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World Conservation Union

East European Programme

The Lowland Grasslands of Central and Eastern Europe



IUCN East European Programme
In collaboration with
Biodiversity Conservation Strategy Programme
of IUCN, WRI, UNEP

The Lowland Grasslands of Central and Eastern Europe

This One



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Contents

Foreword	v
Acknowledgements	vi
Introduction	1
Albania	8
Bulgaria	12
Czechoslovakia	18
Eastern Länder of the Federal Republic of Germany	24
Hungary	31
Poland	45
Romania	60
Western Soviet Republics	64
Yugoslavia	72
Further Action	80
Bibliography	83
Appendix 1: Key to tables of sites identified by indicator species	85
Tables	
1 Lowland grassland sites in Albania identified by indicator species	9
2 Lowland grassland sites in Bulgaria identified by indicator species	14
3 Lowland grassland sites in Czechoslovakia identified by indicator species	21
4 Lowland grassland sites in the Eastern Länder identified by indicator species	28
5 Major areas of grassland in Hungary with their protection status, grassland types and present threats	34
6 Lowland grassland sites in Hungary identified by indicator species	40
7 Areas of lowland grassland in Hungary protected by international conventions	42
8 Lowland grassland sites in Poland identified by indicator species	55
9 Lowland grassland sites in Romania identified by indicator species	62
10 Total area of lowland grassland and total area within nature sanctuaries in the Western Republics of the USSR	65
11 Lowland grassland sites in the Western Soviet Republics identified by indicator species	66
12 National parks in the Western Soviet Republics which include areas of grassland (as on 1 January 1989)	68
13 Nature reserves in the Western Soviet Republics which include areas of grassland (as on 1 January 1989)	71
14 Lowland grassland sites in Yugoslavia identified by indicator species	74

Figures

1	Sites with less than 500mm annual precipitation	2
2	The pannonic region, characterised by annual precipitation of less than 450mm	3
3	Locations of lowland grassland sites in Albania, identified by indicator species	10
4	Locations of lowland grassland sites in Bulgaria, identified by indicator species	15
5	Locations of lowland grassland sites in Czechoslovakia, identified by indicator species	20
6	Distribution of permanent pasture in the Eastern Länder of the Federal Republic of Germany	25
7	Locations of lowland grassland sites in the Eastern Länder of the Federal Republic of Germany, identified by indicator species	27
8	Distribution of steppe and steppe-like habitats in the Hungarian lowlands in the 1980s	31
9	Distribution of meadow and pasture in Hungary	38
10	Locations of lowland grassland sites in Hungary, identified by indicator species	39
11	Distribution of the main types of lowland grassland in Poland	46
12	Regional distribution of grassland in Poland in 1973 as a proportion of agricultural land and the proportion of the three main types of grassland by region	48
13	Regional distribution of grassland in Poland in 1988 as a proportion of agricultural land and the proportion of the three main types of grassland by region	49
14	Proportions of the three main types of grassland in Poland in 1973 and 1988	50
15	Locations of lowland grassland sites in Poland, identified by indicator species	53
16	Distribution of the two types of nature reserve in Poland which could protect lowland grassland	54
17	Locations of lowland grassland sites in Romania, identified by indicator species	61
18	Locations of lowland grassland sites in the Western Soviet Republics, identified by indicator species	67
19	Locations of nature reserves in the Western Soviet Republics which include grassland	70
20	Distribution of valley pasture in Yugoslavia	73
21	Locations of lowland grassland sites in Yugoslavia, identified by indicator species	76

Foreword

Natural steppe grassland is an ecosystem often associated with the USSR and eastern Europe but the condition of this habitat is little understood and poorly documented. Correspondingly, managed and semi-natural grasslands are widespread in Europe but have received little attention as an important wildlife habitat in their own right, in contrast to "natural" ecosystems such as certain forest types.

The managed and semi-natural grasslands are usually dependent on certain farming systems, most often "traditional" grazing, mowing and pastoralism practised in the absence of intensive chemical use. Over the past 30 years, these traditional systems have, in much of Europe, been replaced by intensive farming practices due to pressure on farmers to maximise crop production. Over this period, little, if any, consideration was given to the effects on both natural and semi-natural grasslands and their characteristic flora and fauna.

Over the past few years several initiatives have brought grasslands to the fore, beginning with the publication of The Council of Europe report on "Dry Grasslands of Europe" in 1981. Since then there have been two European Forums on Birds and Pastoralism (11-14 November 1988 and 26-30 October 1990) and also a seminar specifically to consider all aspects of the conservation of lowland grassland birds in Europe (held at the University of Reading in March 1991). The International Council for Bird Preservation's [ICBP] Bustard Group has also been involved for some years in studying and conserving grassland birds and their habitat and ICBP's recently initiated Dispersed Species Project will look at the distribution and conservation status of many lowland grassland birds. Recommendations for the conservation of lowland grasslands arising in part from these activities are summarised after the country sections of this Research Series booklet.

This report was initially prepared in draft form in March 1990 for the UK Nature Conservancy Council with contributions from several experts on their own countries, but has been updated and expanded in the light of recent developments to form part of the IUCN East European Programme's series of environmental reports.

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Introduction

Lowland Grassland Vegetation

Grasslands are widespread throughout central and eastern Europe although very few areas are in a natural state. The term is used here to include areas predominantly covered with Graminae and herbaceous plants, where vegetation height is less than one metre on average and non-ericaceous (Wolking and Planck, 1981; Goriup and Batten, 1990). Included are the climax grassland vegetation, or steppes, of the USSR and a few areas in eastern Europe, plus a range of anthropogenic grasslands, including once forested areas, drained marshes and drained peatbogs. Occasionally or annually flooded grasslands are also described for comparison, as are mountain pastures, where they are important within a country, although the main focus is on lowland dry grasslands. It should also be noted that areas of cereal crops which are grown non-intensively with low applications of fertilizer harbour comparable populations of animals, such as invertebrates and birds, to many highly fertilized grasslands and could be considered equally good habitat for some species; the distribution of non-intensive crop cultivation is not covered in this report. Conversely, highly artificial grasslands, such as those seeded with exotic species, are only included incidentally, although they are far less common in eastern Europe than in western Europe.

One problem with the consideration of grasslands is that inventories of grasslands within a country, particularly in eastern Europe, are lacking and even the concept of grassland as a valuable and distinct habitat has received little consideration. In the literature the distinction between wet and dry or lowland and upland grassland is often unclear. For this reason, and because all these types of grassland share similar characteristics, including some bird species, upland and wet grasslands have been included where appropriate. The only habitats where lowland grassland may occur naturally are on very dry sites (Figure 1), on saline soils and possibly in some regularly flooded or fen areas (Polunin and Walters, 1985). Even in areas where grassland is the climatic climax vegetation, a minute fraction of the potential grassland area remains in a natural state, although larger areas may contain a number of the original grassland species.

Natural and Semi-natural Grasslands

A few areas in Europe have a combination of climate, soil moisture, suitable bedrock, aspect or slope which supports natural grassland, although species composition may have been somewhat altered by centuries of use causing them to survive only in a semi-natural state. Natural grasslands, or steppes, are most extensively developed in the USSR although only the Western Soviet Republics are included in this report. The word *steppe* is derived

from the Russian *stepj*, meaning treeless. In southern Romania, northern Bulgaria, north-east Yugoslavia and parts of Hungary there is a westward extension of the steppe region of the USSR, known as the pannonic region (Figure 2). The annual precipitation of less than 450mm falls mostly as heavy thunderstorms in May and June, with little water penetrating the soil, producing a summer drought. Much of this area has a climax vegetation of steppe-wood but now only a limited area remains of semi-natural grassland, which includes native species but is often altered in species composition by grazing or hay-cutting.

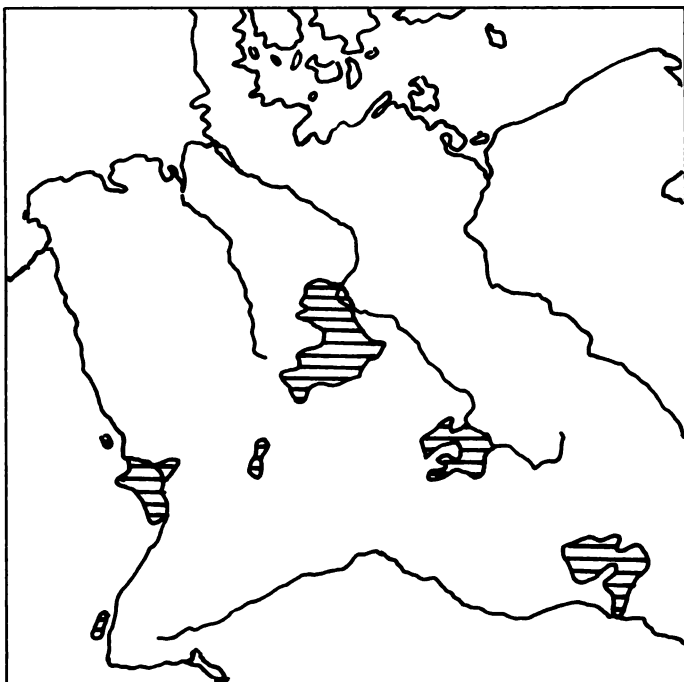


Figure 1. Sites with less than 500mm annual precipitation (shaded)
(Source: *Ellenberg, 1978 in Wolkinger and Planck, 1981*)

Plant assemblages are often described according to the Braun-Blanquet system, based on the dominant species present, and this is described for grasslands in Wolkinger and Planck (1981) and Van Dijk (1991) and will be referred to below. Many of the dry grasslands in Europe are related to the class of “thermophilic dry grasslands” (*Festuco-Brometea*) which has two orders: the continental steppe-grasslands (*Festucetalia valesiaca*) and the frequently calcicolous sub-Mediterranean grasslands (*Brometalia erecti*). These two types

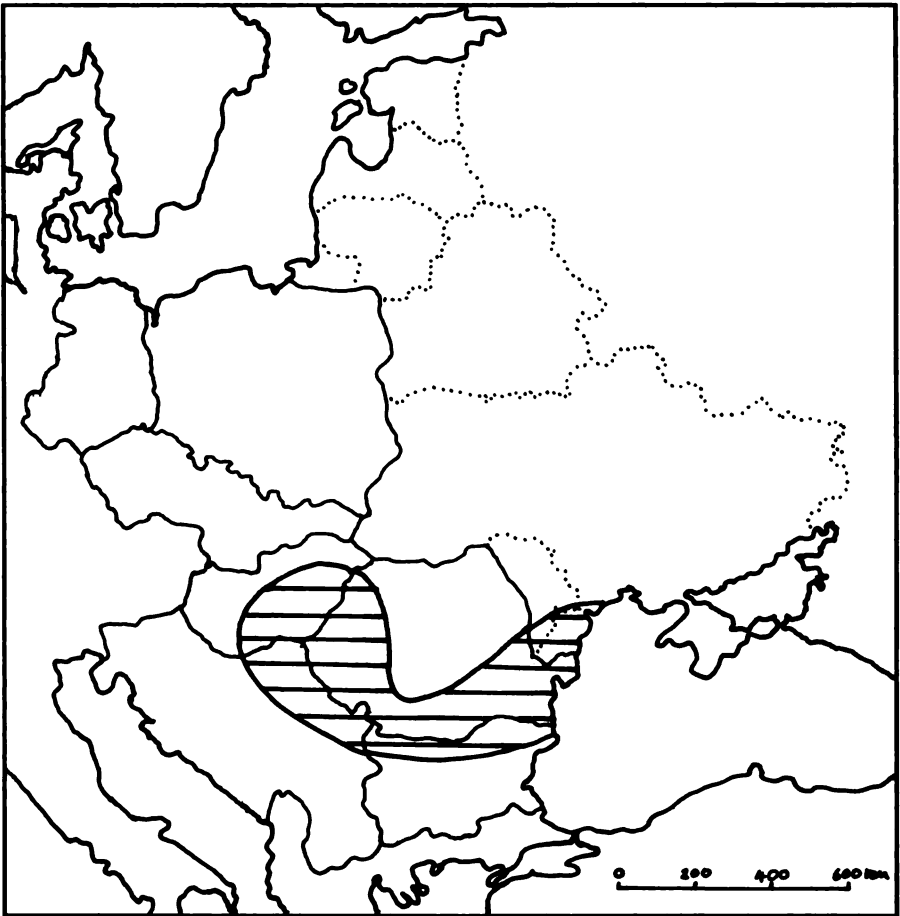


Figure 2. The Pannonic region (shaded), characterised by annual precipitation of less than 450mm (Source: Polunin and Walters, 1985)

spread across Europe from the dry continental regions of southern Russia and the calcareous mountains of the northern Mediterranean respectively after the last ice age, assisted by man's clearance of forest and grazing by his animals. The two types intermix in the area between the Rhine and the Weser but become less species rich with distance from their area of origin.

Steppe grasslands contain a number of grasses of the genera *Stipa* and *Festuca* with a variety of florally attractive dicotyledonous species. Of the sub-Mediterranean grasslands,

Bromus erectus is characteristic with various other Gramineae and a variety of orchids. Two subdivisions of this class are recognised, depending on habitat: the Xerobromion alliance occurs on drier, steep or exposed sites and Mesobromion on wetter sites with deeper soils. Other important types of dry grassland are pioneer communities on sandy soils including coastal dunes, belonging to the Sedo-Scleranthetea class. Another separate class, the Violetea calaminiariae, occurs on sites with heavy metal soils. The so-called neutral grasslands Molinio-Arrhenatheretea, many of which occupy wetter sites, are usually more heavily managed and will be described in more detail in the next section. The plant communities of these various types of grassland are described in more detail in Wolking and Planck (1981) and Van Dijk (1991).

Semi-natural steppe grasslands are now most widespread in the steppes of the USSR and the pannonic region (see Figure 2), in particular on the Hungarian plain where the main climax community of steppe woodland has long been cleared. Fire as well as grazing is an important factor in maintaining secondary steppes. Areas such as the puszta steppe grasslands in Hungary are often dominated by feather grasses *Stipa* spp. In such areas non-graminaceous species are often numerous, especially in protected reserves where there is little grazing and these semi-natural steppes often have a wider range of flowering plants than natural steppe communities. Secondary steppe occurring in moist localities such as in Bulgaria is often dominated by *Chrysopogon gryllus*, *Anthoxanthum odoratum* and *Agrostis capillaris*. In southern Romania the fescue grass *Festuca rupicola* occurs with *Stipa joannis* on sites which have been heavily grazed and subsequently eroded. Dry, sandy inland dunes occur between the Danube and the Tisza rivers and in the Danube delta and these are colonised by a distinctive successional community dominated by *Bromus tectorum* (Polunin and Walters, 1985).

Parts of the pannonic region have developed into salt steppe where evaporation exceeds precipitation during the hot, dry summer months, bringing salts to the surface. Areas with salt soils now cover about a million hectares in south-east Europe and Hungary and a few species are restricted to them. Dry salt steppes, which are intermediate between dry grasslands and steppe, are particularly common in Hungary and have an abundance of *Festuca pseudovina* (Polunin and Walters, 1985).

Dry grasslands characteristic of the pannonic region also occur on dry, sunny south-facing slopes on well-drained alkaline or neutral soils in other parts of central and eastern Europe and tussocky, drought-tolerant grasses predominate, including *Festuca pallens*, *F. rupicola*, *F. valesiaca* and the feather grasses *Stipa capillata*, *S. pennata* and *Koeleria macrantha*. Peak growth is reached in late spring or early summer, when many species such as *Adonis vernalis* come into flower before the dry summer. On most sites these are not climax communities. Similar dry grasslands dominated by *Stipa capillata* occur in Czechoslovakia and Poland (Polunin and Walters, 1985).

Within the Mediterranean region, such as in Yugoslavia, species composition is different from that of steppe influenced communities. Grassland is usually a result of intense grazing by sheep and goats and less by cattle and is dominated by *Stipa* spp. where annual rainfall is less than 500mm.

Managed Grasslands

Anthropogenic factors have greatly extended the area of grassland in Europe, mainly by clearance of forest and drainage of bogs and marshes. Many such areas support a range of plant species similar to those of natural grasslands, but need to be artificially maintained or managed to prevent invasion by scrub and other successional plants. Mowing and/or grazing may be employed. Non-intensively managed grasslands are also an important habitat for grassland animals. However, in some intensive farming systems, meadows are seeded with special high-yielding mixtures, although this is rare in eastern Europe. In some farming strategies, temporary grasslands play a part in a rotational system and may only exist for a few years at a time, but can still be important to some bird species. Managed lowland grassland in countries with shortage of land is usually found on marginal land, least suitable for crops or seasonally flooded, while in countries with more space and where animal production is important, grassland may be found on the best soils (Dziewulska, 1990).

Meadows may be mown up to three times a year and certain species of dicotyledonous plants have evolved distinct races which flower either late or early in relation to grazing or mowing regimes. Many meadows and pastures have wetter conditions than the semi-natural dry grasslands and are invaded more rapidly by shrubs and trees if management ceases. Moist meadows which are widespread in valleys up to about 600m are dominated by *Arrhenatherum elatius* and produce two to three hay crops per year. Another common grassland type developing on lower hills, particularly on sandy loams, is dominated by *Lolium perenne* and makes good pasture. Poor grasslands developed on acid soils, grading into heathland, are commonly dominated by the mat-grass *Nardus stricta*. Particularly wet meadows transitional to fen are often dominated by *Molinia caerulea* while regularly flooded areas also support rushes *Juncus* spp. (Polunin and Walters, 1985).

The optimal management of grasslands depends on various factors including their habitat and type and the type of community which is desired. Grassland management is discussed in detail in Snaydon (1987), Breymeyer (1990a) and a number of other works dealing extensively with this are Wolkinger and Planck (1981), Polunin and Walters (1985) and Hopkins (1991). Variations in weather and climate or in management result in dynamic grassland communities. Management in the form of grassland rehabilitation or re-creation is also a possibility under many conditions using suitable mowing or grazing regimes or by sowing commercially produced seed mixtures (see Duffey *et al.*, 1974; Wells, 1991).

Fertilization of Grasslands

Pastures generally receive natural fertilizer from the animals grazing them. However, in some cases now, animals are penned up at night, which significantly reduces the nutrients added (Brey Meyer, 1990a). Many grasslands are given applications of artificial fertilizers, of which nitrogen compounds are the cheapest and most effective way of increasing meadow productivity. However, these alter species composition, tending to increase the proportion of Graminae and decreasing legumes and forbs (Titlyanova *et al.*, 1990). Applications of up to 50kg of nitrogen/ha/year can result in little change in vegetation character (Van Dijk, 1991). Above this, not only do numbers of dicotyledonous plant species decline but so do insect numbers; applications of about 200kg/ha of nitrogen in the Eastern Länder reduced the insect fauna on the soil by about a third and the number of insects in the vegetation by three-quarters (Litzbarski, 1991). This has obvious effects for birds and mammals feeding in such areas.

The Effects of Pollution

The deposition of pollutants on grasslands can have striking effects similar to the more widely known effect of "acid rain" on trees. In south-west Poland, one of the most highly polluted regions in Europe, one study showed that species composition of an area of grassland affected by much pollution was highly impoverished with only three species making up 75-97% of the plant biomass. The soil water was also very acid, with a pH of 4.1 to 5.9. Above ground growth of plants was severely stunted and the soil fauna was decreased in biomass and proportion of large fauna. Particularly noteworthy was the reduction in Oligochaeta which are important for decomposition. Above ground, insects were small and assimilated food less efficiently (consequently needing to consume more plant matter) which is disadvantageous for birds and other predators (Brey Meyer, 1990b).

Lowland Grassland Animals

The fauna of grassland or steppe areas has developed alongside man's gradual modification of the natural grassland or forest over thousands of years. Grassland areas expanded in the post-glacial phase, from tundra grasslands to the north and east or the Mediterranean limestone grasslands, but it is not possible to tell how far animal species of dry grasslands are relict as they can move faster and further than plants (Wolking and Plank, 1981). These animal species do not necessarily require virgin steppe and many have adapted to increased intensification of land use. However, during the 20th century and particularly over the last 30 years, much greater intensification of farming and the use of agrochemicals has led to range contractions and local extinctions in a number of species. Many steppe

fauna can be supported by cereal and fodder crops grown non-intensively (without chemical applications and under a crop rotation system) and, particularly as the more natural areas are shrinking, such cropland should be considered as suitable habitat for many steppe birds (Goriup, 1988).

One mammal which is particularly important in preserving grasslands is the rabbit *Oryctolagus cuniculus* which was formerly widespread in Europe, including the western parts of eastern Europe, but its numbers have been affected by hunting and myxomatosis. In eastern Europe the European suslik *Citellus citellus* is still fairly numerous and is an important grazer in some areas, particularly in the steppe grasslands of eastern Austria (Wolkinger and Planck, 1981). Plant species richness and variety of grassland habitat (such as areas of plants of different heights) is particularly important to many invertebrate species, a number of which have one specific food plant at certain stages of their life cycle. Insect faunas are often neglected, particularly in management considerations, although often many larger animal species depend on them for their food supply (Fry and Lonsdale, 1991).

A number of lowland grassland animals are becoming rare with the reduction in quality and extent of their habitat and many are now considered threatened according to IUCN criteria. Included are a number of Lepidoptera which depend on dry steppe habitats or flowery meadows, such as the skippers *Syrichthus cribellum* and *S. tessellum* (IUCN, 1990f; Higgins and Riley, 1970). Concern has recently been expressed about a threatened lowland subspecies of viper *Viperus ursinii rakoensis* (see under Hungary). Lowland grasslands are also the main habitat of four globally threatened bird species: *Falco naumanni*, *Tetrax tetrax*, *Otis tarda* and *Chettusia gregaria*, all of which are declining in numbers (Tucker, 1991).

Albania

Grassland Status and Distribution

Albania covers an area of 27,400km² and of this, 3,980km² (about 15%) was permanent pasture in 1985-1987 (World Resources Institute, 1990). A large proportion of the grassland in Albania (over 80%) is pasture which, however, is very dry and of low productivity. Meadows and pastures play a significant role in land use, more possibly than in any other east European country, making up 40-60% of agricultural land taking the country as a whole (Dziewulska, 1990). Of exploitable land, pasture covers 36% (IUCN, 1991). This is partly due to dominance of uplands and mountains which take up about three-quarters of the country, and the large areas of former marshland, now partly drained, on the coastal plain (Dziewulska, 1990). Natural alpine and sub-alpine pastures cover c. 14% of the country (IUCN, 1991). Many areas are used for grazing goats and sheep rather than cattle, possibly due to the predominance of mountainous terrain. Throughout the country hay yields are generally very low, about one to three tons/ha/year (Dziewulska, 1990).

