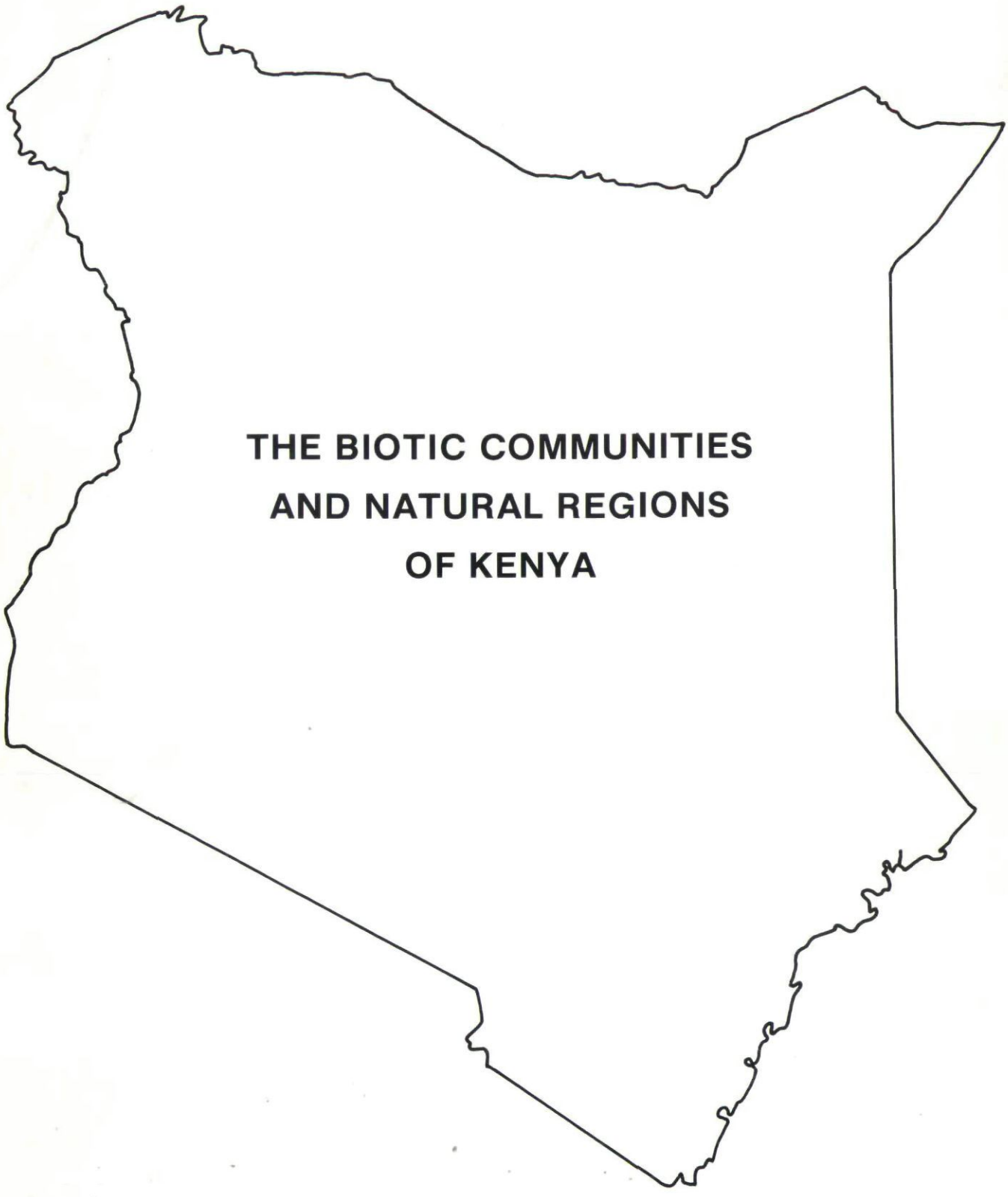

# THE BIOTIC COMMUNITIES AND NATURAL REGIONS OF KENYA



WILDLIFE PLANNING UNIT
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REPUBLIC OF KENYA

# THE BIOTIC COMMUNITIES AND NATURAL REGIONS OF KENYA

Based on the Work of

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# I. INTRODUCTION

## The Biotic Communities and Natural Regions of Kenya

The biotic communities and natural regions were formulated by the Wildlife Planning Unit of the Wildlife Conservation and Management Department as a prerequisite to the preparation of a System Plan for Kenya's National Parks and Reserves.

Briefly, a System Plan would :

—ensure that the Parks and Reserves System represents Kenya's natural resources in a comprehensive manner.

—provide a rational basis for evaluating the existing system.

—provide a rational basis for the identification and establishment of new parks and reserves.

—provide an analysis of local and national factors that influence the future development and management of the Parks and Reserves System.

This paper presents the Biotic Communities and Natural Regions of Kenya in the anticipation that they will be of considerable interest and value to all planners concerned with the management of natural resources. Though originally formulated principally for the wildlife resource it is visualised that this analysis could provide a rational basis for a wider range of natural resource planning and management activity.

# II. BIOTIC COMMUNITIES OF KENYA

Biotic communities represent the synthesis of a variety of ecological factors such as soil, rainfall, altitude and temperature which result in the development of a distinctive community of fauna and flora. These communities incorporate the major plant and animal species in the country and thus are a significant factor in developing a rational basis for the long term growth of Kenya's national park and reserve system. Nineteen biotic communities are defined and mapped.

The development of the classification follows the work of Lamprey (1975) with a major contribution by D. J. Pratt (pers. comm.). Few countries of equivalent size have quite the variety of landscapes of Kenya, extending from a glacial peak across highlands and plateaux to semi-desert and tropical coast. Such diversity represented at the map scale used here requires generalizations that mask numerous small and local communities.

The mobility and adaptability of the major faunal species make it difficult to delineate boundaries based on faunal characteristics. For that reason, plus a lack of detailed knowledge and information on the fauna, vegetation played an important role in delineating many of the biotic communities. The ecological classification of vegetation follows Trapnell (Trapnell and Griffiths, 1960; Trapnell and Langdale-Brown, 1962; Trapnell *et al* 1978) with actual boundaries drawn or extrapolated from a variety of published and unpublished surveys listed in the references. Those were supplemented by a satellite colour photomosaic of the country.

The vegetation surveys from which the biotic communities map was compiled, were done for a variety of purposes, at a variety of scales using different systems and intensities of survey. Considerable difficulty was experienced in trying to standardise the data and identify and assign indicator species and types to the appropriate communities.

The authors are aware that there may be errors in interpretation and plotting but those can only be resolved with more intensive surveys, revisions and field checking. The map, which is in the jacket at the back of this report, also notes those areas for which no data were available. Below is a listing of the biotic communities followed by a brief description of each.

