

Forest Ecology, Biodiversity and Management (FRM-512)

Practical Manual

For

M. Sc. (Forestry) Silviculture and Agroforestry



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Study of forest productivity estimation methods

Introduction: Forest productivity is often defined as the standing forest volume at a given time t , V_t , which is the cumulative increase of stand volume since the stand was initiated (at $t=t_0$). It is referred to as yield in studies of forest growth and yield. Typically, the term productivity is used to account for the accumulation of aboveground stem wood in standing trees, although it may also include below-ground accumulation. Productivity distinguishes between *primary productivity* (the rate at which energy is stored by photosynthetic and chemosynthetic activity of producer organisms, chiefly green plants) and *secondary productivity* (the rate at which the carbon stored by primary producers is assimilated by animals or decomposers). Primary productivity is further divided into *gross primary productivity*, “the total rate of photosynthesis including the organic matter used up in respiration during the measurement period,” and *net primary productivity* (NPP), “the rate of storage of organic matter in plant tissues in excess of the respiratory utilization by the plants during the period of measurement.” In the context of a forest, NPP includes not only the biomass in trees, but also that in herbs and shrubs, although the biomass of herbs and shrubs is usually negligible compared with that of trees. These definitions have become standard in the ecological literature. Thus, the net productivity of trees (the items of interest to most foresters) usually closely approximate the NPP. The term “productivity” is noteworthy because it is a rate and involves acquisition of photosynthate per unit time.

Objectives: To study forest productivity and different methods used for its estimation

What are the different methods used to measure forest productivity?

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Experiment No: 9

Visit of national park

Objectives: To study ecology and biodiversity of national park

Q.1	Where did you visit?
Q.2	Write forest characteristics
Q.3	Write species diversity (Trees, animals, birds)
Q.4	Estimate species density, abundance, frequency by using quadrat method

Experiment No: 10

Visit of wildlife sanctuary

Objectives: To study ecology and biodiversity of wildlife sanctuary

Q.1	Where did you visit?
Q.2	Write forest characteristics
Q.3	Write species diversity (Trees, animals, birds)
Q.4	Estimate species density, abundance, frequency by using quadrat method

Experiment No: 11

Visit of Botanical garden

Objectives: To study ecology and biodiversity of Botanical garden

Q.1	Where did you visit?
Q.2	Write forest characteristics
Q.3	Write species diversity (Trees, animals, birds)
Q.4	Estimate species density, abundance, frequency by using quadrat method

Experiment No: 12

Visit of arboretum

Objectives: To study ecology and biodiversity of arboretum

Q.1	Where did you visit?
Q.2	Write forest characteristics
Q.3	Write species diversity (Trees, animals, birds)
Q.4	Estimate species density, abundance, frequency by using quadrat method

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GLOSSARY

Biodiversity- Biodiversity—short for biological diversity—means the diversity of life in all its forms—the diversity of species, of genetic variations within one species, and of ecosystems.

Biome- A major portion of the living environment of a particular region (such as a fir forest or grassland), characterised by its distinctive vegetation and maintained largely by local climatic conditions.

Carrying capacity The maximum number of people, or individuals of a particular species, that a given part of the environment can maintain indefinitely.

Co-management- The sharing of authority, responsibility, and benefits between government and local communities in the management of natural resources.

Conservation- The management of human use of nature so that it may yield the greatest sustainable benefit to current generations while maintaining its potential to meet the needs and aspirations of future generations.

Conservation of Biodiversity- The management of human interactions with genes, species, and ecosystems so as to provide the maximum benefit to the present generation while maintaining their potential to meet the needs and aspirations of future generations; encompasses elements of saving, studying, and using biodiversity.

Co-management- The management of a specific resource (such as a forest or pasture) by a well-defined group of resource users with the authority to regulate its use by members and outsiders.

Cultural diversity- Variety or multiformity of human social structures, belief systems, and strategies for adapting to situations in different parts of the world. Language is a good indicator of cultural diversity, with over 6,000 languages currently being spoken.

Ecology- A branch of science concerned with the interrelationship of organisms and their environment; the study of ecosystems.

Ecosystem- Ecosystems are self-regulating communities of plants and animals interacting with each other and with their non-living environment—forests, wetlands, mountains, lakes, rivers, deserts and agricultural landscapes.

Ecosystem diversity- The variety of ecosystems that occurs within a larger landscape, ranging from biome (the largest ecological unit) to microhabitat.

Eco Tourism -Travel undertaken to witness sites or regions of unique natural or ecologic quality, or the provision of services to facilitate such travel that have the least impact on biological diversity and the natural environment.

Endangered species- A technical definition used for classification referring to a species that is in danger of extinction throughout all or a significant portion of its range. IUCN The World Conservation Union defines species as endangered if the factors causing their vulnerability or decline continue to operate.