Recent Losses

The area of permanent pasture was reduced by about 2.5% between 1976 and 1986 (World Resources Institute, 1990). Between 1946 and 1978, 48,530ha of additional land was put into agricultural usage and 186,000ha were improved while 88% of the 250,000ha of swampy coastal plain has been reclaimed; this may have included areas of wet grassland. Some 16 million trees were planted in 1983, presumably resulting in at least some grassland loss (IUCN, 1991).

Continuing Threats

The five-year plan in operation in the early 1980s failed to effect its policy of herding livestock from small farms into large collectives because many farmers preferred to slaughter their cattle rather than comply. The results of this policy may have had the effect of intensified use of pastures by collectives to increase yields and the abandonment of some small, isolated pastures, both of which would result in a deterioration of grassland quality. Policies of the next five-year plan in the late 1980s have changed to support small producers (Artisien, 1987). However, the 1989 plan for agriculture projected a 16.9% increase in overall production, partly through greater use of pesticides and fertilizers and an increase in livestock (IUCN, 1991).

Table 1: Lowland grassland sites in Albania identified by indicator species
(Key in Appendix 1)

No.	Name	Area (ha)	Protected Status	Management Category	Indicator Species	Grassland Type
1	Liqen i ohrit	9,700	None	-	SR,OT,GP	?
2	Kënet'e Karavastas	4,000	NP	II	GP	?
3	Wetlands of Shëngjin, Lesh and Kunes	5,500	NRs	IV	SR	-
4	Pishe Poro	5,500	NR	IV	CY,BI	?

Current Protection and Main Sites

Only four lowland grassland sites have been identified by indicator species; these are listed in Table 1 and located in Figure 3. Three of these sites are in protected areas. However, Albania may also offer less habitat for lowland grassland birds than other east European states, as a relatively large proportion of the country is mountainous and unsuitable for most lowland species, while the low-lying coastal plain is where most agricultural intensification has occurred; less disturbed areas are generally forested or mountainous (IUCN, 1991) and therefore any undisturbed lowland grassland is unlikely to have survived. This list is also based mainly on Grimmett and Jones (1989), who acknowledge that there is a great lack of information about sites and bird distributions in the country.

For none of the four sites is the type of grassland, or even whether grassland is present, indicated in the information available. In both national parks and nature reserves, traditional grazing rights have been withdrawn (IUCN, 1991) which suggests that grassland is not regarded as valuable as a habitat unless it is entirely natural, although little information is available on reserves management which could include other methods of management (such as hay cutting) as a way of maintaining habitat diversity. Legislation exists within Albania to protect rare animals and reintroduce threatened species; the list of threatened animals in the country includes lowland grassland species such as two bustards and also *Vipera ursinii* (IUCN, 1991).

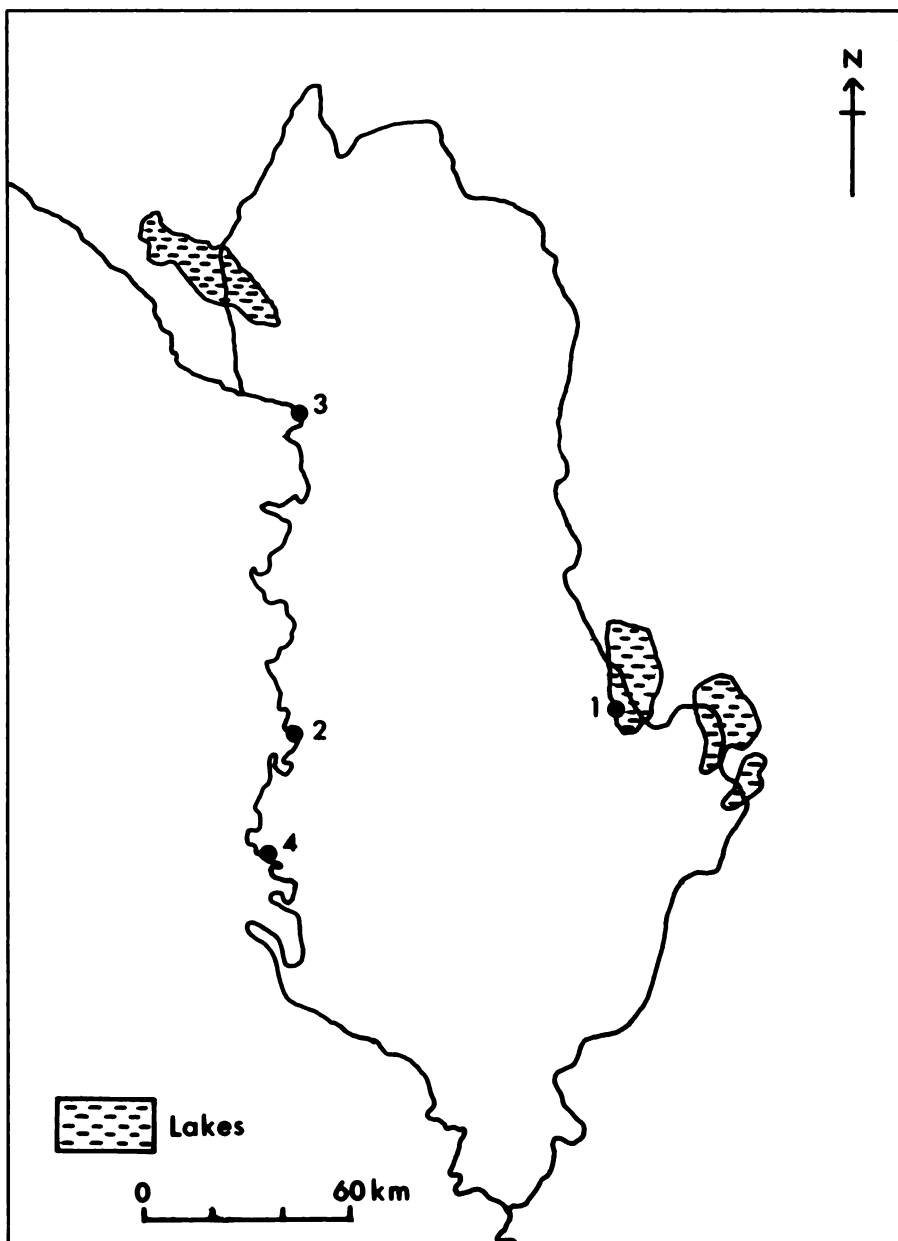


Figure 3. Locations of lowland grassland sites in Albania identified by indicator species

Protected Areas Legislation

The Albanian Constitution proclaims that "The protection of the land, natural resources and the waters from damage and pollution is a duty of the state and of all public and economic organizations, as well as of all citizens." All land and natural resources are legally in the public domain, making all protected areas state property. Two relevant pieces of legislation are the Law on Forest Protection, No. 3349 of 3 October 1963, and the Law on Hunting, No. 1351 of 1 November 1951. National parks are created under these laws (IUCN, 1990a).

Protected areas are classified into three categories (IUCN, 1990a):

Parqet nationale (national parks): these have the dual role of providing public recreation and education and protecting the landscape. No permanent residence or exploitation is permitted. Hunting is prohibited and ancient grazing rights have been withdrawn, although villagers from neighbouring settlements are allowed to gather dead wood. Tourism is encouraged, vehicular access allowed and each national park has a forest lodge for accommodation.

Integral reserves (nature reserves): these are strictly protected for nature conservation. A total protection regime is imposed with no entry, occupation or exploitation permitted. Hunting is prohibited and ancient grazing rights have been withdrawn.

Orientated reserves: these allow traditional human activities, education and protection of the landscape or wildlife. Recreational fishing is permitted.

Bulgaria

Grassland Status and Distribution

Bulgaria covers about 111,000km², of which about half is mountainous. Gramineous communities cover about 15,000km² or 13.5% of the country's area (IUCN, 1991). About one-fifth is used for haymaking, the rest for grazing. Meadows which are primarily for hay production are most commonly found on river terraces with a high soil moisture content. Some areas of wet meadow, which are flooded for part of the year, are also used for hay cutting. These meadows are all semi-natural grasslands, derived through anthropogenic factors on areas which were once forested (Meshinev, 1990).

In the Transdanubian lowlands, grassland is relatively scarce due to saline soils and old agricultural traditions, which mean that most land is used for growing wheat, maize and sunflowers. Also, in the Thracian Basin, only about 30% of the area is grassland. However, grassland makes up most of the agricultural land area (60-80%) along the southern border. The proportion of meadows as opposed to pasture in Bulgaria is also one of the lowest of any European country (Dziewulka, 1990). About 1.5 million tons (dry weight) of hay are produced annually (IUCN, 1990).

There is no information available on the area of grassland in Bulgaria which has elements of steppe vegetation. Specialists agree that Bulgaria does not come within the steppe region, but whether steppe communities spread into areas where man had removed the forests, or whether such plants existed naturally within forest clearings and therefore have primary character, is uncertain. Today, most grassland with steppe elements has been converted to agricultural land and it survives mainly on rocky, eroded areas with thin soils. Areas with remnants of steppic grasslands include: (a) Dounavska plain, where the climax vegetation is probably forest steppe and most areas are cultivated or highly modified; (b) South Dobroudja; (c) the Black Sea coast, on rocky, highly eroded hilly areas; (d) uplands of West Bulgaria where thin calcareous soils predominate and highly fragmented areas with steppe elements occur, most notably in the Dragoman-Beledie han and Mount Golo bardo regions; and (e) Gorna Tracia region (Meshinev, 1990).

Recent Losses

Up to the 1950s the grassland area in Bulgaria decreased by about 30% in 10-20 years. Around Sofia and in the regions of Staba Zagora, Tarnoro, Razgrad and Tolbahin, there have been more recent decreases in grassland area. The main losses are by meadows being turned into intensive pastures or cropland, as most grassland is located in the most intensively cultivated region of Bulgaria. Areas where steppe elements were once common

in vegetation communities have diminished through losses to arable farming and intensification of grazing (Meshinev, 1990). Between 1976 and 1986 an increase of about 13% in the area of permanent pasture occurred (World Resources Institute, 1990) but this may have been largely through the conversion of meadows.

Continuing Threats

The quality of many grasslands is deteriorating. Increased use of machinery and trampling by grazing animals after a hay crop is taken is destroying soil structure. Pollution from agrochemicals is worsening, both from aerial spraying and percolation of polluted water, as more chemicals are used to increase production. Some meadows are not irrigated properly so that overwatering occurs, resulting in changes in vegetation composition which rapidly becomes hygromesophilic, including less valuable formations such as *Cariceta* and *Junceta* (Meshinev, 1990). Areas with elements of steppe vegetation are being increasingly fragmented (Meshinev, 1990). Problems related to specific sites include uncontrolled grazing at Atanasovosko Ezero and changes in land use here, which may occur if salt extraction schemes go ahead (IUCN, 1990e).

Current Protection and Main Sites

Grassland containing steppe phytocenoses is included in a few protected areas: Roussenski Lom National Park; Tchernelka; Kabioushka Kaliakra mogila; Madarski Konnik reserve; Kaliakra reserve; and Ostritza reserve. Fragments of hygrophilic and mesophilic grass communities occur in the reserves of Kamtchia, Gorna Tophtchia, Srébarna and Arcoutino (Meshinev, 1990). In addition, Meshinev lists ten meadow areas within "protected territories" for *Leucojum aestivum*, where there is partial protection. These are: Vinitza, Plovdiv region; Osmar, Shoumen region; Staro Oryahovo, Varna region; Palausovo, Yambol region; Ormana, Yambol region; Karadzovo, Haskovo region; Lyubimetz, Haskovo region; Goritza, Bourgas region; Kosharitza, Bourgas region; Yasna polyana, Bourgas region. The Ropotamo National Park (8500ha) is described by Polunin and Walters (1985) as having vast meadows. Nine lowland grassland sites, identified by indicator species, are listed in Table 2 and located in Figure 4: most of these have some form of protection, being at least partly within a nature reserve. However, there have been inadequate surveys of non-wetland sites (Grimmett and Jones, 1989) which contributes to the lack of overlap between the sites identified on a botanical basis by Meshinev and by avifaunal criteria; only two sites (Kaliakra and Roussenski Lom) are common to both lists.

Red Data Books for the Bulgarian flora and fauna have been compiled and include 763 species of higher plants and 156 animal species, of which there are 19 mammal, 100 bird and 13 reptile and amphibian species. Information on the distribution and status of a number of

**Table 2: Lowland grassland sites in Bulgaria, identified by indicator species
(Key in Appendix 1)**

No.	Name	Area (ha)	Protected Status	Management Category	Indicator Species	Grassland Type
1	Atanasovosko Ezero	1,690 part 1,050	- NR Ram	IV	CP,BO,CI,[GG]	G
2	Cape Kaliakra	688	NR	IV	CI,CY,BR,CP,[OT]	DS
3	Yatata Reservoir	154	HS	-	CY,CP	?
4	Studen Kladenetz	20,000 774	- NR	-	CI,BR,FN	DG?
5	Rusenski Lom	3,260	NP	III	CI,BR,FN,FC	HM,G
6	Gintzi	10	HS	-	BR,FC	DG
7	Cape Emine	100	None	-	[CI,GG]	DS
8	Steneto	5,487 2,598 2,635 2,889	- NR NR BioR	- I/IV	BR,FC	DG
9	Lake Burgas	2,800 70	- PS	-	GP,GN	G

lowland grassland species should therefore be available. However, the flora and fauna of only about 10% of the area within reserves has been studied (IUCN, 1991).

Certain flora and fauna are covered by the Law on the Protection of the Environment which gives legal protection to a variety of species and their main habitats (Nankinov, 1989). Protected species of plants and animals are listed in full in IUCN (1991); a number of herbaceous plants which grow in relatively undisturbed grasslands are included and many of the grassland birds used here as indicator species are protected within Bulgaria. A system of penalties for causing damage to protected plants and animals was set out in a Decree of the Council of Ministers in 1980 (Cerovsky, 1988). One initiative which is now reported as being implemented is the reintroduction of some fauna extinct or near-extinct in Bulgaria,

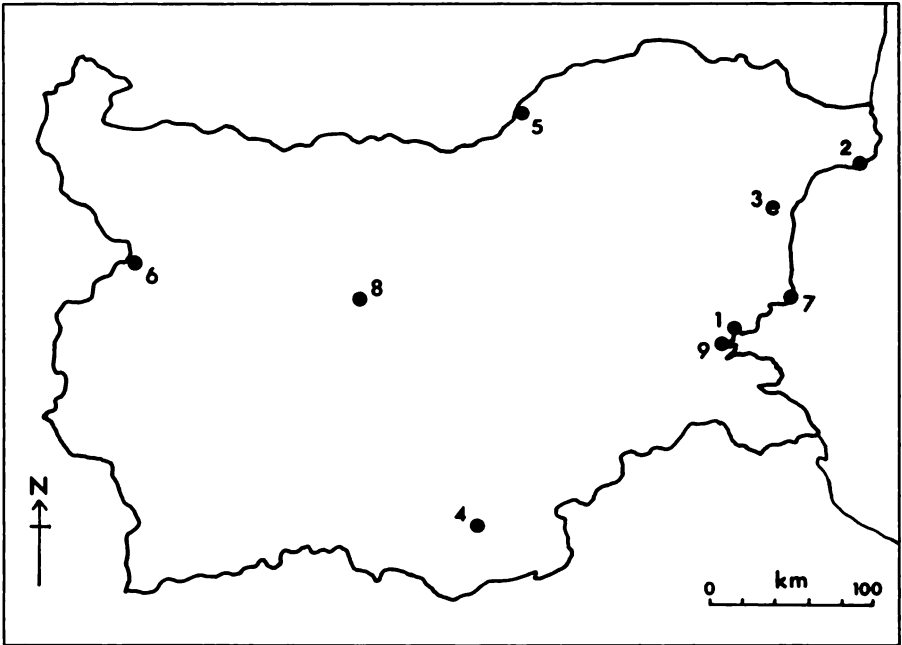


Figure 4. Locations of lowland grassland sites in Bulgaria identified by indicator species (see Table 2)

including *Otis tarda* and *Tetrax tetrax*; the captive breeding of threatened and rare species is also being considered (IUCN, 1991). The development of a grassland conservation strategy in Eastern Europe is to be led by Hungary and Bulgaria (IUCN, 1989b).

However, the protection of lowland grassland habitats in Bulgaria seems incidental and inadequate, due for a large part to insufficient knowledge about the characteristics and distribution of such areas. Most research dates back to early this century and, in particular, not enough is known about the role of anthropogenic factors in maintaining grassland vegetation in areas where forest is the climax vegetation. There are specialists at the Institute of Botany at the Bulgarian Academy of Sciences capable of detailed studies of grassland phytocenoses, but finance for fieldwork is not available (Meshinev, 1990).

Protected Areas Legislation

The Constitution refers to nature conservation under Article No. 31 (1971). In Articles 22 and 23 of the Constitution proposals for designation of protected natural sites can be

submitted by enterprises, institutions, organisations and individuals. The 1967 Law on Nature Protection covers the preservation, restoration, rational use of nature and natural resources, monuments, historical sites, development of science and scientific research. This Law, and the 1969 Code of its Application, effectively repeals earlier legislation. The duties of all organisations and agencies in the field of flora, fauna and habitat protection are further defined in a number of acts including Protection of Air, Water Resources and Soil from Pollution (1963), Water (1969), Protection of Cultivated Lands and Pastures (1973) and Forests and Hunting and Fishery. Some other acts may also include relevant sections (IUCN, 1990a).

The *Komitet za opazvane na prirodna sreda* (KOPS) (Committee for Environmental Protection) of the Council of Ministers was set up in 1976. KOPS declares a locality or an object under protection, by an order of the Committee's President, after consultation with the Academy of Science's Institute of Ecology and interested departments on whose territory the objects are located. These orders are published in the State Gazette.

Under the 1967 Law there are five types of protected areas (IUCN, 1990a):

Rezervat (nature reserves): these are strictly protected areas containing rare plant and animal communities, threatened by depletion or extinction and used for scientific research. Economic exploitation, including any agricultural and industrial activities, is prohibited. Admittance to and movements in reserves requires the approval of KOPS and is restricted to defined roads and paths. A special directive was adopted designating the creation of buffer zones around reserves. In exceptional circumstances clear felling is allowed for forest protection reasons.

Naroden park (national parks): cover comparatively large areas suitable for short-term recreation and tourism and for research. Other categories of protected areas may be included within the boundaries of national parks. National parks are also termed 'People's Parks' and tourism development is encouraged, especially by state enterprises such as Balkan Tourist. Entry is free and unrestricted. Tourism may be well developed. These areas have general protection throughout, with no settlement or exploitation allowed; hunting, fishing and flower-picking is forbidden. Some national parks are zoned into a scientific zone (no exploration, visitors restricted to certain paths), a tourist zone (accommodation, tree-felling and afforestation) and a commercial forest zone.

Nature sanctuaries: specific natural formations protected because of aesthetic and scientific significance, preserved for public interest due to national, geographic or scientific values as well as phenomena of aesthetic, natural or historical value, which includes single items such as trees and rocks.

Protected sites: specific locations with picturesque landscapes or characteristic habitats suitable for recreation.

Bulgaria

Historical sites: the sites of major historical events, historical monuments and graves as well as protected specific natural features of the landscape and their surrounding areas. Certain sites are protected jointly by KOPS and the Committee for Culture and the Institute for the Monuments of Culture.

Czechoslovakia

Grassland Status and Distribution

Czechoslovakia has an area of 127,896km², including 9,460km² of meadow and 8,034km² of pasture in 1988 (7.4% and 6.3% respectively of the country's area); almost all of this area was in agricultural use (IUCN, 1990b). The percentage of arable land which is grassland is highest in eastern Slovakia (40-60%) and this area also has the highest proportion of grasslands as pasture rather than meadows. This area generally has fairly low population densities and relatively large farms. The area either side of the Vltava valley, south of Prague, has the highest percentage of grassland as there are vast permanent meadows, making up on average over 80% of the grassland area. Hay yields are higher on average in the Czech lands (4-6 tons/ha/year) than in Slovakia (2-4 tons/ha/year) (Dziewulska, 1990). Another estimate suggests that 10-15% is semi-natural grassland. Mesobromion grasslands still occur on scattered sites while Arrhenatheretum associations have become rare. Molinietalia meadows are most common on river floodplains where single areas may cover over 100ha (Van Dijk, 1991).

Recent Losses

A significant amount of agricultural land has been and continues to be taken for other purposes, amounting to 800,000ha over the past 40 years; at present these losses involve 12,000ha per year, of which about 2,000ha is grassland, orchards, vineyards and gardens. Expansion of intensification, drainage and other so-called improvements has occurred and contributed to a deterioration in grassland quality. To support the population increase in Czechoslovakia over the past 40 years using traditional farming methods would have needed an extra one million hectares of agricultural land; in fact, the total area of agricultural land decreased by 700,000ha over this period. Over-fertilization is a considerable problem and the application of selective herbicides has led to a total loss in some Czech meadows of common plants such as *Primula elatior* and *Anemone nemorosa* (IUCN, 1990b). Reductions in the area of lowland grassland and of non-intensively cultivated land (which provides suitable habitat for a number of grassland fauna) through agricultural intensification has led to declines in a number of animal species, such as Czechoslovakia's populations of *Otis tarda* (now only 280 birds) and *Burhinus oedicnemus* (now 15-20 pairs) (Grimmett and Jones, 1989).

Continuing Threats

Problems related to increased agricultural use affect many areas. Over the past 20 years there have been vast increases in applications of fertilizers in agriculture as a whole. Even in areas such as the Krkonoše Mountains National Park farmers are applying 270kg/ha/year of artificial nitrates to increase grassland production. There is little sign of this policy changing, current high levels of applications adding to the residues from past years. Second or holiday homes are very common in Czechoslovakia and recently a new type has emerged, the "gardener colony" which is being promoted by the authorities and influential bodies to make use of "barren lands". These pose a real threat to some of the last remaining wildlife habitats and undoubtedly affect grasslands, which are often regarded as marginal land. The most threatened ecosystems within Czechoslovakia and the ones which are actually disappearing are species-rich meadows and wetlands (IUCN, 1990b).

