Ecologically Sensitive Sites in Africa

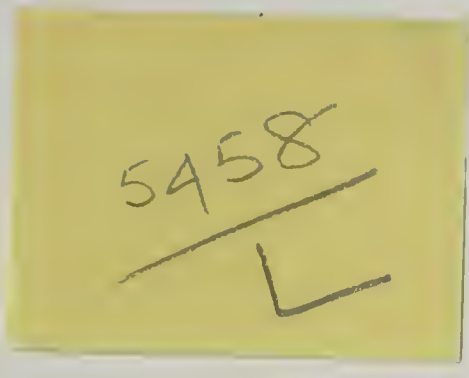
Volume II: Eastern Africa

Ethiopia
Kenya
Somalia
Sudan
Tanzania
Uganda

Compiled by the World Conservation Monitoring Centre

For

The World Bank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World Conservation Monitoring Centre
Cambridge, UK

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The World Bank
Washington DC, USA

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WCMC is a joint venture between the three partners who developed *The World Conservation Strategy* and its successor *Caring for the Earth*: IUCN-World Conservation Union, UNEP-United Nations Environment Programme, and WWF-World Wide Fund for Nature. Its mission is to provide an information, research and assessment service on the status, security and management of the Earth's biological diversity as the basis for its conservation and sustainable use.

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TABLE OF CONTENTS

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 on 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.

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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

- 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 ramaining	
		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	1,189,890	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.

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 though 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.

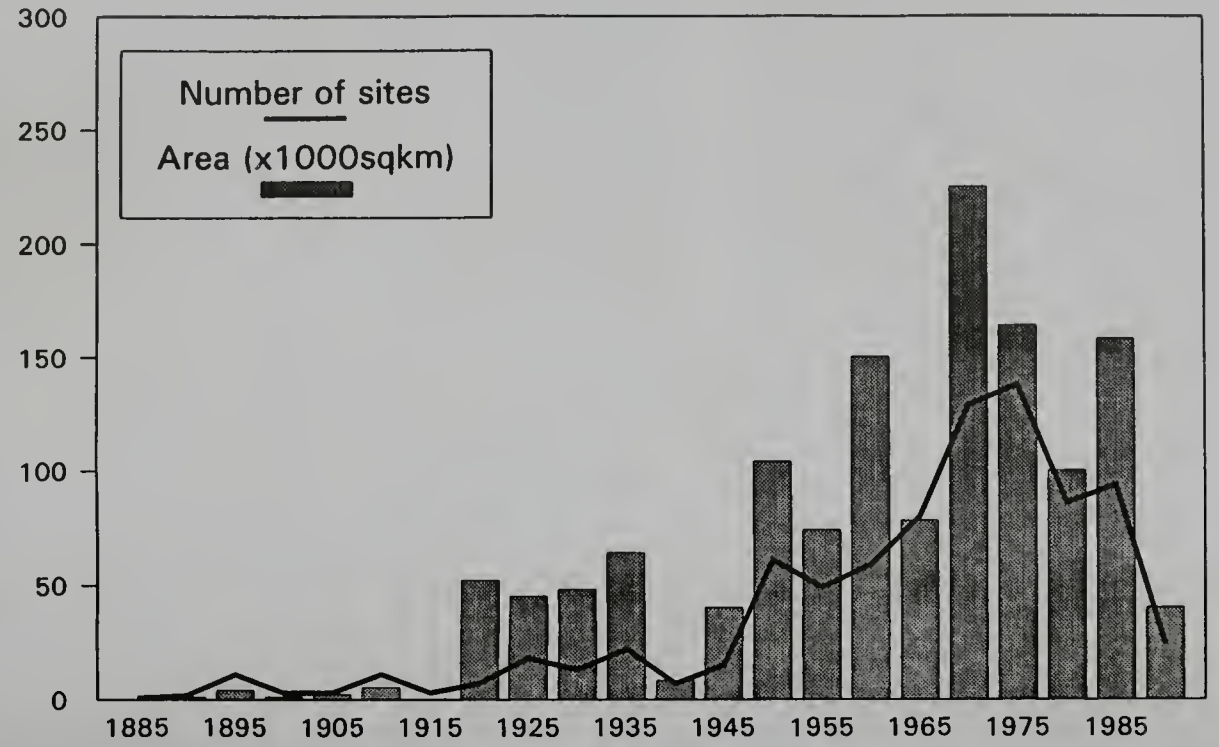
As development has accelerated in the past few decades, the governments in the region have recognized the importance of legally protected areas as part of the overall pattern of land use, though of course the effectiveness of such legal regimes varies widely. Many of these areas have been established 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



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

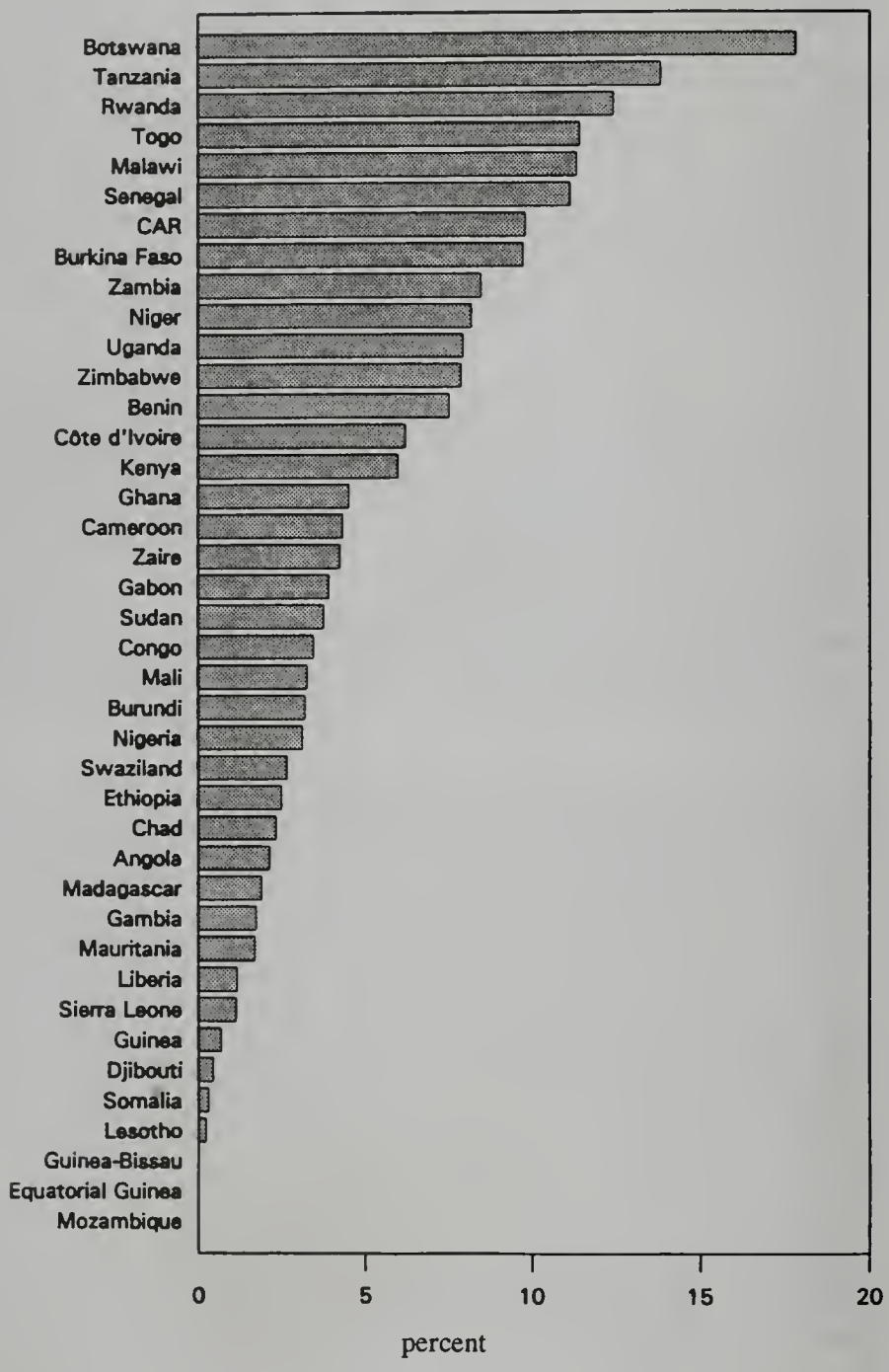
1.1 Conservation of biological resources has become an important item on every country's development agenda. Conservation in the modern sense is part of development. As defined by the *World Conservation Strategy*, it means: "The management of human use of the biosphere so that it may yield the greatest 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 modem 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,

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 win 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

- 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.

REFERENCES

Dugan, Patrick J. 1990. *Wetland Conservation: A review of current issues and required action.* IUCN, Gland, Switzerland. 96pp.

Eagles, Paul F.J. 1984. *The Planning and Management of Environmentally Sensitive Areas.* Longman, London and New York. 160pp.

IUCN. 1980. *World Conservation Strategy: Living Resource Conservation for Sustainable Development.* IUCN UNEP-WWF, Gland. 44pp.

IUCN. 1987. *Action Strategy for Protected Areas in the Afrotropical Realm.* IUCN, Gland. 51pp.

IUCN. 1990. *1990 United Nations List of National Parks and Protected Areas.* IUCN, Gland, Switzerland and Cambridge, UK. 284pp. [Compiled by the World Conservation Monitoring Centre]

IUCN. 1992. IV World Congress on National Parks and Protected Areas, 1992, Caracas, Venezuela. IUCN, Gland, Switzerland.

IUCN/UNEP. 1986. *Review of the Protected Areas System in the Afrotropical.* IUCN, Gland, Switzerland. 259pp.

IUCN/UNEP /WRI. 1992. *Global Biodiversity Strategy: Guidelines for Action to Save,Study and Use Earth's Biotic Wealth Sustainably and Equitably.* World Resources Institute, Washington, DC, USA. 250pp.

Kelleher, Graeme and Richard Kenchington. 1990. *Guidelines for Establishing Marine Protected Areas.* Great Barrier Reef Marine Park Authority/IUCN Commission on National Parks and Protected Areas. 64pp.

Lusigi, Walter J. 1992. *Managing Protected Areas in Africa.* UNESCO - World Heritage Fund, Paris, France. 200pp.

MacKinnon, J.R., K. MacKinnon, G. Child, and J. Thorsell. 1986. *Managing Protected Areas in the Tropics.* IUCN, Gland. 295pp.

McNeely, Jeffrey A. 1988. *Economics and Biological Diversity: Developing and Using Economic Incentives to Conserve Biological Diversity.* IUCN, Gland, Switzerland. xv + 200pp.

McNeely, J.A. and K.R. Miller (eds.). 1984. *National Parks, Conservation, and Development: The Role of Protected Areas in Sustaining Society.* Smithsonian Institution Press, Washington, D.C. 838pp.

McNeely, J.A. and J.W. Thorsell. 1987. *Guidelines for Development of Terrestrial and Marine National Parks for Tourism and Travel.* World Tourism Organization, Madrid. 29pp.

McNeely, Jeffrey A., Kenton R. Miller, Walter V. Reid, Russell A. Mittermeier and Timothy B. Werner. 1990. *Conserving the World's Biological Diversity.* IUCN, Gland, Switzerland; WRI, CI, WWF-US, and the World Bank, Washington, D.C. 193pp.

Nelson, J.G. *et al.* 1988. The ABC resource survey method, the ESA concept and comprehensive land use planning and management pp. 143-175 *in* Moss, Michael R. (ed.). *Landscape Ecology and Management.* Polyscience Publications Inc., Montreal, Canada.

Oldfield, Sara. 1988. Buffer Zone Management in Tropical Moist Forests. *IUCN Tropical Forest Paper* 5:1-49.

Poore, Duncan (Ed.). 1992. *Guidelines for Mountain Protected Areas.* IUCN, Gland, Switzerland and Cambridge, UK. 56pp.

Poore, Duncan, and J. Sayer. 1987. *The Management of Tropical Moist Forest Lands: Ecological Guidelines.* IUCN, Gland. 63pp.

Siegfried, W.R. and B.R. Davies. 1982. *Conservation of Ecosystems: Theory and Practice.* SANSP 61:1-97.

Stuart, Simon N. and Richard J. Adams. 1990. Biodiversity in Sub-saharan Africa and its Islands: Conservation management and sustainable use. *Occasional Papers of the IUCN Species Survival Commission No. 6.* IUCN, Gland Switzerland. 242pp.

Usher, Michael B. 1986. *Wildlife Conservation Evaluation.* Chapman and Hall, London. 394pp.

WCED (World Commission on Environment and Development). 1987. *Our Common Future.* Oxford University Press, Oxford, UK.

WCMC. 1992. *Protected Areas of the World: A review of national systems. Volume 3: Afrotropical.* IUCN, Gland, Switzerland and Cambridge, UK. xxii + 360pp. [Compiled by the World Conservation Monitoring Centre]

WCMC. 1992. *Global Biodiversity: Status of the Earth's living resources.* Chapman and Hall, London. xx + 594pp.

World Bank. 1986. *Wildlands: Their Protection and Management in Economic Development.* World Bank, Washington, D.C. 220pp.

OPERATIONAL POLICY NOTE NO. 11.02

WILDLANDS: THEIR PROTECTION AND MANAGEMENT IN ECONOMIC DEVELOPMENT

Table of Contents

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)[1] 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.[2] For a more detailed discussion of wildland management, see the Bank's Technical Paper: *Wildlands: Their Protection and Management in Economic Development*[3] 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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1 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.

2 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.

3 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 under-utilized. 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[4] 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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[4] 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. [5]

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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[5] 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 imlemented 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 specicfic 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.[6] 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,[7] 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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[6] 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)."

[7] 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.[8]

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.[9]

d. **Industry projects** involving: chemical and thermal pollution which may damage wildlands[10]; 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.[11] 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[12] 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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[8] 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.

[9] & [10] Industrial pollution control is discussed in the Bank's Environmental Guidelines available from PPDES.

[11] See Section 5 for technical guidance on establishing a WMA.

[12] 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.[13]

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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[13] 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,[14] the requirement of a compensatory wildland component can be interpreted more flexibly to involve measures other then 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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[14] 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.[15] 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.[16] **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.[17] Otherwise, small annual outlays from the national or other government budget will be needed.

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[15] 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.

[16] 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).

[17] 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[18]

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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[18] 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[19]

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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[19] 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 ennvironmentally 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

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[20]
(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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[20] 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

EASTERN AFRICA

Ethiopia, Kenya, Somalia, Sudan, Tanzania, Uganda

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.

ETHIOPIA

INTERNATIONALLY DESIGNATED PROTECTED AREAS

Simien Mountains National Park IUCN Categories II and X

This national park of 17,900ha occupies a broad undulating plateau of open grassy plains, and includes a wide altitudinal range between 1900m and 4624m, the highest peak in Ethiopia. The World Heritage Site covers an area of 22,000ha. The park was set up primarily to conserve the resident population of Walia ibex *Capra walie*, the spectacular scenery and principal catchment area of the Mayshasha River. Vegetation is a complex of Afro-alpine woodlands, heath forest and montane moorland, with high levels of plant endemism. The park includes most of the range of the Walia ibex, endemic to the Simen Mountains. Other threatened mammals include the Simen fox *Canis simensis* and leopard, and there are seven endemic bird species. Little is known about the status of the ibex population, and there is a danger of ibex hybridising with goats. Zoning, primarily to protect Walia ibex habitat, has not been carried out. Some areas have suffered from fires, overgrazing and cultivation, leading to erosion in the past. About 1500 people live within the park. There have also been reports of the area being taken over by rebel factions. All infrastructure within the park has been destroyed during the previous eight years fighting (Hillman, 1993; Hurni, 1986; IUCN/UNEP, 1987).

NATIONALLY PROTECTED AREAS

Abijatta-Shalla Lakes National Park IUCN Category II

(not gazetted)

Over half of this park of 88,700ha consists of lakes, including the shallow Lake Abijatta (19,600ha) and 260m deep Lake Shalla (43,200ha). The latter is an important wetland. Over 300 bird species occur, including lesser flamingo and a large breeding colony of threatened great white pelicans. Vegetation consists mainly of *Acacia* and *Ficus* savanna, with small areas of riverine forest; some lakes are edged with a nearly continuous bank of reeds. Grazing, tree felling, charcoal-burning and fishing by the local population continues, but commercial lake fishing has been stopped. The park is situated in one of the most populated areas of Ethiopia; recently the whole area has been overrun, and permanent settlements established. At the time of changeover of government in Ethiopia in May 1991, major destruction and looting occurred in the park, virtually destroying all management infrastructure, hence management is now minimal (Hillman, 1993; IUCN/UNEP, 1987).

Awash National Park IUCN Category II

This is a 75,600ha park completely surrounded by the **Awash West Wildlife Reserve**, and is located at the foot of the Shoa escarpment on the eastern edge of the Rift Valley where this opens out into the Danakil plains. The plains are traversed by the Awash River, and most of the area is covered by open, semi-arid savanna. In the south-west is a dormant volcano, Mount Fantalle (2005m), and hot springs surrounded by palm forest exist. Large herds of ungulates use the area, and threatened mammals include Grevy's zebra *Equus grevyi*, Swayne's hartebeest *Alcelaphus buselaphus swaynei*,

leopard and cheetah. Lion occur, and the park also supports the Somali wild ass. However, seasonal cattle grazing by nomadic peoples was never completely prevented, and conflicts between these people and wildlife have been aggravated by recent droughts. The northern part of the park is now overrun by nomadic pastoralists and is badly overgrazed, with few large wild animals remaining. The main Addis Ababa to Dire road and the railway to Djibouti pass through the park. Little damage was incurred during the government changeover in May 1991 (Hillman, 1993; IUCN/UNEP, 1987).

Babile Elephant Sanctuary IUCN Category II

Covering an area of 698,200ha, this sanctuary was established in 1970 and was formerly known as **Harar Elephant Sanctuary**. Part has been proposed as a World Heritage site covering 650,000, 400km west of Addis Ababa between 1000m and 1788m above sea level. Semi-arid xerophilous woodlands are inhabited by elephant, possibly a distinct subspecies *Loxodonta africana orleansi*. The area lacks the priority species of **Ogaden**. Commercial agriculture has been started in the area. Despite continued disturbances in this area since May 1991, the Sanctuary has suffered more from the incursions of large numbers of refugees and their livestock from neighbouring Somalia (Frame, 1987; Hillman, 1993; Stuart *et al.*, 1990).

Bale Mountains National Park IUCN Category II (not gazetted)

This is a high, rugged, once-glaciated mountain area of 247,100ha completely surrounded by **Bale Wildlife Reserve,** at elevations up to 4317m. It is an important water catchment area for four major rivers, and includes a high altitude plateau dotted with permanent lakes. The park's main purpose is to provide a refuge for mountain nyala *Tragelaphus buxtonii*, and to preserve the area's outstanding natural beauty. The vegetation is extremely varied, ranging from Afro-alpine moorland at high altitudes (the largest area in Africa) through ericaceous moorlands and juniper-*Hagenia* forest to grassland and marshes. There are 46 species of mammal, including leopard, Simen jackal and several endemics such as Simen fox and 14 endemic bird species. However, 2500 people live within the park together with 10,500 livestock, although there have been plans to relocate them in the past. Heather moorland is burned in dry years to improve grazing, which can lead to soil erosion and endangers water supplies. Uncoordinated development on the boundaries is a threat, and animals are sometimes killed on roads through the park. Considerable damage was incurred in the park at the time of the government changeover in Ethiopia in May 1991 (Hillman, 1993; IUCN/UNEP, 1987).

Kuni-Muktar Mountain Nyala Sanctuary IUCN Category II

9°00'N, 40°55'E Montane dry evergreen forest, dominated by *Juniperus/Podocarpus,* high altitude grasssland and heath. Important for the conservation of Mountain Nyala and Menelik's Bushbuck. Considerably disturbed after the government changeover in May 1991 (Hillman, 1993).

Mago National Park IUCN Category II (not gazetted)
Part of the Omo-Tama-Mago complex of contiguous protected areas, Mago National Park covers an area of 216,200ha. Much of the park is a flat valley floor where open broadleaf savanna predominates, whilst thornbush growing on the dryer valley floor merges into riverine forest in the south. The park was created mainly to conserve the large numbers of plains wildlife in the area, and is particularly important for buffalo and Beisa oryx. Endangered mammals include elephant, leopard and African wild dog. Access is difficult, and recent information on the status of the area is scarce. The park is settled by pastoral peoples, human encroachment has increased, and poaching occurs throughout the region (IUCN/UNEP, 1987).

Nechisar National Park IUCN Category II (not gazetted)
Covering 51,400ha this park primarily comprises grassy plains transected by several rivers, areas of rocky ridges and Lake Haro Robi. Some savanna woodland and lakeshore riverine forest occurs, as does highland forest in the east. The area was set up because of its prolific wildlife. The 38 mammal species recorded include large herds of Burchell's zebra and Grant's gazelle. Threatened mammals include Swayne's hartebeest and leopard. Only 10% of the park is inhabited, but grazing, cultivation, removal of firewood and illegal fishing are prevalent in some parts. However, it is the conservation area in Ethiopia that has been least affected by human encroachment. Some damage was incurred to the distant outposts of the park at the time of government changeover in May 1991 (Hillman, 1993; IUCN/UNEP, 1987).

Omo National Park IUCN Category II (not gazetted)
Part of the Omo-Tama-Mago complex of contiguous protected areas, Omo covers an area of 406,800ha. The park is dominated by three open grassy plains, separated by rocky ridges and drained by tributaries of the Omo. The vegetation is mainly *Acacia* scrub savanna. The park was set up to preserve this extensive area of wilderness and the prolific plains wildlife, especially common eland and elephant. There are large herds of buffalo, and giraffe, leopard, lion and African wild dog occur. Several nomadic tribes live in the area, and human encroachment has increased considerably over the last few years. Not significantly affected by the government changeover of 1991 (Hillman, 1993; IUCN/SSC, 1990; IUCN/UNEP, 1987).

Senkelle Swayne's Hartebeest Sanctuary IUCN Category II (not gazetted)
This 5400ha area consists mainly of open grassland with some *Acacia* stands, and was set up to save the most viable population of the endemic and endangered Swayne's hartebeest *Alcelaphus buselaphus swaynei*, which numbered over 2000 in 1989. The sanctuary, previously under the jurisdiction of **Abijatta-Shalla Lakes National Park**, is now managed independently. The entire infrastructure of the sanctuary was destroyed at the time of the government changeover in May 1992, and the animals widely dispersed (Hillman, 1993; IUCN/UNEP, 1987).

Yabello Sanctuary IUCN Category II
4°55'N, 38°25'E Established in 1985, this sanctuary covers 253,700ha about 550km south of Addis Ababa. Altitudes range from 1430m to 1800m. Situated in the savanna

of the south-east highlands, it was established to protect Swayne's hartebeest *Alcelaphus buselaphus swaynei*. Five threatened endemic bird species occur, including Stresemann's bushcrow *Zavattariornis stresemanni* and white-tailed swallow *Hirundo megaensis*. Little affected by the government changeover in May 1991 (Hillman, 1993; WCO, 1985).

Yangudi-Rassa National Park IUCN Category II (not gazetted)
This is a low-lying area of 473,100ha located between **Gewane** and **Mille Sardo wildlife reserves** and **Afdem-Gewane Controlled Hunting Area**. Most of the area is flat, and covered with open grassland, savanna and riverine forest. It was set up primarily to conserve a population of Somali wild ass. Other mammals include Grevy's zebra, cheetah and leopard. Poaching is reported, and human encroachment has increased considerably over the last few years (IUCN/SSC, 1990; IUCN/UNEP, 1987).

OTHER MANAGED AREAS

Abelti Gibe National Forest Priority Area IUCN Category VIII
10,000ha

Adaba Dodola Lajo National Forest Priority Area IUCN Category VIII
59,000ha

Afdem-Gewane Controlled Hunting Area
593,200ha Established in 1973, this borders on **Yangudi Rassa National Park** in Hararghe and Welo regions.

Akobo Controlled Hunting Area
504,900ha Established in 1973.

Akobo Gog National Forest Priority Area Category VIII
218,000ha

Alledeghi Wildlife Reserve
(Also spelt **Alidegi**) Contiguous to **Awash National Park** and **Awash West Wildlife Reserve**, this reserve covers 183,200ha (IUCN/UNEP, 1987).

Aloshe Batu National Forest Priority Area Category VIII
40,000ha

Anferara Wadera National Forest Priority Area Category VIII
50,000ha

Arba Gugu National Forest Priority Area Category VIII
21,000ha

Arero Yabelo National Forest Priority Area Category VIII
40,000ha

Arsi Controlled Hunting Area
Podocarpus-Juniperus forest occurs in this 1,087,600ha hunting area (WCMC, 1991).

Awash West Controlled Hunting Area
Established in 1973, this controlled hunting area covers an area of 913,600ha. It comprises grasslands important for game, and *Pistacia chinensis* woodlands.

Awash West Wildlife Reserve
Established 1973; this area of 178,100ha completely surrounds **Awash National Park** and is contiguous to **Alledeghi Wildlife Reserve**. It includes grasslands which are important for game, and *Pistacia chinensis* woodlands.

Babiya Folla National Forest Priority Area Category VIII
74,000ha

Bale Controlled Hunting Area
Established in 1973; 300ha

Bale Wildlife Reserve
6°30-7°20'N, 39°00-40°30'E (Bale Mountains) Covering 176,600ha in the Bale Mountains, this reserve was established in 1973. There is a particular need to conserve montane forest in Bale province (IUCN, 1987).

Belete Gera National Forest Priority Area Category VIII
174,000ha

Bonga National Forest Priority Area Category VIII
52,000ha

Borana Controlled Hunting Area
4,536,600ha Established in 1973.

Bore National Forest Priority Area Category VIII
50,000ha

Boyo Swamp Controlled Hunting Area
Established in 1973.

Bulki Malakoza National Forest Priority Area Category VIII
11,000ha

Butagira National Forest Priority Area Category VIII
15,000ha

Butugi Melka Jebdu National Forest Priority Area Category VIII
19,000ha

Chato Sengi Dengeb National Forest Priority Area Category VIII
63,000ha

Chercher and Arba Gugu Controlled Hunting Area
Established in 1973; 304,500ha

Chew Bahr Wildlife Reserve
This reserve covers 421,200ha in the extreme south-west of the country. Established in 1973, it includes the seasonal 112,500ha Chew Bahr Lake within the wildlife reserve in *Acacia-Combretum* scrub country. It is visited by large numbers of flamingoes in wet years, and is important to many large mammal species (Burgis and Symoens, 1987; Hughes and Hughes, 1992).

Chillalo-Gallena National Forest Priority Area Category VIII
22,000ha

Chillimo Gaje National Forest Priority Area Category VIII
22,000ha

Dabus Valley Controlled Hunting Area
212,700ha Established in 1973.

Dahlac Islands Marine National Park
This 200,000ha proposed park in the province of Eritrea (due to become an independent country) will include some of the several hundred of the Dahlac Islands archipelago, and a marine area of 180,000ha. The larger limestone islands are interspersed with coralline islets and patch reefs. This is an arid area with little freshwater, supporting scattered *Acacia* scrub, extensive mangroves and *Sargassum* flats. It has been identified as a priority conservation site. The threatened marine fauna includes dugong *Dugong dugon*, green turtle *Chelonia mydas* (breeding) and hawksbill turtle *Eretmochelys imbricata*. A variety of corals occur on offshore reefs, supporting a rich fish fauna; both reef and fish are exploited commercially. The mangroves are critical for the productivity of fish stocks, and their preservation could be ensured if current small-scale commercial fishing continues. Overgrazing has led to erosion on some islands, but most are uninhabited (Hillman, 1993; IUCN/UNEP, 1987; IUCN, 1987).

Deme Laha National Forest Priority Area Category VIII
30,000ha

Denkoro National Forest Priority Area Category VIII
8000ha

Din Din National Forest Priority Area Category VIII
19,000ha

Eastern Hararghe (Harar-Wabi Shebelle) Controlled Hunting Area
2,378,800ha

Erer-Gota Controlled Hunting Area
238,600ha Established 1973.

Gambella National Park
This park covers 506,100ha of lowland plains, traversed by the Gilo and Itang rivers; it occurs on the eastern extremity of the Upper Nile marshlands. Deciduous woodland predominates, some of it very dense, whilst other areas comprise open savanna, grassland and marshes. The park is of particular importance for the migration of large herds of white-eared kob and Nile lechwe *Kobus megaceros*. Threatened mammals include a remnant population of elephant and also black rhinoceros, leopard and cheetah. Lion occur. There are reports that Gambella is threatened by adjacent agricultural development, and has ceased to function as a wildlife conservation area. Park stores and vehicles were all destroyed at the time of the government changeover in May 1991 (Hillman, 1993; IUCN\SSC, 1990; IUCN, 1990; IUCN/UNEP, 1987).

Gara Muleta National Forest Priority Area Category VIII
7000ha

Gash Setit Wildlife Reserve
70,900ha Established in 1959, this reserve is considered to be important for conservation of antelope.

Gebre Dima National Forest Priority Area Category VIII
165,000ha

Gedo Yerer Dire National Forest Priority Area Category VIII
10,000ha

Gerbicha Zukuala National Forest Priority Area Category VIII
12,000ha

Gergeda National Forest Priority Area Category VIII
70,000ha

Gewane Wildlife Reserve
Established in 1973, this 243,900ha reserve borders on **Yangudi Rassa National Park** in Hararghe and Welo regions, 350km north of Addis Ababa.

Gidame National Forest Priority Area Category VIII
17,000ha

Gidola Kamba National Forest Priority Area Category VIII
16,000ha

Godere National Forest Priority Area Category VIII
160,000ha

Gore Bele National Forest Priority Area Category VIII
100,000ha

Gura Ferda National Forest Priority Area Category VIII
140,000ha

Harena Kokossa National Forest Priority Area Category VIII
182,000ha

Jarso Gursum National Forest Priority Area Category VIII
7000ha

Jelo Muktar Metakesha Ades National Forest Priority Area Category VIII
16,000

Jibat Mute Jegenfo National Forest Priority Area Category VIII
121,000ha

Jikao Controlled Hunting Area
Established in 1973, this 337,500ha hunting area borders the north of **Gambella National Park** in Ilubabor province.

Jorgo Watto National Forest Priority Area Category VIII
20,000ha

Kahtassa National Forest Priority Area Category VIII
58,000ha

Komtto Waja Tsege National Forest Priority Area Category VIII
37,000ha

Konchi National Forest Priority Area Category VIII
13,000ha

Kubayu National Forest Priority Area Category VIII
60,000ha

Linche Dali Gewe National Forest Priority Area Category VIII
50,000ha

Maze Controlled Hunting Area
Established in 1983.

Megada National Forest Priority Area Category VIII
21,000ha

Mena Angetu National Forest Priority Area Category VIII
190,000ha

Menagesha Suba National Forest Priority Area Category VIII
15,000ha

Mille Sardo Wildlife Reserve
Established in 1973, this 876,600ha reserve borders on **Yangudi Rassa National Park** in Hararghe and Welo regions. It supports populations of Somali wild ass.

Mizan-Teferi Controlled Hunting Area

Murle Controlled Hunting Area
Established in 1973; 417,200ha

Nakfa Wildlife Reserve
Established in 1959, this 163,900ha reserve is considered to be important for antelope conservation.

Negele National Forest Priority Area Category VIII
10,000ha

Omo West Controlled Hunting Area
Established in 1973, this 456,100ha hunting area is situated to the west and south of **Omo National Park**.

Segen Valley Controlled Hunting Area
Established in 1983.

Sekela Mariam National Forest Priority Area Category VIII
10,000ha

Sele Anderacha National Forest Priority Area Category VIII
225,000ha

Shire Wildlife Reserve
75,300ha Established in 1973.

Sibo Tole Kobo National Forest Priority Area Category VIII
100,000ha

Sigmo Geba National Forest Priority Area Category VIII
280,000ha

Tama Wildlife Reserve
Established in 1973, this 326,900ha reserve is contiguous to **Mago National Park** in the Omo-Tama-Mago Complex, in Gamo Gofa region.

Tedo Controlled Hunting Area
Established in 1973, this 234,700ha reserve borders the north of **Gambella National Park** in Ilubabor province.

Tiro Botor Becho National Forest Priority Area Category VIII
85,000ha

Wof Washa National Forest Priority Area Category VIII
13,000ha

Yayu National Forest Priority Area Category VIII
150,000ha

Yegof Erike National Forest Priority Area Category VIII
18,000ha

Yeki National Forest Priority Area Category VIII
122,000ha

Yob Wildlife Reserve
Established in 1959, this 265,800ha reserve is important for antelope conservation.

UNPROTECTED SITES

Amhara
This is reported to be a key forest protection area (Stuart *et al.*, 1990)

Arero Forests
5°20'N, 39°35'E These are forest patches dominated by *Juniperus procera*, at an elevation of about 1800m in the upper Dawa and Ganale Dorya valleys near Arero and Neghelli. Prince Ruspoli's turaco *Tauraco ruspolii* is endemic to these forests, its status poorly known (Collar and Stuart, 1988).

Asaita Lakes
11°31'N, 41°40'E These consist of the Gamari, Gargori, Afambo and Bario Lakes, north-west of **Lake Abbé**. Riverine forest supports bushpig, whilst Nile crocodile, hippopotamus and waterbirds occur in and around the lakes (Burgis and Symoens, 1987; WCMC, 1991).

Asale Lakes
13°56'-14°06'N, 40°22'-40°32'E Covering 7000ha at 125m below sea-level in the Danakil (Afar) Depression, these consist of two lakes, 2.5km apart, fed by underground water; their biology is little known (Hughes and Hughes, 1992).

Aseb Tidal and Coastal Wetlands
12°55'N, 42°55'E Living coral reefs are almost continuous along the coastline in this region, and are especially well developed at Aseb.

Awasa Lake
7°00'N, 38°26'E This lake covers an area of about 12,000ha at an elevation of 1680m. It supports extensive fringing marshes, wet grassland and reedbeds, and is an important bird habitat, favourable for flamingo. It is beginning to achieve some prominence as a recreational area, a hotel exists, and commercial fishing takes place. The southern end of the lake is within **Nechisar National Park** (Hughes and Hughes, 1992; IUCN, 1987).

Bellata and Sai Forests
Humid upland and lowland forests of the south-west are disappearing rapidly. As a centre of endemism, they should be protected. They are thought to be the original home of coffee *Coffea arabica* (IUCN, 1989; WCMC, 1991).

Ch'amo Lake
5°50'N, 37°35'E This lake covers about 45,000ha at an altitude of 1233m. It supports extensive lakeshore marshes, swampy woodlands and wet grasslands. Dominant lake fish include *Bagrus docmac* and *Lates niloticus*, whilst there are some hippopotami, a large population of Nile crocodile and a rich avifauna, including flamingo. There is an important local fishery, and tourism is developing (Hughes and Hughes, 1992; IUCN, 1987).

Chire Conservation Area
This northern area is important for the conservation of antelope (Stuart *et al.*, 1990).

Danakil Depression
A gap in the system of faunal protection occurs here, but the region is politically unstable (WCMC, 1991).

Eritrea, South
13°21'N, 41°40'E Hills in this region harbour the threatened Nubian dragon tree *Dracaena ombet* (Stuart *et al.*, 1990).

Ethiopian Central Plateau
Deciduous woodlands on well-drained slopes occur in this area, and are not included in any current conservation areas. They are rich in endemics, including the rodents *Praomys ruppi*, *Colomys goslingi* and *Lephuromys melanonyx* (Stuart *et al.*, 1990; WCMC, 1991).

Forest
Situated in the semi-arid north, this area (unnamed in the reference) supports a 6000ha woodland of *Juniperus excelsa*, *Olea africana* and *Rhus abyssinica*. On high slopes 2000-2700m, this is an ideal site for study of ecotones between Afromontane forest, *Acacia* wooded grassland and a more Mediterranean flora. There is local overgrazing by stock, and soil erosion (Frame, 1987).

Gamo Gofa
This has been suggested as a key forest protection area (Stuart *et al.*, 1990)

Gara Ades Mount
Stands of *Podocarpus-Juniperus-Olea* forest occur on this mountain (WCMC, 1991)

Gojam
This is reported to be a key forest protection area (Stuart *et al.*, 1990)

Gore and Tepi Forests
7°35'N, 35°35'E This is an area with remnants of humid upland and lowland forests in the south-west, thought to be the original home of coffee *Coffea arabica*. They are important centres of endemism (WCMC, 1991).

Harenna Forests (formerly Araenna and Harana)
6°50'N, 39°00'E; 6°50'N, 40°20'E; 6°30'N, 39°00'E; 6°30'N, 40°20'E Located at the south-eastern limit of the Ethiopian Highlands near the towns of Goba and Mena in Delo, Mendoyu and Awrajas districts, these forests cover an area of 150,000ha. Part of the forests are protected within **Bale Mountains National Park**. They support numerous endemic species, including 11 of the country's 14 endemic amphibians, and 15 of the country's 24 endemic birds, as well as mountain nyala and African wild dog. Threats to the forests include clearing, littering, heathland burning, bamboo grove exploitation and removal of *Podocarpus* saplings (Frame, 1987).

Harerge
This is reportedly a key forest protection area (Stuart *et al.*, 1990)

Ilubabor Montane Forests
This is reported to be a key forest protection area (IUCN 1987; Stuart *et al.*, 1990)

Kaffu Montane Forests (IUCN, 1987)

Kefa
This is reported to be a key forest protection area (Stuart *et al.*, 1990)

Lake Abaya
6°20'N, 37°53'E This 107,100ha lake contains several islands. The shores are generally flat, with extensive marshes and swampy woodlands, and a number of rocky promontories. There are records of 28 species of fish in the lake, and Nile crocodile

and hippopotami occur. The avifauna is diverse, and the lake is important for flamingo. Commercial fishing and some shoreline cultivation take place (Hughes and Hughes, 1992; IUCN, 1987).

Lake Abbé
11°05'N, 41°46'E 23,000ha of this 34,000ha lake are in Ethiopia. Although 37m deep, the diverting of water for irrigation has reduced its size by one-third. The biology of the lake is unknown, and there is little direct human impact apart from water diversion (Hughes and Hughes, 1992).

Lake Afrera
13°18'N, 40°55'E Covering 12,500ha at 102m below sea-level, the lake is situated in the Danakil (Afar) Depression. Reputedly 106m deep, it is saline and fed by subterranean thermal water. Its biology is unknown, and it is little used by humans (Hughes and Hughes, 1992).

