

**Course: B.A Third Year**  
**Subject: Geography**  
**Paper: Resources and environment**  
**Paper code: C 303**  
**Unit: II**  
**Topic: Types and Distribution of forests**



## **Types and Distribution of forests**

Dear students, welcome to the Geography series, I have great pleasure in inviting your valued attention to this episode dealing with **Types and Distribution of forests**. In my previous episode detailed discussion was carried out on Distribution, utilization and conservation of Mineral resources

In this episode let us understand the forest resources, its types and its distribution on the earth. This episode consists of following modules:

- 1.1 Forest defined**
- 1.2 Distribution of forests**
- 1.3 Types of forests**
- 1.4 Forest category and classification**
- 1.5 Forested area today**

### **1.1 Forest defined**

A **forest** (also called a **wood, woodland, wold, weald** or **holt**) is an area with a high density of trees. There are many definitions of a forest, based on the various criteria. These plant communities cover approximately 9.4% of the Earth's surface (or 30% of total land area), though they once covered much more (about 50% of total land area), in many different regions and function as habitats for organisms, hydrologic flow modulators, and soil conservers, constituting one of the most important aspects of the Earth's biosphere. Although a forest is classified primarily by trees a forest ecosystem is defined intrinsically with additional species such as fungi.

Forests sometimes contain many tree species only within a small area (as in tropical rain and temperate deciduous forests), or relatively few species over large areas (e.g., taiga and arid montane coniferous forests). Forests are often home to many animal and plant species, and biomass per unit area is high compared to other vegetation communities.

Forests are differentiated from woodlands by the extent of canopy coverage: in a forest, the branches and the foliage of separate trees often meet or interlock, although there can be gaps of varying sizes within an area referred to as forest. Woodland has a more continuously open canopy, with trees spaced further apart, which allows more sunlight to penetrate to the ground between them

## 1.2 Distribution of forests

### Factors influencing the distribution of forests

- i) temperature
- ii) precipitation
- iii) soil
- iv) altitude
- v) slope factor
- vi) wind
- vii) sunlight

The most important factor for plant growth is temperature and it has been proved that plant requires at least a monthly average temperature of 6 C for its growth. Both excessive low and excessive high temperatures are harmful to plant. Next to temperature is precipitation, is an important factor influencing the plant growth. Xerophytes- grow under extreme dry conditions, Mesophytes plants grow in moderate water conditions, whereas Hydrophytes plants are water loving plants. The chemical contents, porosity, permeability and retentive capacity of soil determine the growth of different type of vegetation. Altitudinal variations affect plant growth as the temperature fall with the rise in the altitude plant species differ with the variation in altitude. Like altitude, it also modifies and controls the vegetation type in a region. Leeward and windward side of the vegetation affects the type of vegetation. Excessive movement of wind restricts the growth of trees due to increase in the transpiration. Sunlight favours the growth of plants by supplying energy for the manufacture of food through photosynthesis.

.Forests can be found in all regions capable of sustaining tree growth, at altitudes up to the tree line, except where natural fire frequency or other disturbance is too high, or where the environment has been altered by human activity. Global forests are found in tropical, temperate and frigid zones. In tropical region rain forests and monsoon and deciduous forests found depending upon the influencing factors for the growth of trees. In Temperate or in mid latitude, Mediterranean forests and temperate mixed forests are seen, where as in high mid-latitude softwood forests are found due to low temperature, e.g. Taiga or coniferous forests.

The latitudes 10° north and south of the Equator are mostly covered in tropical rainforest, and the latitudes between 53°N and 67°N have boreal forest. As a general rule, forests dominated by *broadleaf forests* are more species-rich than those dominated by gymnosperms *conifer*, *montane*, or *needle leaf forests*, although exceptions exist.

Among the major forested biomes are:

- rain forest (tropical and temperate)
- taiga
- temperate hardwood forest
- tropical dry forest
- The tropical hardwood forests, including rain forests, occur throughout the lowland areas of the tropics—especially along the routes of rivers in Central and South America and in central and W Africa—and in the East Indies, the Malay Peninsula, and parts of India, Indochina, and Australia. They are characterized by an annual rainfall of 160–400 in. (406–1,000 cm) annually, with an average temperature of at

least 80°F (27°C), and support a great diversity of plant life. The foliage is a luxuriant and interlaced community from ground level to the tree canopies, and the trees support the omnipresent woody vines and air plants. Although some tropical forests are deciduous, most tropical trees are considered evergreen because their leaves are not shed simultaneously at a certain season; however, they are believed to drop and renew their leaves sporadically each year. Even though they cover only 7% of the earth's landmass, about one half of the planet's species live there.