## The Biotic Communities

1. Afro-Alpine Glacier and Moorland
2. Highland Moist Forest
3. Guineo — Congolean Rain Forest
4. Highland Dry Forest
5. Evergreen and Semi-Evergreen Bushland
6. Grassland
7. Semi-Arid Wooded and Bush-Grassland
8. Arid Thorn Bushland and Woodland
9. Semi-Desert
10. Coastal Forest and Woodland
11. Groundwater and Riverine Forest
12. Coastal Evergreen Bushland
13. Coastal Palm Stands
14. Permanent Swamps
15. Freshwater Lakes
16. Alkaline Lakes
17. Marine Beaches and Dunes
18. Mangroves
19. Coral Reefs and Islands

### 1. Afro-Alpine Glacier and Moorland

This biotic community consists of land above 3200 m subject to severe frost and at its highest elevations (5000 m), covered with permanent ice and snow. Vegetation is sparse above 4500 m but at lower elevations there is grassland and shrubland, with ericaceous species and stands of giant *Lobelia* and *Senecio*. Wild and domestic ungulates occasionally penetrate from lower elevations but the indigenous fauna comprises a small but distinctive range of birds, insects and small mammals.

### 2. Highland Moist Forest

The highland moist forest community consists of forest reserves and protected areas in the higher and moister parts of the country usually above 2000 m and with mean annual rainfall over 1200 mm corresponding closely to ecoclimatic zone II (Pratt and Gwynne, 1978). The forest cover is characterised either by *Podocarpus*, often associated with *Olea*, *Nuxia* and other forest trees, or where the moisture index is negative, by *Juniperus* (cedar), *Croton megalocarpus* or (on Mt. Kenya) *Newtonia buchananii*. Much of the highland area formerly under moist forest is now under cultivation or has lost its forest cover by other means; the forest areas that remain are important not just as a timber resource but as catchment area and habitats for a number of relatively rare mammals such as the bongo, giant forest hog and colobus monkey and some distinctive birds including forest species of turaco.

Narrow zones fringing the highland forest or blocks within the forest are dominated by *Arundinaria alpina* (Bamboo). They form a very distinct wildlife habitat for species such as the bongo.

### 3. Guineo-Congolean Rain Forest

This biotic community represents the last surviving relicts of the Kenya portion of the vast tract of tropical rain forest which once extended from the Zaire basin to western Kenya. The Kakamega forest relicts are in eco-climatic zone II and receive a well distributed mean annual rainfall of 1923mm.

Characteristic trees are tall *Croton megalocarpus, Celtis milbraedii, Chrysophyllum albidum, Aningeria altissima, Fagara milbraedii* and *Manilkara butugi*. The forest trees carry many epiphytes and orchids ferns and mosses are abundant. There are many forest lianes — often of large size.

Among the rare animals of this community are Flying Squirrels, Blue Monkeys, Red-tailed Monkeys, Palm Civets and Pottos. There are many notable birds including the spectacular Great Blue Turaco and the African Grey Parrot.

### 4. Highland Dry Forest

Highland dry forest characterizes the biotic community of the higher hills and mountains in the drier parts of the country to the north and south of the central highlands. Mean annual rainfall is around 1000 - 1200 mm. The 'dry cedar forests' include *Olea, Teclea* and *Euclea* and under the driest conditions become very stunted and merge into evergreen bushland. The highland dry forest is a valuable refuge for the wildlife of the evergreen bushlands particularly buffalo and elephant.

### 5. Evergreen and Semi-Evergreen Bushland

Extensive tracts of evergreen and semi-evergreen bushland are common on the Loita Plains and extend from Laikipia north to the Lorogi Plateau. Characteristic woody plants are *Olea, Akocanthera*, and *Euclea* together with *Rhus, Scutia* and *Carissa*. Fire sometimes creates grassland but equally or more commonly *Tarchonathus* (leleshwa) and associated *Acacias* invade to maintain a woody canopy as seen between Nakuru and Narok. Some parts are given over to ranching or provide dry-season grazing for pastoral herds but wildlife is moderately abundant, particularly buffalo, giraffe, the larger antelopes and, more locally, elephant.

### 6. Grassland

Grasslands occur where soil and water conditions or periodic fire prevent the establishment of dense stands of woody vegetation. The resulting grassland is usually dominated by perennial species but comprises many distinct communities, depending on complex interactions of climate, water, soil conditions and fire. Grazing value — whether for domestic stock or plains game — varies with grassland species but generally supports large numbers of grazing animals at specific times of the year.

Four categories of grassland are mapped:
—seasonal floodplains and delta grasslands
—alkaline/volcanic ash grasslands
—fire induced grasslands
—highland grasslands

Grasslands in seasonal floodplains are most common in the arid and semi-arid north and eastern part of the country with species of *Cynodon, Sporobolus* and *Lintonia* predominating. The soil developing from volcanic ash under dry climatic conditions results in alkaline/sodic soils which support *Chrysopogon* frequently in association with the saltbush *Suaeda*. The extensive plains of Laikipia, Athi/Kapiti and Loita have been frequently burned to keep back bush encroachment and to maintain a green flush for grazing. The main genera on these grasslands are *Digitaria, Cymbopogon* and *Cynodon* while on the coast species of *Panicum, Pennisetum* and *Dactyloctenium* dominant, across many of the inland areas. *Adropogon* and *Pennisetum* are common in the highland grasslands.

### 7. Semi-Arid Wooded and Bush-Grassland (Savannah)

Only small patches of the biotic community remain outside the settled and cultivated areas of the country. Presently largely in ecoclimatic zone IV, which represents the limit of arable land, these remaining patches will become increasingly threatened by the expansion of human activity. The landscape is predominantly of 'savannah' aspect with trees of *Combretum* or *Acacia* (typically *A. hockii, A. gerrardii, A. seyal*), sometimes with *Lannea, Albizia*, or *Terminalia* and shrub species, and with a grass cover dominated by *Hyperthelia, Hyparrhenia, Digitaria* or *Themeda*. Much of the area is under ranching or pastoral use but wildlife is locally abundant and includes species such as kudu and other large antelope. Periodic grass fires usually contribute to maintaining the open aspect.

### 8. Arid Thorn Bushland and Woodland

The arid thorn woodlands and bushlands form the most extensive biotic community in Kenya encircling the central highlands like a large reverse letter "C" from Amboseli through Tsavo, the north-east and north-west. The community is characteristic of ecoclimatic zone V and is represented by a dense or moderately dense cover of *Acacia* and/or *Commiphora* species. Most usually the woody vegetation is dominated by shrub species of *Acacia* (*A. senegal, A. nilotic, A. brevispica, A. mellifera*) but there are also extensive areas dominated by *Commiphora* and other broad-leaved deciduous shrubs and, more locally under favourable rainfall or soil conditions, there are sizeable blocks of *Acacia* or *Commiphora* woodland or wooded grassland, including tall *A. tortilis* on deep alluvial soils and *Commiphora* woodland towards the coast or on deep red soils in N.E. Kenya. Together these woodlands and bushlands support a high proportion of Kenya's range livestock and ungulate wildlife (including Tsavo Park and the Samburu/Isiolo Reserves.) Although locally the woody vegetation attains thicket density, most areas provide good to moderate grazing based on perennials like *Cenchrus ciliaris, Chloris roxburghiana* and *Eragrostis* species. Although distinctions can be drawn between wetter and drier, volcanic and basement and

woodland and bushland communities they do not vary greatly as wildlife habitats, except in so far as the northern areas support races and species of ungulates and birds not found in Southern Kenya. The woodlands also provide a particularly good nesting and feeding habitat for a range of dry-country bird species.