Lake Langano
7°35'N, 38°46'E This lake has an area of 24,000ha at an elevation of 1582m. The largely barren shores are rocky, with swampy bays in the south. The water is usually a reddish-brown colour, and is rich in cichlid and cyprinid fish. Birdlife is abundant, and the lake is important for flamingo. There is commercial fishing and a hotel (Hughes and Hughes, 1992; IUCN, 1987).

Lake Tana
11°35'-12°18'N, 37°01'-37°35'E This 315,600ha lake contains several minor, and two major islands, both of the latter being volcanic cones. It supports numerous species of fish, including the endemic *Clarias tsanensis*. Birdlife is varied, and small mammals such as otter occur. The lake is fished, and used for recreation (Hughes and Hughes, 1992).

Menagasha State Forest, National Park
8°56'-9°00'N, 38°32'-38°34'E This is an area of 3460ha on the south-west slopes of Mt Wachacha in the Shoa region, 30km south-west of Addis Ababa. Limited areas of dry montane, coniferous, mixed broadleaved and *Hagenia abyssinica* plateau forests occur. Fauna includes spotted hyena, colobus monkey, common and black-backed jackals, and aardvark (Frame, 1987).

Mersa Berissa
17°55'N, 38°35'E Small mangrove stands occur here, dominated by *Avicennia marina*.

Mersa Mubarec
16°31'N, 39°08'E Small mangrove stands occur here, dominated by *Avicennia marina*.

Ogaden
7°20'N, 46°00'E (centre) The threatened Yaheb nut bush *Cordeauxia edulis* is found near Gedlegube and Bokh, and there is a diverse succulent flora. The region is an important area of endemism for reptiles and ungulates. Speke's gazelle occurs (Stuart *et al.*, 1990).

Omo River Delta
4°28'-5°13'N, 35°44'-36°13'E Situated upstream of where the river enters Lake Turkana (Rudolph), this area consists of a swampy delta with two lakes, the combined wetland covering 120,000ha. The river supports levée forest, and fishing and hunting take place (Hughes and Hughes, 1992).

Sidamo
This is a key forest protection area (Stuart *et al.*, 1990)

Tigray (Stuart *et al.*, 1990)

Tiro Boter Forest
Situated north of Jima, this is a representative of medium altitude Afromontane forest (WCMC, 1991).

Turtle Beaches (IUCN 1987)

Welega
This is a key forest protection area (Stuart *et al.*, 1990)

Welo
This is a key forest protection area (Stuart *et al.*, 1990)

Wufwasha Forests
These have been protected by Ethiopian emperors over the last 400 years (Frame, 1987; WCMC, 1991).

Zwai Lake
8°00'N, 38°50'E This lake covers an area of 65,400ha at an altitude of 1636m. Its margins are flat and swampy, except on the south and south-eastern sides. Eight species of fish have been recorded, including one probable endemic, *Barbus zwaicus*. Hippopotami occur, and the avifauna is reasonably rich; the lake is important for flamingo and pelican. There is commercial fishing (Hughes and Hughes, 1992; IUCN, 1987; Stuart *et al.*, 1990).

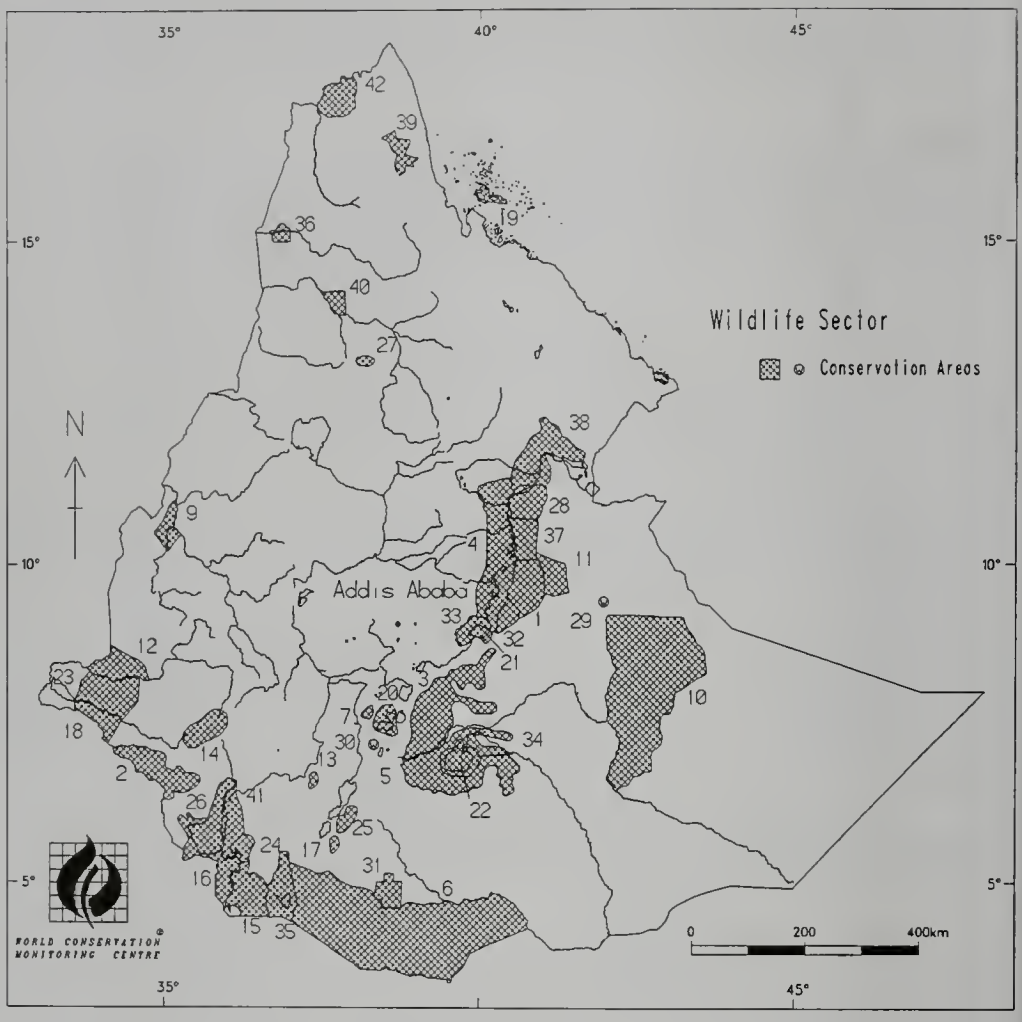
Junction of Ethiopia, Somalia and Djibouti
10°55'N, 42°50'E This is an important area for Beira antelope.

ETHIOPIA - PROTECTED SITES

National/international designations

Name of area and map reference (see Fig. 1.1)	Management area (ha)	Year notified
Controlled Hunting Areas		
1 Afdem-Gewane	593,200	1973
2 Akobo	504,900	1973
3 Arsi	1,087,600	1973
4 Awash West	913,600	1973
5 Bale	966,300	1973
6 Borana	4,536,600	1973
7 Boyo Swamp		1983
8 Chercher & Arba Gugu	304,500	1973
9 Dabus Valley	212,700	1973
10 Eastern Hararghe (Harar-Wabi Shebelle)	2,378,800	1973
11 Erer-Gota	238,600	1973
12 Jikao	337,500	1973
13 Maze		1983
14 Mizan-Teferi		1985
15 Murle	417,200	1973
16 Omo West	456,100	1973
17 Segen Valley		1983
18 Tedo	234,700	1973
Marine National Park		
19 Dahlac	200,000	1969
National Forest Priority Areas		
National Parks		
20 Abijatta-Shalla Lakes	88,700	1970
21 Awash	75,600	1966
22 Bale Mountains	247,100	1969
23 Gambella	506,100	1974
24 Mago	216,200	1975
25 Nechisar	51,400	1973
26 Omo	406,800	1966
27 Simen Mountains	17,900	1966
28 Yangudi Rassa	473,100	1976
Sanctuaries		
29 Babile Elephant	698,200	1970
Kuni-Muktar Mountain Nyala		1990

Fig 1.1 Ethiopia: protected ecologically sensitive sites



ETHIOPIA - PROTECTED SITES (cont.)

National/international designations

Name of area and map reference (see Fig. 1.1)	Management area (ha)	Year notified
30 Senkelle Swayne's Hartebeest	5,400	1972
31 Yabello	253,700	1985
Wildlife Reserves		
32 Alledeghi	183,200	1973
33 Awash West	178,100	1973
34 Bale	176,600	1973
35 Chew Bahr	421,200	1973
36 Gash-Setit	70,900	1959
37 Gewane	243,900	1973
38 Mille-Sardo	876,600	1973
39 Nakfa	163,900	1959
40 Shire	75,300	1973
41 Tama	326,900	1973
42 Yob	265,800	1959
World Heritage Sites		
Aksum		1980
Fasil Ghebbi, Gondar region		1979
Lower Valley of the Awash		1980
Lower Valley of the Omo		1980
Rock-hewn churches of Lazibella		1978
Simen National Park	22,000	1978
Tiya		1980

ETHIOPIA - UNPROTECTED SITES

Name of area and map reference (see Fig. 1.2)	Management area (ha)
Amhara	
1 Arero Forests	
2 Asaita Lakes	
3 Asale Lakes	
4 Aseb Tidal and Coastal Wetlands	
5 Awasa Lake	12,000
Bellata and Sai Forests	
6 Ch'amo Lake	45,000
Chire Conservation Area	
7 Danakil Depression	
8 Eritrea, South	
Ethiopian Central Plateau Forest	
Gamo Gofa	
Gara Ades Mount	
Gojam	
9 Gore and Tepi Forests	
10 Harenna Forests 1	
11 Harenna Forests 2	
12 Harenna Forests 3	
13 Harenna Forests 4	
Harerge	
14 Ilubabor Montane Forests	
Kaffu Montane Forests	
Kefa	
15 Lake Abaya	107,000
16 Lake Abbé	23,000
17 Lake Afrera	12,500
18 Lake Langano	24,000
19 Lake Tana	315,600
20 Menagasha State Forest	3,460
21 Mersa Berissa	
22 Mersa Mubarec	
23 Ogaden	
24 Omo River Delta	120,000
Sidamo	
Tigray	
Tiro Boter Forest	
Turtle Beaches	
Welega	

ETHIOPIA - UNPROTECTED SITES (cont.)

Name of area and map reference (see Fig. 1.2)	**Management area (ha)**
Welo Wufwasha Forests	
25 Zwai Lake	65,400
26 Junction of Ethiopia, Somalia and Djibouti	

Fig 1.2 Ethiopia: unprotected ecologically sensitive sites

KENYA

INTERNATIONALLY DESIGNATED PROTECTED AREAS

Amboseli Biosphere Reserve IUCN Categories II and IX

Amboseli National Park (39,206ha) forms the core of **Amboseli biosphere reserve,** which includes a buffer zone of around 240,000ha. The park lies within a dry lake basin, a relic of a saline lake in the Pleistocene. Shallow seasonal flooding occurs, and three large swamps in the south-east are the only source of permanent water. The vegetation is primarily semi-arid savanna, and the park supports 56 species of mammal including black rhinoceros and several other threatened species. Over 425 bird species have been recorded. There is a large pastoral Maasai population around core area of the park, whom are now having adverse effects on the ecosystem due to changes in their local economy. They are excluded from a 8000ha wildlife viewing area, and conflicts have arisen between their needs and tourist interests. Reduction in the quality of grazing in some areas has caused habitat change and, by decreasing competition, led to unbalanced increases in some herbivore populations. Thriving tourism has also had adverse influences on some animal species in the park (IUCN/UNEP, 1987).

Kiunga Marine National Reserve IUCN Categories VI and IX

This national reserve covers 25,000ha within a biosphere reserve of 60,000ha, including a marine area offshore from the contiguous **Dodori National Reserve** (87,739ha). It comprises a sandy coast with mangroves, and about 50 calcareous islands and coral reefs parallel to the coast. On the mainland there is dry, shrubby coastal forest. The diversity of the marine systems are very varied, and extensive coral and reef fish populations occur. The offshore islands are rich in seabirds, with large nesting colonies of gulls and terns. Dugong *Dugong dugon* and green turtle *Chelonia mydas*, both threatened species, are common. There has been little human activity in the area, and this is one of the main reasons for protection. The mangrove forest was being cut at an increasing rate for commercial purposes, but this ceased when the reserve was declared. Poaching of green turtles and their eggs, and of dugong, is now limited. Certain water sports are allowed within the park, but Kiunga is the least developed of Kenyan marine parks and reserves (IUCN/UNEP, 1987).

Lake Nakuru National Park IUCN Category II

This park, designated a Ramsar site in 1990, covers 18,800ha. It incorporates Lake Nakuru (1,700ha), a closed shallow alkaline soda lake in the Central Rift Valley. The lake is bounded on one side by the Rift Valley escarpment, with some craters and an open savanna plain to the south. Blue-green algae are prolific in the lake waters, causing its characteristic colour, and are the major food source of vast flocks (about 1.5 million) of greater and lesser flamingo. Over 450 bird species have been recorded, and this is one of the few Kenyan national parks established specifically for their protection. The park supports many mammals, including a group of Rothschild's giraffe, and has been surrounded by an electric fence to keep poachers out, and rhinoceros in. The area is extremely vulnerable to aquatic pollution, and fires spreading into the park from outside are a problem (Forse, 1988; IUCN/UNEP, 1987).

Malindi-Watamu Biosphere Reserve IUCN Categories II, VI and IX

This 19,600ha biosphere reserve comprises **Malindi and Watamu marine national reserves** (total area 24,509ha) and **Malindi and Watamu marine national parks** (totalling 3800ha). It stretches along 30km of coastline and includes intertidal rock, sand and mud, a sublittoral area and cliffs. Fringing coral reefs occur in the Watamu area. The marine flora and fauna are diverse due to a wide variety of habitats, and roseate and bridled tern nest on Whale Island. The most significant threat is the increased silt load of the Sabaki River, resulting from uncontrolled cultivation and consequent soil erosion in the Ukambani hills. Corals and shells were once heavily exploited for souvenirs, but this has been greatly reduced. Some traditional fishing is permitted, but it may be necessary to introduce fishing quotas. Oil spills from tankers have occurred at sea, but the extent of pollution has not yet been evaluated. There are 50,000 visitors annually, which causes some pressure on the area (IUCN/UNEP, 1987).

Mount Kenya Biosphere Reserve IUCN Categories II and IX

This biosphere reserve of 71,759ha includes **Mount Kenya National Park**, which comprises land above 3100m with two salients down to about 2600m, while **Mount Kenya Forest Reserve** (200,871ha) is between 1600m and 3100m in elevation. The mountain is the highest in Kenya (5199m), is deeply dissected by valleys formed largely by glacial erosion, and has about 20 small lakes and numerous other glacial features above 3950m. Vegetation varies with altitude and rainfall, and there is a rich alpine and sub-alpine flora, including giant lobelias, but plants become sparse above about 4500m. The lower slopes are more forested, with various associations of bamboo, *Podocarpus* and *Hagenia*. Mount Kenya is important as a water catchment area, and because of its variety of habitats has an extremely diverse fauna. Human interference is low and mainly confined to the forest reserve at lower altitudes. Fire, started by humans and lightning, is a threat to the dry lower forest and is seriously affecting the Afromontane vegetation. A population explosion of hyrax (who eat tourists' litter in the Teleki valley) is damaging the giant groundsels here, which the hyrax otherwise feed on. Some trails are destroying valley bottom habitat, and the construction of a high altitude road across the eastern slopes may cause large-scale degradation (IUCN/UNEP, 1987; Kokwaro and Beck, 1987).

Mount Kulal Biosphere Reserve IUCN Category IX

This biosphere reserve of 700,000ha has a core area of about 1100ha and includes **South Island National Park** (3880ha). It includes Mount Kulal (2295m) and its deep crater, the saline Lake Turkana, volcanic South Island and hot springs on the lake shore. Seasonal streams cross the volcanic landscape of craters and lava flows. One area, the Chalbi Salt Desert, is an ancient lakebed that is occasionally flooded. Vegetation ranges from montane forest and grassland, to desert and saltbush. The fauna is extremely diverse, with an antelope and a subspecies of white-eye endemic to Mount Kulal, and with at least six threatened species. The restriction of the movements of nomadic peoples in the area has brought about changes in grazing practices which have resulted in overgrazing, causing habitat degradation and desertification. A major and increasing impact is tree felling; the montane forests have

been reduced and regeneration hindered in several areas by understorey removal. Grass fires started by pastoralists have also eroded the forest edge, and there are about 2300 of these people living in the area. A major threat to Lake Turkana is the reduced inflow due to water extraction schemes, which have caused the lake to shrink dramatically (Alexander, 1990; IUCN/UNEP, 1987).

South Island National Park IUCN Category IX
This park of 3880ha includes an island in Lake Turkana and is part of **Mount Kulal Biosphere Reserve** (IUCN/UNEP, 1987).

Watamu Marine National Reserve - see **Malindi-Watamu Biosphere Reserve**

Watamu Marine National Park - see **Malindi-Watamu Biosphere Reserve**

NATIONALLY PROTECTED AREAS

Aberdare National Park IUCN Category II
This park covers 76,619ha of a high, isolated range of volcanic mountains forming part of the eastern wall of the Rift Valley, dissected by deep ravines. Vegetation varies with altitude, from a rich alpine and sub-alpine flora through bamboo forest into montane rainforest. The area supports a rich and abundant fauna, including the endangered black rhinoceros and over 200 bird species. A road bisects the park and trout fishing is permitted; tourism is well-developed and encouraged in all sectors. A network of tracks helps patrolling for poachers and fire prevention. The park is separated from cultivated areas by a fence and ditch which are helping to reduce rhino poaching, but there is increasing pressure from surrounding farmland, and tree felling occurs (IUCN/UNEP, 1987).

Arabuko Sokoke National Park IUCN Category II
Arabuko Sokoke Forest Reserve IUCN Category VIII
This 36,000ha forest reserve and 600ha national park are situated on a flat infertile coastal plain. It is the only surviving area of lowland dry coastal forest (now largely coppiced) of any appreciable size in East Africa, with six distinct forest types. It is also one of the top ten priority forest sites for bird conservation in Africa. Two bird species, the Sokoke scops owl *Otus ireneae* and Clarke's weaver *Ploceus golandi*, are wholly endemic to Sokoke, and three other threatened bird species occur. The threatened Ader's duiker *Cephalophus adersi* is found only here and on Zanzibar. The major threat has been from widespread selective logging, which was observed within the nature reserve in 1987. Timber removal is carried out under license outside the nature reserves, where forest clearance is reducing the total forest area to a level below that which may be needed to support some species. Huma settlement surrounds the forest, and fires are a threat in the dry season. Lack of funds and staff prevent the full enforcement of forestry regulations (Collar and Stuart, 1988; IUCN/UNEP, 1987; Polhill, 1989).

Arawale National Reserve IUCN Category VI

This reserve covers 53,324ha of flat thorny plain and sandy rivers. It is important as the only area in Kenya where Hunter's hartebeest occurs, and it further supports threatened species such as Grevy's zebra *Equus grevyi* and elephant. Poaching occurs but is largely under control. Grazing of livestock is a problem, and semi-permanent cattle enclosures have been built by nomadic tribes within the reserve. A series of artificial waterholes have been planned (IUCN/UNEP, 1987).

Bisanadi National Reserve IUCN Category VI

This reserve of 60,600ha is part of a complex which includes **Meru National Park** (87,044ha), **Kora National Park** (178,780ha), **Rahole National Reserve** (127,000ha) and **North Kitui National Reserve** (74,500ha), situated on an open dry plain dissected by seasonal watercourses. Vegetation is mainly thorn bushland and thicket, and the area is important as a wet season dispersal area for wildlife (primarily elephant and buffalo) from Meru National Park. Illegal hunting and livestock grazing occur (IUCN/UNEP, 1987).

Boni National Reserve IUCN Category VI

This reserve covers an area of 133,900ha, and is almost contiguous to **Dodori National Reserve** (87,739ha) on the flat coastal plain. There is a braided drainage system between marine sand and clay ridges, and part of the area is seasonally flooded to a depth of 2m. There are two major flood pan areas. The wetter part of the reserve and parts of Dodori are the only areas in Kenya where coastal lowland groundwater forest occurs; drier areas support dry bushland. In the dry season it is an important focus for elephants from east Lamu and southern Garissa, and the threatened Ader's duiker *Cephalophus adersi* occurs. There is poaching, although it is partly controlled by a camel-mounted anti-poaching unit (IUCN/UNEP, 1987; Polhill, 1989).

Buffalo Springs National Reserve IUCN Category II

This 13,100ha reserve is on the opposing side of the Ewaso Nyiro river from **Samburu National Reserve** (16,500ha), in an area of gently rolling lowlands with some basalt lava fields. There are seasonally dry luggas, riverine forest, wooded savanna and some alkaline grassland. The area supports 22 large mammal species (including five threatened ones), for which it is an important dry season habitat. It is a breeding area for Grevy's zebra, and the riverine forests support high densitis of elephant. Over 320 species of birds have been recorded. Illegal grazing and unregulated tourism are having an impact on the reserve, and there are plans to develop a potentially disruptive road system. This reserve, **Samburu National Reserve** and **Shaba National Reserve** (14km away) are small, and a recent management plan has suggested that they be managed as a unit, and increased in size (IUCN/UNEP, 1987).

Central Island National Park IUCN Category II

Established in 1983, this national park covers an area of 500ha.

Cheptugen-Kapchemutwa Nature Reserve IUCN Category IV
31ha

Chyulu National Park IUCN Category II
Established in 1983, this 47,090ha park is situated in the Chyulu Hills. This is an important area of forest and grassland, supporting populations of elephant, buffalo, black rhino, eland and greater kudu. Seven new races of bird have been described from here, plus the park is home to several endemic insect species, and is a key bat habitat. This is a major water catchment for the Mzima Springs, from where water is piped to Mombasa. Human encroachment into the area is increasing (Frame, 1987).

Dodori National Reserve IUCN Category VI
This area of 87,739ha is contiguous to **Kiunga Marine National Reserve**, for which it acts as an important buffer zone, and is almost contiguous to **Boni National Reserve**. It includes the Dodori valley, the river estuary, and Pleistocene dunes parallel to the coast. The vegetation consists primarily of lowland dry forest, with areas of marsh, floodmeadow grassland and mangrove, and it includes some of the last remaining areas of groundwater forest in Kenya. This is a major breeding area for topi, and elephant and lesser kudu are the most common large mammals. The mangroves support a rich avifauna, including pelican, and there are substantial breeding populations of threatened dugong and green turtle. There is poaching in the wet season, and very little management or development have occurred (IUCN/UNEP, 1987; Polhill, 1989).

Hell's Gate National Park IUCN Category II
This park covers 6800ha, including the Njorowa Gorge (or Hell's Gate) which is the ancient outlet of Lake Naivasha, and Longonot Crater. The gorge is notable for birds of prey (about 30 raptor species occur) and swifts. The park's population of Ruppell's griffon vulture has been seriously reduced since 1950 by indiscriminate killing and poisoning. Plains game occur despite continuous poaching, and the interruption of migration patterns by fences. A planned thermo-hydro-electric power scheme could affect the area (IUCN/UNEP, 1987).

Kaimosi Forest Nature Reserve IUCN Category IV
19ha

Kakamega National Reserve IUCN Category II
This reserve of 4468ha is situated in hilly country drained by two major rivers; scattered seasonal swamps occur. It is notable as the most eastern locality of West African equatorial rain forest in Kenya. Grassy glades on shallow soils occur within the forest, and there are some areas of secondary, wet *Combretum* woodland. Many of the area's plant and animal species occur nowhere else in the country; the avifauna is unique in Kenya, and includes several threatened species. Selective logging is permitted outside the nature reserves, but deforestation is occurring at a devastating rate and there is pressure to replant with faster-growing exotic species. Illegal

firewood collection, grazing and poaching occur, and the local human population is creating pressure for more agricultural land (IUCN/UNEP, 1987).

Kamnarok National Reserve IUCN Category VI
Established in 1983; 8774ha

Kaptagat Forest Nature Reserve IUCN Category IV

Karura Nature Reserve IUCN Category IV
102ha

Katimok Kabarnet Nature Reserve IUCN Category IV
58ha

Kerio Valley National Reserve IUCN Category IV
Established in 1983; 6570ha

Kisite, Mpunguti Marine National Park IUCN Category II
4°00'-4°44'S, 39°21'-39°26'E This marine park is contiguous with **Mpunguti Marine National Reserve**, covering a combined area of 2800ha. It includes a trapezoidal section of Indian Ocean and four waterless coral islands covering about 18ha, as well as considerable areas of fringing reefs and sand. Seagrasses cover a large area of the sub-littoral zone of the reef, and there is an interesting coral and fish community. The offshore islands support many pelagic birds, including breeding colonies of roseate and sooty terns. Blasting has caused damage to reefs in the past, but present protection has allowed regeneration. Raiding of island bird colonies has been controlled. There is a fishing village with a few tourist facilities within the park, and tourism is becoming increasingly important; some illegal fishing occurs (IUCN/UNEP, 1987; UNEP/IUCN 1988).

Kora National Park IUCN Category II
Covering an area of 178,780ha, this national park is part of a complex of conservation areas that imclude **Meru National Park** (87,044ha), and **Rahole** (127,000ha), **North Kitui** (74,500ha) and **Bisanadi** (60,000ha) **National Reserves**. Low hills with isolated inselbergs greatly increase local floral and faunal endemicity; vegetation types include *Acacia-Commiphora* bushland, and riverine forest along the Tana River. The park supports a varied fauna including four threatened mammal species, with a rich avifauna along the Tana River. Poaching occurs, and livestock grazing by Somali pastoralists has led to serious soil erosion in the east of the park. The Tana River dam has altered the normally seasonal fluctuations in river levels, and profoundly affected the area's ecology; it also threatens to flood wider areas. Several large settlement schemes may increase pressure on the trees in the delta as a whole (IUCN/UNEP, 1987; Polhill, 1989).

Lake Bogoria National Reserve IUCN Category II
This reserve of 10,705ha includes a shallow soda lake at the foot of the eastern escarpment of the Rift Valley. An area of thermal springs and geysers occurs, whilst vegetation types include thorn savanna and thicket, small patches of riverine forest, and shoreline alkaline grassland. Greater kudu *Tragelaphus strepsiceros* occur, and greater and lesser flamingo seasonally occupy the lake shore. There is some illegal grazing and settlement within the reserve (IUCN/UNEP, 1987).

Langata Nature Reserve IUCN Category IV
96ha

Longonot National Park IUCN Category II
Established in 1983, this park covers an area of 5200ha.

Losai National Reserve IUCN Category VI
This reserve of 180,680ha is situated in the Losai Mountains, on a lava plateau with scattered volcanic plugs and cones, dissected by dry luggas. Thorn bushland predominates. Poaching has eradicated the former populations of elephant and rhinoceros, illegal grazing occurs, and the security situation has caused problems (IUCN/UNEP, 1987).

Malka Mari National Park IUCN Category II
Established in 1989, this park covers an area of 87,600ha.

Maralai Game Sanctuary IUCN Category IV
500ha

Marsabit National Reserve IUCN Category II
This park of 113,200ha comprises an isolated, forested mountain surrounded by desert country. The mountain consists of a group of volcanic craters, several of which contain freshwater lakes. The surrounding area is an *Acacia*-scrub dominated desert, with lava fields. The area supports a varied fauna including 350 birds, and a number of threatened species. Forest felling occurs outside the area of the park, and greater kudu are now recovering after an outbreak of rinderpest in 1960. Desertification through overgrazing has occurred and an IUCN project is attempting to replace cattle with camels in an effort to reduce this (IUCN/UNEP, 1987).

Masai Mara National Reserve IUCN Category II
This reserve of 151,000ha, contiguous to **Serengeti National Park** in Tanzania (1,476,300ha), comprises undulating grassland, dense thickets, riverine forests, patches of *Acacia* woodland, isolated rocky outcrops, and the Siria escarpment in the west. The reserve forms the northern end of the Serengeti ecosystem. This area is important in the dry season for migratory herbivores, including 250,000 zebra and 1.3 million wildebeest from the Tanzanian section of the Serengeti, and is Kenya's foremost game viewing area. The 65 species of mammal include many elephants, and the largest lion population in Kenya. The main problems are illegal grazing and

poaching around the periphery, which have almost eradicated the black rhinoceros. Cultivation is becoming more intense around the reserve, and these problems are exacerbated by the boundary not being demarcated. Fires and elephant damage are reducing habitat diversity. Tourism also causes conflicts with wildlife and is likely to increase (IUCN/UNEP, 1987).

South-Western Mau Nature Reserve IUCN Category IV
0°30'S, 35°30'E Established in 1960 and covering 43,032ha, 30% of the forest cover in the "Mau Forest" has been removed in the last decade by softwood plantations, charcoal burning, illegal encroachment, logging and fires. Rare mammals include bongo *Tragelaphus eurycerus*, golden cat *Felis aurata* and giant forest hog *Hylochoerus meinertzhageni*, and this is the only Kenyan locality for the yellow-backed duiker *Cephalophus sylvicultor* (WCMC, 1988c; Young, 1984).

Meru National Park IUCN Category II
This park of 87,044ha is contiguous to **Kora National Park** (178,780ha), and **Rahole** (127,000ha), **North Kitui** (74,500ha) and **Bisanadi** (60,000ha) **National Reserves**. Volcanic hills occur in the west, while the east is an open plain; the Tana River on the southern boundary includes Adamson's Falls. Thorn bushland and thicket prevail, merging into *Terminalia* wooded grasslands in the west. There are some riverine swamps, and in the north a small outlier of rain forest still exists. The area supports a wide variety of ungulate species and threatened mammals, including leopard, cheetah, elephant, Grevy's zebra, and black rhinoceros. 277 bird species have been recorded. Deforestation, although mostly outside the park, may affect the park's water supplies. There are reports of encroachment by pastoralists.

Mbololo Nature Reserve IUCN Category IV

Mombasa Marine National Park IUCN Category II
Established in 1986; covers an area of 1000ha

Mombasa Marine National Reserve IUCN Category VI
Established in 1986; covers an area of 20,000ha

Mount Elgon National Park IUCN Category II
This park of 16,923ha lies on the eastern flank of Mount Elgon (4627m), a massive volcanic cone containing a huge caldera; half the mountain lies within Uganda. Various volcanic features occur including basalt columns, and lava tunnels (some up to 60m in diameter) which are visited by elephants in search of salt. There are several altitudinal vegetation zones, from wet montane forest to high altitude moorland. The park supports a very varied fauna including typical montane moorland species, and threatened animals such as leopard, elephant and golden cat. Plans to extend the park to include Sosio forest would benefit the elephants (Anon., 1989). Severe human encroachment is occurring in the western section as well as into the forest and moorland buffer zone around the park (IUCN/UNEP, 1987).

Mpunguti Marine National Reserve IUCN Category VI
4°00'-4°44'S, 39°21'-39°26'E Situated 6km from the Tanzanian border, this marine reserve covers 1100ha; it is contiguous with **Kisite Marine National Reserve**. The reserves cover four small coral islands, surrounded by considerable reefs. Roseate and sooty terns breed on the islands. Tourism is becoming increasingly important, and local fishermen are allowed to fish within this reserve. (UNEP/IUCN, 1988).

Mwea National Reserve IUCN Category VI
This reserve covers 6803ha of gently rolling bushland, bordered to the south by a reservoir on the Tana River. The vegetation is primarily thorn bushland and *Acacia* and *Commiphora* woodland, with scattered baobabs. The area supports remnant elephant and buffalo populations, but most larger mammal populations are low. Illegal hunting and seasonal livestock grazing occurs; there is timber felling and considerable encroachment from irrigation and settlement schemes. Control of Egyptian geese (as rice pests) may increase the incidence of bilharzia as they predate the bilharzia parasite's snail hosts (IUCN/UNEP, 1987).

Nairobi National Park IUCN Category II
This park of 11,721ha comprises a plain crossed by several deep river valleys, with an upland formed by an old lava flow in the west. Dry transitional savanna predominates, with gallery forest in the valleys, while upland areas are forested. The combination of forest, pasture and permanent water makes the park important for migrants, particularly in drought years, and the park is noted for its concentrations of large mammals, with over 80 species recorded. It also supports about 80 black rhinoceros and 500 bird species. The major threat to the park is human encroachment on the southern border (all other sides are fenced), which may interrupt migration routes and isolate the park even more. A plan to dam the Mbagathi River could flood large areas of the park. Fire is a problem on the periphery. Tourism is well developed and may cause management problems if it increases (IUCN/UNEP, 1987).

Nandi North Nature Reserve IUCN Category IV
Established in 1978; covers an area of 3434ha

Nasolot National Reserve IUCN Category VI
This reserve of 9200ha comprises a flat plain with seasonal watercourses, rising to the foothills of the Sekerr range; it includes a portion of the Turkwell river gorge. The vegetation is primarily thorn bushland, and the reserve supports elephant, black rhinoceros and lesser kudu (IUCN/UNEP, 1987).

Ndere Island National Park IUCN Category II
Established in 1986; covers an area of 420ha

Ngai Ndethya National Reserve IUCN Category VI
This reserve of 21,209ha forms a corridor between **Tsavo East** and **Tsavo West National Parks** (total area: 2,081,200ha), and is important in maintaining a route for migrating animals between them. Open thornbush plains with scattered baobabs

predominate, bordered by the Athi River to the east and seasonal watercourses to the north and south. About 10,000 people live in settlements within the reserve, and wildlife populations and habitats have consequently been severely altered (IUCN/UNEP, 1987).

North Kitui National Reserve IUCN Category VI

This reserve covers 74,500ha, and is part a conservation complex which includes **Meru National Park** (87,044ha), **Kora National Park** (178,780ha) and **Rahole** (127,000ha), and **Bisanadi** (60,000ha) **National Reserves**. Dense bushland covers the low hills, and there are seasonal watercourses which drain north into the Tana River; these form 20km of the northern boundary, and there is some riverine forest. There are Nile crocodile and hippopotamus in the Tana River, along which the avifauna is particularly rich. Illegal grazing and hunting occur, although there is an anti-poaching unit in the area (IUCN/UNEP, 1987).

Ol Donyo Sabuk National Park IUCN Category II

This park covers 1842ha; its main feature is a granitic inselberg rising from the surrounding plains. This is almost entirely forested, except for a small bare area around the summit. The forest is a remnant of a once widespread montane forest type dominated by species of *Olea, Podocarpus* and *Croton.* A rich fauna occurs, including threatened species such as black rhinoceros, leopard and the butterfly *Charaxes nandina*. There have been plans to divert tourists from **Nairobi National Park** to this area (IUCN/UNEP, 1987).

Rahole National Reserve IUCN Category VI

This reserve of 127,000ha is part of a conservation complex comprising **Meru National Park** (87,044ha), **Kora National Park** (178,780ha), and **North Kitui** (74,500ha) and **Bisanadi** (60,000ha) **National Reserves**. It is situated on an open dry plain, and traversed by the seasonal Rahole sand river. Dry thorn bushland is the dominant vegetation type. The elephant population has been almost eradicated, but the area supports antelope species, and threatened species such as Grevy's zebra and beisa oryx *Oryx beisa*. The area has been invaded by semi-permanent settlers and illegal hunting and grazing occur, partly due to difficulty of access and lack of surveillance (IUCN/UNEP, 1987).

Ras Tenewi Marine National Park Proposed II

This marine reserve covers 35,000ha: 10,500ha of this consist of dry land, and 24,500ha of a marine area extending 9km offshore. It includes extensive coral reefs and several rocky islands; tidal pool development is extensive in the Ras Biongwe area. The area has been identified as a priority site for protection (IUCN, 1987). Terrestrial vegetation includes dune grassland, palms, coastal thicket and lowland forest further inland. The fauna includes threatened species such as elephant, dugong, olive ridley turtle *Lepidochelys olivacea*, green turtle and hawksbill turtle *Eretmochelys imbricata*; Ras Tenewi is the most important turtle breeding site in Kenya. The area is also on an important flyway for Palaearctic and Eurasian migrants, and Tenewi Rocks are the only nesting site in Kenya for sooty tern. Poaching of

turtles and their eggs occurs through inadequate patrolling, and increases in tourism and local populations are potential threats.

Ruma National Park IUCN Category II

This park of 12,000ha is located on a flat valley floor, with the Kanyamua escarpment to the south-east. The vegetation is a mixture of tall grassland and woodland, with extensive thicket vegetation dominated by *Acacia* spp. The area supports leopard and buffalo. To reduce grass and shrub cover, Rothschild's giraffe, common zebra and ostrich have been introduced. The area is surrounded by dense human settlement, but people avoid the park because of tsetse fly infestation and uranium deposits, the latter thought to be responsible for making former inhabitants sterile (IUCN/UNEP, 1987).

Saiwa Swamp National Park IUCN Category II

This 6km-long swamp of 192ha lies alongside the meandering perennial Saiwa River. Vegetation in the swamp comprises tall bullrushes and sedges, bordered by a mixture of grassland, riverine forests and *Acacia* woodland. The park was primarily established for the protection of a population of 80-100 sitatunga, but it also supports De Brazza's monkey (28 of the 100-200 total in Kenya) and a diverse avifauna. There has been a proposal to enlarge the park, and the Kenyan government has already acquired land for this purpose (IUCN/UNEP, 1987).

Samburu National Reserve IUCN Category II

This reserve of 16,500ha is on the opposite bank of the Ewaso Ngiro River to **Buffalo Springs National Reserve** (13,100ha) and 9km from **Shaba National Reserve** (23,910ha), in a low-lying area. Away from the river are steep gullied slopes, rounded hills and lava plains. Vegetation includes riverine woodland, open *Acacia tortilis* woodland and bush and shrub communities. The reserve is important for the threatened Grevy's zebra, as it may be on one of its major migration routes. It also supports at least 22 large animal species, including threatened species such as elephant, cheetah and Nile crocodile. Illegal livestock grazing occurs, especially along the river, and tree damage is caused by elephant that have immigrated from surrounding areas. Tourists harass animals, and plans to construct additional tracks through the riverine forest would irrevocably disturb the area. The reserve is small, and there are plans to manage it as a unit with **Shaba** and **Buffalo National Reserves** (IUCN/UNEP, 1987).

Shaba National Reserve IUCN Category II

This 23,910ha reserve is within 9km of **Buffalo Springs** (13,100ha) and **Samburu** (16,500ha) **National Reserves,** and is mainly a lowland lava plain with isolated hills. There are numerous springs and a large swamp, and vegetation types include riverine communities, *Acacia tortilis* woodland, and bushland. The area supports 17 large mammal species, including threatened animals such as Grevy's zebra, leopard and cheetah. There is illegal hunting and livestock grazing in the reserve; the area to the north is used as a military training area, and is much disturbed as a result (IUCN/UNEP, 1987).

