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**PRELIMINARY REVIEW
OF NAMIBIA'S
NATURAL RESOURCES**

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PRELIMINARY REVIEW OF NAMIBIA'S NATURAL RESOURCES

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PRELIMINARY REVIEW OF NAMIBIA'S NATURAL RESOURCES

EXECUTIVE SUMMARY

Introduction

This study summarizes the information available in various libraries and other sources in Washington D.C. on the biotic natural resources of Namibia. These indicate that many aspects have been reasonably well researched and recorded, particularly desert ecology, large mammals, and birds, but even in these fields, there is much further work required. However, no environmental appraisal appears to exist, nor is there a conservation strategy. Namibia is fortunate in that low population pressures in the past, combined with sound legislation, have limited adverse impacts to the environment.

Physical Geography

Namibia is 824,292 sq. km in extent (317,827 sq. miles, larger than Texas). This does not include Walvis Bay (1124 sq. km) nor the guano islands, which are South African possessions. The inhospitable Atlantic coastline is 1600 km long, with the only anchorages being Walvis Bay and Luderitz. This latter port has severe physical limitations (shallow, and with a rock restricted entrance).

The country comprises three major physiographic zones:

- (a) The Namib Desert along the coast, 65–165 km wide, with alternating dune fields and stone or gravel plains, mostly devoid of vegetation except in the winter rainfall zone in the south.
- (b) The escarpment zone is either abrupt, or a series of hills of increasing altitude, progressively better clothed with grass, shrubs, and low trees.
- (c) The interior plateau averaging 1100 m in altitude, and which is a continuation of the South African plateau. It is largely unbroken by hills or mountains. The eastern half is an extension of the Kalahari Desert from Botswana, being sand with grass, shrubs and trees but no surface water.

The only perennial rivers are those that form the northern and southern boundaries. Interior rivers flow only very briefly after heavy storms.

Rains fall in summer (November to March), except for the minimal winter rains in the extreme southwest. Rainfall varies from 100 mm (4 inches) in the south, to 6–700 mm (around 25 inches) in the north. The Namib Desert receives less than 25 mm (one inch). Summer temperatures are hot to very hot, but winter nights are often frosty. Fogs occur regularly along the coast due to the cold north flowing Benguela Current.

The geology is a complex mosaic of many different rocks, all of which directly help to determine the overlying soil types, except where the parent rock is covered with windblown sand. The geological formations are relatively well mapped due to the extensive occurrence of economic minerals (diamonds, uranium, copper, zinc, lead, tin, iron, gold, silver, coal, salt, and others). The northern areas are dominated by ancient schists, gneiss, granite, and dolomite, while shales, sandstone, and calcrete occur in the south.

Ecological Components

The preliminary vegetation map of Namibia classifies the vegetation into 15 units. Much further work is needed to further refine these, and to map the many distinctive and unique micro-habitats. Botanical survey work is undertaken by the Herbarium in Windhoek. The arid southern plains support a sparse cover of low perennial shrubs, similar in appearance to Arizona sagebrush, and with little grass except in years of heavy rainfall. This is an extension of the South African Karroo, and is best suited for light grazing by sheep, especially karakul for pelts (one sheep per 5 hectares). The northern half of Namibia is a savanna woodland of shrubs and deciduous

trees, mostly thorny Acacias, with deciduous broad-leafed trees more frequent on the sands and in the northeast. There are no true forests. Cattle are ranched in the savanna zones (one head per 8–10 ha).

In general, the country is too arid for rainfed cropping except in the extreme north. Irrigation is limited by lack of water and/or suitable soils in most areas. Crops grown in ovamboland and adjacent commercial farming areas are maize, millet and sorghum. With further development of irrigation in the north, a wider range of crops could be grown, and a large measure of self-sufficiency attained. About half of the food is currently imported.

Although there has been a considerable reduction of many game animals, especially on the southern plains, Namibia still retains substantial numbers of most of the original species, particularly in the Etosha and Namib/Naukluft National Parks; others exist in various smaller reserves, and on ranches and in ethnic homelands. Many farmers are now incorporating wildlife activities into their ranching systems to increase the biomass carried and to diversify incomes; the Department of Nature Conservation assists by providing breeding stock and advice. The wildlife industry (including tourism) generated nearly 15 million Rand in 1985; this should increase considerably in the future.

Namibia has the world's largest remaining population of cheetah; however, many of these are on private farmland where they are regarded as vermin. Additional research is urgently required to help this universally threatened species to survive. There has recently been severe poaching of the unique desert strains of elephant and black rhino. The wild dog is also threatened and requires additional protection. The very dedicated and competent staff of the Department of Nature Conservation is inadequate and underfunded for all their responsibilities.

Forty of Namibia's 603 species of birds are almost entirely endemic, but apart from the Cape Vulture and three other birds, populations of all appear to be stable. Habitat destruction of riverine forest on the northern border is the greatest danger to those species inhabiting these very restricted ecosystems, but the vultures have been decimated by poison baits put out for jackals and other predators.

The radically different ecosystems that occur in the Caprivi Strip and along the northern rivers, provide very limited habitats for species of fauna and Flora not found elsewhere in Namibia. In addition, the many unique micro-habitats in and adjacent to the Namib Desert also contain are confined to these sites. Much additional mapping is required to enumerate and evaluate plan conservation strategies where necessary.

Six of the 97 species of freshwater fish have restricted habitats and are in the vulnerable Namibia's marine fisheries were among the richest in the world, but the fish and rock lobster stocks have been severely depleted by overfishing by foreign fleets; however, the extension of the exclusive fishing zone from 6 to 200 miles, coupled with international recognition of the new regime, should improve this situation. Additional patrol, monitoring and research facilities are required.

Demographic Factors

Since its liberation from German colonial control by South African forces in 1915, Namibia was administered by South Africa in terms of a mandate originally authorized by the League of Nations. In 1962/63 the Odendaal Commission redefined and increased the areas set aside as 'homelands' for the various indigenous ethnic groups, paving the way for local government. Forty percent of the territory became homelands, 45% remained as freehold farms, and 15% was designated State land (game and diamond reserves).

Current population estimates vary, but are thought to be between 1.3 and 1.8 million; 86% are black, 6.5% are white, and 7.5% are of mixed race. The population growth rate was calculated to be 2.7% in 1981, but is now thought to be around 3%. Fifty seven percent of the population lives in 8% of the country in the extreme north, as this is where the best rainfall, cropping and grazing occurs. The Ovambos are the largest tribal group; they are split by the artificial border with Angola. Afrikaans has been the principal Western language, but English will

in future be the sole official language. Adult literacy is 72.5% for males, and 70.8% for females (UNESCO, 1985).

Economic Factors

The GDP (1988) was US\$1,895 million. In 1989/90, revenue was projected as R1,791 million, and total expenditure was R2,239 million. (The monetary unit is the South African Rand; one R = US\$0.40). South Africa previously supported the economy with subsidies totalling about R300 million. Principal sources of foreign exchange earnings are mining (28% , especially diamonds and uranium), beef, and karakul pelts.

The infrastructure is very well developed with an extensive network of paved and good dirt roads, railroads, telecommunications, schools, hospitals and clinics, and sound administration at national and local levels. However, the small internal market requires that 85% of manufactured goods have to be imported, as well as virtually all the timber required in the local manufacturing industries.

Natural Resource Conservation and Management

The new Government has apparently included the need for the conservation of biological diversity in the constitution and has demonstrated this commitment by appointing several very competent persons to senior positions in the Government and Administration, as well as by taking other appropriate steps. However, it is not known whether or not environmental impact assessments are required for new development projects.

The principal threats to the country's biotic resources arise from the expanding populations in the ethnic homelands, and the corresponding increases in grazing pressures and deforestation. Most of Namibia's freehold and communal farming areas are environmentally fragile, as they are located in marginal rainfall areas; they require careful management and monitoring. It is anticipated that the worst aspects of marine exploitation will be avoided in future. Hopefully, the poaching of elephant and rhino should abate somewhat, but will require constant vigilance and attention. Cheetah research and protection requires fostering.

Natural Resource Management Projects

Apart from the previous programs that the new Government will apparently continue insofar as finances will permit, there are now various donors, NGO'S, and PVO's taking an active interest in natural resource issues and beginning to fund projects. Elephant and rhino conservation head the list. Organizations that are known to be involved are EEC, EWT, FINNIDA, IUCN, National Geographic, NORAD, NORAGRIC, SIDA, WSSA, and WWF.

The Ministry of Wildlife, Conservation and Tourism is soliciting funding for 23 projects, of which USAID has expressed an interest in three.

This Review concludes with eight recommendations for other activities that merit support, of which education-oriented projects and cheetah research rank high. An in-country follow-up is recommended for a better analysis of needs.



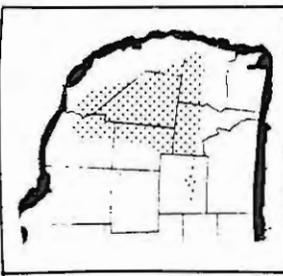
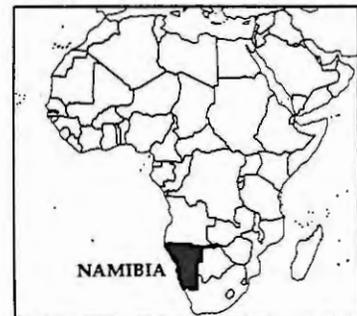
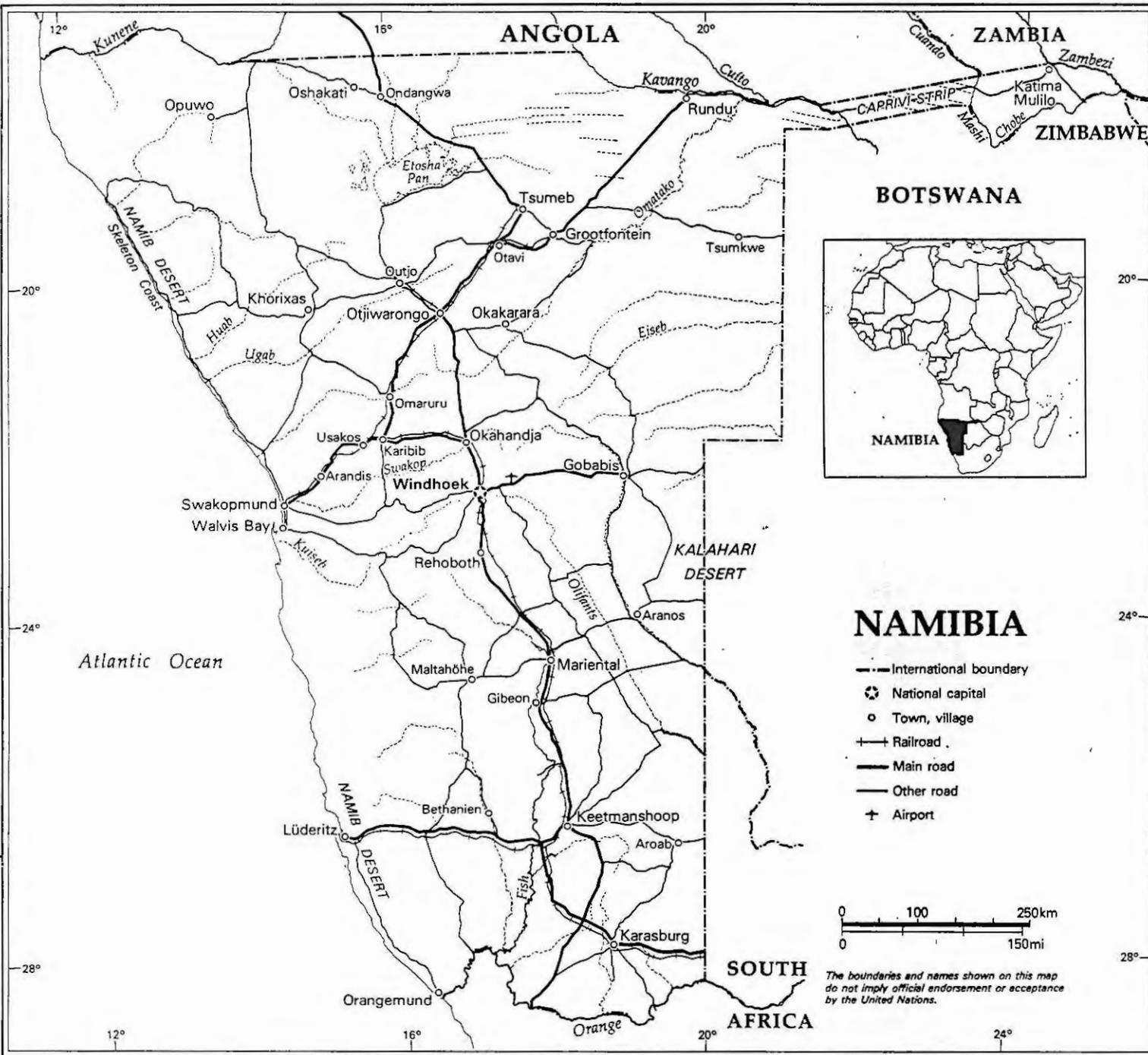
ABBREVIATIONS AND ACRONYMS

| | |
|----------|--|
| CDM | Consolidated Diamond Mines |
| CITES | Convention on International Trade in Endangered Species |
| DERU | Desert Ecological Research Unit |
| EEC | European Economic Community |
| EWT | Endangered Wildlife Trust |
| FINNIDA | Finnish Aid |
| GDP | Gross Domestic Production |
| IUCN | International Union for the Conservation of Nature and Natural Resources |
| LAU | Large Animal Unit |
| NGO | Non-Government Organization |
| NORAD | Norwegian Agency for Development Assistance |
| NORAGRIC | Norwegian Center for International Agricultural Development |
| PVO | Private Volunteer Organization |
| R | South African Rand, currency in Namibia, 1R = US\$0.40 approx. |
| RSA | Republic of South Africa |
| SIDA | Swedish International Development Agency |
| SWA | South West Africa (previous name of Namibian territory) |
| SWAPO | South West Africa People's Organization |
| UCT | University of Cape Town |
| UNESCO | United Nations Scientific and Education Commission |
| UNDP | United Nations Development Programme |
| USAID | United States Agency for International Development |
| WSSA | Wildlife Society of Southern Africa |
| WWF | World Wildlife Fund |

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NAMIBIA

AREA: 318,000 sq.mi. 823,620 sq.km.
POPULATION: 1,800,000 (est'd for July 89)
CAPITAL & LARGEST CITY: Windhoek
(110,644 est'd 1981 census)
GNP: US\$ - per capita, 1987



NAMIBIA

1.0 INTRODUCTION

1.1 Scope of the Report

The following work was done to assist USAID in focussing its funding for Namibia, particularly the funding budgeted for natural resource management. Over a period of two weeks the authors surveyed the paper and human resources available in the Washington D.C. area regarding Namibia. This information was analyzed for accuracy, comprehensiveness and consistency. The following report was then drawn up providing an initial overview of Namibia's principal land features, ecological features, demographic features, and human activity. Areas where further information or research is needed were identified. The authors made an effort to document all government and donor-supported programs in natural resource management, and then to suggest opportunities for USAID to complement and support existing programs.

