

# UPSC INDIAN FOREST SERVICE TOOLKIT

*The Ultimate Guide to Success*

## Module - 3

Indian tribes

Joint Forest Movement (JFM)

Forest Soil

Ecology & Environment

Tree Improvement

Watershed Development



3

Anuradha Mishra



5

Ajay Gupta



6

Shobhit Joshi



11

Dinesh Jangid



17

Yash Dhoble



19

Udayan Subbudhi



23

Akarsh B.B.



24

Swarnadipta  
Rakshit



26

Senthilkumar V



30

Suchet Balkal

**35** Out of **149** Total Selections in

**Indian Forest Service (IFoS) 2022**



6

Ayush Krishna



9

Vinod Jakhar



10

Gurleen Kaur



11

Apoorv Dixit



30

Mohammed Abdul  
Rawoof Shaik



32

Shinde Sandeep  
Karbhari



35

Chandra Kumar  
Agrawal



42

Anshul Tiwari



52

Vikas Yadav



57

Subburaj G

**21** Out of **108** Total Selections in

**Indian Forest Service (IFoS) 2021**



1

Ashish Vijaywar



2

Ankit Kumar Jain



3

Sachindra  
Singh Tomar



4

Shubham Soni



6

Rahul Chouhan

**05** Out of **06** Total Selections in

**Assistant Conservator of Forest (ACF)**

**MPPSC State Forest Service 2020**

INDIAN FOREST SERVICE (MAIN) EXAM 2024

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# FORESTRY

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**MODULE - 3**



**EDITION : 2024**

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## SYLLABUS

- ❖ **TRIBOLOGY** : Tribal scene in India; tribes, the concept of races, Principles of social grouping, stages of tribal economy, education, cultural tradition, customs, ethos and participation in forestry programs.
- ❖ **JFM** : Details of steps involved such as the formation of Village Forest Committees, Joint Forest Participatory Management. Principles, objectives, methodology, scope, benefits and role of NGOs.
- ❖ **ENVIRONMENTAL CONSERVATION AND BIODIVERSITY**
  - Environment* - components and importance, principles of conservation, impact of deforestation; forest fires and various human activities like mining, construction and developmental projects, population growth on environment.
  - Pollution* - types, global warming, greenhouse effects, ozone layer depletion, acid rain, impact and control measures, environmental monitoring; concept of sustainable development. Role of trees and forests in environmental conservation; control and prevention of air, water and noise pollution. Environmental policy and legislation in India. Environmental Impact Assessment. Economics assessment of watershed development *vis-a-vis* ecological and environmental protection
- ❖ **TREE IMPROVEMENT AND SEED TECHNOLOGY** : General concept of tree improvement, methods and techniques, variation and its use, provenance, seed source, exotics; quantitative aspects of forest tree improvement, seed production and seed orchards, progeny tests, use of tree improvement in natural forest and stand improvement, genetic testing programming, selection and breeding for resistance to diseases, insects, and adverse environment; the genetic base, forest genetic resources and gene conservation in situ and ex-situ. Cost benefit ratio, economic evaluation.
- ❖ **FORESTS SOILS** : Classification, factors affecting soil formation; physical, chemical and biological properties.
- ❖ **SOIL CONSERVATION** : Definition, causes for erosion; types – wind and water erosion; conservation and management of eroded soils/areas, wind breaks, shelter belts; sand dunes; reclamation of saline and alkaline soils, water logged and other waste lands. Role of forests in conserving soils. Maintenance and build-up of soil organic matter, provision of lopping's for green leaf manuring; forest leaf litter and composting; Role of micro-organisms in ameliorating soils; N and C cycles, VAM.
- ❖ **WATERSHED MANAGEMENT** : Concepts of the watershed; the role of mini-forests and forest trees in overall resource management, forest hydrology, watershed development in respect of torrent control, river channel stabilization, avalanche and landslide controls, rehabilitation of degraded areas; hilly and mountain areas; watershed management and environmental functions of forests; water-harvesting and conservation; groundwater recharge and watershed management; the role of integrating forest trees, horticultural crops, field crops, grass, and fodders.



## Module - 3

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**TRIBOLOGY**

2023	<ul style="list-style-type: none"> <li>Enlist the problems faced by the tribal communities in India [10 M]</li> </ul>
2015	<ul style="list-style-type: none"> <li>Enumerate and discuss the <u>factors responsible for restricting tribal population</u> in the national parks (10 m).</li> </ul>
2014	<ul style="list-style-type: none"> <li><u>Name</u> different tribes of India <u>state-wise</u> and their specific <u>characteristics</u>. How can we make use of their <u>traditional knowledge</u> in forest conservation (flora and fauna) ? (20 m).</li> </ul>
2013	<ul style="list-style-type: none"> <li>Give the fundamental <u>characteristics of the tribal economy</u> in India (8 m).</li> </ul>
2011	<ul style="list-style-type: none"> <li>Write short notes on (i) Tribal economy, (ii) Chola Naickans, (iii) Gujjars, (iv) Gonds (10 m).</li> <li>Discuss the characteristics which are shared by the diverse tribal groups all over India (10 m).</li> </ul>
2010	<ul style="list-style-type: none"> <li>How can we make use of the <u>traditional knowledge</u> of the major tribes of India in forest conservation (both flora and fauna) ? [Linked Q]</li> </ul>
2009	<ul style="list-style-type: none"> <li>Discuss various approaches required to motivate the members of a <u>tribal community</u> to introduce <u>social forestry plantation</u> in their farmland. [Linked Q]</li> </ul>
2007	<ul style="list-style-type: none"> <li>Describe the <u>ethnic communities</u> of India. Give their contribution to ethnobotany</li> </ul>
2006	<ul style="list-style-type: none"> <li>Forest are key to the <u>tribal economy</u>, Justify</li> </ul>

**JOINT FOREST MANAGEMENT (JFM)**

2023	<ul style="list-style-type: none"> <li>Write a note on the gender issues in Joint Forest Management (JFM) [8 M].</li> <li>What is village forest committee? Explain its role in forest management [10 M].</li> </ul>
2022	<ul style="list-style-type: none"> <li>“Participatory Forest Management is a success”. Illustrate with examples (10 m)</li> </ul>
2021	<ul style="list-style-type: none"> <li>How do the <u>ownership rights</u> of forests <u>influence the success</u> of joint forest management? (8 m).</li> </ul>
2020	<ul style="list-style-type: none"> <li>How does collaborative forest management ensure community and household resilience? (8m) [Linked Q]</li> </ul>
2019	<ul style="list-style-type: none"> <li>Why are <u>participatory rural appraisal</u> (PRA) techniques important for planning and execution of Joint Forest management (JFM) Activities? Explain the <u>tools and techniques of PRA</u> (15 m).</li> </ul>
2018	<ul style="list-style-type: none"> <li>What are the <u>Objectives</u> of Joint Forest Management (JFM)? Give <u>Methods</u> used for preserving forest resources through JFM (15 m).</li> </ul>
2017	<ul style="list-style-type: none"> <li>Write in detail as to why the Joint Forest Management Policy was initiated and what are its <u>Constraints</u> in implementation? (15 m).</li> </ul>
2016	<ul style="list-style-type: none"> <li>Trace the <u>History of JFM</u> in India, narrate any one success story with details (15 m).</li> </ul>
2014	<ul style="list-style-type: none"> <li>Introduction of JFM in various states in India was found <u>Positive in biodiversity conservation</u>, discuss in details (8m).</li> </ul>

