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Abstract: At least 127 species of mammals have been recorded from Niger. Of these, 28 are bats and 27 are small rodents. A table shows the status, principal areas occupied and reasons for decline of the larger mammals. Based on censuses, studies and observations made between 1985 and 1990, the estimated number of cheetah is not superior of 200 individuals. According to the IUCN categories the cheetah is listed as "vulnerable". Causes of decline include poaching and hunting, skin and animal trade, eradication by farmers, and drought and desertification. Air and Termit areas are the principal areas frequented by the cheetah.

BIOLOGICAL DIVERSITY ASSESSMENT FOR NIGER

by

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PART 1. THE STATUS OF BIOLOGICAL DIVERSITY AND ITS CONSERVATION

I. LANDSCAPE PATTERNS

A. Classification of Biotic Zones

The classification of the biogeographical zones present in Niger has typically taken into account isohyet distribution and defined various "belts" as Saharan, Sahelian or Sudanian, or some mixture, such as Saharo-Sahelian. This is useful up to a point. Niger certainly contains areas of Saharan desert where rainfall is not annual, and it contains a small area of Sudanian woodland in the extreme south (average rainfall over 800 mm.). However, the distribution of biotic zones in between is very variable, and in a sense, "mobile", as long-term rainfall patterns shift.

The classification that follows is one of several that could be adopted (see Figures 1 and 2 for rather different interpretations) and is presented in a more or less north to south progression.

A.1 Desert

This formation includes characteristic sandy erg formations (classic desert with dunes) and more gravelly reg formations, as well as extensive sandy plains, where vegetation is often inexistant except along the desert edge or near mountain massifs. Rainfall is typically very low and erratic in its temporal and spatial distribution. However, when it occurs, an annual vegetation appears, characterized by Stipagrostis spp and Tribulus longipetalus, which may last two or three years without further rain. Sand-filled desert wadis, which may only receive rain every 10-20 years, and are often only distinguishable by a line of trees (Acacia raddiana), will respond to rainfall with a rapid herbaceous growth (Panicum turgidum, Astragalus pseudotrigonus and Chrozophora brocchiana).

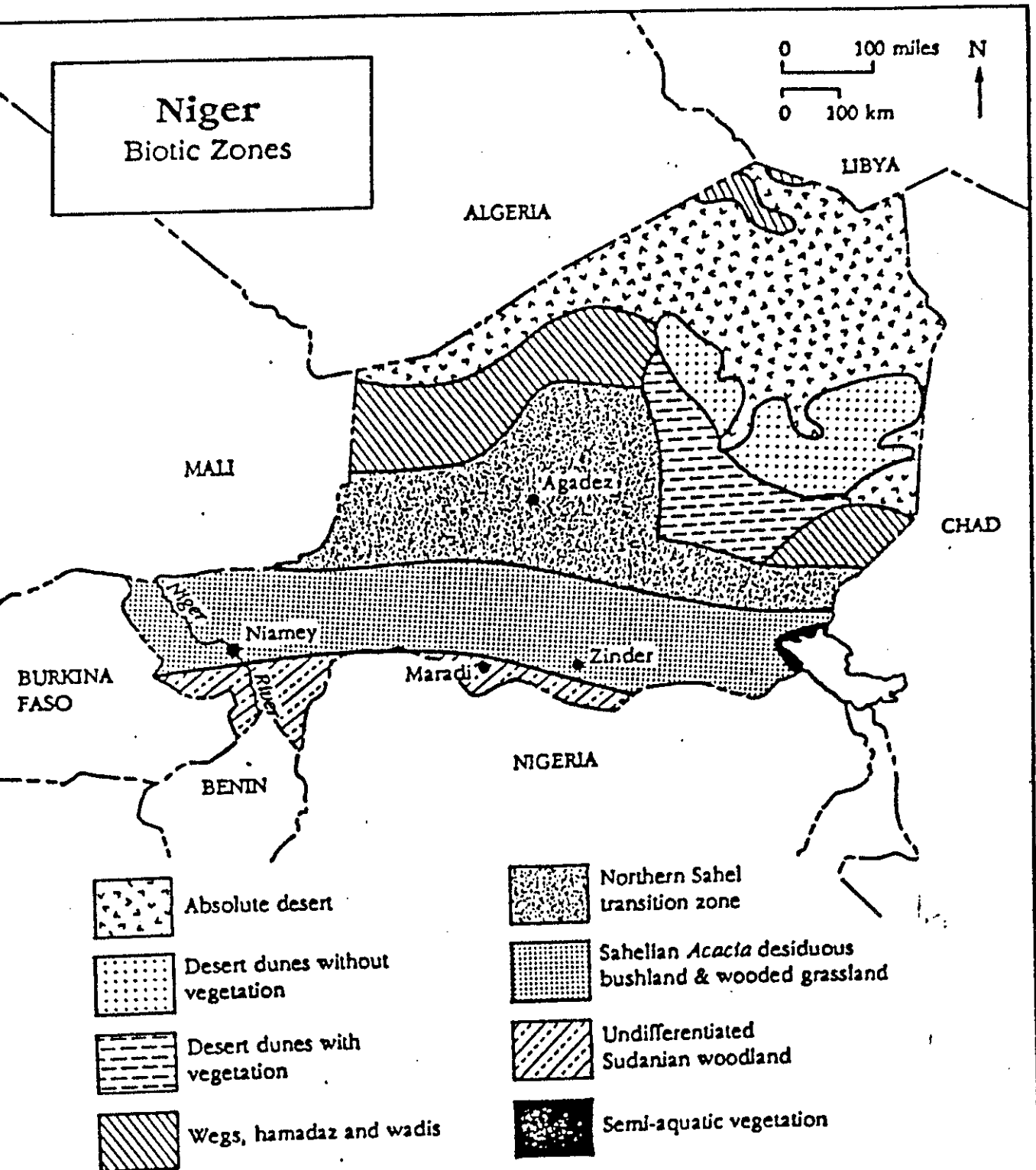
A.2 Saharo-montane

These high mountain chains, of which the Air and Termit massifs are the most conspicuous, may reach an altitude of over 2000 m. (Mt. Bagezane), and receive a higher rainfall than surrounding areas because of their elevation. Ravines, wadis and temporary and permanent pools exhibit a relatively rich variety of plant species. The high plateaux are refuges for relict populations of Mediterranean (e.g. wild olive Olea lapperinei) and Sudanian (e.g. Anogeissus leiocarpus, Grewia tenax) origin. Acacia ehrenbergiana, A. laeta, Rhus tripartita (another Mediterranean species) and Ficus salicifolia are characteristic woody species and Aerva javanica, Lavandula stricta and Solenostemma oleifolium are prominent herbaceous species. Along wadis, a more varied vegetation is present, dominated by such woody species as Acacia raddiana, A.

