

**REPORT TO THE GOVERNMENT
OF LIBERIA ON CONSERVATION,
MANAGEMENT AND UTILIZATION
OF WILDLIFE RESOURCES**

by

KAI CURRY-LINDAHL



International Union
for Conservation of Nature and Natural Resources
Morges, Switzerland
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The International Union for Conservation of Nature and Natural Resources (IUCN) was founded in 1948 and has its headquarters in Morges, Switzerland; it is an independent international body whose membership comprises states, irrespective of their political and social systems, government departments and private institutions as well as international organisations. It represents those who are concerned at man's modification of the natural environment through the rapidity of urban and industrial development and the excessive exploitation of the earth's natural resources, upon which rest the foundations of his survival. IUCN's main purpose is to promote or support action which will ensure the perpetuation of wild nature and natural resources on a world-wide basis, not only for their intrinsic cultural or scientific values but also for the long-term economic and social welfare of mankind.

This objective can be achieved through active conservation programmes for the wise use of natural resources in areas where the flora and fauna are of particular importance and where the landscape is especially beautiful or striking, or of historical, cultural or scientific significance. IUCN believes that its aims can be achieved most effectively by international effort in cooperation with other international agencies such as UNESCO and FAO.

The World Wildlife Fund (WWF) is an international charitable foundation for saving the world's wildlife and wild places. It was established in 1961 under Swiss law and shares joint headquarters with the International Union for Conservation of Nature and Natural Resources (IUCN). Its aim is to support the conservation of nature in all its forms (landscape, soil, water, flora and fauna) by raising funds and allocating them to projects, by publicity, and the education of the general public and young people in particular. For all these activities it takes scientific and technical advice from IUCN.

Although WWF may occasionally conduct its own field operations it tries as much as possible to work through competent specialists or local organisations.

Among WWF projects, financial support for IUCN and for the International Council for Bird Preservation (ICBP) have the highest priority, in order to enable these bodies to build up the vital scientific and technical basis for world conservation and specific projects. Other projects cover a very wide range from education, ecological studies and surveys, to the establishment and management of areas such as national parks and reserves and emergency programmes for the safeguarding of animal and plant species threatened with extinction.

WWF fund-raising and publicity activities are mainly carried out by National Appeals in a number of countries, and its international governing body is made up of prominent personalities in many fields.

Report to the Government of Liberia on Conservation,
Management and Utilization of Wildlife Resources

by

Kay Curry-Lindahl
Chairman of the Nimba Research Committee,
Vice-Chairman of the Survival Service Commission,
and of the Int. Commission on National Parks of IUCN.

Introduction

Liberia is almost entirely located within the tropical lowland rain forest belt of Africa. Only its northernmost part extends into the belt of Guinean woodland savanna, which stretches across Africa from Senegal to Sudan. Coastal mangrove swamps and lagoons, river marshes and man-made savannas and bushlands are scattered within the high forest belt and concentrated along the coast.

Liberia, being chiefly a rain forest country, has to consider an important and, for Africa, significant heritage of renewable natural resources including some unique mammalian species. This is a great responsibility not only towards the Liberian people but also to Africa and the world.

The fauna of Liberia is adapted and specialized to the lowland rain forest ecosystem and its range of habitats: brackish and freshwater swamps, rivers, periodically inundated gallery forests, and high forests. This means that the animals are typical of the great African equatorial lowland rain forest, but, as stated above, Liberia also possesses some unique species.

Background of this Report

In 1963 the Nimba Research Committee of the International Union for Conservation of Nature and Natural Resources (IUCN) was authorized by the Government of Liberia and by the LAMCO to carry out biological and ecological investigations on Mount Nimba. This research has been financed by the LAMCO and based at the Nimba Research Laboratory in Grassfield. It has been focused on the vegetation and the vertebrate fauna (mammals, birds, reptiles and amphibians), but other zoological groups have also been investigated. The results of the scientific work at Nimba have clearly indicated how important this mountain chain is from the educational, recreational and scientific points of view. I will comment further on this aspect in the regional part of this report.

The author has served as Chairman of the Nimba Research Committee since its establishment in 1962. Hence, it has been my task to organize the scientific work at Nimba as well as to serve as liaison between the Committee and the Government of Liberia and the LAMCO. As the investigations at Nimba have been conservation orientated it has chiefly been the Secretaries of Agriculture that I have informed about our work at Nimba. Annual conversations with the Hon. John W. Cooper, Secretary of Agriculture, led to discussions on conservation of nature and renewable natural resources in general and the wildlife of Liberia in particular. In 1966, the Hon. Mr. Cooper suggested that I should draw up a nature conservation plan for Liberia including proposals for the establishment of national parks, nature reserves, wildlife management, hunting legislation and so on.

Unfortunately, other conservation commitments and missions in Africa on behalf of the United Nations Development Programme (UNDP), UNESCO, IUCN, the Organization of African Unity (OAU) and various Governments have almost constantly during 1966-1969 kept me away from my institution in Stockholm, where I had planned to draft in my free time the conservation plan for Liberia. Therefore, this report has been considerably delayed. I am grateful for the patience and the understanding for my dilemma that Secretary Cooper has constantly shown, most recently expressed at our meeting in Monrovia on February 7, 1969.

Other discussions of great value to me have been held with various officials of the Department of Agriculture, particularly with Mr. Anthony T. Sayeh, Chief of the Bureau of Forest Conservation, Mr. T. A. Gorgla, Deputy Chief for Forest Management and Mr. George G. Fully, Deputy Director of the Bureau of Forest Conservation.

Beside information received from Liberian authorities and available literature this report is based on personal experience in Liberia during the period 1963 - 1969.

African Convention on Conservation
of Nature and Natural Resources

In 1964 the OAU asked IUCN to draw up, in cooperation with FAO and UNESCO, an African Convention on Conservation of Nature and Natural Resources* This Convention was adopted by the Council of Ministers of the OAU at its meeting in Addis Ababa in February 1968 and was signed by the African Heads of State in Algiers in September 1968. Since then a number of Governments have ratified the Convention.

Liberia belongs to the Contracting States which have signed the Convention..Hence, it is desirable that the national legislation of Liberia should reflect the conservation obligations and measures agreed to by the Contracting States.

Therefore, this report on a conservation plan for Liberia has written in close agreement with the guidelines given by the African Convention on Conservation of Nature and Natural Resources. As I have had the honour to assist OAU on behalf of IUCN in drafting the African Convention, it has been easy for me to work in its spirit. Also FAO'S document on the conservation and Management of Wildlife and its Habitats has been useful. This document was finalized and adopted by the Working Party on Wildlife Management of FAO's African Forestry Commission at its meetings in Fort Lamy 1967 and Lomé 1969. Since the author as representative of IUCN was invited to assist the African Governments and the Secretariat of FAO by participating in the work on this document I am familiar with its thinking.

Principles

The preamble of the African Convention on the Conservation of Nature and Natural Resources reads as follows:

"We the Heads of State and Government of Independent African States

FULLY CONSCIOUS that soil, water, flora and faunal resources constitute a capital of vital importance to mankind;

CONFIRMING, as we accepted upon declaring our adherence to the Charter of the Organization of African Unity, that we know that it is our duty "to harness the natural and human resources of our continent for the total advancement of our peoples in spheres of human endeavour";

FULLY CONSCIOUS of the ever-growing importance of natural resources from an economic, nutritional, scientific, educational, cultural and aesthetic point of view;

CONSCIOUS of the dangers which threaten some of these irreplaceable assets:

ACCEPTING that the utilization of these natural resources must aim at satisfying the needs of man according to the carrying capacity of the environments;

DESIRIOUS of undertaking individual and joint action for the conservation, utilization and development of these assets by establishing and maintaining their rational utilization for the present and future welfare of mankind; CONVINCED that one of the most appropriate means of achieving this end is to bring into force a convention."

Actual Conservation Legislation in Liberia

In Liberia, the Forest Conservation Act of 1953 states that the forests are among the Nation's "greatest natural resources and may best contribute to our economic and social welfare by being devoted to their most productive use for permanent good of the whole people".

In the field of wildlife, Section IV, Paragraph g, of the same act stipulates that one of the primary objects of the Bureau of Forest Conservation is to conserve recreational, fish and wildlife resources of the country concurrently with the development of a forestry program. Further the Act (Section X) also gives power to the President of the Republic "to create and establish National Parks embracing any area of the country having such outstanding science, recreational, scientific or other pertinent values that it is deemed wise and expedient in the national interest to set aside as permanent parts to be retained insofar as is practicable in their existing condition".

In fact, President Tubman has on several occasions expressed concern over the state of Liberia's forest reserves and resources. In August 1953, at a council meeting in Tappita, the President discussed possible revenues of forests, in which he included game resources as a food supply as well as the general benefits for the people of Liberia through soil conservation and water retention. The President also urged everyone to grow rice in swamps, instead of cutting down the high forest for rice fields. In other words, President Tubman warned against the destructive shifting cultivation practice and emphasized the value of wildlife as a protein resource.

