release of living modified organisms does not corresponds fully to the requirements of EC directives, OECD recommendations and international agreements in the sense to reduce risks to human health and biological diversity. Especially obligations of individual institutions and persons dealing with living modified organisms are not sufficiently prescribed and no system providing required information in this sphere has been established so far.

Officially, only questions regarding transgenic plants and their restricted use have been solved through the establishment of the *Czech Committee for Transgenosis of Plants*. This Committee is active since 1990, at the beginning as a voluntary group of biologists working in the fields of transgenic plants, molecular biology and agriculture science, in order to evaluate the projects of cultivation of newly developed transgenic plants in small field experiments. At present it serves as an advisory body of the Ministry of the Environment, giving recommendations on applications for testing transgenic plants in the Czech Republic sent to the Ministry by some firms. The procedure of evaluation follows in principle the EC Directive 90/219/EEC and the Directive 90/220/EEC. The Committee approves experiments with new types of transgenic plants (so far potato, rape, tobacco, *Lotus corniculatus*) in small experimental fields. Concerning transgenes, they were individual natural pTi and pRi T-DNA genes, kanamycin resistance nptII and hydromycin resistance hptII selectable genes, GUS reporter gene and *B. thuringinensis* delta-endotoxin gene.

The Czech Committee for the Convention on Biological Diversity, established in 1997 by the Ministry of the Environment, serves as an intersectoral co-ordinating body even in biosafety issues.

Legislation of the Czech Republic does not sufficiently solve consequences of development and use of living modified organisms for the environment and human health. For this reason a new *Act on Genetically Modified Organisms* has been proposed taking into account principals of existing European and international regulations, especially EC directives, OECD regulations, Convention on Biological Diversity and its *Cartagena Protocol on Biosafety*. The text of the Act was prepared by the Ministry of the Environment and the Ministry of Health, in co-operation with the Ministry of Agriculture. In the preparatory group also specialists from universities, research institutions, mainly of the Academy of Sciences of the Czech Republic as well as representatives of NGOs took part. The proposal of the Act was approved by the Government of the Czech Republic in December 1999, in January and April 2000 was dealt by the Parliament and subsequently by different Committees of the Senate. The entry into force of the Act is foreseen from January 1, 2001.

Some already existing legislation deal only partly with living modified organisms, such as:

Act No. 20/1996 on Care of Human Health

Act No. 166/1999 on Veterinary Care

Act No. 241/1991 on Breeding and Reproduction of Farm Animals

Act No. 110/1997 on Food and Tobacco Products. A novel of this Act was prepared and passed to the Parliament; this novel will require labelling of food containing GMOs and products thereof.

Act No. 92/1996 on Cultivars, Seeds and Seedlings regulates only the use of genetically modified plants as seeds and seedlings. Registration of a genetically modified organism as seed, seedling or cultivar needs to be approved by the Ministry of the Environment.

Other legislation in the sphere of veterinary and plant protection, as well as nature conservation and landscape protection deals with living modified organisms only indirectly and marginally. Therefore novels of some of these acts are prepared to correspond to the new Act on GMOs of the Czech Republic, as well as to the *Cartagena Protocol on Biosafety*.

As to the practical application, the Novartis maize was approved as feed in the Czech Republic. There was no concern about the bla gene since it can be expressed only in G-bacteria and our veterinary microbiologists found that 50% of strains in livestock are already resistant to penicillin antibiotics and this resistance is localised on the plasmid, *i.e.*, is transmissible to other bacteria. Similar incidence of penicillin resistant bacteria is found in nature, particularly in the soil and epiphytic microflora and consequently belongs to the normal feed of livestock.

Ministry of the Environment of the Czech Republic as a responsible governmental body for the implementation of the Convention on Biological Diversity and *Cartagena Protocol on Biosafety* develops activities also in the sphere of capacity building and public awareness, which play an important role in biotechnology development and transfer, in the form of workshops,

dissemination of information to general public and participation of the specialists in conferences and discussions. Also the Czech Committee for Transgenosis of Plants contributes to this process through organization of workshops, Internet presentation and by editing specialized publications.

At the Charles University, a special course on biosafety regulation was launched in the school year 1997/1998. The course was tailored to governmental and local authorities, research and other institutions, which are supposed to handle living modified organisms. A textbook on biosafety was published - in the Czech and English languages. The book is designed for university students in genetics, microbiology, biotechnology, agriculture and other fields where the use of GMOs is expected as well as for the distant learning course for civil servants. It can be used as a training tool in the capacity building.