FIGURE 1.

NIGER BIOTIC ZONES

(from Shaikh et al., 1988)



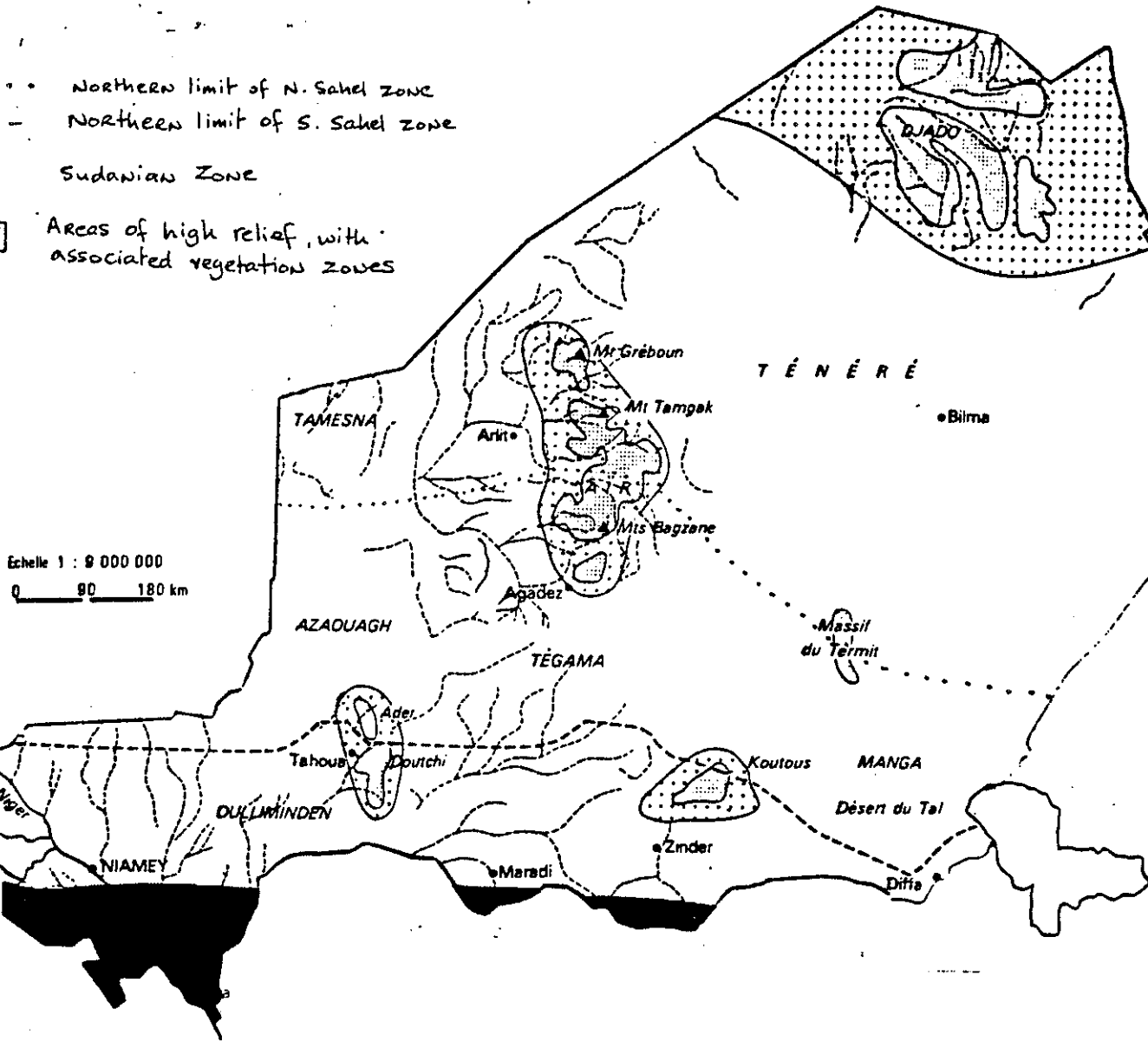


FIGURE 2. BIOTIC ZONES (from Jeune Afrique Atlas of Niger)

albida, Balanites aegyptiaca, Ziziphus mauritiana and Salvadora persica. Around pools, vegetation types are very variable but include Tamarisk spp. and Phoenix dactylifera as well as typical wetland genera as Phragmites, Typha and Cyperus. Because of the permanent humidity, species of Mediterranean and Sudanian affinities are found here also.

A.3 Wadis and Oases

Rainfall in the mountain areas results in runoff often far from the place of origin. Wadis and low-lying areas benefitting from this concentration of rainwater have relatively well-developed vegetation formations with Acacia albida, A. raddiana, A. nilotica, Balanites aegyptiaca and Maerua crassifolia and a herbaceous layer including Panicum turgidum, Aerva javanica and Cymbopogon schoenanthus. The type of substrate and infiltration rate determines to a large extent the type and persistence of the vegetation. Temporarily flooded areas are often dominated by dense stands of A. raddiana with a characteristic herbaceous stratum including Astragalus pseudotrigonus and Bubonium graveolens.

Oases are areas where surface or near surface water is permanent and vegetation is typically palms (Hyphaene thebaica, Phoenix dactylifera) or tamarisk (Tamarisk spp), with or without emergent waterside vegetation such as Phragmites and Typha. Examples of such oases can be found at Bilma, Kawar and Fachi.

A.4 Sahelian Grasslands (the "pastoral zone") 150-350 mm. rainfall.

The vegetation of this zone varies according to latitude, rainfall patterns, soil type and fertility and topography, and, increasingly with patterns of use. Large areas may be dominated by grass cover, with very few trees and shrubs whereas other areas, particularly towards the south have the appearance of a relatively wooded savanna.