A number of specific meadow plant communities are threatened by conversion to arable, abandonment and drainage; Calthion and Molinion alliances are threatened by drainage, whilst Cnidion and Veronica-Lysimachion are disappearing gradually due to regulation of watercourses and Alopecurion has little chance of survival. Although a number of these types of grassland are in protected areas they are partly threatened by lack of management (Van Dijk, 1991).

Threats related to specific sites are as follows. Tree planting is occurring and agricultural chemicals and heavy machinery are used in the Znojmo area. Air pollution and large numbers of visitors (8-10 million per year) affect the Krkonoše Mountains National Park. Recreational use also causes disturbance at three sites. In the Šumava mountains, overgrazing by sheep, goats and moufflon is causing habitat destruction. Fish ponds are being expanded at two sites, Senné-rybníky ponds and Záhorské Močiare marshes, and at the latter meadowland is suffering from intensified use. At Treboňsko, there is aerial spraying of insecticides and meadow loss is occurring through neglect, leading to vegetation succession (IUCN, 1986; Grimmett and Jones, 1989).

Current Protection and Main Sites

Protected areas legislation in Czechoslovakia includes one category of "protected habitat" where the occurrence of one or more animal or plant species can merit protection (IUCN, 1990a) and, under this, grassland habitats and species could be protected. National nature reserves, although usually small, preserve a number of modified or semi-natural ecosystems in addition to completely natural habitats (IUCN, 1990b). Fourteen sites were identified by indicator species and are listed in Table 3 and located in Figure 5. Small parts of five of these are state nature reserves, three others are protected landscapes and two have protection proposed. Two mountainous sites are included (Krkonoše and Šumava Mountains) on

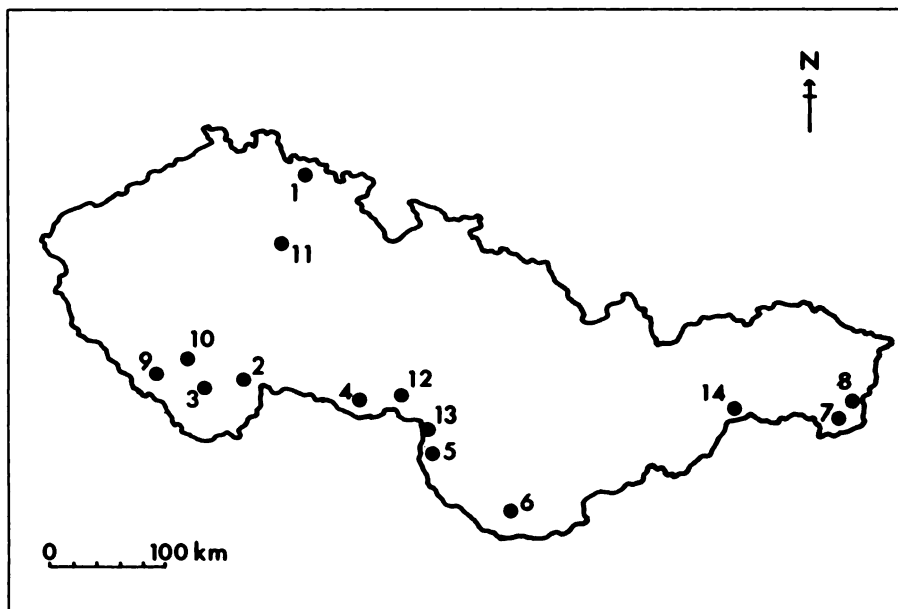


Figure 5. Locations of lowland grassland sites in Czechoslovakia identified by indicator species (see Table 3)

account of the bird species that have been recorded, but they can probably only support a limited range of lowland grassland birds.

Special decrees protect rare and threatened plants and animals. In 1986 new acts were passed by the National Councils in both the CSR and the SSR, introducing fines for offences against the State Nature Conservancy Acts and Decrees. The State Nature Conservancy and the Czechoslovak Academy of Sciences are jointly compiling volumes of the national Red Data Book, of which one for birds has been completed with others to follow shortly, and this should provide more information about and assist in the protection of a number of lowland grassland plants and animals (IUCN, 1990b).

Protected Areas Legislation

The relevant section of the Constitution, relating to protected areas, is Law No. 100/1960, Article 15. The two republics have separate laws dealing with conservation: the State Nature Conservancy Act of 1955, Law No. 1/1955 for the Slovak Republic, and the State

**Table 3: Lowland grassland sites in Czechoslovakia, identified by indicator species
(Key in Appendix 1)**

No.	Name	Area (ha)	Protected Status	Management Category	Indicator Species	Grassland Type
1	Krkonoše Mountains	38,500	NP NNR (part)	II	BO, CY	G
2	Treboňsko	70,000	PLA BioR	V	CI,CP,AF	WM/DG
3	Dehtář pond	250	prop	-	CP,CY,[GG]	WM
4	Znojmo area	750	prop	-	CY,OT,BO, AF,AC	DG/C
5	Záhorské močiare marshes	27,522	(PLA) NNR (part)	-	CI,AC,FC	WM
6	Podunají	750,000 8,218	PLA NNR	-	CI,OT	SS/M
7	East Slovakia marshes	150,000	NNR	-	CI,CP,AF,FV	WM
8	Senné-rybníky ponds	424 213	- NNR	-	CI,CP,AF, [GG]	WM
9	Šumava Mountains	163,000	(BioR) PLA/NNRs	-	CI,CY	G
10	Řežabinec pond	110	NNR	-	CI,[CY]	WM,DG
11	Zehuňský rybník ponds	511	NNR	-	CI,[CY,AF]	WM
12	Pálava	7,500	PLA BioR	-	CI	DS/G
13	Soutok	7,000 33	NNR	-	CI	FC,WM
14	Slovenský Kras Karst	36,165	PLA BioR	V	CI,FC	M

Nature Conservancy Act of 1956, Law No. 40/1956 for the Czech Republic. In 1986 the Czech and Slovak national councils enacted Laws Nos 65/1986 and 72/1986, respectively, to impose penalties for offences against the State Nature Conservancy decrees of 1956. Republic acts are brought together and integrated by Federal legislation. In June 1990 a Commission for the Environment was set up at the federal level. The integration of natural resource conservation with economic activities is dealt with by sectors such as forests, water management, agriculture, mineral surveys, mining, industrial production and construction.

At republic level the State Nature Conservancy Acts define nature conservation as the preservation, renewal, enhancement and use of natural wealth and the special protection of important areas and natural features. These laws are supplemented by separate republic guidelines issued in 1978 and 1980 dealing with nature conservation development. The overall objective is to integrate conservation and use of natural resources and to apply principles of ecosystem conservation.

Protected areas are established under the 1955 and 1956 acts by the respective Ministries of Culture. The Ministries of Culture decide on the establishment of all protected area categories, with the exception of national parks which were also established under the 1955 and 1956 Acts by decrees of the Czech and Slovak national councils. Regional national committees give guidance to district national committees which are responsible for nature conservation, protected areas and the establishment of protected natural features and monuments at the district level (IUCN, 1990a).

There are three main categories of protected areas (IUCN, 1990a):

Narodni parky (national park): defined as areas with very valuable natural resources, little influenced by human activity, with great climatic, health and recreational importance. National parks have complete protection, except for some forest exploitation which is strictly controlled and are zoned with an area for recreational development. Hunting is prohibited. National parks are fully open to visitors with the exception of access to strict nature reserves within the park. Tourism is regarded as a main objective of national parks.

Chranene Krajinne Oblasti (protected landscape areas): areas of lower natural values but with significant scenic and aesthetic qualities. They represent the harmonious interaction between natural components and traditional human activities, and aim to protect all values and typical features of the landscape and encourage rational use of natural resources. They are also used extensively for recreation. Within CHKO the most valuable areas are strictly protected as nature reserves or natural features. Although they are not excluded from further exploitation, all economic activities are carried out in accordance with the understanding of the republic-level nature conservation bodies. All CHKO in the Slovak Republic have buffer zones.

Statni Prirodni Rezervace (national nature reserves): areas where the complete ecosystem is subject to conservation management and are strictly protected areas of great scientific and research importance.

A further five categories of protected areas are also used (IUCN, 1990a):

Chranene Studijni Plochy (protected study areas): small protected sites designated for research and teaching purposes.

Chranene Prirodne Vytvory Krasove Javy (protected natural features): geological features, especially karst areas, as well as individual monumental trees.

Chranene Parky a Zahrady (protected park or gardens): historic parks protected under the Cultural Monument Act.

Protected Habitats: sites in which the occurrences of one or more plant or animal species are subject to preservation.

Chranene Naleziste (protected natural monuments): are natural features documenting human activities or associated with historical events.

The Eastern Länder of the Federal Republic of Germany

Grassland Status and Distribution

The Eastern Länder cover an area of 108,290km², of which 12,330km² (11%) is agricultural grassland and pasture. The northern and central parts of the country are predominantly flat lowland formed of Pleistocene deposits. Industrial agriculture is well developed, and much of the grassland is used intensively (Cerovsky, 1988). The distribution of permanent pasture in 1973 is shown in Figure 6. The proportion of agricultural land which is grassland over the whole country is on average low (about 30%) due to agricultural intensification. Meadows, as opposed to pasture, are relatively uncommon in the north-west of the country, but in the east, near the Polish border, there are vast permanent meadows and pasture forms only about 10-30% of grassland. The south-east of the country also has the highest hay yields of 6-8 tons/ha/year (Dziewulska, 1990).

There were once extensive peat grasslands in the north but these have long been drained. Riverine grasslands in the south have been converted to arable or intensively used grassland. Although the large collectives increased their sheep stocks in the 1980s, which was favourable for grasslands, it is doubtful whether this situation will persist (Van Dijk, 1991).

Recent Losses

Intensification of agriculture and conversion of grasslands to arable farming has undoubtedly decreased grassland quality and area. The grassland situation in Mecklenburg and Brandenburg, at least, has become transformed from its former state, the once extensive Molinion alliances having disappeared between about 1960 and 1980. Cereals have become important in many areas and any remaining grassland is usually reseeded with highly productive varieties. In Saxony, many types of grassland vegetation have been lost. At the end of the 1960s, on one floodplain studied, 17 types could be distinguished. In 1989, only four remained, usually as small fragments. A third of the former grassland area had become arable land, while only 12% of the remaining grassland was considered to be of a traditional nature. Some dry limestone grasslands, particularly those in private hands which could not easily be used by large collectives, have also suffered from abandonment and scrub encroachment (Van Dijk, 1991).

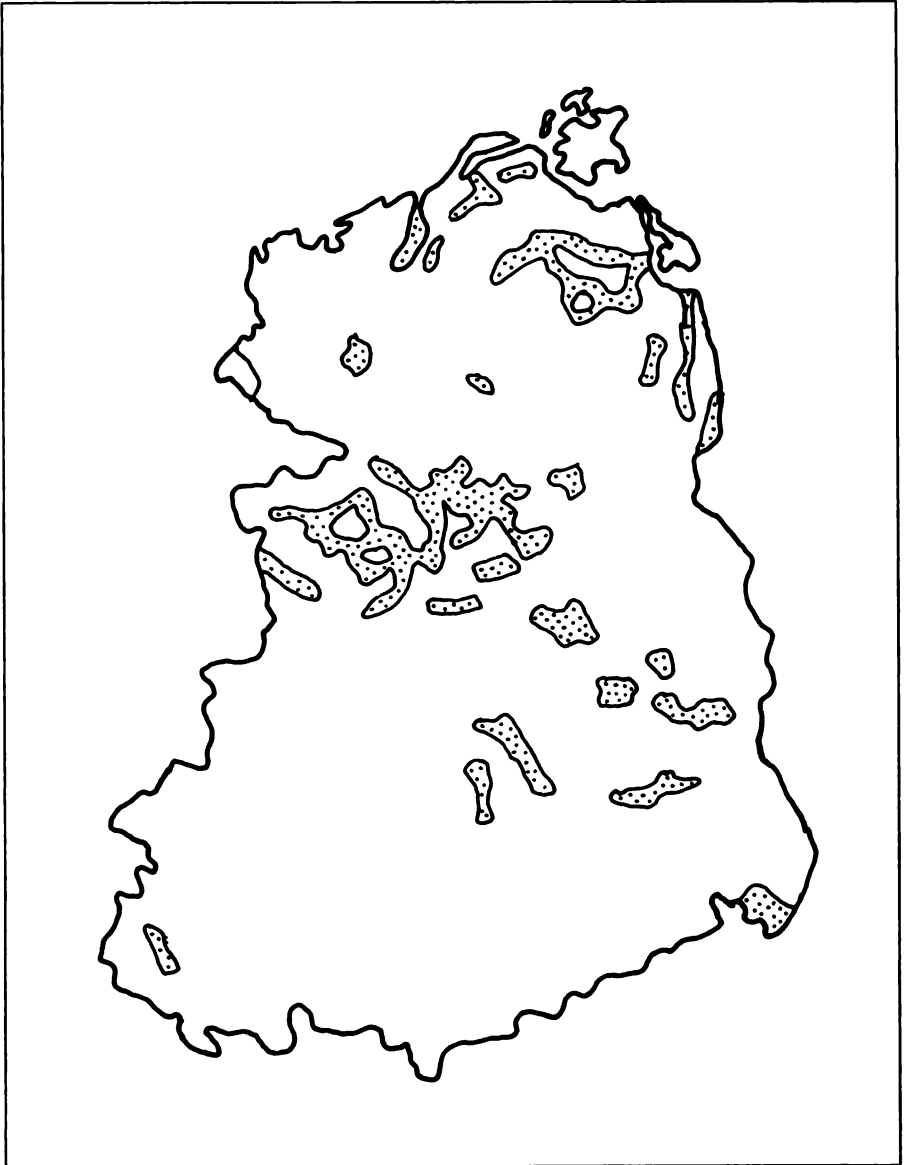


Figure 6. Distribution of permanent pasture in the Eastern Länder of the Federal Republic of Germany (Source: US Government, 1973)

Drainage, ploughing, sowing monocultures and application of chemicals has generally led to a 40-80% decline in numbers of plant species and a 50-80% loss of arthropods. Also affected by land use changes and reductions in the invertebrate food supply are the grassland bird populations. The numbers of *Circus pygargus* and *C. cyaneus* have declined drastically to 30-35 pairs per species, half that of the 1975 populations (Litzbarski, 1991), and a serious reduction in numbers of *Asio flammeus* has occurred. The Eastern Länder have the largest population in central Europe, apart from Hungary, of *Otis tarda* but their numbers are decreasing (Grimmett and Jones, 1989), although there are now several Bustard Protection Areas (Table 4) where habitats are managed for this species' requirements.

Continuing Threats

The natural environment is under heavy pressure from industrialised agriculture and industrial pollution (Cerovsky, 1988). Many meadows and grazing lands are reported as being used intensively (e.g. at Belziger Landschaftswiesen and Unteres Odertal) and overgrazing is a problem. At Rieter See and Nonnenhof mit Lieps Nature Reserves meadows have become overgrown (Grimmett and Jones, 1989).

Current Protection and Main Sites

The sites of floristic importance which still remain in the Eastern Länder are mostly protected, while grassland sites of major avifaunal importance are on areas with high groundwater levels which may be more difficult to cultivate (Litzbarski, 1991). Of the sixteen sites identified by indicator species (Table 4), all are partially protected by nature reserve status, although the part that is grassland is not necessarily included in the reserve. The locations of these reserves are shown in Figure 7. Three of the sites in Table 4 are Bustard Protection Areas where habitats are managed particularly for *Otis tarda*.

Current Projects Concerning Grassland Conservation

Grassland extensification projects have been carried out in both the Western and Eastern Länder, although on a much smaller scale in the latter. These projects have the aims of: preventing further land drainage; optimising biocide application; minimising fertilizer use; management by mowing and/or grazing; and discouraging cultivation activities between 1 April and 1 June. One in Sachsen-Anhalt starting in 1989 was to cover 1,500ha at an annual cost then of 1.5 million O [GDR Marks]. Three others in Brandenburg beginning in 1988 were to cover 3,500ha at a total annual cost of 3 million O (Litzbarski, 1991).

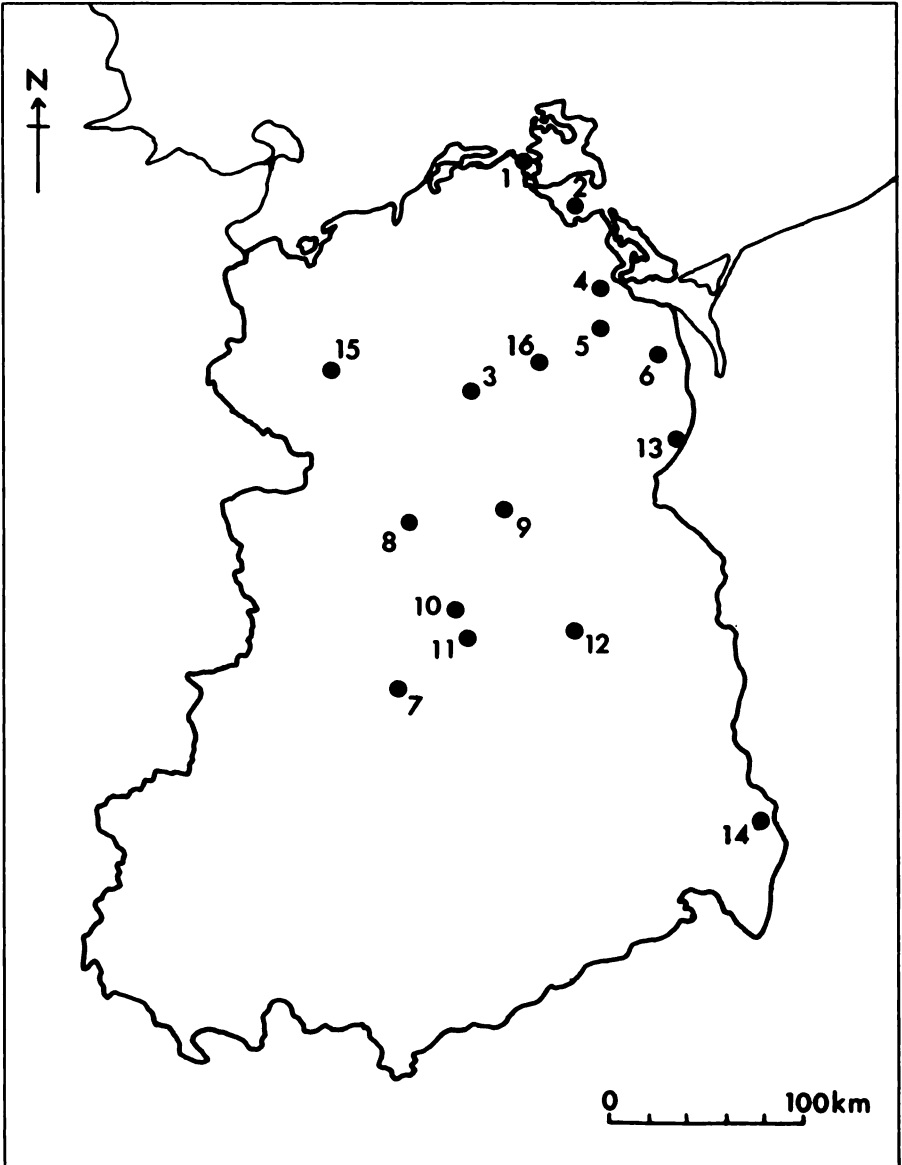


Figure 7. Locations of lowland grassland sites in the Eastern Länder of the Federal Republic of Germany, identified by indicator species (see Table 4)

**Table 4: Lowland grassland sites in the Eastern Länder, identified by indicator species
(Key in Appendix 1)**

No.	Name	Area (ha)	Protected Status	Management Category	Indicator Species	Grassland Type
1	Westrügen-Hiddensee-Zingst (mit Bodden)	26,250 part most	NR Ram	V	[GG]	M
2	Greifswalder Bodden	74,850 2,000 part	WNI NR LPA	-	CI	G,HM
3	Ostufer Müritz Grosser Schwerin und Steinhorn	5,122	LPA NR	IV	CY,GG	-
4	Peenetalmoor und Auklamer Stadtbruch	2,678	NR	IV	CP,CI,CY, GG,AF	-
5	Galenbecker See und Putzarer See	1,375 part 1,015	WNI NR Ram	IV	CP,CY,GG, AF	G/HM
6	Koblentzer See und Latzig See	497 397	NR	-	CP,CY,GG, [CI]	HM/G
7	Steckby-Lödderitzer Forst und Zerbster Ackerland	9,000 17,500	NR,BPA BioR	IV	CI,CP,OT, CY,GG	M
8	Untere Havelmederung, Gulper See und Schollener See	6,250 part 5,792	LPA NR Ram	IV	CI,[GG]	G/HM
9	Kremmener Luch	645	NR WNI	IV	CY,CP,GG	WM/G/ HM
10	Rietzer See	1,000 682	WNI NR	IV	CY,CP,CI, GG,AF	M
11	Belziger Landschaftswiesen	1,000	BPA	-	OT,CI, CY,AF	M/G

cont'd ...

Table 4 (cont'd)

No.	Name	Area (ha)	Protected Status	Management Category	Indicator Species	Grassland Type
12	Prierowsce	210 part	NR BPA	IV	CY,CP,OT, GG,AF	M
13	Unteres Odertal Polder bei Schwedt	400 5,400	NR Ram	IV	CI,CP,GG	M
14	Teichgebiet Niederspree	925 463	WNI NR	- IV	CI,GG	M
15	Teichgebiet Lewitz	920	NR	IV	GG,[CI,CY]	M
16	Nonnenhof mit Lieps	700	NR	IV	GG	M

Protected Areas Legislation

The first comprehensive environmental law in the Eastern Länder was the *Landeskulturge-setz* (Culture of Country Act) of 14 May 1970. As a consequence of this basic document on area protection, an ordinance covering species protection linked to habitat conservation (flora and fauna) was passed on 1 October 1984. Measures enacted by the post-unification government have been aimed at preserving ecologically intact and unique habitats and supporting programmes for protection of endangered plant and animal species (IUCN, 1990a). Nature conservation legislation in the Eastern Länder is still being revised and details about it are not yet available (H. Bibelriether, *in litt.*, 1991). In the Western Länder, protected area categories, establishment procedures and nature conservation responsibilities have been largely defined in legislation at the state (Länder) level with general legislative provisions for nature conservation at the Federal level, including the right to establish Acts to draw up the framework for Länder legislation, at least in the field of nature and landscape protection. The most important piece of federal legislation in the Western Länder concerning protected areas is the Federal Nature Protection Act of 20 December 1976 which provides the framework legislation for the Länder (IUCN, 1990a).

