

Biogeographic Areas of Kerala

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India's Rich Biodiversity

India ranks sixth among the 12 mega biodiversity countries of the world. Indian biodiversity is unique not so much for its numerical species diversity as for the range of biodiversity attributable to a variety of biogeographics and physical environment situations. Our numerous mountain chains in extensive continuum are repositories of invaluable forest wealth. A traditional feature of our wilderness has been an intimate interspersion of human inhabitation with people dependent on the biomass resources for their bonafide use. Notwithstanding this continuous onslaught on our forest wealth, the overall range of India biodiversity is still unmatched.

The Planning of Wildlife Protected Areas

At the Fourth World Congress on National Parks held at Bali, Indonesia in 1982, it was decided that the planning of rational conservation strategies for Countries and Regions should be based on Biogeographic knowledge and concepts. The Bali Action Plan stated that steps should be taken to "further develop and distribute a Biogeographical Classification System for use in the global analysis of Protected Area coverage." Such concepts were incorporated into India's own National Wildlife Action Plan of 1983. It is stated in the Plan: Establish a network of scientifically managed Protected Areas such as National Parks, Sanctuaries and Biosphere Reserves to cover representative and viable samples of all significant Biogeographic Sub-divisions within the country. Such Protected Areas should have an adequate geographic distribution." These goals were further endorsed at the Working Session of the ICUN Commission on National Parks and Protected Areas held in Corbett Park in India in 1985. The Corbett Action Plan gave the objective of conservation for South and East Asia as follows:

"The establishment of a representative network of Protected Areas within the Indo-malayan realm."

"To use modern biogeographic concepts to prepare reviews of natural habitats and ecological communities within each nation and determine the adequacy of Protected Area coverage of these habitats and communities."

In order to fulfill the objectives of the National Wildlife Action Plan, a team of the Wildlife Institute of India was entrusted with the responsibility of preparing a biogeographic classification and background information on the biogeography of India and a standardised format for the use of personnel assigned the task of data collection. The preparation of an acceptable classification was a difficult job. However, the resulting classification was based on the premise that without a planning framework for conservation not much could be accomplished. It was finally decided that any area with distinctive faunal and floral features was recognised as a separate biogeographic unit.

The Biogeographic Classification

The Wildlife Institute of India (WII) classification used four levels of planning unit:

a) The Biogeographic Zone:

Large distinctive units of similar ecology, biome representation, community and species like the Himalayas and the Western Ghats.

b) The Biotic Province

Secondary units within a zone, giving weight to particular communities separated by dispersal barriers or gradual change in environmental factors eg North-West Himalaya either side of the Sutlej River.

c) The sub division or Region

A tertiary set of units within a province, indicating different land forms e.g. Aravalli Mountains.

d) The Biome

This is an ecological unit, not a biogeographic unit. A biome such as wetland could be found in several biogeographic zones.

Within India the classification recognises ten Zones, divided into 25 Provinces. The Zones are:

1. Trans-Himalayas with 1 province
2. The Himalayas with 4 provinces
3. The Indian Desert with 2 provinces
4. The Semi-Arid Zone with 2 provinces
5. The Western Ghats with 2 provinces
6. The Deccan Peninsula with 5 provinces
7. The Gangetic Plain with 2 provinces
8. North East India with 2 provinces
9. The Island with 3 provinces
10. The Coasts with 2 provinces

Provinces may have one or more subdivisions

The Biogeographical Regions of the Western Ghats

One of the major Tropical Evergreen Forest regions of the country, the Western Ghats occupies an enviable position in our eco system. It is estimated that two-thirds of India's endemic plants are found here! In addition to the immense biological values these forests claim, they also play an essential role in maintaining water supply to energy generation and irrigation schemes and to the huge river systems - the Krishna, Godavari and Cauvery. The biological communities are genetic store houses and have

tremendous untapped potential for biological and chemical development in the fields of medicine, chemistry and industry.

