

Ecoregion

North Western Ghats Montane Rainforest



Area of the ecoregion
30,934 km²



Altitude
700 to 900 m



Annual rainfall
2600 – 5000 mm



Temperature
16°C – 38°C



Ecological
Restoration
Alliance

Overview

This ecoregion is part of the larger Western Ghats escarpment that forms a long narrow belt along the western coast of the Indian peninsula. This region along with its close cousin the South Western Ghats Montane Rainforests are considered a major global biodiversity hotspot hosting a large proportion of endemic and rare species. The northern Western Ghats (also often called the Sahyadri) are geologically distinct from southern regions as they are a direct extension of the lateral geological belt of the Deccan Plateau, as the large formations of basalt fall away to the Malabar coast. This region thus contains unique geological formations of ridges, plateaus and rocky outcrops, that has major implications to the formations of unique biogeographic adaptations and associated faunal communities. This region receives some of the highest annual precipitation in the country with as much as 8000 mm of rainfall per annum leading to this range being the principal source for the majority of the major river systems in peninsular India.

Ecological Restoration Projects in the Ecoregion

Ecological Restoration of Panchgani tableland



Montane rainforest evergreen slopes and folds, Sharavathi valley: Chetph

Adjoining ecoregions

This ecoregion is subsumed on both the eastern and western flanks by the North Western Ghats Moist Deciduous Forests. Towards the south the region abuts the Malabar Coast Moist Forests and transitions latitudinally into the South Western Ghats Montane Rainforest.

Geography

The region forms a 895 km long and thin belt along the crest of the Western Ghats escarpment which covers an area of 30,934 km². This ecoregion extends from the Daman Ganga river basin up north down to the Pushpagiri wildlife sanctuary in southern Karnataka. The region spans the entirety of Maharashtra and the majority of Karnataka. This region is the tapering ridge of the Deccan Plateau bedrock as it falls to the Arabian Sea coast. The escarpment and geographic location of the Ghats slopes creates large amounts of rainfall, creating the source for most of the major rivers and tributaries of peninsular India including: eastward flowing rivers such as the Koyna, Krishna, Bhima, Malaprabha, Ghataprabha, Godavari, Tungabhadra; and the small group of westward flowing rivers that include: Netravati, Sharavati, Kali, Mandovi and Zuari. The mean elevation of these escarpments are stable with limited variation averaging 700 - 900 m in elevation. Large hill formations as in the southern extent of these ranges are absent. The hills are largely flat-topped, riddled with numerous deep and highly fluviially dynamic valleys with extremely strong erosive processes with folds and faults. Towards the west, the elevation falls significantly and rapidly to a minimum of 60 m near the plains.

Geology and Soil

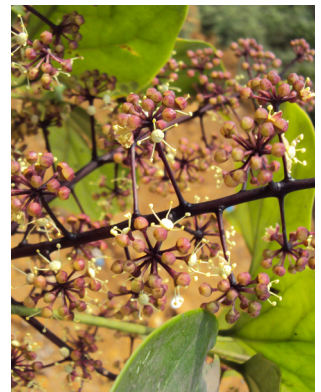
The geology of this region is distinctive and plays a major role in shaping the biogeography of the region. The northern Western Ghats are known for the lateritic landscape with slabs of heavily leached and weathered ferralitic laterite sitting in vertical beds over a bedrock of layered basalt. The rocks are found in flat layers forming the even undulating terrain of the plateau to the east and the vertically stratified structures of the Ghats. Towards the south of this ecoregion, the bedrock of basalt becomes interspersed with gneiss and schist formations. The laterite and basalt go through large-scale erosion processes due to the high rainfall, with accompanying hydrological weathering. Most of the laterite have been broken down into red ferralitic



Trees–Canopy[left to right]: *Knema attenuata*, *Poeciloneuron indicum*, *Hopea ponga*, *Xantolis tomentosa*



Trees–Sub-canopy[left to right]: *Beilschmiedia dalzellii*, *Garcinia morella*, *Ehretia laevis*, *Wendlandia thyrsoides*



Lianas[left to right]: *Alangium salvifolium*, *Canthium angustifolium*, *Gnetum ula*, *Schefflera venulosa*

ferruginous loam soils but intact slabs form caps over hill tops forming flat topped mesa plateaus or 'Sadas' (local name), which are distributed through the Sahyadri ranges of Maharashtra. Basalt is an igneous rock and thus in the process of its weathering large amounts of kaolinite clays are produced, these clays play a major role in the soil horizons. Soil depth is very shallow when sitting on intact ferricretes or 'laterite shelves' and increases in depth near valleys and troughs. Soil type has a strong influence on the vegetation types of the region, at regional and local levels.

