Biodiversity Conservation and Management in Afghanistan: A State-of-the-Art Review Paper

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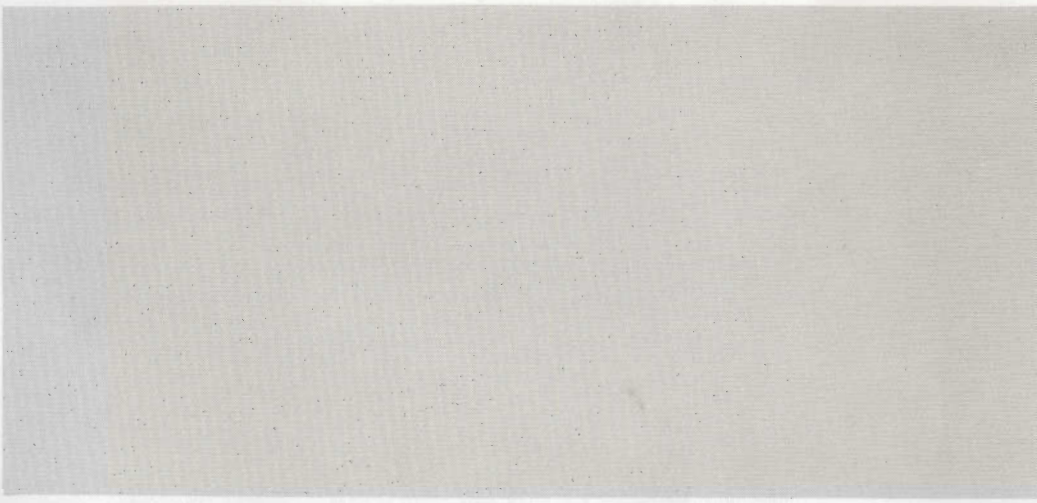

Afghanistan

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INTRODUCTION

Afghanistan, covering an estimated area of 652,000 square kilometres, lies in Central Asia. Completely landlocked, it is surrounded by Tajekistan, Uzbekistan, and Turkmenistan in the north, Iran in the west, Pakistan in the south and southeast, and China in the northeast. It is divided by the mountains of the Hindu Kush and is host to rich flora and fauna.

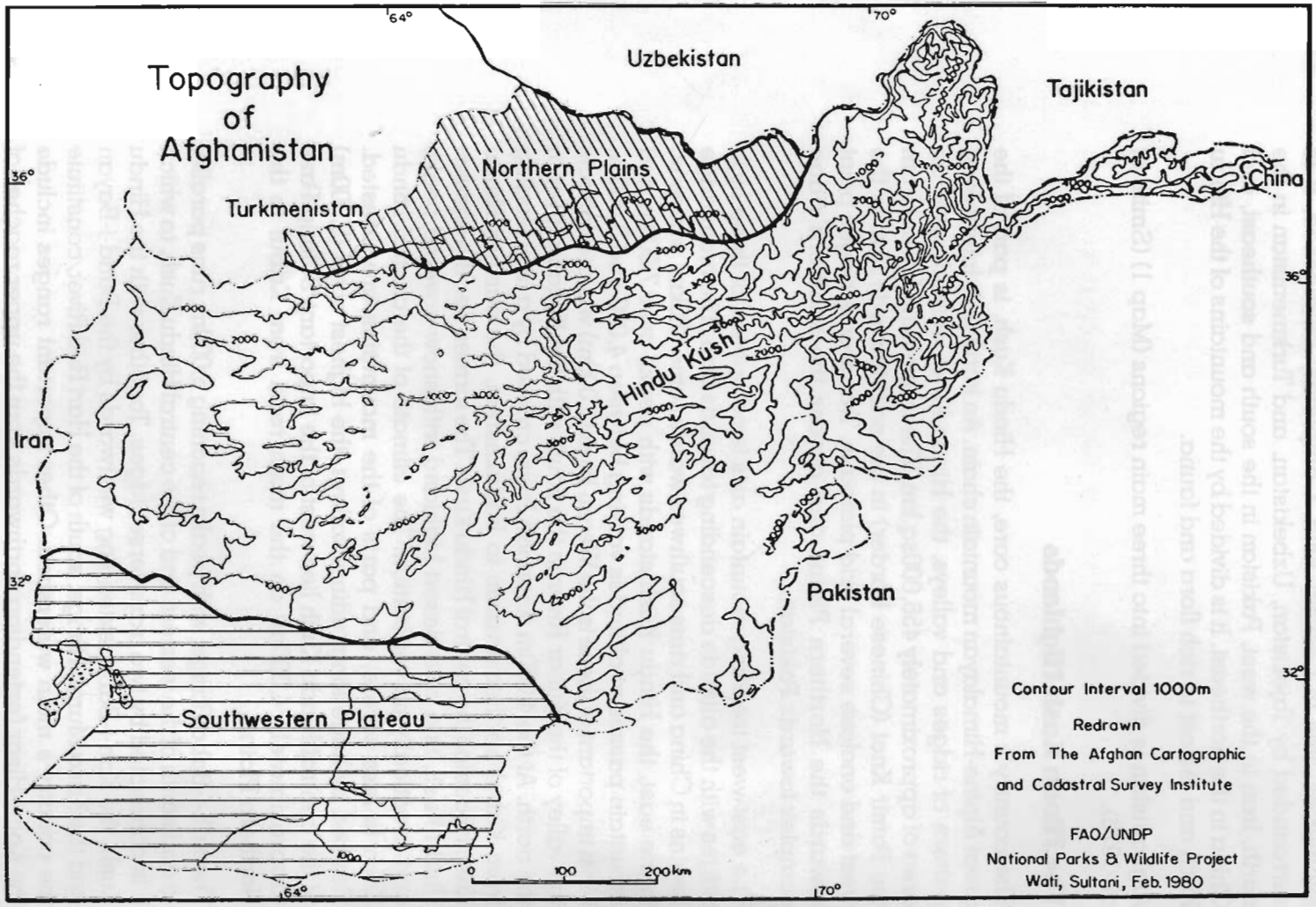
Afghanistan is divided into three main regions (Map 1) (Smith et al. 1973).

The Hindu Kush Highlands

The country's mountainous core, the Hindu Kush, is part of the great Alpine-Himalayan mountain chain. An intricately interwoven pattern of ridges and valleys, the Hindu Kush, extends over an area of approximately 456,000sq.km. The mountains fan out from the Pamir Knot (Chinese border) in the east towards Iran in the west and enclose several arid plateaus. Transverse ridges point towards the Northern Plains and across the southern ridge complex towards Pakistan.

The east-west trending mountain axis is composed of three high ridges with the altitude descending towards Iran. The main ridge begins in China and runs southwestwards some 480km, whereas, in the east, the Hindu Kush stands with peaks over 7,000m and mountain passes at altitudes varying between 4,000 and 5,000m. Most important of these is the Weran Pass (5,000m) which connects the valley of the Kunar River in the south with the Kokcha River in the north. At the 4,000m Anjuman Pass, crossed by a trail leading from Kabul northeastwards to Badakhshan, the eastern Hindu Kush becomes the central Hindu Kush. The former, i.e., the eastern Hindu Kush, is a cold desert highland with snow-covered peaks and practically no vegetation. The climate of the central Hindu Kush is less severe, and parts of the mountains are forested. Flanked by huge longitudinal valleys, the highest crest (5,000m) of the central Hindu Kush lies west of the important Salang Pass (approximately 4,000m) on the main road from Kabul to the Northern Plains.

The Koh-i-Baba Range, with peaks reaching 5,000m, runs parallel to and south of the western end of the central Hindu Kush, to which it is connected by two transverse ridges. Together with the Hindu Kush, the Koh-i-Baba, extending westwards by the Band-i-Bayan and the Kasa Murgh Range, south of the Hari Rud River, constitute the country's main watershed. Other important ranges include the Koh-i-Hisar (extending northwards from the upper reaches of the Murghab River), the Firoz Koh, and the Paropamisus, north of the broad Hari Rud Valley. The city of Herat is situated near the



Map 1: Topography of Afghanistan

western end of this valley, which runs into an intermontane plateau situated astride the boundaries with Iran. The Zamast Pass (elevation 2,500m) on the road from Herat to Maimana is the main pass in the barren, deforested Paropamisus Range.