The bibliography is selectively annotated and lists the library location of references where known. Given the time constraints, the list of contacts in Washington D.C. and elsewhere in the U.S. is not exhaustive. It does provide a useful starting list for anyone interested in pursuing the subject. The list of foreign contacts is compiled from our own research as well as lists provided by Dr. George Rabb, IUCN – Species Survival Commission Chairman; David A. Smith's paper prepared for PACT; and FINNIDA's baseline study of Namibia's forests and woodlands.

1.2 Information Sources

The principal sources of literature for this study were the National Geographic Library, Joint World Bank/IMF Library, Library of Congress, Smithsonian Natural History Museum Library, USAID Library, and the USAID Namibia Desk file. Other literature contributions and all informed personnel contacted in Washington are mentioned in the annexes. Darrel C.H. Plowes, Senior Technical Advisor for this report, made significant contributions from his own knowledge of the country and its ecology.

1.3 Limitations of the Report

The primary limiting factor was the amount of available information in Washington D.C. The library collections specific to Namibia were in every case much smaller than those for other African countries. We assume much additional information relevant to this report may be found in Namibia and the Republic of South Africa. Namibia has only recently gained its independence from the Republic of South Africa, and very few people and organizations in Washington D.C. have previous experience in the country. Most of the organizations interested in supporting development in Namibia are in similar planning stages as USAID. Therefore, the full picture of international involvement will not become clear until later this year.

2.0 PRINCIPAL LAND FEATURES

2.1 Geographical Facts

Namibia occupies an area of 824,292 sq.km. (380,000 sq. miles, larger than Texas). This does not include Walvis Bay (1124 sq.km) which is a South African possession. It is the second largest country on the southern African subcontinent, second only to South Africa, its southern border state. Namibia is further bordered by Angola on the north, Botswana on the east, and Zambia and Zimbabwe along the northern and eastern edges of the Caprivi Strip extension. This extension provides Namibia with access to the Zambezi River. It has an Atlantic shoreline of approximately 1600 km (1000 miles).

There are currently two territorial disputes. A short section of the boundary with Botswana is indefinite, and the quadripoint with Botswana, Zambia and Zimbabwe is in disagreement. Walvis Bay and the various guano islands, which had been British possessions during the German colonial period, were ceded to South Africa by Britain and remain under the Republic of South Africa rule after Namibia's independence.

2.2 Physical Features

With the exception of the narrow coastal plain, the bulk of Namibia is part of the interior plateau landscape and western drainage system of Southern Africa. Three major topographical features exist.

The Namib Desert, a narrow plain 65–165 km wide runs the entire length of the 1,600 km Atlantic coastline. The cold, north flowing Benguela Current and high pressure atmospheric conditions are responsible for the extremely low rainfall and contribute to the regular occurrence of fog along the coast. The environment is similar to that along the Peruvian and Chilean seaboard. The desert plain takes two forms: extensive sand seas, including the highest dunes in the world (300 m); and gravel/rock deserts. Vast stretches of this plain are almost devoid of vegetation, except in the south, where it has a light cover of low succulent shrubs and lichens sustained by fog.

East of the Namib rises the eroded Escarpment reaching altitudes of 1,500–2,000 m, including the Khomas Hochland to the west of Windhoek. The escarpment is either abrupt and broken, or a gradual elevation from the dune and gravel plains. Various granite plutons, of which Brandberg mountain (2579 m) is the highest, were thrust up in the past through the overlying rocks.

Beyond the Escarpment lies the extensive interior Central Plateau which slopes gently eastward to the Kalahari Basin. It has an average altitude of 1000m, but rises to over 1500 m near Windhoek and Otiwarongo. Unlike the Namib, the Kalahari Desert of eastern Namibia is well vegetated, despite its deep sands and absence of surface water. These sands are often in the form of parallel stabilized fossil dunes.

Over half of Namibia's landscape is characterized by plains and dunes. Mountainous terrain is confined mainly to the escarpment region and the center of the interior.

The coastline as a whole is hostile to ships. Only two natural ports exist: Walvis Bay and Lüderitz. Walvis Bay is the only deep water port, but is Republic of South Africa territory. Lüderitz has three shallow bays whose shared entrance is obstructed by submerged rocks. German attempts to construct a port at Swakopmund were unsuccessful.

There are currently no active land volcanos. The Brukkaros mountain is an extinct volcano that was used as a base for astronomic observation by the Smithsonian Institute in the 1930's. The Roterkamm on the edge of the southern Namib is an old volcanic crater. The huge Messum crater, possibly of meteoric origin, lies to the west of Brandberg mountain and reveals geologic clues linking this area to Brazil prior to the continental drift.

2.3 Hydrology and Drainage Systems

Most of Namibia's Central Plateau drainage is east to the Kalahari (Okavango and Molopo River systems). The only other major drainage system flows south to the Orange River. Very little surface drainage occurs because precipitation is soon dissipated into the sands.

There are no permanent rivers in the interior, only along the northern and southern borders. The Kunene and Kavango rivers mark much of the northern border, with the Kavango turning south through the Caprivi Strip to discharge into the Okavango Delta in Botswana. The Kwando (Cuando) River also bisects the Caprivi Strip, and then flows into the Linyanti Swamp before continuing east as the Chobe River. The Chobe flows along the southern edge of the Caprivi before joining the Zambezi. The Orange River defines the southern boundary with the Republic of South Africa. The Orange is perennial, but the estuary mouth on the Atlantic coast is closed by a sand bar for ca. 3 months of the year (Aug–Oct). Flow in the Orange River is significantly reduced by a combination of irrigation, household and industrial use in Republic of South Africa. Additional control of its flood waters are now being planned through a series of hydro–electric dams in Lesotho. Namibia has no legal claim to water in the Orange River, as the international boundary follows the north bank.

All other rivers are seasonal, flowing only briefly in summer after thunderstorms many may remain dry for several successive years. Apart from bore holes, well points sunk along these rivers are usually the only source of water. The Fish River flowing south through the Fish River Canyon (second only to the Grand Canyon in size) to the Orange can develop devastating flash floods at times. The Kuiseb and Swakop Rivers flow occasionally from the Khomas Hochland to near Walvis Bay and Swakopmund respectively, but the sporadic floods almost never actually reach the Atlantic. In Ovamboland, a summer flood plain and delta system originates from runoff from Angola, bounded by the Etaka and Cuvelai rivers, and terminates in the Etosha Pan. The Etosha Pan is the dry saline remains of a former large lake, with sediments 300–500 m deep. It receives water in the north during high rainfall years. Near Tsumeb lie the Oshikoto and Guinas Lakes. These are water-filled, collapsed limestone caverns, which provides habitat for at least one endemic fish species. The Auob and Nossob Rivers are sand-filled dry systems flowing north–south in the east, eventually joining the Molopo on the Republic of South Africa/Botswana border. Borehole water is available along the length of their beds.

Surface water was apparently much more plentiful in southern Namibia 100 years ago. One farmer near Helmeringhausen states that his grandfather used to travel regularly through this area by ox wagon from the Cape to trade. He found water in pools along what is now a dry river bed. The situation has deteriorated considerably since then, with surface water now almost non-existent in the southern interior.

2.4 Climate

According to U.S. Department of Agriculture classifications, four main climatic regions exist in Namibia. The coastal zone is listed as Cool subtropical desert, with the northern half of the Namib being a transition to Semi-hot and cool tropical desert. Nearly all the escarpment region and the whole southern interior is grouped as Hot subtropical desert, with pockets of Tropical highland desert in northern sections of the escarpment. The interior north of Windhoek to Tsumeb is listed as Semitropical tierra fria (cool steppe), and from Tsumeb north to Angola as Monsoon subtropical.

The Institute for Cartographic Analysis, University of Stellenbosch, Republic of South Africa, lists four area classifications based on rainfall: the extremely arid coastal zone, the arid southern interior, the semi-arid central and north-western area, and the small subhumid north-eastern zone. Mean annual rainfall is approximately 270 mm, a good indication of the general aridity of the country. From the Namib desert with an annual mean of less than 20 mm, rainfall increases towards the interior and the north-east. Katima Mulilo, at the eastern edge of the Caprivi Strip, receives an annual mean of more than 700 mm.

The regularity and intensity of rainfall is greatest in the north-eastern areas. Rainfall variability (the deviation of rainfall in any particular year from the long-term annual mean) increases from the north-east to the south-center and coast, along similar zones as defined by average rainfall. Rainfall is erratic and unreliable for most of the country. It usually takes the form of severe thunderstorms that cause flash floods, and which allows of little time for the rain to soak into the parched earth.

Over 95% of the country receives the bulk of its precipitation during the summer months. The south-west corner receives episodic winter rains from an extension of the eastward moving Cape cold fronts, but the amount is low and insignificant. Rainfall extends over approximately 5 months in the north-east, but is limited to less than one month in the south and west. In the north the first rains can be expected in October/November with a maximum in January/February. In the south the rainy season usually begins in January, peaking in March.

The effectiveness of Namibia's low rainfall is further reduced by the pattern and severity of evaporation rates. The period of highest evaporation coincides with the summer rainfall season. Potential evaporation is lowest in the north and the south-west, and increases markedly towards the central and south-eastern areas. Due to high day temperatures and lower atmospheric humidity, evaporation rates in the southern interior plateau far exceed average rainfall, thereby contributing considerably to the year-round aridity.

Summer temperatures range from warm to hot, and winters are mild to cold. Seasonal temperature variation is greater in the interior than along the coast, where they are moderately cool, averaging 15⁰-20⁰C. Temperatures in the interior are regarded as moderately warm, averaging 20⁰-25⁰C. The cold stable air mass along the coast and the altitude of the interior plateau result in lower temperatures than would normally be expected at these latitudes. The highest temperatures are experienced in the Orange River trough, the Kalahari Basin and the Caprivi Strip. The warmest month is October in the north, December in the central region, and January in the south. The lowest temperatures occur in the central interior plateau, bringing sharp frosts, and very rarely even snow around Aus. The coldest month is August along the coast, and generally July for the rest of the country.

A strong cold wind blows in off the ocean during winter. The resulting sand blast along the coast can be very severe, frosting car windows and polishing rocks in the desert. Movement of sand dunes adjacent to roads and rail lines requires regular attention to keep them clear.

Night fog occurs on approximately 33% of the year along the coast, with slightly higher occurrence during winter. The fog dissipates within 1-3 hours of sunrise.

2.5 Geology

The geology of Namibia is a mosaic of varying rock formations, with a predominance of ancient schists, gneiss and granite in the north, together with some adomite and basalt, and with sandstone, shale and limestone formations in the south. The official 1:1,000,000 scale Geological Map of South West Africa/Namibia (Government Printer, Republic of South Africa, 1980) and the publication The Geology of SWA/Namibia (Geological Survey, Windhoek, 1982) provide the essential information.

A wide range of metals and minerals have been located over time, with intensive geologic exploration being undertaken by both the geological survey department and private mining corporations. The metals and minerals include: diamonds, gold, silver, copper, uranium, lead, tin, zinc, vanadium, iron, and salt. Despite the long exploration history, new deposits are still being opened for extraction. The most recent gold mine was formally opened by President Nujoma in June 1990 near Karibib. Coal has been located near the Nossob River on the Botswana border. Natural gas reserves are known to exist offshore near the mouth of the Orange River. Other minerals occur in lesser quantities, together with a variety of semi-precious stones.

The ancient, igneous origin of much of Namibia's geology precludes the presence of gas or oil reserves in most of the interior. Windblown sands overlies and obscures the geological formations in the eastern half of the country, including Ovamboland.

