

# Ecologically Sensitive Sites in Africa

Volume V: Sahel

Burkina Faso  
Cape Verde  
Chad  
Gambia  
Mali  
Mauritania  
Niger  
Senegal

Compiled by the World Conservation Monitoring Centre

For

The World Bank



5461

# **Ecologically Sensitive Sites in Africa**

**Volume V: Sahel**

**Compiled by**



**World Conservation Monitoring Centre  
Cambridge, UK**

**for**



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# ECOLOGICALLY SENSITIVE SITES IN AFRICA

## PREFACE

During the last two decades, there has been growing evidence that environmental degradation in its many forms constitutes a threat of growing significance to economic development. In addition, the rapid evolution of the environmental agenda has led to an increased understanding of the interdependence among economic activities and their environmental consequences, both within and between countries. The economic and physical interdependence between nations is illustrated by the emergence of new kinds of environmental problems, such as the deterioration of the ozone layer, the greenhouse effect, tropical deforestation, and the transboundary movement of hazardous wastes.

The Bank has been active in the field of environmental protection and, in the last decade, has financed numerous projects containing environmental components as well as several free standing environmental projects, which have had solely environmental objectives, such as reforestation, watershed management and pollution control. Through the introduction of new directives on environmental assessment, environmental action plans, forestry policy, the global environmental facility, resettlement, indigenous people and wildlands, the Bank has definitely distinguished itself as a leader in environmental protection.

Despite the above efforts, it became evidently clear that the Bank's response did not match the changing realities in the degree of effort devoted to environmental matters or in the approaches actually used. This combined with a few well publicised cases in which World Bank projects actually had some negative environmental consequences - such as contributing to the destruction of tropical rain forests and posing threats to wildlife populations, indigenous people, and established human settlements, prompted the Bank to rethink and adjust its policies toward environmental management. In its recent reorganisation, the Bank management decided to bring environmental concerns more systematically into the mainstream of its operation by establishing a Vice Presidency on Environmentally Sustainable Development.

This new action reiterates the Bank's commitment to bringing environmental issues into the mainstream of the lending operations and policy work. Partly influenced by global events such as the Rio Summit and from the Bank's own experience in environmental work, there continues to be a general consensus on five priority areas which will require the Bank's special attention and also the attention of its member countries. These include destruction of natural habitats; land degradation; degradation and depletion of fresh water resources; urban, industrial, and agricultural pollution; and degradation of the "global commons". Although these five areas have been addressed in the Bank's operations through various country focused environmental action plans, through coverage of environmental issues in country economic and sector work, and through actual lending operations, there has been expressed concern by task

managers on the availability of environmental information on which to base certain decisions.

This publication is made in response to requests from task managers in the Africa region who wanted to know the location and properties of the ecologically sensitive sites in Africa to which they could refer while implementing Bank projects in the region. This publication is also made to assist task managers to comply with the Bank's Operational Policy Note No. 11.02 on "Wildlands: Their Protection and Management in Economic Development". The publication has been compiled by the World Conservation Monitoring Centre, UK in collaboration with the Africa Environment Division of the Technical Department at the World Bank. It contains the most up-to-date available data and we hope it will find wider application beyond the Bank's operations.

Walter Lusigi  
Senior Ecologist  
World Bank  
Environment Division  
Technical Department  
Africa Region



# SECTION I

## ECOLOGICALLY SENSITIVE SITES IN AFRICA

*A summary of key issues*

### INTRODUCTION

*The challenge facing nations today is no longer deciding whether conservation is a good idea, but rather how it can be implemented in the national interest and within the means available to each country. (WCED, 1987)*

*In order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it. (Principle 4, Rio Declaration on Environment and Development, UNCED 1992)*

Environmental concerns are much in the news. Drought, poacher wars and civil strife are evident in many African countries, and a general feeling of malaise affects much of the continent. As a result, the natural and semi-natural ecosystems of Africa are having increasing stresses put upon them, and ecologically sensitive areas are being degraded through mismanagement, rather than conserved through effective management. This has serious implications for human well-being, as a wide range of benefits can result from investment in conserving ecologically sensitive areas. The value of such benefits will vary considerably from area to area and resource to resource, but most will fall into one or other of the following categories:

- ▶ Fixation of solar energy through photosynthesis, transfers energy through green plants into natural food chains, providing the support system for species which are harvested
- ▶ Maintenance of evolutionary processes and genetic variability
- ▶ Maintenance of water cycles, including recharging groundwater, protecting watersheds, and buffering extreme water conditions (such as flood and drought)
- ▶ Regulation of climate, at both macro- and micro-climatic levels (including influences on temperature, precipitation, and air turbulence)
- ▶ Production of soil and protection of soil from erosion, including protecting coastlines from erosion by the sea

### *Ecologically Sensitive Sites in Africa*

- ▶ Storage, cycling and buffering of essential nutrients, including carbon, nitrogen, and oxygen
- ▶ Absorption and breakdown of pollutants, including the decomposition of organic wastes, pesticides, and air and water pollutants
- ▶ Provision of direct support to local communities through sustainable resource use
- ▶ Provision of recreational-aesthetic, socio-cultural, scientific, educational, spiritual, and historical values

Because the benefits of conservation are so important to society, the rate of natural habitat loss (see Table 1) and threats to species in Africa (see Table 2) is a source of great concern throughout the world.

Many development plans fail to recognize that retention of natural systems may constitute the optimal use of certain areas, in economic as well as ecological terms. Instead of conserving the rich resources of forest, wetland, and sea and managing them on a sustainable basis, current processes of development are depleting many biological resources at such a rate that they are rendered essentially non-renewable, thereby potentially reducing the benefits to society in the longer term. Experience has shown that market forces alone will often lead to such over-exploitation, largely because many of the costs are external and simply ignored.

Since biological resources will be inadequately conserved by market forces alone, given current means of assessing costs and benefits, effective government intervention is required to meet the conservation needs of society. Environmental management measures available to governments for promoting conservation include:

- ▶ establishing national parks and other types of protected area
- ▶ promoting citizen awareness and action through public education and supporting non-governmental conservation organizations
- ▶ modifying resource exploitation through legal or administrative means
- ▶ implementing international conservation conventions, particularly the *Convention on Biological Diversity*
- ▶ establishing government departments or ministries responsible for environmental matters
- ▶ implementing special action to conserve threatened species and habitats

**Table 1** Original extent of closed canopy moist forest in four regions of Africa, compared with remaining extent as judged from maps and FAO (1988) statistics for 1980.

	Approximate original extent of closed tropical moist forests (sq.km)	Remaining extent of moist forests (sq.km)		Percentage of moist forest remaining	
		From atlas maps* (moist forests)	FAO (1988) data for 1980 (closed broadleaved forest)	From map data	From FAO (1988) data
Occidental and Central Africa	1,777,400	488,973	715,040	28	40
Eastern Africa	658,300	—	77,500	—	12
South Central Africa and Indian Ocean	2,301,936	1,234,419	1,169,890	54	52
West Africa	770,760	101,063	111,300	13	14

\* Table adapted from table 10.1 in J.A.Sayer, C.S.Harcourt and N.M.Collins (Eds.) 1992. *The Conservation Atlas of Tropical Forests: Africa*. Macmillan, Basingstoke, Hants, UK. 288pp.

**Table 2 Numbers, by country, of endemic and threatened mammals and birds**

	Known species	Endemic species	Threatened species	Threatened endemics
Angola	1,148	16	26	4
Benin	818	0	12	0
Botswana	723	0	15	0
Burkina Faso	644	1	11	0
Burundi	740	0	9	0
Cameroon	1,145	21	44	8
CAR	877	2	14	0
Chad	630	0	22	0
Congo	700	1	15	0
Cote d'Ivoire	913	2	27	1
Djibouti	?	0	9	1
Equatorial Guinea	576	4	18	1
Ethiopia	1,091	52	39	16
Gabon	807	3	21	4
Gambia	597	0	8	0
Ghana	943	1	21	0
Guinea	719	1	23	0
Guinea-Bissau	484	0	7	0
Kenya	1,376	17	35	7
Lesotho	321	0	9	0
Liberia	783	3	28	1
Libya	156	4	21	0
Madagascar	355	164	81	78
Malawi	825	0	17	0
Mali	784	0	20	0
Mauritania	110	1	19	0
Mozambique	845	2	21	0
Niger	604	0	16	0
Nigeria	1,105	4	35	3
Rwanda	820	0	18	0
Senegal	780	1	16	0
Sierra Leone	761	0	20	0
Somalia	810	19	24	6
Sudan	1,205	7	25	1
Swaziland	428	0	5	0
Tanzania	1,322	25	56	19
Togo	826	1	10	0
Tunisia	251	1	20	0
Uganda	1,304	7	28	3
Zaire	1,501	48	58	19
Zambia	961	3	20	3
Zimbabwe	831	2	15	0

Data from: World Conservation Monitoring Centre 1992. *Global Biodiversity Status of the Earth's Living Resources*. Chapman and Hall. 594pp.

- ▶ building information gathering and monitoring capabilities as the basis for improved resource planning
- ▶ establishing special training programs for government officials
- ▶ promoting integrated rural development schemes which incorporate conservation
- ▶ developing *ex situ* facilities for preserving threatened genetic resources, in support of *in situ* conservation programs

However, conservation actions have been underway in Africa many years, yet natural habitats are still being lost at a rapid rate. Experience has taught the hard lesson that traditional protected areas will be unable to conserve most biological resources by themselves. Additional approaches to conservation are required to more effectively integrate protected areas within the broader processes of land-use planning, and to bring about policy shifts in a wide variety of sectors which have impacts on ecologically sensitive areas.

This has been the message of a number of reports and meetings in recent years, and is clearly stated within the articles of the *Convention on Biological Diversity*.

Article 8 of the *Convention* deals specifically with *in situ* conservation. It calls on contracting parties to:

- ▶ establish a system of protected areas where special measures are needed to conserve biodiversity
- ▶ develop guidelines for the selection, establishment and management of such areas
- ▶ manage biodiversity both within protected areas and in the wider landscape
- ▶ promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species
- ▶ promote environmentally sound and sustainable development in areas adjacent to protected areas
- ▶ restore degraded ecosystems and promote the recovery of threatened species
- ▶ control or eradicate alien species that threaten indigenous biodiversity
- ▶ respect and maintain the knowledge and practices of indigenous and local communities, including the equitable sharing of benefits arising from the utilization of such knowledge and practices

- ▶ develop appropriate environmental legislation

These measures are all highly pertinent to the identification and conservation of ecologically sensitive areas, and one of the top priorities in promoting sustainable development must be to encourage countries to ratify the convention. The first step in implementation is to undertake a comprehensive national assessment of the status of, and threats to, the country's biodiversity, its utilization and management, the economic benefits it provides and the costs of its effective management. This process includes the identification of ecologically sensitive areas, both within and outside existing protected area systems. The management of these areas to maintain their ecological integrity, and thus to maximise their potential economic benefits, is then prescribed in the national biodiversity strategies and action plans countries are called upon to produce under Article 6 of the Convention.

Particularly important therefore is the development of management programs using a broad systems approach based on an increasingly sophisticated ecological understanding of ecosystem productivity, processes, and dynamics. Integrated rural development can draw on national conservation strategies, river basin development strategies, environmental impact assessment, Geographic Information Systems and other technologies to promote environmentally sound management of large ecosystems containing both natural and transformed habitats. While such programs can make important contributions to conservation of biodiversity, they also contribute indirectly through stabilizing resource use in areas which are not biologically diverse. These activities focus upon maintaining, or restoring, natural ecosystems so that the ecological and hydrological processes which they support are maintained, and the benefits which they provide to human society are made available on a sustainable basis.

By managing these ecosystems sustainably and stabilizing land-use, the root cause of many human population movements can be addressed, with biological diversity being a beneficiary. For example, in many parts of Africa, forests are being lost because of slash and burn agriculture. In most areas, the expansion of this agricultural practice is a consequence of non-sustainable resource use and declining agricultural productivity in other ecosystems which the rural poor have been forced to abandon. By focusing attention on restoring formerly productive agro-ecosystems, and by maintaining the ecological and hydrological processes which maintain the productivity of these systems, agricultural pressure on the marginal lands can be reduced and they can be allocated to activities which are more conducive to the conservation of biological diversity.

It is apparent that mechanisms need to be developed for identifying ecologically sensitive areas in a systematic manner and establishing minimum quality criteria for managing such areas. To enhance its contribution to sustainable development, the World Bank requires guidelines for rapid identification of ecologically sensitive areas, and needs to develop means of promoting special measures that could be incorporated

in project planning and implementation to maintain the ecological integrity of such areas. The aim of this report is to assist in this process.

However, no simple recipe exists for determining how resources should be used. Ecological, social, political, economic, and technological factors all enter into the decision. Each of these factors can change over time, and because the factors are inter-related, a change in one can affect all the others. Therefore, while this discussion will concentrate on ecological factors, it will consider the others as well. In the final analysis, guidelines need to be applied by people exercising their best judgement given the current state of knowledge. The dynamic state of development in the Africa region is likely to continue, and building the capacity to adapt to constant change will require concerted action.

*This section of the report is based on material drafted by Jeffrey A. McNeely, Chief Conservation Officer at IUCN - The World Conservation Union. The section was originally drafted in December 1991, and then revised in early 1993 by Robin Pellew and Jeremy Harrison of the World Conservation Monitoring Centre to take account of subsequent developments.*





## WHAT IS AN ECOLOGICALLY SENSITIVE AREA?

### 1. Introduction

- 1.1 While many natural habitats are being converted into uses -- such as agriculture, aquaculture, or forestry -- which yield greater productivity to humans (at least in the short term), the natural value of some areas is so significant that they need to be converted with great care, or even left in their natural state. Areas of significant value in their natural state can be termed *Ecologically Sensitive Areas* (ESAs) (see Box 1). They may contain unique features, maintain key natural processes, support rare plants or animals and their habitats, or provide important breeding areas for wildlife. Some ESAs are natural, while others have been significantly altered by certain human activities. In terms of management, some ESAs will prosper through "benign neglect" while others will require intensive management to restore or maintain their natural values.

#### Box 1: Ecologically Sensitive Areas

Criteria for ecologically sensitive areas would include:

- provide protection of steep slopes, especially in watershed areas, against erosion
- support important natural vegetation on soils of inherently low productivity that would yield little of value to human communities if transformed
- regulate and purify water flow
- provide conditions essential for the perpetuation of species of medicinal and genetic conservation value
- maintain conditions vital for the perpetuation of species that enhance the attractiveness of the landscape or the viability of protected areas
- provide critical habitat that threatened species use for breeding, feeding or staging

Source: McNeely *et al.* 1990

- 1.2 In order to ensure effective management of ecologically sensitive areas, and to avoid inappropriate conversion, it is essential that criteria are developed which can be used to guide decisions on whether an area can be converted freely to alternative uses, can be converted to only certain uses (such as forest production), or should not be converted at all.

## *Ecologically Sensitive Sites in Africa*

- 1.3 A useful scale for seeking an answer is the ecosystem, a community of organisms interacting with the local living and non-living elements of the environment and forming a system in which life-sustaining processes are maintained. The ecosystem involves the accumulation, circulation, and transformation of matter and energy through such biological processes as photosynthesis and decomposition. The processes often work through the means of water, which provides a means of transfer and storage of energy and materials used by living organisms within the ecosystem.
- 1.4 The boundaries of an ecosystem are often identified by changes in vegetation, soil, or landscape form. The scale of the ecosystem depends on the purpose of analysis; a small mountain pond is an ecosystem, and so is the mountain on which it is located. Almost all ecosystems are connected with others of various scales. Protected areas with artificial boundaries may be whole or partial ecosystems, depending on the size of the area and the form of the boundary; a protected area surrounded by forest is a much different ecosystem to a similar one surrounded by agricultural land.
- 1.5 Some ecosystems are relatively robust and resist permanent damage, while others are very sensitive to disturbance and may require long periods to recover from disruption. Grasslands naturally subject to periodic fires, are robust, while mature tropical rain forests may be easily disturbed and require decades or even centuries to recover. Particularly sensitive ecosystems include those which lie on geologically unstable substrata, such as steep slopes subject to landslides, and those which are dependent on influences from outside the system, such as estuaries and deltas. Ecosystems need to be classified according to their sensitivity to certain kinds of treatment by people, and the most useful indicators of sensitivity need to be identified.
- 1.6 People have shown the capacity to convert almost any piece of natural habitat into agricultural land which can produce a crop for at least a few growing seasons. But areas which are inappropriate to such use quickly degrade into wastelands, such as the great expanses of *Imperata* grasslands found in much of tropical Asia; worse, inappropriate conversions of watersheds, such as through illegal logging, can contribute to very high human costs downstream through floods, erosion, siltation, and other external factors.
- 1.7 Logically, an objective survey of all remaining natural habitats should first be conducted to ascertain which have the highest value in their present state, and the least value if transformed. In practical terms, and as a working rule of thumb where complete information is not yet available, it may be best to accept the rationale behind the process of selection of protected areas already followed. This would mean that first priority ESAs should include areas which are already given legal protection (though recognizing that not all areas given legal protection really qualify as an ESA); second priority ESAs should include all

areas which have been proposed for protection; and third priority ESAs should be all other areas where natural habitat remains.

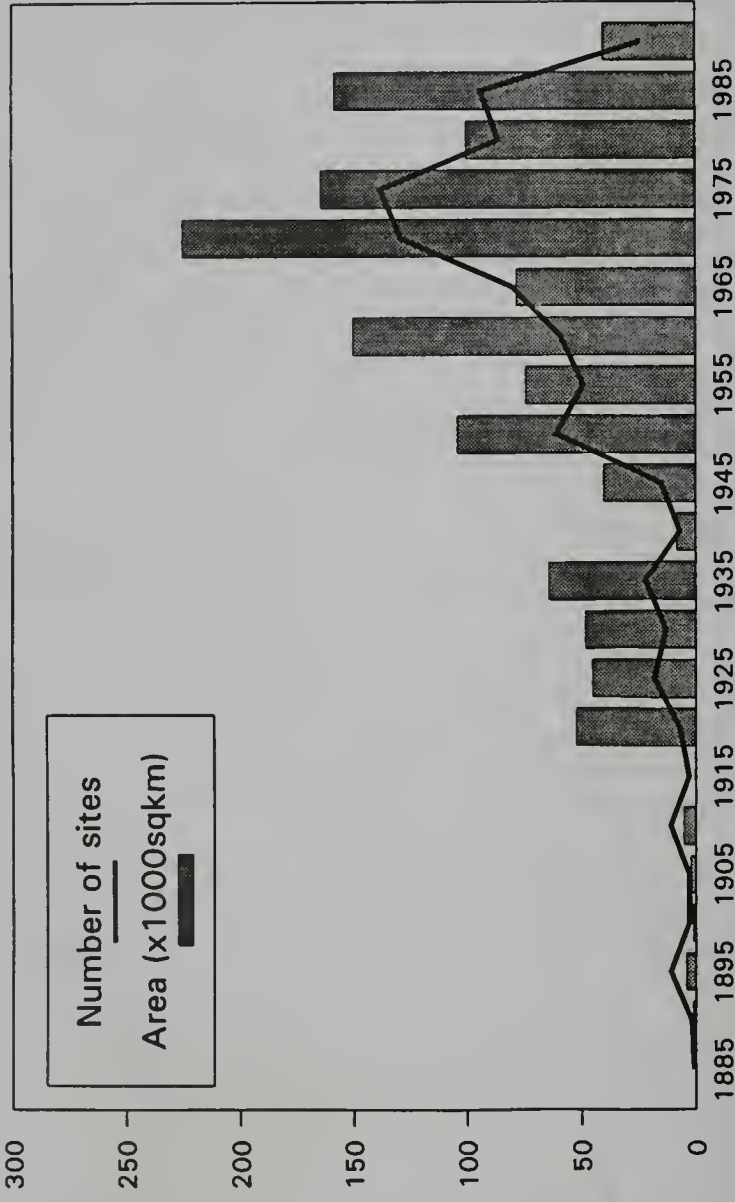
## 2. Legally protected areas

- 2.1 Areas which have been given legal protection preventing conversion to other uses should be among those not considered for alteration or conversion; their contribution to development is through maintaining their relatively natural state. In fact, the World Bank's policy on wildlands (World Bank, 1986) expressly prohibits the use of IBRD funds to convert legally protected areas to any other uses except under the most stringent and exceptional conditions.

As development has accelerated in the past few decades, the governments in the region have recognized the importance of legally protected areas as part of the overall pattern of land use, though of course the effectiveness of such legal regimes varies widely. Many of these areas have been established in the past 30 years (see Fig. 1), and over that period administration and management of protected area systems has also changed in many countries. WCMC (1992) summarises how each of the national protected area systems is set up in Sub-Saharan Africa, and Lusigi (1992) discusses many of the challenges and issues facing protected areas management in Africa.

- 2.2 However, it would be a mistake to consider that once an area is legally established, then all threats have been removed. In fact, virtually all protected areas in the Africa have an uneasy relationship with the people living around them. The reasons for this are apparent: the local people pay most of the costs of conservation by not being able to harvest resources as they might wish, while the bulk of the benefits go to the nation at large or even to the international community. Governments need to seek additional means of redressing this imbalance, by ensuring that the costs of conservation are shared more widely, and that more of the benefits are delivered to the local communities.
- 2.3 Protected areas within the wildlife sector are often augmented by a range of designated areas established and managed by other sectors (such as forestry or fisheries) with management objectives which support a nature conservation function. The World Conservation Monitoring Centre (WCMC) has carried out research on areas within the forest sector, and is working on a series of reports which will show the extensive nature of their contribution in some countries. Review of the conservation value of some of these areas on the ground may be a valuable next step (the development community is currently funding such a study in Sri Lanka).
- 2.4 In addition to being protected under national legislation, some areas are given further protection under international legislation, notably the *Convention on Wetlands of International Importance* (Ramsar, 1971) and the *Convention*

Fig. 1 Increase in area and number of protected sites in Sub-Saharan Africa 1885-1990



Five year period commencing....

*Concerning the Protection of the World Cultural and Natural Heritage* (Paris, 1972). The list of areas given such protection expands each year as the States Party add areas to the list. Areas currently given such protection are identified and described in later sections.

2.5 While not a convention, the Biosphere Reserve programme of Unesco also has considerable relevance to the region. As part of UNESCO's Man and the Biosphere Programme (MAB), a biosphere reserve is established to conserve representative natural areas throughout the world, and to use these areas to further understanding of the interaction between man and nature. Biosphere reserves ideally take an existing protected area as the core, then incorporating land around the core with varying degrees of human intervention are permitted. Biosphere reserves in Africa are also listed in later sections.

### **3. Other critical habitats**

3.1 While many countries in Africa have an impressive record on establishing protected areas, there are many gaps in coverage, with many ESAs of high priority for conservation yet to receive any effective management. The regional systems review carried out by IUCN (IUCN/UNEP, 1986) identifies a number of important sites, as does the action plan for protected areas in Africa (IUCN, 1987) and in the African Biodiversity Review prepared by IUCN (Stuart and Adams, 1990). Many of these unprotected ESAs may in fact deserve higher attention than the existing protected areas, because they are more liable to alteration to inappropriate uses, and a number are identified in the body of this report.

3.2 Even if they are not yet protected, habitats can also be considered ecologically sensitive areas if they meet the criteria identified in Box 3. The identification of such ESAs outside of existing protected areas ideally requires considerable research and information, but the pace of development is such that it will inevitably prove necessary to take some relatively arbitrary decisions on the limited information available. In making such decisions, use should be made of all available information, including both national and international reviews.

3.3 Threatened species are of particular concern to both governments and the general public. Many such species are protected under national legislation, and in addition many African countries are members of international conventions which provide protection to threatened species. It is widely accepted that the best way to conserve species is through protecting their habitats while simultaneously controlling exploitation. Critical habitats of threatened species are particularly important ESAs.

3.4 Potential ESAs can also be identified from digitized data on the distribution of key species using a Geographic Information System (GIS). By overlaying such

distribution data onto habitat maps, sites of particular species richness can be identified. These should then be priority areas for ground surveys. The application of information technology in this way enables proactive conservation planning to maintain the ecological integrity of such areas before they are disturbed by unsustainable management practices.

- 3.5 Information on the status and distribution of both habitats and species is central to the study of biodiversity conservation within a country, and a key part of both protected area systems reviews and the development of the national biodiversity strategies necessary for implementation of the *Convention on Biological Diversity*. Information is often widely distributed, and effort is required to bring the information together, and to develop research and monitoring programs to support biodiversity conservation. A range of international organizations, including UNEP and WCMC are in a position to support such activities.

#### 4. Areas to be rehabilitated

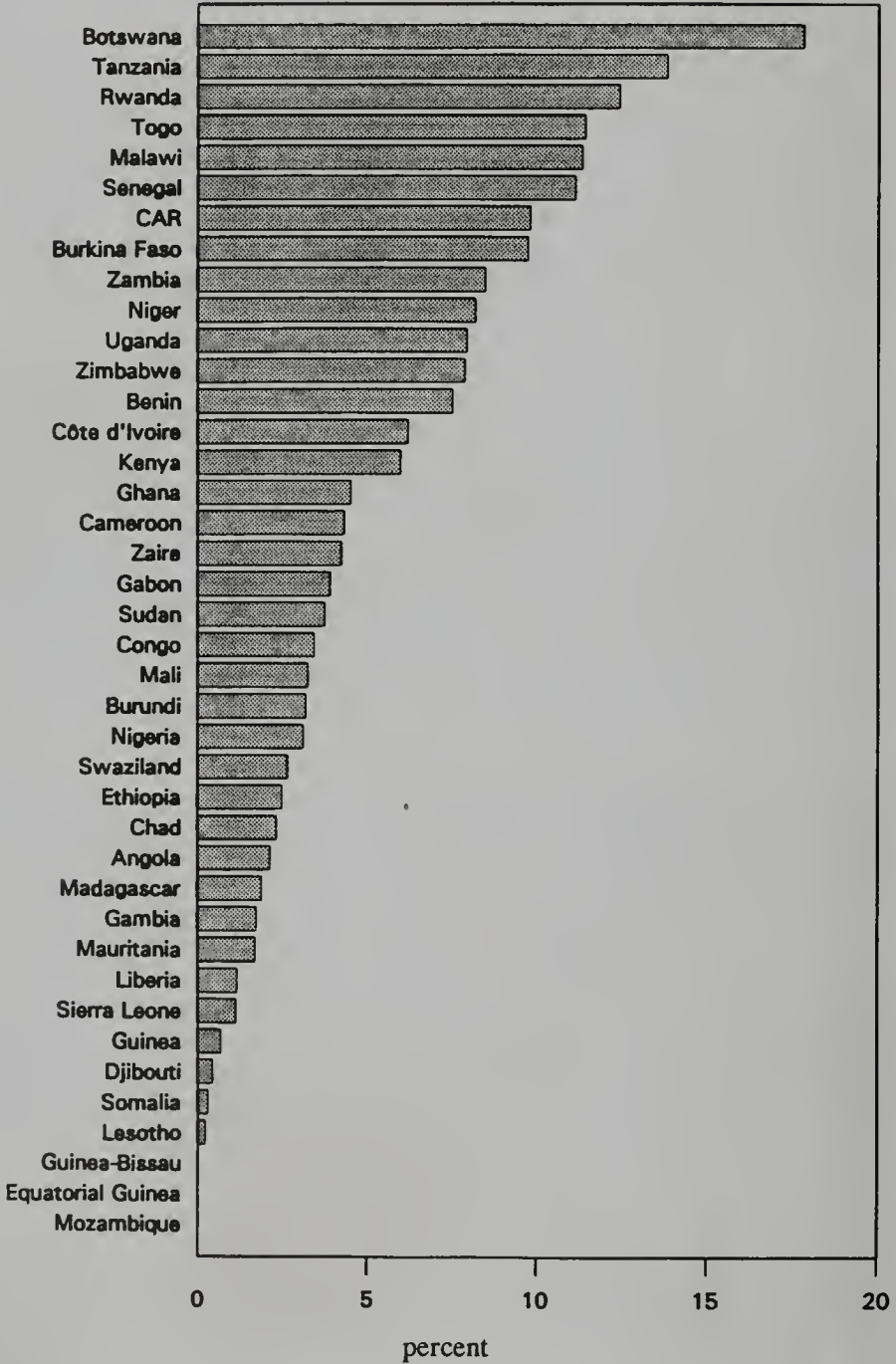
- 4.1 Many ESAs have already been over-exploited, with resulting degradation. These areas need to be rehabilitated so that they can once again make important contributions to sustainable development. Since tropical forests often grow on soils which are poor in cations or suffer from other deficiencies, attempts at agriculture are often followed rather quickly by abandoned fields and degraded vegetation. As a result, large areas of Africa are covered by devastated landscapes which are productive only for grazing at a very low stocking density. With proper economic incentives, such areas can be made productive again, either for agriculture, forestry, or conservation of biological diversity.
- 4.2 It may be more expensive in the short run to reconstitute damaged ecosystems than to conserve new lands (and is certainly more expensive to reconstitute damaged ecosystems than it is to exploit new ones), but it will often be as economically efficient in the long run to rebuild degraded local ecosystems rather than to exploit (and degrade, requiring rebuilding) other more remote land, which may itself be sensitive to degradation.
- 4.3 Given the right circumstances it is also possible to develop ecologically sensitive areas from lands which previously had no particular value, through careful development of new habitats. This may have economic as well as ecological benefits.