The Western Ghats enjoy high rainfalls and have good soil resources facilitating the cultivation of cash crops like tea, coffee, cocoa, rubber, cardamom, quinine etc. However, these crops have caused intensive pressure on the remaining forest lands. The total area of the Western Ghats zone is about 160,000 sq. km of which forests constitute roughly one-third. Of this the evergreen forests of principal conservation interest cover some 15,000 sq. km. or 9% of the zone. The forest zone stretches from the hills south of the Tapti River in the north to Kanyakumari in the south. In the west the zone is bounded by the coast. The zone has great physical diversity. Elevation ranges from 500 m to 2700 m from sea level. There are areas that receive 5000 mm rainfall per annum as well as areas with much less rainfall, as low as 600 mm per annum with prolonged dry seasons. This gradient produces a change from evergreen to semi-evergreen to moist deciduous to dry deciduous formations. The altitude imposes additional factors of cold and exposure, leading to the development of 'stunted montane' communities. There are major biogeographic barriers or forest gaps such as the Moyar Gorge, Palghat Gap and Shenkottah Gap, which separate the Nilgiri, Anamalai and Agastyamalai mountain blocks.

Plant Values

4000 of the 15,000 higher plant species of India occur in the Western Ghats, which is only 5% of the total land area. Of these 1800 are endemic. The evergreen forest area has the richest formation with 3000 species compared to 850 species in the Moist Deciduous forests. The forests in the Western Ghats have great ecological similarity with those in North East India and Andamans, but are very different in terms of species composition. For example, the family Dipterocarpaceae is possibly the most distinctive group of south east Asian timber trees of evergreen forests. India has 29 species of which 13 are in the Western Ghats and are found nowhere else. Of these, four are highly localised endemics of worrying conservation status, but constitute an important genetic resource for timber development.

Major regions with endemic species are Nilgiri, Anamalai, Palani, Cardamom, Varushanad and Agastyamali- Thirunelveli hills of the southern ghats. The Botanical survey of India has listed 518 rare or endangered species, endemic in nature, for peninsular India. Most of them are in the Western Ghats. Of these the Agastyamalai zone has 109 species; Nilgiri 93; Thirunelveli 52; and Anamalai 39 species.

Animal Values

Most of the vertebrate species found in peninsular India are found in the Western Ghats. There are also a few endemic species. The only large mammal communities missing are the more arid bovid group of gazelle, blackbuck and nilgai with associated lesser fauna, and the moist grassland fauna of swamp deer and buffalo. The region is also rich with freshwater fish fauna, several reptile species as well as birds. The Travancore tortoise and cane turtle are two endangered species restricted to small area of

central Western Ghats (Coorg-Travancore). There are 62 mammal genera in the zone, one of which, a rodent, is endemic. There are several linkages of bio-geographic interest: to the Himalayas, North-East India and Sri Lanka.

Significant species and species groups restricted to the Ghats include:

Primates : Nilgiri Langur and Lion Tailed Macaque.

Rodents : Plataconthomys, an endemic monotypic genus, the spiny dormouse of the southern ghats.

Squirrels : Distinctive sub speciation has taken place in *Ratufa indica*, with separate forms in Maharashtra, Mysore, Malabar and Tamil Nadu ghats. The Grizzled squirrels restricted to two localities in the drier TN forests and Chinnar

Carnivores : Malabar civet - southern evergreen forests. Rusty spotted cat - northern deciduous forests.

Ungulates : Nilgiri tahr - Nilgiri to Agastyamlai montane grassland.

Hornbills : Malabar grey hornbill.

In addition, the Western Ghats have potentially viable populations of other species of conservation significance such as the tiger, leopard, dhole, sloth bear, Indian elephant and gaur.

Biogeographical Sub-divisions of the Western Ghats

The Western Ghats can be mainly divided into two distinct zones: Coastal plains and Western Ghats mountains. The plains are a small unit, separated from the uplifted ghats in all geological and geographical classifications of India. The plains are totally deforested and have no protected areas.

The Ghats are subdivided into 12 latitudinal regions as follows:

Dangs - Below Ghats Areas Surat and North Maharashtra

Upper Krishna Drainage Central and South Maharashtra, Goa and North Karnataka

Kanara North-Central Karnataka

Coorg South-Central Karnataka

Mysore-Lower Nilgiri South Karnataka - North Tamil Nadu

Wayanad Plateau North Kerala

Nilgiri	North Kerala and Tamil Nadu
Anamalai	N-Central Kerala and Tamil Nadu
Palani	An easterly spur in Tamil Nadu
Periyar-Cardamom	S-Central Kerala and Tamil Nadu
Varushanad- Andipatty	an easterly spur in Tamil Nadu
Agastyamalai	South Kerala and Tamil Nadu

These sub-divisions have physical differences in geology, land form and climate which are reflected in differing communities of evergreen forests with distinctive assemblages of endemic taxa.