Shimba Hills National Reserve IUCN Category II

This reserve covers 21,740ha of the Shimba Hills, a low range parallel to the coast which constitutes a major water catchment area. Vegetation types include grassland, with forest on scarp slopes and along steep-sided valleys. Mature forest occurs in the low-lying southern area, and there is also relict forest, one of the last of its type, from a wetter era. The reserve supports at least 13 species of large herbivore including about 150 sable antelope *Hippotragus niger* (the last population in Kenya), and at least 200 elephant with a large proportion of young. Elephant tree damage may be increasing, but this may benefit the sable. Timber exploitation has ceased, but there are still plantations which deprive grazers of their habitat. Burning is necessary to maintain sable habitat, but causes considerable damage if uncontrolled. The inhabitants of surrounding villages cause some disturbance, including low levels of poaching (IUCN/UNEP, 1987).

Sibiloi National Park IUCN Category II

This park of 157,085ha is the most remote of Kenya's national parks, and is largely a wilderness in its natural state. It consists of open plains interspersed with seasonal watercourses, flanked by volcanic formations including Mount Sibiloi and the volcanic **Central Island** in Lake Turkana (some distance from the mainland). Grassy plains with doum palms predominate, with scrubby *Salvadora* bush on Central Island. Mammals include a variety of antelopes, and threatened species such as Grevy's zebra and cheetah. The world's largest colony of crocodiles (about 12,000), and African skimmers breed on Central Island. Lake Turkana is on an important flyway for north-bound migrants, with over 350 bird species recorded. Scrub on Central Island is cut for firewood by fishermen; efforts to make the island a sanctuary have been unsuccessful, and there are proposals to extend the park northwards (IUCN/UNEP, 1987).

South Kitui National Reserve IUCN Category VI

The reserve of 183,300ha is contiguous to **Tsavo National Park**. It includes the seasonal Thua river and its floodplain, and low hills with thorn bush and scrub thickets. The fauna is similar to that of the northern area of **Tsavo East National Park**, and the area formerly supported a substantial elephant population. Illegal hunting and livestock grazing occur (IUCN/UNEP, 1987).

South Turkana National Reserve IUCN Category VI

This area of 109,100ha includes two prominent hills, surrounded by plains dissected by seasonal watercourses. There is some *Acacia*-dominated riverine forest on the Kerio River; the remainder is dense thorn bush with remnant forest on hilltops. Elephant and greater kudu have been recorded. Settlements have been encroaching and there is illegal livestock grazing (IUCN/UNEP, 1987).

Tana River Primate National Reserve IUCN Category II

This reserve of 16,900ha includes about 50km of the meandering Tana River and its floodplain, plus adjacent dry plains. The riverine forest is highly diverse, with nearly 300 tree species recorded, and is important for its varied primate fauna. Seven species

of primate occur, the highest number in any one part of Kenya, including an endemic subspecies of red colobus *Procolobus [badius] rufomitratus rufomitratus*, and Tana mangabey *Galeritus galeritus*. Both of these are threatened species which declined in the 1970s and 1980s. 43 other mammals species have been recorded, and the 248 bird species include the threatened endemic Tana River cisticola *Cisticola restricta*, the range of which is little known. A decline in primate populations may be related to the death of some large trees from unknown causes. Human settlement has been allowed within the reserve, and illegal hunting, seasonal livestock grazing and uncontrolled fires occur. The boundaries of the reserve need marking more clearly. The ecological balance is also likely to become severely upset by 10 dams on the upper Tana River, four of which have already been completed (Collar and Stuart, 1988; IUCN/UNEP, 1987).

Tsavo East and Tsavo West National Parks IUCN Category II
Tsavo East covers 1,174,700ha and **Tsavo West** 906,500ha; the parks are contiguous both to one another and to two game reserves in Tanzania. The topography is varied, with the 300m-high Yatta Plateau in the north of **Tsavo East** and the south-eastern end of the volcanic Chyulu Hills rising to over 2438m in **Tsavo West**. The park contains a diversity of habitats, including bush grassland, saltbush and *Acacia* and *Commiphora* woodland, but over-browsing has resulted in large areas now being dominated by grasses. The area supports a wide variety of large mammals including several threatened species, and a rich avifauna. Recurrent drought and an increasing incidence of fires have resulted in large-scale vegetation changes in several areas. Poaching occurs despite protection measures, and has significantly reduced the elephant and buffalo populations over the past 20 years (Olindo *et al.*, 1988). The Nairobi-Mombasa highway and railway cross the park and the Chyulu Hills, which are a major catchment area, are suffering from encroachment (IUCN/UNEP, 1987).

Uaso Narok Nature Reserve IUCN Category IV
Established in 1981; covers an area of 1575ha

Yala Nature Reserve
0°07'-0°01'S, 33°58'-34°15'E This reserve is situated in south-western Kenya adjacent to Lake Victoria, encompassing the Nzoia Delta and lakeshore southwards to Ugowe, and the areas eastwards to Lake Kanyaboli. The reserve covers 30,000ha of wetland, and includes several minor lakes and some forest. The area is little-known (Frame, 1987; Hughes and Hughes, 1992).

OTHER MANAGED AREAS

Al Jogi Rhinoceros Sanctuary Private

Arabuko Sokoke Forest Reserve - see **Arabuko Sokoke National Park**
Established in 1943; 36,000ha

Bahati Forest Reserve IUCN Category VIII
Established in 1932; 10,187ha

Bojoge Forest Reserve IUCN Category VIII
Established in 1991; 2150ha

Buda Forest Reserve IUCN Category VIII
Established in 1932 and covering 668ha, this is one of the kaya coastal forest fragments: see **Kaya Forests** (Polhill, 1989).

Bunyala Forest Reserve IUCN Category VIII
Established in 1956; 826ha

Chebartigon Forest Reserve IUCN Category VIII
Established in 1949; 103ha

Cheboyit Forest Reserve IUCN Category VIII
Established in 1941; 2489ha

Chemorogok Forest Reserve IUCN Category VIII
Established in 1949; 1347ha

Chemurokoi Forest Reserve IUCN Category VIII
Established in 1941; 3966ha

Chepalungu Forest Reserve IUCN Category VIII
Established in 1956, this forest reserve covers an area of 10,188ha in south-western Kenya, near the Tanzanian border. It is a little-known locality, of special interest (Frame, 1987).

Chepkuchomo Forest Reserve IUCN Category VIII
Established in 1962; 320ha

Cherial Forest Reserve IUCN Category VIII
Established in 1949; 43ha

Choke (Mnjonyi) Forest Reserve IUCN Category VIII
Established in 1991; 74ha

Dagoretti Forest Reserve IUCN Category VIII
Established in 1938; 764ha

Eburu Forest Reserve IUCN Category VIII
Established in 1932; 8715ha

Eldoret Forest Reserve IUCN Category VIII
Established in 1966; 148ha

Embakasi Forest Reserve IUCN Category VIII
Established in 1941; 573ha

Embobut Forest Reserve IUCN Category VIII
Established in 1954; 21,934ha

Escarpment Forest Reserve IUCN Category VIII
Established in 1941; 94ha

Fururu Forest Reserve IUCN Category VIII
Established in 1991; 14ha

Gogoni Forest Reserve IUCN Category VIII
Established in 1932 and covering 824ha, this is one of the coastal kaya forest refuges: see **Kaya Forests** (Polhill, 1989).

Gonja Forest Reserve IUCN Category VIII
Established in 1961, this 842ha forest reserve includes Gonja Kaya Forest (Robertson, 1987).

Ikilisa Forest Reserve IUCN Category VIII
Established in 1960; 79ha

Iveti Forest Reserve IUCN Category VIII
Established in 1933; 348ha

Jombo Forest Reserve IUCN Category VIII
Established in 1941 and covering 907ha. Jombo Hill is one of the coastal **Kaya Forests** near Mrima Hill but a little further inland (Polhill, 1989).

Kabarak Forest Reserve IUCN Category VIII
Established in 1962; 1392ha

Kabiok Forest Reserve IUCN Category VIII
Established in 1949; 14ha

Kaisungor Forest Reserve IUCN Category VIII
Established in 1941; 1086ha

Kalimani Forest Reserve IUCN Category VIII
Established in 1960; 180ha

Kamiji Forest Reserve IUCN Category VIII
Established in 1933; 170ha

Kangure Forest Reserve IUCN Category VIII
Established in 1961; 188ha

Kapchemutwa Forest Reserve IUCN Category VIII
Established in 1941; 9101ha

Kapchorua I and IV Forest Reserves IUCN Category VIII
Established in 1941; 288ha

Kapkanyar Forest Reserve IUCN Category VIII
Established in 1967; 10,600ha

Kapolet Forest Reserve IUCN Category VIII
Established in 1941; 1552ha

Kapsaret Forest Reserve IUCN Category VIII
Established in 1932, this forest reserve of 1194ha is in the Kericho-Sondu area, where it is endangered by sugarcane development. Trees include species of *Terminalia*, *Combretum*, *Euphorbia* and *Ficus*. Two rare birds live here, viz. the tinker barbet *Pogoniulus chrysoconus* and the black-billed barbet *Lybius guifsobalito* (Frame, 1987).

Kaptagat Forest Reserve IUCN Category VIII
Established in 1941; 13,037ha

Kaptaroi Forest Reserve IUCN Category VIII
Established in 1936; 328ha

Kaptimom Forest Reserve IUCN Category VIII
Established in 1949; 89ha

Karua A, B and C Forest Reserves IUCN Category VIII
Established in 1961; 210ha

Karura Forest Reserve IUCN Category VIII
Established in 1932; 1044ha

Kasigau Forest Reserve IUCN Category VIII
Established in 1941, this area of 202ha is an important forested hill, encroached by humans in the lower areas. Some rare tree species occur, as do two restricted bird species, viz. white-starred forest robin *Pogonocichla stellata* and the white-eye *Zosterops poliogastra*. The hill is remarkable for its variety of ferns, some of which are endemic (National Museum, 1982).

Katende Forest Reserve IUCN Category VIII
Established in 1960; 949ha

Katimok Forest Reserve IUCN Category VIII
Established in 1949; 2071ha

Kemeto Forest Reserve IUCN Category VIII
Established in 1949; 210ha

Kenze Forest Reserve IUCN Category VIII
Established in 1960; 188ha

Kererr Forest Reserve IUCN Category VIII
Established in 1954; 2160ha

Kessop Forest Reserve IUCN Category VIII
Established in 1941; 2347ha

Ketnwan Forest Reserve IUCN Category VIII
Established in 1949; 47ha

Kiagu Forest Reserve IUCN Category VIII
Established in 1959; 1366ha

Kiambicho Forest Reserve IUCN Category VIII
Established in 1961; 376ha

Kiambu Forest Reserve IUCN Category VIII
Established in 1932; 134ha

Kiamuti Forest Reserve IUCN Category VIII
Established in 1961; 182ha

Kibithewa Forest Reserve IUCN Category VIII
Established in 1959; 206ha

Kibwezi Forest Reserve IUCN Category VIII
2°27'S, 37°55'E Situated on interesting lava flows, this 5850ha forest protects an important water supply point for Kibwezi township. It is an example of dry xerophytic forest, with elephant, buffalo and other game recorded in the area. Well-known bat caves exist in the vicinity, near Kiboko (National Museum, 1982).

Kieiga Forest Reserve IUCN Category VIII
Established in 1959; 546ha

Kierera Forest Reserve IUCN Category VIII
Established in 1959; 763ha

Kiganjo Forest Reserve IUCN Category VIII
Established in 1932; 322ha

Kijabe Hill Forest Reserve IUCN Category VIII
Established in 1980; 706ha

Kijegge Forest Reserve IUCN Category VIII
Established in 1959; 3296ha

Kikingo Forest Reserve IUCN Category VIII
Established in 1959; 1234ha

Kikuyu Escarpment Forest Reserve IUCN Category VIII
Established in 1943; 41,940ha

Kilala Forest Reserve IUCN Category VIII
Established in 1960; 151ha

Kilombe Hill Forest Reserve IUCN Category VIII
Established in 1936; 1554ha

Kilulunyi Forest Reserve IUCN Category VIII
Established in 1991

Kilungu Forest Reserve IUCN Category VIII
Established in 1933; 148ha

Kimojoch Forest Reserve IUCN Category VIII
Established in 1949; 759ha

Kinyesha Mvua Forest Reserve IUCN Category VIII
Established in 1991; 50ha

Kinyo Forest Reserve IUCN Category VIII
Established in 1949; 324ha

Kiongwani Forest Reserve IUCN Category VIII
Established in 1960; 34ha

Kioo Forest Reserve IUCN Category VIII
Established in 1960; 45ha

Kipipiri Forest Reserve IUCN Category VIII
Established in 1956; 5019ha

Kipkabus (Elgeyo) Forest Reserve IUCN Category VIII
Established in 1961; 920ha

Kipkabus (Uasin, Gishu) Forest Reserve IUCN Category VIII
Established in 1941; 5732ha

Kipkunurr Forest Reserve IUCN Category VIII
Established in 1941; 15,176ha

Kiptaberr Forest Reserve IUCN Category VIII
Established in 1967; 12,886ha

Kisere Forest Reserve IUCN Category VIII
Established in 1933; 484ha

Kitalale Forest Reserve IUCN Category VIII
Established in 1977; 2350ha

Kitale Township Forest Reserve IUCN Category VIII
Established in 1932; 401ha

Kiteta Forest Reserve IUCN Category VIII
Established in 1933; 22ha

Kithendu Forest Reserve IUCN Category VIII
Established in 1960; 219ha

Kitondu Forest Reserve IUCN Category VIII
Established in 1960; 1085ha

Kitoo Forest Reserve IUCN Category VIII
Established in 1960; 37ha

Kitumbuuni Forest Reserve IUCN Category VIII
Established in 1960; 76ha

Kiu (Ngungu) Forest Reserve IUCN Category VIII
Established in 1960; 83ha

Kyai Forest Reserve IUCN Category VIII
Established in 1960; 106ha

Kyemundu Forest Reserve IUCN Category VIII
Established in 1960; 141ha

Laikipia South Forest Reserve IUCN Category VIII
Established in 1932; 3472ha

Lariak Forest Reserve IUCN Category VIII
Established in 1932; 3939ha

Lelan Forest Reserve IUCN Category VIII
Established in 1958; 28,606ha

Lembus Forest Reserve IUCN Category VIII
Established in 1959; 16,211ha

Leroghi Forest Reserve IUCN Category VIII
Established in 1936; 91,944ha

Leshau Forest Reserve IUCN Category VIII
Established in 1960; 195ha

Lewa Downs Rhinoceros Sanctuary Private
Established in 1984; 2023ha

Loitokitok Forest Reserve IUCN Category VIII
Established in 1977; 767ha

Londiani Forest Reserve IUCN Category VIII
Established in 1932; 108ha

Longonot Forest Reserve IUCN Category VIII
Established in 1978; 4774ha

Lugari Forest Reserve IUCN Category VIII
Established in 1977; 2163ha

Maatha Forest Reserve IUCN Category VIII
Established in 1959; 639ha

Macha Forest Reserve IUCN Category VIII
Established in 1991; 15ha

Magumu North Forest Reserve IUCN Category VIII
Established in 1978; 242ha

Magumu South Forest Reserve IUCN Category VIII
Established in 1979; 369ha

Mailuganji Forest Reserve IUCN Category VIII
Established in 1941, this 1715ha forest reserve contains Kaya Mtae (4°06'S and 39°27'E), at an altitude of 340m (Robertson, 1987).

Maji Mazuri Forest Reserve IUCN Category VIII
Established in 1932; 7609ha

Makongo (Kitui) Forest Reserve IUCN Category VIII
Established in 1961; 3432ha

Makongo (Machakos) Forest Reserve IUCN Category VIII
Established in 1960; 166ha

Makuli-Nguuta Forest Reserve IUCN Category VIII
Established in 1960; 1653ha

Malaba Forest Reserve IUCN Category VIII
Established in 1933; 719ha

Mangrove Swamp Forest Reserve IUCN Category VIII
Established in 1932, this forest reserve covers an area of 45,068ha. The main forest areas are at Lamu, Pate, Tana River, Ngomeni, Mida, Kilifi, Mtapwa Creek, Mombasa Creek, from Chale Island south to Vanga. All mangroves are exploited for timber, charcoal and building material. The dominant genus is *Rhizophora* (Frame, 1987).

Maragoli Forest Reserve IUCN Category VIII
Established in 1957; 470ha

Marenji Forest Reserve IUCN Category VIII
Established in 1967; 1529ha

Marmanet Forest Reserve IUCN Category VIII
Established in 1932; 23,329ha

Marop Forest Reserve IUCN Category VIII
Established in 1949; 217ha

Marsabit Forest Reserve IUCN Category VIII
Established in 1932; 15,281ha

Mataa Forest Reserve IUCN Category VIII
Established in 1960; 43ha

Mathews Range Forest Reserve IUCN Category VIII
Established in 1956; 93,766ha

Mau (Eastern) Forest Reserve IUCN Category VIII
Established in 1941; 64,966ha

Mau (Southern) Forest Reserve IUCN Category VIII
Established in 1941; 136ha

Mau (South-western) Forest Reserve IUCN Category VIII
Established in 1932; 19,833ha

Mau Narok Forest Reserve IUCN Category VIII
Established in 1967; 797ha

Mbili Forest Reserve IUCN Category VIII
Established in 1991; 10ha

Mbooni North Forest Reserve IUCN Category VIII
Established in 1933; 40ha

Mbooni South Forest Reserve IUCN Category VIII
Established in 1933; 208ha

Mchungunyi Forest Reserve IUCN Category VIII
Established in 1991; 8ha

Menengai Forest Reserve IUCN Category VIII
Established in 1977; 5990ha

Meru (Lower Imenti) Forest Reserve IUCN Category VIII
Established in 1932, this 2462ha forest reserve is situated south of the Mathews Range in central Kenya. It is an area of botanical interest, in which illegal logging is taking place. It is gazetted (Frame, 1987).

Meru (Upper Imenti) Forest Reserve IUCN Category VIII
Established in 1938; 10,388ha

Metkei Forest Reserve IUCN Category VIII
Established in 1954; 1987ha

Mkongani North Forest Reserve IUCN Category VIII
Established in 1956; 1113ha

Mkongani West Forest Reserve IUCN Category VIII
Established in 1956; 1368ha

Modagache (Weni-tole) Forest Reserve IUCN Category VIII
Established in 1991; 3ha

Molo Forest Reserve IUCN Category VIII
Established in 1932; 902ha

Molo West Forest Reserve IUCN Category VIII
Established in 1932; 275ha

Momandu Forest Reserve IUCN Category VIII
Established in 1955; 139ha

Mosegem Forest Reserve IUCN Category VIII
Established in 1949; 204ha

Mount Elgon Forest Reserve IUCN Category VIII
1°05'N, 34°37'E Established in 1932, this forest reserve covers 73,333ha of montane flora on the slopes of Mount Elgon; it is felt that it should be upgraded to a nature reserve.

Mount Kenya Forest Reserve IUCN Category VIII
Established in 1943 and covering 200,871ha, this forest reserve is adjacent to **Mount Kenya National Park**.

Mount Londiani Forest Reserve IUCN Category VIII
Established in 1932; 29,682ha

Mount Nyiru Forest Reserve IUCN Category VIII
Established in 1956; 45,932ha

Mrima Forest Reserve IUCN Category VIII
4°29'S, 39°15'E Established in 1961, this 377ha forest reserve is situated in Msambweni Division in Kwale district. It is an area of moist coastal forest, much disturbed by now defunct mining operations in the 1970s and 1980s. It was said to be reduced to 290ha by 1975; tree cutting is still a threat although it is a **Kaya Forest** (Polhill, 1989; Robertson, 1987).

Mtarakwa Forest Reserve IUCN Category VIII
Established in 1949; 112ha

Muguga Forest Reserve IUCN Category VIII
Established in 1938; 225ha

Mukobe Forest Reserve IUCN Category VIII
Established in 1962; 749ha

Mukogodo Forest Reserve IUCN Category VIII
Established in 1937; 30,190ha

Mumoni Hill Forest Reserve IUCN Category VIII
Established in 1938; 2ha

Munguni Forest Reserve IUCN Category VIII
Established in 1959; 194ha

Muringato Nursery Forest Reserve IUCN Category VIII
Established in 1932; 25ha

Mutejwa Forest Reserve IUCN Category VIII
Established in 1959; 1376ha

Mutharanga Forest Reserve IUCN Category VIII
Established in 1959; 300ha

Mutito Forest Reserve IUCN Category VIII
Established in 1962; 1959ha

Mutala Forest Reserve IUCN Category VIII
Established in 1960; 567ha

Mwachi Forest Reserve IUCN Category VIII
Established in 1938; 417ha

Mwachora Forest Reserve IUCN Category VIII
Established in 1991; 6ha

Mwakamu Forest Reserve IUCN Category VIII
Established in 1991; 2ha

Mwandongo Forest Reserve IUCN Category VIII
Established in 1991; 688ha

Nabkoi Forest Reserve IUCN Category VIII
Established in 1932; 3015ha

Nairobi Arboretum Forest Reserve IUCN Category VIII
Established in 1932; 30ha

Nakuru Forest Reserve IUCN Category VIII
Established in 1977; 619ha

Namanga Hill Forest Reserve IUCN Category VIII
Established in 1979; 11,784ha

Nandi Forest Reserves IUCN Category VIII
0°17'N, 34°53'E Established in 1936, these include both **Nandi North** (10,501ha) and **Nandi South** (19,502ha) **Forest Reserves**, once connected with Kakamega Forest Reserve. The reserves lie on a south-facing scarp, rising to an elevation of 2130m. Nandi South is covered by intermediate evergreen forest, and 34km² of Nandi North Forest Reserve are a proclaimed nature reserve (IUCN Category IV). An endemic subspecies of greenbul occurs. Both Nandi forests are considered internationally important in that they contain plants and animals that are West or Central African in distribution, and in Kenya are limited to this area. Timber is extracted (Collar and Stuart, 1988; Hughes and Hughes, 1992).

Ndare Forest Reserve IUCN Category VIII
Established in 1932; 5554ha

Ndatai Forest Reserve IUCN Category VIII
Established in 1960; 14ha

Ndiwenyi Forest Reserve IUCN Category VIII
Established in 1991; 6ha

Ndojos Range Forest Reserve IUCN Category VIII
Established in 1956; 97,165ha

Nduluni-Kalani Forest Reserve IUCN Category VIII
Established in 1960; 110ha

Ngaia Forest Reserve IUCN Category VIII
Established in 1959; 4140ha

Ngamba East Forest Reserve IUCN Category VIII
Established in 1978; 1070ha

Ngamba Forest Reserve IUCN Category VIII
Established in 1961; 1070ha

Ngong Road Forest IUCN Category VIII
Established in 1932, this 1325ha forest in the Ngong Hills of south-central Kenya is situated in the Central Highland biome. It is in an important water catchment, and could be of use as a study area for Nairobi-based educational institutions. Bushbuck occur (Frame, 1987).

Njuguni Forest Reserve IUCN Category VIII
Established in 1959; 20,003ha

Nthangu Forest Reserve IUCN Category VIII
Established in 1960; 844ha

Ntuga Forest Reserve IUCN Category VIII
Established in 1959; 1379ha

Nuu Forest Reserve IUCN Category VIII
Established in 1961; 3533ha

Nyambeni Forest Reserve IUCN Category VIII
Established in 1959; 5391ha

Nyamweru Forest Reserve IUCN Category VIII
Established in 1941; 797ha

Nyeri Forest Reserve IUCN Category VIII
Established in 1932; 1135ha

Nyeri Hills Forest Reserve IUCN Category VIII
Established in 1944; 192ha

Nzaui Forest Reserve IUCN Category VIII
Established in 1960; 967ha

Ol Arabel Forest Reserve IUCN Category VIII
Established in 1941; 9983ha

Ol Bolossat Forest Reserve IUCN Category VIII
Established in 1938; 3327ha

Ol Doinyo Orok Forest Reserve
This is situated near the Namanga border post, west of Amboseli National Park. The extent of forest is not clear (Frame, 1987).

Ol Pusimoru Forest Reserve IUCN Category VIII
Established in 1957; 36,948ha

Ololua Forest Reserve IUCN Category VIII
Established in 1941; 668ha

Pemwai Forest Reserve IUCN Category VIII
Established in 1949; 148ha

Perkerra Catchment Forest Reserve IUCN Category VIII
Established in 1962; 4359ha

Rumuruti Forest Reserve IUCN Category VIII
Established in 1932; 6367ha

Saimo Forest Reserve IUCN Category VIII
Established in 1949; 751ha

Sanao Forest Reserve IUCN Category VIII
Established in 1949; 300ha

Sekendu Forest Reserve IUCN Category VIII
Established in 1977; 804ha

Sekenwo Forest Reserve IUCN Category VIII
Established in 1962; 862ha

Shimba Forest Reserve IUCN Category VIII
Established in 1956, this forest reserve covers an area of 19,243ha. Part is gazetted as **Shimba Hills National Reserve**. The reserve comprises small patches of diverse forest, with many plant endemics. It is the most important area in Kenya for sable antelope, and 12 other large herbivore species occur, including roan antelope and elephant. There is a policy of replacing the indigenous forest with exotic softwoods. Logging and forestry are spoiling the scenic values of the area, and there is conflict between the Forest Department and National Parks which remains unresolved. Elephant movements are impeded by settlements inland (Polhill, 1989; WCMC, 1988).

Sogotio Forest Reserve IUCN Category VIII
Established in 1941; 3561ha

Sokta Hills Forest Reserve IUCN Category VIII
Established in 1949; 164ha

Sorio Rhinoceros Sanctuary Private

Susu Forest Reserve IUCN Category VIII
Established in 1991; 2ha

Tarambas Hill Forest Reserve IUCN Category VIII
Established in 1949; 423ha

Taressia Forest Reserve IUCN Category VIII
Established in 1936; 385ha

Thunguru Hill Forest Reserve IUCN Category VIII
Established in 1959; 631ha

Thuuri Forest Reserve IUCN Category VIII
Established in 1959; 735ha

Timau Forest Reserve IUCN Category VIII
Established in 1950; 295ha

Timboroa Forest Reserve IUCN Category VIII
Established in 1932; 5891ha

Tinderet (Northern) Forest Reserve IUCN Category VIII
Established in 1932; 26,150ha

Tinderet Forest Reserve IUCN Category VIII
Established in 1932; 27,870ha

Tingwa Hill Forest Reserve IUCN Category VIII
Established in 1954; 915ha

Toropket Forest Reserve IUCN Category VIII
Established in 1941; 117ha

Trans-Mara Forest Reserve IUCN Category VIII
Established in 1941; 35,270ha

Tulimani Forest Reserve IUCN Category VIII
Established in 1960; 326ha

Tumeya (Elgeyo Marakwet) Forest Reserve IUCN Category VIII
Established in 1961; 366ha

Tumeya (Uasin Gishu) Forest Reserve IUCN Category VIII
Established in 1941; 215ha

Turbo Forest Reserve IUCN Category VIII
Established in 1968; 10,788ha

Tutwoin Forest Reserve IUCN Category VIII
Established in 1949; 12ha

Uaso Narok Forest Reserve IUCN Category VIII
Established in 1960; 2053ha

Ururu Forest Reserve IUCN Category VIII
Established in 1936; 433ha

Utangwa Forest Reserve IUCN Category VIII
Established in 1960; 55ha

Utunene Forest Reserve IUCN Category VIII
Established in 1960; 166ha

Uuni Forest Reserve IUCN Category VIII
Established in 1960; 93ha

Waiya Forest Reserve IUCN Category VIII
Established in 1960; 263ha

Weni-Mwana Forest Reserve IUCN Category VIII
Established in 1991; 5ha

Witu Forest Reserve IUCN Category VIII
Established in 1962, this 3938ha forest reserve is situated on the Tana River estuary. It is home to several rare birds, the Tana River red colobus *Colobus badius rufomitratus* and Tana River mangabey *Cercocebus g. galeritus*. It is felt that the area should be upgraded to nature reserve status. See also **Tana River Forest Reserve** (Collar and Stuart 1988; Stuart *et al.*, 1990).

UNPROTECTED SITES

Arabuko Sokoke National Park - see **Arabuko Sokoke Forest Reserve and National Park**
36,000ha

Aroso Forest Reserve Proposed
294ha

Awach Nursery Forest Reserve Proposed
2ha

Aywaya Forest Reserve Proposed
142ha

Baden Powell Walk Nature Reserve
Forest occurs, but is unsurveyed (Frame, 1987).

Bondoni Forest Reserve Proposed

Boni Forest Reserve Proposed
Situated 70km north-north-east of Lamu, this reserve covers 18,466ha of *Brachystegia* woodland. There is some traditional use of timber by local peoples (Young, 1984).

Chalbi Desert
The determination of conservation priorities in this desert region are urgently required. The area contains a salt pan subject to occasional flooding (Stuart *et al.*, 1990).

Cha Simba Rocks
3°41'S, 39°44'E Situated in Kaloleni Division in Kilifi District. Massive rocky outcrops with many rare plants occur including the endemic *Saintpaulia rupicola*, as well as *Cola octobaloides*, *Savia fadenii*, *Pandanus rabaiensis* and *Euphorbia wakefieldii*. The area is accessible and has a recognised potential for tourism (Robertson, 1987).

Chawia Forest Reserve Proposed
86ha

Cherangani Hills
Situated in west-central Kenya, including Mount Kameligon, in the Western Highlands biome. Primarily supports an alpine vegetation and forest, the former supporting plants such as *Erica arborea*, *Protea kilimandscharica* and giant species of *Lobelia*, *Senecio* and *Hypericum*. It is an important catchment area. Fauna includes bongo, elephant, giant forest hog and buffalo, and it is one of only two known localities for the golden mole *Chrysochloris stuhlmanii forester*. Threats include encroaching human settlement (Frame, 1987).

Choke Forest Reserve Proposed
74ha

Diani Marine National Park Complex Proposed
This is an area of about 250ha which comprises Similani, Kaya Kinondo and the Chale Islands. Lowland rain forest occurs (this is one of the kaya coastal forest fragments; see **Kaya Forests**), with mangroves along the shoreline. The bat caves on Similani are notable and harbour at least eight species of bat. Chale Islands are important nesting sites for several birds, including the threatened spotted ground thrush. Tourist-related building developments are a threat, and have virtually destroyed the forest vegetation. Shell collecting causes disturbance to the reefs, and contamination by insecticides is a potential threat (IUCN/UNEP, 1987; Polhill, 1989).

Endau Forest Reserve Proposed
Covering 6718ha on Endau hill, this is one of the last surviving naturally forested hills in Ukambani.

Esspich Hill (Cheburua)
2°00'N, 35°15'E A mountain north of the Cherangani Range, close to the Uganda border. It supports montane forest reaching 8000ft, apparently unstudied (Frame, 1987).

Fighi Ju Mkumu Forest Reserve Proposed
1000ha

Gaikuyu Forest Reserve Proposed
3075ha

Gembe Forest Reserve Proposed
1987ha

Giribi Forest Reserve Proposed

God Kwer Forest Reserve Proposed

Gurar Hills
Situated near Moyale, in the Moyale Complex biome. The hills contain good habitat for black rhino and lesser kudu (Frame, 1987).

Gwasi Forest Reserve Proposed
12,140ha

Homa Forest Reserve Proposed
1062ha

Huri Hills Forest Reserve Proposed
30,000ha

Igno Mkundu Forest Reserve Proposed
2000ha

Imba Forest Reserve Proposed
732ha

Irizi Forest Reserve Proposed
2891ha

Jadini Forest
This is a remnant of a formerly more extensive forest, rich in species, some perhaps undescribed (Frame, 1987).

Kabonge Forest Reserve Proposed
31ha

Kachagalau-Lorusuk Hill
2°15'N, 35°10'E Situated north of the Cherangani Range, near the Ugandan border. The "hill" reaches over 3000m, and supports montane forest. It is biologically unexplored (Frame, 1987).

Kakuzi Hill Forest Reserve Proposed
1800ha

Kalangu Forest Reserve Proposed
200ha

Kamasia
A poorly studied area of botanical interest and importance in western central Kenya (Frame, 1987).

Kamatira Forest Reserve Proposed
1910ha

Kambe Rocks
3°52'S, 39°39'E Situated in Kaloleni Division in Kilifi District. An area of great natural beauty and botanical interest (Robertson, 1987).

Kanzalu Forest Reserve Proposed
100ha

Karaini Forest Reserve Proposed
24ha

Karoli Area
There is an urgent need to establish conservation priorities in this desert area (Stuart *et al.*, 1990).

Kaya Forests
These are fragmentary forest refuges (many of which are dealt with individually: see under specific names below) of the Miijkenda people, scattered between Malindi and the southern border, which have considerable plant diversity, often being situated on limestone or coral rag. Some are considered sacred, especially by the older people, but others are being cleared (e.g. at Kaloleni); all are threatened by pressure from expanding agriculture (Polhill, 1989).

Kaya Bura Forest
3°08'S, 39°56'E In Malindi Sub-District, Kilifi District. About 100ha of unexplored forest (Robertson, 1987).

Kaya Fungo Forest
3°48'S, 39°30'E In Kaloleni Division, Kilifi District, at an altitude of 200m. Approximately 100ha of woodland occur, with species of *Brachystegia*, *Afzelia* and *Julbernadia* (Robertson, 1987).

Kaya Jibana Forest
3°50'S, 39°40'E In Kaloleni Division in Kilifi District. About 150ha of forest; there are two exceptional plant records from here, viz. *Cavacoa aurea* (second East African locality) and *Tetracera littoralis*, the second locality outside **Arabuko Sokoke Forest Reserve** (Robertson, 1987).

Kaya Kambe Forest
3°52'S, 39°39'E In Kaloleni Division in Kilifi District. About 75ha in area, but threatened by cutting, cultivation and mining activities in the north and north-west (Robertson, 1987).

Kaya Kauma Forest
3°37'S, 39°44'E In Ganze Division, Kilifi District. Approximately 100ha of lowland forest, grading into lowland woodland, and adjacent (non Kaya) forest. An extra-limital species of *Commiphora* has been collected here (Robertson, 1987).

Kaya Kinondo Forest
4°23'S, 39°32'E In Diani Location, Kwale District. This forest covers about 27ha and contains very interesting plants such as *Grevia madagascariensis*, *Calophyllum inophyllum*, *Diphasia* sp. (known only from this forest), *Stadmannia oppositifolia*, *Diospyros ferrea* and *Cycas thouarsii* (Robertson, 1987).

Kaya Kivara Forest
3°41'S, 39°41'E In Ganze Division, Kilifi District. Approximately 150ha of forest occurs, consisting mostly of *Brachystegia*, *Julbernadia*, *Manilkara* and *Brachylaena* species. The area is important as a store of genetic resources, and as a water catchment (Robertson, 1987).

Kaya Rabai Forests
3°55'-3°58'S, 39°36'-40°3'E In Kaloleni Division, Kilifi District. Valuable plant records for Kenya have been made here, viz. *Ficus craterostoma* and *Sterculia tragacantha*. Much degradation has occurred (Robertson, 1987).

Kaya Ribe Forest Recommended
3°54'S, 39°38'E Situated in Kaloleni Division, Kilifi District. The forest covers about 100ha, and is representative of a forest type that is under severe threat all along Kenya's coast. It protects the catchment of the Mleji and Mbuzini rivers (Robertson, 1987).

Kiambere Forest Reserve Proposed
643ha

Kiangombe Forest Reserve Proposed
2104ha

Kianjiru Forest Reserve Proposed
1004ha

Kibauni Forest Reserve Proposed
2000ha

Kigala Forest Reserve Proposed
200ha

Kindaruma Saba Hills
In Northern Frontier District in the Ukambani biome type, these hills are a vital watershed area for nomads and their livestock (Frame, 1987).

Kingatua Forest Reserve Proposed
50ha

Kinyesha Mvua Forest Reserve Proposed
51ha

Kiria Forest Reserve Proposed

Kirimiri Forest Reserve Proposed
101ha

Kirinyaga, Kahari, Urumandi
An extension to **Mount Kenya National Park**, comprising the old Kirinyaga Game Reserve, Kahari Hill Salient and Urumandi annex, covering about 200km^2. It consists of Afro-alpine and Highland Moist Forest biomes, vital to **Mount Kenya National Park** in that they contain about half of the park's forest mammals and birds (Frame, 1987).

Kisii
In south-western Kenya, near the Tanzanian border. A poorly collected area, little known (Frame, 1987).

Kitovu Forest Reserve Proposed
Covering 161ha in south-central Kenya near the Tanzanian border, this groundwater forest is of great botanical interest. It is reputedly the only known Kenyan site for Kretschmer's longbill *Macrosphenus kretschmerei*, and for the possibly endemic butterflies *Euphedra neophron violacea* and *Bepearia dealbata kitovu* (Frame, 1987; National Museum, 1982).

Kitui Forest
This is a relict forest in south-central Kenya, in an area of botanical interest. It is under severe pressures from settlers and charcoal burners (Frame, 1987).

Koguta Forest Reserve Proposed
413ha

Koobi Fora
This area is in north-central Kenya, adjacent to the Ethiopian border east of Lake Rudolph. It is a poorly-collected area, of special interest (Frame, 1987).

Kurwitu Forest
2°32'S, 40°32'E Situated near Kurwitu, on the coast, this forest grows on uneven, bare coral rock. A remnant of the original coastal forest, it is characterised by slender-trunked forest with canopies up to 25m tall (Frame, 1987).

Kuja Bull Camp Forest Reserve Proposed

Kyawea Forest Reserve Proposed
63ha

Lake Chala
3°19'S, 37°42'E This water-filled volcanic crater is said to harbour an endemic species of cichlid; it is also the type locality for the plant *Euphorbia quinquicosta* (National Museum, 1982).

Lake Baringo
0°38'N, 36°05'E Covering an area of 13,000ha, this lake is situated in dry *Acacia* scrub on the floor of the Rift Valley. It contains several islands, is fed by six rivers and contains several fish species. The Molo Swamps dominate the southern end of the lake. Birdlife is plentiful, with over 300 species recorded; there is an abundant small mammal fauna. Commercial fishing occurs, and recent erosion is causing increased turbidity (Burgis and Symoens, 1987; Hughes and Hughes, 1992).