### 9. Semi-Desert

The north-central and western part of the country where woody vegetation is restricted mainly to shrub species of acacia (principally *A. reficiens*) and dwarf shrubs such as *Duosperma* and *Indigofera spinosa* and where perennial grasses can dominate only when water collects or in cycles of favourable rainfall. Areas of virtually barren land occur, indicated on the map as stippled areas. These are commonly referred to as the "desert" areas of Kenya.

Although most of the semi-desert is used seasonally by pastoral herds and flocks, its carrying capacity is low for both domestic and wild ungulates. A few species such as oryx and some gazelle, however, can utilise this harsh environment and it also supports a distinctive avifauna and a surprisingly large number of adapted small mammals and reptiles.

### 10. Coastal Forest and Woodland

Localised areas where a dense or moderately dense stand of tall trees remain. The coastal forests — now much restricted in area — are characterised by species of *Sterculia, Chlorophora* and *Memecylon*. Drier woodlands at the coast (sometimes achieving a forest aspect) include stands of *Cynometra, Manilkara* and *Afzelia*, of *Brachlaena* and *Diospyros* and of *Brachystegia* and *Julbernardia*. The *Brachystegia* woodland is the northernmost extension of the 'miombo' woodlands that form a major biotic community of Tanzania and Zambia. It was never widespread and is rapidly disappearing in Kenya.

### 11. Groundwater and Riverine Forest

These biotic communities are supported largely by groundwater seepage and thus exhibit a more luxuriant growth of vegetation than would be expected from the rainfall in the area. Examples are the Boni/Dodori forests, Tana River Forest and the vegetation along the Turkwell river. Riparian and groundwater forests and woodlands are varied in composition and localised in area but, are worthy of conservation for their specific flora and fauna (principally avifauna). The vegetation along the Tana River is a complex of a variety of species whereas other riverine developments consist generally of more open *Acacia tortilis* or *A. elatior* and duom palms with a much reduced faunal composition.

### 12. Coastal Evergreen Bushland

The evergreen bushland of the coast may be secondary to forest and/or cultivation or it may be 'natural'. It is often interspersed with areas of cultivation. Characteristic woody plants are *Crossopterix febrifuga, Piliostigma thonningii, Annona chrysophylla, Heeria mucronata, Lantana camara, Rhus natalensis, Securinega virosa, Hoslundia opposita*, and *Grewia glandulosa*. Locally the area provides grazing or browse for domestic or wild ungulates but it is not noted as a wildlife habitat except for monkeys, baboons, birds and rodents.

### 13. Coastal Palm Stands

These woodlands are characterized by *Hyphaene* and *Borassus* palms on open grassland and on groundwater sites. The most significant examples are located northwest of the Kenyatta Settlement Scheme and on the south coast around Ramisi. Such areas are an important habitat for birds and often monkeys but are not otherwise significant as wildlife habitat.

### 14. Permanent Swamps

Permanent Swamps are wet all year characterized by Papyrus (*Cyperus papyrus*) and swamp grasses such as *Echinochloa, Miscanthidium* and *Phragmites*. They are important habitats for migrating waterfowl and indigenous marsh birds. Significant among the mammals that frequent this biotic community is the Sitatunga antelope of which the distribution in Kenya is confined to a few of the permanent swamps of western Kenya.

### 15. Freshwater Lakes

The freshwater lakes in Kenya are Victoria, Turkana, Naivasha, Baringo and Bolosat. Other small bodies of freshwater may also be classified within this group as well as impoundments created by dams. *Tilapia* and bass are commercially important species of fish in this community.

### 16. Alkaline Lakes

Inland lakes of the Rift Valley characterised by a high alkali or soda content in the water and soil. The flora and often the fauna of these areas are distinct from those of the freshwater areas. The surrounds are often *Sporobolus spicatus* grassland or support 'salt bushes' such as *Suaeda*. Often their area increases or decreases as the lake level rises and falls. These lakes are of little direct interest to man and domestic livestock (though some are 'mined' for their salt) but are of high tourist interest and support most of Kenya's flamingoes. The main lakes are Magadi, Elementaita, Nakuru, and Bogoria.

### 17. Marine Beaches and Dunes

This biotic community, confined to the Kenya coast, is characterised by bare sand dunes lightly vegetated by colonizing plants. The beaches may be washed by wave action or consist of dry dunes around barrier beach ponds.

Examples are the beaches along the Malindi coast and the stabilized dunes and barrier beach ponds along Ras Tenewi north of the Tana Delta.

### 18. Mangroves

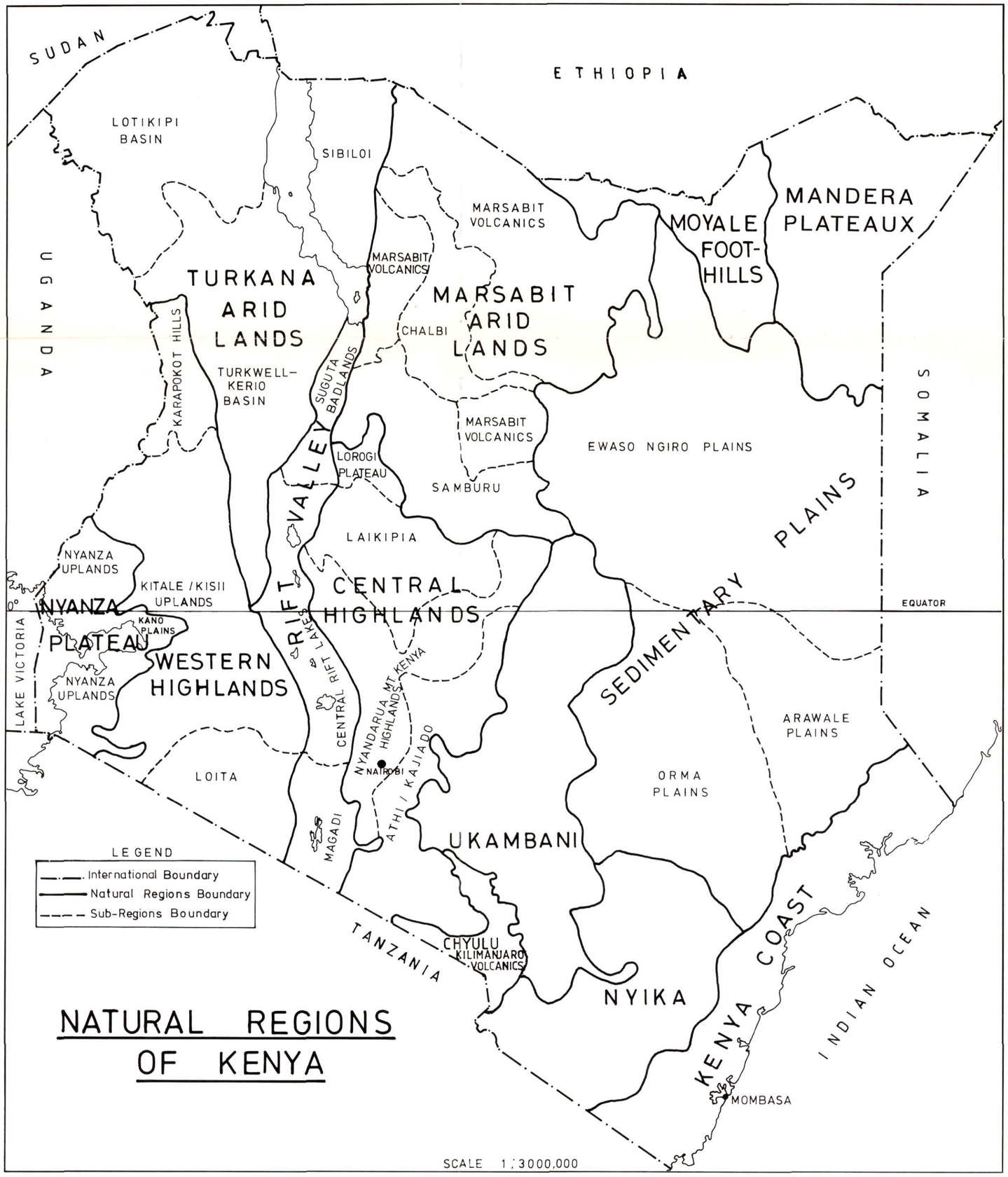
Mangroves are a specialized vegetation type growing along the tidal banks of protected estuaries or portions of the coast where the force of the waves is broken by coral reefs or islands. Examples are found in Kilifi creek and in the sheltered bays around Lamu. Twelve mangrove species occur on the coast of East Africa (Lind and Morrison, 1974) though *Rhizophora mucronata* is probably the most characteristic species along the Kenya coast. The export of mangrove poles is an historically important industry along the coast.