In the northern areas, vegetation can be similar to that mentioned for the wadis of the Saharo-Sahelian zone. Perennial grasses dominate the herbaceous cover, notably Panicum turgidum. On clay soils, other species predominate, e.g. Sorghum aethiopicum. In the "steppe" areas, primarily on deep sandy soils, annual grasses are characteristic, notably Cenchrus biflorus, Aristida mutabilis, A. funiculata and Schoenefeldia gracilis. Trees are generally rather dispersed, except where local conditions favor more dense stands (e.g. Acacia nilotica around depressions). Species include Acacia raddiana, A. laeta, A. senegal, Maerua crassifolia and Balanites aegyptiaca. Towards the south and east, particularly, the landscape becomes more wooded with areas dominated by Commiphora africana on the more lateritic soils, and Sclerocarya birrea on the sandier plains. Guiera senegalensis, Boscia senegalensis and, especially

further south, Combretum glutinosum, also occur. Grass cover is mainly annual species but some perennials such as Aristida pallida and Cyperus conglomerata occur (although these are more common further north). In depressions, that retain moisture, vegetation is generally more abundant, including Acacia spp. and grasses such as Panicum laetum and Eragrostris pilosa. In degraded areas, grasses tend to be sparse or absent and the principal plants are invasive species such as Calotropis procera, Zornia glochidiata and Mollugo spp.

A.5 Plateau Woodlands

On the lateritic soils of the plateaus of the Sahelo-Sudanian zone, vegetation is characterized by a shrub woodland, or brush ("brousse tigrée") dominated by several species of Combretaceae, notably Combretum micranthum, C. nigricans, Guiera senegalensis and Combretum glutinosum. Boscia angustifolia, B. senegalensis, Cadaba glandulosa, Acacia ataxacantha and A. macrostachya are characteristic species of these areas. The herbaceous layer consists of a variable species mix, including Eragrostris tremula, Diheteropogon hagerupii, Pennisetum pedicellatum, Alysicarpus ovalifolius and Tephrosia spp.

A.6 Sudanian Woodlands

On the richer, deeper soils of the higher rainfall areas of the Sudanian zone a well-developed woodland appears, often dominated by Terminalia avicennoides with Anogeissus leiocarpus, Pterocarpus erinaceus, Prosopis africana, Adansonia digitata, Bombax costatum and Isoberlinia doka. Perennial grasses include Andropogon gayanus and Hyparrhenia involucreta. Gallery forests along watercourses may have a canopy height of up to 25 m. and characteristic species include Mitragyna inermis, Detarium microcarpum, Khaya senegalensis, Daniella oliveri and Nauclea latifolia. Some gallery forests (notably in "W" National Park) contain stands of Cola laurifolia and Kigelia aethiopicum. In some areas, notably the Dallol Mauri in south Dosso department, there are fairly extensive stands of Borassus aethiopicum palms.

A.7 Wetlands

The principal wetland areas in Niger are the Niger river, which runs through the southwestern portion of the country over a distance of 550 km., its floodplain and tributaries, and Lake Chad, which, in good rainfall years, extends into Nigerien territory. A number of permanent lakes exist, including those at Tabalak, Kao and Madarounfa, as well as the oases in the desert areas. Seasonal rivers, streams and ponds are widespread during the rainy season. The most important of these is the Komadougou-Yobe river, which forms the international boundary with Nigeria in the southeast for 150 kms. of its length.

B. Changes in Landscape Patterns

Historically, the landscape of Niger has gone through many changes as a result of global climate changes. This is evidenced by the presence of relict populations of Mediterranean and Sudanian species in the Saharomontane massifs. In the Pleistocene, much of Niger was covered by a huge lake, which then retreated, only to reappear 10,000 years later. During the drier spells before and after the appearance of the lake, the country was probably dominated by savanna and woodland, even north to areas now in the Sahara desert. This is attested to by cave paintings in the Air dating back to Neolithic times which represent animals unrecorded from the area in modern times, such as rhinoceros, elephant, buffalo and lion (Lhote, 1979). Even 6,000 years ago, Lake Chad was estimated to cover 320,000 square kms. and to be 40 m. deep. About this time the environment again became more arid, eventually leading to the predominance of steppe and desert present today. Lake Chad has diminished to the point where its surface area in recent years has been as low as 3,000 square kms. (Kindler et al., 1989).

Currently the Sahara desert dominates the northern portion of the country. Centuries of human use have altered the landscape, from the establishment of favored tree species such as the date palm Phoenix dactylifera along traditional caravan routes to the advent of crop (principally millet) cultivation in more southerly regions. Traditionally the clearing of croplands for millet was accompanied by extensive fallow periods (now much reduced, even inexistant in some areas). Certain tree species were favored by the advent of cultivation, most notably Acacia albida, which is presently the characteristic tree species of cultivated areas in Niger. The presence of other species in some areas may also be linked to human occupation, e.g. Balanites aegyptiaca, Sclerocarya birrea and Adansonia digitata.

In recent years, there is evidence of a much more radical change in the landscape of Niger due to two factors. The first is the series of droughts that has hit the Sahel since the late 1960s, being especially severe in 1968-74 and 1983-84. The second factor is the concomitant increase in the human population (now 7.4 million and increasing at 3.2% annually) with an increased trend towards sedentarization. The high rainfall years of the 1950s and early 1960s saw an influx of farmers and pastoralists into southern Niger. At the onset of the drought, many remained. The result has been an increase in the area of land under cultivation, often through extension onto marginal lands, decreasing fallow periods, increasing sedentary livestock populations and greater pressure on woodland resources for fuelwood and grazing land. In the pastoral zone, increased sedentarization has occurred with the northward spread of agriculture and the settling of certain sections of the pastoralist community. The northern limit of cultivation is calculated to have advanced about 110 kms. over the past thirty

years, resulting in an estimated reduction of overall range production potential of one third (Weber, 1987). The size of the population living north of the 350 mm. isohyet increased eightfold between 1960 and 1985, to 2.3 million.

B.1 Effects of Recent Climate Changes

The effect of the drought has resulted in a number of changes in the vegetation of Niger. This can be linked to the fact that isohyets have been displaced 70-100 kms. to the south. There has been:

- 1) a net loss of woody species, particularly noticeable in northern areas where woody cover is less;
- 2) a shift in species composition of rangelands from perennial grasses to more annual grasses and forbs;
- 3) a southward extension of certain Saharan species, e.g. Leptadenia pyrotechnica, a characteristic species of sand dunes;
- 4) the restriction of certain species, formerly more widespread, to favored microhabitats such as depressions (especially for species on the northern edge of their range). Carrière (1989) noted in Mauritania, for example, the restriction of the grass Schoenefeldia gracilis to microdepressions, and its replacement over wide areas of the northern Sahel by Cenchrus biflorus. However, Schoenefeldia remained dominant in areas of the southern Sahel.

Data from the forest of Fayra, near Torodi, in the southeast of the country indicate about a 50% mortality after the 1984 drought for Prosopis africana, Anogeissus leiocarpus, Pterocarpus erinaceus and Combretum nigricans (Mochi and Rapant, 1989). Other species severely affected were Grewia bicolor and Dichrostachys cinerea, and Crateva adansonii, Lannea microcarpa and Butyrospermum paradoxum disappeared entirely from certain areas. Similar declines were noticed elsewhere (e.g. Ado, 1987). Other tree species such as Balanites aegyptica, Sclerocarya birrea and Diospyros mespiliformis were relatively unaffected by the drought.