2013	<ul style="list-style-type: none"> <li>Describe constitution of <i>JFM Network</i> by MOEF, GOI with its terms of reference (7m).</li> <li>What entry point activities are recommended in joint forest management? (8m)</li> </ul>
2012	<ul style="list-style-type: none"> <li>What shifts in attitude among Forest Personnel from the present are required for better success of Joint Forest Management? Discuss (10 m).</li> </ul>
2010	<ul style="list-style-type: none"> <li>How can we make use of the traditional knowledge of the major tribes of India in forest conservation (both flora and fauna) ?</li> </ul>
2009	<ul style="list-style-type: none"> <li>Write general <i>principles of benefit sharing</i> under Joint Forest Management</li> </ul>
2008	<ul style="list-style-type: none"> <li>How are the village forest committees constituted for conservation of forest resources under Joint Forest Management? (10 m)</li> </ul>

### POLLUTION & ENVIRONMENTAL CONSERVATION

2023	<ul style="list-style-type: none"> <li>Greenhouse gases result in global warming. Discuss [8 M]</li> <li>What is Environmental Impact Assessment (EIA)? Describe the activities involved and general procedure in EIA [15 M]</li> <li>Write on carbon sequestration and discuss the role of afforestation in absorptions of carbon dioxide (CO<sub>2</sub>) from atmosphere [10 M]</li> <li>Write the components of vehicular air pollution and list the damages caused to roadside trees [8]</li> </ul>
2021	<ul style="list-style-type: none"> <li>What is the <i>relationship between air pollutants and climate change</i>? How does forest vegetation abate different types of pollutants? Describe Air (Prevention and Control of Pollution) Act, 1981 in relation to pollution management. Suggest name of suitable plant species (15m).</li> <li>Explain the <i>role of trees and forests in Environmental conservation</i> (15m) [Linked Q – Silviculture]</li> <li>What are the <i>impacts of COVID-19 pandemic on environment and biodiversity</i> (8m)</li> <li>What is REDD+? How does clean development mechanism help in sustainable management of forests? (8m)</li> <li>What is the role of forest plantations in <i>Carbon Sequestration</i>? (10 m)</li> </ul>
2020	<ul style="list-style-type: none"> <li>Describe the <i>In-Situ Biodiversity Conservation</i> with reference to biosphere reserves (8m).</li> <li>What do you mean by population diversity? What are the different methods to measure biodiversity? (15m).</li> <li>Explain the methods of <i>Environmental Impact Assessment</i> (15m).</li> </ul>
2019	<ul style="list-style-type: none"> <li>List out the <i>greenhouse gases</i> that contribute to <i>global warming</i>. What are the effects of global warming? Explain the role of trees and forests in combating environmental degradation (15 m).</li> <li>Explain the concept of <i>sustainable development</i>. Discuss in brief the agenda for sustainable development (10 m).</li> </ul>
2018	<ul style="list-style-type: none"> <li>Write the salient features of the <i>solid waste management act, 2000 and 2016</i>. What new initiatives have been taken in the <i>solid waste management rules, 2016</i>? ( 8m).</li> <li>Write about the <i>pre- and post-Environmental Impact Assessment (EIA)</i> of any mining area of India. Does GIS help in EIA? Write the name of the software used in Environmental Impact</li> </ul>

	<p>Assessment for the mining areas (10 m)</p> <ul style="list-style-type: none"> <li>• What is <i>sustainable development</i>? Write about the criteria and indicator of sustainability fulfilling the needs and demands of growing population of India (10 m).</li> <li>• What is the <i>ecological and economical importance of biodiversity</i>? Mention the salient measures for <i>conservation of biodiversity</i> (8 m).</li> </ul>
2017	<ul style="list-style-type: none"> <li>• Comment on the possible <i>impact of greenhouse gases</i> on the global environment (8 m).</li> <li>• Discuss the term <i>Biodiversity</i>. Explain the levels in which it can be studied. What are the different measures employed to measure biological diversity? Elaborate (20 m).</li> </ul>
2016	<ul style="list-style-type: none"> <li>• Define <i>global warming</i>. Explain in brief the principle behind greenhouse effect. Write the consequences of global warming on forest, wildlife and the human health (20 m).</li> <li>• What are the <i>objectives of carrying out EIA</i>. Discuss sequentially, the different phases of an EIA study (10 m).</li> <li>• Explain the <i>Role of forest in environmental conservation</i> (10 m).</li> <li>• How are “Environment”, Environmental pollutant” and “Hazarous substance” narrated in environment (protection) act, 1986? (10 m).</li> </ul>
2015	<ul style="list-style-type: none"> <li>• What is the penalty prescribed in section 15 of the environmental (Protection) act, 1986 for contravention of the provisions of the environmental act, rules and orders? (8 m).</li> <li>• Write the <i>chemistry of ozonosphere</i> and list the adverse effects of ozone layer depletion (10 m).</li> <li>• What is <i>arsenic pollution</i>? Discuss the strategies to mitigate it (10 m).</li> </ul>
2014	<ul style="list-style-type: none"> <li>• What do you understand by the term <i>greenhouse gases</i>? Explain how these gases disturb the ecological balance of nature and suggest suitable remedies (10m).</li> <li>• Why is a balance between production, social and environmental objectives necessary in sustainable forest management plans? (20 m).</li> </ul>
2013	<ul style="list-style-type: none"> <li>• What is <i>Global Warming</i>? Discuss how it disturbs the ecological balance of nature, and suggest suitable remedies (20 m).</li> <li>• Explain the following – (i) Criteria pollutant, (ii) Pollutant standard index, (iii) Severance tax, (iv) Smog (<math>2 \frac{1}{2} \times 4 = 10</math> m).</li> <li>• Briefly describing the <i>National Legislation on Biodiversity</i>. Name the activities for which states can seek fund from the central government (10 m).</li> </ul>
2012	<ul style="list-style-type: none"> <li>• What are major ecological considerations in afforestation’s? (5m)</li> </ul>
2011	<ul style="list-style-type: none"> <li>• Name the <i>Biodiversity Hot Spots</i> in India. Discuss the major threats to biodiversity (10 m).</li> <li>• Write short notes on – (i) Carbon sequestration, (ii) Riparian buffers, (iii) Forest decline, and (iv) Nitrate pollution (<math>2 \frac{1}{2} \times 4 = 10</math> m).</li> <li>• What are the effects of particulate <i>air pollutants</i> on the regeneration of a forest ecosystem? Discuss (10 m).</li> </ul>
2010	<ul style="list-style-type: none"> <li>• Discuss the following - <i>Rio conference</i> (5 m).</li> <li>• What do you understand by the term ‘hot spot’ in relation to floral biodiversity? Explain methods of <i>ex-situ and in-situ conservation</i>.</li> <li>• How is <i>Forest Certification</i> done in developed countries? Comment on its present status in India.</li> </ul>

	<ul style="list-style-type: none"> <li>Write on tree species for smoke and dust pollution control (5 m)</li> </ul>
2009	<ul style="list-style-type: none"> <li>Describe the role of forests in environmental conservation (12m)</li> </ul>