### 19. Coral Reefs and Islands

This community includes the marine reefs, their associated aquatic vegetation and marine life that lie along the Kenya coast. The coral reef fringes the coast from Shimoni to Malindi and north of the Tana River to the Somali border broken only opposite creeks and river mouths where the outflow of fresh water has killed the coral. The outer edge of the reef is on the average about 600 meters from the shore. Coral Islands are closely associated with the offshore reef system and provide habitat for many colonial nesting bird species. They are most numerous north of Lamu and along the south coast at Shimoni near the Tanzania border.

## Settled and Cultivated Land

Land largely cleared of natural vegetation and given over to cultivated crops is mapped as settled and cultivated. In the highlands this consists largely of coffee and tea and elsewhere of subsistence cereals and pulses but including sisal, cotton, rice and horticultural crops on plantations and irrigation schemes. Cultivated lands sometimes maintain an interesting avifauna but their main significance in terms of wildlife lies in their need for protection from wildlife invasion and damage. It is not within the scope of this study to consider the complexities of the biotic communities developed in association with human settlement.


SUDAN
ETHIOPIA
UGANDA
SOMALIA
TANZANIA
LOTIKIPI BASIN
SIBILOI
MARSABIT VOLCANICS
MOYALE FOOT-HILLS
MANDERA PLATEAUX
TURKANA ARID LANDS
MARSABIT/ VOLCANICS
MARSABIT ARID LANDS
CHALBI
KARAPOKOT HILLS
TURKWELL-KERIO BASIN
SUGUTA BADLANDS
MARSABIT VOLCANICS
EWASO NGIRO PLAINS
LOROGI PLATEAU
SAMBURU
RIFT VALLEY
LAIKIPIA
NYANZA UPLANDS
KITALE / KISII UPLANDS
CENTRAL HIGHLANDS
EQUATOR
NYANZA PLATEAU
KANO PLAINS
WESTERN HIGHLANDS
NYANZA UPLANDS
LAKE VICTORIA
RIFT VALLEY LAKES
CENTRAL RIFT
NYANDARUA MT. KENYA HIGHLANDS
SEDIMENTARY PLAINS
ARAWALE PLAINS
LOITA
NAIROBI
ATHI / KAJIADO
ORMA PLAINS
MAGADI
UKAMBANI
LE GEND
International Boundary
Natural Regions Boundary
Sub-Regions Boundary
CHYULU KILIMANJARO VOLCANICS
NYIKA
KENYA COAST
INDIAN OCEAN
MOMBASA
NATURAL REGIONS OF KENYA
SCALE 1:3000,000

# III. NATURAL REGIONS OF KENYA

The divisions of Kenya into Natural Regions provides a basis for the rational development of a system plan for the national parks and reserves. Ojany, in the National Atlas of Kenya (1970 p.4) notes that with an area of only 582,644 sq. km., Kenya is a country of tremendous topographical diversity, displaying practically every landform type ranging from glaciated mountains and permanent snow, through recent volcanic activity, to desert landscapes. The definition of Natural Regions is an attempt to utilize this topographic diversity combined with the ecological influence as depicted by the biotic communities to divide the country into reasonably related, easily recognizable areas.

## The Natural Regions

Thirteen Natural Regions are recognized, some of which have been divided into sub-regions. These appear on the fold-out map facing this page.

I. ***Nyanza Plateau Natural Region***
   (a) Kano Plains
   (b) Nyanza Uplands

II. **Western Highlands Natural Region**
   (a) Karapokot Hills
   (b) Kitale-Kisii Uplands
   (c) Loita

III. **Rift Valley Natural Region**
   (a) Sibiloi
   (b) Suguta Badlands
   (c) Central Rift Lakes
   (d) Magadi

IV. **Turkana Arid Lands Natural Region**
   (a) Lotikipi Basin
   (b) Turkwell — Kerio Basins

V. **Marsabit Arid Lands Natural Region**
   (a) Marsabit Volcanics
   (b) Chalbi
   (c) Samburu

VI. **Central Highlands Natural Region**
   (a) Lorogi Plateau
   (b) Laikipia
   (c) Nyandarua/Mt. Kenya Highlands
   (d) Athi/Kajiado

VII. **Ukambani Natural Region**

VIII. **Chyulu/Kilimanjaro Volcanics Natural Region**

IX. **Nyika Natural Region**

X. **Sedimentary Plains Natural Region**
   (a) Orma Plains
   (b) Ewaso Ngiro Plains
   (c) Arawale Plains

XI. **Moyale Foothills Natural Region**

XII. **Mandera Plateaux Natural Region**

XIII. **Kenya Coast Natural Region**
   (a) Coastal Hinterland
   (b) Fringing Reef and Mangrove Swamps

# I. NYANZA PLATEAU NATURAL REGION

*gently sloping landscape between the shores of Lake Victoria and the 1500 m contour with the eroded surface exposing granite outcrops.*

- annual mean temperature ranges between 14° C — 34° C with rainfall increasing from 500 mm along the south western shoreline to 1700 mm around Kakamega.
- heavily populated and intensively cultivated and grazed.

