

**THE NATIONAL STRATEGY AND ACTION PLAN FOR  
BIODIVERSITY IN TURKEY**

February 2001

Acknowledgments

***The National Biodiversity Strategy and Action Plan is prepared as Turkey's Participation in a Global Initiative to Conserve and Sustainably Use Biological Resources.***

This Strategy outlines Turkey's biological wealth status, what generally needs to be done, and what specific actions are recommended to ensure its conservation and sustainable use. The Turkish people recognise the need to maintain a healthy environment and are concerned about the degradation of ecosystems and loss of species and genetic diversity that result from human activities. The Government of Turkey signed the United Nations Convention on Biological Diversity in 1992 and ratified it in 1996. It represents a global and national instrument for guiding efforts to conserve biodiversity and use biological resources sustainably.

The Turkish Constitution, Laws and Regulations and international conventions in the field of nature conservation (i.e., NEAP, Paris, Ramsar, Bern, CITES, Combat Desertification etc.) provide the legal framework for seeking the strategy for continuity of biodiversity in Turkey. In order to secure sustainable development, there is need to determine national objectives and policies related to environment along with all other plans and policies. An initiative began in early 1995 to prepare a "National Environmental Action Plan (NEAP)" under the co-ordination of the State Planning Organization (DPT) of Turkey and the Ankara Office of the World Bank. Nineteen different study groups each including several experts from universities, ministries, research organizations, NGOs and the private sector were formed. One of these study groups worked on the "Biodiversity Action Plan for Turkey". Due to the broad coverage of this subject, this particular study group was further divided into three sub-groups (on forest, wetlands and steppe ecosystems) and two additional studies were completed on legal and institutional arrangements for biodiversity conservation and the role of NGOs in biodiversity conservation. It is the result of this overall process, which has been combined to develop this strategy and action plan for the conservation and sustainable use of biodiversity in Turkey.

The Strategy implies the important role of Turkey, which is working in cooperation with other countries, towards the implementation of the Convention. The responsibility for conserving biodiversity and ensuring the sustainable use of biological resources is a shared responsibility among various governmental institutions, and across various sectors.

The Strategy provides a framework for action at all levels that will enhance the ability to ensure the productivity, diversity and integrity of the natural systems and, the ability to ensure sustainable development.



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# I. EXECUTIVE SUMMARY

## 1.1 Introduction

Biodiversity supports human societies ecologically, economically, culturally and spiritually. Despite their importance, ecosystems are being degraded and species and genetic diversity reduced at a devastating rate due to the impact of growing human population and increasing resource consumption rates. The global decline of biodiversity is now recognized as one of the most serious environmental issues facing humanity. Recognition of the worldwide impact of the decline of biodiversity inspired the global community to negotiate the United Nations Convention on Biological Diversity. Turkey signed the Convention at the Earth Summit in 1992 and ratified in 1996. The three objectives of the Biodiversity Convention are:

- the conservation of biodiversity;
- the sustainable use of biological resources; and
- the fair and equitable sharing of benefits resulting from the use of genetic resources.

The Convention, as a global instrument sets the stage for each nation to assess the adequacy of current efforts to conserve biodiversity, achieve sustainable use of biological resources and to determine how gaps will be filled and opportunities realized.

The Turkish Biodiversity Strategy is a response to the obligation for parties that have ratified the Convention to prepare a national strategy as a guide to the implementation of the Biodiversity Convention. It recognizes existing constitutional and legislative responsibilities for biodiversity and emphasizes the importance of intergovernmental cooperation to create the policy and research conditions necessary to move ecological management ahead. The Strategy consists of an assessment and description of Turkey's biodiversity, the strategy with goals, and a priority action plan.

## 1.2 Assessment

Turkey consists of three different biogeographic regions, each with its own endemic species and natural ecosystems. These are: the Caucasian mountain *forests* with the temperate deciduous forest, including alpine meadows; Central and Eastern Anatolian *Steppe* grasslands and the Mediterranean region, which includes the world's largest remaining Cypress forests. The steppe ecosystem is perhaps the most important of all from the point of view of economics, as a large number of food crops have been derived from their wild species native to Turkey. *Wetland ecosystems* provide suitable breeding, feeding environment and habitat, and are second to tropical forests regarding biodiversity levels. Wetlands are vitally important for many endangered and endemic species. Significant degradation exists in each of the mentioned ecosystems, and each of them has endemic, endangered, threatened, or extinct species.

## 1.3 Strategy

*To create a society that lives and develops as part of nature, values the diversity of life, takes no more than can be replenished and leaves a world rich in biodiversity to future generations.*

The Strategy 's goals are:

- i) conserve biodiversity and use biological resources in a sustainable manner;
- ii) improve the understanding of ecosystems and increase resource management;
- iii) promote an understanding of the need to conserve biodiversity and use biological resources in a sustainable manner;
- iv) maintain or develop incentives and legislation that supports the conservation of biodiversity and the sustainable use of biological resources;
- v) work with other countries to conserve biodiversity, use biological resources in a sustainable manner and share equitably the benefits that arise from the utilization of genetic resources
- vi) provide implementation of the strategy.

Proposed mechanisms for implementing the Turkish Biodiversity Strategy include:

- a) initiating priority actions integrated with ongoing activities;
- b) reporting on policies, activities and plans aimed at implementing the Strategy;
- c) coordinating the implementation of the Strategy;
- d) ensuring that there are mechanisms in place to encourage full participation in the implementation of the Strategy; and
- e) routine reporting on the status of biodiversity.

#### **1.4 Priority Action Plan**

The Strategy prescribes actions proposed to build on existing infrastructure and activities, which will contribute to the achievement of the conservation of biodiversity and sustainable use of biological resources as required by the Biodiversity Convention. The priority action plan calls for a range of projects, which begin the integrated implementation of the Strategy for Turkey. Actions outlined for immediate pursuit are as follows:

1. Arrangements regarding legal and institutional problems, for the conservation of biodiversity.
2. Establishment of protected areas and preparation of management plans for fauna and flora species especially for endemic and endangered ones.
3. Provide training to all levels of the society on conservation concepts, principles and sustainable use of natural resources.
4. Promote environmental public awareness through Cupertino with all stakeholders (agencies, NGOs, media).

## **II. INTRODUCTION**

### **2.1 Importance of Biodiversity to Turkey**

Despite increasing environmental problems, Turkey is among one of the very few countries that retained most of its natural structure. There are still many species that forcibly survive through special artificial means in other countries which are found living in their wild and native forms in Anatolia.

Turkey has cultural practices, a land-tenure system, institutions for managing biological resources, NGOs, universities and public and private organizations. However, Turkey needs trained personnel from various associated disciplines, familiar with both the programs already under way and the laws and policies that govern and guide conservation of biodiversity and use of its biological resources. Together, this diversity and the Turkish people must interact in a way, which will conserve, replenish, and improve on the biotic wealth. It is the purpose of this action plan, to renew the commitment to conservation activities for the benefit of both Turkey and the rest of the world.

Although the term "biodiversity" is relatively new to policy-makers, scientists have been warning of a global crisis for some time and have ranked the decline of biodiversity as one of the most serious global environmental threats now facing humanity. As a result of human activities, ecosystems, species and genetic diversity are being eroded much faster than natural rates. Today species extinction is thought to be between 1,000 and 10,000 times more rapid than before this era of human environmental impact. This accelerating decline in diversity threatens the ecological, economic, spiritual and cultural benefits that we currently derive from the Earth's living resources.

Turkey contains a diversity of ecosystems; including features ranging from Mediterranean coastal zone to snow capped mountains, deep valleys to towering peaks, fertile alluvial plains to bare rocky slopes. These ecosystem mosaics harbor thousands of plant and animal species, their races and populations, many of which are endemic. Found within are different community types and habitat mosaics that have been formed with blends of many different species. Further complicated interactions and intricate ecological processes among the species and their living and non-living environments have been in progress, in every community through thousands of years of successional stages.

Stability and sustainability derived from diversity of these ecological systems is increasingly threatened by man's impacts in Turkey. Our natural resources and biodiversity are in the unfortunate course of "DDD" Deterioration, then Decrease and finally Disappearance. The main reasons for the three D's are: the rapid human population increase and traditions, which sometimes include unwise and extravagant utilization of our natural resources.

### **2.2 What is Biological Diversity?**

Biotic wealth, or biodiversity refers to the variety and variability among living organisms, the ecological complexes in which they occur, and the way in which they interact with each other and their environment. Biodiversity is usually divided into three hierarchical categories - genes, species, and ecosystems.

**Genetic diversity** refers to the variability within a species. This diversity can be measured by the variation in genes within an individual species, population, variety, subspecies, or breed.

**Species diversity** refers to the variety of species within a local area, region, or at the global scale. The number of species in a region - its species "richness" - is the most often used measure.

**Diversity of ecosystems** refers to a community of organisms and their physical environment interacting as an ecological unit. Ecosystems differentiate this level from the community level and include abiotic factors such as fire, climate, and nutrient cycling that influence the composition, structure, and interaction of biotic communities. Biodiversity conservation at the ecosystem level seeks to preserve the basic trophic structure (i.e., the food web which starts from the plants that transform energy of sun into life and then continues with herbivores, omnivores, carnivores and decomposers) and patterns of energy flow and nutrient cycling. At this level, conservation should seek to preserve properties and processes, not just species or assemblages of species.