## CONCEPTUAL FRAMEWORK FOR DESIGNATION AND CLASSIFICATION OF ENVIRONMENTALLY SENSITIVE AREAS

### 1. Introduction

- 1.1 Conservation of biological resources has become an important item on every country's development agenda. Conservation in the modern sense is part of development. As defined by the *World Conservation Strategy*, it means: "The management of human use of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations. Thus conservation is positive, embracing preservation, maintenance, sustainable utilization, restoration, and enhancement of the natural environment" (IUCN, 1980).
- 1.2 Conservation of biological resources is not a new idea. Farmers have always had the sense to avoid eating the seeds for growing next year's crop, to select the seeds which have the most favourable characteristics, and to plant a wide variety of crops. Herders don't slaughter their breeding stock, and they select the individuals for breeding which are the easiest to manage, have the most meat, or display other desirable traits. For most of human history, the natural world has been protected from the most disruptive human influences by cultural/ecological factors such as taboos preventing over-exploitation, tribal warfare which kept wide areas as wilderness "buffer zones" between groups, land ownership by ancestors or lineages rather than individuals, relatively sparse human populations, and so on.
- 1.3 But during the last few generations, economic growth based on the conversion of fossil fuels has spurred such rapid expansion of human numbers that new approaches to conservation are required. One such approach has been the establishment within the past 100 years of explicit government policies aimed at ensuring that wild living resources are conserved, usually through the designation of particular ecologically sensitive areas as national parks or other sorts of protected areas. Today, all but a small handful of countries have national parks and national legislation promoting conservation (see Fig. 2). Most governments have established wildlife management agencies, joined international conservation conventions, and built environmental considerations into the national education system. Non-governmental organizations are active throughout the region in promoting public awareness of conservation issues, including those dealing with biological diversity.
- 1.4 The conservation movement has been led by naturalists. While their contributions have been fundamental, they are unable to address fully the basic problems of conservation because the limiting factors are not biological, but rather political, economic, and social. The decisions affecting the natural

**Fig.2 Percentage of each country within protected area system  
(source: WCMC)**





environment are influenced by pressures and incentives that go far beyond the relatively straight-forward technical considerations of what might in theory be best for the ecologically sensitive areas, and consider in addition questions of social equity, political possibility, and technical feasibility.

- 1.5 Advice on delivering conservation action needs to be sought from development practitioners, engineers, politicians, rural sociologists, agronomists, and economists. In the last analysis, local resource users are the ones who make local-level decisions, and their decisions are affected above all by enlightened self-interest. Those seeking to conserve ESAs need to be able to identify legitimate self-interests of rural people, and design ways of ensuring that the interests of ESAs and community self-interest coincide. Development aid agencies, including the Bank, therefore have an important role to play.
- 1.6 It has become apparent that a sectoral approach to managing ESAs is unlikely to be successful, even in the short run. While government institutions responsible for wildlife and protected areas need strengthening, even the most successful conservation programs will fail unless they are supported by appropriate developments in other sectors. Progress in sustainable approaches to forestry, agriculture, rural development, international trade, energy, population, national security, and other areas are so essential to the success of efforts to conserve ESAs that they deserve as much attention as the traditional conservation-related sectors.
- 1.7 The need for a broad based multi-sectoral approach to conservation is clearly identified in both the *Global Biodiversity Strategy* (IUCN/UNEP/WRI, 1992) and the *Convention on Biological Diversity*. Under the convention, countries will be required to prepare national biodiversity strategies and action plans, and to report on their implementation. These plans will need to focus on biodiversity outside the confines of protected areas, and address the fundamental requirements of reconciling the pressures of human development with conservation of ESAs in the wider landscape.

## 2. Criteria for designating and managing Environmentally Sensitive Areas

- 2.1 In planning a system to protect ESAs for supporting national development goals, criteria for selection and management are essential. Criteria will enable a relatively systematic comparison of different sites; help communicate to decision-makers why certain areas or policy initiatives are important; help focus research on the most important questions; promote the drawing of boundaries for the ESA by specifying the features which need special management; and facilitate public information programs.
- 2.2 In seeking to identify which sorts of protective regimes are most appropriate for each major ESA (including, but not limited to, designation as a protected area),

local social, political, and economic factors need to be considered along with the ecological ones. The following set of criteria are presented in rough descending order of importance, though modifications will be required for adapting to each particular situation. Each criterion is presented as an ideal against which each site can be considered. No site can be expected to meet the ideal, but the criteria can provide a basis for comparing sites against each other. In some cases, it may be appropriate for planning purposes to assign numerical scores to the various criteria, with relatively higher scores being assigned to the first four criteria.

a) Criteria which determine the importance of the site to human society

*Economic benefit.* The site provides obvious long-term economic benefits, such as watershed protection or tourism (even though their initial establishment might involve short-term economic disruptions).

*Diversity.* The site has a great variety of species and ecosystems, and is sufficiently large to contain viable populations of most species; it contains a variety of geomorphological features, soils, water regimes, and microhabitats.

*Critical habitat, international.* The site is essential to the survival of one or more threatened species which occurs in no other country, contains the only example of certain types of ecosystems, or contains landscapes of outstanding universal value.

*Critical habitat, national.* The site is essential to the survival of one or more species which are threatened nationally or internationally, or contains the nation's only example of certain types of ecosystems. The ecological functioning of the area is vital to the healthy maintenance of a natural system beyond its boundaries (such as habitat for migratory species, an important catchment area for lowland irrigation systems, protection of the coast against typhoons, etc.).

*Cultural diversity.* The site supports populations of indigenous people who have developed mechanisms for living in a sustainable balance with the natural ecosystems, and whose continued presence in the ESA would help ensure that the diversity of the area is maintained.

*Urgency.* Action is required quickly at the site in order to avert an immediate threat (though it should be realized that this is often a "damage control" action; it is usually best to protect far in advance of threat).

b) Criteria to determine additional elements which enhance the value of the site

*Demonstration.* The site demonstrates the benefits, values, or methods of protection, and can show how to resolve conflicts between natural resource values and human activities.

*Representativeness.* The site is representative of a habitat type, ecological process, biological community, physiographic feature, or other natural characteristic.

*Tourism.* The site lends itself to forms of tourism compatible with the aims of conservation; this criterion is often related to those of economic benefit and social acceptance.

*Landscape.* The site has features of outstanding natural beauty; these are usually also unique, easily destroyed, and attractive to tourists and any alteration would significantly reduce the area's amenity value.

*Recreation.* The site provides local communities with opportunities to use, enjoy, and learn about their natural environment.

*Inventory and Monitoring.* The site can serve as a non-manipulated area against which to measure changes occurring elsewhere; it can form the basis for assessing any ecological change. It can also serve as the site for detailed inventory of biodiversity to provide a baseline for long-term monitoring. Research has been carried out over a long period in the site, and major field studies have been carried out to provide a strong foundation on which new research can build. The site represents ecological characteristics of regional value so research can yield arguments that can have impacts far beyond the protected area.

*Awareness.* Education and training within the site can contribute knowledge and appreciation of regional values. The site can serve to exemplify techniques or scientific methods, making it particularly important for education purposes.

c) Criteria to help determine the management feasibility of a site

*Social acceptance.* The site is already protected by local people; or official protection by the government (particularly against outside exploitation) would be welcomed.

*Opportunism.* Existing conditions or actions at the site lend themselves to further action (such as the extension of an existing protected area or establishment of a buffer zone around an existing park).

*Availability.* The site can be acquired easily, through inter-departmental

transfer, easements, or other legal forms of control.

*Convenience.* The site is accessible to researchers or students for scientific and educational uses.

### **3. An expanded approach to protecting ecologically sensitive areas**

- 3.1 The best-known method of managing ESAs is through national parks, but many other types of reserves can also make contributions to both conservation and development, providing a range of management "tools" (Box 2). Ten years ago, the leading professionals in the field of national parks management, meeting in Bali, Indonesia, asserted that while national parks must be as carefully protected as ever, they must be supplemented by a range of other categories of protected areas in order to fully meet the social and economic development needs of modern society.
- 3.2 In the Bali Declaration (in McNeely and Miller, 1984), these authorities pointed out that protected areas are an indispensable element of conservation because they maintain those essential ecological processes that depend on natural ecosystems; they preserve the diversity of species and the generic variation within them, thereby preventing irreversible damage to our natural heritage; they maintain the productive capacities of ecosystems and safeguard habitats critical for the sustainable use of species; they provide opportunities for scientific research, education, training, recreation, and tourism; and they provide opportunities for the sustainable use of their natural resources for the benefit of local communities.
- 3.3 Since 1970, the world's networks of protected areas have expanded in extent by more than 80 per cent, around two-thirds of which are in the Third World (IUCN, 1990). The IUCN review of the protected areas of Africa suggested that the total expanse of protected areas in Africa needs to be increased at least three times, if the protected areas are to be effective in delivering nature's benefits to people. But given the pressures on the land today, these additional protected areas will need to be of a new type, far more flexible in their management than the traditional national parks. They may in fact merit a new term such as "Sustainably Managed Areas", or "Managed Resource Protected Areas".
- 3.4 New approaches to linking protected areas to surrounding lands are required if the appropriate benefits are to flow to society. While the specifics will vary from case to case, the major generalization is that local support for protected areas must be increased through such measures as education, revenue sharing, participation in decisions, complementary development schemes adjacent to the protected area, and, where compatible with the protected area's objectives, access to resources. In short, economic incentives should be used to encourage people to behave according to their own enlightened interest, and sound

**Box 2: Categories and management objectives of protected areas**

While all protected areas control human occupancy or use of resources to some extent, there is wide variation in the degree of such control. Different protected areas are established for different purposes, and therefore have different management objectives. The following categories, which were first defined by IUCN in 1978, are currently under review. As a result of this review, it is likely that categories VI-VIII will be removed, and replaced with a new category VI - "Sustainably Managed Area" or "Managed Resource Protected Area".

- I Scientific reserve/strict nature reserve. To protect nature and maintain natural processes in an undisturbed state in order to have ecologically representative examples of the natural environment available for scientific study, environmental monitoring and education, and for the maintenance of genetic resources in a dynamic and evolutionary state.
- II National park. To protect relatively large natural and scenic areas of national or international significance for scientific, educational, and recreational use, under management by the highest competent authority of a nation.
- III Natural monument/natural landmark. To protect and preserve nationally significant natural features because of their special interest or unique characteristics.
- IV Managed nature reserve/wildlife sanctuary. To ensure the natural conditions necessary to protect nationally significant species, groups of species, biotic communities, or physical features of the environment when these require specific human manipulation for their perpetuation.
- V Protected landscapes. To maintain nationally significant natural landscapes characteristic of the harmonious interaction of man and land while providing opportunities for public enjoyment through recreation and tourism within the normal life-style and economic activity of these areas.
- VI Resource reserve. To protect the natural resources of the area for future use and prevent or contain development activities that could affect the resource pending the establishment of objectives based on appropriate knowledge and planning.
- VII Natural biotic area/anthropological reserve. To allow the way of life of societies living in harmony with the environment to continue undisturbed by modern technology.
- VIII Multiple-use management area/managed resource area. To provide for the sustained production of water, timber, wildlife, pasture, and outdoor recreation, with the conservation of nature primarily oriented to the support of the economic activities (although specific zones can also be designed within these areas to achieve specific conservation objectives).

Adapted from: IUCN (1990)

government policies should be designed to ensure that conservation is indeed in their self-interest. Such approaches were extensively discussed at the IV World Congress on National Parks and Protected Areas, held in Caracas, Venezuela,

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in 1992, and the Caracas Action Plan (IUCN, 1992) calls for new and innovative programs of integrated planning and cooperative management.

- 3.5 Another theme of the World Parks Congress held in Caracas, 1992, was the contribution made by other sectors. Strictly protected areas are unlikely to ever cover more than about five percent of Africa. Since permanent agriculture seldom covers more than a quarter of a nation's land area, ample land exists for forestry, shifting cultivation, grazing, and other uses which may, with proper management, contribute to conservation of biological diversity.
- 3.6 By themselves protected areas will never be able to conserve all, or even most, of the species, genetic resources, and ecological processes they were established to protect; these areas are just too small to support viable populations of wildlife if the areas are isolated from the surrounding lands. Far greater expanses are required for conservation than modern societies can afford to remove from direct production. The best answer to this dilemma is to select and manage protected areas to support the overall fabric of social and economic development, not as islands of anti-development, but rather as critical elements of regionally envisioned harmonious landscapes. Through a planned mix of national parks and other categories of ESAs, amidst productive forests, agriculture, and grazing, conservation can serve human communities and safeguard the well-being of future generations of people living in balance with their local ecosystems.
- 3.7 Improvements in conservation over the coming decades will be of three main types:
  - ▶ the establishment and improved management of categories of protected areas where some kinds of human use are tolerated or even encouraged
  - ▶ the establishment of new types of protected areas in degraded landscapes which have been restored to productive use for conservation
  - ▶ management regimes in non-protected areas which bring sustainable benefits from harvesting biological resources to local communities

and will be founded on a rapidly improving information base to support management decisions.

## **DEVELOPING GUIDELINES ON THE RELATIONSHIP BETWEEN VARIOUS TYPES OF BANK PROJECTS AND ECOLOGICALLY SENSITIVE AREAS**

While many development projects have led to the abuse of ESAs, in fact a positive relationship between development projects and ESAs would be of benefit to both the project and the ESA. A series of guidelines can be developed for each major type of development project which would illustrate how the project can contribute to the viability of the ESA. The following examples indicate the sorts of guidelines which might be appropriate.

### **1. Water resources development projects**

- 1.1 Natural vegetation cover on water catchments regulates and stabilizes water run-off. Deep penetration by tree roots or other vegetation makes the soil more permeable to rainwater so that run-off is slower and more uniform than on cleared land. As a consequence, streams in forested regions continue to flow in dry weather and floods are minimized in rainy weather. Water resources development projects -- dams, irrigation systems, urban water supply, and others -- depend on watershed protection to such an extent that many valuable reserves in these ESAs have been established by drawing support from the development projects involved; irrigation and energy agencies can therefore make powerful potential allies for protected areas which protect watersheds.
- 1.2 In many cases, the total costs of establishing and managing reserves which protect catchment areas can be met and justified as part of the hydrological investment. Guidelines should be developed to specify how the potential positive relationship between watershed protection and water resources development projects can be converted into reality.
- 1.3 One of the objectives of water resources development projects should be improved integration in the management of such resources. Guiding principles of integrated river basin management (Dugan, 1990) include:
  - a) The hydrological balance of the basin should be quantified, including measures of both water quantity and quality, and incorporating surface, underground and coastal waters.
  - b) The values of all the major ecosystems in the basin should be identified, as well as the full range of biophysical processes upon which they depend.
  - c) The products and services taken from each part of the system should be inventoried and the minimum requirements for the sustenance of these

features determined.

- d) The short and long term impact on the environment of planned changes to the system should be determined, and appropriate compensatory measures should be implemented as required.

- 1.4 The establishment and management of protected areas in coastal and marine ESAs is still in its infancy, with most such areas being merely an extension seaward of existing terrestrial protected areas. Many critical habitats in the coastal zone need protection so that they can provide services to mankind on a continuous basis; these services include support for fish breeding, shoreline protection, and sustainable harvesting of construction materials.
- 1.5 Virtually all wetland habitats are important for fisheries, but of particular relevance are inland floodplains which are often affected by development projects. Dams, irrigation systems, and other measures affect both inland and coastal wetlands important for fisheries, and alternative means of managing these systems need to be developed, along with guidelines to assessment of potential impacts on both environmental and socio-economic grounds.

## **2. Tourism development projects**

- 2.1 Natural areas -- mountains, rivers, wetlands, forests, savannas, coral reefs, deserts, beaches -- are major attractions for tourists. Tourism can bring numerous socio-economic benefits to a country, in terms of creating local employment, stimulating local economies, generating foreign exchange, stimulating improvements to local transportation infrastructure, and creating recreational facilities. Positive effects on the environment often derive from these socio-economic benefits. Such positive effects may include:
  - ▶ encouraging productive use for conservation objectives of lands which are marginal for agriculture, thereby enabling large tracts of land to remain covered in natural vegetation
  - ▶ promoting conservation action by convincing government officials and the general public of the importance of natural areas for generating income from tourism
  - ▶ increasing awareness amongst local communities of the benefits from conservation, including the economic opportunities it can generate
  - ▶ stimulating investments in infrastructure and effective management of natural areas



- 2.2 These benefits can provide incentives for effective management of the natural areas which are tourist destinations, which in turn enhances the quality of the natural resources that attract tourists. Properly planned and managed tourism in natural areas is both non-polluting and renewable, and numerous examples exist where tourism has provided powerful incentives for conserving biological resources.
- 2.3 However, biological resources can also be damaged by inappropriate tourism developments. McNeely and Thorsell (1987) have outlined the positive and negative impacts that tourism can have on such resources and recommend that the guiding principle for tourism development in natural areas should be to manage the natural and human resources so as to maximize visitor enjoyment while minimizing negative impacts of tourism development.
- 2.4 Four general principles are relevant for linking investments in tourism with conservation of ESAs:
- ▶ Planning for tourism development must be integrated with other planning initiatives, particularly in national parks and other natural areas which are potential tourist destinations.
  - ▶ Tourism authorities working with protected area managers should determine the level of visitor use an area can accommodate with high levels of satisfaction for visitors and few negative impacts on the environment (the carrying capacity), and ensure that this level is not exceeded.
  - ▶ For each major tourist destination based on the attractions of biological diversity, a management plan should be developed to specify objectives for both tourism and resource management and to determine how sufficient income from tourism can be provided to the natural area to provide an incentive for improved management.
  - ▶ National policy should require environmental impact assessments (EIA) for all tourism development projects or programs, and specify the ways and means that the tourism development can provide economic benefits to both the local people and the natural areas which are the primary tourist destinations.
- 2.5 In short, tourism and conservation of ESAs can be natural partners, and each can benefit from the other if both are properly managed. Sufficient resources must be devoted to managing the natural areas, but it is often difficult to convince the governments who are responsible for budgets to allocate sufficient funds for this purpose. It is in the interest of both tourism and conservation that governments be so convinced.

### **3. Agricultural development projects**

- 3.1 In addition to the water resource management benefits of ESAs, other positive linkages can also be formed. For example, good soil protection by natural vegetation cover and leaf litter can preserve the productive capacity of the reserve itself, prevent dangerous landslides, safeguard coastlines and riverbanks, and prevent the destruction of coral reefs and freshwater and coastal fisheries by siltation.
- 3.2 Linkages between conservation and agriculture are also important in industrialized countries. Under regulations adopted by the European Community, EC Governments may define certain areas of the farmed countryside as "Ecologically Sensitive Areas." Such areas are important in environmental terms, and their continued environmental protection depends upon the survival of the traditional forms of farming which give rise to their environmental qualities. Within ESAs, farmers are paid grants to encourage them to continue to farm in a traditional way; ESA payments, therefore, can involve limitations on the amount of fertilizer which can be used, restrictions on changes of agricultural land use and controls over the dates at which meadows are cut for hay; they may also include positive payments to encourage practical conservation, such as woodland management or the restoration of archaeological features.
- 3.3 A group of US-based NGOs called the "Committee on Agricultural Sustainability for Developing Countries" (CASDC) has suggested a series of criteria for developing sustainable farming systems. Such systems are required if pressures on marginal agricultural lands are to be reduced, thereby enabling such lands (which are often ESAs) to be devoted to conserving natural ecosystems and the benefits they provide. Sustainable farming systems:
  - a) Maintain and improve soil productivity, quality, and tilth.
  - b) Augment the potential for achieving the highest possible efficiency in the use and conservation of basic farm resources (soil, water, sunlight, energy, and farmers' time).
  - c) Incorporate as much biological interaction as possible, including such processes as mulching, the use of nitrogen-fixing plants, the use of agroforestry techniques, and the use of inter-cropping and crop rotations to control pests and weeds.
  - d) Minimize the use of external inputs which damage the environment and endanger human health (some chemical fertilizers; non-selective pesticides and herbicides; and some forms of energy), maximizing instead the use of available, affordable, renewable, and environmentally benign inputs.

- e) Avoid the contamination of groundwater by using only those fertilizers, pesticides and herbicides that do not penetrate below the plants' growing zone and then only in controlled doses.
- f) Meet the needs of farm families for energy to work their land, cook, and heat from readily available and affordable energy sources.
- g) Meet the needs of farm families for cash income, including from off-farm sources.
- h) Are adaptive, so that even as society evolves and communities change, they will strengthen communal cooperation, protect rural survival systems, through community support and sharing allow farm families to keep going in difficult times (famine, drought, and natural or political disasters), and make possible effective local management of community-controlled common property resources (ponds, woodlots, grazing lands, irrigation systems) in ways that permit equitable sharing of benefits.

3.4 Many of the conventional agricultural, water resources development, and forestry projects of the Bank can contribute to the conservation of ESAs by focusing attention on linkages between the ESA and the surrounding lands. To reduce inappropriate pressures on ESAs, the basic criteria of sustainability must be developed and applied to all kinds of farming systems, from the intensive mono-cropping systems to animal husbandry to agroforestry to the vast numbers of mixed systems used by small farmers throughout the region. Therefore, Bank projects in agriculture need to support work on the continuing evolution of the concepts and practices of sustainability, provide encouragement and incentives for the adoption of sustainable agricultural systems (many of which are discussed in McNeely, 1988), and ensure that farmers receive their fair share of the benefits from conserving ESAs.

#### **4. Linkages with other sectors**

4.1 Other types of projects for which such considerations can be developed include livestock development, cottage industries, aqua-culture, land classification and titling, reforestation, rangeland management, and mangrove management. While some guidelines will be common to all types of project, others will be specific to certain sectors (such as aqua-culture, forestry, or livestock development). For each type of project, guidelines should be developed for application in the design and implementation of the project. Such guidelines should not focus simply on mitigation, but be far more positive in linking development with conservation by showing the mutual benefits that can follow from enhanced consideration of how conservation can support development.

## MINIMUM QUALITY STANDARDS FOR ECOLOGICALLY SENSITIVE AREAS

### 1. General considerations

- 1.1 Protected ESAs will succeed in realizing their conservation objectives only to the extent that the areas themselves are effectively managed, and to the extent that the management of the land surrounding them is compatible with the objectives of the protected areas. IUCN has conducted considerable work in this field (see for example Kelleher and Kenchington, 1990; MacKinnon *et al.*, 1985; Oldfield, 1988; Poore, 1992; Poore and Sayer, 1987), which can provide the basis for developing such quality standards. General considerations which need to be incorporated in development projects include:
- a) The acceptance of protection depends on putting a sufficient economic value on natural resources and biological diversity and, often, on demonstrating that such areas bring a positive benefit to the local communities around them. Examples may be provided by the role of ESAs as sources of water and products, their maintenance of regional climatic conditions, and their support for tourism.
  - b) Each ESA, or regional set of ESAs, should have a management plan which establishes the objectives of management, the obstacles to achieving the objectives, the steps required to overcome the obstacles, the resources required, and the costs and benefits of achieving the objectives.
  - c) Management of an ESA and that of the adjacent land must be planned together, since few protected areas are self-contained entities. The establishment of "buffer zones" (better referred to as "zones of influence") in which human activities including uses of natural resources in adjacent land are compatible with the conservation of natural ecosystems within protected areas, are often vital to the integrity of the latter.
  - d) The management context and likely ecological resilience of the area in the face of climatic trends and human pressures need critical review, taking into account the likely trend in human numbers in the area in question.
  - e) Certain "keystone" and critical species will be used as diagnostic indicators of the adequacy of the protected area system, it being assumed that if habitats capable of assuring the survival of viable populations of these are protected, the lesser known species will also be safeguarded.

- f) A conscious relationship needs to be established between *in situ* and *ex situ* approaches to conservation and these methods need to be integrated into over-all regional development; the potential contribution of the general managed landscape to conserving biological diversity should not be under-estimated.
- g) The national infrastructure needs to be so designed as to ensure that the protected area system designed to manage ESAs is properly evaluated as a national asset and that adequate resources are deployed in its management.
- h) The project must gather baseline data on key ecological, economic and social parameters, so that its long-term effects can be monitored.
- i) A major effort is needed to raise public consciousness, enlist the aid of professionals in the field (e.g. in universities, museums and professional networks), and educate local communities about the value of the ESA to the region.

## 2. Economic factors

2.1 Decisions about the identification and management of ESAs, including consideration of alternative land uses, must be based on analysis of costs and benefits, and their distribution. Realizing that change is a constant factor in land use, these economic factors require continual review. It is apparent, then, that economics must be an important foundation of all programs for enhancing the contributions of ESAs to society.

2.2 As a basis for applying economic incentives and calculating benefits and costs of various management options for ESAs, governments need to estimate the economic contribution that ESAs make to the national economy. This requires:

- ▶ ensuring that national accounting systems make explicit the trade-offs and value judgements regarding impacts on biological resources that may not be measured in monetary terms
- ▶ conducting research on methodologies for assessing the cross-sectoral impacts -- positive and negative -- of resource utilization
- ▶ collecting information on the physical properties of resources in specific environments and for specific uses
- ▶ developing methodologies for assigning values to non-marketed biological resources, appropriate to the needs of the country

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- ▶ estimating the economic productivity of various ecosystems, with various types of inputs
- 2.3 The sustainable levels of production of economic benefits from ESAs -- including goods such as fish, timber, wildlife, and medicinal plants, and services such as supply of clean water, tourism, and recreation -- should be estimated, and demands upon benefits planned within those limits. This should be reflected in the prices of forest products and other biological resources.
- 2.4 The review and formulation of all national policies which have a direct or indirect bearing upon ESAs and the biological resources they contain must therefore:
- ▶ estimate the relevant benefits which ESAs can produce
  - ▶ treat ESAs as reservoirs of capital resources and invest accordingly in preventing the depletion of their productivity
  - ▶ ensure that the objectives of sustainable utilization are met
  - ▶ address the basic needs of the local people who depend on the ESAs for their continued prosperity
3. **National policies for managing ESAs**
- 3.1 The incentives which are required to bring the benefits of ESAs to the community require commensurate policies at the national level. A national or regional conservation strategy can be an effective means of reviewing such policies, and determining what shifts are required to achieve national objectives for conserving the productivity of biological resources. Major policy components of the required integrated action might include the following considerations:
- a) Sufficient data needs to be compiled from a wide range of sources to enable ESAs to be identified objectively, and to help define the most appropriate management regimes for these areas.
  - b) The many economic and financial benefits of integrated rural development linked with conservation of ESAs and the biological resources they contain need to be quantified and brought to the attention of policy makers.
  - c) Both conflicts and potential for cooperation between the various activities of agriculture, fisheries, forestry, conservation and rehabilitation need to be identified in integrated plans and programs.

- d) Institutional reform and improvement is often a prerequisite to good design and implementation of integrated sectoral development plans and programs.
- e) Legislation consonant with the socio-economic patterns of the target group and the natural resource needs to be formulated, both to institute disincentives and to ensure that incentives carry the power of law.
- f) Policies and legislation in other sectors need to be reviewed for possible application to conservation of biological resources and community involvement in such work.
- g) Effective incentives need to be devised to accelerate integrated development in and around ESAs, aimed at narrowing any gap between what the individual sees as an investment benefit and what the government considers to be in the national interest.
- h) The rural population needs to be involved in the design and follow-up of plans and projects regarding ESAs, not simply their implementation.

3.2 Systems of incentives for improving the contribution of ESAs to rural development can be designed in a large number of ways, and numerous options exist for coordinating these incentives with other national policy objectives. In designing systems of incentives, governments should compare several options, with estimated costs and benefits, for each of the various national objectives being addressed. Systems of incentives need to be supported by suitable machinery for implementing the system, including regulation, enforcement, monitoring, and feedback.

3.3 All government sectors which depend on the productivity of ESAs should design policies to encourage the sustainable use of these resource systems, possibly as part of the process of preparing a national conservation strategy. In addition, other sectors which have major impacts on ESAs, such as transport, highways, and the military, should ensure that their policies do not unnecessarily deplete biological diversity.

3.4 Coordination and control of natural resource use in and around ESAs, in particular to introduce systems of incentives which involve several sectors, may require the creation of new agencies with wide-ranging authority over certain aspects of the operations of implementing ministries within a particular region.

3.5 Based on the best available information, governments should establish national objectives for the management of ESAs. Drawing on the latest advances in conservation biology, governments need to state, as a matter of public record, what proportion of the current land and water area is intended to be legally

protected for conserving biological resources. Such policy objectives can often be incorporated as part of a national protected area system plan or a national conservation strategy; on the basis of such national objectives, governments can measure the costs and benefits of implementing conservation programs effectively.