The Northern Plains

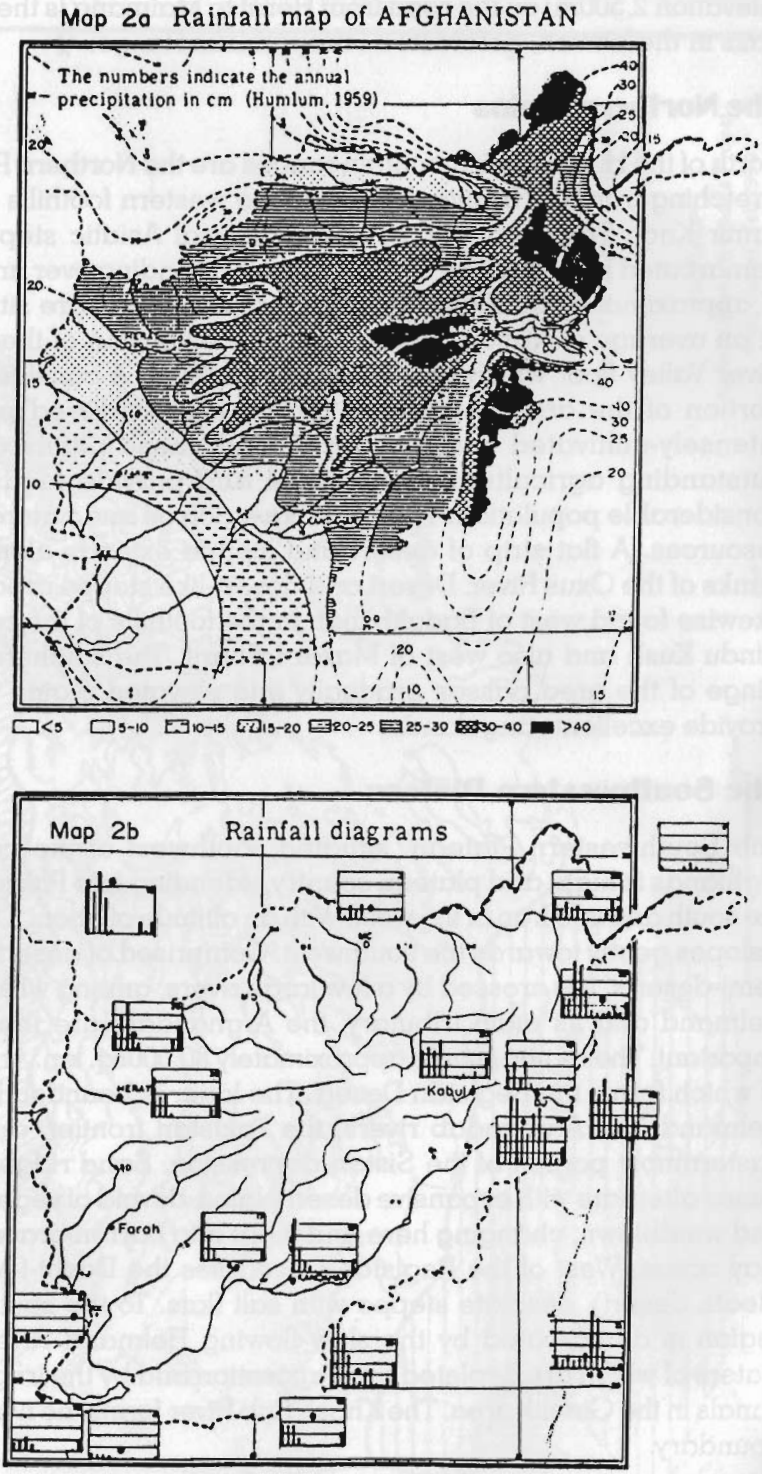
North of the Hindu Kush mountain ranges are the Northern Plains, stretching from the Iranian border to the western foothills of the Pamir Knot. The area, a part of the Central Asiatic steppe, is demarcated in the east by the Oxus River. Extending over an area of approximately 64,000sq.km., the Northern Plains are situated at an average elevation of 666m, with the exception of the Oxus River Valley floor which drops to a low of 300m. A considerable portion of the area consists of fertile, loess-covered plains. Intensely-cultivated and densely-settled, these plains are of outstanding agricultural importance and provide food for a considerable population. They also have rich oil and natural gas resources. A flat strip of desert and steppe extends along the banks of the Oxus River. Desert and desert-like steppe areas are likewise found west of Badakhshan in the foothills of the central Hindu Kush and also west of Mazar-i-Sharif. The southernmost fringe of the area passes gradually into elevated plains which provide excellent rangelands.

The Southwestern Plateau

The Southwestern Plateau, situated southwest of the central highlands is high, arid plateau country extending into Pakistan in the south and into Iran in the west. With an altitude of about 1,000m, it slopes gently towards the southwest. Comprised of deserts and semi-deserts, it is crossed by a few large rivers, among which the Helmand and its main tributary, the Arghandab, are the most important. The region covers approximately 80,000sq. km., a fourth of which forms the Registan Desert. The latter is bounded by the Helmand and Arghandab rivers, the Pakistan frontier, and the easternmost portion of the Sistan depression. Sand ridges and dunes alternate with expansive desert plains, devoid of vegetation and windblown, changing here and there into barren gravel and clay areas. West of the Registan Desert lies the Dasht-i-Margo (death desert), desolate steppe with salt flats. To the south, the region is demarcated by the slow-flowing Helmand River, the waters of which are depleted by evaporation and by the irrigation canals in the Girishk area. The Khash Rub River forms the northern boundary.

The annual rainfall distribution map of Afghanistan (Map 2) illustrates an essentially arid country with more than 50 per cent of the area receiving less than 300mm of rain.

Map 2: Rainfall Map of Afghanistan



The quantity of rain is indicated in cm for each month.

The height of the frame corresponds to 4 cm of rain and precipitation is given in the top right hand corner.

The black spots indicate the exact location of measurement.

Biogeographical Divisions of Afghanistan

Afghanistan belongs to the Palaeoarctic region; it is separated from the Oriental region by the Sulaiman mountains. Strong oriental influences are found in the lower Kabul Valley. The following biogeographical provinces are recognised (Map 3) (FAO 1981).

Palaeoarctic Realm

- Iranian Province: Desert and steppes of northern Afghanistan
- Iranian Desert Province: Helmand Basin and Registan
- Anatolian-Iranian Desert Province: Southern steppes
- Hindu Kush Province
- Pamir-Tienshan Province: Pamir highlands
- Himalayan Highlands' Province: Eastern mountains

Indo-Malayan Realm

- Indus-Ganges Monsoon Forest Province: Lower Kabul Valley

CURRENT STATUS OF BIODIVERSITY IN AFGHANISTAN

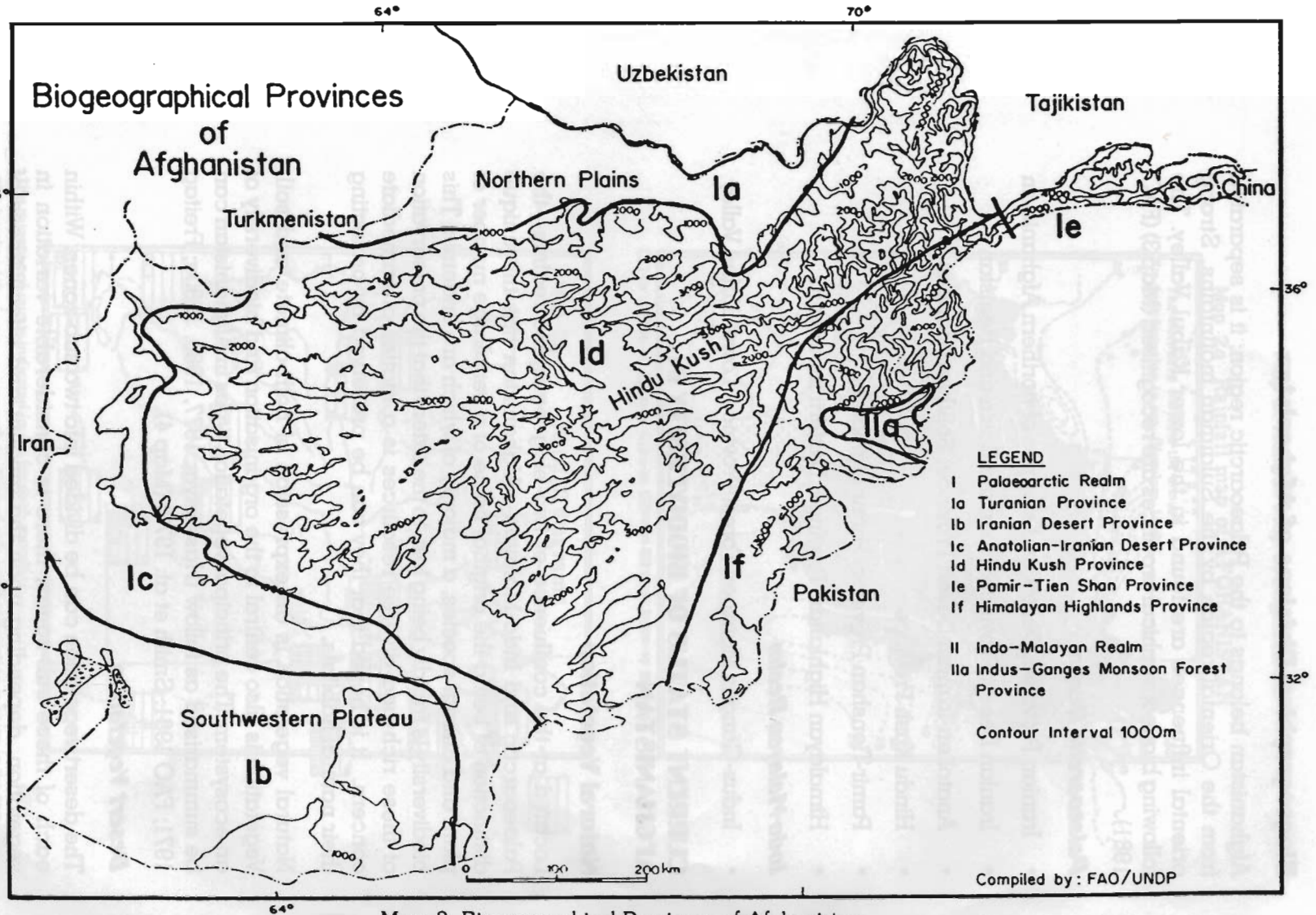
Natural Vegetation

Located at the confluence of two biogeographic realms—the Palaeoarctic and Indo-Malayan—Afghanistan has the unique distinction of being the original home of a very large number of plant and animal species, a majority of which are endemic. This biodiversity is rapidly being lost, to the extent that the preservation of these rich and diverse resources is a matter of immediate concern. It is hoped that they can be preserved by protecting their natural habitats.

