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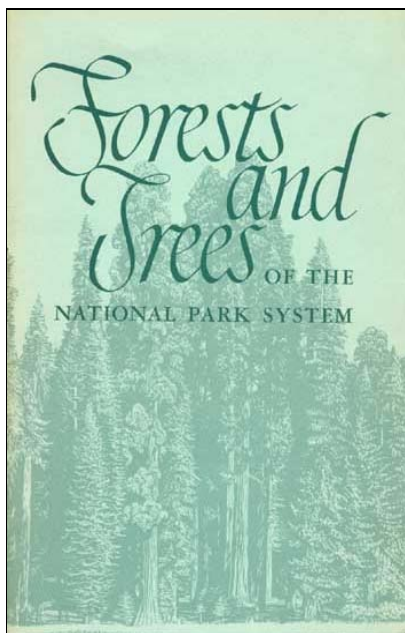


FORESTS AND TREES of the National Park System

by

John D. Coffman

Chief Forester (Retired), National Park Service



National Park Service
Washington, D.C.
1954

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Illustrations

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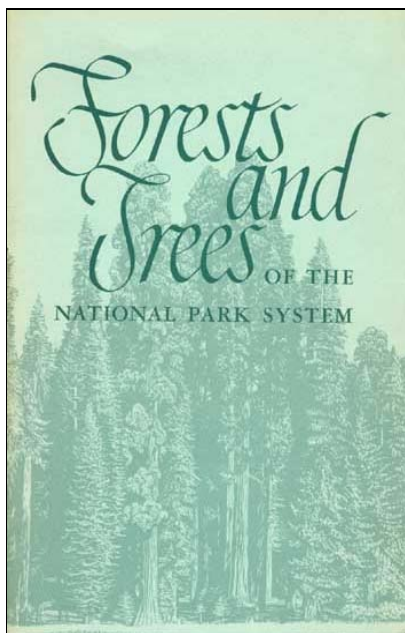


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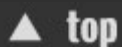
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Introduction



WITH THE PROGRESSIVE REDUCTION and disappearance of the natural and undisturbed forests of the United States through lumbering and forest fires, the primeval stands preserved within the national parks and monuments become of greater value and importance. By wise provision of Congress, the forests of the National Park System are withdrawn from commercial exploitation. The act of August 25, 1916, establishing the National Park Service, enjoins the Service "to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

The forests of the National Park System form a magnificent framework to the mountains, lakes, streams, and other geological features of the parks and monuments, adding immeasurably to their inspirational appeal. Likewise, the recreational values of these areas are enhanced mightily by the presence of trees. It would be difficult to imagine the present popularity of camping and travel within the national parks and monuments should they by any misfortune be denuded of their forests or tree growth. What are now our most attractive campgrounds would be abandoned; even at timberline the loss of the gnarled, windswept trees battling for existence would remove one of the prized features of high mountain scenery.

The forested lands at the higher elevations within the National Park System are located within the "protection forest" belt, so called because their chief value is watershed protection, including the regulation of streamflow and prevention of erosion and avalanches. In addition to those values, these forests are important as wildlife habitat and for recreation and scenery.

In a number of instances the national parks include, at the lower elevations, portions of forests of high commercial value, as for example in Great Smoky Mountains, Yosemite, Sequoia, and Olympic National Parks. An aroused and insistent public urged the preservation of these forested areas, and the question was carefully weighed by Congress before these areas were set aside as national parks or parts thereof. In the East, several of the States have participated in the purchase of private forested lands for inclusion in national parks within State boundaries. The Rockefeller philanthropies have likewise assisted in such acquisition

for national park purposes both in the East and in the West. As the remnants of our original forest disappear under the axe or become modified by commercial enterprise, these natural areas will become increasingly important for the study and enjoyment of Nature in its undisturbed state.

It is estimated that when the first colonies were established in America, forests occupied 937 million acres of the land now included in the 48 States of this Nation. Over this area, virgin forests have been reduced to approximately 5.4 percent of their original extent, now represented in large part in the National Park System, in the less accessible areas of the national forests, and in State parks and preserves. Of the total area of 22,278,502 acres in the National Park System (as of June 30, 1952), 8,109,945 acres are forested; 7,482,069 acres of this forest land are located within the 48 States. This is approximately 1.2 percent of the present forested area of 622 million acres in the continental United States.

