FOREST TYPES OF THE UNITED STATES

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Because of the size of the United States, the diversity of its conditions, and the wealth of its vegetation (we have about four times as many tree species as does Europe) and because of differences in terminology and of opinions on classification, climaxes, and such, it is not surprising that ideas about the forest types of the United States are still somewhat controversial.

Dr. James Graham Cooper (1830–1902), Army surgeon, explorer, and naturalist, seems to have been the first to publish a vegetative-type map of North America. It appeared in 1859 in his paper *On the Distribution of the Forests and Trees of North America, with Notes on its Physical Geography.* Overleaf is reproduced the United States part of Dr. Cooper’s map; the original letters for his regions are retained, but hachures have been added to make their differentiation clearer to the eye. It will be observed that four of Dr. Cooper’s regions are in the Eastern seaboard, three are in the Appalachians, six are in the Plains States, five are in the Rocky Mountain areas, three are in the Intermountain area, and two on the Pacific coast. Most of them are forested areas, at least in part.

Dr. Cooper was a link between ancient students of the subject and the modern investigators, who have added a great deal to our ken of botany.

Theophrastus of Eresus (372–287 B.C.) by the will of Aristotle became heir to the great philosopher’s celebrated library, guardian of his children, and his successor as head of the Lyceum at Athens. Theophrastus has been called “primum verorum botanorum”—the first real botanist. He was perhaps the first to emphasize the relation of trees and other plants to their environment, and may rightly be regarded as the father of the concepts of ecological and vegetative types.

Nearly two centuries ago, Linnaeus, in his *Philosophia Botanica,* had a chapter on plant distribution correlated with the geographic regions, climate, soils, and the other factors of habitat.

Henry Solon Graves, who published *Practical Forestry in the Adirondacks* in 1899, is generally credited with the introduction of the term “forest type” in this country. The late Dr. Frederic E. Clements, a distinguished ecologist and author of *Plant Formations and Forest Types,* published in 1909, calls Professor Graves’ types “plant (or forest) formations.” He separates formations into associations, associations into societies, societies into communities (with two or more principal or secondary species), and communities into families (defined as groups of co-specific individuals).

The Ecological Society of America tentatively suggested this definition of “forest types” in 1934: “A forest stand essentially similar throughout its extent as regards composition and development under essentially similar conditions, i.e., essentially similar throughout as regards floristic composition, physiognomy, and ecological structure.”

Ten years later the Committee on Forestry Terminology of the Society of American Foresters defined forest type thus: “A descriptive term used to group stands of similar character as regards composition and development due to certain ecological factors, by which they may be differentiated from other groups of stands. The term suggests repetition of the same character under similar conditions. A type is temporary if its character is due to passing influences such as logging or fire; permanent if no appreciable change is expected and the character is due to ecological factors alone; climax if it is the ultimate stage of a succession of temporary types. A cover
type is a forest type now occupying the ground, no implication being conveyed as to whether it is temporary or permanent."

Raphael Zon, in *Principles Involved in Determining Forest Types*, published in 1906, emphasizes the importance of forest types in silvical studies of individual species, and sets forth a philosophy basic to determining forest types. The main considerations are physical conditions of climate, soil, and the like; man and his operations; accidents, such as fire and wind. He says that "one of the most important characteristics of a forest type is its stability, its resistance to invasion by other forms," and adds that the reproduction of the forest must always be considered.

Arthur W. Sampson (*The Stability of Aspen as a Type*, 1916) believes that aspen is a temporary type, replaced, slowly but surely, by conifers.

Carlos G. Bates, in *Forest Types in the Central Rocky Mountains as Affected by Climate and Soil*, 1924, states that, in a general way, the forest zones of that region correspond with air-temperature zones. He adds that a review of the facts leaves little doubt that the tree species of the central Rocky Mountains are controlled in their distribution almost wholly by the degree of insolation of the site, with the resultant temperatures, and by the closely related surface conditions of moisture.

A distinguished Finnish forester and ecologist, Aimo K. Cajander, places forest typification on a combined ecological and botanical basis (*The Theory of Forest Types*, English translation revised by Mr. M. L. Anderson, 1926). He recognizes two kinds, in principle, of forest classification, according to quality and site. He says: "The features of a plant association are generally determined by those species which are present in the greatest abundance and frequency. Those species, however, which are present at a lesser rate of abundance, but are, nevertheless, always or nearly always present, are also, of course, equally characteristic of the association. Finally those species, which, though they may be more or less rare, are met with, however, almost exclusively in the association in question, are also characteristic of that association. On the other hand, of course, the absence of certain plant species is also a very important feature in the delineation of a plant association, although the definite establishment of absence is more difficult."


Gustaf A. Pearson, in *Forest Types in the Southwest as Determined by Climate and Soil*, 1931, distinguishes seven broad zones with four forest types: Woodland, ponderosa ("western yellow") pine, Douglas-fir, and Engelmann spruce. The soil differences, he says, appear to be due more to physical than to chemical differences, the more porous soils being best suited to tree growth, the upper altitudinal range determined by ability to withstand low temperatures and the
lower altitudinal range to drought endurance. The soil, except locally, rarely acts as a limiting factor. He does not regard light as a limiting factor in the range of trees, but it may affect the composition of stands.

