

# BULGARIA'S BIOLOGICAL DIVERSITY

Although Bulgaria is a relatively small country, it is rich in biological diversity due to its highly varied climate, geology, topography, and hydrology. Bulgaria covers an area of 110,912 km<sup>2</sup>. This land base can be divided into five general regions. The Danubian plain straddles the Danube River along the northern border with Romania. The Stara Planina (also known as the Balkan Mountains) stretches across the country from the western border to the Black Sea coast. South of the Stara Planina Mountains are the central plains and valley of the Maritsa River. The southwestern quarter of Bulgaria consists of the high mountains of the Rila, Pirin, and Rhodope chains. The Black Sea coast forms the eastern border of the country.

Bulgaria sits at the crossroads of three broad bioclimatic regions -- the mid-European continental, Eurasian steppe, and Mediterranean -- that overlap and create a range of transitional climate conditions. The complex topography of mountain massifs, foothills, lowlands, and plains provides a high degree of variation in microhabitats and determines the vertical distribution of life zones, from the alpine forest belts of the high mountain peaks to the dune communities along the Black Sea coast. Diverse rock and soil substrates, hydrological conditions, and aquatic sys-

Graphic has been removed

tems (including the Black Sea and Danube River) contribute to the wide range of habitat conditions. In addition, the effects of the Tertiary and Quaternary periods are evident in the presence of many relict and endemic plant and animal species. This variation in habitat types and biogeographic influences has given Bulgaria a level of floral and faunal diversity that ranks among the highest in Europe.

Most of Bulgaria's land has been extensively altered by human use. As of 1990, about 62 percent of the land base (and almost all of the lowlands) was in agricultural production (see Box 8). Most of the rest consists of forested land. Forestlands total about 3.9 million hectares (35 percent of the country's total land base). The forests are dominated by oaks (*Quercus* spp.) up to 1,000 m, beech (*Fagus* spp.) and other broad-leaved trees between 1,000 and 1,500 m, and conifers (primarily *Picea abies*, *Abies alba*, and *Pinus* spp.) in the higher elevations up to

about 2,200 m. Coniferous forests cover about 1.1 million hectares and broad-leaved forest about 2.2 million hectares. About 60 percent of the forested area (2.3 million hectares) consists of forests of natural origin, the balance being stands of artificial origin. The remainder consists of other vegetation types, such as coastal marshes, brackish and freshwater wetlands, grasslands, and shrub communities, as well as inland waters and developed areas.

## AN OVERVIEW OF BIOLOGICAL DIVERSITY

The National Biological Diversity Conservation Strategy (NBDCS) workshop brought together a broad spectrum of specialists in the natural and applied biological sciences to present and discuss the state of knowledge of biological diversity within their areas of expertise. These scientists and their collaborators were asked to summarize, with the aid of maps generated through geographical information system technology, information under the categories of species richness; rare species; endemism; ecosystems, habitats, and unique communities; ecological services; fragility under specific human activities; known threats; sites containing representative samples of Bulgaria's biological diversity; species of proven or potential economic importance; and areas requiring further study.

Some of these categories were more appropriate for some taxonomic groups than for others. In a number of cases, the available information allowed only tentative estimates and was inadequate to generate meaningful maps. Despite such gaps, the workshop provided a comprehensive overview of Bulgaria's biological diversity and its status. The findings are reviewed in this section. Table 1 at the end of this chapter summarizes species-level data (and, where appropriate, data pertaining to other taxonomic levels) in four categories: number of described species, rare species, endemic species, and known extinctions. The data are derived from the expert assessments presented at the NBDCS workshop as well as from other published sources. It should be noted that data for

many of these categories are preliminary, and require further research.