**TREE IMPROVEMENT + SEED TECHNOLOGY**

2023	<ul style="list-style-type: none"> <li>Explain the following – (a) Lignotuber, (b), (iii), (iv), (v) <i>Ortet</i> and <i>Ramet</i> [15 M]</li> <li>Discuss the significance of <i>exotics in tree improvement</i>. Name four exotic tree species [8]</li> <li>Define <i>heritability</i> and its types. How does Narrow Sense Heritability differ from Broad Sense Heritability? [10 M]</li> <li>Discuss the scope and future of hybrids in applied tree improvement [10 M]</li> <li>Discuss the <i>significance of variation</i> in tree improvement [10 M]</li> </ul>
2022	<ul style="list-style-type: none"> <li>Why is <i>conventional breeding</i> that has a much better role to play in genetic improvement of trees not given much importance in research? (8 m)</li> <li>What are the objectives of <i>progeny testing</i>? Discuss the advantages and disadvantages of different methods of progeny testing (15 m)</li> <li>Discuss the <i>important considerations</i> that are made before choosing a tree improvement approach (10 m)</li> </ul>
2021	<ul style="list-style-type: none"> <li>What are the advantages and disadvantages of <i>tree-breeding methods</i> over biotechnological methods? (10m).</li> <li>Give an overview of forest genetic resources and <i>gene conservation programmes</i> in India. Suggest effective practices for sustainable management for quality improvement in Indian Forests (15m).</li> </ul>
2020	<ul style="list-style-type: none"> <li>What is meant by <i>accompanied</i> and <i>unaccompanied clonal seed orchards</i>? Why are the gains from the two types so different? (8 m).</li> <li>What are the different <i>factors governing the successful introduction of an exotic tree species</i>? (10m).</li> <li>Describe the advantages, peculiar problems and various <i>steps in tree improvement</i> (15 m).</li> </ul>
2019	<ul style="list-style-type: none"> <li>What are the <i>objectives of tree improvement</i>? Explain in Details the <i>five essential steps</i> of tree improvement (8 m).</li> <li>Define : (i) Variation, (ii) Selection differentiation, (iii) Selection intensity, (iv) Heritability. How do you increase the genetic gain for a given trait in tree breeding? (15 m)</li> <li>Name the <i>two phases of tree improvement</i>. as a tree breeder, how do you use these two phases simultaneously to meet the short-term demand of wood-based industries and the long-term demand of establishing seed orchards for a given tree species (15 m).</li> </ul>
2018	<ul style="list-style-type: none"> <li>How would you develop <i>tree improvement programmes</i> for raising productivity in forestry? (10 m).</li> <li>What is the importance of <i>heritability</i> and how can genetic gain be estimated in tree improvement programme? (10 m).</li> <li>Describe incomplete <i>mating designs</i> used in tree improvement (10 m).</li> <li>What are the different <i>selection methods</i> used by the tree breeders? (10 m).</li> </ul>

	<ul style="list-style-type: none"> <li>• Discuss the possibilities of <i>biotechnological interventions</i> in tree improvement programmes (10m).</li> <li>• Why do forest plantations fail? Cite relevant examples [<i>Linked Q</i>]</li> </ul>
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**FOREST SOIL**

2023	<ul style="list-style-type: none"> <li>• How does moisture influence the soil formation and growth of vegetation? [8 M]</li> <li>• Explain the theory of humus formation predominant in forested vegetation [10 M]</li> </ul>
2022	<ul style="list-style-type: none"> <li>• How does C: N ratio of plant residue in soil influence the rate of decomposition and nitrogen availability to plants? (8m).</li> <li>• How does watershed influence the ecology and socio-economic development of a region? (8m)</li> <li>• Give a detailed profile of a soil showing various zones and explain the function of each soil zone (10 m)</li> </ul>
2021	<ul style="list-style-type: none"> <li>• How does soil organic matter decomposed influence forest productivity? (8m)</li> <li>• Explain the terms – (a) Cation Exchange Capacity, (b) Salinity &amp; Alkalinity (8m)</li> </ul>
2020	<ul style="list-style-type: none"> <li>• Write short notes on the following – (a) Soil texture and structure, (b) Soil organic matter, (c) Carbon nitrogen ratio (15m).</li> <li>• What is the different soil type found in India? Identify five tree species growing each in Alluvial soils, red soils, Black cotton soils and Arid and desert soils (15m).</li> </ul>
2019	<ul style="list-style-type: none"> <li>• Soil is an interface of air, minerals, water and life. Comment (8 m).</li> <li>• What are the <i>pedogenic process</i> ? Explain the important process of soil formation (15 m).</li> </ul>
2018	<ul style="list-style-type: none"> <li>• Write in detail about the <i>influence of parent rock in the distribution of tree species</i> (8m) [<i>Linked Q</i>].</li> </ul>
2017	<ul style="list-style-type: none"> <li>• What are the various methods adopted to conserve the soil on sloping areas? Explain in brief (10 m).</li> </ul>
2016	<ul style="list-style-type: none"> <li>• Write distinguish features of <i>saline alkaline soil</i> (8m).</li> <li>• Explain types of rocks based on formation and minerals based on chemical compositions (8m)</li> </ul>
2015	<ul style="list-style-type: none"> <li>• Why is a lot of emphasis laid on research relating to soil conservation? Discuss (8 m)</li> <li>• Describe different textural classes of soil and the way they affect plant growth (10m).</li> <li>• Why is <i>saline-alkaline soil</i> considered problematic? can you suggest any procedure to make it suitable for plant growth ? (10 m).</li> </ul>
2012	<ul style="list-style-type: none"> <li>• Explain different process of soil erosion. Briefly describe them giving examples as to how the vegetation including trees can help in conserving soil and water (10 m).</li> <li>• What is the major ecological consideration in Afforestation (5 m)</li> </ul>
2011	<ul style="list-style-type: none"> <li>• Explain the different processes of soil erosion. Briefly describe them giving examples as to how the vegetation including trees can help in conserving soil and water (10 m).</li> </ul>





Since prehistoric times, India has been a country of multi-racial community, spread throughout the Indian peninsula with its definite cultural variations and level of development. Among them, many groups are still in a primitive state and are very weakly affected by so-called modernization. Therefore, those people are called *aboriginals*, and the popular names we often used for them are Vanvasi, Pahari (in HP, UK), Adimjati (Primitive People), Adivasi (Indigenous People), Anusand Janajati (Scheduled Tribes (ST)), etc.

### 1.1 DEFINITION

- The tribe is a collection of families bearing a common name, a common living homeland, members of which speaking the same languages and observed certain taboos regarding marriages and occupations.
- A tribe is a group speaking a common dialect and inhabiting a common territory.
- A tribe is a small isolated, closely-knit society.

The term 'tribe' is derived from the *Latin* word '*tribus*' which is used by the Romans for a social group of poor people among its citizens.