### **2.3 The Convention on Biological Diversity**

Years prior to the Earth Summit at Rio de Janeiro in 1992, the depletion of biodiversity was recognized as a grave concern requiring co-ordinated international effort if losses were to be stemmed. The Earth Summit became a deadline for which a global agreement might be reached, and negotiations began in the late 1980s under the guidance of the United Nations Environmental Program. It resulted in important global agreements including the Convention on Biological Diversity signed in Rio, and to which Turkey is now a Party.

One hundred and fifty-six governments, including Turkey, made a statement at the Earth Summit in which they accepted the responsibility for conserving the full diversity of plant, animal, and microbial life within their borders, to use biological resources sustainably and to seek the equitable sharing of benefits from biological diversity.

The Convention builds on the concept of sustainable development, which is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. The Convention conveys an understanding of the relationship between human activity and the natural world and the need to sustain living organisms, genetic diversity and the integrity of ecosystems. Implementation of the Convention will require a significant change in the ways we use and manage our natural resources. It requires a co-operative, cross-sectoral approach, based on partnerships, within and among nations.

#### **2.3.1 Turkey's Commitment**

Ratification of the Biodiversity Convention provided a new starting point for recognizing the importance of biodiversity and addressing the issues surrounding it in Turkey. Turkey is already party to all relevant international conventions, with one or more of their objectives being the conservation of biodiversity. However the Biodiversity Convention

seeks to highlight, consolidate and harmonize efforts in the directions which were agreed to in Rio and guide us away from the three D's. Turkey is bound by the terms of the Convention, including the obligation to develop a national biodiversity strategy and action plan.

The Turkish Biodiversity Strategy and Action plan has been developed and is presented here as a guide to implementing the Biodiversity Convention in concert with other obligations and addressing the difficult issues posed by the loss of biodiversity. The implementation of the strategy will be in Cupertino with members of the public and stakeholders, and will pursue the strategic directions according to its policies, plans, priorities and fiscal capabilities.

### **2.3.2 Aim of the Strategy**

The aim of this Strategy is to briefly describe and assess the status of biodiversity in Turkey, to describe the conservation strategy for which there is general agreement, and to prescribe actions that need to be taken in order to achieve the objectives of biodiversity conservation in Turkey. This strategy is: a "living document" that can be updated and adjusted as goals are achieved and conditions changed. It is prepared and presented with the assistance and for the benefit of all citizens and agencies in Turkey that will be involved in its implementation. It will also provide assurance to the international community that there is a plan in place in Turkey that will contribute to the global effort to conserve biodiversity as a priceless and often shared resource.

### III. ASSESSMENT

#### 3.1 Overview of Status of Biodiversity in Turkey

##### 3.1.1 General Overview

More formal descriptions of Turkey highlight several distinct biogeographic regions, each with its own endemic species and natural ecosystems, i.e. The Caucasian Mountain *forests* with the temperate deciduous forest, alpine meadows, Central and Eastern Anatolian *steppe* grasslands and the Mediterranean region, which includes the world's largest remaining Cypress (*Cupressus sempervirens*) forests and Lebanon Cedar (*Cedrus libani*) forests. In addition, Turkish *wetlands* are of crucial importance for many breeding species of birds. For example, Dalmatian pelican (*Pelecanus crispus*), which is a globally threatened bird, breeds in Manyas (Kuş) Lake, Gediz and Büyük Menderes Deltas. Approximately 70 % of the world population of another globally threatened species White-headed duck (*Oxyura leucocephala*) winters in Turkish wetlands especially at the Burdur Lake. In addition, Tuz Lake is most important incubation site of greater flamingos (*Phoenicopterus ruber*). In the midsections of the lake there are two incubation colonies each consisting of 5-6 thousand nests. Millions of migratory birds move between Western Eurasia and Africa each year. In the fall, flocks of storks and birds of prey can be seen from the hills of Camlica in Istanbul. Çoruh Valley, located in the northeast of Turkey is another major migration route, especially for birds of prey.

##### 3.1.2 Land Use Pattern In Turkey

Turkey has a total surface area of 77,482,000 hectares. Land use pattern of Turkey is as follows (1995):

Land use class	Area (ha)	Percentage (%)
Arable	27,118,000	35
Grassland	21,245,000	28
Forest	15,496,000	20
Lakes and water surface	1,286,000	1.6
Others	11,932,000	15.4
<b>Total</b>	<b>77,482,000</b>	<b>100.00</b>

##### 3.1.3 The Major Ecosystems Throughout Turkey

###### 3.1.3.1 Forests

There are two main forest types, one is Temperate Coniferous Forest and the other one is Temperate Deciduous Forest. Sub-grouping of these forest types can be done according to woody species (i.e. pine forest, cedar forest, fir forest, beech forest or mixed beech and oak forest), ecosystem characteristics (i.e. forest in transition zone into steppe and forest in humid, semi-arid and arid zones) and regions (Mediterranean forests, Eastern Black Sea forests, Western Black Sea forests)

The deciduous forests of the Western Black Sea region have a high number of woody species that may reach up to 15 species within very small area. Colhician forests and Alpine Meadows have very high endemism ratios especially above the tree line. Also, it is worth talking about some of the virgin old-growth forests especially in Artvin. Moreover, cedar forests in Taurus Mountains are one of the largest natural Cedar (*Cedrus libani*) forests of the world. The forests of the Taurus Mountains bear very high endemism ratio with number of endemic plant species with.

Regarding of the importance of the existing fauna in the country two of the globally threatened species in Europe, namely the Black Vulture and Imperial Eagle, breed in Turkish forests.

Forest ecosystems include high-mountain and alluvial forests and cover 15.496.000 hectares where almost 50% are degraded. Deciduous forests are prevalent in Turkey and coniferous forests are found at varying altitudes from sea level to timberline. Humid, sub-humid coniferous, and dry forests (oak, black and red pine) as well as shrubs and maquis, are found in the Aegean and Mediterranean regions. Forests in Turkey include, three distinct and different floristic regions, each described later.

### **3.1.3.2 Steppes**

Grasslands, which can be defined as: the areas covered with herbaceous plants, occupies 21.745.000 ha. This figure was 44.300.000 ha in 1935 and 37.800.000 ha in 1950. The figures show a steady decrease in the amount of grasslands. There are several reasons for that. No doubt primary reason is the anthropogenic effect. Most of the grasslands have been plown to gain agricultural areas in the past to meet the food demand of the increasing population. This trend has come to an end in the recent years because almost all potential-areas have already been invaded. What's left now is only the marginal areas with no potential to be used as agricultural areas. Steppe areas which, are considered as being the total of grasslands and the marginal areas, now account over 28.000.000 ha.

Cultivated areas (27.100.000 hectares) cover 35% of the total area of Turkey, the majority being in the steppe ecosystem. Of the total agricultural area, field crops account for 70%, fruits, 5%; vegetables, 2.7%, vineyards, 2% and olive fields, %2.2. The remaining 18% of the cultivated area is used as fallow annually within the cereal growing system. The steppe ecosystem is perhaps one of the most important from the point of view of economics. A large number of food crops, which have been derived from the wild species, which are endemic to Turkey. These have evolved in the region over the ages from wild varieties, many of which are now responsible for feeding the majority of humankind.

### **3.1.3.3 Wetlands**

Wetlands of Turkey display a wide variation of characteristics reflecting the diversity of climate, topography, elevation and soil conditions. Surrounded on three sides by seas and with approximately 1.280.000 hectares of wetlands, while 200.000 ha of wetlands was lost due to drying since 1960's. Wetlands provide habitats for large numbers of water birds and other aquatic species. There are around 250 wetlands, of which many have international significance.

Wetlands are threatened due to different human uses such as pollution, illegal fishing, excessive use of water for agricultural purposes, dam construction).

Wetlands are vital for migrating species. The main reason why Turkey's wetlands are of international importance stems from the country's geographical location. Two of the most important West Palaearctic region bird migration routes pass through Turkey.

More than 200,000 birds of prey enter the route from the Eastern Black Sea region then fly up the River Çoruh and spread out over wetlands throughout eastern Anatolia. This migration through Turkey is the greatest migration of birds of prey in the West Palaearctic Region.

The Bosphorus migration route enters Turkey in Thrace from the west of the Black Sea and passes over the Bosphorus to Anatolia, from northwest to south. It is subject to the pass over of more than 250,000 storks in groups of 200-700 birds, making for one of the most spectacular bird-movements in the world.

Thus, the wetlands of Turkey are more crucial than any other country, in enabling birds to make the long journeys, providing them habitats to embark upon during the course of their migration safely.

### **3.1.4 Flora and Fauna**

Turkey has 75% of the total number of plant species found in the whole of Europe. One third of Turkish flora, which is more than twice as diverse as that of neighbouring countries are found only in Turkey. Cherries, apricots, almonds and figs all originated in Turkey. Turkish flora includes many wild relatives and genetic diversity of important domestic species (e.g. wheat, chickpea, lentil, apple, pear, apricot, chestnut, and pistachio). Turkey is also home to a number of ornamental flowers, the most notable being the tulip. Among continental countries, Turkey ranks 9<sup>th</sup> in terms of biodiversity richness with over 33% of its flora being endemic.