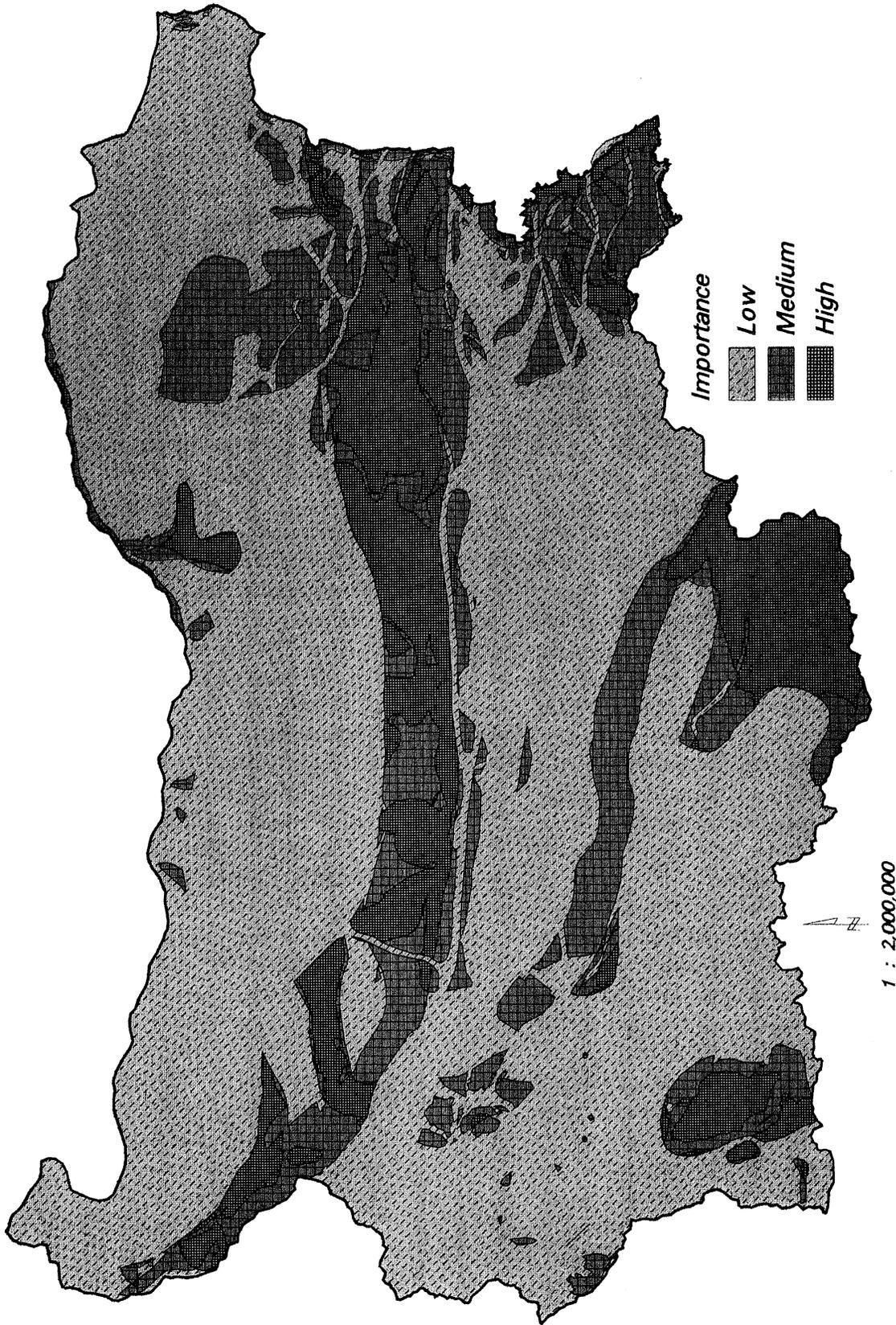
## Species Richness

Bulgaria's biota ranks among the most species-rich in Europe, especially relative to the country's size.

The Bulgarian flora is known to contain between 3,550 and 3,750 species of vascular plants, some 3,000 algae, 668 mosses, and 58 ferns and fern allies, as well as more than 700 species of lichens. About 2,100 taxa of macromycetes fungi have been described for Bulgaria (as compared with a total of 5,500 species for the world).

More than 20,000 invertebrates have been described for Bulgaria. This total includes more than 1,800 taxa of protozoans and more than 2,500 arachnids, mollusks, nematodes, and other noninsect invertebrates. About 85 percent of the known invertebrates are insects. Almost 17,500 insect species and subspecies have been described, and the total number has been estimated at 27,000. Within several insect orders (e.g., the Ephemeroptera, Heteroptera, and Orthoptera), more species are known to occur in Bulgaria than in all of Central Europe. Of special note is Bulgaria's unusually diverse invertebrate cave fauna.