The classified forest of Bakabe, known as the Kapokeraie de Bakabe for its abundance of Kapok trees (Bombax costatum) now contains no Kapoks.

In the Sahelian zone, large expanses of Acacia senegal and Commiphora africana have perished. A consequence of this die-off is that herbaceous species that depended on the favorable microclimate and increased organic matter provided by living trees have also suffered.

However, some species have shown remarkable powers of regeneration soon after the drought, notably Combretum nigricans and Guiera senegalensis. Others have been very slow to recover, though the good rains of 1988 saw the emergence of seedlings of a number of hard hit species, e.g. Prosopis africana.

B.2 Effects of Recent Human Activity

Increased population and settlement patterns emphasizing sedentary agriculture have had a marked effect on the Nigerien landscape. Those lands suitable for cultivation have largely been cleared of natural vegetation, except for certain species valued for their products (fruits, leaves, bark) and shade. In the Sudanian zone, these include the following tree species:

- Acacia senegal
- Adansonia digitata
- Balanites aegyptica
- Diospyros mespiliformis
- Ficus spp.
- Parkia biglobosa
- Tamarindus indica
- Butyrospermum paradoxum

Among grasses, Andropogon gayanus is particularly valued, and often managed for production.

In the Sahelian zone, Acacia albida is the dominant tree species of cultivated areas, although other species such as Balanites aegyptica are also retained. In land left in fallow, a grass and forb layer will return, along with woody species such as Guiera senegalensis and Piliostigma reticulatum.

As the areas most suitable for cultivation are cleared, population pressure and declining yields lead farmers to cultivate increasing areas of marginal land (on slopes and poor soils). This trend has been exacerbated by drought so that extensive agriculture has become a risk-minimizing strategy on the part of the farmer, adapted to spatially erratic rainfall patterns. The removal of vegetative cover on marginal lands increases the tendency towards soil degradation (nutrient leaching, loss of organic matter, acidification) and increases the risk of soil erosion.

The zones that are not generally exploitable for agriculture, such as the plateau woodlands, have also suffered from the effects of increased human populations. The principal sources of degradation are their exploitation for fuelwood and the large numbers of domestic livestock using the forests. Transhumant herds traditionally exploiting these zones have been augmented by the increasing numbers of livestock owned by sedentary agriculturalists. The composition of local herds has, moreover, evolved towards a greater proportion of goats relative to cattle and sheep. This perhaps puts a greater strain on forest resources due to the wider range of forage species utilized by goats relative to cattle and sheep. These effects are most severe around urban centers where fuelwood demand is high but the need for fuelwood and grazing have led locally to zones of degradation around small villages.

The extensive rangelands of the southern Sahel have decreased markedly in area due to their conversion to agriculture. The

effective northern limit of cultivation (NLC) has moved further north by about 100 kms. in the last thirty years, whereas the 350 mm. isohyet (the official NLC, beyond which pastoralists would theoretically not be liable for damage caused by their animals to cultivated areas) has been displaced 70-100 kms. to the south. In the northern rangelands, the increase in settlements around water points has resulted in sometimes total loss of existing vegetation, to be replaced by weedy species such as Calotropis procera, or even totally barren areas. These areas can extend up to 30 kms. from settlements and have increased with the installation of Government-constructed boreholes. Increasingly, dry-season gardening is replacing natural vegetation around water bodies and low-lying areas. Finally, the scarcity of trees brought about by the drought has put increased pressure on the remaining woody vegetation for use as fuelwood, construction and forage. In areas with few trees, this pressure is severe, accelerating the disappearance of woody vegetation as regeneration is threatened.

To summarize, the trend of lower and more erratic rainfall patterns with drought years has resulted in a southward shift of the northern limits of vegetative species and communities with isolated pockets remaining in favored, buffered localities. This phenomenon is not new in this region. Periodic droughts are a feature of the Sahel (National Research Council, 1983a). In the past, vegetative communities have recovered to take advantage of relatively high rainfall periods, as in the 1950s and 1960s, either through regeneration through a dormant seed bank in the soil, or dormant trees (Warshall (1989) mentions an A. nilotica forest "coming back from the dead" after several leafless years), or from seed dispersal from surviving individuals (through wind, water, wild and domestic animals). However, the recent droughts have coincided with an unprecedented increase and sedentarization of the human population on Nigerien territory. This has reduced many of the options available for the potential recovery and recolonization of former and present vegetative communities, should rainfall patterns improve. It is not known whether rainfall patterns will improve, either in the short-term or in the long-term. What is certain is that, barring mass emigration, the population of Niger will significantly increase in the coming decades, and at current rates of increase, will double in 25 years. Yet these people will be largely dependent on the land, its ecological processes and its biological diversity. The landscape of Niger will never be the same as it was thirty years ago. The primary goal of biodiversity conservation is to preserve, enhance and manage vegetative (and animal) communities to continue to provide sustainable benefits to the human population.

B. Animals

Just as the vegetation in Niger can be considered to advance and retreat according to climatic trends, the fauna can also be considered as a dynamic entity responding to long- and short-term fluctuations in climate and habitat availability. Faunal changes may be easier to monitor and be more immediately responsive to these changes than changes in plant communities. For example, one observer considers that the large mammal fauna in Niger has declined in numbers by about 90 % over the last twenty years (Anada, 1990). Several species have become extinct in this time (see Table 1.). Whether they would reappear in more favorable times is debateable. There would at least need to be a source pool for recolonization and sufficient available habitat to maintain populations.

An example of the complexity of the Nigerien fauna can be gauged by examining the components and movements of its avifauna. During and after the wet season, there is a net northward movement of certain components of the bird fauna, with Sudanian species invading the Sahel and Sahelian species being found in the Saharan zone. Some of these species stay to breed. There is a corresponding retreat in the dry season. In addition, there is an influx of Palaearctic migrants during the northern winter, some of which remain in Niger and others of which pass through to spend the winter in more southerly latitudes. Superimposed upon this pattern are the intra-African migrants, some of which, such as the familiar Abdim's Stork (*Ciconia abdimii*), arrive to breed in Niger during the rains but subsequently migrate to southern Africa, and at least one Palaearctic species (*Apus pallidus*) that is a summer visitor breeding in Niger. However, despite the mobility of birds, the availability of appropriate habitat in Niger and elsewhere may be critical to certain populations. For example, the British population of the Whitethroat (*Sylvia communis*), a species wintering commonly in the Sahel, declined by at least 60 % between 1968 and 1969, coincident with the major drought in the Sahel that year. A similar, though less drastic decrease coincided with the 1984 drought. Such declines, often temporary, have been noted elsewhere in Europe for a number of species characteristically wintering in the Sahel (Fuller et al., 1989). It is known that such migrants often remain faithful to discrete wintering sites and migration routes so such areas are critical to the continued survival of certain populations.