Thus, as far as forests are concerned, Liberia's Forest Conservation Act takes care of this resource. However, this legislation is chiefly concerned with the timber producing values of forests without regard to the multiple role of the forests as habitats for wildlife, from which proteins in great scale are derived. The Act only mentions the recreational value of fish and wildlife resources, despite the fact that this protein capital represents one of the most useful natural resources of Liberia. Moreover hitherto no National Parks and Wildlife Refuges have been established. The lack of adequate measures for the conservation, management and utilization of wildlife has led to a deplorable destruction of wild animal resources, caused by over-exploitation through continuous hunting pressure combined with a far-reaching deterioration of habitats through unwise land use. In this way a major protein resource in Liberia is gradually being eliminated.

Therefore, it seems to be necessary for Liberia to take drastic and urgent measures to restore, conserve and manage the wild animal resources of the country. The present report, essentially, deals with these problems.

The natural setting of Liberia

In the Introduction of this Report some general natural history-features of Liberia as a high forest country were briefly mentioned.

Physiographically, Liberia is characterized by four regions:

1. A coastland of rolling hills extending inland 50-80 miles and varying in height from sea level to about 300 feet.
2. Dissected table-lands, separated from the coast land by an escarpment (of about 300 feet). These plateaus form the largest portion of Liberia and rise to 1000-2000 feet. Several mountain ranges are located on the plateaus and reach locally to near 3000 feet. Two of these ranges are so important that they are here regarded as distinct regions. They are:
3. The Wologisi Range (culminating in Mount Wutivi, 4.400 feet) in north-western Liberia and
4. the Nimba Range in north-eastern Liberia. The latter massif is part of a mountain chain, located in three countries: Liberia, Guinea and the Ivory Coast. The highest point of Liberian Nimba, before the mining activities changed the elevation, reached 4.520 feet, the highest peak of the Nimba Range, 5.600 feet, lies in Guinea.

The tropical climate of Liberia is characterized by high rainfall, although there is a dry season of varying length in different areas of the country. The coastal belt has the heaviest precipitation (Monrovia 4750 mm a year), whereas the rainfall gradually decreases towards the interior of Liberia (Harbel 3450 mm, Totota 2200 mm, Suakoko 1900 mm). However, in the mountainous regions the precipitation is again high, with 3000 mm on Mount Nimba for example.

Humidity is, in general, high with an average above 90 % in the coastal region, whereas there is a higher variation in the interior and mountainous regions. When the dry Harmattan wind is blowing, humidity may fall below 50 %.

Mean temperatures in Liberia vary between 75-86° F.

The climatic pattern of Liberia favours high forest vegetation and is important for the understanding of the ecology of the area.

Lateritic soil covers most of Liberia. However, patches of flat plains with white-sand soil occur locally. The pre-Cambrian bedrock is composed of igneous and metamorphic rocks such as granitic gneisses, sandstones and schists.

As said above the vegetation of Liberia chiefly consists of forests. High forests occupy between 35-40 % of Liberia, but also within the remaining 65-60 % there are forest areas in various stages of degradation due to shifting cultivation or recoverage after farming. There are also planted forests and woods reconquering man-made savannas as a stage of natural re-forestation. Bush covers vast expanses, particularly in the coastal region and in agricultural areas.

Rain forests are the natural climax vegetation of Liberia, which means that unless they are artificially burnt or cut they will gradually restore themselves over the largest part of the country.

The fauna of Liberia is rich in species, but the populations have been depleted due to excessive hunting. Locally many species have been exterminated by the same factor. Species like elephant, forest buffalo, hippopotamus, pygmy hippopotamus, at least nine species of forest antelopes, two pigs, an ape, several species of monkeys and other groups of mammals as well as many birds and reptiles represent valuable resources which in Liberia could produce a wealth of proteins and hides if managed properly.

Characteristic mammals of the Liberian rain forests are pygmy antelope, Maxwell's duiker, black-fronted duiker, black-dorsal striped duiker, light-backed duiker, bush buck, bongo, bush pig, giant forest hog, tree hyrax, diana monkey, mona monkey, spotted monkey, olive colobus monkey, black and white colobus monkey, red and black colobus monkey, mangabey, chimpanzee, lesser bush baby, several rodents, insectivores and bats, palm civet and leopard. Locally still existing are elephant, buffalo and hippopotamus. All these species and groups certainly existed in suitable habitats all over Liberia before forest destruction and over-hunting reached fatal levels.

Some Liberian mammals have a very restricted range, and, therefore, Liberia has a moral obligation as custodian to preserve them. The most famous is the pygmy hippopotamus. It has perhaps always been rare. However, it is at present diminishing alarmingly, probably due to hunting pressure. Fortunately, the pigmy hippo breeds fairly well in captivity, which suggests that it will not become extinct.

Even rarer than the pygmy hippo is a forest antelope, Jentink's duiker (Cephalophus jentinki), known only from a few areas in Liberia and the Ivory Coast. Similarly the banded duiker (C. zebra) has a restricted range.

Land use and wildlife

Article VII of the African Convention on Conservation of Nature and Natural Resources stipulates: "The Contracting States shall ensure conservation, wise use and development of faunairesources and their environment, within the framework of land-use planning and of economic and social development. Management shall be carried out in accordance with plans based on scientific principles, and to that end the Contracting States shall:

- (a) manage wildlife populations inside designated areas according to the objectives of such areas and also manage exploitable wildlife populations outside such areas for an optimum sustained yield, compatible with and complementary to other land uses; and
- (b) manage aquatic environments, whether in fresh, brackish or coastal water, with a view to minimise deleterious effects of any water and land use practice which might adversely affect aquatic habitats."

The primary problem of Liberia is that of proper land use. Wildlife occurs on all kinds of lands and it is the most vulnerable part of them.

In Liberia there is a need for rational utilization of wildlife for human food and other products, because the country has not the potential for a large production of livestock. A wide range of Liberia's wild mammals provide excellent meat, but a too intensive exploitation over almost the whole of Liberia has reduced the wildlife resource to a fraction of its former wealth and productivity. Therefore, it is necessary to regulate the proportion of wildlife populations to be exploited. Such a regulation necessitates a clearly defined policy on range and forest management problems, particularly concerning burning practices and shifting cultivation. The latter is in most cases detrimental and should be abolished. A rational land use on a sustained yield basis requires a general development plan for Liberia which, after careful ecological studies should designate areas for timber production, game cropping, livestock ranching, large-scale group farming areas and, finally, nature reserves such as national parks and game sanctuaries. Many of these forms of land use can go together, for example timber production and game cropping.

Unfortunately, the regulations concerning the wildlife resources (Part VIII of the Forest Conservation Act) are not sufficient to protect Liberia's game populations adequately. Moreover, the existing legislation is not effectively enforced. National Parks have been planned but have never been demarcated, gazetted or patrolled. Species protected all over Africa have in Liberia been protected only in theory. The only species which is protected in Liberia is the chimpanzee, but this law is not followed. In the Nimba region alone Liberians hunt chimpanzees intensively. Suckling young chimpanzees are constantly caught after the killing of their mothers. Shooting of females and young animals of all species throughout the year goes on without any regard whatsoever to reproduction seasons. Pregnant females are shot indiscriminately. Night-hunting with blinding lamps has become a tradition.

It appears almost as a miracle that there still are some animals in some regions of Liberia despite this tremendous hunting pressure. These populations are apparently declining continually and the production of bushmeat dropping steadily, but the fact that some species still exist is a clear indication of what the response might be, if they were conserved, managed and harvested properly. In wild animals Liberia has a very important natural resource, protein capital and economic potential, which should be developed and utilized for the benefit of society. Now it is used by those who hunt industrially for their own profit without any regard whatsoever that they are plundering national property.

The fact that such a large proportion of the human population of Liberia hunts either for their own food or to sell game meat to markets clearly indicates that the wildlife resources play an important role in the welfare of the people of Liberia. Therefore, the wild animals of Liberia must be saved from extermination.

Mining, forestry and agriculture provide most of Liberia's income, Livestock production is not sufficient to supply the country's need for meat and animal proteins. There is no prospect of its becoming so in the immediate future. During the last years sea fisheries have been developed in Liberia with great success and are now regularly providing almost all accessible parts of the country with fresh fish. This is a very sound utilization of marine animals as a natural resource, provided no over-

fishing takes place and spawning grounds are left intact. In principle, exactly the same utilization may be applied to terrestrial animal resources, but in this case it will first be necessary to restore and build up the animal populations of Liberia to a level or capital, which can support cropping on sustained yield basis. This requires a wildlife restoration plan, which should be a part of an overall land use development plan of Liberia.