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What is a Tree?

The line of distinction between trees and shrubs is not altogether clear-cut and therefore varies with different authors. For our purpose a tree may be defined as a woody plant with a single stem or trunk and a more or less definite crown, and attaining a height of at least 12 feet.

Omitting the intricacies of strict botanical classification, the tree species of the National Park System may be divided, in a broad sense, into three categories. In the first two listed below, growth in diameter is due to the addition of new layers of wood inside the cambium, which lies beneath the bark. This growth produces annual rings.

Conifers, or Cone-bearing Trees.—These trees are also known as evergreens and softwoods. Common examples of this group are pines, firs, spruces, hemlocks, and junipers.

Broadleaf, or Deciduous, Trees.—Also termed hardwoods. Common examples are oaks, maples, sycamores, and elms.

There are exceptions to these distinguishing characteristics in both groups. For example, among the conifers the larch and baldcypress are deciduous, shedding all their needles in the fall; and some of the southern pines, which are conifers, have wood which is harder than that of some of the so-called hardwoods. Furthermore, the yew, an evergreen with leaves similar to those of conifers, has a fruit which is a berry rather than a cone. In the broadleaf group are some species which are evergreen, such as hollies, live oaks, and some magnolias.

Palms, Yuccas, and Cacti.—Palms have their bundles of water- and food-conducting cells with strong fibers scattered through the softer tissue, usually much closer together toward the outer edge than in the center. The wood, especially in the outer part of the trunk, may be very dense and hard. Palm trunks have no true cambium, do not continue diameter growth from year to year by the addition of new layers of cells, and are mostly unbranched. There is but one main growing point—the terminal bud.

The trunks of the Joshua-tree (a yucca) and the saguaro (a giant cactus) become branched. Tree yuccas, with light and fibrous wood, also have separate conducting bundles but these are arranged in more or less concentric layers, new growth being laid down by a special kind of cambium.

In the saguaro and other tree cacti, the wood consists of elongated,

somewhat latticelike, cylinders of dense fibers occurring in circles, and imbedded in more or less fleshy pulp. Tree cacti trunks enlarge their diameter yearly by laying down additional layers of pulp and woody tissue. After the death of the plant, the pulp decomposes, leaving a skeleton of woody cylinders.

These three types of trees are of limited occurrence in the National Park System, but are of unique interest. The Florida royalpalm and cabbage palmetto are found in Everglades National Park in southern Florida; California washingtonia, or California-palm, and Joshua-tree, in Joshua Tree National Monument in southern California; and the saguaro, in Saguaro and Organ Pipe Cactus National Monuments in Arizona.

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Forest Types and Life Zones

Plants and animals tend to group themselves into definite associations, based primarily on climate, physiography, and soil conditions. Some biologists refer to these natural biotic provinces as life zones. Ecologists, however, prefer a terminology of biomes for the major categories in the classification of communities of interdependent living things—plant and animal—in and with their environment. Many foresters prefer a descriptive name of the vegetative type, possibly supplemented by the name of the corresponding life zone. This latter method is used in this treatise so far as possible.

In the use of the phrase "life zones," it is necessary to remember that the boundaries of these zones vary with conditions of temperature, moisture, exposure, and soil, so that they are quite variable as related to lines of elevation or latitude. There is a merging of the species and types of one zone with those of the adjacent zone along their common boundaries. Thus one author may differ from another in the designation of the life zone where the line of separation is indistinct.

Zones of altitude on a mountain may be compared to the zones of latitude on the surface of the earth which have comparable conditions of temperature, moisture, exposure, and soil. Thus a mountain of great height at the equator might offer at its different elevations the general variations in environment that would be encountered during a journey from the equator to the Arctic Circle. In general, the altitude of timberline, where tree growth stops, decreases as the latitude north increases.

Because of the marked differences between vegetative types of the Western and Eastern United States, these two sections of the country are discussed separately.