B.1 Mammals

At least 127 species of mammals have been recorded from Niger (Annex 4.). Of these, 28 are bats and 27 are small rodents. Most of these species have been recorded in either "W" National Park or the Air and Ténéré National Nature Reserve. Table 1. shows the status, principal areas occupied and reasons for decline of the larger mammals. According to the IUCN categories, Cheetah, West

African manatee, Barbary Sheep and Dorcas, Dama and Red-fronted Gazelles are listed as "vulnerable" and Addax and Scimitar-horned Oryx are considered globally endangered. Another, little-known gazelle, the Slender-horned Gazelle (Gazella leptocerus), a true Saharan species, has also been recorded from the Nigerien desert. The Scimitar-horned Oryx has undergone a precipitous decline in recent decades, and if any survive in the wild, it will be in the Ouadi Rime-Ouadi Achim Faunal Reserve in Chad. The last individuals seen in Niger were noted in 1986. The Addax is undergoing a similar decline and none have been seen in Air-Ténéré NNR since 1986 (tracks have been found in each of the last three years), although four were seen at Termit in 1990 (Newby, J., pers. comm.). The Dama Gazelle should probably also be classed as endangered, with a population estimated at 170 individuals in the Air-Ténéré NNR. More disturbingly, the species has shown no recovery in the relatively good rainfall years since 1987, in contrast to the more sedentary Dorcas Gazelle, whose population has doubled in the Air-Ténéré NNR, to about 12,000 individuals (Magin, 1990a). For the Oryx, Addax and Dama Gazelle, a variety of factors has led to the demise. These species traditionally undergo long migrations in search of seasonally available pasture. Drought, and occupation of marginal lands by pastoralists and their herds has placed them under great pressure and hunting from motorized vehicles from wealthy and influential people and from the military is threatening their existence. Poaching by the military is the principal threat to Dama Gazelles in the Air-Ténéré NNR (Magin, 1990a). It is clear that any effort to protect these species requires action from the very highest level to effectively prohibit poaching by these groups. Barbary sheep have seemingly increased spectacularly in the Air-Ténéré NNR since 1986, with a doubling of the population to about 3,500 individuals. Significantly this species is not threatened by hunting by the military because of the inaccessibility of its mountain habitat (Magin, 1990a).

Compared to the domestic livestock using the Air-Ténéré NNR (over 90,000 head, mostly sheep and goats), the wildlife forms a very small proportion of the overall biomass (less than 6 %, even in favored habitats), but more information is needed on seasonal habitat use by both domestic stock and wildlife to assess the effects of potential competition and effect on pasture resources. It should be noted, however that the presence of pastoralists and their herds can prevent wildlife exploitation of favored habitats even if potential competition with livestock is minimal (Magin, 1990b).

In March, 1990 a workshop on the conservation of Addax and Scimitar-horned Gazelle in Niger was organized by the DFPP, WWF and the Zoological Society of London. As well as raising the profile of these two species in Niger and raising the profile of Niger as possibly the last potential stronghold of these species in the wild, the workshop came out with recommendations on their conservation, including plans for captive breeding and

harrassment by tourists. The endangered Nubian Bustard (Neotis nuba) also has a healthy and increasing population in this reserve. The threat of organized hunting parties of Arabs has not materialized in the reserve, although such exploitation has occurred in nearby Mali (Newby, J., pers. comm.).

It is noteworthy that, in areas fairly recently converted to agriculture, the continued presence of a number of bird species, particularly large birds such as birds of prey and ground hornbills is linked to the availability of remaining large trees, indicating that nest sites may be a limiting factor in their distribution. By far the most important tree species is Khaya senegalensis. Considering the beneficial ecological role played by these bird species (control of rodents, locusts) and the cultural significance of others (such as the Ground Hornbill (Bucorvus abyssinicus), a symbol against witchcraft and associated with traditional hunting), this relationship needs to be considered in environmental planning. Although Khaya senegalensis is a protected species, considerable mortality has occurred because of bark-stripping for medicinal purposes. A stronger incentive for the preservation of this species on agricultural lands needs to be instated, e.g. through education and awareness campaigns and encouragement of regeneration and rational exploitation by forestry agents.

B.3 Reptiles

The small numbers of Nile crocodiles along the Niger river are threatened. The African Spurred Tortoise, on IUCN's Red Data List presumably occurs in Niger, and IUCN has suggested a survey of its status and conservation needs (IUCN, in prep).

III. PROTECTED AREAS

A. Description

There are a number of protected areas in Niger which are designed to preserve and protect ecosystems and to prohibit or control the exploitation of their constituent plant and animal species (see Figure 3). These include:

A.1. "W" National Park (220,000 hectares) in the southwestern part of the country. This represents the Nigerien portion of a tri-national Park extending into Burkina Faso (330,000 ha.) and Benin (502,000 ha.). All consumptive exploitation and settlement is prohibited in the park. The Tamou Reserve (76,000 ha.) abuts "W" National Park to the northwest. Although settlement here was originally prohibited at the time of its creation in 1962, recognition of considerable occupation led to the declassification of part of the Reserve (which originally covered 143,000 ha.) in 1976. Considerable settlement has occurred in the Reserve. The