As forests and savannas represent various ecological situations as producers of wildlife, these habitats, with emphasis on the forests, will be discussed separately below.

Forests

Liberia's Forest Conservation Act points out that the danger to the forest resources is chiefly from undesirable human activities. The Forest Reserves have been clearly demarcated and are regularly patrolled. However, the actual system only takes care of forests as producers of timber. Although portions, or all of any Forest Reserves within each of the Provinces, according to the Forest Conservation Act, "shall be proclaimed a Wildlife Refuge for the purpose of maintaining the wildlife found in Liberia", no such refuges have hitherto been established. It is further stated by the Act that "absolutely no hunting shall be permitted on these refuges and it shall be the responsibility of the Bureau to maintain scientific control of the species population contained therein", but wildlife as an important source of animal protein has not received serious and positive consideration in planning the conservation, management and utilization of Liberia's forests. Paradoxically, despite the fact that most Liberians partly subsist on bush meat, nobody seriously objects to the regrettable truth that the demand for wildlife food has led to a hunting pressure to the point of extermination of the animals.

As mentioned in the Introduction, forests in Liberia consist chiefly of lowland rain forests, which in some of the higher mountain ranges emerge into a kind of transitional rain forest intermediate between the lowland and montane types of rain forests.

Very few true virgin forests remain in Liberia, though many secondary forests develop into a climax forest if left undisturbed from human activities. Many such secondary high forests exist in Liberia. As far as I know the largest tracts containing true virgin forests in Liberia are located in the Nimba Range area, where ridges, slopes, valleys and gorges have spectacular forests. Therefore, it is of extreme importance that as much as possible of the Nimba forests should be preserved.

Due to the timber value large areas of Liberia's forest habitats are managed for forestry which means that the forests are still there, though they are greatly marked and influenced by exploitation. These secondary forests could harbour a rich wildlife, but unfortunately the actual forest management seems to pay little or no attention to this aspect. The opening up of these forests for transport road makes them very accessible for hunters, who can easily use the trails also by night. In general the

larger or medium-sized mammals, which normally live in these forests, have been so seriously depleted or locally exterminated by over-hunting that they represent only a fraction of what these habitats could produce. In fact, the secondary forests with their initially dense undergrowth are excellent food reservoirs for browsing mammals.

Despite the timber value of Liberia's forests, farming and shifting cultivation go steadily on, reducing more and more of the productive forests. Also primeval forests are touched upon, which means that in future virgin forests will remain only within very few areas, not even within the Forest Reserves. Therefore, National Parks or strict nature reserves should be set aside immediately. Fortunately, Liberia has established a number of forest reserves. These reserves preserve the forests for timber production, but not the animals living there. The hunting rights have remained unaffected after the establishment of forest reserves. In fact, networks of timber transport roads passing through or close to the forest reserves (to reach adjoining forest areas for exploitation) often make the animals living in the reserve more vulnerable than in the past.

In several districts of Liberia, where there are forest reserves, people have been allowed to farm areas lying literally on the boundary to such reserves. This is a bad practice, which is detrimental not only to the periphery of the forest reserves but also to its animal life through increased hunting pressure by traps and other means, some of which may even be illegal.

Liberia has in its forest a rich animal protein resource, which should be taken care of in the interest of the whole community. The forest reserves already exist. They are at present the nuclei for wildlife productivity in the Liberian forests and should therefore protect the animals as well. If the forest reserves could be combined with animal sanctuaries (or game reserves) they would gradually enable the fauna to restore its populations to normal (maximum) levels, the surplus of which will later expand and populate surrounding areas, where it can be harvested.

As the forest reserves are already demarcated and patrolled, it does not seem to be administratively difficult to change their status to "forest and game reserves" as foreseen by the Forest Conservation Act (Wildlife Refuges). Local opposition against the abolishment of hunting rights in the forest reserves should be met with arguments explaining the advantage to everybody to set aside game reserves, where the animals will increase in number and later with their surplus repopulate surrounding areas. The idea is to build up a capital in the reserves and to take out the dividend by hunting in surrounding areas.

In such a multiple use policy of combined forest and game reserves the ideal would be to have these reserves surrounded by controlled buffer zones, which can be forests utilized for timber production. Finally, outside the buffer zones farming and other kinds of land use can take place. Such a zoning would enable many animals to utilize more than one zone and would give a high standing crop biomass and productivity. Some species can even thrive in the farm lands without doing damage, The habitat changes brought about by logging create useful habitats for some species but disfavour others.

The mosaic pattern of Liberia's forest reserves, scattered all over the forested part of the country, makes a system of this kind easy to establish and would benefit large units of land, that have a potential to produce large quantities of animal proteins.

Some species, for instance elephants, may locally come in conflict with the farmers by damaging crops. However, there are means of reducing or stopping such destruction. Moreover, the value coming from harvesting of elephants would in the long run be far superior to lost values through local crop destruction. Private farms alone should, of course, not bear the burden of losses, caused by animals, which are useful to society. Therefore, in cases where crop damages have been claimed and verified, farmers should be compensated from public funds. This system is practiced in other countries.

However, the elephant situation in Liberia is such that there cannot be much damage by elephants, because very few of them remain.

A programme to give forest reserves and timber lands in Liberia more than one useful function would also lead to other advantages than animal protein production. Rain forests are in themselves a great attraction, at least for people living outside them. Their attraction and recreational values would be considerably raised, if they, beside vegetation, also produced animals. Also for education and scientific research the advantages are obvious and of benefit to the human population.

It is not easy to harvest rationally wild animals in forest habitats, but this difficulty has not formed a barrier to hunters either in the past or in the present. They have in fact hunted so efficiently that there are very few animals left. Despite the actual scarcity of animals in the forests and the fact that the formerly most important game species have vanished, the forest hunters still succeed killing animals not only for their household pot but also to provide meat to markets located within the forested part of Liberia. This means that the animal resources of some Liberian forests still yield something, although only a small percentage of their potential. If managed appropriately, the productivity of animal life could be raised substantially and contribute annually to the protein needs of the country.

The question of bush meat production will be discussed separately.

Potential meat producing mammals in the forests of Liberia are elephant, tree hyrax, buffalo (bush cow), hippopotamus, pygmy hippopotamus, bush buck, black-dorsal striped duiker, Jentink's duiker, banded duiker, bongo, light-backed duiker, black-fronted duiker, bay duiker, Maxwell's duiker, pigmy antelope, bush pig, giant forest hog, ten species of primates and several rodents. Many other mammals as well as birds, reptiles and invertebrates also represent important protein resources, which at least locally, are extensively used.

Also hides, furs and skins of a number of forest animals can contribute to the economy of Liberia, so the animal productivity is not limited to the herbivores only.

At present Liberia has in its existing reserves the background setting for an integrated approach to the use of forest lands. Hitherto the Bureau of Forest Conservation has only attempted to deal with a single resource, which in reality is only a part of a much larger productive unit. The other part, the wild animals, has been neglected, considered as waste or even antagonistic to silviculture, This is a basic mistake and in the long range disastrous for the country. It has led to a depletion of wildlife throughout the forests, and several animal species have been exterminated over large forest areas as they have in the savannas. There are still a few larger forest species left, but they are going fast as are the smaller species.

If the actual laissez faire attitude towards wildlife continues unchanged, Liberia will in a few decades lose one of its most valuable natural resources. The large potential of wild animal proteins in forests should be properly utilized in the interest of the people.

Therefore, it is recommended that the forest reserves should also become game reserves, where no hunting at all is allowed. This measure necessitates increased patrolling. The interests of timber and game productivity for the maintenance of "Forest and Game Reserves" are mutual and in no way antagonistic. The exclusion of hunting should even be welcomed by the foresters, because it eliminates factors which interfere negatively in climax biocommunities.

The Bureau of Forest Conservation should examine the possibility to keep some Forest and Game Reserves open for human recreation and inspiration. Some of these reserves representing primeval or secondary climax forests could even be developed into national parks without threatening or changing their virgin or climax status, because facilities except walking trails should be located outside the reserves.

It is further recommended that the Forest and Game Reserves should, where it is possible, be surrounded by buffer zones, where hunting is strictly controlled and annually regulated according to the status of the animal populations. These buffer zones should preferably consist of forests, and logging activities can go on there, if so desired. Thus, also for the buffer zones a multiple use is desirable.

Forests represent a wealth of Liberia. Therefore, it is bad economy that such a large proportion is annually destroyed to be replaced by in the long run detrimental land use (shifting cultivation).

As said previously, the rain forest is the natural vegetation of most of Liberia, while most of the actual savannas are man-made. Left to themselves forests will gradually recolonize the grasslands and bushlands. There are many indications of forest expansion, but despite this potential the forest acreage in Liberia is decreasing affecting negatively the water and soil resources as well as the ecological stability and function of the living landscape.