Lake Elmenteita
0°27'S, 36°15'E Covering an area of 1800ha at an elevation of 1776m, little is known of the biology of this lake; large numbers of flamingo sometimes occur, and white pelican have been known to breed here. There is little human impact (Burgis and Symoens, 1987; Hughes and Hughes, 1992).

Lake Magadi
1°57'S, 36°15'E A saline lake with thermal lagoons, in which an endemic subspecies of cichlid fish is found. Flamingo visit the lake after the rains. Sodium carbonate deposits on the lake bed are commercially exploited (Hughes and Hughes, 1992).

Lake Naivasha
0°45'N, 36°20'E Situated in the Central Rift Valley Province, at 1889m. The water level is very variable, but may cover 150km^2. The endemic fish *Aplocheilichthys antinorii* has not been recorded for a number of years, and several others species of fish have been introduced into the lake, including an exotic species. It is an important site for waterfowl, and small numbers of hippo occur. The area around the lake is settled and farmed (Burgis and Symoens, 1987; Stuart *et al.*, 1990).

Lake Victoria
0°30'N-3°12'S, 31°37'-34°53'E This is the third largest lake in the world, of which 6% (413,340ha) of the surface area is within Kenyan territory. About 550km of shoreline occur within Kenya, along which six major rivers and several freshwater

swamps occur. The lake contains 177 fish species, 127 of which are cichlids. The introduction of Nile perch *Lates niloticus* has had a devastating effect upon the smaller fish fauna of the lake. Hippopotami, crocodiles and other species of animal still occur, although the Kenyan shore is densely settled. The lake is fished commercially, and there is evidence that certain Kenyan parts of the lake are being over-fished (Hughes and Hughes, 1992).

Lakipi Rhinoceros Sanctuary
A private site, containing a significant population of black rhinoceros.

Lambwe Forest Reserve Proposed
2516ha

Lambwe Valley National Park
This park is important for roan antelope (Stuart *et al.*, 1990).

Latema Forest Reserve Proposed
100ha

Loima Hills Forest Reserve Proposed
10,000ha

Loita Hills
Near Narok; protection has been recommended (Frame, 1987).

Lotikipi Plain
3°52'-5°04'N, 34°18'-35°27'E About 500,000ha of the total area of 720,000ha is situated within Kenya, at an altitude of about 500m. Located in semi-desert, it is a grassy floodplain with scattered *Acacia* and *Balanites* trees, reeds and papyrus. It is formed by the irregular flooding of several rivers, at which times water may be 1m deep. There is some hunting (Hughes and Hughes, 1992).

Lower Imenti - see **Meru (Lower Imenti) Forest Reserve**

Lungi Forest Reserve Proposed
9517ha

Lorian Swamp
0°11'-1°15'N, 38°47'-40°21'E About 196km long and 25km wide at its maximum width with a total area of 231,000ha, this area is situated east of the Mathews range in central Kenya. It extends east, into Somalia. Crocodile occur, and elephant and buffalo are visitors (Frame, 1987; Hughes and Hughes, 1992).

Lotikiri Swamp

Machakos
This is an area of botanical interest in south-central Kenya (Frame, 1987).

Mai Forest Reserve Proposed
515ha

Maimu Forest Reserve Proposed
500ha

Mangea Hill
3°15'S, 39°43'E Situated in Ganze Division, Kilifi District. A botanically rich area of about 25km², this woodland includes tree genera such as *Brachystegia*, *Julbernadia*, *Manilkara*, *Xylopia* and *Ficus*. A road has been built to the summit, and deforestation is proceeding rapidly. Protection is recommended (Robertson, 1987).

Mango Forest Reserve Proposed
45ha

Marabu-Magina Forest Reserve Proposed
494ha

Maranga Forest Reserve Proposed
219ha

Marsabit National Park Proposed
36,000ha

Matha Forest Reserve Proposed
100ha

Mavindi Forest Reserve Proposed
100ha

Mbololo Juu Forest Reserve Proposed
170ha

Mbololo Mwambirua Forest Reserve Proposed
45ha

Mikuru Forest Reserve Proposed
100ha

Miriu Forest Reserve Proposed
171ha

Migori River
Forests occur on either side of the Migori River, and on the east and west sides of the Olomismis-Lolgorian road. These remnant patches are rich in epiphytic orchids, but are poorly known and under threat of exploitation (Frame, 1987).

Mng'Ambwa (Mwawanyu) Forest Reserve Proposed
1000ha

Molinduko Forest Reserve Proposed
194ha

Mount Kulal Forest Reserve Proposed
45,729ha

Moyale
Situated in north-central Kenya, this area is adjacent to the Ethiopian border; it is a little-known area of special interest (Frame, 1987).

Mraru Forest Reserve Proposed
200ha

Mtwapa Creek
Small remnants of coastal forest survive at the Jumba Ruins National Monument. Narrow-trunked trees with canopies reaching a height of 25m occur (Frame, 1987).

Muhaka Forest
4°20'S, 39°31'E Situated in Msambweni Division, Kwale District, this 150ha remnant forest is rich in species and may contain undescribed forms. About two-thirds are leased to the Nairobi-based International Centre for Insect Physiology and Ecology as a field station. Threats include illegal settlement and timber cutting (Frame, 1987; Robertson, 1987).

Mukagodo
Located to the south-west of the Mathews Range in central Kenya; a little-known locality, of special interest (Frame, 1987).

Mumoni Forest Reserve Proposed
10,441ha

Muruanisigar
In north-western Kenya west of Lake Rudolph, this is a little-known area of special interest (Frame, 1987).

Museve Forest Reserve Proposed
48ha

Mutha Forest Reserve Proposed
1785ha

Muthiini Forest Reserve Proposed

Mutuluni Forest Reserve Proposed
596ha

Muune Forest Reserve Proposed
100ha

Mwaganini Forest Reserve Proposed
36ha

Mwakinambu Forest Reserve Proposed
1000ha

Mwandongo Forest Reserve Proposed
1698ha

Mwarakaya Area
3°47'S, 39°42'E . Situated in Kaloleni division of Kilifi District, this is an area of limestone pinnacles containing rare plants, including *Saintpaulia rupicola* (Robertson, 1987).

Narok Swamp
About 55km long and 12km wide, this swamp occurs at the confluence of the Ewaso Narok river and a major tributary (Hughes and Hughes, 1991).

Ndhoani Forest Reserve Proposed
1387ha

Ndoto Forest
Situated in the Ndoto Range of north-central Kenya, this forest contains species of *Podocarpus*, *Croton*, *Rharmus*, *Olea*, *Teclea* and *Phoenix*, as well as the cycad *Encephalartos tegulaneus*, *Protea* sp. and an endemic *Aloe* sp. A poorly-collected area of special interest. The fauna is unstudied (Frame, 1987).

Ndune Forest Reserve Proposed

Ngangao Forest Reserve Proposed
139ha

Ngorome Forest Reserve Proposed
348ha

Nguruman Forest Reserve Proposed
1°42'S, 35°50'E Covering 348ha, this forest reserve is situated in south-central Kenya on the Tanzanian border west of **Lake Magadi**, in the Magadi biome. There is a rich avifauna, including several recently- described races. The area is part of a Maasai Land Unit, an area of 47,750ha which still supports populations of elephant, buffalo, hippo and various ungulates, rivalling Ngorongoro Crater in Tanzania for scenic beauty. It is the largest block of ungazetted upland forest in Kenya (Frame, 1987).

Njukini East Forest Reserve Proposed
498ha

Njukini West Forest Reserve Proposed
570ha

Nyamarere Forest Reserve Proposed

Nyasoko Forest Reserve Proposed

Nyiro
Situated in north-central Kenya, this is a little-known area of special interest (Frame, 1987).

Nyiru Mountain
Forests occur on Nyiru Mountain (Frame, 1987).

Otacho Forest Reserve Proposed
595ha

Pangani Rocks
An area of great natural beauty and botanical value, under threat from quarrying (Robertson, 1987).

Psigorr Hills
This is a picturesque area in the Western Highlands biome, supporting populations of elephant, buffalo and other forest mammals (Frame, 1987).

Pusimoro Forest
Located in the Central Highlands biome, this is an important forest on the list of critical and endangered habitats in Kenya (Frame, 1987).

Rabuor Forest Reserve Proposed

Ramogi Forest Reserve Proposed
283ha

Ranen Forest Reserve Proposed
150ha

Rangwe Forest Reserve Proposed
1214ha

Ronge Forest Reserve Proposed
318ha

Ruri Forest Reserve Proposed

Sagalla Forest Reserve Proposed
70ha

Salaita Forest Reserve Proposed
100ha

Sekerr Forest Reserve Proposed
8021ha

Shimoni Forest
4°32'S, 39°10'E Situated along the Umba and Mwena rivers, this is an important link for intra-African bird migrations between Kenya's northern coastal forests and the Usambara Mountains in Tanzania. One of the kaya coastal forest fragments (see **Kaya Forests**), it is an important habitat for rare forest mammals. Species of fauna recorded include the spotted ground thrush *Turdus fischeri*, African pitta *Pitta angolensis*, coastal colobus monkey *Colobus angolensis palliatus*, elephant shrew *Rhychocyon cernei petersi*, a bat species otherwise only known from West Africa, and unconfirmed reports of Aders's duiker, blue duiker and the coastal race of the suni *Nesotragus moschatus kirchenpaueri*. The forest has been rated as vulnerable to endangered (Frame, 1987; Polhill, 1989).

Shombole Swamp
2°05'S, 36°03'E This swamp lies between lakes Magadi and Natron. It is a large and exceptionally important *Typha* wetland possibly unique in East Africa, particularly valuable for wintering and migrating Palaearctic waterfowl. It is an important watering place for local peoples and livestock, and hippopotami and buffalo occur (National Museum, 1982).

South-Western Mau National Park - see **South-Western Mau Nature Reserve**
8021ha

Tana River Forest Reserve Proposed
This reserve occurs on a flat alluvial plain, covering 340,000ha. These forests are considered important; a new species of ironwood *Cynometra lukei* was discovered here in 1988, and a rare and localised species of poplar *Populus ilicifolia* occurs. Several

rare bird species occur in these forests, which are also the only home of the Tana River red colobus *Colobus badius rufomitratus* and Tana River mangabey *Cercocebus g. galeritus*. See also **Witu Forest Reserve** (Stuart *et al.*, 1990).

Taveta Forest
This groundwater forest on the Tanzanian border is in good condition, with some large trees and interesting species. It is under the control of the Ministry of Environment and Natural Resources (Polhill, 1989).

Tugen Hills
Forest occurs in these hills, the extent of which is unclear (Frame, 1987).

Twanyoni Forest Reserve Proposed

Ukazi Inselberg
This is the only location in Africa where the apterous dipteran *Mormotomyia hirsuta* (a wingless fly) occurs, where it is associated with bat dung. A remarkable colony of bats lives in a huge split rock, which is also one of the few known nesting sites of the rare Taita falcon *Falco fasciinucha*. Another unique feature is the presence of the endemic soft tick *Ornithodorus vansomeroni*, which lives in swallow and chat nests (National Museum, 1982).

Utwani Forest
This forest is situated in the Tana River delta, and includes areas of riverine forest. Pressure on the forests of the delta may increase because of several large settlement schemes (Polhill, 1989).

Vuria
Located in south-central Kenya near the Tanzanian border, this is a poorly-known area of special interest (Frame, 1987).

Wajir Area
Prominent trees in this area include endemic *Diospyros*, *Cordia* and *Euphorbia* spp. (Frame, 1987).

Warges Hill
This is an isolated hill with small patches of indigenous forest. Poorly known, its current status is uncertain (Frame, 1987).

West Kano Bird Sanctuary
An important bird sanctuary in the Western Highlands biome.

Wire Forest Reserve Proposed
392ha

Yekanga Forest Reserve Proposed
100ha

Ziwani
Situated in south-central Kenya near the Tanzanian border, this is a little-known area of biological interest (Frame, 1987).

KENYA - PROTECTED SITES

National/international designations

	Name of area and map reference (see Figs. 2.1, 2.2 and 2.3)	Management area (ha)	Year notified
Forest Reserves[1]			
1	Aberdares (Central Muranga)	21,811	1943
2	Aberdares (Central Nyandarua)	48,156	1943
3	Aberdares (Central Nyeri)	33,059	1943
4	Arabuko Sokoke	41,764	1943
5	Bahati	10,187	1932
6	Bojoge	2,150	1991
7	Buda	668	1932
8	Bunyala	826	1956
9	Cheboyit	2,489	1941
10	Chembartigon	103	1949
11	Chemorogok	1,347	1949
12	Chemurokoi	3,966	1941
13	Chepalungu	4,977	1956
14	Chepkuchumo	320	1962
15	Cherial	43	1949
16	Choke (Mnjonyi)	74	1991
17	Dagoretti	764	1938
18	East Ngamba	1,070	1978
19	Eastern Mau	64,966	1941
20	Eburu	8,715	1932
21	Eldoret I & II	148	1966
22	Embakasi	573	1941
23	Embobut	21,934	1954
24	Escarpment	74	1941
25	Fururu	14	1991
26	Gogoni	824	1932
27	Gonja	842	1961
28	Ikilisa	79	1960
29	Iveti	348	1933
30	Jombo	907	1941
31	Kabarak	1,392	1962
32	Kabiok	14	1949
33	Kaisungor	1,086	1941
34	Kakamega	19,792	1933
35	Kalimani	180	1960
36	Kamiti	170	1933
37	Kangure	188	1961

Fig 2.1 Kenya: protected ecologically sensitive sites

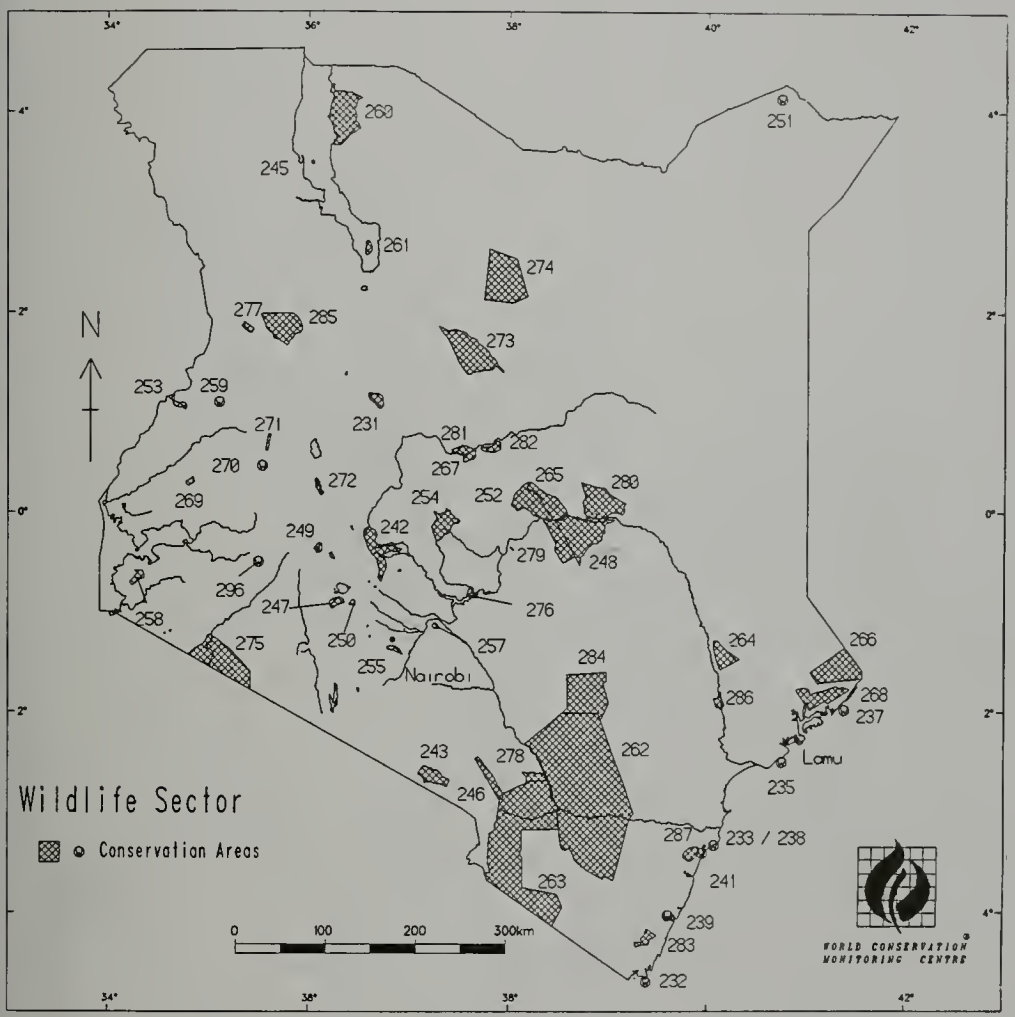
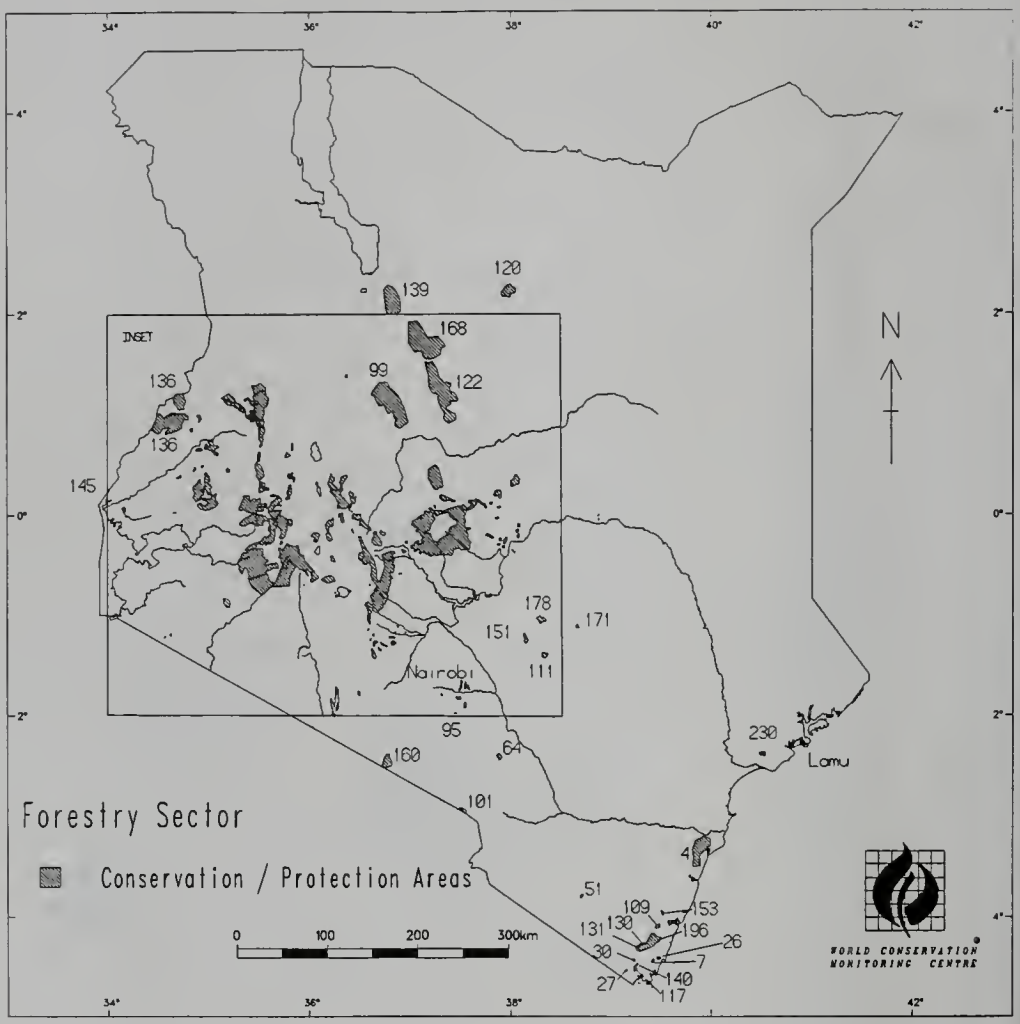
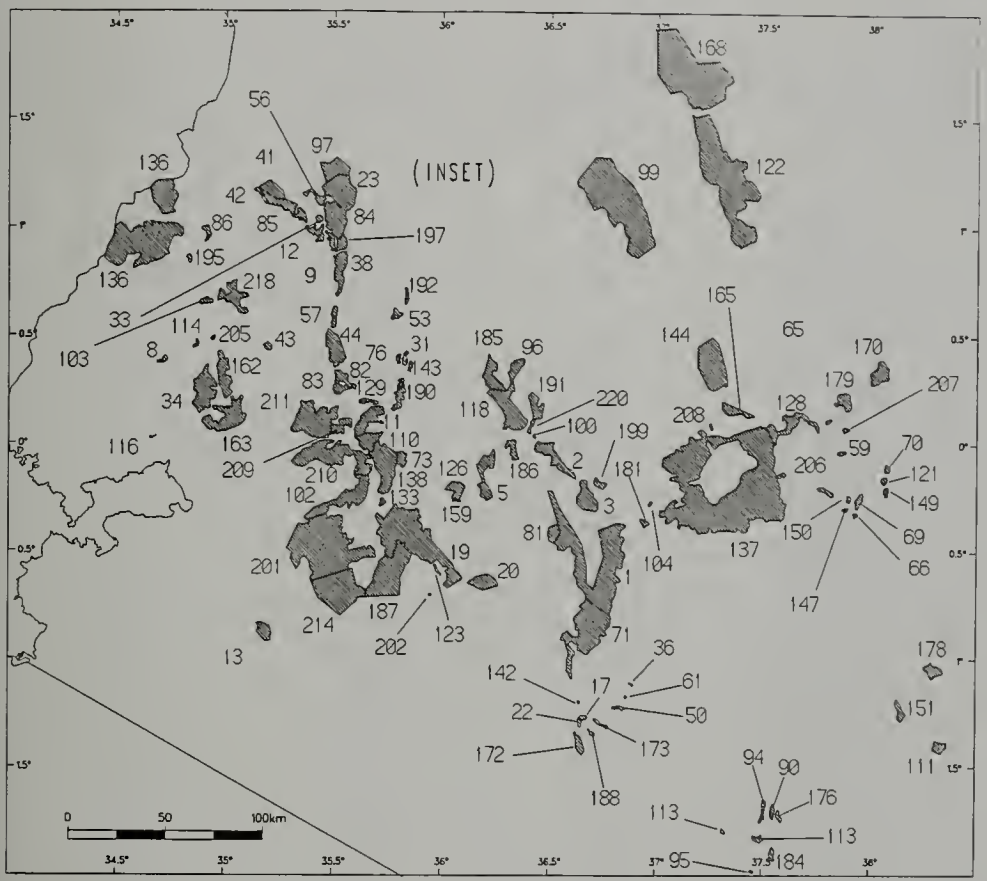


Fig 2.2 Kenya: protected ecologically sensitive sites



For inset, see Fig 2.3

Fig 2.3 Kenya: protected ecologically sensitive sites



Inset expanded from Fig 2.2

KENYA - PROTECTED SITES (cont.)

National/international designations

Name of area and map reference (see Figs. 2.1, 2.2 and 2.3)		Management area (ha)	Year notified
38	Kapchemutwa	8,954	1941
39	Kapchorua I	146	1941
40	Kapchorua IV	142	1941
41	Kapkanyar	6,037	1967
42	Kapolet	1,552	1941
43	Kapsaret	1,194	1932
44	Kaptagat	12,980	1941
45	Kaptaroi	328	1936
46	Kaptimom	89	1949
47	Karua A	28	1961
48	Karua B	137	1961
49	Karua C	45	1961
50	Karura	1,041	1932
51	Kasigau	202	1941
52	Katende	949	1960
53	Katimok	2,064	1949
54	Kemeto	210	1949
55	Kenze	188	1960
56	Kerrer	2,160	1954
57	Kessop	2,347	1941
58	Ketnwan	47	1949
59	Kiagu	1,366	1959
60	Kiambicho	376	1961
61	Kiambu	134	1932
62	Kiamuti	182	1961
63	Kibithewa	206	1959
64	Kibwezi	5,850	1936
65	Kieiga	546	1959
66	Kierera	793	1959
67	Kiganjo	302	1932
68	Kijabe Hill	706	1980
69	Kijegge	3,296	1959
70	Kikingo	1,234	1959
71	Kikuyu Escarpment	38,334	1943
72	Kilala	151	1960
73	Kilombe Hill	1,554	1936
74	Kilulunyi		1991
75	Kilungu	148	1933

KENYA - PROTECTED SITES (cont.)

National/international designations

	Name of area and map reference (see Figs. 2.1, 2.2 and 2.3)	Management area (ha)	Year notified
76	Kimojoch	759	1949
77	Kinyesha Mvua	50	1991
78	Kinyo	324	1949
79	Kiongwani	34	1960
80	Kioo	45	1960
81	Kipipiri	5,019	1956
82	Kipkabus (Elg-Marak)	920	1961
83	Kipkabus (Uasin/Gishu)	5,827	1941
84	Kipkunurr	15,176	1941
85	Kiptaberr	12,886	1967
86	Kitalale	2,037	1977
87	Kitale Town	401	1932
88	Kiteta	22	1933
89	Kithendu	219	1960
90	Kitondu	1,085	1960
91	Kitoo	37	1960
92	Kitumbuuni	76	1960
93	Kiu (Ngungu)	83	1960
94	Kyai	106	1960
95	Kyemundu	141	1960
96	Lariak	4,998	1932
97	Lelan	14,820	1958
98	Lembus	12,276	1959
99	Leroghi	91,944	1936
100	Leshau	195	1960
101	Loitokitok	766	1977
102	Londiani	108	1932
103	Lugari	2,163	1977
104	Lusoi	260	1984
105	Maatha	639	1959
106	Macha	15	1991
107	Magumo North	242	1978
108	Magumo South	369	1979
109	Mailuganji	1,715	1941
110	Maji Mazuri	7,609	1932
111	Makongo-kitui	3,432	1961
112	Makongo-machakos	166	1960
113	Makuli-nguuta	1,653	1960

KENYA - PROTECTED SITES (cont.)

National/international designations

	Name of area and map reference (see Figs. 2.1, 2.2 and 2.3)	Management area (ha)	Year notified
114	Malaba	719	1933
115	Mangrove Swamp	45,068	1932
116	Maragoli	470	1957
117	Marenji	1,529	1967
118	Marmanet	23,329	1932
119	Marop	217	1949
120	Marsabit	15,281	1932
121	Mataa	43	1960
122	Matthews Range	93,766	1956
123	Mau Narok	797	1967
124	Mbili	10	1991
125	Mchungunyi	8	1991
126	Menengai	5,990	1977
127	Meru (Lower Imenti)	2,462	1938
128	Meru (Upper Imenti)	10,388	1938
129	Metkei	1,987	1954
130	Mkongani North	1,113	1956
131	Mkongani West	1,366	1956
132	Modagache (Weni-tole)	3	1991
133	Molo	902	1932
134	Momandu	139	1955
135	Mosegem	204	1949
136	Mount Elgon	73,706	1932
137	Mount	200,871	1943
138	Mount Londiani	29,682	1932
139	Mount Nyiru	45,932	1956
140	Mrima	377	1961
141	Mtarakwa	112	1949
142	Muguga	225	1938
143	Mukobe	749	1962
144	Mukogodo	30,190	1937
145	Mumbaka	479	1986
146	Mumoni Hill	2	1938
147	Munguni	194	1959
148	Muringato Nursery	25	1932
149	Mutejwa	1,376	1959
150	Mutharanga	300	1959
151	Mutito	1,959	1962

KENYA - PROTECTED SITES (cont.)

National/international designations

Name of area and map reference (see Figs. 2.1, 2.2 and 2.3)		Management area (ha)	Year notified
152	Mutula	567	1960
153	Mwachi	417	1938
154	Mwachora	6	1991
155	Mwakamu	2	1991
156	Mwandongo	688	1991
157	Nabkoi	3,015	1932
158	Nairobi Arboretum	30	1932
159	Nakuru	619	1977
160	Namanga Hill	11,784	1979
161	Namuluku	8	1986
162	Nandi North	10,501	1936
163	Nandi South	19,502	1936
164	Nanyungu	16	1986
165	Ndare	5,554	1932
166	Ndatai	14	1960
167	Ndiwenyi	6	1991
168	Ndotos Range	97,165	1956
169	Nduluni-kalani	110	1960
170	Ngaia	4,140	1959
171	Ngamba	1,070	1961
172	Ngong Hills	3,077	1985
173	Ngong Road	1,325	1932
174	Njuguni	2,003	1959
175	North Mbooni	40	1933
176	Nthangu	844	1960
177	Ntugi	1,379	1959
178	Nuu	3,533	1961
179	Nyambeni	5,391	1959
180	Nyamweru	797	1941
181	Nyeri	1,135	1932
182	Nyeri Hill	192	1944
183	Nyeri Municipality	8	1987
184	Nzaui	967	1960
185	Ol-arabel	9,365	1941
186	Ol-bolossat	3,327	1938
187	Ol-pusimoru	16,833	1957
188	Ololua	668	1941
189	Pemwai	148	1949

KENYA - PROTECTED SITES (cont.)

National/international designations

Name of area and map reference (see Figs. 2.1, 2.2 and 2.3)		Management area (ha)	Year notified
190	Perkerra Catchment	4,359	1962
191	Rumuruti	6,367	1932
192	Saimo	751	1949
193	Sanao	300	1949
194	Sekenwo	862	1962
195	Sekhendu	804	1977
196	Shimba	19,243	1956
197	Sogotio	3,561	1941
198	Sokta Hill	164	1949
199	South Laikipia	3,472	1932
200	South Mbooni	208	1933
201	South-western Mau	82,411	1932
202	Southern Mau	136	1941
203	Susu	2	1991
204	Tarambas Hill	423	1949
205	Taressia	385	1936
206	Thunguru Hill	631	1959
207	Thuuri	735	1959
208	Timau	295	1950
209	Timboroa	5,891	1932
210	Tinderet	27,870	1932
211	Tinderet North	26,150	1932
212	Tingwa Hill	915	1954
213	Toropket	117	1941
214	Transmara	35,270	1941
215	Tulimani	326	1960
216	Tumeya (Elgeyo Marakwet)	366	1961
217	Tumeya (Uasin Gishu)	215	1941
218	Turbo	10,788	1968
219	Tutwoin	12	1949
220	Uaso Narok	2,041	1960
221	Ururu	433	1936
222	Utangwa	55	1960
223	Utunene	166	1960
224	Uuni	93	1960
225	Waiya	263	1960
226	Wanga	77	1986
227	Weni-Mwana	5	1991

KENYA - PROTECTED SITES (cont.)

National/international designations

Name of area and map reference (see Figs. 2.1, 2.2 and 2.3)		Management area (ha)	Year notified
228	West Molo	275	1932
229	Western Mau	19,833	1932
230	Witu	3,938	1962
Game Sanctuary			
231	Maralai	500	
Marine National Parks			
232	Kisite/Mpunguti	3,900	1978
233	Malindi	600	1968
234	Mombasa	1,000	1986
235	Ras Tenewi	35,000	1991
236	Watamu	3,200	1968
Marine National Reserves			
237	Kiunga	25,000	1979
238	Malindi	21,309	1968
239	Mombasa	20,000	1986
240	Mpunguti	1,100	1978
241	Watamu	3,200	1968
National Parks			
242	Aberdare	76,619	1950
243	Amboseli	39,206	1974
244	Arabuko Sokoke	600	1990
245	Central Island	500	1983
246	Chyulu	47,090	1983
247	Hell's Gate	6,800	1984
248	Kora	178,780	1989
249	Lake Nakuru	18,800	1967
250	Longonot	5,200	1983
251	Malka Mari	87,600	1989
252	Meru	87,044	1966
253	Mount Elgon	16,923	1968
254	Mount	71,759	1949
255	Nairobi	11,721	1946
256	Ndere Island	420	1986
257	Ol Donyo Sabuk	1,842	1967

KENYA - PROTECTED SITES (cont.)

National/international designations **Name of area and map reference (see Figs. 2.1, 2.2 and 2.3)**		**Management area (ha)**	**Year notified**
258	Ruma	12,000	1983
259	Saiwa Swamp	192	1974
260	Sibiloi	157,085	1973
261	South Island	3,880	1983
262	Tsavo East	1,174,700	1948
263	Tsavo West	906,500	1948
National Reserves			
264	Arawale	53,324	1974
265	Bisanadi	60,600	1979
266	Boni	133,900	1976
267	Buffalo Springs	13,100	1985
268	Dodori	87,739	1976
269	Kakamega	4,468	1985
270	Kamnarok	8,774	1983
271	Kerio Valley	6,570	1983
272	Lake Bogoria	10,705	1970
273	Losai	180,680	1976
274	Marsabit	208,800	1949
275	Masai Mara	151,000	1974
276	Mwea	6,803	1976
277	Nasolot	9,200	1979
278	Ngai Ndethya	21,209	1976
279	North Kitui	74,500	1979
280	Rahole	127,000	1976
281	Samburu	16,500	1985
282	Shaba	23,910	1974
283	Shimba Hills	19,251	1968
284	South Kitui	183,300	1979
285	South Turkana	109,100	1979
286	Tana River Primate	16,900	1976
Nature Reserves			
287	Arabuko Sokoke	4,332	1979
288	Cheptugen-Kapchemutwa	31	
289	Kaimosi Forest	19	
290	Kaptagat Forest		
291	Karura	102	

KENYA - PROTECTED SITES (cont.)

National/international designations

Name of area and map reference (see Figs. 2.1, 2.2 and 2.3)		Management area (ha)	Year notified
292	Katimok Kabarnet	58	
293	Langata	96	
294	Mbololo		
295	Nandi North	3,434	1978
296	South-Western Mau	43,032	1961
297	Uaso Narok	1,575	1981

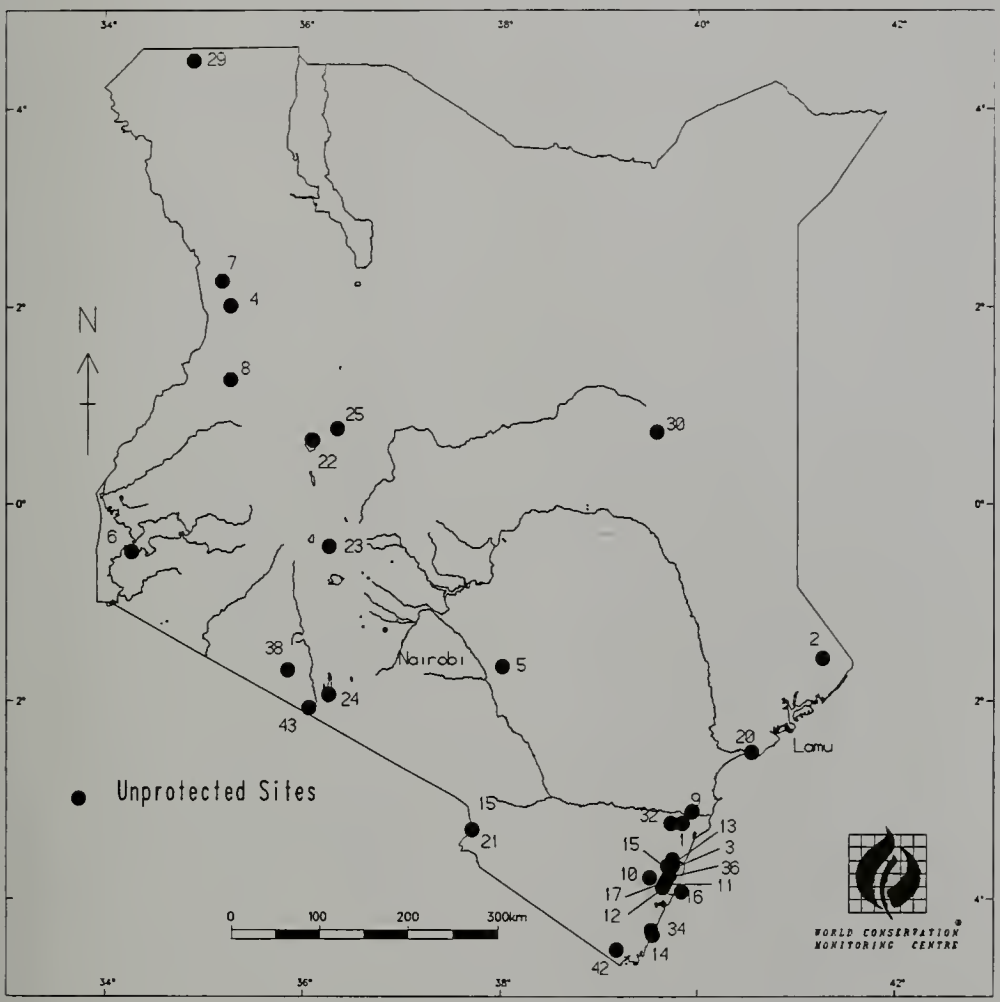
[1]Includes an unknown number of plantation reserves covering a total area of 165,000ha.

Biosphere Reserves		
Amboseli	279,200	
Kiunga Marine	60,000	1980
Mount Kenya	71,759	1978
Mount Kulal	700,000	1978
Malindi-Watamu	19,600	1979
Ramsar Site		
Lake Nakuru	18,800	1990

KENYA - UNPROTECTED SITES

	Name of area and map reference (see Fig. 2.4)	Management area (ha)
1	Arabuko Sokoke National Park	36,000
	Aroso Forest Reserve	294
	Awach Nursery Forest Reserve	2
	Aywaya Forest Reserve	142
	Baden Powell Walk Nature Reserve	
	Bondoni Forest Reserve	
2	Boni Forest Reserve	18,466
	Chalbi Desert	
3	Cha Simba Rocks	
	Chawia Forest Reserve	86
	Cherangani Hills	
	Choke Forest Reserve	
	Diani Marine National Park Complex	250
	Endau Forest Reserve	6,718
4	Esspich Hill	
	Fighi Ju Mkumu Forest Reserve	1,000
5	Gaikuyu Forest Reserve	3,075
6	Gembe Forest Reserve	1,987
	Giribi Forest Reserve	44
	God Kwer Forest Reserve	5
	Gurar Hills	
	Gwasi Forest Reserve	12,140
	Homa Forest Reserve	1,062
	Huri Hills Forest Reserve	30,000
	Igno Mkundu Forest Reserve	2,000
	Imba Forest Reserve	732
	Irizi Forest Reserve	476
	Jadini Forest Reserve	
	Kabonge Forest Reserve	31
7	Kachagalau-Lorusuk Hill	
	Kakuzi Hill Forest Reserve	1,800
	Kalangu Forest Reserve	200
	Kamasia	
8	Kamatira Forest Reserve	1,910
	Kambe Rocks	57
	Kanzalu Forest Reserve	100
	Karaini Forest Reserve	24
	Karoli Area	
	Kaya Forests	
9	Kaya Bura Forest	100

Fig 2.4 Kenya: unprotected ecologically sensitive sites



KENYA - UNPROTECTED SITES (cont.)