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Forest Enemies

Fire is the greatest single destructive force threatening the park forests. During the 20-year period from 1930 to 1949, inclusive, the area of forest, brush, and grass burned over annually within the National Park System averaged 10,990 acres—less than two-tenths of 1 percent of the acreage requiring intensive fire protection. During this 20-year period the average number of fires per annum was 349, of which 234, or 67 percent, were man-caused, and 114, or 33 percent, were set by lightning.

Little can be done to prevent lightning fires, although research has been suggested to determine to what extent the build-up of clouds toward electrical storms can either be dissipated or diverted into normal rain storms without lightning by seeding the clouds with dry ice or some other reactor at the proper time.

As for man-caused fires, every effort is being made, in cooperation with State, private, and other Federal forest protection organizations, to impress upon the public the danger of fire and the means of preventing forest fires.

The Service has developed a well-trained and well-equipped fire control organization, of which the park ranger organizations constitute the backbone. These are augmented by fire lookout observers and fire control aids. In periods of emergency all other personnel of the parks are called on to assist, and, if necessary, additional fire fighters are employed from outside the parks. The fire control record of the Service compares very favorably with that of any other forest protection agency, despite the tremendous number of visitors.

Forest insects take a considerable toll of the forest trees, especially when unfavorable conditions, such as prolonged drought, reduce their vitality and their resistance to the attacks of destructive insects, enabling the latter to build up into epidemic proportions. Within the national parks the chief agents of this type of damage are the bark beetles, which girdle and kill the trees by their galleries in the cambium layer. Other destructive insects are found among the leaf feeders, such as the spruce budworm, the hemlock looper, the needle miner, the tent caterpillar, and the fall webworm. When epidemics develop, they result in widespread destruction and require large sums of money for control. The policy of the National Park Service, therefore, is to maintain a very careful watch for any observable build-up of infestation beyond the normal condition and take corrective measures to prevent the development of serious epidemics.

Tree diseases.—Some of the native fungi and viruses may at times erupt into serious epidemics, as the oak wilt at present. However, the worst troubles in this line have been from introduced diseases. Examples of these are the chestnut blight, which has practically wiped out the native chestnut in the eastern forests; the Dutch elm disease, which is killing large numbers of elms in the East; and the white pine blister rust, a fungus disease introduced on both the Atlantic and Pacific coasts on imported nursery stock.

To preserve representative stands of white or 5-needled pine species in 14 areas of the National Park System, both East and West, the Service is carrying out intensive operations to control the white pine blister rust. These areas contain representative stands of one or more of the following species: eastern white pine, western white pine, whitebark pine, limber pine, foxtail pine, and sugar pine. This white pine blister rust fungus has alternate hosts—a white pine species in one stage of the infection and ribes (currants and gooseberries) during the other stage. The fungus spreads by means of tiny wind-borne spores. When a pine is infected, cankers develop in the bark. Infected pines die when the fungus completely girdles the main stem or trunk or when many of the branches are killed by girdling. The rust cannot be transmitted directly from one pine tree to another but the spores developed by the rust on the pines infect the currants and gooseberries, and the spores from these species in turn infect the white pines. Control for the preservation of the white pines is therefore accomplished by eradication of the ribes.

Insects and tree diseases together are today responsible for greater losses of forest trees than is fire.

Man.—Taking this country as a whole, the human species is the agent responsible for the greatest forest losses. A large share of this is due to man's carelessness with fire, such as throwing away burning matches or tobacco; leaving unextinguished campfires; and failing to prevent the spread of debris-burning fires. Other contributing causes, originating with man, are logging operations, sparks from locomotives, and incendiarism. In commercial forests, failure to leave seed trees or to protect reproduction while logging, or from fire thereafter, has resulted in millions of acres of unproductive forest land. Man is also responsible for much of the forest destruction by diseases and insects by the introductions of foreign pests through inadequate precautions. Fortunately, the areas of the National Park System are exempt from logging operations, and they have experienced a very low ratio of man-caused fires in comparison with the millions of people who visit them. This care on the part of park visitors is a great aid in the protection of national park values.