Due to regular man-made fires savannas, bushlands and "waste lands" every year conquer grounds from the forests. This seems particularly to be the case on the lower plains and hills, where the ravaging fires, nourished by the expanses of grass and bush, penetrate into the forests, pressing their frontiers backwards quite rapidly. This burning practice is the reason why the forests of lower plains and broad valleys through reduction seem to be concentrated more and more along water courses, where the forests are too humid to become vulnerable to fires.

Natural fires caused by lightning have never occurred in Liberia.

Savannas

The major part of the present savannas of Liberia are due to earlier agriculture activities. Unfortunately, many of the forest areas cleared for shifting cultivation and later abandoned, are after repeated burning taken over by elephant grass, which prevents the forests from recolonizing their former sites. Areas conquered by elephant grass are, in general, entirely unproductive, because they do not constitute fodder to wild or domestic animals.

The woodland savanna region of northernmost Liberia is a kind of transitional zone between the fringe of the rain forest and the Guinean woodland savanna biome. These savannas have been greatly influenced by artificial burning and their origin may be entirely due to man. This means that today they represent a fire resistant vegetation, which as far as productivity is concerned does not represent the natural potential of the same area.

The author of this report has no personal experiences of the Guinean woodland savanna of north-western Liberia, but I know fairly well this rather uniform vegetation belt from many other areas in West Africa. Unfortunately, little is known in the literature about the former fauna of Liberia's woodland savanna. However, elsewhere in the same vegetation belt these savannas may support considerable populations of large wild mammals. This is the case particularly in National Parks and equivalent nature reserves. In fact, savannas of various kinds produce a greater number of larger herbivorous mammals than forests, so in this respect the savannas are extremely important as protein producers. They have normally a higher animal biomass than forests. Originally, the woodland savannas of Liberia were presumably inhabited by large herds of a wide range of grazing and browsing wild ungulates. Hunting pressure and habitat destruction have gradually and acceleratingly reduced this natural resource to a fraction of its former wealth. As long as some remains of this formerly so rich fauna still exist in surrounding areas and suitable habitats are available, there are possibilities, at least locally, to rebuild what has been destroyed.

Guinean woodland savannas are generally on poor soils and are not particularly suitable for optimal agriculture or pastoralism, but in undisturbed status they produce continuously a high yield of wild animals which are useful as a protein resource. Land use practices that cause deterioration of the potential capacity of the area should be avoided in the long range interest of everybody. In Liberia such wildlife destruction has gone very far even in tracts which are quite unsuitable for any conventional form of land use. It is a tragic fact that the savanna wildlife resources of Liberia have been destroyed over areas, which today are empty of animals and to a great extent even birds. This serious misuse of a renewable natural resource is a national loss without benefit to society. A sound land use of Guinean woodland savannas and management on the basis of a sustained yield would inevitably lead to an increased utilization of wildlife. Therefore, it is vital to restore this animal resource wherever the present habitats so allow, and to restore natural habitats where this is still possible.

Quantitative studies of the wild African ungulates utilizing savanna and marginal lands in the Congo and in East Africa have convincingly shown that these animals are capable of reaching on poor pastures, and without affecting adversely the vegetation and the soil, a standing crop biomass and a productivity which is many times higher than those obtained by domestic cattle on good grazing lands. There are many ecological factors explaining the reasons why wild animals are so much more productive than domestic ones on various types of rangelands, but it is beyond the scope of this report to go into these complex details. What is important for Liberia is, however, that its northern savannas have comparable precipitation and almost similar vegetation as the highly productive areas in the Congo and East Africa, so the basic prerequisites are available for an equally high protein production, provided the fauna can be restored.

Bushmeat production

In fact, the only public mention in Liberia of the value of wild animals as a food supply which I have been able to find in the literature, is President Tubman's statement in August 1953 (quoted by Holsoe 1961).

Despite the depleted wild animal resources of Liberia bushmeat still plays an important role as a protein supply, particularly in rural and forest areas. In the markets of almost every village bushmeat is for sale. Such meat usually fetches higher prices than other forms of meat. The reasons for this are unknown but seem to be twofold: bushmeat is scarcer but more appreciated than other meat.

In a number of most useful papers Asibey (1965 a, 1965 b, 1966 a, 1966 b) has statistically shown the value of wildlife as a source of protein in Ghana, Quantitative work on bushmeat in Ghana was started by the Wildlife Division in 1963 and has gone on ever since under the direction of Mr. Asibey. His data and experiences, collected from many areas of Ghana, indicate that bushmeat in the diet is generally more favoured by Ghanaians than beef, mutton or pork. In fact, there has been a very extensive use of bushmeat for many years, though this source of food gradually becomes rarer and increases in price. Particularly in the most commercialized areas of Ghana, bushmeat is more expensive than other meat, and the demand is very high. It is quite clear that if more bushmeat were available, it would find a ready market and lucrative sale.

This situation probably indicates that also in Liberia there would be a favourable response from markets and consumers if the bushmeat production could be considerably increased. If this natural resource could be redeveloped to its potential and cropping, processing, storing, distribution and the marketing organized rationally, bushmeat can presumably gradually increase to such levels that it can replace imported meat. The wildlife revenue could offset the cost of food imports. As far as meat is concerned Liberia can perhaps be self-sufficient, if its wildlife potential is restored, managed and utilized. Thus bushmeat, freshwater and marine fish and livestock meat, produced within Liberia, might together keep up with the animal protein needs of the country.

Under normal conditions - e.g. when the wild animal populations correspond with the carrying capacity of the areas concerned - bushmeat is much cheaper to reproduce than livestock meat, because it does not require any other investment than for cropping, processing and marketing, while livestock necessitates permanent caretaking.

The techniques for cropping, processing, storing and marketing meat from wild animals have developed greatly in many countries of tropical Africa during the last 15 years. In these cropping schemes a wide range of species, from elephants and hippopotamus to smaller antelopes and big rodents have been utilized.

The nutritional value of bushmeat makes it very important as a protein resource. The meat content of a carcass of wild animal is higher than of cattle. The percentage of meat in seven species of antelopes, selected at random, vary from 52,5 per cent to 63,2 per cent, while in cattle it seldom exceeds 50 per cent, in goats it is about 45 per cent and in sheep about 44 per cent.

In the FAO report of 1964 (Cansdale 1964) a conservative estimate is made of what woodland savannas in Ghana are able to produce of bushmeat. The conclusion is one ton of meat per square mile per annum. The rough annual value of this is at least \$ 30 million, and still the forest animal resources are not included. This figure indicates the potential asset of wildlife.

However, wildlife has many other values than being a food resource, but the latter aspect alone justifies the recommendation made above concerning the restoration of wildlife in Liberia's forests, woodland savannas and grasslands.

It is vital for Liberia's economy to get away from the widespread concept that the wildliferesources are secondary to other resources, obtained from other forms of land use. It is also necessary that the whole administration concerned with renewable natural resources understands the ecology and bioeconomy of the living landscape and the relationships between water, soil, vegetation and fauna. The wildlife resources must be objectively integrated in the economy of Liberia. It deserves much more attention. The benefit of game conservation must be made apparent to everybody through education and information at all levels.

It is recommended that specific areas should be selected as soon as possible within the future network of game reserves. When the animal populations in these areas have recovered numerically and their status has been studied by careful scientific investigations, experimental cropping schemes under governmental control should be undertaken in cooperation with regional and local authorities. The results of these schemes may give guidelines for further activities and a rational use of the animal populations in each area as well as in similar areas elsewhere. Obviously, such experimental areas must be large enough to respond to the animal's habitat requirements throughout the year. Unless this is the case, the results will not be significant.

For Liberia it is probably no exaggeration to say that practically all unfarmed land outside urban and mining areas would be very productive for human beings if utilized exclusively for forestry, bushmeat production, national parks and recreational areas. But at present it produces only small quantities of meat, despite its high potential to yield constantly large

quantities. Therefore, the animal populations require a period of tranquillity to build up their stocks to sizes, which can later be regularly harvested by man on a sustained yield basis.

Most woodland savannas and forests in Liberia would certainly produce crops of wild animals economically superior to that of cattle, and, moreover, would not, unlike pastoralism or cultivation, cause erosion and decreasing fertility.

21 species of useful meat-producing ungulates exist in Liberia. Moreover, there are at least 10 primates, several rodents, pangolins, carnivores and other mammals as well as many birds and reptiles which can be used as human food. All these species should be utilized rationally as a protein resource and producers of hides and skins.

The actual situation in several West African National Parks and nature reserves, where the depleted animal populations have recovered rapidly in number as soon as they became protected, clearly indicate that also Liberia can restore its destroyed wildlife, but this operation requires a firm policy, skilful administration, basic research and wise management. It may be argued that Liberia cannot afford economically to undertake such a costly action just for the restoration of wildlife. I would like to emphasize that in the long-term perspective Liberia cannot afford not to undertake those measures. It is an inevitable step towards accomplishing a rational use of the living natural resources. Such a use is a condition for prosperity and survival of Liberia's population as it is for every country that has to base its existence on what the land and water produce.