#### 4. Data needs

- 4.1 In order to identify ESAs and to develop informed policies on their management, governments should build the capacity to assess the status, trends, and utility of their biological resources. This capacity should include:
  - a) National compilations of the flora and fauna (at least higher plants and vertebrates) contained within the nation, in addition to the more usual assessment of stocks of timber, fish, and minerals.
  - b) Where these compilations do not yet exist, development projects might require that rapid appraisal methods be employed -- perhaps through the use of indicator species which can provide the optimal return on investment of field time -- to ensure that biological resources are being given an appropriate level of priority.
  - c) Institutionalized biological surveys, perhaps carried out by university departments of biology, to determine what species occur where and in what numbers, and how these parameters change over time.
  - d) A national program for monitoring the status and trends of biological resources, linked to international systems such as UNEP's Global Environmental Monitoring System and the World Conservation Monitoring Centre.
  - e) Regular publication of the available information on status and trends of biological resources, and the various forces which are affecting these trends.
- 4.2 These efforts will help governments to recognize the consequences of their development activities on the biological resources of the nation, and help identify external effects of development projects on biological resources. However, in-depth assessments are time-consuming, and action should not be delayed until "all" the information is available; instead, some rapid initial assessments need to be done. Development assistance agencies may be willing to assist in such efforts.



**5. Policies on mitigating measures**

- 5.1 ESAs, by definition, make their most important contributions to sustaining society by remaining relatively unaltered by human action; the goods and services they provide depend on natural ecological processes, so any forms of development should be aimed at enhancing rather than reducing their natural productivity.
- 5.2 In cases where objective and competent analysis dictates that public works are required in or near an ESA, environmental impact assessments should be conducted to ensure that the intrusion is made with the minimum detrimental impact on the natural systems in the ESA, and that appropriate mitigating measures are incorporated in the project. An independent decision-making process which has the confidence of the public may be required to ensure that all factors have been given sufficient consideration.
- 5.3 Since public works in or near an ESA can significantly increase the value of the ESA (for example, through maintaining low sedimentation rates in reservoirs), sufficient investments should be made in improving the management of the ESA so that it can make the most productive contribution. This may require measures to share the costs of improved management on a sustained basis.
- 5.4 In some cases, where a development project must intrude on an ESA, equivalent areas may be added to other parts of the ESA, or the value of the ESA lost to the project can be invested in other parts of the national ESA system. In this regard, full consideration should be given toward enhancing investments in ESAs which have been degraded through inappropriate uses.
- 5.5 Any mitigating measures which are proposed should be incorporated in the management plan for the ESA, and contribute to regional land-use objectives.

## CONCLUSIONS

The governments of many of the countries of Africa have recognized the importance of Ecologically Sensitive Areas to their development programs, even if they have not used this exact term. However, few nations have been able to invest sufficiently in a systematic approach to designating and managing their ESAs, nor in conducting the economic analysis which would demonstrate the value of such areas to national development.

ESAs are important for social, economic, political, and ethical reasons, and they can make important contributions to sectors ranging from forestry to tourism to rural development. However, many ESAs are being abused rather than nurtured, and a number of general policy changes are required to enable ESAs to be identified, and for the most appropriate management regimes to be implemented.

Each country will have its own particular opportunities and constraints and no set of guidelines or criteria will automatically provide the right answers. Each country will need to design its own approaches to ESAs, and the Bank should stand prepared to provide whatever assistance might be requested.

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**OPERATIONAL POLICY NOTE NO. 11.02**

**WILDLANDS: THEIR PROTECTION AND MANAGEMENT  
IN ECONOMIC DEVELOPMENT**

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## 1. INTRODUCTION

1. The maintenance of specific natural land and water areas in a state virtually unmodified by human activity, hereafter termed wildland management, is an important subset of the broad environmental concerns addressed in OMS 2.36, "Environmental Aspects of Bank Work". The conversion of wildlands to more intensive land and water uses (through land clearing, inundation, plantations, or other means)<sup>1</sup> continues to meet important development objectives, and is an element of certain World Bank-supported projects. At the same time, wildlands are rapidly diminishing in many Bank member countries. The remaining wildlands can often contribute significantly to economic development, particularly in the longer term, when maintained in their natural state. The Bank's policy therefore is to seek a balance between preserving the environmental values of the world's more important remaining wildlands, and converting some of them to more intensive, shorter term human uses.

2. The Bank already has considerable experience of wildland management in Bank-supported projects. This OPN codifies existing practices and provides operational guidance concerning conservation of wildlands.<sup>2</sup> For a more detailed discussion of wildland management, see the Bank's Technical Paper: *Wildlands: Their Protection and Management in Economic Development*<sup>3</sup> which amplifies each section of this OPN. The Office of Environmental and Scientific Affairs in the Projects Policy Department (PPDES) is available to advise and assist staff on issues of wildland management.

## 2. JUSTIFICATION

3. There are two principal justifications for wildland management. First, wildlands serve to maintain biological diversity (i.e., the full range of the world's biota).

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<sup>1</sup> Conversion here applies to permanent fundamental alteration of the natural ecosystem. Temporary modification by such means as highly selective, long rotation logging usually creates fewer relevant effects.

<sup>2</sup> Other conservation activities (designed to protect the environment, but not necessarily to preserve biological diversity) are discussed elsewhere, e.g., in the 1978 Forestry Sector Policy Paper.

<sup>3</sup> Available from the Office of Environmental and Scientific Affairs.

Second, wildlands provide environmental services important to society. In addition, certain wildlands are essential for maintaining the livelihood of tribal peoples, discussed in OMS 2.34.

## **2.1 Biological Diversity**

4. Wildland management is necessary to prevent the untimely and often irreversible loss of a large proportion of the world's remaining biota, including the more visible plant and animal species. Because their wildland habitats are today rapidly disappearing, a large and growing number of biotic forms face extinction. Appropriate, low-cost wildland management measures can greatly reduce current extinction rates to much lower (perhaps almost "natural") levels, without slowing the pace of economic progress. By preserving the integrity of the biotic community and its plant and animal species, wildlands are important for the replenishment of surrounding degraded or abandoned areas.

5. Preserving biological diversity is important to development because of the economic potential of species that are currently undiscovered, undervalued, or underutilized. Many previously unknown or obscure, and often threatened, species have turned out to have major economic benefits. But less than 20 per cent of the world's plant and animal (largely invertebrate) species have ever been inventoried, and even fewer screened for possible human uses. They therefore present valuable development opportunities if they are not irreversibly destroyed. In addition, there are important scientific, aesthetic, ethical, and practical reasons to avoid or minimize the extinction of the remaining biotic stock. While some species can be conserved *ex situ* (such as in zoos or seed banks), wildland management is the only technically and economically feasible means of preserving most of the world's existing biological diversity.

## **2.2 Environmental Services**

6. In addition to maintaining biological diversity, many wildlands also perform important "environmental services", such as improving water availability for irrigated agriculture, industry, or human consumption; reducing sedimentation of reservoirs, harbors, and irrigation works; minimizing floods, landslides, and coastal erosion (and possibly droughts in some regions); improving water quality; and providing essential habitat for economically important fishery species. Despite their economic value and importance in meeting human needs, such environmental services are not always accorded adequate attention because they are usually public goods that tend to be poorly understood, undervalued, or even overlooked. When environmental services are lost due to wildland elimination, remedial measures are almost always far more expensive than prior maintenance. While many environmental services can also be maintained by establishing more intensive water and/or land use systems (e.g., bio-oxidation sewage treatment, tree plantations), wildland management is frequently more cost-effective.

## **2.3 Wildlands of Special Concern**

7. Wildlands of special concern are areas that are recognized to be exceptionally important in conserving biological diversity or perpetuating environmental services. They can be classified into two types. First are wildlands officially designated as protected areas by governments, sometimes in collaboration with the United Nations or the international scientific community. These are National Parks, Biosphere Reserves, World Heritage Natural Sites, Wetlands of International Importance, areas designated for protected status in national conservation strategies or master plans, and similar "wildland management areas" (WMAs), i.e., areas where wildlands are protected and managed to retain a relatively unmodified state (Annex 1).

8. Second are wildlands as yet unprotected by legislation, but recognized by the national and/or international scientific and conservation communities, often in collaboration with the United Nations, as exceptionally endangered ecosystems, known sites of rare or endangered species, or important wildlife breeding, feeding, or staging areas. These include certain types of wildlands that are threatened throughout much of the world, yet are biologically unique, ecologically fragile, or of special importance for local people and environmental services. Wildlands of special concern often occur in tropical forests, Mediterranean-type brushlands, mangrove swamps, coastal marshes, estuaries, sea grass beds, coral reefs, small oceanic islands, and certain tropical freshwater lakes and riverine areas. Within the spectrum of tropical forests, lowland moist or wet forests are the most species-rich and often the most vulnerable. Wildlands of special concern also occur in certain geographical regions (Annex 2) that have been reduced to comparatively small patches and continue to undergo rapid attrition. As a result, these regions harbor some of the most threatened species in the world.

## **3. THE BANK'S INVOLVEMENT TO DATE**

### **3.1 Existing Record**

9. During the last 15 years, the World Bank Group<sup>4</sup> has assisted with financing of upwards of 40 projects with significant wildland management components. Most of them have involved establishment or strengthening of WMAs. Bank-supported

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<sup>4</sup> Includes the International Development Association (IDA) and the International Finance Corporation (IFC)



WMAs include national parks, nature reserves, wildlife sanctuaries, and those forest reserves managed primarily for their watershed or biological values, rather than for wood harvest. Other wildland management components of Bank projects have involved management of wildlife and the humans that utilize it, including anti-poaching measures, management of water flows from reservoirs to maintain wildlife habitat, and relocation of certain species. In still other cases, the location of projects has been changed to avoid important wildland areas.

10. Wildland management components have two principal objectives: first, to prevent, minimize, or partially compensate for wildland elimination, thereby conserving biological diversity; second, to preserve or improve the environmental services provided by wildlands, thereby enhancing the project's economic or social benefits. Most Bank-supported projects emphasize one or the other objective, however some Bank projects have wildland components seeking both objectives.<sup>5</sup>

11. Costs of wildland management components in Bank projects have typically been low. They have normally accounted for less than three per cent of total project costs, and in half of the cases for less than one per cent. In many instances, it is difficult to separate out the cost of the wildland component because of its integration with other components.

12. In one case, wildland management was the sole objective, so accounts for 100 per cent of project costs. At the other extreme, a large number of Bank projects have achieved significant wildland management objectives at zero additional cost. For example, manipulation of a hydroelectric project's water release schedule costs little or nothing, even though it provides major downstream benefits for wildlife, as well as for people and cattle.

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<sup>5</sup> For example, the establishment of the Dumoga-Bone National Park in the Indonesia Irrigation XV project helps ensure a more reliable water supply while reducing sedimentation of valuable irrigation works; at the same time, it helps ensure that a significant portion of the project area remains in its natural state, despite surrounding developments.

13. Wildland management components require additional Bank staff time and can increase project complexity, but they have rarely caused significant delays at any stage of the project cycle. Moreover, the failure to incorporate adequate wildland components can result in much greater delays and complexity later on. Furthermore, the failure to incorporate adequate wildland components can substantially reduce project benefits and might result in project failure. As wildland management components within Bank-supported projects become more routine, the additional staff effort required to manage them successfully is expected to decrease further.

14. The Bank's track record in implementing wildland management components is encouraging. According to project completion reports or environmental post-audits, implementation of only three out of 43 wildland components has been markedly slower than for most other project components. In at least four cases, the wildland component has been implemented with less difficulty than other project components.

### 3.2 Lessons Learned

15. A number of important lessons have emerged from the Bank's experience with wildland management to date. First, wildland management components should be routinely and systematically incorporated into certain types of Bank projects (outlined in Section 4.1). Up to now, this has not always been done, and some projects which would have benefitted from wildland components have not included them.

16. Second, wildland components should be incorporated as early as possible within the project cycle (Annex 3) to minimize costs and facilitate implementation. While inclusion of wildland components in later stages of the project cycle may at times be necessary because of unforeseen circumstances, it is more effective and less costly to incorporate them as early as possible in the project cycle.

17. Third, meeting wildland management goals requires effective management "on the ground", not simply on paper. Colonists and resource extractive companies have rapidly moved into such "paper parks" (parks existing only on a legal document or map, rather than on the ground) unless they were inaccessible for other reasons. The wildland management objectives have to be translated into specific measures with a budget for their implementation. These measures include hiring and training of personnel, provision of necessary infrastructure and equipment, development of a scientifically sound management plan for each particular wildland, and a policy environment - legal, economic and institutional - which supports the wildland preservation objective. The mere declaration of intent to protect wildlands or wildlife, or even the designation of WMAs on a map, does not ensure effective management unless specific supporting measures are implemented.

18. Fourth, the multiple objectives of wildland management are most successfully attained if the WMA is carefully designed. For example, a WMA cannot preserve biological and genetic diversity, evolutionary processes, and environmental services

if it is too small. While some Bank-supported WMAs clearly appear sufficiently large to accomplish most or all of their objectives, others are so small that their ability to conserve biological diversity or provide environmental services or other benefits is questionable. Besides size, the specific location and shape of a WMA can be important factors in determining its success. Appropriate WMA design features are best determined for each case by a conservation specialist.

19. Finally, the success of a WMA, as of other project components, is contingent upon government commitment. This, in turn, often depends upon the degree of financial support provided by the Bank. Most of the Bank-supported wildland components have provided some direct support to establishing or strengthening WMAs. However, in some cases, the costs of the WMA establishment were assumed entirely by the Government, and the Bank took no specific measures to ensure the continued availability of such financing. By taking measures to ensure counterpart financing, or by providing the financing itself, the Bank can help ensure the availability of the relatively modest sums necessary for WMA establishment and continuation.

20. Financial support is usually not sufficient, however. It is often also necessary to maintain dialogue with governments, affected local people, and environmental advocates about the importance of conservation and the benefits of WMAs (tourism, watershed protection, etc.) and to include local people in the planning and benefits. Government commitment to the WMA is fostered by such dialogue, by supervision, by monitoring of national legal provisions, and by loan conditionality. In addition, two complementary and parallel activities contribute to WMA success: (1) rural development investments that provide farmers and villagers in the vicinity of the WMA an alternative to further encroachment, and (2) coherent national and sectoral planning and policies that promote wildland conservation.

#### **4. POLICY GUIDANCE**

21. The Bank's general policy regarding wildlands is to seek to avoid their elimination and rather to assist in their preservation. Specifically, (1) the Bank normally declines to finance projects involving conversion of wildlands of special concern (as defined in Section 2.3), even if this conversion occurred prior to the Bank being invited to consider financing. (2) When wildlands other than those of special concern may become involved, the Bank prefers to site projects on lands already converted (e.g., logged over, abandoned, degraded, or already cultivated areas) sometime in the past, rather than in anticipation of a Bank project. Deviations from this policy must be explicitly justified. (3) Where development of wildlands is justified, then less valuable wildlands should be converted rather than more valuable ones. (4) When significant conversion (e.g., 100 sq. kms., or a significant proportion of the remaining wildland area of a specific ecosystem, if smaller) of wildlands is justified, the loss should be compensated by inclusion of wildland management

components (see Section 4.2 below) in the project concerned, rather than in some future project. This component should directly support preservation of an ecologically similar area.<sup>6</sup> This policy pertains to any project in which the Bank is involved, irrespective of whether the Bank is financing the project component that affects wildlands.

22. The success of projects that do not eliminate any wildland often depends on the environmental services provided by wildlands. In such cases, the Bank's policy is to include a project component to conserve the relevant wildland in a WMA, rather than leaving its preservation to chance. In areas without remaining wildlands, alternative conservation measures may be needed to provide similar project benefits. In other cases, where the wildlands do not directly benefit or serve the objectives of the project, the project may be improved by supporting management of wildlands to provide socio-economic benefits in the general project area (see paragraph 6). Projects with wildland management as the sole objective should also be encouraged.

#### 4.1 Types of Projects Needing Wildland Management Components

23. Based upon these criteria, projects with the following aspects should normally contain wildland components:

- a. **Agriculture and livestock projects** involving: wildland clearing, wetland elimination,<sup>7</sup> wildland inundation for irrigation storage reservoirs; watershed protection for irrigation; displacement of wildlife by fences or domestic livestock; **fishery projects** involving: elimination of important fish nursery, breeding, or feeding sites; overfishing or introduction of ecologically risky

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<sup>6</sup> The policy in the 1978 Forestry Sector Policy Paper states "... in countries where there are no adequate natural resource conservation programs, the Bank will not support projects that might result in disintegration of a habitat not elsewhere represented in the country and not under suitable protection (as in national parks and wildlife reserves)."

<sup>7</sup> Wetlands (such as ponds, marshes, swamps, flood plain forests, estuaries, mangroves) can be eliminated inadvertently through water diversions upstream or deliberately through drainage, diking, or filling.

exotic species within aquatic wildlands; **forestry projects** involving: access roads, clear-felling or other intensive logging of wildlands, wildland elimination.<sup>8</sup>

- b. **Transportation projects** involving: construction of highways, rural roads, railways, or canals which penetrate wildlands, thus easing access and facilitating spontaneous settlement; channelization of rivers for fluvial navigation; dredging and filling of coastal wetlands for ports projects.
- c. **Hydro projects** involving: large-scale water development, including reservoir, power, and water diversion schemes; inundation or other major transformation of aquatic or terrestrial wildlands; watershed protection for enhanced power output; construction of power transmission corridors.<sup>9</sup>
- d. **Industry projects** involving: chemical and thermal pollution which may damage wildlands<sup>10</sup>; wildland loss from large-scale mining; wildland conversion for industrial fuels or feedstocks.

#### 4.2 Types of Wildland Management Components

24. The most effective type of wildland management component is support for the conservation of ecologically similar wildlands in one or more WMAs.<sup>11</sup> In cases where a WMA already exists in the same type of ecosystem that is to be converted by a Bank-supported project, it may be preferable, for administrative or biological conservation<sup>12</sup> reasons, to enlarge the existing WMA, rather than to establish a new one. The government's wildland agencies, local university wildlife departments, and various international organizations can often advise in such judgements.

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<sup>8</sup> Plantations of fast-growing tree species are often an important complement to more direct wildland management activities by reducing the economic pressures for cutting the remaining forest wildland. They should be sited preferentially on already deforested land. Reforestation and land rehabilitation are covered in the 1978 Forestry Sector Policy Paper.

<sup>9</sup> & <sup>10</sup> Industrial pollution control is discussed in the Bank's Environmental Guidelines available from PPDES.

<sup>11</sup> See Section 5 for technical guidance on establishing a WMA.

<sup>12</sup> Biological conservation is usually more effective in one large WMA than in several small ones comprising the same total size and encompassing the same types of natural habitats.

25. A wildland management component could also involve the creation of wildlife habitat, in addition to or rather than preservation of already existing habitat. For example, marginal land on the fringes of irrigation projects could be converted to wildlife reserves by taking advantage of the water supply created by the projects. Natural depressions or seasonal swamps could be exploited by diverting water from the canal systems (probably a very small part of the total supply). Such reserves attract significant numbers of migratory and residential waterfowl with minimal additional project costs and land.<sup>13</sup>

26. A useful option is to improve the quality of management of existing WMAs. Many WMAs in Bank member countries receive insufficient on-the-ground management, due to lack of adequately paid staff, training, staff housing, other infrastructure, equipment, spare parts, fuel, or a well-developed management plan through which efficient resource allocation decisions can be made. Small components can often help correct these deficiencies. In countries where effective management is clearly lacking, it is generally preferable to improve the management of existing WMAs than to create new units "on paper", thereby further over-extending the limited capabilities of the responsible agencies. Whenever a new WMA is established as a project component, provisions are needed to ensure effective management. Since many wildland agencies (e.g., departments of national parks or wildlife) are not as operationally effective as necessary, institutional strengthening (particularly support for training) should be an important element of Bank-supported wildland management components.

27. The establishment or strengthening of WMAs is particularly effective when the Government includes these wildland areas in a national conservation or land use plan. A growing number of Bank member governments have undertaken some type of systematic land use planning for wildland management. Such planning can take various forms, ranging from "master plans" for a system of national parks and other WMAs, to "National Conservation Strategies" which address wildland management as only one component of a broad range of natural resource planning concerns, and in which policy intervention such as economic incentives are used to influence resource utilization. Bank assistance with such planning efforts greatly strengthens wildland management at the national level. When member governments agree to develop appropriate land use plans, it is important for the Bank to refrain from supporting projects which involve eliminating wildlands and run counter to these plans.

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<sup>13</sup> The Wildfowl Trust, Slimbridge, England, has set up such reserves on 5-8 sq. km.

28. In those relatively few Borrower countries in which wildland elimination pressures are still minor,<sup>14</sup> the requirement of a compensatory wildland component can be interpreted more flexibly to involve measures other than the establishment or strengthening of one or more WMAs. Such alternative options include careful project siting to avoid converting the more environmentally sensitive wildlands, support for research on and management of particularly sensitive species, support for land use planning efforts, or institutional strengthening of the government's wildland management agency, and training in ecology, biological conservation, and wildland management.

## 5. DESIGN OF WILDLAND MANAGEMENT AREAS

### 5.1 Design Considerations

29. WMA design features include size, shape and siting. Because an optimal design may vary greatly in different ecosystems, it is best determined in each case by a conservation specialist.

30. The size of a compensatory WMA should be sufficient to maintain the biological diversity or other important values present in the area to be converted. A WMA which is large enough to encompass a viable population of the largest local predator (e.g., eagle, tiger), or the seasonal territories and migration routes of the largest local herbivore, will most likely preserve all other pertinent ecological values. These objectives would most likely be achieved in a WMA larger than 1,000 sq. kms. Many values are conserved in moist forest WMAs of 500 sq. kms, although possibly not all in perpetuity. Interim WMAs of less than 100 sq. kms can be useful short-term expedients for subsequent expansion into surrounding degraded areas. In general, the larger the WMA, the greater the number of ecological interdependencies and gene pools that will be preserved. Both are necessary to a healthy and self-perpetuating ecosystem. It is recognized that conflicting pressures for more intensive land use often make the establishment of large WMAs difficult. In any case, compensatory WMAs should be no smaller than the wildland area converted by the project.

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<sup>14</sup> Wildland elimination pressure may still be minor because of low human population densities and growth rates, little economic demand for agricultural land, timber, or other resources, or because a substantial proportion of each remaining wildland ecosystem in a country has been set aside in WMAs which receive good on-the-ground protection and have strong policy support from the Government.

31. The optimal shape of a WMA will depend upon its objectives. A more circular shape may preserve more biological diversity than other shapes of the same area. Shape is also determined by the location of centres of endemism and other wildlife resources. Boundaries are more effective when they coincide with natural surficial features, such as a river or watershed.

32. To ensure that the compensatory WMA is ecologically similar to the area to be converted, it is obviously necessary to site the WMA in the same ecosystem as the area to be converted. Moreover, siting the WMA some distance away from the converted area (separated by a managed buffer zone for example) helps reduce pressures for encroachment upon the WMA from people living in the converted area.

## **5.2 Management Categories**

33. A variety of different use related categories can be used in establishing WMAs. The choice of category depends upon the particular objectives being accorded priority for management. The categories listed in Annex 1 indicate the variety of WMAs appropriate under different circumstances.

## **5.3 Personnel and Training Needs**

34. The need for well-trained personnel in the proper management of WMAs cannot be overemphasized. Without adequate numbers of such trained people, WMAs cannot effectively serve their intended national or societal functions. Bank-supported wildland project components should therefore provide for staffing levels and training activities that ensure competent management of WMAs. The appropriate number and types of WMA personnel depend upon the category of WMA, its size, and its intensity of management. The minimum adequate permanent staff size for a "modest to average" WMA is usually about eight.

## **5.4 Equipment, Infrastructure, and Budgetary Needs**

35. Designation of WMAs on a map in no way ensures that they will be managed to provide their greatest possible benefits to society. Effective on-the-ground management requires a variety of physical inputs. In Bank-supported WMAs, efforts should be made to ensure that these inputs are provided as a project component in adequate supply and on a timely basis. Annex 4 contains a basic checklist of the physical inputs that are typically needed for effective WMA management. Some types of WMAs will require a variety of additional inputs, according to specific management objectives.

36. The budgetary requirements for establishing and operating WMAs will vary according to size and the amounts of needed infrastructure, equipment, and personnel. The comparatively large (3,200 sq. kms.) Dumoga-Bone National Park, financed by the Indonesia Irrigation XV Project, cost roughly US\$ 1 million for establishment and



initial operating costs; most smaller WMAs can be expected to cost considerably less.

37. In some instances, establishment or enlargement of WMAs may require additional funds for purchasing land from private or tribal owners. It may at times also be necessary to resettle and compensate people living within the boundaries of a newly-established WMA.<sup>15</sup> Usually, however, WMAs are established on wholly government-owned properties on which people have not settled.

38. The largest recurrent cost of WMAs is usually staff salaries. It is important to maintain salaries at levels that encourage high productivity and a degree of permanence, and discourage corruption.<sup>16</sup> Spare parts for machinery, while usually a relatively small budget item, are also a vital recurrent expenditure. Without a reliable supply of spare parts for often remote WMA areas, necessary equipment will often lie idle or may become cannibalized to provide spare parts. In some cases, salaries, spare parts, fuel, and other recurrent costs can be fully or partly met by fees collected from tourists, persons engaged in some form of harvesting, or scientific researchers.<sup>17</sup> Otherwise, small annual outlays from the national or other government budget will be needed.

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<sup>15</sup> See OMS 2.33 for guidelines regarding involuntary resettlement and OMS 2.34 for guidelines regarding tribal people in Bank-financed projects. In many cases, indigenous hunter-gatherer societies are as much a part of the "natural" environment as the wildlife, and can safely remain in the park as caretakers as long as traditional ways of life are continued.

<sup>16</sup> High productivity also depends upon these important components: 1) environmental education for an understanding of the importance of the WMA; 2) pride in the WMA and the role of those who protect and support it; and 3) self-interest through some direct accrual of benefits of the WMA (aesthetic, recreational, moral, etc., as well as economic).

<sup>17</sup> The proportion of recurrent costs that can be recovered in this manner varies greatly in different WMAs, from 0 to 100 per cent.

## 5.5 Management Plans

39. Wildland management areas typically need well-developed management plans to ensure efficient allocation of the scarce financial and skilled human resources devoted to their management. A management plan is a written document which guides and controls the use of the resources of a WMA and directs the design of subsequent programs of management and development. A thorough management plan will:

- (a) Describe the physical, biological, social, and cultural features of the WMA within a national, regional, and local context;
- (b) Identify those items of particular concern from which the objectives for managing specific areas of the WMA are derived;
- (c) Describe appropriate uses of the entire WMA through zoning; and
- (d) List in chronological order the activities to be carried out to realize the proposed management programmes.

40. Preparation and implementation of management plans are carried out by the government wildland agency. Project staff should ensure that Bank-supported WMAs either have adequate management plans or will develop them early in the project. Some parts of a management plan can be completed in a few days, while others may take years to refine. While a longer-term management plan is being developed as soon as possible after loan signing, an "interim management plan" or "operational plan" may be used. PPDES can be of assistance in these matters.

## 5.6 Legal Considerations

41. The success of a WMA may depend upon how its design fits into an overall national legal framework concerning natural resources management in general and wildland management in particular. To maintain their legitimacy in the eyes of policy-makers and local populations, WMAs must have a firm legal foundation. National legislation, sometimes accompanied by a specific Presidential designation, is often needed to establish a WMA. Depending upon the particular situation, such legislation needs to establish precise WMA boundaries; specific management zones within the WMA, including buffer zones; a central management authority (at the national or sub-national level) with unambiguous responsibilities; and a mechanism to channel local participation in WMA management decisions. Bank staff should ensure that Bank-supported WMAs are established and managed within a compatible legal and policy context.

June 2, 1986

## ANNEX I

### Categories of Wildland Management<sup>18</sup>

1 **Scientific or Strict Nature Reserves** represent the most restrictive WMA category, intended to maintain representative samples of natural ecosystems in an undisturbed state for scientific research, environmental monitoring, education, and preservation of biological diversity. Tourism, recreation, and most other human uses are usually not permitted.

2 **National Parks** are usually relatively large areas where native plant and animal species (and often outstanding geological or other scenic features) are of special interest. Controlled tourism and scientific research are permitted; more intensive human uses usually are not.

3 **Natural Monuments** are often smaller WMAs intended to protect highly localized species, ecosystems, or geological formations. Tourism and scientific research are permitted to the extent that they are compatible with preservation of the unique natural features.

4 **Managed Nature Reserves or Wildlife Sanctuaries** protect rare plant or animal species, or large concentrations of resident or migratory wildlife. Manipulation of vegetation and other intensive management may be done to improve the habitat for species of special concern. Tourism, research, and occasionally limited livestock grazing or fuelwood collection are permitted, when these activities are compatible with wildlife management objectives.