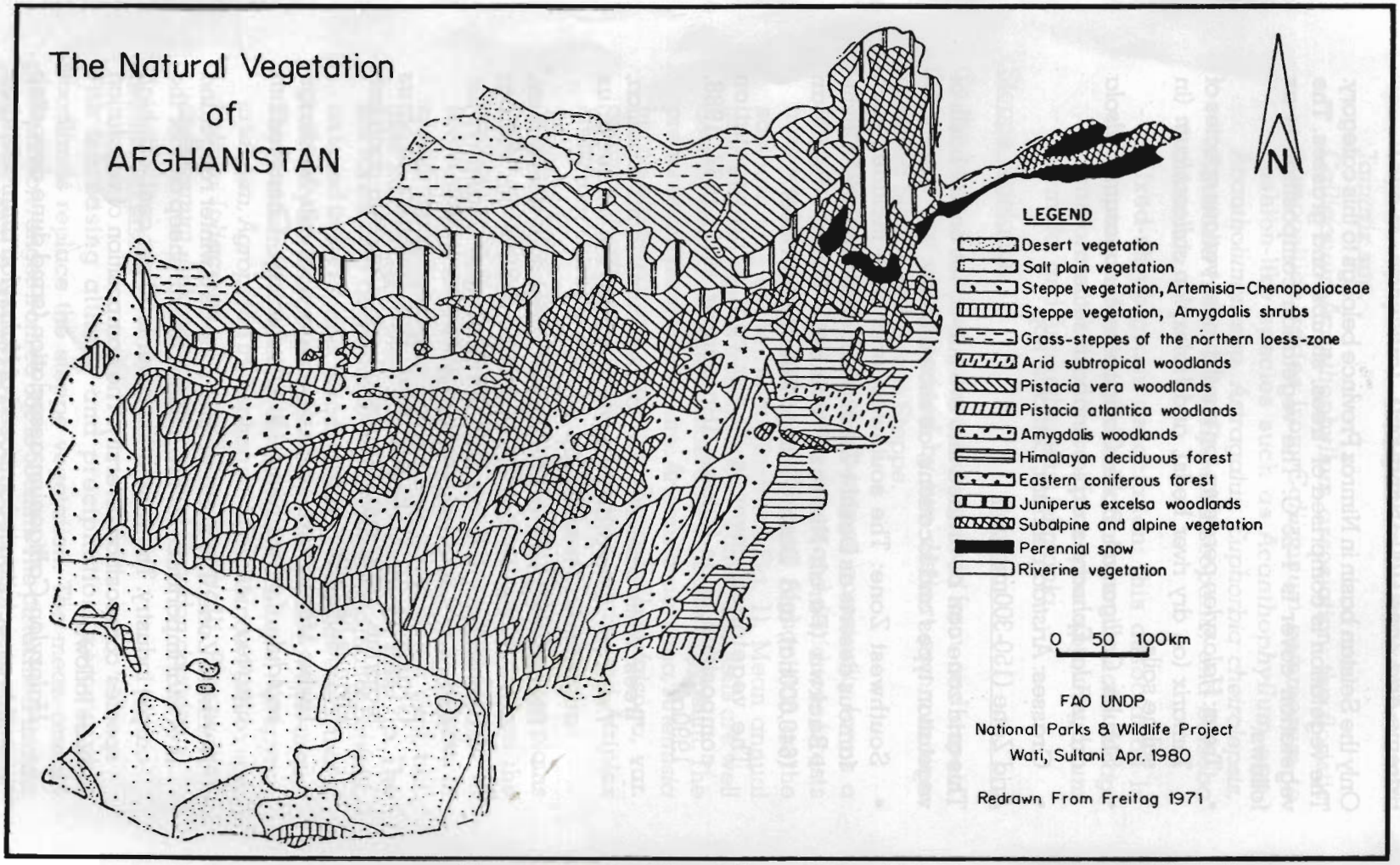
Natural vegetation is an expression of both climate and soil. Vegetation is also central to the organisation and biodiversity of an ecosystem. The principal vegetation types in Afghanistan can be summarised as follow (Hassanyar 1977, 1980, 1990a; Freitag 1971; FAO 1981; Smith et al. 1973) (Map 4).

Desert Vegetation

The desert vegetation can be divided into two sub-zones. Within each of these sub-zones, there is considerable variation in vegetation, depending upon the amount and effectiveness of precipitation and on site conditions. These sub-zones are described below.



Map 3: Biogeographical Provinces of Afghanistan



Map 4: The Natural Vegetation of Afghanistan

Extreme Arid Zone (100-150mm ppt)

Only the Seistan basin in Nimroz Province belongs to this category. The vegetation is comprised of trees, shrubs, and grasses. The vegetation cover is 1-25°C. The vegetation composition is as follows.

- Trees: *Haloxylon persicum* (on sand dunes), various species of *Tamarix* (on dry river beds), and *Haloxylon salicornicum* (in saline soils).
- Shrubs: *Calligonum molle, Calligonum commosum, Salsola arbuscula, Ephedra scorpia, Anabasis setifera*
- Grasses: *Aristida pennata, Distichlis* spp

Arid Zone (150-300mm ppt)

This arid zone can be divided into two sub-zones on the basis of vegetation types and locations, as shown below.

- Southwest Zone: The southwest arid zone includes such famous deserts as Dasht-i-Zerai (Kandahar Province), Dasht-i-Backwa (Farah-Nimroz Provinces), Dasht-i-Registan (640,000ha), and Dasht-i-Margo (Nimroz Province).

  The vegetation cover is 30 per cent . The vegetation composition is as follows (Hassanyar 1977, 1987, 1988, 1990a).

  - Trees: White saxual *(Haloxylon persicum), Tamarix gallica, T.salina, T.hispida, Tamarix asphylla, Elaeagnus augustifolia, Prosopis* spp
  - Shrubs: *Sophora pachyclada, Calligonum intertestum, Salsola canescens, Artemisia herba-alba, Alhagi camelorum, Kochia* spp, *Atriplex* spp, *Zygophyllum fabago, Chenopodium nitracea*
  - Grasses: *Artistida pennala, Poa bulbosa, Bromus tectorum, Stipa* spp, *Agropyron* spp, *Cynodon dactylon, Elymus junceus*
  - Forbs: *Mimosa rubicaulis, Peganum harmala, Medicago regidula, Lytherus* spp, *Onobrychis* spp, *Chenoposium nitracea*
- Northern Zone: The northern arid zone as a winter rangeland is of vital importance for five million karakul sheep and for the carpet industry. The vegetation cover is 30 per cent with high species' composition diversity. The composition of vegetation is as follows.
  - *Haloxylon-Calligonum* association (sand dune deposits): this association is composed of *Haloxylon ammodendron*

(Syn.H. aphyllum), *Calligonum turkestanicum*, and *Tamarix* spp.

- *Calligonum-Acanthophyllum* association: the floristic composition varies from *Calligonum commosum* to cushion-like species such as *Acanthophyllum* spp, *Acantholimon* spp, *Astragalus*, *Euphorbia cheirolepsis*, *Artemisia herba-alba*, *Ephedra scoparia*, and *Salsoba arbuscula*.
- Mixed-shrub-grass association: this association is composed of *Hertia intermedia*, *Callogonum molle*, *Alhagi camelorum*, *Poa bulbosa*, *Leucopoa* spp, *Peganum harmala*, and *Ammothamnus lehmanla*.

Steppe Vegetation

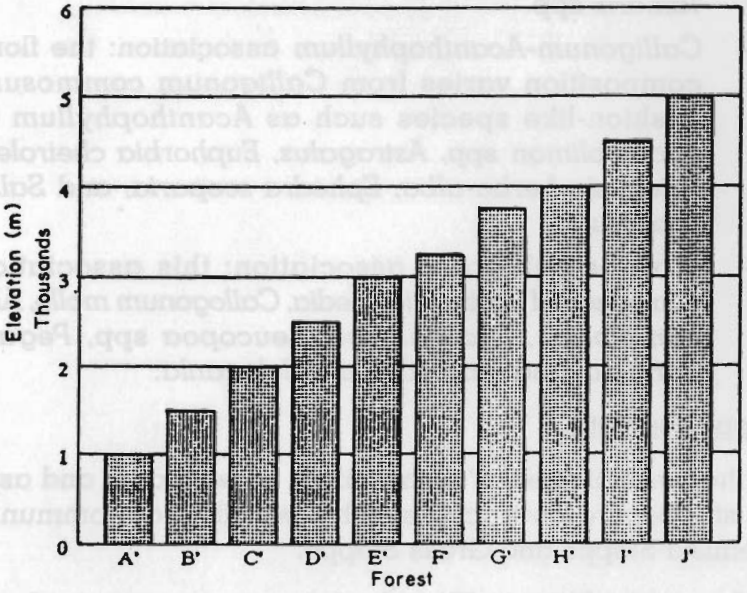
On the basis of species' composition, growth form, and aspect, the steppe are characterised by two distinct communities: Artemisia Steppe and Grass Steppe.