- The temperate hardwood forests of North America, Europe, and Asia are marked by seasonal rainfall distribution. The trees, typically species of beech, maple, ash, oak, elm, and basswood, are deciduous but are often mixed with conifers, especially in areas of poorer soil. The temperate hardwood forests overlap the boreal, or northern, conifer forest belts, which encircle the earth in the sub-arctic and cool, temperate regions south of the treeless tundra. The vegetation is typically fir and spruce in northern regions and at higher altitudes, and pine, larch, and hemlock in southern regions and at lower altitudes. In transitional areas, especially where there is a pronounced season without rain (e.g., the chaparral and tropical mountain slopes), scrub forests are frequently found in which the trees are more widely spaced and grasses intervene. Non-tropical rain forests exist in New Zealand, Tasmania, Chile, and the Pacific coast of North America.
- In the United States east of the prairies are the northern (boreal) forest belt, in which sugar maple, beech, and birch mix with the conifers; the hardwood forest belt, a typical temperate forest; and the warmer southern forest belt, encompassing many stands of smaller pines and cypress thickets. In the chiefly coniferous Rocky Mt. forest belt, the Ponderosa pine is most common. The Pacific forest belt has the heaviest stands of trees in America and probably in the world. The characteristic redwood and giant sequoia mingle with Douglas fir and other species.

### 1.3 Types of forest

Forests can be classified in different ways and to different degrees of specificity. One such way is in terms of the "biome" in which they exist, combined with leaf longevity of the dominant species (whether they are evergreen or deciduous). Another distinction is whether the forests composed predominantly of broadleaf trees, coniferous (needle-leaved) trees, or mixed.

- Boreal forests occupy the sub arctic zone and are generally evergreen and coniferous.
- Temperate zones support both broadleaf deciduous forests (e.g., temperate deciduous forest) and evergreen coniferous forests (e.g., Temperate coniferous forests and Temperate rainforests). Warm temperate zones support broadleaf evergreen forests, including laurel forests.
- Tropical and subtropical forests include tropical and subtropical moist forests, tropical and subtropical dry forests, and tropical and subtropical coniferous forests.
- Physiognomy classifies forests based on their overall physical structure or developmental stage (e.g. old growth vs. second growth).
- Forests can also be classified more specifically based on the climate and the dominant tree species present, resulting in numerous different forest types (e.g., ponderosa pine/Douglas-fir forest).

A number of global forest classification systems have been proposed, but none has gained universal acceptance. UNEP-WCMC's forest category classification system is a simplification of other more complex systems (e.g. UNESCO's forest and woodland 'sub formations'). This system divides the world's forests into 26 major types, which reflect climatic zones as well as the principal types of trees. These 26 major types can be reclassified into 6 broader categories: temperate needle leaf; temperate broadleaf and mixed; tropical moist; tropical dry; sparse trees and parkland; and forest plantations. Each category is described as a separate section below.

### 1. Temperate needle leaf

Temperate needle leaf forests mostly occupy the higher latitude regions of the northern hemisphere, as well as high altitude zones and some warm temperate areas, especially on nutrient-poor or otherwise unfavourable soils. These forests are composed entirely, or nearly so, of coniferous species (Coniferophyta). In the Northern Hemisphere pines *Pinus*, spruces *Picea*, larches *Larix*, silver firs *Abies*, Douglas firs *Pseudotsuga* and hemlocks *Tsuga*, make up the canopy, but other taxa are also important. In the Southern Hemisphere most coniferous trees, members of the *Araucariaceae* and *Podocarpaceae*, occur in mixtures with broadleaf species that are classed as broadleaf and mixed forests.

### 2. Temperate broadleaf and mixed

Temperate broadleaf and mixed forests include a substantial component of trees in the *Anthophyta*. They are generally characteristic of the warmer temperate latitudes, but extend to cool temperate ones, particularly in the southern hemisphere. They include such forest types as the mixed deciduous forests of the USA and their counterparts in China and Japan, the broadleaf evergreen rain forests of Japan, Chile and Tasmania, the sclerophyllous forests of Australia, Central Chile, the Mediterranean and California, and the southern beech *Nothofagus* forests of Chile and New Zealand.