5 **Tribal Peoples Reserves** are relatively unmodified natural areas in which indigenous tribal peoples or vulnerable ethnic minorities (see OMS 2.34) continue to practice traditional, low-intensity forms of land use such as hunting and gathering or nomadic pastoralism. Settlement or potentially disruptive resource utilization by outsiders is not permitted.

6 **Protected Landscapes** are areas which have often been significantly modified by people, but which still contain important wildland resources. Traditional land uses, including fishing, grazing, and some agriculture, are often permitted to accommodate the needs and interests of local populations. Land use control is often at the local government level.

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<sup>18</sup> Recognizing that different countries use different names for various types of WMAs, the standardized system of WMA nomenclature developed by the International Union for Conservation of Nature and Natural Resources (IUCN) is used here to facilitate comparisons and reduce confusion.

7 **Resource Reserves** are "interim" WMAs. They are typically fairly extensive areas which are not yet heavily settled, but which may be under relatively recent pressure for colonization, timber or mineral extraction, or other intensive uses. This WMA category is designed to restrict such uses until a land use plan or other management guide is issued to channel further development in an environmentally suitable manner.

8 **Multiple Use Management Areas** are intended to allow sustainable production of such economic goods as water for downstream uses; timber (obtained through low-intensity logging); fuelwood; wild fruits, herbs, gums, or other plant products; wildlife; fish; grazing; and outdoor recreation. Included in this category are most "forest reserves" and "protection forests," including those established largely for watershed catchment protection. Within these WMAs, management is primarily oriented to the sustaining of these economic activities, although special zones may also be designated within these areas to achieve more specific conservation objectives, such as preservation of biological diversity. These WMAs are generally large and capable of sustaining these types of economic activities without degradation or elimination of the wildland resource. Generally, these wildland areas do not possess nationally unique or exceptional natural features.

**ANNEX II**

**Some Tropical Wildlands of Special Concern<sup>19</sup>**

**Eastern Africa**

- 1 Madagascar: significant proportions of the northern and eastern moist forests.
- 2 Ethiopia: much of the remaining highland forest.
- 3 Tanzania: Usambara, Pare, and Uluguru Mountains.
- 4 Rwanda: mountain forests along the Zaïre and Uganda borders.
- 5 Kenya: Kakamega, Nandi, and Arabuko-Sokoke forests.

**Western Africa**

- 6 Cameroon: particularly Cameroon Mountain and the moist forested area extending into Gabon, and to the vicinity of the Cross River in southeastern Nigeria, including the Oban Hills.
- 7 Ivory Coast: southwestern forests (including the Taï forest), and adjacent parts of Liberia and Sierra Leone.

**East Asia and Pacific**

- 8 The Malay Peninsular (including parts of Thailand): Lowland forests, especially along the northwestern and eastern coasts.
- 9 Indonesia: much of the remaining lowland forests of Kalimantan, Sumatra, Sulawesi (especially the two southern peninsulas), and many smaller islands (e.g., Siberut).
- 10 Philippines: much lowland forest on all larger islands.

**South Asia**

- 11 Sri Lanka: the coastal hills of the southwest and the Sinharaja forest of the "wet zone."
- 12 India: most of the forests remaining on the Western Ghats.
- 13 Burma: the untouched teak forests in the northern regions.

**Latin America and Caribbean**

- 14 Ecuador: lowland coastal forest
- 15 Mexico: Lacandon forest in Chiapas.
- 16 Honduras-Nicaragua border: Mosquitia forest.
- 17 Panama: Darien province.
- 18 Colombia: the Choco region adjacent to Darien province.
- 19 Brazil: coastal forests of the "Cocoa Region" in the southeastern extension of Bahia between the coast and 41°30'W longitude, and between 13° and 18°15'S latitude, and an outlier near Linhares, Espiritu Santo.
- 20 Brazil: parts of the eastern and southern Amazon region.

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<sup>19</sup> This list is by no means to be interpreted as comprehensive.

**Tropical Aquatic Areas**

- 1 Amazon River and associated wetlands (including varzea forests) (Brazil, Peru, Colombia, Ecuador, and Bolivia.)
- 2 Orinoco River and Delta (Venezuela and Colombia).
- 3 Purari River (Papua New Guinea).
- 4 Musi River (Sumatra, Indonesia).
- 5 Lake Malawi (Malawi), and other Rift Valley Lakes.
- 6 Lake Toba (Sumatra, Indonesia).
- 7 Sudd Swamp (Sudan).
- 8 Pantanal Swamp (Mato Grosso, Brazil).
- 9 Lake Atitlan (Guatemala).

### ANNEX III

#### The Project Cycle

Responsibility for implementing wildland management projects or components rests primarily with regional operations staff, with advice and operational support provided by PPDES, as detailed for all environmental work in OMS 2.36. At *identification*, projects being considered are reviewed by regional staff in conjunction with PPDES to identify, as early as possible, the need to avoid converting a wildland tract or to preserve such a tract as part of the project. To determine whether a proposed project will develop or be in close proximity to environmentally important wildlands, Bank staff can consult those government agencies with jurisdiction over wildland management authority. PPDES maintains contacts with such agencies and will assist upon request. Additional sources of information on ecologically important wildlands are computerized data bases maintained by some non-governmental organizations (NGOs) and several published directories, available from PPDES. In this manner, it will often be possible to learn quickly whether a proposed project site contains existing or proposed WMAs; known endangered species; major wildlife or fish breeding, feeding, or staging areas; important watershed catchments; or living resources of major importance to local people. If none of these mechanisms reveal the existence of ecologically important wildlands in the project area, a brief pre-project field survey is necessary since many important wildlands are not yet identified. This field survey should be undertaken by relevant specialists from the government's environmental ministry, wildlife agency, national university, or similar institution. This brief survey indicates the nature and extent of impacts on critical wildlands that would result from the implementation of the project and puts the information in a national context. The results should be recorded on the form provided in Annex 5.

During *preparation*, project staff (or their consultants) may assist the Borrower or project sponsor in carrying out the necessary environmental studies, including those pertaining to wildlands. PPDES can recommend consultants or other experts who can identify important wildland areas, carry out necessary field surveys, or help design appropriate wildland management project components. At the completion of any necessary studies, the Project Brief (see OMS 2.13) should highlight whether the project involves the conversion or disintegration of a relatively unmodified ecosystem and include alternative suggestions for achieving the goals of the government. If conversion is justified, the Brief should outline why, together with the wildland management components needed.

As part of *appraisal*, project staff assess the planned wildland management and other environmental measures, as specified by OMS 2.20. The Staff Appraisal Report specifically describes any planned wildland management measures, including budgets and agency responsibilities. While PPDES is available for consultation and assistance at any stage of the project cycle, it is also responsible for reviewing projects at the Yellow Cover stage (see OMS 2.00). In addition to the Staff Appraisal Report, the

### *Ecologically Sensitive Sites in Africa*

President's Report (see OMS 3.02) also notes any significant environmental -- including wildland management -- issues and mitigatory measures. Once wildland measures are identified as necessary, timely action should be ensured by conditionality such as loan effectiveness of disbursement. Since wildland management must be done in perpetuity to be effective, the loan agreement should specify long-term measures which the Borrower has agreed to implement.

*Supervision* missions should routinely review implementation of the wildland component with the Borrower. Such aspects are handled as for environmental issues in general (see OMS 2.36). Implementation of important wildland components should, as a general principle, be well underway before a project's major land clearing or construction works are allowed to proceed.



**ANNEX IV**

**Physical Inputs Required in Most Wildland Management Areas**

- a. Headquarters building and guard posts at entry points.
- b. Staff housing
- c. Visitor information center, including educational and interpretive exhibits where appropriate.
- d. Research facilities, including laboratory and housing for scientists.
- e. Roads and trails (amount will vary according to intensity of management desired).
- f. Fencing and signs, adequate to ensure proper demarcation and to control access.
- g. Communications, internal and external to the WMA: radio, walkie-talkies, mail, and telephone (where appropriate).
- h. Electricity, gas, or other energy systems.
- i. Sewage and waste systems.
- j. Four-wheel drive, motor bikes, or other vehicles.
- k. Boats, outboard motors, and docking facilities, where needed.
- l. Appropriate tools, maintenance equipment, and *spare parts*.
- m. Fuel.
- n. Management-oriented publications: maps, species lists, pamphlets for visitors, etc.

ANNEX V

**Wildland Survey and Management Form<sup>20</sup>**  
(Sample only)

Name of Project:

Expected Appraisal (or other) Date:

Date of this Survey:

Surveyor:

Affiliation:

Methodology(ies) (circle one):

Site inspection/Library research/Both/Other(specify)

- 1 Specific subcategory(ies) of ecosystem that proposed project will affect: (e.g., tropical semi-evergreen moist forest, salt-marsh, wet savanna)
- 2 Important environmental and biological features of ecosystem(s): (e.g., water catchment area for large agricultural valley and habitat for the endangered mountain gorilla)
- 3 Projected general impact type on ecosystem(s) of proposed project: (e.g., deforestation, flooding, draining)
- 4 Proportion (%) of the region's remaining ecosystem(s) (as in #1 above) to be converted (and/or impacted, if different): (e.g., this project will flood about 10% of this country's remaining lowland riparian swamp forest.)
- 5 Estimated annual rates of attrition of affected ecosystem(s) in this country and historical trend of this rate: e.g., The current annual rate of attrition of (semi-montane forest) is 3% a year. This rate was 0.5% in 1975 and 1% in 1980.)

Maps and more complete reports used or available can be appended or cited.

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<sup>20</sup> This type of information is expected as part of identification, and can be used for the project brief. This form can be completed by the government's environmental ministry or wildlife agency, or by the project pre-feasibility team's wildlands specialist.

## SECTION II

### SAHEL

Burkina Faso, Cape Verde, Chad, Gambia, Mali, Mauritania, Niger, Senegal

#### ANNOTATED LIST OF SITES

Within each country, sites are divided into four subsections, according to the degree of protection they appear to enjoy.

**INTERNATIONALLY DESIGNATED PROTECTED AREAS** These are the World Heritage sites, Biosphere Reserves and Ramsar sites within each country.

**NATIONALLY PROTECTED AREAS** Excluding those in the above section, these include all nationally designated protected areas having objectives which qualify them for IUCN Management Categories I-VII (see below).

**OTHER MANAGED AREAS** In this section are other designated sites which have a nature conservation function (including forest reserves and other IUCN Management Category VIII sites), as well as some well managed private reserves.

**UNPROTECTED SITES** This section includes sites where there is no officially recognised protection status. Three types of site are included: proposed protected areas, where implementation is either being studied or is under way; recommended sites, where protection has been recommended by an individual or group but where implementation is yet to be initiated; and other sensitive sites which have been recognised as valuable wildlands.

In some countries, the political situation may have caused management to lapse, and in these and other cases information on the current status of the site can be hard to obtain. The annotated list is based on the information available.

The protected areas information shown on the maps for each chapter have been classified by management authority; i.e the forestry sector, wildlife sector or additional sector (e.g. Presidential reserve). Information concerning the location of all numbered sites was not available. Hence some sites numbered on the lists do not appear on the maps.

*This list has been prepared as a desk study, and is based on available information. It should be taken as a guide rather than a definitive study.*

## Information Sources

The World Conservation Monitoring Centre gathers, analyzes and disseminates information on the status, security and management of the Earth's biological diversity as a service to the international community. The information presented in this publication has been drawn from WCMC's databases and geographical files which have been developed in collaboration with numerous national and international sources. These data, which have been gathered over a number of years, are held within tabular databases, paper files and geographic information systems (GIS) at the Centre. WCMC relies on its own and its sponsors' worldwide network of contacts, as well as published and unpublished literature, to provide accurate information and an efficient service to its users.

The protected areas listings in the country chapters have been downloaded from the WCMC Protected Areas Database which contains over 32,000 records. The WCMC maintains these data in collaboration with the IUCN Commission on National Parks and Protected Areas, the UNESCO Man and the Biosphere Programme, the World Heritage Convention and others. This desk study has concentrated heavily on these data and on the extensive conservation library held at WCMC.

Much of the information WCMC holds has a spatial element and since 1989 WCMC has been operating a GIS. A substantial amount of data on threatened habitats, protected and unprotected sites and other related subjects have now been assembled. The digital spatial data run in parallel with the supporting structured data, and the locational or boundary information shown on the maps within the country chapters are updated as new data are acquired. The spatial data are maintained within the Centre's GIS in ARC/INFO format and are available to all parties concerned with environmental conservation, via the WCMC *Biodiversity Map Library* (BML). The BML has been designed and implemented to enhance the Centre's information service providing a method for maintaining the environmental data in a structured and easily accessible manner. The information shown on the maps in this book are stored in the BML.

*The following text was originally drafted in December 1991 by James Culverwell and Hilary Tye, and updated in 1993 by James Culverwell and Harriet Gillett. Maps were prepared by Mary Edwards. Final copy was prepared by Harriet Gillett with assistance from Mark Lewis. Secretarial support was provided by Veronica Greenwood, with assistance from Deborah Rothera. Clare Billington and Jerry Harrison were responsible for overall coordination.*

## BURKINA FASO

### INTERNATIONALLY DESIGNATED PROTECTED AREAS

**Forêt classée de la Mare aux Hippopotames** IUCN Categories VIII and IX  
An area of 19,200ha is classified. The biosphere reserve, established in 1986, includes 16,300ha. The whole site was established as a Ramsar site in 1990. The reserve lies on a flat floodplain with marshy areas in the north, and the 660ha perennial 'hippopotamus pool' in the south. Open forest predominates, with gallery forests along watercourses, and thickets on laterite pans. Large mammal densities within the reserve are low due to poaching, and hippopotami are the most important species. The avifauna includes over 200 species. There are five villages supporting a total of 22,000 people very close to the reserve, and thus the importance of the reserve for protecting the local wildlife is great. Fires are of particular concern in forested areas during the dry season, and are often deliberately lit. Inadequate staffing is a problem (IUCN 1989; IUCN/UNEP, 1987).

**Mare d'Oursi Bird Sanctuary** Proposed  
14°30'-14°45'N/0°25'-0°40'W Covering 45,000ha, the area, created a Ramsar Wetland Site in 1990, is within the **Sahel Partial Faunal Reserve** and Sylvo-pastoral Reserve and is inhabited by nomads. It includes the catchment of a small lake, and is traversed by seasonal watercourses. To the south and west the landscape is undulating, whilst to the north and east low dunes occur. Tree and bush savanna predominates. The sanctuary attracts a variety of birds including several bustard species, and especially migrants. It has been recommended that protection be increased (Burgis and Symoens, 1987; IUCN, 1987a; Spinage, 1984).

**W du Burkina Faso National Park** IUCN Category II  
This 190,000ha park is part of a 1,023,000ha international conservation area shared with Benin and Niger, and is within the contiguous **W National Park** complex of reserves, which cover an area of about 4,000,000ha. **Parc National du W** Ramsar Wetland Site (235,000ha) was established in 1990. The complex is an important area for the conservation of West African savanna species. The park is on a peneplain in the upper Niger basin, and includes a steep-sided gorge. Open Sudanian savanna predominates in the north, becoming more heavily wooded in the south. Mammals include lion, leopard, elephant, buffalo and a number of ungulate species. However, illegal settlement and poaching continue; the vegetation throughout the park is degraded and timber is removed illegally (IUCN/UNEP, 1987).

### NATIONALLY PROTECTED AREAS

**Arly Partial Faunal Reserve** IUCN Category IV (part)  
This reserve covers an area of 130,000ha. Expanded from the original **Arly Total Faunal Reserve** of 76,000ha, it is contiguous to **Pama Partial Faunal Reserve** (74,700ha) and **Singou Total Faunal Reserve** (192,000ha). This expansion now forms

a continuous area with **W du Burkina Faso National Park** and is opposite a similar complex in Benin. The area is a flat lowland, with water bodies persisting through the dry season. Sudanian savanna woodland predominates, with extensive gallery forest in the north and along the Pendjari River. The three reserves are of particular importance for large mammal protection, supporting the highest densities of wild animals in the country. A number of threatened species occur, including leopard, cheetah and elephant. The total combined reserve has been referred to as a national park since 1978, but this has not been legally implemented. There is a small village, and some cultivation. Poaching, fishing and illegal removal of timber cannot be prevented due to inadequate staffing (IUCN, 1987a; IUCN/UNEP, 1987; Spinage, 1984).

**Arly Total Faunal Reserve** - see **Arly Partial Faunal Reserve** IUCN Category IV

**Deux Bales National Park**

IUCN Category II

This park comprises 56,600ha of undulating granitic plains, broken by rock outcrops and lateritic plateaus. The vegetation consists of Sudano- Zambesian savanna with gallery forest along rivers. The fauna includes hippopotami, buffalo, elephant and crocodile, but faunal diversity is reported as having been reduced by poaching and cattle farmers. Mining and agriculture are further affecting the park's integrity. Extensions have been proposed that would include **Dibon Classified Forest**, forming a total area of 80,600ha (IUCN/UNEP, 1987; Spinage, 1984).

**Kabore-Tambi National Park**

IUCN Category II

This park (formerly named Pô National Park) covers 242,700ha of alluvial floodplains along both banks of the Volta Rouge River, which is reduced to isolated waterholes during the dry season. There are a number of small marshes, and wooded savanna predominates. Mammals include lion, elephant, buffalo and a number of antelope species. Poaching, illegal wood collection and grazing have been a problem, and animal numbers and diversity have been reduced. Access controls and guard patrols were improved but poaching remains a serious problem, and the continued use of lakes in the park by fishermen restricts access for wildlife. The park is surrounded by a zone in which hunting is permitted (IUCN/UNEP, 1987).

**Kourtiagou Partial Faunal Reserve**

IUCN Category IV

This reserve covers 51,000ha within the contiguous **W National Park** complex of reserves, which total nearly 4,000,000ha. An extension of **Arly Total Faunal Reserve** to create **Arly National Park** (ungazetted) has made this area contiguous to **Kourtiagou**. Wooded savanna predominates, and the fauna includes a number of ungulate species. Hunting is permitted, but poaching is a problem as is illegal grazing and timber extraction (IUCN/UNEP, 1987).

**Madjoari Total Faunal Reserve**

IUCN Category IV

11°20'N/1°99'E Established in 1955 as a reserve of 17,000ha and later expanded to 24,000ha; part of this, totalling 17,500ha, is now incorporated into the expanded **Arly Total Faunal Reserve**, adjacent to **Arly Partial Faunal Reserve**. The vegetation is Sudanian woodland savanna (Spinage, 1984; Stuart *et al.*, 1990).

**Pama Partial Faunal Reserve - see Arly Partial**

**Faunal Reserve**

IUCN Category IV

This reserve, part of which is **Pama Classified Forest**, covers 74,700ha adjacent to both **Singou Total Faunal Reserve** and **Arly Partial Faunal Reserve**. Pama comprises a flat plain with seasonal rivers and wooded savanna. Mammals are reported to include lion, leopard (very few) and olive baboon. Poaching and illegal timber extraction are continuing problems (IUCN/UNEP, 1987).

**Sahel Partial Faunal Reserve**

IUCN Category IV

Covering an area of 1,600,000ha, this reserve lies in the northern part of the country. Sahelian bushland vegetation on sand predominates, with both ancient and more recent dunes occurring in the northern parts. The fauna includes gazelle and ostrich (uncommon), but poaching occurs. The whole reserve except the far north-west corner is severely overgrazed, and there is illegal settlement and removal of timber. About a tenth of the area is proposed as **Seno-Mango Biosphere Reserve** (IUCN, 1989; IUCN/UNEP, 1987).

**Singou Total Faunal Reserve**

IUCN Category IV

This reserve covers an area of 192,000ha and is adjacent to **Pama Partial Faunal Reserve** and **Arly Partial Faunal Reserve**, extending to the **W National Park** complex. The region is very dry, with a few scattered areas of marshland. Fairly dense wooded Sudanian savanna predominates, generally drier than that found further south, characterised by fire-tolerant *Hyparrhenia* grasses. Mammal species are similar to those found in the Arly reserves, including lion, leopard, elephant, buffalo and several antelope and primate species; the three reserves are of particular importance for mammal conservation. However, illegal settlement, grazing and heavy poaching continue to be a problem (IUCN, 1989; IUCN/UNEP, 1987).

**OTHER MANAGED AREAS**

**Babolo Classified Forest**

Established in 1943; 550ha

**Bahon Classified Forest**

Established in 1937; 1600ha

**Bambou Classified Forest**

Established in 1937; 1800ha

**Bansie Classified Forest**

Established in 1937; 300ha

**Baporo Classified Forest**

Established in 1936; 4800ha

**Barrage Classified Forest**

Established in 1941; 260ha

**Benou Classified Forest**

Established in 1937; 1700ha

**Beregadougou Classified Forest**

Established in 1953; 5000ha

**Bissiga Classified Forest**

Established in 1941; 4100ha

**Bougouriba Classified Forest**

Established in 1985; 8500ha

**Boulon Classified Forest**

Established in 1955; 12,000ha

**Bounouna Classified Forest**

Established in 1955; 1300ha

**Dan Classified Forest**

Established in 1953; 4300ha

**Dem Classified Forest**

Established in 1937; 350ha

**Dibon Classified Forest**

Established in 1954; This 24,000ha forest area is currently threatened by conflicting mining, agricultural and elephant conservation interests. It has been suggested that it be included in the proposed enlargement of **Deux Bales National Park** (Spinage, 1984; Stuart *et al.*, 1990).

**Dida Classified Forest**

Established in 1955; 75,000ha (Stuart *et al.*, 1990).

**Diefoula Classified Forest**

Established in 1937; 85,000ha This area is important for large mammal conservation, and it would be included within the boundaries of the proposed **Komoe-Leraba National Park** (Stuart *et al.*, 1990).

**Dinderesso Classified Forest**

Established in 1941; 8500ha

**Gonse Classified Forest**

Established in 1953; 6000ha

**Gouandougou Classified Forest**

Established in 1955; 9500ha



**Kalyo Classified Forest**

Established in 1936; 42,000ha

**Kapo Classified Forest**

Established in 1937; 9900ha

**Kari Classified Forest**

Established in 1938; 13,000ha

**Koflande Classified Forest**

Established in 1953; 30,000ha (Stuart *et al.*, 1990).

**Kou Classified Forest**

Established in 1951; 2060ha

**Koulbi Classified Forest**

Established in 1955; 40,000ha

**Koulima Classified Forest**

Established in 1957; 2150ha

**Laba Classified Forest**

Established in 1936; 16,750ha

**Logonieque Classified Forest**

Established in 1955, this classified forest covers an area of 29,000ha. It would be incorporated into the proposed **Komoe-Leraba National Park** (Stuart *et al.*, 1990).

**Maro Classified Forest**

Established in 1940; 50,000ha

**Nakambe Classified Forest**

Established in 1936; 1000ha

**Nazinga Classified Forest**

Established in 1953; 38,300ha

**Nazinon Classified Forest**

Established in 1954; 31,700ha

**Niangoloko Classified Forest**

Established in 1936; 6650ha

**Niouma Classified Forest**

Established in 1954; 735ha

*Ecologically Sensitive Sites of Africa*

**Nosebou Classified Forest**

Established in 1940; 14,000ha

**Oualou Classified Forest**

Established in 1938; 14,000ha

**Oulingore Classified Forest**

Established in 1936; 6850ha

**Pa Classified Forest**

Established in 1937; 16,000ha

**Pama Classified Forest**

Established in 1955; 149,000ha

**Peni Classified Forest**

Established in 1942; 1000ha

**Pic Nahouri Classified Forest**

Established in 1938; 836ha

**Poa Classified Forest**

Established in 1941; 350ha

**Sa Classified Forest**

Established in 1938; 5400ha

**Sissili Classified Forest**

Established in 1955; 32,700ha

**Sitenga Classified Forest**

Established in 1936; 840ha

**Sorobouly Classified Forest**

Established in 1953; 11,165ha

**Source Mouhoun Classified Forest**

Established in 1955; 100ha

**Sourou Classified Forest**

Established in 1937; 14,000ha

**Tere Classified Forest**

Established in 1953; 10,700ha

**Tiogo Classified Forest**

Established in 1940; 37,600ha

**Tisse Classified Forest**

Established in 1938; 21,500ha

**Toroba Classified Forest**

Established in 1938; 2900ha

**Tougouri Classified Forest**

Established in 1936; 600ha

**Tui Classified Forest**

Established in 1944; 47,000ha

**Twesse Classified Forest**

Established in 1954; 490ha

**Volta Blanche Classified Forest**

Established in 1953; 98,000ha

**Wayen Classified Forest**

Established in 1941; 12,000ha

**Yakala Classified Forest**

Established in 1936; 600ha

**Ziga Classified Forest**

Established in 1963; 9000ha

**UNPROTECTED SITES**

**Beli Bird Sanctuary**

Proposed

14°50'-15°05'N, 00°15'-00°38'W Covering 160,000ha within the **Sahel Partial Faunal Reserve** and **Sylvo-pastoral Reserve**, the area includes stabilised dunes beside a seasonal river. This is a Sahelian area, and dry savanna and thickets predominate. It supports a diverse avifauna, particularly migrant species (IUCN 1987a; Spinage, 1984).

**Bontioli Partial Faunal Reserve**

Declassified

Covering an area of 29,500ha, this area is relatively flat with wooded savanna. Wildlife numbers have declined dramatically due to poaching and other pressures, with very low numbers of ungulates and warthogs now surviving; a few elephants pass through seasonally. Hunting is permitted in the partial reserve, but poaching, cattle grazing and illegal removal of timber continue to degrade the area (IUCN/UNEP, 1987).

**Komoe-Leraba National Park**

Proposed

A total of 280,000ha has been proposed as this national park, to ensure protected area coverage of a portion of south-western Burkina Faso. Large mammal populations occur, and **Diefoula Classified Forest** and **Logoniegue Classified Forest** would be situated within the proposed National Park (Stuart *et al.*, 1990).

**Mou Classified Forest**

Declassified

1938 34,000ha

**Nabere Partial Faunal Reserve**

Declassified

This area of 36,500ha was originally a partial faunal reserve, but is now more representative of a game reserve and has been degazetted. Sudanian wooded savanna predominates; it is reported that heavy poaching occurs, and that very few of the larger animals remain (IUCN/UNEP, 1987).

**Nauri Park**

Situated adjacent to Nazinga Game Ranch, this is apparently an important conservation area (Stuart *et al.*, 1990).

**Nazinga Ranch Protection Zone**

Declassified

Covering 806,000ha, this is a model project of the rational exploitation of wildlife, emphasising active participation of local human populations. It contains important populations of large mammals, including red-flanked and grey duiker, and elephant. The endangered African spurred tortoise *Geochelone sulcata* is found here (IUCN, 1989; Stuart *et al.*, 1990).

**Seno-Mango Biosphere Reserve**

Proposed

This 112,700ha Sahel reserve (situated within the **Sahel Partial Faunal Reserve**) supports the last vestiges of Sahelian flora and fauna in Burkina Faso, including limited numbers of the endangered dorcas and dama gazelles. The boundaries of the area need revising to include only the relatively intact north-western corner of the existing Biosphere Reserve, and to exclude all settled and grazed areas (IUCN, 1987a; Spinage, 1984; Stuart *et al.*, 1990).

