ENVIRONMENTAL PROTECTION MINISTRY
REPUBLIC OF LITHUANIA

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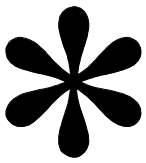
BIODIVERSITY CONSERVATION

STRATEGY AND ACTION PLAN



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1996

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BIODIVERSITY CONSERVATION STRATEGY AND ACTION PLAN

DRAFTED BY:

Steering Committee:	R.Baðkytë, Dr. P.Mierauskas, Hab. Dr. J.Virbickas
Task Force Group:	Hab. Dr. P.Kavaliauskas, S.Paltanavièius, Hab. Dr. M.Þalakevièius
Local Experts:	Hab. Dr. J.Balevièienë, Dr. L.Balèiauskas, A.Brukas, A.Gutkauskas, Dr. P.Kurlavièius, Dr. R.Pakalnis, Dr. V.Urbonas, Dr. S.Oleninas
Foreign Experts:	Dr. P.M.Rogers, Phil Brylski
Cartography:	M.Dumbliauskienë
Translation:	G.Kapturauskienë

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EXECUTIVE SUMMARY

The first part of the Biodiversity Conservation Strategy and Action Plan reviews information on the biodiversity in Lithuania, including its unique features, biogeographic regions, communities, ecosystems, habitats, and species. This section also reviews information about the use of biological resources, the Lithuanian Red Data Book, the protected areas system and Nature Frame. The existing activities for the protection of biodiversity - legal-institutional, territorial planning, research and monitoring, information, education and international cooperation - are briefly discussed.

In the second part of the Strategy, existing problems are analyzed, a system of goals and their priorities are established, the strategic concept is adopted and the principles of the strategy are defined. The third section presents action plans for protection of the most important ecosystems (forest, Baltic sea, coastal and inland water bodies, wetland and meadow, agro- and urban ecosystems), for forming the Nature Frame and for achieving species protection and other ex-situ programs.

The Biodiversity Conservation Strategy and Action Plan also identifies the economic and political prerequisites (financing, international aid, political and institutional regulations) that are needed to implement biodiversity conservation programs in economic sectors, local government, using local capabilities.

Present situation. Natural and semi-natural ecosystems (forests, wetlands, meadows, water bodies and sand) cover approximately one-third of Lithuania. Species density is variable, especially in forests. Lithuania belongs to the natural zone of mixed forests. There are three biogeographic units in Lithuania: Eastern Baltic, Central European and the marine province of the Baltic sea.

To protect species and communities the Lithuanian Red Data Book has been compiled and protected areas have been established. Most protected areas important for conservation of biodiversity are in eastern Lithuania, many in highlands and on sand plains. In 1993, 5 protected areas were given Ramsar status. All natural protected areas, and other ecologically important or more or less natural areas are connected by a system of landscape conservation ecological compensation zones known as Nature Frame.

There are 32 laws which directly or indirectly regulate environmental protection and the use of biological resources. The Ministry of Environmental Protection is responsible for the conservation of biodiversity. The Ministry of Agriculture and Forestry, which regulates economic use of some biological resources, Ministry of Construction and Urban Development, and municipal institutions also have responsibilities for biodiversity protection.

Conservation of biodiversity depends, for the most part, on an application of the principles and criteria of biodiversity in preparing planning documents of all kinds and at all levels, and foreseeing the financial means, and actions needed for conservation of biodiversity. At present too little attention is paid to biodiversity conservation in the documents of programs in the economic sectors of Lithuania.

Research on biodiversity is being undertaken by the Institutes of Botany, Ecology, Forestry, Vilnius University, the Pedagogical University of Vilnius and the University of Klaipëda. The main non-governmental organizations working in the field of biodiversity conservation are the Lithuanian Fund for Nature and various societies of ornithology, botany, theriology.

There is no systematic monitoring of biodiversity in Lithuania, although there is research at various levels, from genes to ecosystems. Much remains to be learned about Lithuanian biodiversity, including the identification and status of the native flora and fauna.

Not all most important international conventions related to wildlife protection have yet been ratified.

Strategic part. The quality of biodiversity is threatened by a number of activities, including land-reclamation, intensified logging, damage of forest ecosystems because of natural calamities and pollution, changes in ecological conditions in meadows and their degradation and loss in the course of economic activities, and conversion of rivers and rivulets into ponds.

The evaluation of trends in Lithuanian biodiversity and the impacts affecting it at different levels indicates the following main problems for biodiversity conservation concern: in-situ protection problems (7 problems at the geosystematic level, 8 problems at the ecosystematic level, 8 problems at the species level, 2 problems at the genetic level) and ex-situ /artificial conditions/ protection problems (2 problems at the genetic level, 4 problems at the organizational level).

The priority of problems has been established by experts. The problems and goals of biodiversity conservation make a unified system. The overall goal of strategy must be to create the preconditions necessary for saving the most important ecosystems and species for future generations, and to develop the foundations needed for balanced use and management of biological and landscape resources.

The goals of biodiversity conservation should address all problems and establish the preconditions for the organization and planning of biodiversity conservation programs and activities.

Action plan. A concept uniting all high priority goals of biodiversity conservation was chosen for development of the biodiversity conservation action plan. Action items are presented not according to goals but to ecosystems and special programs. The time frame for action items is 10 years, whether they be legal, institutional, territorial planning or designing, research and monitoring and information, or education or training. For each action, the timing, possible financial sources and relevant institutions are indicated.

Implementation of the action plan. During implementation of the action plan, the Ministry of Environmental Protection shall prepare yearly work plans indicating the finance needed and the sources of funds.

Implementation of the Action Plan requires 11,2 million litas. Possible financing sources include state and municipal institutions themselves, state and municipal institutions' nature protection funds, the forest fund, foreign funds, various organizations or other states, private capital, etc. Quick implementation of the Action Plan without the help of foreign countries and organizations is unrealistic.

The legal basis of biodiversity protection needs to be further developed. Regulation of biodiversity should be integrated with laws which regulate all fields of the economy. The regulations of biodiversity protection should become not only a part of laws but a part of territorial planning documents. The financial requirements of biodiversity conservation should be foreseen while preparing programs for separate branches of the economy. It is important that the conservation of biodiversity become an integral part of agriculture, forestry, industry, construction planning, and hunting and fishing policy.

The public should take an active part in the process of biodiversity protection.

A policy of regionalization of environmental protection will help implement the Biodiversity Conservation Strategy and Action Plan. To this end 10 regions for environmental protection are proposed. Municipal institutions should be invited to participate in decentralizing environmental protection, which would at the same time increase communication between various social groups and non-governmental organizations.

DEFINITIONS

Biodiversity - diversity of living organisms, and terrestrial, marine and other aquatic ecosystems also ecological complexes of which they are a part. It includes diversity within species, between species and between ecosystems.

Community - a group of populations of various species, at a given place and time.

Ecosystem - dynamic complex of communities of plants, animals and microorganisms and their abiotic surroundings, which function as unit.

Ex-situ protection - protection of biodiversity components outside the boundaries of their natural habitats.

Genetic diversity - diversity of genes which different organisms carry.

Genetic resources - genetic material which has actual and potential value.

Habitat - space, living place used by an organism where it coexists with other organisms and influenced by landscape components and climate.

In-situ protection - protection of ecosystems, natural habitats, conservation of species and their populations or restoration in their natural environment. In case of domesticated or cultivated species, the environment where they developed their distinctive features.

Population - group of individuals of one species. Its spatial boundaries are defined mostly by the researcher.

Species - totality of population or populations that interbreed and produce fertile offspring, occupies defined range and have common morphophysiological features and common relations with biotic and abiotic environment.

1.0. INTRODUCTION

Biological diversity includes all the diversity of species, living in terrestrial, marine and other aquatic ecosystems, their habitats, and the biological processes that support them. The Earth's biodiversity has developed over billions of years, and its components have importance from ecological, scientific, recreation, economic, aesthetic, ethic and other points of view. Biodiversity stimulates functional diversity in nature and provides its resistance, adaptability and capability to restore both itself and productivity of natural systems. It also creates a background for the survival of mankind as well as other forms of life.

Nevertheless, biodiversity degenerates in the course of man's economic development in which, globally, hundreds species of plants, fungi and animals have became endangered or extinct, several in the Lithuanian Baltic region. The increasing loss of species irretrievably deprives us of a opportunities springing from ecological diversity. The Convention on Biodiversity, signed in Rio de Janeiro in June, 1992 (the Rio Convention), set up provisions for the conservation of the world's biodiversity.

The Rio Convention confirmed humankind's common responsibility for the conservation and sustainable use of biodiversity. The Convention provides for each signatory country to identify the most important components of its biodiversity, to monitor them, and to evaluate and regulate activities which adversely affect them. The Convention calls for special attention to conserving biodiversity *in-situ*, i.e., under natural conditions. Accordingly, it was recommended that a system of protected areas be created to support conservation of natural ecosystems and viable populations, to regulate the use of biodiversity, and to restore degraded ecosystems and endangered species, to control biotechnology and the introduction of species, and to prepare the legal and institutional framework and plans and strategies toward those ends.

Lithuania ratified the Convention in July, 1995, and is thus obliged to prepare. a country biodiversity study, strategy and action plan (Biodiversity Conservation Strategy and Action Plan). Biodiversity and landscape conservation were addressed in the country's 1995 National Environmental Strategy, and are a precursor of this Action Plan.

The National Environmental Strategy of Lithuania was prepared by the Ministry of Environmental Protection together with experts from science and design organizations and from Ireland IDI (International Development Ireland) in 1995. It was the first step in preparing of the action plans for biodiversity conservation, and was used as the background for the Action Plan for Biodiversity Conservation.

In 1995, following the World Bank recommendations, Pilot National Action Plans were developed for the conservation of

biodiversity of the three Baltic States (Estonia, Latvia and Lithuania). Following the financial aid of the World Bank for preparing of Biodiversity Strategy the Ministry of Environmental Protection, the main institution responsible for landscape and nature protection in Lithuania, initiated preparation of the strategy in 1996. Biodiversity Conservation Strategy and Action Plan has been developed based upon the Pilot National Action Plan for the Conservation of Biological Diversity, using the National Environmental Strategy materials. Biodiversity Conservation Strategy and Action Plan has been made more specific with regard to ecosystems, the current status analysis has been supplemented with biogeographic units of Lithuania, presenting the distribution of protected areas in biogeographic units and including the Strategy Section. Concrete actions were proposed, recommended projects indicated which needed foreign financial assistance, etc.

The main goals of the Biodiversity Conservation Strategy and Action Plan are to conserve the country's biological diversity - major ecosystems and species - for future generations, at the same time contributing to the global conservation efforts which employ every measure known and available to mankind, at laying down the foundations for sustainable use and management of biological and landscape diversity by integrating its conservation measures into the national economy development programs.

This Biolodiversity Conservation Strategy and Action Plan is prepared for 20 years although most of the actions are meant to be implemented within 5 years. Thus, the action plan should be revised in five years.

The Lithuanian Republic Biodiversity Conservation Strategy and Action Plan has been prepared in collaboration with specialists from the Institutes of Botany and Ecology, Vilnius University, the Ministry of Agriculture and Forestry, and NGOs, by the Working Group established under the order of Minister of Environment and with the help of foreign consultants. Steering Committee for the preparation of strategy has been established.

The Ministry of Environmental Protection is thankful to the members of the Working Group and to all specialists from Institutes of Botany, Ecology, Forestry and others, Vilnius and Klaipëda Universities and Vilnius Pedagogical University, Garden of Botany and specialists of other organizations, representatives of NGOs, Ministry of Agriculture and Forestry, Ministry of Construction and Urban Development and employees of other ministries who presented their comments and suggestions for development and improvement of the Strategy and Action Plan.

1. CURRENT STATUS AND TRENDS

1.1. Biodiversity Review

This section provides an overview of the biogeography and ecosystems of Lithuania and details the diversity of the country's vegetation, fungi and wildlife communities and other species in the regions.

1.1.1. Biogeography

The characteristics and significance of Lithuania's biogeography have not been studied in detail. Some effort has been made to identify biogeographic units based on plants, animals, and fungi. However, this has not been completed in a systematic manner. A preliminary scheme of biogeographic units was developed by P.Kavaliauskas using the underlying principle of ecogeographical differentiation for the determination of lower taxa boundaries.

Lithuania occupies both the boreal and temperate biogeographic regions, with mixed-forest biome predominating at its southern boundary (Figure 1). The broadly ecotonal pattern at the boundaries of three biomes gives Lithuania special significance for biodiversity not only at the local, but also at the regional and national levels.

In Lithuania, three main biogeographic provinces are represented: Eastern Baltic, the Baltic Sea Marine and Central European (Figure 2, Table 1.1.1).

Table 1.1.1. Characteristics of Lithuania's biogeographic provinces and units (P.Kavaliauskas, 1996)

A. THE BALTIC SEA MARINE PROVINCE
Prevalence of biocenoses of a medium latitude continental sea in shallow low salinity marine complex. In the sub-littoral zone, macrophytes grow at the depth of 10 meters, forming communities poor in species which combine to form Zostero-Furcellarietum associations. Edificators of the communities are: Zostera minor, Zostera marina, algae Furcellaria fastigiata and Fucus vesiculosus.
A I. SOUTH-EASTERN BALTIC COASTAL WATERS UNIT
Actively producing marine biocenoses, shallow (max. 20 m deep), relatively warm, markedly low salinity, and sandy/gravel sub-aquatic plateau bottom.
A II. SOUTH-EASTERN BALTIC OPEN SEA UNIT
Marine biocenoses of medium depth, relatively cool, low salinity, with muddy/silty sloping bottom.
B. EASTERN BALTIC PROVINCE (Atlantic Region)
Medium humidity transitional climate, mixed spruce forest (broad-leaved coniferous) with Western European elements in agrarian woody landscape. Vegetation type of the zone - mixed spruce forests - currently represent various types of broad-leaved spruce forests: from communities which are rich in species composition (Querco-Piceteum) with temperate species (Aegopodium podagraria, Hepatica nobilis, Anemone nemorosa, Tilia cordata, Carpinus betulus) to southern taiga (Eu-Piceetum) communities which are poor in species composition with Boreal and Boreal-temperate (Oxalis acetosella, Maianthenum bifolium, Trientalis europaea) species.
B' I. THE BALTIC COAST UNIT
Biocenoses of pine woods of sandy sea-coast plains and dunes and small-leaf forests with elements preferring dry and saline conditions near centralized urban development.
B'II. THE CURONIAN LAGOON AQUATIC UNIT
Biocenoses of polluted fresh-water lagoon.
B' III. THE CURONIAN LAGOON COASTAL UNIT
Mixed forest in sandy wet plains of the Lagoon coast and delta as well as those of raised bogs and flooded meadows under intense agrarian cultivation.
B' IV. WESTERN ÞEMAIÈIAI UNIT
Mixed spruce and pine forest and wetland meadows in the loamy valleys and plains of the Pajûris Lowland in agrarian and woody landscapes.
B' V. NORTHERN PANEMUNIAI UNIT
Mixed spruce and small-leaf forest and dry meadows in clay plains, in woody agrarian landscapes.
B' VI. THE NEMUNAS RIVER VALLEY UNIT
Mixed pine and spruce forest and high marshes in sandy terraces and old deltas in forested and agrarian urbanized landscapes.
B' VII. SÛDUVA LOWLANDS UNIT
Mixed spruce and broad-leaved forest and drained meadows and wetlands in clayey and undulating loamy plains in agrarian and agrarian woody landscapes.
B' VIII. DZÛKAI HIGHLAND UNIT
Mixed spruce and pine forest and lowland meadows and lakes in loamy plateaus and highlands.
B' IX. SÛDUVA HIGHLAND UNIT
Mixed spruce and broad-leaved forests and lowland meadows and lakes in loamy hills in agrarian and woody landscapes.

(Boreal Region)
B" X. CENTRAL ÞEMAIÈIAI UNIT
Typically spruce and mixed pine forest with wetlands and lakes of loamy plateaus and hills in mixed farmland and forest landscapes.
B" XI. EASTERN ÞEMAIÈIAI UNIT
Mixed spruce and pine forest and raised bogs of loamy plateaus and plains in agrarian and agrarian woody landscapes.
B" XII. ÞIEMGALA LOWLANDS UNIT
Broad-leaved spruce forest and broad-leaved forest and dry meadows on loamy plains of agrarian landscapes, abounding in carbonates.
B" XIII. CENTRAL LATVIA UNIT
Mixed spruce and pine forest and wetlands meadows of loamy plains under-forested and woody agrarian landscapes.
B" XIV. CENTRAL LITHUANIA UNIT
Mixed spruce and broad-leaved forests and lowland meadows of loamy ridgy plains in woody agrarian landscapes.
B" XV. EASTERN AUKÐTAIÈIAI SLOPES UNIT
Mixed spruce and small-leaf forests and wetlands of loamy undulating plains in agrarian and woody agrarian landscapes.
B" XVI. NERIS/ÐVENTOJI VALLEYS UNIT
Pine woods in the sandy valleys and of raised bogs and flooded meadows in woody and point-type urbanized landscapes.
B" XVII. AUKÐTAIÈIAI HIGHLANDS UNIT
Mixed spruce and pine forests of loamy plateaus and hills and of lakes, lowland meadows and fens in agrarian landscapes.
B"XVIII. EASTERN LITHUANIA LAKY CHANNELS UNIT
Mixed and typical pine woods of sandy valleys and low valleys, and of raised bogs and lakes in woody and woody agrarian or urbanized landscapes.
B" XIX. NORTHERN NALÐIA HIGHLANDS UNIT
Mixed spruce and pine forests of loamy hilly areas and of lowland meadows in agrarian and woody agrarian landscapes.
B" XX. POLOCK LOWLANDS UNIT
Mixed spruce and small-leaf forests of clayey plains and of flooded meadows in agrarian landscapes.
B" XXI. SOUTHERN NALÐIA HIGHLANDS UNIT
Mixed spruce and pine forests of loamy old plateaus and hilly areas and of lowland meadows in agrarian and woody agrarian landscapes.
C. CENTRAL EUROPEAN PROVINCE
Predominantly mixed pine forest of the medium continental climate with warmth-loving steppe elements. Vegetation type of the zone - thermophyllic pine forests (Cladonio-Pinetum, Vaccinio vitis-ideaea-Pinetum) to which endemic and sub-endemic of Bohemia/Poland (Festuca psammophilla) and Polese (Dianthus borbasii, Silene lithuanica, Tragopogon gorskianus) are characteristic.
C I. DAINAVA LOWLANDS UNIT
Typically mixed pine forests of sandy plains and continental dunes and of raised bogs in woody and woody agrarian landscape.

1.1.2. Ecosystems and habitats

Lithuanian ecosystems include: natural/semi-natural (forests, wetlands, meadows, coasts, and sandy, marine - the

Baltic Sea and Curonian Lagoon - aquatic - lakes and rivers - systems), and anthropogenic (agrarian and urban) ecosystems. Lithuania ecosystems have received less attention than have the individual species. Currently, there is no uniform classification and maps for habitats which is accepted by botanists, mycologists, zoologists and geographers. As a result, there are no maps of regional ecosystems and habitats. The following provides a summary of the country's natural and semi-natural ecosystems.

Forests occupy 30.1% of Lithuania. Forests are Europe's most common semi-natural ecosystems, which require attention because of their significant biological, economic and recreational functions. Forest communities, when identified by the traditional system of classification for Eastern Europe, fall in 30 associations within the following 4 classes: (1) blackthorn growths on river banks (*Rhamno-Prunetea*), (2) riverside willow groves (*Salicetea purpurea*), (3) coniferous forests (*Vaccinio-Piceetea*), (4) deciduous forests (*Querco-Fagetea).* The dominant species, as illustrated in Figure 3, are pine (37.6%) and spruce (24.0%). Although broad-leaved deciduous forests are not abundant they are, with mature forests of various species composition, of great importance for the conservation of forest biodiversity. Mature forests comprise only 9.6% of forests. Deciduous trees are gradually being replaced by coniferous ones; oak woods and ash groves account for only 4.5%.

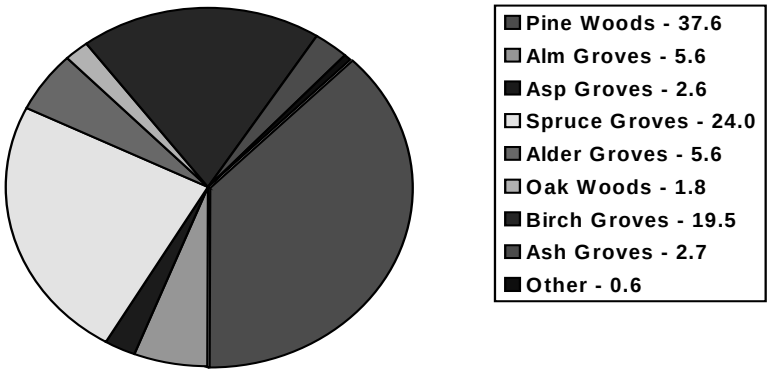

Figure 3. Distribution of dominant tree species in Lithuanian forest area (%)

The state of Lithuania forests is not good. They have been drained, monocultures prevail, and in some regions, impacts are occurring due to intensive recreational use. Other isolated incidents, including wind-felled trees, have been increasing, especially since 1993. Acid rain is also an increasing problem. In previous times, high populations of ungulates damaged forest regeneration. However, the number of

animals has diminished in recent years, reducing this problem.

Wetlands. During the last 30 years, 70% of the wetlands have been lost. The diversity of wetland vegetation is not large; there are 4 classes: (1) fens alder (*Alnetea glutinosaea*), (2) fens small sedge thicket (*Scheuchzerio-Caricetea nigrae*), (3) raised bogs grassy peat-moss (*Oxycocco Sphagnetea*), and (4) raised bogs whortle-berry (*Vaccinietea uliginosi*).

Wetlands are among Lithuania's the most important ecosystems. Their delineation is a high priority action for their protection. The status of wetlands in Lithuania is highly dependent on their size. Small wetlands, particularly those on cultivated land, were destroyed by land reclamation and forest drainage. Small wetlands enhance the mosaic character of a landscape and render an ecotonal effect, and are therefore among the most valuable. Their role is particularly important in agricultural landscapes, where wetlands are often affected by succession. Wetlands and ponds made by beavers are also important because composition of biodiversity is rich during the first 5 to 8 years following their formation.

The existence of wetlands vegetation is seriously threatened by intensive land reclamation. Vast areas of wetlands suffer from eutrophication which has adverse effects on vegetation: stagnation in raised bogs, characterized by reduction in growth rate. With mineralization, atypical meadow and forest species appear. *Oxycocco-Sphagnetea* class communities in raised bogs undergo transformations into *Vaccinietea uliginosi*: the reduction of ground water level promotes the growth of semi-shrubs - ledum, heather, bog whortleberry (*Ledum palustre, Calluna vulgaris, Vaccinium uliginosum*, etc.), reduced vitality of cranberries (*Oxycoccus palustris*) and wetland varieties of pine (*Pinus sylvestris*) are increasingly replaced by mineral soil varieties with accompanying characteristic species. Wetland grasses give way to meadow and forest species of wide amplitude, and the biomass shrinks to a third. Particularly threatened are limy fens communities of *Caricetalia davallianae*. Areas that these communities occupy in Lithuania are larger than 100 ha in total. During the past 50 years, the area of *Seslerietum uliginosae* communities has noticeably decreased.

Natural meadows, particularly in forests and river valleys, typically boast the richest diversity of plants and related invertebrates and fungi. Unfortunately, during the last 30 years, natural meadows have decreased: in 1956, meadows covered 19.6% of the country, whereas by 1980 they accounted for only 6.5%. Natural continental meadows which were intensely cultivated or planted with forest have suffered most. The diversity of meadow communities is high. They belong to 5 classes: (1) saline (*Asteretea tripolii*), (2) steppe (*Festuco-Brometea*), (3) fertile (*Molinio-Arrhenatheretea*), (4) barren (*Nardetea*), (5) forest meadows on slopes (*Trifolio-Geranietea sanguinei*), and 45

associations. Communities of fertile meadows are dominant, and steppe meadows reach the northern limits of their range in Lithuania.

The surviving natural flooded and continental meadows has deteriorated. Conservation of semi-natural meadows is related to their extensive use, yet no legal economic compensatory mechanism has been created. Economically strong farms use fertile meadows intensively as pastures, which degrades them. In other cases, in low-intensity use, non-fertile meadows and pastures are over-grown with shrub or forest. In some regions, particularly Þemaitija, unused arable land is turning into meadow.

Wetlands, forest, and meadow ecotopes are of particular importance to animals. The biodiversity of invertebrates and other animals observed in these transitory areas is the highest.

The transformation of meadows into farmlands has resulted in almost total destruction of continental meadows. Only fragments have survived between arable fields, near forests and on hill slopes. Today meadow vegetation is represented only by the flooded meadows in river valleys and near lakes. Species and other taxonomic composition changes are observed, species of a wide ecological amplitude are becoming widespread. In most meadows, productive *Alopecuretum pratensis* communities are replaced by the *Deschampsietum caespitosae* communities which are of low value, adventive *Bunias orientali* and other species penetrate the communities, sedge (*Caricetum*) growths after land reclamation are replaced by low-value grasses (e.g. the expansion of *Ranunculus repens* in the lower reaches of the Nemunas River). Particularly threatened are rare communities and those which occur at the boundaries of the area. *Iridetum sibirici* and *Cirsietum rivularis* are diminishing in area. Unbalanced use of fertilizers and soil acidification have resulted in extinction of the orchid (*Orchidaceae*) family species.

Sandy areas, with the exception of sea beaches and those of major rivers, are mainly of secondary origin habitats, having emerged as a result of economic activities (former military training grounds, open continental sands).

Biodiversity in sand communities is not high. There are only 4 classes: (1) white dune beach-grass (*Ammophiletea*), (2) nitrophyllic sea-rocket (*Cakiletea maritimae*), (3) gray dune club grass(*Corynephoretea*) and (4) *Sedo-Scleranthetea,* with 14 associations. Those ecosystems, however, are both unusual and rare. Negative impact on sand ecosystems is mostly due to the overgrowth of open sand stretches, planting with forest crops for economic use, or intensive recreation.

Problems mostly arise due to the overgrowth of open sand stretches or their planting with forest. The most adverse impact upon coastal dunes is rendered by intensive recreation: habitats of rare plants and fungi are destroyed, trampled, sand-slides occur.

Sand vegetation has been adversely affected by extension of forests areas. Thickets of mountain pine (*Pinus mugo*) which are typically planted in the sandy coastal soils are ousting the following

rare and endemic species characteristic of the eastern coast of the Baltic Sea: *Festuca sabulosa, Tragopogon heterospermus, Linaria loeselii, Corispermum intermedium*. Pine forests (*Pinus silvestris*) are planted on the south-eastern continental sandy plains. In these wooded areas rare sand vegetation species characteristic of the region and those occurring at the boundaries of the area have become extinct: *Armeria elongata, Spergula vernalis, Teesdalia nudicaulis, Bromus commutatus, Silene lithuanica*.

Aquatic ecosystems include lakes, reservoirs, rivers, the northern part of the Curonian Lagoon and the Baltic Sea along the coast of Lithuania. Vegetation of water bodies is characterized by high diversity of both fresh and saline water vegetation.

Lithuania has mesotrophic, eutrophic, hypertrophic and dystrophic lakes. Eutrophication of lakes increased in the seventeenth century, when forests were converted to arable land, and has further increased since the middle of the current century due to extensive use of mineral fertilizers and intensive land reclamation. The large mesotrophic and eutrophic lakes have been most studied. Lakes and the Curonian Lagoon have been the most severely damaged by eutrophication

The botany of lakes has been studied quite extensively, but rivers, small water bodies and coastal waters less so. Aquatic vegetation is dominated by small floating plants (*Lemnetea*), large rooted and floating hydrophytes (*Potametea*), stoneworth algae (*Charetea*) and coastal large halophytes (*Phragmitetea*), communities which are common in nearly all water bodies. Small halophytes and hydrophytes (*Litorelletea*) occasionally occur in clean oligotrophic and mesotrophic lakes, as do some terophytes (*Isoeto-Nanojuncetea*) communities in wetlands habitats, and (*Utricularietea intermedio-minoris*) communities in small distrophic and mesotrophic water bodies. Halophytic flowering plants and algae (*Zosteretea marinae*) communities can be found in the littoral of the Baltic Sea. At present, the littoral of most of the mesotrophic lakes, even large ones, is totally overgrown with aquatic plants, to a depth of 6-9 meters, with the exception of water edge affected by intense breaking of waves. Aquatic vegetation in shallow eutrophic lakes may be spread all over the lake. Most thick vegetation is found in slow rivers of Central Lithuania; South-Eastern rivers with high water flow, particularly in regions of intense agriculture or below waste water discharge points, are being quickly overgrown.

River ecosystems in Lithuania are polluted and anthropogenically eutrophicized from point and non-point source run-off of biogenic minerals and organic substances. Small rivers and tributaries are oligotrophic and oligomesotrophic; medium size rivers are oligomesotrophic and mesotrophic. The lower reaches of major rivers are either mesotrophic or eutrophic.

Aquatic vegetation changes under the impact of economic activities. The vegetation in most of the small water bodies was destroyed by land drainage; plants perish at the points of industrial waste water discharge. In areas under intensive farming aquatic vegetation is thriving and its growth rate has considerably increased. Fast overgrowth of water bodies during which quantitative and qualitative changes take place in aquatic vegetation are the most outstanding consequences anthropogenic eutrophication.

In totally overgrown eutrophic water bodies species diversity inevitably declines, and species and communities of a wide ecological amplitude take root. For example, in the Þuvintas Lake alone during a period of 30 years, 14 stonewort algae, 9 flowering plants and 1 moss species have became extinct. During roughly the same period, *Nyphoides peltata* has became extinct in all rivers in the western part of the country (Jûra, Minija, Gëgë), its only certainly known remaining habitat being the Kniaupas Bay of the Curonian Lagoon.

Sub-aquatic plant species are the first to decline - they are most sensitive to water quality, particularly clarity, and sediment changes. The most rare plants of our flora - *Myriophyllum alterniflorum, Lobelia dortmanna, Isoetes lacustris, Najas minor, Lychnothamnus barbatus, Nitella spp* - belong to this group.

Another obvious tendency in the development of aquatic vegetation is the prevalence of large emergent halophytes, such as *Phragmites australis, Schoenoplectus lacustris, Sparganium erectum* etc. in lake shallows up to 2 m deep and in shallow river beds. For this reason, small species which are typical of sand and gravel bottoms are declining in shallow lakes, and in rivers the same holds true for sub-aquatic reophilic pond weeds and aquatic ranunculaceous plant species and communities.

Agrarian ecosystems occupy the largest land area in Lithuania (53.7%), have the most impoverished biodiversity, and are not well understood. Recent changes in land use, which includes land privatization, less intense agriculture and agro-chemical use, and increase in fallow land has provided an opportunity for meadow and scrub systems to develop. Conditions in agrarian ecosystems are not expected to deteriorate in the near future.

Ruderal communities occur on domestic non-hazardous waste lands and fallow land. The ruderal flora comprises about 200 species. They grow in ever changing communities. Ruderal communities are open, their species composition is not constant. Their admit species from various habitats. Therefore amongst ruderal vegetation about 30% of occasional species flourish. Floristic composition is highly dependent upon the soil. In broken stone sites, *Descurainia sophia* and *Erucastrum gallicum* can often be found. *Melilotus alba*, *M. officinalis* and *Cichorium intybus* are common in fallow land. *Aegopodium podagraria* and nettles (*Urtica dioica*) are increasingly found in domestic nitrified dumping sites.

