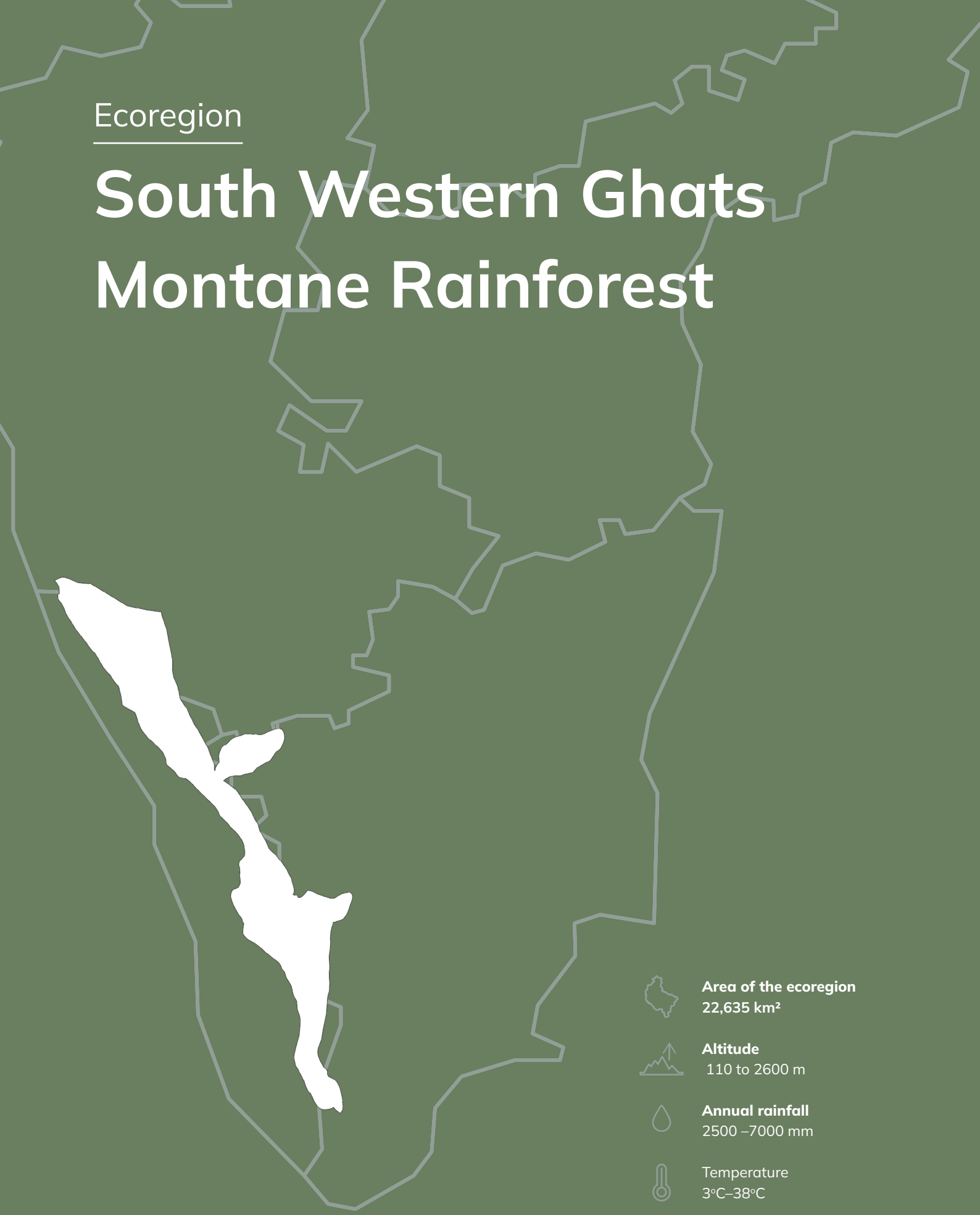
Ecoregion

South Western Ghats Montane Rainforest



Area of the ecoregion
22,635 km²

Altitude
110 to 2600 m

Annual rainfall
2500 –7000 mm

Temperature
3°C–38°C

Ecological Restoration Alliance

Overview

The South Western Ghats Montane Rainforests is one of the world's most unique and biodiverse biodiversity hotspots. It is characterised by high productivity and high variability, and localised micro-climates within the ecoregion. This complex landscape is defined by the thousands of niches, and relationships formed between and amongst species over millennia with refined adaptations to their context and roles within the biome. The forests and ranges of the region play a crucial role in water regimes and are the source for a majority of large rivers, and streams across the southern peninsula.