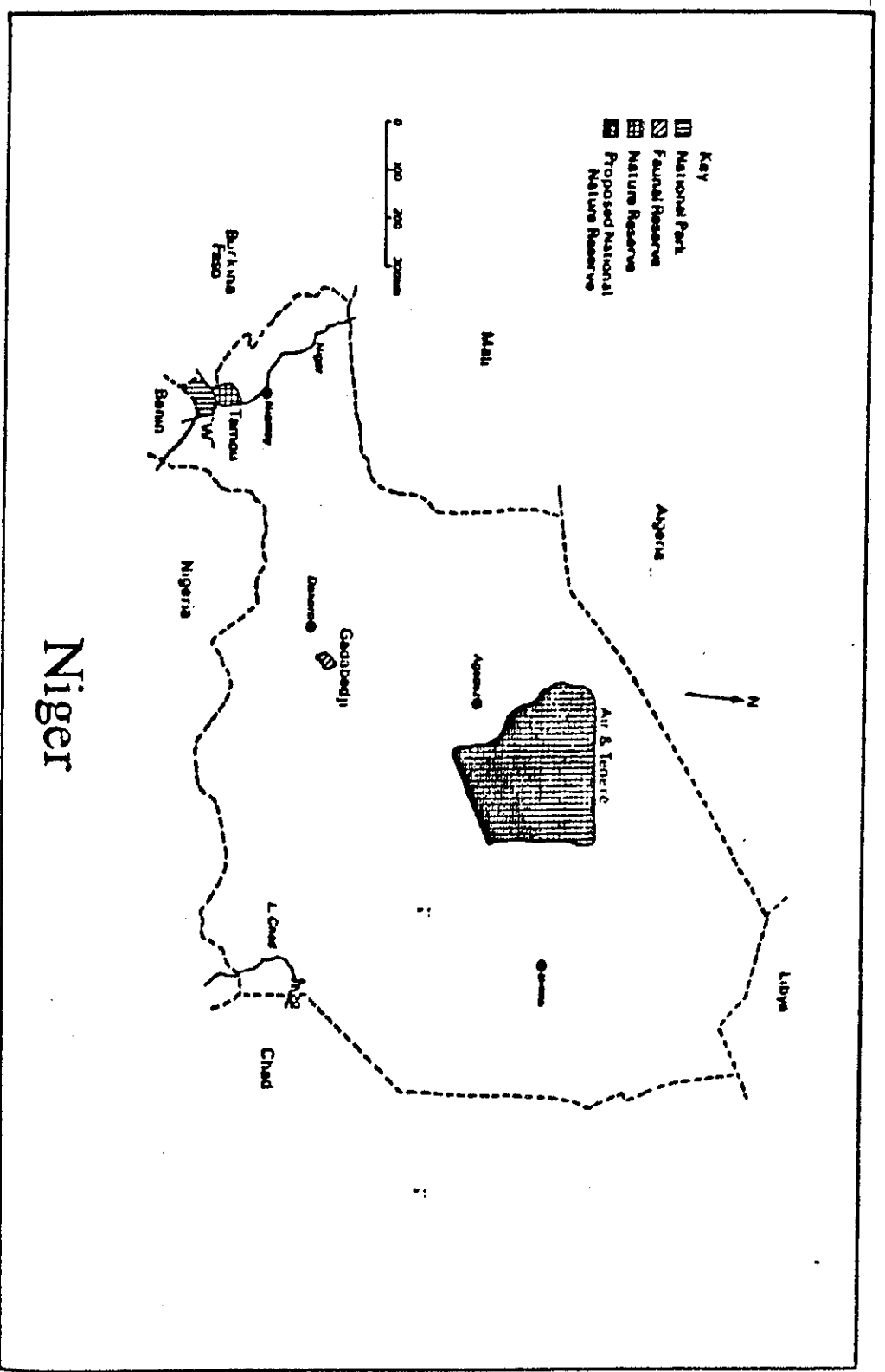


FIGURE 3. PROTECTED AREAS OF NIGER (from IUCN, 1988)

Dosso Partial Reserve (306,500 ha.) to the northeast of "W" Park was set up as a buffer area to "W" Park. No provisions regarding settlement, farming and grazing were included in the classification, and it is now widely settled. Activities of farming villages in these two reserves are supposedly monitored by Park personnel.

A.2. The Air and Ténéré National Nature Reserve (7,736,000 ha.) in the Department of Agadez in north-central Niger. This is a recently-gazetted, (1988), multiple use reserve accommodating the customary rights of human populations living in the area, but subject to certain restrictions regarding the exploitation of the natural environment. An area comprising approximately 12% of the National Nature Reserve is classed as an Integral Nature Reserve (Addax Sanctuary) in which access is strictly limited.

A.3. Gadabéji Faunal Reserve (76,000 ha.) located in the southern pastoral zone (Dakoro arrondissement) has similar status to the Tamou Reserve and is subject to rather heavy use by pastoralist groups. It has been a reserve since 1955.

A.4. Classified natural forests number 79 in Niger, and cover an area of 212,000 ha. (not including restored perimeters and state plantations) scattered throughout the country (only one in Agadez Department). Only two are larger than 10,000 ha., these being Mounouk (61,000 ha.) in Diffa Dept. and Tera (44,000 ha.) in Tillabery Dept. With the exception of a few managed forests such as Guesselbodi, no exploitation of these forest is permitted (except the collecting of dead wood for personal use in some forests) but in reality many are very degraded and some have almost disappeared (including Mounouk, where the trees, principally Acacia senegal, died as a result of the drought).

A.5. Protected forests comprise the rest of the forest estate in Niger (note that forest is defined as any natural vegetation stand other than agricultural land - "donnant des fruits autres qu'agricoles"). In 1980, "forested land" was estimated to cover nine million ha. (six million ha. in the sahelo-Saharan zone, 2.6 million ha. in the Sahelian zone and 300,000 ha. in the Sahelo-Sudanian zone). Local populations may have certain use rights in protected forests that cannot be taken away without compensation. In reality, many protected forests are less degraded than the classified forests, but factors other than legal status, e.g. ease of access, effectively determine the degree of exploitation of a given forest. Small forest stands traditionally protected for cultural and religious reasons (bois sacrés) occur in the extreme southwest, but their number and extent is thought to be small.

A.6. Several Government ranches are scattered throughout the pastoral zone with the object of semi-intensive livestock raising. Because of the exclusion of settlement and pastoralist pressure, the natural vegetation is in better condition than is

found generally in the pastoral zone. The largest of these ranches, Ekrafane (110,000 ha.) is located in the west of the country, on the border with Mali.

B. Analysis of Needs

B.1. "W" National Park

In terms of biological diversity, "W" National Park is undoubtedly the most important area in Niger. Yet, despite its status it is faced by a series of problems threatening its integrity and continued role in the conservation of representative ecosystems. These include the following:

1) Poaching. Poaching of large mammals for meat and other valuable products (skins from reptiles and ivory from elephants) is a serious problem in the park, especially along the rivers which offer ease of access for poachers, and attract wildlife in search of water. Yet the boundaries of the park are marked by such watercourses over 250 kms. of their length. Poaching is probably worst along the Mekrou where poachers take refuge across the river in Benin. Poaching is particularly serious during times of drought when animal numbers are reduced and those remaining are forced to concentrate around well-watered areas. Poaching by the military is a regular and serious threat to the Park's wildlife, against which Park authorities have little recourse. In addition to wildlife, certain tree species have also suffered from illegal exploitation, notably *Borassus* ("ronier") palms (*Borassus aethiopium*), which have been decimated along the Mekrou river.