Unless a much larger effort to restore wildlife in Liberia is made in the immediate future, it might come too late, because the present rapid destruction of animal resources and habitats may rule out forever the possibility of a faunal regeneration in habitats, which are still capable of giving necessary food and shelter.

The present situation in Liberia leads to the following recommendations.

There is a number of forest reserves in Liberia. If they become combined forest and game reserves, it would be advantageous but far from enough as a measure for the restoration of wildlife. A network of new game reserves must be set aside in many parts of Liberia, so they can function as fauna reservoirs, where animal populations can build up in number and then spread to surrounding areas, Also the savanna game reserves should be encircled by buffer zones, where hunting is strictly controlled and regulated. In many areas these measures should be combined with a hunting moratorium from three to five years or so, which should enable the animal populations to recover to levels coming closer to the potential of the habitats concerned. Then controlled hunting can be opened and adjusted to the animal surplus. A moratorium of this kind, combined with other conservation measures, was in 1967 proposed by IUCN (Curry-Lindahl 1967 a, b) to the Congo government for the Katanga Province, which is many times larger than Liberia. This moratorium in Katanga came into force the same year. Also for a wildlife restoration plan for Ghana such a moratorium has been suggested (Curry-Lindahl 1968).

Such a plan requires careful planning and selection of areas as well as certain sacrifices from those who used to hunt all over as much as they liked, but in the long range it would be of advantage to everybody. A survey of the present status of Liberia's animal resources must be undertaken, so it becomes clear where the last strongholds of game are located. Large areas of unspoiled country (in the sense that its natural habitats are intact) should be carefully investigated in order to find out the most effective land use. The plan is of such a magnitude that a large part of the regional and local administration must take part in addition to the officers and rangers of the Bureau of Forest Conservation. The plan cannot be applied unless the Department of Agriculture is considerably enlarged at all levels. Again considerable funds will be required for the execution of this protein restoration plan. It is possible that international sources can contribute financially and technically to such an important protein pilot scheme with importance for large parts of West Africa.

Without appropriate conservation and management measures for building up the wild animal populations to levels allowing a sustained yield there is hardly any other way to increase the protein production of lands in Liberia. Similar action should also be taken for aquatic resources, which could certainly contribute increasingly to the growing demand for protein in Liberia.

Conservation and management of wildlife

It must be stressed that haste is essential in establishing and implementing a plan for the conservation and management of wildlife in Liberia. Otherwise it may be too late to succeed in restoring and later utilizing this resource.

Such a plan requires an organization on central and provincial levels as well as a national wildlife policy that has full support of the Government. Game reserves, hunting legislation and conservation education at all levels are essential tools to reach desirable results in a minimum of time. Another prerequisite is a conservation-minded staff, composed of people with an ecological understanding for complex land use problems. In other words, for conserving, managing, controlling and harvesting game effectively there must be laws and qualified people as well as funds to administer the laws and other conservation measures.

Hunting legislation

The role of wildlife in Liberia's economy as an essential source of protein has for long been established, but no statistics showing the quantities of bushmeat consumed and marketed are available. Also figures indicating the approximate number of killed species of mammals are lacking. The size of the still existing animal populations are also unknown. The only things we know with certainty about Liberia's wildlife is that the quest for game meat is considerable; that a large proportion of the human population is constantly hunting; that meat from wild animals is the essential protein source for a large part of the population (presumably 60-70 per cent); that wildlife resources are acceleratingly decreasing

and have locally been exterminated; that virtually nothing is done to stop the overexploitation; that most Liberians are not concerned about the country's wildlife in all its aspects except its significance as food; that many people do not seem to realize, even in areas where the animal populations are near extermination due to overhunting, the necessity to adjust their hunting pressure to levels which the animals can sustainingly withstand.

This plundering of an extremely important natural resource of Liberia will lead to a catastrophe, when a large proportion of the people will be overtaken by events. This danger cannot be overstressed.

It is urgent and necessary that Liberia regulates the hunting activities by establishing closed seasons combined with a ban on the killing of females in an advanced stage of pregnancy and by protecting totally or regionally a number of species which are at present threatened by extermination. Moreover, Liberia is obliged - in accordance with her acceptance of the African Convention on Conservation of Nature and Natural Resources - to give total protection throughout the year to a number of species.

Article VITI - Protected species - of the Convention stipulates:

(1) The contracting States recognize that it is important and urgent to accord a special protection to those animal and plant species that are threatened with extinction, or which may become so, and to the habitat necessary to their survival. Where such a species is represented only in the territory of one Contracting State, this state has a particular responsibility for its protection. These species which are, or may be listed, according to the degree of protection that shall be given to them are placed in Class A or B of the Annex to this Convention, and shall be protected by Contracting States as follows: -

- (i) species in Class A shall be totally protected throughout the entire territory of the Contracting States; the hunting, killing, capture or collection of specimens shall be permitted only on the authorization in each case of the highest competent authority and only if required in the national interest or for scientific purposes; and
- (ii) species in Class B shall be totally protected, but may be hunted, killed, captured or collected under special authorization granted by the competent authority.

(2) The competent authority of each Contracting State shall examine the necessity of applying the provisions of this article to species not listed in the annex, in order to conserve the indigenous flora and fauna of their respective countries. Such additional species shall be placed in Class A or B by the State concerned, according to its specific requirements.

The following Liberian species are listed in Class A:

Diana monkey (Cercopithecus diana)
Chimpanzee (Pan troglodytes)
African palm squirrels (Epixerus)
Water civet (Osbornictis piscivora)
African golden cat (Felis aurata)
West Africa manatee (Trichechus senegalensis)
Pygmy hippopotamus (Choeropsis liberiensis)
Jentink's duiker (Cephalophus jentinki)
All pelicans (Pelecanidae)
All storks, hammerkops, ibises, spoonbills, herons, egrets and bitterns
(Ciconiidae, Scopidae and Ardeidae)

Secretary bird (Sagittarius serpentarius)
All vultures (Aegyptus, Gyps, Pseudogyps and Torgos)
Crowned hawk-eagle (Scepnaoetus coronatus)
All cranes (Gruidae)
Abyssinian ground hornbill (Bucorvus abyssinicus)
White-headed guineafowl (Agelastes meleagrides)
White-necked rockfowl (Picathartes oreas)
Grey-necked rockfowl (P. gymnocephalus)
All marine turtles (Cheloniidae and Dermochelyidae)
Cameron toad (Bufo superciliaris)
Viviparous toad (Nectophrynoides occidentalis).

The following Liberian species are listed in Class B:

All shrew otters (Potamogalidae)
All prosimians of the family Lorisidae (pottos, galagos)
All monkeys except common baboons
Giant pangolin (Manis gigantea)
Tree pangolin (M. tricuspis)
Long-tailed tree pangolin (M. longicaudata)
All otters of the subfamily Lutrinae
Serval (Felis serval)
Leopard (Panthera pardus)
Aardvark (Orycteropus afer)
Elephant (Loxodonta africana)
Giant forest hog (Hylochoerus meinertzhageni)
Hippopotamus (Hippopotamus amphibius)
Water chevrotain (Hyemoschus aquaticus)
Sitatunga (Tragelaphus spekei)
Bongo (Boocercus eurycelus)
Buffalo (Syncerus caffer)
Banded duiker (Cephalophus zebra)
Royal antelope (Neotragus pygmaeus)
Dwarf antelope (N. batesi)
All birds of prey and owls which are not in Class A
All bustards
All crocodiles.

Thus already by the fact of being a Contracting State, which has adhered to the African Convention on Conservation of Nature and Natural Resources, Liberia is obliged to protect a number of species of mammals, birds, reptiles and amphibians. The basic step in doing so is to take legislative measures.

At present only one species is protected in Liberia: the chimpanzee. The elephant cannot be hunted without a permit from the Secretary of Agriculture. No female monkey with suckling young is allowed to be shot or trapped within forest reserves. Commercial hunting of "Big Game" is not allowed without a licence, issued by the Bureau of Forest Conservation. "Any Big Game shot or killed must be reported to the Town Chief of the nearest town within two days after the killing took place". Despite this provision there are no statistical data available of how many and which animals are shot yearly. "Big Game" is not defined in the Forest Conservation Act, but according to verbal information from Mr. Sayeh, Chief of the Bureau of Forest Conservation, the following species are included in "Big Game": chimpanzee, elephant, hippopotamus, pygmy hippopotamus,

buffalo, bongo and leopard.

The latter species is regarded as "dangerous" and "destructive", a view that generally does not correspond to the truth. The leopard is in most parts of its distribution range a useful animal.

The part dealing with "Wildlife resources" of the Act of Forest Conservation contains many useful prescriptions, but with the exceptions given above it does not protect wild animals, which at present may be hunted all over Liberia the year around.