Ecological restoration projects within the ecoregion

Nature Conservation Foundation: Rainforest restoration in the Anamalai Hills
Gurukula Botanical Sanctuary
Upstream Ecology
Keystone foundation
ibnii vana

Adjoining ecoregions

This ecoregion is almost completely encapsulated by the South Western Ghats Moist Deciduous Forests to the west and east as the moist forests transition to drier regions.

Alpine shola grasslands ecosystems in the nilgiris

Towards the north this ecoregion is contiguous with the North Western Ghats Montane Rainforests.

Geography

The ecoregion spans 22,635 km² mainly with the Western Ghats. The ridges, plateaus, and interlocked ranges, rise up from the low lying western coast that stretches as a narrow belt 525 km in length. The ecoregions stretches from its northern tip just south of Mangalore to the hill ranges of Kalakad near the southern tip of the peninsula. The western flank of the ecoregion is punctuated by short and fast flowing rivers such as the Periyar, Bharathapuzha, Kuttiyadi, Chaliyar and Bavali. These rivers carry large volumes of water and sediment and are formed via a dense network of streams and tributaries. Major east flowing rivers that originate from within this specific ecoregion include the Kaveri, Thamirabarani that provide an essential influx of water to the dry interior of the peninsula. The complex topographical formations, and the longitudinal placement of the Ghats creates a region of extreme resource abundance and dramatic within-region variation in relation to different factors such as elevation and latitude.

Geology and soil

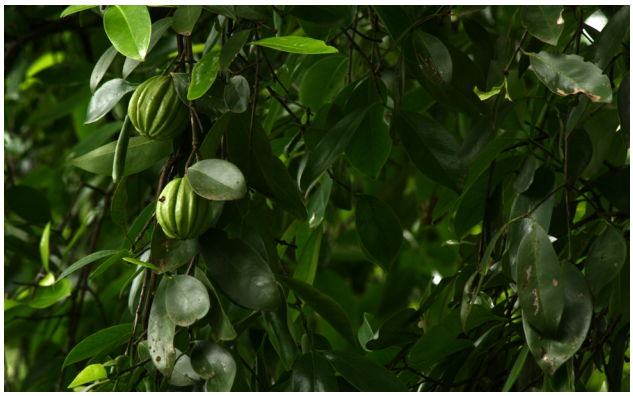
The soil is primarily made of an acidic-ferralitic consistency with a large proportion of humus, or a andisol of volcanic origins. The soil horizon is characterised by high organic content, biotic organisms and nutrition in the upper layer, with a heavily-leached nutrient-deprived deeper layer. The bedrock primarily consists of gneisses, charnockites and schists. There is considerable variation in the chemical composition and nutrient availability in the soil where slopes are more weathered and eroded and there is a build up of minerals, ions and moisture content within valleys and troughs. This process is typified as soil catenas typical of tropical regions.