The vertebrate fauna has been studied most extensively and is known to include some 730 species: 94 species of mammals, 383 birds, 36 reptiles, 16 amphibians, and 207 Black Sea and freshwater fish. Within these groups, Bulgaria can claim several special distinctions. Only Spain and Greece have as rich a herpetofauna. With 29 species of bats, Bulgaria is home to virtually all the extant species in Europe. The large mammal fauna, with 23 extant species, is among the richest in Europe, and includes the wolf (*Canis lupus lupus*), brown bear (*Ursus arctos*), badger (*Meles meles*), two species of marten (*Martes martes* and *M. foina*), three species of polecat (*Mustela eversmanni*, *M. putorius*, and *Vormela peregusna peregusna*), three species of deer (*Dama dama*, *Cervus elaphus*, and *Capreolus*



MAP 2. SPECIES RICHNESS

Categories of importance for species richness reflect composite rankings based on assessments of the known or estimated numbers of species present, or of the value of an area in terms of species richness

*capreolus*), and three marine mammals (*Dolphinus delphis*, *Phocaena phocaena relicta*, and *Tursiops truncatus ponticus*). A fourth marine mammal -- the Black Sea monk seal, a distinct form of the Mediterranean monk seal (*Monachus monachus*) -- is presumed to be extinct.

Current data on the numbers of described species are summarized in Table 1. The number of described species is not, of course, equivalent to species richness. Only in the "higher" taxonomic groups (i.e., vascular plants and vertebrates) can the number of described species be considered more or less equivalent to total species richness. Among insect orders, the number of described species may represent anywhere from 28 percent (Diptera, 2,800 described species out of an estimated total of 10,000) to 100 percent (Isoptera, 2 described species out of a total of 2) of total species richness. Among less studied groups -- algae, protozoans, and aquatic invertebrates -- knowledge of species richness is still far from complete and will be more difficult to ascertain. Even within well-studied groups, the classifications of species and subspecies are subject to revision. Despite these difficulties, the state of knowledge about diversity within these groups is more advanced in Bulgaria than in most countries.

Available information on the levels of species richness in the Bulgarian landscape has been synthesized in Map 2. The map incorporates available data on fungi; algae; vascular plants; all invertebrates; aquatic organisms of the Danube River, Black Sea, and Aegean Sea basins; freshwater fish of the Danube and selected rivers; amphibians; reptiles; birds; and mammals. The map also incorporates data on plant communities dominated by Bulgarian and Balkan endemics due to the significance of centers of endemism as indicators of species richness. Based on these data, the areas of highest species richness for all taxonomic groups include the Stara Planina Mountains, Pirin Mountains, Rhodope Mountains (especially the eastern portions), Strandzha Mountain, Maritsa and Lom River basins, and Black Sea coast.