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Preservation of Natural Conditions

As previously set forth, Congress wisely prescribed that the national parks and monuments are to be administered in such manner as will leave them unimpaired for the enjoyment of future generations. Many of the laws establishing national parks contain specific provisions for the retention of their forests in a natural, undisturbed condition.

It is the intent of this legislation that interference with the normal processes of Nature within the forests of the national parks and monuments shall be limited to that necessary to provide for their use and enjoyment by the public, and to provide for the protection of the areas from fire and from devastating epidemics of insects and tree diseases. The maintenance of natural conditions precludes commercial forestry practices such as logging, pruning, thinning, and discrimination against so-called inferior species. These practices, designed to produce the most valuable crops of commercial products, are foreign to the purposes for which the national parks were set aside. Within the parks all native species have a proper place in the natural picture and may not be disturbed except for essential development or protection.

Forests are not static, but are communities of many species of living plants and the habitat of many species of animal life, from the microscopic creatures within the soil to the mighty moose and grizzlies that roam, through some of them. All of these elements combine to form a complex living community in which each species has its place and adapts itself to its environment if it is to survive. It is self-evident that all trees will die in the natural course of events.

The openings thereby created in the forest will be filled by young trees, and thus the life of the forest will be continued without interruption. Decaying trees furnish homes for many species of birds and mammals. The destruction of these habitats over wide areas may even result in the extinction of some species, as is proving to be the case with regard to the ivory-billed woodpecker.

The forests of the National Park System, maintained in their natural state and allowing the natural processes of growth and decay free play, constitute great outdoor museums in which natural relations between plants and animals may be studied. This, in fact, is one of the important functions of national park forests. In order that they may be suitable laboratories of Nature it is essential that they constitute complete biotic units.

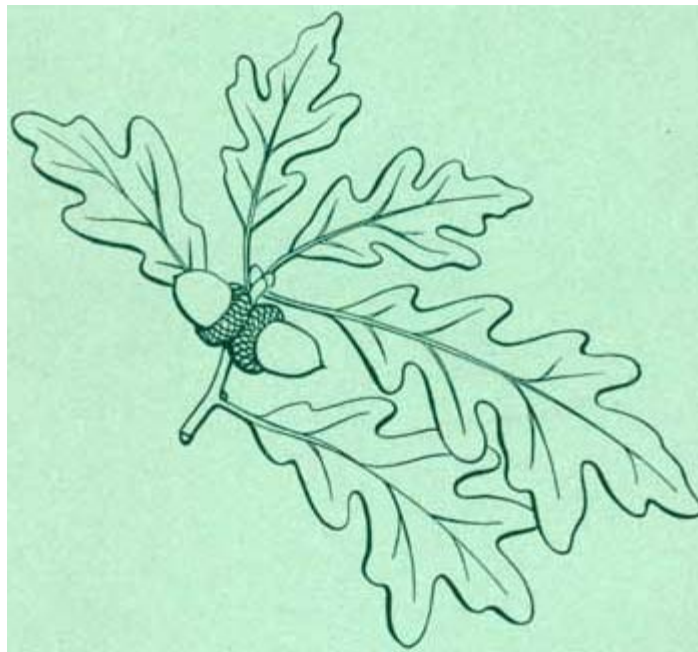
Use of these forests for scientific studies does not prevent their

enjoyment for recreational use and for inspiration and beauty. They form the setting for many of the superlative scenic attractions of the Nation.

There are those who believe it wasteful to permit large and valuable trees to die, fall down, and rot when they could have been used commercially. Such persons have in numerous instances advocated selective logging in the national parks in order to utilize the mature and overmature trees while they are still merchantable. Such logging, no matter how selective or restrictive it may be or how carefully it is accomplished, changes the complex forest community, and the area no longer exists as a natural forest.

The time is coming when there will be no more virgin forest except that preserved in the National Parks . . . then the demands for the virgin forest in the national parks will become more insistent. But it will be more important with each passing year to protect from encroachments all of the National Parks and Monuments, which comprise only about one percent of the area of the continental United States. If we lower our standards and relax our vigilance we may lose the heritage which the wisdom of our forefathers bequeathed to us.

—Editorial, American Planning and Civic Comment.



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