Name of area and map reference (see Fig. 2.4)		Management area (ha)
10	Kaya Fungo Forest	100
11	Kaya Jibana Forest	150
12	Kaya Kambe Forest	75
13	Kaya Kauma Forest	100
14	Kaya Kinondo Forest	27
15	Kaya Kivara Forest	150
16	Kaya Rabai Forest	
17	Kaya Ribe Forest	100
	Kiambere Forest Reserve	643
18	Kiangombe Forest Reserve	2,104
19	Kianjiru Forest Reserve	1,004
	Kibauni Forest Reserve	2,000
	Kigala Forest Reserve	200
	Kindaruma Forest Reserve	
	Kingatua Forest Reserve	58
	Kinyesha Mvua Forest Reserve	51
	Kiria Forest Reserve	
	Kirimiri Forest Reserve	101
	Kirinyaga, Kahari, Urumandi	
	Kisii	
	Kitovu Forest Reserve	161
	Kitui Forest	
	Koguta Forest Reserve	413
	Koobi Fora	
	Koroli Desert	
	Kuja Bull Camp Forest Reserve	18
20	Kurwitu Forest	
	Kyawea Forest Reserve	63
21	Lake Chala	
22	Lake Baringo	
23	Lake Elmenteita	
24	Lake Magadi	
25	Lake Naivasha	
27	Lake Victoria	
	Lakipi Rhinoceros Sanctuary	
28	Lambwe Forest Reserve	2,516
	Lambwe Valley National Park	
	Latema Forest Reserve	41
	Loima Hills Forest Reserve	10,000
	Loita Hills	

KENYA - UNPROTECTED SITES (cont.)

Name of area and map reference (see Fig. 2.4)	Management area (ha)
29 Lotikipi Plain	
30 Lorian Swamp	
Lotikiri Swamp	
Lungi Forest Reserve	9,517
Machakos	
31 Mai Forest Reserve	515
Maimu Forest Reserve	500
32 Mangea Hill	
Mango Forest Reserve	45
Marabu-Magina Forest Reserve	25
Maranga Forest Reserve	219
Marsabit National Park	36,000
Matha Forest Reserve	100
Mavindi Forest Reserve	100
Mbololo Juu Forest Reserve	69
Mbololo Mwambirua Forest Reserve	18
Migori River	
Mikuro Forest Reserve	100
Miriu Forest Reserve	171
Mng'Ambwa (Mwawanyu) Forest Reserve	1,000
Molinduko Forest Reserve	194
33 Mount Kulal Forest Reserve	45,729
Moyale	
Mraru Forest Reserve	200
Mtwapa Creek	
34 Muhaka Forest	
Mukagodo	
35 Mumoni Forest Reserve	10,441
Muruanisigar	
Museve Forest Reserve	48
Mutha Forest Reserve	1,785
Muthini Forest Reserve	
Mutuluni Forest Reserve	596
Muune Forest Reserve	100
Mwaganini Forest Reserve	36
Mwakinambu Forest Reserve	
Mwandongo Forest Reserve	
36 Mwarakaya Area	
Narok Swamp	
37 Ndhoani Forest Reserve	1,387

KENYA - UNPROTECTED SITES (cont.)

	Name of area and map reference (see Fig. 2.4)	Management area (ha)
	Ndoto Forest	
	Ndune Forest Reserve	
	Ngangao Forest Reserve	123
	Ngorome Forest Reserve	348
38	Nguruman Forest Reserve	
39	Njukini East Forest Reserve	498
40	Njukini West Forest Reserve	570
	Nyamarere Forest Reserve	
	Nyasoko Forest Reserve	22
	Nyiro	
41	Nyiru	
	Otacho Forest Reserve	118
	Pangani Rocks	
	Psigorr Hills	
	Pusimoro Forest	
	Rabuor Forest Reserve	50
	Ramogi Forest Reserve	283
	Ranen Forest Reserve	67
	Rangwe Forest Reserve	1,214
	Ronge Forest Reserve	318
	Ruri Forest Reserve	
	Sagalla Forest Reserve	70
	Salaita Forest Reserve	41
	Sekerr Forest Reserve	8,021
42	Shimoni Forest Reserve	
43	Shombole Swamp Forest Reserve	
	South-Western Mau National Park	43,032
44	Tana River Forest Reserve	
	Taveta Forest Reserve	
	Tugen Hills	
	Twanyoni Forest Reserve	
	Ukazi Inselberg	
	Utwani Forest	
	Vuria	
	Wajir Area	
	Warges Hill	
	West Kano Bird Sanctuary	
	Wire Forest Reserve	392
	Yekanga Forest Reserve	100
	Ziwani	

SOMALIA

INTERNATIONALLY DESIGNATED PROTECTED AREAS

None

NATIONALLY PROTECTED AREAS

Alifuuto (Arbowerow) Nature Reserve IUCN Category IV
1°21'N, 43°53'E Covering 180,000ha, this reserve supports a rich and varied fauna, including buffalo and oryx. Elephant (possibly a distinct subspecies - *Loxodonta africana orleansi*) survive in low numbers in this priority wetland (Stuart *et al.*, 1990).

Balcad Nature Reserve
2°20'N, 45°22'E Owned by the Somali Ecological Society, this small 190ha reserve supports remnants of riverine forest and scrub savanna along the Shebelle River, 29km from Mogadishu. About 200 bird species have been recorded (Simonetta and Simonetta, 1983).

OTHER MANAGED AREAS

Belet Wein Partial Game Reserve
4°45'N, 45°12'E Established in 1969.

Borama District Controlled Hunting Area
Established in 1969.

Bulo Burti Partial Game Reserve
Established in 1969.

Bushbush Controlled Hunting Area - see **Lac Badana National Park**

Bushbush Game Reserve - see **Lac Badana National Park**

Geedkabehleh Game Reserve
9°30'N, 44°00'E Established in 1969, this reserve covers an area of 10,360ha.

Jowhar Partial Game Reserve
Established in 1969.

Juba Left Controlled Hunting Area - see **Angole Farbiddu National Park**

Mandera Game Reserve
Established in 1969.

Mogadishu Game Reserve - see **Jowhar-Warshek National Park**

Oddur Partial Game Reserve
Established in 1969.

Hobyo Wildlife Reserve
5°45'N, 48°28'E Covering 250,000ha, this area of semi-desert grassland and scrub is an important site for the conservation of dibatag, oryx, the near-endemic Speke's gazelle, and Soemmering's gazelle. It is heavily grazed by domestic stock at certain times of the year (Simonetta and Simonetta, 1983; Stuart *et al.*, 1990).

Lag Dere Wildlife Reserve - see **Lag Dere National Park**

Taleh Wildlife Reserve - see **Las Anod National Park**

UNPROTECTED SITES

Angole Farbiddu National Park Proposed
1°05'N, 42°36'E This park comprises a priority wetland, with gallery forest along the central Jubba River valley. Notable rarities occur, including Parisi's slit-faced bat *Nycteris parisi* and Eisentraut's bat *Pipistrellus eisentrauti*, otherwise only known from Cameroon. Commerson's leaf-nosed bat *Hipposideros commersoni* and house bat *Scotoecus albigularis* are only found in the Jubba River valley. This is the only Somali locality for many species of animal, including blue monkey, red duiker, leopard, hippopotamus, buffalo and Nile crocodile. About 5000ha of gallery forest are lost each year to settlement and agriculture; other threats include changes in the water regime and tsetse fly control operations (Simonetta and Simonetta, 1983).

Awdhegle-Gandershe National Park Proposed
1°52'N, 44°50'E Covering 80,000ha, this priority wetland is situated to the west of Mogadishu, and supports a variety of big game (Stuart *et al.*, 1990; UNEP/IUCN, 1988).

Bajuni Archipelago
1°00'S, 42°01'E This archipelago consists of an extensive system of islets and coral reefs lying about 1km offshore, extending southwards to the n border. Both roseate and sooty terns have nested here, and turtles and dugong occur. See **Lac Badana National Park** (IUCN, 1987; Simonetta and Simonetta, 1983; Stuart *et al.*, 1990; UNEP/IUCN, 1988).

Boja Swamps Wildlife Reserve Proposed
0°34'N, 43°03'E Covering an area of 110,000ha, this is a priority wetland that supports numbers of elephant and buffalo (Stuart *et al.*, 1990).

Daalo Forest National Park Proposed
10°45'N, 47°24'E Covering 251,000ha on the north-central Somalian scarp between 1880m and 2000m, this park is located in a spectacularly beautiful area. It contains a limited amount of evergreen *Juniperus* and *Olea* forest. The rare Warsangali linnet

Acanthis johannis and Somali pigeon occur, as do leopard. Protection should be extended to the west to include the habitat of wild ass and Beira gazelle, and to the east to cover the northern coastline. This latter would include a population of the near-endemic Pelzeln's gazelle. See also **Maydh Island** (Collar and Stuart, 1988; IUCN, 1987; Simonetta and Simonetta, 1983; Stuart *et al.*, 1990; UNEP/IUCN, 1988).

Eji-Oobale Wildlife Reserve Proposed
3°25'N, 45°39'E This is a priority wetland, supporting an exceptional variety of plants and animals. Lion have recently become extinct in the reserve, whilst elephant occur in low numbers (Stuart *et al.*, 1990).

El Hammure Wildlife Reserve Proposed
7°30'N, 48°30'E (centre) Covering 400,000ha, this is an important reserve (Stuart *et al.*, 1990).

Far Libah Wildlife Reserve Proposed
3°23'N, 45°30'E This reserve supports populations of greater kudu, and Swayne's hartebeest has been reported. Grevy's zebra, giraffe and black rhinoceros occurred in the past.

Far Wamo Wildlife Reserve Proposed
0°23'N, 42°33' Covering 140,000ha of bushland and grassland mosaic near Gelib, this area supports elephant, giraffe and possibly black rhinoceros; it is a dry season water supply.

Gaan Libaax National Park Proposed
10°03'N, 45°30'E Covering 50,000ha in the northern Somali mountains south of Berbera, this area supports an Afromontane vegetation of *Juniperus procera* and *Buxus hildebrandtii* evergreen scrub. See also **Zeila Wildlife Reserve.**

Gezira National Park Proposed
1°56'N, 45°08'E Covering 5000ha, this lagoon on the outskirts of Mogadishu is important for birds and rare plants (Stuart *et al.*, 1990).

Har Yiblane National Park Proposed
This park contains priority wetlands, and a large permanent swamp. Lesser kudu, Soemmering's gazelle, gerenuk, oryx and cheetah occur (Simonetta and Simonetta, 1983; Stuart *et al.*, 1990).

Haradere-Awale Rugno Wildlife Reserve Proposed
4°22'N, 47°35'E Covering 250,000ha, this area of salt pans, semi-desert grassland and scrub is a key area for dibatag, and Speke's and Soemmering's gazelles (Simonetta and Simonetta, 1983; Stuart *et al.*, 1990).

Harqan Dalandoole Wildlife Reserve Proposed
3°38'N, 44°22'E Covering 800,000ha, this area of deciduous bushland is located on a limestone and gypsum plateau. It is an important area for conservation, and lion, leopard, giraffe and a few elephant occur (Simonetta and Simonetta, 1983; Stuart *et al.*, 1990).

Jowhar-Warshek National Park Proposed
2°15'N, 45°36'E This 220,000ha park includes **Mogadishu Game Reserve** (1969). Habitats include swamp, riverine formations, dunes and coastal plain, and larger animals in the park include Nile crocodile, hippo, waterbuck, Soemmering's and Speke's gazelles, and gerenuk. The threatened Ash's lark *Mirafra ashi* may occur (Simonetta and Simonetta, 1983; Stuart *et al.*, 1990).

Lag Badana-Bushbush National Park Proposed
1°21'S, 41°38'E This park was originally the **Bushbush Controlled Hunting Area** and **Bushbush Game Reserve**, covering 334,000ha. Containing the only area of semi-deciduous bushland in Somalia, the area also supports riverine forest. Buur Gabo Bay is bordered by dense stands of mangroves, with corals. The rare golden-rumped elephant-shrew might occur in the coastal forests. Elephant occur in low numbers, and there is a small possibility of the black rhinoceros surviving. Dugong are thought to be present. The park is situated close to the n border, complementing **Boni National Reserve** in that country. It could be increased in area to include offshore islands (the **Bajuni Archipelago**), and there is tourist development planned for the area. The park is threatened by shifting cultivation and settlement (Simonetta and Simonetta, 1983; Stuart *et al.*, 1990; UNEP/IUCN, 1988).

Lag Dere National Park Proposed
0°37'N, 41°33'E Covering 500,000ha, this park supports an important population of Hunter's hartebeest. Grant's gazelle and giraffe occur, and there is tourism potential (Simonetta and Simonetta, 1983; Stuart *et al.*, 1990).

Lag Radidi
This is a priority wetland (Stuart *et al.*, 1990).

Las Anod-Taleh-El Chebet National Park Proposed
8°34'-9°29'N, 47°25'-49°17'E This park covers an area of 800,000ha. It is an important site for conservation in Somalia, supporting Somali wild ass, oryx, gerenuk, Beira antelope, Speke's and Soemmering's gazelles, cheetah and possibly lion. The **El Chebet** area supports populations of a rare creeping palm. Nomads use the area, and grazing competition from grazing stock is a problem (Simonetta and Simonetta, 1983; Stuart *et al.*, 1990).

Maydh Island
11°03'N, 47°05'E (approx.) Situated offshore to the north of **Daalo Forest National Park**, this is an important seabird nesting site; species include red-billed tropicbird, masked booby, sooty tern and brown noddy (UNEP/IUCN, 1988).

Nogal Valley
This is the only known locality for the endemic frog *Lanzarana largeni*.

Qurajo Proposed
The only remaining site in Somalia where Grevy's zebra survives (Simonetta and Simonetta, 1983).

Ras Hajun-Ras Guba Wildlife Reserve Proposed
10°10'N, 50°40'E This is an important semi-desert grassland site for conservation in the north-east. Speke's and Soemmering's gazelles occur (Stuart *et al.*, 1990).

Rus Guba National Park - see **Ras Hajun-Ras Guba Wildlife Reserve**

Shabeelle River Wetlands
1°28'N, 44°00'E These consist of permanent swamps covering 300,000ha. They are extremely important to wildlife. The birdlife is rich, and Nile crocodile are still common. Ethiopian refugees have settled in the area, and schemes to convert the lower wetlands to other uses are a threat to the area (Simonetta and Simonetta, 1983).

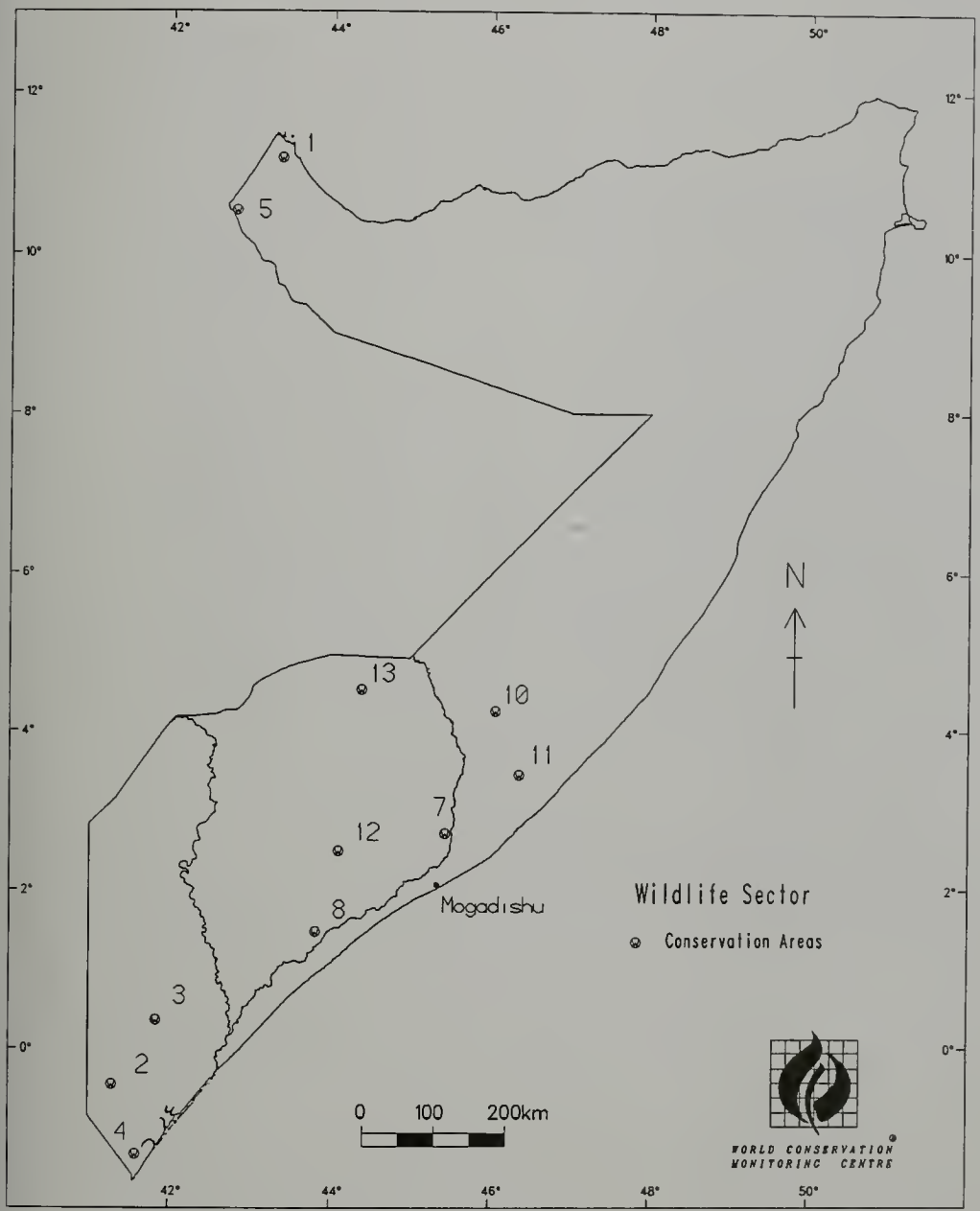
Zeila Wildlife Reserve Proposed
11°00'N, 43°28'E Covering 400,000ha, Zeila was the site of a partial reserve in colonial times. It is rich in montane flora and fauna, and should be re-established to include Lake Libaax Xeeleh Mountains Forest Reserve, the Zeila area and the offshore islands of Shada Din and Aibat. The latter are important for nesting seabirds, and used to support a very large colony of bridled terns *Sterna anaethetus*. The adjacent Mount Wagar supports montane forest, and should be declared as a forest reserve (Frame, 1987; Stuart *et al.*, 1990; UNEP/IUCN, 1988).

SOMALIA - PROTECTED SITES

National/international designations

Name of area and map reference (see Fig. 3.1)	Management area (ha)	Year notified
Controlled Hunting Areas		
1 Borama District		1969
2 Bushbush		1969
3 Juba Left		1969
Game Reserves		
4 Bushbush	334,000	1969
5 Geedkabehleh	10,360	1969
6 Mandera		1969
7 Mogadishu		1969
Nature Reserves		
8 Alifuuto (Arbowerow)	180,000	
9 Balcad	190	1988
Partial Game Reserves		
10 Belet Wein		1969
11 Bulo Burti		1969
12 Jowhar		1969
13 Oddur		1969

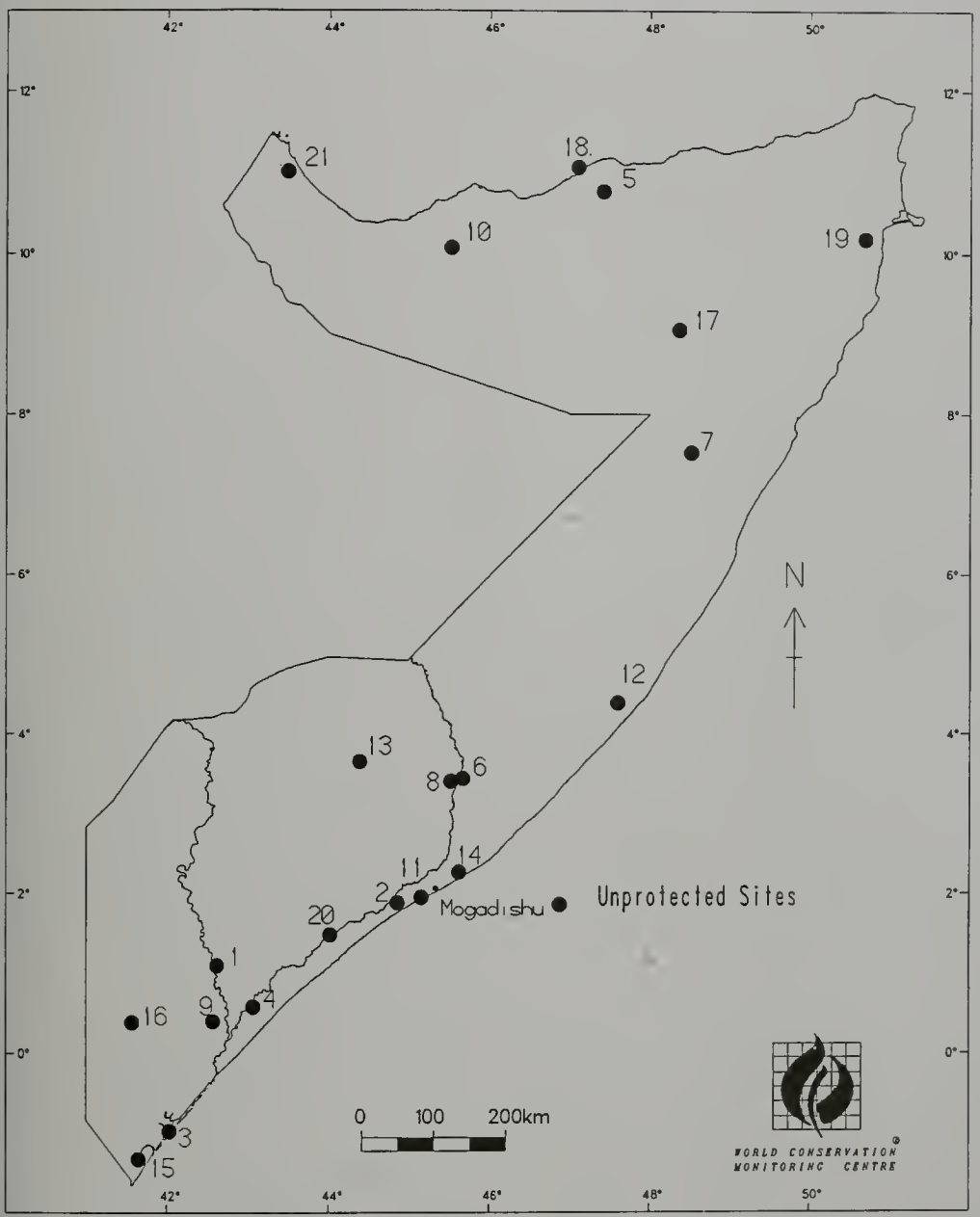
Fig 3.1 Somalia: protected ecologically sensitive sites



SOMALIA - UNPROTECTED SITES

Name of area and map reference (see Fig. 3.2)		Management area (ha)
1	Angole Farbiddu National Park	
2	Awdhegle-Gandershe National Park	80,000
3	Bajuni Archipelago	
4	Boja Swamps Wildlife Reserve	110,000
5	Daalo Forest National Park	251,000
6	Eji-Oobale Wildlife Reserve	
7	El Hammure Wildlife Reserve	400,000
8	Far Libah Wildlife Reserve	
9	Far Wamo Wildlife Reserve	140,000
10	Gaan Libaax National Park	50,000
11	Gezira Lagoon National Park	5,000
12	Haradere-Awale Rugno Wildlife Reserve	250,000
13	Harqan Dalandoole Wildlife Reserve	800,000
	Har Yiblane	
14	Jowhar-Warshek National Park	220,000
15	Lag Badana-Bushbush National Park	334,000
16	Lag Dere National Park	500,000
17	Las Anod-Taleh-El Chebet National Park	800,000
18	Maydh Island	
	Nogal Valley	
	Qurajo	
19	Ras Hajun-Ras Guba Wildlife Reserve	
20	Shabeelle River Wetlands	
21	Zeila Wildlife Reserve	400,000

Fig 3.2 Somalia: unprotected ecologically sensitive sites



SUDAN

INTERNATIONALLY DESIGNATED PROTECTED AREAS

Dinder National Park IUCN Categories II and IX

A park of 890,000ha with a 277,300ha buffer zone; the biosphere reserve covers 650,000ha. Much of the park is a low-lying floodplain crossed by the meandering Rahad and Dinder rivers. Thornbush savanna predominates; in the north, grassland of tall coarse grasses occurs, in the south is *Combretum* woodland, with multi-layered gallery forest along the rivers. Many ox-bow lakes, which gradually silt up, provide nutritious grasses for wildlife, particularly at the height of the dry season. There was a rich fauna, including threatened species such as elephant, leopard *Panthera pardus* and cheetah *Acinonyx jubatus* but numbers have been reduced since the 1960s. The park only includes dry-season habitat for many ungulates and ostrich when traditional grazing lands outside are being lost. Illegal mechanised farming is threatening the whole buffer zone; burning and grazing disturbs about 60% of the area each year causing great changes in vegetation. Livestock are thought to cause outbreaks of disease that have decimated the wild herds. Poaching is a serious threat and animal numbers decreased by up to 50% in the 1970s. A planned canal would block the migration of many species (IUCN/UNEP, 1987; MacKinnon and MacKinnon, 1986).

Radom National Park IUCN Categories II and IX

This park and biosphere reserve of 1,250,970ha is in broken hilly country drained by two main rivers and numerous smaller streams which flood in the wet season. Savanna woodland predominates but wet meadows are important for wildlife as they provide water and fodder during the dry season. The park formerly had a rich fauna with threatened species such as elephant, hartebeest, leopard, wild dog *Lycaon pictus* and cheetah *Acinonyx jubatus*, partly because for a long time it was protected from cattle encroachment by the presence of tse-tse fly. Recently there have been reports of livestock overgrazing and for a long time organised poaching has been the greatest threat. Poaching, honey collection and fishing have always occurred on a small scale but human settlement is increasing, particularly on the periphery (IUCN/UNEP, 1987; MacKinnon and MacKinnon, 1986).

NATIONALLY PROTECTED AREAS

Arkawit Wildlife Sanctuary IUCN Category IV

Established in 1939 82,000ha

Arkawit-Sinkat Wildlife Sanctuary IUCN Category IV

Established in 1939 12,000ha

Ashana Game Reserve IUCN Category VI

9°20'N, 26°30'E Established in 1939 and covering 90,000ha, this is an important savanna reserve north of **Chelkou Game Reserve**. Uganda kob occur (Stuart *et al.*, 1990).

Badingilo National Park IUCN Category II
5°30'N, 32°10'E Established in 1986 and covering 1,650,000ha, including the existing **Mongalla Game Reserve**. Aquatic birdlife is abundant, and includes the world's largest population of the rare shoebill stork *Balaeniceps rex*. Game includes hippopotamus, sitatunga, topi, white-eared kob, reedbuck, waterbuck, oribi, Nile lechwe, Mongalla gazelle, giraffe, zebra, lion and elephant. The black rhino may survive (Burgis and Symoens 1987; Stuart *et al.*, 1990).

Bengangai Game Reserve IUCN Category IV
5°00'N, 27°32'E 1939; 17,000ha; Central African rain forest, the only representative in the Sudan. The area is not large enough to contain viable populations of important species; bongo occur (Frame, 1987; Stuart *et al.*, 1990).

Bire Kpatuos Game Reserve IUCN Category VI
4°40'N, 27°55'E Established in 1939 and covering 500ha of lowland rain forest in the south-west (Frame, 1987; Stuart *et al.*, 1990).

Boma National Park IUCN Category II
This covers 2,280,000ha and abuts the rugged Ethiopian highlands on its eastern edge while to the west vast stretches of floodplain make the area inaccessible during the rainy season. The Guom swamps on the northern boundary attract much wildlife, particularly kob. Vegetation varies with altitude from montane forest through deciduous woodland, grading into *Acacia* woodland to semi-arid short grass or seasonal swamps with tall grass on the floodplains. Before the recent troubles, this park had the most diverse fauna in Sudan, and possibly in Africa, including many antelope species and threatened mammals such as leopard and cheetah. This area is an important stopover for Palaearctic migrants and a nesting site for shoebill. Military activity has resulted in the collapse of park infrastructure and staffing; because of the security situation there has been no recent information about its status except that large animals were killed to feed the army. Local people living in the park were exploiting the natural resources to a limited extent.

Chelkou Game Reserve IUCN Category VI
8°30'N, 27°30'E Established in 1939, this is an important savanna reserve of 550,000ha, compromised by civil war. Uganda kob occur. It may incorporate **Ashana Game Reserve** of 90,000ha (Stuart *et al.*, 1990).

Fanyikango Island Game Reserve IUCN Category VI
9°20'N, 31°21'E Established in 1935, this covers 48,000ha of Sudd swamp. Aquatic birdlife is abundant, and includes the world's largest population of the rare shoebill stork *Balaeniceps rex*. Game includes hippopotamus, sitatunga, topi, white-eared kob, reedbuck, waterbuck, oribi, Nile lechwe, Mongalla gazelle, giraffe, zebra, lion and elephant (Burgis and Symoens, 1987; Stuart *et al.*, 1990,).

Juba Game Reserve IUCN Category VI
4°33'N, 31°32'E Established in 1939, this important savanna reserve covers 20,000ha (Stuart *et al.*, 1990).

Khartoum Sunt Forest Wildlife Sanctuary IUCN Category IV
Established in 1939; 1500ha

Kidepo Game Reserve IUCN Category VI
4°00'N, 33°35'E Established in 1975, this important savanna reserve of 120,000ha is contiguous with **Kidepo National Park** in Uganda (Stuart *et al.*, 1990).

Mbarizunga Game Reserve IUCN Category VI
4°30'N, 28°16'E Established in 1939, this protects 1000ha of montane forest (Frame, 1987).

Mongalla Game Reserve IUCN Category VI
5°05'N, 31°48'E Established in 1939, this covers 7500ha of Sudd swamp, proposed for inclusion into **Badingilo Game Reserve** (Stuart *et al.*, 1990).

Nimule National Park IUCN Category II
The park covers 41,000ha of hilly country dominated by savanna woodland of *Acacia* spp., *Balanites aegyptiaca* and *Combretum hartmannianum*. The park was set up primarily to protect the white rhinoceros and buffalo populations and elephant and a number of antelope species also occur. No human settlement or other activities are allowed. The park suffered severely during the political unrest in Uganda; elephant populations were decimated and white rhinoceros were poached out, but during the 1980s populations have increased through better patrolling. Poachers from Uganda are still a problem in parts and domestic animals sometimes graze in the buffer zone. It is at present the most stable of the parks in Sudan (IUCN/UNEP, 1987).

Numatina Game Reserve IUCN Category VI
7°06'N, 27°30'E Established in 1939, this 210,000ha area to the south of Wau supports Uganda kob (Stuart *et al.*, 1990).

Rahad Game Reserve IUCN Category VI
13°08'N, 35°46'E Established in 1939, this 350,000ha area is contiguous with **Dinder National Park** (Stuart *et al.*, 1990).

Sabaloka Game Reserve IUCN Category V
Established in 1946; 116,000ha

Sanganeb Atoll Marine National Park IUCN Category II
This park of about 26,000ha, 30km off shore is the only genuine atoll in the Red Sea. Because of the low levels of pollution and little depletion by collectors the park has a wide range of biophysiographic reef zones and great coral biodiversity. The atoll rises steeply from the sea bed at more than 800m depth and its rim reaches the surface

at all but the western side and encloses three lagoons. The water is extremely clear, with visibilities of up to 46m. The diversity of marine life includes white-tip shark, which has a patchy distribution in the Red Sea. This is one of the most frequented diving sites in the Red Sea and is subject to disturbances such as anchor damage, some coral and shell collecting and heavy spearfishing. A lighthouse was constructed in 1965 but it is now automatic so that there are no personnel to control tourists, of which there are about 600 per year (IUCN/UNEP, 1987).

Shambe National Park IUCN Category II

7°10'N, 30°48'E Established in 1985, this 62,000ha Sudd swamp reserve supports Nile lechwe, hippopotamus, sitatunga, topi, white-eared kob, reedbuck, waterbuck, oribi, Mongalla gazelle, giraffe, zebra, lion and elephant. It requires extending (Burgis and Symoens, 1987; Stuart *et al.*, 1990).

Southern National Park IUCN Category II

This park of 2,300,000ha is in hilly country drained by several rivers. Savanna woodland covers much of the area with varying densities of trees. Deciduous trees generally predominate, with thorny species and tall grasses becoming dominant in the north. The park has had a high faunal diversity, with large mammals remaining such as elephant, buffalo, white rhinoceros and hartebeest. The park suffered during 17 years of Civil War and more recently from poachers with automatic rifles. Since the 1980 dry season the Southern range has been invaded annually by poachers from the north; in 1983 there were 15-30 camps of 10-300 men each in the park. Illegal honey collecting and uncontrolled fires are also a problem (IUCN/UNEP, 1987).

Tokar Game Reserve IUCN Category IV

18°00'N, 38°00'E Established in 1939, covering 630,000ha

Zeraf Game Reserve IUCN Category VI

9°00'N, 30°30'E Established in 1939 and covering some 970,000ha of Sudd swamp, this reserve is internationally important for mammal conservation. Game includes hippopotamus, sitatunga, topi, white-eared kob, reedbuck, waterbuck, oribi, Nile lechwe, Mongalla gazelle, giraffe, zebra, lion and elephant (Burgis and Symoens, 1987; Stuart *et al.*, 1990).

OTHER MANAGED SITES

None

UNPROTECTED AREAS

Abroch Game Reserve Proposed

Boro Game Reserve Proposed
8°30'N, 24°25'E Very important reserve of 150,000ha on the border with the Central African Republic, supporting Uganda kob, compromised by civil war (Stuart *et al.*, 1990).

Didinga Mountains
4°08'N, 33°48'E Situated in the south of Sudan, this important area of montane forest has been degraded by burning (Stuart *et al.*, 1990).

Dongotona Mountains
4°12'N, 33°07'E Situated in the south of Sudan, this is an important area of montane forest, degraded by burning (Stuart *et al.*, 1990).

Dunganab Bay
20°50'N, 37°17'E Covering about 300km^2, including the Taila Islands and mainland opposite. The bay is shallow and semi-enclosed, formed by emergent coral reefs. It is considered to be a unique marine biotype. The Taila Islands support seabird colonies including the sooty and white-eyed gulls *Larus hemprichii* and *L. leucophthalmus*; ospreys nest on a small island within the Bay. See also Mukawwar Managed Nature Reserve (UNEP/IUCN, 1988).

El Rosieres Dam Bird Sanctuary Proposed
11°30'N, 34°23'E Situated on the Blue Nile.

Imatong Mountains Nature Conservation Area Proposed
4°00'N, 32°56'E Covering 100,000ha of montane forest in the extreme south, the most important in Sudan. Supports about half of the known plant species in the country, and is under threat from expansion of tea and forest plantations. The threatened spotted ground-thrush *Turdus fischeri* is known from the Lotti Forest (Frame, 1987; Stuart *et al.*, 1990).

Jebel Aulia Dam Bird Sanctuary Proposed

Jebel Elba Nature Conservation Area Proposed
22°11'N, 36°21E This covers 480,000ha in the north of the country, and includes the island groups of Siyal (off Abal Deib), and Rawabel (off Abu Naam); hawksbill, green and leatherback turtles nest on the former, and dugong may occur. There are mangroves between Shalatein and Halaib, and the islands are important seabird nesting areas. The area receives a high winter rainfall. Game on the mainland includes wild ass, scimitar-horned oryx, addax, Dama, slender-horned and Dorcas gazelles and Barbary sheep. The Bischarin Bedouins traditionally live in the area, and their continued presence has been incorporated into management plans (UNEP/IUCN, 1988).

Jebel Gurgei Massif
The Nubian ibex occurs (Stuart *et al.*, 1990).

Jebel Marra Massif Nature Conservation Area Proposed
13°00'N, 24°20'E Covering 150,000ha, this is an isolated mountain in northern Sudan, with unique flora and fauna and woodlands. The localised tree *Olea laperrine* occurs in fair numbers (Frame, 1987; Stuart *et al.*, 1990).

Khashm el Girba Dam Bird Sanctuary Proposed

Lake Abiad Bird Sanctuary Proposed
10°17'N, 29°59'E

Lake Ambadi Nature Conservation Area Proposed
8°43'N, 29°19'E Fed by the Jur River, this lake covers some 150,000ha at an altitude of 390m. There is an abundant birdlife, and hippopotami are present (Burgis and Symoens, 1987).

Lake Keilak Bird Sanctuary Proposed
10°50'N, 29°17'E Situated in South Kordofan, at an altitude of about 450m, the lake covers an area of 3000ha when full. Waterbirds occur, and the lake is an important watering place for the cattle of nomads (Burgis and Symoens, 1987).

Lake Kundi Bird Sanctuary Proposed
10°27'N, 25°10'E Covering 1200ha, the lake is an important wintering ground for waterbirds. Human populations are sparse, but nomads pass through the area (Burgis and Symoens, 1987).

Lake No Nature Conservation Area Proposed
9°30'N, 30°37'E Situated just to the west of **Zeraf Game Reserve** at the junction of the Bahr el Gazal and Bahr el Jebel in southern Sudan, the lake is about 10km by 2.5km at an elevation of 385m. Surrounded by extensive papyrus swamps, it is home to a wide variety of Nilotic fish species, and an abundance of birdlife, including white-shouldered plover *Hemiparra crassirostris* and the flycatcher *Alseonax aquatica*. Crocodile and hippopotamus are present (Burgis and Symoens, 1987).

Lake Nubia Bird Sanctuary Proposed
21°55'N, 31°19'E Covering 10,000ha at the southern end of Lake Nasser, west of Wadi Halfa.

Lantoto National Park Proposed
4°28'N, 29°53'E Covering 76,000ha, this very important reserve supports Uganda kob. It is compromised by civil war (Stuart *et al.*, 1990).