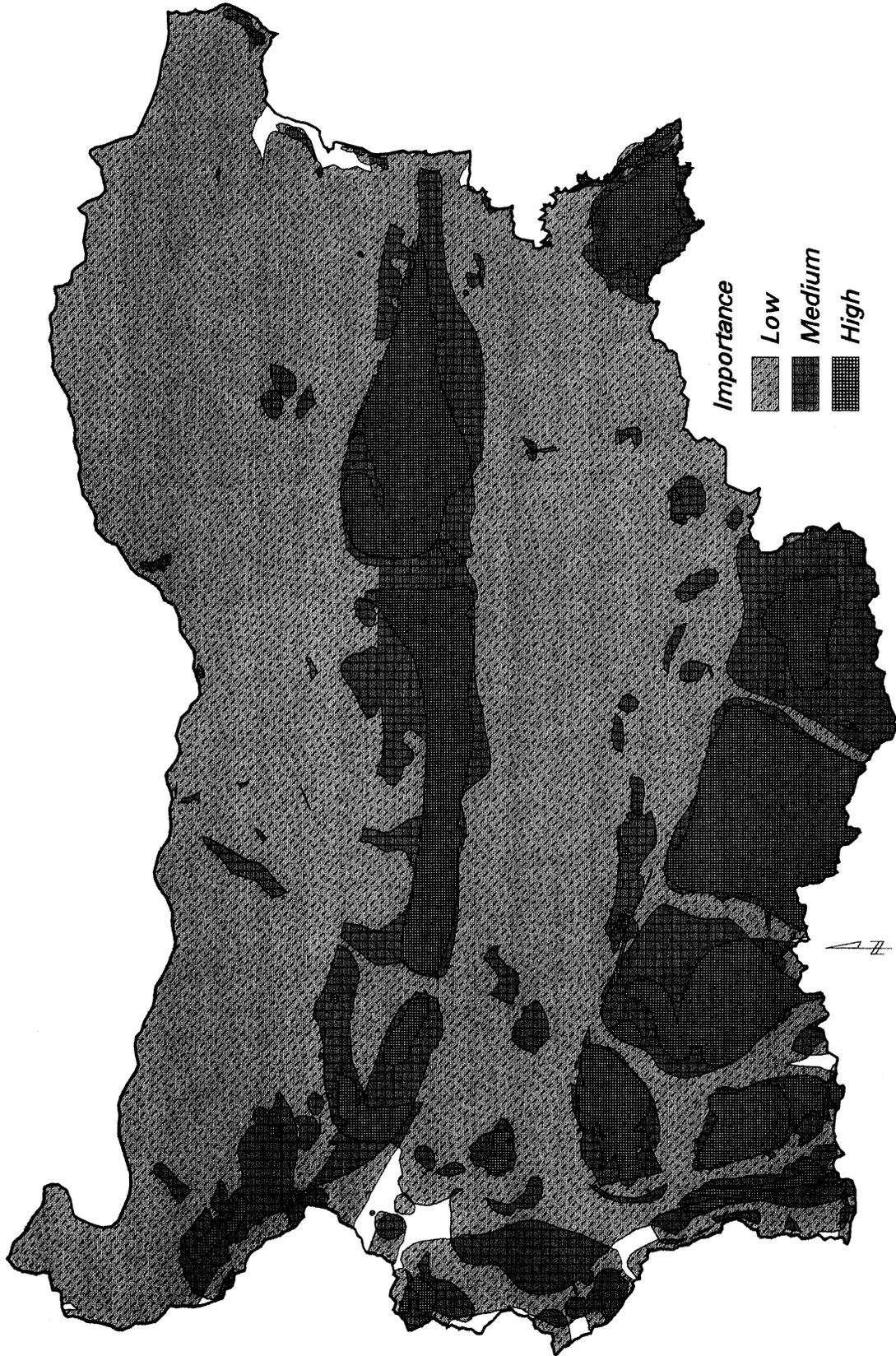
## Endemism

Bulgaria's biota includes significant numbers of endemic species and subspecies. Among the protozoa, fungi, and nonvascular plants, endemism is difficult to establish. For the vascular plants, insects, other invertebrates, and vertebrates, endemism is easier to confirm and an important criterion in setting conservation priorities. (For these latter groups, it is also useful to identify both Bulgarian and Balkan endemic organisms.)

The Bulgarian vascular plant flora contains 170 Bulgarian endemic species and 100 subspecies, and 200 Balkan endemic species and subspecies. Bulgarian endemic organisms constitute about 5 percent of the total flora, a high proportion compared with other, larger European countries. If subspecies are taken into consideration, the percentage becomes even greater (8 percent). Furthermore, many Balkan endemic organisms are believed to have originally occurred in, and subsequently spread from, Bulgaria (primarily the mountain regions). If these species are also taken into account, the degree of plant endemism in Bulgaria rises significantly.

Endemism for both the Balkan Peninsula and Bulgaria has been established for 387 noninsect invertebrate species (8.8 percent of all species, including protozoans) and for 744 insects (4.3 percent of all insect species). Among the noninsect invertebrates, the degree of endemism is highest for the Crustacea (50.5 percent of known species) and Myriapoda (48.4 percent). Among the insects, endemism is highest for the Orthoptera (28 percent) and Plecoptera (25 percent). As more research is conducted on invertebrates, both the absolute number and the percentage of endemic species are likely to rise.

Known endemic vertebrates include 12 freshwater fishes, 1 amphibian subspecies, and 4 reptile subspecies. Recognition of endemism among mammals depends highly on the currently accepted status of the taxa. For example, three subspecies of bats were once considered endemic to Bulgaria, but their taxonomic distinction is no longer recognized. Two small



MAP 3. ENDEMIC TAXA

Categories of importance for endemic taxa reflect composite rankings based on assessments of the known or estimated number of endemic taxa present, or of the value of an area in terms of endemic taxa. Note: unshaded areas were not ranked by any contributors as having importance for endemic taxa.

mammals that occur primarily in Bulgaria -- the Bulgarian golden hamster (*Mesocricetus newtoni*) and a dormouse (*Myomimus roachi*) -- can be considered regional endemics. Among large mammals, at least 4 endemic subspecies -- the bottle-nosed dolphin (*Tursiops truncatus ponticus*), the harbor porpoise (*Phocaena phocaena relicta*), the chamois (*Rupicapra rupicapra balcanica*), and the European marbled polecat (*Vormela peregusna peregusna*) -- are widely accepted. Some experts also consider the local populations of the brown bear (*Ursus arctos*) and least weasel (*Mustela nivalis*) to be Balkan endemics.