2.6 Soils

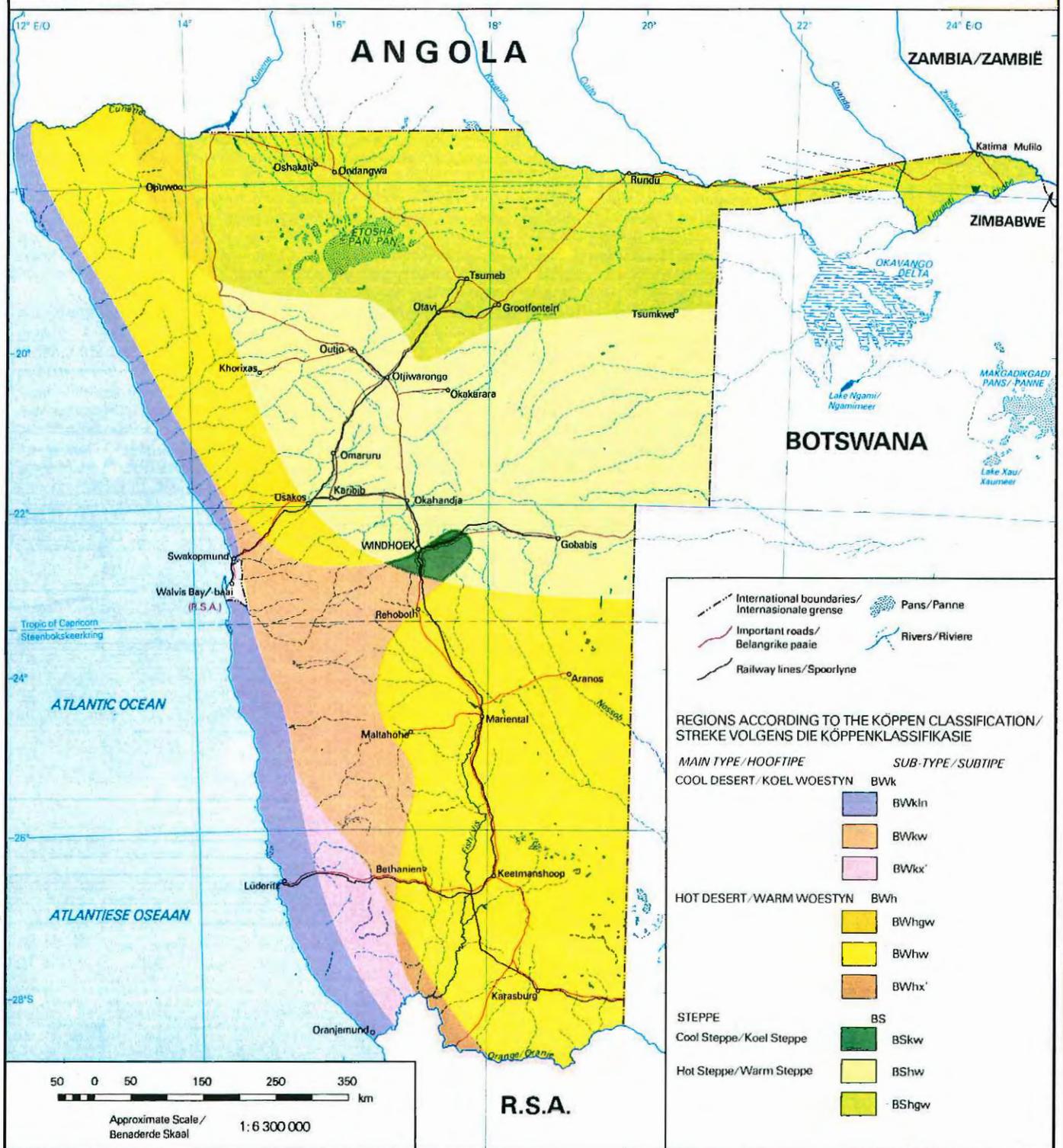
Lithosolic (rock derived), interior arenosolic (sandy) and other poorly developed soil types dominate. Only a few areas (north and north-east) have soils and climate suitable for intensive crop production. Agriculture in most areas is constrained, however, by low rainfall and limited possibilities for irrigation. Most soils are poor, lacking humus and are often of high alkalinity. Harmse, H.J. von M., 1978: Schematic Soil Map of Southern Africa South of latitude 16⁰ 30' S (In Werger, M.J.A.: Biogeography and Ecology of Southern Africa. Junk, The Hague, pp. 73-75) provides a generalized map of the dominant soil types.

CLIMATIC REGIONS



South Africa obviously is part of Sub-Saharan Africa. Unfortunately comparable information was not available to add to this map created by the U.S. Department of Agriculture.

CLIMATIC REGIONS/ KLIMAATSTREKE



Source: Merwe, J.H. van der (ed.), *National Atlas of South West Africa*, Institute of Cartographic Analysis, University of Stellenbosch, (Goodwood, Cape: National Book Printers), 1983.

3.0. PRINCIPAL ECOLOGICAL FEATURES

3.1. Flora

3.1.1. Research history

The study of Namibia's flora was initiated during the German administration, under the direction of Prof. Kurt Dinter. He built up the early collections at the Windhoek Government Herbarium, and sent much duplicate herbarium and live material to Berlin for study. The collection, recording and mapping of the plants and plant communities was continued by Mr. Willie Geiss; he was succeeded on his retirement by Dr. Mike Muller.

Geiss published a preliminary vegetation map in the herbarium journal Dinteria in 1971, with accompanying text and photographs describing his fifteen vegetation units. No further mapping has since been published, due to insufficient funding and staffing at the Herbarium.

From 1966-72 Prof. H. Merxmuller of Munich published a study on Namibia's flora in serial form, the "Prodromus einer Flora von Südwest-afrika". He listed a total of 3,159 flowering plant species in the country; more continue to be discovered. Detailed descriptions of the flora of Namibia are being included in the ongoing Flora of Southern Africa, published by the Botanical Research Institute in Pretoria. The plants of the Caprivi Strip are included in the Flora Zambesiaca, a current joint production of Kew (UK), Zimbabwe, and Portugal.

3.1.2. Endemism

The flora of the Brandberg, Namibia's highest mountain, has been the subject of special study by the Norwegian Prof. B. Nordenstam. His checklist was published in Dinteria vol. 11 (1974). Nordenstam lists 11 taxa as endemic to this 20x30 mile granite massif rising nearly 7000 ft above the surrounding plains at the edge of the Namib desert. It is probable that other endemics exist on the Brandberg and await classification.

Namibia has a number of other unique habitats which have been reduced to isolated relics. Examples include: the Gamsberg plateau on the rim of the escarpment between Windhoek and Walvis Bay which is the last vestige of a peneplain of sedimentary rocks that was formerly much more extensive; the mesa-like sandstone Waterberg Plateau in the north-east; the little explored arid Baynes Mountains (the second highest range in Namibia) in the north-west on which a few endemics are already known; the Great Karas mountains in the south-east; the granite Tiras mountains in the south-west, north of Aus, with several known endemics and the northernmost range of several Cape floral and faunal elements; the Klinghardt mountains in southern Namib, a series of plugs of rare phonolite lava with associated endemics; and a number of lesser hills and numerous geological formations within each of the major climatic and altitudinal regions. All of these are likely to have endemic species.

Without doubt, the most famous plant species in Namibia is the living fossil, Welwitschia mirabilis. This weird cone-bearing species occurs in the Namib Desert from Swakopmund northwards into southern Angola. It obtains its moisture needs from coastal fogs. A smaller form, which has a different photosynthetic mechanism, occurs inland in limestone cracks in the summer rainfall zone among mopane trees near Khorixas.

3.1.3. Vegetation zones

As shown by Geiss, the vegetation of Namibia is mainly xerophytic (arid). He grouped his fifteen ecosystem units into three major biomes: desert, savanna, and woodland.

The Namib Desert along the Atlantic coast contains many interesting or highly specialized desert and semi-desert species (succulents, ephemeral annuals, halophytes, etc.). Extensive lichen communities occur in the fog belt near the sea, especially in the southern section lying in the winter rainfall zone. Ephemeral annual grasses, growing only

a few inches high and able to complete their life-cycles in a few weeks after a shower or two, mark the transition zone on the edge of the Namib.

Further inland, stands of perennial bushman grass (*Stipagrostis* spp.) clothe the sands of the pro-Namib, particularly in years of good rainfall. Low perennial shrubs, which are extensions of the Karoo flora utilized for sheep farming in South Africa (similar in appearance to the sage-brush formations of Arizona), dominate the semi-arid southern half of the Central Plateau. Perennial grasses are scarce in this zone, although waving stretches of grass transform the countryside in years of outstanding rainfall; usually though, the rainfall is too low and erratic, and run-off on the sun baked loam soil is too high, to sustain many. Sheep have probably played a role in eliminating most of the grasses. Geiss places this Karoo ecotype in his savanna biome category, but usage of this term elsewhere suggest that savanna should indicate a tree/grass association.

From about Rehoboth northwards, the vegetation changes to thorny acacia savanna (bushveld). Deciduous mopane trees (*Colophospermum mopane*) dominate the poorly drained brackish soils and provides high quality browse, especially when the leaves are dry. The saline margins of the 100 km wide seasonally dry Etosha pan support a halophytic community of dwarf shrubs and grasses. The Kalahari sands on the eastern border have a larger component of broadleaf trees and shrubs, with fewer acacias, although the camelthorn (*Acacia erioloba*) is prevalent along dry river courses. The seasonally inundated floodplains of Ovamboland and the Caprivi Strip feature aquatics and grasses in association with palms (*Hyphaene ventricosa*) and riverine trees. Cattle and goats replace sheep in the bushveld savannas.

The woodlands of the north-east are an extension of the Zambebian floral region. The various tree species are largely deciduous in the dry winter months, and grow in stands that are sufficiently open to permit of a sparse grass cover.

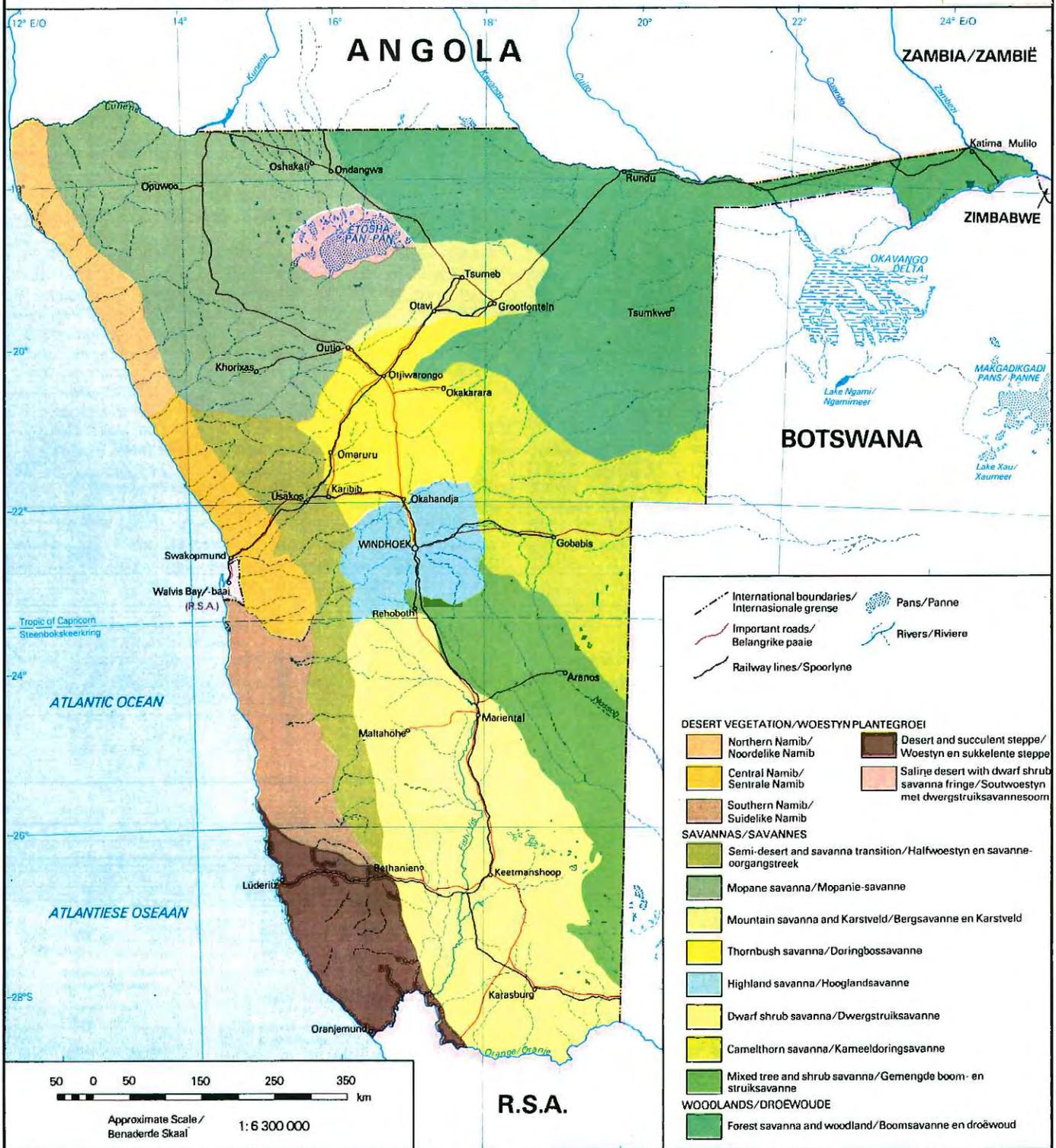
3.1.4. Research needs

In the drier zones, where a plethora of geological formations and other factors influence soil types and growing conditions, a mosaic of micro-habitats supports a variety of plants adapted to the different ecological niches. Many of these micro-habitats are limited in extent and are unique. This results in very localized populations of many species. The distribution and status of each of these specialized taxa is poorly understood and further study is recommended.