The Czech Republic has been involved in the international process aiming at biosafety regulation. The Czech specialists participated in the sessions of Ad Hoc Working Group on Biosafety established by the Conference of the Parties to the Convention on Biological Diversity to elaborate an international protocol, activities of which culminated by adoption of the *Cartagena Protocol on Biosafety* in January 2000, in Montreal. The Czech experts took part in the regional UNEP conferences for Central and Eastern Europe. They are also involved in activities of other international bodies in the field of biosafety, such as OECD Group on Biotechnology, UNIDO, European Federation of Biotechnology, etc. Bilateral co-operation was developed in this respect with the Netherlands, Austria, Italy, Spain and United Kingdom.

Due to certain expert basis the Czech Republic can offer assistance in the field of biosafety risk assessment and risk management for developing countries and other countries with economy in transition, where capacity building in this sphere is needed (members of the Czech Committee for Transgenosis of Plants, specialists of the Ministry of the Environment, Academy of Sciences and of the Charles University).

13. Clearing-House Mechanism

13.1 Biodiversity Conservation Information Systems

Several information systems dealing with special items of biodiversity conservation exist in the Czech Republic. The above-mentioned *National Information System on Plant Genetic Resources* is one of the most important.

As a part of the *National Biodiversity Conservation Strategy* project, administered by the World Bank, a clearing-house mechanism will be established. The proposal includes among others the preparation of a Web-site on current biodiversity conservation issues.

13.2 Nature Conservation Information System

The *Nature Conservation Information System* (hereinafter NCIS) is a distributed, regionally oriented state information system with an open modular database arrangement. It collects, preserves, provides and processes specialised data on nature conservation, incl. biodiversity protection, from the whole territory of the Czech Republic. The NCIS is a part of the proposed *Environmental Information System and/or the State Information System of the Czech Republic*. The Agency of Nature Conservation and Landscape Protection of the Czech Republic is responsible for the NCIS building, fulfilling and operation.

The fundamental purpose of the NCIS is to provide an information support for decision-making in the State Administration in nature conservation and landscape protection, information service for other environmental activities out of the State Administration, professional communication with other information systems of the State Administration, if they require data on nature conservation and landscape protection for fulfilment of their tasks, data to other individual persons and corporations in agreement with accepted procedures of data providing from the information systems in the State Administration, the development of data content and of the special NCIS applications.

The NCIS is structured into three main groups of data collecting, administration and use: **source databases solution and source databases operation** (the files of Specially Protected Species, the observation of selected phenomena in a region etc.), **three-dimensional data representation** of operated databases (GIS) and the processing and **the use of data from the remote sensing** (aerial surveying and the use of satellite imaginary).

Currently functional **NCIS modules** include:

- **Sites (localities)** – the basic module containing geographical, administrative and technical data about selected localities.
- **Units** – the substituting or supporting component of the basic module for the adjunction of findings without the possibility of relation to particular point defined by the pair of co-ordinates.
- **Botany** (from the current database FLORA) – the module for botanical findings where the findings data (botanical, ecological) are related to a particular site; the species database with transfer dictionary is a component of this module; the division to vascular and non-vascular plants is included.
- **Phytocoenology** – the submodule for phytocoenological survey assignment.
- **Zoology** (from the current database FAUNA) – the module for zoological findings, where the findings data (zoological, ecological) are related to a particular site; species database and the division to zoological groups are included.
- **Small-size Specially Protected Areas** – the module providing environment, which is necessary for the administration of the Central List of Specially Protected Areas.
- **Monumental trees** – the module providing the operation of the central list of monumental trees.

GIS environment is implemented in the ARC/INFO system (PC and Windows NT) and in the SPANS system (Windows 95). The multispectral and geodetic surveys of large-size (National Parks - NPs, Protected Landscape Areas - PLAs) and small-size Specially Protected Areas are gradually implemented. The Landsat (TM) satellite data (the resolution of 30 m), available for the whole territory of the Czech Republic, are concurrently updated with relevant, eventually more detailed data (SPOT, IRS, *etc.).*

14. Monitoring and Research

Biomonitoring programmes focused on different components of biological and landscape diversity have been developed mainly in Specially Protected Areas, such as UNESCO Biosphere Reserves. Especially forest monitoring has a long tradition in the territory of the Czech Republic. The Research Institute of Forestry and Game Management and universities (faculties of forestry in Prague and Brno) have played an important role in this respect.

Various biomonitoring research projects have been granted by the Ministry of the Environment, Ministry of Agriculture, Academy of Sciences, universities, the Central Grant Agency of the Czech Republic, or on the basis of international co-operation.