2) Illegal grazing. Large herds are regularly grazed in the park. These belong to transhumant herders and newly-installed populations in areas around the park, who often hire locals to look after their herds. After the 1984 drought there was an invasion of herders (mostly Peuls) into the area, with an estimated 10,000+ head inside the park. The problems raised by this practice are multiple, and include:

a) the destruction of vegetal resources, through grazing and browsing. This includes young seedlings and palatable species now rare outside of the park due to livestock pressure. Herders also cut trees for forage. This extends beyond lopping to the actual felling of live trees. Livestock pressure is worst in the remaining gallery forests which are the last refuges of rare and distinctive communities and species.

b) prevention of access to favored pasture and to water points by wild animals. The fertile floodplain of the Niger river, for example, has been more or less totally pre-empted by livestock, so that wild animals traditionally relying on this resource have been forced to seek other, more marginal habitats. This further concentrates animals, thus facilitating poaching.

c) the degradation of natural resources. Erosion is becoming a serious problem in the park and is caused principally by livestock.

The situation is particularly acute along riverbanks, where animals congregate. Vegetation is removed, ravines form and increased sedimentation of rivers and streams results, threatening their capacity to retain water and affecting the fish and other aquatic animals dependent upon a steady supply of water of adequate quality. Aquatic vegetation is also negatively affected. In addition, trampling of the vegetation causes soil compaction, thus altering the plant community to favor hardier species (which are of course the predominant species of degraded land over large areas of the country outside the park).

d) the transmission of livestock diseases to wild animals. In 1981-82, 75 % of the park's Buffalo population died of rinderpest.

3) Brushfires. Each year, one third of the park is burned, on average. In 1988, 70-80 % was burned. These fires are mostly started by herders to stimulate regrowth for pasture. Some may be started by poachers. Firebreaks and attempts at fire management (e.g. early season fires) have had little success in controlling these fires.

4) Increased settlement around the park. The reserves of Tamou and Dosso have seen a rapid colonization; not just from neighboring regions but from less productive lands further north, such as around Ouallam. In addition to destruction of vegetation as land is cleared, settlement also puts pressure on animals using the reserves (mainly Tamou) as a wet season refuge. Illegal hunting has certainly increased. Several islands in the Niger river that clearly fall within the park boundaries are occupied illegally by fishermen. Fishing in the National Park is itself illegal and the nets used also threaten aquatic birds and mammals, such as cormorants and manatees.

5) The presence of significant deposits of rock phosphate in the park have led to periodic calls for its exploitation. On economic grounds, however, extraction is not considered worthwhile. Such exploitation would clearly be incompatible with the area's status as a National Park.

6) The threat of barrages on the Mekrou and Gambou rivers still exists although no immediate plans are under consideration. The potential to severely affect the Park's important gallery formations would be very high.

What are the solutions to these problems? Newby (1985) suggests three approaches. He points out that the legislation in place for the park is adequate (a management plan was drawn up in 1982). However, it is not enforced. People using the park illegally are perfectly aware of the fact that what they are doing is illegal, but park guards are so few (two in 1990) that the risk of getting caught is very low. There is a need to increase the numbers, training and motivation of park guards. At present guard patrols are frequently abandoned because of lack of fuel or parts for

vehicles. Poaching patrols could take place on foot but fire-fighting requires vehicles for prompt and proper attention. In addition, morale among park staff is very low and "W" National Park is regarded as a hardship post by field agents. This is in part because of the support difficulties, but also reflects the low priority accorded the park by higher levels of authority. What is needed is a concerted effort to convince authorities, at all levels, of the importance, nationally and internationally, of "W" National Park and of the extent and seriousness of the threats to it. The GON allocation for the park in fact dropped 10% (to 4.5 million fcfa - \$US 18,000) from 1989 to 1990, although the French Office Nationale de Chasse has contributed 10 million fcfa (\$US 40,000) for park improvement.

The EEC has, since 1987, been developing a major regional project aimed at addressing the problems of the protected areas along the national frontiers of Burkina Faso, Benin and Niger. For Niger this covered "W" National Park and Tamou reserve. In 1988, an extensive "feasibility study" was carried out, investigating the status of biological and socioeconomic information, various zoning possibilities and management options, infrastructure and maintenance needs, and training and research needs. Unfortunately, since that time, the starting of the project has been delayed by lack of agreement among the Governments of the three countries and the EEC upon administrative structure and location. Another project, to be implemented by Peace Corps and supported by USAID, is planned to start in February, 1991 and continue for three years. Peace Corps has a twenty year history of working in the park and is responsible for much of the data collected on its fauna and flora. Research and monitoring in the park will continue, but the focus of activities will be in the adjacent reserves of Tamou and Dosso, where a program of conservation education and the development of small-scale natural resource and agricultural activities is intended to help local populations better manage their natural resources while respecting the integrity of the park.

However, the immediate problems noted above still remain. Recurrent costs are always a large problem for protected area management that need to be taken into account because just one or two years lack of surveillance can have disastrous consequences for the fauna and flora. Small populations can quickly be wiped out. Therefore, there is a need for resources to bridge the gap until the EEC project gets underway. Logistical and equipment support to park personnel, training of guards and trackers, including reward and other incentive systems and campaigns to increase awareness at various levels and to increase tourism are all critical immediate needs. A couple of years neglect could take a lot of time and effort to reverse in terms of environmental degradation, of which biological diversity is such a critical part.

B.2. Air-Ténéré National Nature Reserve

Although this reserve was only gazetted in 1988, a great deal of the work that led to this was achieved under a joint IUCN/WWF/DDA project (Conservation and Natural Resource Management in the Air and Ténéré) with the GON, which started in 1982 and is in a second phase, planned to continue until the end of 1993, with Swiss and Danish support. The goal of the project is sustainable development of the region based on the rational utilization of all of its natural resources and has three principal components - protection, rehabilitation and rational use of natural resources. Much valuable inventory, monitoring and research work has been done on the animals and plants of the region and a lot of effort has gone into conservation education at all levels from pastoralists to schoolchildren, and to support local populations Government services to encourage a better natural resource management. Activities include reforestation, soil and water conservation, improved stoves, protection of gardens as well as woodless construction. This has been accompanied by a diverse training program varying from basic first-aid education to well-digging and solar dryers for vegetables.