### 3. Tropical moist

Tropical moist forests include many different forest types. The best known and most extensive are the lowland evergreen broadleaf rainforests include, for example: the seasonally inundated várzea and igapó forests and the terra firma forests of the Amazon Basin; the peat swamp forests and moist dipterocarp forests of Southeast Asia; and the high forests of the Congo Basin. The forests of tropical mountains are also included in this broad category, generally divided into upper and lower montane formations on the basis of their physiognomy, which varies with altitude. The montane forests include cloud forest, those forests at middle to high altitude, which derive a significant part of their water budget from cloud, and support a rich abundance of vascular and nonvascular epiphytes. Mangrove forests also fall within this broad category, as do most of the tropical coniferous forests of Central America.

### 4. Tropical dry

Tropical dry forests are characteristic of areas in the tropics affected by seasonal drought. The seasonality of rainfall is usually reflected in the deciduousness of the forest canopy, with most trees being leafless for several months of the year. However, under some conditions, e.g. less fertile soils or less predictable drought regimes, the proportion of evergreen species

increases and the forests are characterized as "sclerophyllous". Thorn forest, a dense forest of low stature with a high frequency of thorny or spiny species, is found where drought is prolonged, and especially where grazing animals are plentiful. On very poor soils, and especially where fire is a recurrent phenomenon, woody savannas develop (see 'sparse trees and parkland').

## 5. Sparse trees and parkland



Taiga forest near Saranpaul in the northeast Ural Mountains,

Sparse trees and parkland are forests with open canopies of 10-30% crown cover. They occur principally in areas of transition from forested to non-forested landscapes. The two major zones in which these ecosystems occur are in the boreal region and in the seasonally dry tropics. At high latitudes, north of the main zone of boreal forest or taiga, growing conditions are not adequate to maintain a continuous closed forest cover, so tree cover is both sparse and discontinuous. This vegetation is variously called open taiga, open lichen woodland, and forest tundra. It is species-poor, has high bryophyte cover, and is frequently affected by fire.

## 6. Forest plantations

Forest plantations, generally intended for the production of timber and pulpwood increase the total area of forest worldwide. Commonly mono-specific and/or composed of introduced tree species, these ecosystems are not generally important as habitat for native biodiversity. However, they can be managed in ways that enhance their biodiversity protection functions and they are important providers of ecosystem services such as maintaining nutrient capital, protecting watersheds and soil structure as well as storing carbon. They may also play an important role in alleviating pressure on natural forests for timber and fuel wood production.

### 1.4 Forest category classification

A number of global forest classification systems have been proposed but none has gained universal acceptance (Jenkins and Groombridge 2007). A forest category classification has been developed by the United Nations Environment Program (UNEP) and the World Conservation Monitoring Center (WCMC). The UNEP-WCMC forest category classification system is a simplification of other more complex systems (e.g. UNESCO's forest and woodland "sub formations"). This system divides the world's forest into 26 major types, which reflect climatic zones as well as the principal types of trees.

## *Broad categories*

### *Twenty-six forest categories*

Twenty-six forest categories in the UNEP-WCMC system are used to enable the translation of forest types from national and regional classification systems to a harmonized global one. Note that categories 12 and 13 below have been created as a result of data holdings that do not specify the forest type, hence 26 categories are quoted, not 28 shown here (UNEP 2007).

Temperate and boreal forest types:

- **Evergreen needle leaf forest** - Natural forest with greater than 30 percent canopy cover, in which the canopy is predominantly (> 75 percent) needle leaf and evergreen.
- **Deciduous needle leaf forest** - Natural forests with greater than 30 percent canopy cover, in which the canopy is predominantly (> 75 percent) needle leaf and deciduous.
- **Mixed broadleaf/needle leaf forest** - Natural forest with greater than 30 percent canopy cover, in which the canopy is composed of a more or less even mixture of needle leaf and broadleaf crowns (between 50:50 percent and 25:75 percent).
- **Broadleaf evergreen forests** - Natural forests with greater than 30 percent canopy cover, the canopy being > 75 percent evergreen and broadleaf.
- **Deciduous broadleaf forests** - Natural forests with greater than 30 percent canopy cover, in which > 75 percent of the canopy is deciduous and broadleaves predominate (> 75 percent of canopy cover).
- **Freshwater swamp forest** - Natural forests with greater than 30 percent canopy cover, composed of trees with any mixture of leaf type and seasonality, but in which the predominant environmental characteristic is a waterlogged soil.
- **Sclerophyllous dry forest** - Natural forest with greater than 30 percent canopy cover, in which the canopy is mainly composed of sclerophyllous broadleaves and is > 75 percent evergreen.
- **Disturbed natural forests** - Any forest type above that has in its interior significant areas of disturbance by people, including clearing, felling for wood extraction, anthropogenic fires, road construction, etc.
- **Sparse trees and parkland** - Natural forests in which the tree canopy cover is between 10-30 percent, such as in the steppe regions of the world. Trees of any type (e.g., needle leaf, broadleaf, palms).
- **Exotic species plantation** - Intensively managed forests with greater than 30% canopy cover, which have been planted by people with species not naturally occurring in that country.