- Artemisia Steppe: This shrub-steppe community forms a broad transitional belt between desert and deciduous forests from west (Herat) to southeast (Ghazni) Afghanistan on the southern side of the Hindu Kush (cf. Fig. 1). Mean annual precipitation ranges from ca 200 to 300mm. The soils are well developed and contain considerable amounts of gypsum. The predominant plant species are: *Artemisia maritima*, *Artemisia herba-alba*, *Stocksia brahuica*, *Zygophyllum falsogo*, var. *oxanum*, *Hertia intermedia*, *Atriplex repens*, and *Atriplex hastatum*, var. *salinum*.
- Grass Steppe: This community occupies the fertile loess plains below deciduous forests (*Pistacia vera* community) on the northern side of the Hindu Kush mountain range (cf. Fig. 1). Mean annual precipitation varies from ca 150 to 300mm. In spring, the vegetation cover reaches about 90 per cent, but, after the middle of May, the vegetation quickly dries up. The soil varies from deep prairies with high organic matter content, as found in the Kunduz Taliqan areas, to a shallower soil that is relatively low in organic matter, e.g., in the Balkh-Jowzjan areas. The dominant plants are: *Bromus* spp, *Poa bulbosa*, *Agropyron cristatum*, *Agropyron trichophorum*, *Stipa sibirica*, *Festuca* spp, *Lolium Ioliaceum*, *Echinochloa crus-galli*, *Pinnesetum dichotomum*, *Aeluropus littoralis*, and *Cynodon dactylon*.

Deciduous Forests

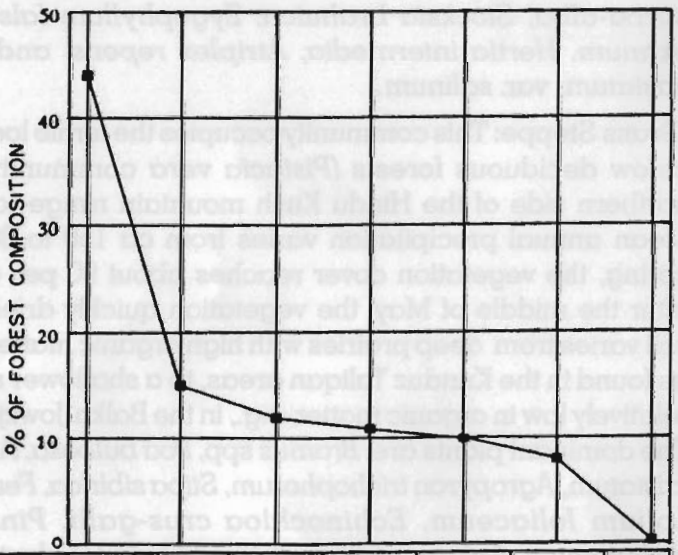
With increasing altitude and precipitation, xeromorphic woodlands replace the steppe vegetation. The mean annual precipitation ranges from ca 300 to 500mm. The pistachio (*Pistacia vera*) was once a widespread indigenous tree in Afghanistan.

Figure 1: Diagramatic Presentation of Vegetational Zonation



Legend 1:

A'–Dalbergia sisso forest
B'–Oleo–Reptonia forest
C'–Oak forest
D'–Cedar forest
E'–Pine forest
F'–Spruce–Fir
G'–Juniper
H'–Rhododendron
I'–Snow line
J'–Alpine



FOREST	A	B	C	D	E	F	G
	44	15	12	11	10	8	0.434

Legend 2:

A–Cedar forest
B–Oak forest
C–Oak–Cedar forest
D–Olive–Reptonia forest
E–Cedar–Spruce–Fir forest
F–Spruce–Fir forest
G–Juniper forest

Productive pistachio forests now only occur in the north where they cover an area of 300,000ha in Badghis Province and produce about 2,000 tons of nuts a year. The *Pistacia vera* forms a broad belt from Badghis Province to Badakhshan (above the grass steppe) on the northern side of the Hindu Kush. The trees are sparsely distributed throughout steppe landscapes at densities of 15-20/km^2. Other important species are: *Pistacia khinjuk*, *Prunus bucharica*, *Fraxinus xanthosyloides*, *Cotoneaster* spp, *Cecis griffithi*, and *Pistacia atlantica*.

Sclerophyllous Forests

In eastern Afghanistan, from Chaga-sarai to Kundai, different types of western Himalayan and Mediterranean evergreen sclerophyllous forests occur (Figure1).

The dominant tree is *Quercus baloot*, a variant of *the Quercus ilex* of the Mediterranean region, with spiny coriaceous leaves. The *Quercus baloot* forest forms an extensive belt at altitudes between 1,300 and 2,000 metres. It covers a very broad ecological range and is extremely drought and cold-resistant. *Reptonia boxifolia* forest forms the lower forested belt, at an altitude of 800 to 1,300 metres. Other important species at lower elevations are: *Olea cuspidata*, *Pisticia kinjuk*, *Ficus palmata*, *Zizyphus jujuba*, and *Punica granatum*. The mean annual precipitation ranges from ca 400 to 600mm in these areas of sclerophyllous forest.

Coniferous Forests

Almost all conifers grow in a distinct altitudinal zonation (Figure 1) in the eastern Hindu Kush, except for the *Juniperus excelsa* which occurs in the northern Hindu Kush. An examination of the climatic data presented by Freitag (1971) and Hassanyar (1972) shows that the conifer species are largely confined to areas receiving Indian summer monsoon rain. The influence of the Indian monsoon is more evident at altitudes above 2,000m. For this reason, the best conifer forests are located between 2,000 and 3,300m.

A brief summary of the conifer species is given in Table 1.

Alpine Tundra

Alpine vegetation occupies a large area in the central and easternmost highlands of Afghanistan (cf. Figure 1). The mean annual precipitation ranges from ca 400 to 600mm, nearly 90 per cent of it being in the form of snow. The main plant genera tend to be *Kobresia*, *Carex*, *Primula*, *Pedicularis*, *Cousinia*, *Acantholimon*, *Astragalus* (400 species), *Oxytropis*, *Koenigia*, *Draba*, *Delphinium*, *Cerastium*, and *Oxyria*--all but two of which are well presented in the 'real' Arctic.

Table 1: The Native Conifer Species of Afghanistan

Genera	Scientific Name	Local Name	Location
Pinus	*Pinus gerardiana wali. exlamb*	*Jalghoza*	Eastern Hindu Kush
	P. wallichiana A.B.Jadis	*Neshtar*	Eastern Hindu Kush
Cedrus	*Cedrus deodara (Roxb) Loud*	*Almonz*	Eastern Hindu Kush
Abies	*Albies spectabilis (D.Don)Spach*	*Bijour*	Eastern Hindu Kush
Picea	*Picea smithiana Boiss*	*Serroup*	
Juniperus	*Juniperus semiglobosa*	*Cedar Obakht*	Northeastern and Eastern Hindu Kush
	J. excelsa Brandis	*Cedar Obakht*	Northeastern and Eastern Hindu Kush
	J. serauschanica Kom	*Cedar Obakht*	Northeastern and Eastern Hindu Kush
	J. squamata	*Cedar Obakht*	Eastern Hindu Kush
	J. nana	*Cedar Obakht*	Eastern Hindu Kush
	J. specius sap. recurva	*Buxh Ham*	Eastern Hindu Kush
	J. polycarpus C. Koch		Eastern Hindu Kush
Taxus	*Taxus wallichiana Zucc*		Eastern Hindu Kush

Source: Freitag 1971

Natural vegetation and forest areas represent the two extremes of the effects of the war (Hassanyar 1994a). On the positive side, natural pastures and overall vegetative cover in the Hindu Kush areas are possibly at a higher level than they have been for many decades. This effect is directly related to the reduction in numbers of animals and, hence, less grazing pressure. To ensure availability of pastures in future, preservation and management projects should be given high priority once food security is attained, and systematic regional and national vegetation and grazing assessment surveys should be introduced as soon as it is feasible.

Serious depletion of Afghanistan's forests is the negative side of the story. A quick review of rainfall data and the long history of human settlement in the region suggested that by the 1990s there would be, in any case, very few well-forested areas in Afghanistan, even if war had not intervened. However, in 1979, there were still some important residual forest areas, particularly pine forests, in the northeast.

Wildlife

Endowed with such a variety of ecosystems, it is, therefore, not surprising that Afghanistan is home to 119 species of mammals, 460 species of birds, 4,500 species of vascular plants, two species of reptiles, and hundreds of species of insects, mushrooms, algae, fish, and nonvascular plants.

Mammals

Altogether 119 mammalian species are recorded in Afghanistan, of which the Caspian tiger (*Panthera tigris virgata*), cheetah (*Acionony x jubatus venaticus*), musk deer (*Moschus*), snow leopard (*Panthera uncia*), sand fox (*Vulpes ruppelli*), Blandford's fox (*Vulpes cana*), and three species of ungulates, the goitered gazelle (*Gazella subgutturosa*), markhor (*Capra falconeri*), and Bactrian deer (*Cervus elaphus bactrianus*) are on the endangered species' list (Table 2).