As already mentioned, Kerala falls within two biogeographic zones: 5, the Western Ghats and 10, the Coasts. The Malabar coastal region of biotic province 10 A, Western Coasts, The Malabar plains region of biotic province 5A, Coastal Plains and five regions of biotic province 5B, Western Ghats.

Approximate areas are:

10 A Coast	- 70 sq km or 0.2% of the state
5 A Coastal Plain	- 23,500 sq km or 60.5%
5B Western Ghats	- 15,300 sq km or 39.3%

A further sub-division is used in the Western Ghats province, with five regions recognised for conservation management. They are Wayanad, Upper Nilgiri, Anamalai, Periyar and Agastyamalai.

Kerala with a total area of 38,870 sq km is one of the most important forest areas of India. High rainfalls on the Ghats have blessed the state with tremendous biological values of great variety. However, the pressures of a fast developing economy have caused loss of vast areas of forest cover and consequently, legal forest land now covers only 24% of the total land area. Though small in size, Kerala has considerable ecological diversity. The peculiar topography of the state created spatial variation in climate and soil parameters. The high levels of local endemism can be attributed to biogeographic barriers provided by the large valleys. Today Kerala has 15 Protected Areas totaling 2,308 sq km or 5.9% of the total land area, which is inadequate to protect the great biological wealth of the forests.

Biological Values

The coastline largely degraded. Most biological values are found in the Western Ghat province. And Kerala part of the Ghats has the wettest, most tropical and most biologically diverse forests. Of the seven evergreen forest types recognised in the region, Kerala has four:

Cullenia-Mesua; Persea - Dipterocarpus; Dipterocarpus-Mesua; and montane shola. Major biogeographic barriers separate the Wayanad-Nilgiri areas from Anamalai-Periyar and that form the southern Agastyamalai hills. Extreme levels of localised endemism are borne out of the fact that the Kerala area of Agastyamalai has some 109 totally endemic plants, Nilgiri another 95 and Anamalai 39.

The area's biological diversity is equally true of animal life. More than half of the country's amphibians are restricted to the Western Ghats. These are endemic reptiles like the Travancore tortoise, birds like the Grey Malabar Hornbill and mammals like the Malabar civet. The forests in Kerala have significant populations of tiger, leopard, elephant, gaur and many lesser ungulates. The Nilgiri Tahr is characteristic of higher mountain grasslands. There are two primates endemic to the area: the Nilgiri Langur and the Lion - tailed macaque. The Silent Valley National Park with its diverse flora and fauna is an excellent example of evergreen forest of immense biological values.

The Wayanad Evergreen Forests.

Spread across Kerala and Karnataka, this region is the transition zone between the southern Cullenia dominated forest and the drier Dipterocarpus of the north. Floristically very rich, the tract has two small Sanctuaries: while Aralam WLS with an extent of 55 sq km is in Kerala, the Brahmagiri WLS is in Karnataka. Located on the western slopes of the Ghats, Aralam is rich in wildlife. Elephant, deer, bison are common. The plant life is typical of evergreen and semi-evergreen forests of the Ghats. The altitude varies from 50m to 1145m from MSL. Temperature varies at the foothills from 21°C to 40°C whereas on the higher reaches it is between 8°C and 25°C. The average rainfall is about 300 mm. June to August are the wettest months.

Adjacent to the three contiguous protected areas of Nagarhole, Bandipore and Mudumalai is the Wayanad Wildlife Sanctuary of Kerala with an extent of 144 sq km. It is also an integral part of the Nilgiri Biosphere Reserve which was established for the conservation of the biological diversity of the region. There is a large elephant population. In addition, there are different kinds of deer, monkeys and birds. Tree species and plants common to South Indian moist deciduous forests and West coast semi-evergreen forests are seen. Altitude varies from 650 m to 1150 m. And temperature varies from 13°C to 32°C. Average rainfall is 2000 mm.

The Upper Nilgiri of Kerala

The Nilgiri plateau and western slopes contain some of the finest forest Wildlife habitat in India. Two small partially adjacent Protected Areas are located here. One is the Silent Valley National Park of Kerala and the other is the Nilgiri Tahr WLS in Tamil Nadu. Only 89 sq km in extent, the Silent Valley NP is the Core of the Nilgiri Biosphere Reserve and claims a long unbroken ecological history. The forests belong to the biogeographical class of the Malabar Rain Forests, and relic of the ancient India-Malayan continuum and harbour a thousand species of plants.