- **Native species plantation** - Intensively managed forests with greater than 30 percent canopy cover, which have been planted by people with species that occur naturally in that country.
- **Unspecified forest plantation** - Forest plantations showing extent only with no further information about their type, This data currently only refers to the Ukraine.
- **Unclassified forest data** - Forest data showing forest extent only with no further information about their type.

#### Tropical forest types:

- **Lowland evergreen broadleaf rain forest** - Natural forests with greater than 30 percent canopy cover, below 1,200 meter altitude that display little or no seasonality, the canopy being >75 percent evergreen broadleaf.
- **Lower montane forest** - Natural forests with greater than 30 percent canopy cover, between 1,200-1,800 meter altitude, with any seasonality regime and leaf type mixture.
- **Upper montane forests** - Natural forests with greater than 30 percent canopy cover, above 1,800 meter altitude, with any seasonality regime and leaf type mixture.
- **Freshwater swamp forest** - Natural forests with greater than 30 percent canopy cover, below 1,200 m altitude, composed of trees with any mixture of leaf type and seasonality, but in which the predominant environmental characteristic is a waterlogged soil.
- **Semi-evergreen moist broadleaf forests** - Natural forests with greater than 30 percent canopy cover, below 1,200 meter altitude in which between 50-75 percent of the canopy is evergreen, more than 75 percent are broadleaves, and the trees display seasonality of flowering and fruiting.
- **Mixed broadleaf/needle leaf forest** - Natural forests with greater than 30 percent canopy cover, below 1,200 meter altitude, in which the canopy is composed of a more or less even mixture of needle leaf and broadleaf crowns (between 50:50 percent and 25:75 percent).
- **Needle leaf forest** - Natural forest with greater than 30 percent canopy cover, below 1,200 meter altitude, in which the canopy is predominantly (> 75 percent) needle leaf.
- **Mangroves** - Natural forests with > 30 percent canopy cover, composed of species of mangrove tree, generally along coasts in or near brackish or salt water.
- **Disturbed natural forests** - Any forest type above that has in its interior significant areas of disturbance by people, including clearing, felling for wood extraction, anthropogenic fires, road construction, etc.

- **Deciduous/semi-deciduous broadleaf forests** - Natural forests with greater than 30% canopy cover, below 1,200 meter altitude in which between 50-100 percent of the canopy is deciduous and broadleaves predominate (> 75 percent of canopy cover).
- **Sclerophyllous dry forest** - Natural forests with greater than 30 percent canopy cover, below 1,200 meter altitude, in which the canopy is mainly composed of sclerophyllous broadleaves and is more than 75 percent evergreen.
- **Thorny forests** - Natural forests with greater than 30 percent canopy cover, below 1,200 meter altitude, in which the canopy is mainly composed of deciduous trees with thorns and succulent phanerophytes with thorns may be frequent.
- **Sparse trees and parkland** - Natural forests in which the tree canopy cover is between 10-30 percent, such as in the savannah regions of the world. Trees of any type (e.g., needle leaf, broadleaf, palms).
- **Exotic species plantation** - Intensively managed forests with greater than 30 percent canopy cover, which have been planted by people with species not naturally occurring in that country.
- **Native species plantation** - Intensively managed forests with greater than 30 percent canopy cover, which have been planted by people with species that occur naturally in that country.

Tropical hardwood forests are found in South America, Africa and Southeast Asia, and tropical monsoon forests are East Africa, India, Myanmar, Thailand and Indo-China. Mid latitude temperate deciduous forests (Mediterranean forests) are found in California, Central Chile, Cape Province, Southern Australia, west, central and south Europe, and China, Manchuria, Japan, and New Zealand. High latitude coniferous forests are found in pole ward side of 60 N in Eurasia and North America and in southern Chile.