Until November 1989 there were three categories of protected area (IUCN, 1990a):

Naturschutzgebiet (Natural nature reserve or protected area): areas established for the protection of a wide variety of species and ecotypes. Management geared to nature conservation, although some rural land-use was allowed.

Landschaftschutzgebiet (Landscape protected area or reserve): areas established primarily for the protection of rural and scenic landscapes including geological features. Forest management and agricultural use occur throughout designated LSGs.

Flächennaturdenkmäler (Natural monuments): natural elements, such as geological features, ancient trees, or natural objects often associated with historical events. They are classed as *Naturdenkmäler* if single natural objects or *Flächennaturdenkmäler* if a small area, covering a maximum of 3ha.

Hungary

Grassland Status and Distribution

Hungary has a total area of 93,030km², of which grassland covered 1,185,570ha (12.7% of the country's area) in 1990 (Márkus, 1991). About a third is meadow and the rest pasture. Of the total grassland area, 800,000ha is intensively managed, with high amounts of fertilizer applied, regular mowing and livestock penning. The rest is more extensively used and includes 200,000-250,000ha which are considered to be of conservation value (Márkus, 1990).

The most important areas of grassland occur to the east of the Danube, on the Great Plain and here, 30% of the total protected area is grassland (Márkus, 1990). The original climax vegetation of much of the Hungarian plain was steppe woodland, replaced, mainly in the eighteenth and nineteenth centuries, through grazing, drainage and clearance, by steppic grassland, or *puszta*. A characteristic of many areas of *puszta* is the concentrations

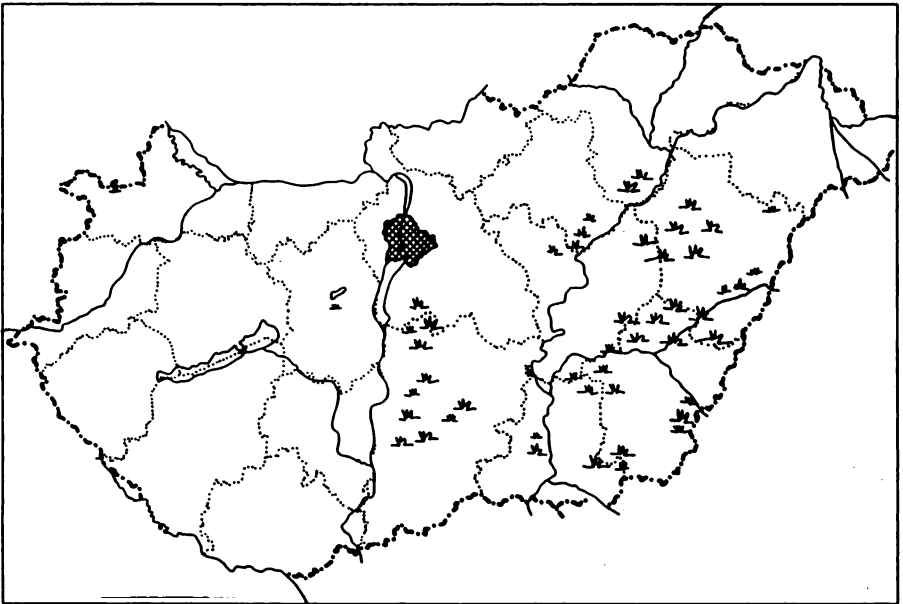


Figure 8. Distribution of steppe and steppe-like habitats in the Hungarian lowlands in the 1980s (Source: Márkus, 1990)

of salts in the upper soil horizons, due to relatively low rainfall and high evaporation rates during the hot summer months, bringing salts to the surface. Distinctive halophytic plants occur, including many species of maritime origin. Such areas are usually maintained by sheep, horse and cattle grazing.

In only a few particularly dry areas is grassland the climatic climax. On alkaline and saline soils, a grassland rich in annuals developed. Much of this area is now arable farmland, particularly for cereals (Márkus, 1990). However, the less-intensively farmed areas are important for a number of grassland birds, and help to support one of the largest populations in Europe of *Otis tarda*: 2000 birds, second only to the Spanish population, and possibly that of the USSR. The most important steppe areas are included in Hortobágy National Park and Pusztazer Landscape Protection Area but many of the agricultural areas, important for *O. tarda*, are unprotected (Grimmett and Jones, 1989). However, the distribution of *O. tarda* is quite closely related to that of areas of puszta (see Figure 8) (Márkus, 1991). The Hungarian Red Data Book also lists two grassland bird species as extinct in terms of breeding populations within the country: crane *Grus grus* and little bustard *Tetrax tetrax*, the former still occurring on passage, though in increasing numbers, with 20-50 birds over-summering (Márkus, 1991). Hungary's grasslands are also described by Márkus (1990), and the approximate distribution of steppe-like habitats shown in Figure 8. Areas of meadow and pasture in 1973 are shown in Figure 9.

Three sub-types of grassland can be recognised within Hungary, characterised by different plant communities and degrees of exploitation, according to Márkus (1990):

(a) Loess grassland once covered about 7.5% of Hungary and this was the only treeless climax community. Almost all of it has been ploughed and only isolated fragments prevail at sites such as roadsides, on dykes and on ancient earthworks.

(b) Chalk-sand grassland can now only be found between the Danube and Tisza rivers, particularly in Kiskunság. Such sites are characterised by sand dune drifts, dry microclimates and south-facing aspects. Many areas are protected, but the former extent has decreased due to afforestation with introduced species and agricultural development, including vineyards and orchards.

(c) Alkaline grasslands, or *pusztyas*, occur in areas of high spring rainfall and very hot, dry summers, which result in salt accumulation near the surface. The area of such grasslands has decreased through soil improvement, tree planting, rice field and fish pond development and intensification of management, including fertilizing and planting of exotic species (Márkus, 1990).

At present, land ownership is mostly by the state and large cooperatives which hold 90-95% of the agricultural area (Márkus, 1991). Hay meadows as opposed to grazed grasslands prevail in the wetter western and southern parts of Transdanubia, often occupying about

60% of the grassland area. In the Hungarian plain, which is much drier and has generally less than 500mm of rain per year, hay yields are very low, only about one to three tons/ha/year (Dziewulska, 1990).

Recent Losses

Lowland grasslands have only been altered on a large scale since the 1950s, due to the intensification of agriculture and improvements in economic infrastructure, which had the sole aim of increasing production (Márkus, 1990). Fertilizer applications have increased 100% since World War II (IUCN, 1990b). In 1950 there were 1,474,000ha of grassland (including seasonally flooded areas) in Hungary, but by 1990 this had been reduced to 1,185,570ha; in 40 years nearly 300,000ha (20%) has been lost. Changes in grassland land use have also occurred over this period; in 1950, 40% of grassland was meadows as opposed to pasture, but by 1990 the proportion of meadows was 20%. Wet meadows in particular have declined drastically, from 600,000ha in 1950 to 200,000ha in 1990, a reduction of 67%. This was largely through large-scale drainage in the 1960s subsidised by the state. Instead of increasing productivity, this move led to reductions in grass yields and deterioration in soil fertility, partly through over-trampling by grazing animals. Conservation of grassland sites and species did not begin until the 1970s, with the creation of Hortobágy and Kiskunság National Parks (Márkus, 1991).

The area of grassland has suffered continuous encroachment from afforestation and arable farming, including vineyards, orchards and winter wheat on chalk-sand grassland. Ploughing has almost totally destroyed the loess grasslands. Areas of alkaline grassland have suffered from soil improvement, rice-field and fish pond development, and intensification of grassland management including fertilizing and introduction of alien species (Márkus, 1990).

Continuing Threats

A wide range of present threats are given for about 50 sites in Hungary in Márkus (1990: see Table 5). The most common threats at these sites are: fertilizing and "melioration" (19 sites each); alien grass introduction (16 sites); ploughing (15 sites); weed encroachment (14 sites); goose farming (13 sites); and alien plant encroachment (11 sites). Forty sites have three or more different threats, a few have as many as six or seven.

The current management systems in many areas are causing the degradation of semi-natural grasslands. Over-grazing is a problem, particularly in drained meadows. A decline in the number of grazing livestock over the last 40 years, together with reductions in permanently grazed areas and an increase in the number of cattle confined indoors, has also

Table 5: Major areas of grassland in Hungary with their protection status, grassland types and present threats (Source: Markus, 1990)

Name of area	Conservation Status		Area (ha)	Grassland Types	Present Threats
	(i)	(ii)			
Hortobágyi Nemzeti Park	BR,RS	NP	52,000	AG,LG	UG,WE,FH
Kiskunsági Nemzeti Park & Kiskunsági Puszta	BR	NP	11,030	SG,AG	TT,RD
Kiskunsági Szikes Tavak	RS,BR	NP	3,903	AG	MN
Pülpöpházi Homokbuckák	BR	NP	1,665	SG,AG	MT,WE,AE
Bugaci Homokpuszta	BR	NP	10,920	SG	WE,MN,FH,AE
Orgoványi TK	-	LPA	2,953	SG	WE,MT,AE
Csévharszti Bórókas TT	-	NCA	105	SG	MT,FH,WE
Kéleshalmi Homokbuckák	-	NCA	168	SG	MT,WE
Kunpeszéri Legelő	-	-	ca. 1,000	SG	MN,FN,MT
Borsodi Mezőség TK	-	LPA	9,168	AG	FG,AI
Dérványai TK	-	LPA	3,433	AG	GF,GE
Hajdúsági Erdőpuszták TK	-	LPA	6,243	AG,SG	MN,AL,AE
Hajdubagósi TT	-	NCA	265	SG	RD
Pusztaszeri TK	-	LPA	22,151	SG,AG	FD,FG,AI
Szabadkigyósi TK	-	LPA	4,773	AG	MN,TT
Pitvarosi Puszták TK	-	LPA	3,156	AG	MN,GF
Agota Puszta TT	-	NCA	4,700	AG,LG	GF
Bihari Legelő (Puszta) TT	-	NCA	711	AG	TT
Kardoskúti Fehértó TT	RS	NCA	448	AG	AI
Dinnyési Fertő TT	RS	NCA	545	AG	CG,MN
Ecseg Puszta	-	-	2,067	AG,LG	GF,MN,RD
Balmazújvárosi Nagy-Szik	-	-	600	AG	FD,AL,PG
Császártöltési Lősz-Puszta	-	-	16	LG	WE,AE
Tátársánci Ósgyep TT	-	NCA	1	LG	WE,AE
Erdélyi Hérics (<i>Adonis transylvanica</i>) Csorvási Termohelye	-	NCA	1	LG	WE,AE
Balatonkeresi Tátorjános (<i>Crambe tataria</i>)	-	NCA	1	LG	WE,AE,VP
Bölcskei Tátorjános (<i>Crambe tataria</i>)	-	NCA	10	LG	WE,AE

cont' d ...

Table 5 (cont'd)

Name of area	Conservation Status		Area (ha)	Grassland Types	Present Threats
	(i)	(ii)			
Megyaszoi Tátorjános (<i>Crambe tataria</i>)	-	NCA	35	LG	WE,AE,FH
Biharugrai Puszta	-	-	1,800	AG	GF,FG,AI, PG,FN
Bucsa Jenő-majori Puszta	-	-	500	AG	FG,AI,OG
Füzesgyarmat Balkán Puszta	-	-	900	AG	FG,MN,FN
Füzesgyarmat Aklos Puszta	-	-	400	AG	FG,MN,PG
Déaványai Puszták	-	-	ca. 2,500	AG,LG	GF,MN,PG, GE,RD
Harta-Akasztói Puszta	-	-	2,500	AG,SG	OG,MN,VP,OP MM,RC,RD
Soltszentimrei Puszták	-	-	600	AG,SG	FG,AI,PG, FN,OP,RD
Karcag-Kunhegyesi Puszták	-	-	700	AG,LG	GF,WE,FG, MN,RD,FN,PG
Tiszaluc-Kesznyéteni Puszta	-	-	1,700	AG	MN,AI,FN,RC, RD
Müller-szék	-	-	200	AG	OG,GF,MN, PG,RD
Szeghalom Károlyderéki Puszta	-	-	400	AG	GF,FG,AI,MN, GE,RD
Kisbucsei Puszta	-	-	300	AG	FG,AI,MN
Dormándi Nagyhanyi Puszta	-	-	300	AG	FG,AI,PG
Sarud-Jánosi Puszta	-	-	150	AG	FG,AI,PG
Tiszanánai Puszta	-	-	250	AG	FG,AI,PG
Kömlői Puszta	-	-	150	AG	FG,AI,PG
Poroszlói Puszta	-	-	400	AG	WE,AE
Biharnagybajomi Puszta	-	-	300	AG	GF,FG,PG
Kardoskut Ficséri Legelő	-	-	300	AG	GF,FG,MN
Békéssámszon-Székkutasi Puszta	-	-	600	AG	PG,MN,FG

cont' d ...

Table 5 (cont'd)

Name of area	Conservation Status		Area (ha)	Grassland Types	Present Threats
	(i)	(ii)			
Csőkmői Puszta	-	-	300	AG	PG,MN,FG,FN, GF
Zsákai Puszta	-	-	800	AG	GF,AI,FG,PG, RD
Furtai Puszta	-	-	400	AG	PG,GF,MN
Cserebökényi Puszta	-	-	1,000	AG	FG,MN,PG,RD, AI
Szentesi Fertő-Puszta	-	-	250	AG	PG,GF,AI
Polgár Nagykopasz Puszta	-	-	500	AG	FG,MN,PG
Szeghalom-Füzesgyarmai Puszták	-	-	1,200	AG	FG,GF,MN,PG
Csabacsüdi Puszták	-	-	600	AG	FG,AL,MN
Mezőgyán-Nagyantéi Puszta	-	-	1,200	AG	FG,AL,RD

Key to Table 5

Conservation Status

(i) *International designations*

BR Biosphere Reserve

RS Ramsar Site

(ii) *National designations*

LPA Landscape Protection Area

NCA Nature Conservation Area

NP National Park

TK Tájvédelmi Körzet (LPA)

TT Természetvédelmi Terület (NCA)

Grassland Types

AG Alkaline grassland

LG Loess grassland

CG Chalk-sand grassland

cont' d ...

Key to Table 5, (cont'd)

Present Threats

AE	Alien plant encroachment	OP	Orchard planting
AI	Alien grass introduction	PG	Ploughing
FG	Fertilizing	RD	Rice-field development
FD	Fish-pond development	RC	Road-construction
FH	Fire-hazard	TT	Tractor tracks
FN	Forestation	UG	Under-grazing
GE	Gas-exploration	VP	Vineyard planting
GP	Goose farming	RD	Rubbish dumping
MM	Melioration	WE	Weed encroachment
OG	Over-grazing		

led to a deterioration in habitat in many areas. Other areas have suffered due to a short-lived agricultural policy which encouraged the cultivation of isolated pastures for a few years, but policy changed and these areas were abandoned but then became infested with weed species due to a lack of grazing (Márkus, 1991). Grassland conservation faces serious problems because the traditional farming methods by which these areas were maintained are dying out and their restoration is difficult (IUCN, 1990b).

One threat not directly included in Márkus' information is tourist pressure. Such areas as Pilis, Lake Fertő and Kiskunság suffer from having large numbers of hikers and in the 1,000ha of Hortobágy that are open to tourists there is considerable disturbance (IUCN, 1986). However, probably the greatest threat to Hungary's lowland grasslands, even within protected areas, is intensification of agricultural uses.

Even within the protected areas including lowland grassland, management needs improving. Only one half of all Hungary's grassland reserves have long-term management plans. A major problem is under-grazing through the lack of appropriate livestock. Not even all the most important areas of grassland within protected areas are owned by nature conservation authorities, so appropriate management cannot be implemented. At present, these authorities manage 15,000ha and they are negotiating for the ownership of further grassland areas formerly used by the Soviet military (Márkus, 1991).

Current Protection and Main Sites

Protected areas within Hungary at present include 121,413ha of grassland, which comprises about 24% of the total area protected within Hungary (Márkus, 1990). Twenty-nine lowland grassland sites, identified by indicator species, are listed in Table 6 and located in Figure 10.

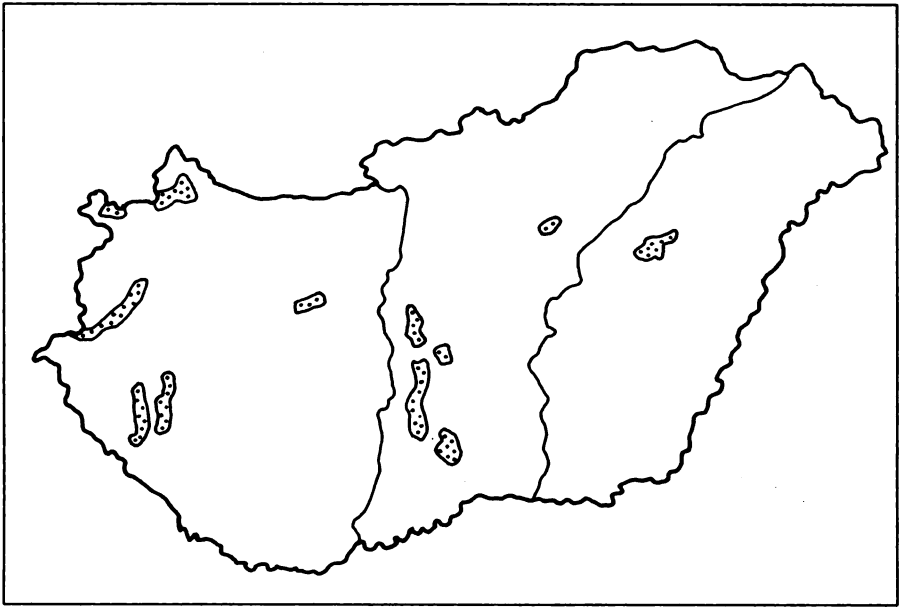


Figure 9. Distribution of meadow and pasture in Hungary
(Source: US Government, 1973)

Of these, 23 have some form of protected status, while the other six, mainly areas of *puszta*, have no protection. Of the 49 sites listed by Márkus (Table 5), only 29 are protected at a national level. Between these two lists of sites there is partial overlap: eight sites with some form of protection (Hortobágy, Agota Puszta, Kiskunsági szikes-tavak, Devaványa, Kardoskut Fehértó, Velence and Dinnyés, Szabadkigyósi Puszta and Pusztaszeri) and three unprotected sites (Biharugrai-Halastavak, Harta-Akasztói Puszta and Pitvarosi Puszta) are included in both. More overlap has not occurred, due mainly to different criteria being used to identify sites. The larger number of sites included by Márkus reflects the advantage of local knowledge, particularly as he includes 22 small, unprotected sites of under 1,000ha in area, mainly of alkaline grassland. However, their importance for grassland birds needs assessing.

After the creation of two national parks, primarily for the conservation of dry grassland in the early 1970s, the national focus turned to forested areas and measures related to grasslands proceeded slowly. However, in 1990, just over 28,000ha of grassland were protected within six Ramsar sites and 5640ha strictly protected within the core areas of four biosphere reserves which are essentially dry grassland sites, although Pilis is also mountain-

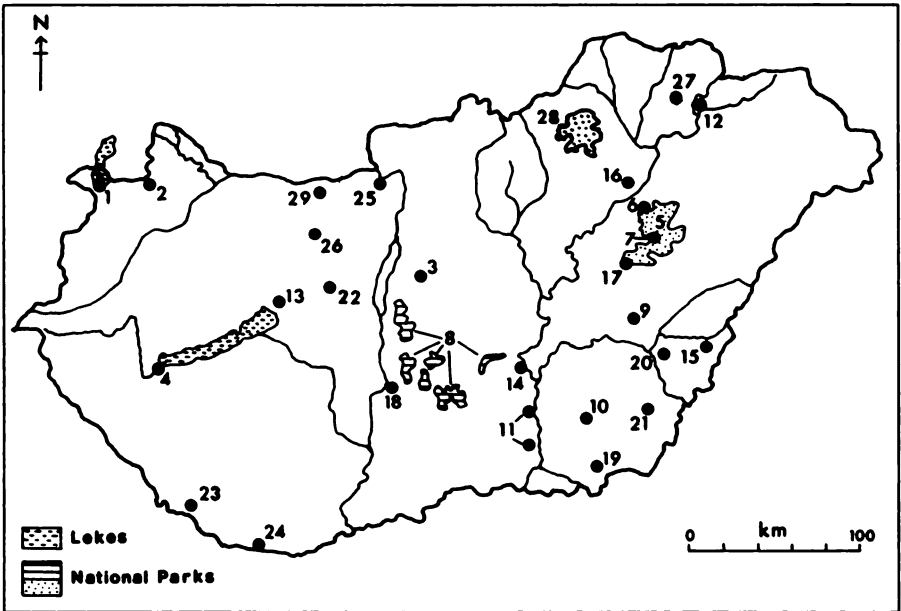


Figure 10. Locations of lowland grassland sites in Hungary, identified by indicator species (see Table 6)

ous (see Table 7). Lake Fertő (Neusiedlersee) has also been proposed as an international park with Austria (Márkus, 1991).

Habitat reconstruction during the second half of the 1980s has occurred in several areas of puszta which are protected. Such areas include Hortobágy, Kiskunság, Lake Fertő and Kardoskut, where the main aims were to recreate grassland and wetland habitats favourable to birds (Márkus, 1991). Protection for *Otis tarda* is to be increased. The Hungarian Red Data Book was completed in 1986 and lists 730 plant, 110 vertebrate and 290 invertebrate species as endangered or extinct, including a number of lowland grassland species. Animal populations inhabiting grassy steppes and meadows have suffered some of the worst losses (ICUN, 1990b).