According to the European classification of vegetation, ruderal communities belong to 6 classes: (1) eutrophic flooded communities in mud, (2) nitrophyllic terrestrial communities on alkaline soils, (3) nitrophyllic high perennial absinthnim communities, (4) fallow land high

xerophyte, (5) mesoxerophyte communities, and (6) communities of low ruderals of compressed soils.

Natural ecosystems are being destabilized and invaded by ruderal species, especially in continental meadows.

Instability of natural ecosystems increasing, migration of ruderal (particularly that of introduced ones) species into natural continental meadows and forest communities is observed.

Urban ecosystems occupy nearly 5% of Lithuania (2.7% - buildings, 2.05% - roads), with an increasing urban development trend. Urban areas characteristically have high population densities, concentration of industries and transportation systems, and high levels of pollution. Urban recreational areas are heavily used.

The urban landscape, where conditions are ecologically extreme, and direct and indirect introductions of alien fauna and flora are common, accounts for fairly high biodiversity. On average, urban landscapes have 39 out of the country's 70 mammal species (24 of them are common). In Vilnius, 185 species of bird, 7 of 13 amphibia and over 400 fungi have been recorded.

Parks in urban systems provide habitat for many species (plants, fungi, animals). Species inventories have been conducted in 239 parks. Generally, trees in parks are local deciduous with a few local and alien conifers. Individual hundred-year-old trees, such as the oak of Stelmuþë park, create special habitats. The area under the crowns of trees is occupied by the emerging semi-natural multi-species plant communities, with rare species of fungi. Rare alien species occasionally propagate away from their distribution area. They include: *Ginkgo biloba* in Ðvëkðna park, the gray chestnut (*Aesculus glabra*) in Teraspolis park, silver lime tree (*Tilia tomentosa*) in Alanèiai park, and the tulip tree (*Lyriodendron tulipifera*) in Veliuona park. Ðvëkðna and Vilkënai parks are home to large European yew trees (*Taxus baccata*).

The **mosaic of ecosystems** in Lithuania is a result of centuries of economic activity and development. Recently, with the collapse of the kolkhoz agricultural system, vast stretches of land have been sub-divided, and the ecological mosaic thus increased. During the first stage decline of the agricultural sector there was an increase in extensively used meadows and pastures; they have since tended to overgrown by shrubs and forest. Mostly are planted coniferous tree, which is not in favor of biological diversity.

Within ecosystems, biological diversity natural change trends are related with succession and the formation of stable climax communities. In this respect, the inevitable loss of stage communities species is compensated by an emergence new species characteristic only of late succession

stages and climax communities. It is climax communities that suffer most from anthropogenic loads as they simply cannot take shape in a too short span of time. However, not necessarily the climax ecosystems are most abundant in species. Their plant species diversity is low. Cosmopolitan alien species prevail. Some pioneering ecosystems have rich biodiversity, such as water bodies with raised water-level, overgrowing long-fallow lands.

In Lithuania, the following ecosystem changes are expected:

- further distribution of early stage land communities and a reduction in the area of climax communities with a loss of certain succession stages,
- loss of biodiversity in eutrophic wetlands and lakes with gradually prevailing mono-dominant communities,
- a decrease of species and communities diversity in the forest ecosystem due to intense farming, mature deciduous forests being mostly affected,
- a decrease of meadow communities and species due to growing shrubbery or due to the transformation of meadows into cultivated land,
- biodiversity increase in agro/ecosystems due to an increasingly fragmentary mosaic of land plots and reduced use of fertilizers and chemicals, as well as increasing areas of long-fallow land,
- stabilization of the trophic state of lakes and water reservoirs and of changes in community structure and due to a reduction in anthropogenic eutrophication,
- deterioration of water quality in rivers, changes in community structure and a reduction in biodiversity due to the development of hydropower and water transport systems and continuing anthropogenic eutrophication,
- ecological recovery of northern parts of Curonian Lagoon due to a reduction in pollution. Further changes of communities are probable, however, due to the proposed destruction of the natural barrier between the Lagoon and the sea which will allow salt water into the northern part of the Lagoon (Klaipëda sea-port will be developed southwards and the isthmus is to be deepened),
- reduced biodiversity in the coastal waters of the Baltic Sea due to the development of various coastal industries and associated dumping of waste.

According evaluation made by different experts the areas of priority interest in biodiverstity conservation are shown in Figure 4.

1.1.3. Communities and Species

Vegetation. Natural and semi-natural vegetation covers roughly 1/3 of Lithuania. The Lithuanian flora is comprised of 1,796 species (Table 1.1.2). The largest families are *Compositae* (124 species), *Poaceae* (117 species), and *Cyperaceae* (93 species). There are approximately 20 tree species, 57 bushes, 23 shrubs, and 1,266 herb. The number of plant species in different ecosystems are unequal.

The most important associations are forests (713 species), meadows (555 species, with up to 438 species in individual flooded meadows), freshwater habitats (130 species), and sandy soils (167 species).

Table 1.1.2. The number of plant species in Lithuania

Systematic categories	Number of known species
Flowering plants (*Angiospermae)*	1328
Coniferous plants (*Gymnospermae)*	3
Club moss (*Lycopodiophyta)*	7
Horse tails *(Sphenophyta)*	8
Ferns *(Polipodiohyta)*	21
Mosses *(Musci)*	320
Liverworts *(Hepaticae)*	106
Horn-flowered mosses *(Anthocerotae)*	3
In total	1796

Many of Lithuania’s plants are at the boundary of their range:

- the following species reach the northern boundary in Lithuania: *Allium angulosum, Arnica montana, Lathyrus laevigatus, Mentha longifolia, Prunella grandiflora, Seseli annuum, Spergula vernalis, Trifolium rubens, Vicia pisiformis, Potamogeton acutifolius, P. trichoides, Najas minor, Nymphoides peltata*;
- north-western boundary are reached by 7 species: *Aquilegia vulgaris, Calamagrostis pseudophragmitoides, Festuca psamophila, Koeleria delavignei, Neottianthe cucullata, Silene lithuanica, Trifolium lupinaster*;
- the western boundary, by one species: *Astragalus danicus*;
- the eastern boundary, by four species: *Cacile baltica, Carex arenaria, Myrica gale, Trichophorum caespitosum*;
- the southern boundary, by two species: *Montia fontana, Galium triflorum*;
- and the north-eastern boundary, by hornbeam (*Carpinus betulus*), *Aira praecox, etc*.

The Lithuanian flora includes the following Ice Age relicts:

- *Betula nana, Baeothryon caespitosum, Cladium mariscus, Carex paupercula, Lobelia dortmanna, Isoetes lacustris, Swertia perennis* (pre-Boreal relicts);
- *Cephalanthera rubra, Gratiola officinalis, Isopyrum thalictroides, Melitis melissophyllum, Viola stagnina* (sub-Boreal relicts);

- *Bromus benekenii, Carex heleonastes, Gagea pratensis, Gymnadenia odoratissima, Lunaria rediviva, Teucrium scordium,* and *Tofieldia calyculata* (Atlantic relicts).

A number of endemic and subendemic species occur in southern Lithuania, all of which are rare. On south-eastern sandy soils, the following endemics of Polese sands occur: *Tragopogon gorskianus, Dianthus borbasii, Silenia lithuanica*; *Festuca psammophila*. In the south-western deciduous forests, *Cerastium sylvaticum*, a Central European neoendemic, can occasionally be found. All the mentioned species are rare, some of them are communities edificators.

Intense economic activities have caused irrevocable changes in vegetation: simplification of community structure and species composition, physiognomic and dynamic changes, and synantropisation, which is a particular threat to the cenofund. The general trend is that rare species and communities with a narrow ecological amplitude are declining in all aquatic areas.

During the past 45 years several species have become naturalized in different communities, predominately the sand communities. The reduction of natural ecosystems area has resulted in community destabilization, changes in community structure and species composition, domination of cosmopolitan, and widespread species and the loss of species typical of unique ecosystems. This is observed predominately in sandy meadows and wetlands (particularly low marshes). Specific vegetation changes are explained in Annex 2.

Fungi. Mushrooms in Lithuania - which are representatives of broad-leaved deciduous and boreal coniferous forests and partly taiga - are typically found in the following ecosystems: forests, meadows, wetlands, fields, water bodies. There are over 6,000 species of fungi in Lithuania (Table 1.1.3), found in virtually all habitats. The majority, over 4,000, occur in forests, with fewer species in meadows (over 600), water bodies (200), wetlands (150), and sand habitats (200). There are 1200 species of soil fungi. Of the 2,000 macromycete species, 400 are edible and 100 poisonous. Plurizone/circumpolar micromicete and boreal/nemoral macromicete species prevail (60%). Predominance of holarctic species indicates quite old relationship with the fungi of Eurasia and North America.

Table 1.1.3. The number of fungi species in Lithuania

Taxa	Number of known species
Myxomycetes	120
Zygomycetes	100
Chytridiomycetes	30

Ascomycetes	700
Basidiomycetes	2500
Deuteromycetes	2200
Lichens	400
In total	6050

The distribution of fungi in various ecosystems is very uneven. Fungi are most diverse in forests. The species diversity of macromicetes, including that of lichens, has been more thoroughly studied than the diversity of micromicetes. Both micromicetes and macromicetes have been insufficiently studied in Lithuania and the data on the diversity of separate fungi groups as well as their distribution are quite scarce, some groups have not been studied at all. Every year ten to twenty or even several tens of new fungi species are identified. It is estimated that the realm of fungi in Lithuania consists of 3.5 to 4.5 thousand macromicete and 8 to 12 thousand micromicete species.

The Ice Age relics of Lithuanian flora - *Betula nana, Carex paupercula, Viola stagnina, Bromus benekenii, Carex heleonastes, Gagea pratensis* and *Lunaria rediviva* - are parasitized by micromicetes. In southern Lithuania micromicetes biotrophes sometimes also occur on endemic and subendemic plants. Biotrophic fungi species usually adversely affect some plant species' functioning in ecosystems. In Lithuania about 2000 macromicete species grow, of which 1200 are agaricoidic fungi of which number 400 species are edible and 100 are poisonous mushrooms.

Trends in the status of fungi are poorly studied. However, their composition and structure, particularly that of macromycetes and parasitic micromycetes, are closely associated with on-going and irreversible changes in ecosystems and first of all plant communities. Due to the impact of intense economic activity - land reclamation and use of agro-chemicals - changes in species composition are taking place, particularly in soil communities. Species of a wide ecological amplitude are becoming dominant, displacing species characteristic of the original ecosystem. Forestry and commercial mushroom-collecting adversely impact macromycetes, especially the best edible mushrooms, such as boletus, chanterelle and others.

Fauna. Most wildlife in Lithuania is associated with broad-leaf deciduous/coniferous forest and southern taiga. The two biomes encompass a variety of habitats (forest, meadow, aquatic, agricultural and urban). Although the largest wildlife biomass is found in deciduous and mixed forest, the highest species diversity occurs in ecotonal areas, such as where forest and wetlands meet. Even in comparatively well studied groups, species new to Lithuania are being found. Taxa which are insufficiently studied in Lithuania, and which may yield new insights into Lithuanian

biodiversity, are amphibians, reptiles, bats, small predators, insectivores and rodents.

There are some 500 vertebrate and 20,000 invertebrate species in Lithuania (Table 1.1.4), most of the smaller of which, particularly protozoa, insects, helminths, sponges, coelenterate and bryozoa, have been insufficiently studied. Lithuanian mammal fauna consists of elements of Central European broad-leaved forest and Eastern European taiga: characteristic of the first zone are some bats (*Chiroptera*), all dormice (*Gliridae*), yellow necked mouse (*Apodemus flavicollis*), marten (*Martes martes*), roe deer (*Capreolus capreolus*), wild boar (*Sus scrofa*); whereas moose (*Alces alces*) and white hare (*Lepus timidus*) are characteristic of the second zone. Semi-aquatic mammals are: otter (*Lutra lutra*), beaver (*Castor fiber*), Canadian mink (*Mustela vison)*, muskrat (*Ondatra zibethica*), water shrew (*Neomys fodiens*), water vole (*Arvicola terrestris*) and open landscape species include European hare (*Lepus europaeus*), striped mouse (*Apodemus agrarius*), and common and meadow voles (*Microtus arvalis & M. agrestis*).

Activities of beavers are successfully countering many adverse consequences of land reclamation. The abundance of beavers has during recent years reached carrying capacity, and they are little harvested because of lack of demand. By building dams on rivulets and land reclamation ditches the beaver floods meadows and forests creating a peculiar complex of ecological conditions. Gnawed off trees decay on the ground and those flooded by water die standing. The cave system and houses offer shelter to other mammals, small predators in particular. Optimal spawning and wintering conditions for amphibians are created in the heads of water. Luxuriant grass communities which appear at water edges abound in a multitude of insect species. Raised water and caves destroy the slopes of land reclamation ditches, pipes are blocked with mud and sludge, and within 5 to 8 years the rivulet course is restored close to the natural one.

Economic activities have contributed to reduced forest cover, which has adversely affected northern animal species and most other large animals. Several have become extinct or extirpated; including auroch (*Bos primigenius),* European bison (*Bison bonasus),* red deer *(Cervus elaphus)*, brown bear *(Ursus arctos),* wolverine (*Gulo gulo),* European wild cat (*Felis silvestris),* wild horse *(Equus gmelini silvaticus),* and beaver *(Castor fiber)*, of which bison, red deer, and beaver have been reintroduced. Six non-native species have been introduced: muskrat (*Ondatra zibethica),* raccoon dog *(Nyctereutes procyonoides),* eastern mink *(Mustela lutreola),* Sika deer (*Sika nippon)*, fallow deer *(Dama dama)*, and moufflon (*Ovis ammon musimon).* Six species are occasional visitors or migrants: brown bear, beluga *(Delphinopterus leucas),* common porpoise *(Phocaena phocaena),* common seal *(Phoca vitulina)*, grey seal *(Halichoerus grypus)* and ringed seal (*Phoca hispida)*.

Table 1.1.4 estimates species richness in various groups of animals. The data are incomplete, owing to the general incompleteness of taxonomic studies.

Table 1.1.4. Estimated numbers of fauna species in Lithuania

Taxa	Estimated number of species
Mammals (*Mammalia*)	70
Birds (*Aves*)	321
Reptiles (*Reptilia*)	7
Amphibia (*Amphibia*)	13
Fishes (*Pisces*)	96
Cyclostomata	3
Insects (*Insecta*):	~15000
Dragon-flies (*Odonata*)	57
Hymenoptera (ns):	
Braconidae	~200
Ichneumonidae	~450
digger wasps	145
Diptera	~2000
Lepidoptera:	2217
butterfly	1200
Microlepidoptera	1017
Beetles	1800-2200
Ants	>40
Arachnida	~200
Mollusca	~170
Rotatoria	300
Porifera	6

321 bird species have been recorded in Lithuania, of which 213 breed or have bred here (22 breed only occasionally). Twenty-two are increasing in abundance, 53 declining, 22 breeding occasionally and 93 have stable populations. For the remaining species, population trends are unknown. The abundance of 12 species is very small, not exceeding 20 individuals.

Lithuania’s waters are inhabited by 3 species of *Cyclostomata* and 96 species of fish: 26 marine, 53 freshwater, and 11 migratory. There are 16 species of introduced freshwater fish. Five fish species are at the edge of their range, of which 3 are Ice Age relicts. 60 fish species inhabit the Lithuanian coastal waters of the Baltic Sea and the Curonian Lagoon.

Lithuanian mesotrophic lakes are inhabited by up to 145 zoobenthic species (Drûkðiai Lake) and up to 279 zooplankton species. Lake eutrophication, hypertrophication and distrophication has caused a decline in the number of zooplankton and benthic animals and fish. Hypertrophication and distrophication are responsible for a reduced number of

phytoplanktonic algae species: from 221 to 246 in mesotrophic and eutrophic lakes, to 53 - 63 in distrophic ones.

The number of zooplankton and benthic species in the Curonian Lagoon is similar to that in eutrophic lakes. The diversity of zooplankton and benthic species in rivers and the Baltic Sea is considerably smaller.

Of 213 bird species breeding in Lithuania, 53 have decreasing populations. Wetland drainage has had a dramatic impact. Resulting changes in habitat has reduced the number of birds nesting in shrub thickets and meadows by 90%, and in shrub and forest by 70 and 40%, respectively. Economic activities of the forest sector have an adverse effect primarily upon the large birds, birds of prey, black storks, and woodpeckers. Similarly, modified ecosystems have also had an adverse impact on the migration routes and wintering sites of migrating birds and bats.

Land reclamation, land drainage, and the application of agro-chemicals have also caused a reduction in the numbers and diversity of amphibians in open habitats. However, the situation is currently improving with formerly vast monoculture fields being replaced by a mosaic of farmland which offers more favorable conditions, and with reduced use agro-chemicals.

1.1.4. Biodiversity communities of importance and significance

From the point of view of plant biogeography, Lithuania’ communities are unique and important for regional and/or global biodiversity. Lithuania straddles the junction between boreal coniferous and broad-leaved forest. Within a comparatively small area the taiga and temperate biomes converge. For example, the north boundary of hornbeam (*Carpinus betulus*) separates the northern and southern broad-leaved - coniferous forests. The vegetation, by its both floral and phytocenotic peculiarities, belongs to the Eastern Baltic sub-province. The south-eastern sandy plain belongs to the Central Europe province.

Broad-leaf/coniferous (*Querco-Pineetum*) forests occur in small areas, and they are being degraded as a result of intensive economic activities. The degradation is evidenced by a change from a rich variety of species, including many broad leaf species such as *Cypripedium calceolus*, *Corydalis cava,* to species-poor spruce forests with predominant floral complex of southern taiga, namely, wood-sorrel (*Oxalis acetosella*), *Maianthemum bifolium*, *Trientalis europaea*.

In southern Lithuania, small areas of Central European deciduous forests have survived: hornbeam/oak/lime forests (*Tilio-Carpinetum, Calamagrosto-Quercetum petraeae*) with most rare species listed in the Lithuanian Red Data Book, such as

Festuca altissima, *Bromus benekenii, Dentaria bulbifera, Hodelymus europaeus*.

It is only in the Curonian Spit that characteristic Baltic forests with *Erica tetralix* are known. The eastern boundary of this community is the Baltic coasts of Lithuania and Latvia. In the province of Dainava-Polesë, thermophyllic pine-woods occur: *Cladonio-Pinetum, Vaccinio vitis-idaea-Pinetum* with Dainava-Polesë and Bohemia-Poland endemics, namely, *Festuca psamophila, Koeleria grandis, Tragopogon gorskianus, Silene lithuanica*. *Pulsatilla patens*, a rare species which is protected in Europe, grows there, and *Arnica montana* reaches the boundaries of their range.

Lithuania's major oak-woods

The distribution of oak-woods in Lithuania is uneven. The most valuable oak-woods have survived in the Central Plain of Lithuania (Gustonys, Naudvaris, Naujamiestis, Ðventybrastis, Josvainiai, Ðëta, Labûnava Oak-woods), in Dzûkai (Punia Wood, Dûkðtos Oak-woods) and Sûduva Highlands (Viðtytgiris, Drausgiris Oak-woods) and in Kaunas City. Their status is unstable and highly dependent upon the market situation (timber prices). There are practically no restoration activities, and illegal logging is frequent.

Horn-beam Forests

Hornbeam forests, at the edge of their range are unstable. Larger forests exist in Vidzgiris, Viðtytgiris, and Virbalgiris, but mature ones have remained only in protected areas.

Meadow vegetation has developed in the areas of felled forest and drained wetlands. More natural meadow communities have survived only in the flooded areas of major rivers: Nemunas, Jûra, Minija, Nevëþis, and Merkys. In the meadows are spread communities of southern latitudes, communities which are very rare or at the boundaries of their range include: *Agrostietum vinealis, Mesobrometum erecti, Poo-Trisetum flavescentis, Campanulo-Vicietum tenuifoliae*. *Iridetum sibirici* are rare in the whole distribution area. Halophytic communities such as *Juncetum gerardii*, which are characteristic only of countries around the Baltic Sea and contain the rare species *Aster tripolium, Glaux maritima,* and *Triglochin maritima*, grow on the banks of the Curonian Lagoon. There are also park-type meadows with small forests (*Avenulo-Filipenduletum*) with single oak-trees and many representatives of broad leaf forest species. Rare fungi species are found in these meadows.

Natural meadow habitats

Major groups: flooded meadows in the valleys of the Nemunas, Jûra, Minija and Nevëþis, Dubysa, Venta, Nemunëlis rivers. The status of those meadows is poor and very poor. Some have been totally destroyed due to economic activities in flooded land, with only fragments surviving (near the Nemunas, Rambynas Regional Park). Meadows in the lower reaches of the Jûra and Nevëþis rivers have been cultivated, depriving them of their unique vegetation and some insect species.

Continental meadows: particularly dry meadows in Þemaièiai, Dzûkai and Sûduva Highlands, are threatened with overgrowth, afforestation and cultivation. Many wet and marshy continental meadows have been destroyed or degraded by land reclamation. Continental meadows are in a better status only in forest areas and on the steep slopes of the Baltic Highlands area, where they were used extensively.

Within wetland communities, raised bogs, as an ecosystem at the boundaries of its range, is interesting from a

phytogeographical point of view. Species which grow at the boundaries of their range include: *Rubus chamaemorus,* and *Chamaedaphne calyculata*. Raised bogs edge communities include: *Caricetum heleonastes, Eriophoro-Trichophoretum caespitosae, Myrico-Salicetum auritae,* and *Seslerietum uliginosae.* The limy fen communities of the *Caricetalia davallianae* series, in South-Eastern Lithuania, contain quite large populations of *Liparis loeselii* and *Hammarbya paludosa*. The foregoing species should be protected pursuant to the Bern Convention.

Wetlands habitats

According to accepted international definition, wetlands include raised bogs and fens. Transitional bogs include marshy forest and shallow lakes which are completely eutrophic. Areas most valuable in this respect in Lithuania are as follows:

- a complex which includes wetlands in the Nemunas River delta, reeds and complex of flooded meadows and forests,
- large bogs - Èepkeliai, Kamanos, Artoji, Berþalotas, Mûða Tyrelis, Svencelë,
- shallow eutrophic lakes - Þuvintas, Þaltytis and fishery ponds,
- wet and swampy forests - Rûdninkai and Þalioji woods.

Habitats of River Valleys

Out of 63700 km of natural rivers, only 13000 km have not been straightened, rivers in plains having suffered most. The survivors are in a fairly good state, with rivers of average pollution prevailing. Delineation of protection zones along water bodies was of a positive impact. Privatization, however, poses a threat to the smallest rivulets, because their legal protection has not been regulated. The natural role of river valleys is important: small forest rivers are centers of biodiversity; and valleys of big rivers typically have a rich variety of habitats. They represent an important element of the Nature Frame and function as migration corridors of animal and plant species (the Nemunas, Nemunëlis, Neris, Minija, Akmena, Jûra, Merkys, Neveþis, Dubysa, Venta and Þeimena river-valleys).

Particular psammophyllic vegetation of the Sea coastal white dunes (*Hieracio-Festucetum arenaria; Hieracio-Festucetum sabulosae; Elymo-Ammophilletum*) includes littoral endemics of the Eastern Baltic coast - *Tragopogon floccosus, Linaria loeselii, Cakile maritima* and a rare coastal species - *Eryngium maritimum*. Endemic communities of *Festuco psamophillaea-Koelerietum glaucae* grow on the sands of south-eastern continental dunes and river-banks, where the distributions of sub-oceanic species - *Armeria elongata, Corynephorus canescens* - and sub-continental species - *Libanotis sibirica, Koeleria delavigneii, Dianthus borbasii* - overlap.

Coastal and Marine Habitats

The Lithuanian coast is 98 km long .Coastal dunes are the habitat of greatest value, and many are protected. The Curonian Spit and former military training grounds at Ðaipë are especially valuable. Ever intensifying recreation is a threat, especially at Ðaipë. So far insufficient attention has been given to coastal waters. The shallow coastal waters of the Baltic Sea are of international importance. They are the wintering sites of waterfowl and fish spawning grounds. The most rare plant species also grow there.

The Curonian Lagoon Ecosystem

Of aquatic ecosystems, the Curonian Lagoon, linked to the ecosystems of the Nemunas River delta and the Curonian Spit is exceptionally important and productive, and deserves special protection.

The former military training grounds at Kairiai are biologically diverse, with unique complexes of halophytic meadows and sands, and rare species of macromycetes.

The conservation of rare Lithuanian species and communities, including those whose distribution is mainly in the Baltics and those for which Lithuania represents the edge of their range, is important for both Lithuania and Europe generally. According to the classification of vegetation types commonly used in Europe, Lithuania's vegetation comprises 30 classes (44 series, 75 unions) and 230 associations. For a small area, such diversity is significant.

Fungi. The distribution of fungi in Lithuania is closely linked to the coniferous and broad-leaved forest belts, particularly the distributions of plant genera rather than species. Often a fungus species, particularly of macromycetes, is associated with a single tree genus, e.g. beech. In other regions, where the latter does not occur, the fungus may be associated other genera, e.g. oak. Depending upon the type of nutrition, fungi are divided into 3 major ecological groups: saprotrophic, biotrophic, and mycosymbiotrophic (Figure 5).

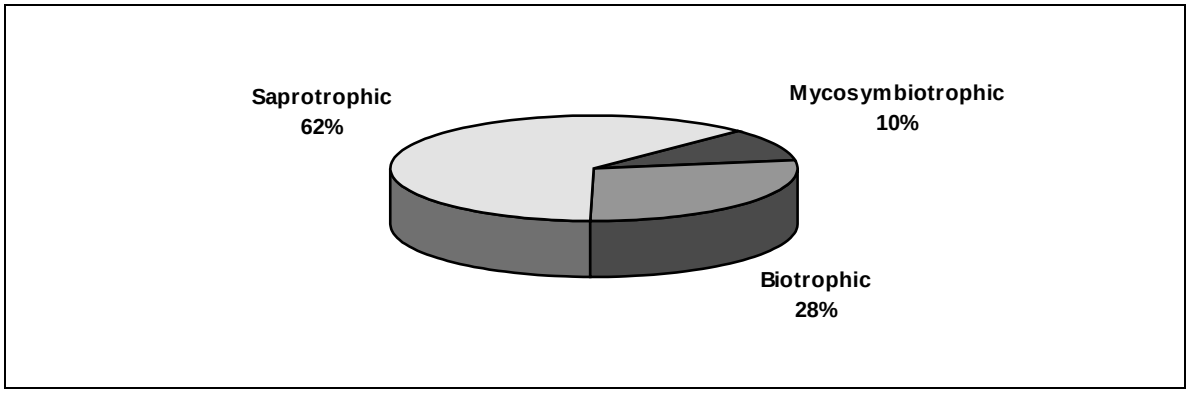

Figure 5. Ecological groups of fungi

A diverse fungus community, including many rare macromycetes species, grows in small areas in broad-leaf/coniferous (*Querco-Pineetum*) forests. Intense economic activities pose a clear threat to some rare macromycetes. In particular *Clavariadelphus pistillaris, Gomphus clavatus, Lepiota cortinarius, L. hystrix, Leucopaxillus copactus, Sarcosoma globosum,* etc. can no longer be found. Only in southern Lithuania have small hornbeam/oak/lime (*Tilio-Carpinetum, Calamagrosto-Quercetum petraeae*) forests survived with very rare macromycetes: *Boletus aereus, Hygrophorus penarius, H. poetarum, H. russula, Melanophyllum eyrei, Stropharia squammosa*, etc. Most are listed in the Red Data Book. A few psammophylic mycobiota, characteristic of the Baltic Sea region - occur only on the coast of Lithuania: *Hebeloma dunense, Inocybe dunensis, I. maritima, Laccaria maritima, Lepiota alba, Peziza ammophila, Phallus hadriani,*

etc. Additionally, *Coprinus dunarum* is endemic to the coasts of Lithuania and Latvia.

Micromicetes prevail in southern communities. Over 300 species have been identified, including: *Clavaria clavulinopsis, Dermoloma, Entoloma, Geoglossum, Galerina, Gerronema, Hygrocybe, Laccaria, Marasmius*, *Mycena* and representatives of other genera. Park-type forest meadows with single oaks and alders are home to rare non-moralic fungi: *Gyrodon lividus, Lactarius lilacinus, Lepiota hystrix, Langermannia gigantea*, etc. Meadow macromycetes are sensitive to nitrogen fertilizers. Pine-woods which grow on South-Eastern continental sand dunes and river banks are home to macromycetes which are rare in Europe and reach the Eastern boundary of their range: *Suillus flacidus, Tricholoma apium, T. colossum, T. focale, Collybia maculata f.longispora, Inocybe serotina, and Psathyrella psammophila*. Wetland fungi are scarce and tend to have specific associations, particularly with *Alnus, Betula, Pinus,* and *Salix.* Species *Hygrocybe helobia, Hypholoma udum, O. ericet., L. holopus, S. flavidus, Tephrocybe palustris*, and *Trichoglossum hirsutum* grow in such wetlands, in addition to some 50 other species of micromycetes.

Terrestrial and aquatic wildlife. Two bird migration routes cross Lithuania, one connecting Russia and the Baltic States with Western Europe and Africa, the other Scandinavia with the Middle East and Asia. During spring and autumn migration over 170 migrating bird species are registered. Migration intensity is higher and the flyways more concentrated in the narrow Baltic Sea coastal zone.

Lithuania's coastal waters and its economic zone of the Baltic Sea and the Curonian Lagoon provide wintering sites of international importance for over 1% of the north-western European population of sea ducks and divers, including: Red-throated and Black-throated Divers (*Gavia stellata, G. arctica)*, Steller's Eider (*Polysticta stelleri)*, Long-tailed Duck(*Clangula hyemalis)*, Velvet Scoter (*Melanitta fusca)*, Smew *(Mergus albellus),* Red-breasted Merganser *(Mergus serrator),* Goosander *(Mergus merganser)*, and also Little Gull (*Larus minutus)* (Table 1.1.5).[1]

Table 1.1.5. Abundance of some birds species populations in wintering sites

Species	Max. abundance		
	In Lithuanian marine waters	In north-western Europe	In Ramsar sites in Lithuania
Black-throated Diver/Red-	28000 25%	110000	1100

[1] The importance of wintering sites is assessed depending upon accumulations in which over 1% of all individuals of a bird population are registered.

throated Diver				
Steller's Eider	1500	5%	>30000	300
Long-tailed Duck	900000	21%	4,2 mln.	>20000
Velvet Scoter	700000	70%	1 mln.	>10000
Smew	1100	4%	30000	300
Red-breasted Merganser	900	0.9%	100000	1000
Goosander	25500	17%	150000	1500
Little Gull	13000	17%	75000	750

Fourteen internationally important resting sites of waterfowl are in Lithuanian inland waters and the Curonian Lagoon. In recent years, during spring and autumn migrations, up to 18% of the European population of Bewick's Swan (*Cygnus columbianus*) stop in the Curonian Lagoon. During autumn migration the Nemunas River delta offers rest for up to 22% of the north-eastern and north-western European populations of Bean Goose (*Anser fabalis)*, the abundance of which has been diminishing in the country in recent years, and up to 6% of the total population of north-eastern Europe's Lesser White-fronted Goose (*Anser erythropus)*. Other species worth mentioning are: Whooper Swan (*Cygnus cygnus),* White-fronted Geese *(Anser albifrons),* Greylag Geese *(Anser anser),* Wigeon (*Anas penelope),* Teal (*Anas crecca),* Shoveler *(A. clypeata),* Pochard *(Aythya ferina),* Tufted Duck *(A. fuligula),* Scaup *(A. marila),* and Common Scoter *(Melanitta nigra)*.