Table 2: Endangered Mammals Found in Afghanistan

Scientific Name	English Name	Status
Canis lupus	Wolf	V
Selenarctos thibetanus	Himalayan black beer	E
Panthera pardus	Leopard	V
Panthera tigris virgata	Turanian tiger	Ex
Panthera uncia	Snow leopard	Ex
Acinonyx jubatus	Asiatic cheetah	Ex
Equus hemionus	Onager or wild ass	V
Moschus moschiferus	Musk deer	Ex
Cervus elaphus bactrianus	Bactrian deer	E
Capra falconeri	Markhor	V
C.f.negaceros	Markhor	VE
C.f. jerdoni	Markhor	E

V Vulnerable E Endangered Ex Extinct

Source: IUCN (1978) Red Data Book, Vol. 1.

Indiscriminate hunting, destruction of habitat, and deterioration of range conditions are factors which have decimated the carnivore and ungulate populations. In the case of rodents, these conditions have resulted in an opposite trend. Due to a decline in predators, rodents have increased in number and, in some places, are threatening the well-being of human settlements. In the fertile northern provinces, moles and gerbils have become serious pests, threatening agriculture. In the 1970s, rodent pests were so destructive in the northern provinces that the government declared a 'state of emergency'. The government subsequently issued a presidential decree (No. 628, dated 26 December, 1973) placing a ban on the sale and export of predator species and their remains for an initial period of three years (FAO 1981).

The total annual export of untanned skins was estimated at between 125,000 and 200,000. The main species marketed in order of abundancy were the red fox (*Vulpes vulpes*), jungle cat (*Felis chaus*), jackal (*Canis aureus*), desert cat (*Felis lybica*), corsac fox (*Vulpes corsac*), stone marten (*Martes foina*), and manul (*Felis manul*).

Table 3 enlists percentages constituted by the various species and their estimated annual harvest in numbers.

Table 3: Species, Percentage of Total Annual Production and Annual Harvest

Species	% of total annual production of fur	Annual harvest in numbers
Red fox	48.3	193,000
Jungle cat	19.9	80,000
Jackal	11.4	46,000
Desert cat	4.9	20,000
Corsac fox	4.7	19,000
Stone marten	3.9	16,000
Wolf	2.5	10,000
Manul	1.8	7,000
Other species	2.6	10,000

Source: FAO 1977b

At an average price of Afghanis[1] (Afs) 375 per skin, the total monetary value of animal fur production in 1976 was about Afs150,000,000 (US$ 3.5 million).

Afghanistan has many species of wild animals which are relatives of domestic species of economic value. Some of the most important are listed below.

The Marco Polo sheep (*Ovis ammon poli*) is, more than any other, the mammal associated with Afghanistan. About 2,500 Marco Polo sheep are thought to exist in the Big Pamir and an unknown number in the Waghjir Valley of the Small Panir (Hassanyar 1981). The other important species are the wild goat (*Capra aegagrus*), the markhor (*Capra falconeri*), the ibex (*Capra ibex*), the urial (*Ovis orientalis*), the common gazelle (*Gazella dorcas*), the goitered gazelle (*Gazella subgutturosa*), the Bacterian deer (*Cervus elaphus bactrianus*), and the Asiatic wild ass (*Equus hemionus*) (FAO 1981, Hassanyar 1990b).

Birds

The only comprehensive account of the birds of Afghanistan is that given by Paludan (1959), consisting of records of 389 species, of which 231 were thought to breed. Other more recent publications bring the total number to about 460 (FAO 1981).

The rich waterfowl populations of Afghanistan's wetlands provide a magnificent spectacle and constitute an economic resource of considerable potential, both for local subsistence hunting and for sport.

The greatest threat to the waterfowl that visit Afghanistan lies in the immense changes in land use in their breeding grounds in Turkmenistan and in their ultimate wintering areas in the Indus Valley. In the long run, there is need for greater liaison between the governments of these countries for conservation of migratory species. Very few individuals of the waterfowl species which are commonly hunted actually nest within Afghanistan. Of the species that do nest, most are herons (*Ardea* spp), egrets (*Egretta* spp), and waders (especially *Charadrius* spp and *Tringa* spp), which are numerous and widely distributed throughout the Palaeoarctic region and do not justify species' conservation measures.

The one notable exception is the greater flamingo (*Phoenicopterus ruber*) which breeds at Dasht-e-Nawar and Abi-i-Estada. These colonies total between one and two per cent of the world's population. All flamingoes are to some extent endangered, as their precise habitat requirements render them susceptible to

[1] There are 50.60 Afghanis to the US dollar

changes in the environment. The principal threats to the two colonies in Afghanistan are the possibility of a change in the hydrological regime or the water chemistry of the lakes as a result of irrigation (contamination with chemical fertilizer), agriculture in their catchments, and disturbances to the breeding colonies caused by people, especially egg collectors.

The rarest bird known to occur in Afghanistan is the Siberian crane (*Grus leucogeranus).* This species exists in two distinct populations. One breeds in Yakutia (Russia) and winters in southeast Asia; it numbers about 300 individuals. The second bird breeds in tundra areas in Kazakhistan and migrates through Afghanistan to winter at the Bharatpur Sanctuary near Agra in India. The entire population apparently migrates together. They habitually stop over for some time at Abi-i-Estada during the spring and autumn migrations. As recently as 1970, 76 of them were recorded at Abi-i-Estada, but, in 1980, only 33 arrived to winter in Bharatpur, and these are probably all that are left of the western population of the species.

Three other bird species that occur in Afghanistan are listed as vulnerable in the Red Data Book. These are the Dalmatian pelican (*Pelcanus crispus*), the white-tailed edge (*Haliaetus albicilla*), and the peregrine falcon (*Falco pelegrinoides babylonicus*).

Two other groups of birds should be mentioned, because of the attention they have attracted in international circles. These are bustards (*Otididae*) and pheasants (*Phasianidae*). Three species of bustard occur in Afghanistan, the great bustard (*Otis tarda*), the Houbara bustard (*Chla-mydotis undulata*), and the little bustard (*Tetrax tetrax*).

Of the nine species of *Phasianidae* known to occur in Afghanistan, two, the Himalayan monal (*Lophophorus impejanus*) and the Koklaas (*Pucrasia macrolopha*), may be threatened by the destruction of their habitat in the forests of the eastern Hindu Kush. A third species, the widely-distributed *Phasianus colchicus*, is represented by the rare sub-species *P.C. biachii* and *P.C. principalis*. These are also threatened by the destruction of swampy thickets along the Oxus, Murghab, and Hari Rud rivers, apart from by hunting. A fourth member of the family, the Himalayan snowcock (*Tetraogallus himalayansis*), is widespread in the high mountain areas of the central and northeastern Hindu Kush.

Reptiles and Amphibians

Two species of reptile found in Afghanistan are listed in the Red Data Book. These are the central Asian Cobra (*Naja oxiana*), classed as endangered, and the central Asian grey lizard (*Varanus griseus caspius*), classed as vulnerable.

Amphibians, as expected, are not well-represented in Afghanistan. The only salamander species, the endemic *Batrachuperus mastersi*, is found in the mountain streams of the Paghman range. Five species of frogs and toads (*Rana* and *Bufo*) have been recorded.

Fish

Brown trout (*Salmo trutta*) and milk fish, which are carp from the family *Cyprinidae*, are found in the mountain rivers of Afghanistan.

Wetland Ecosystem

Many of Afghanistan's rivers have no outlet to the sea and drain into a series of depressions from which water evaporates. This results in the formation of large shallow saline lakes and marshes, the most extensive being those of Sistan in the southwest (Map 5). The beds of these wetlands are made of the sediments transported by the rivers, these are mineral rich waters which are highly fertile. It is for this reason that the wetlands are amongst the most biologically productive ecosystems in the country. There are seven wetlands in Afghanistan, three are considered to be of international importance for migrating and wintering waterflowls.

The three wetlands with rich biodiversity are as follows (FAO 1977a, 1981).

Hamuni-Puzak

The Sistan wetlands are the most important wintering areas for ducks in Afghanistan. The numbers visiting the area each year vary according to climatic conditions in the Caspian area and water levels in the wetlands of eastern Iran. In January 1976, 500,000 waterfowls were counted in Hamuni-Puzak.

Abi-i-Estada-Dasht-e-Nawar

Ab-i-Estada and Dasht-e-Nawar have both received considerable attention from naturalists. They are readily accessible from Kabul and are important habitats for migrant and wintering waders and ducks. They also support large breeding colonies of greater flamingoes (*Phoeni-copteruws ruber*). Abi-i-Estada also has the distinction of being regularly visited by the entire population of endangered Siberian crane (*Grus leucogeranus*). This population, which breeds in Kazakhistan and winters in Bharatpur, India, now numbers only 300 individuals.

Up to 10,000 greater flamingoes have been seen at Abi-i-Estada and several thousand pairs breed. Smaller numbers occur at Dasht-e-Nawar. In 1979, waterfowls were counted at Abi-i-Estada. About 2,000 ducks of nine different species were present in mid-April, at least 2,000-3,000 coots in April and May, and 15,000

waders of 26 species were estimated. The most common were little stints (*Calidris minuta*) and rufs (*Philomachus pugnax*).

Kole-Hashmat Khan

Another natural wetland that deserves special conservation is Kole Hashmat Khan on the outskirts of Kabul. This lake and reed swamp (*Phragmites* spp) of 191ha is a remnant of the extensive wetlands that used to exist in the Kabul basin. It was retained as a shooting preserve by the King of Afghanistan and, more recently, has been protected by republician guards as a waterfowl sanctuary where occasional shooting is allowed. It is rich in bird biodiversity, about 20,000 ducks and coots may be present on the lake during winter. In 1979, 14 species of duck, 25 species of wader, and a wide variety of other marsh birds were recorded.