Table 6: Lowland grassland sites in Hungary, identified by indicator species
(Key in Appendix 1)

No.	Name	Area (ha)	Protected Status	Management Category	Indicator Species	Grassland Type
1	Fertő-tó	3,433 12,542	LPA BioR	V	OT	DS/M
2	Hanság	8,242	LPA	V	CP,OT,AF	G
3	Ocsa	3,576	LPA	V	CP,BO,FC,AF	M
4	Kis-Balaton	14,745 1,400	LPA Ram	V	LP,CI,AF	G
5	Hortobágy	52,000 15,000	BioR Ram NP	II	CP,OT,BO,CB CI,FC,AF,AC FV,[GG]	DS/SS
6	Pusztai kócsi mocsarak	2,815 15,000	NCA Ram	IV	CP,CI,FV	WM/SS
7	Agota-pusztai	4,700	NCA	IV	CP,OT,BO,CI	SS
8	Kiskunsági szikes-tavak	3,903 30,636 4,000 22,095	- NP Ram BioR	- II	BO	DS/WM
9	Déványai	8,933	LPA	V	OT,BO,AC,FV [GG]	DS
10	Kardoskut Fehér-tó	448	Ram NCA	IV	[GG]	G/SS
11	Pusztai and Szeged-Fehértó	22,226 5,000	LPA Ram	V	BO,CI,[GG]	G,DG
12	Tokaj-Bodrogsziget	4,242	LPA	V	CP,CI,[GG,AF]	FM/G
13	Sárrét	2,211	LPA	V	CP,OT,AC [CI,AF]	G
14	Tiszaalpári rét	600	none	-	CP	HM/G
15	Biharugrai-halastavak	5,000	none	-	OT,CI	G
16	Mezőség	7,000	none	-	OT,BO,FV	DS/WM

cont'd ...

Table 6 (cont'd)

No.	Name	Area (ha)	Protected Status	Management Category	Indicator Species	Grassland Type
17	Nagykunsági puszta	3,600	none	-	OT,BO,CB FV,[GG]	DS
18	Harta-Akasztói puszta	2,000	none	-	CP,OT,BO	DS
19	Pitvarosi puszta	3,156	none	-	OT,[GG]	DS/G
20	Belmegyeri puszta	400	none	-	FV	DS
21	Szabadkigyósi puszta	3,785	LPA	V	FV,[GG]	DS
22	Velence and Dinnyés	965	Ram	IX	CI	SS/WM
23	Barcs	3,417	LPA	V	CI	DG
24	Szaporca-O-Dráva	257 250	NCA Ram	IV	CI,CY	?
25	Pilis	23,323 23,000	LPA BioR	V	FC	DS
26	Vértes	13,723	LPA	V	FC	MN
27	Zemplén	26,396	LPA	V	FC,CI	DS
28	Bükk	38,775	NP	II	FC	DS
29	Gerecse	8,617	LPA	V	FC,CI	DS

Current Projects and Recommendations Concerning Grassland Conservation

The following are listed in Márkus (1991):

- the EC PHARE Environment Programme Wetlands and Grasslands Protection Study in Hortobágy and Kiskunság National Parks includes the general objectives of conserving unique natural resources;
- the IUCN East European Programme includes an examination of the Environmental Impacts of Intensive Agriculture in Hungary;
- Hungarian Ministry of Environment (ME) environmental policy projects include the development of environment-friendly agriculture;

Table 7: Areas of lowland grassland in Hungary protected by international conventions
(Source: Márkus, 1991)

Name and total area (ha)	Ramsar Site (ha)	Biosphere Reserve core area (ha)	Biosphere Reserve total area (ha)
Hortobágy NP (52,000)	15,000	1,285	52,000
Pusztaszer LPA (5,000)	5,000	-	-
Kiskunság NP (30,628)	3,903	2,280	22,095
Lake Fertő LPA (12,542)	2,870	375	12,542
Velence-Dinnyés NCA (1,000)	965	-	-
Kardoskut NCA (500)	488	-	-
Pilis (23,323)	-	1,700	23,000
TOTAL	28,226	5,640	109,637

- the ICBP Important Bird Areas follow-up includes surveys carried out by the Hungarian Ornithological and Nature Conservation Society (HOS) to monitor sites identified in Grimmett and Jones (1989);
- there is a WWF-ME-HOS Project for Conservation of Hungarian lowland grasslands;
- species specific projects under the ME include monitoring the status of great bustard populations; studies of bustard-friendly agriculture; a study of the protection of great bustard nesting sites; management of threatened great bustard nesting sites in the Dévaványa region; monitoring the status of the white stork and management of threatened nesting sites; a study of hen harrier winter roosts; management of threatened Montagu's harrier nesting sites; conservation of the saker falcon; and management of barn owl nesting sites.

Following a report by the European Herpetological Society, the Standing Committee of the Bern Convention has made a recommendation "on the protection of the habitat of *Vipera ursinii rakoensis* in Hungary" which was adopted on 11 January 1991. This species

inhabits meadows which have little protection except in Hanság Landscape Protection Area. Purchasing land in other parts of its range and expanding Hanság is recommended, as well as enforcing the prohibition on burning arable land, which is detrimental to many animals and plants.

The development of a grassland conservation strategy in Eastern Europe is to be led by Hungary and Bulgaria (IUCN, 1989b).

Protected Areas Legislation

Nature conservation legislation is based on Bill No. IV of 1982 and Cabinet Decree No. 8/1982 on Conservation of Nature. The basic objectives include: the assessment of natural assets and the declaration of protected areas; the determination of methods for maintaining areas under protection (balancing nature conservation operations with economic activities); acquiring ownership rights for protected areas, most notably those sites endangered by economic activities; and the protection and management of nature reserves. Protected areas are designated at the national or local level, according to their degree of importance (IUCN, 1990a).

Definitions of national protected areas are as follows (IUCN, 1990a):

Nemzeti Park (national parks): large areas of land essentially of an unchanged natural state, where the landscape, fauna, flora or geological formations are of outstanding national importance. These areas are of value for public education and recreation. Zonation ensures that strictly protected areas exist where nature conservation is the prime management objective.

Tajvedelmi Korzetek (landscape protection areas): large areas of special scenic value, that are protected to safeguard and maintain nature conservation values as well as landscape features. Protection of these areas extends to natural landscapes, regions and objects whose preservation and maintenance is of importance for science, culture or other public interest.

Termes Zetvedelmi Terulet (nature conservation areas): established to preserve and maintain small areas of importance for nature conservation. They are divided into two categories, those of national significance and those of local importance, the latter being declared by county councils only.

Conservation legislation also provides for *in situ* protection of important fauna and flora resources. The safeguarding of habitats of the most valued protected species is one of the primary objectives for the designation of protected areas. More than 90% of the total number of vascular plant species and 100% of the protected animal species benefit from *in situ* protected area designation. Legislation states that it is forbidden to destroy, damage or

change the character of natural landscapes, areas and objects declared protected. Utilisation of agricultural lands in declared protected areas can only be ensured in conformity with the category of protection, except in strictly protected areas where agricultural land may be withdrawn from use in the interest of nature conservation (IUCN, 1990a).

Poland

Grassland Status and Distribution

Poland has a total area of 312,000km²; grassland covers about 13% of the country's area and makes up about 22% of the arable land (Denisiuk, 1990; Ostrowska, 1991). The area of meadows and pasture has in recent years been markedly reduced, to about 4,040,000ha in 1988, about 90% of this being lowland grassland. In many river valleys, such as those of the Biebrze, Odra, Barycz, Warta, Noteć, the Lower Odra and Lower Wisla valleys, grasslands cover over 50% of the surface area (Denisiuk, 1990). A large proportion of meadow and pasture in Poland is confined to river valleys (Denisiuk *et al.*, 1991). River valleys also still hold extensive areas of semi-natural grassland, as opposed to grassland areas outside floodplains which have been far more drastically modified, typically with applications of 150kg of nitrogen/ha/year (Denisiuk, 1990). Botanically rich grasslands are not so common as expected; the use of fertilizer is often well over the critical limit for species richness of 50kg/ha/year of nitrogen (Van Dijk, in press). Along large rivers, species-rich semi-natural grasslands tend to occur on mineral soils (*Festuco-Sedetalia* on drier areas, *Molinietalia* in lower areas) while on smaller rivers they occur more commonly on peaty soils. *Molinio-Arrhenatheretea* grasslands in the Lublin area, covering about 10% of Poland, have recently been studied and almost all types have high economic value and contained many interesting plant species. Dry grasslands in river valleys were locally well developed along the Bug, near the USSR border (Van Dijk, 1990). Figure 11 shows the distribution of the most important grassland areas in Poland. These can be divided into three types:

(a) Dry grassland areas are often on south-facing slopes which support some steppe plants. The bird community includes *Anthus campestris*, *Falco vespertinus*, *Emberiza calandra* and *Otis tarda*, with *Burhinus oedicephalus* on sandier soils. About 45% of Poland's grasslands are dry grassland, including areas of former bog and swamp which have been drained (Denisiuk *et al.*, 1991).

(b) Damp grasslands are those which flood occasionally for short periods and have a fairly high water table. Such areas are highly productive and include hay meadows and pastures of high economic value. The flora is rich and dominated by grasses, while including a diverse and colourful dicotyledonous plant community. Typical bird species include *Coturnix coturnix*, *Falco tinnunculus* and *Perdix perdix* (Denisiuk *et al.*, 1991).

(c) Wet grasslands are regularly inundated at certain times of the year. Sedges are often common and only some of these areas are used for hay production, which is then dried and made into "hay flour". Grazing does not occur; however the avifauna is rich and diverse, including *Circus pygargus*, *C. macrourus*, *Grus grus*, *Vanellus vanellus* and *Asio flammeus* (Denisiuk, 1990). About 21% of grassland in Poland is wet grassland but these areas have

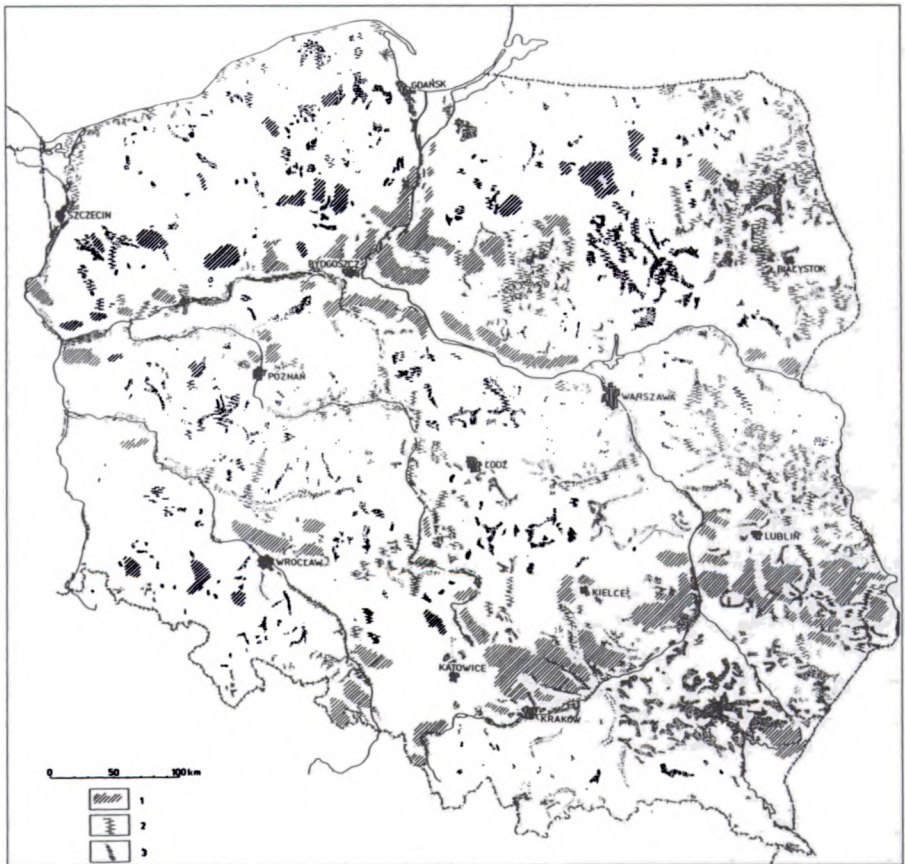


Figure 11. Distribution of the main types of lowland grassland in Poland. (1) dry grassland; (2) wet grassland; (3) temporarily inundated grassland (Source: Denisiuk, 1990)

decreased by about 100,000ha in the past 20 years (Denisiuk *et al.*, 1991).

Areas of grassland within a rotational cropping system can also be important for some wildlife, although their highly artificial nature limits the range of species. Such areas cover about 2% of all agricultural land, or 300,000 - 350,000 ha annually. They are often sown with fodder grasses and Papilionaceae (Denisiuk *et al.*, 1991).

Large-scale drainage of riverside peatbogs in Western Poland took place in the second half of the 18th century in the valleys of the Odra, Warta and Noteć, to provide meadows or arable land, although most of these areas were subsequently brought under cultivation

during the 19th century. In the 1920s, further areas of peatbogs were reclaimed in northern and eastern Poland to be used as pastures or in ley systems. During World War II, management was neglected, but at present 82% of drained peatlands are managed as meadows. The peat-based soils pose a particular problem, in that they are subject to mineralization so that the soil surface becomes lower and therefore drainage ditches have to be deepened periodically. Before drainage they also act as vast storage reservoirs of river water, a resource which Poland has lost (Kajak and Okruszko, 1990). About 36% of grassland in Poland is on drained peatbog. Vast areas of these are located in the northern and north-east parts of the country, along the rivers Narew, Biebrza and Supraśl and on the lower stretches of the Odra, Warta, Noteć, Obra and Leba (Dziewulska, 1990).

Steppe grasslands were once extensive, but are now reduced to remnants on steep slopes and poor soils. Steppic vegetation is most typical on the Malopolska and Lublin Uplands, in Przemyśl and on the lower Vistula and Oder. A few halophytic grasslands occur near the sea or salty springs, for example, along the Baltic coast. Arenaceous grasslands are relatively common, particularly in Kotlina Warszawska, Kotlina Toruńsko-Bydgoska, Międzyrzecze Warcińsko-Noteckie, Kurpiowski Forest and on the Baltic Coast (Denisiuk *et al.*, 1991).

Although Poland is an agrarian country, characterised by small farms of an average size of just over 5ha, the application of fertilizer is low compared with many other European countries, thereby making unintensively farmed areas more suitable for birds (Grimmett and Jones, 1989). Large farms have not developed so much as in drier east European countries, due to strong resistance to collectivisation after World War II, and in 1989 over 70% of agricultural land was in private ownership. Fragmentation of land holding has resulted in a much greater area of unused boundary land which is often suitable for wildlife, including grassland species (Ostrowska, 1991). There are also large areas of communal grassland in this system (Van Dijk, 1991). In the whole country, there are about 16 pairs of *Otis tarda* and breeding populations of 200-300 *Circus pygargus* and ca. 1000 *Grus grus* (Grimmett and Jones, 1989).

Recent Losses

During the last 20 years, the area of meadows has declined by 200,000ha, or about 5%, the main causes of this being intensification of agriculture. Deterioration in grassland quality has also occurred through increased use of chemical fertilizers and pesticides. Intensive forestry has increased its area and encroached on some former grasslands. Wet grasslands have become increasingly subject to drainage, declining in area between 1973 and 1988 from 36% to 23% of all grassland, and this may have significantly affected the populations of birds associated with them (see above).

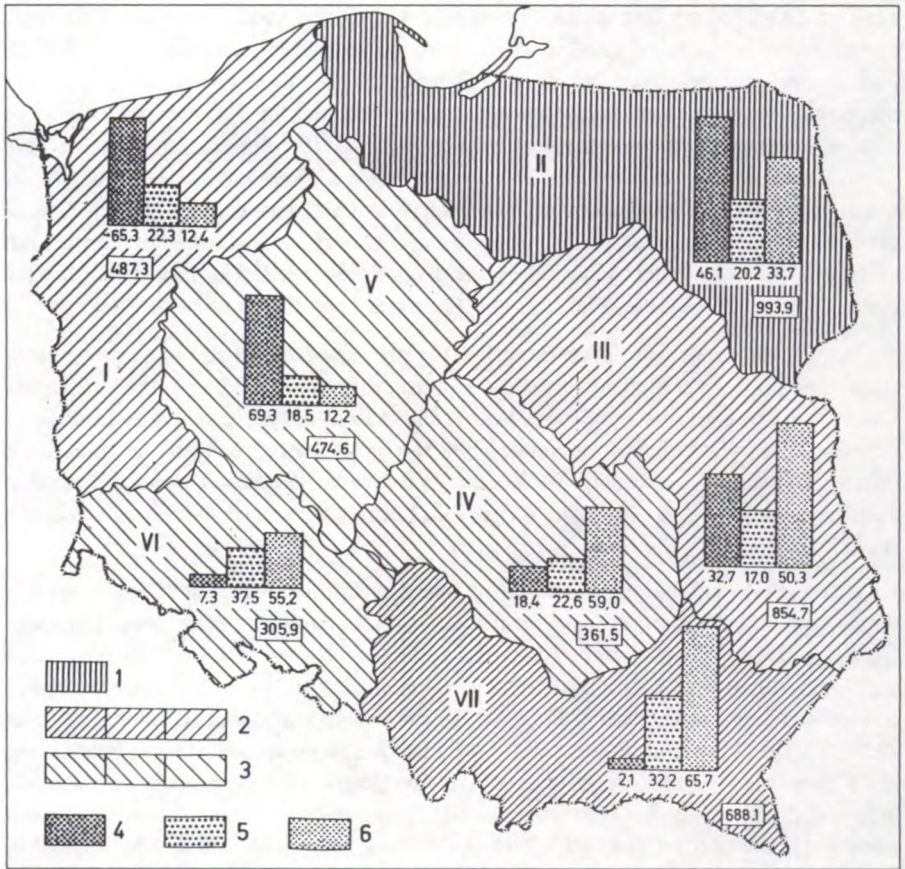


Figure 12. Regional distribution of grassland in Poland in 1973 as a proportion of agricultural land and the proportion of the three main types of grassland by region: (1) 26%; (2) 20.2-23.4%; (3) 14.2-16.6%; (4) grasslands inundated over long periods; (5) grasslands temporarily inundated; (6) grasslands not inundated (Source: Denisiuk, 1990)

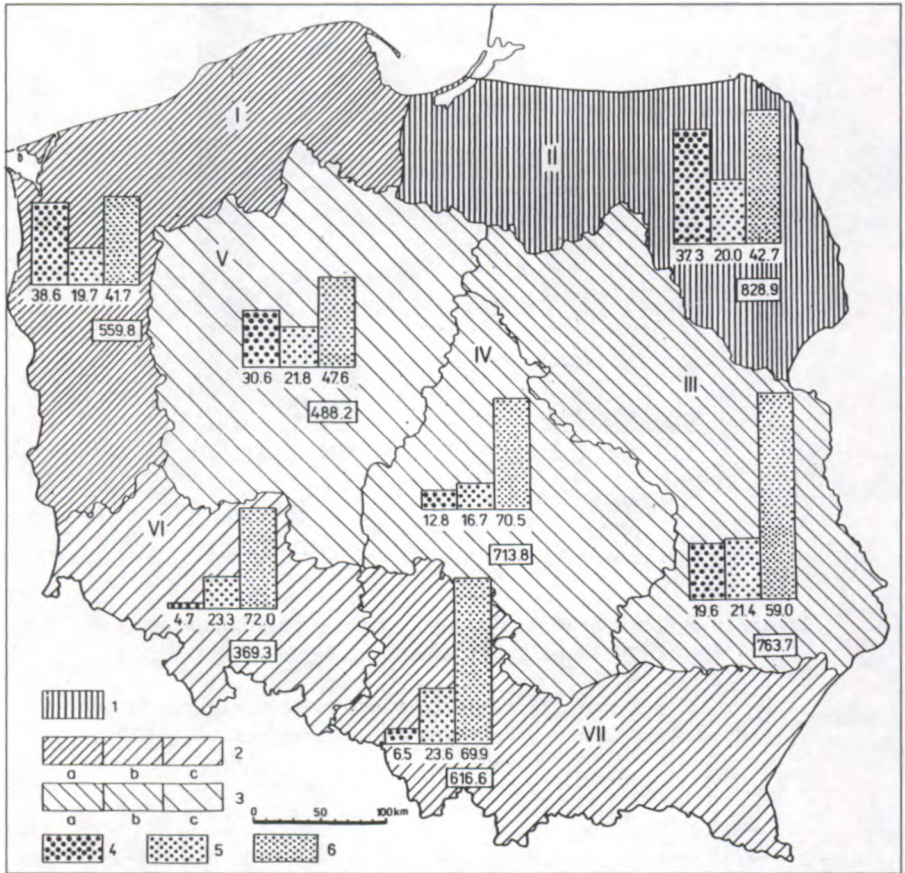


Figure 13. Regional distribution of grassland in Poland in 1988 as a proportion of agricultural land and the proportion of the three main types of grassland by region: (1) over 30%; (2a) 25.1-30%; (2b) 23.6-25%; (2c) 22.1-23.5%; (3a) 20.1-22%; (4) grasslands inundated over long periods; (5) grasslands temporarily inundated; (6) grasslands not inundated (Source: Denisiuk, 1990)

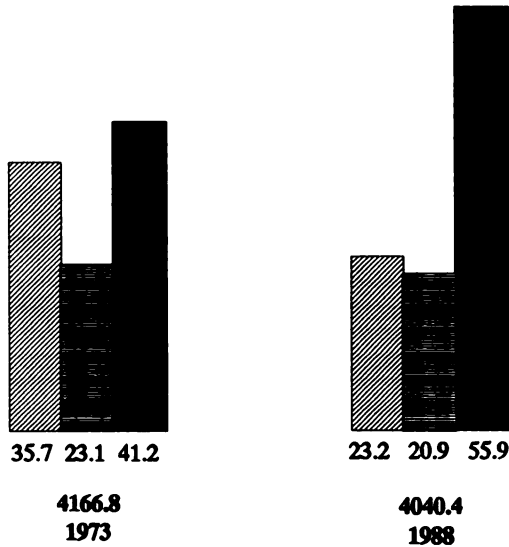


Figure 14. Proportions of the three main types of grassland in Poland in 1973 and 1988 (Source: Denisiuk, 1990)

Key to categories (left to right): grasslands inundated over long periods; grasslands temporarily inundated; grasslands not inundated

The area of reclaimed grassland has changed somewhat over the past 25 years. In 1989, drained grasslands covered 387,000ha, increasing from 62,500ha in 1965, while irrigated grasslands increased from 287,000ha to 427,000ha over the same period (Ostrowska, 1991). Once drained, management is difficult, expensive and almost impossible as the surface is very dry and grass yields are lower (Denisiuk *et al.*, 1991). In Poland as a whole there is about a million hectares of abandoned agricultural land, of which a large proportion seems to be grasslands (Van Dijk, in press).