Machar Game Reserve Proposed

Meshra Game Reserve Proposed
7°30'N, 29°30'E Covering 450,000ha, this very important reserve supports Uganda kob. It is compromised by civil war (Stuart *et al.*, 1990).

Mukawwar (Mukkawar) Marine Nature Reserve Proposed
20°50'N, 37°17'E This covers 12,000ha, incorporating Mukkawar, Mesharifa and Mayetib Islands, outer reefs such as Arlington and the coastal area around Mersa Inkafail; it is of importance for coral reefs, mangroves and seabirds. Marine turtles nest on Mukawwar. See also **Dunganab Bay** (UNEP/IUCN, 1988; Stuart *et al.*, 1990).

Port Sudan Marine National Park Proposed
The park is to enclose a 4km-long mersa which forms a natural harbour several tens of metres deep. There are coral formations in the harbour mouth and fringing reefs off shore to the north and south which are covered with seagrass and algae. The sheltered south-facing reef has a 35m vertical face and the otherwise varied reef habitats help support a rich growth of corals and other marine life with about 60 species of fish. Increasing industrialisation in the region and the resulting pollution are a serious threat to the reefs, particularly a hot water power station, oil, chemicals and sewage. A new port was to be built 10km north at New Suakin but the Towartit and Wingate reefs off Port Sudan are the only anchorages for big ships and are seriously threatened by physical damage and waste discharges. All the more accessible coral reefs are being damaged by excessive visitor pressure. There is also heavy spearfishing and collecting of coral and shells, particularly by sailors (IUCN/UNEP, 1987).

Red Sea Hills
19°40'N, 36°45'E (centre) These support an unusual flora and fauna, including the very rare Nubian dragon tree *Dracaena ombet*, Dorcas and Soemmering's gazelle, Nubian ibex, Nubian wild ass and Barbary sheep; protection is needed (Stuart *et al.*, 1990).

Sennar Dam Bird Sanctuary Proposed

Suakin Archipelago National Park Proposed
19°00'N, 37°30'E This area includes numerous small islands stretching for about 100km along the southern Sudanese coast, about 27km from Suakin. It displays great diversity, and is of importance for coral reefs, seabird colonies and marine turtle nesting sites - about 300 hawksbill turtles are known to nest here (Stuart *et al.*, 1990; UNEP/IUCN, 1988).

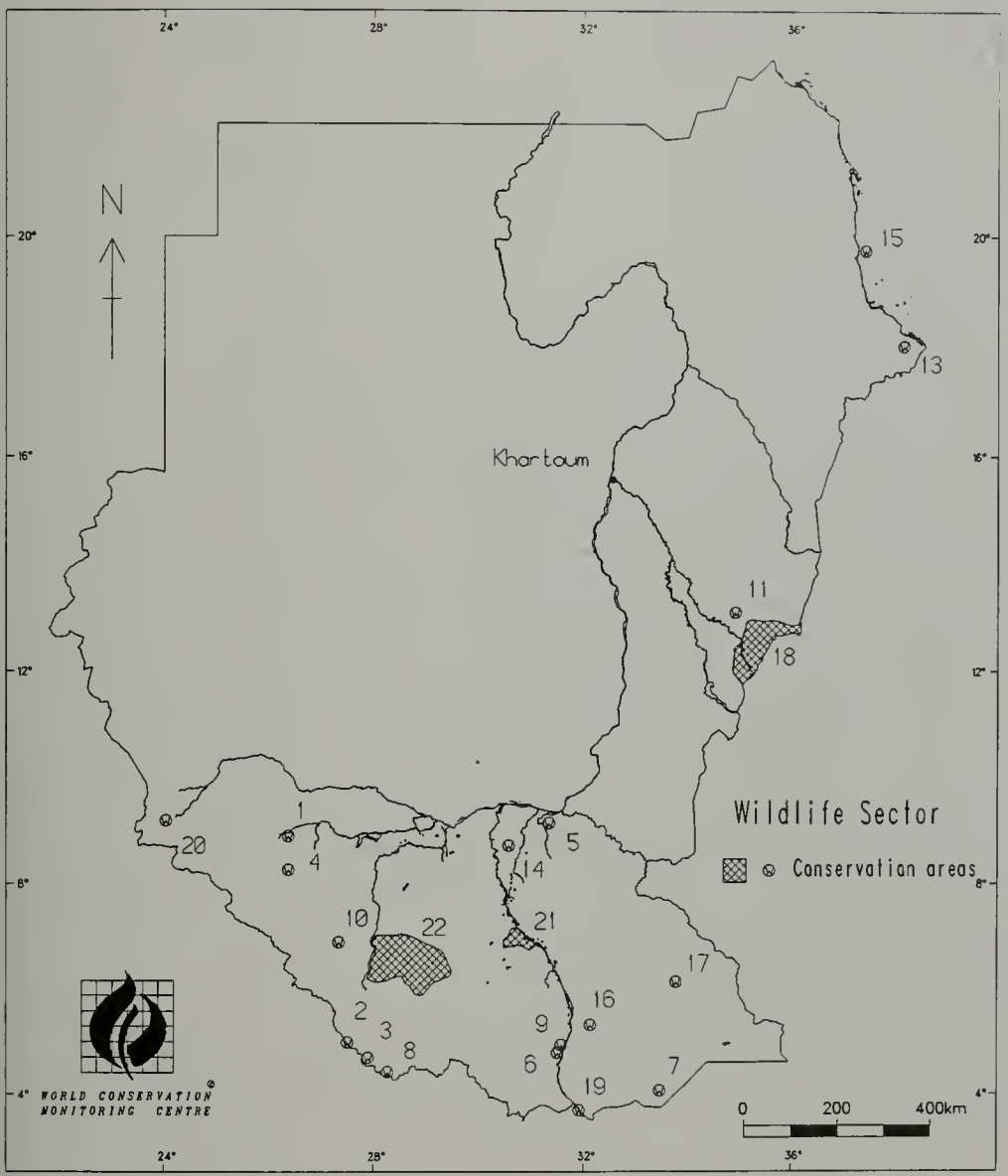
Wadi Howar Game Reserve Proposed
Situated in the arid north-west on the border with Chad.

SUDAN - PROTECTED SITES

National/international designations

Name of area and map reference (see Fig. 4.1)	Management area (ha)	Year notified
Game Reserves		
1 Ashana	90,000	1939
2 Bengangai	17,000	1939
3 Bire Kpatuos	500	1939
4 Chelkou	550,000	1939
5 Fanyikango Island	48,000	1935
6 Juba	20,000	1939
7 Kidepo	120,000	1975
8 Mbarizunga	1,000	1939
9 Mongalla	7,500	1939
10 Numatina	210,000	1939
11 Rahad	350,000	1939
12 Sabaloka	116,000	1946
13 Tokar	630,000	1939
14 Zeraf	970,000	1939
Marine National Park		
15 Sanganeb Atoll	26,000	1990
National Parks		
16 Bandingilo	1,650,000	1986
17 Boma	2,280,000	1986
18 Dinder	890,000	1935
19 Nimule	41,000	1954
20 Radom	1,250,000	1980
21 Shambe	62,000	1985
22 Southern	2,300,000	1939
Wildlife Sanctuaries		
23 Arkawit	82,000	1939
24 Arkawit-Sinkat	12,000	1939
25 Khartoum Sunt Forest	1,500	1939
Biosphere Reserves		
Dinder National Park	650,000	1979
Radom National Park	1,250,970	1979

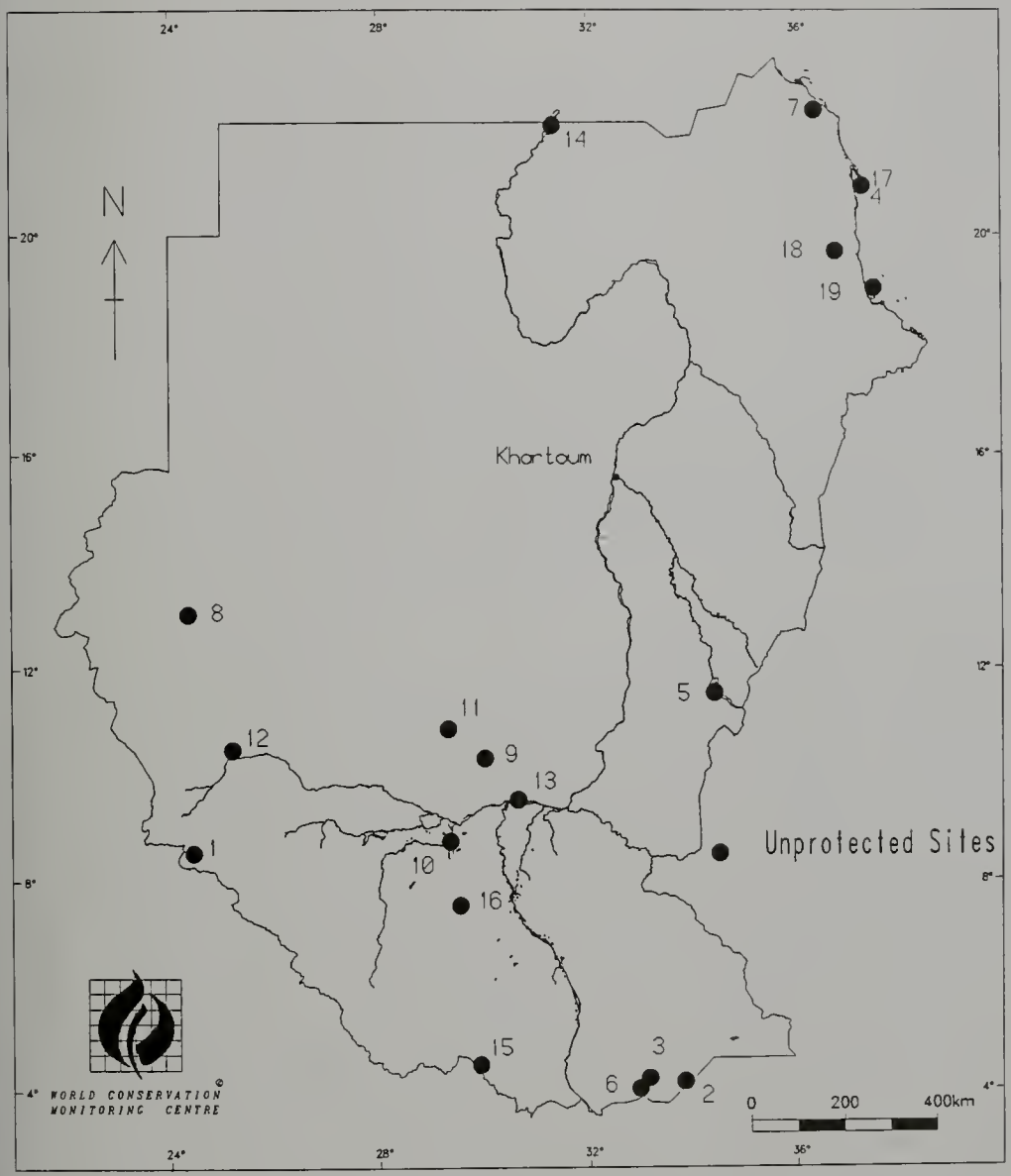
Fig 4.1 Sudan: protected ecologically sensitive sites



SUDAN - UNPROTECTED SITES

	Name of area and map reference (see Fig. 4.2)	Management area (ha)
	Abroch Game Reserve	
1	Boro Game Reserve	150,000
2	Didinga Mountains	
3	Dongotona Mountains	
4	Dunganab Bay	
5	El Rosieres Dam Bird Sanctuary	
6	Imatong Mountains Nature Conservation Area	100,000
	Jebel Aulia Dam Bird Sanctuary	
7	Jebel Elba Nature Conservation Area	480,000
	Jebel Gurgei Massif	
8	Jebel Marra Massif Nature Conservation Area	150,000
	Khashm el Girba Dam Bird Sanctuary	
9	Lake Abiad Bird Sanctuary	
10	Lake Ambadi Nature Conservation Area	150,000
11	Lake Keilak Bird Sanctuary	3,000
12	Lake Kundi Bird Sanctuary	1,200
13	Lake No Nature Conservation Area	
14	Lake Nubia Bird Sanctuary	10,000
15	Lantoto National Park	76,000
	Machar Game Reserve	
16	Meshra Game Reserve	450,000
17	Mukawwar (Mukkawar) Managed Nature Reserve	12,000
	Port Sudan Marine National Park	
18	Red Sea Hills	
	Sennar Dam Bird Sanctuary	
19	Suakin Archipelago National Park	
	Wadi Howar Game Reserve	

Fig 4.2 Sudan: unprotected ecologically sensitive sites



TANZANIA

INTERNATIONALLY DESIGNATED PROTECTED AREAS

Kilimanjaro National Park IUCN Categories II and X

The World Heritage site comprises the whole of Mount Kilimanjaro and its surrounding montane forests. **Mount Kilimanjaro National Park** (75,575ha) comprises the area above the tree line and six forest corridors running down into the montane forest. Kilimanjaro is the highest mountain in Africa (5,895m). It is one of the largest extinct volcanoes in the world, with a classic conical shape, and covers an area of 388,500ha. There are three main peaks of varying ages and a number of smaller parasitic cones. Vegetation depends on altitude, with montane forest, moorland, alpine bogs and alpine desert including *Senecio* species. The fauna is very varied, including threatened species such as elephant, leopard *Panthera pardus* and the Kilimanjaro swallowtail *Papilio sjoestedti*, a subspecies of which is restricted to the mountain. Protection is disadvantaged by the park's management plan not including the forest reserve, where felling continues. Illegal hunting, honey gathering, felling, fuel wood collection, grass burning and domestic livestock grazing occur. Problems also result from the heavy use of the area by tourists. However, Kilimanjaro was reported in 1984 to be the only park in Tanzania which approached self-sufficiency through tourist revenues (IUCN/UNEP 1987).

Lake Manyara National Park IUCN Categories II and IX

The park covers approximatley 32,500ha, two-thirds of which comprises Lake Manyara, itself contiguous to **Marang Forest Reserve** The park was established as a Biosphere Reserve in 1981. The terrestrial part is a narrow strip between the rift valley scarp and Lake Manyara (an alkaline lake with no outlet); some of the rift wall and parts of the plateau at its top are included in the park. The scarp is dissected by spectacular gorges cut by rivers flowing into the lake. Vegetation is varied, depending on relief, and includes forest, *Acacia* woodland, swamps and areas of baobab with fire-resistant grasses at the top of the escarpment. Manyara has what is possibly the greatest density of mammals (by biomass) in the world, mainly because of the large numbers of elephant and buffalo, and it is also well known for its lions and other threatened species. However, black rhinoceros have been wiped out. In the dry season large herds of wildebeest and other plains game enter the park for short periods. Manyara also has exceptional numbers of birds, particularly waterbirds, with thousands of flamingos. Poaching is kept to a low level. However, conflicts arise between wildlife and the surrounding agricultural areas; the park is too small to be viable, so that animals, particularly elephants, wander outside, causing damage; wildlife is also affected by epidemic diseases. There have been proposals to include more of the plateau above the escarpment and a corridor to **Tarangire National Park** but finance is lacking (Borner, 1990; IUCN/UNEP, 1987; MacKinnon and MacKinnon, 1986).

Ngorongoro Conservation Area IUCN Categories VIII, IX and X

This area covers 828,800ha and is contiguous to **Serengeti National Park** with which it forms a biosphere reserve of 2,305,100ha. Ngorongoro also forms a World Heritage

site. It includes Ngorongoro crater, one of the largest unbroken inactive calderas in the world, with a floor area of 26,400ha whose walls rise 400-600m. The conservation area also includes Empakaai crater and Olduvai gorge. The crater floor is mainly open grassy plains with alternating fresh and brackish water lakes, swamps and patches of *Acacia* woodland that becomes almost desert during periods of severe drought. The grasslands are rich, relatively untouched by cultivation and support very large animal populations, particularly large herds of ungulates. There are at least 20 black rhinoceros, possibly the only viable breeding population left in northern Tanzania. On the crater rim elephant and leopard occur. Migrants from the Serengeti include over one million wildebeest. Ngorongoro was first established as a conservation area to benefit the Maasai and develop multiple land use. However, various difficulties have prevented management plans being accepted. Poaching is a major problem and efforts have been made to control it with international support; in an effort to increase support for conservation, Ngorongoro has been put on the list of World Heritage Sites in Danger and included in the list of eleven most endangered areas. Trampling and overgrazing affects 5% of the area. Migration routes outside the conservation area are threatened by settlement and agriculture. Artificial water supply systems are also old and need maintenance. The Maasai burn some wooded areas and land use conflicts have increased as the Maasai have become more sedentary and practise more cultivation. Tourist pressure is great and 92% of the area's budget is derived from entrance fees (IUCN/UNEP, 1987; MacKinnon and MacKinnon, 1986).

Selous Game Reserve IUCN Categories IV and X

The reserve of 5,000,000ha, a World Heritage site, is the second largest in Africa and part of the **Selous** complex (7,400,000ha), which includes **Mikumi National Park** (323,000ha), **Magombero** and **Kilombero Game Controlled Area**. Altitude ranges from 100m to 1200m in the south-west and soils are relatively poor and infertile. Much of the reserve has deciduous miombo woodland, with some wooded grassland in the east; over 2000 plant species have been recorded. It supports large numbers of a wide variety of ungulates and several threatened species, including cheetah *Acinonyx jubatus*, wild dog *Lycaon pictus*, elephant (55,000 in 1986) and black rhinoceros *Diceros bicornis* but numbers of many species have been declining. The human population was relocated in 1912 and Selous has therefore remained relatively intact. Hunting is permitted in all but five of the 47 management blocks. Regular anti-poaching patrols are made but lack of equipment and transport means the interior is seldom patrolled and some species, particularly rhinoceros and elephant, have been severely reduced. Poaching is probably the greatest threat at present; communal wildlife management and village development schemes are however being established to reduce pressure. The proposed Stiegler's Gorge Dam on the Rufiji River is a serious threat as both dam and reservoir would be entirely within the reserve and flood some 44,000ha. Roads for oil exploration are being built into 75% of the reserve and will increase accessibility and necessitate a population within the reserve to maintain the developments. Tourism is well developed and in 1985 the reserve earned about US$2,000,000 from licensed game hunting; however, only 10% was returned for reserve expenditure (Baldus, 1989; IUCN/UNEP, 1987).

Serengeti National Park IUCN Categories IV, IX and X

The park of 1,476,300ha, a World Heritage site, is part of a biosphere reserve covering 2,305,100ha which also includes the contiguous **Ngorongoro Conservation Area** (828,800ha). Other contiguous reserves include: **Maswa Game Reserve**; and **Maasai-Mara Nature Reserve** and **Ikorongo Game Controlled Area** in . **Grumeti Game Controlled Area** has been included. It extends westwards to within 8km of Lake Victoria. The plains of Serengeti are punctuated with numerous granitic rock outcrops and in the north and west are mountain ranges. There are two almost perennial rivers and a number of lakes, marshes and waterholes. Undulating open grassy plains predominate but become almost desert during periods of severe drought. There is an extensive block of acacia woodland savanna in the centre, denser woodland in the north and some gallery forest. The park is best known for its now unrivalled herd sizes of plains game which migrate between seasonal water supplies. These include over one million wildebeest, a wide variety of other ungulates and many lions. It also supports a number of threatened species including hunting dog *Lycaon pictus*, leopard *Panthera pardus*, cheetah *Acinonyx jubatus* and elephant. There are over 350 bird species, including kori bustard and ostrich. However, poaching in peripheral areas seems to be increasing, anti-poaching activities being hampered by lack of fuel and equipment, and rhinoceros have been eradicated. At one time the Serengeti was not used by elephants but cultivation and settlement outside the park have forced them into it. Elephant and giraffe damage and uncontrolled fires have caused a decline in woodlands. In some areas trees have been felled, boundary markers removed and cultivation begun. Recently the park administration has worked with village authorities to resettle encroachers and re-mark the boundary. IUCN is coordinating on ambitious conservation and development programme in the Serengeti region in collaboration with NORAD which includes a system of zoning. There are a large and increasing number of tourists visiting each year (IUCN/UNEP, 1987; MacKinnon and MacKinnon, 1986).

NATIONALLY PROTECTED AREAS

Arusha National Park IUCN Category II

The park covers 13,700ha and is adjacent to **Mount Meru Game Reserve** (30,000ha) which acts as a buffer zone. The park includes Mount Meru (4,565m) and has a volcanic terrain of high relief with a number of lakes and swampy areas formed in craters or on lava-blocked river courses. The vegetation is mainly dense montane rain forest or thicket, with moorland at higher altitudes. The varied fauna includes threatened species such as elephant, black rhinoceros *Diceros bicronis* and leopard *Panthera pardus*, and large numbers of waterfowl, including greater and lesser flamingo, occur on the lakes. However, there is a high human population density around the park and illegal grazing, wood removal and poaching occur, reducing the elephant and rhinoceros populations considerably; small animals are also taken. Lack of equipment and poor maintenance of facilities make the park difficult to patrol (IUCN/UNEP, 1987).

Biharamulo Game Reserve IUCN Category IV

This reserve of 130,000ha is on the shores of Lake Victoria, contiguous to **Burigi Game Reserve** (220,000ha), and contains a number of valleys. It has several permanent watercourses; extensive swampy areas, numerous waterholes and springs also provide water all year. *Acacia* scrub occurs near the lake and *Brachystegia* woodland reaches its northern limit here. A number of ungulates use the area and threatened mammals such as elephant and rhinoceros also occur. However, most populations of larger mammals have been severely reduced by poaching. Hunting by licence is permitted but hunting by tourists has become negligible (IUCN/UNEP, 1987).

Burigi Game Reserve IUCN Category VI

The reserve of 220,000ha, contiguous to **Biharamulo Game Reserve** (130,0000ha), is dominated by several valleys and borders Lake Burigi. There are a few permanent watercourses and perennial water supplies from a number of waterholes and springs. The dominant vegetation cover is wooded savanna of the *Acacia-Combretum* type and there are large papyrus swamps, riverine forests and relict forest patches in some valleys. Nearly 30 mammal species were recorded in the early 1980s, including elephant, but well-organised poaching by large parties has reduced animal numbers considerably, especially in peripheral areas. Protection measures are very limited with no manned ranger posts within the park. Most of the reserve is also burnt annually by poachers. However, the land is of little value for agriculture and is seen as being best utilised for wildlife and water catchment management. Hunting is allowed under licence (IUCN/UNEP, 1987).

Dar es Salaam Reserve IUCN Category IV

6°50'S, 39°15'E This includes Mbudya (6°39'S, 39°15'E), Bongoyo (6°42'S, 39°16'E), Pangavini (6°41'S, 39°14'E) and Fungu Yasini (6°36'S, 39°14'E) islands, and reefs running for 20km along the coast. The area has generally become degraded through the dynamiting of reefs, siltation and erosion, all of which have affected its future tourism potential (UNEP/IUCN, 1988).

Gombe National Park IUCN Category II

This park of 5200ha lies on the escarpment of the rift valley, overlooking Lake Tanganyika. A number of watercourses flowing into the lake form wide valleys. The lower slopes are covered by miombo woodland, with thicker gallery forest along watercourses and along the crest of the scarp. Ridge tops are grass-covered, probably as a result of fire. The area was established as a game reserve to protect the chimpanzee population but a number of other primates occur and leopard is also found. Fire is a serious problem, spreading from cultivated areas or fish-smoking activities, and a firebreak has been cleared on the eastern side. Several villages and a main road are located near the boundary and there is illegal fishing and removal of vegetation. Some exotic oil palms remain (IUCN/UNEP, 1987).

Ibanda Game Reserve IUCN Category IV
20,000ha; open woodland habitat (Stuart *et al.*, 1990)

Katavi National Park IUCN Category II
The park covers 225,300ha and is contiguous to **Mlele Game Controlled Area** (300,000ha). It comprises the floodplain of the Katuma River which links lakes Katavi and Chala and includes vast areas of swamp. Grasslands with black cotton pans dominate with scattered stands of *Acacia* and palms. The varied fauna includes a number of threatened species such as leopard *Panthera pardus*, elephant and Nile crocodile *Crocodylus niloticus* and over 400 bird species have been recorded, including large numbers of waterfowl, particularly pelicans. The main problems are poaching, illegal fishing and vegetation destruction, aggravated by fires in the dry season which cannot be prevented because of shortage of funds for development. However, the area is fairly remote and inaccessible (IUCN/UNEP, 1987).

Kigosi Game Reserve IUCN Category IV

Kilimanjaro Game Reserve IUCN Category IV

Kizigo Game Reserve IUCN Category IV
400,000ha; part of **Ruaha National Park** and the **Rungwa Game Reserve** complex, together with the associated game controlled areas. Poaching of elephants is rife, and giraffe, zebra, Lichtenstein's hartebeest, sable and roan antelope and eland occur (Stuart *et al.*, 1990).

Mahale Mountain National Park IUCN Category II
The park comprises 157,700ha of the 50km-long Mahale Mountain range and includes Mount Nkungwe (2462m), the highest peak, as well as 9600ha of Lake Tanganyika. The western slopes of the mountains drop precipitously towards the lake, with ravines carrying perennial streams. Vegetation includes lowland forest, miombo woodland and areas of bamboo, the last possibly developing after frequent fires. The park contains over 50 species of mammal, including nine primates, and there are at least 120 bird species. About 90% of the 193 species of fish in Lake Tanganyika are endemic. The area is remote and only accessible by boat, so is little disturbed. Lack of funds prevents positive management (IUCN/UNEP, 1987).

Maswa Game Reserve IUCN Category IV
The reserve covers 220,000ha and is contiguous to **Serengeti National Park** and its associated reserves (covering well over 2,000,000ha); it is part of the Serengeti-Ngorongoro Biosphere Reserve. It forms an important buffer zone between Serengeti National Park and the densely populated region of Sukumaland. The landscape is similar to that of Serengeti National Park, with flat plains in the south and west, undulating relief in the centre and rugged terrain in the east. The hills are an important catchment area. Vegetation includes East African woodland savanna, with *Acacia* and *Commiphora* spp. and grassland, particularly in the north. Maswa is important for migratory ungulates but threatened species such as leopard *Panthera*

pardus, cheetah *Acinonyx jubatus*, black rhinoceros *Diceros bicornis* and hunting dog *Lycaon pictus* occur in small numbers. Encroachment for grazing, agriculture, tree felling and poaching are difficult to control and the human population of the surrounding areas is rapidly increasing. However, recent demarcation of the boundary and prohibition of hunting by natives as well as a total ban on hunting of some species has led to an increase in animal numbers. Hunting of some species under licence is permitted (IUCN/UNEP, 1987; MacKinnon and MacKinnon, 1986).

Maziwi Island Marine Reserve IUCN Category IV
5°30'S, 39°50'E Declared a marine reserve in 1981, the well-vegetated island formerly covered an area of about 0.5ha. It became submerged in the early 1980s. Over 300 green turtles used to nest here annually. Data on the corals are needed (UNEP/IUCN, 1988; Stuart *et al.*, 1990).

Mazumbai Natural Forest Reserve IUCN Category IV
The reserve covers 300ha in the West Usambara Mountains and is contiguous to other reserves to the west and south. It comprises a unique island of lower montane rain forest and transition to montane rain forest. A variety of mammals inhabit the area and many new species of invertebrates have been discovered. There is pressure to log the buffer forest reserve (IUCN/UNEP, 1987).

Mikumi National Park IUCN Category II
The park of 323,000ha is contiguous to **Selous Game Reserve** (5,000,000ha). Mikumi comprises two major ecological units: grassland and wooded savanna on the Mkata River floodplain with seasonal swamplands; and hilly country covered with miombo woodland. The fauna is very varied, with several primate species, about 360 species of bird and threatened animals such as wild dog *Lycaon pictus*, leopard *Panthera pardus*, elephant and black rhinoceros *Diceros bicornis*. Levels of poaching and grazing are low because of the area's inaccessibility and unsuitability for grazing. However, the Tanzania-Zambia highway through the park has been recently rebuilt and will facilitate access and lead to road casualties (IUCN/UNEP, 1987).

Mkomazi Game Reserve IUCN Category VI
The reserve covers 100,000ha on the border and is contiguous to **Umba Game Reserve** (150,000ha); these both form an important buffer and extension to **Tsavo National Park** in . This area is one of arid plains and isolated rocky peaks with scattered thorn bush. Mammals formerly included many elephant, buffalo, lion, leopard, giraffe and several gazelle species but during the 1970s and 1980s serious poaching and encroachment by people and cattle caused the extirpation of at least six species and effectively transformed the area into a cattle ranch; there was also considerable pressure on waterholes during the dry season. Pastoralists were all relocated by the end of 1988 and animal populations are now recovering (*Wildlife Conservation*, July/August 1990: 19). However, cutting of gallery forest along the Umba River has removed important habitat (IUCN/UNEP, 1987).

Mount Meru Game Reserve IUCN Category IV
3°14'S, 36°42'E Covering 30,000ha, this is an important water catchment, predominantly with undifferentiated Afro-montane and Afro-montane single dominant forests, on volcanic soils adjacent to **Arusha National Park** (Lovett, 1985; Stuart *et al.*, 1990).

Moyowosi Game Reserve IUCN Category IV
The reserve of 600,000ha lies in a relatively flat area, with swamps at the confluence of the Malagarasi and Moyowosi rivers and several permanent waterholes and springs. Most of the area is covered by miombo woodland, with some grassland and riverine forest. A variety of ungulates use the area, particularly in the dry season, and elephant occur, especially in more wooded parts. Poaching, timber removal, fishing and honey collecting occur and are difficult to control. Some exiled pastoralists from Burundi may still be using parts of the reserve (IUCN/UNEP, 1987).

Ruaha National Park IUCN Category II
This park of 1,295,000ha is contiguous to **Rungwa Game Reserve** (900,000ha) and **Kizigo Game Reserve** (400,000ha). Its central spine is the watershed between the only two perennial rivers, the Nzombe and Ruaha. The vegetation includes grassland, swamps and evergreen forests, with undulating terrain in the north dominated by baobab. The area supports a wide variety of ungulates and several threatened animal species, including leopard *Panthera pardus*, cheetah *Acinonyx jubatus*, elephant and Nile crocodile *Crocodylus niloticus*. Over 370 bird species have been recorded. No roads have been constructed in one section (which is designed to act as a strict nature reserve) and heavy poaching occurs, especially of rhinoceros, which have been eradicated (Borner, 1990) because of the difficulty of movement for patrols. Illegal fishing occurs and bushfires started by honey gatherers and poachers also affect half the park each year. High elephant densities in some areas has led to damage to baobabs and acacias and an increase in many herbivore species indicates that large-scale habitat change is occurring (Barnes *et al.*, 1989; IUCN/UNEP, 1987).

Rubondo National Park IUCN Category II
The park of 45,700ha is located on an island in Lake Tanganyika and comprises hills joined by a flat narrow isthmus. Some 90% of the island has moist evergreen forest, with wooded grassland on steeper, exposed slopes and fringes of papyrus along some shores. The park has a varied fauna, many of the larger mammals having been introduced (including threatened species such as elephant, chimpanzee *Pan troglodytes* and black rhinoceros *Diceros bicornis*) as it is intended to provide a safe refuge for threatened forest species and has high tourist potential. Some poaching and wood-cutting occur as access is possible by canoe (IUCN/UNEP, 1987).

Rumanyika Game Reserve IUCN Category IV
80,000ha; open woodland habitat (Stuart *et al.*, 1990)

Rungwa Game Reserve IUCN Category IV

This covers 900,000ha of undulating plains and is contiguous to **Ruaha National Park** (1,295,000ha) and **Kizigo Game Reserve** (400,000ha). There are marshy valleys and rocky ridges with miombo woodland savanna in the wetter north-west and *Acacia-Commiphora* woodland in the south-east. There are large numbers of a wide variety of ungulates and a number of threatened species, including elephant, black rhinoceros *Diceros bicornis*, cheetah *Acinonyx jubatus* and leopard *Panthera pardus*. Hunting is allowed by licence; however, uncontrolled poaching is extensive and illegal woodcutting occurs although many areas are fairly inaccessible (IUCN/UNEP, 1987).

Saadani Game Reserve IUCN Category IV

The 30,000ha reserve includes 20km of unspoilt coastline comprising savanna, grassland, and abandoned sisal plantations with mangroves along the shore. It supports at least 24 large mammal species, including threatened fauna such as elephant and leopard *Panthera pardus*, and is the southernmost range of Coke's hartebeest (or kongoni). Some species have also been introduced. Hunting is permitted by licence but some uncontrolled poaching occurs and another problem is the lack of water in the dry season. In 1989 the area was declared a national project and infrastructure is being developed (Bygott and Kishe, 1990; IUCN/UNEP, 1987).

Saanane Island Game Reserve IUCN Category IV

Probably semi-evergreen rain forest (Lovett, 1985)

Tanga Coral Gardens Marine Reserve IUCN Category IV

5°00'S, 39°30'E Established in 1981 adjacent to Tanga town, the reserve includes the reefs of Mwamba Wamba, Mwamba Shundu and Fungu Nyama. They are used for fishing, and tourism is possible. They are under threat from dynamiting, siltation and pollution. Current legislation should be implemented and management strategies developed. The area has been suggested as a biosphere reserve (UNEP/IUCN, 1988; Stuart *et al.*, 1990).

Tarangire National Park IUCN Category II

The park covers 260,000ha of arid undulating country with some rock outcrops and higher ground in the south-east and is crossed by the deeply incised Tarangire river which shrinks to a series of deep pools at the height of the dry season. Vegetation is varied, with *Acacia tortilis* parkland, some riverine grassland and sparse gallery forest, and baobabs are common. The park supports most of the East African 'plains' species such as lion, leopard, cheetah, elephant and zebra and is an important dry season refuge for many game. Impala are particularly common. Some of the avifauna and semi-arid vegetation are near the south-west limit of their range. However, because of increases in the human population and large ranch schemes in surrounding areas, migration routes are being interrupted and Tarangire is in danger of being isolated. Many animals use game controlled areas to the north and east during the rains but these are suffering encroachment and do not have sufficient conservation status. Poaching and bushfires are also a problem; rhinoceros in particular have been

decimated. Availability of water is also limited and has partly restricted tourist development (IUCN/UNEP, 1987).

Ugalla River Game Reserve IUCN Category IV

This flat area of 500,000ha is bisected by the Ugalla River. Vegetation includes floodplain grasslands, *Borassus* palm woodland, termite-mound woodland and miombo *Brachystegia*. Many animals are easily visible, including several ungulate species and elephant. Hunting, and fishing during the dry season, are permitted by licence. However, poaching and illegal woodcutting occur as there is no proper patrolling (IUCN/UNEP, 1987).

Umba Game Reserve IUCN Category IV

The reserve covers 150,000ha of the flat coastal plain which has some small hills and is drained by the Umba River system. It is contiguous to **Tsavo National Park** in . Vegetation includes thornbush scrub of *Acacia/Commiphora*, coastal savanna and thickets in moister places. The reserve includes the southern extent of the once large populations of elephant and black rhinoceros in the adjacent Tsavo National Park in . However, there is poor administration and lack of funding, and encroachment from pastoralists had been increasing, with settlements of nomads becoming permanent. However, pastoralists were all relocated by the end of 1988 and animal populations are now recovering. Mining, abandoned in 1984, has also seriously affected natural resources (IUCN/UNEP, 1987; *Wildlife Conservation*, July/August 1990: 19).

Uwanda Game Reserve IUCN Category IV

The reserve includes 500,000ha on the shores of Lake Rukwa. The lake is subject to cyclic floods and is presently at a very high level. There is a complexity of floodplain habitats, including grassland and some woodland. This is one of two Tanzanian areas where puku occur and other mammals include zebra, topi, buffalo, and elephant. Animal numbers are much reduced during floods. However, management is virtually non-existent and illegal fishing, hunting and grazing occur.

Uzungwa Forest Reserve IUCN Category IV

A national park of 120,000ha is proposed to include sections of the adjacent Mwanihana and West Kilombero Scarp forests , both at present classified as catchment reserves. The Uzungwas are the central section of a chain of isolated block mountains which run from southern Malawi to north-eastern Tanzania, with peaks reaching 2800m. Mwanihana is located on the steep scarp face and is mainly forested but West Kilombero, which has forest at 2000-2600m, is largely plateau grassland. A considerable altitudinal range (300-2800m) is included; the park has a continuum between lowland and montane rain forest which occurs only at a few sites in tropical Africa. The African violet *Saintpaulia ionantha*, only known in the wild from a few plants in the Usambaras, has recently been found in the Uzungwas. The fauna is rich and varied and includes six species of primate and a number of large mammals, including elephant and leopard. The avifauna includes eight threatened species with limited distributions including rufous-winged sunbird, only recently discovered and limited to the Mwanihana Forest. Uzungwa is included in the ten most important

forests in Africa for the conservation of threatened birds. The forests are important for watershed protection on the steep mountain slopes. Much of West Kilombero Scarp Forest Reserve is not included in the proposed national park but is set aside to provide timber and other forest products. Plantations have been proposed to relieve pressure on the forests as no replanting occurs at present. Most disturbance occurs at low altitudes and exploitation includes large-scale commercial logging, small pitsaw operations and illegal timber removal. Fire also affects some areas (Collar and Stuart, 1988; IUCN/UNEP, 1987).

OTHER MANAGED AREAS

Burunge Game Controlled Area
Established in 1974; 40,000ha

Chabula Marsh Game Controlled Area
Established in 1974; 10,000ha

Endulen Game Controlled Area
Established in 1974; 60,000ha

Gombe Game Controlled Area
Established in 1974; 300,000ha

Grumeti Game Controlled Area
Established in 1974; 200,000ha

Handeni Game Controlled Area
Established in 1974; 350,000ha

Igombe Dam Game Controlled Area
Established in 1974; 10,000ha

Ikorongo Game Controlled Area
Established in 1974; 300,000ha

Kalimawe Game Controlled Area
Established in 1974; 30,000ha

Kigosi Game Controlled Area
Established in 1974; 700,000ha

Kihirumira Pool Game Controlled Area
Established in 1974; 10,000ha

Kilombero Game Controlled Area
Established in 1974; 650,000ha

Kimboza Forest Reserve IUCN Category VIII
This reserve covers 385ha in the eastern foothills of the **Uluguru Mountains** and is categorised as a catchment reserve (#109, Tanzanian Ministry of Lands, Natural Resources and Tourism, 1972). The bedrock is mainly marble, producing an unusual karstic terrain with isolated pinnacles and including the Rivu River gorge. The lowland rain forest is of a distinctive nature as it includes a number of species endemic to this particular type of karstic rock; there is a flora of nearly 400 species. The avifauna with over 70 forest species is probably the richest of all East African lowland forests but forest ungulates are relatively rare as a result of hunting. This reserve has been suggested as a candidate for a Forest Education Centres Project. Pressure on peripheral land has also increased, with pole cutting and continual erosion of forest margins along footpaths. Non-reserve forest between Kimboza and Ruvu South forest has been cleared so that the two are no longer connected. Logging pressure is intensive and the reserve includes 11ha of plantations (Bensted-Smith and Msangi, 1989; IUCN/UNEP, 1987; Polhill, 1989).