Data on the number of endemic species and subspecies are summarized in Table 1. Available information on the spatial distribution of endemic taxa has been synthesized in Map 3. The map incorporates data on the endemic Bulgarian and Balkan algae, medicinal plants and other vascular plants, and invertebrates; the endemic Balkan mammals; and the endemic Bulgarian fishes, amphibians, and reptiles. The map also incorporates data on plant communities characterized by a high level of endemism. The most important regions in terms of the presence of endemic species are the Stara Planina, Rhodope, Pirin, Vitosha, Rila, and Strandzha mountains and the Strouma River valley. By definition, of course, many endemic taxa are highly localized in their distributions. This is reflected in the outlier areas of high endemism within the map. More detailed descriptions of these areas can be found in the papers presented at the NBDCS workshop.

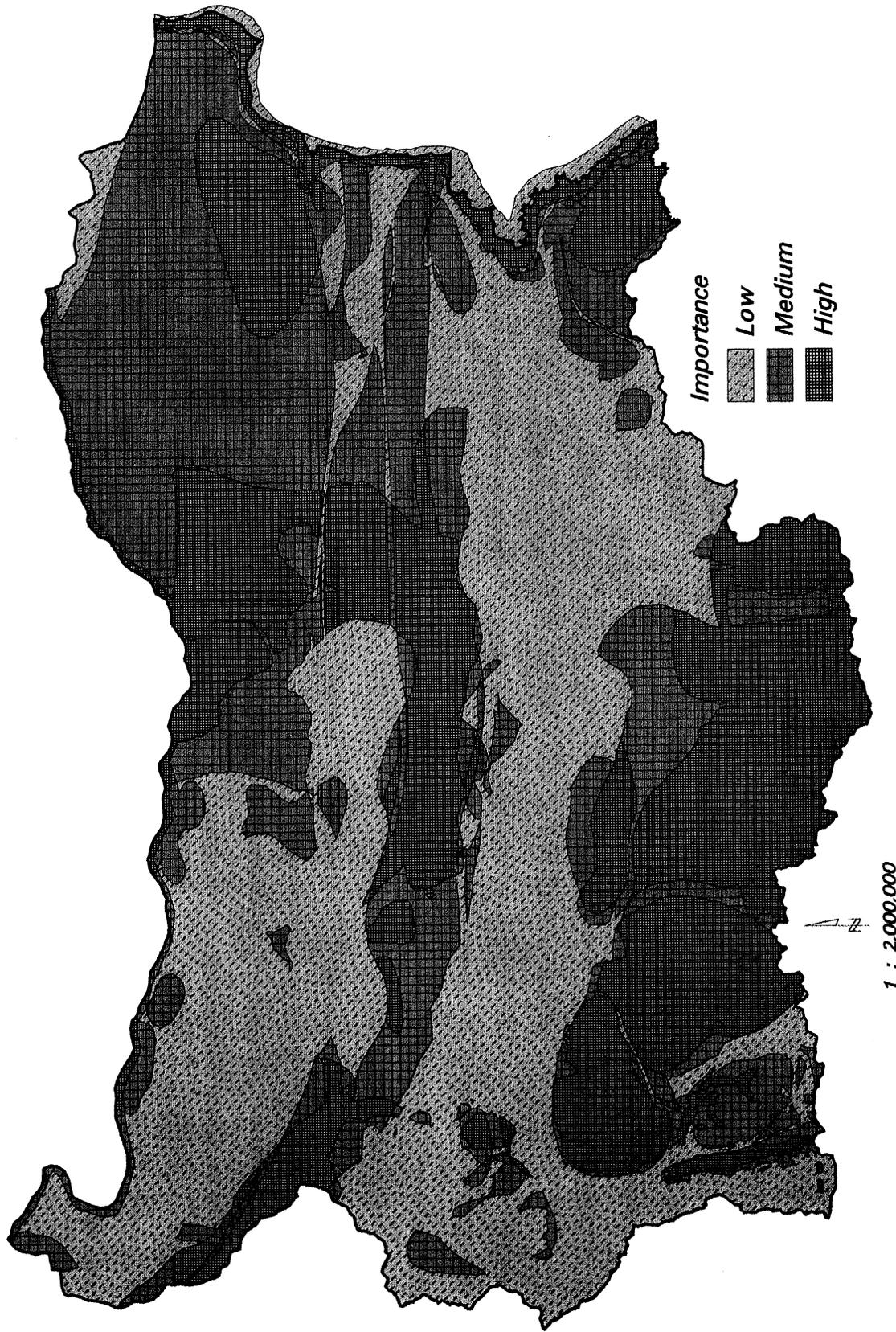
### Rarity

The incidence of rarity varies significantly among the different taxonomic groups. The particular biological characteristics of some groups, such as algae and fungi, make it exceedingly difficult to identify rare species with any certainty. For other groups, such as the bats and herpetofauna, there are few rare species; most species in these groups are relatively widely distributed and are common or abundant in other parts of their ranges.

Based on available information, some 69 species of algae, moss, and other nonvascular plants and 25 forms of lichen can be considered rare. More than 700 vascular plants, many of which are high mountain endemic species, are considered rare. The 1984 *Red Data Book of the People's Republic of Bulgaria (Volume 1, Plants)* listed 574 species "of special scientific interest," 330 species protected by the Law for the Protection of Nature, and 150 species threatened with extinction.

Among invertebrates, rare species are relatively numerous due to their restricted populations and limited ranges. Based on current assessments, 23 percent of noninsect invertebrates (567 species) are considered rare, a high figure relative to other taxa. (The degree of rarity is highest among the protozoa, nematodes, and arachnids.) More than 1,500 insect species are considered rare. Among insect orders represented by more than 50 species, those with the highest percentage of rare species are the Plecoptera (29 percent), Neuroptera (27.4 percent), Odonata (26.6 percent), Ephemeroptera (18.6 percent), and Trichoptera (18.0 percent).