Overseas demand exists for many of the attractive specialized succulents, but which are protected by stringent legislation. Nurseries should be established, and encouraged to produce these plants from seed with the aim of making sufficient specimens readily available. This would reduce both the need for field collection and the practice of poaching.

The overall number of endemics in Namibia appears to be unknown. Hall, A.V. (1980) provides a list of threatened plants from Namibia that includes 12 endemics and 44 non-endemics. This list is probably in need of revision.

NATURAL VEGETATION/ NATUURLIKE PLANTEGROEI



Source: Merwe, J.H. van der (ed.), National Atlas of South West Africa, Institute of Cartographic Analysis, University of Stellenbosch, (Goodwood, Cape: National Book Printers), 1983.

3.2. Fauna

3.2.1. Large Mammals

Prehistoric 'Bushman' rock art, and the accounts of early travellers, testify to the former existence of a wide range of large mammals throughout the country. The most ubiquitous antelope was the springbok, followed by gemsbok (oryx), on the dry southern plains. Both of these species can survive indefinitely in the absence of open water. The Burchell's zebra, blue wildebeest, and eland were also common in the southern plains, especially around water holes and pans.

Greater kudu, black-faced impala, buffalo, giraffe, black rhino, and elephant have always been more prevalent in the wooded savanna zones of the north than in open country. The Kalahari woodlands were the principal habitat of red hartebeest, but this and other species have suffered in times of drought as migration has been restricted by Botswana border and ranch fences. The fences were erected to control stock diseases.

Sable, roan antelope, and bushbuck are restricted to the extreme north-east. The flood plains of the Caprivi Strip provide habitat suited to common waterbuck, southern reedbuck, puku, situtunga and red lechwe. The rare Hartmann's mountain zebra survives only in the Naukluft Park and the Marienfluss Valley in Kaokaland. Hippopotamus and crocodiles are restricted to the northern perennial rivers (Kunene and Kavango) and those in the Caprivi strip; they were also previously present in the Orange river in the south.

The elephant and black rhino populations of northern Namibia were severely poached during the latter stages of the SWAPO–Republic of South Africa liberation war. In the case of the unique desert elephants of the Skeleton Coast, the reduction of the gene pool is particularly worrying. Dehorning of the rhinos in Kaokaland appears to be deterring poachers, but increased poaching pressure in the Etosha Park is feared as a result. The Etosha Park is vulnerable as it is inadequately patrolled.

Predators of all types were formerly ubiquitous due to their ability to survive independently of water when necessary. Lions, spotted hyenas and wild dogs have now been largely eliminated outside of the reserves and parks. The wild dog no longer occurs within the Etosha Park, although it is hoped to reintroduce it there from other Namibian populations. The wild dog has been drastically reduced throughout Africa, so Namibian populations are targeted for conservation. The rare brown hyena favors sandy areas, both in the Kalahari and along the coast wherever food supplies permit. On the arid Skeleton Coast, a unique population of lions has adapted to a diet of seals.

The cheetah continues to exist on many ranches, despite persecution by farmers who view cheetah as a threat to small stock. The cheetah population in Namibia is probably the largest remaining pool of this endangered animal. More field work is required to ascertain the cheetah's status, breeding and mortality rates, and food preferences; and to develop conservation strategies. Currently, a trade ban exists on both leopard and cheetah pelts. Leopard are also well adapted to survive in close proximity to human habitation, especially in mountain areas.

The three Cape fur seal rookeries on the Namibian coast have the distinction of being the only places on the African mainland where they breed. They hold about 60% of the total population in the region.

3.2.2. Birds

Namibia has a wealth of bird life. Species and distribution are well annotated in Robert's Birds of Southern Africa, Winterbottom's Checklist of the Birds of South West Africa, many papers in The Ostrich (journal of the South African Ornithological Society), and in Madoqua. Of the 887 species recorded in the Southern Africa sub-region (south of the Kunene and Zambezi Rivers), 603 have been recorded from Namibia and its coastal waters. Forty of these are of special interest as Namibia has virtually the only localities for their occurrence in the sub-region. These are mostly from the Caprivi and the Angolan border, or else they are species that are endemic to either the

Namib or the escarpment areas. Only one species (Francolinus hartlaubi) is fully endemic to Namibia, but twelve others are nearly so.

3.2.3. Reptiles and amphibians

A fairly high rate of endemism exists among the reptiles and amphibians of Namibia due to the diversity of unique local habitats. It is known that loggerhead turtles nest on the Skeleton Coast. A new species of pancake tortoise has recently been discovered and should receive further study. Of the 97 recorded species of freshwater fish, six are very localized and considered threatened. Descriptions of the marine fish have been incorporated into the well illustrated Sea Fishes of South Africa by J. & M. Smith. They are also included in the studies undertaken by the J.L.B. Smith Institute of Ichthyology at Rhodes University, Grahamstown, South Africa.

3.2.4. Insects

The unique and extraordinarily specialized insect life of the Namib Desert has been well researched by the Desert Research Station at Gobabeb. Some of these have been featured in the National Geographic film of the Namib. It is also known that several endemic or rare butterflies exist in local areas of the country. Generally, much remains to be learned about the insects of Namibia.

3.3. Conservation Status

3.3.1. Flora

Because of the comprehensive conservation legislation that has existed in Namibia for many years now, and the stringent application of these regulations, it is probable that no species of plant is currently endangered in the country. However, there are many endemics with only small localized populations. These will always be in the vulnerable category, especially if they happen to occur on sites of economic importance (mining, farming, housing, hydro-power, etc.). The other significant danger is to species that are popular with collectors. Surveys of all such species are necessary to ascertain the locality and extent of these populations, and the degree of their vulnerability. Following such an inventory, appropriate additional conservation measures can be introduced if desirable and feasible.

The gravest danger to the Namibian flora stems from the ever increasing population pressures in the more heavily settled areas. Overgrazing inevitably accompanies expanding rural populations in Africa, as most indigenous inhabitants have cultures and needs that center around livestock holdings. Because of the marginal nature of the Namibian environment for farming activities, even very slight mismanagement by overgrazing or timber cutting causes severe degradation. The authors of this paper are not aware of what surveys, if any, have been done to ascertain and define areas degraded by farming and other activities. Such data is needed if any rehabilitation programs are to be initiated. The Nama communal areas near Keetmanshoop and Karasburg appear to have been particularly badly affected by overgrazing of the Karroid vegetation.

Namibia is well served by national parks and reserves; these conserve a representative range of many of the country's ecotypes and plant species. In addition, the Spergebiet (prohibited diamond zone), extending in a 100-130 km wide belt from Oranjemund to just south of Walvis Bay, has acted as a total preserve for all its flora and fauna. Management of this area has apparently now become the responsibility of the Department of Nature Conservation. Virtually the entire 1600 km long coastal desert enjoys Park or Reserve status.

Despite the extensive coverage now encompassed in State and private conservation areas, there is a need to extend this coverage to all ecological units. Emphasis should be given to those species with small localized habitats. This will require better data on the distribution and status of such species. Further education of landowners and the public will be important in ensuring the permanent conservation and optimum utilization of the country's rich biological diversity.

3.3.2. Fauna

Large game was rapidly decimated by the introduction of firearms to the region in the middle of the 19th Century. The sub-division of much of the country into fenced farms and ranches brought on further reductions in many large animal populations, especially those that were inimical to stock or crops. The expansion of barbed wire and jackal proof mesh fences interfered with migration, as well as survival during times of drought. Fencing also interferes with gene flow and the maintenance of healthy populations.

The conservation status of what remains of Namibia's fauna is good by most African standards for several reasons. The most important are the low population densities, the lack of firearms amongst indigenous populations prior to the war, the existence of a dedicated (though understaffed) Department of Nature Conservation, an extensive system of National Parks and Reserves, and a considerable number of farm holdings where game is protected. The Department of Nature Conservation has relocated various of the country's more endangered species to safer areas. Since 1959, it has also promoted multiple land-use on private farms, and has provided surplus game animals to land owners at subsidized prices. A number of property owners, particularly in the savanna zone, have conserved their wildlife for recreational and commercial hunting.

Countering these positive factors, poaching, especially of elephant and black rhino, reached serious proportions during the war years owing to the proliferation of unregistered firearms, and the breakdown of normal law enforcement measures. Between February and October 1989, 22 elephant and 31 rhino were known to have been killed in the north. Other game species were probably also decimated, but little data is available to substantiate this.

Kudu are one species that has managed to survive outside game parks. They can easily clear normal fences, and are adept at hiding in bushy areas. On many karakul farms, relic populations of springbok and ostrich are also still encountered.

The status of ten of the 20 indigenous species of antelope is satisfactory. Only four are regarded as endangered. These are restricted to limited areas in the Caprivi Strip where poaching from various quarters has been difficult to control following the withdrawal of military forces. These species are bushbuck, sitatunga, waterbuck, and puku. Three species are listed as vulnerable: red lechwe, southern reedbuck, and tsessebe. Three more species are listed as rare in Namibia: roan, sable and two races of impala. These three are limited to the extreme north of the country.

Apart from the Cape fur seals, little appears to be known about the status of other marine mammals off the Namibian coast. Whales were formerly abundant and hunted by American whalers from the 18th century onwards. The extent of dolphin and porpoise casualties due to fishing operations is apparently unrecorded.

Most species of birds have stable populations. Five species are regarded as threatened. The most affected species is the Cape Vulture, of which only 15 adults remain at the Waterberg colony. Poison baits put out by farmers for jackals and other vermin have probably been the main killer. This threat is now being addressed by education campaigns, and a feeding program for the vultures.

The offshore guano islands, which remain under South African administration, have a wealth of seabirds (gannets, cormorants, penguins, pelicans, gulls and terns). Penguin numbers are decreasing to the south of Lüderitz, but appear to be stable on the northern islands. Sea bird numbers overall are probably affected by the collapse of marine fish stocks. In wet years the Etosha Pan is an important breeding site for Lesser Flamingo.

Namibia is a CITES signatory (with reservations on elephant and cheetah), but it is not a member of the RAMSAR Convention which administers the conservation of important wetlands. The Walvis Bay lagoon is of major importance on the west coast of Africa, but is currently under South African administration. Sandwich Bay, just

to the south, is another major site for migratory water birds and many also utilize the shallow southern bay at Lüderitz.

Historically, wildlife protection policy has had a negative orientation throughout Southern Africa, including Namibia. It has centered on the creation of reserves and the enforcement of conservation legislation. This 'hands-off' approach to the public fosters negative attitudes towards the respective resources and to the enforcing authorities. There has been inadequate positive conservation. Effective conservation should combine education aimed at increasing popular appreciation of wildlife and the environment and the safeguarding of endangered species, with measures to cultivate and bulk up diminishing populations. Even more vital is the need to ascertain why the predicament arose, and to take appropriate steps to halt and reverse the process. The root cause of most habitat destruction is the combination of human population increase and poor land use systems. It is essential that these problems be addressed to maintain a satisfactory status for Namibia's fragile environment, and the wildlife it supports.

3.4. Current Trends

The new SWAPO dominated government appears to recognize the importance of Namibia's wildlife and natural resource base. This is evidenced by the caliber of people appointed to high office since Independence, and the offer to give citizenship to expatriate wildlife wardens who have lived in the country for more than five years. Amongst these senior appointments are that of Nico Bessinger as Minister, and Hanno Rumpf as Secretary, of Nature Conservation, Wildlife and Tourism, and of Carl Schlettwein as Deputy Minister of Agriculture, Water Development, Sea Fisheries and Rural Development.

In addition there are various local and international NGO's and PVO's that now operate or have been set up in Namibia in recent years, such as the Endangered Wildlife Trust, Save the Rhino Trust, African Conservation Trust, International Wildlife Foundation, Cheetah Preservation Fund, IUCN Species Survival Commission, World Wildlife Fund, Wildlife Society of Southern Africa, etc.

3.5. Research Overview

The principal source of research in Namibia has been by permanent and visiting staff at the Desert Ecological Research Unit (DERU) at Gobabeb in Namib Desert Park, inland from Walvis Bay. This station (founded 1963) is headed by Dr. Mary Seely, a U.S. citizen, and is now administered by a local trust. Researchers there have produced over 600 scientific papers covering all facets of desert ecology, and many popular articles. DERU is now embarking on an important role in the educational field for Namibian citizens and schoolchildren. With the experience this institution has gained in organizing and undertaking research, it would be highly desirable to capitalize on this knowledge and extend similar coverage to other major biomes of Namibia via a series of interlinking institutions.

For many years the Department of Nature Conservation has had a number of high caliber staff who have undertaken important investigations into the wildlife (particularly mammals and birds), ecology, management and conservation of the various parks and reserves. These contributions are usually published in Madoqua, the official scientific journal of the Department. The Departmental Research Director is Dr. Eugene Joubert.

The State Museum in Windhoek is a relatively small institution with few biologists on the staff. Biological research by the Museum appears to have been directed principally towards the collection and classification of various insect groups (especially beetles) and lower vertebrates.

The Transvaal Museum in Pretoria has filled the gap for many years in covering terrestrial biological classification studies. In addition, the past Curator of the Kaffrarian Museum (Capt. G.C. Shortridge) in Kingwilliamstown, Cape Province, South Africa, made an extensive mammal collection in Namibia in the early 1930's. This became the basis of Shortridge's excellent two volume work The Mammals of South West Africa.

The Percy Fitzpatrick Ornithological Institute at the University of Cape Town is a repository of much information on the birdlife of Namibia. Other studies on the birds of this country have emanated from the Kimberley Museum in South Africa.

Biological study material from German colonial times is lodged primarily in Berlin.