The project is still experimental. A great deal has been learned about the ecology of the region and a number of approaches have been tried to improve local natural resource management and environmental protection (see the project evaluation report, 1989). This has undoubtedly resulted in a greater appreciation of the opportunities and constraints to an integrated environmental management of the region on a global scale. The area is used by a variety of transhumant and nomadic herders and locally by groups practising small-scale gardening. It is, of course, fundamental to fully understand the ways in which these various groups interact with the environment and their perception of the environment in order to build on traditional use patterns to achieve a better environmental protection and management. Active participation and responsabilization of all groups using the area will be critical to success. The current phase of the project will continue research on the ecology of the region, including the effects of different land use management strategies on this ecology, setting effective monitoring and evaluation criteria and developing a management plan for the area based on a zonation according to various ecological and land-use categories. Success will ultimately depend on the involvement of local populations, but the legal framework of the reserve and the political framework of the proposed Rural Code offers an opportunity to establish rights and responsibilities for local groups practising sound and sustainable environmental management. This project is providing some important precedents in the incorporation of local populations in the management of protected areas, and should be supported.

phase of this project, to be financed by the African Development Bank, will further pursue these options. Like any popular management scheme, agreement will have to be required by all parties. An awareness raising component is thus intended to reach new fisherman coming into the area, e.g. from Mali and Benin. Fishing rights in lakes and other wetlands need to be clarified.

A.3. Wildlife

Hunting was prohibited in Niger in 1964 on a two year renewable basis, with the aim of allowing wildlife populations to recover. This ban became permanent in 1974. However continued droughts and habitat loss have meant little recovery. The last two or three years have seen a partial recovery in some areas coincident with higher rainfall. Nevertheless there is some pressure to re-open hunting, principally for small game. In practice the ban on hunting has not coincided with an increase in wildlife. Most Nigeriens cannot afford firearms, and continue to hunt small game by traditional means, particularly pest species such as francolins, guinea fowl and rabbits that destroy crop seeds and seedlings. On the other hand, the military continues to hunt indiscriminately, using vehicles and firearms. The argument for reopening hunting lies in the economic incentives for the conservation of habitats and wildlife for sustainable utilization. This, however would require adequate resources and manpower to regulate such hunting (quotas, species permits, etc.), as well as the active involvement of local populations. Nevertheless, within the context of local land use management plans, limited hunting of small game species could be allowed and could be an incentive to develop such plans. The Rural Code Committee and the DFPP, with support from IUCN's Environmental Law Center in Bonn have commenced a study of the legislation relating to hunting and other forms of wildlife exploitation with a view to developing a legal and institutional framework allowing optimal exploitation ("valorisation") of wildlife.

B. International Conventions

Niger has a good record concerning the ratification of international treaties protecting its flora and fauna. In addition to demonstrating concern for the conservation of nature, these conventions allow international cooperation in this field. Niger has signed the following conventions (the year denotes the year the convention was ratified by Niger):

The African Convention on the Conservation of Nature and Natural Resources (OAU) - 1970
The World Heritage Convention (UNESCO) - 1974 (accepted, not ratified)
The Convention on Wetlands of International Importance (RAMSAR) - 1987

PART 4. RECOMMENDATIONS

1) Fully incorporate and integrate biological diversity concerns into the national NRM strategy.

A national conservation strategy (NCS), typically championed by IUCN for many countries, is not appropriate per se for Niger, given the development of a more inclusive NRM strategy. This is admitted by the IUCN representation in Niger. Rather the elements of a NCS should be harmonized and incorporated in the NRM strategy. The development of this strategy represents a significant opportunity for the consideration and incorporation of biological diversity issues and concerns into national policy and many of the recommendations that follow will best be pursued through this process. This will require the coordination of the Directions of Environment and Wildlife & Fisheries, INRAN, IUCN and WWF, among others.

2) Assure the maintenance of a representative sample of Niger's biological diversity through the integrity and continued functioning of a system of protected areas. This should include studies of the feasibility of incorporating Termit, and possibly Ekrafane, as areas with some kind of protected status. Consideration should also be given to areas along the Niger River. Critical to this goal is a commitment to assuring the effectiveness of "W" as a National Park. This should include interim support until the EEC regional project gets underway.

3) Produce a strong policy statement, backed by appropriate legislation for the banning of hunting of large mammals and birds by the military and other influential groups.

4) Review the options for developing an effective program of research in biological diversity conservation, involving INRAN and the National University.

5) Incorporate biological diversity concerns into agricultural research, e.g. consideration of wild plant species in local farming systems.

6) Inventory vulnerable areas valuable for biological diversity conservation, notably wetlands and remaining gallery forests. Also areas of high crop genetic resource potential. Biological diversity inventories of the Government ranches to establish their potential as multiple-use reserves is recommended. Conduct inventories of rare and endangered species, e.g. manatee.

7) Incorporate biological diversity concerns into the Rural Code.

IUCN is actively working with the Rural Code committee on the incorporation of biological diversity concerns. Studies could include:

FELIDAE

<i>Felis silvestris</i> (Schreber)	Chat sauvage d'Afrique	African Wild Cat
<i>Felis margarita</i> Loche	Chat des sables	Sand Cat
<i>Felis caracal</i> Schreber	Caracal	Caracal
<i>Felis serval</i> Schreber	Serval	Serval Cat
<i>Panthera pardus</i> (Linnaeus)	Léopard	Leopard
<i>Panthera leo</i> (Linnaeus)	Lion	Lion
<i>Acinonyx jubatus</i> (Schreber)	Guépard	Cheetah

HYAENIDAE

<i>Hyaena hyaena</i> (Linnaeus)	Hyène rayée	Striped Hyaena
<i>Crocuta crocuta</i> (Erxleben)	Hyène tachetée	Spotted Hyaena

TUBULIDENTATA

ORYCTEROPODIDAE

<i>Orycteropus afer</i> (Pallas)	Oryctérope	Aardvark, Antbear
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PROBOSCIDEA

ELEPHANTIDAE

<i>Loxodonta africana</i> (Blumenbach)	Eléphant d'Afrique	African Elephant
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HYRACOIDEA

PROCAVIIDAE

<i>Procavia johnstoni</i> (Pallas)	Daman de Rocher	Rock Hyrax
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TUBULIDENTATA

TRICHECHIDAE

<i>Trichechus senegalensis</i> (Link)	Lamantin du Sénégal	African Manatee
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ARTIODACTYLA

HIPPOPOTAMIDAE

<i>Hippopotamus amphibius</i> (Linnaeus)	Hippopotame amphibie	Hippopotamus
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SUIDAE

<i>Phacochoerus aethiopicus</i> (Pallas)	Phacochère	Wart Hog
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