Anatolia is similarly rich in fauna, with over 80.000 species. It is the original homeland for the fallow deer and the pheasant. Lions, tigers and leopards once prowled freely across the Anatolian steppe. Today, the mountains and national parks are still abound with wildlife, such as brown bears, wild boar, lynx, wolves, the occasional leopard and over 400 species of birds, several of them endangered

Turkey's Mediterranean and Aegean coasts provide refuge for the endangered *Monachus monachus*, *Caretta caretta* and *Chelonia mydas*.

The table below lists the numbers of plant and animal species with endemic, rare and extinct ones in Turkey.

Plants and Animal Groups	Described Species	Endemic Species	Rare and endangered Species	Extinct Species
<b><u>PLANTS</u></b>				
Ferns	86	1		
Gymnospermae	23	3		
Monocotyledons	1423	249		
Dicotyledons	7415	2509		
<b><u>ANIMALS</u></b>				
Invertebrates	120.000			
Vertebrates				
Pisces (incl.marine)	472	3	50	
Amphibians	20	1		
Reptilians	93	2		
Aves	454		14	
Mammalian	155	1		

### 3.14.1 Endemism of the Turkish Flora

Turkey is one of the leading countries for known plant endemism; about 33% of the plant species in the flora are endemic to Turkey. The richest family in endemism in Turkey is *Compositae* having a total of 431 species, 40% of which are endemic. Of the 400 species of *Leguminosae*, 41% are endemic, and of the 306 *Labiatae* species, 57% are endemic. Also there are 10 genera, which are endemic to Turkey. It is this exceptional amount of endemism that places a huge responsibility on Turkey to ensure that these species are adequately protected so as not to become endangered or extinct, particularly those, which provide crops upon which much of the world depends.

### 3.1.4.2 Extinct and Endangered Species

It has been confirmed that 8 endemic plant species, which were collected in 19<sup>th</sup> and 20<sup>th</sup> centuries are now extinct. Of those, two were made extinct as a result of flooding beneath the Keban High Dam water reservoir and the others are known to be extinct because of overgrazing and habitat destruction due to human settlements.

There are 104 endangered plant species of which 46 are endemic. Beautiful ornamental plant species such as *Sternbergia candida*, *Saponaria halophilla*, *Glycyrrhiza iconica*, *Thermopsis turcica*, *Helichrysum pershmeni-anum* are also endangered. There are 388 vulnerable plant species of which 183 are endemic.

### 3.2 Status of Biodiversity in the Steppe Ecosystems

#### 3.2.1 Species Richness of Steppe Flora

Forests were known to be covering 70% of Turkey and steppe ecosystem had a very marginal area just surrounding the Tuz Lake around 12.000 years ago. With time, steppe flora dominated the land through anthropogenic modification, causing the destruction of the forest. In the last 50 years, urbanization, industrialization, infrastructure caused a large amount of steppe areas to be lost, and the remaining are degraded due to heavy grazing.

#### 3.2.2 Species Richness of Field and Horticultural Plants and Endemism

Turkey is at the crossroads of two important Vavilovian gene centers: -The Mediterranean and the Near East- each important for the origin of field crops as well as horticultural plants. Some of the cultivated plant species originating in Turkey are *Linum*, *Allium*, *Hordeum*, *Secale*, *Triticum*, *Avena*, *Cicer*, *Lens*, *Pisum*, *Vitis*, *Amygladus*, *Prunus*, *Beta*, etc. There are 5 "micro-gene centre" in Turkey (Harlan 1951):

Thrace-Aegean Region: bread wheat, durum wheat, Poulardwheat, club wheat, einkorn wheat, lentil chickpea, melon, vetch, lupine, and clover.

Southern-Southeastern Anatolia: emmer wheat, einkorn wheat, *Aegilops speltoides*, squash, water melon, cucumber, bean, lentil, broad bean, grapevine, and forage plants.

Samsun, Tokat, Amasya: numerous genera and species of fruits, broad bean, bean, lentil, and several forage legumes.

Kayseri and environs: almond, apple, pea, fruit species, grapevine, lentil, chickpea, alfalfa, and sainfoin.

Agri and environs: apple, apricot, cherry, sour cherry, forage legumes and watermelon.

As the importance of these crops is recognized by the Ministry of Agriculture and Rural Affairs, many species and varieties from each of these genera are grown for the Seed Production and Distribution Program. Field crops include wheat, barley, maize, chickpea, lentil, dry bean, sunflower, potato, soybean, groundnut, sesame, tobacco, cotton and sugarbeet, and forage plant species including alafalfa, sorghum, sainfoin and vetches. More than 200 plant species are under this program, and in addition, there are thousands of local varieties, ecotypes and transition forms maintained by farmers from their own sources.

The total number of grain crops developed and registered in Turkey by using native and introduced progenitors in the last thirty years is 256, of which 95 are wheat, 91 corn, 22 barley, 19 rice, 16 sorghum, 11, oats, and 2 rye varieties. The National Seed Program is constantly developing new varieties so that the number of cultivated species and varieties

is continuously increasing while “obsolete” varieties, such as cultivated einkorn, and emmer, bitter vetch, and lupin disappear from lack of use.

Horticultural crops are numerous with an estimate of 50 vegetable genera being produced with an estimated 100 varieties grown and distributed. This includes tomato, pepper, eggplant, lettuce, cabbage, radish, onion, squash, cucumber, melon, watermelon, bean, pumpkin, pea, spinach, carrot, broad bean, leek, garden rocket, purslane, fennel, cauliflower, parsley, bean and gherkin. By adding the local varieties and those obtained from seeds from other sources, the total number of vegetable varieties grown in the country is estimated to at 200.

Varietal richness is observed also in fruit production. There are probably 80 of the estimated 138 species of fruit grown in Turkey, and the number is increasing with the introduction of some tropical and subtropical fruits such as avocado and kiwi. Varieties of fruits and nuts found in Turkey include: apple, pear, quince, cherry, sour cherry, apricot, peach, fig, pomegranate, mulberry, almond, hazelnut, walnut and pistachio.

Viticulture also takes an important place in Turkish agriculture. Anatolia is the gene centre of grapevines (*Vitis vinifera* L.) where wild vines (*Vitis silvestris*) are also found.

The flora of Turkey is very rich in medicinal and aromatic plants where the rate of endemism is high. Some important genus that are used for medicinal and aromatic purposes are *Delphinium*, *Digitalis*, *Gypsophillia*, *Helychrysum*, *Leucojum*, *Linum*, *Liquidambar*, *Malva*, *Matricaria*, *Mentha*, *Nigella*, *Orchidaceae* ssp., *Origanum*, *Pimpinella*, *Rosa*, *Salvia*, *Sideritis*, *Teucrium* and *Thymus*.

Ornamental plants for indoor and outdoor use, and natural bulb flowers are grown and marketed. Cut flowers are also grown and include carnations, roses, and gladiola. Production of arum, chrysanthemum, hyacinths, lilies, narcissus, and cyclamen is increasing.

### **3.2.3 Species Richness of Steppe Fauna**

Steppe ecosystem of Turkey has many important vertebrate species such; Anatolian mouflon (*Ovis orientalis anatolica*), an endemic subspecies, Steppe Lynx (*Felis caracal*), wolf (*Canis lupus*), *Sicista caucasia*, mole (*Talpa europa*), *Citellus citellus*; and Great Bustard (*Otis tarda*), Lesser Kestrel (*Falco naumanni*) and Short-toe Eagle (*Circaetus gallicus*), hawk (*Buteo* sp.), Falcon (*Falco* sp.), Harrier (*Circus* sp.), Little Bustard (*Otis tetrax*), quail (*Coturnix coturnix*), Hoopoe (*Upupa epops*), which are globally threatened birds live in Turkish steppelands.

Turkey is one of the most important countries for endemism due to its bringing three continents, its climate and topography with its varying ecology and wide range of fauna. It was home to species, which migrated here from the north during the glacial periods, and as the ice receded, it became home to species, which migrated north from more southerly home ranges.

In addition to the natural flora and fauna, introduced species have made Turkey home. Many species belonging to Afro-Ethiopia, Irano-Caspian, Angora and oriental regions are found in Turkey, although zoogeographically Turkey is placed in the Palaearctic zone.

Lack of study on the steppe fauna makes it difficult to describe and list species with any confidence, especially the microscopic and small ones. Insects, for example, have not been listed except for those few studies conducted for particular reasons. Some flatworms with economic importance have also been studied. It is estimated that only 10% of the insect species known to exist in Turkey have been identified so far. Vertebrates, however, are best known as a result of early and detailed studies. Of particular interest are at least 454 native and migratory bird species.

### 3.2.4 Native Races of Farm Animals

Turkey has been a long-standing agricultural country, growing many cultivated plants as well as raising livestock. As a result, a large portion of the country has now turned into degraded steppe due to unsustainable use of the Anatolian ecosystem for agriculture over the ages. A long history of agriculture has produced important field crops and races of animals, which have since been distributed around the world. The estimated numbers of farm animals are:

Cattle	11,031,000
Sheep	29,435,000
Goats	8,057,000
Chicken	236,997,000

Native animal races developed in Turkey include 7 cattle breeds, 18 sheep breeds, 4 goat breeds, 7 horse breeds, and 8 poultry breeds, plus the Angora rabbit. 14% of the existing cattle population consists of high yielding pure breeds, 40.5% hybrids, and 45.5 of native races.

### 3.2.5 Extinct and Endangered Fauna Species

There is little information on extinct fauna in Turkey however some loss has been ascertained for some vertebrate species. Castor (*Castor fiber*) is known to be extinct since the beginning of the last century in Turkey. Great bustard (*Otis tarda*) is a globally endangered species, which is still found in Turkish steppe lands).