The geographical distribution in 1973 and 1988 of the three types of grassland described above by region is shown in Figures 12 and 13. The most significant change is in the area of wet grasslands, which were drained on a large scale over this period. Excessive drainage has caused some areas, particularly in the Biebrze and Odra valleys and in the lowlands of Greater Poland, to become similar to steppe habitat. In Greater Poland, drained peat bogs have also developed into steppe-like habitats (Denisiuk, 1990). Figures 12 and 13 also show

the percentage of grassland in agricultural lands by region in 1973 and 1988. There is no marked change in countrywide distribution of grassland over this period except possibly a general slight decrease in grassland area; note, however, that the percentage classes are different on the two maps. The total area of the three major grassland types in 1973 and 1988 is shown in Figure 14; while the proportion of frequently inundated grasslands has decreased considerably and of temporarily flooded grasslands slightly (as has the total grassland area), non-inundated grasslands have dramatically increased their share, presumably through drainage of the other two types.

Deterioration in grassland quality has also occurred, particularly on drained sites, through overgrazing and imbalances in soil moisture so that useful grass species disappear and become replaced by weed species, including *Juncus* rushes. This problem is most common in Western Poland but also occurs in central parts of the country (Denisiuk *et al.*, 1991). Grassland deterioration has also affected its animal populations and a number of grassland species including *Tetrax tetrax* have become extinct over the last century (IUCN, 1990b).

Continuing Threats

The intensification of agriculture continues, including drainage of wet grasslands for arable farming and is probably the biggest threat to grasslands in Poland (Denisiuk *et al.*, 1991). Abandonment and afforestation are however becoming more significant threats, particularly in the light of recent political changes in Poland. It is important for many grasslands to be kept in agricultural use; areas of grassland on peaty soils are commonly found in the smaller river valleys and have a distinct character and great botanical importance: large areas of these have recently been abandoned due to intensification on better soils and the rest must be regarded as extremely threatened (Van Dijk, 1991). Some peatbogs which have been drained have now developed steppe-type vegetation and may be abandoned or have become difficult to manage productively. Many meadow plant species have become endangered, including *Troillus europaeus*, *Iris sibirica*, *Fritillaria meleagris*, *Gentiana pneumonanthe* and *Hierochloe odorata*, plus many Orchidaceae (Denisiuk *et al.*, 1991).

The effects of complete privatisation of land from 1990 are difficult to predict, but changes in intensity of land use may result from withdrawal of state support. While the grassland area may increase as a result, quality will deteriorate without proper management. Due to a great increase in interest rates in Poland, many cattle owned by small farmers are being sold to pay debts and this may affect grassland management, as hay cutting will probably be reduced. Changes in management to increase production have not usually benefited wildlife: for example, many meadows are now cut in May rather than in June, which seriously impairs corncrakes breeding in them (Van Dijk, 1991). Increases in

the already high level of hay production for fodder are also occurring, probably through increased fertilization, and milk production forms an important part in the Polish economy, the annual value equalling that of pit coal (Denisiuk *et al.*, 1991).

A number of botanically interesting grassland types now have limited distributions. Dry calcareous grasslands of *Festucetalia valesiacae* have become very rare and the last remnants will soon disappear if no management to prevent successional vegetation changes is carried out. Most of these areas have been converted to arable farming and only a few remain in private hands. Areas of *Arrhenatheretum* grassland on loess soils have also become rare, being mainly limited to roadsides and the palace park of Białowieża, and may disappear without protection. *Calathion* and *Calathion*-like vegetation is still quite common in certain areas, particularly on wet peaty sites and the lower parts of river floodplains. However, the future of areas within national parks is not preserved by management, as grazing by domestic stock is generally not allowed in such areas. One possibility is to use elks to maintain grassland which could be preserved in landscape parks where private ownership is maintained. Another type, the periodically wet *Molinietalia* grasslands characterised by species such as *Carex panicea* and *Gentiane pneumonanthe*, are likely to disappear in the near future if nothing is done, as they are no longer of much agricultural value and are therefore being abandoned. However, if such areas are purchased for reserves, management in the form of grazing or hay cutting will have to be employed (Van Dijk, in press).

Current Protection and Main Sites

The best-preserved remains of semi-natural grasslands are usually small in area and mainly within nature reserves and also one national park, Polesie (Denisiuk *et al.*, 1991). There is some information on grassland status in a few protected areas. In the Wielkopolska National Park and its surroundings, very dry grasslands occur, although species richness is lower than expected, possibly due to lack of lime. In the Kampinos National Park there is an extensive area of *Calthion* grassland, but most of this is being left to natural succession or planted with alder and ash. It is not planned to maintain semi-natural vegetation or to keep domestic cattle in the park. However, there is a herd of about 100 elk in Kampinos which help keep some areas grazed and these grasslands are botanically interesting. Narew Landscape Park includes a number of wet grassland types, particularly *Calthion* vegetation and supports *Grus grus*. In the Biebrza valley it is possible that a national park of 20,000-47,000ha may be established and if so, positive management of existing grassland areas to maintain their character may be included, a situation unusual in Poland where the promotion of natural habitats usually takes priority in national parks. The nature reserve of Czerwone Bagno (11,629ha) has lines of sand dunes, several kilometres long, with species rich, very dry grassland which is dominated in parts by one rough grass species, possibly due

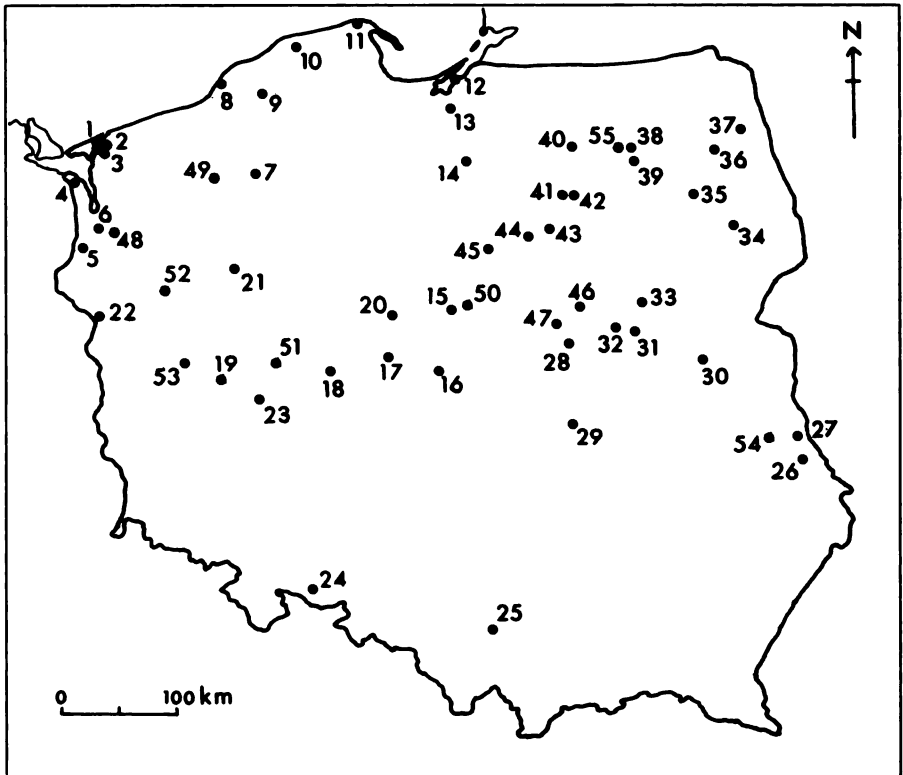


Figure 15. Locations of lowland grassland sites in Poland identified by indicator species (see Table 8)

to former use by man, and supports *Grus grus*. In the Lublin area almost all the calcareous grassland has disappeared, but there is about 50ha left in each of two 200-300ha reserves (Van Dijk, in press).

A large number of lowland grassland sites (55: see Table 8 and Figure 15) have been identified by indicator species, although many apparently have a limited range of grassland bird species, mainly *Circus pygargus* and *Grus grus*. However, this is probably due to lack of information; the ICBP Important Bird Areas follow-up will concentrate on obtaining more detailed information on important sites from Polish ornithologists. There is also a scheme sponsored by the Netherlands to finance about 20 Polish ecologists to survey grassland sites (G. van Dijk pers. comm., 1991). The range of *Otis tarda* is not well covered by protected areas (Grimmett and Jones, 1989).

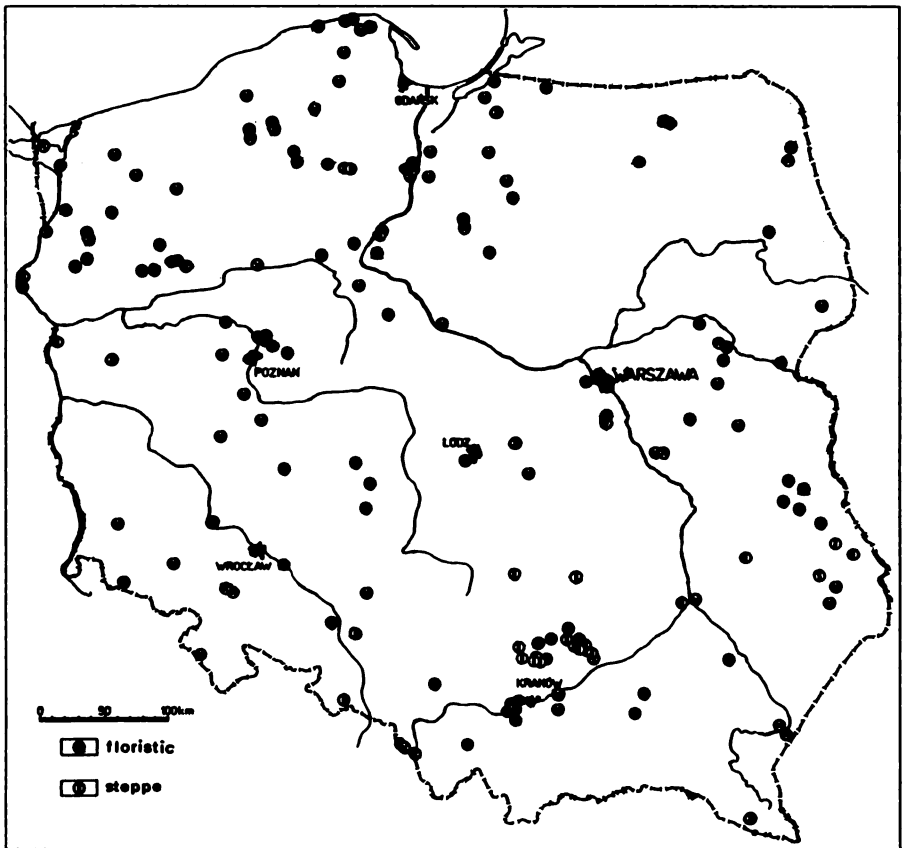


Figure 16. Locations of two types of nature reserve in Poland which could protect lowland grassland (Source: Denisiuk *et al.*, 1991)

Only just over half of the sites in Table 8 are protected or partially protected. There are no areas in Poland where grassland plants or animals are protected specifically and no grassland reserve category exists nationally although for nature reserves, of which there are over 1,000, there are nine types, of which “steppe” and “floristic” are two, and these could cover a limited range of grasslands. The distribution in Poland of these two types of nature reserve is shown in Figure 16. However, most nature reserves are small in area (Denisiuk *et al.*, 1991). With such a wide range of grasslands, from wet meadows to near steppe-like habitats, a great deal of research is needed into the best ways of managing such areas and

**Table 8: Lowland grassland sites in Poland, identified by indicator species
(Key in Appendix 1)**

No.	Name	Area (ha)	Protected Status	Management Category	Indicator Species	Grassland Type
1	Zalew Kamieński	4,000	none	-	CY,CP,GG	G
2	Bagna doliny rzek Świniec i Niemicy	1,500	none	-	CY,CP	HM/G
3	Bagna Rozwarowskie	1,600	none	-	CY,CP,GG	FM/G
4	Jezioro Świdwie	382	OR Ram	IV	CY,CP,GG	HM
5	Dolina Odry i jezioro Dąbie	45,600 most part part	none OR (LP)	VII	CY,CP,GG	FM/HM/G
6	Obszar wokół miasta Weltyń	4500	none	-	CY,CP,GG	M/G
7	Jezioro Szczecineckie	18,000	APL	VIII	CP,GG	M
8	Koszaliński i Słupski pas nadmorski	55,120 part	APL OR	VIII	CY,CP,AC,GG	M
9	Park Krajobrazowy Dolina Słupi	37,040	LP	V	CY,CP,GG	M
10	Słowiński Park Narodowy	18,247 700	NP OR BioR	II	CY,CP,GG,AF	M
11	Bielawskie Błota	700	LP (OR)	V	CP,GG,AF,FV	M
12	Zalew Wisłany	32,800	prop	-	CP	G
13	Jezioro Druzno	3,022 part	NR OR	IV	CP,GG	M
14	Lasy Iławskie	17,400	(LP) OR	-	GG	M
15	Jez. Rakutowskie i Olszyny Rakutowskie	800	LP NR OR	V IV	CP,GG	M

cont'd ...

Table 8 (cont'd)

No.	Name	Area (ha)	Protected Status	Management Category	Indicator Species	Grassland Type
16	Pradolina Warszawsko-Berlińska	9,000 most part	(Ram) none NR	-	CP,GG,AF,AC	G/M
17	Kramskie Błota	3,700	prop	-	CY,CP,GG, AF	HM/G/IG
18	Dolina środkowej Warty	35,000	prop	-	CP,GG,AC	G/M
19	Wielki Leg Obrzański	15,880	prop	-	AC,GG	M
20	Jezioro Gopło	2,180 part part	LP OR	V	CP,GG	WM
21	Dolina Noteci koło Czarnkowa	9,860	prop	-	CP,GG	FM
22	Rezerwat Słońsk	4,166 1,100	Ram/OR NR	IV	CP,GG	G/HM
23	Zbiornik Wonieść	1,970	prop	-	AC,GG	M/IG
24	Zbiornik Nyski	2,000	none	-	FV	M
25	Zespół stawów rybnych w Budzie Stalowskiej	724	none	-	CP	M
26	Torfowiska węglanowe koło Chelma	1,500 part	NR	-	CP,GG,AF	HM
27	Bagno Bubnów	1,000	(NR)	-	CP,AF	HM
28	Wisła od Dębłina do Plocka	18,000	PL (OR)	-	BO	G
29	Dolina Pilicy	6,800	APL	VIII	CP	M
30	Bagno Calownia/ lub Biel	2,900	LP APL	V VIII	CP	HM/G
31	Dolina Liwca	11,800	APL	VIII	AC,GG	HM/G

cont'd ...

Table 8 (cont'd)

No.	Name	Area (ha)	Protected Status	Management Category	Indicator Species	Grassland Type
32	Dolina dolnego Bugu	50,000	APL (LP)	VIII	CP,BO,GG	G/M
33	Lasy Lochowskie	20,000 276	APL NR	VIII IV	AC,GG	?
34	Narwiański Park Krajobrazowy	8000	LP	V	CP,GG	HM
35	Dolina Biebrzy: basen południowy	3,000	(NP) (NR)	-	CY,CP,GG,AF	HM/G
36	Dolina Biebrzy: basen centralny	40,000 most part	(NP) none NR	-	CY,CP,GG,AF	HM/G
37	Dolina Biebrzy: basen północny	9,000	none	-	CP,GG	HM/G/IG
38	Bagna Nietlickie	1,200	none	-	CP,GG	M
39	Półwysp Czarny Róg	600	none	-	CP,GG	M
40	Ląki Dymerskie	300	none	-	CP,GG	M
41	Dolina rzeki Omulew	1,000 part	LP	-	CP,GG	WM
42	Galwica	3,500	none	-	CP,GG	M
43	Dolina rzeki Orzyc: część górna	7,000	APL (OR)	IV	CP,GG	WM/G/HM
44	Dolina Mławki	6,500	APL	-	CP,GG	HM/G
45	Ląki Raczyny	150	prop	-	CY,CP,GG	WM/G/HM
46	Dolina dolnej Narwi i Zalew Zegrzyński	1,200	APL (LP)	-	CP,AC	M
47	Kampinoski Park Narodowy	3,400 2,029	NP NR	II	CP,AC,GG	M
48	Jeziro Miedwie	3,200	none	-	CY	M

cont'd ...

Table 8 (cont'd)

No.	Name	Area (ha)	Protected Status	Management Category	Indicator Species	Grassland Type
49	Drawski Park Krajobrazowy	41,430	LP OR	V	GG	M
50	Jeziro Karaś	816	Ram NR OR	IV	GG	G
51	Dolina Warty koło Krajkowa	1,290 160	NR	-	GG	FM/G/IG
52	Ujście Noteci	3,530	none	-	GG,AF	H
53	Dolina Leniwej Obry	1,300 95	FR	-	GG	HM/G
54	Jeziro Uściwierz i przyległe torfowiska	600	none	-	CP,AF	?
55	Jeziro Luknajno	710	BioR Ram OR	IV	CY,[GG]	M

maintaining the biodiversity of flora and fauna, including basic biological surveys. The role of grasslands in the agricultural economy needs to be assessed (Denisiuk, 1990).

Protected Areas Legislation

The Law on Nature Conservation of 7 April 1949 still governs the general organisation of nature conservation. It defines three protected area categories: national parks, nature reserves and natural monuments, and regulates their creation, administration and management. Two further types of protected area: landscape parks and areas of protected landscape, were initiated in the 1970s. The Law of 1980 concerning Protection and Management of the Environment regulates all problems connected with landscape protection. This is a general act, passed in January 1981, to regulate natural resource use in the national planning context, to control pollution levels and apply protection of the landscape in general terms.

The new administration in 1990 was preparing a new framework law covering all aspects of environmental protection which was to be presented to Parliament by the end of that year. Sector laws will then be developed (IUCN, 1990a).

The five protected area classifications are (IUCN, 1990a):

Park narodowy (national park): areas of especially beautiful landscape, rich in natural values, of over 500ha, protected for their unique natural values, for their floral and faunal components and their overall landscape features. In practice, areas proposed for conservation as national parks are over 1,000ha. They are zoned into strict protection areas and partial protection areas, the former excluding all human activity, the latter allowing active conservation management of selected elements. Additionally, several national parks have buffer zones designated around them.

Rezerwat przyrody (nature reserves): areas of various sizes (mostly less than 100ha) divided for management purposes into strict (fully protected) reserves and partial (partially protected) reserves. The former are used exclusively for research, the latter are subjected to controlled management activities (most areas belong to the second group, many are mixed, with strict and partial protection respectively). They are classified into nine basic types, according to the main object of protection, namely: forest, floristic, steppe vegetation, halophytic, peatbog, water, faunal, inanimate nature and landscape reserves.

Park krajobrazowy (landscape parks) also termed *parki natury* (nature parks): this category combines nature conservation with the needs of recreation and tourism. They represent areas of exceptional natural values, with a predominance of natural landscape and are regarded as non-intervention zones for the development of industry and urban agglomerations and for large recreation centres.

Obszar chronionego krajobrazu (area of protected landscape): are more extensive territories than landscape parks and contain landscape features characteristic of a given region, often with cultural features as well, and are envisaged as major areas for recreation and tourism development. Economic activities (agriculture, forestry, industry) are not subject to serious limitations, but have to conform to certain standards.

Pomnik przyrody (natural monuments): may also be included in protected areas. They are mostly single objects, such as large trees, old alleys, cliffs, erratic blocks, rock outcrops, etc.

Romania

Grassland Status and Distribution

Romania has an area of 237,500km² of which 69% is lowland, under 800m above sea level. In 1988 nearly 14% of the country (30,030km²) was pasture and about 6.5% (14,030km²) meadows (IUCN, 1991). The southern part of the country is relatively dry and once supported an extension of steppe vegetation from the Ukraine. However, particularly on the fertile loess soils, these areas have been converted into arable farmland. Some remnants of steppe and riverine meadows do still survive (Van Dijk, 1991). Steppe is the natural vegetation of most of the extreme eastern part of the country, either side of the Danube, where it crosses Romania, this being the area of lowest rainfall. Natural vegetation of wooded steppe grassland would also occur along the country's southern border, to the west of the steppe zone and on the extreme western boundary. It is in this latter natural vegetation zone that steppe remnants and isolated populations of great bustard *Otis tarda* survive (IUCN, 1991).

About 29% of the country's agricultural area is grassland (van Dijk, 1991). Romania has a higher proportion of her agricultural land as grassland than many countries in eastern Europe, partly due to lower population densities in the Carpathians and the prevalence of large-scale farms (Dziewulska, 1990). Secondary grassland has also developed on hills which were once forested (Grimmett and Jones, 1989). However, much of the lowland plains associated with the Danube and Siret rivers have very little grassland (often 2-8% of agricultural land) as fertile soils favour the cultivation of crops. In these low-lying areas, most grassland (over 80% on average) is pasture. These floodplain areas have relatively high yields of hay (4-6 tons/ha/year) while the rest of the country has relatively low hay yields, less than 4 tons/ha/year (Dziewulska, 1990). The country as a whole has much of its grassland intensively managed (IUCN, 1991).

Recent Losses

Between 1938 and 1975 the area of pasture rose and the area of hayfields fell, both by about 300,000ha, but between 1975 and 1988 the area of both remained fairly stable, with 3,003,000ha of pasture and 1,403,000ha of hayfields in 1988. Other categories of agricultural land use show similar stability over the last 20 or even 50 years. However, the numbers of sheep, cattle and goats produced has doubled over the past 50 years (IUCN, 1991) suggesting an increase in farming intensity, possibly due to the improvement of pasture with fertilizers to increase hay yields. Intensification has occurred at the expense of some of Romania's last remaining pockets of natural and semi-natural vegetation (IUCN, 1991).