*the flat sedimentary Kano Plains bounded by the Nyando escarpment divides the area into two sub-regions.*

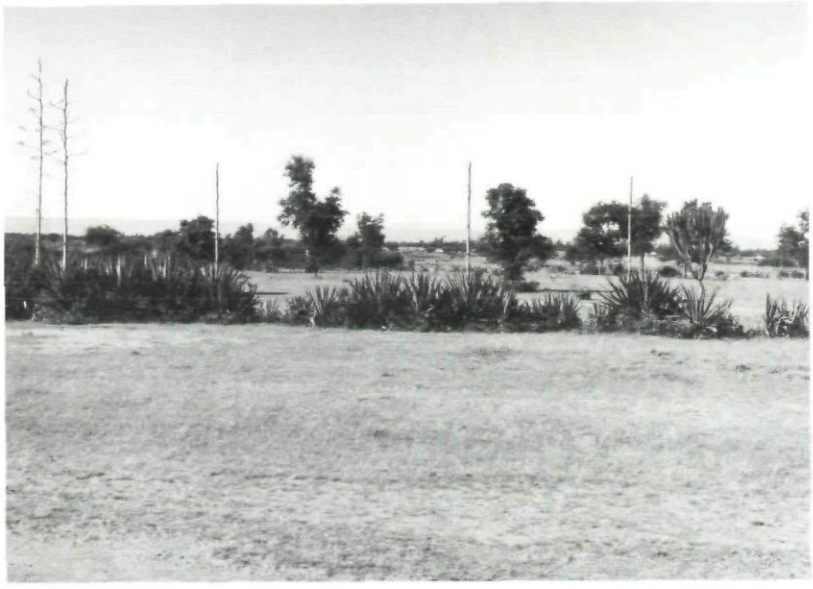
## Kano Plains Subregion

- combination of flat topography, good soils and reliable rainfall have resulted in intensive settlement and cultivation.
- natural fauna and floral greatly reduced, but avifauna is still notable.

## Nyanza Uplands Subregion

- broken and varied topography
- Yala swamp represents a significant example of a permanent freshwater biotic community.
- Lambwe Valley National Reserve conserves an example of the indigenous fauna and flora.

# I. NYANZA PLATEAU NATURAL REGION



(a) Kano Plain Subregion

(b) Nyanza Uplands Subregion

## II. WESTERN HIGHLANDS NATURAL REGION

*characterized by Mt. Elgon on the west and steep escarpments along the eastern boundary extending from Nguruman through Mau and Elgeyo to include the Karapokot Hills in the north.*

- region of great diversity in which basement and volcanic landscapes are well represented
- altitude ranges from 4300 m at Mt. Elgon to 1200 m around Turkwell gorge in the north to 1500 m in the Mara plains to the south.
- the highland areas may receive over 2000 mm of rain per year while annual mean temperatures range from 30° C to less than 6° C.
- much of this region is the best agricultural land in Kenya and carries a correspondingly high population. The range of vegetation types is great and reflects the wide diversity of ecological condition.

*subregions are defined by increasingly drier and warmer conditions to the north and south with correspondingly more open habitat.*

### Karapokot Hills Subregion

- series of linear basement hills capped by dry forest with dry bushland at lower altitudes.
- deeply incised Turkwell Gorge.
- fauna and flora largely unknown.

### Kitale-Kisii Uplands Subregion

- most intensively populated and productive area of Kenya.
- high altitude rainforest occurs on Mt. Elgon, Cherangani Hills and Mau Escarpment.

### Loita Subregion

- includes volcanic footslopes of Mau Hills and Loita Plains to the basement outcrops of the Loita Hills and Nguruman escarpment.
- area of increasing agricultural development.
- northernmost part of Serengeti escosystem including northernmost movement of wildebeest migration.
- biotic communities of Loita Hills and Nguruman show affinities with the communities of the Kitale-Kisii Uplands subregion.


(a) Karapokot Hills Subregion

(b) Kitale-Kisii Uplands Subregion

(c) Loita Subregion

## III. RIFT VALLEY NATURAL REGION

*bordered by the walls of the Great Rift Valley.*

- altitudes range from 375 m at Lake Turkana to 1700 m at Lake Naivasha then decrease to 600m at Magadi in the south. Numerous volcanoes scattered throughout the length of the valley.
- annual mean temperatures range from over 34° C in the north and south of the region to less than 10° C in the central portion. Similarly, rainfall reaches from less than 250 mm to over 1000 mm around Nakuru.
- maximum population and agricultural development is found in the central portion decreasing to scattered nomadic pastoralism in the north and south extremities.

*the region is subdivided by a combination of distinctive geological and eco-climatic factors.*

### Sibiloi Subregion

- step faulting along the eastern shore of Lake Turkana
- sediments of major archaeological importance exposed around Koobi Fora in Sibiloi National Park.
- important nesting sites for nile crocodile on the islands in Lake Turkana.

### Suguta Badlands Subregion

- barren, hot landscapes of deeply eroded hills and lava plains draining into a flat basin of seasonally flooded soda pans.
- Teleki's volcano, at the southern tip of Lake Turkana, typifies the widespread recent volcanic activity throughout the subregion.

### Central Rift Lakes Subregion

- moderate climatic conditions have encouraged human settlement and agricultural development.
- chain of freshwater and soda lakes provide habitats for large and diverse bird populations.
- geothermal activity evident throughout.

### Magadi Subregion

- grid faulting evident throughout area.
- significant soda deposits at Lake Magadi support varied bird life and valuable mineral exploitations.
- Engare Ngiro swamp, fed by the Ewaso Ngiro river, supports varied wildlife populations and pastoral activities.

(a) Sibiloi Subregion

(b) Suguta Badlands

(c) Central Rift Subregion

(d) Magadi Subregion

# IV. TURKANA ARID LANDS NATURAL REGION

*Dry, sparsely vegetated, rolling landscape grading to barren lands towards Lake Turkana with scattered ranges of rocky hills. Narrow belts of Acacia and palm trees line the permanent waters of the Kerio and Turkwell Rivers.*

- annual mean temperatures range from 14°C in the southern portion to over 34°C at Lodwar with rainfall grading from 750 mm in the southwest to less than 160 mm in the east.
- area is sparsely inhabited by nomadic pastoral tribes.

*subregions defined by drainage characteristics.*

## Lotikipi Basin Subregion

- vast level arid plain of seasonally vegetated dark soil surrounded by ranges of rocky hills.
- indigenous wildlife populations sparse, seasonally augumented by migrations from neighbouring countries.

## Turkwell-Kerio Basins Subregion

- two permanent rivers, from sources in the western highlands, flow through rolling arid, lands towards a desert-like dune landscape near Lake Turkana.
- rich in archaelogical sites.

(a) Lotikipi Basin Subregion

(b) Turkwell-Kerio Basins Subregion

# V. MARSABIT ARID LANDS NATURAL REGION

*arid ranges of hills and volcanic plains surrounding a central drainage basin, the Chalbi and Koroli deserts.*

- surrounding hills grade from 2700 m at Mt. Nyiru down to about 450 m in the Chalbi desert.
- mean annual temperatures range from 34° C throughout most of the area down to 14° C on Marsabit mountain.
- rainfall is below 250 mm in the central portion of the region rising to 500 mm towards the north and south with the higher hills receiving 1000 mm.
- sparsely occupied by pastoralist nomads except for more concentrated agriculture on the higher hillsides.