Climate

This region receives between 2500 to over 7000 mm of rainfall per annum with 7 - 10 months of the year having a majority of rainy days. Most of the annual rainfall falls during the southwest monsoon between June and August, sometimes extending into September. High precipitation is a distinctive feature of this ecoregion. As the Western Ghats mountains run parallel to the coast, the hills intercept most of the prevailing winds and moisture-bearing clouds as they sweep in, causing deluges of water to be released through orographic rainfall in the windward face of the slope, while

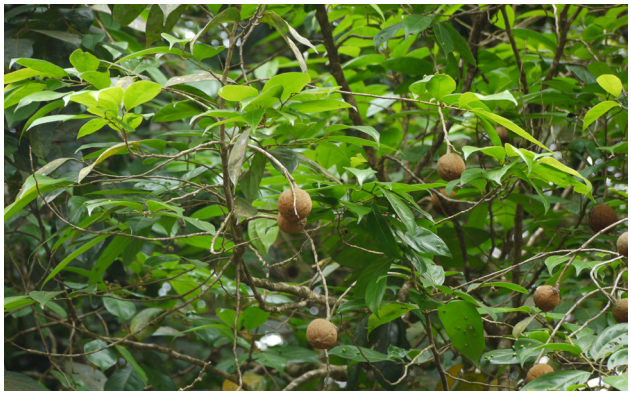
Low Elevation



Canopy[clockwise]: *Artocarpus hirsutus, Ficus drupacea, Xanthophyllum flavescens, Garcinia gummi-gutta*






Sub-canopy[clockwise]: *Baccaurea courtallensis, Orophea erythrocarpa, Hydnocarpus pentandra, Ixora nigricans*

Mid Elevation




Canopy[clockwise]: *Cullenia exarillata, Palaquium ellipticum, Mesua ferrea, Canarium strictum*




Sub-canopy[clockwise]: *Actinodaphne bourdillonii, Drypetes malabarica, Villebrunea integrifolia, Meliosma simplicifolia*

High Elevation




Trees[clockwise]: *Cinnamomum wightii, Syzygium densiflorum, Rhododendron arboreum, Viburnum cylindricum*




Grasses[clockwise]: *Artemisia nilagirica, Chrysopogon zeylanicus, Heteropogon contortus, Polygala japonica*

the rainshadow regions to the leeward receive less. This region also receives more interspersed rains during the northeast monsoon between October and December. Temperatures can vary from a minimum of 3° C - 4° C to 38° C in the hot summers. However elevation has a pivotal role to play as this ecoregion holds some of the highest peaks of the Western Ghats reaching over 2400 m in the Nilgiri and Anamalai ranges. Climate becomes progressively more temperate with an increase in altitude and these factors strongly influence vegetation communities and ecosystem processes.

Natural vegetation

The dominant vegetation type includes multi-storeyed, tall evergreen forests with high plant diversity and density, and high rates of endemism. The storeys are made up of the emergent canopy (40 - 60 m), the main canopy (20 - 35 m), the subcanopy and the understorey. The plants are all broad-leaved with straight boles competing to maximise availability of sunlight. The forest type is tree dominated, with much of the plant and animal diversity concentrated in the canopy layers, as arboreal niches. These forest types also hold large numbers of epiphytes such as orchids and ferns with high levels of specialised relationships of symbiosis and competition. The understory includes many endemic shrubs and herbaceous plants. Leaf fall occurs throughout the year and most of the carbon stock is stored within the living biomass as there is rapid turnover of nutrients through an extensive saprophytic chain.

The complex topography of the ghats, Agasthyamalai biosphere reserve

Characteristic native plant species

Low elevation rainforests (plains to 700 m)

Low-elevation rainforests occur between moist deciduous forests and higher montane rainforests. Although high in moisture, this eco-zone has a more distinct annual seasonality with wider climatic extremes. The community of species in this belt are characterised by a distinct upper elevation limit. The forests may extend up to 800 m elevation in places.

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High elevation montane rainforest-grassland mosaic (1600 to 2600 m)

This elevation range is characterised by the shola grassland mosaic that would have once been extensive in the upper reaches of the Nilgiris and the Anamalai Hills. In this ecosystem the exposed slopes and ridges are dominated by a high diversity of short grasses and herbaceous plants, while the troughs and valleys hold isolated pockets of rainforests with distinctive species with limited overlap with species of lower elevations. The grasslands and forests ecosystems have a sharp ecotone with no transition communities or species. Thus the landscape has no intermediary belts or fluid change but functions in crucially defined pockets, pieces and boundaries with sharp edges between the two different biomes that remain relatively static in their spread and patterns over millennia. In highest reaches of the alpine regions grasslands are also interspersed with large tracts of rhododendron species and distinctive herbaceous species like strobilanthes. The shola grassland mosaic is the principal catchment area of many of the rivers and streams originating from the Ghats.