Kitwai Game Controlled Area
Established in 1974; 350,000ha

Kongwa Game Controlled Area
Established in 1974; 150,000ha

Lake Daramatai Game Controlled Area
Established in 1974; 2ha

Lake Kwila Game Controlled Area
Established in 1974; 7000ha

Lake Manka Game Controlled Area
Established in 1974; 2000ha

Lake Natron Game Controlled Area
Established in 1974; 300,000ha

Lihogosa Game Controlled Area
Established in 1974; 3000ha

Loliondo Game Controlled Area
Established in 1974; 400,000ha

Lolkisale Game Controlled Area
Montane forest; integrated development programmes required (Frame, 1987; Stuart *et al.*, 1990).

Longido Game Controlled Area
Established in 1974; 150,000ha

Luganzo Game Controlled Area
Established in 1974; 250,000ha

Lukwati Game Controlled Area
Established in 1974; 200,000ha

Magombero Forest Reserve IUCN Category VIII
The reserve covers 1500ha within **Selous Game Reserve** and is used to provide fuel and construction timber. It has a high water table and is subject to seasonal flooding; ground-water forest, swamps and wet grassland occur. Buffalo are numerous and several primates are found. However, a 60-70m cleared strip bordering the Tanzania-Zambia railway runs through the reserve for 6km and has necessitated selective felling of the large trees, which creates a potential biological barrier. Some illegal trapping occurs and the future of the red colobus population is precarious. There is extensive illegal agricultural encroachment (IUCN/UNEP, 1987).

Masasi River Game Controlled Area
Established in 1974; 18,000ha

Meserani Dam Game Controlled Area
Established in 1974; 7500ha

Mic-wa-Mbu Game Controlled Area
Established in 1974; 150,000ha

Mkungunero Game Controlled Area
Established in 1974; 70,000ha

Mlele Game Controlled Area
Established in 1974; 300,000ha

Msima Game Controlled Area
Established in 1974; 200,000ha

Muhuwesi Game Controlled Area
Established in 1974; 150,000ha

Mwadui Diamond Mine Game Controlled Area
Established in 1974; 1000ha

Mwambesi Game Controlled Area
Established in 1974; 100,000ha

Nchwa-Nkima Game Controlled Area
Established in 1974; 5000ha

Ngeju-Njiro Dam Game Controlled Area
Established in 1974; 3000ha

Ngorongoro Game Controlled Area
Established in 1974; 1500,000ha

Nyonga Game Controlled Area
Established in 1974; 3,500,000ha

Pugu Forest Reserve IUCN Category VIII
6°54'S, 39°05'E The reserve covers 2200ha in a low-lying area and contains 1000ha of natural vegetation up to an altitude of 305m, including the last remaining vestiges of lowland coastal forest. The unique flora includes 12 endemic species and it is the best-studied coastal forest in Tanzania. About 14 species and varieties of plant are believed to be endemic; 65 forest bird species have been recorded. It is important for several threatened species: it is the southern limit of the Sokoke pipit and the east coast akalat also occurs; leopard has been recorded recently but many large mammal species have disappeared. The area is used to provide fuel, building poles and timber, and over half of it has been cleared. Replanting, often of exotic species, occurs. A large kaolin deposit exists within the reserve, upon which a brick and tile industry, requiring fuelwood, has been established. The forest has been mentioned as part of a Forest Education Centres Project. It has been proposed that some of the area become a strict nature reserve. See also **Kazimzumbwi Forest** (Bensted-Smith and Msangi 1989; Burgess *et al.*, 1991; Collar and Stuart, 1988; IUCN/UNEP, 1987; Polhill, 1989).

Rau Forest Game Controlled Area
Established in 1974; 10,000ha

Rukwa Game Controlled Area
7°37'S, 31°53'E This is an important wetland, the northern part of which is planned for inclusion in **Katavi National Park**. The lake contains several fish species, including the endemic *Tilapia rukwaensis*. Hippopotamus and crocodile occur in the lake, whilst numerous species of large mammal, including zebra, topi and puku, feed on the floodplains. White pelicans breed to the north of the lake (Burgis and Symoens, 1987; IUCN, 1987; Stuart *et al.*, 1990).

Rungwa River Game Controlled Area
Established in 1974; 150,000ha

Ruvu Masai Game Controlled Area
Established in 1974; 150,000ha

Ruvu Same Game Controlled Area
Established in 1974; 100,000ha

Sanya-Lelatema Game Controlled Area
Established in 1974; 80,000ha

Simanjiro Game Controlled Area
Established in 1974; 200,000ha

Speke Gulf Game Controlled Area
Established in 1974; 30,000ha

Ugunda Game Controlled Area
Established in 1974; 150,000ha

Umba River Game Controlled Area
Established in 1974; 30,000ha

Usambara Mountains East and West IUCN Category VIII
The multiple use management area includes 621,000ha: 216,000ha in the West and 405,000ha in the East Usambaras, of which 16,500ha are within 19 forest reserves. These ancient, steep-sided mountain blocks support one of the richest biological communities in Africa in terms of numbers of species and endemic taxa. Forest is widespread and varies in character with altitude and rainfall. At least 55 mammal species have been recorded and the avifauna includes two threatened species endemic to the Usambaras, the Usambara ground robin *Dryocichloides montanus* and Usambara eagle owl *Bubo vosseleri* , and five threatened species of limited distribution. The Usambaras are among the ten most important forest sites in Africa for the conservation of threatened birds. However, the forested area has declined by nearly 80% this century, predominantly owing to clearance for cash and subsistence crops and as a result of commercial timber exploitation. The remaining forests are small and fragmented, and clearance of steep slopes has resulted in erosion. Hunting is also a problem. Village development and sustainable use projects have, however, been initiated to reduce pressure on the forests (Collar and Stuart, 1988; IUCN/UNEP, 1987; Polhill, 1989).

Utengule Swamps Game Controlled Area
Established in 1974; 50,000ha

UNPROTECTED SITES

Babati Forests
Unspecified forests in this area require conserving (Stuart *et al.*, 1990).

Bahi Swamps
6°05'S, 35°10'E (centre) An important wetland (IUCN, 1987; Stuart *et al.*, 1990)

Bereku Ridge Forest
4°26'S, 35°50'E Covering about 4800ha north of Kondoa, this is an area of exceptional *Brachystegia microphylla* woodland (Polhill, 1989).

Buhoro Floodplain
Important wetland (IUCN, 1987; Stuart *et al.*, 1990)

Chugu Forest
6°36'S, 36°37'E Moist montane forest on Chugu Mountain in central Tanzania, about 120km north-east of the town of Iringa (Frame, 1987).

Fungu Kisimkasi (Latham Island)
6°50'S, 39°50'E Situated 48km off shore, 64km south-east of Dar es Salaam. The only major East African seabird island, supporting breeding colonies of notably masked booby, brown noddy, roseate and greater crested terns, sooty tern (10,000-50,000) and possibly marine turtles (IUCN, 1987; Stuart *et al.*, 1990; UNEP/IUCN, 1988)

Fungu Yasini
Current legislation should be implemented, and management strategies developed (Stuart *et al.*, 1990).

Gelai Forest
2°37'S, 36°06'E Situated on volcanic soils on Mount Gelai in Monduli District, to the south of **Lake Natron**; in need of improved conservation measures (Frame, 1987; Stuart *et al.*, 1990).

Grumeti Game Reserve Proposed
200,000ha

Ikorongo Game Reserve Proposed
300,000ha

Itigi Thicket
5°43'S, 34°30'E (Itigi Station) Restricted biome in central Tanzania, covering 13,000ha around Itigi Station; formerly important for rhino, and now being cleared for agriculture (IUCN, 1987; Polhill, 1989; Stuart *et al.*, 1990).

Kagera Swamp
Riverine swamp-forest along the lower Kagera river between Uganda and Tanzania, bordering **Akagera National Park** in Rwanda; habitat for blue duiker and black mangabey (Frame, 1987; IUCN, 1987).

Kama Mountains
Forests; present levels of protection are considered insufficient (Stuart *et al.*, 1990).

Kichi Hills
An area of extensive relict forest, with dry coastal semi-deciduous forest on ridge tops which is botanically little known and is a promising area for research and conservation (Burgess *et al.*, 1991; Polhill, 1989; Stuart *et al.*, 1990).

Kijereshi Game Reserve Proposed

Kilombero Swamp and Floodplain
8°27'S, 36°17'E These wetlands include some of the largest populations of wildlife outside protected areas in the country, including puku (Stuart *et al.*, 1990).

Kiono/Zaraninge Forest
6°06'-6°10'S, 38°35'-38°39'E A relict coastal forest covering 1900-2200ha, about 1500ha from the coast, within Zaraninge Forest Reserve, adjacent to **Saadani Game Reserve**. There are records of 51 species of forest bird, including the threatened Sokoke pipit and three near-threatened bird species. The rare lesser pouched rat occurs. An increase in cash cropping is a potential threat (Burgess *et al.*, 1991; Frame, 1987; Stuart *et al.*, 1990).

Kipengere (Livingstone) Mountains
9°42'S, 34°26'E (centre) In southern Tanzania; dry montane forests requiring protection, to the east of Lake Malawi, including Ndumbi forest of 2500ha, the southernmost locality for the tree *Juniperus procera* in Tanzania (Frame, 1987; Polhill, 1989; Stuart *et al.*, 1990).

Kisanga Rugaro Mountains
7°33'-7°40'S, 35°57'-36°07'E About 10km south-east of Iringa town; moist montane forest (Frame, 1987)

Kisiju Forest
7°24'S, 39°20'E This is to be designated as a forest reserve. Covering 200ha of primary coastal forest on a small sandy island 5km north of the village of Kisiju, supporting at least two species of very rare plant. There are dense stands of copal trees *Hymenaea verrucosa* which are probably typical of a former wetter period. Thirteen forest bird species have been recorded. The island has been settled in the past and is unprotected (Burgess *et al.*, 1991; Polhill, 1989).

Kitulu Plateau
In the Southern Highlands. Remarkable montane grassland and forest flora, of particular importance (Stuart *et al.*, 1990).

Kondoa Forests
Unspecified forests in this area require conserving (Stuart *et al.*, 1990).

Lake Balangida
4°21'S, 35°21'E Soda lake near Mount Hanang, important for birds (IUCN, 1987; Stuart *et al.*, 1990)

Lake Balangida Lelu
4°40'S, 35°14'E This soda lake is important for birds (IUCN, 1987; Stuart *et al.*, 1990).

Lake Burigi
2°07'S, 31°17'E Situated in the north-west; considered to be important (Stuart *et al.*, 1990).

Lake Chale
3°19'S, 37°42'E On the n border, important for waterbirds (Stuart *et al.*, 1990)

Lake Eyasi
3°37'S, 35°05'E This soda lake is of importance to birds such as pelican and flamingo (IUCN, 1987; Stuart *et al.*, 1990).

Lake Jipe
3°35'S, 37°45'E On the northern border; particularly important for waterbirds (Stuart *et al.*, 1990)

Lake Kimba
1°27'S, 31°34'E In the north-west; considered to be of importance (Stuart *et al.*, 1990)

Lake Kitangiri - see **Wembere Swamp and Floodplain**

Lake Lutamba
10°01'S, 39°27'E Situated about 30km west of Lindi, this area of coastal bushland and thicket is botanically important (Polhill, 1989).

Lake Natron
2°19'S, 36°03'E This is the only breeding place for lesser flamingo in Tanzania; many greater flamingo also occur (Frame, 1987; Stuart *et al.*, 1990).

Lake Nyasa - see Lake Malawi

Lake Tanganyika
3°21'-8°51'S, 29°04'-31°12'E This is the second deepest lake in the world (1470m), having a surface area of 3,280,000ha. Measuring 659km by 85km, it generally has steep shores with adjacent high mountain ranges. A significant local fishery exists, and there are numerous endemic fish species (Hughes and Hughes, 1991; Stuart *et al.*, 1990).

Lake Victoria
0°30'N-3°12'S, 31°37'-34°53'E The third largest lake in the world, with a surface area of 6,889,000ha, of which 3,375,600ha are within Tanzania. The age of the lake is estimated to be about 750,000 years and the fish fauna includes nearly 200 endemic cichlid species, although these have been catastrophically affected by Nile perch *Lates niloticus*, ill-advisedly introduced in the late 1950s. Nile crocodile still occur, as do sitatunga, waterbuck and hippopotamus. The lake shores are fairly densely populated, and a commercial fishery has developed (Hughes and Hughes, 1991).

Latham Island - see **Fungu Kisimkasi**

Lelatema Mountains
3°35'S, 37°16'E Situated south of Moshi, on the west side of the Ruvu (Pangani) River, these probably support a form of dry montane forest, covering 26,000ha (Polhill, 1989).

Le Parko
Montane forest in Monduli District (Frame, 1987)

Livingstone Mountains - see **Kipengere Mountains**

Loliondo Mountain
2°00'S, 35°38'E These forests on volcanic soils are in need of improved protection (Frame, 1987; Stuart *et al.*, 1990)

Longido
2°42'S, 36°43'E Montane forest on volcanic soils on Longido Mountain, in Monduli District; in need of improved conservation (Frame, 1987; Stuart *et al.*, 1990).

Losiminguri
3°24'S, 36°05'E Montane forest on volcanic soils in Monduli District east of **Lake Manyara**, in need of improved conservation (Frame, 1987; Stuart *et al.*, 1990).

Lugunga Forests
6°34'S-36°23'E, 6°27'S-36°23'E Situated on Lugunga Mountain and an adjacent mountain to the north, in central Tanzania. Approximately 108km and 120km, respectively, north-east of the town of Iringa. Moist montane forests on Lugunga reach 2357m (Frame, 1987).

Luhakwe Forest
6°57'S, 37°57'E On Luhakwe Mountain in central Tanzania, about 31km south-east of Morogoro town, east of the northern end of the **Uluguru Mountains**. Moist montane forest (Frame, 1987)

Mafia Islands
7°40'S, 39°40'E Established in 1981 and incorporating the two marine reserves of **Chole Bay** and **Tutia Island** at 7°59'S, 39°46'E and 8°07'S, 39°39'E, respectively, situated opposite the **Rufiji Delta**. One-third of Tanzania's green turtle population is found here; Ras Dima (in the **Rufiji Delta**) is an important foraging area for the olive ridley turtle, and is Tanzania's most important locality for dugong. Excellent coral reefs in good condition still exist. The bat *Pteropus seychellensis comorensis* is found on the islands - the only Tanzanian locality. There is an extensive area of coastal semi-deciduous forest on coral rag along the eastern coast and the presence of thickets of *Philippia mafiensis* is botanically unique. The area has recognised marine park potential (IUCN, 1987; Polhill, 1989; Stuart *et al.*, 1990; UNEP/IUCN, 1988).

Mahenge Mountains
8°49'S, 36°40'E Moist montane forests on the plateau tops of two mountains; one forest is about 12km north of Sali town and covers 200ha and the other, at the northern edge of the town (8°57'S, 36°39'E), covers 500ha. These are interesting outliers of the 'Eastern Arc' forest system; the area is densely populated but the forest fragments are botanically rich and relatively unexplored. The Zanzibar galago, Usambara tree hyrax and threatened Abbott's duiker *Cephalophus spadix* occur in this forest type (Frame, 1987; Polhill, 1989; Stuart *et al.*, 1990).

Malagarasi Floodplain
Partly outside **Moyowosi Game Reserve**, east of Kigoma on **Lake Tanganyika**. Wattled crane is reported from here (IUCN, 1987; Stuart *et al.*, 1990).

Malundwe Mountain
7°23'S, 37°18'E About 70km south-west of Morogoro town. Moist montane forest, covering less than 100ha (Frame, 1987)

Mamwera Mountain
6°25'S, 36°58'E In central Tanzania, about 85km north-west of Morogoro town. Either moist or dry montane forest, covering some 3500ha (Frame, 1987).

Mangalisa Mountain
Two moist montane forests, situated at 7°00'S, 36°30'E, and 6°55'S, 36°30'E, about 77km and 85km north-east, respectively, of the town of Iringa. The northern forest is at an altitude of 2287m (Frame, 1987).

Matengo Highlands Recommended
Supports forests which are interesting outliers of the 'Eastern Arc' forest system. The Zanzibar galago, Usambara tree hyrax and threatened Abbott's duiker *Cephalophus spadix* are confined to forests such as these (Stuart *et al.*, 1990).

Matumbi Massif
8°20'-8°23'S, 38°54'-38°58'E The complex topography of the these hills covers 40,000ha about 20km from the coast. Between 1000ha and 2500ha of coastal forest

are protected in valleys above 600m within **Kiwengoma Forest Reserve**. There are records of 44 species of forest bird, including the near-threatened Uluguru violet-backed sunbird and southern banded snake eagle. A high percentage of the invertebrate fauna is endemic. Extensive logging has removed selected tree species (Burgess *et al.*, 1991; Stuart *et al.*, 1990).

Mbisi Forest
7°55'S, 31°40'E About 3000ha of moist montane forest in the southern highlands (the Ufipa Plateau). One of the few areas where the eastern red colobus occurs and is of considerable botanical interest (Frame, 1987; Polhill, 1989; Stuart *et al.*, 1990).

Mbulu Mountain
Supports two montane forests on volcanic soils; in need of improved conservation (Frame, 1987; Stuart *et al.*, 1990).

Minziro Forest
Covering 26,500ha in the extreme north-west of the country adjacent to the Ugandan border, this is an outlier of the central African lowland rain forests and swamp forest and is probably the richest biological area in Tanzania. *Podocarpus* timber is extracted. Should be given maximum protection (Stuart *et al.*, 1990).

Mpanda Highlands
Situated 95km south of Uvinza, this covers about 26,500ha of thicket-woodland mosaic. Red colobus are found (Polhill, 1989).

Msanga Mountain
7°15'S, 36°45'E About 90km east-north-east of Iringa. Moist montane forest, covering about 700ha (Frame, 1987).

Msumbugwe Forest
5°32'S, 38°45'E A low-lying forest area covering 1000-1500ha in Tanga Region, less than 200m in elevation, 15km inland from the coast and 24km south-west of Pangani. The tree *Stuhlmannia moavi* is endemic to the forests of this area. The forest has been adversely affected by local human activities, and is unprotected (Burgess *et al.*, 1991).

Muyuni - see **Zanzibar Island**

Mwega Mountain
7°03'S, 36°41'E About 95km north-east of Iringa. Moist montane forest covering about 300ha, up to a height of 1942m asl (Frame, 1987).

Ngoro ya Ndege Forests
6°42'S, 37°36'E On Ngoro ya Ndege Mountain in central Tanzania. Either moist or dry montane forest, covering about 200ha (Frame, 1987).

Nguru Mountains
6°05'S, 37°30'E These are part of a mountain chain including the **Usambara** and **Uluguru Mountains** and form an extremely steep ridge, rising to 2300m, in the northern part of the Morogoro region in eastern Tanzania. Rain forest occurs on the eastern slopes, and a drier type of forest on the west; the combined area of forest is 12,000ha. Forest reserves exist on higher slopes in general, including Nguru North and Nguru South forests; the latter has been proposed as a nature reserve. Rare birds occur, as well as two endemic species of *Saintpaulia*. The very rare bat *Myonycteris relicta* is recorded from here. Current levels of protection are considered insufficient, and there are problems of human immigration (Bensted-Smith and Msangi, 1989; Collar and Stuart, 1988; Polhill, 1989; Stuart *et al.*, 1990).

Njombe Mountains
9°20'S, 34°46'E (Njombe town) Montane grassland requiring protection; the endemic Njombe (or churring) cisticola occurs (Stuart *et al.*, 1990).

Nkungwe Mountain
6°53'S, 37°55'E Situated in central Tanzania, about 28km east-south-east of Morogoro. Moist montane forest covering 300ha (Frame, 1987)

Nyamarenge Forests
7°39'S-35°55'E, 7°41'S-35°45'E A number of forests, each about 30ha (Frame, 1987)

Pare Mountains
3°44'S, 37°39'E (North) and 4°16'S, 37°56'E (South) Forests occur on both the North and South Pare Mountains, protected within the Chome forest in the former and the Kindoroko forest in the latter; current protection is considered insufficient (Bensted-Smith and Msangi, 1989; Frame, 1987; Stuart *et al.*, 1990).

Pemba Island - see **Ngezi Forest Reserve**

Poroto Mountains
9°08'S, 33°40'E Consisting of 26,500ha of forests requiring protection south and south-east of Mbeya, reaching above 1500m. It is the southernmost locality for *Juniperus*. The area is prone to fires. The mountains could be included in a more extensive national park on the Kipengere Range. See also **Rungwe Mountains** (Frame, 1987; Polhill, 1989; Stuart *et al.*, 1990).

Ras Dege
A mainland site for nesting green turtles (Stuart *et al.*, 1990)

Rondo Plateau
10°10'S, 39°15'E This plateau of about 870m elevation supports two areas of coastal forest in Rondo forest (2000ha) and also in the nearby Mchindiji valley. The former area has been extensively logged but about 27 plant species are thought to be endemic

to the area; 55 species of forest bird have been recorded, including an endemic subspecies of green barbet *Stactolaema olivacea woodwardi*, and some rare and near threatened species. The herpetofauna includes an endemic frog. The area is threatened by illegal burning (Burgess *et al.*, 1991; Frame, 1987; IUCN, 1987; Polhill, 1989; Stuart *et al.*, 1990).

Rovuma Area
Important area in the south, that could be developed in cooperation with the Mozambique government. It supports elephant (IUCN, 1987).

Rubeho Mountains
6°39'-6°57'S, 36°36'-36°53'E Moist montane forest and perhaps some dry montane forest, covering about 8200ha on the Rubeho Mountains Central Tanzania, about 105km north-east of Iringa. Current protection is considered insufficient (Frame, 1987; Stuart *et al.*, 1990).

Rufiji Delta
7°53'S, 39°20'E This is Tanzania's most extensive mangrove area, covering about 40,000ha. It could be developed to include a marine park. The Matubi Massif to the south supports coastal forest. See also **Mafia Islands**. There are pressures to plant the area to rice, and many fishermen depend on the Delta for their livelihood. Clearing of mangroves is fairly common. The Delta has been suggested as a biosphere reserve (Bensted-Smith and Msangi, 1989; Frame, 1987; IUCN, 1987; UNEP/IUCN, 1988).

Rungwe Mountains
9°09'S, 34°42'E (Mdandu) This is situated in the Southern Highlands, a large plateau in south-west Tanzania. Mount Rungwe is an extinct volcano of 2961m. Dry montane forest occurs in several patches in the plateau grasslands, such as at Mdandu. The forests on Mount Rungwe are wetter and more extensive. Rare bird species are known to occur, but current threats to the forests are unknown. there are some softwood plantations and some felling but large, scenic tracts with relatively intact forest still exist (Collar and Stuart, 1988; Polhill, 1989).

Tanga Limestone Forests
5°00'S, 39°00'E (approx.) Small dry *Brachylaena* forest patches growing on Tanga Limestone, immediately inland from Tanga town. Consisting of moist forest, a drier evergreen forest and evergreen thicket, they contain a high diversity of plants, including two endemics, and are the type locality for the African violet *Saintpaulia ionantha*. They are unprotected, and threatened by agriculture (Burgess *et al.*, 1991).

Udzungwa National Park Proposed
120,000ha

Ufipa Forest - see **Mbisi Forest**

Ukaguru Mountains
6°20'S, 36°55'E A spectacular uplifted plateau to the south-west of the **Nguru Mountains** in eastern Tanzania, rising to 2264m. They support a rather dry, scrubby montane forest that covers about 10,000ha. One rare and one near-threatened bird species occur. Mamiwa Kisara North and Mamiwa Kisara South forest reserves are in these mountains. The current level of protection is considered insufficient, and agricultural encroachment is a problem (Bensted-Smith and Msangi, 1989; Collar and Stuart, 1988; Stuart *et al.*, 1990).

Uluguru Mountains
7°10'S, 37°40'E Situated in central Tanzania just south of Morogoro town, these steep and rugged mountains reach a height of 2360m. Lowland, semi-evergreen and moist montane forests occur, covering an area of 12,000ha and containing a unique biotic community with a high level of endemism; two endemic birds occur, viz. the Uluguru bush shrike *Malaconotus alius* and Loveridge's sunbird *Nectarinia loveridgei*; the status of three other bird species is considered critical. In addition four mammals, seven reptiles and eight (out of 21) amphibians are endemic, as are many invertebrates. Although uninhabited, these forests have been largely destroyed in the eastern foothills; the best-known surviving fragment is the **Kimboza Forest**. The slopes in many parts of the Ulugurus have already been cleared to inadvisably high levels and the residual forests cover an important water catchment area for Dar es Salaam (Bensted-Smith and Msangi 1989; Collar and Stuart, 1988; Frame, 1987; IUCN, 1987; Polhill, 1989).

Usangu Flats
8°30'S, 34°09'E (centre) An important wetland (Stuart *et al.*, 1990)

Wembere Swamp and Floodplain
4°00'-5°00'S, 33°48'-34°17'E Huge colonies of waterbirds nest here, and the rare *Karamoja apalis* occurs. **Lake Kitangiri** at the mouth of the swamps is considered important (IUCN, 1987; Stuart *et al.*, 1990).

Wigu Mountain
7°25'S, 37°34'E In central Tanzania, about 62km south-south-west of Morogoro and south of the Uluguru Mountains. About 200ha is forested (Frame, 1987).

Zanzibar Island
This island is heavily settled, but **Jozani Forest Reserve** (6°15'S, 39°24'E) covers about 400ha and adjacent coral rag thickets and mangroves are worthy of protection, as are Muungwi Forest, Muyuni Coastal Strip and Uzi Island. An endemic subspecies, the Zanzibar red colobus *Colobus badius kirkii*, and the threatened near-endemic Ader's duiker *Cephalophus adersi* occur, as well as an endemic subspecies of the black-and-rufous elephant-shrew. An additional 2800ha of forest and thicket occur at **Muyuni** (6°20'S, 39°25'E) (Burgess *et al.*, 1991; Stuart *et al.*, 1990).

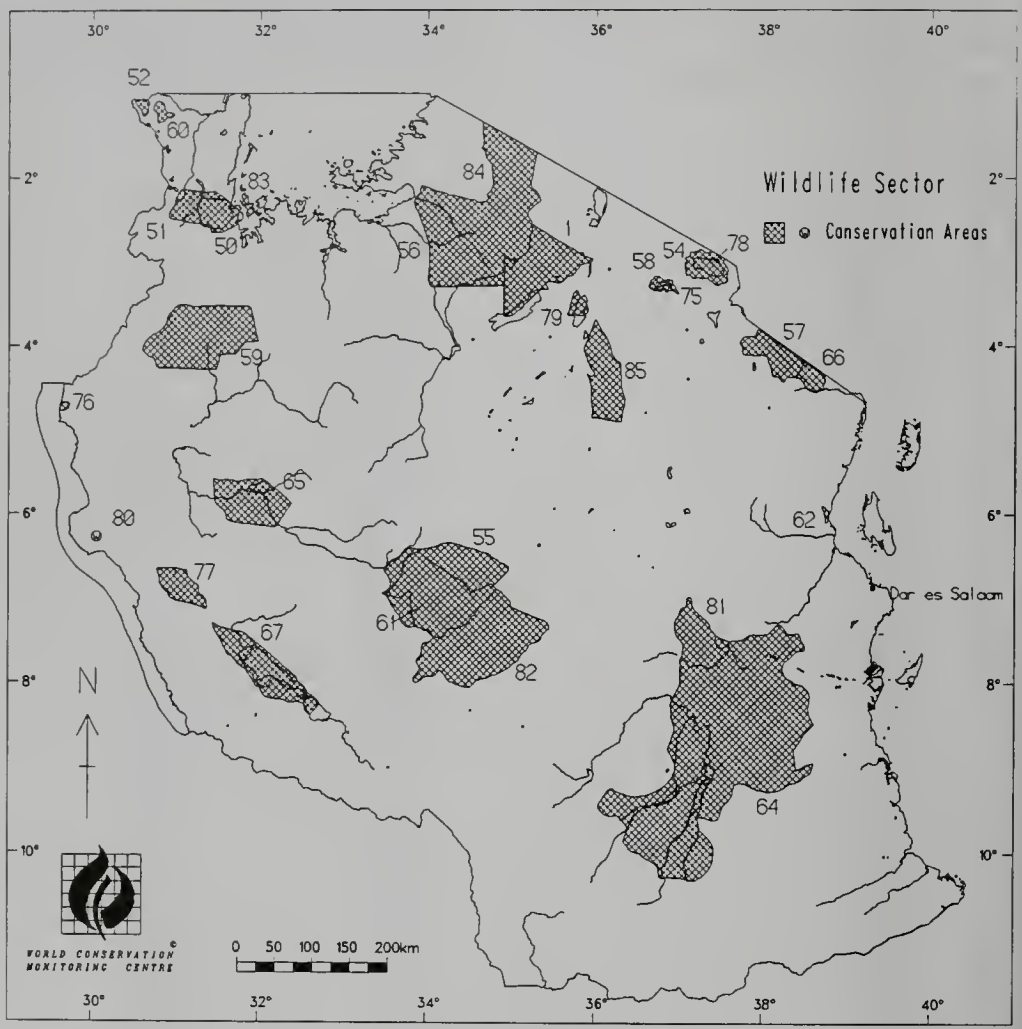
Zaraninge Plateau
6°07'S, 38°30'E Situated about 25km west of the northern mouth of the Wami River, this covers about 2500ha of dry lowland coastal forest, extremely interesting both botanically and ecologically (Polhill, 1989).

TANZANIA - PROTECTED SITES

National/international designations

Name of area and map reference (see Fig. 5.1)	Management area (ha)	Year notified
Conservation Area		
1 Ngorongoro	828,800	1959
Game Controlled Areas		
2 Burunge	40,000	1974
3 Chabula Marsh	10,000	1974
4 Endulen	60,000	1974
5 Gombe	300,000	1974
6 Grumeti	200,000	1974
7 Handeni	350,000	1974
8 Igombe Dam	10,000	1974
9 Ikorongo	300,000	1974
10 Kalimawe	30,000	1974
11 Kigosi	700,000	1974
12 Kihirumira Pool	10,000	1974
13 Kilombero	650,000	1974
14 Kitwai	350,000	1974
15 Kongwa	150,000	1974
16 Lake Daramatai	2	1974
17 Lake Kwila	7,000	1974
18 Lake Manka	2,000	1974
19 Lake Natron	300,000	1974
20 Lihogosa	3,000	1974
21 Loliondo	400,000	1974
22 Lolkisale	150,000	1974
23 Longido	150,000	1974
24 Luganzo	250,000	1974
25 Lukwati	200,000	1974
26 Masasi River	18,000	1974
27 Meserani Dam	7,500	1974
28 Mic-wa-Mbu	150,000	1974
29 Mkungunero	70,000	1974
30 Mlele	300,000	1974
31 Msima	200,000	1974
32 Muhuwesi	150,000	1974
33 Mwadui Diamond Mine	1,000	1974
34 Mwambesi	100,000	1974
35 Nchwa-Nkima	5,000	1974
36 Ngeju-Njiro Dam	3,000	1974

Fig 5.1 Tanzania: protected ecologically sensitive sites



TANZANIA - PROTECTED SITES (cont.)

National/international designations

Name of area and map reference (see Fig. 5.1)	Management area (ha)	Year notified
37 Ngorongoro	1,500,000	1974
38 Nyonga	3,500,000	1974
39 Rau Forest	10,000	1974
40 Rukwa	40,000	1974
41 Rungwa River	150,000	1974
42 Ruvu Masai	150,000	1974
43 Ruvu Same	100,000	1974
44 Sanya-Lelatema	80,000	1974
45 Simanjiro	200,000	1974
46 Speke Gulf	30,000	1974
47 Ugunda	150,000	1974
48 Umba River	30,000	1974
49 Utengule Swamps	50,000	1974
Game Reserves		
50 Biharamulo	130,000	1959
51 Burigi	220,000	1980
52 Ibanda	20,000	1974
53 Kigosi	90,000	1974
54 Kilimanjaro	400,000	1974
55 Kizigo	220,000	1969
56 Maswa	100,000	1951
57 Mkomazi	30,000	1974
58 Mount Meru	600,000	1982
59 Moyowosi	80,000	
60 Rumanyika	900,000	1951
61 Rungwa	30,000	1968
62 Saadani	50	1974
63 Saanane Island	5,000,000	1922
64 Selous	500,000	1964
65 Ugalla River	150,000	1974
66 Umba	500,000	1971
67 Uwanda		
Marine Reserves		
68 Bongoyo & Pangavini Islands		1981
69 Chole Bay		1981
70 Fungu Yasini		1981
71 Maziwi Island		1981
72 Mbudya		1981

TANZANIA - PROTECTED SITES (cont.)

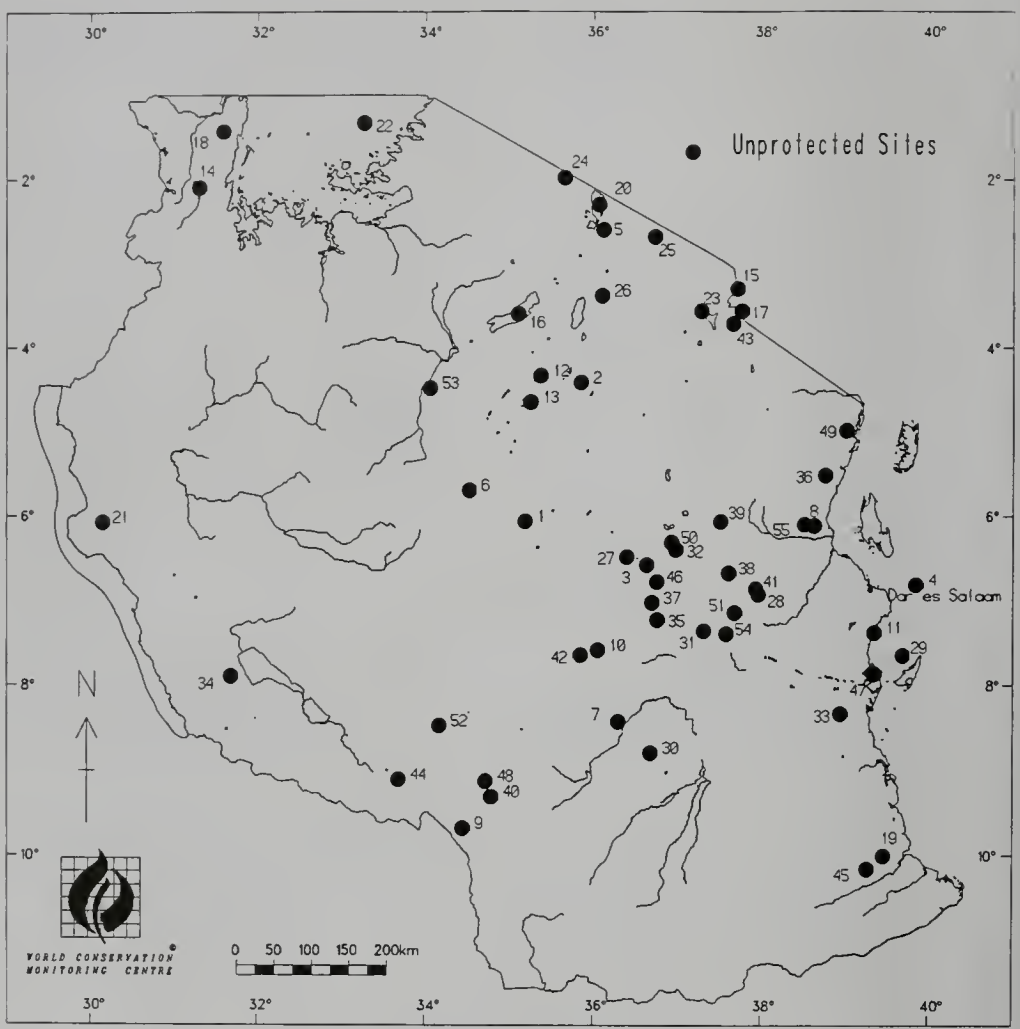
National/international designations

Name of area and map reference (see Fig. 5.1)	Management area (ha)	Year notified
73 Tanga Coral Gardens		1981
74 Tutia Island		1981
National Parks		
75 Arusha	13,700	1967
76 Gombe	5,200	1968
77 Katavi	225,300	1974
78 Kilimanjaro	75,575	1973
79 Lake Manyara	32,500	1960
80 Mahale Mountain	157,700	1985
81 Mikumi	323,000	1964
82 Ruaha	1,295,000	1964
83 Rubondo	45,700	1977
84 Serengeti	1,476,300	1951
85 Tarangire	260,000	1970
Biosphere Reserves		
Lake Manyara National Park	32,500	1981
Serengeti-Ngorongoro	2,305,100	1981
World Heritage Sites		
Mt Kilimanjaro National Park		1987
Ngorongoro Conservation Area	2,305,100	1979
Selous Game Reserve	5,000,000	1982
Serengeti National Park	1,476,300	1981

TANZANIA - UNPROTECTED SITES

Name of area and map reference (see Fig. 5.2)	Management area (ha)
Babati Forests	
1 Bahi Swamps	
2 Bereku Ridge Forest	
Buhoro Floodplain	
3 Chugu Forest	
4 Fungu Kisimkasi (Latham Island)	
Fungu Yasini	
5 Gelai Forest	
Grumeti Game Reserve	200,000
Ikorongo Game Reserve	300,000
6 Itigi Thicket	
Kagera Swamp	
Kama Mountains	
Kichi Hills	
7 Kilombero Swamp and Floodplain	
Kijereshi Game Reserve	
8 Kiono/Zaraninge Forest	
9 Kipengere (Livingstone) Mountains	
10 Kisanga Rugaro Mountains	
11 Kisiju Forest	
Kitulu Plateau	
Kondoa Forests	
12 Lake Balangida	
13 Lake Balangida Lelu	
14 Lake Burigi	
15 Lake Chale	
16 Lake Eyasi	
17 Lake Jipe	
18 Lake Kimba	
19 Lake Lutamba	
20 Lake Natron	
21 Lake Tanganyika	
22 Lake Victoria	
23 Lelatema Mountains	
Le Parko	
24 Loliondo Mtn	
25 Longido	
26 Losiminguri	
27 Lugunga Forests	
28 Luhakwe Forest	

Fig 5.2 Tanzania: unprotected ecologically sensitive sites



TANZANIA - UNPROTECTED SITES (cont.)