Agro-biodiversity

Over 50 per cent of the population is directly engaged in agriculture and a further 25 per cent in the processing of agricultural products. Agriculture, in its various forms, is the most powerful force shaping the environment in Afghanistan. Table 4 gives an approximate breakdown of the types of land found in Afghanistan, together with a breakdown of the way in which this land is actually used. Table 5 shows the average areas under principal crops. Wheat is the main food crop, covering 25 per cent of the area, with an average yield of 2.8 million tons per year (1976-1978).

Table 4: Categories of Land ('000 ha)

Types of Land	Area	Land Use	Area
Arable	7,910		
- Uncultivated	3,900	Uncultivated	3,900
- Cultivated	4,010	Irrigated	2,586
		Rainfed	1,424
Permanent Crops	372	Tree Crops	372
Permanent Pasture	54,700	Grazing	54,700
Forests	1,900	Forests	1,900
Total Land Area	**64,882**		**64,882**

Source: FAO 1981

Arable land is a crucial resource in Afghanistan. Less than 12 per cent, or 8 million ha, of the land is potentially arable, of which an estimated 4 million ha were actually cultivated in 1978. About 2.6 million ha were irrigated farmland, of which 1.4 million ha had sufficient water to support double cropping. Rainfed agriculture was carried out on a further 1.3 million ha. Recent data collected by UNDP (1993) suggest that these figures are

Table 5: Average Crop Area, 1971/72-1976/77 ('000 ha.)

Crop Diversity	Irrigated	Rainfed	Total
Wheat	1,314	1,096	2,410
Maize	479	-	479
Rice	208	-	208
Barley	110	211	321
Seed Cotton	93	-	93
Sugarbeet/Sugarcane	7	-	7
Oilseeds	19	36	55
Vegetables	100	-	100
Fruits	138	-	138
Alfalfa, clover	60	-	60
Others	75	-	75
Total	**2,603**	**1,343**	**3,946**

Source: FAO 1981.

underestimated. Given the fact that large areas of land were no longer cultivated in 1991, an analysis of satellite imagery resulted in figures of 2.8 million ha of irrigated land and more than 3 million ha of rainfed land. It is the irrigated areas that are the productive heartlands of Afghanistan.

Afghanistan is classified as having a large number of agro-ecological zones. The number is as high as 28. This diversity of agro-ecological zones provides wide-ranging crop diversity. Some details of the principal agricultural crop areas and varieties are given in the following sections.

Fruit (140,000 ha)

- *Vitaceae*: grapes (70,000ha); 110 varieties, the total production in 1978 was 824,000 tons.
- *Morus alba*: mulberries are grown widely in Afghanistan for their fruit and leaves, which are used as fodder for silkworms (sericulture).
- *Ficus carica*
- Other important fruit trees are the blackberry (*Rubus fruticosus*), raspberry (*Rubus idaeus*), apple (*Malus sylvestris*), pear (*Pyrus communis*), almond (*Amygdalus communis*), quince (*Cydonia oblonga*), local (*Eriobotrya japonica*), peach (*Persica vulgaris*), apricot (*Armeniaca vulgaris*), sour cherry (*Cerasus vulgaris*), sweet cherry (*Prunus avium*), prunes and plums (*Prunus domestica*), pomegranate (*Punica grantum*), *Pistacia vera*, *Elaeagnus angustifolia*, *Olea europea*, *Citrus sinensis*, and *Citrus aurantium*.

Commercial Crops

- Cotton
- Sugarbeet/sugarcane
- Oil crops (sunflower, etc.)

Legumes

Broad beans (*Vicia faba*), peas (*Pisum sativum*), beans (*Phaseoulus vulgaris*), lentils (*Lens culinaris*), soyabeans (*Glycina soja*), and peanuts (*Arachis hypogaea*).

Vegetables

- Potatoes (18,000ha in 1978)
- Others (tomatoes, eggplants, carrots, turnip, cauliflower, cabbage, melons, watermelons) 75,000ha.

Cereals

- *Triticum* (5 species)
- *Hordeum* (11 species)
- *Secale* (3 species)
- *Sorghum* (5 species)
- *Oriza* (5 species)

In the 1970s, there was an upward trend in agricultural production. Average wheat yields increased from 832 kg/ha in 1964 to 1,131 kg/ha in 1978, mainly due to the Green Revolution. Agricultural products were the main exports and totalled nearly 65 per cent of all pre-war export earnings, 30 per cent of which was from dry fruits, mainly raisins.

The war caused an estimated fall in agricultural production of 45-53 per cent of the 1978 level by 1987.

Table 6 gives a summary from a variety of data sources showing the changes in area cultivated, estimated production, and crop yields which were a direct result of the years of war.

Table 6: Overall Shifts in Use of Land Resources 1978/79 to 1989/90 (Area - '000 ha, production - '000 mt)

	1978-1979			1989-1990	
Land Use	Area	Production	Yield %	Area	Production
CEREALS					
Wheat					
Irrigated	1,300	2,255	100	1,030	1,580
Rainfed	1,048	1,964	100	715	378
Maize	482	780	100	458	587
Barley	310	325	100	256	223
Rice	210	428	100	175	280
FRUITS & VEGETABLES					
Grapes	70	440	-	67	281
Other fruits	70	-	-	48	-
Potatoes	18	250	-	17	169
Other vegetables	76	516	-	72	367
INDUSTRIAL CROPS					
Cotton	112	132	-	50	43
Sugarbeet	5	73	-	0	2
Sugarcane	4	64	-	3	26
Oilseeds	50	35	-	50	24

In 1986, from a total area of 3,827,000ha of cultivated land, fruits and nuts were cultivated on 143,500ha and vegetables on 102,500ha. In the same year, 930,000 tons of fruits and 920,000 tons of vegetables were produced (FAO 1981).

Table 7: Average Crop Area, 1971/72 - 1976/77 ('000 ha)

Crop Diversity	Irrigated	Rainfed	Total
Mexipak	1,314	1,096	2,410
Bakhtar	479	-	479
Genab	208	-	208
1700	110	211	321
Caucasian	93	-	93
Total	2,204	1,307	3,511

The main causes of the destruction of agro-biodiversity are the 'Green Revolution' and dryland wheat farming (Table 7). High-yielding varieties (HYVs) of rice and wheat displaced the traditional varieties. Dryland wheat farming and overgrazing are destroying the wild ancestors of cultivated crops.

Poppy Growing

Both cannabis (*Cannabis sativa*) and opium poppy (*Papaver somniferum*) have been cultivated in Afghanistan for centuries. The crop is grown for traditional medicinal use as well as a cash crop for the international drug trade.Traditionally, chewing opium was one of the few ways of countering pain, disease, or the misery and privation of poverty in the severe winters of the Hindu Kush.

In 1972, poppies were primarily grown in four provinces: Nangarhar in the east, Kandahar in the southwest, Balkh in the north, and Badakhshan in the far northeast.

Before the war, the total area under poppy cultivation was estimated to be about 6,000ha, which yielded a total production of about 200 tons of opium at an average yield of 35 kg/ha. The area under cultivation has increased dramatically since the Soviet invasion in 1979. Estimates for 1992 range from a total area of 21,000-57,000ha, giving a production range of 600-2,000 tons of opium.

Livestock Biodiversity

Rangelands are of vital importance for Afghanistan's two million nomads. The rangelands are also essential for many of the settled population who derive their incomes from animal rearing and employment in the livestock industry. Estimated livestock populations in Afghanistan in 1979 are shown in Table 8. The main breeds of native sheep are the Hazaragi, Turkic, Karakul, Badghisi, Gheljai, Afghani, Kandahari, and Gadic.

Table 8: Livestock Population in 1979

Types of Animal	Numbers
Cattle	3,400,000
Sheep	19,000,000
Goats	2,700,000
Buffaloes	40,000
Equines	432,000
Camels	300,000

Source: FAO 1981

The Afghan rangelands can be divided into three categories: the winter rangelands (16,210,000ha), the spring and autumn rangelands (16,030,000ha), and the summer (22,460,000ha) pastures.

Animal products (wool, hides, skins, karakul pelts, and so on) contribute 15 per cent of total export value. Woollen carpets account for a further seven per cent. There is enormous potential (large areas of rangelands) for expansion in exports of these products.

Some of the main problems for livestock husbandry are as follow.

- Feed limitation (during the winter)
- Water supplies
- Lack of sanitation and disease control programmes

Forests

Only remnants of the forests that once covered a large part of Afghanistan are visible, and most of these are severely degraded and no longer produce sustainable yields. It is estimated that 2.2 million ha (about 3.4%) still support forests. However, these forests are scattered only throughout the eastern Hindu Kush and the northern Hindu Kush.

The four main forest regions of Afghanistan are as follow (FAO 1981; Hassanyar 1993, Kitamura 1960).

Kunar

Some 66,500ha of well-preserved conifer forests exist in Kunar. Out of a national total of 28.9 million cubic metres of usable timber, Kunar contains 25 million cubic metres of timber. In 1973, it was estimated that the area produced 86,000 cubic metres of sawn timber (Alpay 1974).

The Principal forest types of Kunar are given below.