Genetic erosion is also occurring when native animals are crossbred with foreign breeds. In one instance, for example, in the Black Sea region, the native cattle have been bred over time to become essentially Jersey cattle. Fortunately only about 25% of the native races have been crossed with other breeds, leaving 75% of the remaining native varieties pure.

In another instance native “Kivircik sheep” in the Thrace Region have been crossed with the German Ots-Friz to develop Tahirova race resulting in genetic erosion of both endemic breeds. Some sheep varieties such as “Karakul” in the north transitional zone and “Tuj” in Kars province are in danger of extinction. Another threatened native animal race is the Angora goat where protection-program to prevent total extinction has been initiated.

### **3.2.6 Factors Threatening Steppe Biodiversity**

Over the last 2,000-3,000 years, there were probably about 1500 small scale and about 70 large-scale migrations of people through Anatolia. Each had an impact on plants and animals, which are economically important, with the major result being the gradual destruction of much of the forest cover.

Reasons for steppe flora degradation are considered to be the following:

1. Excessive increase of human and animal population;
2. Lack of pasture management
3. Ploughing grasslands for cultivation;
4. Misuse of agricultural lands;
5. Diminution of farm lands;
6. Misuse of grasslands;
7. Acceleration of erosion;
8. Destructive effects of road and dam construction;
9. Collecting plants of economic importance;
10. Improper mining

The causes for the alterations in the distribution and presence of Turkish fauna are as follows:

1. Excessive gathering and hunting;
2. Chemicals and fertilizers;
3. Burning the post-harvest mulches;
4. Degeneration of biotopes;
5. Insemination of native animals by alien races;
6. Improper dwellings;
7. Environmental pollution.

Other factors for the degeneration of steppes are:

1. Inadequate education;
2. Scientific inadequacy;
3. Judicial inadequacy;
4. Inadequacy of deeds and land surveys;
5. Political exploitation;
6. Scarcity of funds;

### **3.3 Status of Biological Diversity in Wetlands and Marine Ecosystems**

With its rivers and lakes covering approximately 10.000 square kilometres, Turkey has significant inland water resources important for sustaining its biodiversity. There are seven drainage basins including 26 river basins in Turkey and groundwater is estimated to be 94 billion cubic metres. Annual average rainfall is 652.5 mm. of which approximately one-third reaches the water table and contributes to the wetland environment.

In Turkey, it is agriculture that consumes the most water. The estimated size of irrigation areas is 3.860.000 hectares, with 3.440.000 hectares irrigated with surface water resources and 420.000 hectares with groundwater resources.

In this report, aquatic ecosystems in Turkey include the following:

1. Wetland ecosystems
2. Marine ecosystems

### **3.3.1 Wetland Ecosystems**

Wetlands, as defined in the RAMSAR Convention are “areas of marsh fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish, or salt including areas of marine water, the depth of which at low tide does not exceed 6 metres”. Along with tropical forests, wetlands have the highest biological production. They offer suitable habitats, both for breeding and survival, to different species of a wide variety of animals and plants, especially waterfowl, with many different characteristics. Also wetlands regulate water regime of the region they are in, stabilization of floods and climate, cleansing of waste-water as well as offering fishing, grazing, reed production, hunting, tourism and recreational opportunities, thus providing substantial input to regional economics.

Inland waters occupy 1.6% of Turkey having 200 natural lakes with an approximate area of 906.000 hectares. In addition, dams occupy 380.000 ha. Van Lake, located in East Anatolia, is the largest of natural lakes in Turkey with very high salinity. In Central Anatolian Plateau there are several low-depth salt lakes. Tuz Lake is the largest of these with 128.000 hectares area. Tuz Lake dries almost completely during summer and salt accumulates up to 30 cm at the upper layers of the lake. Only salt-resistant vegetation grows there. Lakes, marshes, deltas, rushes and muddy plains are very important for wildlife especially waterfowl. More than half of the bird species that live in Turkey are migratory. Wetlands are important locations for birds to rest and spend the winter.

Turkey has 26 river basins with a total water flow of 186 billion m<sup>3</sup>. More than half of the surface flow originates from six main basins: Dicle, Fırat, East and West Black Sea, Antalya and West Mediterranean. There are 9 rivers that are longer than 500 km: Kızılırmak, Fırat, Sakarya, Murat, Aras, Seyhan, Dicle, Yeşilırmak and Ceyhan. The annual total discharge of rivers in Turkey is, 41 billion m<sup>3</sup> to Black Sea and 36 billion m<sup>3</sup> to Mediterranean Sea. Dicle and Fırat Rivers run through Iraq and Syria respectively. Deltas are very important for biodiversity especially regarding waterfowl. The deltas formed by the Meriç, Gediz, Büyük Menderes and Küçük Menderes rivers that are flowing to Aegean Sea and the Göksu, Seyhan, Ceyhan Deltas formed by the respective rivers are suitable habitats for a large number and different species of waterfowl as the Anatolian plain freezes during winter.

Other factors contributing to species loss and habitat destruction are:

- construction of some dams in critical areas, changing of their direction and over-use of water from the system;

- decrease of water quality through pollution due to agricultural activities and domestic and industrial disposals;
- the drainage of wetlands to create agricultural areas and to provide residential constructions (Presently these applications are not carried out)
- illegal and over-fishing;
- illegal hunting and collecting eggs of birds and other reptiles and their young;
- over-grazing;
- removal of aquatic plants and uncontrolled reed harvesting and reed burning;
- the use of lagoons for unmanaged fisheries;
- introduction of alien species;
- second dwelling and tourism;
- sedimentation;

### 3.3.1.1 Species Richness and Endemism in Wetlands

Invertebrates living in the running water ecosystems are largely endemic because the geographical structure of Turkey is very complex and separation of rivers by the mountain ranges cause speciation on the evolutionary process, which yields to high endemism ratio and genetic diversity. For example, the Köyceğiz-Dalyan region shows the relation between habitat and species diversity. *Lindenia tetraphylla* is a new species in Turkey and it is reported that this species is about to become extinct in Yugoslavia. *Arctodiaptomus burduricus*, (in the Burdur Lake) adapted to different conditions, is an endemic species and important for genetic diversity. Also, *Aphanius burduricus* is a fish species that has adapted to the lakes characteristics. Similarly, *Alburnus tarichi*, which is an endemic fish species for the Van Lake, has adapted to the extreme conditions of this lake. These sensitive ecosystems can be easily destroyed by environmental changes.

Plants like reed (*Typha sp.*), *Phragmites sp.*, *Scholenoplectus sp.*, *Juncus sp.* occupy large spaces in Turkish wetlands. Also, plants that cover the surface of the water like water lilies (*Nymphae sp.*), as well as sub-water plants such as *Phodophyllum sp.*, *Wolffi sp.*, *Lemna sp.*, and *Ceratophyllum sp.*, *Myriophyllum sp.*, *Potamogeton sp.* are found in Turkey.

Fish are represented by 472 species, 50 of which are threatened in Turkey. 192 species that belong to 26 different families of fresh water fishes have been identified in the researches done up to date. Most common species encountered in our wetlands are; trout, carp, mullet and sea bass. As Turkey is on the migratory routes, it is at a key position for many species of birds. It is known that there are around 454 bird species in Turkey. Common birds for Turkish wetlands are, storks, flamingoes, spoonbill, black winged stilt, avocet, crane, herons and ducks.

### 3.3.1.2 Rare and Endangered Species

Several globally endangered and protected birds such as the Dalmatian Pelican, marbled teal, Pygmy Cormorant, Audoin's gull, the white-headed duck, slender-billed culet, bittern, lesser white-fronted goose, red-breasted goose and ferruginous duck nest in Turkey. In fact, over 70% of the world's white-headed duck population winters in Turkey. Purple gallinule (*Porphyro porphyro*), a species of bird, which has its population on the decline, is breeding in Turkey exclusively in Goksu Delta.

*Lutra lutra* an endangered species, which is under conservation in Europe, exists in many wetlands across the country.

Due to the drying of Amik Lake for agricultural purposes *Anhinga melanogaster rufa*, which was an endemic species for Turkey, has been extinct.

### **3.3.2 Marine Ecosystem**

Turkey is formed of Anatolian and Thracian peninsulas surrounded by four different seas -the Mediterranean Sea, the Aegean Sea, the Marmara Sea and the Black Sea, all having very different ecological features. Salinity is 18 per thousand in the Black Sea, 23 per thousand in Marmara Sea, 32 per thousand in Aegean Sea and 38 per thousand in the Mediterranean Sea. There is no other country in the world with such a high variation on salinity levels along its shores and the variations in ecological structure of these seas affect the life forms, which inhabit them, from phytoplanktons and seaweeds to fish and marine mammals such as dolphins. It boasts the highest biological diversity in the Mediterranean system. The southern coast of Turkey has the highest salinity and temperature. It is also here that many Indo-Pacific species settled after the opening of the Suez Canal through migration from the Red Sea to the Mediterranean. Twenty-six species have been found in this area as a result of migration.

The Black Sea has low salinity. Its average depth is approximately 2,000 metres with a permanent layer having no oxygen below 150 metres. Since the coastal line along the Black Sea is very narrow, benthic living areas are very limited. The number of species in the Black Sea is one-fifth of those in the Mediterranean Sea, yet it comes first in terms of productivity accounting for seventy percent of Turkey's fish production.