Low elevation rainforests
(plains to 700 m)

Trees

Canopy

Artocarpus hirsutus
Calophyllum polyanthum
Canthium dicoccum
Cassine glauca
Cleidion spiciflorum
Diospyros bourdilloni
Diospyros ghatensis
Dipterocarpus bourdilloni
Dipterocarpus indicus
Elaeocarpus serratus
Euodia lunu-ankenda
Fahrenheitia zeylanica
Ficus amplissima
Ficus drupacea
Ficus microcarpa
Ficus tsjahela
Garcinia gummi-gutta
*Gluta travancorica**
Harpullia arborea
Hopea parviflora
Kingiodendron pinnatum
Knema attenuata
Margaritaria indica
Nothopegia beddomei
Phoebe paniculata
Schefflera wallichiana
Vateria indica
Xanthophyllum flavescens

Sub-canopy

Agrostistachys indica
Aporosa lindleyana
Baccaurea courtallensis
Diospyros buxifolia
Eugenia spp.
Garcinia morella
Hydnocarpus pentandra
Ixora nigricans
Neolitsea fischeri
Orophea erythrocarpa
Reinwardtiodendron anamallayanum
Croton malabaricum

**only in the Agasthyamalai Hills*

Shrubs and Climbers

Calamus brandisii
Dendrocnide sinuata
Ixora lanceolaria
Microtropis stocksii
Ochlandra travancorica
Psychotria nudiflora

Mid-elevation rainforests
(700 to 1600 m)

Trees

Canopy

Aglaia elaeagnoidea
Alseodaphne semecarpifolia
Artocarpus heterophyllus
Bombax ceiba
Calophyllum austroindicum
Calophyllum polyanthum
Canarium strictum
Cinnamomum malabathrum
Cullenia exarillata
Diospyros malabarica
Dysoxylum malabaricum
Elaeocarpus munronii
Ficus exasperata
Ficus microcarpa
Ficus nervosa
Ficus simplicifolia
Ficus tinctoria
Heritiera papilio
Holigarna nigra
Hydnocarpus alpina
Mesua ferrea
Myristica dactyloides
Neolitsea zeylanica
Ormosia travancorica
Palaquium ellipticum
Persea macrantha
Syzygium densiflorum
Syzygium gardneri
Turpinia malabarica

Sub-canopy

Acronychia pedunculata
Actinodaphne bourdillonii
Actinodaphne malabarica
Agrostistachys borneensis
Antidesma menasu
Atalantia racemosa
Croton laccifer
Cryptocarya bourdillonii
Cryptocarya lawsonii
Drypetes malabarica
Drypetes oblongifolia
Drypetes wightii
Epiprinus mallotiformis
Gomphandra coriacea
Meliosma simplicifolia
Villebrunea integrifolia
Syzygium laetum

Shrubs

Agrostistachys indica
Calamus brandisii
Calamus travancoricus
Connarus sclerocarpus
Dendrocnide sinuata
Diotachanthus grandis
Eugenia spp.
Glycosmis pentaphylla
Ixora nigricans
Nilgirianthus foliosus
Psychotria anamalayana
Psychotria connata
Saprosma corymbosum
Strychnos vanprukii

High elevation montane rainforest-grassland mosaic
(1600 to 2600 m)

Trees

Canopy

Aglaia elaeagnoidea
Alseodaphne semecarpifolia
Artocarpus heterophyllus
Bombax ceiba
Calophyllum austroindicum
Calophyllum polyanthum
Canarium strictum
Cinnamomum malabathrum
Cullenia exarillata
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Strychnos vanprukii

Plant seasonality

J	F	M	A	M	J	J	A	S	O	N	D
											
											
											

Vegetation structure, composition and associated fauna change in relation to elevation, latitude, soil types and other aspects such as plant community relationships and co-dependency. Overall, these differences can be assimilated into three distinct ecosystem types within the ecoregion including the low elevation rainforests, mid-elevation rainforests, and montane shola - grassland ecosystems. There are significant transitional and ecotonal zones within the landscape due to the intersections between soil, topography, micro-climate and climate, and geology.