**Sirba Census Zone**

120,000ha (Stuart *et al.*, 1990)

## BURKINA FASO - PROTECTED SITES

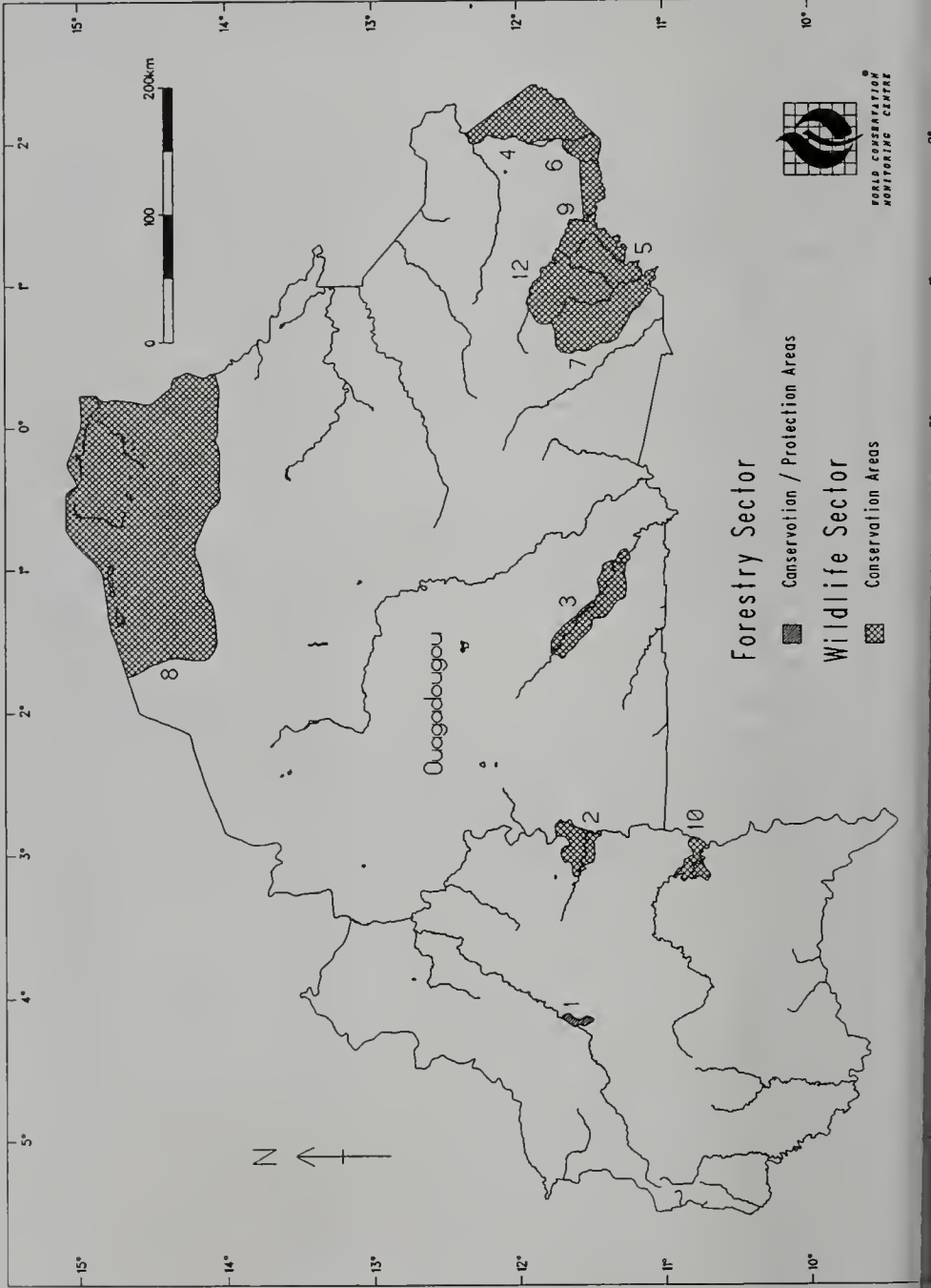
*National/international designations*

Name of area and map reference (see Fig. 1.1)	Management area (ha)	Year notified
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**Classified Forest**

1 Mare aux Hippototames	19,200	1937
Babolo	550	1943
Bahon	1,600	1937
Bambou	1,800	1937
Bansie	300	1937
Baporo	4,800	1936
Barrage	260	1941
Benou	1,700	1937
Beregadougou	5,000	1953
Bissiga	4,100	1941
Bougouriba	8,500	1985
Boulon	12,000	1955
Bounouna	1,300	1955
Dan	4,300	1953
Dem	350	1937
Dibon	24,000	1954
Dida	75,000	1955
Diefoula	85,000	1937
Dinderesso	8,500	1941
Gonse	6,000	1953
Gouandougou	9,500	1955
Kalyo	42,000	1936
Kapo	9,900	1937
Kari	13,000	1938
Koflande	30,000	1953
Kou	2,060	1951
Koulbi	40,000	1955
Koulima	2,150	1957
Laba	16,750	1936
Logoniegue	29,000	1955
Maro	50,000	1940
Nakambe	1,000	1936
Nazinga	38,300	1953
Nazinon	31,700	1954
Niangoloko	6,650	1936
Niouma	735	1954
Nosebou	14,000	1940
Oualou	14,000	1938

Fig 1.1 Burkina Faso: protected ecologically sensitive sites



**BURKINA FASO - PROTECTED SITES** (cont.)*National/international designations*

<b>Name of area and map reference (see Fig. 1.1)</b>	<b>Management area (ha)</b>	<b>Year notified</b>
Oulingore	6,850	1936
Pa	16,000	1937
Pama	149,000	1955
Peni	1,000	1942
Pic Nahouri	836	1938
Poa	350	1941
Sa	5,400	1938
Sissili	32,700	1955
Sitenga	840	1936
Sorobouly	11,165	1953
Source Mouhoun	100	1955
Sourou	14,000	1937
Tere	10,700	1953
Tiogo	37,600	1940
Tisse	21,500	1938
Toroba	2,900	1938
Tougouri	600	1936
Tui	47,000	1944
Twesse	490	1954
Volta Blanche	98,000	1953
Wayen	12,000	1941
Yakala	600	1936
Ziga	9,000	1963
<b>National Parks</b>		
2 Deux Bales	56,600	1967
3 Kabore-Tambi	242,700	1976
4 W du Burkina Faso	190,000	1954
<b>Partial Faunal Reserves</b>		
5 Arly	130,000	1954
6 Kourtiagou	51,000	1957
7 Pama	74,700	1955
8 Sahel	1,600,000	1970
<b>Total Faunal Reserves</b>		
9 Arly	76,000	1954
11 Madjoari	17,000	1955
12 Singou	192,000	1955

**BURKINA FASO - PROTECTED SITES (cont.)**

*National/international designations*

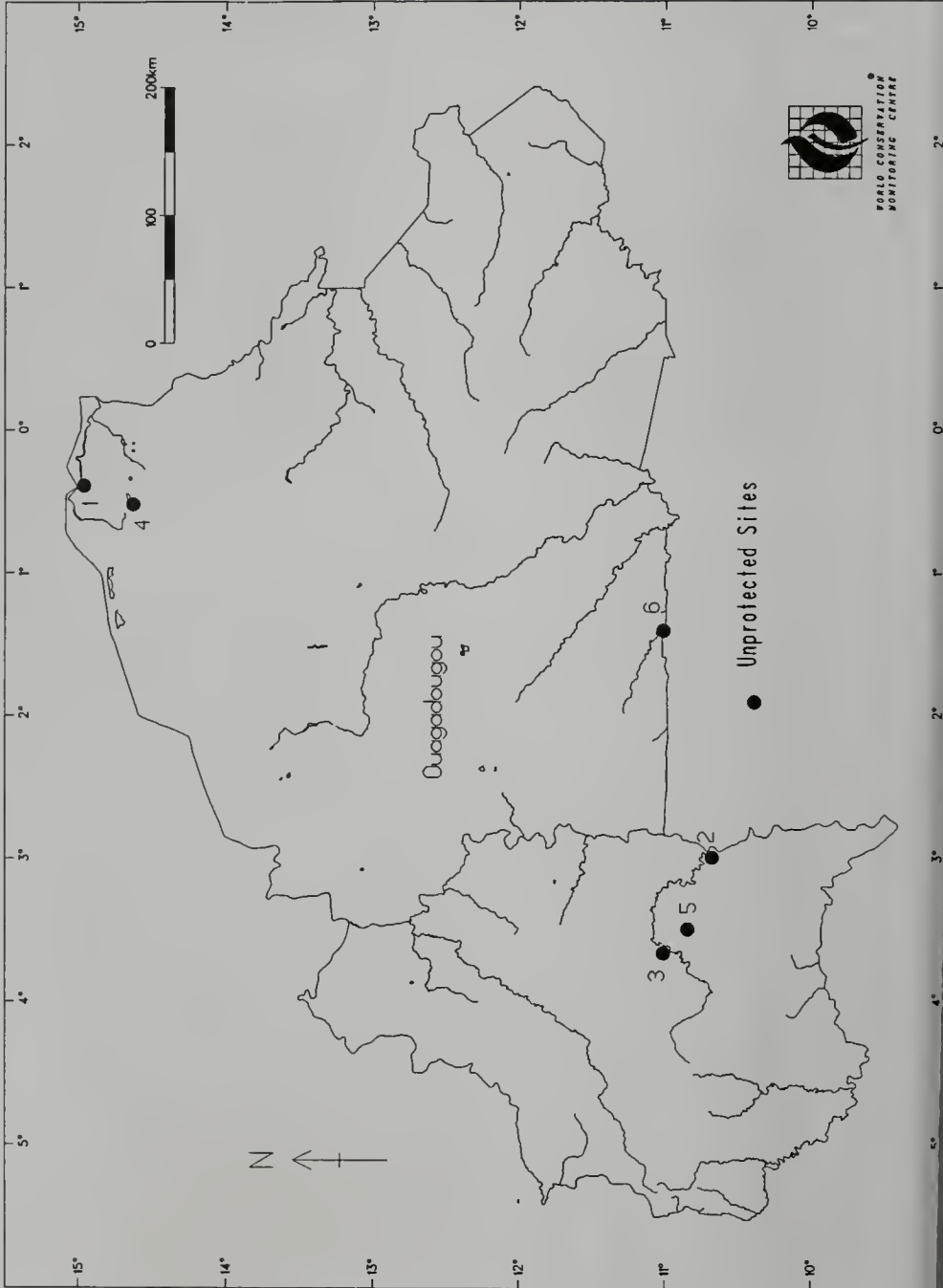
<b>Name of area and map reference (see Fig. 1.1)</b>	<b>Management area (ha)</b>	<b>Year notified</b>
<b>Biosphere Reserve</b>		
1 Forêt classée de la Mare aux Hippopotames	16,300	1986
<b>Ramsar Wetland Site</b>		
Mare d'Oursi		1990
1 Mare au Hippopotames		1990
4 Parc National du "W"		1990



**BURKINA FASO - UNPROTECTED SITES**

<b>Name of area and map reference (see Fig. 1.2)</b>	<b>Management area (ha)</b>
1 Beli Bird Sanctuary	160,000
2 Bontioli Partial Faunal Reserve	29,500
Komoe-Leraba National Park	280,000
3 Mou Classified Forest	34,000
4 Mare d'Oursi Bird Sanctuary	45,000
5 Nabere Partial Faunal Reserve	36,500
Nauri Park	
6 Nazinga Ranch Protection Zone	806,000
Seno-Mango Biosphere Reserve	112,700
Sirba Census Zone	120,000

Fig 1.2 Burkina Faso: unprotected ecologically sensitive sites



## CAPE VERDE

### INTERNATIONALLY DESIGNATED PROTECTED AREAS

None

### NATIONALLY PROTECTED AREAS

None

### OTHER MANAGED AREAS

None

### UNPROTECTED SITES

**Baia de Santa Clara, Island of Santiago** - see **Ilheus Santiago**

**Boa Entrada, Island of Santiago** - see **Ilheus Santiago**

**Cova Tina Integral Reserve**

Proposed

**Fogo Island**

Recommended

14°57'N, 24°25'W An area of 2500ha has frequently been proposed as a reserve or natural monument, incorporating the volcano and environs and protecting most of the island's endemic plants. The proposed strictly protected **Cova Tina Integral Reserve** would be within this area, protecting a number of single-island endemic plants such as *Echium vulcanorum* and *Erysimum caboverdeanum*. The endemic soft-plumaged petrel (the gon-gon) *Pterodroma feae* breeds on cliff walls within the old crater of the volcano, where it is exploited as a food resource (Miller, 1989).

**Ilheu Baluarte** - see **Sal Rei, Boavista Island**

**Ilheus Branco and Raso**

Recommended

16°38'N, 24°37'W Both these small islands are recommended as nature reserves. Several plant endemics occur, and the endemic Raso lark *Alauda razae* occurs on uninhabited Razo, where it numbers around 20 pairs (world population around 250 pairs). There is (was) also a remarkable species of endemic giant skink *Macrosclincus coctei* on Raso (now possibly extinct), and an endemic giant gecko *Tarentola gigas* which occurs on both islands. Other endemic reptiles are the geckos *Hemidactylus bouvieri razoensis* and *Tarentola caboverdiana raziana*, both on Razo. Evidence of nesting sea turtles has been seen on Branco, and both islands are important seabird nesting sites, including endemic subspecies of shearwater and storm-petrel (Miller, 1989; Stuart *et al.*, 1990).

**Ilheu Cural Velho** - see **Sal Rei, Boavista Island**

**Ilheu Maio**

Recommended

15°15'N, 23°15'W The north-west corner of this island, which maintains a unique and fragile vegetative cover, could be considered as a reserve. However, there are ongoing government plans to develop pastures in the area (Miller, 1989).

**Ilheu Rombos**

Recommended

14°58'N, 24°40'W Situated north of Brava island, these small islands have been recommended as total nature reserves. Marine turtles are known to nest on the islands, and several endemic species of plants and terrestrial reptiles occur. Breeding seabirds include Bulwer's petrel *Bulweria bulwerii*, Madeiran storm petrel *Oceanodroma castro*, white-faced storm petrel *Pelagodroma marina eadesi* and brown booby. Feral goats occur on Ilheu Grande (Miller, 1989).

**Ilheu Sal**

Recommended

16°40'N, 22°55'W The Pedra Lume area has been identified as having coral reefs worth preserving, and a recommended marine park here would also protect loggerhead turtle *Caretta caretta* nesting areas (Miller, 1989).

**Ilheu Santiago**

Recommended

15°00'N, 23°40'W The floras of the higher elevations of the Serras do Pico de Antonia and Malgueta are rich in endemics; these higher areas are also breeding grounds for soft-plumaged petrel and Cape Verde shearwater. A breeding colony of brown booby and lesser numbers of red-billed tropicbird *Phaethon aethereus* occurs on the cliffs of the Baía de Santa Clara, and the rare endemic subspecies of purple heron *Ardea purpurea bournei* nests in silk-cotton trees *Ceiba pentandra* in the Boa Entrada area (Miller, 1989).

**Ilheu São Nicolau**

Recommended

16°35'N, 24°20'W Over 43 endemic plant species occur on this island. The northern slope of Monte Gordo has been recommended for protection, including the nearby crater which contains a rich *Euphorbia tuckeyana* and *Odontospermum* biotype unique to the Cape Verde group, and which is threatened by road construction and cultivation. The steeper slopes of Monte Gordo between Faja de Cima and Praia Branco, which support wild biotopes of *Dracaena drago*, have also been recommended. An endemic subspecies of skink *Mabuya fogoensis nicolauensis* occurs. Soft-plumaged petrels breed on the island, where the species is exploited as a food resource (Miller, 1989; Stuart *et al.*, 1990).

**Island of Santa Antão**

Recommended

17°05'N, 25°05'W No specific areas have been designated for protection on this island. However, 48 endemic plant taxa occur, of which at least six are island specific and are threatened by firewood collecting in the Ribeira Grande and Planalto Leste areas. The higher elevations are important nesting sites for soft-plumaged petrel, one of five bird species endemic to the Cape Verde islands. Other endemic birds occurring are Cape Verde shearwater *Calonectris edwardsii*, and endemic races of red kite *Milvus milvus fasciicauda*, buzzard *Buteo buteo bannermani* and peregrine falcon *Falco peregrinus madens* (Miller, 1989).

**North Coast, Boavista Island - see Sal Rei, Boavista Island**

**Sal Rei, Boavista Island**

Recommended

16°05'N, 22°55'W The Baia de Sal Rei area is locally important for Palaearctic migrants. The vegetated dunes to the north of Sal Rei are worthy of protection, and the **North Coast** of the island should be investigated with regard to protecting turtle beaches and coral reefs. The small islands of **Baluarte** and **Cural Velho** have colonies of brown booby *Sula leucogaster* and magnificent frigatebird *Fregata magnificens*, the only nesting area in the western Atlantic ocean (Miller, 1989).

**São Vicente Island**

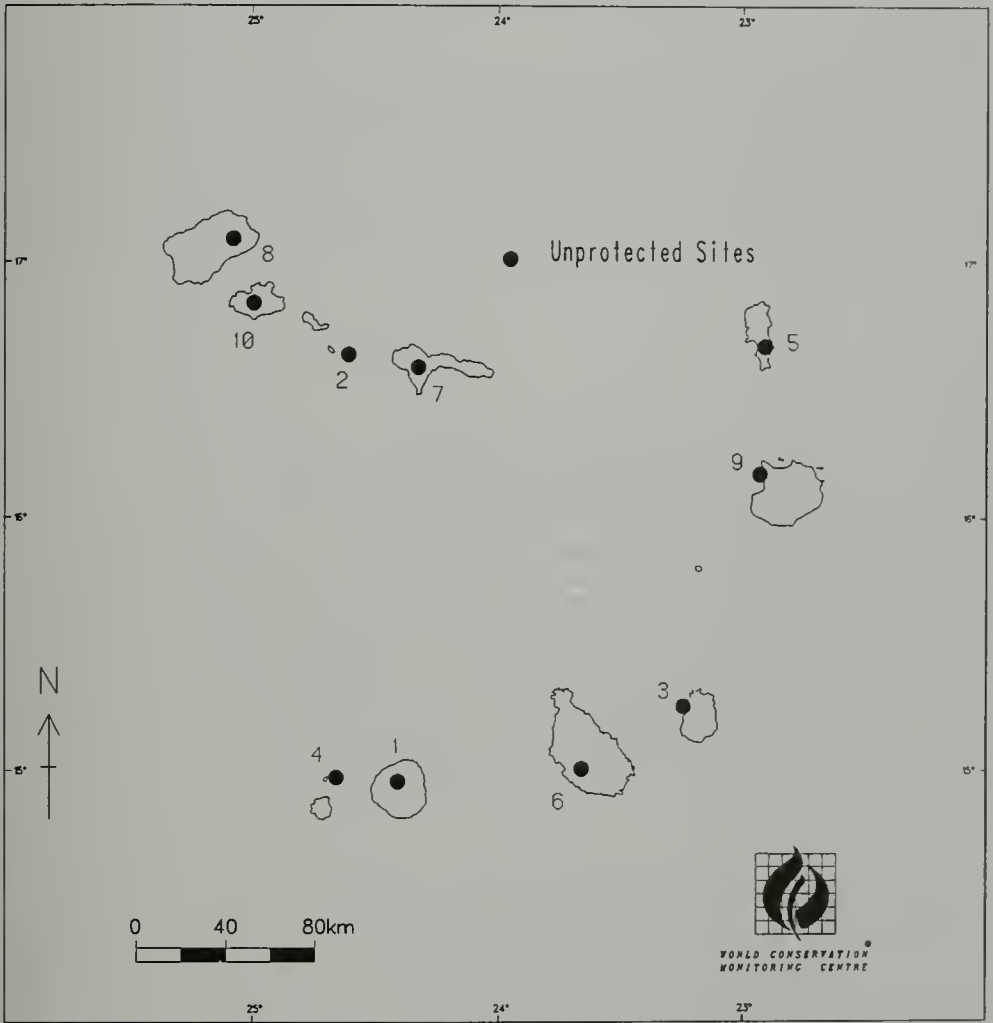
16°50'N, 25°00'W The Baia das Gatas area has coral reefs worthy of protection.

**General:** 12 endemic lizard species, 92 endemic vascular plants, 21 endemic bird subspecies occur on the islands (Stuart *et al.*, 1990).

**CAPE VERDE - UNPROTECTED SITES**

<b>Name of area and map reference (see Fig. 2.1)</b>	<b>Management area (ha)</b>
Cova Tina Integral Reserve	
1 Fogo Island	2,500
2 Ilheus Branco and Raso	
3 Ilheu Maio	
4 Ilheu Rombos	
5 Ilheu Sal	
6 Ilheu Santiago	
7 Ilheu São Nicolau	
8 Island of Santa Antão	
9 Sal Rei, Boavista Island	
10 São Vincente Island	

Fig 2.1 Cape Verde: unprotected ecologically sensitive sites







## CHAD

### INTERNATIONALLY DESIGNATED PROTECTED AREAS

#### Lac Fitri Biosphere Reserve

Proposed  
12°50'N, 17°30'E A Ramsar site covering 195,000ha was established in 1990, and an area of 160,000ha has been proposed as a biosphere reserve. Fringed by permanent swamps, the lake measures about 35km by 20km, with an average surface area of about 50,000ha. The birdlife is rich, and pelican are sometimes present in large numbers. Nile crocodiles are now rare, but elephant still occur. The lake is extensively fished (Burgis and Symoens, 1987; Hughes and Hughes, 1992; IUCN, 1987a; Stuart *et al.*, 1990).

### NATIONALLY PROTECTED AREAS

#### Manda National Park

IUCN Category II  
Covering an area of 114,000ha, this park is situated on a plain with dense savanna woodland. The Chari River bed provides an excellent refuge for animals, and contains natural watering holes. In the eastern part are numerous marshy areas around stagnant pools. The park was originally established for the protection of the giant eland (which may still be common) but does support a variety of ungulates. The marshes and river courses are rich in birdlife. Poaching is a continuing problem, and in the 1980s professional ivory poachers eliminated most of the elephant population; only a few elephant return in the dry season. Overgrazing by nomads' livestock occurs, and recently some permanent settlements have been established within the park. However, the fauna still merits increased protection, although there is currently insufficient equipment to ensure adequate surveillance (IUCN/UNEP, 1987; Stuart *et al.*, 1990).

#### Zakouma National Park

IUCN Category VI  
This park of 300,000ha is the core of **Bahr Salamat Faunal Reserve** (2,060,000ha) and lies on a vast plain with large rock outcrops in the west. The seasonal Bahr Salamat River shrinks to isolated waterholes in the dry season. Vegetation is a diverse Sudanese open wooded savanna. The park is notable for its population of several hundred elephant and supports a number other threatened species, many ungulates and a rich avifauna. Animal populations apparently remain high despite recent political events. Poaching increased in the 1970s and 1980s because of the increased availability of weapons, and a lack of staff and equipment to prevent it. Desertification is becoming a problem, particularly through invasion by transhumant cattle and villagers looking for water. However, Zakouma is now benefiting from a rehabilitation project financed by the EC (Daboulaye and Thomassey, 1990; IUCN/UNEP, 1987).

### OTHER MANAGED SITES

#### Abeche Refuge Area

305ha

IUCN Category VIII

**Aboutefan Faunal Reserve**

Dominated by sparsely vegetated massifs including Mt Guédi (1508m), this reserve of 110,000ha supports open savanna on its lower elevations, with woodland containing Sahelian elements at low density on the dry plains. The reserve was established to protect the greater kudu *Tragelaphus strepsiceros*; most other mammals occurring in the reserve are characteristic of the Chad fauna, with the exception of several savanna species such as buffalo, hippopotamus and certain antelopes. The greater kudu is protected by the inaccessibility of its preferred habitat, but densities of other wildlife species have decreased dramatically due to poaching pressure, and remain an important conservation concern. Surveillance and provision of equipment to deal with these problems have apparently been inadequate since 1965 (IUCN, 1989; IUCN/UNEP, 1987).

**Ahmadje Refuge Area**

IUCN Category VIII

345ha

**Bahr Salamat Faunal Reserve**

This reserve covers 2,060,000ha (including Lac Iro) surrounding **Zakouma National Park**. It is situated on a wide plain, drained by the Bahr Salamat River which only flows during the rainy season, at which time Lake Iro is flooded. During the dry season some waterholes persist around the lake's edge, and there are marshes along watercourses. The reserve includes both Sahelian and Sudanian savanna, resulting in a high diversity of flora and fauna. Mammals within the reserve are similar to those occurring in **Zakouma National Park**, with at least three threatened species and populations of giant eland and hippopotamus. The greatest threat is from well-armed poachers, who cannot be effectively controlled due to lack of personnel and equipment. There is some illegal cultivation and grazing within the reserve (IUCN/UNEP, 1987).

**Baibokum Refuge Area**

IUCN Category VIII

**Bebo Classified Forest**

IUCN Category VIII

12,400ha

**Binder Lere Faunal Reserve**

The reserve covers 135,000ha in a rocky, eroded area, centred on the Gauthiot Falls on the Mayo-Kebbi River; it includes two lakes. Notable for being located at the transition between open forest and savanna woodland, it was established to protect the hippopotamus population in the lakes. It also supports a variety of other mammal species. Many villages and intensive cultivation surround the reserve. Poaching is severe, particularly by raiders from Cameroon and the military. No development has occurred, although surveillance is carried out (IUCN/UNEP, 1987).

**Bokoro Refuge Area**

IUCN Category VIII

212ha

<b>Bongor Refuge Area</b> 49ha	IUCN Category VIII
<b>Deli Classified Forest</b> 2340ha	IUCN Category VIII
<b>Djoli Kera Classified Forest</b>	IUCN Category VIII
<b>Doba Refuge Area</b>	IUCN Category VIII
<b>Dora Kagui</b>	IUCN Category VIII
<b>Fada Archai Faunal Reserve</b> This reserve of 211,000ha comprises an eroded rocky area, interspersed with wadis and barren sand dunes in the south-west. A few small permanent ponds with rocky bottoms occur, but the area is notably barren, with a depauperate flora including species of <i>Acacia</i> and <i>Balanites</i> near the wadis. The reserve was primarily established to protect the barbary sheep, but there are also a few addax <i>Addax nasomaculatus</i> , cheetah and leopard, all of which are threatened species. Since 1972 political instability in the region has resulted in a lack of personnel, and insufficient equipment has been a drawback. Poaching is also becoming more efficient, with the introduction of modern weapons from nearby military bases (IUCN/UNEP, 1987).	
<b>Gagal Refuge Area</b> 215ha	IUCN Category VIII
<b>Haut Bragoto Classified Forest</b> 214,000ha	IUCN Category VIII
<b>Helibongo Classified Forest</b> 1254ha	IUCN Category VIII
<b>Kelo Refuge Area</b> 138ha	IUCN Category VIII
<b>Koundoul Refuge Area</b>	IUCN Category VIII
<b>Lac Ouei Classified Forest</b> 350ha	IUCN Category VIII
<b>Lere Refuge Area</b> 73ha	IUCN Category VIII

**Mandelia Faunal Reserve**

This is an area of 138,000ha, inundated by the floodwaters of the Chari and Logone rivers during the wet season. Fairly dense savanna woodland predominates, and

mammals include elephant (660 when the reserve was first established), several ungulate species and large numbers of birds around the waterholes and two rivers. However, there are insufficient staff and equipment to prevent illegal grazing and cultivation, and poaching, both by locals and from Cameroon, is a great problem. Many larger mammals appear to have migrated to Cameroon to avoid the hunting pressure, although there are reports of elephant and kob returning. Several villages remain in the reserve, and a number of bridges have been erected over rivers by the military. There are reports that the area may be degazetted.

**Massagnet Sylvo Pastorale Reserve**  
140,000ha

IUCN Category VIII

**Moundon Refuge Area**

IUCN Category VIII

**Ouadi Rimé-Ouadi Achim Faunal Reserve**

Covering 8,000,000ha within a shallow, featureless depression in a part of the Chad basin, this reserve comprises a system of both semi-permanent and mobile low sand dunes, and granitic outcrops; wadis are the most prominent feature. Wooded steppe and annual grasses occur on some dunes, but sub-desert and desert cover two-thirds of the area. The reserve was set up to protect the threatened cheetah, addax *Addax nasomaculatus* and scimitar-horned oryx *Oryx dammah*, and the reserve holds one of the last viable wild breeding populations of the last-named species. Ostrich also occur. Extensive poaching by nomads, motorised hunters and the military takes place, and there is grazing conflict between domestic stock and wild ungulates. The opening of wells near the winter quarters of addax and oryx has caused an increase in poaching. These species concentrate around the wells, and there is a concomitant increase in the numbers of domestic animals. Equipment has always been inadequate, but all personnel left the reserve in 1979 for security reasons. However, it is still probably the most important protected area in the Sahelian sub-desert zone (IUCN, 1989).

**Pala Refuge Area**  
112ha

IUCN Category VIII

**Siagon Yamodo Classified Forest**  
46,500ha

IUCN Category VIII

**Siniaka-Minia Faunal Reserve**

This area of 426,000ha lies on an immense plain broken on one side by a few rocky massifs up to 1613m. It is traversed by the seasonal Siniaka and Dorioum rivers, which retain waterholes in the dry season. In the north is thorny scrub and thicket, which grades into Sudan savanna further south. The reserve has been important for black rhinoceros in the past (six were recorded in 1974), greater kudu and giant eland, and supports other threatened species. However, lack of equipment and staff make surveillance almost impossible and, as military arms and vehicles are easily available to hunters, there is considerable poaching. Mammal populations of conservation importance still remain, however (IUCN, 1989).

**Timberi Classified Forest** IUCN Category VIII  
64,000ha

**Yamba Berete Classified Forest** IUCN Category VIII  
521ha

## UNPROTECTED SITES

**Beinamar Faunal Reserve** Proposed  
8°40'N, 15°23'E Covering 76,500ha and proposed by local peoples, this area contains some rare species (IUCN, 1987a).

**Ennedi Massif**  
16°30'-16°54'N, 21°46'-22°15'E The western edge of this area is deeply gullied, with forested gorges supporting dense riparian forests of *Acacia nilotica*, *Adina microcephala*, *Ficus sycomorus* and *Balanites aegyptiaca*. Well-watered, it is still home to fair numbers of Nile crocodile, and lion, cheetah, leopard, striped hyena and baboon are still found. The watering points are visited by nomads, but the area is remote and essentially uninhabited. Part of the massif is within **Fada Archai Faunal Reserve** (Hughes and Hughes, 1992).