### 1.2 CHARACTERISTICS OF THE INDIAN TRIBE

- *Definite territory* - members of a tribe occupy a common and well-defined territory, *i.e.*, the Bheria tribe of MP lives in the Patalkot (Chindwada district).
- All the members of a tribe *speak a common language* or dialect but *usually lack script*, *i.e.*, Koru by the Koru tribe, Gondi by Gonds, etc. [The Santhali has its own script called *Chikiscript*].
- The members of a tribe are claimed to be *originated from a common ancestor* and blood related to each other.
- Have *common folk arts* & culture, *common religion*, beliefs, **customs**, **Taboos**, and myths.
- Names have *common types of surname*.
- *Common occupation* primarily *depends upon the forest* for their livelihood. Hunting and food gathering are common practices.
- Shows *strong social and political unity*. Govern by their own laws through tribal assembly to maintain peace, justice and punish if someone violates customs. Generally, Mukhia commands the tribe with the help of the body of warriors and tribal assembly, and his decisions are final.
- Habitation in *remote and inaccessible forest areas*, Illiteracy.



Tribal prefer to live in thatched house



### 3.1 KINSHIP

Man is social by nature and establishes many types of relationships with a number of individuals, usually initiated by genetic or blood relationships.

Importance : (1) It creates groupings, and (2) it provides guidelines for interaction (behaviours) among persons in these social groupings.

#### ► TYPES OF KINSHIP

- *Affinal kinship* : it is based on marriage. The most affinal relationship is the one between husband and wife.
- *Consanguineous kinship* : kinship based on descent, commonly known as blood relation, *i.e.*, Father-son, Mother-son, etc.

#### ► DEGREE OF KINSHIP

- Primary kin or 1<sup>st</sup>-degree kin (पहली पीढ़ी) – are those who are directly related to each other, *i.e.*, Mother-Father, Brother-sister.
- Secondary kin or 2<sup>n</sup> degree kin are not directly related to one another but through primary kins, *i.e.*, Grandfather and grandson, Grandma, grandson, cousins, etc.
- Tertiary kin – your brother/sister-in-law is your 3<sup>rd</sup>- degree kin.

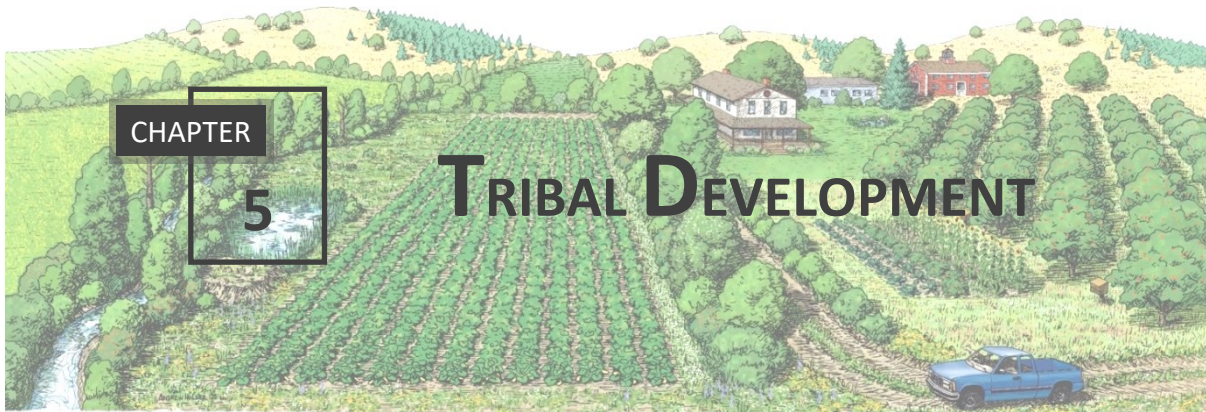
#### ► KINSHIP BEHAVIOUR

- **Avoidance** : means that two kins, generally of the opposite sex, should avoid each other. In almost all societies, avoidance rules prescribe those men and women must maintain a certain amount of modesty in speech, dress, and gesture in a mixed company. Thus, a father-in-law should avoid daughter-in-law. The Purdah system in the family in the North illustrates the usage of avoidance.
- **Existence of Matrimonial System** : The wife had to stay at his husband's residence.
- **Joking relationships** : just opposite of avoidance, here involve a particular combination of friendliness and antagonism between individuals, *i.e.*, Bhabhi-Dewar.

### 3.2 TABOO

Each society has its own belief system that takes roots from its past history and cultural identity. This belief system affects all factors of human life, including health, ritual, marriage, caste, culture, social, religion, conversation, etc. Tribals are no exception to it.





Tribal communities continue to be vulnerable even today, not because they are poor and illiterate compared to the general population, but their inability to negotiate and cope with the consequences of their integration with the mainstream economy, society, cultural and political systems. The requirements of planned development brought with them the dams, mines, industries, and roads, all located on tribal lands. Tribal institutions and practices were forced into an uneasy coexistence.

#### ► **SOCIO-ECONOMIC AND CULTURAL PROBLEMS OF TRIBALS**

- Problems related to the forest – rapidly decreasing natural resources, climate change and erratic rainfall, misuse of rights, and concessions by some.
- Agricultural still in primitive phase & irrigation issue
- Illiteracy and Poverty
- Health issues & alcoholism
- Inadequate employment opportunity and Bondage labor
- Lack of credit and market facility = Indebtedness.
- Land alienation
- Exploitation of tribals by Middle-man, Traders, contractors, and NGO gang.
- Migration for employment
- Poor governance & corruption
- Displacement due to developmental programs.

#### ► **SOLUTION**

- To save their rights : give special status to the tribal area and socio-cultural linked programs, promoting the proper implementation of forest right act.
- Economic development through -
  - \* IPR and bio-prospecting
  - \* Geotagging of their produce
  - \* fair and festivals like Bhagoria haat, Hornbill festival of Nagaland, etc., to promote cultural tourism, ecotourism, etc.
  - \* Joint forest management & promotion of cottage industry.
  - \* Marketing their products through Flipkart/Amazon.
  - \* Promotion of social forestry and agroforestry on their own land.
  - \* Promotion of forest-based cottage industry, collection of MFP in a sustainable manner.
  - \* Agriculture development programs like solar pumps for irrigation.



# CHAPTER 1

## Chapter outline

- 1.1 Historical Background
  - ✦ Success stories
- 1.2 Objectives of JFM adoption
- 1.3 Salient features of JFM
- 1.4 JFM structure
  - ✦ JFMC
  - ✦ Eco-dev. Committee
  - ✦ Powers of FPCs
- 1.5 Formation of a JFMC
  - ✦ Introduction
  - ✦ Approval
  - ✦ Formation of JFMCs and Executive committees
- 1.6 Legal back-ups to the JFM
- 1.7 Causes of Poor performance of JFMCs [Constraints]
- 1.8 Role of JFM
- 19 Exercise

# JOINT FOREST MANAGEMENT

**Joint Forest Management (JFM)** is an approach and program initiated by the *National Forest Policy of 1988*. Under this, the state forest departments support local forest-dwelling and forest fringe communities to protect and manage forests by sharing the costs and benefits of the forests with them. Communities organise themselves into a JFM Committee to preserve and manage nearby forests, guided by locally prepared guidelines and micro-plans.

JFM is a *participation of the local community* in the management of forest

## 1.1 HISTORICAL BACKGROUND

In 1931, **Van Panchayats** in Uttarakhand started participating in forest management, as the remote Himalayan region where creating hardness to the forest department because of the poor Cost-benefit ratio.

Later, the Forest Department of **West Bengal** successfully started a pilot project in the **Arbari**\*\*\* village (hilly area) during 1971–72, and it was a major success.