The Valley has a fair representation of all peninsular mammals. There are also several species of birds, butterflies and moths.

The Anamalai Hills of Kerala

The Anamalai Hills face the Nilgiri plateau across the Palghat Gap. The topography is complex and causes a great diversity of climate and vegetation type. Anamudi (2700m) is the highest peak in the entire Western Ghats. The Palghat Gap has isolated the Anamalai Hills resulting in extensive speciation in several plant and animal groups. Elevation ranges between 150 m and 2500m. Forests extending from lowland Dipterocarp communities to wet temperate shola forests to moist and dry deciduous formations contain the most varied set of habitats and animal and plant species of any region in peninsular India.

The existing Protected Area covers one National Park and four Sanctuaries in Kerala, and one large Sanctuary in Tamil Nadu.

They are:

Eravikulam NP	- 77 sq km
Chinnar WLS	- 90 sq km
Parambikulam	- 285 sq km
Peechi - Vazhani	- 125 sq km
Chimmony	- 90 sq km

The first three protected areas are interconnected with the Anamalai WLS in Tamil Nadu.

Peechi- Vazhani WLS remains more or less buffer to the better Protected Areas. Both Chimmony and Parambikkulam WLS's have major management problems with constant exploitation, plantation, fire, tribals and new access roads. There are of course, good quality evergreen forests in the reserve area bordering these sanctuaries.

The Upper Pooyankutty forest, in the Eravikulam-Chinnar area, comprising part of Malayattor and Anamudi RFs, is in one of the highest rainfall areas of Kerala, and has the only extensive low altitude forests (200-500m) in the Malabar Ghats. It is the most likely place to maintain a viable Malabar civet population in Kerala. Chinnar WLS has some of the driest and steepest forest in the state, rising from 500 m to 2300 m in a few kilometers.

Periyar - Cardamom Hills in Kerala.

The Periyar Tiger Reserve with an extent of 777 sq km is the most well known Protected Area in Kerala. It has a core area of 350 sq km, which has the status of a National Park. Unfortunately, many of its conservation values have been threatened by the rapidly deteriorating status of forest lands on the adjacent Tamil Nadu border.

There are vast tracts of Tropical Evergreen Forests (305 sq km) in addition to Semi-Evergreen Forests, Moist Deciduous Forests and Savannah Grasslands. At the higher altitudes Montane Sub-tropical and Montane Temperate Forests are also seen. The altitude varies from 900 m to over 2000 m. The area receives abundant rainfall, the average being 2500 mm. One of India's major wildlife preserves, Periyar is noted for its geomorphology, wild life and scenic beauty. The tract supports a variety of plant and animal species.

Agastyamalai in Kerala.

The Agastyamalai Hills are the extreme south of the Western Ghats. Covered with typical evergreen forests, the Hills are separated from the northern hill forests by the Shenkottah Gap and thus the flora and lesser fauna have many endemic taxa. There is a strong biological link to the Sri Lankan forests. At least 150 endemic species have been noted in the area.

The altitude varies from 100 m to 2000 m. There are several small Sanctuaries in the region; some are contiguous and some are isolated. In the Tamil Nadu part there are two WLS and in the Kerala part there are three.

Neyyar WLS 128 sq km

Peppara WLS 53 sq km

Shenduruney WLS 100 sq km

Conservation Proposals

According to the wildlife Institute of India, most of the existing Protected Areas in the Western Ghats are not large enough for long-term conservation of biological values. It has been suggested that Protected Areas in Tropical Evergreen Forest Zones (5B) should be enlarged as much as possible so that

they will remain relatively undisturbed conservation units. A target figure often suggested is 100 sq km in order to safeguard both low density species and high levels of community diversity. Such a target is possible to achieve if contiguous protected Areas in each of the Biogeographic Regions of Kerala, Tamil Nadu and Karnataka are conveniently regrouped to form large enough units for long term management, which alone can ensure efficiency.

A brief description of each new proposal made by the Wildlife Institute of India is reproduced below.

5B Western Ghats Mountains

1) Wayanad.

No new proposal for Kerala. The two fragmented portions of Wayanad WLS need tighter management if wildlife values are to survive.