Fish in Lithuania's inland waters belong to Ponto-Caspic, plains Boreal, ancient Tertiary, pre-montane Boreal, and Arctic faunistic complexes, of which the first two prevail, and introductions from other continents. According to species composition, a line between the Baltic Province, the Neva and Rein Areas stretches through Lithuania along the Nemunas River basin, marking the northern limit of undermouth (*Chondrostoma nasus*) and the barbel (*Barbus barbus*) distributions. Lithuania is at the southern limit of the distribution of such glacial relics as Coregoninae and Osmeridae, and relic crustacea. Lithuania abounds in fish species which under the Bern Convention are recommended for protection in European waters. Ten species of migratory fish naturally breed in the Nemunas basin, as do lampreys. In that basin, the resources and reproduction of salmon and sea-trout are regulated by the Gdansk Convention.

The Baltic Sea fish fauna is derived from Arctic, Atlantic and freshwater faunistic complexes. Dominant species are those originating from the Atlantic which, during the periods of sea change, gave rise to sub-species characteristic only for the Baltic Sea, including: Baltic cod (*Gadus morhua callarias*), Baltic herring (*Clupas harengus membras*), Baltic sprat (*Sprattus sprattus balticus*), Baltic marine (*Pleuronectes platessa baltica*) and river flounder (*Platichthys flesus trachurus*). The Lithuanian economic zone of the Baltic Sea, which belongs to Sub-Sector 26 (as outlined by ICES), abounds in resources of those sub-species

of marine and migratory and freshwater fishes. It is among the richest in fish Baltic Sea areas. Near the coast of Lithuania there are also internationally important sprat and halibut spawning grounds. Young Baltic sprat and 9 migratory fish and lampreys are numerous.

1.2. Protection and Use of Biota

1.2.1. The Lithuanian Red Data Book of Species and Communities

The Lithuanian Red Data Book of Species. The Lithuanian Red Data Book (1992) includes 501 species: 210 plants, 210 animals and 81 fungi, most of which are endemic or sub-endemic. Species are grouped according to their rarity (Table 1.2.1) Also included are 80 species characteristic of forest and shrub-land, 42 of meadows, 36 of wetlands, 32 aquatic, and 9 psammophiles.

Of the 130 aquatic plant species found in Lithuania, only half are common throughout the country. They are not threatened and occur in new larger aquatic areas. In turn the remaining species are becoming increasingly scarce and are common only in limited areas in the edge of range.

At present, out of the 210 plant species included in the Lithuanian Red Data Book, 32 are aquatic. However, this number does not include all rare, declining or presumed extinct species. In the early decade of the last century, stonewort algae were still growing. In recent decades, they have not been found. They include: *Chara braunii, C canescens, Nitella batrachosperma, N hyalina, N tenuissima, N translucens,* and *Tolypella nidifica*. No new data is available for duckweed *Potamogeton trichoides* or *P acutifolius*, which in Lithuania is at the northern limit of its range. Species which grow in specific habitats are threatened, e.g. those which like open sandy or rocky shallows (*Alisma gramineum, Callitriche hermaphroditica, Ranunculus reptans*), open marshy lakes (*Sparganium angustifolium*) and vary rare species of *Nitella algae*.

Table 1.2.1. Number of species listed in the Lithuanian Red Data Book

	CATEGORIES						
	0	1	2	3	4	5	In total
AQUATIC AND TERRESTRIAL PLANTS							
Angiospermae	9	52	56	60	7	-	184
Gymnosperms	1	-	-	-	-	-	1
Vascular plants	2	5	1	2	-	-	10
Mosses	-	2	3	4	2	-	11
Stonewort	2	-	-	2	-	-	4

algae							
In total	14	59	60	68	9	-	210
FUNGI							
Micromycetes	4	7	15	34	8	-	68
Macromycetes	5	5	-	-	3	-	13
In total	9	12	15	34	11	-	81
ANIMALS							
Mammals	1	1	-	3	12	1	18
Birds	5	12	14	21	15	-	67
Rodents	-	2	-	-	-	-	2
Amphibians	-	-	-	-	2	1	3
Fishes	2	1	-	1	2	-	6
Cyclostomes		1					1
Molluscs	1	-	3	-	-	-	4
Insects	2	29	29	31	10	1	102
Crustaceans	-	-	3	3	-	-	6
Leeches	-	-	1	-	-	-	1
Total, animals	11	49	50	56	41	3	210
Total, all taxa	34	120	125	158	61	3	501

The Lithuanian Red Data Book of Plant Communities. When compiling the Book, the syntaxonomic dependence of communities growing in Lithuania was determined and a complete inventory of taxa was prepared. The basic unit in the Lithuanian Red Data Book communities is considered to be an association which includes communities similar in their floristic composition and compatibility to specific ecological conditions.

When selecting communities to be listed into the Lithuanian Red Data Book, attention was paid to (1) the history of communities, (2) the importance of species composition for the conservation of the gene pool, (3) uniqueness in the distribution area, (4) the number of localities, (5) area covered, and (6) the ecological stability of the habitat. Categories of communities' rarity were assessed by an sozological index.

5 categories are in the Lithuanian Red Data Book of Plant Communities:

- *Category 0* - extinct communities, earlier existence of which is fixed in literature;
- *Category 1*- narrow distribution area; communities which are rare throughout the distribution area; their diagnostic species have been listed in the Lithuanian and neighboring countries' Red Data Books;
- *Category 2* - rare communities; the limit of their distribution lies across Lithuania;
- *Category 3* - rare and standard (typical) communities;
- *Category 4* - communities of undefined status (insufficiently studied, but to be protected).

In order to conserve communities of Category 1, strict nature reserves are necessary for all habitats. Communities of Category 2 must be protected in optimal habitats, and when so needed, declared as protected areas. Communities of

Category 3 are to be protected within the existing protected areas. For communities of Category 4, additional research should be undertaken. Most of communities which need protection grow in water bodies, meadows and wetlands (Table 1.2.2).

It is also important to note that parts of habitats listed in the Lithuanian Red Data Book are not yet within protected areas (discussed below). The Red Data Book is therefore not comprehensive.

Table 1.2.2. The Lithuanian Red Data Book communities' distribution in ecosystems

Ecosystem	Category					In total
	0	1	2	3	4	
Forests	1	2	1	2	-	6
Meadows		3	7	2	1	13
Wetlands		6	4	-	1	11
Water bodies		3	6	5	5	19
Sands		-	2	1	-	3
Fields (ruderal vegetation)		-	2	-	-	2
In total	1	14	22	10	7	54

1.2.2. Protected areas

The system of legally protected areas of Lithuania is aimed at the conservation and where possible restoration of: (1) nature and culture heritage features, (2) landscape ecological balance, (3) biodiversity, and (4) gene pool for restoration of biota resources. Also, it creates conditions for the development of interpretive tourism, research, and the promotion of nature and cultural heritage protection.

There are 4 categories of protected area:

1. *Conservation areas* - strict nature or culture reserves, protected landscape features (nature or culture monuments), nature or culture reserves,
2. *Protection areas* - protective zones for various purpose,
3. *Restoration (recuperation) areas* - sites where natural resources are protected or restored,
4. *Integration areas* - national and regional parks, and biosphere monitoring areas.

Primary attention is given to Categories one and four, which cover 728,042 ha (11.1%) of the country, and are called "especially Protected areas".

Table 1.2.3. The system of protected areas in Lithuania

Legal Category	Description	Examples

1. Conservation areas	Strict reserves (5, covering 0.4% of Lithuania). They conserve typical or unique landscapes and gene pool. Economic activities are prohibited.	Strict reserves: total 5. Strict nature reserves: Èepkeliai - 10 590 ha, Kamanos - 4 300 ha, Vieðvilë - 3 216 ha, Þuvintas - 5 442 ha. Kernavë strict culture reserve - 199 ha.
	Protected natural landscape features - to preserve unique nature or culture objects (monuments) Reserves are set up with the aim of conserving complexes of nature and culture heritage or their separate elements, plant and animal species. Reserves may be: natural, cultural, integrated. Economic activities of potentially adverse impact upon protected complexes are limited or prohibited depending upon the character of protected complex, and the kind of reserve.	In total about 700 nature monuments: trees, habitats of rare plants and fungi, unique and declining plant communities, unique boulders, hills of exceptional size and shape, etc. Natural reserves may be: geological, geomorphologic, hydrographical, pedological, botanical, zoological, (ornithological, ichthyological, entomological, herpetological, theriological), telmological, thalasological, etc. Landscape reserves are complex (integrated) reserves. In total about 300 nature and complex reserves: 176 390 ha or 2,7% of Lithuania.
2. Protection areas	Protective zones for various purpose (buffer zones for strict reserves, national or regional parks, nature or culture monuments, water bodies, roads and railways, recreational areas)	Buffer zones for Vieðvilë and Kamanos strict nature reserves, buffer zones for Aukðtaitija, Dzûkija and Þemaitija national parks and Nemunas Kilpos regional park, protective zones for Palanga, Druskininkai, Birðtonas and other resorts, etc.
3. Restoration areas	Sites where natural resources are protected or restored	Areas to be determined
4. Integrated areas	National and regional parks are established to conserve landscapes of national or regional importance which are valuable from a natural or cultural point of view, for maintaining the stability of ecosystems, restoring destroyed or damaged natural and cultural complexes, interpretive tourism, etc. Depending upon the character of protected complexes and features and their use, functional zones may be: conservation (strict reserves and reserves), protective, recreational, economic and residential. Economic activities are limited or prohibited depending upon the character of the zone.	National parks: total 5: Aukðtaitija - 30 289 ha, Dzûkija - 55 880 ha, Curonian Spit - 26 394 ha, Trakai historic - 8 300 ha, Þemaitija - 20 120 ha or more than 2% of Lithuania Regional parks: in total 30: 380 880 ha or 5.8% of Lithuania area
	Biosphere monitoring areas - biosphere reserves and biosphere other areas can be established for implementation of special monitoring programs	Areas to be determined. At the moment suggestions for reorganization of Þuvintas strict nature reserve to biosphere reserve exist

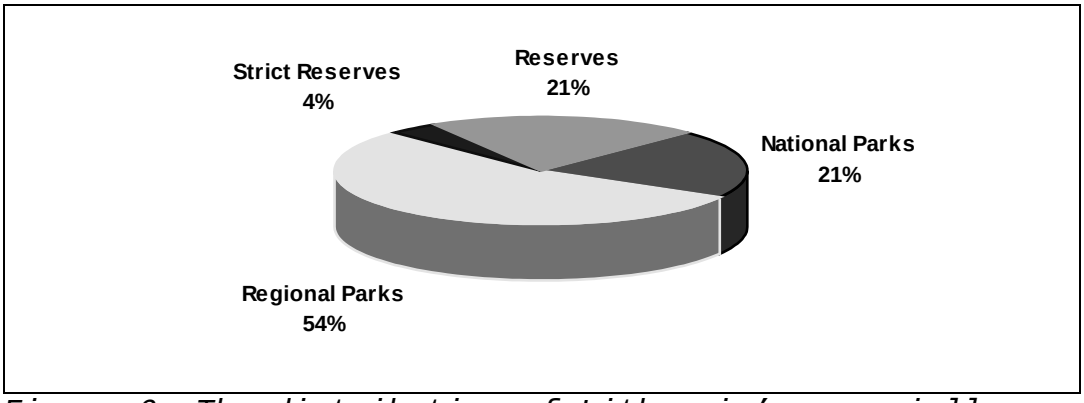

Figure 6. The distribution of Lithuania's especially protected areas (%) by category in the system of protected areas

A large number of botanical, zoological, botanical/zoological, telmological and landscape reserves, and strict nature reserves which are important for the conservation of biodiversity, have been established within national and regional parks.

- Within national parks there are 8 strict nature reserves, with a total area of 8000 ha, 25 botanical, zoological or botanical/zoological reserves and 27 landscape reserves.
- Within regional parks there are 22 strict nature reserves, 53 botanical, zoological or botanical/zoological reserves, 23 telmological reserves and 88 landscape reserves.

Figure 7 shows the location of the types of protected areas identified above. Their distribution in biogeographical units is shown in Table 1.2.4.

The largest number (65) of protected areas which are important for the conservation of biodiversity are in the lake and rivers are in unit of Eastern Lithuania (B''XVIII). A lot of them are in highland regions, sandy plains, or valleys. However, the network of protected areas in another biogeographic units is incomplete. Marine units are least represented. The efficiency of protection and conservation in the biogeographic units can generally be safeguarded by no less than 25 to 30 reserves with specific biological profiles.

Table 1.2.4. Distribution of protected areas amongst biogeographic units

BIOGEOGRAPHIC UNITS		Types of Protected areas					
		Strict nature reserves	Botanical, zoological reserves	Telmological reserves	Landscape reserves	Thalasolo gi-cal reserves	Total
A I.	South-Eastern Baltic Coastal Waters		-	-	-		
A II.	South-Eastern Baltic Open Sea	-	-	-	-	-	-
B'I.	The Baltic Coast	2	1	-	5	-	8
B'II.	The Curonian Lagoon Aquatic	1	-	-	2	-	3
B'III.	The Curonian Lagoon Coastal	1	7	4	6	-	18
B'IV.	Western Þemaièiai	-	8	-	4	-	12
B'V.	Northern Panemuniai	-	6	1	3	-	10
B'VI.	The Nemunas River Valley	2	17	-	11	-	30
B'VII.	Sûduva Lowlands	1	4	-	2	-	7
B'VIII.	Dzûkai Highlands	4	13	3	14	-	34
B'IX.	Sûduva Highlands	2	1	1	1	-	5
B"X.	Central Þemaièiai	4	8	7	22	-	41
B"XI	Eastern	1	19	4	20	-	44

.	Þemaièiai						
B″XII.	Þiemgala Lowlands	-	10	3	6	-	19
B″XIII.	Central Latvia	-	1	1	1	-	3
B″XIV.	Central Lithuania	-	3	-	2	-	5
B″XV.	Eastern Aukðtaièiai Slopes	-	2	6	1	-	9
B″XVI.	Neris/Ðventoji Valleys	1	8	3	8	-	20
B″XVII.	Aukðtaièiai Highlands	3	4	5	11	-	23
B″XVII I.	Eastern Lithuania Laky Channels	5	19	16	25	-	65
B″XIX.	Northern Nalðia Highlands	-	1	2	3	-	6
B″XX.	Polock Lowlands	-	-	2	-	-	2
B″XXI.	Southern Nalðia Highlands	-	2	-	5	-	7
C I.	Dainava Lowlands	4	14	-	10	-	28
TOTAL		31	148	58	162	-	399

Botanical, zoological reserves have been established in Lithuania since 1960 and their area are generally small. Botanical reserves range from 2 to 524 ha and zoological reserves from 9 to 1260 ha, while botanical/zoological reserves are somewhat larger - 104 to 9237 ha.

Processes which have major impact on the status of protected areas:

- inadequate biota components' inventory,
- not enough territorial planning documents,
- forest use and replanting in conflict with the needs of biodiversity conservation,
- former land drainage,
- absence of regulations for biodiversity conservation while performing economic activities,
- construction associated with land privatization,
- poor or non-existent administration,
- lack of interest on the part of the local population,
- lack of education and information.

With the factual development of particularly protected areas' system before land reform, good preconditions for the conservation of landscape and biodiversity in Lithuania have been created, however, part of the areas especially valuable from the biodiversity point of view (wetlands, peat-bogs, meadows, sands, etc.) are still unprotected.

Environmental impact on landscape and biota pose a genuine threat to most protected areas. They dominate in regional parks for which no management programs have been developed. Overall, however, the environmental status of Lithuania's protected areas is satisfactory.

Restoration areas (category of protected areas) are important for protection and recovery of degraded biological resources, and is aimed at natural resources which have been impoverished by economic activity. The goals of restoration include: restoring and augmenting biological resources,

protecting forest, berry and mushroom fields and medicinal herb, and protecting wildlife areas. Proposals for the creation of a system of sites for natural resources protection and restoration in South Eastern Lithuania are prepared.

In 1993 when Lithuania acceded to the Ramsar Convention, 5 wetlands: (1) Èepkeliai, (2) Kamanos, (3) Þuvintas, (4) Viešvilë strict nature reserves, and (5) the Nemunas River Delta regional park, were listed as Ramsar sites. Studies by the Lithuanian Division of IWRB in 1994-1995 identified an additional 9 potential sites: (1) Baltic coastal waters at Palanga, (2) north-western part of the Curonian Lagoon, (3) lakes of Kretuonas, (4) Þaltytis, (5) lakes of Meteliai regional park, (6) Reiskiai marches, (7) Aukðtasis marches, and swamps of (8) Kanis and (9) Berþalotas.

1.2.3. The Nature Frame: A Concept for the natural landscape protection

In 1983, in the national Integrated Nature Protection Scheme, the idea of Lithuania's Nature Frame (ECONET) was raised and approved. Lithuania proposed the concept of Nature Frame, which became the concept and approach for the conservation and protection of Lithuania's natural landscape.

The Nature Frame, which offers a universal approach, was put forward and legally established under the relevant laws of the Republic of Lithuania on environmental protection and protected areas. The Nature Frame links all natural protected areas with other ecologically valuable or relatively natural areas which underpin the general stability of landscape, to form a landscape system of geoecological compensation zones. It is aimed not only at development of a complete system for natural buffering and connecting natural protected areas, but also at conservation of natural landscapes, biodiversity and natural recreational resources. It does so by providing guidelines and conditions for the recovery of forests, optimizing the structure of agrarian landscape from the geoecological point of view, regulating development of agrarian activities, and defining sustainable urbanization. It is a concept based on catchment and biologically important areas. In effect, the principles of Nature Frame can be likened to the principles behind holistic watersheds protection and management.

More specifically, the Nature Frame concept is based on analyses of migration processes in natural landscape and evaluation of gravigenuous structure of natural complex and the conservation and enrichment of bio- and geo-ecological stabilizers in geosystems.

Nature Frame consists of the following:

- *geoecological watersheds* - belts which separate large geosystems and perform the function of ecological buffering between the systems;

- *geosystem stabilization centers* - areas which perform the function of ecological buffers in geosystems;
- *migration corridors* - valleys through which intensive geodynamic and bioinformation circulation takes place.

The Nature Frame, however, is not a continuous network of green belts. Instead, it is an integrated process for all land use, management and protection. In 1989 National Nature Frame Scheme (scale 1:300 000) was developed. In 1993, the Landscape Management Group of Vilnius University worked out Nature Frame Schemes at regional levels (scale 1:50 000) covering all 44 administrative districts. The preparation of these regional schemes included additional information following hydrogeological and geochemical analysis of the landscape structure and assessment of the distribution of natural and semi-natural habitats. During the Soviet period, attempts were made to develop the Nature Frame Schemes at local level (scale 1:10 000). Currently, the Nature Frame covers about 60% of Lithuania, varying from 35-40% (North Lithuanian Plain) to 75-80% (Eastern Lithuania), depending upon natural conditions and land use.

Nature Frame Schemes are used in drafting general master plans at national, regional and municipal levels in Lithuania. Planners and environmentalists use them in the process of approving schemes of urban development when assessing plans, the location of individual buildings, and construction design. Nature Frame formation has recently received particular attention in two major cities - Kaunas and Vilnius.

1.2.4. Ex-situ conservation

Botanical collections. Introduction and acclimatization of plants is performed in botanical gardens in Kaunas, Vilnius and Klaipëda. The largest collections are in the botanical gardens of Kaunas Vytautas Magnus University (5000 taxa) and Vilnius University (2000 taxa), and in arboretum of Girionys (1000 taxa). Kaunas Botanical Garden boasts the largest (718 taxa) collection of trees and has a large section of medicinal herb. The fruit section of Vilnius University Botanical Garden carry out selection of species *Ribes* and *Grossularia*.

There is a large collection of plants (1000 taxa) in the bulb section of the Botany Institute. In the Botany Institute, research on acclimatization, introduction and selection of *Vaccinium, Oxycoccus* and various leguminous fodder species is being done.

Spontaneous introduction of plants occurs in individual collections, of which those belonging to: I.Navidanskas, A.Èiapas, V.Intas, K.Kaltenis, and S.Juknevièius are well known. The collections contain about 800 growing woody plant

species. Some 200 Lithuanian manor parks, dating from XVII-XVIII centuries, boast a rich variety of trees.

In Lithuania there are 2 large herbaria of flowering plants: Vilnius University (650 000 specimens) and at Botany Institute (446 000 specimens) The Botanical Institute also houses 8000 moss specimens, 4 000 specimens of lichens, 18 000 macromycetes and 10 000 micromycetes. Vilnius University also houses about 2 000 lichen specimens, and over 2 000 fungi. In vitro collections of microorganisms (viruses, fungi-destructors) are housed in the Botanical Institute.

The Institute of Agriculture of Lithuania has established a modern plant seed storage facility which examines and maintains 25 collections of species of agricultural plants, containing about 4 000 specimens. At the Gardening and Farming Institute of Lithuania there are 25 garden plant species, containing over 2 000 specimens. Collections of agricultural plants are also maintained at the University of Agriculture of Lithuania.

Zoological collections. There is a zoo in Kaunas and a Marine Museum-Aquarium in Klaipëda. The best collections of animals, however, are in the Zoology Museum, named after T.Ivanauskas in Kaunas, the Zoology Department Museum of the Nature Faculty of Vilnius University, and the Museum of Ecology Institute (entomological, theriological, helminthological expositions). The collections include both Lithuanian and worldwide fauna. Research is carried out at Vilnius University and Ecology Institute. Museums are mainly concerned with public education and training.

Introduction and reintroduction. During the present century, Lithuanian zoological species diversity has been enriched by the addition of 13 mammal, 1 bird (pheasant - *Phasianus colchicus*) and about 15 fish species. There were reintroduced beavers, European bison, red deer. There was an attempt to introduce an alien subspecies of capercaillie.

Most of introduced species especially mammals haven’t adapted to Lithuanian conditions, but some (Racoon Dog, Canadian Mink) became common. Pheasant’s can’t survive in Lithuania due to harsh climate. They are an object of intensive development of hunting.

The most successful were reintroduction of beaver and red deer. Abundance of beaver has reached environmental capacity. After beavers settled in all rivers and rivulets, most of lakes, they spread in channels, solitary (bogs) marches, in water bodies of settlements and cities. Red deer due to high density in most of Lithuanian districts causes damage to silviculture and agriculture. In established state nursery in Panevëþys district European bison’s are reared (about 30 individuals).

In Kaunas zoo and Marine Aquarium animals are breeded therefore reintroduction of various species is possible (for

example gray seal). In Kaunas zoo mostly imported (or alien) are bred, valuable species are exchanged with zoos in other countries. Imported fishes are (bred) reared in piscicultural enterprises.

Up to 1990 in Lithuanian water bodies there were introduced 16 fish, 1 crayfish species and several species of *crustaceans-gamarides* and *mizides*. 20 hydrobiont species (1 fish, 1 crayfish, 18 invertebrates) came by themselves or were brought with ballast water. Acclimatization of the most of introduced fish species was unsuccessful, these are reproduced artificially.

In genetic level the greatest importance is attached to conservation of gene pool of characteristic to Lithuanian regions plant varieties and animal breeds, endemic species, geno- and pheno- pools of rare subspecies, also to populations which have large (or great) diversity of phenotypes and genotypes. Conservation of gene pool of salmon natural populations is particularly urgent because when artificially reproduced gene pools gets very impoverished.

The protection of the gene pool of domestic and cultural biota is important, and the following **domestic species** are a priority:

- Carp of Lithuanian (Bubiai) breed originating from Galician carp introduced in XVII-XVIII century,
- "Þemaitukai" horse breed (containing tarpan lines),
- Lithuanian blackhead sheep,
- Lithuanian hounds,
- Other animals and birds of Lithuanian breed,
- Lithuanian varieties of crops, vegetables, fruits and flowers.

1.2.6. Use of biological resources

Lithuania has used forest (timber and non-timber forest products - berries, mushrooms, fruit, medicinal plants), wildlife, fish and crayfish and other biological resources for economic growth and development. Usage of biological resources are under regulation of the Ministry of Environmental Protection.

Forest resources. Lithuania's forest cover is 30.1%. Coniferous forests occupy 61.9% of the total forest area, soft deciduous - 33.3%, hard deciduous - 4.5%. At present about 83% of forests are state owned, managed and used by management units called "urëdija" or national parks administrations. At the end of undergoing land reform 40-45% of forests will be privately owned. The annual wood growth in Lithuanian forests is 11.9 million m^3. On average, the growth

per hectare in Lithuania forests is estimated at 6.3 m^3. Approximately one-half of the annual wood growth is harvested.

Since 1961, forests in Lithuania have been logged without exceeding the set limits. It has had a positive impact and productivity has increased fast. During 1970-1990 about 2.7-3.3 million m^3 were logged annually but the harvest increased to 4-6 million m^3 per year from 1993-1996 (Figure 8). This can be accounted for by urgent removal of wind-fallen trees, and by increased exports to Great Britain, Germany, Sweden, France and Belgium.

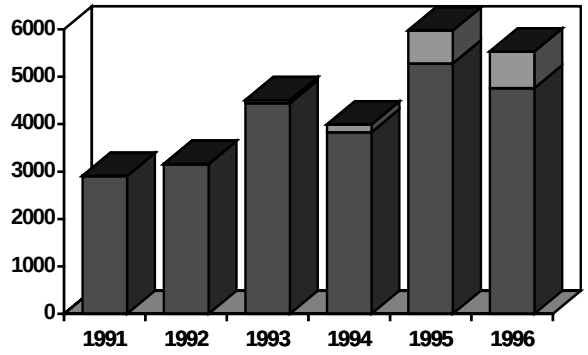

Figure 8. Total annual harvest ('000 m^3) in state and private forests

As a result of intensive forestry, the dominating forest communities which best suit Lithuania's geoecological conditions are being degraded. Forests are dominated by medium-age (50 years) trees, and mature forests account for merely 9% of the total. Under natural conditions coniferous trees dominate (61%),of which as much as 25% are affected by defoliation. As a result of irrational farming only small forests have survived at the limits of the range of lime/hornbeam and oak (communities (*Tilio-Carpinetum* and *Calamagrosto-Quercetum petraea,* respectively). Thus, the status of forests has noticeable declined during the last decade due to unfavorable natural conditions (strong winds, insect and mammal pests, poor farming methods and pollution. Ungulates damage forests locally. This impact is most serious in the oak woods and ash forests, which are less common than in the more abundant pine and spruce forests (more hectares of which are damaged). Most of destroyed and damaged forests are in the forest administrative units of Panevëþys, Ukmergë, Birþai, Këdainiai, Marijampolë, Rokiðkis, Joniðkis, Jurbarkas, Kretinga, Kupiðkis, Ðilutë, Ðiauliai and Zarasai. However, it is not such an outstanding problem as are wind-fallen trees, diseases, pests or illegal logging.

The species composition of forests is deteriorating due to small diversity of seedlings. Some years ago forest planting was also diminishing (up to 6000 ha per year), but

in 1996 more than 8 600 ha and in 1997 - 10 500 ha were planted. During recent years, areas under spruce and ash forest have been increasing, oak-woods somewhat less so. Pine and birch forest have been decreasing slightly.

Non-timber forest resources. Over 100 medicinal plants, about 400 edible mushroom species, and 20 plant species with edible fruit and berries grow in the forests of Lithuania. Berries, of economic significance include: blue-berries, cranberries, raspberries, bog whortle-berries, and wild strawberries. Fruit-bearing trees include hazel while medicinal plants include juniper, buck-thorn, bear-berry, medicinal lycopodium, Icelandic lichens, ledum, etc. Of edible fungi, the most valuable are various white mushrooms, chanterelles, white-caps, russulas, etc. Edible fungus-yielding areas have not been calculated, but the annual biological fungus harvest is 50-60 thousand tons. Pine forests are the richest in fungi (80-120 kg/ha).

The largest berry-fields are those of blue-berries - 19.3 thousand ha of continuous growths (53% of the total berry-field area). Raspberry areas account for 19%, mountain cranberries - 14%, cranberry fields - 11%, bog whortle-berry - 3%, and wild strawberries - 0.6%. There are large areas of hazel. Of medicinal plants, buck-thorn, juniper, ledum and nettle predominate. Comparative data indicates a reduction in the areas of the above mentioned resources in recent years.

Indeed, it appears that all non-timber forest resources, with exception of raspberry thickets in forest cuttings, have diminished. The status of bear-berry fields is poor. The area and fertility of cranberry and bog whortle-berry fields have been adversely affected due to extensive drainage of high marshes or turning them into peat-bogs.

The resources of wild fruit, berries and mushrooms are still diminishing as is the volume of forest medicinal material. A more serious problem is the unsustainable harvesting of bear-berry, the fruit of juniper, bunches of Iceland lichen, blackberries, and spores of medicinal lycopodium. Excessive collecting also contributes to the degradation of mushroom, mountain cranberry, and cranberry areas. With the development of an edible mushrooms industry, the harvesting of canterella (*Cantharellus cibarius*) and white mushroom (*Boletus edulis*) and other mushrooms is increasing; their habitats are trampled and destroyed with adversely affects on forest communities besides the growth of macromycetes.

Game. Hunting of 18 mammal and 27 bird species is permitted. Game resources have been assessed in Lithuania since 1934. According the first assessment in Lithuania was: 201 moose, 13930 roe deer, 280 wild boar, 2340 badgers, 320 capercaillie and 30 fallow-deer. For several decades, hunting

policy was focused on ungulates, which make a good profit for the state.

In recent years some ungulate populations have declined significantly (Table 1.2.1), e.g. during the last 6 years the moose herd more than halved. The quality of herds has also been impoverished - he trophies of hoofed animals are becoming poorer.

Table 1.2.1. Changes in game populations, 1992-1996

Animal species	1992		1993		1994		1995		1996		1997
	number	hunted	number	hunted	number	hunted	number	hunted	number	hunted	number
Moose	5180	1571	3440	610	3300	167	2850	58	3000	72	3830
Red deer	14950	3898	13390	4322	14000	3724	13800	1152	13900	841	15000
Roe deer	43360	10714	37850	10038	40840	7591	41000	5214	36400	-	36300
Wild boar	17300	12716	16600	10038	18940	9141	18500	4853	19400	4322	19400

Among the most important factors which determine the current status of game fauna are habitat changes as a result of economic activities, and ecological relationships (e.g., competition) and direct human impact. Some hunting regulations (e.g., selection of age and sex classes) are neglected and hunters do not improve their qualifications. Many species are adversely affected by cultivation (reduction of habitat), intensive agriculture (drainage of areas, haymaking, pasturing) and intensive forestry (logging of mature forests and dead/dying trees, plantations in forest meadows, open areas, waste lands, drainage of marshes, growing of forest semi-aquatic cultures). Aquatic fauna (otter, mink, beaver and musk-rat) are adversely affected by fishing, recreation, channelisation of small rivers, and water pollution. The greatest damage during recent years has been from poaching.

Tendencies in the abundance of game and its use suggest that during the coming 2 to 3 years fur-bearers - fox, mink, pine marten, beaver - will be hunted more intensively.

In 1996, to restore game populations, hunting of moose and roe deer was limited or banned. Licensing is the basis of management of ungulates and beaver.