*subregions are delimited on a basis of landscape features which coincide with geomorphology.*

### Marsabit Volcanics Subregion

- extensive lava boulder fields with Mt. Marsabit as a prominent feature.
- lava fields south of Marsabit and Mt. Kulal are separated by sedimentary deposits of the Chalbi subregion.
- agricultural activity and human settlement are concentrated on Mts. Marsabit and Kulal as a result of more favourable eco-climatic conditions.
- grasslands of the Huri Hills contrast with the surrounding lava fields.

### Chalbi Subregion

- sedimentary basin of saline and alkaline soils
- extensive barren areas support seasonal flushes of ephemeral vegetation.

### Samburu Subregion

- series of parallel ridges sweeping south-eastward from Mt. Nyiru in decreasing altitude to terminate at the Ewaso Ngiro river in Samburu National Reserve.
- high rainfall in the mountain ranges produce well developed forest stands.
- the open, level landscape of the El Barta Plains is a distinctive feature.

(a) Marsabit Volcanics Subregion

(b) Chalbi Subregion

(c) Samburu Subregion

# VI. CENTRAL HIGHLANDS NATURAL REGION

*characterized by the volcanic massif of Mt. Kenya/Nyandarua and Lorogi Plateau with the contiguous Laikipia and Kajiado plains.*

- topography ranges from the snow capped peak of Mt. Kenya at 5200 m to below 1200 m in the Kajiado area.
- five eco-climatic zones are well represented with landscapes varying from barren rock and tundra-like alpine grassland through humid forests to semi-arid grasslands.
- mean annual temperatures reach from below 6°C in the mountain ranges to 26°C throughout most of the region.
- mean annual rainfall is between 2000 mm in the mountains to below 500 mm in the plains.
- high population and intensive agriculture and grazing are common throughout the area.

*subregions identified by geomorphological characteristics and landscape features.*

### Lorogi Plateau Subregion

- most northerly extension of the central massif separated by Laikipia Plains and exhibiting effects of drier eco-climatic conditions.
- settlement and agriculture increasing throughout.

### Laikipia Subregion

- dry, open, rolling plain under the influence of the rain shadow of Mt. Kenya.
- increasing settlement and cultivation replacing large scale ranching.
- forested Loldaika mountains offer topographic relief.

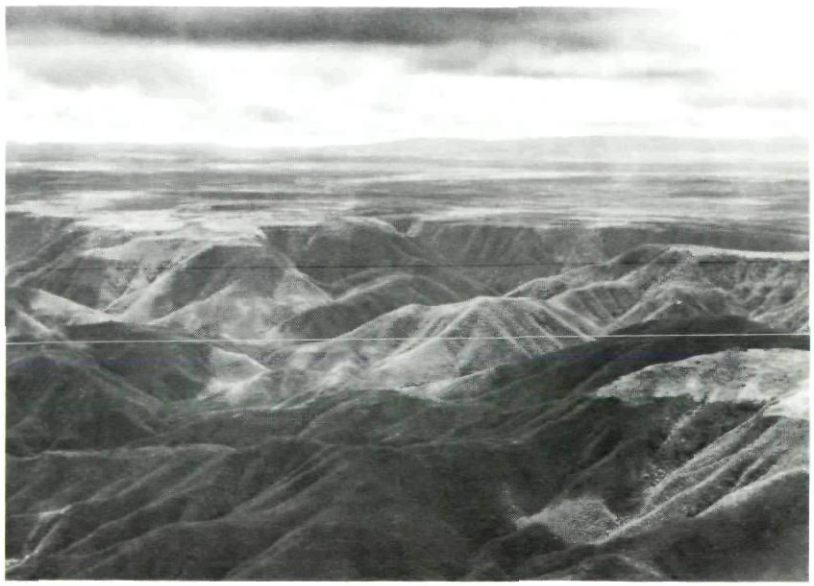
### Nyandarua/Mt. Kenya Highlands Subregion

- permanent glaciers and alpine moorland at high altitudes giving way to diverse bamboo and moist forest surrounded by concentrated human settlement and agricultural development at lower levels.
- considerable urban and industrial development at lower altitudes.

### Athi/Kajiado Subregion

- open grassland grading to bushed and wooded grassland.
- isolated rocky hills of which Namanga mountain is the most prominent.

(a) Lorogi Plateau Subregion



(b) Laikipia Plains Subregion

(c) Nyandarua/Mount Kenya Highlands Subregion

(d) Athi/Kajiado Plains Subregion

## VII. UKAMBANI NATURAL REGION

*a dissected hilly landscape punctuated by inselbergs and tors of resistant and scenically interesting rock outcrops that occur in a north-south pattern.*

- region rises from about 500 m along its eastern boundary to about 1500 m in the west with some hill tops reaching 2000 m.
- mean annual rainfall rises from 250 mm in the east to over 1000 mm in the hills.
- the region is populated and cultivated with the exception of the areas gazetted as national parks and reserves and the dry northern tip.
- the Yatta, a narrow lava plateau 2-3 km wide and over 240 km long, is an intereting feature traversing the southern half of the area.

## VIII. CHYULU/KILIMANJARO VOLCANIC NATURAL REGION

*area influenced by volcanic activity consisting of the Chyulu range of ash cones with numerous permanent, freshwater swamps in the surrounding plains fed from rainfall in the volcanic highlands. Mt. Kilimanjaro forms an impressive backdrop.*

- altitude range is slight from 1500 m on the Chyulu Hills to 1200 m at Lake Amboseli.
- mean annual temperatures are in the 14°C — 34°C range with mean annual rainfall between a low of 250 mm on the plains to over 760 mm on the highlands.
- most of the region is settled and grazed with some arable farming on the footslopes of Kilimanjaro.
- indigenous vegetation and wildlife is still common in the Chyulu Hills.
- Amboseli National Park conserves examples of freshwater swamps and the resident and migratory wildlife.

## VII. UKAMBANI NATURAL REGION

## VIII. CHYULU/KILIMANJARO VOLCANICS NATURAL REGION

## IX. NYIKA NATURAL REGION

*the historic "Taru Desert" is a featureless, thornbush plain with dry seasonal river beds and a few isolated rock hills.*

- aridity rapidly increases towards the north with rainfall dropping from the southern mean annual maximum of 550 mm to 250 mm.
- mean annual temperatures range from 22° C to 34° C.
- the northern boundary approximates the limit of the Duruma deposits of the triassic and Carboniferous-Permian eras and marks the northern limit of hills and rocks before the Sedimentary Plains Natural Region.

## X. SEDIMENTARY PLAINS NATURAL REGION

*predominantly an arid, featureless, sedimentary plain covered with thornbush, declining gently eastwards and traversed by the Tana and Ewaso Ngiro Rivers draining central and northern Kenya.*

- the arid northern and central portions receive less than 250 mm of rainfall which gradually increases to 500 mm towards the coast.
- temperatures range from a mean annual minimum of 22° C along the western boundary to over 34° C.
- population density is very low with nomadic pastoralism the main lifestyle and some cultivation along the Tana River.