Evolution- Any gradual change. Organic evolution is any genetic change in organisms from generation to generation.

Ex situ conservation- A conservation method that entails the removal of germplasm resources (seed, pollen, sperm, individual organisms, from their original habitat or natural environment. Keeping components of biodiversity alive outside of their original habitat or natural environment.

Extinction- The evolutionary termination of a species caused by the failure to reproduce and the death of all remaining members of the species; the natural failure to adapt to environmental change.

Fauna- All of the animals found in a given area.

Flora- All of the plants found in a given area.

Gene- The functional unit of heredity; the part of the DNA molecule that encodes a single enzyme or structural protein unit.

Gene bank- A facility established for the ex situ conservation of individuals (seeds), tissues, or reproductive cells of plants or animals.

Genetic diversity The variety of genes within a particular population, species, variety, or breed.

Grassroots (organizations or movements) People or society at a local level, rather than at the center of major political activity.

Habitat- A place or type of site where an organism or population naturally occurs.

Habitat loss- The outcome of a process of land use change in which a 'natural'; habitat-type is removed and replaced by another habitat-type, such as converting natural areas to production sites. In such process, flora and fauna species that previously used the site are displaced or destroyed. Generally this results in a reduction of biodiversity.

Hotspot- An area on earth with an unusual concentration of species, many of which are endemic to the area, and which is under serious threat by people.

Indicator species- A species whose status provides information on the overall condition of the ecosystem and of other species in that ecosystem.

Indigenous people- People whose ancestors inhabited a place or country when persons from another culture or ethnic background arrived on the scene and dominated them through conquest, settlement, or other means and who today live more in conformity with their own social, economic, and cultural customs and traditions than with those of the country of which they now form a part. (also: 'native peoples' or 'tribal peoples')

In situ conservation- A conservation method that attempts to preserve the genetic integrity of gene resources by conserving them within the evolutionary dynamic ecosystems of the original habitat or natural environment.

Intellectual property rights- Rights enabling an inventor to exclude imitators from the market for a certain period of time.

Invasive species- Invasive species are those that are introduced—intentionally or unintentionally—to an ecosystem in which they do not naturally appear and which threaten habitats, ecosystems, or native species. These species become invasive due to their high reproduction rates and by competing with and displacing native species, that naturally appear in that ecosystem. Unintentional introduction can be the result of accidents (e.g. when species escape from a zoo), transport (e.g. in the ballast water of a ship); intentional introduction can be the result of e.g. importing animals or plants or the genetic modification of organisms.

Inventory- On-site collection of data on natural resources and their properties.

Land use- Land use refers to how a specific piece of land is allocated: its purpose, need or use (e.g. agriculture, industry, residential or nature).

Native species Flora and fauna species that occur naturally in a given area or region. Also referred to as indigenous species.

Overexploitation- Overexploitation occurs when harvesting of specimens of flora and fauna species from the wild is out of balance with reproduction patterns and, as a consequence, species may become extinct.

Patent- A government grant of temporary monopoly rights on innovative processes or products.

Protected Areas- An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means. A protected area can be under either public or private ownership.

Red List- The IUCN Red List of Threatened Species provides taxonomic, conservation status and distribution information on taxa that have been globally evaluated using the IUCN Red List Categories and Criteria. This system is designed to determine the relative risk of extinction, and the main purpose of the IUCN Red List is to catalogue and highlight those taxa that are facing a higher risk of global extinction (i.e. those listed as Critically Endangered, Endangered and Vulnerable). The IUCN Red List also includes information on taxa that are categorized as Extinct or Extinct in the Wild; on taxa that cannot be evaluated because of insufficient information (i.e. are Data Deficient); and on taxa that are either close to meeting the threatened thresholds or that would be threatened were it not for an ongoing taxon-specific conservation programme (i.e. are Near Threatened)

Rehabilitation- The recovery of specific ecosystem services in a degraded ecosystem or habitat.

Restoration- The return of an ecosystem or habitat to its original community structure, natural complement of species, and natural functions.

Seedbank- A facility designed for the ex situ conservation of individual plant varieties through seed preservation and storage.

Species- A group of organisms capable of interbreeding freely with each other but not with members of other species.

Species diversity- The number and variety of species found in a given area in a region.

Succession- The more or less predictable changes in the composition of communities following a natural or human disturbance.

Sustainable development- Development that meets the needs and aspirations of the current generation without compromising the ability to meet those of future generations.

Sustainable use- The use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations.

Taxonomy- The classification of animals and plants based upon natural relationships.

Threatened species- A technical classification referring to a species that is likely to become endangered within the foreseeable future, throughout all or a significant portion of its range.

Wild species- Organisms captive or living in the wild that have not been subject to breeding to alter them from their native state

Wild life- Living, non-domesticated animals. Some experts consider plants also as part of wildlife.