Variation within ecoregion

This ecoregion is stratified by elevation, latitudinal gradients, topography, orographic rainfall slopes from east to west, local soil type limitations and biogeographic-community evolution. Plant community composition and endemism varies with latitude. Lower latitudes receive more rainfall and have a more uniform temperature seasonality and shorter dry seasons. There is a strong latitudinal gradient with greater species abundance and endemism the further south one goes. Most plants growing in the north can also thrive in the southern areas, whereas plants specialised to the climate of the southern reaches are confined by the progressive change from tropical to monsoonal climate moving north. Inversely there are plants calibrated to the seasonal conditions and thus this leads to unique species restricted to northern regions as well although in smaller numbers.

Species endemic south of the Palghat Gap

Hill ranges south of the Palghat gap have many endemics distinct from the Nilgiris and ranges further north. Even within the southern Western Ghats, higher levels of endemism are found in the Agasthyamalai Hills.

Bentickia condapanna
Dimorphocalyx beddomei
Diospyros foliolosa
Diospyros humilis
Drypetes malabarica
Elaeocarpus venustus

Garcinia travancorica
*Gluta travancorica**
Goniothalamus wightii
*Hopea utilis**
Humboldtia decurrens
Litsea beddomei
Memecylon talbotianum
Palaquium bourdillonii
*Poeciloneuron pauciflorum**
Polyalthia rufescens
Sacrosanct corymbosum
Semecarpus travancorica
Tabernaemontana gamblei
*Vernonia travancorica**

**Only in Agasthyamalai region*

Endemic species of the mid ranges

This spans the Nilgiris including Silent Valley in Kerala. The Nilgiris plateau is at a distinctively higher elevation than all its surrounding formations and thus has unique high altitude montane shola-grassland ecosystems as in upper reaches of the Anamalai and Palni Hills. However there are species unique to the Nilgiris, such as:

Actinodaphne lanata
Casearia wynadensis
Cinnamomum wightii
Lasianthus ciliatus
Microtropis microcarpa
Octotropis travancorica
Photinia serratifolia
Syzygium palghatense
Terranea nilagirica

Endemic species of the northern reaches

The northern limits of this ecoregion merge with the Deccan plateau and mainly comprise the Wayanad plateau and the Brahmagiri wildlife sanctuary south of Kodagu. This belt forms a bridge between the floristically and geologically distinct lateritic plains of the North Western Ghats Montane Rainforest ecoregion and the southern reaches. Few examples of endemism within this specific area include:

Aglaia littoralis
Croton lawianus
Garcinia indica
Goniothalamus wynaadensis
Humboldtia brunonis
Imola polyantha
Psychotria dalzellii

Plant seasonality

Episodes of fruiting, flowering and flushing are extremely variable between the hundreds of classes and groups within the ecosystem; with there being a constant cycle, or basal productivity throughout the year. However there are peaks, or times of significant convergence which can be classified as the most optimal time for these

processes which the table attempts to represent. Furthermore there are multi-year cyclic patterns associated with fruiting and seeding patterns.

Pollination and seed dispersal ecology

The plants of the ecoregion are largely animal dispersed with a smaller number of wind, water, and mechanically dispersed species. Seed dispersal is dominated by primates, bats, birds, and other large and small mammals, i.e., bears, civets and squirrels. Animal plant relationships include many co-evolved and mutualistic relationships. Pollination occurs through birds, moths/butterflies, small mammals, and bees.