Followed by Haryana and Odisha, but all these (WB, HR, Odisha, etc.) were pilot projects or individual efforts of some dedicated forest officers and had no forest policy or legal back-ups.

Other similar efforts, *i.e.*, Forest Cooperatives in the Madras Presidency (the 1900s) and cooperative Forest Societies in Kangra (1940s, earlier Punjab, now Himachal Pradesh). Woodlots on panchayat lands under Social Forestry (the 1980s - with Revenue sharing agreements).

The actual initiative by MoEFCC on JFM started with the **National Forest policy – 1988**\*\*\* on its past experiences, followed by the **Guideline of 1990**\*\*\* to utilize forest wealth to improve local livelihoods. This guideline explains how the forest committee was formed, its powers & functioning, NWFP sharing %, etc. *This guideline forms the basic foundation of JFM in India. That's why most Academicians consider this as the year of initiation of JFM in India.*

## CHAPTER 2

### Chapter outline

#### 2.1 PRA

Tools

#### 2.2 RRA

Salient features

Constraints

Tools

# PARTICIPATORY RURAL APPRAISAL (PRA) AND RAPID RURAL APPRAISAL (RRA)

Collection of information for planning rural development activities, including JFM, involves detailed surveys, data collection, and extensive field visits. In the past, the staff of the department or project used to collect information on their own. However, this method had the following drawbacks

- High time, money, and workforce-consuming.
- Most of the time proved to be beyond the capacity of the staff resources.
- The data generated was not very reliable (and sometimes forged)
- The local communities were not involved in this process, resulting from which their views did not get adequately reflected.
- The efforts by the staff were prone to be biased, leading to severe distortions.
- Often the information was not reliable.

As a result, many schemes launched after detailed planning could not achieve the desired results despite the best intentions of those who planned and implemented it. The perceptions of staff could be different than that of the participating local communities. Planners realized that participation of the communities in plan formulation was essential. To collect information and enhance the level of communities involvement, the following two processes have been evolved.

- A. Participatory rural appraisal (PRA)
- B. Rapid rural appraisal (RRA)

**IFoS 2019** : Why are participatory rural appraisal (PRA) techniques important for planning and execution of Joint forest management (JFM) Activities? Explain the tools and techniques of PRA (15 m).

### 2.1 PARTICIPATORY RURAL APPRAISAL (PRA)

Participatory Rural Appraisal (PRA) is a tool to facilitate the collection and analysis of information by and for community members. It emphasizes local knowledge and involves communities in the

## CHAPTER 4

### Chapter outline

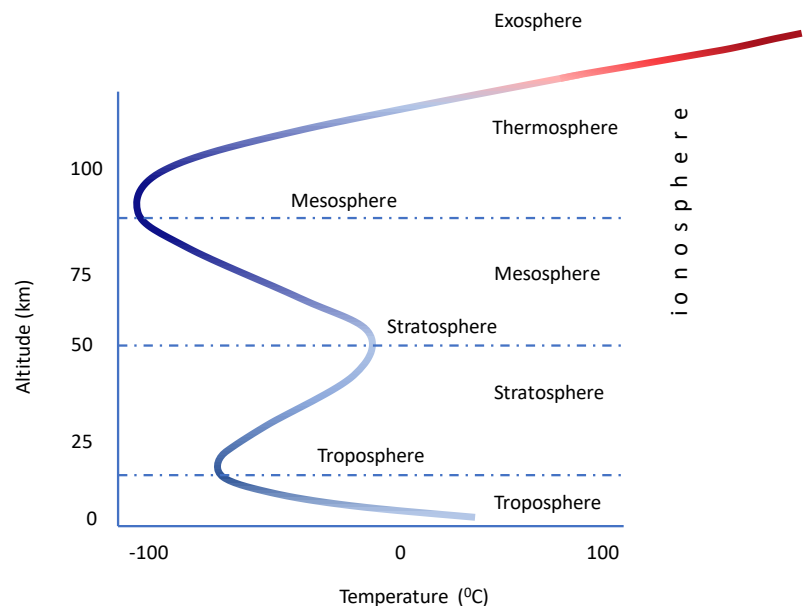
- 4.1 Structure and component of environment
- 4.2 Climate change & Global warming
- 4.3 Climate change & its effect
- 4.4 Effect of Climate change on India
- 4.5 Mitigation & Adaptation strategies
- 4.6 Global response to climate change
- 4.7 India's response
- 4.8 Exercise

# CLIMATE CHANGE & GLOBAL WARMING

The word 'environment' is most commonly used to describe Nature and means the *sum of all living and non-living things surrounding an organism or group of organisms*. The environment includes all elements, factors, and conditions that impact the growth and development of certain organisms. The environment includes biotic (all surrounding living organisms) and abiotic factors (light, temperature, water, atmospheric gases combine with biotic factors) that influence observed organisms.

## 4.1 STRUCTURE AND COMPONENT OF ENVIRONMENT

There are four main spheres of the environment : the lithosphere, the hydrosphere, the atmosphere, and the biosphere. These correspond to the rocks, the water, the atmosphere, and the life. Environment therefore refers to the study of Earth, air, water, living creatures, and their mutual relationships.



**Note :** In the chapter locality factors, we already refer to various environmental factors. It is unnecessary to go into more detail here. Any traditional book can be used for more information.



## CHAPTER 5

### Chapter outline

- 5.1 Definition
- 5.2 Historical background
- 5.3 Concept of Sustainable development
- 5.4 Elements of Sustainable development
- 5.5 Why practice sustainable forest management
- 5.6 Standards for the SFM
- 5.7 Who develops standards and how
- 5.8 International initiatives
- 5.9 Indian initiatives

# SUSTAINABLE FOREST DEVELOPMENT

In recent years, environmental issues have attracted a tremendous amount of attention worldwide. It was the Brundtland Commission report in 1987 and the Rio summit in 1992 that sparked major motivation. This interest is focused mainly on sustainable ways to better management of resources and carry out the development in a harmonious fashion in relation to the environment. Although, the world needs new development to run its economies and to make progress. This puts pressure on us to think about how we can manage our resources in a sustainable way. This resulted in the institution of new legislation originating from national and international sources where potential adverse effects of future development activities are tried to mitigate or avoid at the planning stage. Environmental impact assessment (EIA) is such an example that assesses the impacts in advance.

### 5.1 DEFINITION

Sustainable forest management (SFM) is defined as a *dynamic and evolving concept*, which aims to *maintain and enhance the economic, social, and environmental values* of all types of forests, for the benefit of present and future generations. Forests and trees, when sustainably managed, make vital contributions both to people and to the planet, bolstering livelihoods, providing clean air and water, conserving biodiversity, and responding to climate change (F.A.O.)

‘Sustainable forest management is the process of managing forests to achieve one or more clearly specified objectives of management with regard to the production of a continuous flow of desired forest products and services, without undue reduction of its inherent values and future productivity and without undue undesirable effects on the physical and social environment.’ (ITTO, Criteria, and Indicators for Sustainable Management of Natural Tropical Forests, 1998)

# CHAPTER 9

# FOREST CERTIFICATION

## FOREST CERTIFICATION

Forest certification is a process that involves *monitoring, tracing, and labelling* of *timber, wood, pulps, and non-timber forest products*. The objective of forest certification is to evaluate the quality of forest management practices from environmental, social, and economic perspectives against a set of agreed standards.