The Aegean and the Marmara coasts have been well researched revealing that the surface of the Marmara Sea is under effect of the Black Sea through the Bosphorus. Its deeper areas contain the Aegean-Mediterranean waters with more than 400 benthic species present. Approximately 3,000 plant and animal species have been identified in Turkey's seas. Because of the insufficient number of scientists specializing in this field and insufficient taxonomic studies total numbers are probably significantly higher.

#### **3.3.2.1 Coastal Ecosystems**

The coastal ecosystems in the East Mediterranean region are very rich ecosystems with a diversity of flora and fauna. The following threaten their existence:

- people and vehicles, especially during high tourist season;
- sand removal for transportation elsewhere;
- ongoing agricultural activities such as grazing;
- cutting and/or uprooting plants;
- construction of dwellings around the dunes;
- fires;
- afforestation (this inhibits the natural structure and movement of dunes)
- reforestation disregarding ecological characteristics of the area.

#### **3.3.2.2 Marine caves**

There are thousands of marine caves with very different geological structures along the Turkish coasts, home to many fish and other aquatic life. Although some of them have been identified as monk seal habitat, there has, unfortunately, been little research related to seals' relationships to marine caves in Turkey

Thirty-five to 40% of Turkey is composed of carbonate rocks suitable for cave formation. Only 1,100 caves have been studied and mapped and they are all evidently deteriorating. The most important factors contributing to the destruction of marine caves and to the loss of aquatic organisms are:

- over-pumping of water;
- pollution;
- changes in the direction of the water flow;
- natural threats include earthquakes; collapses; and sudden floods.

Although there are no legal arrangements to protect all of Turkey's caves and their organisms, some of these are in areas that are protected as National Parks (GDNPGW), Natural, Archaeological and Historical Sites (MOC) and as a Specially Protected Area (MOE/ASP). Both legal arrangements and "protection and utilization models" must be determined in order to protect and provide the continuation of Turkey's caves and organisms living in them. No systematic research has been undertaken. Therefore, it is not possible to make a regional classification of aquatic cave organisms and their distribution.

### **3.3.2.3 Islands**

Islands have an important biological diversity. Many migrant species such as passerines use islands on their migratory journey. For example: Audouin's gull (*Larus audouinii*), which is a globally threatened bird species lives and breeds on Aegean Islands.

### **3.3.2.4 Rare and Endangered Species**

There are about 20 species of mammals in Turkish seas including seal, whales and dolphins with most populations rapidly decreasing. Mammals, marine turtles and some of the shark species are more susceptible to decline because they multiply in relatively limited numbers.

The Mediterranean monk seal is considered to be one of the 12 most endangered species in the world. It was estimated that there were 300 - 400 of them between 1987-1991. Less than 50 live on the coasts of Turkey. Habitat destruction, tourism activities and pollution threaten monk seals. Also, seals have been blamed for the destruction of fishing nets and thus killed by fishermen.

Three marine turtle species are found in the Mediterranean and two of them are endangered. Especially 17 areas in Mediterranean coast of Turkey have been recognized as important nesting fields for *Caretta caretta* and *Chelonia mydas*. Habitat destruction forces them towards extinction.

### **3.3.3 Anthropogenic Problems Affecting Biological Diversity in Wetland and Marine Ecosystems**

A trawling survey in the East Mediterranean found large quantities of plastic and other petrochemical products. There would be more expected today. Plastic when ingested by marine turtles and mammals can lead to injury and death. The gradual destruction of a huge productive marine ecosystem such as the Black Sea has dismayed people around the world, which has occurred largely as a result of pollution carried to the sea by rivers. Black Sea, which was oligotrophic originally has turned into eutrophic. Moreover, a Ctenophora species possibly brought to the Black Sea from the Northwest Atlantic through the ballast water of ships, has consumed the zooplankton, which is the primary food of the fish species and has negatively affected the fishery and whole ecosystem. Consequently, many plankton or fish species have either disappeared, or are in danger of extinction.

The breeding area of an economically important fish species such as anchovy has shifted from the northwestern part of the Black Sea, which is a highly polluted area, to its Southeast. The factors affecting the ecosystem of the Black Sea have played an important role in decreasing the annual fish production from 300.000 tons in 1988 to 50-100.000 tons. The dolphin population has also been affected and is decreasing rapidly. The decrease of zooplankton can also result in the increase of phytoplankton creating a harmful environment (red-tide) for marine organisms.

Over-fishing is a major contributor to stock depletion. Anchovies accounted for 60% of the fisheries economy between 1980-88. An anchovy has to live at least one year to reproduce, and the average length of a one-year-old anchovy is 9.5 cm. However, of those caught in 1987-88, 88.8% reached maturity; in 1988-89 only 22.6% reached this stage of development; and in 1989-90, only 1.7 %. A similar situation applies for other species such as codfish, mullet, and horse mackerel.

Illegal fishing is destroying fish and other marine populations. The use of troll nets closer than 3 km. to the land and the use of dynamite for fishing are primary examples of the illegal fishery activities. Fishing with dynamite is widely used on the coasts of the Mediterranean Sea, which kills every organism in its effective area. Further, dynamite used where the monk seals live causes pregnant females to miscarry and to leave their prime habitat.

Some activities having negative effects on biological diversity are inadvertently allowed by the laws and regulations. For example, fish producers are allowed catch young fish without restriction. Since the nets used for catching young perch are not selective, they also destroy millions of young belonging to other species.

### **3.3.4 Protection Programs of Marine Ecosystems and Marine Species**

#### **3.3.4.1 International Programs**

##### **3.3.4.1.1 Mediterranean Action Plan (MAP)**

In 1975, sixteen Mediterranean countries and the European Commission (EC) met in Barcelona under the auspices of UNEP. They approved the Mediterranean Action Plan (MAP), under the UNEP Oceans and Coastal Areas Program, and its component program for Pollution Monitoring and Research in the Mediterranean Sea (MED-POL). MAP consists of three components: scientific (assessment); socio-economic (prospect and integrated planning); and institutional and legal (Barcelona Convention and Protocols). Its aim is not only marine environment matters but also all sustainable development problems connected with coastal areas.

#### **3.3.4.1.2 GEF - The Black Sea Environment Project (GEF - BSEP)**

Faced with a rapidly deteriorating water quality, six coastal countries of Black Sea recently decided to act in concert to revert this degradation. The Convention on the Protection of the Black Sea Against Pollution was signed in Bucharest in 1992 (The Bucharest Convention), and supplemented by ministerial declaration signed in Odessa, Ukraine (the Odessa Declaration), in an effort to provide guidelines for policy and concrete actions.

In the framework of its line of activities in international waters, GEF was asked to provide financial support to the objectives of the Bucharest Convention, through creation of a Black Sea Environmental Program (BSEP). This program was agreed upon and signed 1993. Although the BSEP is essentially GEF initiative, it almost immediately gained additional support from the European Union through the PHARE and TACIS programs, as well as from a number of individual donor countries (Austria, Canada, Denmark, France, Japan, Netherlands, Norway).

The BSEP was endowed with a program co-ordination unit (PCU), located in Istanbul. As the Bucharest Convention develops its own growing body, to be called the Istanbul Commission, the PCU is expected to provide support to the secretariat of this Commission, and gradually become an integral part of it.

The ultimate aim of the program is an-at least partial-restoration Black Sea Ecosystems, and a sustainable, wise use of the sea's natural resources. This enormous challenge, which is estimated to require at least a decade of work and investments, can only meet with success if littoral countries act in concert.

The BSEP's ambition is to sustainably contribute towards this goal by delivering the following end products:

- 1) A short-term strategy to move towards a more sustainable Black Sea Ecosystem.
- 2) Black Sea Action Plan, agreed upon by all littoral states.
- 3) Support systems for the implementation of the work of the Istanbul Commission.
- 4) Training programs for improving the management of the Black Sea Ecosystem at all levels, including that of environmental ecosystems.
- 5) A set of feasibility studies for urgent investments.

All of the items mentioned above were finished. Now, all the countries are preparing their national strategy and action plan and investment portfolio.

### **3.3.4.1.3 NATO TU-Black Sea**

An appropriate model or models, for the control and sustainability of the Black Sea ecosystem, has been researched by all countries neighboring the Black Sea through NATO support.

### **3.3.4.2 National Programs**

#### **3.3.4.2.1 Belek Coastal Administration Plan Project**

The project titled “Coastal Management and Tourism in Turkey: Çıralı- Belek” has been initiated by the Society for Nature Protection (DHKD) with funding from the European Union, Life Program in 1992 and was planned to be finalized in 2000.

93% of the funding for the project comes from the EU and the rest of it is divided between the WWF and DHKD.

The environmental, social, economical and ecological changes, which are due to the tourism investments made integrated planning approach a necessity in coastal areas. The project aims at, the full participation of all interested parties, conservation of the coastal ecosystem and the endangered species, raising the awareness of the local public, generating income alternatives, conservation of local, social, economical and environmental balances and entities and to develop a sustainable development model.