- Deciduous forests
  - Walnut forest (*Juglans regia*)
  - Birch forest (*Betula Kunarensis, Betula jacquemontii*)
  - Plane tree (*Platanus orientalis*)
  - Hazelwood (*Corylus colurna*)
- Evergreen oak forest
  - *Quercus baloot*
  - *Q. dilatata*
  - *Q. semecarpifolia*

- Coniferous forest
  - Cedar forest: *Cedrus deodara*
  - Spruce-fir forest: *Picea smithiana, Abies spectabilis*
  - Pine forest: *Pinus wallichiana, Pinus gerardiana*
  - Juniper forest: *Juniperus communis var. nana, Juniperus seravschanica.*
  - Yew shrubland: *Taxus wallichiana*
- Alpine Shrublands
  - *Rhododendron collectianum* (90%)
  - *Juniperus nana* (10%)

Paktia

In 1973, Paktia had 14,500ha of exploitable forests containing 2.13 million cubic metres of industrial wood. However, the exploitation of 300,000 cubic metres of wood/year resulted in the destruction of 5,000ha of forest/year. The industrial tree species are *Cedrus deodara, Pinus wallichiana, Abies spectabilis,* and *Picea smithiana.* The province also contained 165,000ha of degraded forests and 210,000ha of woodlands (trees and pasture). These areas contain extensive stands of wild olive (*Olea ferruginea*) and oak (*Quercus baloot*).

The former species could produce commercial quality olives, if grafted with domestic varieties. The latter was the main source for 80,000 tons of fuelwood and 1,000 tons of charcoal.

Nangarhar

Some 3,000ha of productive forest remained by 1973, containing 170,000 cubic metres of industrial timber, while 500 ha/year were destroyed. The sustainable yield at that time was 1,800 cubic metres. The important trees are *Cedrus deodara, Pinus wallichiana, Abies spectabilis,* and *Picea smithiana.*

Badghis

The pistachio (*Pistacia vera*) was once a widespread indigenous tree in Afghanistan. Productive pistachio forests now only occur in the northern parts where they cover an area of 300,000ha in Badghis province and produce about 2,000 tons of nuts per year. Other species are *Pistacia khinjuk* and *Pistacia atlantica.*

According to the UNDP (1993), deforestation in the early 1990s was estimated to occur at a destructive rate and tree areas in Kunar and Paktia (the eastern Hindu Kush) could have been more or less completely eliminated by 1996. Fortunately, the source of this data estimate is not very reliable, and there is some evidence that the rate of decline of forest areas in Kunar Province may not

be as severe as suggested. However, there are other reports which cite even greater destruction, yet contrarily, in 1993, timber was arriving in unprecedented amounts (Hassanyar 1994a).

Reports from the eastern provinces (the eastern Hindu Kush) suggest that trees, such as oaks, are now being cut for firewood, and, in Kunar, the last old growth forests are being felled for sale in Pakistan. In the northeast (the northern Hindu Kush) some of the valuable pistachio forests have apparently been cut for timber and firewood. Trees and forest areas are similarly being depleted throughout the country (Hassanyar 1994a and 1994b).

CONSERVATION AND MANAGEMENT

Afghanistan has many species of wild animals and plants which are relatives of domestic species of economic value. These wild native species are important sources of genetic material for the improvement of domestic species.

Many cereal crops, fruit trees, and sheep and goats, which are important sources of food throughout the world, were first domesticated in Western Asia and the Middle East. The crops and some of the livestock still used in Afghanistan include a range of primitive varieties. They yield less than some modern improved breeds but often have genetic resistance to diseases and environmental stress. The wild relatives of domestic plants and animals and the primitive varieties still in use may provide valuable material for the genetic improvement of modern crops. Their conservation should, therefore, receive high priority.

The principal plant species whose wild ancestors are found in Afghanistan are *Pistacia* spp, *Pyrus* spp (pear), *Malus* spp (apple), *Prunus domestica* (plum), *Prunus dulcis* (almond) *Triticum* spp (wheat), and *Oryza* spp (rice). The tree species grow in isolated patches along the rivers and the cereals occur on the steppes and as weeds in cultivated land.

Wild sheep (*Ovis orientalis, Ovis ammon poli*) and wild goats (*Capra aegagrus*) are highly adaptable to the harsh climate in the high mountains of the Hindu Kush and could help to render domestic varieties genetically drought and cold tolerant. The Marco Polo sheep, notably the largest of its genus, could be used to breed larger-sized animals in other varieties.

Conservation of these genetic resources was a high priority before the war. In 1977, the Afghan Government established a germ plasm unit in the Darul-Aman Research Station, Kabul, in collaboration with the International Board for Plant Genetic Resources (IBPGR). However, the entire project was destroyed during the fighting from 1992-1995.

The historic United Nations Conference on the Human Environment, held at Stockholm in 1972, launched a global environmental movement. UNESCO's World Heritage Convention, adopted by UNESCO's General Convention in 1972, has played a vital role in promoting conservation of the world's biological diversity. Since these propitious beginnings, there have been significant developments in the field of biodiversity conservation and management in Afghanistan (Hassanyar1987).

In 1970, as a result of assistance from the UNDP and FAO, a protected areas' network (PAN) and a conservation strategy was established in Afghanistan (Annex 1). An institutional and legislative framework was established in the 1970s.

The main biodiversity conservation movement before the war can be summarised as follows.

- Institutional Framework
- Environmental Legislation
- Environmental Awareness

Management

Institutional Framework

- Department of Forestry and Natural Resources

  This Department came into being in September 1976 within the framework of the Faculty of Agriculture, Kabul University. This Department offers courses in forestry, range management, wildlife, national parks, and mountain ecosystems' research.

- Ministry of Education

  Environmental education for primary and secondary schools, curriculum development, and textbook materials

- Ministry of Planning

  Integrated planning, review, and assessment of the government's development programmes and funding of environmental projects

- Afghan National Commission for MAB

  Ecological projects' formulation, funding of environmental research projects, seminars, workshops, and so on

- Kabul Municipality

  Solid waste disposal, air pollution, sewerage, urban landscaping, and others.

Environmental Legislation

- Article 32 of Basic Law says: "The government shall be responsible for the protection and enhancement of the environment and for the prevention of any disturbance in or destruction to the ecological balance of the environment."
- Presidential Decrees on Nature Conservation
  - Presidential decree No. 628, 26 December, 1973, banned the sale and export of predator species. On September 30, 1973, Band-i-Amir was declared a national park.
  - Presidential decree NO. 707, 6 June, 1977, Abi-i-Estada and Dasht-e-Nawar were declared Flamingo and Waterfowl Sanctuaries.
  - Pamir was declared a wildlife sanctuary for the Marco Polo sheep in September 1978.
- Bye-Law No. 702, October 22, 1989.

  Import, production, and use of pesticides.
- A draft forest law exists but has not been legislated.

Environmental Awareness

- Formal education: schools and universities
- Non-formal education
- Mass media - TV, newspapers, and radio

CONCLUSIONS

Afghanistan is facing a biodiversity crisis. There is a rapid loss of species, populations, domesticated varieties, and natural habitats such as the Hindu Kush mountain forests (Nuristan and Paktia) and wetlands (Kole-Hashmat Khan). Therefore, the conservation of biodiversity and the sustainable use of its components are extremely important for the future development of Afghanistan. For example, genetic resources are maintained in various gene banks and can be used for future breeding programmes.

According to Vavilov (1951), Afghanistan has been the centre of origin of many cultivated plants. Afghanistan has many species (genetic diversity) of wild plants which are the relatives of domestic species of economic value. Conservation of these resources should be a high priority.

However, some of the biodiversity conservation problems of Afghanistan cannot be solved without collaboration with other countries.The obvious examples are illegal trading (live animals or skins) of animals, transboundary migration, and destruction of wildlife habitats. ICIMOD can play an important role in the

promotion of regional activities in conservation and protection of biodiversity in the Hindu Kush-Himalayan ecosystems.

The decade of the 1970s witnessed a significant development in Afghanistan in the context of establishing a broad-based concept of environmental conservation and management. Another notable development of the decade was the establishment and/or strengthening of educational institutions and the legislative framework as prerequisites for sound environmental management.

Despite the above developments, a cursory examination of the environmental predicament indicates that many of the environmental problems discussed and foreseen two decades ago are still persistent, and some have become further aggravated by the war. Deforestation, destruction of wildlife habitats, and siltation of wetlands have been occurring at an alarming rate.

LITERATURE CITED

Alpay, O.N. , 1974. *Range Management and Animal Husbandry in Afghanistan.* Rome: FAO: DP/AFG.

FAO, 1977a. *Management Plan for Abi-i-Estada and Dasht-e-Nawar Flamingo and Waterfowl Sanctuaries.* Rome:FAO:DP/AFG/74/016.

FAO, 1977b. *The Trade in Wild Animals Furs in Afghanistan,* p2. Rome:FAO: DP/AFG/74/016.

FAO, 1981. *National Parks and Wildlife Management: Afghanistan.* Rome: FAO; DP/AFG/78/007.

Freitag, H., 1971. *Die Naturliche Vegetation Afghanistan.* In *Vegetation*: 22:285-344.

Hassanyar, Amir S., 1972. *Ecology of Afghanistan.* Kabul:Kabul University Press.

Hassanyar, Amir S., 1977. 'Restoration of Arid and Semiarid Ecosystems in Afghanistan'. In *J. Environ. Conserv.* 4(4): 279-301.