As previously noted, the Government Herbarium has largely been a one man organization in the past, but it has built up an impressive assemblage of the country's flora. At one time after his retirement, Mr. Geiss was contemplating producing a book on the wild flowers of Namibia, drawing on his extensive slide collection and his exceptionally detailed knowledge of the country. It would be highly desirable to have this done before this source of knowledge is lost.

Any marine fisheries research that has been undertaken will probably have been done by the Institute of Sea Fisheries in Cape Town, or by the J.L.B. Smith Ichthyological Institute in Grahamstown, as no research facility appears to exist in Namibia.

4.0. HUMAN VARIABLES

4.1. Demography

| | |
|-----------------------------------|----------------------------------|
| Population (mid 1989) | 1.3–1.8 million (estimates vary) |
| Population Density | 2 /km ² |
| Population Growth Rate | 2.7% (1981) (? 3.0% 1991 IMF) |
| Population of Windhoek (1988) | 114,500 |
| Population Projection – 2000 A.D. | 2.6 million |
| – 2020 A.D. | 4.5 million |

Languages: Afrikaans is the principal language of about 60% of the white population, German of 33%, and English of 7%. All three have been official in the past.

Several indigenous languages are also spoken, mainly forms of the Ovambo/Herero group. The new government has opted to make English the sole official language in the future. Present second language usage by indigenous Namibians corresponds roughly to the proportions spoken by the white populations, especially Afrikaans.

Ethnic divisions: 86% of the population is black, 6.5% is white, and 7.5% is mixed; about half of the black population belong to the Ovambo tribal group. The remaining ethnic groups include the Kavango, East Caprivians, Kaokovelders, Damara, Herero, Nama, Rehoboth, and Colored. The Angola border splits the Ovambos and other northern tribes. Many Herero live over the border in Botswana.

Adult literacy: Males – 72.5%, Females – 70.8% (UNESCO 1985), but is likely to be much lower in the heavily populated traditional subsistence areas in the North of the country.

Religion: Non-whites follow Christian or indigenous beliefs; Whites are predominately Christian (Protestant).

Most of the population lives on the plateau, with two-thirds of the blacks residing in the better-watered northern ten per cent of the country, and almost all whites living in the southern two-thirds. The Ovambo, Kavango, East Caprivians, and Kaokolanders are the groups who live in the north. The whites, Damara, Herero, Nama, Rehoboth Basters and Coloreds, are mainly clustered in the central highlands around Windhoek (the capital) and other towns, and around the ports and mining centers. The Namib and Kalahari regions are otherwise largely uninhabited, except for small numbers of Bushmen (San) in the latter. The Odendaal Commission (1962/63) assigned specific 'homelands' for the various ethnic groups, extending many of the previous reservations by

acquisition of white-owned farms. This resulted in a tenure allocation of 40% for homelands, 45% as freehold farms, and 15% as state land (wildlife and diamond areas).

4.2. Economic Statistics

| | |
|--------------------------------|-------------------|
| Officially Recorded GDP (1988) | US\$1,895 million |
| Per Capita Income (1988) | US\$1,200 |

The above indicators suggest Namibia is a prosperous middle-income country, one of the richest in sub-Saharan Africa. However, Namibia has one of the most skewed income distributions, with the white minority enjoying a standard of living comparable to Western economies, while the majority live traditional lifestyles in their homelands at levels barely above subsistence. Many of these homeland families supplement their incomes by male migration to towns, mines and farms for employment.

In 1988, the white population had an estimated per capita GDP of US\$16,500; non-whites employed within the modern sector (ca. 40% of the total) had an estimated per capita GDP of US\$750; and the rest engaged in subsistence agriculture and informal activities had an estimated per capita GDP of US\$85.

Although the new government inherited one of the best physical infrastructures in the region, one of the most efficient telecommunication systems, and a highly developed public administration, it also took charge of a stagnating economy whose unemployment rate is estimated at 30%, and output per head declining in real terms.

Highly extractive and poorly integrated enterprises have been the traditional source of Namibia's wealth. About 90% of goods produced, primarily metals, mineral, beef and karakul sheepskins, are exported, while about 85% of the goods required domestically, including roughly one-half of the food, are imported.

In the 1989/90 budget, revenue was projected at R1,791 million, and total expenditure at R2,239 million. In the past such budgetary gaps were covered by South African subsidies (R300 million) and by borrowing. In 1989/90 the South African government reduced subsidies to R80 million, 17% of the 1986/87 subsidy level, and ceased acting as guarantor of Namibian loans.

The monetary unit is the South African Rand (R), with an exchange rate of approximately 1R = US\$0.40.

4.3. Mining

Mining is the largest sector of the economy; accounting for 28% of GDP and employing 10,000 persons in 1988. Although this represents a fall from 1980 levels of 50% and 21,000 persons, respectively, mining is still vital to Namibia's post-independence development. In 1988 mining contributed: 73% of export of goods; 27% of gross investment; 26% of Government revenue; and 17% of remuneration to employees.

4.4. Agriculture

LAND USE (Estimate)

| | |
|---------------------|--|
| Arable land | 1% (limited to the far north) |
| Permanent crops | Negligible % |
| Rangeland | 64% |
| Forest and woodland | 22% |
| Other | 13% (includes negligible % irrigated land) |

Commercial agriculture, principally karakul sheep and beef, contributed about 9.6% of GDP in 1988. This figure was stronger than the 1986 level, despite the adverse effects of war, drought, overgrazing, inefficient farming

methods, and a fragile ecology. In addition to the 34,400 persons employed commercially, 120,000 black families practice mixed subsistence farming in the far north. The extent of arable cropping in the subsistence sector is limited to 5% of the overall farmland, and is confined to the northern districts.

The commercial sector is located in the south-center plateau region, where 5,000 large commercial ranches (almost all white owned), and 20,000 black stock-raising households engage primarily in cattle and sheep production. The end product is processed meat and karakul sheepskins for export.

Most of the country is characterized by a relatively low grazing capacity. The best land, in the north-center and north-east, can support one large animal unit (LAU) per 8-10 ha. Along the escarpment and in the south the rangeland grazing capacity is reduced to one LAU per 24+ ha. (For small livestock, the normal conversion is 5 head = 1 LAU). Grazing land in the north and center that can be more intensively utilized is given to cattle ranching, while sheep farming is adapted to the drier southern areas with lower grazing capacity.

In 1980 livestock totalled 8.9 million head, with sheep accounting for 50%, cattle 28% and goats 22%. Goats are primarily integrated into communal farming systems, in combination with cattle or sheep. Dairy farming is concentrated west of Gobabis, north of Outjo, and north of Grootfontien. Pig farming is limited to communities around Swakopmund.

Only the north-east regions of the country are capable of rainfed crop production. This land is listed as marginally suitable for rainfed millet, sorghum and maize production. Neither wheat, cassava or rice are viable rainfed crops for any part of Namibia.

The only large-scale commercial arable farming is in the Karstveld around Tsumeb, and on the Hardap irrigation scheme in the south. The principal crop is maize, for both human and animal consumption; local demand exceeds supply and is largely met through imports. Fresh produce for the mining community at Oranjemund is produced locally under irrigation by CDM.

All agricultural sectors are in crisis. The main problem in the subsistence sector is overcrowding as a consequence of high birth rates. This problem has been locally exacerbated by recent droughts. Although these farmers have proved both efficient and resourceful in the past at the subsistence level, they are now hampered by land inadequacy. Ovamboland use to produce food surpluses, but is now forced to import at least one-quarter of its food, even in good years. The drought, which lasted continuously from 1978-85 in some areas, caused a significant decline in stock numbers in the south. Commercial ranches remain heavily dependent on state subsidy.

Marketing and meat-packing were reorganized under the SWA Meat Corporation in 1985 to increase local processing and reduce dependence on live cattle exports to South Africa.

Stock health control is the responsibility of the Division of Veterinary Services in the Ministry of Agriculture, Water Development, Sea Fisheries and Rural Development. Their organizational structure and mandate includes the construction of game and stock fences, quarantine camps, and the function to identify infested areas and to coordinate response. About 6,600 km of fencing is maintained to prevent transfer of disease from neighboring stock or game, principally along the border with Botswana. These fences greatly restrict the migratory routes of large wild mammals, but are effective in containing outbreaks of diseases, i.e. foot-and-mouth disease, which have been disastrous in the past.

With the threat of war diminished, an increase and diversification of crop production in the north will be sought to improve food self-sufficiency. The Northern Region is climatically suitable for growing much of the country's crop requirements, including millet, beans, cassava, groundnut, sugar, cotton, maize and sorghum, provided water can be made available. It was for this reason that the South African Administration commenced an ambitious irrigation project in Ovamboland, using canals emanating from the Calueque dam on the Kunene River in Angola above the Rua Cana Falls. Another planned scheme based on water from the Kavango River has caused alarm

in Botswana and international conservation circles. It is feared this scheme will have adverse impacts on the unique Okavango Delta wilderness area. Irrigation expansion along the Orange River is unlikely, partly because the river water is outside Namibia's international border and partly because suitable terrain is probably very limited. When the political situation in Angola permits, it will be desirable to set up a regulatory commission that would include Botswana and Namibia, to control and apportion waters from the rivers emanating in Angola.

4.5. Fisheries

The coastal fishing grounds off Namibia were among the largest and most productive in the world. However, in 1988 fishing contributed only 2.0% to Namibian GDP and employed 1,700 persons. Until independence there had been no internationally recognized coastal resource authority, and this allowed vessels from many developed countries to fish freely in Namibian waters without any benefits bestowed on Namibia. Reacting to this incongruity, the UN Council for Namibia, in 1974, prohibited all fishing operations within a 6 mile territorial limit, unless authorized by the Council. Exploitation of the fishing resource by the international community continued practically unchecked outside this 6 mile limit. After independence, the Nujoma Government immediately increased the limit of its territorial waters from 6 to 200 miles, legalizing Namibian sovereignty over this natural resource. However, it is probable the Namibian Administration lacks adequate means of enforcement.

The lack of fishing control off Namibia's coast led to over-exploitation which abetted depletion of the resource. This is confirmed and highlighted by a dramatic decrease in the catches of several types of fish, particularly pelagic (surface) fish, and rock lobster since the mid-1970's. The pelagic fish harvest dropped from a 1974 high of over 800 million kg to about 300 million kg in 1981. Similarly, rock lobster catches dropped from 3 million kg to less than 1.5 million kg over the same time period. This decrease strains in turn the viability of secondary processing industries.

Estimates on the ability for Namibia's fish stocks to return to previous levels vary, but most agree that with proper management the fishing sector should be a significant contributor to Namibia's economic growth. Once government policy is defined and the fishing industry is organized around sustainable catch limits, fish processing will further contribute to growth and employment. To realize all the benefits, investment in processing facilities and infrastructure will be needed to match the increased catch brought back to Namibian ports. In the past, because the bulk of the harvest was processed elsewhere, the Namibian economy derived little benefit from this resource. In 1988, the total catch by all fleet fishing in Namibian waters was estimated to exceed R1,500 in value; however, in 1986, Namibian-based vessels took only 17% of the catch.

The fisheries sector is divided into two industries: an inshore pelagic fishery using Namibian-based purse-seine net fleets, and an offshore demersal (bottom) fishery previously conducted by foreign trawl fleets and now conducted by state-owned fleets.

The inshore fishery targets pilchard, anchovy, maasbanker (sardine) and rock lobster (crayfish). Prior to independence it was controlled by South African companies based at Walvis Bay and Lüderitz. This industry contributed 10% of GDP in 1975, but suffered heavy lay offs and factory closure in 1984/85 when the catch totalled 3% of its peak. Since 1985, an increase in the anchovy catch has spurred new growth.

The offshore fishery was dominated by Soviet, Eastern European and Spanish ships which caught hake, sole, snoek (horse mackerel) and a variety of other pelagic (surface) and demersal fish. These fleets froze the catch on board and returned home for processing. The stocks of hake, which was the main fish, are at about one-third of their former level. Horse-mackerel has become the main target for state-owned fleets.

4.6. Forestry

Namibia is exceptionally poor in exploitable timber trees. A limited amount of African teak (*Baikaea plurijuga*) and kiaat (*Pterocarpus angolensis*) occurs on Kalahari sand in the extreme north-east. Mopane yields good termite

and borer proof fence and hut poles, and high calorific firewood. Camelthorn and other acacias also make excellent firewood. Regeneration is slow for all these species, and timber shortages are spreading in areas of denser settlement. Plantation forests cover less than 1000 ha.

The commercial forest sector contributes less than 1% to GDP, but Namibia's woodland informally contributes a wide variety of products to rural households. Forest designation is reserved for only a small part of the country's woody biomass which is situated in the north-eastern part of the country along the border with Angola and Zambia. Open woodlands and shrub lands account for most of Namibia's forest products supply.

Local populations harvest these dispersed sources for fuelwood, fodder, building material, and other uses. Greatest demand comes from the Ovambo, Kavango, and Caprivi regions where over half the population lives. This area is beginning to suffer fuelwood shortages and erosion problems.

Most of the wood used in industry has to be imported, but wood products as a whole is the largest subsector in the manufacturing industry.

Prior to independence, the forestry sector was largely ignored, and therefore little information about forestry stocks and potential is available. Forestry research and education have also been very limited. This caused the Nationhood Programme for an Independent Namibia to set the following forestry priorities: Research and data collection, national afforestation program design, industrial plantation establishment, and training/extension in management techniques.

4.7. Energy Sources and Requirements

The distribution of electrical energy is limited to cities and large towns, with the center plateau region (surrounding Windhoek and west to Walvis Bay) having the most extensive infrastructure. Outside of this area, Oranjemund (the site of the most important diamond mining) and the Tsumeb-Grootfontein-Otavi area are the only other major electricity consumers.