Climate

The northern Western Ghats contain regions with some of the highest rainfall in peninsular India receiving as much as 7600 mm annually (Agumbe), with rainfall averaging between 2600 mm and 5000 mm. Precipitation is primarily received from the southwest monsoon during the months of June to September with extreme local variability in quantity and abundance of rainfall. Rainfall patterns are dominated by orographic and topographical effects, where an elevation above 800 m acts as a barrier for incoming moisture resulting in concentration of rainfall near the crests and ridges of the Ghats and a rapid decline inland into the Deccan. Temperatures vary in a range of 16° to 38° with the coldest month being January. Summer duration and intensity varies with latitude and elevation but usually lasts between 4 to 7



Jog falls, accentuating the horizontal laterite bedrock and steep gorges, Karnataka: Abhay Kulkarni

Characteristic native plant species

Trees

Canopy

Actinodaphne angustifolia
Aglaiia elaeagnoidea
Alseodaphne semecarpifolia
Artocarpus hirsutus
Canthium dicoccum
Caryota urens
Cinnamomum verum
Cleistanthus malabaricus
Dimocarpus longan
Diospyros nigrescens
Diospyros paniculata
Drypetes venusta
Holigarna arnottiana
Holigarna grahamii
Hopea parviflora
Hopea ponga
Humboldtia brunonis
Knema attenuata
Lagerstroemia microcarpa
Macaranga peltata
Myristica malabarica
Nothopegia beddomei
Nothopegia castaneifolia

Olea dioica
Palaquium ellipticum
Persea macrantha
Poeciloneuron indicum
Polyalthia fragrans
Strombosia ceylanica
Syzygium laetum
Terminalia paniculata
Vateria indica
Xantolis tomentosa















Sub-canopy

Atalantia racemosa
Beilschmiedia dalzellii
Casearia wynadensis
Chionanthus mala-elengi
Ehretia laevis
Garcinia morella
Garcinia talbotii
Glochidion ellipticum
Hydnocarpus pentandra
Ixora brachiata
Leea indica
Litsea josephii
Madhuca neriifolia
Memecylon terminale
Nothapodytes nimmoniana
Psychotria anamallayana
Psychotria truncata
*Reinwardtiodendron
anamallayanum*
Symplocos racemosa
Wendlandia thyrsoidea

Lianas

Alangium salvifolium
Ancistrocladus heyneanus
Bauhinia phoenicea
Calamus gamblei
Calamus thwaitesii
Canthium angustifolium
Derris thyrsoiflora
Gnetum ula
Hugonia ferruginea
Kunstleria keralense
Luvunga sarmentosa
Piper nigrum
Rourea santaloides
Schefflera venulosa
Strychnos dalzellii
Ventilago madraspatana