Hassanyar, Amir S., 1980. 'The Stability of Spruce Forests in Montane Ecosystems of Afghanistan'. *In Proceedings of International Symposium,* Bmo pp 210-220. Czechoslovakia: Publisher not given.

Hassanyar, Amir S., 1981. 'The Marco Polo Sheep'. In *Georg. Bull. (9-10).*

Hassanyar, Amir S., 1985. *Natural Forests of Afghanistan,* Kabul: Kabul University Press.

Hassanyar, Amir S., 1987. 'A Survey of Environmental Legislation and Institutional Framework in Afghanistan'. In *International Workshop on SACEP Environmental Legislation-January 15-16, 1987*, New Delhi, India.

Hassanyar, Amir S., 1988. 'Revegetation of the Registan Desert in Southwest Afghanistan', pp 194-196. In congress abstract.

Hassanyar, Amir S., 1990a. 'Arid Zones of Afghanistan in Perspective'. In *UNESCO Publ. Misc# 1. Kabul*, pp 1-6.

Hassanyar, Amir S., 1990b. `A Survey of the Mammals ot Afghanistan'. In *Fielddiana, Zool.* 60: 1-95.

Hassanyar, Amir S., 1993. 'The Role of Forests in Rehabilitation of Rural Afghanistan'. In *J. Afghan Future* No. 216.

Hassanyar, Amir S,. 1994a. 'Impact of 16 Years of War on Human Environment in Afghanistan'. In *MAB Bull. No. 1*, pp 42-56.

Hassanyar, Amir S., 1994b. 'Role of Forests in Rehabilitation of Rural Afghanistan'. In *Shurai Saqafati Publ.* # 216, pp 79-86.

IUCN, 1978. *The Red Data Book*, Vol 1. Switzerland, Gland:IUCN.

Kitamura, Siro, 1960. *Flora in Paktia* (No.2).Frankfurt, Germany: FADA

Paludan, K., 1959. 'On the Birds of Afghanistan'. In *Vidensk, meddr. dansk. naturh. Foren. 122:1-332.*

Smith, H.H, Bernier, D. W., Bunge, F.M., Rints, F.C., Shinn, R.S., and Toloki. 1973. *Area Handbook for Afghanistan*, pp 15-17, 21-25. Wash. D.C.: US Government Printing Office.

UNDP, 1993. *Human Development Report 1993*. Delhi: Oxford University Press.

Vavilov, N.J., 1951. *The Origin, Variation, Immunity and Breeding of Cultivated Plants, Selected Writings*. New York: Ronald Press.

Annex
Protected Areas

BIG PAMIR

Name: Pamir-i-Buzurg (Big Pamir)

Designation: At present designated as a wildlife sanctuary, the area merits promotion to national park status and could be proposed as a world heritage site.

Location: Badakhshan province, approximately 250km to the east of Faizabad (73°E, 37°10'N).

Area: 6,793 ha.

Environment: Mountainous country with many glaciers and mountain lakes. Elevations are between 3,250 and 6,103m. The mountains are bare or covered with dry alpine steppe vegetation, with grasses and sedges in the valleys. On the flat table-land and ridges, alpine heath vegetation is found with *Ericaceae*, many grasses, and *Primula macrophylla*.

The Pamirs are well-known for the Marco Polo sheep (*Ovic ammon poli*). The estimated population in Afghanistan is more than 2,500. Marco Polo sheep occur in the adjacent mountain ranges of Tajikistan, China, and Pakistan and some migrate across international frontiers.

Ibex (*Capa ibex sibericus*), hare (*Lepus capensis*), and a variety of rodents, such as the long-tailed marmot (*Marmota caudata*) and vole, are common. The lynx (*Felis lynx*) and the endangered snow leopard (*Panthera uncia*) also occur.

Ninety-six species of birds have been recorded. They include the rare bar-headed goose (*Anser indicus*), which breeds near the lakes, and the cranes (*Grus gras*). The lammergeier (*Gypaetus barbatus*), Egyptian vultures (*Neophran perenopterus*) and the griffon vulture (*Gyps fulvus*) are common.

Status: Gazetted as a wildlife sanctuary on 10 September, 1978.

Value: The Pamirs form one of the most exciting landscapes in central Asia. Mountains rise above 7,000m and contain beautiful rivers and lakes. Two ethnic groups, the Wakhis and Kirghis, still lead a traditional pastoral life. Archaeological sites include petroglyphs and graves.

Conservation Problems: Domestic livestock, which compete with Marco Polo sheep for fodder, and uncontrolled hunting cause problems. The trophy-hunting programme maintained by the Afghanistan Tourist Organisation is incompatible with national park status.

ABI-I-ESTADA

Name: Abi-i-Estada (Standing Water).

Designation: Flamingo and Waterfowl Sanctuary.

Location: Ghazni Province, approximately 130km to the south of Ghazni City, 32°50'N and 67°80'E.

Area: The lake surface and a proposed strip of land two km wide above higher water level, approximately 27,000ha.

Environment: Abi-i-Estada is a large shallow alkaline lake. The size varies seasonally. It is surrounded by mudflats and arid highland steeps, which are dominated by *Amygdalis*, *Cousinia* spp, *Tamarix laxa*, and *Artemisia maritima*. Grasses are common. The mudflats are bare with only a few *Taraxacum monochlamydum*. The only aquatic vegetation is the pondweed *Rupia maritima*. The lake is a very important resting and feeding site for migratory waterfowl. It is an important resting area for thousands of ducks and waders. The very rare Siberian cranes (*Grus leucogeranus*) occur in migration. There is a colony of up to 5,000 pairs of the greater flamingo (*Phoenicopterus ruber roseus*).

AJAR VALLEY

Name: Darai Ajar (Ajar Valley)

Designation: In 1973, Ajar Valley was declared a wildlife sanctuary.

Location: Bamiyan Province, 55km to the northwest of Bamiyan City, 67°37'E, 36°40'N.

Area: 40,000ha.

Environment: The Ajar Valley is at an elevation of 1,800m along the Ajar Valley. The river has eroded its way through the soft limestones and formed a narrow, twined canyon. Part of the river is subterranean. Exposed geological strata are coloured red, green, and black. The river banks have a Tugai vegetation with *Salix* spp, *Tamarix* spp, and many herbaceous plants. Gradually, the vegetation on the slopes becomes drier with an *Ephedra* steppe community. At higher altitudes this is replaced by *Zygophyllum* and *Acantholimon* associations. In depression

areas and at higher elevations, a *Carex stenophylla* alpine meadow community is found. This is an important grazing area for ibex (*Capra ibex*), wild goat (*Capra aegagrus*), and urial sheep (*Ovis orientalis*). Bactrian deer (*Cervus elaphus bactrianus*) have been introduced and number about 42. Seventy feral yaks (*Bos grunniens*) are present. The main carnivores are snow leopard (*Panthera uncia*), leopard (*Panthera pardus*), lynx (*Felis lynx*), wolf (*Canis lupus*), and jackal (*Canis aureus*). Sixty bird species have been identified so far. The population of Alpine ibex was 5,000 in 1976.

Status: The Ajar Valley was established as a Wildlife Sanctuary on 10 September, 1978.

Value:The area is very rich in biological diversity and was protected for many years as a hunting reserve by the former king. Grazing by domestic animals was prevented. The area in and around the Ajar Valley contains some of the most beautiful scenery to be found in central Asia.

NURISTAN

Name: Nuristan

Designation: Biosphere Reserve

Location: Kunar and Laghman Provinces, 35°15'N, 70°45'E.

Area: Not yet determined.

Environment: Nuristan is mountainous with peaks of up to 6,300m. It consists of a variety of geological formations, mainly granite, chlorite, and grano-chlorites. Due to the frequent monsoon rains the area is forested and the vegetation ranges from evergreen forests to alpine steppes and glaciers. The human population is sparse, especially in the narrow and steep upper valley of the Paron and Kantiwa rivers. The lower valleys have walnut (*Juglans regia*) and birch (*Betula kunaresis, B. jacquemontii*) forests and thickets and valley meadows. Between 1,500m and 2,500m, there is a thick stand of oak forests, dominated by *Quercus baloot* and *Q. semecarpifolia* on drier slopes and, in more humid places, by *Quercus dilatata*. Above this belt, up to the tree line at 3,300m lies a coniferous forest belt with cedar (*Cedrus deodara*), spruce (*Picea smithiana*), fir (*Abies spectabilis*), pine (*Pinus gerardiana, Pinus wallichiana*), juniper (*Juniperus semiglobosa*), and yew (*Taxus wallichiana*). Above the coniferous forests there is an alpine shrubland dominated by rhododendron (*Rhododendron colletianum*), dwarf juniper (*Juniperus nana*), and alpine heath and alpine meadowland which provides very good summer grazing.

These very varied habitats have rich species of wildlife which include the markhor (*Capra falconeri*) ibex (*Ibex ibex*), urial (*Ovis orientalis*), the endangered black bear (*Selenarctos thibetanus*) and brown bear (*Ursus arctos*), snow leopard (*Panthera uncia*) and leopard (*Panthera pardus*), lynx (*Felis lynx*), and wolf (*Canis lupus*).

Oriental mammals, such as the musk deer (*Moschus moschiferus*), rhesus monkey (*Macaca mulatta*), flying squirrel (*Petaurista petaurista*), *Hylopetes fimbriatus*, and yellow-throated marten (*Martes flavigula*), have their westernmost extension here. Eighty-eight bird species were recorded during the 1977 FAO survey.