#### **3.3.4.2.2 Marine Turtle Monitoring and Assessment Commission**

Turkey is responsible from the conservation of 17 important marine turtle breeding areas identified by WWF, DHKD and Dokuz Eylul University in 1988 due to the international conventions that its party to. In this context, and in the framework of the Barcelona Convention and its annexed Protocols, an inter-governmental meeting has been organized in 1987, in which an action plan for the protection of marine turtles in the Mediterranean has been agreed. Following this, a “Marine turtle Monitoring and Assessment Commission” has been formed in 1990. Since 1991 this studies of this commission is coordinated by the Ministry of Environment.

#### **3.3.4.2.3 Protection of the Mediterranean Monk Seal in Turkey: The Foça and Yalıkavak Pilot Projects**

An international conference was held in Antalya in 1991 in order to determine national and international strategies for protecting the Mediterranean monk seal, and Foça and Yalıkavak were selected as pilot regions. A National Committee was formed under the co-ordination of the Ministry of Environment. All fishing was banned in the pilot region and some educational activities were undertaken to gain the support of students, fishermen, local administrators and tourists. The public was informed through the press. The fundamental threat to the seals was the destruction of habitat, and it was suggested new protection areas be established around Mersin and Fethiye that could be effectively

monitored where the seals are most frequently seen. It was also noted that these areas should be conserved. The Siren Rocks located in the West of the Orak Island in the Foça region is a natural paradise for both seals and humans due to its unique beauties and features and it has been designated as a specially protected area.

#### **3.3.4.2.4 Protection Programs of Wetland and Marine Ecosystems**

Projects for the conservation of wetlands are made for the Ministry of Environment. These projects are mainly on inventory and management plans oriented. Inventory studies of Ecological and Biological Research of Internationally Important Wetlands Project and, Seyhan and Ceyhan Deltas, Sultan Sazligi, Seyfe Lake, Tuzla Lake, Tuz Lake, Samasam Lake, Kulu Lake, Kozanli Saz Lake, Col Lake, Uyuz Lake, Bolluk Lake, Tersakan Lake, Esmekaya Marshes, Kucuk Menderes and Buyuk Menderes Deltas, Bafa Lake, Gulluk Marshes, Koycegiz Lake, Salda Lake, Corak Lake, Egirdir Lake, Karatas Lake, Yarisli Lake, Kovada Lake, Karamik Swamp, Eber Lake, Aksehir Lake, Cavuscu Lake, Otamis Marshes, Beysehir Lake, Burdur Lake, Marmara Lake, Aci Lake and Hirfanli Dam Lake has been completed.

In the project areas physical and chemical analyses has been made, current situations assessed, biological and ecological wealth has been identified. This information is thought to be used for the "Wetlands Database", which is planned to be constructed. At the same time, in the contexts of projects environmental problems and other developments threatening environmental values has been identified and pollution maps have been made. All the information gathered will be used as a guiding light for future implementations as well as in solution advices and precautionary measures for existing problems.

In the context of Wetland Management Project there has been two Wetland Management Plan Projects made respectively in Burdur Lake and Gediz Delta. It is with these projects that the natural environmental characteristics, use of natural resources and socio-economical characteristics of Burdur Lake and Gediz Delta has been assessed.

#### **3.3.5 Reasons for the Loss of Biological Diversity in Wetland and Marine Ecosystems**

There are essentially 5 reasons given for the loss of biodiversity in aquatic ecosystems in Turkey they are

1. Introduction of alien species;
2. Over-fishing;
3. Illegal hunting
4. Pollution;
5. Destruction of habitats;
6. Tourism;
7. Changes in water regime.

### **3.4 Status of Forest Biodiversity in Turkey**

#### **3.4.1 Species Richness of Forest Flora**

Topographical, climatic and soil differences make Turkish forests quite wealthy in respect of plant biodiversity. Especially the abundance of relic and endemic plants increases the importance of Turkish forests from a biodiversity point of view. One third of the flora of Turkey is from the old times and many of those are endemics. One of the main reasons for this biodiversity is the severe climatic changes that occurred in the fourth geological period. Most of the endemic plant species lay in Taurus Mountains, Nur Mountains and the eastern Black Sea coast.

There are over 40 economically important forest tree species having natural distribution in forest ecosystems. Turkey is a rich country with respect to native forest tree species. There are 5 pine (*Pinus* sp.), 4 fir (*Abies* sp.), 5 juniper (*Juniperus* sp.), one spruce (*Picea* sp.), cedar (*Cedrus* sp.), cypress (*Cupressus* sp.), yewtree (*Taxus* sp.) and a juniper subspecies (*Juniperus drupacea*) each among coniferous native tree species. Among deciduous native tree species; 18 oak (*Quercus* sp.), 10 willow (*Salix* sp.), 4 poplar (*Populus* sp.), 4 alder (*Alnus* sp.), 2 hornbeam (*Carpinus* sp.), 3 ash (*Fraxinus* sp.) and 5 maple (*Acer* sp.), and also elm (*Ulmus* sp.), walnut (*Juglans* sp.), linden (*Tilia* sp.), mountain ash (*Sorbus* sp.), birch (*Betula* sp.) tree species exist. Also one species of plane (*Platanus* sp.), laurel (*Laurus* sp.), beech (*Fagus* sp.), chestnut (*Castanea* sp.), sweetgum (*Liquidambar* sp.) and olive (*Olea* sp.) grow in Turkish forests naturally.

% 82.3 of Turkey's forests is Production Forest, % 15 Protection-Characterized Working Section, % 1.5 of it is Park and % 1.2 of it is Protection Forest.

The number of economically important other plant species is also high; over 20 woody wild fruit trees, over 10 vegetable crops, 14 medicinal, 5 forage and 17 ornamental plant species are present in Turkey's forest ecosystems. These numbers would increase with further work on forest ecosystem inventories.

### 3.4.2 Species Richness of Forest Fauna

Most of Turkey's large mammals live in the forest ecosystem. Turkey presents habitats to many carnivorous mammals such as bear (*Ursus* sp.), fox (*Vulpes* sp.), jackal (*Canis aureus*), lynx (*Lynx lynx*), hyena (*Hyena hyena*) and other mammals such as deer (*Cervus* sp. ve *Capriolus* sp.), chamois (*Rupicapra rupicapra*), wild goat (*Capra aegagrus aegagrus*), wild boar (*Sus scrofa scrofa*), badger (*Meles meles*), Marten (*Martes foina*), hedgehog (*Erinaceus* sp.), hare (*Lepus capensis*), squirrel (*Sciurus* sp.), weasel (*Mustela* sp.) as well as reptiles such as various snakes, chameleon (*Chameleo chameleo*), lizard (*Lacerta* sp.), turtle (*Testudo* sp.) and birds like pheasant (*Phasianus colchicus*), caspian snowcock (*Tetraogallus caspius*), woodpeckers (*Dendrocopus* sp.), caucasian black grouse (*Tetrao mlokosiewiczi*), birds of prey (*Aquila* sp., *Accipiter* sp., *Circus* sp., *Buteo* sp., *Pandion* sp., *Falco* sp., *Pernis* sp.), various owl species and many passerine birds.

Chamois (*Rupicapra rupicapra*), black vulture (*Aegyphius monachus*), imperial eagle (*Aquila heliaca*), wild cat (*Felis silvestris*), Little Spotted Eagle (*Aquila pomarina*) and Spotted Eagle (*Aquila clanga*) are among the species protected under international conventions.

### 3.4.3 Extinct and Endangered Fauna Species

Although there is limited information, it is known that Asian elephant (*Elephas maximus asurus*) has live in lakes and wetlands around Kahramanmaraş and Hatay, and in the valleys of Fırat and Dicle Rivers, until first century B.C. In the same era, wild oxen (*Bos primigenus boganus*) lived in different regions in Anatolia. Wild ass (*Equus hemionus anatoliensis*) has been reported to live around Fırat and Karasu until the end of 12<sup>th</sup> Century A.D. Lions (*Panthera leo persicus*) have been last encountered in the second half of 19<sup>th</sup> century A.D. around Birecik in Fırat valley. Cheetah (*Acinonyx jubatus*) lived in eastern Anatolia until the beginning of the 19<sup>th</sup> century A.D. The last known date that a tiger (*Panthera tigris virgata*) has been hunted is 1970 in the South-east Anatolia.

Apart from the extinct species some mammals are declining such as deer (*Cervus elaphus maral*), Roe deer (*Capriolus capriolus capriolus*), fallow deer (*Cervus dama*), wild sheep (*Ovis amon anatolica*) and gazelle (*Gazella subgutturosa*) are now considered endangered in Turkey.

### **3.4.4 Threats to Forest Biodiversity**

Forests, which once covered most of Turkey have been dwindling step by step for many years. Fuel-wood cutting has totally denuded parts of the country. Of course, as the forest disappears, so do the animals for which it is their habitat. Factors leading to a decline of biodiversity in Turkey's forests can be attributed to the followings:

1. Over-grazing,
2. Air pollution;
3. Alien (invasive) species;
4. Out-of-purpose utilisation of forest land;
5. Global Climatic Change;
6. Forest fires;
7. Harm caused by insects;
8. Uncontrolled collection of plant and animal specimens.

### **3.5 Initiatives for the Conservation of Biological Diversity**

*Ex-situ* and *in-situ* conservation, are two different and generally recognized means of conserving biodiversity, each with special approaches and measures.

#### **3.5.1 Ex-situ Conservation**

*Ex-situ* conservation is achieved through establishing gene banks, seed banks, zoos, botanical gardens, etc. and related measures to be taken to ensure long term viability. Unlike *in-situ* conservation, *ex-situ* conservation of the genetic material is maintained by artificial means.