It is therefore suggested that the Government of Liberia take effective conservation measures by establishing hunting regulations. These will serve as tools to stop the present decline of the fauna and its habitats and to organize a restoration and conservation plan for wildlife resources, followed later by a management and utilization policy on sustained yield basis as a kind of profitable land use.

A part of the hunting regulation should be in the form of a temporary "hunting moratorium" on regional basis as discussed previously on p.14-15 of this report. Such a measure would enable the animal populations to recover in number until they can support a sustained yield through controlled hunting.

Although objections and reservations may be locally made to such hunting regulations and about how effective the control would be, there is no doubt that there is a great deal of good will amongst the tribes. We have, for example, seen proof of such a positive attitude many times, particularly among the Mano of north-eastern Liberia,

In the initial phase of hunting control it will certainly be difficult to obtain successful results by limiting the hunting activities through closed seasons. The best solution would be to make a radical reduction of the use of rifles by introducing taxes on firearms and cartridges combined with fees for hunting licenses. Such a measure would provide the Government with valuable statistics about how many gun owners there are in Liberia. It would also facilitate the annual calculation of bushmeat productivity and income resulting from wildlife. The amounts coming to the Treasury from licence fees and taxes for firearms and cartridges could contribute to the expenses for the control of the hunting legislation.

In fact, the actual situation in Liberia, where every Liberian without any permission can buy and carry rifles is as far as the author knows unique in the world.

The African Convention on Conservation of Nature and Natural Resources stipulates in Article VII - Faunal Resources - that the Contracting States shall adopt adequate legislation on hunting, capture and fishing, under which the issue of permits is properly regulated.

Moreover, also for the security of the state and its people it seems to be desirable to have a control of persons carrying firearms.

In any way a control of hunting regulations is a necessity for an organized game production. The game legislation should cover not only "conventional game" such as buffaloes and antelopes but also several small mammals, such as rodents, which produce excellent meat and already are exposed to traditional hunting by many tribes. Such species are fast-reproducing provided their environment meets with their ecological requirements. Hence, they should be rationally exploited under controlled

conditions for their meat value. This includes management of habitats to avoid declines in the number of important animal species. Such management must be based on scientific facts with particular reference to ecology and population dynamics. The harvest of various species should chiefly be based on surpluses and be taken at the appropriate periods of time.

It is recommended that later on game processing centres should be created in important game production areas in order to improve the hunting techniques and handling of wildlife carcasses and meat including storage, marketing and distribution. This is also of interest for the veterinary medicine and public health services.

Management objectives cannot be decided without previous ecological land use surveys and inventories. The main aims of management in game producing areas should be to obtain, through licensed hunting, an optimum sustained yield compatible with other forms of land use as well as social factors.

In the latter field it is inevitable for obtaining positive results progressively to extinguish such customary hunting and fishing rights, which constitute an obstacle to the application of wildlife restoration, management and utilization schemes.

In drawing up a detailed game legislation for Liberia it is recommended that the Government utilizes the stipulations, recommendations and guidelines given by the African Convention on Conservation of Nature and Natural Resources as well as FAO's document on the Conservation and Management of Wildlife and its Habitats. The latter document was adopted by the African Governments in Fort Lamy in 1967 and recommended by the African Forestry Commission at its meeting in Lomé 1969. This recommendation specifically states that governments may use the document in the eventual revision of their national legislation on wildlife management.

During the last two years several African countries have improved their wildlife legislation through various measures, among which limited hunting seasons have been one of the most important means.

Obviously, the implementation of a new wildlife legislation in Liberia requires trained personnel at various levels. In the initial phase Liberians could receive University training in wildlife management at the University of Ibadan in Nigeria or undergo courses at the College of African Wildlife Management at Mweka, Tanzania, which, following an initiative of IUCN, is run internationally through financial and technical assistance from the UNDP, FAO and the World Wildlife Fund with the purpose to serve the African countries. There are also possibilities to send Liberians to study in Ghana, whose Department of Game and Wildlife with its nature reserves belongs to the ecologically most advanced organizations in West Africa in the field of wildlife management. A third possibility would be to train Liberians in Liberia by expatriate experts. Later on the University of Liberia could set up a wildlife training school in an appropriate region of the country. Such training should also cover administration, management and development of national parks and nature reserves.

National parks and nature reserves

Hunting regulations will not be enough as action treatment in a restoration plan of Liberia's wildlife resources. They must be combined with the establishment of national parks and nature reserves, where the animals are totally protected or managed adequately so they can build up their populations to a level corresponding to the potential of their habitats.

At present the Bureau of Forest Conservation has planned and mapped three national parks in Liberia, but so far none of these reserves has been created. Nor have any Wildlife Refuges been established within the Forest Reserves. This means that there is no area in the whole of Liberia where animal life is protected. This situation is, in a negative sense, unique for Africa and the remaining part of the world, where the international consensus of conservation opinion and governmental policies has led to an increasing number of national parks and nature reserves.

Since achieving independence, several African countries have established new national parks through the personal initiative of their Presidents. This has happened, for instance, in Tanzania, Kenya and Uganda where 8 new national parks have been established in recent years.

The values of national parks and nature reserves are manifold. They preserve a national heritage of great cultural asset. They function as living intact and dynamic landscapes, which are essential for scientific research and may in the future yield important data for accurate understanding of environmental problems. They produce animals on a high scale, which often favours surrounding regions. They are of high educational importance. Their recreational value is often pronounced. They give intellectual inspiration and physical wellbeing for visitors coming from urban and industrial areas. They contribute greatly to the tourist industry and are in many countries the most economic and profitable land use, yielding much higher revenues than agriculture or forestry. Moreover, national parks in Africa and elsewhere usually are an important source of foreign currency and contribute to the development of tourism in the country.

Foreign tourists come to Africa essentially to see and photograph wildlife and scenically spectacular areas in national parks and nature reserves. But also through sport-hunting the wild fauna is a source of tourism revenue. For example, in Kenya the revenue from tourism during the fiscal year 1966-1967 was about \$ 40 million. This industry is based almost exclusively on the existence of national parks and nature reserves as it is also the case in Tanzania and Uganda. Tourism is the second largest source of income in Kenya, in Uganda the third and in Tanzania the fourth.

Article X - Conservation Areas - of the African Convention on Conservation of Nature and Natural Resources states;

"(1) The Contracting States shall maintain and extend where appropriate, within their territory and where application in their territorial waters, the Conservation areas existing at the time of entry into force of the present convention and, preferably within the framework of land-use planning programmes assess the necessity of establishing additional conservation areas in order to: -

- (i) protect those ecosystems which are most representative of and particularly those which are in any respect peculiar to their territories,
 - (ii) ensure conservation of all species and more particularly of those listed or may be listed in the annex to this convention;
- (2) The Contracting States shall establish where necessary, around the borders of conservation areas, zones within which the competent authorities shall control activities detrimental to the protected natural resources."

Further, at its meeting in Lome, Togo, in January 1969, the Working Party of FAO's African Forestry Commission, at which conference Liberia participated, made the following recommendation:
"Recommends to Member States to promote a policy of creation and management of national parks and other reserves and of wildlife protection".

The African Convention on Conservation of Nature and Natural Resources defines various types of nature reserves as follows:

"(4) 'Conservation area' means any protected natural resources area, whether it be a strict natural reserve, a national park or a special reserve;

(a) 'strict nature reserve' means an area:

- (i) under State control and the boundaries of which may not be altered nor any portion alienated except by the competent legislative authority,
- (ii) throughout which any form of hunting or fishing, any undertaking connected with forestry, agriculture or mining, any grazing, any excavation or prospecting, drilling, levelling of the ground or construction, any work tending to alter the configuration of the soil or the character of the vegetation, any water pollution and, generally, any act likely to harm or disturb the fauna or flora, including introduction of zoological or botanical species, whether indigenous or imported, wild or domesticated, are strictly forbidden,
- (iii) where it shall be forbidden to reside, enter, traverse or camp, and where it shall be forbidden to fly over at low altitude, without a special written permit from the competent authority, and in which scientific investigations (including removal of animals and plants in order to maintain an ecosystem) may only be undertaken by permission of the competent authority;

(b) 'national park' means an area: -

- (i) under State control and the boundaries of which may not be altered or any portion alienated except by the competent legislative authority,
- (ii) exclusively set aside for the propagation, protection, conservation and management of vegetation and wild animals as well as for the protection of sites, land-scapes or geological formations of particular scientific or aesthetic value, for the benefit and enjoyment of the general public,
- (iii) in which the killing, hunting and capture of animals and the destruction or collection of plants are prohibited except for scientific and management purposes and on the condition that such measures are taken under the direction or control of the competent authority;

- (iv) covering any aquatic environment to which any/all of the provisions of section (b) (i-5ii) above are applicable.