Rare vertebrates include 29 species of Black Sea and freshwater fish and 2 snakes (*Coluber rubriceps* and *Vipera aspis balcanica*). Seventy-eight birds (including 16 globally threatened species and 61 species listed in the 1985 *Red Data Book of the People's Republic of Bulgaria (Volume 2, Animals)*) are considered rare. Many of these are raptors. Nineteen mammal species (including 2 extinct species) were listed in the *Red Data Book*. There are few rare small mammals. Several species exist in relatively high numbers, but they are confined to limited ranges; others occur as scattered populations in a limited number of locations. Seven bat species exist in limited numbers in Bulgaria, but are relatively abundant in other countries. For the purposes of this strategy, 10 large mammals are considered rare: the four endemic subspecies noted previously, the brown bear (*Ursus arctos*), wolf (*Canis lupus*), steppe polecat (*Mustela eversmanni*), pine marten (*Martes martes*), otter (*Lutra lutra*), and wild cat (*Felis sylvestris*).



MAP 4. RARE TAXA

Categories of importance for rare taxa reflect composite rankings based on assessments of the known or estimated number of rare taxa or the value of an area in terms of rare taxa.

Data on the number of rare taxa are summarized in Table 1. Available information on the spatial distribution of rare taxa has been synthesized in Map 4. The map incorporates data on rare fungi, plants, invertebrates, fish, amphibians, reptiles, birds, and mammals. The map also incorporates data on rare plant communities dominated by relict species. Distribution patterns, it should be noted, vary widely among the different taxa. For example, the Strouma River valley and the southern Black Sea coast support the highest number of known rare insect species. The highest concentration of rare bird species is found in the Atanasovsko Lake region along the Black Sea coast. Rare plants, primarily endemic angiosperms, are found most frequently in the higher mountains. Especially important areas for the presence of rare species in general are the Rhodope, Rila, Strandzha, and central and western Stara Planina mountains; the Black Sea coast; the Strouma River valley; and the eastern and central Danubian plain.

### Extinctions

Numerous species are known to have become extinct in Bulgaria in recent years as a result of anthropogenic pressures (see Table 1). They include at least 2 Black Sea algae species and 4 additional nonvascular plants. According to the *Red Data Book* of Bulgarian plants, 31 vascular plant species have become extinct since the 1930s. Five of these were endemic to Bulgaria.

Extinctions are difficult to document for invertebrates due to the lack of information on their current and historic occurrence and the problems associated with studying and monitoring their populations. Despite these difficulties, seven extinctions have been recorded among invertebrates (all in the Ephemeroptera).