Marinus Westveld (Type Definitions Based on Statistics of Stand Composition, 1934) gives type definitions of the red spruce-yellow birch (with yellow birch subtype) as well as the red spruce-sugar maple-beech (with sugar maple subtype) types. In the red spruce-yellow birch type, the conifers usually make up more than 40 percent of the stand, with spruce and the balsam fir in about equal numbers, the yellow birch composing between 25 and 50 percent, and sugar maple seldom more than 5 percent of the total stand. In the red spruce-sugar maple-beech type, the conifers make up 25 to 45 percent of the stand, spruce usually being more abundant than fir. Sugar maples generally make up more than 10 percent of the stand and, combined with beech, usually considerably exceed the yellow birch in number.

Again, in the field of forest classification systems and their terminology, there is a large literature and differences in viewpoint.

The eminent German forester Heinrich von Cotta in 1804 listed forest lands in 100 quality classes, “0” being absolutely barren land incapable of producing wood of any sort, and “100,” the best imaginable land.

W. Schütze, who wrote Beziehungen zwischen chemischer Zusammensetzung und Ertragsfähigkeit des Waldbodens in 1871, classified six areas of German forest land on the basis of determining in a surface layer 5 3/4 feet deep the percentage of mineral matter soluble in hydrochloric acid. This is a refinement in the methodology of forest typification which obviously it has not been practical to utilize in this country on any large scale.

The late John W. Harshberger, in his Phytogeographic Survey of North America, 1913, divides the part of North America lying within the United States into two zones, temperate and subtropical. These zones, so far as forests are concerned, are again divided into 9 regions, 24 districts, and 16 areas. Under these forest areas, forest and other plant formations are recognized.

Jesse B. Mowry (The Nature and Development of Forest Types, 1920) recognizes two classifications of the term “forest type”: Where type means (1) locality, and (2) composition. He believes that, for the present at least, forest types should be designated by terms indicating both concepts. He emphasizes the importance of moisture in tree growth, their tissues consisting of from 65 to 95 percent of water, and quotes Ebermeyer to the effect that conifers require less potash, lime, and phosphate than do deciduous trees.

Although published a quarter of a century ago, still the best available map of the vegetation of the United States is that by Homer L. Shantz and Raphael Zon (Natural Vegetation, Section E, Atlas of American Agriculture, U. S. Department of Agriculture, Bureau of Agricultural Economics, Part I—The Physical Basis of Agriculture, 29 pages, Washington. 1924). This map is reproduced on the next page, on a smaller scale and with hatching replacing the original colors. It will be observed that the forested and woodland areas are classified in it under 18 divisions.

A booklet of the Forest Service, Instructions for Making Timber Surveys in the National Forests, 1925, has a chapter, “Standard Classification of Forest Types,” covering 7 treeless land types and 52 woodland and forest-land types.

The Committee on Forest Types of the Society of American Foresters in 1940 recognized and defined 97 forest types in the eastern United States. “Eastern United States” is interpreted to include “the eastern forests which are separated from the western forests by a broad zone of relatively treeless or desert country. The territory covered by the committee extends in some places to the westward of the eastern
forests. The western boundary of the 'eastern United States' as thus defined is a wavy north and south line extending from Canada to Mexico between the 97th and 101st degrees of longitude."

Lee R. Dice, in the book *The Biotic Provinces of North America*, 1943, recognizes 20 biotic provinces in the United States, in 17 of which trees are either important or dominant. He defines biotic province as "a considerable and continuous geographic area . . . characterized by the occurrence of one or more important ecologic associations that differ, at least in proportional area covered, from the associations of adjacent provinces. In general, biotic provinces are characterized also by peculiarities of vegetation type, ecological climax, flora, fauna, climate, physiography, and soil."

The Committee on Western Forest Types of the Society of American Foresters in 1945 recognized and defined 50 forest types in the western part of the United States. This means that the Society of American Foresters has recognized 147 distinct forest types in the United States. Some of these, such as ponderosa pine, redwood, lodgepole pine, and Engelmann spruce, may occupy large areas in pure or almost pure stands. Most of the types, however, are mixed. In general, eastern types are more complex than western, and conifer types less complex than hardwood forests. In going from north to south, the types, with some exceptions, tend to a greater number of species.

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**FORESTS AND SOILS**

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Successful reforestation, particularly with the hardwoods, has to take into consideration selection of the proper species and the balance between trees and soil. Perhaps the soil has eroded or all trees have been removed from it; then it is not simple to choose trees that grow well on bare land; also, the balance that existed in the virgin forests was destroyed when the land was cleared. Basic soil and atmospheric changes often make such areas incapable of supporting the original species.

Soil loss from erosion following fire, overgrazing, clearing, and cultivation is a basic loss. It reduces productivity of cleared land; it also lowers the site quality in existing forests. Any appreciable change in soil necessitates a shift in species composition in order to obtain those best suited to the site. Site deterioration means species of lower value in the stand and a loss to the owner.

Accordingly, the problems of restoring and conserving our trees and forests will be simplified by a knowledge of forest soils and of the relation between forests and soils.

A soil is a natural mineral body with distinct features that identify it, even in widely separated areas. It has definite structure with horizons or layers, one over the other. The topsoil, from which the fine soil has been washed by percolating waters, is the A horizon. Just under it is horizon B, the heavy horizon or subsoil, which receives the fine soil washed out of A. The C horizon is the parent soil material below B.

A fertile soil contains a myriad of living organisms, plant and animal, adapted to the soil conditions. It has pore space, which contains water and