In Turkey, early studies by the Ministry of Agriculture in 1930 and the Agricultural Faculty of Ankara University in 1933 began *ex-situ* conservation, with about 50,000 seed samples, mostly grains and legumes collected and maintained until 1960 by the Yesilkoy Agricultural Research Institute most of which was then moved to the Aegean Regional Agricultural Research Institute. It still carries out studies concerning the taxonomy,

documentation and preservation of cereals, legumes, forage crops, vegetables, fruits, ornamental, medicinal, and aromatic plant species

*Ex-situ* conservation activities have been undertaken since 1964, and are continuing within the ongoing National Plant Genetic Resources Research Project. The National Seed Bank was established in 1972 in Izmir to preserve the genetic resource material of which collection began in 1964, having been kept in cold storage until 1972. The present facilities of Izmir Gene Bank for seed collection have been designed for the needs of long- and medium term storage. All conditions in the gene bank comply with internationally recommended standards. For the safe duplication of the base collection there is another storage facility in Ankara at the Central Research Institute for field crops.

The national collection contains landraces, wild and weedy relatives (both for seed and vegetative collections), other wild species which are essentially economically important (medicinal, aromatic, ornamentals etc.) and endemic plant species. There are some species from southwest Asia, as well as a small portion of world the wheat and barley collection.

The *ex-situ* conservation is implemented both for generative and vegetative collections, that are preserved in seed bank and field gene banks respectively.

The Agricultural Faculty of Ankara University plants seeds for renewing seed vitality to provide germ plasm for plant breeding and there are about 11,000 seed samples including bread and durum wheat, club wheat, barley, oats, triticale, pigeon peas, lentils, and broad beans. In addition, there are thousands of plant species and seed samples, identified to species, collected from the natural flora of Turkey.

The Ministry of Agriculture as well as Ankara University has contributed to the *ex-situ* conservation of fruit genetic resources by establishing their own collection orchards and vineyards for species which are important for their ecology, and for further improvements of new cultivars. Subsequently, Ataturk and Cukurova Universities have launched similar activities.

The vegetatively propagated material, mainly fruit genetic resources are kept in filed gene banks at 13 institutes. At the Aegean Agricultural Research Institute the vegetative garlic collection, some medicinal and aromatic plants and vegetatively propagated ornamental plants are also kept as a field collection.

### **3.5.2 *In-situ* Conservation**

Conservation of the species in their own ecosystems is an approach, which recognizes our dependence on the natural environment for our survival. The studies on conservation of species in their own ecosystems began in the early 1950s before the concept of "*in-situ* conservation" was widely accepted. Following the founding of the Ministry of Forestry, laws and regulations were put in place to provide for *in-situ* conservation.

Activities of the Ministry of Forestry related to *in-situ* conservation consist of the National Parks, Nature Parks, Nature Reserves, Natural Monuments, Wildlife Reserve Areas, and Forest Recreational Areas. The General Directorate of National Parks and Wildlife Conservation is responsible for the management of these areas, all of which contribute to

*in-situ* conservation. However, most were established primarily for the recreational purposes.

#### Areas Contributing to *In-situ* Conservation in Turkey

Protection Areas	Responsible Agency	No.	Total Area (ha)	Establishment Year (since)
National Parks	MOF	33	641.753	1958
Nature Parks	MOF	16	52.256	1983
Nature Reserves	MOF	35	85.303	1987
Nature Monuments	MOF	54	333	1988
Wildlife Reserve Areas	MOF	123	1.851.317	1966
Conservation Forests	MOF	53	365.884	1950
Gene Conservation Forests	MOF	163	23.408	1994
Seed Stands	MOF	344	46.348	1969
Specially Protected Areas	MOE	13	418.850	1988
Ramsar Sites	MOE	9	159.300	1994
Natural Assets	MOC	750	-	1973
Natural Entities	MOC	2370	-	1973

The preparation of a National *In-situ* Conservation Plan continues under the co-ordination of the Ministry of Environment. The Ministries of Environment, Forestry, Agriculture and Rural Affairs had been jointly executed the GEF funded “*In-situ* Conservation of Genetic Resources Project” in Turkey, which was the first of its kind in the world.

Both government and non-government organizations have been carrying out programs for conservation of biological diversity by various means for a long time. This has been done by (i) *in-situ* conservation programs such as National Parks, Nature Reserves, Nature Parks, Wildlife Reserve Areas, Natural Assets, Natural Entities, Specially Protected Areas, Gene Protection and Management Zones, and (ii) *ex-situ* conservation programs such as Seed and Fruit Orchards, Arboreta, Botanical Gardens, and Gene Banks.

#### 3.5.2.1 National Parks, Nature Reserves, Nature Parks, and Nature Monuments

The concept of “National Park” formed in 1956 was legalized by being described as “protecting the nature, educating the public supplying resting and sportive needs of society and improving tourism”. There are 33 National Parks in Turkey. National Parks are very

important with regard to the conservation of forest, steppes, wetlands and coastal biodiversity.

When the “National Parks Law” was brought into force in 1983, “parts of nature” was used in addition to “forest” allowing this law to be applied to other areas requiring protection as well as forests. Since the main purpose is the protection of nature, recreation and tourism, “Nature Reserve” expression is added to the laws. Nature Reserves are described as “natural areas that have rare, threatened or vulnerable ecosystems and species of significance for scientific and educational characteristics, that include select samples because of natural phenomena and that must be protected and that are preserved for uses of only scientific and educational purposes”.

“Nature Park” is defined as a natural area containing characteristic vegetation and wildlife features and suitable for recreational activities. There are 16 Nature Parks in Turkey.

“Nature Monument” is defined as a natural area having the characteristic and scientific values brought by nature or natural phenomena and protected within the framework of the principles of National Parks. 54 areas have been declared as Nature Monuments in Turkey.

#### **3.5.2.2 Wildlife Reserve Areas**

They are areas, which are reserved in order to protect the game and wild animals whose populations are decreasing, in their natural environments with their habitats without influencing the ecosystem characteristics. In some, there are also breeding stations for the endangered species. There are 123 Wildlife Reserve Areas throughout Turkey.

#### **3.5.2.3 Specially Protected Areas**

When the Mediterranean Action Plan (MAP), came into force in 1988, the “Council of Environment Protection” was formed for the plan to achieve its general objectives, and the concept of “Specially Protected Area” gained legal status. The Law Decree (no 383) was published in 1989 and put into force in order to protect environmental values of specially protected areas declared in accordance with Article 9 of Environment Law, to address their present environmental problems, to preserve and develop their historical and cultural values as well as their biological and ecological resources. There are 12 SPA declared in Turkey. These are particularly important with respect to conservation and sustainable use of biodiversity especially for being marine turtle nesting sites and habitats of the Mediterranean monk seals.

#### **3.5.2.4 Natural Assets**

By the acceptance of the “Law of Antiquities” in 1973, The Ministry of Culture, in order to protect cultural heritage as well as the natural heritage, has started studies according to the concept of “Natural Asset” in the aforementioned Law. The Law of “Conservation of the Cultural and Natural Assets” of 1983, defines the concept “sites” as well as “Natural Entities”. “Natural Entities” include ancient caves, rock shelters, special trees and group of trees.

Sites, which are rich in terms of bio-diversity, are under protection by the Ministry of Culture in the classification of "Natural Asset" in general.

Supreme Board of Protection for Cultural and Natural Assets defined "Natural Assets" in their 05.11.1999/659 decision, as being: "overground, underground or sub-marine assets that belong to geological eras, prehistoric and historic eras and that should be protected because of their rareness or specifications and preciousness".

### **3.5.2.5 Gene Protection and Management Zones**

Gene Protection and Management Zones are defined as being: "the natural and semi-natural areas protected with the purpose of maintaining genetic diversity in target species". GMZ's are *in-situ* gene conservation areas where the evolutionary processes take place in populations of endangered or economically important plant species as well as species with high potential of genetic diversity and differentiation.

### **3.5.2.6 Ramsar Sites**

Turkey has become a party to the Ramsar Convention in 1994. Activities were started in order to become a party to the Ramsar Convention and in 1994 with 5 wetlands (Lake Kus (Manyas), Lake Seyfe, Lake Burdur, Sultan Marshes and Göksu Delta). In 1998, Gediz Delta, Akyatan Lagoon, Lake Uluabat, Kızılırmak Delta and Lake Kuş (Manyas) and Lake Burdur, which a portion of the latter two was already included in the list, was added to the Ramsar List.

## **3.5.3 Status of Biodiversity Conservation in Turkey**

### **3.5.3.1 Development Plans and the Environment**

Environmental policies that reveal concern for biological diversity are reflected in the "Five-year Development Plans" to varying degrees. A brief outline is as follows:

There is no environmental policy stated in the First Five-Year Development Plan for the years between 1963 to 1967. However the Ministry of Forestry initiated its area and species based protection programs in the period. Subsequent National Plans made only minor reference to environmental issues, it was not until the 5th Development Plan that the government adopted the principles of Sustainable Development in keeping with global recognition of its importance. It was only in the 6<sup>th</sup> Five-year Development Plan that inclusion of environmental policies in other sectoral strategies apart from direct environmental strategies occurred. In this plan; the overall aim was "conservation and development of the natural environment"; and the main principle was to implement policies of industrialization, urbanization and agricultural modernization in a manner that will protect social, cultural and ecological structure, prevent environmental pollution and maintain an economical balance among the sectors. In this plan, within the sectors of economy, industry and energy the concept of environment comes up frequently. Still, the 6<sup>th</sup> Five-Year Development Plan is inadequate in that there is no specific reference to concepts like biodiversity conservation and sustainable development. Nowadays, policies that aim at sustainable development focus on environmental management. Environment is

recognized as an element of economical and social assessments related to the sustainable use and conservation of natural resources.