Fish and crayfish resources. Data on the status of fish resources and use are provided in Table 1.2.2.

Table 1.2.2. Fish resources status and use

Water body	Fish biomass (B)	Annual increase	Annual industrial production (IP)	Catches in 1990, t	Catches in 1996, t
Lakes	~7500 t	~3000 t	1000 t	398	125
Water reservoirs	~4000-5000 t	~1500-2000 t	~525-700 t	65	no data
Rivers*	50 kg/ha	25 kg/ha	7 kg/ha	63	72
Northern part of the Curonian	5000 t	no data	1500 t	2320	78

Lagoon Lithuanian economic zone in the Baltic Sea	210-220 th t	no data	60-70 th t	1684	2413

* *at the lower reaches of the Nemunas River B~250 kg/ha, IP~ 125 kg/ha*

In 1990, over 60 t fish were grown in fish ponds but has recently reduced to about a quarter of that amount.

In recent years a good ecological situation for restoration of export of cray fish resources to Western Europe exist. Branch office of state-owned piscicultural enterprise in Simnas has modern equipment for raring *Patamobius astacus* and its offspring. That enables to release up to 50-60 thousands young ones into lakes yearly.

Official fisheries statistics in recent years do not reflect reality. Due to the economic decline and inadequacies in economic restructuring, irrational taxation policies, the transfer of responsibility for management of most internal waters to municipalities, deficiencies in veterinary services, fish resources are being exploited inefficiently. Rational development of fisheries is proposed in the “Fisheries Development Program”.

There have been no essential changes in fish resources in all types of Lithuanian waters. With the decentralization of the fishery sector and a consequent appearance of a large number of users, the inventory of fish resources and their use has become inadequate, hindering regulation of fishing. Due to the absence of a market and outdated fish processing technologies, less valuable fish are not fished. Illegal fishing has become frequent. There is no registration for amateur fishing. The equipment used in pisciculture and technology applied is out of date. Techniques for rearing pike, carp and lavaret are somewhat more advanced. State pisciculture enterprises meet the demands of only part of the restocking requirements of inland waters because of the shortage of advanced technologies. In leased water bodies, the reproduction of eel, pike-perch and pike is insufficient for the intensity of fishing.

With the increase of pollution in the Curonian Lagoon with consequent intensification of eutrophication and hypertrophycation, fish communities have shown gradual changes: for example, the numbers of migratory fish has decreased and those of resident fish has increased. During 1970-1990, the period of the most intensive pollution in the lagoon, the proportion of migratory fish in the total harvest catches diminished up to 16%. However, after the Klaipëda Straits were lengthened and pollution in the Nemunas River catchment reduced, migratory fish in the Lagoon increased up to 16-22-fold during 1991-1994. It is likely that with the reduction of pollution of the Lagoon and after the Klaipëda Sea-port is dredged and deepened, the passage of migratory

fish in the Lagoon will grow as will fish catches and their value.

1.3. Biodiversity conservation prerequisites

1.3.1. Legal and institutional background

The Lithuanian legal system is comprised of laws, regulations, rules, Government resolutions, standards norms, methodologies and recommendations. Although the regulatory system for the protection of living natural resources and biodiversity is still incomplete, previously adopted laws and new legal acts are being revised as the social/ economic situation changes.

So far 32 laws either directly or indirectly govern environmental protection and the use of natural resources. Two of particular importance are the Law on Wildlife and the Law on Protected Plant and Animal Species and Communities. Both were adopted by the Seimas at the end of 1997.

Legal acts which regulate establishment and protection of protected areas, and establishment of Red Data Books of species and communities are important means of conservation of natural features and biodiversity.

Laws directly related with biota protection:

- The Republic of Lithuania Law on Environmental Protection (1992),
- The Republic of Lithuania Law on Protected areas (1993),
- The Republic of Lithuania Law on Land (1994),
- The Republic of Lithuania Law on Forests (1994),
- The Republic of Lithuania Law on Territorial Planning (1995),
- The Republic of Lithuania Law on Environmental Impact Assessment (1996),
- The Republic of Lithuania Law on Wildlife (1997),
- The Republic of Lithuania Law on Protected Plant, Animal and Fungi Species and Communities (1997).

Other legal acts which regulate the regime of biota protection and use

- regulations of managed reserves (1983),
- regulations of nature monuments,
- individual regulations of strict nature reserves,
- individual regulations of national parks (1992),
- individual regulations of regional parks (1996),
- General Regulations of Protection Zones of Strict Nature Reserves and National and Regional Parks (1996),
- Special Conditions for Land and Forest Use (1993),
- Hunting Regulation Rules (1994),
- Rules of Forest Protection and Use in Protected areas (1996),
- Rules of the Use of Forest Minor Resources (1996),
- Mushroom Picking Rules (1996).

The protection of biological resources in the territory of Lithuania is the primary responsibility of the

Environmental Protection Ministry. However, the Ministry of Agriculture and Forestry, and the Ministry of Construction and Urban Development also contribute to biodiversity protection, primarily with respect to regulating natural resource use.

The main role of the **Ministry of Environmental Protection** is to conserve Lithuania's landscapes, natural ecosystems, natural features and biodiversity. To do this the Ministry:

- drafts laws and other legal instruments for the protection of biodiversity and resources,
- develops and approves rules, norms and standards for the use of biological resources,
- plans protected areas,
- creates programs on environmental measures for the conservation of biodiversity,
- assigns limits and conditions for the use of biological resources,
- regulates or controls registers of natural resources,
- arranges for the compilation and maintaining of protected areas and biological diversity (habitat) registers,
- makes proposals for the establishment of protected areas,
- regulates and controls activities in protected areas, organizes activities of strict nature reserves, national and regional parks which are in its regulatory sphere,
- compiles and revises the Red Data Book,
- organizes and performs activities related with the conservation and increase of rare and declining plant, fungi and animals,
- regulates the import and export of plants, animals, and trophies, and the keeping animals in captivity,
- determines the procedure of environmental impact assessment and project approval,
- organizes and coordinates integrated ecological monitoring,
- organizes and coordinates applied research related to biological resources protection, formation of the protected areas network, etc.

The main role of the **Ministry of Agriculture and Forestry** is to protect forests ecosystems, biological and landscape diversity in forests, to improve the protective properties of forests, and to increase forest cover. Implementing this the Ministry:

- controls the use, restoration and protection of Lithuanian forests,
- regulates activities of the national and regional parks which are in its regulatory sphere,
- arranges the inventory of forests and forests register,
- organizes the inventory of forest genetic resources, selective seed farming and forest restoration.

The functions of the **Ministry of Construction and Urban Development** connected with biodiversity conservation:

- coordinates the works of territorial planning, legal regulation of construction, works of norming and standartizing, prepares the norms, rules and standards of territorial planning and construction;
- takes part in the planning of perspective development of towns, villages and recreational territories, takes part in analysing the problems of cultural heritage, economy and nature protection;

- organizes and coordinates the preparation of the general plan of Lithuanian Republic;
- establishes the order of the structure of the general territorial planning documents and construction projects as well as the order of their preparation and changes.

Local municipal institutions organizing the realization of the laws of environmental protection, other legal acts and biological diversity protection:

- manage and use natural resources appointed to them, allocate state natural resources according to the limits appointed to the municipalities;
- prepare, ratify and realize the programs of municipalities' environmental protection and natural resource use programs, schemes and other means of environmental protection;
- establish and manage the protected areas of the municipality and landscape objects;
- regulate the planted places of the settlements, prepare and ratify the rules for green plantation protection.

The authorization of the **region head** in the field of the use of natural resources and protection of landscape and biodiversity:

- according to his competence establishes the limits of natural resource use and controls them;
- organizes activity in the protected areas which belong to the region and takes part in managing other protected areas except strict reserves;
- according to the established order evaluates the impact of the economic activity on the environment and coordinates projects;
- according to his competence controls forest condition, usage, restoration and protection.

Today misunderstandings often arise due to ill-defined functions of the Environmental Protection Ministry's regional departments, municipal institutions and newly created regional authorities. Common environmental interests are often impeded by (1) overlap of the functions of the Ministries of Environmental Protection, Agriculture and Forestry, and Construction and Urban Development and (2) environmental services of regional authorities, which are at their early stage of existence.

Within regional authorities, formal education sections have been set up which are responsible for the integration of environmental education into pre-school, general education and other curricula, for teacher training.

Lithuanian cities and districts have environmental units or offices which, pursuant to the Law on Environmental Protection for municipal institutions, implement environmental protection legislation and decisions on the issues of environmental protection made by the Environmental Protection Ministry and other units of government. Environmental units of municipal institutions coordinate and participate in organizing public environmental education, information and training in towns and districts. Based on the Law on Local Municipalities, municipal institutions organize

additional training for children and youth and take care of environmental protection requirements.

Informing and training the general public has become a priority of municipal institutions. Their main goals are: (1) strengthening environmental awareness of municipal institutions' staff and of the public; and (2) promoting their local counterparts' involvement in resolving tasks of sustainable development in cities and regions which promote environmental protection and environmental education.

Non-governmental organizations. In Lithuania there are about 80 environmental non-governmental organizations or NGOs (movements, funds, societies, associations, centers, clubs and circles). The main tasks of NGOs are to raise public environmental awareness, instill harmony in the relations between man and nature, involve the public in solving environmental protection problems, initiate cooperation with the public in foreign countries, instill a respect for and love of nature, biodiversity and responsibility for its preservation for future generations, and involve experts from specific fields of science in the work of public environmental information and training of specialists.

The main NGOs in the field of biodiversity conservation are: Lithuanian Nature Fund, Association of Ornithologists, Association of Botanists, etc.

1.3.2 Territorial planning and economic sectors

The conservation of biodiversity also largely depends on territorial planning documents and their implementation. In 1984 the Integrated Nature Protection Scheme, in which there was important input for the conservation of biodiversity, was planned to the year 2000. A system of protected areas was included and some components have been implemented. The idea of Lithuania's Nature Frame was raised and approved.

Just as the system of legal acts had to be changed after a change in the social economic situation, so had the system of planning documents. Planning is regulated by the Law on Territorial Planning. General (integrated), special (of different kinds - for development of infrastructure, for management of forests, protected areas, etc.) and detailed planning documents in Lithuania are prepared according to this Law. Box summaries current planning goals and examples of current activities.

In Lithuania the main planning goals are

- safeguarding sustainable and stable development,
- forming a valuable, healthy and harmonious living, working and leisure environment,
- forming of well-founded policies of the development of dwellings and infrastructure systems,
- using natural resources rationally without affecting the

landscape's ecological balance,
- conserving the natural and cultural heritage and aesthetic potential of the landscape,
- reserving areas for residential development, infrastructure and other land use,
- coordinating interests of legal and physical entities, municipalities and the state on the use of areas and sites, on the conditions for activities therein,
- promoting investment in the country's economic and ecological development with optimal distribution throughout the territory,
- adjusting the country's management to its natural, economic and cultural conditions and peculiarities.

Examples of Planning Activities

- Ongoing development of a general master plan for the country and Klaipëda Region.
- National Parks management plans approved by the Government of the Republic of Lithuania.
- Out of 30 regional parks, only two had formal plans prior to their establishment (again, they to be supplemented to meet the new requirements). For fifteen other parks plans have been prepared (adopted) or are being finalized.

The economic development of the forest, agriculture, transport, and tourism requires consideration of the environmental impacts of development. Little consideration has been paid to this issue. However, effort is being made to protect the environment:

- The Lithuanian Forestry and Timber Industry Development Program declares the importance of the conservation of biodiversity in forests, since forestry is the main sector for economic development of natural resources. The program provides for creation of a separate program for conservation of genetic diversity in forests;
- The Program for Usage of Earth Entrails outlines the use of mineral resources, but does not mention conservation of biodiversity.
- So far, no agriculture program has been adopted.

When the Law on Forests is passed, some forests may be assigned to agriculture according to conditions and the function of a particular forest. All Group II and some Group III forests (Table 1.3.4) in should focus on selective logging and development of multi-aged complex stands, with the exception of those forests in the poorest habitats.

Table 1.3.1. Distribution of forests by groups and categories

(01 01 1997, according data of the Ministry of Agriculture and Forestry)

FORESTS GROUPS AND CATEGORIES	AREA	
	(ha)	(%)

Group I - reservation forests:	30278	1.4
strict reserves	23129	
strict reserves in state parks	6976	
small (micro) strict reserves	173	
Group II - special-purpose forests:	280824	13.
A) forests for protection of ecosystems	201431	1
ecological protection forests in reserves	163709	9.4
forests of protected landscape features (nature	2107	
monuments)	17748	
anti-erosion forests	3153	
genetic sites	206	
special research sites	660	
forest segments of common and rare tree species	1408	
protected plots for nature resources restoration	12440	
forests for Baltic sea and Curonian Lagoon protection	79393	
B) recreational forests	24488	3.7
city forests	25395	
forest parks	12236	
forests of recreational zones of national and regional	2464	
parks	14810	
forests of resorts (zones of 1 and 2 regime)		
forests of recreational sites		
Group III - protective forests:	282340	13.
forests of reserves with III group regime	49556	2
forests of protective zones in national and regional	8974	
parks	30178	
forests of buffer zones of national and regional parks	21122	
forests or resorts (zones of 3 regime)	10671	
forests for protection of agrarian land	1068	
forests of recreational and aesthetic value near roads	145368	
forests of protective zones for water bodies	3572	
forests of the Baltic sea and Curonian Lagoon	6391	
protection zone (2-7 km)	165	
forests around factories	5275	
forests of seed-plots		
forests for training and research		
Group IV - forests used for economic purposes:	154914	72.
forestry zones in national and regional parks	5	3
economic forests	101251	
	144789	
	4	
In total	214258	100.
	7	0

1.3.3. Research and monitoring

Research and monitoring for biodiversity has not been systematically and comprehensively conducted. Various institutions have, however, made important contributions. The synthesis of this research and monitoring information gives some insight on the status of biodiversity in Lithuania.

Research. There is no national biodiversity research program, but some work has been done at the Institute of Botany, the Institute of Ecology, and other Lithuanian scientific and educational institutions - Vilnius University, Vilnius Pedagogical University, Klaipëda University. These are the main centers for research of flora, fauna and fungi

in Lithuania, as well as the societies of botanists, ecologists, ornithologists, theriologists, entomologists, and hydrobiologists.

Flora and fauna research is carried out at the species level (populations, individuals), and on communities and ecosystems but not all to the same degree. An insignificant amount of attention has been given to studies of biodiversity at the ecosystem level, and to the development of data bases and registers, and to the protection of genetic resources. Due to the abundance of insects, aquatic invertebrates (particularly benthos), protozoa, and others, these groups have been insufficiently studied.

The National Program of Cultural Plant Resources are implemented with a support of Lithuanian fund for science and studies starting 1994. The Institutes of Forests, Agriculture, Gardening, Botany, Universities of Vilnius and Agriculture and Vilnius Pedagogical University, as well as Kaunas Botanical Garden are involved in the implementation of the Program the aim of which is create scientifically based preconditions for conservation of plant genetic resources in Lithuania. In the Institute of Agriculture equipment of modern storage for seeds of perennial plant species is almost finished. Versatile researches are being performed on cultural plants which are stored in 25 collections.

Since 1994, the Ecology Institute has been developing and supplementing the biodiversity database. Only a third of protected areas have been more thoroughly studied from the zoological and botanical point of view. Studies of fauna are performed even outside protected areas in various regions of Lithuania. The Institute of Botany is the main center of mycological research in Lithuania, having a qualified staff. The Botany and Ecology Departments of the two universities carry out only fragmentary work in the mentioned respect.

Berry, fruit, and medicinal plant species of wild flora are investigated in the Institute of Botany, Vilnius University and Kaunas Botanical Garden. The Forestry Institute is investigating pine, spruce and oak populations (1300 marked trees have been selected and 780 ha of collection sites established) in forestry resources plots (former forest genetic reservations /4/, genetic /276/ and seed /70/ reserves). Lithuanian tanidic plants are investigated and collected in the Vilnius Pedagogical University.

Research of biodiversity in the Baltic Sea coastal waters is carried out in Klaipëda University started in 1993. The data base of bentos organisms is created and preliminary classification of marine biotops is prepared, as well as the map of their distribution in Klaipëda-Palanga area is made. The scientists of Klaipëda University take part in the international biodiversity research programs, scientific potential of marine biologists is being formed.

Non-timber forest resources of Lithuanian forests are studied by the Institutes of Forests, Botany, and Economics, and the Medical Academy, with the help of expeditions and questionnaire techniques.

There are few scientific data at the level of biocenosis (phytocenoses and zoocenoses). A primarily classification of Lithuania's higher plant communities has been made. Volume 1 of a six volume edition of "Lithuanian plants" has been submitted for publication. The communities of Lithuanian waters have been classified, and their population trends, due to the impacts of physical, chemical and environmental factors, have been determined. Soil community classification and a study on community changes, according to soil type and economic use, are being finalized. The distribution of vertebrate communities in relation to landscape and ecosystems structure is being investigated. Most information on flora, and fauna (on algae, fungi, protozoa, zooplankton, zoobenthos, land invertebrate and other communities) has not been analyzed in terms of communities.

The majority of existing data on flora, mycobiota and fauna (on algae, fungi, protozoa, zooplankton, zoobentos, land invertebrate and other communities) has not been analyzed ecologically. Habitat structure has been studied only in several aquatic ecosystems (Drûkðiai Lake, Curonian Lagoon; and to a lesser extent: in Kaunas and Elektrënai water reservoirs, Dusia Lake, and the Baltic Sea coastal waters). It is an important task to generalize the studies of flora and fauna in an ecological/biocenological context for biological diversity research.

Biological diversity analysis data at the level of ecosystems are still more important. Some types of aquatic ecosystems have been studied more thoroughly, mezotrophic lakes and the Curonian Lagoon in particular. The Institute of Forests have performed ample studies of forest ecosystems. Information for the analysis of biological diversity problems of internal waters of other trophic levels, of permanent river ecosystems, of inland waters - wetlands, meadows, sands, anthropogenicized ecosytems - is insufficient.

Major publications and journals related to Lithuania's biodiversity:

- During the last 20 years, 6 volumes of Lithuanian Flora have been published which describe 1300 species. A 3 volume monograph "Flora of the Baltic Countries" is being published (Volume 1, 1993; Volume 2 , 1995). The Lithuanian Red Data Book was published in 1992. Books on the vegetation of some protected areas have been published (Þuvintas and Èepkeliai strict nature reserves, Aukðtaitija national park, regional parks of Aukðtadvaris, Þagarë, Anykðèiai, Nemunas Kilpos and Labanoras).
- Volume 1 of the 6-volume publication "Lithuanian Vegetation" has been submitted for printing. The Botany Institute issues a scientific journal "Botanica Lituanica".
- In 1990, a multi-volume publication "Lithuanian Fungi" was started, which has resulted in publication of the first 6 volumes.
- The following major publications on wildlife have come out: 5

volumes of Lithuanian Fauna - mammals, birds, insects; volumes on fish, reptile and amphibian are ready for print. Earlier publications include: “Birds of Lithuania”, “Fishes of Lithuania”, “Insects of Lithuania”, “Moths of Lithuania”, “Hoofed Animals of Lithuania”.

- Journals issued by the Institute of Ecology, such as, “Acta Ornithologica Lituanica”, “Acta Entomologica Lituanica” publish data on the faunistic composition of Lithuanian wildlife, rare and declining and new species (all these journals have in recent years been combined into “Acta Zoologica Lituanica”).
- Lithuanian Ornithologists Society issues a scientific journal “Ciconia” and a science popular magazine “White Stork” (in Lithuanian). Data on birds and their protection are published there.

Ecosystem structure has been studied intensively only in Drûkðiai Lake and the Curonian Lagoon. Ecosystems in Kaunas and Elektrënai reservoirs, Dusia Lake, and the Baltic coastal waters have been studied to a lesser extent.

Monitoring. The Environmental Protection Ministry is responsible for implementing a comprehensive monitoring program of air, water, soil, vegetation, and wildlife. It also monitors integrated environment sectors for pollution.

Biodiversity and endangered species in Lithuania are not specifically monitored, although vegetation and wildlife observations are made in selected stations. At present, monitoring observations are made at 3 integrated monitoring stations: Aukðtaitija, Dzûkija and Þemaitija national parks. Integrated environmental monitoring includes individual species and ecosystem monitoring, and is generally performed at a research level by technical specialists. There is virtually no monitoring of the status of protected species and no program for the conservation of separate species, biocenoses or ecosystems. Currently an inventory of the Lithuanian Red Data Book species and habitats to be protected in forests is being made. A few enthusiasts consistently contribute new data on some animal species listed in the Lithuanian Red Data Book.

Due to lack of funds, the activities of the Ecological Monitoring System Action Program have been on the decline. As mentioned earlier, there is too little attention given to vegetation and wildlife, and investigations on fungi are not included at all. Research receives too little funding or none at all. Integrated environmental monitoring may be terminated due to insufficient funding. However, there are some monitoring activities which should be noted:

- From 1983 to 1986, the Botany Institute created a vegetation monitoring methodology and a system of stations encompassing the diversity of species and communities. In each of Lithuania’s natural geographical units, two stations were selected for the observation of vegetation in positive and negative mesoforms of land surface. Station sites

were mapped using air photos. This work was interrupted due to a lack of funds. Since 1991, one wetland, five agricultural areas and four lake vegetation species have been monitored.

- In 1980, monitoring of the vegetation and wildlife of the Nuclear Power Plant cooler - Drûkðiai Lake, as well as of landscape types was started to register and analyze changes in biocenoses and geosystems.
- For forest management, specialized forest monitoring is performed. Non-timber forest products are not monitored.
- Monitoring of the Curonian Lagoon and the Nemunas River delta zoocenoses and fish resources has been performed by the Institute of Ecology since 1949.
- Since 1993, at the request of the Fisheries Department of the Ministry of Agriculture, the Institutes of Ecology and Agrarian Economy have been monitoring fish and their feeding resources in the Lithuanian economic zone of the Baltic Sea.
- Monitoring fish resources in industrial inland waters is performed periodically at the request of municipal institutions, by the experts from Vilnius University, Vilnius Pedagogical University, Klaipëda University, Marine Research Center of the Environmental Protection Ministry, members of the societies of botanists, ecologists, ornithologists, theriologists, entomologists, and hydrobiologists.
- Since 1993, environment monitoring has been performed by the “Tatula Fund” in Karst region.

1.3.4. Information, education and staff training

Efforts to educate and train specialists and the general public are at various stages of development and implementation. Access to information is limited to technical publications. Public outreach and public education is generally conducted on a case by case basis. Some training has been initiated, but requires a more systematic approach to benefit the community.

Information. Despite the numerous tasks completed to date, information on the diversity of Lithuania’s vegetation and wildlife is still incomplete, particularly for communities and ecosystems. Much of this information has been developed over decades, and is found in numerous different scientific publications, and has not been synthesized into a single source document.

Publishing of completed Lithuanian Fauna and Lithuanian Fungi volumes has stopped due to a lack of funds. There is no complete inventory of the habitats of species listed in the

Lithuanian Red Data Book. Registering rare and threatened species recommended to be protected under the Bern Convention is performed fragmentarily at the request of the Environmental Protection Ministry. The Lithuanian Red Data Book on higher plant communities is ready for printing. Information is scattered in various scientific journals and is not accessible to the general public.

Ample information has been collected on Lithuania's forests. In 1995, a State inventory of forests was made and later a computer data bank was established. Inventories are revised every 5 years. Between 1979-1988, an inventory of forest berries, fruit and medicinal herb growing in Lithuanian forests was made. There is no data on mushroom fields and mushroom resources.

There is very little information on the biodiversity of ecosystems characteristic of Lithuania. Published research data refers to the biodiversity within ecosystems rather than the diversity of ecosystems. Only some information on Lithuanian flora, fungi and fauna genetic diversity can be found only in foreign scientific journals. In the HELCOM Environmental Database the number of works by Lithuanian scholars is small; very few works on flora and fauna are included.

Education. The Environmental Protection Ministry has initiated an ecological education program for the general public and for various qualified specialists. According to their competence, ministries and departments organize ecological education under the coordination of the Environmental Protection Ministry. Such educational activity is mainly related to environmental quality rather than to the conservation of biodiversity.

Today, practically all establishments of higher education in Lithuania have special courses in ecology, environmental research and land management. The staff at Vilnius University is experienced in arranging such courses, even though the University does not have specialized departments for the purpose.

Environmentalists of a narrow profile are trained at the Agriculture University, Vilnius Gediminas Technical University, Kaunas Vytautas Magnus University and other establishments of higher education. At present there is a shortage of qualified ecology, land management, and environment specialists in the Environmental Protection Ministry, and other ministries, municipal institutions and secondary schools.

There is no special program for training, education, or improvement of medium-level specialists, or for improvement of the ecological and environmental education of school-children. Since 1993, the "Tatula Fund" for the karst region has been implementing a wide ecological education and training program.

Training of specialists with western aid is of a low standard. The content of lectures is poor, and there is no qualified assistance. In order to improve the qualifications of specialists in ministries and municipal institutions, it is necessary to organize courses with the assistance of experts from Lithuanian scientific and educational institutions

Lithuania is in need of qualified florists and phytocenologists. There are no mycologists systematizers, mycocenologists able to study various fungi groups, there is a shortage of experimental, household and medical field mycologists. There are not enough zoologists to work with the fauna of various groups. Lastly there are no biologists and biogeographers of a wide integral profile.

1.3.5. International cooperation

Lithuania has not ratified all international conventions aimed at the protection of nature. It has, however, ratified the following:

- Convention on Biodiversity (Rio, ratified 1995);
- European Convention on Wildlife Protection (Bern Convention, ratified 1996).

Lithuania has acceded to the:

- Convention on the Protection of Wetlands of International Importance Particularly Waterfowl (Ramsar Convention, signed 1993 -the first tasks have already been fulfilled within the Ramsar Sites Selection Program, in addition to the 5 previously studied areas another 9 were suggested in 1995);
- Convention on Fisheries and the Protection of Fish Resources in the Baltic Sea and Protection Belts (Gdansk, signed 1992),
- Baltic Sea Marine Environment Protection Convention (Helsinki, signed 1974, not yet ratified).

Based on the research performed by the Institute of Ecology, internationally important bird wintering sites in the Baltic Sea and the Curonian Lagoon have been identified. The Lithuanian Ornithologists Society is implementing an Important Bird Areas Program at the request of Bird Life International. Research on biodiversity protection in Baltic coastal waters is being carried out cooperatively with the Swedish Coastal Research Institute. There is a joint program, approved by the Baltic Assembly, “Baltic Ecosystems” for 1997-2002 between the Academies of Science of Lithuania, Latvia and Estonia which covers research on biodiversity. The Lithuanian Fund for Nature is implementing an important inventory of wetlands related to the Peat Excavation Program of the Government of the Republic of Lithuania.

Lithuanian Environmental Protection Ministry has signed cooperation agreements in environmental protection, and biodiversity conservation with:

- Denmark - Environmental Protection and Energy Ministry of (Vilnius, 1991);
- Poland - Environmental Protection Natural Resources and Forestry Ministry (Warsaw, 1992);
- Finland - Environmental Protection Ministry (Helsinki, 1992);
- Germany - Environmental Protection Ministry (Vilnius, 1993);
- Austria - Federal Ministry for the Environment, Youth and Family (Vienna, 1994);
- Belourussia - Nature Resources and Environmental Protection Ministry (Minsk, 1995);
- Slovak Republic - Environmental Ministry (Bratislava, 1996).

The Government of the Republic of Lithuania signed a bilateral agreement with Sweden for cooperation in environmental protection (1992), and a trilateral agreement for cooperation in environmental protection with Estonia and Latvia (Tallinn, 1995).

Starting 1994 close cooperation between Lithuanian and North European countries scientists in field of protection of cultural plant genetic resources take place, the common project is under implementation with the financial support of Council of Ministers of North Countries. Gene Bank of North Countries is leading institution in the project. Starting 1995 Lithuanian scientists take part in another two programs: (1) SCP/GR (European cooperative programme for crop genetic resources) and (2) EUFORGEN (European forest genetic resources programme). The International Institute of Plant Genetic Resources in Rome is leading these programs.

The closest cooperation in field of biodiversity conservation is carried out with the Baltic States - Latvija and Estonia. Joint seminars, projects, meetings are organized. Financial support for mentioned cooperation is presented by Denmark, for which cooperation in field of conservation of landscape and biodiversity has a priority.

In 1996 agreement between the governments of eleven countries the Baltic 21 is under preparation. The Baltic 21 project is a regional development of Agenda 21 which aims at finding a feasible implementation strategy for sustainable development in the Baltic Sea Region. Its purpose is to change policy and to balance development in all economic sectors (energy, agriculture, forestry, transport, industry, etc.) in the interest of environmental protection. Lithuania (Ministry of Environmental Protection and Ministry of Agriculture and Forestry) and Finland are responsible for preparing the program for forestry sector in the Baltic 21. It is hoped that Baltic 21 will play an important role in effective solving environmental protection and other problems of the region.

2.0. STRATEGY

Defining a strategy for the protection of biodiversity requires (i) recognizing problems which are specific to Lithuania, (ii) developing a methods that will solve the problems and achieve the goals, (iii) identifying the goals of an effective and implementable strategy, (iv) understanding the concepts which define a strategy.

2.1. Problems and goals

The problems and goals of the strategy are based on an investigation and analysis of the process and activities. The general impacts from these processes and activities, the positive and negative impacts on biodiversity, and the goals of the strategy are identified in the following section.

2.1.1. Analysis of sectoral problems

During the Soviet period, biodiversity was most adversely affected by land drainage (drainage of natural meadows and wetlands), channelisation of small rivers, damage to river valleys, and cutting down of small forests or harvesting in small farmsteads. These activities and impacts result from the lack of environmental awareness of the general public, disrespectful approaches towards the environment by national and local government, and lack of attention to ecological criteria in landscape management. Bad management and decision making practices were accepted as normal.

Today, the status of biodiversity and biological resources in the natural landscape, the forestry and agricultural sectors and in aquatic systems in Lithuania is mainly influenced by the following:

- intensive felling, destruction of small forests which are of particular importance to biological and landscape diversity, all resulting from privatization,
- essential changes in ecological conditions due to land drainage in the Soviet period,
- damage of forest ecosystems as a result of natural disasters (droughts, pests, etc.) and pollution,
- destruction of the diversity of tree species in forests as a result of using several selected tree species,
- changes in the ecological conditions of meadows due to a decline of economic activities,
- reversion of rivers and rivulets into ponds thus changing the thermal regime and destroying migration routes,

- intensification of illegal fishing in natural inland waters, increase of fisheries, inefficient restocking, collapse of the fish breeding system,
- poor control of vessels - tank washing at sea and increased Baltic Sea pollution with oil products,
- pollution of the sea with industrial and municipal waste waters,
- formation of zones with increased pollution in surrounding of inland waters bodies and intensification of ecological succession in them,
- increase of recreational activities in natural environments,
- destruction and decrease of natural landscape islands in urban areas,
- development of the road network; increasing of number of motor vehicles,
- usage of game resources, ignoring natural breeding processes, increased poaching, lack of control and monitoring.

As a result of intensive and irrational use, Lithuanian forests are in a critical state: They have a disproportionate number of coniferous rather than deciduous trees, small percentage of mature forests, uneven distribution of mature forests, and logging is excessive, including the logging of young trees. Some forests have died due to industrial pollution (Jonava, Kėdainiai, etc.). Today, forest cover in Lithuania is too small, especially in the northern and central regions. Forest cover is smallest in the karst region, 7-10%, where soil erosion is intensive, waters are polluted, and both community and genetic biodiversity is declining. Due to damage by pests, spruce forests are under intensive clear-cut, which is a threat to the existence of the entire forest community.