In 1980 a total of 414 Megawatts was generated by domestic power stations and distributed to the urban areas via a transmission system totalling 5,000 km in length. The main lines run north south from the hydro-power station at the Rua Cana Falls below the Calueque Dam on the Kunene River down through Omaruru, Windhoek, Mariental, Keetmanshoop, Karasburg, and south to link into the South African system. In addition to the mentioned hydro-power station, power is generated at a coal fired station in Windhoek, and three diesel turbines located in Walvis Bay, Lüderitz, and Katima Mulilo. These last two only supply local consumption of less than 5 MW. An additional 250 MW was imported from South Africa to satisfy demand. All power consumed in Oranjemund is transmitted from South Africa.

Two undeveloped sources of hydro-electrical production are along the Kunene River and the Kavango River. The estimated generation capacity for these two sources is over 1,500 MW and 25 MW respectively. Both of these lie along the border with Angola and are far from the highest points of consumption. However, with further infrastructure development they could eliminate dependence on South African energy and provide new sources of energy to the northern populations.

Although the largest power station is located in Ovamboland, wood is the main source of energy for cooking, heating and light in the north. Most of the inhabitants of the homelands still live in traditional huts in small scattered villages. Shortages in woody biomass are being experienced around most peri-urban areas.

4.8. Water Resources

In patterns similar to the electrical power transmission network, the pre-independence administration in Namibia developed various water schemes with storage dams, sand storage reservoirs, direct withdrawal of river water,

boreholes, purification of effluent, canal systems and pipelines. The emphasis on this infrastructure was to deliver purified water to urban centers, mining settlements, and irrigation schemes, and to a lesser extent the smaller rural communities. The single largest dam is the Hardap Dam located outside Mariental along the Fish River. The Hardap accounted for 48% of dam capacity in 1980.

In 1990, a Ministry of Health and Social Services and UNICEF Namibia survey of Northern Namibia and Katutura (a black peri-urban settlement on the outskirts of Windhoek) stated that both rural and urban areas were suffering from a lack of adequate water provision and waste disposal. In the dry season between 1 and 3 hours were typically spent by rural households travelling to potable water. This was much greater than the time spent in surveyed peri-urban centers, and this was highlighted as a possible incentive for migration out of rural areas.

4.9. Hunting

The prolific and varied wildlife of Namibia has always provided a source of sustenance and sport to its inhabitants. The increasing pressures from expanding populations, and the shrinkage of undisturbed habitat has considerably diminished the availability of game animals. Game birds (guinea fowl, francolin, sandgrouse) have been less affected. Duck numbers have always been negligible except in wetlands in the Caprivi Strip and the Ovamboland oshana zone. The larger bustards were regularly shot for the pot in former times, but protective legislation has largely eliminated this.

Hunting has always been a tradition with all the indigenous people, and is presumably still practiced. Such hunting was done with a variety of weapons, traps, and techniques. It is reasonable to suppose that many of the firearms acquired during the recent war will not be surrendered, and will be used in and around communal areas for hunting and poaching. Cross-border incursions from similarly equipped persons are highly probable, especially in the Caprivi area.

Education campaigns, focussing on both tribal and political leaders in the homelands, as well as the schools, will be necessary to promote a better understanding of the complex relationships between human needs for food, livestock, timber, and the needs of wildlife. Such campaigns will be vital for the survival of wildlife, and the ability to maintain yields of these valuable natural resources to local communities. If not yet undertaken, it will be important to see to what extent the experience gained with the Zimbabwe CAMPFIRE program, and similar programs in Zambia and elsewhere, can be replicated in the various homelands. The emphasis of such programs should be to illustrate the benefits local communities can derive from the continued presence of game animals, including the financial rewards of a safari industry.

Outside of the homelands, commercial hunting has become an ever increasing and profitable alternative or addition to cattle ranching on many of the larger farms. This has been actively encouraged and assisted by the Department of Nature Conservation since 1959. Visiting trophy hunters from many countries, especially Germany, have brought in a substantial amount of foreign exchange in recent years (R2.0 million in 1985). Photo safaris on private holdings contributed a further R5.0 million. The value of sport hunting is estimated at an additional R2.3 million. These amounts can be expected to increase substantially in the future with the cessation of hostilities.

The main game species targeted in hunting on private land are kudu, gemsbok, and springbok. The estimated kudu population of about 200,000 on private land was reduced to 75% of this figure in the early 1980's by a severe rabies outbreak, but should rebound.

Present legislation makes all game that occurs on private land the property of the landowner, and is therefore hunted at the owner's discretion. One exception to the owner's freedom is with regard to specially protected species. This is similar to the Zimbabwe legislation. In addition, the Directorate of Nature Conservation is empowered to inspect farms, and to set quotas for hunting and harvesting where necessary.

An item still awaiting satisfactory resolution is that of ivory trophies and elephant products. Recent attempts have been made under CITES to impose a ban on all exports and trade in these commodities. Several countries in southern Africa support the moratorium in principle, but are opposed to a total ban. Careful management within many of these countries has resulted in stable or growing elephant populations. In these countries culling is necessary to protect the relevant ecosystems from overpopulation by elephants. The income derived from the cropping of this surplus has been vital in helping to finance wildlife management, especially in certain communal areas. The techniques of elephant cropping and usage of the harvest are especially well developed in Zimbabwe, and merit study and adoption.

The harvesting of surplus game is also an important provider of meat for both local and export markets. Germany supplies the largest demand for venison. Springbok provide the bulk of the harvest, and exports bring in R1.0 million annually. It should be possible to expand this market in the future, as export demand far exceeds supplies. On various Karoo farms in South Africa, springbok are harvested by commercial contractors using helicopters and refrigerator vans under efficient and hygienic conditions. Namibia should prove equally suited to this form of operation. Mixed farming with game and domesticated livestock should provide far better biomass output than by using the latter alone. This type of system, properly managed, is also more environmentally friendly than reliance on domestic livestock alone to harvest vegetation on ranches.

4.10. Parks and Reserves

Namibia is exceptionally well served by National Parks and Reserves. These include some of the largest and best maintained on the African continent, with excellent rest camp facilities. Accommodation will need expansion, with facilities provided for persons in the lower income groups. Special attention should be given to the needs of school groups. The Department of Nature Conservation and the former Administrator of South West Africa followed a policy of steadily adding land from State holdings to the conserved category to encompass areas of special interest, or which were best suited to wildlife usage. These are classified into several different categories, but literature available for this study does not indicate how the status of each of these varies.

The following is a list of the parks and their respective areas:

| | |
|----------------------------------|------------------------|
| Namib-Naukluft Park | 49,768 km ² |
| Etosha National Park | 22,270 km ² |
| Skeleton Coast Park | 16,390 km ² |
| Khaudom Game Park | 3,841 km ² |
| W. Caprivi Game Reserve | 1,750 km ² |
| Fish River Nature Reserve | 461 km ² |
| Waterberg Plateau Park | 405 km ² |
| Hardap Dam Game Reserve | 250 km ² |
| Mahango Game Park | 244 km ² |
| Von Bach Dam Recreational Resort | 43 km ² |
| Daan Viljoen Game Park | 40 km ² |

In addition to the above, the recent transfer of some management responsibility in the Spergebiet to the Department of Nature Conservation adds in effect an enormous area (roughly 25,000 km²) to that already set aside for wildlife and environmental conservation. It also adds various additional ecotypes to those that currently have permanent protection. Details on the exact arrangements were not available for this report, but in view of the existing need to control illicit diamond digging it is unlikely that the public will have access to this area until all the known diamond deposits have been exhausted.

Apart from the protection provided on State land, wildlife also enjoys protection in varying degrees on most private farms. Some properties are devoted almost entirely to this, with game being managed on a sustained yield basis for trophy and sport hunting, controlled game cropping, or photo safaris. The future for such game animals will

depend on the policies that will be adopted by the new or future governments toward the ownership and exploitation of land. At present, indications are favorable.

A few other minor sites also provide a measure of protection, such as the game park at Kombat mine, and the sewage works at Swakopmund and Walvis Bay which attract numbers of water birds. The rocky headland at Cape Cross, which is used as a rookery by the colony of Cape fur seals, has a wall beyond which the viewing public is not admitted. The guano islands along the coast to the north and south of Lüderitz also provide full protection to the various seabirds since the public is not allowed access to them.

Shore angling is excellent, but is only permitted on the 300km stretch of coast from Sandwich Bay (south of Walvis Bay) to north of Cape Cross, and at the Nature Conservation resorts at Torra Bay and Terrace Bay on the Skeleton Coast. Legislation protects shellfish within this area, and there are closed seasons for rock lobster which abound near Lüderitz. There are no marine parks; however the inhospitality and inaccessibility of most of the coast provide adequate inshore protection.

For the past few years, the Department of Nature Conservation and private organizations have taken an active role in assisting the Damara homeland administration to develop plans for the integration of wildlife and herding. Special emphasis has been given to two project areas: the Huab river catchment area and the Purros river area which are inter alia, habitats for desert elephants and black rhinos. The Huab catchment area is now also receiving funding assistance from WWF.

As stated in Section 3.3 there is still a need for a comprehensive survey to ascertain what other ecotypes are currently unprotected. Arrangements should then be made to set aside representative samples of these ecotypes to ensure permanent conservation of all biotic resources of the country, preferably on a sustained use basis where practicable.

4.11. Natural Resource Legislation

Namibian wildlife appears to have inherited adequate protective legislation from the former administration, but details of this were not available for this survey. This protection will have been heightened by the inclusion in the new constitution that conservation of biological diversity is an essential component of state policy. Furthermore, the new post of Ombudsman is allocated the responsibility to investigate complaints regarding the over-exploitation of natural resources, the degradation of the environment, and the protection of natural beauty.

It is not known to the report authors as to whether or not environmental impact assessments are a requisite during the consideration of new development projects. This could be a serious shortcoming if such assessments are absent from current planning procedures.

4.12. Threats to Biotic Resources

The main threats in recent years have been to the marine fisheries, which have been grossly exploited by foreign fishing fleets. The enactment of the new 200 mile EEZ (with the legal ability to enforce this), coupled with the licensing of fishing fleets (mostly state run) and the allocation of quotas, should remedy this problem. Proper monitoring of catches and scientific research into the biology of the fish populations remain essential to the optimization of catches on a sustained basis.

Equally pressing has been the poaching of elephant and rhino in Damaraland and Kaokaland, and of elephant and other large mammals in parts of Caprivi Strip. Effective control will depend partly on building up and equipping an adequate cadre of well-trained game scouts, backed by helicopters and other means of rapid mobility. This will require funding on a considerably increased scale, beyond the resources of the new government. It will also need the active cooperation of the local populace. Education and benefit-sharing schemes will need to be expanded with this goal in mind.

The destruction of cheetah on ranching land by poisoning and trapping, and their containment by fencing, are a matter of considerable concern. Research is needed to determine how the cheetah can be best protected in farming areas, and to learn more about their biology, food preferences, breeding and genetics.

A further threat to the country's biotic resources results from the expanding population pressures on the fragile, over-taxed environment. Two significant components are overgrazing and tree cutting. The latter is a significant threat to birds and other fauna that inhabit the narrow strips of riverine woodland in Ovamboland and Kavango. Fortunately, the rainfall of these areas is probably sufficient to make forestation with fast growing species a practical alternative for the supply of local timber needs. Overgrazing exacerbates flash flooding and soil erosion, and it diminishes the replenishment of underground water supplies. It also contributes to the disappearance of many birds and animals, which no longer have places to hide or breed.

5.0. NATURAL RESOURCE MANAGEMENT PROJECTS

5.1. Current Projects

Presumably the appropriate Ministries in Windhoek, and possibly also in South Africa, hold most of the information on past natural resource management projects in Namibia, and of species population estimates useful for establishing trends in population sizes and locations. Most international aid organizations and conservation groups are currently in the planning stages for projects in Namibia. Simon Stuart's IUCN paper on biodiversity lists eight "Current Conservation Measures" in Namibia. They are as follows:

Government Administration of Conservation – including both the Ministry of Wildlife, Conservation and Tourism which is responsible for National Parks, Game Reserves, and wildlife on state-owned land, and all aspects of tourism (including the registration of private game ranches, guest farms, hunting farms, safari companies and professional hunters); and the Ministry of Agriculture, Fisheries, Water and Rural Development which is responsible for agriculture, inland and sea fisheries, veterinary services, forestry, water affairs and rural development.

Government and Directorate of Nature Conservation Projects – covering the investigation of threats to the conservation of biological diversity; inspection of farms and determination of game quotas; regular aerial game counts with appropriate research into trends; surveys of nomadic "communal game" species and cheetah, jackal and caracal; various ornithological projects; education of farmers and school-children concerning the use of poisons; Caprivi Management Plan linking conservation to economic development; Wetlands monitoring; dehorning of rhinos as a poaching deterrent.

Multi-agency Projects – particularly the Auxiliary Game Guard Network which is a joint Government, EWT, WWF, WSSA project instrumental in reversing trends in elephant and rhino poaching.

EEC Projects – radio-tracking of elephants in the Caprivi Strip.

EWT Projects – monitoring of dehorned rhinos, and contributions in environmental education programs and equipment, in Damaraland and Kaokoland.

WSSA Projects – support for Save the Rhino Trust Fund.

WWF Projects – current focus on three projects: Huab Catchment Area wildlife conservation and utilization; provision of emergency support for anti-poaching units; and conservation of desert elephants.

Integrated Rural Development and Conservation – working with two semi-nomadic herder groups in the Purros Project and influencing the way they view and use wildlife; control and levying of tourists; craft marketing; and casual conservation employment.