2) Nilgiri

Karimpuzha NP 225 sq km

Excellent stands of varied evergreen and semi-evergreen forest communities from 300 m to 2554 m - an extremely important altitudinal variation (much greater than that of neighboring Silent Valley.) Karimpuzha has similar large mammal values e.g. tiger, elephant, gaur, Nilgiri langur, Lion-tailed macaque etc. This new area will create a large enough unit to give long-term protection to these unique forest values. Karimpuzha is used by a hunter gatherer tribe. Full park status therefore will take time and care to implement. WLS status should be sought initially.

Palamala WLS 100 sq km

Kurathimalai WLS 100 sq km

Both proposals will protect further examples of the range of Evergreen Forests in the Nilgiri. Kurathimalai goes from 1000m - 2000 m in altitude. Both areas have Montane Shola Grassland values. Palamala has Nilgiri Tahr.

3) Anamalai

Chimmony WLS Extension

to 130 sq km

Chimmony WLS can be extended to form a protected corridor with Parambikkulam WLS by the inclusion of 40 sq km of Kodasseri RF on the western borders. This is fairly undisturbed evergreen forest.

Parambikkulam WLS Extension

to 405 sq km

Two extensions are proposed, both of which. Will add good evergreen forest, which will help compensate for Parambikkulam's loss of forest due to reservoir creation. These are in the north, incorporating 70 sq km of Nelliampathy Plateau RF to the Sholayar River.

The Peechi- Vazhani to Chimmony to Parambikkulam WLS block is thus a continuous area of 660 sq km which in turn joins Anamalai WLS in TN.

Anamudi NP 300 sq km

Anamudi WLS 207 sq km

Kerala has a small NP, Eravikulam and a small WLS, Chinnar on the southern flanks of the Anamalai ranges. These can be made more effective by incorporating 300 sq km of Upper Pooyankutty forest. This area, part of Malayattoor and Anamudi RFs receives one of the highest rainfalls in Kerala and has excellent low altitude hill forests below 500m.

Chinnar WLS is in a rain shadow zone and has some of Kerala's dipterocarp forests. Incorporating an estimated 40 sq km Kudakkadu RF and isolated shola forest blocks in the south will increase the effectiveness of PA boundaries.

The complete unit Pooyankutty-Eravikulam-Chinnar of 507 sq km should be redesignated as Anamudi NP in the north, bordering Anamalai in TN and a buffer zone, Anamudi WLS in the south.

Note that the contiguous Protected Area on the Anamalai Range will be 2007 sq km in Kerala and Tamil Nadu.

4) Periyar

Periyar NP Extended

to 400 sq km

Periyar NP, the Core area of Periyar Tiger Reserve is presently 350 sq km. Intensive visitor use in the reservoir area of Theakkady and temple area of Sabarimala are reducing conservation value and effectiveness. Incorporation of 50 sq km undisturbed forest in Gundakkal RF in Ranni Division will counteract genetic loss.

5) Agastyamalai

Agastyamalai NP 200 sq km

Agastyamalai WLS 181 sq km Kerala has three small WLSs (Total 281 sq km) in this hill range - Schedurney, Peppara and Neyyaar; the latter two being contiguous, The upper part of Ponmudi RF area (100 sq km) should be incorporated as a corridor between Shendurney and Peppara-Neyyaar. (The lower half of Ponmudi, 100 sq. km, is considered as part of province 5A). The new area of 381 sq km should be designated as Agastyamalai Park in the higher reaches, bordering Mundathurai and Kalakadu in TN, and as Agastyamalai WLS in the lower reaches.

Agastyavanam Biological Park

This is a unique scheme of ecorestoration and conservation initiated by the Government of Kerala, the first of its kind in India.

The Western Ghats guarding the eastern boundary of Kerala has always been considered a rare abode of rich biodiversity with an abundance of endemic flora and fauna. Unfortunately, however, over the years, owing to excessive biotic interference and pressure from adjoining habitations for firewood, fodder and charcoal, forests in several areas have been destroyed or degraded. One such area is in the southern most part of the Ghats close to the Neyyaar and Peppara WLSs. Several endemic species of plants and animals have either been exterminated or are on the verge of total extinction.