Significant amounts of chemicals were used in vast arable field areas for care of monocultures, including: poorly balanced fertilizers, fungicides, herbicides, other pesticides. Pollution of soil, lakes, rivers, the Curonian Lagoon and the Baltic Sea with chemicals from agricultural lands, farm dungwater, and waste water from cities and settlements, increased. Eutrophication in lakes was intensive. As a result, secondary succession occurred and some plant, animal and fungi species became extinct. Single farmsteads were systematically destroyed, thereby destroying land use traditionally based on a balanced use of organic fertilizers. The genetic resources of many cultural plants and domestic animals and birds were lost irretrievably.

There is a continuing lake eutrophication in Lithuania. Waste land is increasing with ruderal and synantropic species, and the composition of communities is simplifying.

Allocation of new wetlands for peat excavation would inevitably cause an adverse effect on Lithuania's biodiversity. The planned construction of new ports, reconstruction and new construction of oil terminals, construction of major highways for transit, and location of new soil dumping sites in the sea without taking the necessary precautionary measures would also adversely affect the biodiversity in those areas.

The survival of natural continental meadows and limy fens is acutely at risk. Most natural flooded and continental meadows have been destroyed. A particularly intensive case of the latter took place in the Ðilutë district, where 75% of wetlands, 30 000 ha, of the lower reaches of Nemunas River and 10 000 ha of the flooded meadows of the Minija lower reaches were drained and their former economic value lost.

Factors which have had and will continue to have a significant impact upon the status of biological resources and biodiversity:

- Atmospheric air pollution with NO_X, SO_2, CO_2, CO compounds, dust, ozone depleting substances, heavy metals,
- water pollution with storm water, household, industrial, agricultural waste water, fertilizers, pesticides, oil products,
- soil contamination in cities, and near highways and cultivated lands (with fertilizers, pesticides, etc.),
- accumulation of industrial, hazardous and household waste, old pesticides, radioactive wastes,
- physical pollution: high levels of noise in cities, environmental contamination with radionuclides, electromagnetic pollution in cities, thermal pollution of water bodies.

2.1.2. Problems in biodiversity protection

As noted in section 2.1.1 there are sectoral activities which impact biodiversity. In addition there are in-situ and ex-situ factors which hinder biodiversity protection at the global, regional, and species level. These factors have been identified, based on research and monitoring that has been done in the country.

IN-SITU (NATURAL) PROTECTION PROBLEMS IN BIODIVERSITY CONSERVATION:

Problems of geosystematic level:

- damage of the landscape's general geoecological balance,
- destruction of the natural structure of watershed landscape,
- destruction of the natural structure of valleys and hollows landscape,
- destruction of the natural structure of karst landscape,
- eutrophication of inland water bodies,
- degradation of natural landscape in especially protected areas,

- degradation of the natural landscape in cities and towns;

Problems of ecosystematic level:

- degradation of forests ecosystems,
- degradation of marine ecosystems,
- degradation of coastal ecosystems,
- degradation of inland water ecosystems,
- degradation of marches ecosystems,
- degradation of meadows ecosystems,
- declining sands ecosystems,
- degradation of ecosystems of anthropogenic environments;

Problems of species level:

- degradation and decline of populations (including relics, endemics, rare and threatened species),
- reduction of species diversity in biocenoses, simplification of plant communities,
- declining internationally important populations,
- spreading of adventive and invading species,
- destruction of bird and fish migration routes and changes in their environment,
- degradation of non-timber forest resources,
- degradation of hunted fauna (game) resources,
- degradation of fish and crayfish resources.

Problems of genetic level:

- degradation of forests populations,
- degradation of gene pool of introduced alien biota taxa.

EX-SITU (ARTIFICIAL) PROTECTION PROBLEMS:

Problems of genetic level:

- degradation of domesticated taxa (species, sub-species, forms, breeds, etc.),
- degradation of the gene pool of taxa not characteristic of the country but of international importance, which are bred ex-situ;

Problems of organizational level:

- insufficient material/technical state of existing ex-situ protection stations,
- non-systematic ex-situ measures used for wild biota,
- absence of national collections of microorganisms,
- absence of veterinary and phytopathological protection control of genetically modified organisms.

Summary of factors negative for biodiversity protection:

- lack of ecology advocacy and awareness,
- absence of a biodiversity protection system vision,
- frequent changes in the process of land reform,
- lack of regulation of land use, and absence of biological assessment,

- lack of funds for environment protection, including organizational and practical measures,
- lack of studies on separate biodiversity components,
- lack of territorial planning documents, delays in the development of integrated management plans for the Republic of Lithuania, regions and municipalities,
- lack of restoration programs and projects for damaged natural complexes, slow progress in forest replanting and recultivation activities,
- lack of professional designers, botanists and zoologists trained in territorial planning,
- segmentation of administration for protected areas under different institutions,
- rapacious utilitarian attitudes among public toward nature and natural areas,
- underestimation of the importance of university and academic education, lack of understanding of the significance of applying natural sciences research in economic development,
- absence of a country-wide study on biodiversity, insufficient motivation for territorial biological protection,
- insufficient development of biogeography and lack of ecosystem studies.

Summary factors favorable to the conservation of biodiversity:

- collapse of the former irrational uniform agriculture system; implementation of a State pilot program ("Tatula") in the karst region focused on sustainable farming; sustainable bio-organic land cultivation,
- reduction of land reclamation scale and tempo,
- reduction of both industrial production volumes and pollution,
- elimination of former Soviet military training grounds,
- National Environmental Strategy development and approval,
- inherited biological sciences system and accumulated country research fund,
- international agreements and aid for the conservation of biodiversity,
- fast development of activities of non-governmental organizations,
- State and institutional environmental programs ("Nuclear Energy and Environment", EKOSLIT, etc.).

The present nature protection policies which in Lithuania have evolved on the basis of traditional attitudes towards environment protection of focusing attention upon environmental pollution reduction problems make it complicated to solve biodiversity and biological resources problems. Biological diversity protection is actually understood as the formation of protected areas system and limitations in changing the landscape. Direct biota genetic resources (the diversity of species and communities) preservation is given too little attention.

2.2. Strategy principles and concept

2.2.1. Principles underlying the strategy

Biodiversity conservation requires a rational use of biota resources and the implementation of sustainable development ideology in land management. Implementation of the strategy is impossible without establishing a number of principles or attitudes.

The general biodiversity conservation strategy principles are as follows:	
equality of generations	the present generation of people is not entitled to leave for the following generations damaged natural environment and impoverished wild nature,
ecological equality	all people in the world today have equal rights to healthy natural environment and its biological resources,
obligations of the state	the economic prosperity of the country and the conservation of biodiversity is the inherent obligation and concern of the state,
prevention	principles aimed to avoid negative impacts upon natural environment and biodiversity by means of actions aimed to prevent potentially drastic nature use,
infringer punishment	physical and legal entities must compensate for damage they cause to natural environments and biodiversity.
Specific biodiversity conservation principles are as follows:	
precaution	every decision which may have an impact upon biodiversity should be accepted with maximum caution, taking into consideration all possible consequences,
validity	all decisions which have an impact upon biodiversity should have sound scientific motivations and take into consideration potential environmental impacts,
replacement	any activities, methods or materials which may adversely affect biodiversity have to be replaced with less harmful ones,
relocation	any activities which pose a threat to biodiversity have to be relocated to other sites less valuable from a biological point of view, in cases where there is no possibility to change or neutralize them,
systematisity	biodiversity conservation should be based on an ecosystematic approach, the analysis of habitats and relations between species,
in-situ priority	in the protection of all species in-situ measures should be absolutely dominant, and ex-situ protection considered only as a supplement hereto,
regionalization	acceptance of full responsibility for biodiversity conservation in a region’s territory, even when the biological objects occur in other countries, the same principle applies to separate regions of the country.

2.2.2. Method of determining biodiversity goals

The sectoral, in-situ and ex-situ problems are of unequal weight. To determine each problem/factors relative value, a special assessment method was developed based upon the expertise used to prepare the National Environmental Strategy.

The method includes (1) an assessment of problems according to two groups of criteria which determine their urgency and complexity, in which (2) the main criterion was the degree of loss of biodiversity.

The assessment of problems was carried out by experts, without complex calculations, using qualitative assessment in a three scoring system. The system included an application of different weighted coefficients for separate criteria (see Table. P2-1, Annex “Strategy Formation” for details). Based on the assessment, problems were prioritized from an environmental point of view. Problems with a urgency rating assessed at over two points was considered a priority, i.e. those having an urgency above average.

The goals-system. The prioritized conservation and biodiversity protection problems were then used to develop a uniform goal system. The overall goal of the biodiversity conservation strategy should meet the demands of biota protection where it is threatened either by decline or degradation. The following biodiversity conservation goals have been outlined:

Geosystematic level *(in-situ)* ***goals***

- **G1** - *maintain overall geoecological balance of country’s landscape* by means balancing cultural landscape formation, guaranteeing the creation of a proper Nature Frame as an ecological compensating system, creating the Nature Frame green areas system, and restoring the damaged structures or features of the most important Nature Frame zones;
- **G2** - *avoid further degradation of the landscapes in watersheds*, which are the main linking elements in the Nature Frame system by management of landscape, renaturalization of damaged natural areas;
- **G3** - *prevent further degradation of river valley and lake hollow landscape* by safeguarding the protection and use regimes of protection zones around water bodies, and determine means for conserving valuable valley habitats;
- **G4** - *prevent further degradation of the natural structure of the karst landscape* by regulating the human activities which activates karst processes, by strengthening the protection of nature, and by promoting ecological land use;
- **G5** - *stabilize and reduce eutrophication of inland waters* by reducing the chemical pollution, by strengthening and enforcing water protection zones by the formation of green buffer zones and by strengthening control of potential pollution sources;
- **G6** - *prevent further degradation of landscape in especially protected areas* by improving the surveillance and management of protected areas, by reducing clear-cutting, by regulating construction activities, by

implementation of scientifically based sustainable recreation system in protected areas, by directing agricultural development towards environmentally balanced use of land;

- **G7** - *avoid further degradation of the natural landscape in cities and towns* by preserving and expanding green areas in urban territories, by protecting valleys, by preserving the scenic value of landscapes, and by protecting the natural features of the hydrographic network.

Ecosystematic level** (in-situ) **goals:

- **E1** - *avoid further degradation of forest ecosystems* by their rational use, prohibiting drainage of forests, and forming and preserving an optimal forest structure;
- **E2** - *prevent further degradation of marine ecosystems* by developing scientifically sound protection and rational use of marine deep biocenoses, and by strengthening marine environment protection systems;
- **E3** - *prevent further degradation of the coastal ecosystems* by strictly limiting the intensity of use in coastal zones, by prohibiting construction close to the sea, protecting rare and declining biocenoses, and conserving wintering sites and fish spawning grounds of international importance;
- **E4** - *prevent further degradation of inland waters* by the regulation of their use, by not increasing anthropogenic loads in the coastal zone, by avoiding radical changes in hydroecological conditions;
- **E5** - *conserve wetland ecosystems by prohibiting exploitation of new wetlands*, by restoring peat lands, and by delineating measures for the conservation of valuable habitats;
- **E6** - *conserve natural meadow ecosystems* by prohibiting their non-traditional use, by defining possibilities for restoring meadows;
- **E7** - *prevent the decline of sand ecosystems* by avoiding afforestation or construction and development in sandy areas, by safeguarding the protection of valuable species and communities in those areas;
- **E8** - *conserve and enrich human environment* by preventing destruction of natural biocenoses in agrarian and urban areas, by keeping up their restoration processes, and increasing biodiversity.

Species level** (in-situ) **goals:

- **R1** - *maintain diversity of species* by developing a special program for the conservation of relic, endemic, rare and declining taxa, and by establishing legal basis for effective protection;

- **R2** - *prevent the further reduction of the species composition of biocenoses* by ensuring the stability of species composition in biocenoses, and by establishing legal basis for effective protection;
- **R3** - *ensure conservation of species of international importance* through developing and implementing special programs, and by establishing a legal basis for effective protection;
- **R4** - *protect locally characteristic species and natural populations* by preventing the spread of adventitious and invasive species, and by enhancing research;
- **R5** - *avoid destruction of migration routes of fauna species and changes in their environment*, by regulating the use of areas (particularly those which lead to the fragmentation of habitats), by establishing legal basis for effective protection;
- **R6** - *protect or restore non-timber forest products* by ensuring rational use, by preparing and implementing a program for resources restoration;
- **R7** - *protect and restore game resources* by optimizing use of game and restoring populations which resources have been decreased;
- **R8** - *protect and restore fish resources* by protecting spawning grounds of valuable fish species, by organizing artificial reproduction of valuable fish species, and by restocking lakes and rivers;

Genetic level** (in-situ) **goals:

- **V1** - *avoid degradation of forests populations* by strengthening conservation means at state level, continuing research and monitoring of forests populations,
- **V2** - *avoid degradation of gene pool of introduced alien biota taxa* by ensuring maintenance of introduced taxa, strengthening basis for experiments;

Genetic level** (ex-situ) **goals:

- **Ex1** - *prevent further degradation or extinction of the gene pool of domesticated taxa* by strengthening protection of the gene pool of domesticated taxa, including plants, fungi and animals, by reviving and expanding scientific selection activities;
- **Ex2** - *prevent the further degradation of the gene pool of taxa of international importance* which are not characteristic of the country by conservation in captivity, by improving the experimental basis;

Organizational level** (ex-situ) **goals:

- **Ex3** - *provide meaningful financial-technical support for the maintenance of existing ex-situ protection*, and for organizing specialized *ex-situ* protection centers;
- **Ex4** - *create the system for coordination of ex-situ protection activities* and to plan measures for ex-situ conservation;
- **Ex5** - *create a national collections of micro-organisms*, recover collections, which were lost;
- **Ex6** - *secure genetically modified organisms* through effective veterinary and phytopathological control system.

Successful achievement of biodiversity goals requires a systematic and long-term actions in the future. However, most problems can be solved in the medium or even short-term. So implementation periods have been set as: short-term, medium-term and long-term, with an indication of positive and negative factors. In addition the potential impact of achieving the goals and the sectors within the economic community responsible for their are evaluated. The resulting system of goals is presented in Table 2.2.1 and in Annex 4, Table A4-2.

Table 2.2.1. Specific goals for the conservation of biodiversity (G1 is Goal #1 above, etc.).

TIME PERIOD	PROTECTION LEVELS	GOALS	
		PRIORITIES*	OTHER
(L) LONG TERM	GEOSYSTEMATIC	G1, G2, G3	
	SPECIES-SPECIFIC	R2	
	GEOSYSTEMATIC	G6, G7	G4, G5
(M) MEDIUM TERM	ECOSYSTEMATIC	E1, E4, E6, E8	E2
	SPECIES-SPECIFIC (in-situ)	R1, R5,	R4, R6, R8
	GENETIC (in-situ)	V1	V2
	EX-SITU	Ex1, Ex3, Ex5	Ex2
(S) SHORT TERM	ECOSYSTEMATIC	E3, E5	E7
	SPECIES-SPECIFIC (in-situ)		R3, R7
	EX-SITU		Ex3

* priority goals are set for priority problems

2.2.3. Strategy concept formation

Defining a strategy for the protection of biodiversity requires that a concept be systematically developed to achieve specific goals. In preparing that concept and the principles of a strategy, the authors acknowledge that time was inadequate and all possible theoretical options were not analyzed.

In preparing the strategy, it seemed logical to focus on options which integrate biodiversity protection at all levels. Focusing on the options individually, however, proved to be too narrow, orientated only towards achieving geosystematic, ecosystematic, species-specific or ex-situ protection. Instead, acceptable options for the strategy concept were selected with respect to the interests of all trends of biodiversity conservation and to the priorities of goals. The most general principle underlying the strategy formation was the inclusion of priority goals.

Seven logically acceptable biodiversity conservation strategy options (types) were determined. They include:

I complete (which considers all the goals set);

II prioritized (which considers all priority goals);

III geoecosystematic protection priority (all geosystematic and ecosystematic protection trend goals & priority goals from species-specific and ex-situ protection trends are considered);

IV species-specific protection priority (all species-specific and ex-situ protection goals & all priority goals from geosystematic and ecosystematic protection areas are considered);

V focusing on terrestrial biota protection goals (all terrestrial biocenoses ecosystematic protection goals & priority goals from other protection trends are considered);

VI focusing on aquatic biota protection goals (all aquatic biocenoses ecosystematic protection goals & priority goals from other protection trends are considered);

VII proportional (2/3 of all goals in all protection trends are considered).

To develop action programs for biodiversity conservation it was necessary to select a strategy option. For this purpose the above mentioned acceptable strategy concept options (types) were assessed with the help of five systematic assessment criteria: *ampleness, constructiveness, trend selection, consistency and realistic basis.* In addition, a weighted assessment system, based on three qualitative points, and was used.

The systematic assessment criteria:

Ampleness highlighting all problems in the selected strategy options.

Constructiveness transparency of the strategy composition and its effectiveness, related to the selection of priority goals.

Trend selection clear orientation of the strategy by focusing on separate groups of goals.

Consistency	equal attention to all strategic conservation trends.
Realistic basis	the reality of a strategy conception option's implementation and simplicity in attaining the considered goals.

The system on which the analysis of the strategy concept options was based is summarized in Annex "Strategy formation," Table P2-2. Under this system, *Option II* (above) received the highest score, which as noted above, combines all priority goals for the conservation of biodiversity. Other high scores in the systematic assessment were given to the Options with trend selections (V and VI) which focused on the goals of land or aquatic biota protection. Based upon these results, strategy concept *Option II* was recommended for the development of a biodiversity conservation methodology and action program.

3. ACTION PLAN

3.1. General programs aimed at biological diversity protection

According to the chosen priority variant of the strategy concept the action plan is prepared for reaching specific priority goals which are pointed out in the second part of this work. Here the action plans are not presented for separate goals but for separate ecosystems according to European biodiversity and landscape conservation strategy. There also have been prepared special programs for realization of biota species and ex-situ means. In table 3.1 a list of action plans pointing out specific priority goals for which it is prepared is presented.

Below, action programs developed with the indication of legal institutional, territorial planning/designing, research, monitoring and information, training and education actions for the nearest decade are presented. Implementation period, needed funds, protection financial sources and responsible institutions for the proposed actions are presented. Funds needed for actions implementation are provisional, presented at the level of 1996. Only general amount of funds needed for implementation of different action plans are shown. Priority actions are indicated in each program.

In the implementation of the action plans presented below the Environmental Protection Ministry every year has to work out annual working plans by revising, supplementing or specifying actions, primarily specifying the funds needed as well as indicating concrete financial sources. In developing the annual action plans the Environmental Protection Ministry should contact other institutions regarding the implementation of actions within their competence.

Table 3.1. List of action programs

The name of action program (number of table)	Specific priority goals to be achieved
General programs	
Nature Frame Action Program (3.1.2)	G1, G2, partially G6
Forest ecosystems protection (3.1.3)	E1
Coastal ecosystems protection (3.1.4)	E3, partially G6 (G5, E2 - non priority)
Inland water ecosystems protection (3.1.5)	E4, G3
Wetlands and meadow ecosystems protection (3.1.6, 3.1.7)	E5, E6, partially G6
Anthropogenic environment ecosystems protection (3.1.8, 3.1.9)	E8, G7
Special programs	
Protection of species (3.2.1)	R1, R2, R5
Ex-situ protection (3.2.2)	Ex1, Ex3, Ex5

-*	V1

* - protection of diversity within species is not clear enough at the moment in Lithuania; so, it is proposed to prepare specialized strategy and action plan for conservation of diversity within species (Table 3.1.1), but there is no action program for this specific goal (V1) prepared in this document

3.1. General programs of biological diversity conservation

As action plans are presented by ecosystems, the most general tasks are presented in this section. Mainly, these are development of a Country Biodiversity Study, and a register of biodiversity (habitats) and to detail biogeographic units, based upon the latest floral and faunistic research, to prepare a special strategy and action plan for conservation of diversity within species. For implementation of the general plan of biodiversity (Table 3.1.1) 1,0 million litas is needed and for priority actions - 0,5 million litas.

Table 3.1.1. The general action plan for the protection of biodiversity

ACTIONS * priority actions	**TIME PERIOD**	**POTENTIAL FINANCIAL SOURCES**	**RESPON-SIBLE INSTITU-TION**
1.* Develop the country's Biodiversity Study	1997-1998	IF funds	SC
2.* Establish Lithuania's biogeographic units (scale 1:200 000)	1999-2000	SB, IF	EPM
3.* Map CORINE habitats (scale 1:200 000) - in progress	1997-1998	PHARE	EPM
4.* Develop habitats register - in progress	1997-2005	PHARE	EPM
5. Prepare strategy and action plan for conservation of diversity within species	1998-2000	SB, IF	MAF, AAM
5. Develop methods for calculating damage to biodiversity	1999	SB, IF	EPM
6. Organize research of climate change impacts on biodiversity	since 2000	IF	EPM
7.* Publish Lithuania's Red Data Book of plant communities	1997	SB	EPM
8. Publish information about Biodiversity Convention	1998	SB, IF	EPM
9. Develop biodiversity monitoring sub-program	1998-1999	SB, IF	EPM
10. Publish new series on biota characteristics	1998-2005	SB	MES

Abbreviations:
EPM Environmental Protection Ministry
MOAF Ministry of Agriculture and Forestry
MES Ministry of Education and Science
MCUD Ministry of Construction and Urban Development
SC Science Council
RA Region Administrator
MI Municipal Institutions

SB State Budget Funds
MB Municipal Budget Funds
IF Funds of International Funding Organisations and Foreign Governments
SNF State Nature Fund
MNF Municipalities Nature Funds
FF Forest Fund
PHARE Phare Program

3.1.1. Creation of the Nature Frame

The Nature Frame Action Program has been developed to attain the main goals of geosystematic level presented in Section 2.2.2, “Method of determining biodiversity goals” (G1, G2, G6). Formation of Nature Frame is related with general territorial planning very closely. So particularly important actions in the Nature Frame action program are its integration in general plans. At present only the general plans for the country and Klaipëda Region have been initiated. There are still 9 regional and 52 municipal level general plans to be developed.

An important task is developing a legal basis for Nature Frame. The draft of Nature Frame Regulations after negotiations with state institutions will be passed to the Government for approval. Other legal acts, which safeguard solutions of problems are also necessary, particularly any recommendations which concern the formation of the bioecological structure of the Nature Frame. In order for the Nature Frame to be meaningful for biodiversity conservation, the most biologically important areas, corridors must be shown in the schemes of the Nature Frame.

To understand the changes and trends in landscape structure on which the state of biodiversity depends, it is necessary to regularly implement a statistical and cartographic inventory of natural and semi-natural lands.

Information shortage on Nature Frame, its structure and role should be addressed and solved by a special publication. Lectures on Nature Frame should become an integral part of educational programs. To ensure these forms of information adequately reflect all biological aspects, special methodology must be prepared.

The positive factors for implementation of Nature Frame action program are: (1) Law on Protected areas, the theoretical geoecological basis for Nature Frame design, (2) methodological recommendations for the Nature Frame mapping (scale 1:300 000 & 1:50 000), (3) Europe-wide formation of ECONET (Nature Frame), and (4) European biological and landscape diversity strategy.

The main constraints to implementation of Nature Frame action program are: (1) delay in the development of general territorial plans, (2) lack of professional designers experienced in special environmental planning, (3) scarcity

of funds for research and design, and (4) insufficient bioecological information.

It is expected that with the implementation of this Action Plan, the protection of biodiversity will be safeguarded at the geosystematic level. Additionally, priority problems of natural landscape protection, which are the main theoretical preconditions for the conservation of biodiversity, should be solved.

Formation of an ecologically viable Nature Frame implies an increase in forest cover; this issue is discussed in the next section (3.1.2 - Protection of forest ecosystems).

To implement the Nature Frame action program (Table 3.1.2), 1,0 million litas is needed, and for priority actions, 0,5 million litas.

Table 3.1.2. Nature Frame action program

Actions * priority actions	**Time**	**Potential financial sources**	**Responsible institutions**
1. Legal-institutional regulation			
1.1.* Approve Nature Frame regulations	1997	-	EPM
1.2. Develop Nature Frame design rules	1998	SB	EPM
1.3.* Develop recommendations for the bioecological structure formation of the Nature Frame	1998	SB, IF	EPM
1.4. Introduce one additional staff-member position in regional departments for conservation of landscape and biodiversity, and for the surveillance of protected areas	1998-1999	SB	EPM
2. Territorial planning/designing			
2.1.* Incorporate the Nature Frame into the country's general plan (scale 1:200 000)	1997-1998	SB	CUM
2.2.* Incorporate the Nature Frame into the general plans of districts (scale 1:100 000)	1997-2007	SB	DA
2.3. Incorporate the Nature Frame into the general plans of municipalities (scale 1:50 000)	1997-2017	SB, MNF	MI
2.4. Develop experimental projects for the Nature Frame biostructure formation at local level (scale 1:10 000)	1998-2000	IF, MB, MNF	EPM
3. Research, monitoring			
3.1. Develop a long-term country's afforestation program with the aim of the Nature Frame formation	1998-1999	MF, IF	MOAF, EPM
3.2.* Delimit distribution areas which are most important biologically within the Nature Frame at state and regional level	1997-2000	SB, IF	EPM
3.3. Well-ground the role of valley corridors in migration processes	2000	SB	SC
4. Information, training, education			
4.1.* Publish "Lithuania's Nature Frame"	1998-1999	SB, SNF	EPM
4.2. Prepare information about the Nature Frame and include into educational programs for secondary and other schools	1998-2000	SB, SNF	EPM, MES

4.3. Prepare materials about the Nature Frame and its biological function for public education	1999-2000	SB, IF, SNF	EPM, MES

3.1.2. Protection of forest ecosystems

A high priority of the Action Plan is preventing further degradation of forests (E1). This can be achieved by rationally using and restoring forests by (1) forming and maintaining their optimal structure and location, and (2) prohibiting drainage of forests. Significant influence on forests state have changes in the ownership, particularly increasing area of privately owned forest. So, regulatory problems arise and specific territorial plans and design measures implementation become important. Many problems also arise due to ill-defined forestry administration and the instability of control institutions. In development of the Action Plan, the increase and support of felling and timber use, particularly for export, was considered. In the next decade there will be almost no draining of wet forest, due to a lack of funds, but after restoration of private ownership these activities, however, can be increased.

Lithuania’s gradual economic integration with Europe, with changes in agriculture policies, and prevailing private land management, is expected to generate excess cultivated land and increasing the area of forest will become possible. According to the requirements for the Nature Frame creation and after evaluation of territorial optimization of Lithuanian landscape biostructure, national forest cover should be increased by at least 10%, and considerably more in particular regions. Afforestation programs should be aimed particularly at regions of risky agriculture and low forest cover, and in localities where landscape which is sensitive to human development.

Increasing anthropogenic loads upon forests, particularly global and local atmospheric pollution and climate change, will reduce the stability of natural forests, and particularly will reduce the stability of cultural origin forests. This primarily refers to the status and protection measures of coniferous forests (spruce and pine forest) which are the most sensitive. Priority and more state support should be given to those forest owners who restore and sustain mixed-age forests of local species. To precisely localize actions for protection of forest biodiversity, it is necessary to have detail maps of forest habitats, and undertake specialized monitoring of forest state changes.

The increasing number of private forest owners makes public information, training, and education increasingly important. Both ecological and legal education is important in relation to the tasks of biodiversity conservation and Lithuania’s national and international commitments. Training and education will help create foundations to support and

implement specialized projects for the restoration of biodiversity in forest ecosystems. Projects for the restoration of broad-leaved forests should be popular within the Lithuanian public.

To implement forest ecosystem action program (Table 3.1.3), 1,6 million litas is needed, and for priority actions, 0,2 million litas.

Table 3.1.3. Action Plan for the protection of forest ecosystems

Actions * priority actions	**Time**	**Potential financial sources**	**Responsible institutions**
1. Legal-institutional regulation			
1.1.* Amend Law on Forests with provisions on the protection of biodiversity	1997-1998	-	EPM, MOAF
1.2.* Update state and private forest use and management rules by including measures for biodiversity conservation	1998-1999	-	EPM, MOAF
1.3. Approve rules for main and restoration felling	1997-1998	-	EPM, MOAF
1.4. Prepare normative for setting and protection of rare and valuable habitats in forests	1998-1999	FF	MOAF, EPM
2. Territorial planning/designing			
2.1.* Develop a program of biodiversity conservation in forests	1998-1999	SB, IF	MOAF, EPM
2.2.* Develop a program for establishment of small strict nature reserves for the protection of the diversity of forest types	1998-1999	FF, SB	MOAF, EPM
2.3. Develop a program of specialized measures for the protection of forest communities which are at the boundaries of their range	1999	FF, SB	MOAF
2.4. Develop and implement forest use models according to Resolutions of the European Forest Protection Helsinki Conference of 1993	1998	FF	MOAF
2.5. Develop programs for restoration of Lithuanian broad-leaved forests	1999	FF	MOAF, EPM
2.6. Develop program for restoration of spruce forests	1998-1999	FF	MOAF
3. Research, monitoring			
3.1. Map forest ecotopes	1998-2000	PHARE funds	MOAF
3.2. Update forest community classification	1998-1999	FF, SB	EPM, MOAF
3.3. Determine forest communities' tolerance to anthropogenic loads	1999-2003	FF, SB	MOAF
3.4.* Monitor forest communities and forecast their change per decade	1997-2010	SB, FF	EPM, MOAF
3.5.* Determine forest biodiversity indicators and assessment criteria	1998-2000	SB, FF	EPM, MOAF
3.6. Determine principles of fungi	1999-	SB	SC

communities classification, develop classification of fungi communities in Lithuania	2002		
3.7. Determine influence of mikorize to forest communities	2001-2005	SB	SC
3.8. Determine forest evolution changes	2000	FF, SB	MOAF
4. Information, training, education			
4.1. Offer specialized training courses for forest owners	1999-2001	FF, SB	MOAF, EPM
4.2. Publication of "Lithuanian forest ecosystems"	2000	FF, SB, IF	EPM, MOAF
4.3. Publish "Lithuanian fungi"	1999	FF, SB	EPM
4.4. Prepare "Lithuanian forests" study guide	1999	FF, IF	SC
4.5.* Prepare information about biota protection in Lithuanian forests and include it into educational programs for different schools	1998-2000	SB, FF	MOAF, EPM
4.6. Publish posters on Lithuanian protected forest natural values	1999-2001	FF, SB	MOAF, EPM
4.7. Make a training film on Lithuanian forests	1998-2000	FF, SB, IF	MOAF, EPM
4.8. Publish map of Lithuanian forests (scale 1:300000)	1997	FF, SB	MOAF

3.1.3. Protection of coastal and the Baltic sea ecosystems

The Action Plan for protection of coastal and the Baltic sea ecosystems has been developed to attain the goal of ecosystematic level (E3), and partially to attain the goal of geosystematic level (G6) presented in Section 2.2.2, "Method of determining biodiversity goals". The Action Plan is intended to develop legal protection of biodiversity of coastal ecosystems, establish the basis for protection of biodiversity and for control and regulation of biota resources utilization, and avoid adverse environmental impact of port expansion or other economic activity. To those ends the Action Plan will:

- focus on establishing a legal institutional foundation,
- adopt laws on sea protection and fisheries,
- develop coastal protection regulations,
- propose ratification of the Bonn Convention,
- develop a legal basis for the protection of fish spawning grounds,
- identify and give legal protection to bird wintering and resting sites, and fish spawning grounds.