## HISTORY

- The first forest certification scheme, the *Smart Wood* program, was launched by the *Rainforest Alliance* in 1989. This program aimed to promote Sustainable Forest Management (SFM) practices in tropical forests, particularly in *Indonesia*. However, this concept of forest certification gained wider recognition and popularity after the Earth Summit, held in Rio de Janeiro, Brazil, in 1992. At this conference, many countries and organizations recognized the importance of SFM and agreed to work towards promoting it.
- In 1993, the *Forest Stewardship Council (FSC)* was established as an international, non-governmental organization in *Bonn, Germany* with the aim of promoting responsible forest management worldwide via timber certification. The FSC developed a certification scheme that included *Environmental, Social, and Economic* criteria to ensure that forests were managed in a sustainable way. Its present director is Kim Carstensen. Council was developed 10 Principles and 56 Criteria for forest stewardship.



### 10 FSC Principles (here, only 7 given)

- *Comply with all applicable laws, regulations, treaties, conventions and agreements together.*
- Maintain or improve the social and economic *well-being of workers*
- Uphold *Indigenous Peoples' right* of ownership and use of forest resources
- Manage their products and services in a way that maintains or improves their *long-term economic viability, social benefits, and environmental benefits.*
- Monitoring and assessment – to *demonstrate progress towards management objectives.*
- Maintenance of *high conservation value forests* – to maintain or enhance the attributes which define such forests.
- To make sure that plantation and management activities are in accordance with FSC Principles and Criteria

## CHAPTER 10

# ENVIRONMENT IMPACT ASSESSMENT

### Chapter outline

- 10.1 Historical development of EIA
- 10.2 Need for EIA
  - ✿ Kuznet's curve
- 10.3 Scope and Objectives of EIA
- 10.4 Principles of EIA
- 10.5 Methods of EIA
  - ✿ Ad-hoc
  - ✿ Checklist
  - ✿ Matrix
  - ✿ Network
  - ✿ Over-ley
  - ✿ Stimulation
  - ✿ Cost-benefit
  - ✿ Environmental Index
- 10.6 EIA dev. In India
  - ✿ EIA Notification 1994
  - ✿ Notification 2006
- 10.7 EIA 2020 Draft
- 10.8 Exercise

Environmental impact assessment (EIA) evaluates both progressive and harmful environmental impacts of a proposed plan, strategy, program, Or any project previous to its execution. In EIA, plans, policies, and programs are used for state departments and projects for individuals and private companies. EIA is a decision-making tool used to compare different alternatives for any new assignment and further seeks to recognize the one that produces minimum environmental impact and brings maximum economic and social benefits.

### 10.1 HISTORICAL DEVELOPMENT OF EIA

During the 1960s, people understood that undertaking development projects disturbed the environment, resources, raw materials, and people. Due to this, pressure groups formed to develop a tool that can be used to ensure the environment in any growth. To counter this issue, the USA decided to establish a National Environmental Policy Act in 1970 for environmental protection. Hence, the *USA became the first country to enact legislation on EIA*. After that, Australia adopted EIA in 1970, Canada and New Zealand in 1974. Afterward, EIA was formalized and established in the world at the United Nations Conference on the Environment in Stockholm in 1972; Presently, all developed countries have enacted legislation on ETA.

### 10.2 NEED FOR ENVIRONMENT IMPACT ASSESSMENT

Modern economic activity thrives on growth and development, and any development-related activity is bound to have an impact on the environment this impact may vary from sector to sector, and this impact may be positive and negative. There is a long-drawn debate on environment and development with the assumption that development and environment conservation are antithetical to each other. National economic perspective demands development and growth, *e.g.*, Infrastructure, employment generation through various projects like industry,

# CHAPTER 13

# CARBON CYCLE

## 13.1 EXERCISE

**IFoS 2021** : What is the role of forest plantations in *Carbon Sequestration*? (10 m)

✿ Discuss the role of forest for *carbon sequestration* [Odisha Civil (Main) 2015 | 20 Marks]

**IFoS 2020** : Why is *carbon cycle important* ? How do human activities affect carbon cycle? (10 m).

**IFoS 2018** : What is *carbon sink* ? How do forest soils act as important carbon sinks? (8 m).

**IFoS 2015** : Why is *carbon recycling important* ? What are its influences on climate? Discuss your points for or against (10 m).

**IFoS 2012** : Write short notes on - *Source-sink relationship* with respect to carbon cycle (5 m).

✿ Explain the role of *afforestation* in *carbon sequestration* [Odisha Forest Service (Mains) 2015 | 20 Marks]

## 13.2 CARBON CYCLE

Carbon is the foundation of all life on Earth, required to form complex molecules like proteins and DNA. This element is also found in our atmosphere in the form of carbon dioxide (CO<sub>2</sub>). Carbon helps to regulate the Earth's temperature, makes all life possible, is a key ingredient in the food that sustains us, and provides a major source of energy to fuel our global economy.

The carbon cycle describes the *process in which carbon atoms continually travel from the atmosphere to the Earth and then back into the atmosphere*. Since our planet and its atmosphere form a closed environment, the amount of carbon in this system does not change.

On Earth, *most carbon is stored in rocks and sediments*, while the rest is located in the ocean, atmosphere, and in living organisms. These are the reservoirs, or sinks, through which carbon cycles. Carbon is released back into the atmosphere when organisms die, volcanoes erupt, fires blaze, fossil fuels are burned, and through a variety of other mechanisms. In the case of the ocean, carbon is continually exchanged between the ocean's surface waters and the atmosphere or is stored for long periods of time in the ocean depths.

### IMPORTANCE OF CARBON CYCLE

- The carbon cycle is *vital to life on Earth*. Studying the movement of *carbon energy* helps us to understand the *working of forest ecosystems* and the factors that influence it.
- Carbon dioxide *traps the long-wave radiation* from the Earth, *causing temperatures to rise*. Understanding the absorption and release of carbon dioxide is crucial in comprehending climate dynamics and predicting global warming.



# INTRODUCTION OF EXOTICS

## METHODS OF TREE IMPROVEMENTS

①	②	③	④
<b>EXOTIC TREE INTRODUCTION</b>	<b>SELECTION</b>	<b>HYBRIDIZATION</b>	<b>BIOTECHNOLOGICAL INTERVENTION</b>
To gain specific products / Quality, <i>i.e.</i> , Casuarina	Because they have already adopted the local environment	By breeding	By Tissue Culture, Somatic hybridization, etc.

Exotic plants refer to plant species that are not native to a particular region or ecosystem but have been introduced from other parts of the world. These plants are often sought after for their unique characteristics, aesthetic appeal, or potential economic value, *i.e.*, Teak is exotic in UP. But, for practical purposes, an exotic is defined as an introduction of a species from a foreign country.

## FACTORS GOVERNING THE INTRODUCTION OF EXOTICS

- Economic importance
- Invasive potential : Their aggressive growth, lack of natural predators or diseases, and ability to adapt to new environments make them difficult to eradicate or control once established. Now they start disrupting native ecosystems, threatening biodiversity, and causing ecological imbalances.
- Management challenges [Requirement of Technical skill]
- Availability of fund
- Aesthetic value : often chosen for their distinctive features, such as vibrant flowers, unusual foliage, or striking growth habits. They are commonly used in gardens, parks, and landscaping projects to enhance visual appeal.