14.1 Biomonitoring in Protected Areas as a Part of State Nature Conservancy Programme

The described system is an example of biomonitoring programmes of the country. It is implemented by the Agency for Nature Conservation and Landscape Protection of the Czech Republic. Its concept dated back to 1985 (the main project *Preparation and Maintainance of Biomonitoring in Nature Protection and its Gradual Implementation* – ABSOLON 1991). The first implementing phase of a complex synecological biomonitoring in protected areas was initiated in 1995 and it was finished in 1998. During 1993 - 1994 certain component verifications were experimented, focused on the methodology of data collection. These resulted in the *Methods of Data Collecting for Biomonitoring in Protected Areas* (ABSOLON *et al.* 1994).

The Complex Synecological Biomonitoring involved four more or less segregate monitoring programmes focused on selected model groups of organisms – vegetation, birds, epigeon and water organisms. Component monitoring programmes should be accomplished within the given monitoring area according to different types of testing areas. At the beginning, 56 monitoring areas were selected, mostly in Protected Landscape Areas.

At present, 42 monitoring areas are officially registered, including 286 testing plots. They are completely documented (including maps). The main results of the projects are as follows:

- 329 special reports and data files at the period 1993-1998.

- Survey of meteorological data.
- Evidence cards of monitoring areas with appendices (including maps 1: 50 000 and 1: 10 000) and evidence cards of testing plots (since 1997).
- Methodological materials for standardisation of data inscription and logistics of monitoring project.
- the *Complex Synecological Biomonitoring in Protected Areas: A Feasibility Study* (CHRUDINA 1997).
- New concept of transformation of the project *Complex Synecological Biomonitoring in Protected Areas* to the project *Biomonitoring in Protected Areas*.

In 1999 the second phase has been prepared within the project *Biomonitoring in Protected Areas*. This project involves the complex monitoring in selected permanent monitoring plots, the monitoring of impact of management and monitoring of local and regional evolution trends of selected bioindicator taxa.

A new concept of biomonitoring consists of two basic steps:

- Sum up of all monitoring programmes and repeated observations within protected areas.

This step aims at a survey of information about

a) used methods, b) observed taxa and variables, c) testing or monitoring areas.

- Selection of key bioindicators, monitored in the territory of the Czech Republic.

This second phase has not been implemented so far due to lack of funds.

15. Environmental Education and Public Awareness

State institutions (*e.g.* schools, State Nature Conservation authorities) as well as numerous non-governmental organisations in the Czech Republic develop activities in the sphere of environmental education and raising public awareness. In 1998, both chambers of the Parliament approved the Act on the Right of Access to Information on the Environment, which reflects the pan-European process culminating in adoption of the *Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters*. The Czech Republic signed this Convention during the Fourth Ministerial Conference *Environment for Europe* held in Aarhus, Denmark, June 1998 and the process of ratification is under way now.

Traditionally, environmental education, which includes also biodiversity protection principles, forms an important part of the large-scale protected areas (NPs, PLAs) activities.

The Ministry of Agriculture, the Forests of the Czech Republic, state enterprise, and other relevant institutions support sustainable forest management also through information and public awareness by means of publications, advertising brochures, films and video-programmes,

television programmes or exhibitions. The Forests of the Czech Republic, state enterprise, prepare a long-term educational and extension service programme on sustainable management of forests.

Conservation principles are included in curricula of different universities, not only those oriented to natural sciences, but also of technical character. Nevertheless more attention should be given to the environmental and especially biodiversity conservation questions in curricula, mainly in basic and secondary schools. During the last years several specialized environmental education centres have been developed, based both on governmental and NGO status and sources, or even of a mixed character (GOs/NGOs). Their activities are often focused to children and to co-operation with schools. Several NGOs have already a long tradition in their education activities environmentally oriented and contribute thus significantly to public awareness. Biodiversity became the main topic of several international programmes and projects underway and of international co-operation being implemented mainly through IUCN – The World Conservation Union.

On the occasion of the International Day of Biodiversity, the Ministry of the Environment of the Czech Republic organised the press conferences in 1995, 1996 and 1997. A poster presenting the day with respect to biodiversity conservation and sustainable management of its components was edited by the Ministry of the Environment and the Agency for Nature Conservation and Landscape Protection of the Czech Republic in 1998.