Name of area and map reference (see Fig. 5.2)	Management area (ha)
29 Mafia Island	
30 Mahenge Mountains	
Malagarasi Floodplain	
31 Malundwe Mountain	
32 Mamwera Mountain	
Mangalisa Mountain	
Matengo Highlands	
33 Matumbi Massif	
34 Mbisi Forest	
Mbulu Mountain	
Minziro Forest	
Mpanda Highlands	
35 Msanga Mountain	
36 Msumbugwe Forest	
37 Mwega Mountain	
38 Ngoro ya Ndege Forests	
39 Nguru Mountains	
40 Njombe Mountains	
41 Nkungwe Mountain	
42 Nyamarenge Forests	
43 Pare Mountains	
44 Poroto Mountains	
Ras Dege	
45 Rondo Plateau	
Rovuma Area	
46 Rubeho Mountains	
47 Rufiji Delta	
48 Rungwe Mountains	
49 Tanga Limestone Forests	
Udzungwa National Park	120,000
50 Ukaguru Mountains	
51 Uluguru Mountains	
52 Usangu Flats	
53 Wembere Swamp and Floodplain	
54 Wigu Mountain	
Zanzibar Island	
55 Zaraninge Plateau	

UGANDA

INTERNATIONALLY DESIGNATED PROTECTED AREAS

Lake George
00°07'N 30°02'E; designated a Ramsar Wetland in 1988

Queen Elizabeth (Rwenzori) National Park IUCN Categories II and IX
The national park of 197,800ha is included in a biosphere reserve of 220,000ha. It is contiguous to **Kigezi Game Reserve** (38,232ha), **Kyambura Game Reserve** (15,514ha), **Kazinga Animal Sanctuary** (2243ha), **Kibale Forest Corridor Game Reserve** (33,915ha) and **Virunga National Park** (780,000ha) in Zaïre. The park is situated in the western Rift Valley and bisected by the 34km-long Kazinga Channel between lakes George and Edward. There is a wide range of ecosystems from semi-deciduous tropical forest and savanna to high altitude grassland. It also has the only medium-altitude semi-deciduous forest of any extent within an Ugandan park. A west African influence is apparent in the fauna, particularly among birds and invertebrates. The park has been renowned for its high mammalian biomass with large herds of buffalo and elephant (153 in 1980) and supports 545 bird species. Higher areas are relatively undisturbed but a number of settlements near the lake are growing and pressure on natural resources is increasing, including overfishing, more fires and cattle grazing. Poaching is difficult to control, partly because of lack of equipment; all game species except kob were declining in the early 1980s (IUCN, 1986; IUCN/UNEP, 1987).

NATIONALLY PROTECTED AREAS

Ajai Game Reserve IUCN Category IV
This area of 15,600ha includes seasonally flooded swamp bordering the River Nile and two of its tributaries and also a number of swamp islands, including Ajai island. Wooded savanna and grassland communities occur, with areas of thick forest in the east and successional habitats on islands. The western sector has dense elephant grass *Pennisetum* sp. with clumps of wild date palm. The area was established primarily to protect the white rhinoceros (wiped out by the war in 1979) but all species are protected from hunting. Owing to a lack of forage in the surrounding dry scrubland, the island is an important refuge for many animals in the dry season, including hippopotamus, a number of ungulates and several primate species. However, the small size of the reserve means that many animals have to use areas outside it as well, where they are subject to poaching (IUCN/UNEP, 1987).

Bokora Corridor Game Reserve IUCN Category IV
The reserve of 203,363ha is contiguous to **Manteniko Game Reserve** (158,656ha) and flanked on remaining sides by four controlled hunting areas, making a total area of over 2,000,000ha which is joined to **Kidepo Valley National Park** (134,400ha) by other protected areas. It is located on a plateau with some inselbergs. There is some wooded savanna but most land is marginal and of little value for agriculture; there are

a wide variety of antelopes at low densities. However, settlement and domestic livestock grazing compete with the wild populations that are left (IUCN/UNEP, 1987).

Bugungu Game Reserve IUCN Category IV
This reserve of 74,830ha is contiguous to **Murchison Falls National Park** (384,000ha) and **Karuma Game Reserve** (71,272ha), the game reserves forming a buffer zone to the national park. The area is one of rolling grassland and savanna and is well known for chimpanzees although it is unclear how many of them are left in the reserve. A variety of ungulates and elephant have been recorded. The reserve includes part of Budongo forest which has a relatively rich birdlife. There are permanent fishing villages on the shores of Lake Mobutu but these are not considered to be a threat. Poaching is becoming more controlled. Some tree felling occurs for charcoal burning (IUCN/UNEP, 1987).

Buhuka Controlled Hunting Area IUCN Category VI
1°13'N, 30°44'E A small area of 1750ha on the eastern shore of **Lake Albert**.

Buto-Buvuma Site of Special Scientific Interest IUCN Category V
Established in 1989; 1096ha

Bwindi (Impenetrable) National Park IUCN Category II
0°53'-1°08'S, 29°35'-29°50'E Gazetted in 1991, this lies in the extreme south-west Uganda, on the Zaïre border, and incorporates Impenetrable forest. The terrain is very hilly and steep ranging from 1060-2600m. It is amongst the largest of the East African forests, covering 31,000ha, and is one of the richest in terms of numbers of plant and bird species. The threatened African green broadbill *Pseudocalyptomena graueri* and Chapin's flycatcher *Muscicapa lendu* are known to occur, as well as a number of other restricted, threatened and/or near-threatened species. One-third of the world's total mountain gorilla population is found here, as well as nine other species of primate, including chimpanzee. Elephant, bushpig, giant forest hog, redtail monkeys *Cercopithecus ascanius* and leopard still survive. It is an important water catchment (Howard, 1988; Hughes and Hughes, 1992; Stuart *et al.*, 1990).

Central Karamoja (Napak) Controlled Hunting Area IUCN Category VI
22,451ha

Difile Animal Sanctuary IUCN Category IV
1024ha

East Madi Controlled Hunting Area IUCN Category VI
3°08'N, 31°42'E (centre) 175,220ha adjacent to **West Madi Controlled Hunting Area**.

East Teso Controlled Hunting Area IUCN Category VI
1°40'N, 34°12'E Incorporates Lake Opeta, the floodplains of which are of importance to waterfowl (IUCN, 1987; Stuart *et al.*, 1990).

Entebbe Animal and Bird Sanctuary IUCN Category V
0°02'N, 32°15'E 5120ha

Gorilla (Mgahinga) National Park IUCN Category II
This reserve of 2445ha is contiguous to **Volcanoes National Park** (23,000ha) in Rwanda which is contiguous to **Virunga National Park** (809,000ha) in Zaïre. It includes parts of three extinct volcanoes, the highest, Muhabura, having a small crater lake. Alpine summit areas are dominated by St John's wort *Hypericum* spp. and dwarf heaths which merge into broadleaved montane forest and bamboo. Lower slopes have a high altitude type of savanna woodland. The reserve was established primarily to protect the chimpanzee and mountain gorilla populations but the reserve supports a varied fauna. There has been extensive disturbance from poaching and pastoral activities, and a decrease in the park's area has removed much of the best gorilla habitat. Deforestation on the lower slopes has further eroded their habitat. The Ugandan part of the mountain gorilla range is much less well protected than areas in Rwanda and Zaïre and there may now be no resident gorillas. Bamboo removal has, however, ceased since 1982 (IUCN/UNEP, 1987).

Igwe/Luvunya Nature Reserve IUCN Category IV
Established in 1989; 1080ha

Jinja Animal Sanctuary IUCN Category VI
0°26'N, 33°13'E 3261ha

Kaiso Tonya Controlled Hunting Area IUCN Category VI
1°30'N, 31°00'E Covering 22,690ha, this lies on the shores of **Lake Albert**, and is bounded on the east by the Rift Valley escarpment. Mammals occurring include hippopotamus, buffalo, warthog, waterbuck, bushbuck, lion and leopard.

Karuma Controlled Hunting Area IUCN Category VI
2°11'N, 32°15'E Covering 24,061ha adjacent to **Karuma Game Reserve**, and incorporating the Karuma Falls on the Victoria Nile (Stuart *et al.*, 1990).

Karuma Game Reserve IUCN Category IV
This reserve of 71,272ha is contiguous to **Murchison Falls National Park** (384,000ha) for which it acts as a buffer zone. It is in an area of gentle relief crossed by several watercourses. There are savanna grasslands dominated by elephant grass, with isolated forest and savanna trees as the only remnants of the former forest cover. The fauna includes species similar to those in Murchison Falls National Park, including elephant, giraffe and many antelopes. Large herds move between the reserve and Murchison Falls National Park. However, increased settlement and cultivation in areas adjacent to the reserve have resulted in problems with law enforcement and protection of game but the control of poaching is reported to have improved (IUCN/UNEP, 1987).

Kasagala Nature Reserve IUCN Category IV
Established in 1976; 10,314ha

Katonga Controlled Hunting Area IUCN Category VI
0°18'N, 30°47'E Covering 227,660ha adjacent to **Katonga Game Reserve** and **Kibale Forest Corridor Game Reserve** (Stuart *et al.*, 1990).

Katonga Game Reserve IUCN Category IV
The reserve covers 20,662ha and is surrounded on three sides by **Katonga Controlled Hunting Area**. It is bounded to the south by the Katonga River and is predominantly dry savanna with deciduous thickets and perennial grasses. The reserve supports a variety of ungulates and threatened species such as elephant and leopard. It also includes part of the migration route from **Murchison Falls National Park** to south-east **Toro Game Reserve**. Very extensive cattle grazing occurs and has led to a serious decline in numbers of elephants and ungulates (IUCN/UNEP, 1987).

Kazinga Animal Sanctuary IUCN Category VI
0°10'S, 30°99'E 2243ha, partly within **Queen Elizabeth National Park**

Kibale Forest Corridor Game Reserve IUCN Category IV
This 33,915ha reserve is contiguous to **Queen Elizabeth National Park**. It is located in the plateau area of the volcanic crater region east of the Ruwenzori range and includes part of Mpanga forest, a vast tract of moist semi-deciduous tropical forest intermediate between montane and lowland forest which links up with the main block of Kibale Forest. The reserve was originally set up to protect migration routes northwards from **Queen Elizabeth National Park** but is now less useful because of reductions in animal numbers; mammals include elephant and a number of ungulates. The forests are among the richest in East Africa for primates, with 11 species including chimpanzee and l'Hoest's monkey. Kibale is also exceptional for forest birds, with about 290 species, including Kibale ground-thrush *Turdus kibalensis*, endemic to this forest. Agricultural encroachment and illegal timber extraction occurs and has reduced the area of undisturbed forest to 18,500ha. Timber is also being extracted and exotic conifers planted (IUCN/UNEP, 1987).

Kidepo Valley National Park IUCN Category II
The park covers 134,400ha and is surrounded by an extensive controlled hunting area complex. The Kidepo basin is a gently undulating plain crossed by the seasonal Kidepo and Larus rivers although some permanent pools remain in the latter during the dry season. Arid savanna predominates. There are a wide variety of ungulates and threatened species such as cheetah *Acinonyx jubatus*, black rhinoceros *Diceros bicornis* and Karamoja apalis *Apalis karamojae*. Poaching is a problem, particularly from Sudan, and elephant damage to acacias is occurring (IUCN/UNEP, 1987).

Kigezi Game Reserve IUCN Category IV
The reserve covers 38,232ha and is a contiguous buffer zone to **Queen Elizabeth National Park** (197,800ha) and its associated reserves. It is situated in the western

arm of the central African rift valley and is dominated by moist deciduous forest and grass savanna. Mammal populations are similar to those of the adjacent national park but low; included are several primates and threatened species such as chimpanzee *Pan troglogytes*, leopard *Panthera pardus* and elephant. However, settlements and agriculture from surrounding areas are encroaching on the reserve and poaching by local people occurs. A road from Kibale to the national park crosses the reserve and increases access (IUCN/UNEP, 1987).

Kifu Site of Special Scientific Interest IUCN Category V
1419ha

Kisanju Nature Reserve IUCN Category IV
Established in 1960; 2117ha

Kyambura Game Reserve IUCN Category IV
This reserve of 15,514ha is a contiguous buffer zone to **Queen Elizabeth National Park** (197,800ha) and its associated reserves. The relief is characterised by small hills and ten or so crater lakes above the eastern scarp of the western Rift Valley. Savanna grassland and deciduous thickets predominate. The fauna is similar to that of Queen Elizabeth National Park, including a variety of ungulates and threatened species such as elephant and leopard. There is some poaching of hippopotamus and other game for meat and illegal fishing occurs. Some fishing villages existing at the time of declaration have been allowed to remain but further settlement is prohibited (IUCN/UNEP, 1987).

Lake Mburo National Park IUCN Category II
The park includes 53,600ha of undulating open plains with dry *Acacia* and grass savanna. On the southern boundary is swampland and a chain of 11 lakes, including Lake Mburo; lake shores are lined with extensive belts of papyrus, reeds and waterlilies. Hills in the west have small areas of acacia forest and gallery forest. The fauna is a remnant of the abundant fauna which once covered the entire Ankole grasslands and the park is the last area in western Uganda where zebra, roan antelope and impala (not found in any other Ugandan national park) and eland occur. However, massive encroachment by over 10,000 Ankole cattle, permanent and temporary settlements surrounded by banana plantations, was a problem in the early 1980s and, although settlements are reported to have been removed, some encroachment continues, particularly in times of local troubles (IUCN/UNEP, 1987).

Lipan Controlled Hunting Area IUCN Category VI
3°42'N, 33°22'E Covering 89,856ha adjacent to **Kidepo Valley National Park**

Malawa Bird Sanctuary IUCN Category VI
768ha

Manteniko Game Reserve IUCN Category IV
The reserve of 158,656ha is part of the Karamoja plateau and is bounded to the east by the Great Rift escarpment which forms the Uganda/ border in this area. In the south there are spurs of higher ground. Thorny deciduous thicket is the predominant vegetation. The fauna includes several ungulate species and a number of threatened animals including leopard *Panthera pardus* and cheetah *Acinonyx jubatus*. The area has been the traditional pasture during the wet season for herds migrating from the Pian-Upe plains in southern Karamoja. However, the wildlife is sparse, partly owing to poaching, forest destruction, grazing by domestic cattle and encroachment from settlements. Recent droughts and political unrest has exacerbated the situation (IUCN/UNEP, 1987).

Maruzi Hills Nature Reserve IUCN Category IV
Established in 1990; 6829ha

Mount Kei White Rhino Sanctuary IUCN Category IV
45,220ha

Mpanga Site of Special Scientific Interest IUCN Category V
Established in 1989; 453ha

Mt Elgon Forest Reserve IUCN Category VI
1°10'N, 34°30'E This forest reserve covers 119,536ha on the border, encompassing the 4320m Mount Elgon, an extinct volcano. Vegetation zones include mixed montane forest below 2500m, bamboo and low canopy montane forest between 2400m and 3000m, montane heath between 3000m and 3500m, and a high moorland above 3500m. There are records of 144 species of forest bird, including several localised, rare, and threatened species. An endemic subspecies of white-starred forest robin *Pogonocichla stellata* is found, and the threatened lammergeier *Gypaetus barbatus* occurs at high elevations. Elephant, buffalo, bushbuck, blue monkey and black and white colobus still survive, despite intense hunting pressures. Threats include planting with conifers, and extensive agricultural settlement has affected about 20,300ha. It is a vital water catchment area (Frame, 1987; Howard, 1988 and 1991).

Murchison Falls (Kabalega) National Park IUCN Category II
This park covers 384,000ha and is contiguous to **Bugungu Game Reserve** and **Karuma Game Reserve**. It is situated in an area of rolling terrain and includes a small stretch of the shore of Lake Albert. The Victoria Nile bisects the park and forms the spectacular 43m-high Murchison Falls which are a major ecological barrier for aquatic fauna. Elephant damage has destroyed much of the *Terminalia* woodland which once covered the south and west and now the whole area is a uniform grassland, with scattered remnants of riparian forest and papyrus swamps. The park once had a rich fauna, including a number of threatened species, and over 1000 elephant were still recorded in the northern sector in 1980. However, over 75% of the large animal population was destroyed in the late 1970s by poaching. During more recent political disturbances poaching has again increased and equipment has been destroyed. Elephant

and black rhinoceros in particular have been decimated and a group of white rhinoceros which were introduced in the 1970s have disappeared. A proposed hydroelectric power scheme at Murchison Falls would seriously affect the ecological balance of the area (IUCN/UNEP, 1987).

Ngogo Nature Reserve IUCN Category IV
7200ha

Nile Bank Site of Special Scientific Interest IUCN Category V
Established in 1989; 606ha

North Karamoja Controlled Hunting Area IUCN Category VI
A vast area in the north-east of Uganda, covering 1,079,330ha

North Teso Controlled Hunting Area IUCN Category VI
2°18'N, 33°53'E Situated to the north of **Lake Bisina**

North Mabira Nature Reserve IUCN Category IV
3355ha

Ntendure Hill Nature Reserve IUCN Category IV
913ha

Nyakafunjo Nature Reserve IUCN Category IV
710ha

Otze Forest White Rhino Sanctuary IUCN Category IV
20,480ha

Plain Upe Game Reserve IUCN Category IV
This reserve covers 228,715ha and is connected to **Manteniko Game Reserve** (158,656ha) by the **Bokora Corridor Game Reserve** (203,363ha). It includes Mt Kadam (3068m) and is situated on a high plateau with rolling plains drained by intermittent watercourses. Most of the area is subject to flooding during the rainy season and has wooded savanna with some forest. The area supports a wide variety of mammals, including threatened species such as leopard and cheetah and a number of ungulates, many of which migrate into the area to breed from **Bokora Corridor Game Reserve** and **Manteniko Game Reserve**. However, settlement and grazing of domestic livestock has never been prevented in the reserve and competition with wildlife, especially during the dry season, has seriously affected populations of the latter. There is also poaching and forest encroachment in the south (IUCN/UNEP, 1987).

Rkungiri Nature Reserve IUCN Category IV
268ha

Sebei Controlled Hunting Area IUCN Category VI
1°16'N, 34°37'E Covering 253,490ha on the north-eastern slopes of Mount Elgon

Semliki Controlled Hunting Area IUCN Category VI
50,400ha

South Karamoja Controlled Hunting Area IUCN Category VI
1°48'N, 34°56'E Covers 798,470ha to the north of **Sebei Controlled Hunting Area**

Toro Game Reserve IUCN Category IV
The reserve covers 58,456ha and is contiguous to **Semliki Controlled Hunting Area** (50,400ha). It is situated in the delta region of the Semliki River, where it flows into Lake Albert and includes part of the Rift Valley scarp. Open grasslands predominate, with thick forest along streams and on the scarp. The fauna is varied but many populations are low, including that of Ugandan kob, and the avifauna is similar to that of **Murchison Falls National Park**. Controlled hunting is permitted but poaching is difficult to control and has caused many species seriously to decline. There is a fishing village on the shores of Lake Albert (IUCN/UNEP, 1987).

Waibira Nature Reserve IUCN Category IV
3210ha

Wambabya Nature Reserve IUCN Category IV
3429ha

West Madi Controlled Hunting Area IUCN Category VI
3°25'N, 31°32'E 83,123ha adjacent to **East Madi Controlled Hunting Area**

Zoka Forest Reserve IUCN Category VI
6089ha; situated in north-west Uganda; it is an isolated northern forest outlier and is threatened by fire and elephant damage (Polhill, 1989).

Zoka Forest Elephant Sanctuary IUCN Category VI
20,700ha

Zoka Nature Reserve IUCN Category IV
Established in 1990; 6084ha

OTHER MANAGED AREAS

None

UNPROTECTED SITES

Bugala, Bunyama and Kome Islands
Bugala: 0°24'S, 32°15'E Kome: 0°05'S, 32°45'E The creek rat *Pelomys isseli* is endemic to scrub and forest edges on these islands in Lake Victoria (Stuart *et al.*, 1990).

Karamoja Forests
These contain particularly dry upland forest of the Somali-Masai region which is strongly relictual. The Imatongs, which are mostly in Sudan, are the wettest part. Moroto is badly overgrazed and cut on lower slopes and in more accessible places; it is not under government control yet. Napak and Kadam are fairly intact, with less population pressure than other areas (Polhill, 1989).

Lake Albert (Mobutu)
1°35'N, 31°00'E This large lake has been identified as being of biological importance (Stuart *et al.*, 1990).

Lake Bisina - see **Lakes Kyoga, Kwania and Bisina**

Lake Kwania - see **Lakes Kyoga, Kwania and Bisina**

Lakes Kyoga, Kwania and Bisina
1°20'-1°56'N, 32°20'-34°05'E The Victoria Nile flows through the western end of Lake Kyoga, the largest of the three lakes, which is close to and linked with Lakes Kwania and Bisina. The fish fauna is similar to that of **Lake Victoria**. Important for waterfowl. Crocodile, hippopotamus, sitatunga and otter used to occur; their current status is unknown. The lakes are heavily fished (Burgis and Symoens, 1987; IUCN, 1987; Stuart *et al.*, 1990).

Lake Nabugabo
0°28'S, 31°50'E Situated between the town of Masaka and **Lake Victoria**, this small lake of about 3000ha is remarkable in that despite its close proximity to Lake Victoria it has apparently been isolated from it for at least 3700 years by a sandbar about 1km wide. Several fish species occur, four of which are endemic. Most of the lake is surrounded by swamp, but there is forest along the north-west shore (Burgis and Symoens, 1987; Kingdon, 1990).

Lake Victoria
The northern areas have important wetlands (IUCN, 1987; Stuart *et al.*, 1990).

Mt Elgon Forest Park Proposed
110,000ha

North Ugandan Moist Savanna
Butyrospermum moist savanna is extensive in northern Uganda, but not included in any park or reserve (IUCN, 1987).

Semliki Forest Park Proposed
21,827ha

West Bugwe Nature Reserve Proposed
3054ha

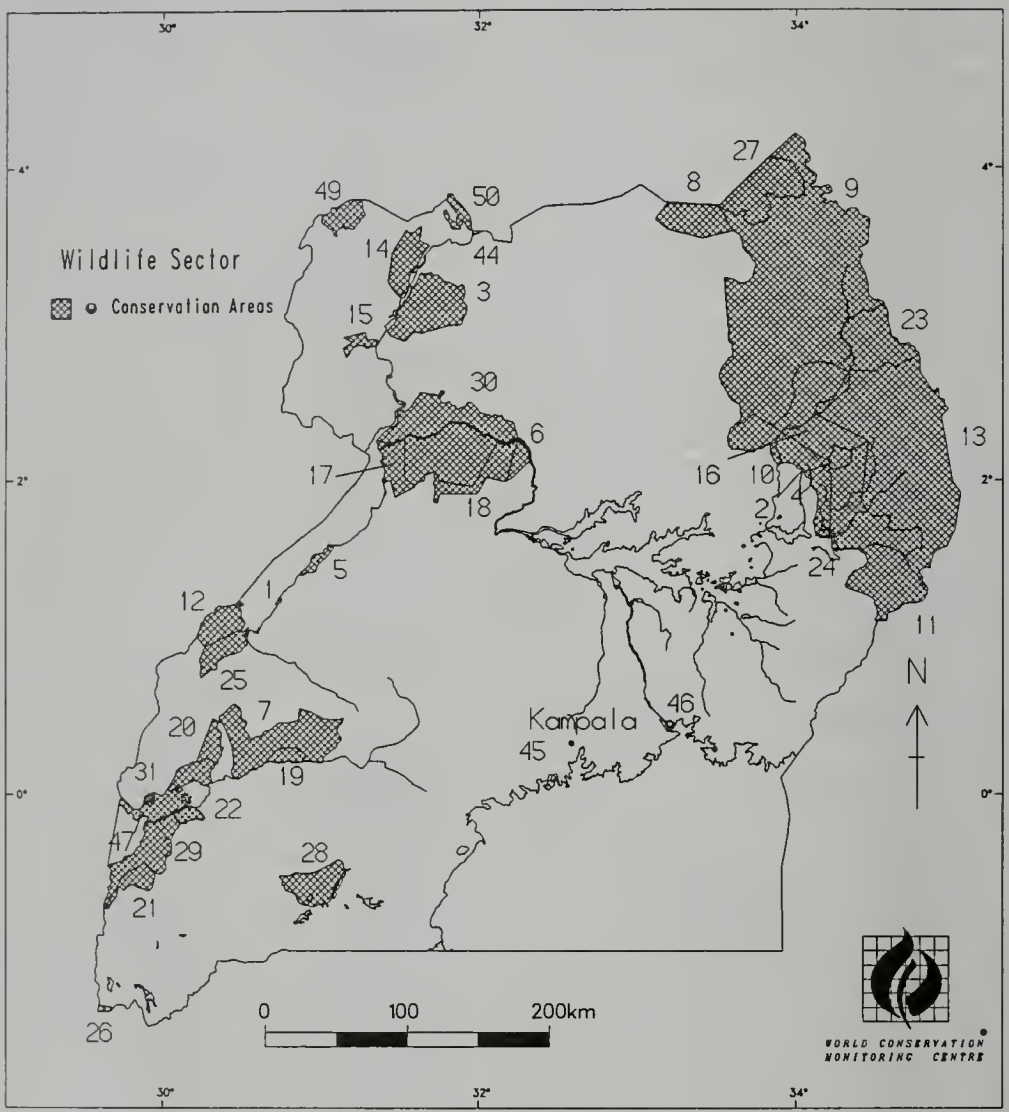
West Mengo Forest (IUCN, 1987)

UGANDA - PROTECTED SITES

National/international designations

Name of area and map reference (see Fig. 6.1)	Management area (ha)	Year notified
Controlled Hunting Areas		
1 Buhuka	1,750	
2 Central Karamoja (Napak)	22,451	
3 East Madi	175,220	
4 East Teso		
5 Kaiso Tonya	22,690	
6 Karuma	24,061	
7 Katonga	227,660	
8 Lipan	89,856	
9 North Karamoja	1,079,330	
10 North Teso		
11 Sebei	253,490	
12 Semliki	50,400	
13 South Karamoja	798,470	
14 West Madi	83,123	
Game Reserves		
15 Ajai	15,600	1962
16 Bokora Corridor	203,363	1964
17 Bugungu	74,830	1968
18 Karuma	71,272	1964
19 Katonga	20,662	1964
20 Kibale Forest Corridor	33,915	1964
21 Kigezi	38,232	1952
22 Kyambura	15,514	1965
23 Manteniko	158,656	1964
24 Plain Upe	228,715	1964
25 Toro	58,456	1929
National Parks		
Bwindi (Impenetrable)	31,000	1991
26 Gorilla (Mgahinga)	2,445	1991
27 Kidepo Valley	134,400	1962
28 Lake Mburo	53,600	1982
29 Mt Rwenzori	61,361	1991
30 Murchison Falls	384,000	1952
31 Queen Elizabeth	197,800	1952

Fig 6.1 Uganda: protected ecologically sensitive sites



UGANDA - PROTECTED SITES (cont.)

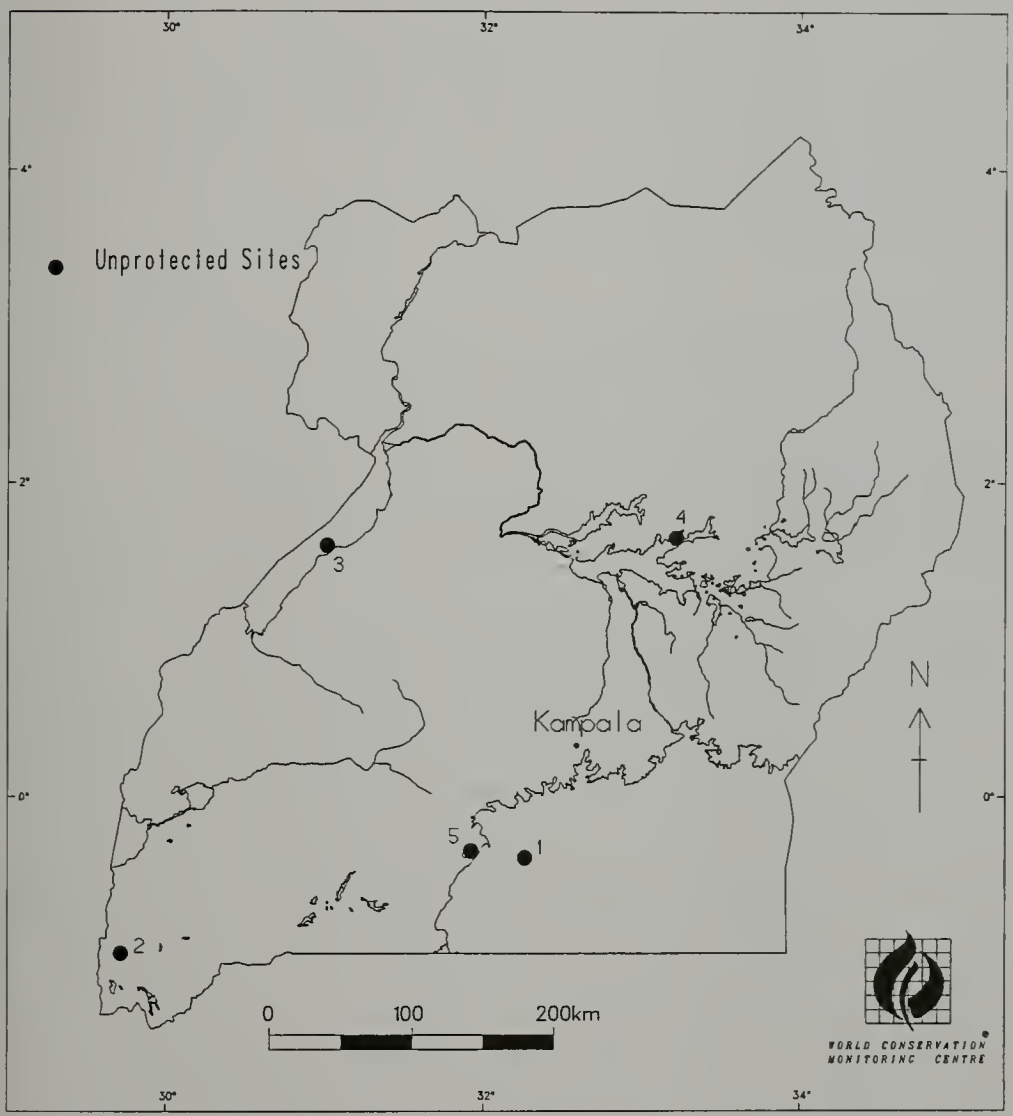
National/international designations

Name of area and map reference (see Fig. 6.1)	Management area (ha)	Year notified
Nature Reserves		
32 Igwe/Luvunya	1,080	1989
33 Kasagala	10,314	1976
34 Kisanju	2,117	1960
35 Maruzi Hills	6,829	1990
36 Ngogo	7,200	
37 North Mabira	3,355	
38 Ntendure Hill	913	1984
39 Nyakafunjo	710	1945
40 Rkungiri	268	
41 Waibira	3,210	1989
42 Wambabya	3,429	1989
43 Zoka	6,084	1990
Sanctuaries		
44 Difule Animal	1,024	
45 Entebbe Animal & Bird	5,120	
46 Jinja Animal	3,261	
47 Kazinga Animal	2,243	
48 Malawa Bird	768	
49 Mount Kei White Rhino	45,220	
50 Otze Forest White Rhino	20,480	
51 Zoka Forest Elephant	20,700	
Sites of Special Scientific Interest		
52 Buto-Buvuma	1,096	1989
53 Kifu	1,419	1989
54 Mpanga	453	1989
55 Nile Bank	606	1989
Biosphere Reserve		
Queen Elizabeth (Rwenzori) National Park	220,000	1979
Ramsar Wetland Site		
Lake George	15,000	1988

UGANDA - UNPROTECTED SITES (cont.)

Name of area and map reference (see Fig. 6.2)	Management area (ha)
1 Bugala, Bunyama and Kome Islands	
Karamoja Forests	
3 Lake Albert (Mobutu)	
4 Lakes Kyoga, Kwania and Bisina	
5 Lake Nabugabo	
Lake Victoria	
Mt Elgon Forest Park	110,000
North Ugandan Moist Savanna	
Semliki Forest Park	21,827
West Bugwe Nature Reserve	3,054
West Mengo Forest	

Fig 6.2 Uganda: unprotected ecologically sensitive sites



REFERENCES

Alexander, F. 1990. Turkana in transition. *Swara* 13(6):34-36.

Anon. 1989. The Mount Elgon elephants area alive. *Swara* 12:19-20.

Baldus, R.D. 1989. Village participation in wildlife management. Selous Conservation Programme. *SCP Discussion Paper* No. 4. Selous Game Reserve/Wildlife Division and Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ). 32pp.

Barnes, R.F.W., Barnes, K.L. and Kapela, E.B. 1989. Ecological changes in Ruaha National Park. *Wildlife Conservation International, and Tanzania National Parks*. 31pp.

Bensted-Smith, R. and Msangi, T. 1989. *Tropical Forestry Action Plan: report on the conservation of ecosystems and genetic resources*. Forest and Beekeeping Division of the Ministry of Lands, Natural Resources and Tourism, Tanzania.

Borner, M. 1990. The black rhinoceros. *Kakauona* 2(1):4.

Burgess, N.D., Mwasumbi, L.B., Hawthorne, W.J., Dickinson, A. and Doggett, R.A. 1992. Preliminary assessment of the distribution, status and biological importance of coastal forests in Tanzania. *Biological Conservation* 62:205-218.

Burgis, M.J. and Symoens, J.J. 1987. *African Wetlands and Shallow Water Bodies*. ORSTOM, Paris.

Bygott, D. and Kishe, J. 1990. Saadani Game Reserve. *Kakauona* 2(1):3.

Collar, N.J. and Stuart, S.N. 1988. *Key Forests for Threatened Birds in Africa*. ICBP Monograph No. 3. International Council for Bird Preservation, Cambridge.

Forse, B. 1988. Rhinos find sanctuary in Kenya. *New Scientist* 10 March 1988:28.

Frame, G.W. 1987. African forest sites. Unpublished report.

Hillman, J.C. 1993. *Ethiopia: Compendium of Wildlife Conservation Information*. NYZS - The Wildlife Conservation Society - International/Ethiopia Wildlife Conservation Organisation. 786pp.

Howard, P.C. 1988. *Nature Conservation in Uganda's Tropical Forest Reserves*. IUCN, Gland, Switzerland and Cambridge, UK. xvii + 313pp.

Howard, P.C. 1991. *Tropical Forest Conservation in Uganda*. International Council of Scientific Unions.

Hurni, H. 1986. *Management Plan: Simen Mountains National Park and Surrounding Rural Area*. Wildlife Conservation Organisation, and Natural Resources Conservation and Development, Mininstry of Agriculture, Addis Ababa. 122pp.

Hughes, R.H. and Hughes, J.S. 1992. *A Directory of African Wetlands*. IUCN, Gland, Switzerland and Cambridge, UK/UNEP, Nairobi, Kenya/WCMC, Cambridge, UK.

IUCN 1987. *Action Strategy for Protected Areas in the Afrotropical Realm*. IUCN, Gland, Switzerland and Cambridge, UK. 56pp.

IUCN 1989. *Sahel Studies*. IUCN Regional Office for Eastern Africa, Nairobi.

IUCN/UNEP 1987. *The IUCN Directory of Afrotropical Protected Areas*. IUCN, Gland, Switzerland and Cambridge, UK.

Kingdon, J. 1990. *Island Africa: the evolution of Africa's rare animals and plants*. Collins, London. 287pp.

Kokwaro, J.O. and Beck, E. 1987. The animal threat to Mount Kenya's Afro-alpine plants. *Swara* 10(1):30-31.

Lovett, J. 1985. An overview of the moist forests of Tanzania. Final Report of Tanzania Forest Habitat Evaluation Project. Tanzania National Scientific Research Council Research Monographs. Draft report. 108pp.

MacKinnon, J. and MacKinnon, K. 1986. *Review of the Protected Areas System in the Afrotropical Realm*. IUCN, Gland, Switzerland and Cambridge, UK, and UNEP. 259pp.

National Museum 1982. *Review of Habitat Status of some Important Biotic Communities in Kenya*. Division of Natural Sciences, Kenya.

Olindo, P.M., Douglas-Hamilton, I. and Hamilton, P. 1988. The 1988 Tsavo count. *Swara* 11(3):23-24.

Polhill, R.M. 1989. East Africa (Kenya, Tanzania, Uganda). In: Campbell, D.G. and Hammond, D. (Eds), *Floristic Inventory of Tropical Countries*. New York Botanical Garden, New York.

Robertson, S.A. 1987. Preliminary floristic survey of Kaya Forests of coastal Kenya. Unpublished report to Director, National Museums of Kenya. 16pp.

Simonetta, A.M. and Simonetta, J. 1983. An outline of the status of the Somali fauna and of its conservation and management problems. *Rivista di Agricultura Subtropicale e Tropicale* 4:456-483.

Stuart, S.N., Adams, R.J. and Jenkins, M.D. 1990. *Biodiversity in Sub-Saharan Africa and its Islands*. Occasional Paper No. 6. IUCN Species Survival Commission.

Tanzanian Ministry of Lands, Natural Resources and Tourism 1972. Forest reserves. Annotated 1:3,000,000 map.

UNEP/IUCN 1988. *Coral Reefs of the World. Vol. 2 - Indian Ocean, Red Sea and Gulf*. IUCN, Gland, Switzerland and Cambridge, UK/UNEP, Nairobi, Kenya. 389pp.

WCO 1985. *Wildlife Conservation in Ethiopia and Development Priorities*. Wildlife Conservation Organisation, Addis Ababa. 34pp.

WCMC 1988. *Kenya - Conservation of Biological Diversity*. Draft. World Conservation Monitoring Centre, Cambridge.

WCMC 1991. *Ethiopia - Conservation of Biological Diversity*. World Conservation Monitoring Centre, Cambridge.

Young, T.P. 1984. *Kenya's Indigenous Forests. Status, threats, and prospects for conservation action*. Report to the WWF/IUCN Eastern Africa Regional Office, Nairobi.

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