**Goz-Beida National Park** Proposed  
12°10'N, 21°20'E Situated to the north of the Salamat floodplains, this area was proposed by local peoples, covers 300,000ha and is the home of rare species (Burgis and Symoens, 1987; IUCN, 1987a).

**L'Aouk National Park** Proposed  
Covering an area of 740,000ha in southern Chad, this park would include the seasonal migrational routes of elephants currently threatened by poaching (IUCN, 1987a; Stuart *et al.*, 1990).

**Lake Chad**  
12°51'-14°27'N, 13°30'-15°20'E This is a vast Sahelian wetland, important to Palaearctic waterfowl, and home to 84 species of fish. The little-known river prinia *Prinia fluviatilis* occurs, as do hippopotamus, sitatunga and the Nile crocodile (now rare) (Burgis and Symoens, 1987; Hughes and Hughes, 1992; Stuart *et al.*, 1990).

**Larmanaye Total Faunal Reserve** Proposed  
An area of 88,200ha proposed by local peoples, and which supports rare species (IUCN, 1987a).

**Ndjamena** Recommended  
12°07'N, 15°01'E The little-known river prinia occurs in this area (Stuart *et al.*, 1990).

**Tibesti Massif**

Recommended

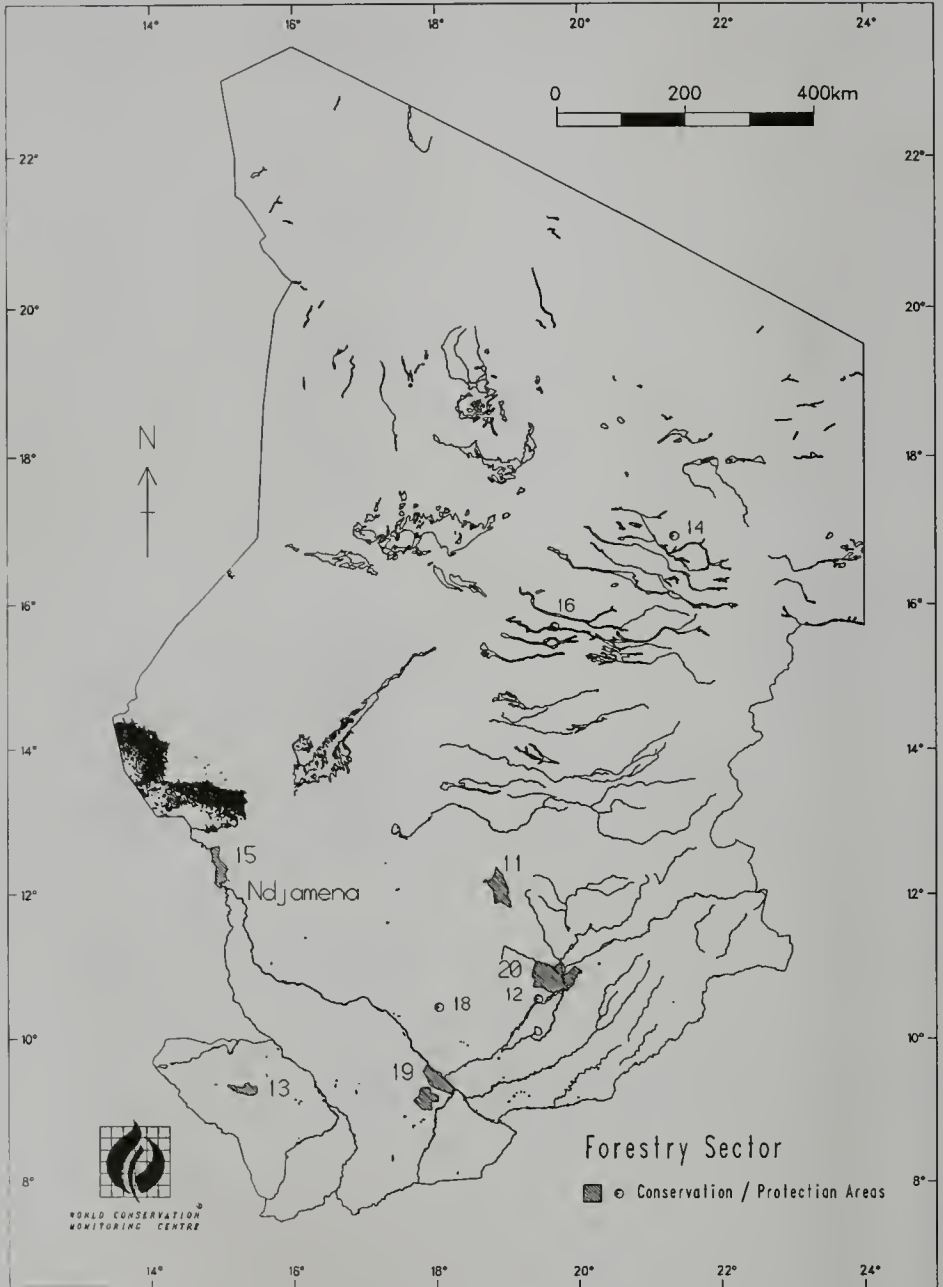
20°00'N, 18°00'E (centre) This large arid mountainous area covers an area of about 6,000,000ha above the 1000m contour, with at least 50% of this occurring over an elevation of 1500m. Residual volcanic activity is still evident in the form of fumaroles, hot springs and mud pools (Hughes and Hughes, 1992).

## CHAD - PROTECTED SITES

*National/international designations*

Name of area and map reference (see Fig. 3.1)	Management area (ha)	Year notified
<b>Classified Forests</b>		
1 Bebo	12,400	
2 Deli	2,340	
3 Djoli Kera		1955
4 Dora Kagui	521	
5 Haut Bragoto	214,000	
6 Helibongo	1,254	1956
7 Lac Ouei	350	
8 Siagon Yamodo	46,500	
9 Timberi	64,000	
10 Yamba Berete	521	
<b>Faunal Reserves</b>		
11 Aboutelfan	110,000	1955
12 Bahr Salamat	2,060,000	1964
13 Binder Lere	135,000	1974
14 Fada Archai	211,000	1967
15 Mandelia	138,000	1969
16 Ouadi Rimé-Ouadi Achim	8,000,000	1969
17 Réserve de la Biosphère de Lac Fitri	50,000	1989
18 Siniaka-Minia	326,000	1965
<b>National Parks</b>		
19 Manda	114,000	1969
20 Zakouma	300,000	1963
<b>Ramsar Wetland Sites</b>		
17 Réserve de la Biosphère de Lac Fitri	195,000	1990

Fig 3.1 Chad: protected ecologically sensitive sites

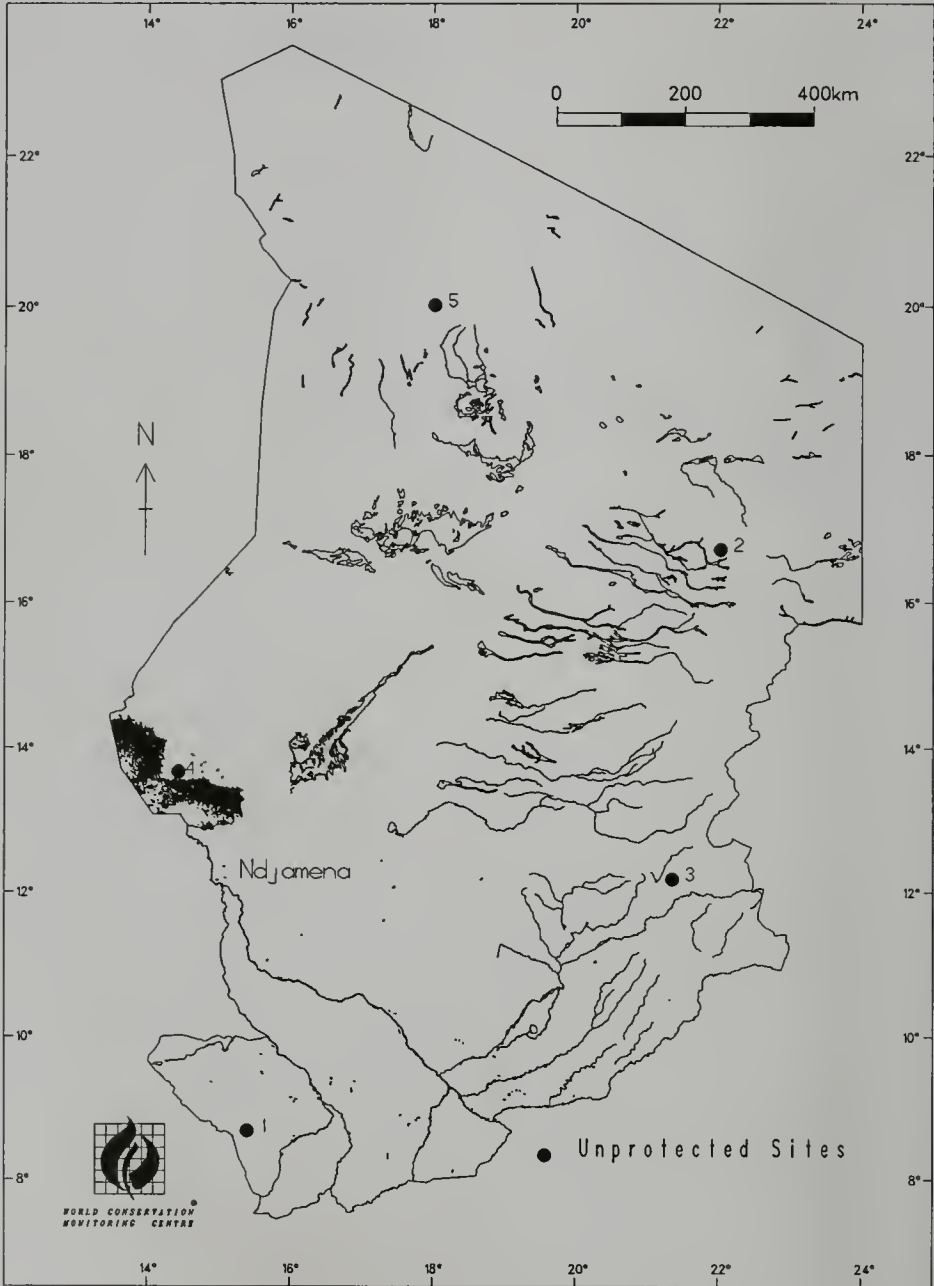




**CHAD - UNPROTECTED SITES**

<b>Name of area and map reference (see Fig. 3.2)</b>	<b>Management area (ha)</b>
1 Beinamar Faunal Reserve	76,500
2 Ennedi Massif	
3 Goz-Beida National Park	300,000
L'Aouk National Park	740,000
Lac Fitri Biosphere Reserve	160,000
4 Lake Chad	
Larmanaye Total Faunal Reserve	88,200
Massagnet Sylvo Pastorale Reserve Njamena	140,000
5 Tibesti Massif	

**Fig 3.2 Chad: unprotected ecologically sensitive sites**



## GAMBIA

### INTERNATIONALLY DESIGNATED PROTECTED AREAS

None

### NATIONALLY PROTECTED AREAS

#### **Abuko Nature Reserve**

IUCN Category IV

This 107ha reserve is bisected by the Lamin stream, which has been dammed to form a series of small pools at one end of the reserve. Because of drought and the exacerbating effect of vegetation removal around the reserve, this stream has not flowed in recent times. The most notable feature of the reserve is a narrow strip of dense evergreen riverine forest (uncommon in the Gambia) along the stream, giving way to open Guinean savanna. The forest is valuable in sheltering a number of species whose main distribution is in the rain forest zone further south, such as two-spotted palm civet and green turaco. It supports over 200 bird species, and two threatened species of crocodile. The reserve is fenced, but poaching and attacks on visitors occur. Water supply is a major problem (IUCN/UNEP, 1987).

#### **Kiang West National Park**

IUCN Category II

This 11,000ha park includes **Faba Forest Park**, and is bisected by the Ngakingkoi bolon, a tributary of the River Gambia. Vegetation is predominantly dry deciduous woodland and Guinea savanna, with patches of acacias and mangroves. The area supports a rich fauna, including West African manatee *Trichechus senegalensis* and Nile crocodile in the lagoons and river. Poaching, agriculture and deforestation occur within the reserve, although manatee are now too rare to be regularly hunted. Farmers illegally hunt warthogs within the reserve, as they damage crops (IUCN/UNEP, 1987).

#### **Niumi/Sine Saloum National Park**

IUCN Category II

13°34'-14°10'N, 15°48'-16°48'W This park covers an area of 4940ha. It is a cooperative conservation exercise with Senegal, supporting valuable mangroves and wetland, with breeding waterbirds (IUCN, 1987a; Stuart *et al.*, 1990).

#### **River Gambia National Park**

IUCN Category II

Covering an area of 2500ha, this park comprises a group of five islands in the River Gambia, covered with high riverine forest; Baboon Island being the largest of these. The park lies opposite **Nyassang Forest Park** on the mainland, adjacent to **Kaolang Forest Park**. The most numerous large animals are warthog and savanna baboon, and the presence of aardvark is notable. The area is important as the site for a chimpanzee rehabilitation scheme, although the main base camp is now located on the neighbouring mainland. Little disturbance is reported (IUCN/UNEP, 1987).

### OTHER MANAGED AREAS

None

## UNPROTECTED SITES

### **Allahein River**

Situated in the north of the country, this river forms the border with Senegal. It supports mangroves extending up-river in a continuous belt 1-2km wide. Further upstream there is herb swamp, and an open tidal lagoon of about 100ha extends into the dune swales of Kartung to the north and west of the river mouth. A swamp system occurs in the dune swales between Gunjur (13°16'N, 16°46'W) and Sanyang (13°16'N, 16°46'W). There is also riverine forest which supports several primate species. However, hunting has exterminated hippopotamus and nearly wiped out the Nile crocodile. Tributary streams are fished, and rice is grown on a small scale on swamp edges (Hughes and Hughes, 1992).

**Bau Bolon Wetland Reserve**  
3,500ha

Proposed

### **Bund Road Mangroves, Banjul**

13°26'N, 16°40'W (approx.) This is a tidal area of mudflats and mangroves at the mouth of the Gambia River. It supports a number of Palaeartic migrants including sacred ibis and avocet, and provides a roost for a wide range of waders. A sewage outlet discharges into the area (Edberg, 1982).

### **Camalou Corner**

Situated south of Bakau, a few kilometres to the west of Banjul (also known as Stink Corner), the area includes a complex of mudflats, mangroves and rice fields which support a variety of resident waterbirds and a number of Palaeartic migrants, and a varied flora. The Gambian Ornithological Society has a photography hide here (Edberg, 1982).

**Coastal Reserve**  
1000ha

Proposed

**Faba Forest Park - see Kiang West National Park**

### **Gambia River**

Permanent tidal swamps extend in a semi-continuous belt along the lower estuary of this river, reaching nearly 200km upstream. Extensive mangroves in the lower reaches spread up to 8km from the river channel, with palm-pandam or herb swamps in the upper reaches. There is considerable traffic along the river and some hunting takes place, with hippopotamus and Nile crocodile hunted almost to extinction, and many waterfowl taken. The less saline areas upstream have been extensively cultivated with rice, which has increased the problems of siltation and erosion. Some areas of mangrove and mudflat are protected in **River Gambia** and **Kiang West** national parks (Hughes and Hughes, 1992).

**Kadang Forest Park**

This is an area of dry deciduous forest near the River Gambia, on the mainland opposite **Kiang West National Park**, which has been recommended for inclusion in this park (Bijleveld *in litt.*, 1975).

**Nyassang Forest Park**

This is an area of dry deciduous forest bordering the River Gambia, on the mainland opposite **Kiang West National Park**, recommended for inclusion in this park (Bijleveld *in litt.*, 1975).

**Tendaba**

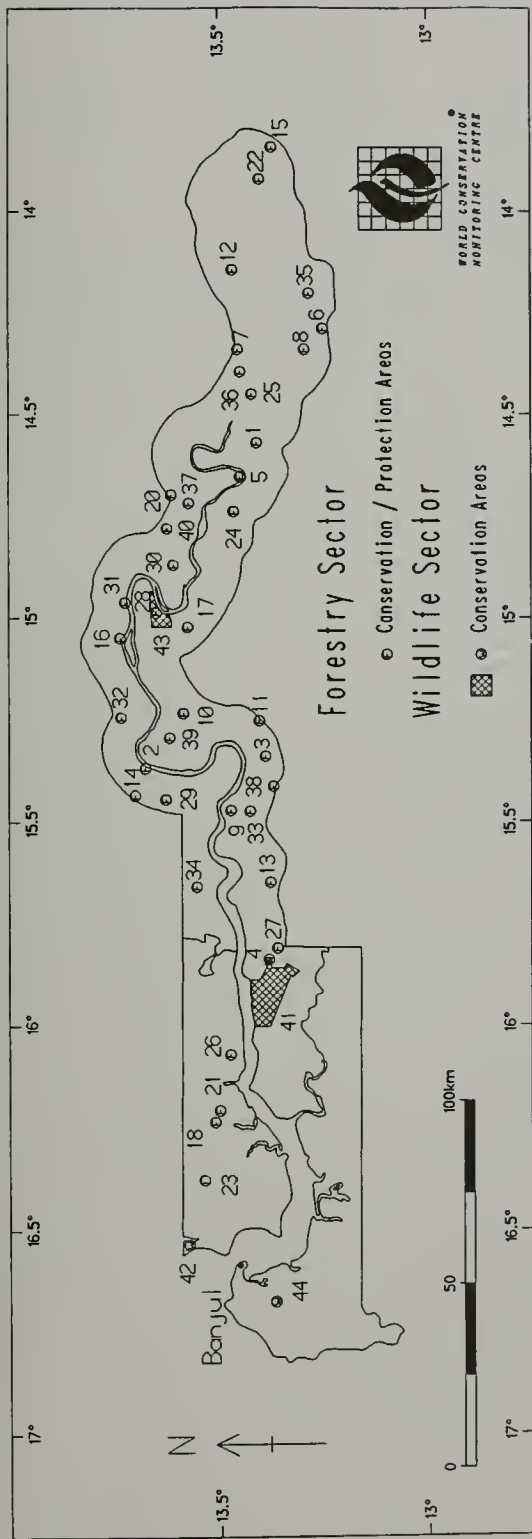
13°20'N, 16°16'W (approx.) This is the site of a tourist camp on the south bank of the River Gambia about 150km upstream from Banjul; it supports mangroves (mainly *Rhizophora racemosa*), savanna and some swamps and waterholes. Birdlife is abundant, and manatee, serval, bushbuck and several primate species occur. Cultivation borders the area, and areas of swamp have been developed for rice (Edberg, 1982).

**GAMBIA - PROTECTED SITES**

*National/international designations*

<b>Name of area and map reference (see Fig. 4.1)</b>	<b>Management area (ha)</b>	<b>Year notified</b>
<b>Forest Parks</b>		
1 Bankuba	850	1954
2 Belel	405	1954
3 Beri Kolon	1,052	1954
4 Brikama	356	1954
5 Dobo	704	1954
6 Gambisara	308	1954
7 Hamdulai	112	1954
8 Helakunda	101	1954
9 Jabisa	16	1954
10 Jamara	579	1954
11 Jambangkunda	356	1954
12 Jeloki	858	1954
13 Jollifin	439	1954
14 Jumbo Yaka	227	1954
15 Jundaia	437	1954
16 Kahi Badi	1,485	1954
17 Kaolong	2,379	1954
18 Kasaywa	202	1954
19 Kenowore	67	1954
20 Kiberi	389	1954
21 Kumadi	283	1954
22 Kusun	316	1954
23 Lohen	95	1954
24 Madina Demba	2,373	1954
25 Mamato Konko	431	1954
26 Marike	174	1954
27 Mutaro Kunda	809	1954
28 N'Jassang	2,347	1954
29 Ngeyen	612	1954
30 Ngongonding	1,250	1954
31 Niani Maru	607	1954
32 Njau	364	1954
33 Nyanaberi	1,198	1954
34 Pakala	1,161	1954
35 Sabbi	73	1954
36 Sakaru Dalla	261	1954
37 Sao Frest	728	1954
38 Se-Ulumbang	529	1954

Fig 4.1 Gambia: protected ecologically sensitive sites



GAMBIA - PROTECTED SITES (cont.)

*National/international designations*

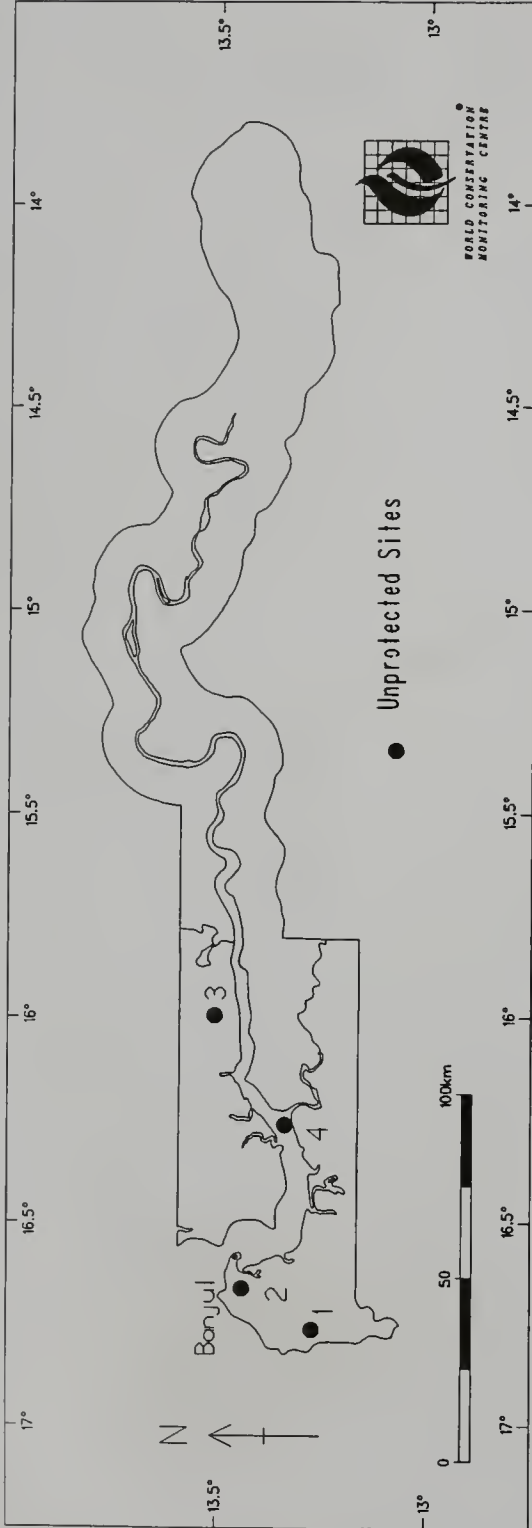
Name of area and map reference (see Fig. 4.1)	Management area (ha)	Year notified
39 Sikunda	445	1954
40 Tanu	2,667	1954
<b>National Parks</b>		
41 Kiang West	11,000	1987
42 Niuni/Sine Saloum	4,940	1987
43 River Gambia	2,500	1978
<b>Nature Reserve</b>		
44 Abuko	107	1968



**GAMBIA - UNPROTECTED SITES**

<b>Name of area and map reference (see Fig. 4.2)</b>	<b>Management area (ha)</b>
1 Allahein River Bau Bolon Wetland Reserve	3,500
2 Bund Road Mangroves, Banjul Camalou Corner Coastal Reserve	1,000
3 Gambia River Kadang Forest Park	
4 Tendaba	

Fig 4.2 Gambia: unprotected ecologically sensitive sites



## MALI

### INTERNATIONALLY DESIGNATED PROTECTED AREAS

#### **Boucle du Baoulé Biosphere Reserve**

IUCN Categories II, and IX

This biosphere reserve of 771,000ha comprises **Boucle du Baoulé National Park** (350,000ha), and **Fina** (136,000ha), **Badinko** (193,000ha) and **Kongossambougou** (92,000ha) **faunal reserves**. An additional 17 forest reserves between Negala and Kita form part of a complex of about one million hectares. The area is relatively flat, with numbers of inselbergs. Vegetation includes Sudano-Guinean savanna and Sahelian savanna in the north, with dense riverine forest along the Baoulé River. The area formerly supported many animal species, but large mammal populations have been devastated; particularly noteworthy were the giant eland *Taurotragus oryx derbianus* and giraffe, but these may have disappeared. Large animals are under heavy pressure from hunting and competition with livestock; subsistence farmers have moved into the interior since the 1984 drought. Erosion around waterholes is severe, and much of the park is burnt each year. Lack of a guard force stationed in the field seriously handicaps enforcement measures. Restoration of the national park is identified as a priority project, but given the competing land pressures and the present status of the fauna, priorities within the reserve should perhaps be re-evaluated (IUCN/UNEP, 1987).

#### **Falaise de Bandiagara**

IUCN Category VII and X

This World Heritage site of 400,000ha is on a 150km escarpment, 100m-500m high. It is interrupted by ravines with a more humid microclimate and denser vegetation. Water is retained in rock fissures, resulting in seasonally boggy areas on flatter surfaces. This area is best known as a centre of the Dogon culture, particularly for the series of cliff cemeteries reached by ladders. However, the botany of the region is of great interest; the escarpment supports important refugial communities of types destroyed by man in more accessible localities, and the ravine flora is a relict, more humid type in an otherwise arid climate. The region is notable for being located at the transition between Sudano-Sahelian and Sahelian phytogeographic regions. There is a varied resident and migratory bird fauna, including cliff species such as fox kestrel and cliff chat, and the pools attract many animal species. The greatest threats include drought and desertification, and the savanna vegetation has been profoundly degraded by fire and scrub clearance, especially around villages (IUCN/UNEP, 1987).

#### **Walado Debo (Lac Debo)/Lac Horo/Séri**

This Ramsar site includes three areas: **Walado Debo (Lac Debo)** (103,100ha), **Lac Horo** (18,900ha), and **Séri** (40,000ha), all situated in the inland delta of the Niger River and covering a total area of 162,000ha (less than 5% of the whole delta). The delta is the largest wetland in West Africa, a crucial wintering region for thousands of Palaearctic and inter-African migrants with 350 bird species recorded, and supporting possibly the largest surviving population of West African manatee. It lies within the semi-desert region of the Sahel, and is exceptional in its annual floods covering up to 25,000km<sup>2</sup> of land. However, in recent drought years less than 5,000km<sup>2</sup> have been flooded. In the dry season the lakes, including Debo and Horo,

are particularly important for waterfowl. Lac Horo is separated from the Niger River by a sluice, and dries up in drought years. The Niger Delta used to be rich in larger mammals, but many antelope species were wiped out during the 1968-1973 droughts. The whole of the Niger delta is densely populated, and fishing, pastoralism and subsistence farming are the main livelihoods. In the dry season, thousands of pastoralists with up to 230,000 cattle and hundreds of thousands of sheep and goats use the area, at which time livestock densities are the highest in Africa. The wildfowl population is exploited by local people, with tens of thousands of birds killed annually (IUCN/UNEP, 1987, Ramsar Convention Bureau, 1990).

## NATIONALLY PROTECTED AREAS

**Badinko Faunal Reserve** IUCN Category IV  
Established in 1951; 193,000ha

**Bafing Makana Faunal Reserve** IUCN Category IV  
This is a relatively new reserve of 158,989ha, situated above the Manantali dam in the Sudano-Guinean savanna zone among hilly terrain, drained by many seasonal and a few permanent watercourses. There is apparently a small village within the reserve, and several on the periphery. A national park in the area has been proposed (Ministry of Environment, Bamako *in litt.*, 1990).

**Banifing-Baoulé Faunal Reserve** IUCN Category IV  
Established in 1954; 13,000ha (Stuart *et al.*, 1990).

**Bossofola Classified Forest** IUCN Category VI  
Established in 1944; 12,000ha

**Douentza Faunal Reserve** IUCN Category IV  
Established in 1960; 1,200,000ha

**Faya Classified Forest** IUCN Category VI  
Established in 1954; this isolated 79,822ha reserve is situated in the west of the country (Stuart *et al.*, 1990).

**Fina Faunal Reserve** IUCN Category IV  
Established in 1954; 136,000ha

**Gourma Elephant Partial Faunal Reserve** IUCN Category VI  
This reserve encompasses 1,200,000ha of savanna woodland, with sandy areas covered by grasses such as cram-cram *Cenchrus* sp. The only water body in the reserve is a temporary lake. The reserve is best known, and was mainly set up for, its elephant population; these animals migrate to Burkina Faso at the end of the dry season. Other large mammals include threatened species such as dama gazelle *Gazella dama* and red-fronted gazelle *G. rufina*. There are no villages within the reserve, but several large ones exist on its periphery. Poaching, and competition from domestic animals for scarce water resources are serious problems and, in the past, lack of staff and

equipment have been a severe handicap. Dry season water bodies have recently been colonised by up to 300 people displaced by drought, and extensive cultivation around marshes causes conflicts with elephants (IUCN/UNEP, 1987).