*subregions are defined on a basis of distinctive drainage patterns.*

### Orma Plains Subregion

- broad shallow valleys, subject to seasonal flooding drain generally eastward to the Tana River which is deeply incised and supports a luxuriant riverine forest.
- the Tana River is the only permanent river in the Sedimentary Plains Natural Region and is being exploited for irrigation.
  (No photograph available)

### Ewaso Ngiro Plains Subregion

- seasonal watercourses frequently terminating in open floodplain grasslands or seasonal swamps in the arid thornbush plain that slopes imperceptably towards the Somali border.
- climatically this is the driest of the 3 subregions with vegetation that supports wildlife and livestock concentrated along the seasonal watercourses largely maintained by rainfall outside the Natural Region.

### Arawale Plains Subregion

- poorly defined drainage network running generally parallel with the Tana River towards the coast but impeded by the elevated ridge of the Lamu/Boni hinterland results in numerous seasonal water pans (ziwas) throughout the area.
- continued underground movement of water is believed to be a significant factor in the maintenance of the forest in the Lamu/Boni hinterland.
- only range of Hunter's hartebeeste in Kenya.

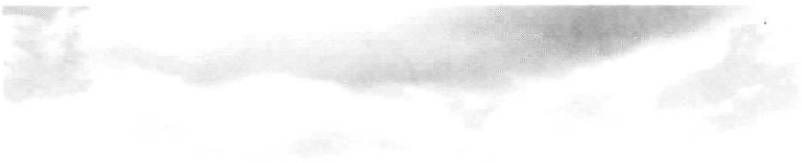
## IX. NYIKA NATURAL REGION

(NO PHOTOGRAPH AVAILABLE)

## X. SEDIMENTARY PLAINS NATURAL REGION

(a) (NO PHOTOGRAPH AVAILABLE)

(b) Ewaso Ngiro Plains Subregion



(c) Arwale Plains Subregion

## XI. MOYALE FOOTHILLS NATURAL REGION

*a hill area of basement or granite rocks extending south from the Ethiopian highlands.*

- rising from arid thornbush at 600 m to semi-evergreen bushland at 1300 m around Moyale.
- mean annual temperatures range from 34° C in the southern portion to 14° C in the uplands at Moyale while mean annual rainfall rises from less than 250 mm to 700 mm at Moyale.
- improved ecological conditions allow increased settlement and cultivation in the north of the subregion.

## XII. MANDERA PLATEAUX NATURAL REGION

*limestone and sandstone plateaux and deeply dissected hills extending to the Galana Daua River on the Ethiopia/Kenya border where the landscape descends rapidly along steep sided gullies to the incised river.*

- altitude ranges from 1000 m down to 366 m at Mandera and 600 m on the Sedimentary Plains Natural Region.
- temperatures range from a mean annual low of 14° C in the highlands to over 34° C at Mandera and rainfall ranges from less than 250 mm to 500 mm.
- outcropping limestone is a characteristic of the area.

## XI. MOYALE FOOTHILLS NATURAL REGION

## XII. MANDERA PLATEAUX NATURAL REGION

## XIII. KENYA COAST NATURAL REGION

*extends from a range of low rounded hills down to a level coastal plain bordered by sandy beaches, coral cliffs or dunes to an offshore fringing reef and coral islands.*

- mean annual temperatures vary from 22° C at the Coast to 34° C inland.
- the highest rainfall of up to 1500 mm occurs around Ramisi and decreases gradually northwards along the coast to Kiunga and rapidly inland to less than 500 mm.
- densely populated and cultivated with decreasing intensity north of Malindi.
- the beaches are a major tourist attraction for overseas visitors.

*subregions are differentiated on a basis of marine and related environment and terrestrial/hinterland environment influenced by the coastal climate.*

### Coastal Hinterland Subregion

- remnant rich forest vegetation on low rolling hills and gentle ridges as a result of favourable ecoclimatic conditions contrasting with the drier thornbush country of the neighbouring Natural Region.
- centuries of human activity have reduced and modified the natural coastal vegetation to isolated patches such as at Witu and Shimba Hills and discontinuous tracts of *Manilkara* forests best preserved in the Boni/Dodori National Reserve.
- the Tana River delta is a significant feature.
- forests north of the Tana River delta are considered to be largely sustained by ground water draining form the Arawale Plains subregion.

### Fringing Reef and Mangrove Swamps Subregion

- the coastline of sand beaches and coral cliffs is fringed by a discontinuous, linear coral reef with archipelagos of coral islands at Shimoni and at Lamu. Mangrove swamp occurs in sheltered creeks and lagoons.
- reef formation is broken at river and stream outlets where freshwater and silt deposits inhibit coral growth.
- dune development occurs between Lamu and Malindi.
- many of the islands support nesting colonies of sea birds.
- the reefs support a wide variety of marine life which is an important tourist attraction and the basis of traditional fishing.
- limited populations of dugong and sea turtles occur in favourable habitats along the coast.

(a) Coastal Hinterland Subregion

(b) Fringing Reef and Mangrove Swamps Subregion

# IV. TABLE OF PARKS AND RESERVES

The present park and reserve system[1] includes 42 areas. How well do they represent the Natural Regions and biotic communities in Kenya? The following tables indicate the gaps and possible future requirements.

[1]Since the preparation of these tables, several areas have been added to the National Parks and Reserves.