Areas of steppe and improved grassland have steadily reduced. The national population of *Otis tarda* has declined since 1945 to about 100 birds at present. Raptor populations, including those of *Falco naumanni* and *F. cherrug*, have seriously declined, indicating a similar decline in the small mammal populations which they prey on. However, one grassland species, *Oenanthe isabellina*, has recently extended its range into Romania (Grimmett and Jones, 1989). Precise losses and current status of the vegetation and avifauna are difficult to assess, due to lack of survey work. However, a number of lowland grassland bird species including *Anthropoides virgo* and *Grus grus* no longer breed in Romania (IUCN, 1991).

Continuing Threats

The intensification of grazing is altering the character of the grassland in the Lacul Istria area. In neighbouring Pădurea Letea, which is mainly forested, the intervening open areas of grazing land are being reafforested. On parts of Perișor-Zătoane-Sacalin Nature Reserve there is illegal grazing which results in animals destroying eggs and chicks of nesting birds.

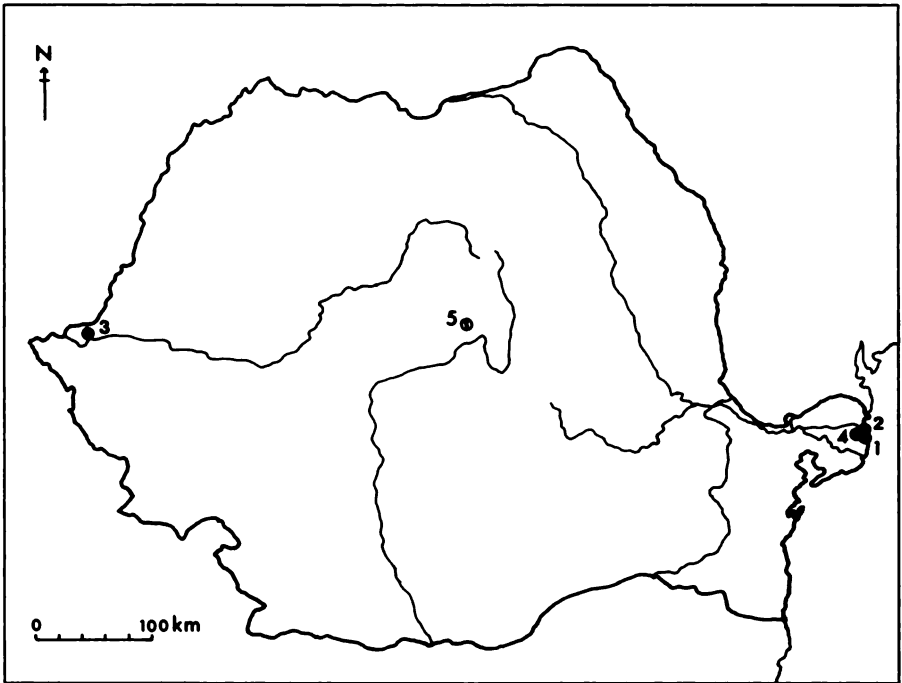


Figure 17. Locations of lowland grassland sites in Romania identified by indicator species (see Table 9)

Illegal hunting also occurs at Eleșteele Sinpaul (Grimmett and Jones, 1989). There are at present no voluntary groups involved in conservation, although nature education is carried out in schools and youth groups. Little legislation on the environment has been passed since the early 1970s (Cerovsky, 1988).

Current Protection and Main Sites

The protected areas network is still underdeveloped. Only five areas of lowland grassland were identified by indicator species (Table 9 and Figure 17), partly because of lack of survey work. However, only about half of the area included has significant protection. One aspect of protected areas legislation which could be favourable to the maintenance of existing areas of lowland grassland is that grazing is allowed in national parks during July and August (IUCN, 1990a). Two nature reserves not identified above: Fintinita and Murfatlar, have a rich steppe vegetation (Polunin and Walters, 1985).

Table 9: Lowland grassland sites in Romania identified by indicator species
(Key in Appendix 1)

No.	Name	Area (ha)	Protected Status	Management Category	Indicator Species	Grassland Type
1	Lacul Istria L. Nuntași & southern L. Sinoie	8000 most	- none	-	BO,GP,GN FV,FC	SS/G
2	Pădurea Letea	5,700 part part	- BioR NR	I/IV	BO,FV	SS/G
3	Lunca Mureșului: Ceala, Pecica, & Bedzin	6,000	none	- -	AC,CI [CY,GG,AF]	WM/G
4	Perișor-Zătoane- Sacalin NR	15,400	NR	IV	GG,GP	G
5	Eleșteele Sinpaul	100	OR	-	CI	G/M

Protected Areas Legislation

The Environmental Law passed in 1973 (No. 9/1973) supersedes previous legislation. Section VI, Article 29 of this Law specifies the official concept governing a national park, the legislative framework and the procedure for creating such protected areas (IUCN, 1990a).

Protected areas are classified into three categories (IUCN, 1990a):

Rezervatii naturale (nature reserves): these are subdivided into seven categories classified as mixed forest, botanical, zoological, geological, morphological, palaeontological and speleological reserves. Ecosystems within nature reserves are under complete protection and access is subject to special authorisation, with tourists allowed to enter by special permit only.

Parcul naturala (nature parks) will protect large areas of the landscape. These are still at a planning stage and lack legal guidelines.

Parcul national (national parks): these have three basic functions, scientific, socio-educational and economic, and are divided into two sectors: a strictly protected zone and a protected zone. The strictly protected zone has complete protection with no permanent residence or pasturing allowed, but biological control of insect pests is permitted. In the protected zone hunting is forbidden. Grazing of domestic stock is also permitted in July and August and tourism encouraged.

Western Soviet Republics

Grassland Status and Distribution

This section covers the republics of Estonia, Latvia, Lithuania, Byelorussia, Moldavia and the Ukraine although the problems and threats which apply to these republics are undoubtedly relevant to the rest of the USSR. Due to the markedly arid continental climate of many parts of the Soviet Union there are large areas with a natural climatic climax vegetation of steppe grassland, in addition to the areas where forest steppe has been cleared. However, probably less than 5% of the area of the entire USSR is still fairly natural steppe, with very little in protected areas. Some is contained within military training areas and is important for *Ovis tarda* (A. Mishchenko pers. comm., 1991). The botany of grassland in Estonia has been well studied and large areas of unfertilized semi-natural grasslands still exist (Van Dijk, 1991).

Areas of grassland in various western republics is given in Table 10. These regions are particularly important for their populations of steppic animal species, including *Ovis tarda* and *Tetrax tetrax* (Grimmett and Jones, 1989). However, with clearance and alteration of the original steppe, birds such as *Tetrax tetrax* are breeding in cereal fields. This is far from ideal since their eggs are often destroyed by machinery. In one area locals are paid for bringing in eggs that would be crushed (which are then hatched and reared in captivity for release in areas lacking bustards). Rooks also present a problem by raiding nests but pressure from the local population prevents their extermination (Flint, 1991).

The importance of grassland is quite variable between the western republics. As a proportion of agricultural land, grassland occupies less than 20% in Moldavia and most of the Ukraine; in northern Byelorussia and Lithuania about 30% is grassland; in southern Byelorussia and Estonia between 40% and 60% of agricultural land is grassland, while in Latvia it is as high as 60-80% (Dziewulska, 1990).

Recent Losses

There is little information about how the grassland situation has changed in recent years. However, intensification of agriculture and desertification are both cited as causes of reduction of the grassland area in Zlotin (1990).

Continuing Threats

The most likely cause of further reduction in grassland area is said to be flooding by large reservoirs for hydroelectric power generation. Continuing losses from agricultural intensi-

Table 10: Total area of lowland grassland and total area within nature sanctuaries in the Western Republics of the USSR (Source: Zlotin, 1990)

[Total area as of 1 November 1988; area in sanctuaries as of 1 January 1990]

Republic	Total grassland in the republic (millions of ha)	Area within nature reserves (ha)	Area within national parks (ha)	Area in nature sanctuaries (ha)
Ukraine	6.6	40,108	4,800	2,214
Byelorussia	3.3	2,046	-	145,900
Lithuania	1.1	280	1,100	3,510
Moldavia	0.3	-	-	-
Latvia	0.7	4,273	34,000	2,500
Estonia	0.4	7,555	7,663	1,300

fication include increases in arable area, hay removal and ploughing of new areas of previously undisturbed steppe. Chemical pollution from adjacent agricultural areas can also be a problem. In areas where intensive agriculture takes up a lot of land, any grassland not used for farming is still threatened by increased use for recreation. In some territories, including ones not generally covered by this report and particularly the European RSFSR, a few species of grassland flowers suffer from overcollecting. Habitat degradation through desertification is also occurring in some southern territories, especially in the Astrakhan-skaya region in the Kalmykh Autonomous Republic (Zlotin, 1990).

Current Protection and Main Sites

The full range of grassland types in the Western Soviet Republics are not well protected, especially natural grassland types as opposed to those derived from forest. Flooded grasslands are particularly poorly represented in protected areas. Some arid grasslands are also suffering from altered hydrographic conditions and their water supply or drainage needs readjusting (Zlotin, 1990). Some areas of relatively well-preserved steppe are protected within nature reserves, but these reserves are small, and several in the Ukraine do not support any bustards (Flint, 1991). Due to the current economic situation and relatively large area of the country already within protected areas, it would be difficult to justify protection of further areas of steppe and semi-natural grassland (A. Mishchenko pers. comm., 1991).

Lowland Grasslands of Central and Eastern Europe

Table 11: Lowland grassland sites in the Western Soviet Republics, identified by indicator species (Key in Appendix 1)

No.	Name	Area (ha)	Protected Status	Management Category	Indicator Species	Grassland Type
<i>Estonia</i>						
1	Matsalu Zaliv	48,634	Ram	I	GG	G/HM
<i>Latvia</i>						
2	Slitere SR	15,517	SR	I	AC,CI,GG	G/M
<i>Ukraine</i>						
3	Shatskiye Ozera	5,710 32,500	NP	II	GG	-
4	Lugansk	1,580	SR	I	AC,OT,GG FV,AF	SS
5	Ukrainian Steppe Reserve, Suny, Donetsk & Zaporozhe	1,634	SR	I	AV,ME,CM FV,SR	VS/HM
6	Sivash Zaliv Azovskoye More	45,700 most	NHR Ram	IV	AV,OT	VS/HM/G
7	Askania-Nova Kherson	33,307	BioR		AV,TT,OT, BO,	VS(1,500ha)
		1,500	SR	I	CB,AC,[GG]	HM/G
8	Yagoriytski & Tendrovski Zalivy	113,200 87,348	BioR Ram	- IX	AV,OT,TT GP,GN	DS/SS
9	Krivaya Kosa Novoazovsk Donetsk	154	SR	-	GP,GN	?
10	Karadag, Sudak	1,370	SR	I	FC	M
<i>Byelorussia</i>						
11	Berezina	76,201	BioR	I	CI,GG	M
12	Belovezhskaya pushcha	87,577	SR	IV	CI	M

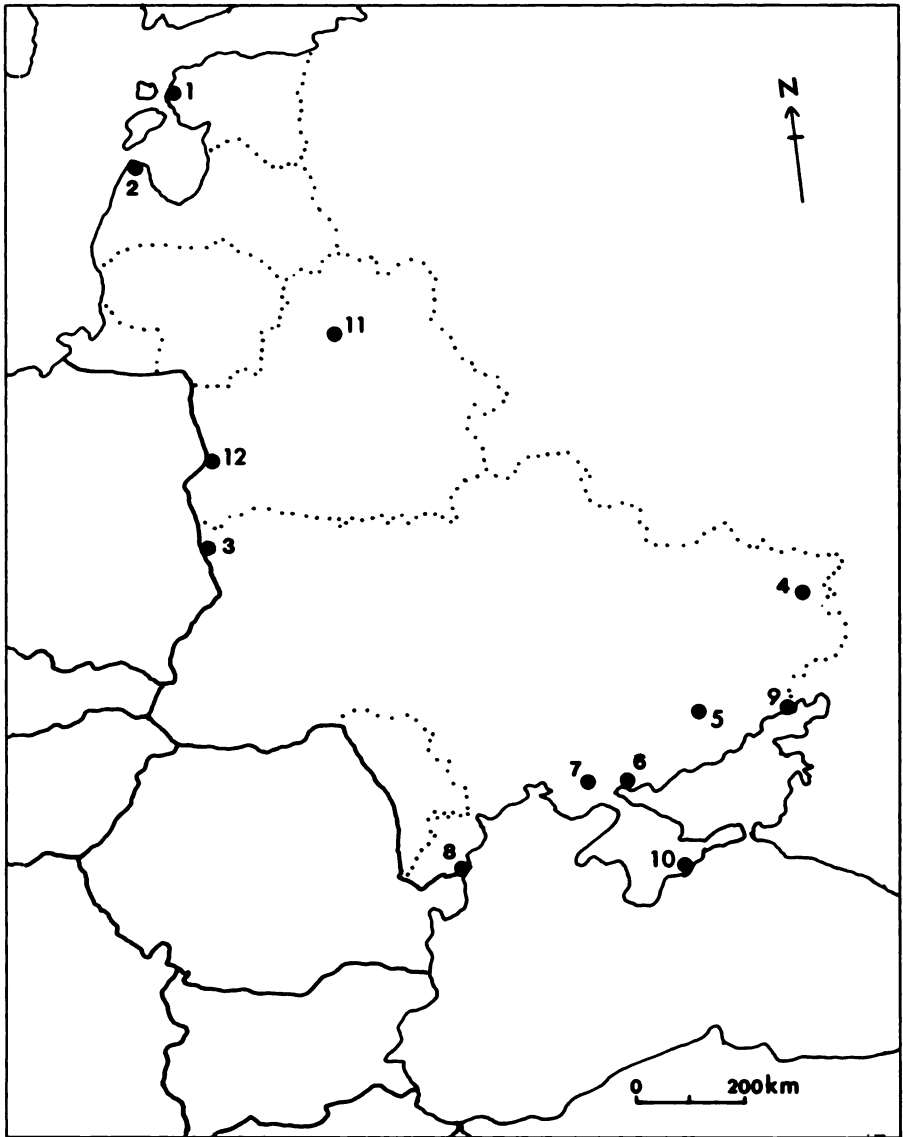


Figure 18. Locations of lowland grassland sites in the Western Soviet Republics, identified by indicator species (see Table 11)

Table 12: National parks in the Western Soviet Republics which include areas of grassland (Source: Zlotin, 1990)
[As on 1 January 1989]

Name	Park area (ha)	Republic	Area of lowland grassland (ha)
Lahemaas	64,911	Estonia	7,663
Gayia	83,750	Latvia	34,400
Lithuanian NP	30,000	Lithuania	1,100
Samarskaya Luka	134,000	Russia	26,800
Mariy Chodra	39,500	Russia	2,000
Ichniansky	15,000	Ukraine	2,500
Cherkassky Bor	41,700	Ukraine	500
Gomolshansky	15,300	Ukraine	1,800

Table 10 shows the total area of grasslands in the Western Soviet Republics and how much is included in various types of protected areas, according to Zlotin (1990). Twelve sites in the western Soviet republics were identified by indicator species, all having some form of protection (Table 11), and eight of these are also included in Zlotin (1990), all of these being nature reserves while none are national parks. Table 12 gives the area of grassland within national parks in the Western Soviet Republics compared with the parks themselves. Table 13 lists nature reserves and their sizes plus the area of grassland they enclose and their locations are shown in Figure 19; many of these reserves are predominantly forested areas but still include significant areas of grassland.

Zlotin (1990) also gives more details about the flora and fauna of selected nature sanctuaries in the European RSFSR which is not covered in this report. At least 15 of these sanctuaries support *Otis tarda* and *Tetrax tetrax*; three areas support *Anthropoides virgo* and/or *Aquila rapax*, while three are important for protecting *Adonis* sp.

Protected Areas Legislation

In 1972 a decree was passed by the Central Committee of the Communist Party of the Soviet Union and the USSR Council of Ministers to strengthen nature conservation and improve the use of natural resources. This led to the current legislation which is based on the State

regulations of 25 June 1980 (which came into force on 1 January 1981) and is entitled The Law on Wildlife Protection and Use and The Law on Air Protection. These USSR and Soviet Republics' Acts on conservation and utilisation of fauna and on air conservation include regulations on protected natural areas and measures to ensure wildlife protection (Articles 21-26) approved by the State Planning Committee and the State Science and Technological Committee of the USSR Council of Ministers. In 1985 the decree of the USSR Supreme Soviet covered conservation of nature law and the rational use of natural resources (IUCN, 1989a).

Three categories of protected area have been defined (IUCN, 1989a):

State reserve (Zapovednik): defined as a typical or unique plot of natural area used by scientific institutions and studied for its natural complexes, established on land excluded from economic utilization. Prohibited activities include building construction, economic activities such as agriculture or industry and unrestricted entry. As far as possible it is maintained in its natural condition unchanged by man. These reserves are often large and exist both to protect threatened flora and fauna and to serve as an outdoor laboratory for field study. Around each state nature reserve is an area of semi-protected land which acts as a buffer with the surrounding countryside. Existing economic activities are allowed to continue if they are not harmful.

National park (natsional'nyi park): a protected natural area established in natural and man-made landscapes (including arable land) mainly on state forest property. It is designated for recreation as well as nature protection and, as in the case of a protected lake shore, differs from a state nature reserve in that tourism is allowed. Sites are zoned into: areas in which economic activities are not banned completely; nature reserves containing the best examples of the original natural habitat, where economic activities and entry by the public is forbidden; nature sanctuaries (*zakazniki*) where tourists are allowed but economic activities are strictly prohibited; and peripheral buffer areas of economic activity where habitation and sustainable levels of exploitation of natural resources (including fishing) are permitted.

National hunting reserve (zapovedno-okhotnich'ye khozyastvo): highly protected and provides a vital refuge for wildlife. At least seven national hunting reserves exist and there are many smaller ones at the union republic level administered under local jurisdiction. Rangers are supposed to control poaching and hunting is limited to sustainable levels.

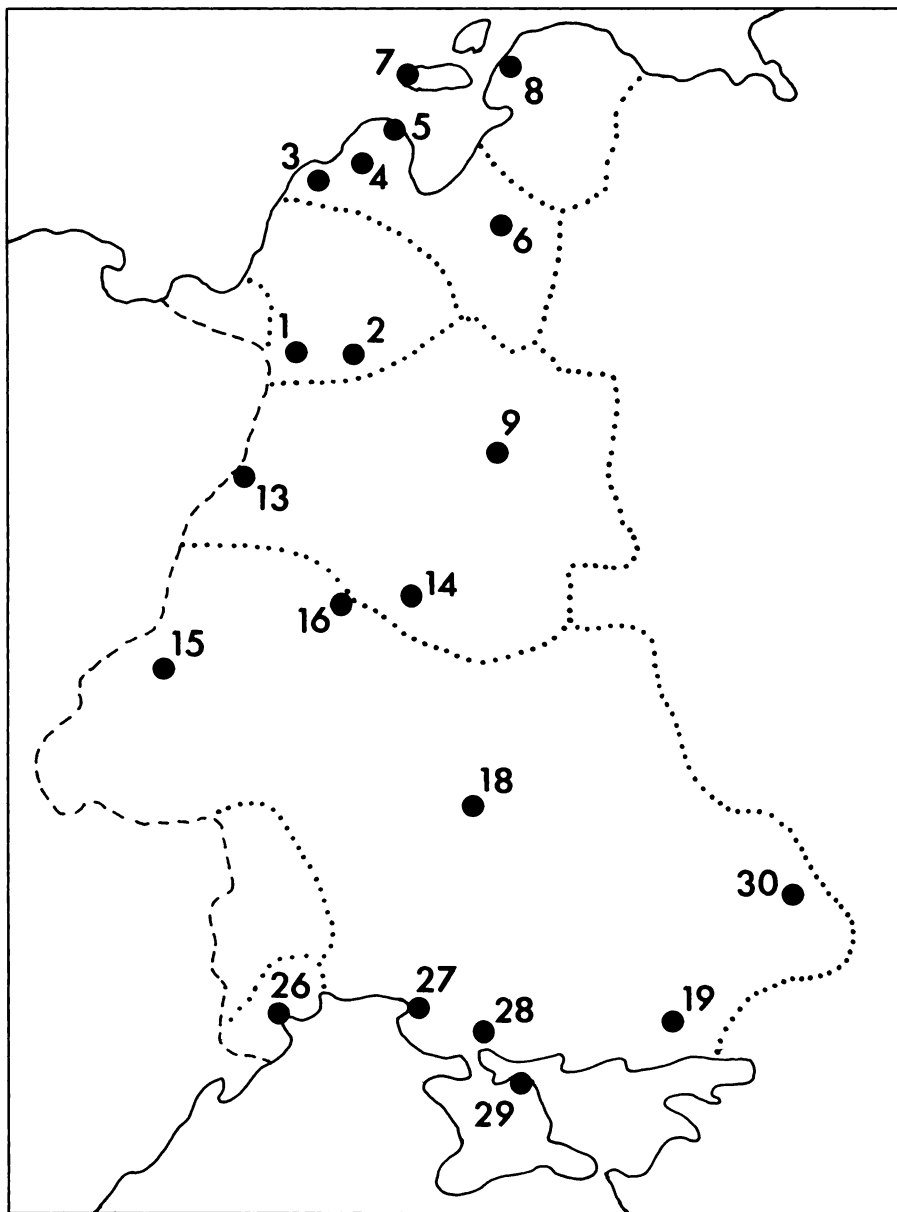


Figure 19. Locations of nature reserves in the Western Soviet Republics which include grassland (Source: Zlotin, 1990)

Table 13: Nature reserves in the Western Soviet Republics which include areas of grassland (Source: Zlotin, 1990)

[As on 1 January 1989; reserves grouped according to their main habitat type]

No. on map	Reserve name	Area (ha)	Republic	Grassland area in reserve (ha)
<i>Mixed forests</i>				
1	Zhuvintas	5,428	Lithuania	25
2	Chiapkjalaiy	8,469	Lithuania	255
3	Grini	1,076	Latvia	65
4	Moritsala	818	Latvia	58
5	Slitere	15,037	Latvia	3,860
6	Krustkalny	2,826	Latvia	290
7	Viydumyae	1,194	Estonia	84
8	Matsalu	39,697	Estonia	7,471
9	Berezinsky	76,201	Byelorussia	9,373
<i>Deciduous forests</i>				
13	Byelovezhskaya Pushcha	87,577	Byelorussia	2,014
14	Pripyatskiy	63,166	Byelorussia	32
15	Rostochye	2,080	Ukraine	120
16	Poleskiy	20,104	Ukraine	310
<i>Forest steppes</i>				
18	Kanevskiy	1,030	Ukraine	32
19	Ukrainskiy	1,634	Ukraine	1,634
<i>Steppes</i>				
26	Dunayskie Plavny	14,851	Ukraine	3,876
27	Chernomorskiy	57,048	Ukraine	14,000
28	Askania-Nova	11,054	Ukraine	10,844
29	Azovo-Sivash state hunting management area	57,430	Ukraine	8,000
30	Luganskiy	1,608	Ukraine	1,292

Yugoslavia

Grassland Status and Distribution

Yugoslavia has an area of 255,804km², of which 64,000km² (25%) is meadow and pasture, including some mountain pastures. There are numerous unimproved flood meadows which occur extensively, mostly in the northern half of the country (Figure 20). In this area there was once an extension of pannonic steppe. This is now mostly cultivated, although a few small areas remain in a fairly natural state (IUCN, 1991). Yugoslavia is also partly in the Mediterranean region, and has more variety in types of grassland than most European countries (Polunin and Walters, 1985). A particularly high percentage of agricultural land is grassland in the Alpi Dolomitiche (over 80%) as this is the wettest area in Europe with 5,300mm of rainfall recorded. In the Dinara Planina, grasslands are important, making up 60-75% of the agricultural area, and are mainly used for grazing but both these areas are largely upland pastures. Yields of hay in these uplands are usually fairly low, less than 4 tons/ha and less than 2 tons/ha in the coastal region, due mainly to poor soils. However, in Slovenia, hay production plays an important economic role (Dziewulska, 1990). About 85% of agricultural land in Yugoslavia is in private hands, an unusual situation, similar to that in Poland, which probably explains the presence of many ecologically rich grasslands, but more information is needed as to the effects of this on possible intensification of agriculture, etc. (Van Dijk, 1991).