Among vertebrates, two snakes (*Vipera aspis* and *Vipera ursinii*), the European mink (*Mustela lutreola*), and the lynx (*Lynx lynx*) are listed in the *Red Data Book* as extinct in Bulgaria. Three species of native fish -- *Lampetra*

*planeri* and *Eudontomyzon danfordi* (in the Petromyzonidae family) and *Knipowitschia longocuadata* (Gobiidae) -- are no longer found in Bulgaria. Nine bird species have been extirpated and are listed in the *Red Data Book* as extinct. Six of these -- the white pelican (*Pelecanus onocrotalus*), black vulture (*Aegypius monachus*), black grouse (*Tetrao tetrix*), Eurasian crane (*Grus grus*), snipe (*Gallinago gallinago*), and pygmy owl (*Glaucidium passerinum*) -- no longer breed in the country but do occur during migration. The other three species -- the lammergeier (or bearded vulture) (*Gypaetus barbatus*), demoiselle crane (*Anthropoides virgo*), and little bustard (*Tetrax tetrax*) -- no longer breed in or migrate through Bulgaria. The Black Sea monk seal is now thought to be extinct, although individuals have been sighted as recently as 1991. In recent years, the endemic subspecies of harbor porpoise and bottle-nosed dolphin have become seriously endangered and may also be nearing extinction.

In addition to these wild species, six indigenous domestic animal breeds -- the Rila Monastery Sheep, the Local Klepoucha Pig, the Local Pravoucha Pig, the Deliorman Horse, the Kamchia Horse, and the Rila Planina Horse -- have disappeared in recent decades.

### Unique and Representative Communities and Ecosystems

Bulgaria is characterized by a wide variety of plant and animal communities, and contains almost all of the main habitat types found in Europe. Among them are a number of unique and representative communities and ecosystems that are especially valuable in terms of biological diversity. Many are well represented within the existing system of protected areas (see Box 4). Others, such as native steppes and riparian forests, are underrepresented, often because they were largely displaced before a network existed to protect them. Bulgaria's unique and representative communities include the following:

- Alpine and subalpine coniferous forests, meadows, wetlands, peat bogs, and lakes in the high mountains -- the Rila, Pirin, Stara Planina, Vitosha, and Rhodope mountains, as well as the Belasitsa, Maleshevska, and Slavyanka mountains.
- Mature coniferous and beech forests in the mountain regions. Especially important are the primary forests of fir (*Abies alba*), spruce (*Picea abies*), and pine (mainly *Pinus peuce*, *P. sylvestris*, and *P. nigra*) in the Rila, Pirin, Rhodope, and central Stara Planina mountains; the Mugho pine (*P. mugo*) scrub forests in the Rila and Pirin mountains; and the unique beech (*Fagus orientalis*) forests of Strandzha Mountain.
- Oak (*Quercus* spp.) woodlands and forests, primarily in the lower elevation mountains and adjacent foothills and plains.
- Karst regions, especially in the Rhodope Mountains, the central Stara Planina, the Pirin Mountains, and Slavyanka Mountain. These regions are notable for their high diversity of endemic plants, birds of prey, and bats. These regions contain most of Bulgaria's 5,000 caves, with their rich cave-dwelling fauna.
- Gorges throughout the main mountain ranges, many of which serve as refuge or outlier habitats for rare and nontypical flora and fauna.
- Mediterranean and sub-Mediterranean communities in the Strouma River valley (especially the Kresna gorge and the Sandanski-Petrich plain), the Maritsa and Mesta River valleys, the eastern Rhodope Mountains, the Sakhar hilly region, Strandzha Mountain, and along the southern Black Sea coast.
- Mesophytic grasslands of the lowland plains, remnants of native steppe communi-

Graphic has been removed

ties, and natural lowland forests (especially of *Quercus pedunculiflora*).

- Riparian shrub and forest vegetation (primarily *Salix*, *Populus*, and *Alnus* spp.) along the Danube and smaller rivers (especially the Batova, Kamchia, Ropotamo, Tundzha, and Veleka).
- Wetlands along the interior rivers, and at major complexes near Belene Island, Srebarna Lake, Shabla (the northern Black Sea coast), the mouth of the Kamchia River, the Bourgas lakes, the mouth of the Ropotamo River, and other portions of the southern Black Sea coast.
- Vardim Island, Belene Island, and other seasonally flooded islands in the Danube River, which are especially important breeding habitats for birds.