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Abbreviations and Acronyms

BR – UNESCO Biosphere Reserve
CBD – Convention on Biological Diversity
COP – Conference of the Parties
CSD – Commission on Sustainable Development
CINC – Czech Institute for Nature Conservation
CZK – Czech Crown
DAD-IS – Domestic Animal Diversity Information System
EAAP – European Association of Animal Production
EC – European Commission
ECPGR – European Co-operative Programme on Plant Genetic Resources
EECONET – European Ecological Network
EVIGEZ – National Information System on Plant Genetic Resources
FAO – Food and Agricultural Organization
FCCM – Federation of Czechoslovak Collections of Microorganisms
GEF – Global Environment Facility
GIS – Geographical Information System
IPAs – Important Plant Areas
IPGRI – International Plant Genetic Resources Institute
IUCN – World Conservation Union
NCIS – Nature Conservation Information System
NFP – National Focal Point
NGO – Non-governmental Organization
NP – National Park
OECD – Organization for Economic Co-operation and Development
PEEN – Pan-European Ecological Network
PGR – Plant Genetic Resources
PLA – Protected Landscape Area
RIAP – Research Institute of Animal Production
RICP - Research Institute of Crop Production
RIFC – Research Institute of Fodder Crops
SBSTTA – Subsidiary Body on Scientific, Technical and Technological Advice
TSES – Territorial System of Ecological Stability
UNEP – United Nations Environment Programme
UNESCO – United Nations Educational Scientific and Cultural Organization
UNIDO – United Nations Industrial Development Organization
WRI – World Resources Institute

Links to and addresses of organizations involved in biodiversity issues

Ministry of the Environment of the Czech Republic	http://www.env.cz/ Vršovická 65, 100 10 Praha 10 – Vršovice
MoE – Electronical Library	http://www.env.cebin.cz/nav/indexhpen.html
Agency for Nature Conservation and Landscape Protection of the Czech Republic	http://www.nature.cz/ (in Czech) Kališnická 4-6, 130 23 Praha 3 – Žižkov
Czech Environmental Institute	http://www.ceu.cz/ Vršovická 4-6, 100 10 Praha 10 – Vršovice
Czech Environmental Inspection	http://www.cizp.cz/ (in Czech) Na brehu 267, 190 00 Praha 9
State Environmental Fund	http://www.sfzp.cz/ (in Czech) Kaplanova 1931/1, 148 00 Praha 4-Chodov
Krkonoše Mts. National Park Administration	http://www.krnap.cz/ Dobrovského 3, 543 01 Vrchlabí
Šumava Mts. National Park Administration	http://www.retour.cz/mesta/zel_ruda/np.htm (in Czech) zámek, 385 01 Vimperk
Podyjí National Park Administration	http://nppodyji.env.cz/ Na Vyhlídce 5, 669 03 Znojmo
Ceské Švýcarsko National Park Administration	Pražská 52, 407 46 Krásná Lípa
Administration of Protected Landscape Areas of the Czech Republic	http://www.schkocr.cz/ (in Czech) Kaplanova 1931,148 00 Praha 4 Chodov,
Pálava Protected Landscape Area Administration	http://www.ihost.cz/chko/eng/palavaus.htm Námestí 32, 692 01 Mikulov
Poodrí Protected Landscape Area Administration	http://www.osu.cz/prf/bi/poodri/begin.htm Trocnovská 2, 702 00 Ostrava
Trebon Basin Protected Landscape Area Administration	http://chkot.envi.cz/ Valy 121, 379 01 Trebon
Blanský les Protected	http://www.ckrumlov.cz/uk/region/soucas/i_chkobl.htmVyšn

Landscape Area Administration	ý 59, 381 01 Ceský Krumlov
Labské Pískovce Protected Landscape Area Administration	http://www.decin.space.cz/chkolp/ (in Czech) Dlouhá jízda 1257, 405 01 Decín 1
Institute of Botany, Academy of Sciences of the Czech Republic	http://www.ibot.cas.cz/ 252 43 Pruhonice
Ministry of Agriculture of the Czech Republic	http://www.mze.cz/ (in Czech) Tešnov 17, 117 05 Praha 1
Forestry and Game Management Research Institute	http://www.vulhm.cz/angl.asp Jílovište – Strnady, 156 04 Praha 5 – Zbraslav
Research Institute of Crop Production	http://www.vurv.cz/ Drnovská 507, 161 06 Praha 6 – Ruzyne
Information System on Plant Genetic Resources	http://genbank.vurv.cz/genetic/resources/
Research Institute of Agricultural Economy	http://www.vuze.cz/anglicky/defaulte.htm Mánesova 75, 120 58 Praha 2