In the context of 7<sup>th</sup> Five-Year Development Plan, the integration of environment with development; with a sustainable development approach, protecting the natural balance and human health ensuring continuous and economically viable natural resource management and leaving the future generations a sustainable natural, physical and social environment has been considered as the main strategy. In the framework of this plan, there was also a specific reference that making use of economical instruments in the integration of environmental policies with economical and social policies and the use of Enforce-Operate/Encourage-Develop approaches in environmental management shall be considered as the main method of action.

In the 8<sup>th</sup> Five-Year Development Plan there is the statement of "The conservation of human health, ecological balance as well as historical and aesthetic values shall be deemed fundamental in enabling economical and social development." Also, there shall be initiative measures for sustainable use of natural resources and the minimization of environmental risks. In the plan, there is also reference to the need for legal, institutional and implementation related arrangements with a holistic approach for possible biosafety oriented risks that may arise from biotechnological processes.

### **3.5.3.2 Legal Status of Biological Diversity**

The legal status of biological diversity in Turkey is reflected in the legal documents such as the Constitution, Laws, International Conventions, Protocols and Related Regulations. There are 35 laws, 3 decrees of law status, 23 regulations, and 10 circulars related to environmental issues, including the Law for Environment, Law on the Conservation of the Cultural and Natural Heritage and National Parks Law's passed in 1983. Many are directly or indirectly related to biological diversity, including Hunting Law passed in 1937 that brings the concept of protection of endangered species for the first time to legislation.

#### **3.5.3.2.1 Constitution**

The Turkish Constitution (1982) stipulates that "the State shall take the necessary precautions towards the protection and utilization of natural resources" and it has some general clauses broadly related to its conservation. For example, Article 56 states that citizens have the right to live in a healthy environment. Article 63 states the principle of protecting cultural and natural resources.

#### **3.5.3.2.2 International Conventions**

Turkey has been party to all conventions below on nature protection, but Bonn Convention.

- Convention for the Protection of Birds (Paris Convention) (1966)
- Convention for the Protection of the Mediterranean Sea Against Pollution (Barcelona Convention) (1988)
- Convention Concerning the Protection of the World Cultural and Natural Heritage (1983)

- Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) (1984)
- Convention on the Protection of the Black Sea Against Pollution (Bucharest Convention) (1994)
- Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar Convention) (1994)
- Convention on Biological Diversity (1996)
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES Convention) (1996)
- United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification Particularly in Africa (1998)
- European Landscape Convention (2000)

### **3.5.3.2.3 Legislation**

Turkish legislation has not been harmonized from a consistent environmental point of view, which presents frequent problems of overlap, lack of legal mandate for institutions responsible for environment related subjects. Clear definition and distinction of responsibility for implementing agencies do not exist. The general approach in Turkish legislation is to protect natural resources, without specific reference to sustainability. Complex relationships between the laws and the implementing agencies and inadequate sanctions that may be imposed for damage to the environment, make enforcement difficult.

Laws in Turkey have been prepared and put into force at different times to meet the requirements of their day. Concepts of “biodiversity” and “ecosystems” are relatively new concerns and previously not considered. For example, “the Law Concerning Drainage of Swamps and Land Thus Acquired” was passed in the 1950's as a measure for eradicating malaria and regulating the allocation and use of lands claimed. The law requires updating and modification regarding the biodiversity richness of wetlands. Although this law possesses an important threat to wetlands, which are major biodiversity resources, it is still in force and there had been no major achievements in the efforts towards its removal.

Existing Forestry Laws and regulations provide for production, harvesting and utilization, including use by and support for rural forest area populations. Significant provisions are also provided for all aspects of forest conservation through establishment of various types of parks and reserves. Although prepared, laws for land tenure and use, rangelands, and regulation of grazing have not been put into force, thus severely undermining efforts for conservation. Lack of such legislation particularly effects “*in-situ*” conservation of large areas of important biodiversity outside of protected areas.

International pressure to include environmental approaches into legislative mechanisms has prompted rapid introduction of complex concepts without supporting legal implementation mechanisms, institutional mandates, and conscious support facilities. Inadequate harmonization of national legislation with international laws and conventions causes contradictions in implementation due to lack of supporting implementation regulations.

### **3.5.3.2.4 Institutional Responsibility**

Various institutions, ministries and organizations have undertaken duties and responsibilities for conserving biological diversity. There is no overall coordinating system for conservation activities in Turkey. Due to various overlaps of mandates there are also no dedicated agencies for conservation of biodiversity in specific ecosystems.

While the Ministry of the Environment creates policies, planning and co-ordination for environmental protection, implementation activities are carried out by some other institutions and ministries such as Ministry of Forestry, MARA, ASPA. In addition, there are some difficulties in putting into effect the rules and regulations related to the protection of natural resources because they are usually contradictory.

MARA has responsibility for co-ordination and utilization of all resources related to agriculture. MOF is responsible from the management of protected areas declared under the National Parks Law. They are the primary institution responsible from the protection of wild life and regulating hunting in Turkey.

Hunting licenses are issued by GDNPGW under MOF and fishing licenses by the General Directorate of Protection and Control, under MARA. Hunting is controlled by MOF based on decisions of the National Hunting Commission, the main monitoring body for hunting, composed of stakeholders from local and central government well as well as the hunter associations.

MOE has been established in 1991 to co-ordinate the activities concerning conservation/protection of wild flora, fauna and their habitats. This environmental legislation states that MOE is the responsible agency for the co-ordination of environment related activities, and co-ordination of the implementation of International conventions and agreements regarding the conservation of nature including Convention on Biodiversity, in Turkey. MOE has duplicated responsibilities with MOF, MARA, and MOC. The Agency for Specially Protected Areas, under the MOE, is presently responsible for protection of Specially Protected Areas in various parts of Turkey with differing unique, natural and historical attributes. Environmental Impact Assessment is required for most of the development investments in Turkey and is processed by MOE in co-ordination with concerned ministries. However staffing constraints of MOE make it very difficult to enforce what regulations imposed.

With the “Law on the Conservation of the Culture and Natural Heritage”, natural, archaeological, urban and historic sites are established throughout the country in order to carry the natural and cultural assets of our country to the future generations.

The Ministry of Culture, executes this duty by its “General Directorate for the Preservation of the Cultural and Natural Heritage” together with the “Supreme Council of the Cultural and Natural Heritage Conservation” which is the main decision organ in establishing the “principle decisions” on conservation, which also acts as a consultant organ to the “Conservation Councils of Cultural and Natural Heritage”, and also with the 18 “Conservation Council of the Cultural and Natural Heritage” which are responsible of determining country-wide sites to be preserved and giving decisions about interventions to these sites.

Responsibility for grassland rests with MARA. However, the grasslands within boundaries of forests are among responsibilities of MOF. MARA also has the authority over the use of pesticides and chemicals.

Shortage of technically trained and specialized staff is a major constraint in environmental conservation programs in Turkey. Inconsistent government personnel allocation policies result in frequent shifting of staff between locations allowing little time for area or subject specific specialization. All ministries suffer from lack of skilled staff, specifically at the field level in rural and nature conservation areas where most biodiversity exists.

Funding for environmental conservation activities ranging from planning and programming to implementation carries low priority in the budgets of the related institutions. Large administrative and staffing budgets leave proportionally smaller allocations for operational activities.

#### **3.5.4. Non Government Organizations (NGOs)**

Conservation education has been carried out but only indirectly and was primarily targeted to prevention of forest fires. In recent years, the private sector has become involved in encouraging fund-raising activities for environmental public awareness with the assistance of NGOs. Concepts of “environment” and “biodiversity” were introduced to Turkey by Government but became very popular through activities of NGOs, as is the case elsewhere. There are no clear provisions in Turkish legislation for NGOs and in their potential input to general environmental, and specifically, biodiversity conservation activities which, are therefore, severely hampered. Legal impediments related to financing mechanisms available to NGOs, their ability to collect donations or raise funds, as well as regulatory constraints regarding Cupertino with international NGOs are major problems.

In spite of the existing problems facing NGOs, a number of internationally important flora, fauna species and their habitats have been put under protection through their efforts in collaboration with international organizations and many activities that have adverse effects on the species and their habitats were stopped. For example, as a national NGO, the Society for the Protection of Nature in Turkey (DHKD), is an associate member of the WWF and is the Turkish partner of BirdLife International. It has carried out marine turtle nesting projects in 17 areas including impact assessments of fisheries, important bird and plant area projects, and integrated wetland management project for the Goksu Delta as well as biodiversity conservation projects in several deltas and lakes. Bodrum Volunteer Association is associated with Greenpeace and A SEED, and has provided help during the implementation of the Monk Seal Project in Bodrum area. Turkish Environment Foundation (TÇV) has many publications related to nature conservation. Other international NGOs are also involved to different degrees in biodiversity conservation in Turkey. Sualtı Araştırmaları Derneği (SAD) is working with the Mediterranean Monk Seals and coastal areas.