Ongoing work includes the US Fish & Wildlife Services proposal to reclassify African Elephants from threatened to endangered; the US Defense Department's African Coastal Security program funding including biodiversity conservation; World Resources Institute's "Tropical Forestry Questionnaire" which includes Namibia in an assessment of the international potential to combat global warming through forestry; National Geographic funded study of food chain dynamics in Namibia; FINNIDA's forests and woodlands project emphasizing past research and utilization history in planning new afforestation and reforestation programs; and NORAGRIC's (Norway) natural resource inventory of Namibia.

5.2. Planned Projects

By late spring 1991 a number of organizations will have completed background research and field visits, and will be ready to identify specific project involvement. These include UNDP, WWF, IUCN, NORAD/SIDA, World Bank, and USAID. The only specifics volunteered at this stage were the IUCN's National Conservation Strategy for Namibia, with funding proposal for NORAD and SIDA; and NORAD's further interest in natural resource management projects following the previously mentioned NORAGRIC inventory report.

Stuart's report lists 15 "Suggested Conservation Activities," most of which deal with action to counter the persecution of specific species; to ensure the protection of specific habitats; and the need for further surveys and studies on topics ranging from wetland assessment, incidental catches of dolphin and porpoise, effects of protective fencing, and the conservation needs of specific species.

The IUCN Species Survival Commission also lists the need to complete and publish the Black Rhino Continental Conservation Strategy, to provide additional support for game patrols, to maintain the existing monitoring program for rhinos, and to support public relations and extension work amongst the pastoral communities living in regions where endangered species exist.

5.3. Opportunities for USAID

The USAID representative in Windhoek stressed that "wildlife conservation is an area where we can be of immediate assistance to the Government of Namibia." Benefits accrued from effective conservation include the promotion and sustainability of its tourism industry, the earning of much needed foreign exchange, and the protection of one of the country's most valuable national treasures. (US Embassy cable 01683, Nov. 1990)

The Ministry of Wildlife, Conservation and Tourism submitted a list of 23 wildlife conservation proposals to the USAID representative in Windhoek. The proposals ranged from a request for a helicopter to funding research holding-pens. The prioritized list led the USAID representative to highlight three sets of projects:

- A study on the distribution and status of the Black rhinoceros in the Etosha National Park to develop a more informed and rational management/conservation program. The Ministry requests approximately US\$61,000;
- Two related studies to determine the carrying capacity of elephants in the Etosha National Park, and elephant movements in north-western Namibia and trans-migration into southern Angola. Funding requests are ca. US\$35,900 and US\$80,400, respectively; and
- Financial and equipment support to the newly formed anti-poaching units. Much of this support can take the form of non-lethal military style equipment such as uniforms, sleeping bags, tents, mess tins, compasses, and binoculars.

The full list of project proposals was not available to this report. It should be obtained and consideration should be given to each project. Some opportunities that became evident during the writing of this paper include the following:

1. Survey and document all ecotypes, with the objective of determining which still require protection to conserve biological diversity and individual species.
2. Finance a study on cheetah biology in settled areas to help conserve this universally threatened species.
3. Finance personnel and equipment for coastal fisheries research and protection.
4. Finance afforestation/reforestation projects in Ovamboland and Kavango.
5. Finance the production of audio-visual training materials and facilities for educational use in natural resource management programs.
6. Donate buses to facilitate access of low-income people to game reserves to enhance environmental awareness.
7. Finance the building of dormitories and interpretive centers at Etosha National Park, and Namib Desert parks.
8. Finance the writing and publication of books and pamphlets on wild flowers, succulents and other natural history subjects to increase knowledge, awareness, appreciation and conservation.

Little is known about the economics of wildlife utilization, although it is the subject of a future World Bank Technical Paper. Kenya, South Africa and Zimbabwe have all had successful wildlife management programs which earn revenue from a broad mix of industries. Tourism in protected areas has historically been the most important component of wildlife industry. Other revenue earners include trophy hunting, sport hunting by locals, game cropping, and live trade for zoos and restocking.

Wildlife management is associated with a number of benefits over domestic livestock management. First, the indigenous species use a wider range of resource components than domestic livestock, and they are better adapted to survive the harsh extremes of drought and disease epidemics. Furthermore, wildlife hosts a range of values (recreation, aesthetic, cultural, scientific, as well as nutritional) that can often be exploited simultaneously. Tourism is non-consumptive. Live animal trade and sport hunting are light consumptive. Animals killed on safari can bring two sources of income; the head is awarded to the high-paying hunter and the body meat is sold fresh or dried at local markets (if on-site refrigeration is organized). Finally, initial studies in Zimbabwe suggest that net returns (Z\$/kg) are higher for wildlife than livestock as the costs of management are much lower. Returns per unit area or quantity of biomass are indicators of the efficiency with which rangeland resource is utilized.

New opportunities to support natural resource management in Namibia will become apparent once all interested organizations complete their background studies and funding proposals, and as ongoing/future research reveals real needs.

USAID funding will be most effective if it is coordinated with the other organization's resource allocation, and if information is shared freely between all participants in Namibia's natural resource management. Investments toward facilitating such interaction and efficient resource use could be an important first step. In particular, the strategies developed over many years in Zimbabwe should be studied in order to involve local leadership and teachers at all levels in the planning and wise management of resources for sustained use.

This review requires supplementation by an in-country follow-up to interview appropriate personnel there, to access additional reports not available in Washington, D.C., and to conduct a visual check of the more heavily populated and vulnerable areas. This would provide USAID with more detailed background and recommendations as a basis for funding biological diversity conservation programs in Namibia.

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- A discussion of the historical distribution and size of elephant populations, with analysis of the causal factors for current elephant break-outs on the southern and eastern borders of Etosha.

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It should also be noted that various publications on Botswana natural resources and the Kalahari will be of relevance for Namibian studies.

UNDP - New York
Africa Bureau
UNDP, RBA, DCI
RM 2478
1 UN Plaza
NY, NY 10017

Marku Vasipaa
Namibia Desk

(Tel) 212 906-6012

- Mr. Vasipaa is scheduled to travel to Namibia in early March. He currently has no list of projects in Namibia, but a document on government policy options is currently being produced. He hopes to have a copy of this document when he returns.

IUCN-Species Survival Commission Dr. George B. Rabb
c/o Chicago Zoological Society Commission Chairman
Brookfield, IL 60513
USA

(Tel) 708 485-0263 EXT 304

- Dr. Rabb was involved in Simon Stuart's summary volume of Biodiversity in Sub-Saharan Africa. He has many contacts in Namibia, some of these are listed in the foreign contacts appendix, grouped under the Species Survival Commission Network Participants.

World Bank
1818 H Street, NW
Washington D.C.

George Gebhart
Namibia Office
(J Bldg)

(Tel) 202 473-4421

- Mr. Gebhart was out of Washington for the duration of this project period. World Bank information is currently limited, two papers of interest are the UNICEF survey of "Income, Health and Nutrition Situation in an Independent Namibia (Sept 1990)," and the "Namibia: Preliminary Economic Review (May 1990)."

African Wildlife Foundation
1717 Massachusetts Ave, NW
Washington D.C. 20036

Diana McMeekin

(Tel) 202 265-8394

- Ms. McMeekin is believed to have information on Namibia, but we were unable to contact her and discuss the nature of her information.

US Environment Protection Agency Linda Spencer
Infoterra
401 M Street, SW
Washington D.C. 20460

(Tel) 202 382-3522

- Possesses country profile of Namibia before Independence. Can track specific information through E-Mail contact with the Infoterra Program Activities Center in Nairobi, Kenya, although as of Feb 1991 Namibia had yet to designate a Infoterra focal point.

USAID
US Department of State
Washington D.C. 20520

David Miller
Namibia Desk

- Mr. Miller provided papers and reports held in the USAID Namibia file.
- This post is now being phased out, and responsibilities for Namibia will be incorporated in the Southern Africa Desk (Ms. Laurie Mailloux)

Other Suggested Contacts

Peter Gogan
Wildlife Bureau
National Park Service

(Tel) 218 283-9821
(H) 218 286-3563

- Terrestrial Wildlife Research Biologist on USFSP roster who did ecological research in Namibia 15 years ago.

Robert Gordon

(Tel) 802 656-3884

- Namibian born, now working at a University in Vermont

Prof. Robert Hitchcock
University of Nebraska
Lincoln, NE

(Tel) 402 472-2480

- Main Namibian contact for WRI Tropical Forestry Survey, his field is anthropology but he has broad knowledge of the country.

Carole Klopatek

(Tel) 602 897-7897

- Mrs. Klopatek is a microbial ecologist with previous work experience in Namibia during the past two years. She is in possession of many current documents and reports, and is planning to return to Namibia in near future to study food chain dynamics under National Geographic funding.

John Marshall

(Tel) 603 924-3486

- Worked on various assignments and projects in Namibia since 1950.

Donald Morris

(Tel) 713 668-8665

- Father of Julia Morris at FSP, should know names of relevant people at the University of Windhoek.

Veiccoh K. Nghiwete
First Secretary, Namibian Consulate
1413 K St. N.W. (at 14th and Vermont Ave.)

(Tel) 202 289-3871

He is at present the only official in this newly established office, but was away during the period of this survey.

Peter Spear
Natural Resources Consulting Company

(Tel) 603 228-4606
(H) 603 224-8202

- On FSP roster, worked one year in Namibia on Wildlife Management.

Other Persons Contacted: No Available Information

Forestry Support Program **Julia Morris** (Tel) 202 453-9589
USDA Forest Service
14th & Independence Ave, SW
Washington D.C.

-No country file on Namibia, did pass on the names of people who might have information which are included in report.

Foreign Fisheries Analysis Branch **Laura Bloodgood** (Tel) 301 427-2286
Bureau of International Affairs
National Oceanographic and Atmospheric Admin.
Ministry of Commerce
1335 East-West Highway
Silver Spring, MD

- Possesses country file that is open to USAID browsing if requested, but it contains very little specific information.

Office of Fisheries Affairs **Larry L. Snead** (Tel) 202 647-2335
US Department of State Director
Washington D.C. 20520

- No dealings with Namibia as of yet, nearest is the the fisheries of West Africa where they are dealing with concessions for US trawlers.

Office of Ecology, Health **Mark Willis** (Tel) 202 647-2418
and Conservation Ecologist
Bureau of Oceans, Environment,
and Scientific Affairs
US Department of State
Washington D.C. 20520

- Mr. Willis is responsible for all Namibian wildlife issues. At the time of writing he had no specific information.

Namibian Natural Resources: Foreign Contact Personnel

Namibia

Surveyor-General
Kaiser Street
Pvt Bag 13812
Windhoek 8000

- Aerial photos, orthophoto maps and topographic sheets available.

National Archives
Pvt Bag 13250
Windhoek 9000

Desert Ecological Research Unit
P.O. Box 1592
Swakopmund 9000

Desert Ecological Research Unit
Namib Desert Research Station
P.O. Box 953
Walvis Bay 9190

- Dr. Mary K. Seely, Director (American) - Founded in 1963 for the purpose of conducting desert related research, particularly in the fields of botany and zoology. Possesses a library of over 600 volumes, and contribute to the publication Madoqua (scientific papers).

South West African Scientific Society
P.O. Box 67
Windhoek 9000

(Tel) 061-225372

Almuth Henrichsen, Director

United States Information Service
P.O. Box 9185
Windhoek 9000

(Tel) 061-32610
(Fax) 061-32476

Harvey I. Leifert, Director

Department of Nature Conservation, Wildlife and Tourism
Pvt Bag 13184
Windhoek 9000

- Hanno Rumpf, Sec. - Responsible for the development and preservation of Namibia's natural resources. Library of ca. 3000 monographs, 500 periodicals. Publishes Madoqua, the official journal of the Department for scientific papers.

Lüderitz Museum
P.O. Box 512
Lüderitz 9000

- Mrs. A. Dyck, Supervisor - Founded in 1966, this small museum incorporates the collections of Friedrich Eberlanz, with interest to the fields of archaeology, herpetology, botany and mineralogy.

State Museum
P.O. Box 1203
Windhoek

- B.C. Stevens, Director - Founded in 1958, the institution focuses on Namibia's natural history, cultural history, anthropology, and national monuments. Library of 4800 volumes and 350 periodicals.

- C.G. Coetzee, Member of Rodent Specialist Group (IUCN)

Swakopmund Museum
P.O. Box 361
Strand Street
Swakopmund

- D. Keibel, Chairman - A small museum founded in 1951, with interest in the fields of natural history, mineralogy, marine life, and history.

Namibia Nature Foundation
P.O. Box 245
Windhoek 9000

(Tel) 061-33145
(Fax) 061-34512

- Douglas F. Reissner, Director - The foundation was established to provide a liaison between the government and agencies interested in funding natural resource related projects.

Directorate of Nature Conservation
Namib Research Institute
P.O. Box 1204
Walvis Bay 9190

(radio tel) 27/642/3581

- Dr. H.H. Berry, Chief Researcher, Member of Equids, Cat Specialist Groups (IUCN)

Mr. Dieter Morsbach
Private Bag 13306
Windhoek 9000

- Member of Cat Specialist Group (IUCN)

Dr. Graham Williamson, Senior Dental Officer
P.O. Box 499
Oranjemund 9000

(Tel) 27 2317

- Member of Orchid Specialist Group (IUCN). Research Associate, Bolus Herbarium, U.C.T.