Recent Losses

The area of permanent pasture in Yugoslavia increased very slightly (by 0.4%) between 1976 and 1986 (World Resources Institute, 1990) but this may have been at the expense of meadowland. Intensification of agriculture has undoubtedly affected many areas. However, the abundance of flood meadows and relatively large areas of meadow and pasture (although this includes mountain pasture) may indicate that grassland areas have suffered less than in other countries. The Sava river valley is of great botanical value in terms of its grasslands but has recently suffered considerable destruction through dyke construction and ploughing of semi-natural grassland. In the past 30 years many of the meadows of North Croatia have been converted to arable land or drained for more intensive use and these activities have detrimentally affected their species-richness (Van Dijk, 1991).

Continuing Threats

Pesticide use is a problem on meadows and unintensively used agricultural land, such as in Bokanjacko blato and Ninske solane. Increased cultivation is a threat to pasture at Jazovo-

Mokrin, which is unprotected. There is a proposal to develop a large area of Deliblatska pescara for agriculture and afforestation, much of which is at present pasture and secondary steppe. Tourism is a problem at a few sites, including Cres Ornithological Reserve and Kornati National Park. Indiscriminate hunting also occurs on some sites and at others birds are disturbed by illegal fishing. A few sites are threatened by large-scale developments such as airports or power stations which need plenty of flat land. Birds' eggs are taken illegally at a number of sites, commonly by foreign collectors, including bustard eggs from Jazovo-Mokrin (IUCN, 1986; Grimmett and Jones, 1989). The recently designated Lonsjko Polje Nature Park is threatened by pollution from the industrial towns of Zagreb, Sisak and Kutina (Van Dijk, 1991).

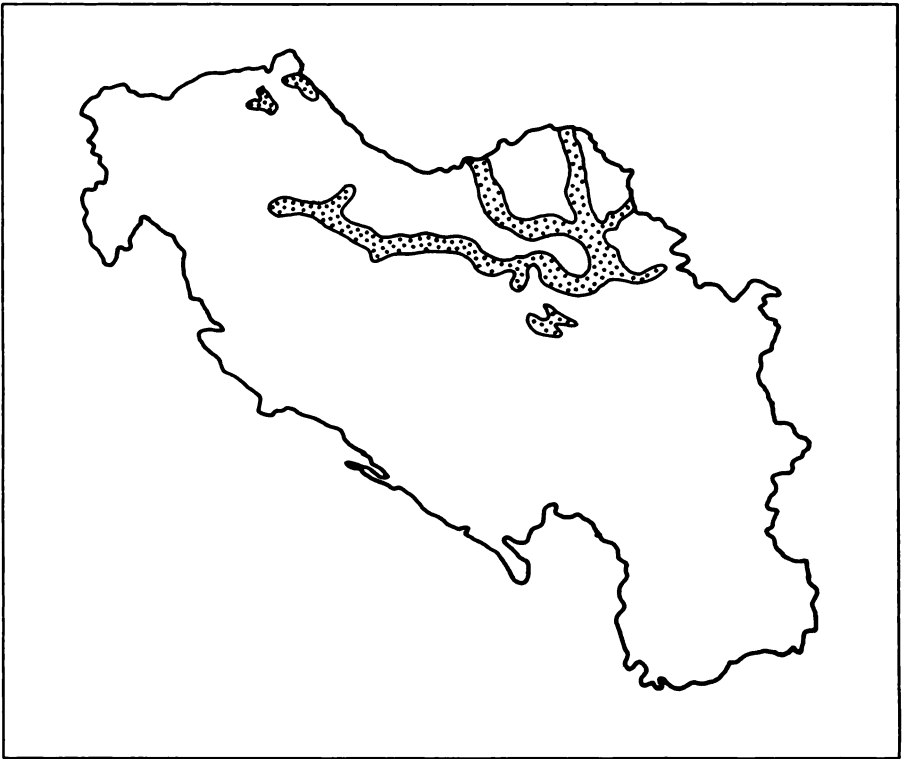


Figure 20. Distribution of valley pasture in Yugoslavia
(Source: U.S. Government, 1973)

Table 14: Lowland grassland sites in Yugoslavia, identified by indicator species
(Key in Appendix 1)

No.	Name	Area (ha)	Protected Status	Management Category	Indicator Species	Grassland Type
1	Sečoveljske soline	850	(NR)	-	AC	SS
2	Ornitološki rezervati na Otoku Cresu	900 550	OR	IV	CB,AC	MG?
3	Bokanjacko blato & Ninske solane	1,000	prop	-	CP,CY	M
4	Nacionalni park Kornati	30,200	NP MSPA	II	CB,AC,FN,FB	MG?
5	Paško polje	625	none	-	AC	WM
6	Dinara planina	20,000	none	-	AC	G
7	Jazovo-Mokrin		none	-	OT,AC,AF,CI [CY,GG]	G/SS
8	Slano Kopovo	ca 600	prop	-	CI,[GG,CY,AF]	G
9	Deliblatska pescara	40,000 29,000	NR	IV	AC,FC	G/SS
10	Severovzhodna Slovenija	238,380 part	FR,NR	-	CI	WM
11	Turopolje	20,000	none	-	CI	MG?
12	Popavno područje rijeke Sava	21,000 532	none BSs	-	CI	M/G
13	Ribnjaci končanica	2,100	none	-	CI	M
14	Jelas polje	2,300	none	-	CI	IG
15	Kopački rit	50,000 6234 10,766	- RZ NP	I	CI,GG,FC,CY	-
16	Ornitološki rezervat na Otoku Krku	1,000	OR	IV	BO	-

cont'd ...

Table 14 (cont'd)

No.	Name	Area (ha)	Protected Status	Management Category	Indicator Species	Grassland Type
17	Nacionalni park Paklenica	3617	NP MSPA	II	FB,MI	DG
18	Nacionalni park Krka	14,200	NP MSPA	II	FN,FB,CB,[CY]	-
19	Gornje podonavije or Monoštor	1000	RNP	-	CI,FC,[CY]	-
20	Fruška gora	25,000	NP	V	CI,FC	S/M
21	Stari begej	2,000 300	RNP NR	-	CI,FC	M
22	Vršački breg	4,000	RNP	-	CI	DS
23	Klisura reke Babuneii Topulke i Cru Kamen	2,500-3,000	prop	-	BR,FN,FB	G
24	Reka Bregalnica	10,000	none	-	CP,FC,TT	G/DS
25	Klisura Crna reka	40,000	none	-	FN,FB	G
26	Demir Kapija	8,000-9,000	prop	-	FN,FB,FC	DS

Current Protection and Main Sites

Twenty-five areas of lowland grassland and one at higher altitudes which is important for *Anthus campestris* (Dinara Planina) have been identified by indicator species. However, less than a quarter are fully protected (Table 14). Their locations are shown in Figure 21. A number of these sites are included for *Ciconia ciconia* alone although this species tends to prefer wetter habitats; however, such sites have only been included if there is evidence of grassland habitat, including seasonally flooded grasslands.

The recently established Lonsjko Polje Nature Park, covering 50,000ha, includes 12,000ha of traditionally managed meadows and pastures. Mountain grassland is well

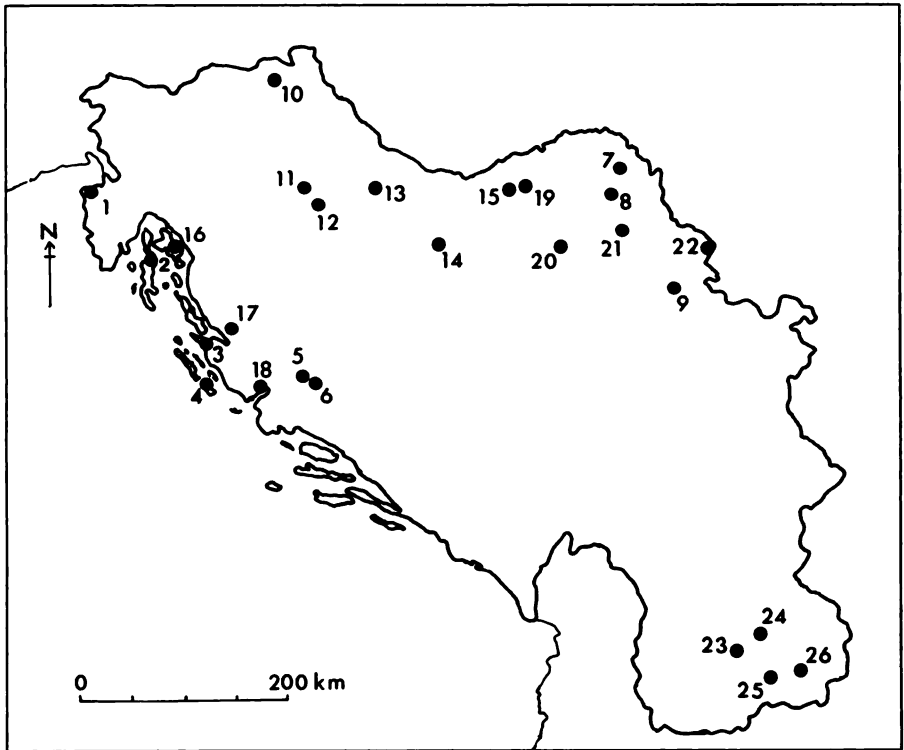


Figure 21. Locations of lowland grassland sites in Yugoslavia identified by indicator species (see Table 14)

developed in some areas and large areas of unfertilized meadows exist in the recently established Kopaonik National Park in Serbia and around the Gdija National Park (Van Dijk, 1991).

Protected Areas Legislation

Although environmental protection was written into the Federal Constitution (*Ustav Socialisticka Federativne Republike Jugoslavije*) of 21 February 1974 it was only recently incorporated into federal development policy as the "Development policy in 1990 in the SFRY", Section 6.2. "Environmental protection and promotion policies", Belgrade, 15 December 1989. Within the federal legislative framework, each republic and autonomous province enacts specific legislation concerning the protection of the environment and

protected areas. Protected areas legislation varies from one republic to another as does the legislation covering the range of activities that can be carried out within protected areas: forestry, hunting, fishing and certain agricultural works (IUCN, 1990a).

The most important types of protected natural areas have been classified into the following groups (IUCN, 1990a):

Nacionalni park or narodni park (national parks): these constitute the largest natural zones of outstanding natural values. Park management varies between republics, many sites being internationally recognised as national parks but others are essentially protected landscapes.

Regionalni park prirode, krajski park, regionalni park (regional natural parks or nature parks): these constitute large areas of specific natural value and are of importance as landscape.

Rezervat prirode, strogi, naravni rezervat (natural reserves or nature reserves): small in size. They are established to protect specific natural elements or species.

Spomenik prirode, naravni spomenik (natural monuments): outstanding geological or animate features, protected for their rarity or specific properties.

Zasticeno rekreaciono podrucje (recreational zones): large areas such as sea coasts, lake shores, river banks, mountain resorts or natural features which are protected specifically for recreation and sports activities.

Ostala zasticena podrucja prirode or Karakteristicni pejzazi (sanctuaries of landscape or recreational importance): sites established largely for recreational importance, cultural heritage and characteristic landscape values are of extensive interest to tourism.

Memorijalni spomenik (memorial monuments): small natural zones established to protect historic features such as important battlegrounds.

Spomenik oblikovane prirode or hortikulturni spomenik (ornate natural monuments or horticultural gardens): notable landscape gardens.

Further Action

A number of suggestions for further action on the conservation of dry grasslands in Europe were made in Wolkinger and Planck (1981). Subsequently, a discussion document "The Conservation Rôle of Pastoral Agriculture in Europe" was prepared as an outcome of the Second European Forum on Birds and Pastoralism in October 1990 by Curtis and Bignal (1991). Following on this, recommendations for further action to conserve grasslands throughout Europe were discussed in detail at an international seminar on "The Conservation of Lowland Dry Grassland Birds in Europe" at Reading University in March 1991 and were summarised in the report of the proceedings (Goriup *et al.*, 1991). Recommendations on the conservation of dry grassland birds were also made in Goriup and Batten (1990). A summary of the main points in these papers and those arising from the compilation of this report is given below.

Priority Requirements

1. **Develop clear definitions of lowland grassland types, from undisturbed steppe to managed grasslands. This will facilitate the identification of the different characteristics and problems of these grasslands.**
2. **Country-based inventories are required, covering all grassland types according to management, geographical location, plant and animal communities.**
3. **Develop a grasslands conservation policy and strategy for each country.**
4. **Preservation of the few remaining natural steppe areas.**
5. **Promotion and encouragement of further studies of grassland ecosystems and their management.**
6. **Encouragement to increase the number and area of grasslands under optimal conservation management.**
7. **Re-creation and rehabilitation of grasslands.**
8. **Persuade protected areas authorities in control of managed grasslands to consider preserving non-natural habitats and continue management (possibly with domestic stock) in cases where this is not the normal policy.**
9. **Extend the coverage of Environmentally Sensitive Areas (ESA) or sites with similar protection status to assist with 6, 7 and 8 above.**

Further Action

10. **Provide farmers with incentives, similar to various European Community initiatives (e.g. agricultural extensification, nitrate sensitive areas, set-aside and ESA) to encourage non-intensive use of grassland and facilitate grassland rehabilitation.**
11. **Extend the Important Bird Areas network and promote international cooperation on the conservation of habitat favoured by globally threatened and migratory lowland grassland bird species.**
12. **Develop a regional and international framework for initiatives and information exchange to encourage cross-border cooperation.**
13. **Devise a clear programme of species-targeted initiatives, directed towards flagship species such as *Otis tarda*.**
14. **Promote public awareness of the value of species-rich lowland grasslands for soil protection, water purification and recreation.**
15. **Identify funding sources and mechanisms to support these activities.**

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Appendix 1

Key to tables of sites identified by indicator species

Site number

This corresponds to the number on the map of sites identified by indicator species for that country. Data from IUCN (1986); IUCN (1987) and Grimmett and Jones (1989).

Site name

Name by which the area indicated as containing grassland is known.

Area

Area of this unit which, in most cases, is not entirely grassland and *not* of the extent of the grassland itself, for which data are rarely available. Several figures are given for each type of conservation status, if different areas involved (e.g. a Biosphere Reserve).

Protection status

Abbreviations (initial letters) of the English translation of the official protection category for that country - see section on "Protected Areas Legislation" for each country. Note that protection categories covering only part of the site area do not necessarily include the relevant area(s) of grassland. For further information on the designation of international categories see IUCN (1990d). The following abbreviations are used in all countries:

Status of international standing

BioR	Biosphere Reserve
Ram	Ramsar Site (Wetland of International Importance)
MSPA	Mediterranean Specially Protected Area
WHS	World Heritage Site

National protection status

NP	National Park
NR	Nature Reserve
FR	Forest Reserve
WNI	Wetland of National Importance
OR	Ornithological Reserve
BS	Bird Sanctuary
BPA	Bustard Protection Area
prop	protection proposed (proposed status in parentheses, if known)
none	no protected status

Management category

According to management criteria developed by IUCN and taken from IUCN (1990d) for sites of 1000ha or over and from IUCN (1989a) for smaller sites. Categories are defined in more detail in IUCN (1990d).

- I Scientific Reserve/Strict Nature Reserve
- II National Park
- III Natural Monument/Natural Landmark
- IV Nature Conservation Reserve/Managed Nature Reserve/Wildlife Sanctuary
- V Protected Landscape of Seascape
- V Resource Reserve
- VI Anthropological Reserve/Natural Biotic Area
- VII Multiple Use Management Area/Managed Resource Area
- IX Biosphere Reserve
- X World Heritage Site

Indicator species

Information on the distribution of most animal species or plant associations in eastern Europe is extremely limited; it is only on avifaunal distributions that widespread information is available. Therefore bird species have been used as indicators of the presence and type of lowland grassland. Breeding species are shown by initials but if only present on passage, initials are in square brackets []. Note, however, that for all sites, only a very abbreviated bird species list has been available and that the information is usually biased towards rarer or more noteworthy species; therefore the tables cannot be taken to indicate a species' absence from a site or give a very accurate picture of its distribution within a country. The species used follow Goriup and Batten (1990) and Tucker (1991).

Codes are initial letters of genus and species except for those marked * :

BI	<i>Bubulcus ibis</i>	BO	<i>Burhinus oedicnemus</i>
CI*	<i>Ciconia ciconia</i>	GP	<i>Glareola pratincola</i>
CY*	<i>Circus cyaneus</i>	GN	<i>Glareola nordmanni</i>
CM	<i>Circus macrourus</i>	CG	<i>Chettusia gregaria</i>
CP	<i>Circus pygargus</i>	PO	<i>Pterocles orientalis</i>
BR	<i>Buteo rufinus</i>	PA	<i>Pterocles alchata</i>
AQ*	<i>Aquila rapax</i>	TA	<i>Tyto alba</i>
FN	<i>Falco naumanni</i>	AN	<i>Athene noctua</i>
FB	<i>Falco biarmicus</i>	AF	<i>Asio flammeus</i>
FC	<i>Falco cherrug</i>	CD	<i>Chersophilus duponti</i>
FV	<i>Falco vespertinus</i>	ME*	<i>Melanocorypha calandra</i>
AL*	<i>Alectoris rufa</i>	ML	<i>Melanocorypha leucoptera</i>
PP	<i>Perdix perdix</i>	MY	<i>Melanocorypha yeltoniensis</i>
CO*	<i>Coturnix coturnix</i>	CB	<i>Calandrella brachydactyla</i>
GG	<i>Grus grus</i>	CR	<i>Calandrella rufescens</i>
AV	<i>Anthropoides virgo</i>	GC	<i>Galerida cristata</i>
TT	<i>Tetrax tetrax</i>	GT	<i>Galerida theklae</i>
OT	<i>Otis tarda</i>	AA	<i>Alauda arvensis</i>

Lowland Grasslands of Central and Eastern Europe

AC	<i>Anthus campestris</i>	CF	<i>Corvus frugilegus</i>
AP	<i>Anthus pratensis</i>	SR	<i>Sturnus roseus</i>
OI	<i>Oenanthe isabellina</i>	MI*	<i>Miliaria calandra</i>
OO	<i>Oenanthe oenanthe</i>		

Type of grassland

References to grassland habitat type in the literature are sparse and inconsistent, and do not always describe very clearly the state of the actual vegetation. Therefore to avoid misinterpreting terms used in some literature, a number of categories have been devised, using, in general, the actual land use or habitat description in the source material:

VS virgin steppe (i.e. never been ploughed)

S steppe

DS secondary steppe

SS salt steppe

DG dry grassland

M meadow

HM hay meadow

WM wet meadow

FM flooded meadow

G grazed land/pasture

DB drained bog

MG sub-Mediterranean grassland

IG intensively farmed grassland

C cereals

These should be used with care, as they have been taken second-hand from sources which, by their nature, have to summarise habitat descriptions. It should also be noted that in almost all cases, the indicator species recorded are not assigned to any particular habitat, e.g. meadow rather than forest. However, the overall trend is that characteristic grassland

Appendix

birds are present where one of the above grassland habitats is significant enough to be mentioned, with the possible exception of *Grus grus*, which also uses wetland sites, particularly on passage; sites which apparently do not include significant amounts of grassland and only seem to support this species or *Ciconia ciconia* have not been included. Similarly, cases such as a predominantly salt pan site with only *Glareola pratincola* have been omitted.

IUCN - The World Conservation Union

Founded in 1948, IUCN - the World Conservation Union - is a membership organisation comprising governments, non-governmental organisations (NGOs), research institutions, and conservation agencies in over 100 countries. The Union's mission is to provide leadership and promote a common approach for the world conservation movement in order to safeguard the integrity and diversity of the natural world, and to ensure that human use of natural resources is appropriate, sustainable and equitable.

Several thousand scientists and experts from all continents form part of a network supporting the work of its Commissions: threatened species, protected areas, ecology, environmental strategy and planning, environmental law, and education and communication. Its thematic programmes include forest conservation, wetlands, marine ecosystems, plants, the Sahel, Antarctica, population and natural resources, and Eastern Europe. The Union's work is also supported by 12 regional and country offices located principally in developing countries.

East European Programme

IUCN's long history of activity in Eastern Europe provided the foundations for an integrated East European Programme, established in 1987. The aims of the Programme are to promote environmentally sound planning in accordance with the aims of the World Conservation Strategy and the Report of the World Commission on Environment and Development, participate in international conservation affairs and to promote and support the application of restoration ecology. The Programme has built up an unparalleled store of information on conservation issues in eastern, central and south-eastern Europe. Dissemination of this information is being carried forward through the EEP Report and Research Series.

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