The last will require a network of sea and lagoon strict nature reserves and reserves, in addition to the existing Ramsar areas (the Baltic coastal zone between Karklë and Palanga, the north-western part of the Curonian Lagoon).

Accidents, oil spills while exploiting oil terminals, and washing holds of vessels illegally all increase pollution

of the Baltic Sea by oil products. To reduce pollution, an observation service should be strengthened, equipped with modern oil spill collectors and capable of applying the latest water treatment technology.

The coastal zone of the Baltic Sea and the Curonian Lagoon have competing interests and demands from many branches of economy (sea navigation, fisheries, recreation, energy sector, transport, etc.) which have had adverse impacts on biodiversity. Proposals on combined management, use and protection of the coast will be included in the project on integrated coastal zone management and the general plan of Klaipëda district, which is currently under way.

To strengthen research efforts and activities, this Action Plan proposes to develop cooperation among all of the countries around the Baltic Sea through joint research programs and projects for the protection of the Baltic Sea and its coasts. A significant task is forming a scientific basis for the rational use of coastal natural resources while conserving biological values. Decisions on the construction of new engineering facilities can only be made after a full environmental impact assessment. To regulate the use of fish resources and establish quotas, it is necessary to have reliable statistical data on fish catches in the Baltic Sea and the Curonian Lagoon, fish export, and any changes in the status of these resources.

For the protection of ecosystems there is a lack of objective information, knowledge and experts. To fill these gaps, training programs will be developed for protection of biodiversity and rational use of fish resources in the sea and the lagoon. The programs will be included in the curriculum of Klaipëda University. Information on the status of coastal fish resources and biodiversity must be regularly made available to employees of Klaipëda City, Klaipëda, Ðilutë and Kretinga Districts, and Neringa City municipalities. Construction of specialized training biological interpretive paths in Curonian Spit national park and Pajûris (Karklë) and Nemunas River Delta regional parks and popular publications would contribute to the education of the general public. Educational activities should be further developed in the parks mentioned above, and in the Marine Museum.

To implement coastal and Baltic sea ecosystems action program (Table 3.1.4), 1,2 million litas is needed, and for priority actions, 0,4 million litas.

Table 3.1.4. Action Plan for the protection of coastal and the Baltic sea ecosystems

Actions * priority actions	**Time**	**Potential financial sources**	**Responsible institutions**
1. Legal-institutional regulation			

1.1.* Adopt the Law on Sea Protection	1997	-	EPM
1.2.* Approve the Law on Fisheries	1997	-	EPM
1.3.* Establish laws for protective zones of bird wintering sites, resting sites, fish spawning grounds by amending the Law on Protected areas, and approve their formal procedure	1998	SB	EPM
1.4.* Ratify Bonn Convention	1997-1998	-	EPM
1.5.* Develop and approve coastal protection regulations	1998	SB	EPM
1.6. Develop regulations for the protection of fish spawning grounds	1998	SB	EPM
1.7.* Develop a network of marine and lagoon strict nature reserves and reserves and Ramsar sites, for the protection of ecosystems and biocenoses	2000-2005	IF	EPM
1.8. Establish the Curonian Lagoon biospheric area (polygon)	2000	SB, IF	EPM
1.9. Establish reserves to protect biodiversity near the Lagoon and to correct boundaries of existing ones	1997	SB	EPM
2. Territorial planning/designing			
2.1.* Include measures for the protection of biological values and natural landscape in the development of the general Klaipëda district plan and Integrated Coastal Zone Plan	1997-1998	SB, IF	EPM, RA, MCUD
2.2. Prepare and implement specialized training biological interpretive paths projects in the Curonian Spit national park and Pajûris and the Nemunas River Delta regional parks	1997-2000	SB, MB, IF, SNF, MNF	EPM
3.Research, monitoring			
3.1.* Inventory the most valuable aquatic areas for biodiversity, in the Baltic Sea, Curonian Lagoon and the coastal zone	1998-1999	SB, IF	EPM
3.2. Organize and update a Baltic Sea, Curonian Lagoon and coastal biological monitoring program	continues	SB, IF	EPM
3.3. Conduct research on the natural processes which impact fish reproduction and the status of fish breeding grounds	1998-1999	SB	SC
3.4.* Inventory the Baltic Sea and Curonian Lagoon fish resources, determining their population trends	1999-2000	SB	EPM
3.5. Develop a program of the Curonian Lagoon biosphere area (polygon)	2000	SB, IF	EPM
3.6. Investigate natural biofilters in the Baltic sea and Curonian Lagoon	1998-1999	SB	EPM
4. Information, training, education			
4.1. Prepare a popular publication, “The Living World of the Lithuanian Coast”	1999	SB, IF, SNF	EPM
4.2. Issue a publication, “Curonian Spit national park”	1997	SB	EPM

4.3. Issue a publication, “Nemunas River Delta regional park”	1997-1998	SB, IF	EPM
4.4. Issue the atlas of the Baltic sea coastal (shallow) water habitats	1997-1999	SB, IF	EPM
4.5. Issue well illustrated guide about East Baltic fauna for pupils and students	2000	SB, IF	EPM
4.6. Make a film “Marine World of the South Eastern Baltic”	2000-2002	SB, IF	EPM
4.7. Make a data base for Marine Museum-Aquarium collection	1999-2000	SB, IF	EPM
4.8.* Create a training program, “Biodiversity protection in Lithuanian coast” for different schools	1998	SB, IF	MES, EPM
4.9. Create a training program, “A rational use of fish resources"	1999	SB, IF	EPM, MES
4.10. Provide education to coastal municipalities in the area of biodiversity conservation	continues	SB, MNF	EPM, MES

3.1.4. Protection of inland aquatic ecosystems

The Action Plan for protection of inland aquatic ecosystems has been developed to attain the goals of geosystematic and ecosystematic levels (G3, E4). The Action Plan for the protection of water bodies has been developed to: (1) prevent further degradation of inland aquatic ecosystems, (2) preserve the diversity of their animal and plant species and communities, (3) regulate use of inland water bodies, and (4) reduce the negative human impact on water bodies and their edges.

The conservation of aquatic plants and animals and communities depends on reducing pollution. A reduction in pollution and improved conservation of aquatic communities requires changes in the use of aquatic resources by individuals. Also, the objectives for aquatic conservation need to be incorporated into general plans and special water management projects. Such plans should be elaborated only after integrated research. When data are not available on the flora and fauna of water bodies in a particular area, such data should be obtained.

Research on the hydrobotany on the majority of small water bodies and larger rivers is needed. Investigations should focus on determining the status of communities and species of rare and extinct aquatic plants, revising lists of species and communities that need to be protected, and determining recommendations for their protection in specific habitats. Water bodies with rare plant or animal species deserve an exceptional protection.

There is a considerable lack of information, research, popular publications and text books on the status of water bodies, flora and fauna. This gap could be filled by publications on the status of water bodies issued by the

Environmental Protection Ministry. Research and popular publications have to be prepared on the flora and fauna of water bodies and rare species and communities. Training and study programs should include hydrobiological subject matter; education films on the subject could also be made.

Some 0,3 million litas are needed for implementation of the Action Plan on inland aquatic ecosystems (Table 3.1.5); for priority actions, 0,05 million litas are needed.

Table 3.1.5. Action Plan for the protection of inland aquatic ecosystems

Actions * priority actions	Time	Potential financial sources	Responsible institutions
1. Legal-institutional regulation			
1.1*. Develop regulations for the protection of water bodies and their edges	1997	SB	EPM
1.2*. Update/extend rules for the use of state-owned and private water bodies	1997-1998	-	EPM
1.3. Approve rules for the use of state-owned and private water bodies	1997-1998	-	EPM
1.4. Establish Daugai regional park	2002	-	EPM
2. Territorial planning/designing			
2.1. Include measures for the protection of water bodies and their biota in the development of water management projects	continuous	SB, MB, private owner funds	EPM, MCUD, MOAF
2.2. Develop a program for the establishment of managed reserves for the protection of aquatic plants and animals	1999	SB	EPM
2.3. Develop a lake renaturalization program	2005	SB	EPM
2.4. Prepare a planning scheme for Daugai regional park	2000-2001	IF	EPM
3. Research, monitoring			
3.1. Study various water bodies' biota, and assess their status	1999-2001	SB	SC
3.2. Supplement monitoring programs on water bodies with studies of river biota and rare species	1997-1999	SB, IF	EPM
3.3. Investigate biota in major rivers - the Nemunas and Neris	1998-2001	SB	EPM
3.4 Prepare the program for establishment of regional park (on the basis of Daugai regional park)	2000	IF	EPM
4. Information, training, education			
4.1*. Publish "Aquatic Vegetation and Wildlife"	2000	SB, SNF	EPM
4.2. Supplement education programs on protected aquatic biota and communities	1999	SB	MES
4.3. Publish posters on protected aquatic biota	1999-2001	SNF	EPM
4.4. Make an educational film on aquatic	2003	SB,	EPM

ecosystems		IF	MES

3.1.5. Protection of wetlands and meadow ecosystems

The Action Plan for protection of wetlands and meadow ecosystems has been developed to attain the goals of ecosystematic level (E5, E6), and partially to attain the goal of geosystematic level (G6) presented in Section 2.2.2, "Method of determining biodiversity goals". An Action Plan for the protection of wetlands and meadow ecosystems has been developed to: (1) conserve wetlands and natural meadow ecosystems, (2) ban new exploitation of wetlands and remaining natural meadows, (3) renaturalize (restore) excavated peat lands, (4) foresee a possibility for the restoration of damaged wetlands and meadows. Actions are presented in Tables 3.1.6. and 3.1.7.

Wetland protection and restoration requires a scientific basis. For this reason it is necessary to take stock of damaged wetlands and the scientific justification for their restoration. Lithuania's wetlands must be evaluated from an integrated conservation point of view.

To implement wetlands protection action program (Table 3.1.6), 1,0 million litas is needed, and for priority actions, 0,5 million litas.

Table 3.1.6. Action Plan for the protection of wetlands

Actions * priority actions	**Time**	**Potential financial sources**	**Responsible institutions**
1. Legal-institutional regulations			
1.1.* Develop wetland protection regulations	1998	SB	EPM
1.2.* Revise the individual regulations for strict nature reserves	1997-1998	SB	EPM
1.3. Establish municipal reserves for conservation of valuable wetland sites	1997-1999	-	MI
1.4. Establish Þuvintas biosphere reserve and develop its regulations	1997-1999	-	EPM
1.5.* Develop methods for restoration of damaged wetlands (excavated peat lands)	1999	SB	EPM
2. Territorial planning/design			
2.1.* Develop program for restoration of peatlands	1997-1998	IF, IF	EPM
2.2.* Develop Þuvintas biosphere reserve planning scheme	1998-1999	IF	EPM
2.3. Develop a regeneration project for the Birþulis lake wetlands complex	1999-2001	IF, SNF,SB	EPM
2.4. Prepare a management plan for Kamanos strict nature reserve	1998	SB	EPM
2.5. Prepare a management plan for Vieðvilë strict nature reserve	1999	SB, IF	EPM

3. Research, monitoring			
3.1. Conduct research of Lithuanian wetland vegetation and fungi composition, and assess their status	1998-2001	SB, IF	SC
3.2. Restore the network for wetland vegetation research stations	1999-2002	SB, IF	SC
3.3.* Observe wetland biota state in strict nature reserves (on-going)	1997-1998	SB	EPM
3.4. Set up a regional monitoring station in Èepkeliai strict nature reserve	1999-2000	SB, IF	EPM
3.5. Compile a list of wetland species	1999-2002	SB	EPM
3.6. Initiate research on the impact of climate change impact on wetlands	since 2000	IF	EPM
4. Information, training, education			
4.1. Compile monographs on ten major Lithuanian wetlands	1998-2008	SB, IF, SNF	SC
4.2.* Publish "Lithuanian protected wetlands”	1998-2000	SB, IF, SNF	EPM
4.3. Publish document on Ramsar Convention	1998	SB, IF	EPM
4.4. Prepare a training program for different schools on the protection of Lithuanian wetlands	1998-2000	SB, IF	EPM
4.5. Issue posters on protected species occurred in Lithuanian wetlands	1999-2001	SB, IF, SNF	EPM
4.6. Make an educational film on Lithuanian wetlands	1998-2000	SB, IF	EPM
4.7.* Issue a map of Lithuanian wetlands and reserves for wetland protection (scale 1:300 000)	1999-2000	SB, IF, SNF	EPM MES

Conservation of meadows in Lithuania are influenced by two major problems: (1) natural overgrowth, and (2) artificial planting by forests. As zone vegetation in Lithuania is forests, maintaining of meadows requires implementation of continuous measures of supervision. One of the main tasks to conserve and maintain meadows is developing rational management and conservation programs for large meadows - those of the Nemunas, Jûra, Minija, Venta, Nemunëlis - which could serve as an example for maintaining all meadows in Lithuania. These programs could determine haymaking time for different physical/geographical units and the use of agricultural machinery.

Meadows, both continental and flooded, have to be mapped and classified, identifying for each of them the minimum area needed for biodiversity conservation. Successful natural regeneration, which occurs in former artificial meadows and pastures, and meadows in protected areas - landscape reserves and national and regional parks - must be promoted. Overgrowth of meadows with shrubs and forests must be prevented.

Some 0,5 million litas are needed for implementation of the meadow ecosystems protection plan (Table 3.1.7); for priority actions, 0,2 million litas are needed.

Table 3.1.7. Action Plan for the protection of meadow ecosystems

Actions * priority actions	**Time**	**Potential financial sources**	**Responsible institutions**
1. Legal-institutional regulations			
1.1. Establish municipal botanical managed reserves for the conservation of natural meadows	1997	-	MI
2. Territorial planning/designing			
2.1. Develop a program for meadow protection and restoration	2001	SB	EPM
2.2.* Develop a protection and use program for the meadows of the Nemunas, Jûra and Minija lower reaches while preparing a planning scheme for the Nemunas Delta Regional Park	1997	IF	EPM
2.3.* Develop a plan for the network of botanical reserves for meadows conservation	1998	SB, IF, SNF	EPM
2.4. Develop and implement a project for Kretuonas Island regeneration	1998-2003	SB, SNF,FF	EPM, MOAF
3. Research, monitoring			
3.1. Inventory Lithuanian continental meadows	1999-2002	SB	SC
3.2. Investigate the Venta and Nemunëlis flooded meadows vegetation	1999-2003	SB	EPM
3.3. Establish a meadow research monitoring station on the basis of the Nemunas River Delta meadows studies station	1998-2000	SB, IF	EPM
4. Information, training, education			
4.1. Expand number of scientists-meadow specialists at post-graduate level	1997-2000	SB, IF	MES
4.2. Prepare and publish “Lithuanian meadow biota species and communities”	1998-2000	SB, IF, SNF	EPM, MES
4.3. Prepare a study guide “Lithuanian meadows”	1999	SB	SC
4.4.* Prepare a training program on the protection of Lithuanian meadow biota for schools	1998-2000	SB	MES, EPM
4.5. Publish posters on Lithuanian protected meadows biota species	1998-2001	SB, SNF	EPM
4.6. Produce a training film on Lithuanian meadows	1998-2000	SB, IF	EPM
4.7.* Publish a map of Lithuanian meadows (S 1:300000)	2002	SB, IF	EPM, MES

3.1.6. Protection of anthropogenic environment ecosystems

The Action Plan for protection of anthropogenic environment ecosystems has been developed to attain the goals of geosystematic and ecosystematic levels (G7, E8) - to conserve and enrich the ecosystems of anthropogenic environments would include stopping destruction of natural biocenoses in agricultural and urban areas by banning construction in the most valuable areas and supporting their restoration.

Ecosystems of urban environments. Changes in land-use are influenced by the expansion of urbanized areas and landscape changes going towards synantropization but not towards naturalization. The ratio of natural and semi-natural areas to urbanized areas in Lithuania is decreasing; from 7.99 in 1994 to 7.93 in 1995. There are several towns in Lithuania (Panevëþys, Marijampolë, Kaunas, Ðiauliai) where this ratio is less than one. This is an indication of the lack of green zones.

Suburban zones used in Soviet time to be allocated for community gardens. Now they are being turned into residential areas, resulting in total urbanization. Recreational water bodies in the suburbs are polluted, and nature is being adversely affected by excessive recreation loads. Legally, the use of those resources is insufficiently regulated.

The zones in Lithuania under extreme integrated anthropogenic loads are: Panevëþys-Marijampolë, Vilnius-Kaunas, Ðiauliai-Maþeikiai, and Klaipëda-Kretinga.

Landscape degradation in cities and towns is related to the process of land privatization. A specific problem related to biodiversity is the spreading of alien species and domestic animals in the urbanized environment, which impoverishes local communities.

Studies of natural landscape in urbanized areas have so far been performed only on a ad hoc basis. They require comprehensive botanical-zoological research.

To implement the Action Plan to protect urbanized environmental ecosystems (table 3.1.8.) about 0,8 million litas is needed; for priority actions - 0,4 million litas.

Table 3.1.8. Action Plan for the protection of urbanized environmental ecosystems

Actions * priority actions	Time	Potential financial sources	Responsible institutions
1. Legal-institutional regulation			
1.1.* Develop norms for the protection of natural landscape, including biologically valuable areas in urbanized areas	1998	SB	EPM, MCUD
1.2.* Develop methodology to determine the	1998	SB	EPM

impact of human activities upon biodiversity in urbanized areas			
2. Territorial planning/designing			
2.1.* Highlight measures for the protection of natural landscape and biodiversity values in the development of general city plans	1997-2000	MB, MNF	MI, EPM
2.2. Develop and implement management projects for detailed green areas	continues	MB, SGF	MI
3. Research, monitoring			
3.1.* Identify the most biologically valuable areas in the cities and suburban zones	1998-2000	SB, MB	MI
3.2. Develop and implement a biological monitoring program for urban areas	1998-2003	SB	MI
3.3. Establish a scientific basis to sustain biodiversity in the green areas in cities	1999-2004	SB, SNF	EPM
4. Information, training, education			
4.1.* Publish information for the public on the status of biota in cities and settlements	continues	-	EPM
4.2. Prepare a training program on biota protection in urban areas for schools	1998-2000	SB	MES, EPM
4.3. Publish "Living nature in Lithuanian cities”	2000	SB, SNF	EPM

* - priority actions

Agricultural environment. In order to maintain biodiversity in agrarian areas it is necessary, to the broadest extent possible, to introduce specific agricultural practices and technologies, form diverse agricultural landscapes that conserve natural conditions, apply specially adapted economic/organizational and legal measures (institutional regulation) and educate or train farmers.

Any program aimed at restructuring agriculture, including sustainable or “organic” (biological) agriculture, should contain measures for biodiversity conservation. The pilot program, “Tatula”, should be further expanded and applied elsewhere. Implementation of its environmental program is based on the “Tatula Fund”, which offers long-term interest-free loans to farmers, whose participation is voluntary. These credits, and other advantages and services, have been successful.

Enforcement of biodiversity conservation principles in agriculture need to be stimulated by economic measures. Agreements on farming (managing) with land owners and user could be signed. According to them land management (land transformation, reclamation, cultivation) should be regulated in the most sensitive areas from the biodiversity point of view. Development of ecological agriculture and other friendly activities need to be stimulated by long-term soft loans.

In areas of high biodiversity, agriculture can be either regulated or prohibited. Any significant curtailment of agricultural activity should qualify for compensation.

When mapping, drained and natural land should be included, as should the intensity of land use and areas flooded during spring.

Implementation of these Action Plan measures for protecting agricultural ecosystems (Table 3.1.9) requires about 0,1 million litas, of which 0,05 million litas are for priority actions.

Table 3.1.9. Action Plan for the protection of agricultural environment ecosystems

Actions * priority actions	Time	Potential financial sources	Responsible institutions
1. Legal-institutional regulation			
1.1.* Develop regulations for landscape management zones for the protection of ecosystems in agrarian areas	1998-2000	SB	MOAF, EPM
1.2.* Establish methods for an integrated ecological assessment of agrarian areas	1998-1999	SB	MOAF
2. Territorial planning/designing			
2.1. Highlight measures for the conservation of natural landscape and biodiversity while preparing land management plans	1998-2005	SB	MOAF, EPM
3. Research, monitoring			
3.1. Provide a scientific basis for the program of sustainable and “bio-organic” agricultural development	1999	SB	MOAF, EPM
4. Information, training, education			
4.1. Prepare and publish “Lithuanian biodiversity protection in agriculture”	1999-2000	SB, IF, SNF	EPM, MES
4.2.* Establish a training program on biodiversity protection in agrarian areas	1998-2000	SB	MES, EPM

3.2. Special Programmes of Biodiversity Protection

3.2.1. Protection of species

The Action Program for protection of species has been developed to attain the priority goals of species level (R1, R2, R5), and partially to attain the goal of geosystematic level (G6) presented in Section 2.2.2, “Method of determining biodiversity goals”. Methods of species protection include:

- protection of species from persecution and intensive use,
- conservation of habitats by establishing protected areas and managing them in accordance with the requirements of their flora and fauna,

- environmental protection by limiting activities causing destruction of landscape and habitats and by reducing air, water and soil pollution.

Criteria for establishing the priorities of species protection

Genetic significance. Endemic species. Specific genetic and scientific significance (representatives of monotypic families and genera, relict genera, species). Scale (global, regional, local) of endangered species. Category of species rarity.

Ecological significance. Significance of species for the stability or survival of a community or ecosystem? Diagnostic species. Species indicators.

Social and economic significance. Importance of species for in medicine. Other economic value. Special cultural or historic value. Importance for scientific research, for maintaining common wealth, e.g. for pest control, plant pollination, etc.

Two factors should be evaluated together: the potential for the activity to endanger or cause the extinction of a species, and the level of potential threat to the species

What are the hazardous factors (risks) causing the extinction of a species, and is it possible to eliminate these factors by using protective measures?

Species that are easily endangered and important according to the criteria listed above, and whose causes of extinction are frequent, should be protected first. Protection programmes should be established and implemented in priority order for the species corresponding to the greater number of the criteria listed below:

I. State of population of international importance:

- population very small, close to critical survival point;
- population rapidly declining;
- expansion of population is hampered by lack of suitable habitats.

II. State of national population:

- population very small, close to critical survival point;
- population rapidly declining;
- expansion of population is hampered by lack of suitable habitats.

III. General state of species:

- easily endangered species exposed to frequent factors causing their extinction;
- inefficient protective measures.

Species of international importance and higher protection interest. Species of international importance are those listed by international environmental organisations as

globally declining. Lithuania is also responsible for their conservation. In Lithuania, the species of certain taxa, e.g. birds, are identified, and their lists are co-ordinated with the international environmental organisations.

The lists of species of priority interest are compiled and amended in accordance with the recommendations of international environmental organisations, European Council, International Conventions and the Lithuanian Red Data Book. The list of species of higher protection interest should include the species corresponding to at least one of the following criteria:

- species included in the Lithuanian Red Data Book and attributed to the categories Ex, E, V, R (0-3),
- species with considerable fraction of global or European population found in Lithuania (the criteria of importance must be approved),
- species found in Lithuania and declining on global or European scale,
- endemic species and subspecies.

Examples of species protection/reintroduction measures (examples):

***Taxus baccata* L.**
National Protection Category: Ex
International Protection Category: -
Occurrence: extinct species. This is a tertiary relic which was found in Prienai, Raseiniai, Ðilutë districts in the XIX century. Currently extirpated from Lithuania.
Growth limiting factors: intensive decline due to soft wood suitable for carving.
Main measures: The population of yew may be restored in former vegetation areas in Western Lithuania. The nearest natural vegetation areas are Latvian coastal forests. Yew reproduces by seed and vegetatively. It is widely cultivated in Lithuania as a decorative plant.

***Liparis loselii* L.C.**
National Protection Category: V
International Protection Category: +
Occurrence: marshes at overgrown lake sides in south east and west Lithuania.
Risks and abundance-limiting factors: Declining of vegetation sites caused by agricultural drainage and biological characteristics of the species (varying abundance and fruiting, population explosions observed in 6 to 9 year periods).
Main measures: Conservation of bog moss marshes on lake sides, population monitoring in Aukðtaitija and Þemaitija national parks, and Veisiejai and Verkiai regional parks.

Erica tetralix
National Protection Category: E
International Protection Category: -
Occurrence: Declining species found in 1975 in one 100x200 m plot on the Curonian Spit close to Pervalka. Another population was discovered at a different site on the Curonian Spit in 1996.
Risks and abundance limiting factors: The species is Atlantic relic at the limit of its range in Lithuania and growing only in specific habitats.

Main measures: Risk of extinction can be caused by successive changes of forest tree species, forestry operations, use of fertilisers. It is necessary to continue the annual monitoring started in 1980, respond to any population changes, and continue searching for new sites of the species in identical coastal plain birch grove habitats.

Acrocephalus paludicola
National Protection Category: 4
International Protection Category: Globally declining species
Occurrence: Several isolated populations are known in the Nemunas River Delta regional park and in neighbouring wet meadows, and in the Þuvintas strict nature reserve.
Risks and abundance limiting factors: Declining number of sites caused by agricultural drainage and habitat degradation by succession after agricultural activity ends
Main measures: Preparation and implementation of management plans for Nemunas River Delta regional park and Þuvintas strict nature reserve; monitoring of the species, and, based on the monitoring results, improve conservation activities for the species.

Boletus fechtneri Velen
National Protection Category: E
International Protection Category: -
Occurrence: Declining species found in Ginuèiai oakwoods on light grassy limy soil in 1978.
Risks and abundance limiting factors: Small populations reduced further by haymaking, cattle pasture, application of nitrogen fertilisers.
Main measures: Continuous monitoring of the species while searching for new habitats in similar oak woodlands.

Bison bonasus
National Protection Category: Rs
International Protection Category: V
Occurrence: Free bison herd is present in Paðiliai forest Panevëþys district. Bison are maintained artificially in enclosures in the same area. Up to ten bison (individual bulls) roam over parts of Lithuania.
Risks and abundance limiting factors: Local population surplus (inability to survive in large herds), inadequate proportion of sexes (surplus of males), poaching.
Main protection measures: Preparation of new plan for introduction of free bison herds, expansion of bison keeping areas in Lithuania, control of age and sexual structure of free populations.

Considerable new data have been accumulated on the occurrence of rare species since the publication of the Lithuanian Red Data Book (1992) /Red Lists, herbaria and fungaria of Botanical institute and Vilnius University/. More moss species should be included in the Red Data Book. Vegetation sites of two 0 category species have been reported: *Botrychium simplex* (in Þemaitija national park) and *Polystichum aculeatum* (in Raigardas landscape reserve). Several new species have been found in Lithuania, and should be included in the Lithuanian Red Data Book. The classification system of the Red Data Book should be reviewed and adjusted to the recommendations of the World Conservation Union (IUCN) Red List Categories (1994).

The well being of protected species sites depends heavily on the behaviour of local people. Economic incentives are needed to make local people interested in conservation of

biodiversity. The preparation of regulations offering economic incentives are planned but their implementation will not produce desired results if funding is not be available for compensation and support of local residents.

For the implementation of the Species Action Plan (Table 3.2.1.) 0,9 million litas is needed, for priority actions - 0,1 million litas.

Table 3.2.1. Action Plan for protection of species

Actions * priority actions	**Time**	**Potential financial sources**	**Responsible institutions**
1. Legal and institutional issues			
1.1.* Prepare draft law on the protection of Lithuanian flora	1997-1998	SB	EPM
1.2.* Accede to the Convention on International Trade in Extinct Species (CITES, Washington, 1973)	1998-2000	-	EPM
1.3.* Prepare rules for the management of the Lithuanian Red Data Book	1997	SB	EPM
1.4.* Proof-read the Red Data Book in accordance to the IUCN criteria (1994)	1998	SB, IF	EPM
1.5.* Prepare rules for the compensation of damage caused by the limitation of economic activities in the vegetation sites of protected species	2000	SB, IF	EPM
1.6. Amend and approve the list of rare and extinct species and protected plant communities (Red List)	1997-1998	SB	EPM
1.7.* Develop biodiversity indicators and standards for environmental impact assessment (EIA)	1998	SB	EPM
1.8. Prepare rules for the protection of habitats of protected species and communities	1998	SB	EPM
1.9. Prepare rules for use of plant, animal and fungi species in scientific research	1999	SB	EPM
1.10. Urgently modify hunting rules prohibiting spring hunting	1999	-	EPM
2. Territorial planning and design			
2.1.* Prepare recommendations and action plans for protection of species and habitats, which conservation require international protection	1997-1998	SB, IF	EPM
2.2. Prepare action plans for conservation of rapidly declining species	1998-1999	SB, SNF	EPM
3. Research and monitoring			
3.1. Prepare principles for identification and categorisation of protected species and communities	1999	SB	EPM
3.2. Prepare study “Introduced and invasive species and their ecological role”	1999	SB	SC
3.3. Undertake botanical, zoological and mycological investigations in reserves and regional parks established in 1992	1998-2005	SB, IF	EPM

3.4. Inventory species in protected areas for evaluation of their status and expediency of establishment	1998-2005	SB, IF	EPM
4. Information, training and education			
4.1. Publish "Protected species in Lithuania"	1998-2000	SB, IF	EPM
4.2. Prepare training programme on species protection in Lithuania for schools	1998-2000	SB	EPM
4.3. Publish posters on protected Lithuanian species	1999-2001	SB, SNF	EPM
4.4. Make movie on Lithuanian species conservation	1998-2000	SB, SNF	EPM
4.5. Publish manual on Bern and Bonn conventions	1998	SB, IF	EPM
4.6. Continue publishing further volumes of Lithuanian Fauna, Flora and Fungi manual	1999-2005	SB	SC

3.2.2. Protection ex-situ

The Action Program for protection ex-situ has been developed to attain the priority goals of genetic and organizational levels (Ex1, Ex3, Ex5).

This form of nature conservation in Lithuania has, possibly, the weakest legal background. Therefore, one of the main tasks of the Action Plan is establishing a legal framework for ex-situ conservation. International cooperation and participating in ECP/GR and EUFORGEN and other programs is necessary for ex-situ protection.

Domestic animal and plants used by man. Genetic resources of plants include only those species, sorts, lines, hybrids and forms that are used by man. The priority should be attributed to the plants of local origin that are especially important to human needs, such as plants used for food, fodder, technical, medical and decorative purposes.

In order to conserve and increase plant genetic resources, comprehensive evaluation, selection and maintenance of genetic identity and formation of databases are necessary in specific collections and sites (in situ). The main goals are:

- research and identification of valuable forms,
- protection of genetic resources (ex-situ).

Wild fauna and flora. Prohibiting the introduction of any species and to regulate the domestication of native fauna in order to conserve these species in the wild. Protected endemic species and rare subspecies should include:

- Lavaret (*Coregonus lavaretus*.) subspecies, whose taxonomy in Lûðiai and Viðtytis lakes is still uncertain,
- Protection of endemic subspecies and forms of plants, fungi and animals.

There are possibilities to implement a program for otter breeding for the purpose of providing stock to other European countries where populations are declining or extirpated. To avoid phenotypic and genotypic weakening of the bison population, exchange of genetic material with other population centres are necessary.

The protection of the gene pool of populations should include:

- economically useful plants with distinguishing external features,
- protection of diversity (geno- and pheno-) of fungi and animals populations.