Plant seasonality

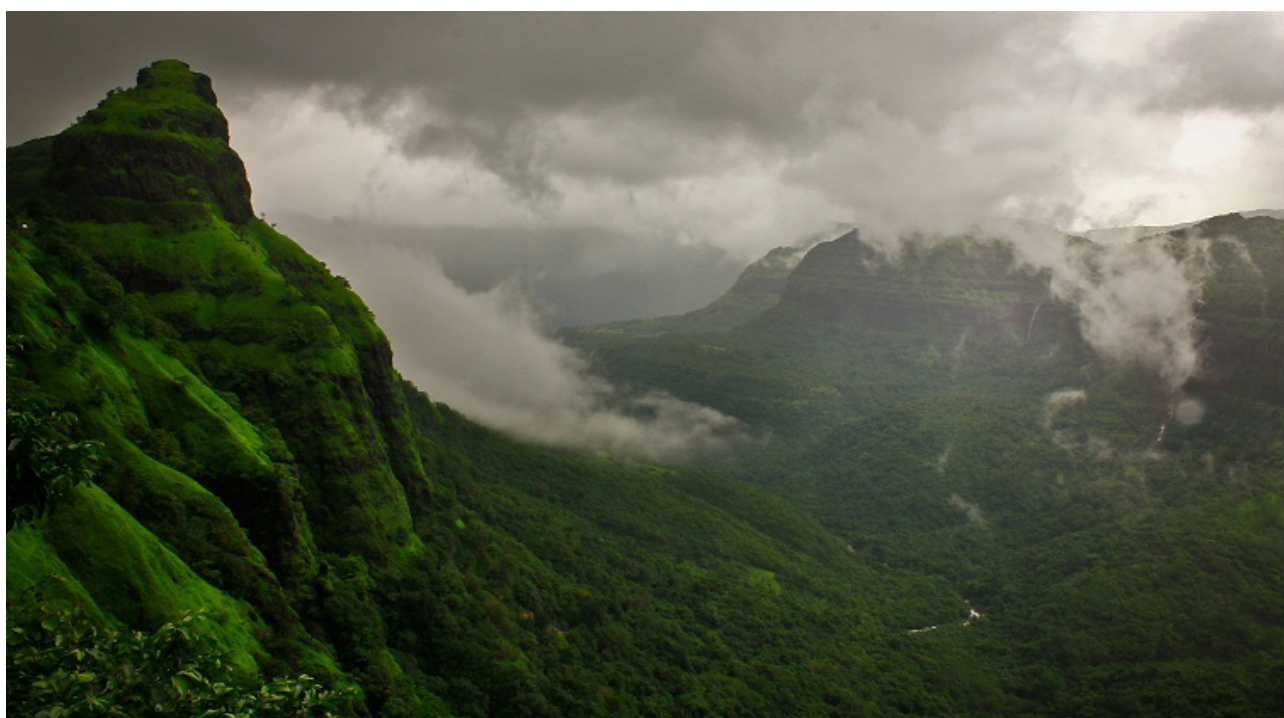
J	F	M	A	M	J	J	A	S	O	N	D
											
											
											

months with the duration and intensity of annual drought periods consistently and proportionally increasing further north.

Natural vegetation

The vegetation structure is largely similar to the southern Western Ghats rainforests. The vegetation type primarily consists of a multistoried and tall forest with predominantly evergreen species. However the composition and structure of northern ecosystems differ from southern regions by having a larger proportion of deciduous species, a more pronounced seasonality, vastly different geology functionally containing a lower diversity of species and lower endemism. Yet, the northern Western Ghats forests are highly diverse, occurring in thick bands along valleys and troughs with distinctive changes in species composition over small distances. About 365 of the plant species are endemic to this ecoregion. The forest type hosts a large diversity of epiphytes and lianas and forms interlocked stands of broadleaved species.

The ecoregion includes laterite and basaltic escarpment top ecosystems, canopy forest ecosystems and low elevation grassland ecosystems (<1000 m). The ferricrete plateaus, exposed ridges, eroded rock outcrops have close to 300 specialised herbaceous species such as *Cyanotis*, *Neanotis*, *Murdannia*, *Drosera*, *Utricularia*, *Lindernia*, *Burmannia*, *Fimbristylis*, *Rhamphicarpa*. This large diverse group of



Laterite escarpments in the monsoon, Varandha Ghat: Annishaik1990

herbaceous plants show high rates of endemism and are adapted to refined, specific and diverse microhabitats. Many of these species are endemic to these landscape formations and follow an annual seasonality occurring mostly in the monsoonal months. About 51 fungi species have also been recorded in these thin soiled heavily leached areas. Most laterite plateaus occur above an elevation of 700 m. Apart from smaller plants there are some stunted and hardy species that sparsely share these habitats such as *Memecylon umbellatum*, *Xantolis tomentosa*, *Atalantia racemosa*. However tree or shrub species within the plateau or eroded mesa plains are greatly influenced by the surrounding vegetation.

Variation within ecoregion

Due to the length and geographic position there is much variation in microclimate, stand structure and species composition in relation to latitude and elevation. With latitude, there is an increasing amount of moist deciduous forest species and a lower canopy height, along with a reduction in annual precipitation and an increase in seasonality. On average three quarters of this forest type consists of wet evergreen ecosystems, with the remainder including a mixture of moist deciduous forest species. This change in forest structure has implications for floral diversity and associated fauna. Forests further north may have a higher proportion of species such as *Terminalia paniculata*, *Terminalia elliptica*, *Grewia* spp., *Lagerstroemia* spp. *Schleichera oleosa*, *Mallotus* and *Memecylon* species. Forests to the south have species shared with southern rainforests, such as *Palaquium ellipticum*, *Dipterocarpus indicus*, *Hopea* spp., *Garcinia* spp., *Dimocarpus longan*, *Artocarpus hirsutus* and *Canarium strictum*. The majority of ferricretes and mesa plains and escarpments are located more towards the north than in southern Karnataka. These exposed outcrops with very thin soil horizons are usually dominated by lower elevation montane grasslands that are significantly lower (<1000 m) than montane grassland shola ecosystems (1800-2600 m) found further south. Lower elevation lateritic based grasslands have far fewer species but play an integral role in the catchment and hydrological cycle of the numerous rivers that originate from the Ghats.