## TABLE I
## REPRESENTATION OF THE MAJOR BIOTIC COMMUNITIES IN THE EXISTING NATIONAL PARKS AND RESERVES SYSTEM

| BIOTIC COMMUNITIES | National Parks and National Reserves | Aberdare N.P. | Amboseli N.P. | Hell's Gate N.P. | Kisite N.P. | Lake Nakuru N.P. | Malindi Marine N.P. | Meru N.P. | Mt. Elgon N.P. | Mt. Kenya N.P. | Nairobi N.P. | Ol Donyo Sabuk N.P. | Saiwa Swamp N.P. | Sibiloi N.P. | Tsavo East N.P. | Tsavo West N.P. | Watamu Marine N.P. | Arawale N.R. | Bisanade N.R. | Boni N.R. | Buffalo Springs N.R. | Dodori N.R. | Kerio Valley N.R. | Kiunga Marine N.R. | Kora N.R. | Lake Bogoria N.R. | Lambwe Valley N.R. | Losai N.R. | Malindi Marine N.R. | Marsabit N.R. | Masai Mara N.R. | Mpunguti N.R. | Mwea N.R. | Nasalot N.R. | North Kitui N.R. | Rahole N.R. | Samburu N.R. | Shaba N.R. | Shimba Hills N.R. | South Kitui N.R. | South Turkana N.R. | Tana River Primate N.R. | Watamu Marine N.R. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 AFRO-ALPINE GLACIER AND MOORLAND | | ● | | | | | | | ● | ● | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 HIGHLAND MOIST FOREST | | ● | | | | | | | ● | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 GUINEO-CONGOLEAN RAIN FOREST | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 HIGHLAND DRY FOREST | | | | | | | | | | | ● | ● | | | | | | | | | | | | | | | | | ● | | | | | | | | | | | | | |
| 5 EVERGREEN AND SEMI-EVERGREEN BUSHLAND | | | ● | | | | | | | | | | | | | | | | | | | | | | | | | | ● | ● | | | | | | | | | | | |
| 6 GRASSLAND a) HIGHLAND | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 GRASSLAND b) FIRE INDUCED | | | | | | | | | | ● | | | | | | | | | | ● | | ● | | | | ● | | | | ● | | | | | | | | ● | | | | |
| 6 GRASSLAND c) ALKALINE/VOLCANIC ASH | | ● | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 GRASSLAND d) SEASONAL, FLOOD-PLAIN AND DELTA | | | | | | | | | | | | | | ● | | | | | | | | | | | | | | | | | | | | | | | | ● | | | |
| 7 SEMI-ARID WOODED AND BUSH GRASSLAND | | | | | | | ● | | | | | | | | | | | | | | | | | | | | | | ● | ● | | ● | | | | | | | | | |
| 8 ARID THORN BUSHLAND AND WOODLAND | | ● | | | | | ● | | | | | | | ● | ● | | ● | ● | | ● | ● | ● | | ● | ● | | ● | | ● | | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | |
| 9 SEMI-DESERT | | | | | | | | | | | | | ● | | | | | | | | | | | | | | ● | | | | | | | | | | | | | | | |
| 10 COASTAL FOREST AND WOODLAND | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● | | | | |
| 11 GROUND-WATER AND RIVERINE FOREST | | | | | | | | | | | | | | | | | | | | ● | | ● | | | | | | | | | | | | | | | | | | ● | | |
| 12 COASTAL EVERGREEN BUSHLAND | | | | | | | | | | | | | | | | | | | | | | ● | | | | | | | | | | | | | | | | | | | | |
| 13 COASTAL PALM STANDS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 PERMANENT SWAMP | | ● | | | | | | | | | | ● | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 FRESHWATER LAKES | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16 ALKALINE LAKES | | | | | ● | | | | | | | | | | | | | | | | | | | | ● | | | | | | | | | | | | | | | | |
| 17 MARINE BEACHES AND DUNES | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18 MANGROVES | | | | | | | | | | | | | | | | | | | | | | ● | | ● | | | | | | | | | | | | | | | | | | ● |
| 19 CORAL REEFS AND ISLANDS | | | | ● | | ● | | | | | | | | | | ● | | | | | | | | ● | | | | ● | | | ● | | | | | | | | | | ● |

## TABLE II
## REPRESENTATION OF THE NATURAL REGIONS IN THE EXISTNG NATIONAL PARKS AND RESERVES SYSTEM

| | NATURAL REGIONS AND SUB-REGIONS | | National Parks and National Reserves | Aberdare N.P. | Amboseli N.P. | Hell's Gate N.P. | Kisite N.P. | Lake Nakuru N.P. | Malindi Marine N.P. | Meru N.P. | Mt. Elgon N.P. | Mt. Kenya N.P. | Nairobi N.P. | Ol Donyo Sabuk N.P. | Saiwa Swamp N.P. | Sibiloi N.P. | Tsavo East N.P. | Tsavo West N.P. | Watamu Marine N.P. | Arawale N.R. | Bisanade N.R. | Boni N.R. | Buffalo Springs N.R. | Dodori N.R. | Kerio Valley N.R. | Kiunga Marine N.R. | Kora N.R. | Lake Bogoria N.R. | Lambwe Valley N.R. | Losai N.R. | Malindi Marine N.R. | Marsabit N.R. | Masai Mara N.R. | Mpunguti N.R. | Mwea N.R. | Nasalot N.R. | North Kitui N.R. | Rahole N.R. | Samburu N.R. | Shaba N.R. | Shimba Hills N.R. | South Kitui N.R. | South Turkana N.R. | Tana River Primate N.R. | Watamu Marine N.R. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I | NYANZA PLA-TEAU | a) Kano Plains | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | b) Nyanza Uplands | | | | | | | | | | | | | | | | | | | | | | | | | | ● | | | | | | | | | | | | | | | | | |
| II | WESTERN HIGH-LANDS | a) Karapokot Hills | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ◒ | | | | | | | | | | | |
| | | b) Kitale-Kisii Uplands | | | | | | | | ● | | | | ● | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | c) Loita | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● | | | | | | | | | | | | | |
| III | RIFT VALLEY | a) Sibiloi | | | | | | | | | | | | | | ● | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | b) Suguta Badlands | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | c) Central Rift Lakes | | | ● | | ● | | | | | | | | | | | | | | | | | | | | ● | | | | | | | | | | | | | | | | | |
| | | d) Magadi | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IV | TURK-ANA ARID LANDS | a) Lotikipi Basin | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | b) Turkwell-Kerio Basins | | | | | | | | | | | | | | | | | | | | | | ● | | | | | | | | | | | ◒ | | | | | | | | ● | |
| V | MARSABIT ARID LANDS | a) Marsabit Volcanics | | | | | | | | | | | | | | | | | | | | | | | | | | | ◒ | | ● | | | | | | | | | | | | |
| | | b) Chalbi | | | | | | | | | | | | | | | | | | | | | | | | | | | ◒ | | | | | | | | | | | | | | |
| | | c) Samburu | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● | | | | | | | |
| VI | CENTRAL HIGH-LANDS | a) Lorogi Plateau | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | b) Laikipia | | | | | | | | | | | | | | | | | | | | ● | | | | | | | | | | | | | | | | | ● | | | | | |
| | | c) Nyandarua-Mt. Kenya Highlands | ● | | | | | ◒ | | ● | ◒ | | | | | | | | | | | | | | | | | | | | | | | ○ | | | | | | | | | | |
| | | d) Athi-Kajiado | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VII | UKAMBANI | | | | | | | | | | | ● | | | ◒ | ◒ | | | ● | | | | | | ● | | | | | | | | | ● | | ● | ◒ | | | | | | | |
| VIII | CHYULU-KILIMANJARO VOLCANICS | | | ● | | | | | | | | | | | | ◒ | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IX | NYIKA | | | | | | | | | | | | | | ◒ | ◒ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| X | SEDI-MENTARY PLAINS | a) Orma Plains | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● | | ● | |
| | | b) Ewaso Ngiro Plains | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ◒ | | | | | | |
| | | c) Arawale Plains | | | | | | | | | | | | | | | | | | ● | | | | | | | | | | | | | | | | | | ◒ | | | | | | |
| XI | MOYALE FOOTHILLS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| XII | MANDERA PLATEAUX | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| XIII | KENYA COAST | a) Coastal Hinterland | | | | | | | | | | | | | | | | | | | | ● | | ● | | | | | | | | | | | | | | | | | ● | | | |
| | | b) Fringing Reef and Mangrove Swamps | | | | ● | | ● | | | | | | | | | | ● | | | | | | | ● | | | | | ● | | | ● | | | | | | | | | | ● |

Key: ● — Completely within a Natural Region or Sub-region. ◒ — Partially within a Natural Region or Sub-region.

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