Animal life

The Western Ghats is one of the most biodiverse regions globally, home to thousands of fauna species with a large number of endemic, and threatened species. The Western Ghats is home to 139 mammal species of which 16 are endemic. This ecoregion is crucial for the conservation of large mammals such as tigers, elephants, leopards, gaur, and sloth bears, besides endemic mammal species such as the Nilgiri tahr, lion-tailed macaque and Nilgiri marten. The landscape is home to 227 reptile species with a large proportion of species being endemic, i.e., malabar pit viper, large-scaled pit

Left to right: *Nilgiri tahr, Malabar pit viper, Malabar Gliding Frog*

Left to right: *Great Hornbil, Malabar trogon, Atlas moth*

viper, Cochin forest cane turtle, stripe-necked coral snake, gunther's narrow-headed snake and the king cobra. There are 179 amphibian species of which 80 percent are endemic, with most of the species having extremely localised populations and narrow ranges; e.g., the malabar gliding frog, malabar tree toad, the purple frog, dancing frogs, bush frogs and several caecilian species. Numerous frog species are being identified and discovered every year. The Western Ghats hosts 500 species of birds including endemics such as the malabar grey hornbill, Wayanad laughing thrush, Nilgiri wood pigeon, Nilgiri flycatcher, White-bellied treepie, Malabar trogon, and Malabar parakeet, and is also home to significant populations of the great hornbill. The Ghats are an important destination for a large number of winter migrant birds, including blue-capped rock thrush, rusty-tailed flycatcher, and several species of warblers. The highest diversity of species is accounted by the insect genera with roughly 6000 species are estimated and known to occupy the forests of the region with 316 lepidoptera species, 174 odonates and hundreds of spider, hemiptera, hymenoptera, coleoptera and isoptera species.

Conservation

A sizable portion of land in this ecoregion falls under protected areas which play a major role in conservation. Within these protected areas however, there has been extensive historic logging, and replacement of what would have been formerly wet evergreen forest types with timber plantations such as teak, eucalyptus,and mahogany. Furthermore, alien invasive species like wattle have threatened a majority of grassland shola ecosystems, taking over these complex ecosystems in large monoculture dense stands within a span of a century, New alien species continue to arrive spread and dominate many specialised niches and ecosystems within this ecoregion stifling biodiversity and at its worst eliminating entire biomes. Numerous forest fragments and tracts remain within private lands bordering and interspersed within commercial plantations such as rubber, tea and coffee. These fragments play a crucial role as corridors for large mammals as well as important 'biodiversity islands' within a sea of monoculture plants. Even small fragments have been shown to hold a high abundance and diversity of endemic species in very limited spatial areas. For a landscape and ecosystems of such high complexity and diversity it is crucial to understand the role of succession, and the localised specialisation and composition of forests. It is important to relate restoration efforts to existing relatively less-disturbed benchmark sites.

Ecological restoration projects within the ecoregion

Nature Conservation Foundation: Rainforest restoration in the Anamalai Hills

Gurukula Botanical Sanctuary

Upstream Ecology

Keystone foundation

ibnii vana

Important protected areas within the ecoregion

Pushpagiri Wildlife Sanctuary

Talakaveri Wildlife Sanctuary

Brahmagiri wildlife sanctuary

Aralam wildlife sanctuary

Kottiyoor reserve forest

Malabar wildlife sanctuary

Mukurthi national park

Avalanche forest reserve

Nilgiri biosphere reserve

Silent Valley national park

Anamalai tiger reserve

Parambikulam Wildlife sanctuary

Eravikulam wildlife sanctuary

Palani hills reserve forest

Idukki wildlife sanctuary

Periyar national park

Konni reserve forest

Thenmala reserve forest

Shendurney wildlife sanctuary

Agasthyamalai biosphere reserve.

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[Pg 4] *Actinodaphne bourdillonii*: Mrinalini K Siddhartha
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[Pg 4] *Villebrunea integrifolia*: Mrinalini K Siddhartha
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One Earth Ecoregion Snapshot
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Ecological Restoration Alliance

www.era-india.org

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