Endangered Wildlife Trust
c/o Palmwag, Box 339
Swakopmund 9000

- Ms. Margaret Jacobsohn, Socio-Ecological Rural Developer, Member of Ethnobotany, Ethnozoology Specialist Groups (IUCN)

- Mr. Garth Owen-Smith, Agriculturist, Socio-Ecologist, Member of Ethnobotany, Ethnozoology Specialist Groups (IUCN), Save The Rhino Trust - Trustee

Nature Conservation & Recreation Resorts
Private Bag 13306
Windhoek 9000

(Tel) 061 63131

- Mr. H.J. Schrader, Chief Nature Conservation Researcher, Member of Antelope Specialist Group (IUCN)

- Mr. M. Griffin, Area of interest: Namibian Canids

- Mrs. I. Stutterheim, Area of interest: Black-backed jackal, Cape fox

- Mr. P.T. van der Walt, Area of interest: Antelopes

Mr. Simpson Tjongarero
Private Bag 2005
Khorixas 9000

- Member of the Damara Council, & Nature Conservation Board, Save The Rhino Trust - Trustee

Blythe and Rudi Loutit
P.O. Box 83
Khorixas
Damaraland 9000

- Blythe Loutit, Founder and Field officer of Save The Rhino Trust

- Rudi Loutit, Senior Conservation Officer, Save The Rhino Trust - Trustee

Lorna Davies
Private Bag 13306
Windhoek 9000

- Accountant, Save The Rhino Trust - Trustee

Jan Bührmann
P.O. Box 22006
Windhoek 9000

- Consultant Civil Engineer, Save The Rhino Trust - Trustee

Wim van der Plas
P.O. Box 889
Swakopmund 9000

- Civil Engineering Contractor, Save The Rhino Trust - Trustee

Martin Bertens
P.O. Box (?)
Swakopmund 9000

- Pilot, Save The Rhino Trust - Trustee

First National Development Corporation (Tel) 061-30611
11 Goethe Street (Fax) 061-33943
Pvt Bag 13252
Windhoek 9000

- A.R. Meiring, Executive Chairman

Development Organization of Namibia
Box 1720
Windhoek 9000

- Bience Gawanas, President; Sandra Tjitendero, Vice president, Research; Carolyn N. Hughes, Vice president, Program.

OXFAM/UK (Tel) 061-222065
Box 24576 (Fax) 061-228080
28 Bismarck Street
Windhoek

- Caroline Allison, Director

UNDP (Tel) 061-26461
Box 13329 (Telex) 061-4944
Leutwein Street
UNDP, c/o UNTAG
Windhoek 9000

- David McAdams, Resident Representative; Jeanne Anglin, Program Officer

Evangelical Church in South West Africa (Tel) 061-224531/2/3
6 Church Street (Fax) 061-226775
Windhoek

- Rt. Rev. Hendrik Frederick, Bishop; Wilfred Neusel, Project Secretary

Council of Churches in Namibia (Tel) 061-37510/1/2
8521 Mashego Street (Fax) 061-225988
Katutura

- The Rev. Abisai Shejvali, General Secretary

British High Commission
116 Leutwein Street
Windhoek

(Tel) 061-232022

- P.G. Wallace

Private Sector Foundation
Box 2217
4 von Lindequist Street
Windhoek 9000

(Tel) 061-37370/1/2

- Charles Truebody, Executive Director

Bushmen Development Foundation
Box 902
Windhoek

(Tel) 061-223784
636327

- John Marshall; Dr. Megan Biesele

Lutheran World Federation
Box 23129
82 John Meinert Street
Windhoek

(Tel) 061-226278

- Nils Nikolaisen, Director

RRR
Box 9965
8 Montblanc Street
Eros
Windhoek 9000

(Tel) 061-37510/1/2/3
(Fax) 061-225988
(Telex) 061-483

- Emanuel Dumeni, Director

Namibia Development Trust
Box 8226
57 Pasteur Street
Windhoek 9000

(Tel) 061-38002
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- Linda Kazoumbaue, Coordinator

Planning Commission
Box 22021
Windhoek

- Dr. Zed Ngavirue, Director

OXFAM/Canada
Box 9042/Box 22229
20 van Rhijn Street
Windhoek 9000

(Tel) 061-33624
(Fax) 061-33347

- Adrian Strong, Programme Coordinator

Namibian Community Cooperatives Alliance
Box 20642
Windhoek 9000

- Paul Vleermuis, Director

UNICEF
Philip Troskie House
Leutwein Street
Windhoek 9000

(Tel) 061-38743
(Fax) 061-224413
(Telex) 061-889

- Shahida Azfar, Representative Designate

SWAPO Headquarters
Box 24149
Goethe Street
Windhoek

(Fax) 061-32368

- Peter Katjavivi, Research Director

DTA Headquarters
Box 173
Leutwein Street

(Tel) 061-38530
(Fax) 061-224078
(Telex) 061-563217

- Andrew Matjila, Vice-chairman

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- Otilie Abrahams

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- Kenneth Abrahams

Zimbabwe

Mr. India Musokotwane
IUCN Regional Representative
P.O. Box 745
Harare

(Tel) 002634-728266
(Fax) 002634-795150

- Mr. Musokotwane is currently planning the development of a national conservation strategy for Namibia. At the time of writing he was visiting IUCN headquarters in Switzerland.

Zambia

United Nations Institute for Namibia
P.O. Box 33811
Sadzu Road
Lusaka

(Tel) 216468

- Hage G. Geingob, Director

Republic of South Africa

National Parks Board
643 Leyds Street
Muckleneuk, Pretoria 0001

(Tel) 012 343-9770
(Fax) 012 343-0907

- Dr. G.A. Robinson, Deputy Chief Director

Port Elizabeth Museum
Box 13147
Humewood 6013

(Tel) 041 561051

- Dr. William Roy Branch, Curator of Herpetology, Member of Tortoise and Freshwater Turtle Group (IUCN)

National Botanical Institute
Private Bag X7
7735 Claremont

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- Mr. Brian J. Huntley, Chief Director, Species Survival Commission Regional Member and Steering Committee Member (IUCN)

Saasveld Forestry Research Center

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- G. Johann Breytenbach, Program Manager for Strategic Nature Conservation.

Finland

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SF-80101 Joensuu

(Tel) 358-73-1511
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University of Helsinki, Institute of Development Studies
Annankatu 42 D
SF-00100 Helsinki

Sweden

Scandinavian Institute of African Studies
P.O. Box 1703
S-75147 Uppsala

SIDA (Swedish International Development Agency)
Stockholm

- Mrs. Löfström-Berg, Namibia Desk Officer

Norway

Norwegian Institute of International Affairs
P.O. Box 8159
Oslo 1

NORAGRIC
Centre for International Agricultural Development
Agricultural University of Norway
P.O. Box 2
N-1432 ÅS-NLH

(Tel) 09 949794
(Fax) 09 940760

- Stein Bie, Director - NORAGRIC will be sending out a Natural Resource Inventory team this spring, funded by both NORAD and SIDA, preparation for Natural Resource Management projects.

Germany

Bundesarchiv
Am Wöllershof 12
D-5400 Koblenz

German Development Institute
Fraunhoferstrasse 33-36
D-1000 Berlin 10

Deutsches Institut für Tropische und Subtropische Landwirtschaft
Steinstrasse 19
D-3430 Witzenhausen

Switzerland

IUCN
Africa Bureau
Avenue du Mont-Blanc
CH-1196 Gland

(Tel) 022-649114

- Jeff McNealy - (Mr. McNealy was recommended by several sources in the Washington area.)

United Kingdom

School of Oriental and African Studies
University of London
Malet Street
London WC1E 7HP

African Elephant Conservation Coordinating Group
Oxford

(Tel) 0865-511455
(Fax) 0865-511450

- Stephen Cobb, Secretariat - This organization is preparing individual country plans for African Elephant range states, and coordinating elephant conservation within Africa, under contract from USAID and US Fish & Wildlife Service.

Department of Applied Biology
University of Cambridge
Pembroke Street
Cambridge CB2 3DX

(Tel) 0223 334431

- Mr. P. Stander, Area of interest: African Wild Dogs

World Conservation Monitoring Center
Cambridge

(Tel) 0223-277314

Summary of Literature Search

A comprehensive literature search from the AID Development Information Center was undertaken with the help of Mary Nelson, (Tel) 703 875-4818. She scanned the following cataloging systems:

AID Publications - Of a total of 18 items, only one post-1981 item listed, "Annual Budget Submission, FY 1992: Namibia." The remaining items are dominated by papers and studies done in "Anticipation of Economic and Humanitarian Needs," and few include information on Namibia's natural resources.

CAB - The key search for reports and journal articles covering international topics.

AGRICOLA - Primarily a domestic topic search of material at the National Agricultural Library, although did turn up some interesting articles from South African journals.

Other searches - SOCIAL SCISEARCH 1972-91/wk 03
 SOCIOLOGICAL ABSTRACTS 1963-90/Dec
 PAIS INTERNATIONAL 1976-90/Dec
 WORLD AFFAIRS REPORT 1971-90/Feb
 FOREIGN TRADE & ECON ABSTRACTS 1974-90/Dec

The searches targeted the following description sets:

- 1 Namibia or South West Africa
- 2 Natural Resources or Wildlife or Minerals or Fisheries or Land Use or Geology
- 3 Environmental Factors or Environment or Environmental?
- 4 Mines and Mineral Resources

All items listed in sets 2,3 & 4 were cross-referenced with set 1. This sub-set was further restricted to those articles written in English.

A total of 95 items were found. Not all of these are listed in the bibliography due to irrelevance of many articles, and repetition of some items between catalogue systems. All of the original search print-out is included in an appendix.

The Smithsonian Natural History Museum Library was the next of several other separate searches conducted. Using NAMIBIA as a Keyword search on their GEAC Library System, 88 items were found. All titles, and in some cases the summaries, were examined, and 19 items were selected (including 1 videotape). Three more items were subsequently the focus of specific title searches based on input from Darrel C.H. Plowes, Senior Technical Advisor, and added to the bibliography.

Contact people at the Natural History Museum Library are:

| | |
|---|--------------------|
| Gil Taylor - Vertebrate Zoology Library | (Tel) 202 357-4696 |
| Ruth Schallert - Botany Library | (Tel) 202 357-2715 |

The Library of Congress, not surprisingly, had the largest Namibia collection, located in the African Section, John Adams building. Our preliminary search discovered 21 items of interest to this study. This figure should not be considered exhaustive. Maps of southern Africa, ranging from political, physical, geological to demographic, migration routes, etc., are found on the first floor of the Madison building. Further inquiries should be directed to:

Laverne Page – Area Specialist, African Section (Tel) 202 707-1979
James C. Armstrong – Overseas Operations Division (Tel) 202 707-5273

Ms. Page sits in the African Section Reading Room and is responsible for all assistance with Namibia. Mr. Armstrong is responsible for acquisitions, and has spent many years in Africa collecting material for the Library of Congress. He visited Namibia as recently as April 1990. He is a valuable source of information regarding literary sources held in the Library of Congress, and those available in Namibia.

The World Resources Institute possessed very little material on Namibia. Kirk Talbott produced two documents, a FINNIDA baseline study on forests and a PVO strategy study prepared by PACT. The only other useful information came from Christine Haugen who is the primary researcher for the "Combating Global Warming Through Forestry" program. Ms. Haugen has sent out a Forestry Questionnaire for Namibia to a variety of people with experience in Namibia. As of 6 February 1990, only one had been completed and returned (Dr. Robert K. Hitchcock, Anthropology Department, University of Nebraska-Lincoln). A copy of Dr. Hitchcock's responses was made available to this study. Ms. Haugen will probably be able to provide more information on Namibian forestry in the future.

Christine Haugen – Research Assistant, WRI (Tel) 202 662-3485

Ken Stansell, US Fish and Wildlife Service, is coordinating the African Elephant Grant program. He will be receiving information on large mammal populations in southern Africa and related projects. Freely available literature there was currently limited to a copy of the African Elephant Action Plan (March 1990), and various related newspaper articles.

The Joint World Bank/IMF Library, located on the 6th Floor of 1875 I Street building, had an impressive collection of current articles, books, official papers, and maps on Namibia. It is currently difficult to get access to this library for "security reasons", but once inside it is one of the easiest libraries to use. The Bank-Fund network libraries collection is listed on two databases (CATALOG and BIBLIOGRAPHY) which are available to search using JOLIS ONLINE. Appointments for visitors must be made one week in advance through a permanent Bank or Fund employee. Separate appointments must also be made for the sectoral library, where most of the books and reports are located. Visitor loans at both libraries are prohibited. It is easiest to access Bank-Fund information through interlibrary loan.

The National Geographic Library possessed a few articles, books, and two films not found elsewhere during the literature search. Of particular interest was the staff handbook on Namibia, a collection of looseleaf notes compiled for the benefit of staff and external researchers going to Namibia. The contact person is:

Carolyn Locke, National Geographic librarian (Tel) 202 857-7783

Enquiries were also made at the Department of Interior Natural Resources Library, United Nations Information Center Library, UNEP library, USEPA library and the African Wildlife Foundation with the following results:

Department of Interior Natural Resources Library (Tel) 202 208-5815

- The online catalog showed only two items, books on the minerals industry in Namibia, and official geographic name listings in the Gazetteer.

United Nations Information Center Library (Tel) 202 289-8670

- No information specific to natural resources in Namibia.

United Nations Environment Program Library (Tel) 202 289-8456

- No country specific information, only global and regional reports.

United States Environmental Protection Agency Library (Tel) 202 382-3522

- Linda Spencer, Infoterra, has volunteered to help search for specific documents, including E-Mail contacts with the Infoterra office in Nairobi. Currently in possession of pre-Independence profile of Namibia.

African Wildlife Foundation (Tel) 202 265-8394

- Diana McMeekin relayed message that she had some relevant reports and papers on wildlife in Namibia.