Most of the forests are therefore divided by escarpments and eroded grassland belts and are thus primarily situated in between valleys and along the windward slopes of the Ghats. The geographic isolation results in very skewed community compositions even between neighbouring valleys. In the northern Western Ghats, 60 percent of the

individuals are on average made up of 29 species. In some specific pockets, a single species can make up close to 50 percent of the community as seen by large tracts of *Poeciloneuron indicum* occurring in northern Karnataka (around 800-900 m).

Plant seasonality

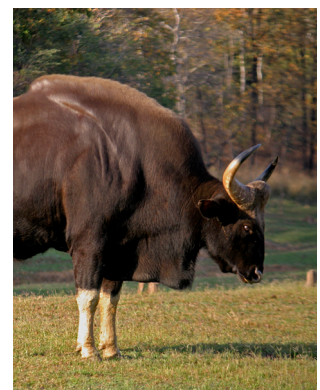
The annual patterns of flowering, flushing and fruiting episodes largely follows that of the South Western Ghats Montane Rainforest with there being a longer period of relative dormancy

Pollination and seed dispersal ecology

The forests of the ecoregion are largely animal dispersed with a small number of wind, water, and mechanically-dispersed species. Animal plant relationships include many mutualistic and co-evolved relationships. Pollination occurs through birds, moths/ butterflies, small mammals, and bees. While seed dispersal is dominated by primates, bats, birds, and other large and small mammals, i.e. bears, civets and squirrels. About 15 percent of the trees are wind dispersed, most of which are moist deciduous species in transitions and pockets within evergreen stands.

Animal life

The landscape plays a crucial role in sustaining large mammal populations including the Asian elephant, bengal tiger, gaur, leopard and overall hosts 139 species of mammals. More than 300 species of birds are found in these forests with some protected areas sustaining the majority of the southern population of the Malabar pied hornbill. This ecoregion is home to close to 50 species of reptiles with a large population of the king cobra. There is an incredibly high diversity of frog species with



Left to right: Malabar pied hornbill, King cobra, *Melanobatrachus indicus*, Gaur

158 species out of which 138 are endemic. The ecoregion shares most of its faunal diversity with the southern Western Ghats with the exception of the amphibian community.

Conservation

A significant proportion of land falls under important wildlife sanctuaries and national parks that play a crucial role in the sustenance of key biodiversity hotspots. However the northern Western Ghats has had a major historical tryst with logging as large areas of trees were felled for use as railway sleepers during the British rule. The forests of the Ghats continue to face severe pressures and fragmentation from commercial enterprises and private land holdings and encroachment. The yearly rate of forest loss is estimated to be between 0.57 to 1.16 percent. Large anthropogenic pressures have significantly reduced the geographical extent and abundance of evergreen rainforest belts, with greater frequency of deciduous species. The conservation of this region is crucially associated with the sustenance of the rain-deprived parts of the Deccan Plateau to which this ecoregion provides water through major river basins and fluvial systems.

Ecological Restoration Projects in the Ecoregion

[Ecological Restoration of Panchgani tableland](#)

Important Protected Areas in the Ecoregion

Koyna wildlife sanctuary

Chandoli national park

Radhanagiri wildlife sanctuary

Bhimgad wildlife sanctuary

Bhagwan Mahavir wildlife sanctuary

Anshi national park

Sharavathi valley wildlife sanctuary

Someshwara wildlife sanctuary

Mookambika wildlife sanctuary

Shri Bhimashankar

Jyotirlinga wildlife sanctuary

Acknowledgements

We want to thank the following individuals and organisations for their contributions and efforts that helped us make this document

Text

Madhavan A. P.

Editors

Divya Mudappa
T. R. Shankar Raman

Design

Arjun Singh
Janhavi Rajan

Images (CC-BY / CC-BY-SA via Wikimedia Commons)