**Kenié-Baoulé Faunal Reserve** IUCN Category IV  
This 67,500ha reserve comprises Sudano-Guinean savanna. It supports mammals such as buffalo and, reportedly, giant eland. Poaching, forest exploitation and agriculture occur (IUCN/UNEP, 1987).

**Kongossambougou Faunal Reserve** IUCN Category IV  
Established in 1955; 92,000ha

**Nafadji Classified Forest** IUCN Category VI  
Established in 1952; 43,000ha (Stuart *et al.*, 1990).

**Sounsou Faunal Reserve** IUCN Category IV  
This 37,600ha reserve consists of Sudanian savanna, with gallery forest along watercourses. Mammals include elephant and several primate species (IUCN/UNEP, 1987).

**Talikourou Faunal Reserve** IUCN Category IV  
Established in 1953, this 13,900ha reserve incorporates the Mali-Mauritanian migration routes of oryx and addax.

#### OTHER MANAGED AREAS

**Asongo-Menaka Partial Faunal Reserve** IUCN Category IV  
Covering 1,750,000ha, this reserve is bordered by the River Niger to the west, and the international border with Niger to the south. The vegetation is predominantly Sahelian. The reserve was established to protect giraffe populations, but due to drought and poaching the last giraffe was killed in 1987. Antelope and hippopotamus populations have also declined. The reserve is surrounded by villages, and poachers cross the border from Niger. Encroachment by livestock is a further threat to surviving wildlife populations (IUCN/UNEP, 1987).

#### UNPROTECTED SITES

**Adrar des Iforhas** Recommended  
20°00'N, 1°40'E (approx.) This is a large plateau area in the north-east of the country, thought to be worthy of protection.

**Bafing National Park** Proposed  
This park will cover up to 316,000ha of rugged terrain, incorporating laterite plateaux, sandstone hills and spectacular escarpments. The park has been proposed in order to compensate for loss of riparian forest and wildlife through the inundation of 47,700ha by a dam on the Bafing River. Bafing contains the only relatively intact stand of

Sudano-Guinean savanna in Mali, and is the only site in the country where the fauna is diverse and abundant. It includes a chimpanzee population, and Mali's last viable populations of giant eland and buffalo. Because of its inaccessibility the area is sparsely populated, but very heavy poaching by locals and Mauritians occurs, and there are bushfires (IUCN/UNEP, 1987).

**Diaka River Floodplains - see Inner Niger Delta**

**Inner Niger Delta**

Recommended

13°34'-16°51'N, 2°28'-5°45'W This is the largest floodplain in West Africa, covering 1,700,000ha. Important for waterbirds, warthog and manatees, it includes **Lac Debo, Lac Fanguibine, Lac Oro and Séri**, and the **Diaka River Floodplains**. Over 100 species of fish have been recorded, but few endemics occur. One endemic that does occur is a planktivorous clupeid *Microthrissa miri*. The area is of enormous importance to waterfowl, and over 350 species of bird have been recorded. It is an important breeding area for pelican, heron, cormorant and pratincole; the last is rare, as are hippopotamus. Human impacts on the area are significant (Hughes and Hughes, 1992; IUCN, 1989).

**Lac Debo - see Inner Niger Delta**

**Lac Fanguibine**

16°40'N/4°00'W Situated in an arid part of the **Inner Niger Delta**, this is the deepest lake in the area. When full, its surface area is around 450km<sup>2</sup>. It is important for waterfowl, and crocodiles, hippo, otter and manatee occur (Burgis and Symoens, 1987; Stuart *et al.*, 1990).

**Sikasso Forests**

10°50'N, 5°50'W These are isolated species-rich forest fragments, containing chimpanzees occurring at the northernmost limit of distribution (IUCN, 1987a; Stuart *et al.*, 1990).

## MALI - PROTECTED SITES

*National/international designations*

<b>Name of area and map reference (see Fig. 5.1)</b>	<b>Management area (ha)</b>	<b>Year notified</b>
<b>Classified Forests</b>		
1 Bossofolo	12,000	1944
2 Faya	79,822	1954
3 Nafadji	43,000	1952
<b>Faunal Reserves</b>		
4 Badinko	193,000	1951
5 Bafing Makana	158,989	1990
6 Banifing-Baoule	13,000	1954
7 Douentza	1,200,000	1960
8 Fina	136,000	1954
9 Kenié-Baoulé	67,500	1952
10 Kongossambougou	92,000	1955
11 Sounsan	37,600	1954
12 Talikourou	13,900	1953
<b>National Park</b>		
13 Boucle du Baoulé	350,000	1954
<b>Partial Faunal Reserves</b>		
14 Ansongo-Menaka	1,750,000	1956
15 Gourma Elephant	1,200,000	1960
<b>Sanctuary</b>		
16 Falaise de Bandiagara natural and cultural	400,000	
<b>Biosphere Reserve</b>		
13 Parc national de la Boucle de Baoulé	771,000	1982
<b>Ramsar Sites</b>		
Lac Horo	18,900	
Séri	40,000	
Walado Debo (Lac Debo)	103,100	
<b>World Heritage Sites</b>		
16 Falaise de Bandiagara	400,000	1989

**Fig 5.1 Mali: protected ecologically sensitive sites**

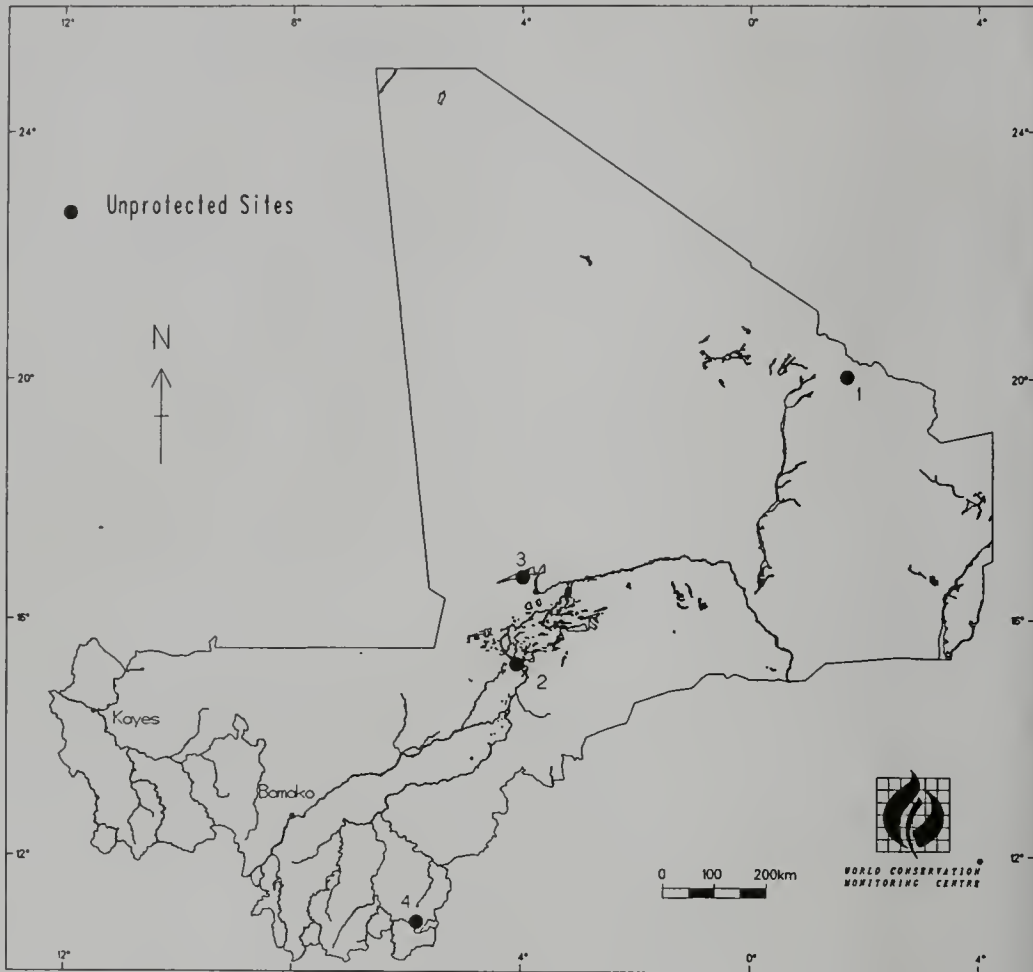




**MALI - UNPROTECTED SITES**

<b>Name of area and map reference (see Fig. 5.2)</b>	<b>Management area (ha)</b>
1 Adrar des Iforhas Bafing National Park	316,000
2 Inner Niger Delta	
3 Lac Fanguibine	
4 Sikasso Forests	

**Fig 5.2 Mali: unprotected ecologically sensitive sites**



## MAURITANIA

### INTERNATIONALLY DESIGNATED PROTECTED AREAS

#### **Banc d'Arguin National Park**

IUCN Categories II and X

This park is both a World Heritage site (1,200,000ha) and a Ramsar site. It covers 1,173,000ha, and is divided equally between marine and terrestrial habitats, and is in a transitional area between the Afrotropical and Palaearctic biogeographic realms. Sandy areas predominate, with a 7400ha marsh and vast mudflats, and many islands in the shallow coastal waters. There are 3100ha of mangroves, the most northerly on this coast. About 30% of the seven million wading birds which use the Atlantic flyway overwinter at Banc d'Arguin, the largest winter concentration of Palaearctic migrants in the world. At least 108 Palaearctic and Afrotropical species have been recorded, and many species breed here. The park contains the largest known colony (150) of monk seals, 25% of the world population, and is a nesting site for four threatened species of marine turtle. It was established to protect both the natural resources and the nationally valuable fisheries. There is a lack of effective protection, and about 500 Imraguen fishermen live in seven villages within the park; however, the local inhabitants do not hunt birds. Overfishing by international fleets occur just outside the park, which may have an adverse affect upon colonies of piscivorous birds. An invasion of rats threatens seabird colonies, and there is illegal hunting of turtles. The status of the monk seal population is critical following the collapse of their breeding caves in 1982. The Netherlands is supporting a major research programme, and may supply a sea-going vessel for fishery patrol and research (IUCN/UNEP, 1987; Ramsar Convention Bureau 1990).

### NATIONALLY PROTECTED AREAS

#### **Baie du Levrier (Cap Blanc) Integral Reserve**

IUCN Category I

21°00'N, 17°00'W Established in 1986, this 310,000ha reserve supports a very important non-breeding population of monk seals, and four species of marine turtle occur in the area. Its integration into **Banc d'Arguin** has been recommended (IUCN, 1987a; Stuart *et al.*, 1990).

#### **Diawling National Park**

IUCN Category II

An area of 13,000ha adjacent to **Djoudj National Park** in Senegal, has been proposed in this, one of the major wetlands of Sahelian Africa; it is a staging point and wintering area for many birds that breed in Eurasia. This vast basin of saline flats is subject to annual flooding; the development of dyke systems in Senegal over the last 20 years has caused water to persist longer in some areas of the basin, but in other areas the fragile soils have become desiccated. Dune areas support a tree cover, and 5ha of mangroves occur. The Senegal River is a feeding site for many Palaearctic migrants, and provides an important breeding ground for fish and marine crustacea. The West African manatee and the Nile crocodile, both formerly abundant, have almost disappeared. The vegetation has been affected by drought, overgrazing and firewood collection. Hydro-agricultural development has considerably modified this area over the last 20 years, interfering with water levels and salinity. The full

## *Ecologically Sensitive Sites of Africa*

ecological effects of the recently constructed Diama dam are poorly known. However, there are plans to create an international reserve here, and to possibly create an artificial estuary (IUCN/UNEP, 1987).

**El Agher Partial Faunal Reserve** IUCN Category IV  
Established in 1937, this reserve of 250,000ha supports a residual Sahelian fauna requiring more intensive management (IUCN, 1987a).

**Elephant Partial Faunal Reserve** IUCN Category IV

**Iles Mauritanienes Integral Reserve** IUCN Category I  
Established in 1962, this reserve protects fish breeding areas and nesting birds.

**Las Cuevecillas Integral Reserve** IUCN Category I  
Established in 1986, this reserve is contiguous with **Banc d'Arguin National Park**, and is important for waders (Stuart *et al.*, 1990).

**Moufflon Faunal Reserve** IUCN Category IV  
Established in 1982, this reserve was created to protect elephant.

**Tilemsi Partial Faunal Reserve** IUCN Category IV  
15°50'N, 5°50'W Situated in the extreme south-east of the country, this reserve was created to protect Dorcas and red-fronted gazelles.

## OTHER MANAGED AREAS

None

## UNPROTECTED SITES

### **Aftout es Saheli**

16°36'-18°07'N, 16°26'-15°59'W Recommended as a Ramsar site, this 120,000ha coastal lagoon extends for 165km between Nouakchott and St Louis in Senegal, in the northern part of the Senegal River delta. Formed by deposition of marine sands across the mouth of an ancient river channel, it is one of the last remaining undisturbed wetlands in the Mauritanian part of the delta. It is dependent on periodic inundation by the Senegal River, and is seriously threatened by plans to regulate the river flow. A management plan for the region has shown that with proper planning it would be possible to develop rice production in the delta without endangering the Aftout. Vegetation includes *Tamarix senegalensis*, *Arthrocnemum glaucum* and *Avicennia africana*, as well as *Phragmites*, *Scirpus* and *Typha* species in areas of prolonged inundation. It is one of the last remaining fish nurseries in this area, and is of importance to waterfowl, especially white pelican (2200) and greater (7200) and lesser (2200) flamingo. It is a feeding area for birds from **Djoudj National Park** and **Langue de Barbarie** (Senegal), and supports an avifauna of at least 120 species. Sparsely populated, the area suffers from intense poaching (Hughes and Hughes, 1992; van Wetten, 1990).

**Gorgol River**

16°10'N, 13°15'W This area has been identified as being of importance to waterfowl; species include the Palearctic migrant *Limosa limosa* (van Wetten *et al.*, 1990).

**Lake d'Aleg**

17°02'-17°09'N, 13°54'-14°04'W This is a semi-permanent saline lake to the north-west of Aleg. Covering 4275ha and fringed by halophytic vegetation, it is a possible nature reserve (Hughes and Hughes, 1992).

**Lake du Mâl**

16°55'-16°59'N, 13°17'-13°26'W This saline lake covers 870ha, and is a possible nature reserve. It is of local importance to waterfowl (Hughes and Hughes, 1992).

**Lake Rkiz**

16°45'-16°55'N, 15°10'-15°27'W Adjacent to the town of Rkiz, this semi-permanent 12,970ha lake is fringed by *Phragmites* and *Typha* marshland, and a rich avifauna is present. Slender-snouted crocodile occur, as well as an abundance of small mammals, including two otter species, water mongoose and cane rat. The lake is fished, and reeds are cut for thatching. It is a possible nature reserve (Hughes and Hughes, 1992).

**Lake Tianbrank - see Senegal River Delta****Marais de Toumbos - see Senegal River Delta****Mares de Kankossa and Kaora**

15°50'-16°00'N, 11°30'-11°36'W Covering 1540ha, this is an area of reedbeds and gallery forest. The lakes are a possible nature reserve (Hughes and Hughes, 1992).

**Mare de Mahmoudé**

16°18'-16°31'N, 7°31'-7°44'W Covering a total area of 40,000ha of which 2000ha is open water and the remainder floodplain, this seasonal lake is surrounded by reedbeds, baobabs, palms and *Acacia nilotica* scrub. The lake is a projected nature reserve, and is of importance to waterfowl (Hughes and Hughes, 1992).

**Senegal River Floodplain**

14°48'-17°11'N, 12°14'-16°30'W This occurs along the right bank of the Senegal River as far as Diogountourou. The width of the floodplain ranges from 100m-8km, and includes the so-called Mare du Diawling, a wetland of 17,500ha. Strips of swamp forest dominated by *Cola laurifolia*, *Cynometra vogellii* and *Diospyros elliotii* occur, and the numerous oxbow lakes and lagoons are fringed by *Phragmites* and *Typha*. The crocodiles *Crocodylus niloticus* and *C. cataphractus* still survive. Birdlife is prolific, and small mammals include species such as otters, water mongoose and cane-rat. Threats to the area include proposed dams and human settlement (Hughes and Hughes, 1992).

**Senegal River Delta**

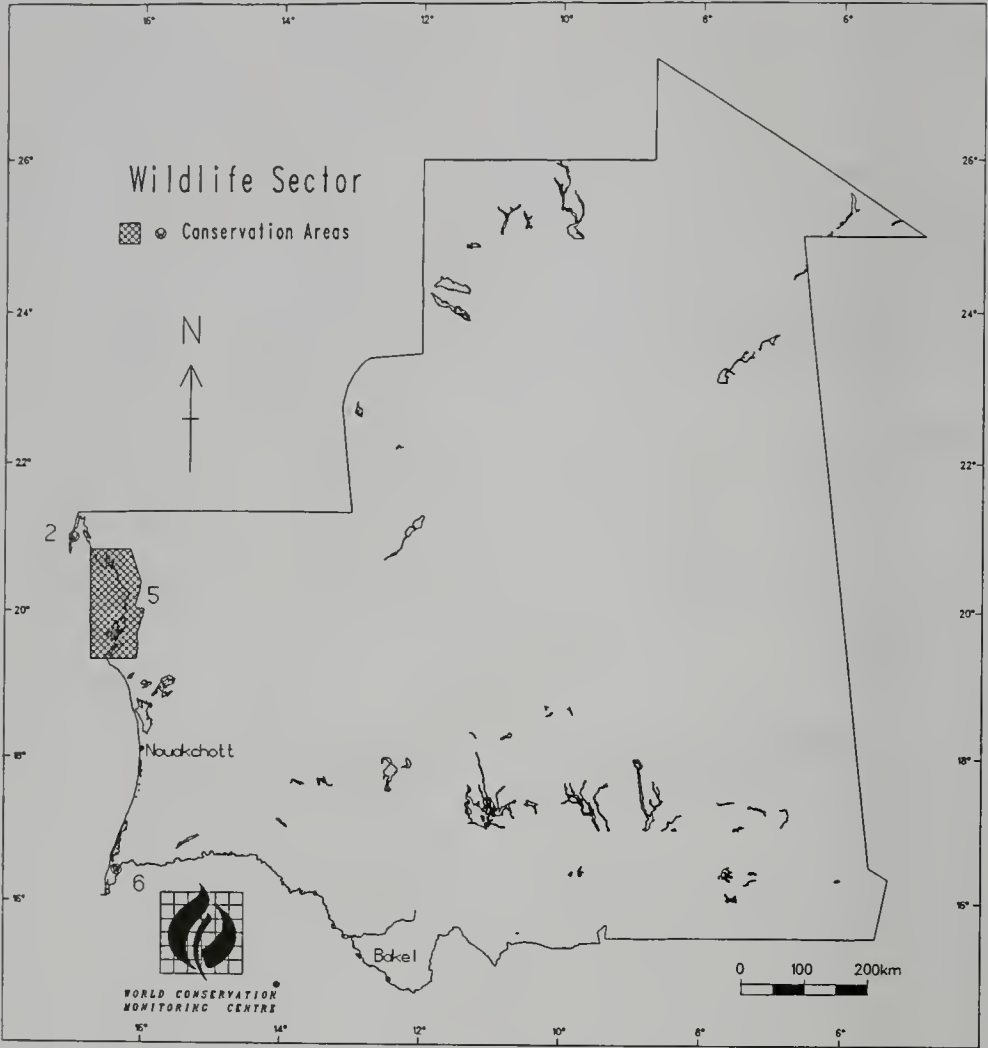
15°44'-16°29'N, 15°35'-16°29'W Covering 320,000ha of lakes, river channels, tidal lagoons, mudflats, permanent reed swamps and floodplain grasslands, the delta includes the brackish 680ha **Lake Tianbrank** (16°28'-16°29'N, 16°22'-16°25'W). The **Marais de Toumbos** (16°32'-16°47'N, 16°18'-16°26'W) is situated near the town of Keur Massene; this consists of a series of vegetated, permanently inundated depressions, within an area of about 5000ha (1400ha of which is permanent water), which are relatively undisturbed. Trees in the delta area include species of *Acacia*, *Balanites*, *Borassus*, *Parkinsonia* and *Tamarix*. It is an important mangrove area with *Rhizophora racemosa* along tidal creeks and *Avicennia africana* in the backswamps, in which colonies of heron, cormorant and spoonbill, amongst others, breed. Sandbars at the river mouth are a nesting area for green and leatherback turtles. The delta is visited by manatees, and small mammals include caracal. Human influence has affected the flooding regime, and schemes to control the hydrological regime will result in a reduction in flooding and a loss of wetland habitat. The area is fished and hunted (Hughes and Hughes, 1992).

## MAURITANIA - PROTECTED SITES

*National/international designations*

<b>Name of area and map reference (see Fig. 6.1)</b>	<b>Management area (ha)</b>	<b>Year notified</b>
<b>Faunal Reserve</b>		
1 Réserve de Moufflon		1982
<b>Integral Reserves</b>		
2 Baie du Levrier (Cap Blanc)	310,000	1986
3 Iles Mauritanienes		1962
4 Las Cuevecillas		1986
<b>National Parks</b>		
5 Banc d'Arguin	1,173,000	1976
6 Diawling	13,000	1990
<b>Partial Faunal Reserves</b>		
7 El Agher	250,000	1937
8 Elephant	—	
9 Tilemsi		
<b>World Heritage Site</b>		
Banc d'Arguin National Park	1,200,000	
<b>Ramsar Site</b>		
Banc d'Arguin National Park	1,173,000	

Fig 6.1 Mauritania: protected ecologically sensitive sites

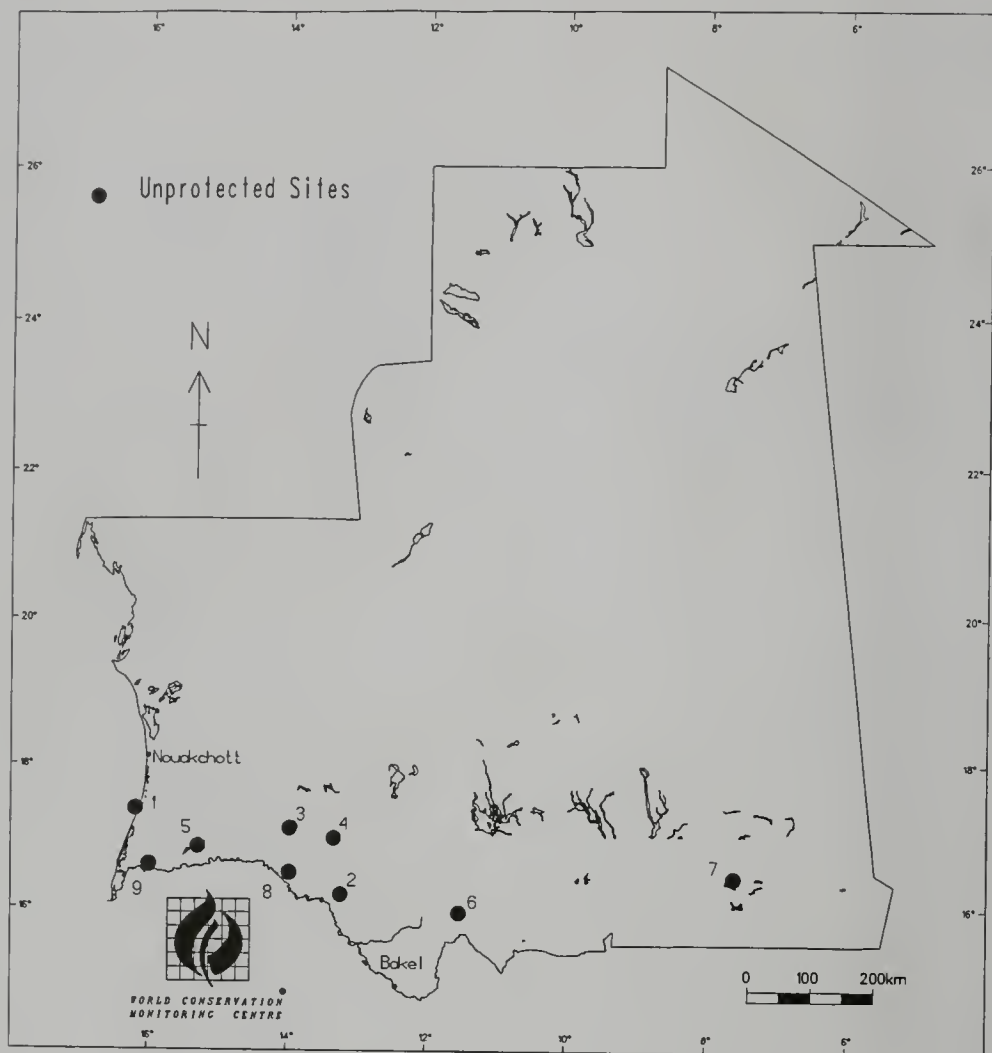




**MAURITANIA - UNPROTECTED SITES****Name of area and  
map reference (Fig 6.2)**

1	Aftout es Saheli	120,000
2	Gorgol River	
3	Lake d'Aleg	4,275
4	Lake du Mâl	870
5	Lake Rkiz	12,970
6	Mares de Kankossa and Kaora	1,540
7	Mare de Mahmoudé	40,000
8	Senegal River Floodplain	
9	Senegal River Delta	320,000

**Fig 6.2 Mauritania: unprotected ecologically sensitive sites**



## NIGER

### INTERNATIONALLY DESIGNATED PROTECTED AREAS

#### **Réserve de l'Aïr et du Ténéré**

IUCN Categories VIII and X

Established as a World Heritage site in 1991; 7,736,000ha. Comprising the vast **Aïr et Ténéré National Nature Reserve**, covering over 6% of Niger, with a core area, **Addax Sanctuary Strict Nature Reserve**, of 1,280,500ha. It is an oasis of Sahelian conditions existing within a Saharan environment. A variety of desert landscapes with seasonal watercourses predominate, as some mountainous areas occur. Vegetation is predominantly Sahelian, especially in the wetter and more sheltered areas such as wadis or ravines, while the Saharan element supports trees typical of sandy habitat. This region is important for protecting the last stronghold of Sahelo-Saharan wildlife in Niger. Of particular concern are addax *Addax nasomaculatus* and oryx *Oryx dammah*, both of which are threatened species. The threatened Barbary sheep *Ammotragus lervia* occurs in the mountains, and the threatened slender horned gazelle has been recorded. Traditional hunting occurs, but has little impact. The greatest problems are overgrazing, and over-browsing of acacias by the livestock of nomads. Droughts in recent years have exacerbated this (IUCN/UNEP, 1987).

#### **W du Niger National Park**

IUCN Category II

This park, which is also a Ramsar site, takes its name from the double bend of the Niger River. The Nigerian section of the protected area complex covers 220,000ha, and is contiguous to **W du Bénin National Park** (568,000ha) and **W du Burkina Faso National Park** (190,000ha), and also to **Tamou Total Faunal Reserve** (77,740ha). The valleys of both tributaries are deeply incised and, together with the Barou rapids, are scenic attractions. The park is at a transition between Sudanian and Guinean savannas; the former predominates, and secondary and gallery forests cover 70%. The park is a key area for savanna conservation in West Africa. It contains the only remaining populations of Niger's Sudanese savanna fauna such as elephant, buffalo and kob, and also supports a variety of ungulates and the threatened Nile crocodile. Poaching, illegal grazing, cultivation and fishing occur within the park, and although fire is used for management, uncontrolled fires occur. Fulani pastoralists use the area during their annual migration. There are proposals for phosphate mining, river damming and railroad construction within the park (IUCN/UNEP, 1987; Stuart *et al.*, 1990).

### NATIONALLY PROTECTED AREAS

#### **Addax Sanctuary Strict Nature Reserve**

IUCN Category I

20°10'N, 8°06'E Established in 1988, this reserve covers an area of 1,280,500ha.

#### **Gadabedji Total Faunal Reserve**

IUCN Category IV

This reserve of 76,000ha comprises permanent dunes separated by plains, and a drainage system of wadis, pans and temporary pools. There is no permanent surface water. North Sahelian wooded steppe and grassland predominate. The area supports threatened species including cheetah (very rare). Poaching and intensive livestock

rearing occur in the reserve, the latter not being technically illegal. Tree cutting also occurs. Lack of funds and manpower make effective control impossible (IUCN/UNEP, 1987).

**Tamou Total Faunal Reserve**

IUCN Category IV

This reserve covers 77,740ha and is contiguous to the W National Parks, which cover a total of nearly one million hectares in Niger, Burkina Faso and Benin. The reserve is on a lateritic peneplain, deeply incised by rivers. Savanna woodland predominates, largely created by shifting cultivation. The area supports a few cheetah, though these are becoming rare; elephant and a number of antelope species occur. There are still many people living within the reserve, with resultant illegal expansion of agriculture, overgrazing, burning, intensive poaching and destruction of woody vegetation. Prospecting for phosphates was permitted in the 1970s (IUCN/UNEP, 1987).