**IFoS 2020** : What are the different factors governing the successful introduction of an exotic tree species ? (10 m).

## ADVANTAGES OF EXOTICS

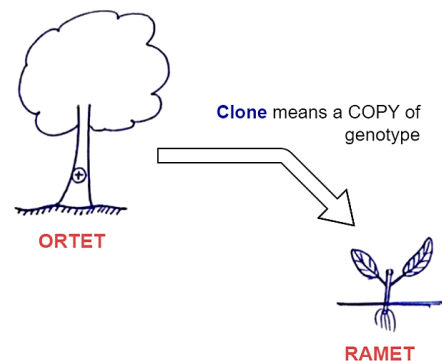
- Exotics *Provide a much wider choice of species* suited to the site and other requirements, especially when there are no suitable indigenous species.
- *R & D of 1 country* can be shared and utilized by other countries.
- Some may *perform well in exotic land* than their natural habitat due to the *absence of pests* & diseases outside of their natural habitat, at least for some rotation, *i.e.*, The leaf-eating insect in Eucalyptus species is quite common in Australia, whereas in India, it is absent.
- *Fast-growing* + higher quality of product = increase *productivity and production* of our forest.
- It can also help to meet the immediate requirements of our industry.

# SEED ORCHARD

Once we identify the *Elite tree*, we begin collecting regenerative material from them to establish the seed orchard for - (a) ensuring a regular and abundant supply of high-grade seeds, (b) Source material of further tree breeding & Tissue culture works, (c) Conservation of genetic resources for future uses, and (4) Ex-situ conservation of valuable tree species.

Here we use some important terminology like Clone, Ortet, Ramet, Sibling or Sib, Progeny, Family, etc. Therefore, before starting this topic, we need to understand these terminologies.

- *Clone* : Individuals obtained from a single plant through asexual reproduction like Cutting, Budding, grafting, tissue culture, or apomictic seed. All plants from a clone are genetically identical.
- *Ortet* : The original plant from which a clone is derived.
- *Ramet* : A vegetatively reproduced copy of a plant. It is genetically similar to the mother plant.
- *Family* : A group of closely related genotypes.
- *SIB* or *Sibling* : A term meaning brother or sister. Half sibs have one parent in common. Full sibs have both parents in common.
- *Progeny* : The children or descendants from the parent plants.



## DEFINITION

- **Seed orchard** is a plantation of the generally superior tree, isolated by a pollen dilution zone and intensively managed to produce a frequent, abundant, and easy harvest of the seed crop.
- **Seed orchard** is an area where superior phenotypes or genotypes are established and managed intensively for seed production or tree breeding purposes.

## TYPES

- Based on the types of planting material.
  1. Clonal seed orchard (CSO)
  2. Seedling seed orchard (SSO)
  3. Extensive seedling seed orchard (ESSO)
- Based on the purpose/function of an orchard.
  1. Production seed orchard.
  2. Breeding seed orchard.



# FOREST SOIL

## [INTRODUCTION]

### 1.1 WHAT IS SOIL ?

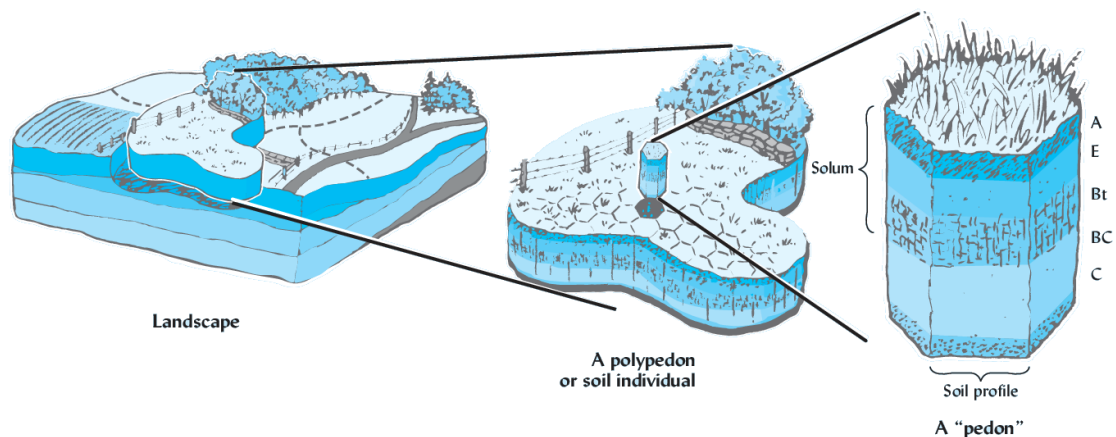
Soil is the *unconsolidated mineral material on the immediate surface of the earth* that serves as a natural medium for the growth of land plants.

Forest soil is a portion of the earth's surface that serves as a medium for the growth and sustenance of forest vegetation.

#### PEDON ?

A *pedon* is a 3-dimensional smallest unit or volume of soil that contains all the soil horizons of a particular soil type with 1 m<sup>2</sup> at the surface and extends to the bottom bedrocks of the soil.

Term Soil is derived from the *Latin* term – *Solum*, which means *Floor*\*\*\*



**Figure 1.1 :** Pedon is a natural body of soil that is large enough to allow classification of the soil.

**PEDOLOGY :** Pedology = Pedon + Logos = Greek word

↓                      ↓  
 Soil/Earth      Study

Pedology is the study of *soil genesis*, *classification*, and *mapping*/description of soil for land use planning. Therefore, it is helpful in forestry, forest road construction, and land capability classification.

- *Soil genesis* : the mode of origin of soil with particular reference to the processes and soil-forming factors responsible for the development of solum or true soil.
- *Soil survey* : consists of morphological examination, description, classification, and mapping of soils in their natural environment.
- *Soil classification* : is the process of logical grouping based on the properties and characteristics of representative units (pedon).

# WEATHERING OF ROCKS

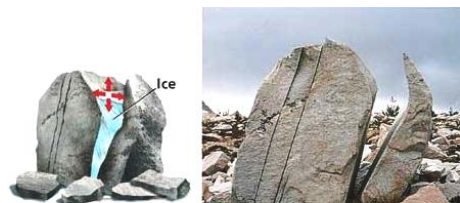
A process of disintegration and decomposition of rocks and minerals brought about by physical agents and chemical processes leads to the formation of **Regolith** (unconsolidated residues of the weathering rock on the earth's surface or above the solid rocks).

**Parent Material** : the unconsolidated, less-weathered mineral material from which soil is developed.

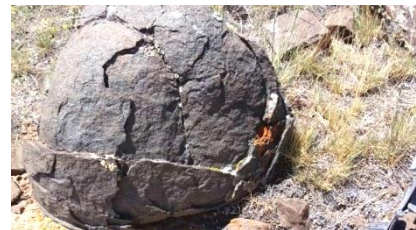
## TYPES OF WEATHRING

❑ **PHYSICAL (MECHANICAL) WEATHERING** : Fracturing of rock into smaller pieces without chemical alteration of the minerals by changes in temperature, water action (erosion, transportation, and deposition), Alternate wetting and drying, wind, glaciers, etc.