[cover] Ecoregion Map: Madhavan A.P.
[Pg 1] Montane rainforest evergreen slopes and folds: Chetph
[Pg 3] *Knema attenuata*: Public Domain Dedication
[Pg 3] *Poeciloneuron indicum*: Dinesh Valke
[Pg 3] *Hopea ponga*: Vinayaraj
[Pg 3] *Xantolis tomentosa*: Dinesh Valke
[Pg 3] *Beilschmiedia dalzellii*: Dinesh Valke
[Pg 3] *Garcinia morella*: Yercaud Elango
[Pg 3] *Ehretia laevis*: Dinesh Valke
[Pg 3] *Wendlandia thyrsoides*: Vaikooverly
[Pg 3] *Alangium salvifolium*: Vinayaraj
[Pg 3] *Canthium angustifolium*: Vinayaraj
[Pg 3] *Gnetum ula*: A.J.T Johnsingh
[Pg 3] *Schefflera venulosa*: Vinayaraj
[Pg 4] Jog falls, Karnataka: Abhay kulkarni
[Pg 7] Laterite escarpments: Annishaik1990
[Pg 9] Malabar pied hornbill: Charles J. Sharp
[Pg 9] King cobra: Michael Allen Smith
[Pg 9] *Melanobatrachus indicus*: David Raju
[Pg 9] Gaur: David Raju

Icons

[cover] Creative Commons by Austin Condiff from NounProject.com
[cover] Cc By by H Alberto Gongora from NounProject.com
[Pg 6] Leaf by Arthur Shlain from NounProject.com
[Pg 6] Flower by Eucalyp from NounProject.com
[Pg 6] Orange by Iconic from NounProject.com

Key References

- Ramesh, B. & Venugopal, D. & Pélissier, R. & Patil, S. & Swaminath, M. & Coutron, P. 2010. Mesoscale Patterns in the Floristic Composition of Forests in the Central Western Ghats of Karnataka, India. *Biotropica* 42: 435 - 443.
- Kulkarni, S. & Hegde, G. 2015. A comparative study on tree diversity in Kulagi and Virnoli ranges in the central Western Ghats of Karnataka in India. *Phytodiversity* 2: 22-31.
- Padaki, A. & Parthasarathy, N. 2000. Abundance and distribution of lianas in tropical lowland evergreen forest of Agumbe, central Western Ghats, India. *Tropical Ecology* 41: 143-154.
- Kanade, R. & Tadwalkar, M., Kushalappa, C. & Patwardhan, A. 2008. Vegetation composition and woody species diversity at Chandoli National Park, northern Western Ghats, India. *Current Science* 95: 637-646.
- Vaidyanathan, S. & Parthasarathy, N. 2000. Comparative analysis of tree diversity and dispersion in the tropical lowland rainforests of Agumbe, Central Western Ghats, India. *Tropical Biodiversity* 7: 45-60.
- Watve, A. 2013. Status review of Rocky plateaus in the northern Western Ghats and Konkan region of Maharashtra, India with recommendations for conservation and management. *Journal of Threatened Taxa* 5: 3935-3962.
- Guha, S. & Jain, V. 2019. Role of inherent geological and climatic characteristics on landscape variability in the tectonically passive Western Ghat, India. *Geomorphology* 350: 106840.
- Das A., Nagendra H., Anand M. & Bunyan M. 2015. Topographic and bioclimatic determinants of the occurrence of forest and grassland in tropical montane forest-grassland mosaics of the Western Ghats, India. *PLoS ONE* 10(6): e0130566.
- Rahangdale, S. & Rahangdale, S. 2014. Plant species composition on two rock outcrops from the northern Western Ghats, Maharashtra, India. *Journal of Threatened Taxa* 6: 5593-5612.
- Amrishi, V. N., Arun, K., Nishitha, D.S.S., Balakrishna, K., Udayashankar, H.N. & Khare, N. 2022. Major ion chemistry and silicate weathering rate of a small Western Ghats river, Sharavati, southwestern India. *Applied Geochemistry* 136: 105182.
- Vijayakumar S. P., Menezes R. C., Jayarajan A. & Shanker K. 2016. Glaciations, gradients, and geography: multiple drivers of diversification of bush frogs in the Western Ghats Escarpment *Proceedings of the Royal Society B* 283: 20161011.
- Wikramanayake, E., Dinerstein, E., Loucks, C. J., Olson, D. M., Morrison, J., Lamoreux, J., McKnight, M. & Hedao, P. 2002. *Terrestrial Ecoregions of the Indo-Pacific: A Conservation Assessment*. Island Press, Washington, DC.

One Earth Ecoregion Snapshot

<https://www.oneearth.org/ecoregions/north-western-ghats-montane-rainforests/>



Ecological
Restoration
Alliance

www.era-india.org

Version 1.0, 5 June 2022

SUGGESTED CITATION

ERAIndia (2022). Ecoregion Profile: North Western Ghats Montane Rainforest. Version 1.0. Ecological Restoration Alliance, India. 12 pages.

<https://era-india.org/resources/North-Western-Ghats-Montane-Rainforest>



This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/).

You are free to copy, distribute, display, remix, adapt, and build on this work provided you give appropriate credit.