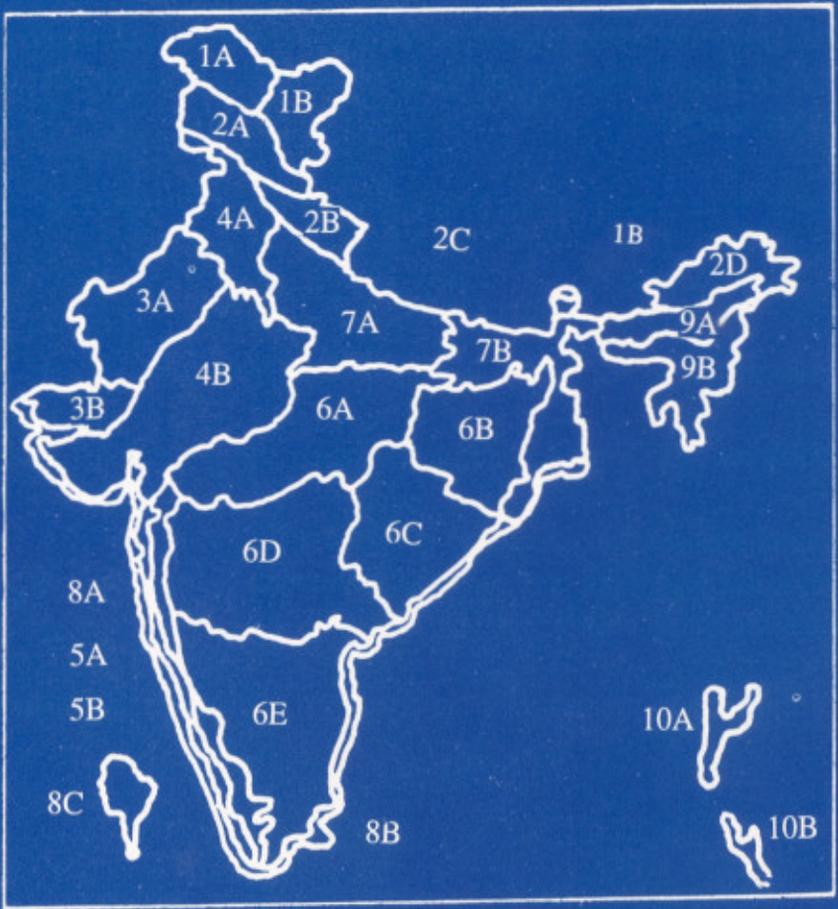
A live to the situation, the Govt of Kerala appointed an expert committee of eminent scientists in 1992 to study the feasibility of setting up a Biological Park in the Agastyamalai region with a view to ecorestoration, afforestation and conservation. The forest area chosen for the park, the Kottor Reserve lies in the Paruthipally Forest Range of Thiruvananthapuram district. Located on the western slopes of the Western Ghats at South-east corner in Nedumangad taluk, the Kottor Reserve touches the outer limits of the Neyyaar WLS in the south-west and borders the outer limits of the Peppara WLS in the north-east. The area is thoroughly denuded and has very little biological values. But the availability of water resource, good soil and equable climate can sustain a vastly enhanced stock of vegetation and wildlife. The existing flora and fauna exhibit a remarkable variety and range promising distinct prospects of regeneration, propagation and preservation of these values. After making a thorough and scientific study of all aspects of this ambitious project, the committee strongly recommended the

scheme. The first phase of the project is likely to be completed by the end of the 8th five year plan in 1997.

The basic objectives of the Biological Park are:

1. the re-afforestation of the highly degraded Kottoor Reserve area ;
2. the re-introduction of animals and birds which have disappeared from the area and
3. the creation of a splendid store-house of the immense variety and diversity of the unique flora and fauna of the Western Ghats.

Covering an extent of 23 sq km, the project site is about 35 km from Thiruvananthapuram city. The famous Agastyakudam Peak (1866m) is only 15 km from the eastern boundary of the project area. The project has been named Agastyavanam Biological Park after the great saint Agastya Muni who had his permanent abode in the Agastyakudam Hill deep inside the Kottoor forest. The Biological Park, when completed, will be an exquisite Nature Reserve of incomparable biological values, a centre of education capable of providing a wealth of information to researchers and the general public.



BIOGEOGRAPHIC ZONES OF INDIA



MAP OF BIOGEOGRAPHIC SUB-DIVISION
OF PROVINCE 5B : THE WESTERN GHATS