CLASSIFICATION AND DISTRIBUTION OF FOREST BY GEOGRAPHY

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Contents

Summary

The development of the main systems of vegetation classification based mainly on climatic factors is described and physiognomic, floristic and ecosystemic approaches are highlighted.

The excursus ranges from the former idea of classification defined by a historical perspective to the recent synthetic expressions that represent and predict real and potential vegetation.

Next, the classification of vegetation is described by means of climograms, which are synthetic expressions of the effect of climate on forests.

New techniques of classification based on remote sensing are briefly discussed. Detection of vegetation with optical and radar sensors and the subsequent supervised or unsupervised human classification is analyzed.

Main forest ecosystems classification is reported finally and forests' distribution on the Earth regions (Africa, Asia, Europe, North and South America, Oceania) is illustrated.

1. Introduction

The growing demand from the public and the scientific community concerning the environment and particularly forests needs a response on the quantity and quality of forest ecosystems.

According to the FAO, in the year 2001 (FAO 2001a) the world's forests cover 3 870 million hectares with an observed negative trend in the last two centuries. The balance between the annual rate of deforestation (14.6 million hectares) and forest increase (5.2 million hectare) is mainly attributable to tropical a non-tropical forest erasing.

The growth of forested areas depends on the restoration of forests, because of afforestation, reforestation and on natural regeneration and abandoned agricultural land. While the negative variation depends on conversion of forest to agricultural land, forest degradation due to overharvesting, overgrazing, fires, insect pests and diseases, storms, wind damages and air pollution.

Improvement of forest management and enlargement of forests (see *Plantations* (section 5-03-01-05)) will potentially reduce the negative trend of the forest surface and provide many goods and services to human life. Forest services such as soil and water conservation, conservation of biological diversity, improvement of human living conditions through recreation and employment opportunities, and protection of natural and cultural heritage are accepted and sustained worldwide.

Moreover the concentration of Greenhouse Gases that are responsible for rapid climate changes can be stabilized by reducing the deforestation rate, increasing afforestation and reforestation, increasing productivity and agroforestry practices.

Given the acute information deficit on the quality of forest ecosystems a better knowledge is needed and the achievement of forest monitoring, assessing and mapping is required to observe evolution in quantity and quality.

Furthermore, detailed indications on climate-vegetation links will help forest administrators to manage and orientate simple and complex forest systems.

In the 19th century, the increase of knowledge supported by experimental observation and a series of explorations and voyages of discovery began the field of causal phytogeography, establishing the relation between plants and their distribution.

Differences in environmental conditions under which each plant community lives became useful in defining the boundaries of the vegetation distribution. Moreover different plants with similar characteristics living in different environments were observed to have a similar physiognomy. Understanding the causes and geographic pattern of climate allows us to predict patterns of ecosystem distribution.

The development of climate-vegetation static models was then founded on the assumption that climate and vegetation were in equilibrium with each other (broadly speaking each climate reflect a vegetation type); although the axiom is valid for long time-scales and on a regional spatial scale, it is unsuitable for large-scale biomes where other factors affect the relationship (for example, soil, geomorphology, etc.).

The perception that vegetation represents a description of the climate has led to a systematic definition of the climate-vegetation relationship developed in phytoclimatology thus the following chapters analyze the main classic methods of vegetation classification that depend on climate parameters, physiognomy of forest, floristic composition and on the ecosystem structure.

The usefulness of this overview consists of the examination of the evolutionary stage through which forest ecology has passed and forest classification has developed. Furthermore this synthetic review helps scientists and those individuals interested in forest classification research or other applied studies to find adequate systems for their own work. Although the collection is not complete and additional indices could be described and added to each category, the selected and described indices are useful to cover the development of forest classification and document the derivation of actual classification systems.

The history of forest or vegetation classification is made of attempts to condense in a few classes the description of the multiform evidence of the forests. On the basis of their common attributes (climate, vegetation, soil) a set of simple units are merged to obtain groups, assuming that plant communities have discrete boundaries and discontinuous composition.

In forest classification, the unit is typically the homogeneous stand with respect to species composition, structure and function and on the basis of the final objective (management, research, pleasure, protection) the classification process requires a collection of data ranging from climatic factors to soils and plants.

2. Classic Methods of Classification

Nowadays it is wide accepted that the establishment, evolution, differentiation and distribution of vegetation depends on the interaction of climatic, biotic, edaphic and historical factors.

Commonly, climate and soil are considered as the main driving forces of vegetation distribution at regional level. Thus broadly speaking, by superimposing climate classifications (see *Environmental Structure and Function: Climate System*) upon plant communities a macro subdivision of vegetation can be obtained.

This idea was not clear until the 19th century when differences in plant communities were defined only by a historical perspective; but the difficulty in establishing a correspondence between climate and vegetation urged scientists to define a correspondence of these terms.

Since the beginning of the 1900s some indices were used to explore and classify both climate and vegetation and their relations.

The climate of a region was modeled and represented by synthetic expressions and each expression attempts to represent the complex variability of regional weather. Integration of climatic classification with vegetation classification leads to phytoclimatic classification. Differences between climatic classification and phytoclimatic classification depend on the logical process.

The deductive process might be used to classify a region from a climatic point of view (a distribution of physical limits can be established after their definition) while the inductive process might be used to define a region by a vegetative point of view (the classification of a region can be formulated by observing the climate and the vegetation distribution).

Within the classic methods of classification based on direct or indirect observation, four approaches can be defined for a simpler understanding, and information supplied provides a detailed summary of the index's relevance, importance and derivation.

Subdivision of classification systems in phytoclimatic, physiognomic, floristic and ecosystemic approaches can be used while some of the differences depend on the scale. Each classification and method represents a framework of the ecosystem and can be used to determine actual vegetation or predict the habitat value for most species that could potentially occur in a region.

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Biographical Sketch

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