**UNPROTECTED SITES**

**Babanrafi Forest**

13°15'N, 7°25'E It is reported that about 100 elephant still survive here (Stuart *et al.*, 1990).

**Lake Chad**

13°42'-14°25'N, 13°02'-13°34'E Important wetlands occur in the vicinity of this lake, none of which are as yet protected. The threatened river prinia *Prinia fluviatilis* occurs, as does valuable waterbird habitat (Stuart *et al.*, 1990).

**Niger River**

Some wildlife habitat has survived in this river. The country's last hippopotami live here, Nile crocodile occur, and the area is important for waterbirds (Stuart *et al.*, 1990).

**Sirba River**

13°28'N, 1°20'E (approx.) This area supports wildlife populations adjacent to Tamou Total Faunal Reserve (Stuart *et al.*, 1990).

**Termit Massif Faunal Reserve**

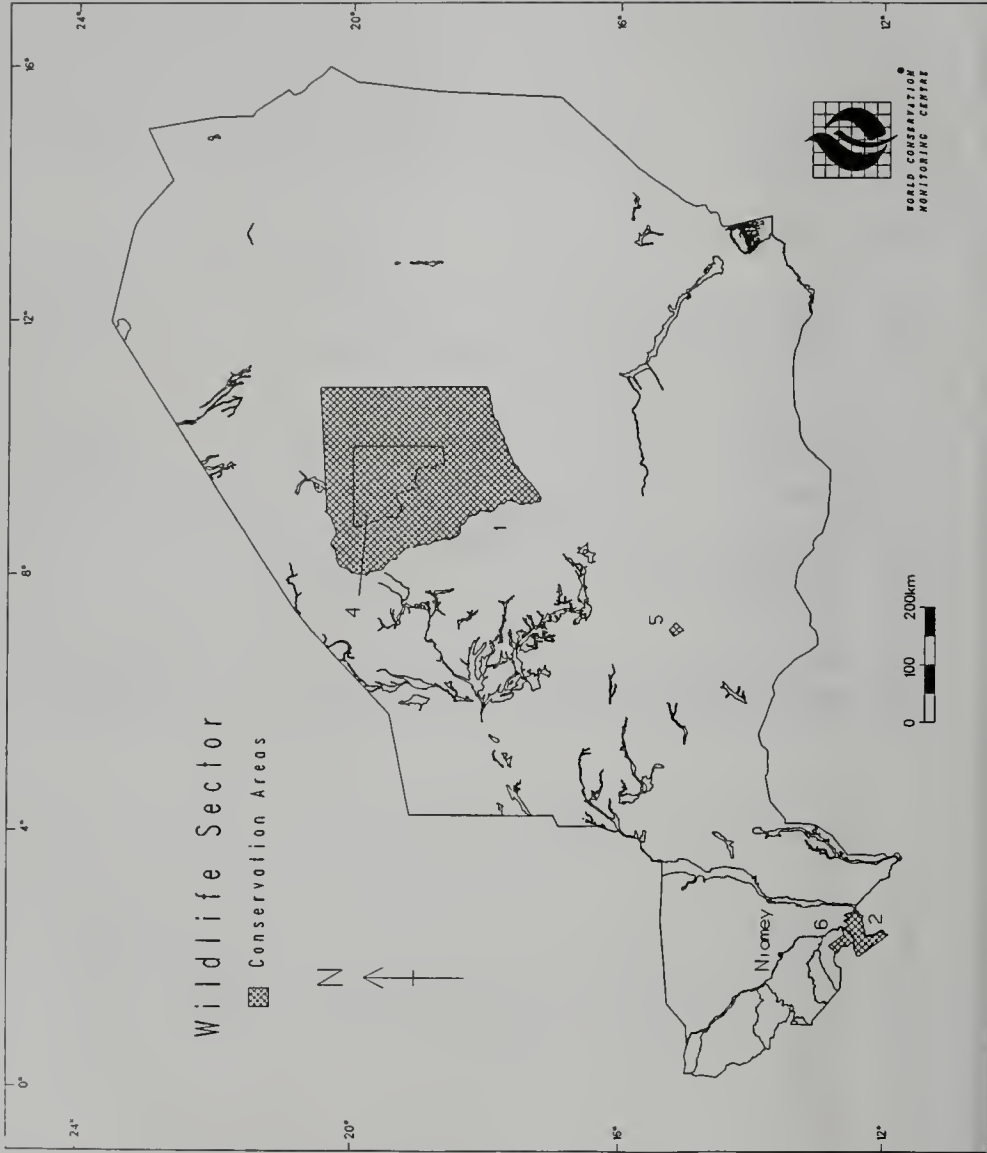
Recommended

16°10'N, 11°20'E This area of 700,000ha is within the Sahelian zone; it supports numbers of addax, and dama and dorcas gazelles, as well as cheetah. It requires a greater measure of protection (IUCN, 1987a; Stuart *et al.*, 1990).

**NIGER - PROTECTED SITES***National/international designations*

<b>Name of area and map reference (see Fig. 7.1)</b>	<b>Management area (ha)</b>	<b>Year notified</b>
<b>National Nature Reserve</b>		
1 Aïr and Ténéré	7,736,000	1988
<b>National Park</b>		
2 W du Niger	220,000	1954
<b>Partial Faunal Reserve</b>		
3 Dosso	306,500	1962
<b>Strict Nature Reserve</b>		
4 Addax Sanctuary	1,280,500	1988
<b>Total Faunal Reserves</b>		
5 Gadabedji	76,000	1955
6 Tamou	77,740	1962
<b>Ramsar Wetland Site</b>		
Parc national du "W"	220,000	1987
<b>World Heritage Site</b>		
Réserve de l'Aïr et du Ténéré	7,736,000	1991

Fig 7.1 Niger: protected ecologically sensitive sites

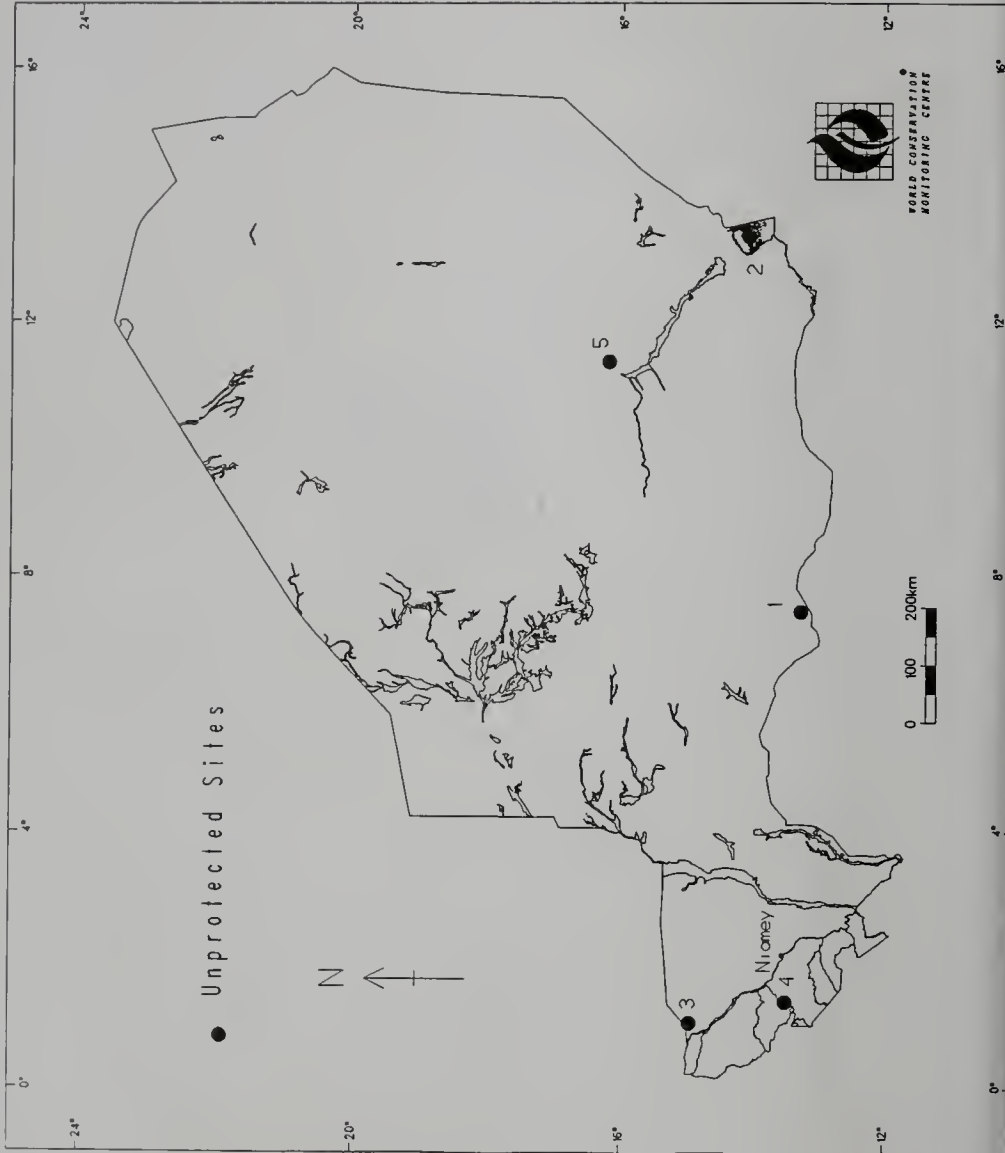


**NIGER - UNPROTECTED SITES**

**Name of area and  
map reference (Fig 7.2)**

- 1        Banbanrafi Forest
- 2        Lake Chad
- 3        Niger River
- 4        Sirba River
- 5        Termit Massif Faunal Reserve

Fig 7.2 Niger: unprotected ecologically sensitive sites





## SENEGAL

### INTERNATIONALLY DESIGNATED PROTECTED AREAS

#### **Ndiaël Faunal Reserve**

IUCN Category IV

16°10'N, 16°05'W The Ramsar site of 10,000ha is included in **Ndiaël Faunal Reserve** which covers 46,550ha. Situated on the Senegal River delta about 12km south-east of **Djoudj National Park**, the area was gazetted in 1965. Its core, the Ramsar site comprising the 'Ndiaël Depression', is a wetland of major importance to waterfowl. It has been severely degraded by water diversion schemes and recommendations have been made regarding the rehabilitation of the site (IUCN, 1987b; Ramsar Convention Bureau, 1990; Stuart *et al.*, 1990).

#### **Delta du Saloum National Park**

IUCN Categories II and IX

Situated in the delta of the Sine and Saloum rivers, four-fifths of the 76,000ha national park is marine (and 73,000ha a Ramsar site), while the biosphere reserve covers 180,000ha of lagoons, channels, flooded areas and sandy islands, and the forest of Fathala. Mangroves predominate, with open dry forest on sandy soils. Mammals are varied but have probably never been abundant. There are manatee and three threatened turtle species, and it is an important fish spawning ground. However, not all of the salt flats or forest are protected and a conflict is caused by the expansion of rice growing in mangrove areas; there is also destruction of the extensive island bird colonies, over-fishing, forest exploitation and burning (IUCN/UNEP, 1987; Ramsar Convention Bureau, 1990).

#### **Djoudj National Park**

IUCN Categories II and X

Djoudj is a national park, a Ramsar site and a World Heritage site. It forms a small part (16,000ha) of the Senegal River delta and comprises an impermeable salt pan which retains the river's floodwater for longer than normal owing to an artificial system of dykes. This attracts three million migrant waterfowl between September and April and as such is one of the most important wetland sites on the West African coast. In recent years rainfall has been less than one-fifth of the average and Djoudj has been much drier. The character of Djoudj depends on fluctuating water levels and may be affected by any dams which are built on the Senegal River. Effects of the recently completed Diama dam are not yet known (IUCN/UNEP, 1987; Ramsar Convention Bureau, 1990).

#### **Gueumbeul Special Faunal Reserve**

IUCN Category IV

Most of the 750ha faunal reserve is also a Ramsar site (720ha). It comprises a lagoon about 2.5km long and nearly 1km wide, and approximately 500m of surrounding land, which forms a shallow depression. The lagoon varies in depth and salinity, fed in winter by rainwater and saltwater inflow from creeks of the Senegal River and the Djeuss marsh. There is a relict area of mangrove, one of the most northerly in Africa. The site is an important wintering area for thousands of wading birds and some breeding species. Alterations to the flow of the Senegal River by barrages could affect this site (Ramsar Convention Bureau, 1990).

**Niokolo-Koba National Park** IUCN Categories II, IX and X  
Established as a Biosphere Reserve and a World Heritage Site in 1981, this relatively flat region of 913,000ha includes wide floodplains of the River Gambia which become inundated during the rains. The varied habitats include several types of savanna, bamboo, dry forest, gallery forest, marshes and seasonally-flooded grassland. There is a diverse fauna including about 150 chimpanzee individuals, leopard, hunting dog and all three African crocodile species. The park is also the last refuge in Senegal for giraffe and elephant. Populations of elephant and leopard are declining because of continued poaching. Illegal burning also occurs within the park and there has been mineral exploration. The park's habitats would also be affected by dams planned for the Gambia and Senegal rivers. The contiguous **Badiar National Park** in Guinea has been established recently partly to discourage poachers and cattle grazers from entering (IUCN/UNEP, 1987; R. Wilson *in litt.*, 1991).

**Samba Dia Classified Forest** IUCN Category IX and VIII  
A forest area of 756ha close to the sea and subject to the influence of the cool, humid Atlantic trade winds. *Borassus aethiopum* dominates the vegetation, partly through human selection, the tree being utilised for many products including resins, fruit and dead wood. Continued traditional uses are still permitted, to preserve the area's character. Management agreements allow harvesting of palm products within the reserve and also stipulate a certain density of *Borassus* palms to be left in farmland outside the boundaries, where moderate grazing and cultivation occur (IUCN/UNEP, 1987).

## NATIONALLY PROTECTED AREAS

**Basse-Casamance National Park** IUCN Category II  
A flat area of 5000ha in part of the Casamance delta with numerous meandering tidal channels fringed with mangroves and seasonally bare salt flats. The reserve also includes tropical forest and wooded savanna and was set up to preserve this type of Guinean flora and its associated fauna which are only found in this southern part of Senegal. More than 50 species of mammal occur including a few leopard and manatee. A few species such as kob have been introduced (IUCN/UNEP, 1987).

**Ferlo-Nord Faunal Reserve** IUCN Category IV  
**Ferlo-Sud Faunal Reserve** IUCN Category IV  
A flat, mainly sandy inland area of 487,000ha (**Ferlo-Nord**) and 633,700ha (**Ferlo-Sud**) which are contiguous. It is crossed by intermittent rivers which attract concentrations of many animals in the wet season; however, animal populations are declining in numbers and variety, particularly the larger mammals. It is also an important wintering ground for many Palearctic migrants, particularly raptors. Serious habitat degradation has been caused by low rainfall in recent years. The already sparse vegetation cover of grass and bushy savanna has been reduced further by overgrazing and strong winds have caused much erosion (IUCN/UNEP, 1987).

**Iles de la Madeleine National Park**

IUCN Category II

The park of 450ha comprises three volcanic islands, the largest covering 15ha, and includes the area within 50m of the shore on each island. The varied avifauna is the main feature, with nesting colonies of a number of species including osprey and red-bellied tropic bird. Three species of dolphin have also been recorded off shore and the loggerhead turtle has bred here. However, uncontrolled development of watersports and fishing causes disturbance, although poaching has been eradicated with the aid of a fast patrol vessel (IUCN/UNEP, 1987).

**Kalissaye Special Reserve**

IUCN Category IV

This 16ha reserve includes a headland and two sandy islands at the mouth of the Kalissaye. Changing currents are continually moving the sandy substrate of these islands which have a herbaceous vegetation of littoral psammophilous species. The vegetation of Sankoye Point is mainly scrub. The sanctuary was set up to protect the breeding colonies of seabirds and breeding sites of marine turtles, including green turtle and loggerhead sea turtle. Nile crocodile and manatee also occur in the reserve's rivers. Part of the island section where pelicans breed is suffering from erosion, which may affect bird numbers (IUCN/UNEP, 1987).

**Langue de Barbarie National Park**

IUCN Category II

This 2000ha park includes a 20km long spit formed of sand dunes and intertidal flats across the mouth of the River Senegal and areas of both marine and riverine waters. Terrestrial parts include three sandy islands with predominantly herbaceous vegetation, the largest, Gandiole, being only 2ha. The park is important for migratory waterbirds and for nesting pelicans and gulls. The marine fauna includes four species of turtle. The park suffers from insufficient funding (IUCN/UNEP, 1987).

**Maka-Diama Hunting Reserve**

IUCN Category VI

60,000ha

**Popenguine Special Faunal Reserve**

IUCN Category IV

The reserve of 1009ha runs inland from the Cap de Naze and includes a 2.5km shoreline of highly eroded cliffs to the south of Dakar. Vegetation is sparse, composed mainly of seasonal grasses and shrubs. The site is important for birds, being situated on a major north-south migration route and attracts at least 67 migratory species including *Monticola solitaria* and *M. striolata*, unusual in this area. It is not known whether plans for improvements in infrastructure and staffing have been implemented fully (IUCN/UNEP, 1987).

**OTHER MANAGED AREAS**

None

UNPROTECTED SITES

**Casamance Estuary**

12°37'N, 16°34'W Only 5000ha of the 360,000ha of wetland and mangroves are protected, within **Basse Casamance National Park**. It supports hippopotamus, mona monkeys and breeding colonies of waterbirds (WCMC, 1989e).

**Coastal Lakes**

14°44'-15°39'N, 16°35'-17°25'W A series of unprotected lakes along the coast between Dakar and Saint Louis. They include Nhiarhol Pool, and the Lakes Mbao, Mbeubeussé, Retba and Ourouaye. They all support particularly rich avian and small mammalian faunas (Hughes and Hughes, 1991).

**Dindéfello Special Faunal and Floral Reserve**

Proposed

This 111ha reserve in the south-east protects chimpanzees, fewer than 300 of which are believed to survive in Senegal (Stuart *et al.*, 1990).

**Djeuss and Lampsar Rivers Floodplain**

16°15'N, 16°18'W An important wetland area to the south of **Djoudj National Park**, north of St Louis (WCMC 1989e).

**Eléphants du Fleuve International Park**

Proposed

**Falémé Integral Hunting Reserve**

Proposed

12°50'N, 11°50'W (centre) A large area situated in the extreme south-east of the country, between **Niokolo-Koba National Park** and the border with Mali.

**Kassel Special Bird Nature Reserve**

Proposed

12°52'N, 16°42'W This covers 90ha of swampland, river and lake to the north of **Kalissaye Special Reserve**, 8km south-east of Kafountine.

**Lake de Guier**

15°55'-16°25'N, 15°45'-16°00'W Situated in the Senegal River Delta complex some distance upstream of **Ndiaël Faunal Reserve**, this is the only large freshwater lake in the country and an important site for a rich and prolific avifauna, particularly when other delta wetlands are dry. The area at high water is about 17,000ha. Surviving mammals include bushbuck, Grimm's duiker, reedbuck, red-fronted and dorcas gazelles, warthog and a small manatee population. Nile crocodile occurs. There are sugar cane plantations and associated irrigation schemes in the area (Burgis and Symoens, 1987; Hughes and Hughes, 1992; WCMC, 1989e).

**Senegambian International Park**

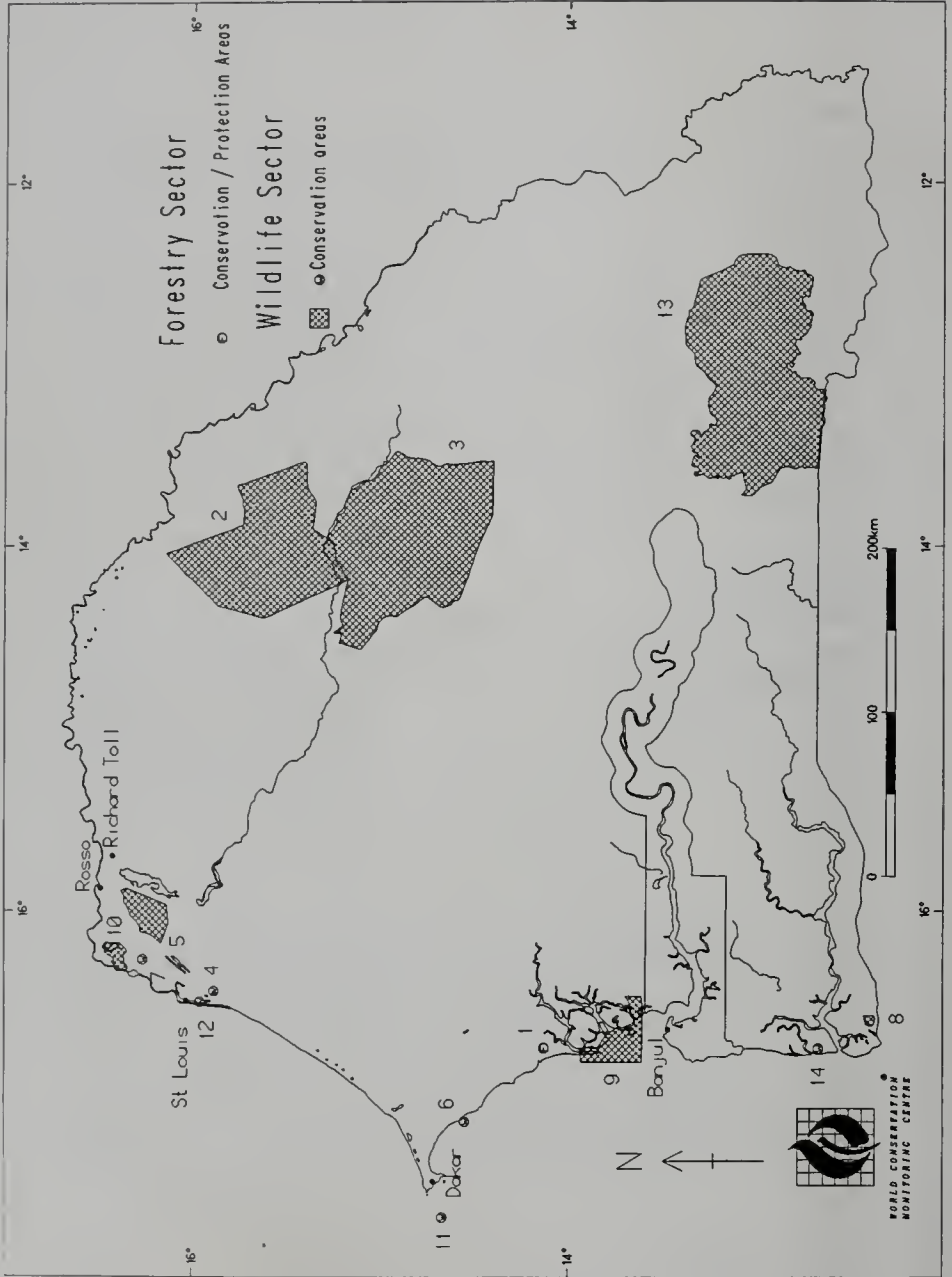
Proposed

## SENEGAL - PROTECTED SITES

*National/international designations*

<b>Name of area and map reference (see Fig. 8.1)</b>	<b>Management area (ha)</b>	<b>Year notified</b>
<b>Classified Forest</b>		
1 Samba Dia	756	1936
<b>Faunal Reserves</b>		
2 Ferlo-Nord	487,000	1971
3 Ferlo-Sud	633,700	1972
4 Gueumbeul Special	750	1983
5 Ndiaël	46,550	
6 Popenguine Special	1,009	1986
<b>Hunting Reserve</b>		
7 Maka-Diama	60,000	
<b>National Parks</b>		
8 Basse-Casamance	5,000	1970
9 Delta du Saloum	76,000	1976
10 Djoudj	16,000	1971
11 Iles de la Madeleine	450	1949
12 Langue de Barbarie	2,000	1976
13 Niokolo-Koba	913,000	1954
<b>Special Reserve</b>		
14 Kalissaye	16	1978
<b>Biosphere Reserves</b>		
Forêt classée de Samba Dia	756	1979
Delta du Saloum	180,000	1980
Parc national du Niokolo-Koba	913,000	1981
<b>World Heritage Sites</b>		
Djoudj National Bird Sanctuary	16,000	1981
Niokolo-Koba National Park		1981
<b>Ramsar Sites</b>		
Bassin du Ndiaël	10,000	1977
Delta du Saloum	73,000	1984
Djoudj	16,000	1977
Gueumbeul	720	1986

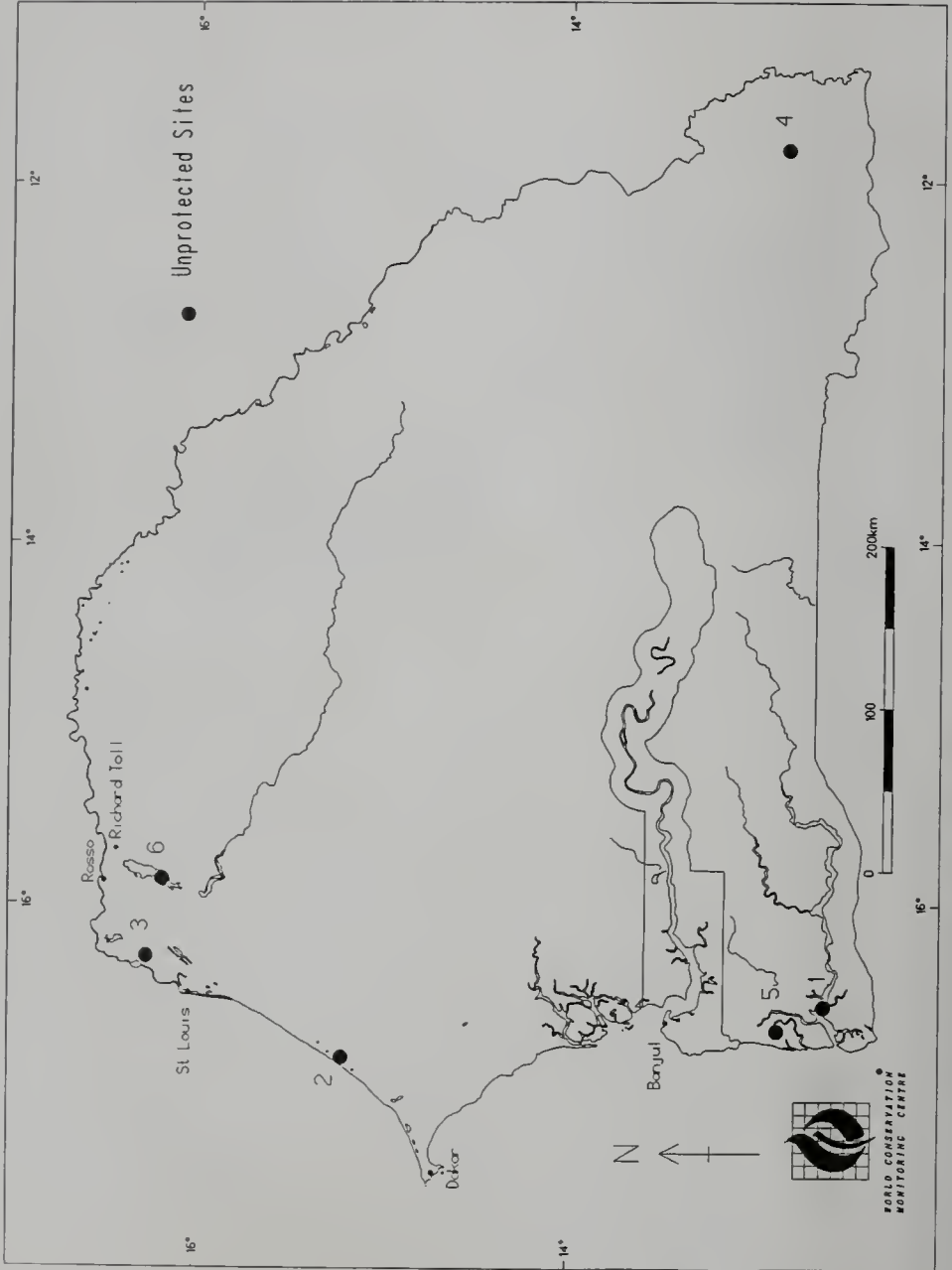
Fig 8.1 Senegal: protected ecologically sensitive sites



**SENEGAL - UNPROTECTED SITES**

<b>Name of area and map reference (see Fig. 8.2)</b>	<b>Management area (ha)</b>
1 Casamance Estuary	360,000
2 Coastal Lakes	
Dindefello Special Faunal and Floral Reserve	111
3 Djeuss and Lampsar Rivers Floodplain	
Eléphants du Fleuve	
4 Falémé Integral Hunting Reserve	
5 Kassel Special Bird Reserve	90
6 Lake de Guier	17,000
Senegambian International Park	

Fig 8.2 Senegal: unprotected ecologically sensitive sites





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