- **Frost cracking** : In cold climates, when water penetrates into the pores of bedrock, it weakens or breaks the rock through freezing and expansion.
- **Salt-Crystal Growth** : This occurs in dry climates, where salt-crystal growth in crevices and pores builds up pressure, similar to frost cracking. Crystal growth in rock pores can disintegrate rock.
- **Thermal Action** : Most rock-forming minerals expand when heated and contract when cooled, a process called thermal action. Because different minerals expand at different rates, internal stresses can crack rocks between mineral crystals. Intense heating of rock surfaces by the Sun during the day, followed by nightly cooling, enhances thermal action.
- **Glaciers action** : various types of moraine formation due to erosion and transportation by glaciers.
- **Atmospheric electrical phenomenon** : during the rainy season, lightning breaks up rocks.
- **Abrasive action of wind** : Sand laden winds, slowly erode the rocks, creating formations such as *Tafoni*.



**Figure 3.1** : Cracking in rocks due to Frost Action (freezing and melting of rainwater)



**Figure 3.2** : Rock exfoliation due to thermal action



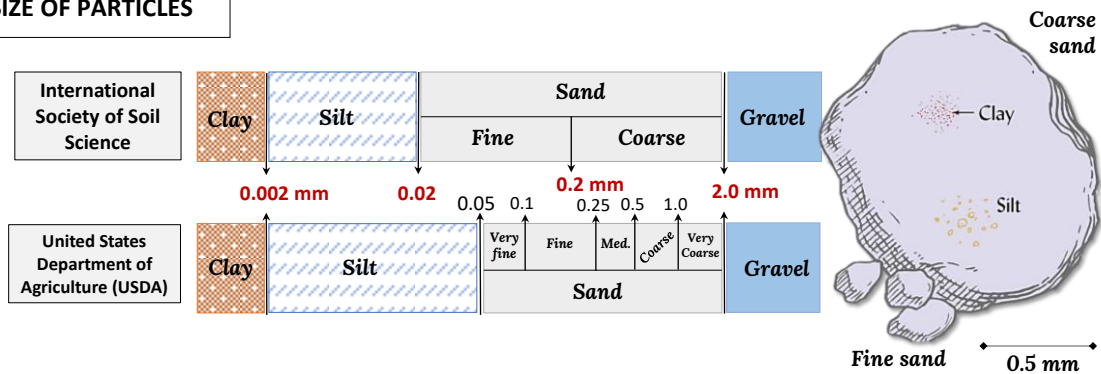
❑ **CHEMICAL WEATHERING** : Decomposition of rocks and minerals by various chemical processes like Hydration, Carbonation, Oxidation, Reduction, etc.

# SOIL PHYSICAL PROPERTIES

## 6.1 SOIL TEXTURE

The *relative percentage of sand, silt, and clay in the soil*<sup>\*\*\*</sup>. Where *sand and silt work as a skeleton* of soil in which *clay particles fill as flesh*. The size of particles in mineral soil is not subject to change (*i.e.*, by cultural practices). Therefore, this composition is considered a permanent feature and a *basic property* of soil. Mechanical analysis of soil separates, *i.e.*, the percentage of sand, silt, and clay done by the *hydrometric method*.

### SIZE OF PARTICLES



- ✎ Clay particle size : <math>< 0.002 \text{ mm}</math><sup>\*\*\*</sup>
- ✎ Soil texture refers to the relative amounts of sand, silt, and clay, and it directly affects a soil's *cohesion*, *adhesion*, and *plasticity*. Clay soils have a characteristically *fine/heavy texture*.
- ✎ **Loam soil** – (a) best suitable soil for agriculture purposes, (b) it contains *sand, silt and clay minerals in an equal property*<sup>\*\*\*</sup> proportional and *not in equal percentage*.
- ✎ **Soil texture determination methods** : (a) Feel methods – Ball formation, Ribbon formation. (b) Laboratory method – Mechanical analysis.

## 6.2 SOIL STRUCTURE

The *arrangement of primary soil particles*<sup>\*\*\*</sup> and their aggregation into a certain definite pattern is called soil structure.

Primary soil particles : Sand, Silt, clay

### Types

- **Plate-like** : arrangement of soil aggregates in a thin horizontal plane like plates or lamina, *i.e.*, Alluvial soil.
- **Prism or Columnar-like** : vertically oriented aggregation or pillars. Occurs in the B horizon of clay soil in *arid* and *semi-arid* regions (Salt-affected soil).
- **Block-like** : aggregation shape like a block of the irregular face. Found in *Humid zone*.



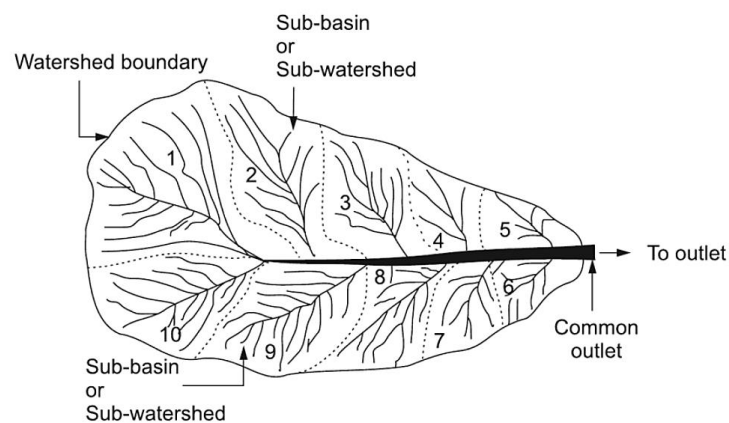
# WATERSHED MANAGEMENT

## 9.1 WHAT IS WATERSHED ?

*A watershed is a geohydrological unit of land that feeds all the water running under it and drains at a common point.*

Or

*A watershed is a geohydrological unit of land that feeds all the water running under it and drains at a common point.*



**Figure 1.1** Definition sketch of watershed.

## WATERSHED MANAGEMENT

Watershed management is the study of the relevant characteristics of a watershed aimed at the sustainable distribution of its resources and *the process of creating and implementing plans, programs, and projects to sustain and enhance watershed functions that affect the Plants, Animals, and human communities within a watershed boundary.*

## OBJECTIVES OF WATERSHED MANAGEMENT?

- Soil and water conservation by controlling damaging run-off.
- Improve the ability of the land to hold water
- Rainwater harvesting and recharging
- Employment generation
- Maintain ecological balance by Growing greeneries - trees, crops, and grasses
- Increase farmers' income (doubling income by 2022)
- Moderate floods in the downstream areas.
- Developing fuel, fodder, and timber resources for the local population.

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Course



**110**  
AIR

**Keshav Prasoon**

Forestry Comprehensive  
Course + Test Series



**111**  
AIR

**Nagabhushana S**

Forestry Comprehensive  
Course



**113**  
AIR

**Shewale Vyankatesh G.**

Forestry Comprehensive  
Course



**123**  
AIR

**Chandra Bhushan**

Forestry Comprehensive  
Course



**127**  
AIR

**Shubham Kanoujia**

Forestry Comprehensive  
Course + Test Series



**128**  
AIR

**Harsh Verma**

Forestry Comprehensive  
Course + Test Series



**134**  
AIR

**Gaugin Gyanendra Singh**

Forestry Comprehensive  
Course

**64** Out of **147** Total  
Selections in

**Indian Forest Service (IFoS) 2023**