## World forest cover, 2000

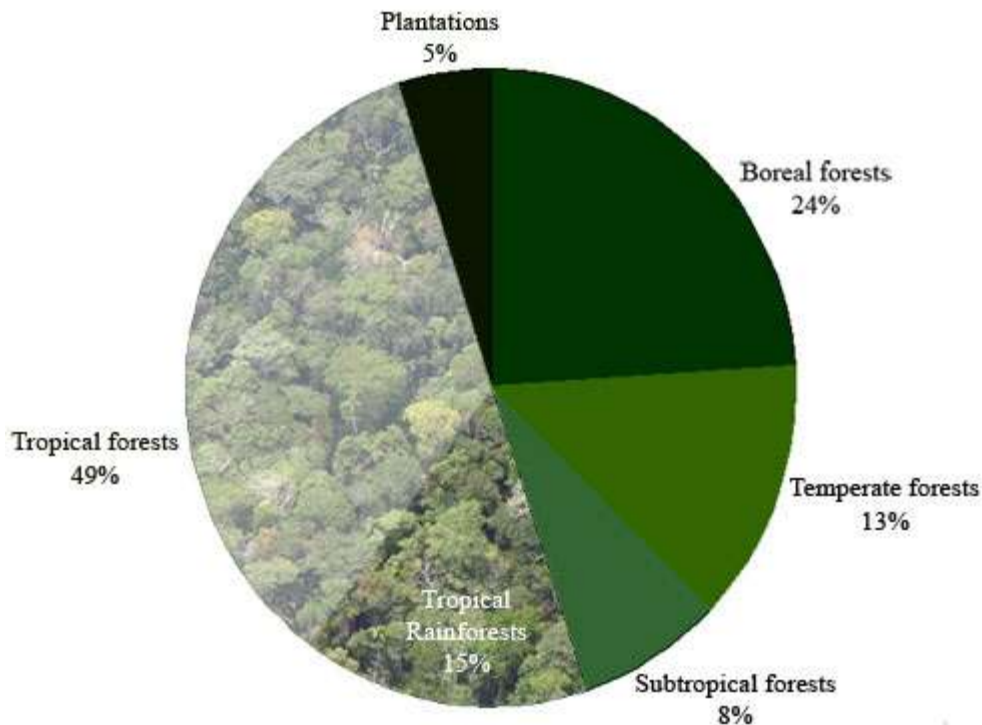


Chart showing percentage cover of world forests. Rainforests are a subsection of "Tropical forests".

### 1.5 Forested Area Today

In early times the only non-forested areas of the earth were those where the land was either excessively dry (e.g., the plains and deserts) or excessively wet (e.g., the swamps). Where the environment was favorable, forests extended from the equator to the timber line, i.e., as far as those regions in the extreme north or at high altitudes where generally there is perpetual snow. Climatic conditions favor the continued expansion of the forests as the ice cap continues to recede and the timber line to withdraw, since the forests, with their mammal and bird inhabitants, move into formerly glaciated regions. However, the favorable natural conditions are more than countered by forest clearing by humans and through fire. About 30% of the world is forested today, but the ratio between forest and population varies immensely. More than one half of the world's softwood timber (the major forest product) comes from North America and Europe—an area with only a fourth of the world's population. Yet the Mediterranean countries have been cleared of most of their forests for centuries, and the forested area of the United States has shrunk in 300 years from about one half to one third of the total land acreage. The United States and Canada share 16% of the world's forests; the former Soviet Union contains 21%, Africa has 20%, and Latin American has 24%.

### Conclusion

Forests are important renewable natural resources. Owing to its richness in a variety of resources these forests have been rampantly exploited to feed the needs of the growing population. The chief economic product of forests is timber. Forests provide raw materials for a variety of industries, a major source of household energy in the developing countries.

Worldwide about half the timber cut each year is used as fuel for heating and cooking, especially in less developed countries. Millions of people are employed in worldwide trade in forest produce is estimated to 100 billion US dollars annually. Forest serves as a habitat for a variety of species, which require large habitats without human interference. It serves as an important biodiversity reserve and as a gene reserve of a variety of wild species. This biodiversity is a very vital source for evolving new economic varieties in agriculture, horticulture, veterinary and medical fields. By absorbing atmospheric CO<sub>2</sub> forests act as big sinks for CO<sub>2</sub> and moderate the greenhouse effect. Vast expanse of forests and other vegetation slows the runoff of water and allows water to percolate into the soil thus helping regulating the stream flow. Further the leaf and plant debris on the forest floor slow water as it runs along the ground. This reduces erosion by allowing water to soak into the soil. Forests increase the water holding capacity of the soil. Because of the thick humus layer, loose soil and soil-retaining powers of trees long roots, forests are vitally important for preserving adequate water supplies. Tree roots penetrate compacted soils and increase soil porosity. The forests being the store house of a variety of resources, which directly benefit the human society.