The activities prohibited in strict nature reserve under the provisions of section (a) (ii) of paragraph (4) of this article are equally prohibited in national parks except in so far as they are necessary to enable the park authorities to implement the provisions of section (ii) of this paragraph, by applying, for example, appropriate management practices, and to enable the public to visit these parks; however, sport fishing may be practised with the authorization and under the control of the competent authority;

- (c) 'special reserve' means other protected areas such as: -
 - (i) 'game reserve' which shall denote an area.
 - (a) set aside for the conservation, management and propagation of wild animal life and the protection and management of its habitat,
 - (b) within which the hunting, killing or capture of fauna shall be prohibited except by or under the direction or control of the reserve authorities,
 - (c) where settlement and other human activities shall be controlled or prohibited;
 - (ii) 'partial reserve' or 'sanctuary' which shall denote an area
 - (a) set aside to protect characteristic wildlife and especially bird communities, or to protect particularly threatened animal or plant species and especially those listed in the Annex to this Convention, together with the biotopes essential for their survival,
 - (b) in which all other interests and activities shall be subordinated to this end;
 - (iii) 'soil' 'water' or 'forest' reserve shall denote areas set aside to protect such resources."

In planning national parks and nature reserves in Liberia, a careful selection of areas should be made through a general survey. There are already a number of existing Forest Reserves. Some of them or parts of them may be converted into national parks or wildlife refuge (to follow the terminology of Liberia's Forest Conservation Act). Others might after restoration of the animal populations, be developed into hunting reserves for cropping.

Ecologically, Liberia should possess a network of nature reserves which are representative of various features of Liberian nature, for instance, coastal mangrove swamps, freshwater swamps, remaining coastal rain forests, gallery forests, lowland rain forests in the western and the eastern parts of Liberia, mountain ranges (particularly parts of the Nimba area), woodland savanna of north-western Liberia, a river system, and so on.

Another criterion for the selection of areas for preservation is the existence of very rare animals and true virgin forests.

The lowland rain forest of Africa is one of the most remarkable features of the continent. Yet, there is still no national park established in any country covered by such forests. Since this type of rain forest may

be called the national habitat of Liberia, it seems logical and natural that this country shows conservation leadership by setting aside one or several national parks in rain forest habitats.

Obviously, national parks should be created in areas having conditions as little affected by human activities and disturbances as possible. The policy in such areas should be to allow natural interactions between vegetation and animals as far as is possible without human interference. In other types of reserves management may be desirable depending of the particular purpose of the area, for example game cropping. The use of fire is often determined by factors outside a reserve, because uncontrolled fires may frequently enter them. Management measures to prevent fires or to use fires as a tool cannot be generalized. A separate management policy has to be carefully worked out for each reserve.

No answers to management problems may be found without biological research. A continuous supply of ecological information is necessary for determining the management policy. The latter has to be adjusted many times in relation to the changes, which take place in the vegetation and the composition of animal populations of various species.

Suggestions of areas for national parks and nature reserves

The following three areas have been planned by the Bureau of Forest Conservation to be set aside as national parks:

Mount Wutivi. Located in the Wologisi Range in north-western Liberia, of which it is the highest massif and dominant feature, clad by high forest. The area also includes the foothills down to the Lofa River. Elephants and other big mammals occur.

Bokoma. Located within the Kpo Range in western Liberia. Scenic area with a spectacular waterfall. Rich in birds.

Tiempo is the largest of the planned national parks. It is located in the south-eastern part of Liberia,

However, there are several other highly interesting areas than those mentioned above which should be preserved as national parks and nature reserves for social, recreational, educational, scientific or aesthetical reasons.

Without doubt the most valuable of these areas is the Nimba Range with its virgin forest and peculiar animal life. Not less than about 200 species of animals do not exist elsewhere in the world than on Mount Nimba. In the Guinea and the Ivory Coast a contiguous part of the Nimba Range is since long a strict nature reserve, a category which, as far as protection goes, ranks higher than national parks. There is also a research station. The scientific world, and particularly international organizations like UNESCO and IUCN, have paid special interest to Mount Nimba, because of its particular value for the study of ecology, evolution and speciation. UNESCO has financially contributed to the research station in Guinea and is interested in doing the same in Liberia provided that the Government so wishes. Through the Institut Fondamental d'Afrique Noire (IFAN) in Guinea and the Ivory Coast a series of geographical and biological

monographs on Mount Nimba have been published. Since 1963 the Nimba Research Committee of the IUCN has organized botanical, zoological and ecological investigations on Liberian Nimba, financed by the LAMCO. This research has been based at the Nimba Research Laboratory in Grassfield and has made the Nimba Range, as far as the flora and fauna are concerned, the best explored and well-known area of Liberia. Several major monographs on the botany and zoology of Liberian Nimba will soon be published.

All these scientific activities at Nimba have emphasized its outstanding position in Africa as a biologically invaluable area. Hence, it is of utmost importance to create as soon as possible a national park in the part of the Liberian Nimba that will not be altered by the mining exploitation. Particularly important is the preservation of the primary forests still existing. The southern Nimba Range should be urgently proclaimed as a strict natural reserve for the purpose of protecting the forest slopes and its animal life. A particularly important site in this area is the Iti Valley with surrounding slopes and ridges of the Nimba. All hunting activities must be stopped immediately before the wildlife is completely wiped out. This nature reserve or national park in Liberia should be combined with the already existing strict nature reserve of Nimba (Réserve naturelle intégrale du Nimba) in Guinea and the Ivory Coast. This would create an international national park at Nimba. Such a category of national parks was, as a principle, foreseen and discussed by the FAO intergovernmental African Conference on Wildlife Management, held in Lomé, Togo, in January 1969.

Further, the international scientific interest for the southern Nimba Range is considerable. It is possible that various research institutions will invest money in the Nimba Research Laboratory at Grassfield for its maintenance. However, this possibility is intimately connected with the existence of an intact part of the Nimba Range, This is also essential for the preservation of aquatic resources of the area.

Other areas which are recommended to be set aside as national parks or nature reserves are the following:

The Cape Mount area at the coast of Liberia. Although this hill is situated very close to civilization it is said to be very rich in monkeys. The local inhabitants do not eat monkeys, but hunters from other tribes are said to go there frequently shooting great numbers of monkeys. The hunting at Cape Mount should be stopped as soon as possible and the hill declared a reserve for later tourist development.

Forest, mountains, hills and lowlands around the Lofa River in north-western Liberia. This area could with advantage be combined with the planned Mount Wutivi National Park and include the Wologisi Range.

The Putu Range and surrounding forests in eastern Liberia westwards beyond the Cestos River. Unfortunately from the conservation point of view, also the Putu Range will be exploited and at least partly destroyed by mining. The area has magnificent forests representing one of the largest remaining forest blocks of West Africa. There is a rich animal life and a very low human population. This reserve could be called the Cestos National Park.

A region between 6°50 and 5°50 N. lat. along the Cavalla

River that forms the boundary to the Ivory Coast in eastern Liberia. This is a high forest area with elephants, hippopotamus, buffaloes, many species of antelopes, leopards and many other animals. This is probably the area of Liberia which has the richest and best preserved animal life, because there are very few human inhabitants. This reserve could be called the Gedeh National Park.

Finally, representative swamp and delta areas should be set aside as reserves.

All the regions mentioned are potential areas for a network of future nature reserves. Some of them or parts of them are already established as Forest Reserves.

It is of utmost importance to establish at least one large national park in eastern Liberia before the destruction there has gone too far.

Even if it would be difficult financially to create a number of national parks or nature reserves at once, it is recommended that the Government demarcates and gazettes a considerable number of potential national parks and nature reserves for later tourist development. Such a first step would help to save the areas from exploitation and destruction.

A principle for the selection of suitable areas for national parks and nature reserves should, in general, be that they have little human settlement and an unspoiled nature with a wide variety of wild animals in reasonable numbers.

The scientific and cultural value of a network of national parks in Liberia is obvious. Its importance as tourist attractions should not be underestimated. Several mammalian species which in national parks could serve as magnets for tourists are the following species: chimpanzee green colobus, black and white colobus, leopard, manatee, pygmy hippopotamus, hippopotamus, Jentink's duiker, bongo, buffalo, elephant and crocodiles.

Certainly some drinking places and salt licks in the forest are by tradition frequently used by a wide range of mammals. These sites should be explored so that one or several of them can be modestly and carefully "developed" into a lookout place for visitors, where they can spend the night watching the animals by spotlights ("artificial moonshine"). The animals do not react negatively to such artificial light.

Of the vegetation, the African high rain forest is in itself of immense touristic value. For most people from overseas the tropical rain forest in all its grandeur represents a magnificent habitat full of exciting visible and audible details giving overwhelming impressions. Therefore, forest trails, where visitors, accompanied by local guides, can walk for an hour or so, should be arranged in representative rain forests.