To implement the Ex-situ Action Plan (Table 3.1.8) about 2,8 million litas is needed; for priority actions - 0,2 million litas.

Table 3.2.2. Ex-situ Action Plan

Actions * priority actions	**Time**	**Potential financial sources**	**Responsible institutions**
1. Legal and institutional problems			
1.1. Prepare law on use of genetically modified organisms	1999-2000	SB	EPM
1.2.* Amend the legislation on the protection of flora and fauna with the requirements for ex-situ protection	1998-1999	SB	EPM
1.3.* Prepare regulations for protection and accounting of botanical, mycological and zoological collections	1998	SB	EPM
1.4. Prepare regulations for trade in wild animals	1999	SB	EPM
1.5. Prepare regulations for reproduction of wild animals in captivity	1999	SB	EPM
1.6. Prepare regulations for species introduction and reintroduction, and replacement of protected species	1998	SB	EPM
1.7. Prepare regulations encouraging ex-situ protection	1999-2000	SB	EPM
1.8. Establish the National ex-situ Protection Co-ordination Centre	2000-2003	SB, IF	EPM
1.9. Establish the National Collection of Micro-organisms	2001-2005	SB, IF	EPM
1.10. Establish programs for native biodiversity in state botanical gardens and nature museums, including the necessary administrative units	2000-2001	SB, MB	EPM, MES
2. Territorial planning and design			
2.1.* Design program of the National Micro-organism Collection	2000	SB	EPM
2.2. Prepare programme of reproduction of rare birds of prey (peregrine falcon, kestrel, golden eagle) in Kaunas Zoological	1998-2002	SB, SNF	EPM

Garden			
2.3.* Prepare a plan for location of ex-situ protection institutions	2000-2002	SB, SNF	EPM
3. Research and monitoring			
3.1. Inventory state and private owned ex-situ protection objects, form data base of botanical, zoological and other collections	1999-2004	SB	SC
3.2. Determine the most efficient ex-situ protection methods	2000-2002	SB	EPM
3.3. Evaluate the importance of the biodiversity objects of ex-situ protection system to the State	2000-2003	SB	EPM
3.4. Prepare and implement ex-situ biodiversity protection monitoring programme	2000	SB	EPM
3.5. Form ex-situ protection data base	2000-2005	SB	EPM
4. Information, training and education			
4.1.* Publish “Lithuanian Botanical and Zoological Collections” manual	1999-2001	SB, SNF	EPM
4.2. Produce 10-year report of ex-situ inventory data	from 2000	SB	EPM
4.3. Amend the programmes of secondary and other schools with ex-situ protection issues	1999	SB	MES
4.4. Amend the biology programmes of higher schools and universities with ex-situ protection issues	2000	SB	MES

4. PLAN IMPLEMENTATION

4.1. Economic and political preconditions

4.1.1. Financing and International Assistance

Implementation of the Action Plan requires financing. If there is a wish to implement Action Plan during ten years for its fulfillment is needed 11.2 mln. litas (for priority actions - 3.1 litas) or 1.1 mln. litas per year (for priority actions - 0.3 mln. litas) counting according to process of 1997. Required funding for implementation of action plans is illustrated in Figure 9. Possible sources include allocations from state and municipal budgets, state and municipal nature conservation funds, forest fund, international funds, organisations and governments, and private capital.

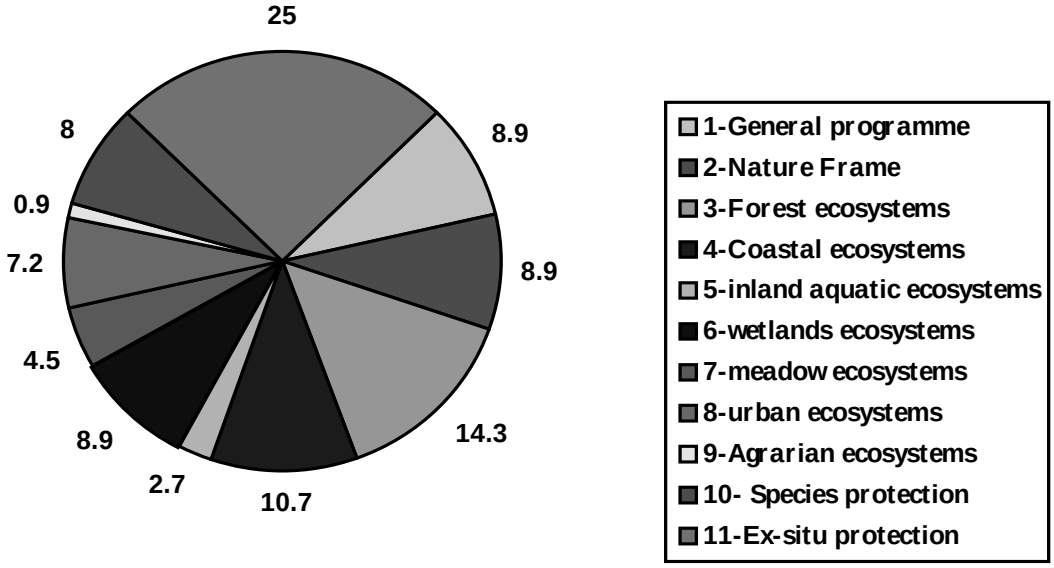

Figure 9. Distribution of financial resources for implementation of the action plan

The state budget for landscape and biodiversity protection and fish resources breeding and protection programmes in 1995 and 1996 was 403,100 litas ($100,800) annually (19.6% of the total funding for environmental programmes). Annual funding for ecological monitoring was 439,400 litas ($109,850) from which a major fraction was allocated for environmental quality monitoring and 155,100 litas ($38,770) was used for environmental education and publications. Approximately the same allocation is planned for future years. In 1996 allocations for landscape and biodiversity conservation were reduced almost by half and in 1997 - almost by four times of those in 1994, which is inadequate for biodiversity conservation activities.

Means for implementation of Action Plan from state budget can be allotted as many as it will be foreseen in the state budget of corresponding year. Therefore, when preparing annual Action Plans for conservation of biodiversity, sources of finance will be concretized or terms for implementation of Action Plan will be prolonged. Certain elements of the action plans can be financed from state and municipal nature conservation funds. In addition municipal institutions fund the identification and inventory of biological values. Non-governmental institutions for implementation of different actions in biodiversity conservation field, can receive funding from various international organisations and state funds.

International assistance. Not all the problems of biodiversity can be solved by Lithuania alone. Protection of many aquatic ecosystems (Nemunas River, Curonian Lagoon, Baltic sea) and others is impossible without international cooperation because of their geographical position. Problems and goals can thus be divided into local, regional and global. For example, eutrophication or catastrophic climate events are most often of regional or global level. In order to reach regional and global goals international agreement and cooperation is necessary. The goals of this strategy and action plan have been divided into 5 categories, accordingly different levels of decision (Table 4.1.1).

Table 4.1.1. Evaluation of the strategy goals according to the of decision

Level of decision making					
Goal	**Global**	**European**	**Baltic region**	**State**	**Local**
Geosystematic level					
G1	+	+	+	+	+
G2			+	+	+
G3			+	+	+
G4				+	+
G5		+	+	+	+
G6				+	+
G7				+	+
Ecosystem level					
E1		+	+	+	+
E2	+	+	+	+	+
E3			+	+	+
E4			+	+	
E5				+	+
E6				+	+
E7				+	+
E8		+		+	+
Species level					
R1	+	+	+	+	
R2			+	+	+
R3	+	+	+	+	
R4	+	+	+	+	
R5	+	+	+	+	+
R6				+	+
R7				+	

R8			+	+	
Genetic level					
V1			+	+	
V2				+	+
Ex1				+	
Ex2	+	+		+	
Ex3				+	
Ex4				+	
Ex5				+	
Ex6				+	

Immediate implementation of the Action Plan without the assistance of foreign governments and organisations (mostly financial, but also technical) is unrealistic. Large scale projects of landscape and biodiversity protection began only in 1996 and were financed by EU PHARE and the Danish Government. Projects that have begun or are under preparation include: landscape and biodiversity conservation in protected areas, plans for the Nemunas River Delta regional park, implementation of Curonian Lagoon regional management project, and comprehensive management of Lithuanian coastal areas.

International assistance is needed for the preparation of broad biodiversity studies in Lithuania. The country biodiversity study is one of the main documents necessary for implementation of the Convention on Biodiversity. Foreign assistance would be useful for the organisation of bioecological protection in the Nature Frame areas, for preparation of action plans for conservation of rare and endangered species, and wetlands protection and restoration. Foreign funding would be helpful for implementation of various project, such as a biodiversity conservation plan for the Eastern Aukðtaitija region and a feasibility study on establishment of Daugai regional park.

The assistance of international specialists is necessary for the establishment of economic regulatory measures providing privileges for inhabitants of protected areas, compensation for losses caused by limiting economic activity within the habitats of protected species, incentives for complying with protection rules, compensation for damage caused by wild animals, etc. Such measures will be successful only if financial resources are made available.

Lithuania has no experience in repurchasing land and forest from private owners. Regulations for acquisition of land and forest are needed. Under the Law on Protected areas, the Government has the priority right to purchase land and property in national and regional parks but it has no resources to do so. It is necessary to establish a fund for acquisition of land and forest in protected areas. Such funds could be used to ensure conservation within current and proposed protected areas, including compensation to former owners in order to maintain state ownership.

There is an obvious lack of publications on biodiversity and protected areas in Lithuanian, English and other

languages. Reference books containing legal acts and their interpretation are needed by specialists in various areas. Foreign assistance could considerably improve the availability of useful publications.

Table 4.1.1. List of the main projects requiring foreign assistance (Figure 10)

1. PREPARATION OF LITHUANIAN BIODIVERSITY STUDY
(see the general action plan for the protection of biodiversity - 1)
Tasks: Preparing the Lithuanian biodiversity study in accordance with the requirements of the Convention on Biodiversity

2. ORGANISATION OF ECOLOGICAL PROTECTION IN NATURE FRAME AREAS
(see Nature Frame action program - 3.2)
Tasks: The concept of Nature Frame was developed from a geoecological background. Nature Frame areas include all natural and semi-natural areas in Lithuania. Locating ecologically important habitats is necessary in Nature Frame areas for the comparison with the ecological network (ECONET) of other European countries. Preparation of habitats (biotops) maps in Nature Frame at national (1:300,000) and regional (1:50,000) scales is proposed.

3. ACTION PLANS FOR CONSERVATION OF RARE AND THREATENED SPECIES AND COMMUNITIES
(see action plan for protection of species - 2.1, 2.2)
Tasks:

- Good research data and protected areas are not sufficient for the conservation of plants, fungi or animals.
- Special actions, measures and continuous care are required.

Therefore, the preparation of special action plans is proposed for species and communities included in EU documents on biodiversity protection, species and communities included in the Lithuanian Red Data Book.

4. PROTECTION AND USE OF LITHUANIAN WETLANDS
(see action plan for the protection of wetlands - 2.1, 2.2, 2.3, 2.5, 3.2, 3.4, 3.6, 4.1, 4.3, 4.6, 4.7)
Tasks:

- Inventory of present and planned Ramsar sites. Comprehensive evaluation of Lithuanian wetlands.
- Preparation of national programme for wetlands protection and use and renaturalisation of peat-bogs based on scientific research. Preparation and approval of wetlands protection regulations.
- Preparation and implementation of management plans for the most valuable areas. Design and implementation of peat-bog restoration.
- Preparation of publications on protected wetlands and their ecological importance.

5. INVENTORY OF ECOSYSTEMS AND HABITATS
(see the general action plan for the protection of biodiversity - 3)
Tasks:

- Preparation of classification of Lithuanian ecosystems corresponding to CORINE and other systems used in the European Union.
- Preparation of data base of rare and other Lithuanian ecosystems, which need to be protected.
- Qualitative and quantitative analysis of distribution of rare and declining species and habitats.

- Preparation of recommendations and plans for protection of habitats, communities and ecosystems.
- Closer specification of the categories of protected areas. The data could be used for their management and for optimisation of the network.

6. BIODIVERSITY INFORMATION, EDUCATION AND TRAINING PROGRAMME
(see actions for information, training and education proposed in all action plans)
Tasks: Publications on landscape and biodiversity problems are very rare in Lithuania. Publications for various society groups (schoolchildren, students, farmers, foresters, businessmen, scientists) are needed.

A series of publications describing protected areas, their values and benefits, protected species of plants, fungi and animals, Nature Frame, original studies for the universities on urban biodiversity, etc. are necessary to attract public attention to the conservation of landscape and biodiversity. The publications of other countries with similar environmental problems should be translated into Lithuanian.

7. OPTIMISATION OF NETWORK OF PROTECTED AREAS BY ESTABLISHING RECUPERATION AND BIOSPHERE MONITORING AREAS
(see action plan for the protection of forest ecosystems - 2.2, action plan for the protection of coastal ecosystems - 1.9, 3.6; action plan for the protection of wetland ecosystems - 2.2)
Tasks: According to the Law on Protected Areas, restoration areas are established for rehabilitation of species weakened by economic activities and for augmentation of natural resources. Biosphere monitoring areas can be formed for establishing a representative comprehensive ecological monitoring system. The term “genetic reserve” is still used in forestry though it is not included in the Law on Protected Areas.

Preparation of a programme for establishing system of restoration (=recuperation) areas

Preparation of a programme for establishing the system biosphere monitoring areas on the basis of scientific research. Preparation of biosphere reserves management plans.

8. FEASIBILITY PROGRAMME FOR ESTABLISHMENT OF REGIONAL PARK (ON THE BASIS OF DAUGAI REGIONAL PARK)
(see action plan for the protection of inland aquatic ecosystems - 3.4)
Tasks. Preparation of standard procedure for the investigation of area. Field and chamber investigations of model area. Preparation of proposals for establishing regional park.

9. ORGANISATION OF EXAMINATION OF INFLUENCE OF CLIMATIC CHANGES TO BIODIVERSITY
(see the general action plan for the protection of biodiversity - 6)
Tasks: Currently, there are no studies on the influence of climatic changes on biodiversity. Such studies do not fit into the framework of interests of any one country. The studies are large, time consuming and expensive. Their results can only be reliable if organised in several countries or in the continent at the same time. This is a field where good international cooperation is needed.

Together with foreign experts a standard project could also be prepared for biodiversity conservation of the Eastern Aukðtaitija region. Projects of this type have not yet taken place in Lithuania. Methods for regional studies of biodiversity must, therefore, be established. On its basis a

biodiversity conservation strategy and action plan of the Eastern Aukstaièiai region could be prepared.

The locations of projects which need support of foreign funds are presented in Figure 10.

4.1.2. Political and institutional regulation

Regulation of biodiversity protection is based on the Rio Convention and other international agreements (e.g., Convention on Climate Change, etc.) which regulate factors which influence biodiversity. On the other hand, within Lithuania biodiversity protection functions are divided between various levels of authority and institutions. Further institutional regulation of biodiversity is performed by the improvement of state and local institutions through the improvement of territorial planning, primarily environmental plans and the development and implementation of sector plans. The legal system for protection of biodiversity should be carefully developed to incorporate provisions relating the conservation of biodiversity into general laws which regulate relationships in all spheres of the economy.

It is necessary to improve the structure and efficiency of existing institutions responsible for the protection of biodiversity, particularly the Environmental Protection Ministry, including its regional departments and agencies (inspectorates) in districts and cities. Present priorities of the Environmental Protection Ministry reflect traditional tendencies in the country. Attention has been mainly devoted to the protection of species and to the regulation of biological resources use, which has been reflected in the activities of the Ministry. Today, with a transfer of attention to the protection of habitats and populations, more attention is being devoted to the protection of ecosystems. When aiming to strengthen the protection of landscape and biodiversity, it is insufficient to have strong central institutions. It is equally necessary to strengthen the regional departments of the Environmental Protection Ministry and the agencies of cities and districts. To do so, they need to employ more landscape protection specialists.

The other main state institutions concerned with the use of resources and areas, the conservation of landscape and biodiversity, are the Ministry of Land and Forestry and the Ministry of Construction and Urban Development. Within those Ministries, strong divisions able to tackle environmental problems in their respective sectors should be established, employing at least one landscape and biodiversity conservation specialist. This would allow the assessment of biodiversity protection measures in drafting laws, activities within programs of various sectors of the economy, territorial planning documents, etc., optimize finding the

most acceptable solutions to environmental problems and to coordination of the development of documents.

Planning positions of landscape geographers and biologists responsible for the protection of landscape and biodiversity should be introduced in the administrations of regions and municipalities.

An important action in developing the institutional system for the conservation of landscape and biodiversity is improvement management for state reserves and national and regional parks. Only one governmental institution - the Ministry of Environmental Protection - need to be responsible for their management.

Biodiversity protection provisions should not only become part of laws, but of territorial planning documents. The latter are particularly important for the conservation of biodiversity as they define the current and predicted natural environment situation and highlight land-use priorities for protection. Development of the territorial organization of the country's economic activities and environmental management is based on general territorial planning documents. Thus, such documents are of fundamental importance for the protection of landscape and biodiversity.

Many violations occur due to ignorance, yet society should play an active role in biodiversity conservation. In Lithuania there is a lack of information on the issues surrounding both landscape and biodiversity, the methods of their protection, the system of protected areas, and the Nature Frame. To fulfill the gaps and form a social consciousness, more attention should be paid to publications and training programs which could improve the situation.

Society should be informed continually on the progress in the life of protected areas via mass media. For education on nature protection to be effective, it should permanently target all sectors of society: politicians, decision makers, local societies, social organizations, teachers, students, schoolchildren, workers of industry and agriculture, etc. Every year advanced courses in the field of nature protection are especially needed by officials who make decisions at state, regional and local level, by staff of administrations of protected areas, and regional departments or district agencies of the Ministry of Environment Protection. Additionally, special courses and seminars are needed for ecologists from municipal institutions. The courses should include protection of biodiversity and Natural Frame.

Secondary schools and schools of higher education need a special program on the background of biodiversity protection. Ecological clubs in secondary schools should be enlarged, and their activities intensified.

It is in the interest of State to start coordinating and regulating education to prevent the occurrence of chaotically increasing courses which do not have sufficient competence in

ecology and related disciplines. Improvement in the education of specialists is essential.

4.2. Preconditions for biodiversity conservation in development of forestry and agriculture

Measures for the conservation of biodiversity, and the general environmental protection should be provided for in developing programs for separate sectors of economy. Human economic activities which are incompatible with the conservation of biodiversity is having an adverse effect on the environment and wildlife in its broadest sense. It is important that the conservation of biodiversity become an integral part of policy for agriculture, forestry, industry, construction planning, hunting and fisheries. This is especially needed with the present decentralization and intensification of use of natural resources. A theoretical coordination of the interests of the sectors of economy is provided by general territorial planning documents. Existing programs in agriculture, forestry, mining, etc.) theoretically include protection of biodiversity. In reality, however, the protection efforts of institutions which use and study biological resources is inadequate and their activities are not coordinated.

The development of the forest and agriculture sectors and the attitudes of the land-use and nature protection they employ have always been and still are of particular importance for the conservation of Lithuania’s biodiversity.

Optimization of forest cover does not only mean its increase. It also means an increase of forests, groups of trees and shrubs, and belt and line plantations in both urban and agrarian landscapes, while in the forest landscape it means sustaining a network of more or fewer density open spaces. The main biodiversity conservation requirements for forest and non-forest land are:

- development of a sufficient network of protected areas and introduction of appropriate controls on economic activities, ranging from prohibition to only slight limitations, and based on territorial planning which harmonizes economic and ecological relations;
- combination of self-regulation processes of ecosystems and regulated management (particularly in semi-natural ecosystems, which the most part of Lithuanian forests are);
- application of ecologically sound principles to all economic activities in the country, not only in protected areas.

The natural and semi-natural forests not used for intensive forestry should, based upon these principal

provisions, be included within protected areas allowing their ecosystems to develop naturally.

The Lithuanian Forestry and Timber Industry Development Program declares the importance of the conservation of biodiversity in forests. It envisages the development of a separate program for the conservation of biodiversity in forests, and the protection of forests' genetic diversity. However, it lacks an integrated approach to the forest as a system of many levels (geo, eco, species). Such an approach should be inherent in all sectors which protect the forest and use it.

Large areas have been planted with forests (about 400000 ha) in the impoverished eroding farmlands in south-eastern Lithuania. So far these forests are not valuable for biodiversity. Their value will increase, however, with age; it can also be increased by economic measures which conserve spontaneously appearing deciduous trees, by regulating the density of forest segments with the help of logging, by the introduction of new species in the second generation of the forest and as soils improve.

Plantation of mixed complex forest on eroding sandy soil in the first generation is simply not possible. Several experiments have been carried out in Lithuania in an attempt to make mixed plantings of the common pine and birch, various shrubs and introduced trees. They show that only a very slight admixture (up to 10% of the species) is justified.

So far in Lithuania there are no officially recognized biodiversity indicators and criteria. Internationally recognized indicators are applied:

- changes in the area (hectares) of forests;
- changes in the area (hectares) of natural and semi-natural forests;
- changes in forest species composition;
- changes in the area (hectares) of monoculture and planted forest ;
- the area of forest protected areas;
- the area of forests planted with introduced species;
- mixed forests as a percentage of the total number of forests;
- the naturally regenerating forests as a percentage of the total number of restored forests;

With respect to the biodiversity in forests three levels can be identified: landscape (forest tracts) level, ecosystematic (forest sites) level and species /genetic level. The main forest management measures to be applied to the forest tract level is as follows:

1. **Optimization of forests structure** with the aim to have optimal ratio between areas covered by trees and non covered by trees in forests tracts. So far there is no ecologically accepted standard, but forest tracts in which tree cover exceeds 95% are considered to be of little value for biodiversity conservation.
2. **Maintaining or forming as diverse a composition of species as possible**, depending upon existing soils

and habitats. The main problem is knowing the natural species composition of forests under various conditions. Scientific standards are necessary. Another problem is knowing the acceptable density of dominant species and the optimal proportion of forest tract for each species. It is recommended that the species composition of disturbed areas be restored to that of natural areas.

3. **Formation of a natural forest age-structure** and distribution of maturity groups. This was an old forestry issue long before modern concepts of biodiversity conservation. Decisions taken by forest cultivators ("normal forest theory") favored biodiversity. In modern times normal forest theory has been replaced by the special purpose forest theory. Nevertheless, the corner-stone of both is that the forest should have various age classes is still valid.
4. **Forest groups and categories** based on the dominant purpose and economic limitations. A distinct legal basis has been established and more or less acceptable standards created.
5. **Regulation of felling**: (1) a ban on logging in some forests (strict nature reserves); (2) a ban on clear cutting in some protected areas; (3) regulation of the ratio of clear, specific-case and selective logging in all forests depending upon the biological characteristics of trees and forest compartments and upon their growth and restoration status.

The main measures to sustain and increase the biodiversity of forests at the level of forest compartments

Technical and technological measures:

1. Technical means least damaging to the environment, particularly soil, in any forest work, maintenance in particular.
2. Different forest management techniques, depending upon habitat conditions and the function of forests.
3. Logging with soil frozen and snow cover present.
4. Maximum replacement of chemicals by biological and mechanical means in combating forest diseases and pests.

Felling measures:

1. Retention of single trees, particularly those close to natural maturity, in clear cuts until their natural death.
2. Retention of biological groups of rare tree and shrub species, retention of groups and belts near wetlands, small rivers and areas abounding in springs whilst performing main-use logging (clear-cut and non-clear-cut).
3. Formation of forest/field junctions by means of special logging or, where necessary, planting.
4. Selection of trees while performing fostering-type logging taking into consideration not only the forest capacity increase, but also the ecological value of the so-called not valuable species by preserving their admixture.
5. Retention of a part of long-dead standing trees and tree trunks while performing sanitary logging.
6. Biotechnical cutting to provide extra feed (mast) for fauna, for an

increase of berry-bearing, rare and medicinal plants.

Measures to be employed while increasing woodedness and restoring forests*:*

1. Prohibition of plant in some parts of forest tracts (in small forest clearings, both small meadows and wetlands and the like).
2. Selection of most suitable type of forests rehabilitation (natural or artificial).
3. Restoration of the most valuable forests by planting "former" species, if their existed in the "own" habitats.
4. Cultivation of biotechnical plantations to favor fauna (food and shelter).
5. Cultivation of field-protecting belts, small forests in wide stretches of agricultural land, planting linear plantations, hedges, plantings near farmsteads and roads.

Measures applicable to land reclamation and forest improvement:

1. Prohibition of drainage in some forests.
2. Limiting the use of fertilizers.
3. Drainage in wet forests in which land reclamation activities are allowed by using of "mini-drainage" options.
4. Strict conservation of environments of small river, areas abounding in springs, and wetlands.

Special measures to sustain and enrich biodiversity:

1. Setting up micro-reserves in sites of exceptional value.
2. Conservation of trees with deep hollows and big nests, retention of "islands" with a regime of ornithological managed reserves near the nesting sites of rare birds; protection of mineral soil islands in wetlands by establishing pedological managed reserves.
3. Protection of ant-hills by fencing, and by increasing their number.
4. Establishing nest boxes for birds, bumble-bees, building of traditional tree hollows in south-eastern Lithuania.
5. Creation of forest openings, small wetlands, meadows and pastures which should not be allowed to overgrow with naturally regenerating forest.
6. Conservation of small areas of forest and shrub in abandoned estates.
7. Limitation introduced trees and shrubs in farmsteads and villages of ethnic culture value.
8. Preservation of the authenticity of natural monuments and their protection zones by neither planting nor logging, nor changing the environment without applying special management projects. Protection of the authenticity of habitats of the objects listed in the Red Data Book with the exception of cases when specific measures are needed for their preservation.
9. Building small ponds, limited use of forest glades and regulated fires with the aim of biodiversity enrichment or to restoring etnocultural features.

To ensure stability in biodiversity, **the main measures in agriculture** are:

- promotion of organic (less intensive) agriculture, this would protect genetic variety and valuable floral, fungal and faunistic elements in agricultural landscape;
- cultivation systems of relatively low intensity should be applied to many traditionally grown agricultural crops;
- traditional technologies of cultivation which were in use before the boom period of mineral fertilizers and pesticides application should be used more widely;

- preserve and enlarge natural grasslands and pastures, combining harvesting with protection of biota;
- stimulate environmentally sound activities which allow slower succession in grasslands and wetlands;
- increase the abundance of fungi and fauna, their variety and activity in tilled areas;
- form and sustain a mosaic agricultural landscape;
- minimize negative environmental effects of agricultural inputs.

For the section in **plant-breeding** the following measures should be considered:

- cultivate tested and accepted breeds of crops;
- cultivate plants typical of the regions;
- apply rotation systems (multi-areal);
- increase use of organic fertilizers;
- rational application of agrochemistry (except growing stimulators, usually);
- restrict reclamation of new areas;
- conserve groves, single trees and small wetlands;
- plant high-tree rather than low-tree orchards.

Stock-breeding systems should be oriented towards use of natural and semi-natural grasslands for breeding of cows and sheep and, less often, horses and goats. For **cattle-breeding** the following should be typical:

- small number of animals per unit of cultivated land;
- reduced application of agrochemical measures;
- relatively large areas of natural or semi-natural vegetation;
- relatively abundant variety of plant species in grasslands and pastures;
- cultivation of local animal breeds;
- application of traditional agricultural methods, especially for hay making;
- less intensive usage of concentrated forage.

The biodiversity of a landscape much depends upon variety of soil types, moisture gradients in the soil etc. The main **principles for structure of an agricultural landscape**, which allow an increase in biodiversity, are the following:

- the proportion of grassland should be increased in karst-effects and where soils are subject to erosion;
- natural and semi-natural elements of a landscape, such as ponds, channels, reservoirs, small rivers, wetlands, grasslands and groves should be evenly distributed;
- maintain relatively large numbers of mature and overmature stands which are important for some species in late stages of forest succession (the negative effect of insularization could be compensated in part by different aged trees in groves, especially that of later stages of succession;

- wide ecotopes between fields scrub, isolated woodlands and open fields;
- presence of a set of natural elements in the landscape, which compose part of local natural framework.

It is suggested to aim for a distribution similar habitats (woodland, scrub, wetland, natural and semi-natural grassland with various amounts of moisture) at intervals not exceeding 400 meters. Such a distribution would allow the drift of genes even in less mobile animal species, thus avoiding local extinction due to fragmentation of habitats.

The main **economic measures** for supporting biodiversity in the agricultural landscape are:

- support of ecological farming by restoring subsidies which have been reduced or cut;
- making official agreements on ecological farming, which should include limitations (on draining, landscape transformation etc.) to protect biodiversity in sensitive places;
- in areas of high biodiversity farming should be strictly regulated, and in special cases prohibited. Compensation for the losses which occur as a result should be available for individuals and enterprises;
- support of conservation of nests, rare species and habitats and other elements of biodiversity.

4.3. Regional and local policy-making

4.3.1. Regional policies

Different regional policies for environmental protection can assist in implementing the Biodiversity Conservation Strategy and Action Plan. When formulating regional policies for biodiversity conservation the areas (regions) with similar ecological problems and the same environmental protection priorities might be established. Even in 9th decade of this century there were made attempts to reveal regions with different environmental problems. These regions needed special programs to be added to the general one prepared for all the country. Special environmental programs (environmental schemes) were prepared for three of these regions.

When (1995) preparing the National Environmental Protection Strategy of Lithuania for identification goals of regional policies, there were recommended to have 10 regions with special ecogeographical features, natural resources, ecological conflicts, peculiarities of their usage, special priorities in environmental protection.

Regional specialization and detalization which is necessary for the Strategy of Biodiversity Conservation could be formed using the existing scheme of regionalisation of environmental protection measures with slight improvements (Annex 3). Special attention in the conservation of biodiversity and biological resources in such regions as Coastal, Eastern Þemaièiai, South Lithuania and Eastern Aukðtaièiai should be paid (Figure 11). It is recommended to give priority for making special programs (during 4-5 years period) for the regions to protect their biodiversity.

At present protection of biodiversity practically is not implemented into reality by existing regional institutions. In the regions more attention should pay local schools of higher education, research institutes or their departments, mass media. It is necessary to stimulate wider practice of making regional programs for biodiversity conservation and to support them via regional and foreign foundations.

4.2.2. Use of local potential

Following decentralization in nature protection, the main center for biodiversity protection should move into the institutions of local government alongside with increase in cooperation between different social groups and NGO. At present there is lack of specialists in local government institutions, they need methodological support, coordination of their activity. Up to now as a rule all the functions of territorial environment protection (including those of biodiversity) are carried out by the departments of environment protection with their ecological staff in the administration of local government bodies.

One of the main area of activity in the regions should cover the search for valuable biological territories and landscapes; for endangered species and their associations; establishment of reserves and protected areas. There are pioneers of such activity in the country. Local governments of Këdainiai and Ðilutë are among them. They started their activity in complex nature protection in 1994. Special research in biodiversity by NGOs were started by 7 local government bodies 1996-1997. Financially they were self supported by the local governments and foreign foundations. Such activity should be stimulated by attracting local specialists and enthusiasts, by using information channels available for schools of basic education, NGOs, and forestry units.

Annex 1. ENVIRONMENTAL REGIONS

For regional application of the Biodiversity Conservation Strategy and Action Plan the following revisions to environmental regions are recommended:

I - Coastal Region

Includes the Districts of Ðilutë, Klaipëda, Kretinga, cities of Klaipëda, Neringa and Palanga. This is an area of Pajûris and Western Þemaičiai Lowlands with unique landscapes of the Curonian Spit and the Nemunas River Delta. Environmental priorities are protection of unique landscapes and biodiversity, coast and reduction of pollution.