The educational value of national parks is without limits. Such reserves should be developed hand in hand with education at all levels from school children to university students. It is also important to make sure that the local authorities feel that they are part of the organization

dealing with national parks,. If the local districts (councils, towns) get about 10 % of the taking yielded by national parks, the local population will be positive to the aims of national parks and be concerned about their success, but if the central organization operates as an isolated body that has no relevance to the local populations or their needs, then their interest will fail.

Rangers, guards and other employees in the national park and wildlife refuge system of Liberia should be recruited from the local people. The Liberian hunter although he is an efficient killing machine is also one of the finest bush naturalists of Africa. He kills but has affection for what he kills and would certainly jump at the chance of being employed to work with and for animals in the field.

Organization

At present the Bureau of Forest Conservation of the Department of Agriculture is responsible for the wildlife of Liberia. Within this Bureau there is a branch of Wildlife Management having a rather low position in the hierarchy of the Department. The wildlife resources of Liberia have such an important place in the economy of the Republic that they deserve a more high-ranking position within the Department of Agriculture. The 1953 Act for the Conservation of the Forests of Liberia defines a broad range of activity within the field of wildlife, but hitherto lack of funds and personnel have made it impossible to implement the measures foreseen by the legislation. This is most unfortunate for Liberia and, in fact, constitutes a gradually increasing economic loss of capital.

At the meeting of the Intergovernmental Working Party on Wildlife Management of FAO's African Forestry Commission at Lomé in January 1969 (with the participation of Liberia) the following recommendation was unanimously adopted:

"Considering the magnitude of the trade in live wild animals and their products, the economic significance of the trade to African countries and the obvious value of wildlife as a source of protein.

Recognizing the danger of exploitation and mismanagement of the wildlife resource and therefore the need for management of wildlife on a sustained yield basis, and for introduction of legislation to achieve the maximum value to the country and to ensure the protection of rare species in accordance with Article 8 of the African Convention on the Conservation of Nature and Natural Resources

Recommends to member governments that:

- a) national legislation and administrative machinery concerning the control of trade in wild animals and their products be introduced and coordinated between the various technical departments responsible;
- b) initiative be taken to harmonize on a regional basis all regulations concerning the exploitation of wildlife and the control of import and export of live wild animals and their products;
- c) steps be taken to determine the numbers of various animal species that can safely be removed on a sustained yield basis;
- d) special attention be given to the development of safe and economic processing and marketing methods of game meat, wild products and trophies."

The African Convention on Conservation of Nature and Natural Resources also covers organization matters by its Article XV - Organization of National Conservation Services - as follows:

"Each Contracting State shall establish, if it has not already done so, a single agency empowered to deal with all matters covered by this Convention, but, where this is not possible, a co-ordinating machinery shall be established for this purpose".

In order to organize and utilize properly the wildlife resources of Liberia I recommend that a Bureau of Wildlife Conservation is established within the Department of Agriculture. It shall work in close connection with the Bureau of Forest Conservation. Both Bureaus have interests in common and should jointly carry out a policy of forest multiple use. As many nature reserves will become combined forest and wildlife reserves, management plans, cropping schemes, patrolling and administration have obviously to be arranged by the two Bureaus together. However, besides the common interests of the two Bureaus there is a lot of important tasks for the Bureau of Wildlife Conservation which leads beyond the field of action of the Bureau of Forest Conservation without being antagonistic to the latter's interests.

Such a separate bureau or even department of wildlife resources has long been a standard practice in several African countries and elsewhere. In fact, the conservation of nature and natural resources is in many countries considered to be so important that it is represented directly within the government (cabinet) by a separate Secretary. This is also, as said above, recommended by the African Convention on Conservation of Nature and Natural Resources.

In this connection I would like to emphasize that it is for many reasons practical to establish administratively independent Conservation and Wildlife Bureaus within or outside a Department, because conservation of living natural resources is such an important item in the life and future of any country and for its population. Hence, such a bureau has to depend directly under the responsible minister without any interference of other bureaus or agencies dealing with near-related fields.

The prime and tremendous task of the new Bureau of Wildlife Conservation of Liberia is to build up, on an ecological basis, a destroyed natural resource before it can be adequately utilized. This work should be done through the following actions:

1. Restoration, conservation, management, development and utilization of the wildlife in and outside the Forest Reserves (including ecological and zoological research necessary for these functions).
2. Establishment of national parks and wildlife refuges in the interest of conservation of nature and the stimulation of tourism and recreation.
3. Game legislation and control.
4. Game cropping schemes.
5. Training and education schemes in the field of conservation at all levels in co-operation with the Department of Education and the University of Liberia.

If a network of national parks, wildlife refuges and game production areas is to be established and a wildlife restoration plan implemented on a multiple use basis all over Liberia, it obviously necessitates not only the setting up of a Bureau of Wildlife Conservation but also a considerable expansion of the Department of Agriculture with increased central, provincial and local staffs. Conservation officers should be appointed in every district.

Conclusions: a wildlife restoration plan

The preceding pages of this report have given a brief review of the wildlife resources of Liberia, their actual status, their role and potential as a protein resource for the people of Liberia and the legislation which is actually governing these resources.

General suggestions concerning the utilization of wildlife resources have been made. Before these resources can be used rationally in order to contribute to the economy of Liberia, they must undergo a period of restoration, followed by conservation and management measures, which will lead to a future development and utilization on sustained yield basis.

Therefore, a wildlife restoration plan is suggested as the at present most important part of a conservation plan for Liberia. With the wildlife, the habitats are intimately connected. Therefore, the conservation of vegetation as well as of water and soil resources is a condition for success.

All recommendations in this report, whether they concern forests, savannas, swamps, bushmeat production, national parks, wildlife refuges, game legislation or organization, are details of a wildlife restoration plan.

It is evident that without urgent and effective measures the production of bushmeat and the animal resources of Liberia will soon fade out to negligible quantities at the same time as the protein needs of the people are increasing. With a sound land use and rational conservation management and utilization of Liberia's wild natural resources the yield coming from this national capital could be raised to many times its present level.

Besides meat production there are many other revenues coming from wild animal resources: hides, furs, hunting licences, fees from national parks and nature reserves and so on.

For such a wildlife restoration plan actions must be taken in many ways. The most important steps recommended by this report may be summarized as follows:

1. Land surveys to find areas where wildlife is not entirely denuded.
2. Selection of areas, scattered all over Liberia, which should be set aside as game reserves for later cropping schemes.
3. Total protection of animal life in all forest reserves, which in this way also become game reserves.

4. Establishment, of national parks.
5. Establishment of buffer zones around all game and forest-game reserves as well as national parks. In these zones hunting should always be controlled and regulated (in time and space) with adjustments to the status of the game population.
6. Moratorium on hunting for a number of years on a regional basis in order to allow the recovering of game populations to levels which later on can be harvested on a sustained yield basis.
7. Creation of a game legislation act fitting the various stages of the wildlife restoration plan.
8. Intensified research with emphasis on game populations. Scientific data are essential as a background for proper land use and management.
9. Studios of techniques for cropping, processing, storing, distribution and marketing of game populations in various areas as well as for the future organization of the cropping schemes.
10. Reorganization of the Department of Agriculture so it can implement the various phases of the wildlife restoration plan. The latter necessitates a Bureau of Wildlife Conservation and a network of regional and local officers.
11. Strengthening of co-operation efforts between all Governmental Departments dealing with the renewable natural resources of Liberia.
12. Intimate collaboration between the Bureau of Forest Conservation and the proposed Bureau of Wildlife Conservation within the Department of Agriculture.
13. Educational schemes at all levels (schools, university, administration).
14. Contacts with international organizations (U.N. Development Programme, FAO, UNESCO, IUCN and the World Wildlife Fund).

All the points above are parts of the wildlife restoration plan. There are many other steps to be taken, but detailed recommendations are premature until major decisions have been taken by the Government of Liberia about the ways to follow.

The expenditure for the wildlife restoration plan is difficult to estimate for a non-economist. As the basis of the whole plan is to let already existing habitats produce game, which is today depleted to a fraction of its potential, one can say that the scheme primarily requires co-operation with nature. This does not cost much. Purchase of lands, if necessary, for establishments of game reserves may lend to largo expenditure, but as the network of game reserves has the chief purpose of producing meat for the human population of surrounding areas, there are certainly governmental means to overcome these expenses. The personnel engaged in the scheme will inevitably be numerous, at least during the initial phases.

In any way the total investments for the wildlife restoration plan are low in relation to future gain. What it is really about is a national effort, patience and the will to restore a wealth, which has been unwisely wasted.

The wildlife restoration plan is in reality a development plan. It develops Liberia's living natural resources to reach a normal yielding level so they can be continuously utilized in an economic way for the benefit of the people. The investments for this plan are low in relation to the future gain and national advantages.

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