II - Central Þemaičiai Region

Includes Plungë, Telðiai, Skuodas, Ðilalë Districts and part of Kelmë District. This is a Þemaičiai and Kurðo Hills area and a region of foothills located in the great island-type Þemaičiai watershed. Environmental priorities in this region concern land-use, soil conservation, conservation of unique landscapes, biodiversity, and recreational resources.

III - Eastern Þemaièiai Region

Includes the Districts of Akmenë, Maþeikiai, Ðiauliai, Radviliðkis, Raseiniai and part of Kelmë District. This is a marshy area located on the eastern slopes of Þemaičiai Upland. Environmental priorities are the protection of water resources and biota resources and biodiversity, and reduction of pollution.

IV - Northern Lithuania Region

Includes the Districts of Joniðkis, Pakruojis, Pasvalys and Birþai. This is a region of the middle reaches of the Venta River and Mûða-Nemunëlis plains, with its mining for construction materials (e.g., dolomites) and intensive agriculture. Environmental priorities concern land-use, protection of water resources, and pollution.

V - Central Aukðtaièiai Region

Includes the Districts of Panevëþys, Kupiðkis, Rokiðkis, Anykðèiai and Ukmergë. This is a plateau of the upper reaches of the Ðventoji and Nevëþis, Lëvuo and Nemunëlis rivers. Environmental priorities concern protection of water resources, biodiversity and reducing pollution.

VI - Eastern Aukðtaièiai Region

Includes the Districts of Zarasai, Utena, Ignalina, Ðvenèionys and Molëtai. This is the region of Aukðtaièiai and Ðvenèionys (N. Nalðia) Uplands and the Þeimena and Dysna Lowlands region, characterized by numerous lakes among

forests. Environmental priorities concern soil conservation, biodiversity, unique landscapes and biological and natural recreational resources.

VII - Vilnija Region

Includes the Districts of Vilnius, Trakai and Đalèininkai and part of the District of Kaiðiadorys, and the City of Vilnius. This is the region of the Dzûkai and Aðmena (S. Nalðia) Uplands, characterized by forested river valleys and numerous lakes. Environmental priorities are the protection of water and natural recreational resources, biodiversity and reduction of pollution.

VIII - Central Lithuania Region

Includes the Districts of Kaunas, Kaiðiadorys, Prienai, Jonava and Këdainiai, part of Marijampolë District and the City of Kaunas. This is the central confluence zone of the country, a landscape of plains and intensive industry. Environmental priorities concern pollution, the protection of water resources, land use structure and biodiversity.

IX - South Western Lithuania Region

Includes the Districts of Tauragë, Jurbarkas, Đakiai and part of Vilkaviðkis and Marijampolë Districts. This is an intensive agricultural zone of clayey ice-age plains. Environmental priorities concern land-use structure, pollution and the protection of water resources.

X - Southern Lithuania Region

Includes the Districts of Alytus, Lazdijai, Varëna and part of Marijampolë, Vilkaviðkis and Đalèininkai Districts. This is the lakeland area of the southern part of the Baltic Uplands and the great sandy Dainava Plain, abounding in rivers, and with dry pine forests. Environmental priorities concern protection of biodiversity, biota resources, natural recreational resources and unique landscapes.

ANNEX 2. STRATEGY FORMATION

Table A2-1. Assessment of biodiversity and resources conservation problems

Assessment trends / Assessment criteria	Urgency				Complexity				
	Biological diver-sity loss	Degradation of the environment	Economic losses	**In total**	Solution possibilities	Restoration of the na-tural en-viron-ment	Spread-ding by areas	Level of regula-tion	**In total**
Weight coefficients / Problems	I 0,5	II 0,3	III 0,2		I 0,4	II 0,3	III 0,2	IV 0,1	
1	2	3	4	**5**	6	7	8	9	10
Geosystematic problems									
Landscape overall geoecological balance violation	3 1,5	3 0,9	2 0,4	**2,8**	3 1,2	3 0,9	2 0,4	3 0,3	**2,8**
Watersheds' landscape natural structure distortion	2 1,0	3 0,9	1 0,2	**2,1**	3 1,2	2 0,6	2 0,4	3 0,3	**2,5**
Valley and low valley landscape natural structure distortion	3 1,5	2 0,6	1 0,2	**2,3**	2 0,8	2 0,6	2 0,4	3 0,3	**2,1**
Karst landscape degradation	2 1,0	2 0,6	1 0,2	**1,8**	2 0,8	3 0,9	2 0,4	2 0,2	**2,3**
Inland waters eutrophication	1 0,5	3 0,9	2 0,4	**1,8**	3 1,2	2 0,6	2 0,4	2 0,2	**2,4**
Natural landscape distortion in particularly protected areas	3 1,5	3 0,9	1 0,2	**2,6**	2 0,8	2 0,6	2 0,4	2 0,2	**2,0**
Natural landscape distortion in cities and towns	2 1,0	3 0,9	1 0,2	**2,1**	3 1,2	3 0,9	2 0,4	2 0,2	**2,7**
Ecosystematic problems									
Forest ecosystems degradation	3 1,5	2 0,6	3 0,6	**2,7**	2 0,8	1 0,3	3 0,9	3 0,3	**2,3**
Marine ecosystems degradation	2 1,0	2 0,6	2 0,4	**2,0**	3 1,2	2 0,6	2 0,4	3 0,3	**2,5**
Coastal ecosystems	2 1,0	3 0,9	1 0,2	**2,1**	2 0,8	3 0,9	2 0,4	1 0,1	**2,2**
Inland waters' ecosystems degradation	3 1,5	2 0,6	2 0,4	**2,5**	3 1,2	1 0,3	2 0,4	2 0,2	**2,1**
Wetlands ecosystems degradation	3 1,5	3 0,9	2 0,4	**2,8**	3 1,2	1 0,3	2 0,4	3 0,3	**2,2**
Meadow ecosystems degradation	3 1,5	2 0,6	2 0,4	**2,5**	2 0,8	2 0,6	3 0,6	2 0,2	**2,2**
Declining sand ecosystems	2 1,0	1 0,3	1 0,2	**1,5**	1 0,4	3 0,9	1 0,2	1 0,1	**1,6**
Degradation of anthropogenic environment ecosystems	2 1,0	3 0,9	2 0,4	**2,3**	3 1,2	1 0,3	3 0,9	2 0,2	**2,6**
Species-related (in-situ) **problems**									
Biota species populations degradation	3 1,5	1 0,3	3 0,9	**2,7**	2 0,8	2 0,6	3 0,6	3 0,3	**2,3**
Biocenoses species diversity degradation	3 1,5	2 0,6	2 0,4	**2,5**	2 0,8	3 0,9	3 0,9	3 0,3	**2,6**
Declining biota species populations	3 1,5	1 0,3	1 0,2	**2,0**	2 0,8	2 0,6	2 0,4	3 0,3	**2,1**

of international importance									
Spreading of adventive and invasive species	2 1,0	1 0,3	2 0,4	**1,7**	1 0,4	2 0,6	1 0,2	2 0,2	**1,4**
Destruction of bird and fish migration routes and their environment changes	2 1,0	2 0,6	3 0,6	**2,2**	3 1,2	2 0,6	2 0,4	3 0,3	**2,5**
degradation of small (secondary) forest resources	2 1,0	2 0,6	2 0,4	**2,0**	2 0,8	2 0,6	3 0,6	2 0,2	**2,2**
Hunted fauna resources degradation	1 0,5	2 0,6	3 0,6	**1,7**	2 0,8	1 0,3	2 0,4	3 0,3	**1,8**
Fished fish species resources degradation	2 1,0	1 0,3	3 0,6	**1,9**	3 1,2	1 0,3	2 0,4	3 0,3	**2,2**
Genetic (in-situ) **problems**									
degradation of forests populations	3 1,5	1 0,3	2 0,4	**2,2**	1 04	2 0,6	2 0,4	1 0,1	**1,5**
degradation of introduced gene pool taxa	2 1,0	1 0,3	1 0,2	**1,5**	2 0,8	3 0,9	2 0,4	1 0,1	**2,2**
Genetic (ex-situ) **problems**									
Degradation of the gene pool of domesticated and cultured biota taxa	3 1,5	1 0,3	3 0,6	**2,4**	2 0,8	3 0,9	2 0,4	3 0,3	**2,4**
Degradation of the gene pool of international taxa not characteristic of the country	2 1,0	1 0,3	2 0,4	**1,7**	2 0,8	3 0,9	1 0,2	3 0,3	**2,2**
Organizational (ex-situ) **problems**									
Insufficiency of the existing ex-situ protection basis material/technical procurement	3 1,5	1 0,3	2 0,4	**2,2**	3 1,2	1 0,3	2 0,4	3 0,3	**2,2**
Lack of systematically in the ex-situ measures used for wild biota	1 0,5	2 0,6	1 0,2	**1,3**	1 0,4	2 0,6	2 0,4	2 0,2	**1,6**
Absence of national collections for the protection of microorganisms	3 1,5	1 0,3	2 0,4	**2,2**	2 0,8	2 0,6	1 0,2	2 0,2	**1,8**
Absence of control of the genetically modified organisms' veterinary and phytopatological protection	2 1,0	1 0,3	2 0,4	**1,7**	1 0,4	2 0,6	2 0,4	2 0,2	**1,6**

Table A2-2. The goals for biodiversity conservation

Levels of Consevation	**Goal**	**Type of problem** by urgency: **I** - over 2.0, **II** - below 2.0 by complexity: **a** - over 2.0, **b** - below 2.0	**mplementation perio** S-short (up to 3 years M-medium (5-10 years) L-long (over 10 years	**Potential impact of present conditions (factors) upon achie-vement of the goal:** positive - negative +++/strong/*** * *** ++ /medium/ *** *** + /weak/ *****	**Sectors, responsible for the implementation of the goal**
1	**2**	**3**	**4**	**5**	**6**
GEOSYTEMATIC (in-situ)	**G1**	**I-a**	L(M)	**++** *** * ***	Territorial planning, Forestry, Agriculture, Urbanistics

	G2	**I-a**	L(M)	**++** * * *	Territorial planning, Forestry, Agriculture, Urbanistics
	G3	**I-a**	L(M)	**+** * * *	Urbanistics, Excava-tion, Agriculture, Forestry
	G4	**II-a**	M(S)	**++** * *	Agriculture, Urbanis-tics, Excavation
	G5	**II-a**	M(L)	**++** * *	Agriculture, Municipal services, Industry, Recreation
	G6	**I-b**	M	**+** * *	Forestry, Agriculture, Urbanistics
	G7	**I-a**	M(S)	**+** * * *	Urbanistics, Recreation
ECOSYSTEMATIC (in-situ)	**E1**	**I-a**	M	**+** * * *	Forestry, Recreation
	E2	**II-a**	M(L)	**++** * * *	Fisheries, Transport, Industry, Excavation, Municipal Services
	E3	**I-a**	S(M)	**+++** * *	Territorial Planning, Urbanistics, Transport, Recreation, Forestry,
	E4	**I-a**	M(L)	**++** * *	Agriculture, Industry, Municipal Services, Fisheries, Recreation
	E5	**I-a**	S(M)	**+++** * *	Territorial Planning, Excavation, Agricul-ture, Recreation
	E6	**I-a**	M	**++** * * *	Agriculture, Forestry, Recreation, Transport
	E7	**II-b**	S	**+++** *	Territorial Planning, Forestry, Urbanistics
	E8	**I-a**	M(L)	**+** * * *	Agriculture, Urbanistics, Transport, Recreation
SPECIES (in-situ)	**R1**	**I-a**	M(S)	**+++** * *	Forestry, Agriculture, Recreation
	R2	**I-a**	L(M)	**++** * * *	Forestry, Agriculture, Recreation, Urbanistics
	R3	**II-a**	S(M)	**+++** * *	Forestry, Agriculture, Recreation
	R4	**II-b**	M	**+** * *	Forestry, Agriculture, Hunting, Fisheries
	R5	**I-a**	M	**++** *	Territorial Planning, Urbanistics, Energy sector,

	R6	**II-a**	M	**+** *** ***	Transport Forestry, Recreation
	R7	**II-b**	S(M)	**+++** *** ***	Hunting, Forestry, Agriculture
	R8	**II-a**	M	**++** *** * ***	Fisheries, Industry, Municipal Services, Recreation
GENETIC (ex-situ)	**Ex1**	**I-a**	M	**+++** *** ***	Agriculture, Forestry
	Ex2	**II-a**	M	**+** *** ***	Conservation
ORGANIZATIONAL (ex-situ)	**Ex3**	**I-a**	M(L)	**+** *** ***	Agriculture, Forestry, Conservation
	Ex4	**II-b**	S(M)	**+** *** ***	Agriculture, Forestry, Conservation
	Ex5	**I-b**	M(L)	**++** *** * ***	Conservation
	Ex6	**II-b**	M(S)	**+** *** ***	Agriculture, Forestry, Hunting, Fisheries, Conservation

Table A2-3. Assessment of acceptable strategy options

Strategy options Weight coefficients	**Criteria** **Ampleness** 0,1	**onstructiveness** 0,3	**Trend selection** 0,2	**Proportionality** 0,1	**Realistic basis** 0,3	**Sum total of points**
I-COMPLETE	3 0,3	2 0,6	1 0,2	3 0,3	1 0,3	**1,7**
II-PRIORITY ORIENTED	2 0,2	3 0,9	1 0,2	2 0,2	3 0,9	**2,4**
III-GEOECOSYSTEMATIC PRIORITY	1 0,1	2 0,6	2 0,4	2 0,2	2 0,6	**1,9**
IV-SPECIES PRIORITY	1 0,1	1 0,3	2 0,4	1 0,1	3 0,9	**1,8**
V-FOCUSING ON LAND BIOTA	1 0,1	2 0,6	3 0,6	1 0,1	2 0,6	**2,0**
VI-FOCUSING ON AQUATIC BIOTA	1 0,1	2 0,6	3 0,6	1 0,1	2 0,6	**2,0**
VII-PROPORTIONAL	2 0,2	1 0,3	1 0,2	3 0,3	2 0,6	**1,6**

Annex 3. METHODOLOGICAL INFORMATION SOURCES

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Annex 4. The list of species of international importance and priority protection interest

Species	Protection status						
	International						National
	Special category	ES Bird directive	Bern convention	Bon convention	CITES	Pan-Europe (IUCN) status	
1	2	3	4	5	6	7	8
Ascomycetes							
Pezizales							
Helvellaceae							
Discina perlata							V
Morchellaceae							
Morchella conica							R
Morchella elata							R
Ptychverpa bohemica							R
Verpa digitaliformis							R
Ausûniniai *Pezizaceae*							
Peziza ammophila							V
Sarcosomataceae							
Sarcosoma globosum							E
Terfeziaceae							
Choiromyces meandriformis							E
Leotiales							
Geoglossaceae							
Trichoglossum hirsutum							V
Lichenes							
Meðkapëdieèiai *Peltigerales* Platuþiniai *Lobariaceae*							
Lobaria pulmonaria							E
Meðkapëdiniai *Peltigeraceae*							
Solorina spongiosa							Ex
Lekanorieèiai *Lecanorales*							
Ðiuriniai *Cladoniaceae*							
Cladonia caespiticia							E
Plynkeþiniai *Hypogymniaceae*							
Hypogymnia vittata							Ex
Keþiniai *Parmeliaceae*							
Arctoparmelia centrifuga							Ex
Saitakerpiniai *Umbilicariaceae*							
Lassalia pustulata							E
Umbilicaria deusta							E
Umbilicaria polyphylla							E
Kedeniniai *Usneaceae*							
Evernia divaricata							Ex
Usnea globrata							E
Usnea glabrescens							E
Usnea lapponica							I
Usnea scobrata							Ex
Papëdgrybiai *Basidiomycetes*							
Afiloforieèiai *Aphyllophorales*							
Pirðtûniniai *Clavariadelphaceae*							
Clavariadelphus pistillaris							E
Raukðliniai *Sparassidaceae*							
Sparassis crispa							R
Kuokiniai *Gomphaceae*							
Gomphus clavatus							E
Ðakotiniai *Ramariaceae*							
Ramaria aurea							V
Trapiagrybiniai *Hericiaceae*							
Hericium coralloides							R
Karpininkiniai *Telephoraceae*							
Boletopsis leucomelaena							V
Ðiurkðteniniai *Hymenochaetaceae*							
Inonotus dryadeus							R

Inonotus dryophyllus							R
Blizgutiniai *Ganodermataceae*							
Ganoderma lucidum							V
Kempininiai *Polyporaceae*							
Aurantioporus croceus							R
Dendropolyporus umbellatus							V
Fomitopsis rosea							V
Funalia trogii							V
Grifolia frondosa							E
Pycnoporus cinnabarinus							R
Spongipellis spumeus							R
Trametes gibbosa							R
Þvynbaravykieèiai *Strobilomycetales*							
Þvynbaravykiniai *Strobilomycetaceae*							
Porphyrellus porphyrosporus							Ex
Boletales							
Boletaceae							
Boletus aereus							E
Boletus erythropus							R
Boletus fechtneri							E
Leccinum decipiens							I
Suillus placidus							E
Xorocomus rubellus							R
Boletus appendiculatus							V
Boletus radicans							V
Boletus impolitus							V
Boletus pulverulentus							V
Agaricales							
Hygrophoraceae							
Hygrocybe ovina							E
Hygrophorus russula							R
Tricholomataceae							
Calocybe ionides							V
Lepista sordida							R
Leucopaxillus tricolor							E
Tricholoma apium							E
Tricholoma batschii							V
Tricholoma inocybeoides							E
Tricholoma subsejunctus							E
Tricholoma ustaloides							E
Rhodotaceae							
Rhodotus palmatus							Ex
Agaricaceae							
Lepiota cortinarius							V
Lepiota fuscovinaceae							V
Lepiota hystrix							V
Lepiota subalba							V
Lepiota lilaceae							V
Melanophyllum eyrei							V
Coprinaceae							
Psathyrella caput-medusae							Ex
Bolbitiaceae							
Conocybe intrusa							V
Cortinariaceae							
Gymnopilus spectabilis							V
Entolomatales							
Entolomataceae							
Entoloma madidum							R
Rhodocybe truncata							R
Amanitales							
Amanitaceae							
Amanita regalis							V
Russulales							
Russulaceae							
Lactarius acerrimus							V
Lactarius repraesantaneus							R

Lactarius scrobiculatus							I
Lactarius volemus							I
Russula aurata							V
Russula laurocerasi							V
Gasteromycetes							
Phallales							
Phallaceae							
Dictyophora duplicata							Ex
Phallus hadriani							Ex
Mutinus caninus							Ex
Lycoperdales							
Gastraceae							
Geastrum indicum							R
Trichaster melanocephalus							R
Lycoperdaceae							
Langermannia gigantea							I
Taxus baccata L.							Ex
Aldrovanda vesiculosa L.			+				Ex
Aphanes arvensis L.							Ex
Rubus arcticus L.							Ex
Trapa natans L.			+				Ex
Hydrocotyle vulgaris L.							Ex
Pedicularis kaufmannii Pinzger							Ex
Caldesia parnassiifolia L. Parl.			+				Ex
Groenlandia densa L. Fourr.							Ex
Gladiolus palustris Gaudin							Ex
Botrychium simplex E.Hitchc.			+				Ex
Polystichum aculeatum L. Roth.							Ex
Tolypella prolifera A. Br. Leonh.							Ex
Myrica gale L.							E
Betula nana L.							E
Agrostemma githago L.							E
Dianthus armeria L.							E
Dianthus superbus L.						+	E
Isopyrum thalictroides L.							E
Dentaria bulbifera L.							E
Drosera intermedia Hayne							E
Saxifraga hirculus L.			+			+	E
Lathyrus pisiformis L.							E
Vicia dumetorum L.							E
Viola stagnina Kit.							E
Viola uliginosa Bess.							E
Myrophyllum alterniflorum DC.							E
Hedera helix L.							E
Eryngium maritimum L.							E
Erica tetralix L.							E
Centunculus minimus L.							E
Glaux maritima L.							E
Centaurium littorale Turner Gilmour							E
Gentianella uliginosa Willd. Boern.							E
Swertia perennis L.							E
Cruciata glabra L. Ehrend.							E
Nymphoides peltata S.G.Gmelin O.Kuntze							E
Melittis melissophyllum L.							E
Teucrium scordium L.							E
Gratiola officinalis L.							E
Pedicularis sceptrum-carolinum L.							E
Pedicularis sylvatica L.							E
Lobelia dortmanna							E
Aster tripolium L.							E
Allium angulosum L.							E
Tofieldia calyculata L. Wahlnb.			+				E

Veratrum lobelianum Bernh.							E
Juncus stygius L.							E
Festuca altissima All.							E
Hordelymus europaeus L. Harz							E
Carex davalliana Sm.							E
Carex heleonastes Ehrh.							E
Cyperus flavescens L.							E
Cephalanthera longifolia L. Fritsch							E
Cephalanthera rubra L. L.C.Rich.							E
Coeloglossum viride L. C.Hartm.							E
Dactylorhiza cruenta O.F.Muell. Soo							E
Dactylorhiza majalis Rchb. Hunt et Summerhayes							E
Epipogium aphyllum F.W.Schmidt Sw.							E
Gymnadenia odoratissima L. L.C.Rich.							E
Hammarbya paludosa L. O.Ktze.							E
Herminium monorchis L. R.Br.							E
Orchis militaris L.							E
Orchis ustulata L.							E
Lycopodiella inundata L. Boern.							E
Isoetes lacustris L.							E
Botrychium matricarifolium A.Br. ex Koch						+	E
Botrychium virginianum L. Sw.						+	E
Asplenium trichomanes L.							E
Sphagnum subfulvum Sjors							E
Lychnothamnus barbatus Meyen							E
Silene lithuanica Zap.							V
Nuphar pumila Timm DC.							V
lelija *Nymphaea alba* L.							V
Pulsatilla patens L. Mill.			+			+	V
Corydalis cava L. Schweigg. et Koerte							V
Lathyrus laevigatus Waldst. et Kit. Grend							V
Trifolium lupinaster L.							V
Peplis portula L.							V
Primula farinosa L.						+	V
Gentiana cruciata L.						+	V
Gentiana pneumonanthe L.							V
Gentianella amarella L. Boern.						+	V
Mentha longifolia L. Huds.							V
Pinguicula vulgaris L.							V
Arnica montana L.							V
Najas marina L.							V
Allium scorodoprasum L.							V
Gladiolus imbricatus L.							V
Iris sibirica L.							V
Festuca psammophila Èelak. Fritsch							V
Ðvelnioji vilnûnë *Holcus mollis* L.							V
Sesleria caerulea L. Ard.							V
Baeothryon caespitosum L. A.Dietrich.							V
Cladium mariscus L. Pohl							V
Cyperus fuscus L.							V
Corallorhiza trifida Chatel.							V
Cypripedium calceolus L.			+				V
Gymnadenia conopsea L. R.Br.							V
Liparis loeselii L.C.Rich.			+			+	V
Listera cordata L. R.Br.							V
Malaxis monophyllos L. Sw.							V

Orchis mascula L.							V
Orchis morio L.							V
Sphagnum molle Sull.							V
Trichocolea tomentella Ehrh. Dum.							V
Drepanocladus lycopodioides Brid. Warnst.							V
Chara galioides DC.							V
Salix myrtilloides L.							R
Quercus petraea Mattuschka Liebl.							R
Montia fontana L.							R
Cerastium sylvaticum W. et K.							R
Dianthus borbasii Vand.							R
Ceratophyllum submersum L.							R
Pulsatilla nigricans Stoerck							R
Corydalis intermedia L. Merat							R
Nasturtium officinale R.Br.							R
Astragalus cicer L.							R
Trifolium rubens L.							R
Vicia pisiformis L.							R
Hypericum hirsutum L.							R
Hypericum montanum L.							R
Elatine hydropiper L.							R
Astrantia major L.							R
Cnidium dubium Schkuhr Thell.							R
Conioselinum tataricum Hoffm.							R
Seseli annuum L.							R
Androsace filiformis Retz.							R
Cruciata laevipes Opiz							R
Galium triflorum Michx.							R
Sherardia arvensis L.							R
Dracocephalum ruyschiana L.							R
Stachys recta L.							R
Succisella inflexa Kluk G.Beck							R
Campanula bononiensis L.							R
Pyrethrum corymbosum L. Willd.							R
Tragopogon gorskianus Rchb.							R
Alisma lanceolatum With.							R
Triglochin maritimum L.							R
Allium vineale L.							R
Colchicum autumnale L.							R
Gagea pratensis Pers. Dumort.							R
Juncus gerardii Loisel.							R
Aira praecox L.							R
Beckmannia eruciformis L. Host							R
Bromus benekenii Lange Trimen							R
Bromus erectus Huds.							R
Calamagrostis pseudophragmites Hall.fil. Koel.							R
Dactylis polygama Horvat.							R
Koeleria delavignei Czern. ex Domin							R
Poa remota Forselles							R
Scolochloa festucaceae Willd. Link							R
Carex brizoides L.							R

Carex ligerica Gay							R
Carex paupercula Michx.							R
Carex muricata L.							R
Carex rhizina Blytt ex Lindblom							R
Eriophorum gracile Koch							R
Schoenus ferrugineus L.							R
Neottianthe cucullata Schlecht.							R
Equisetum telmateia Ehrh.							R
Botrychium multifidum S.G.Gmel. Rupr.			+			+	R
Pogonatum nanum Hedw. P.B.							R
Bryum schleicheri Schwaegr.							R
Thuidium minutulum Hedw. Br.							R
Ctenidium molluscum Hedw. Mitt.							R
Cerastium brachypetalum Pers.							I
Geranium lucidum L.							I
Hypericum humifusum L.							I
Najas minor All.							I
Juncus capitatus Weig.							I
Alopecurus arundinaceus Poir.							I
Sphagnum subnitens Russ. et Warsnt.							I
Fontinalis dalecarlica L.							I
Chara baueri A. Br.							I
Triturus vulgaris			III				
Triturus cristatus			II				I
Bombina bombina			II				I
Pelobates fuscus			II				* I
Bufo bufo			III				
Bufo viridis			II				
Bufo calamita			II				Rs
Hyla arborea			II				* R ar E
Rana ridibunda			III				
varlë *Rana esculenta*			III				
Rana lessonae			III				
Rana temporaria			III				
Rana arvalis			II				
Emys orbicularis			II		II		E
Anguis fragilis			III				
Natrix natrix			III				
Coronella austriaca			II				E
Vipera berus			III				
Lacerta vivipara			III				
Lacerta agilis			III				
Gavia arctica	3				V		E
Podiceps griseigena							R
Podiceps nigricollis							V
Botaurus stellaris	3						R
Ixobrychus minutus	3						I
Ciconia nigra	3						R
Cygnus cygnus	4w						*
Anser anser							R
Anas strepera	3						R
Anas acuta	3						R
Anas querquedula	3						
Anas clypeata							
Aythya nyroca	1						I
Polysticta stelleri	1						
Mergus serrator							V

Mergus merganser							R
Pernis apivorus	4						R
Milvus migrans	3						V
Milvus milvus	4					K*	E
Haliaeetus albicilla	3					R	E
Circaetus gallicus	3						Ex
Circus pygargus	4						R
Aquila pomarina	3						R
Aquila clanga	1						Ex
Aquila chrysaetos	3						Ex
Pandion haliaetus	3						R
Falco tinnunculus	3						
Falco columbarius							E
Falco subbuteo							
Falco peregrinus	3						Ex
Tetrao tetrix	3						V
Tetrao urogallus							V
Perdix perdix	3						
Coturnix coturnix	3						E
Porzana porzana	4						R
Porzana parva	4						
Crex crex	1					R	I
Grus grus	3						R
Recurvirostra avosetta	4/3w						*
Pluvialis apricaria	4						E
Calidris alpina	3w						E
Philomachus pugnax	4						V
Lymnocryptes minimus	3w						*
Gallinago media	2						E
Limosa limosa	2						V
Numenius arquata	3w						V
Tringa totanus	2						V
Tringa glareola	3						V
Larus minutus	3						
Larus canus	2						
Sterna caspia	3						
Sterna albifrons	3						R
Chlidonias hybridus	3						
Chlidonias niger	3						
Chlidonias leucopterus							
Columba oenas	4						V
Streptopelia turtur	3						
Tyto alba	3						R
Bubo bubo	3						E
Athene noctua	3						
Asio flammeus	3						I
Aegolius funereus							R
Caprimulgus europaeus	2						
Alcedo atthis	3						T
Coracias garrulus	2						V
Upupa epops							V
Jynx torquilla	3						
Picus canus	3						V
Picus viridis	2						R
Dendrocopus leucotos							
Picoides tridactylus	3						E
Galerida cristata	3						E
Lullula arborea	2						
Alauda arvensis	3						
Riparia riparia	3						
Hirundo rustica	3						
Anthus campestris	3						I
Motacilla citreola							*
Luscinia svecica							
Phoenicurus phoenicurus	2						
Acrocephalus paludicola	1					K*	I
Muscicapa striata	3						
Panurus biarmicus							R

Lanius collurio	3						
Lanius minor	2						
Lanius excubitor	3						R
Emberiza hortulana	2						
Miliaria calandra	4						
Sorex araneus			III				
Sorex minutus			III				
Neomys fodiens			III				
Myotis dasycneme			II			K	I
Myotis daubentoni			II				
Myotis brandti			II				I
Myotis nattereri			II				
Myotis mystacinus			II				* Ex?
Plecotus auritus			II				
Barbastella barbastella			II				I
Nyctalus noctula			II				I
Nyctalus leisleri			II				I
Pipistrellus nathusii			II				
Pipistrellus pipistrellus			III				I
Eptesicus serotinus			II				I
Eptesicus nilssoni			II				I
Vespertilio murinus			II				I
Sciurus vulgaris			III				N
Castor fiber			III				M
Eliomys quercinus			III				I
Dryomys nitedula			III				R
Glis Myoxus glis			III				R
Muscardinus avellanarius			III				
Sicista betulina							I
Microtus oeconomus			III				
Microtus rosiaemeridionalis							* R ar I
Lepus europaeus			III				M
Lepus timidus			III				R
Phocaena phocaena			III		II		
Delphinapterus leucas			III		II	K	
Canis lupus			II			V	M
Martes martes			III				N
Martes foina			III				N
Mustela erminea			III				
Mustela nivalis			III				
Mustela lutreola			II			V	Ex
Mustela putorius			III				N
Meles meles			III				N
Lutra lutra			II		I	V	I
Lynx lynx			III		II		
Halychoerus grypus			III				E
Phoca hispida			III				
Phoca vitulina			III				
Cervus elaphus			III				M
Dama dama			III				N
Cervus nippon			III				
Capreolus capreolus			III				M
Alces alces			III				M
Bison bonasus						V	Rs

National categories for species according to necessity and ways of conservation

Ex extinct or probably extinct species qualify for Ex0 category in Lithuanian Red Data Book;
E endangered species qualify for E1 category in Lithuanian Red Data Book;
V rapidly declining species qualify for category V2 in Lithuanian Red Data Book;
R rare species qualify for category R3 in Lithuanian Red Data Book;
I rare, insufficiently studied species, qualify for category I4 in Lithuanian Red Data Book;
N rather frequently exploited species - natural resources;
M huntable (or legal game) species;
Rs restored species
* proposed for inclusion in Lithuanian Red Data Book.