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BULLETIN 85. CHAPARRAL: STUDIES
IN THE DWARF FORESTS, OR ELFIN-
WOOD, OF SOUTHERN CALIFORNIA**

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FRED G. PLUMMER

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HENRY S. GRAVES, Forester.

CHAPARRAL

STUDIES IN THE DWARF
FORESTS, OR ELFIN-WOOD,
OF SOUTHERN CALIFORNIA

BY

FRED G. PLUMMER,
GEOGRAPHER.



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LETTER OF TRANSMITTAL

U. S. DEPARTMENT OF AGRICULTURE,
FOREST SERVICE,
Washington, D. C., March 28, 1911.

SIR: I have the honor to transmit herewith a manuscript entitled "Chaparral," by Fred G. Plummer, Geographer, and to recommend its publication as Bulletin 85 of the Forest Service. No publication dealing exclusively with chaparral has ever before been issued, and this bulletin is therefore a pioneer in its field.

Respectfully,

HENRY S. GRAVES,
Forester.

HON. JAMES WILSON,
Secretary of Agriculture.

CONTENTS.

	Page.
True chaparral.....	5
Mock chaparral.....	9
Historical records of past forest conditions in the chaparral region.....	10
Geographic conditions in the chaparral area.....	11
Chaparral and the water supply.....	14
Vertical range of chaparral.....	22
Subzones.....	23
Composition of chaparral.....	23
Dominant species.....	24
Secondary species.....	25
Unimportant species.....	26
Amount of shade produced.....	27
Value of the different species.....	29
Representation of desirable and undesirable species on two watersheds.....	36
Commercial uses.....	37
Fencing.....	38
Browse.....	38
Bee pasturage.....	38
Protection against fire.....	39
Restocking after fires.....	41
Artificial reseeding.....	42
Introduction of larger tree species in the chaparral.....	43
Conifers.....	45
Eucalypts.....	46

ILLUSTRATIONS.

PLATES.	Page.
PLATE I. A good cover of low chaparral near Arrowhead.....	Frontispiece.
II. Fig. 1.—Low chaparral cover bordering Pacific Ocean. Fig. 2.— Mock chaparral covering the site of a recent burn in northern California.....	8
III. Fig. 1.—Low and open chaparral evenly distributed on all slopes Fig. 2.—Heavy cover of chaparral on north slope, and scattering cover on south slope.....	16
IV. Fig. 1.—A heavy blanket of old chaparral. Fig. 2.—Irregular cha- parral, result of barren soil.....	24
V. Fig. 1.—Good cover of old chaparral undamaged by fire. Fig. 2.— Unburned chaparral bordering a new growth on a burn four years old.....	24
VI. Fig. 1.—Distant view of a chaparral fire on the Cleveland National Forest. Fig. 2.—Near and distant views of fire lines 20 feet wide for the protection of chaparral.....	40
VII. Fig. 1.—A recently burned area with grease-wood sprouting from the roots. Fig. 2.—Valley woodland with chaparral covered hills....	44
VIII. Chaparral region of southern California.....	48

TEXT FIGURES.

FIG. 1. Forest zones of the Pacific slope.....	22
2. Grease-wood, <i>Adenostoma fasciculatum</i> , 6 feet high.....	30
3. Lilac, <i>Ceanothus cuneatus</i> , 7 feet high.....	31
4. Yerba santa, <i>Eriodictyon tomentosum</i> , 6 feet high.....	32
5. Christmas Berry, <i>Heteromeles arbutifolia</i> , 10 feet high.....	33
6. Sumac, <i>Rhus laurina</i> , 6 feet high.....	34
7. Lemonade berry, <i>Rhus integrifolia</i> , 6 feet high.....	35

CHAPARRAL.

TRUE CHAPARRAL.

True chaparral is one of the types of a plant formation which occurs in several widely separated parts of the world. The formation is known to plant ecologists as sclerophyllous woodland. It may be described (though not defined) as a mixed forest of stunted trees, and is the result of peculiar climatic conditions. As one of the intermediate forms between a flourishing forest and a desert, it represents a sort of balance between certain environmental extremes. At this balance the growth is dwarfed, and the full-grown trees attain only the dimensions of brush, even low brush.

The dwarfing of tree growth results from deficiency of moisture and one or more other conditions, such as excessive transpiration, barren soil, high altitude, and wind. As we advance into high latitudes or climb to corresponding altitudes, the trees diminish in stature, until we find only struggling procumbent or bushy forms of the most cold-enduring species of trees—species which, at lower latitudes or altitudes, were of good forest size. A similar phenomenon is observed as we advance toward regions of desert conditions, but the result is a dwarf forest of an entirely different kind.

Inasmuch as each species of tree has a given set of moisture and temperature conditions under which it does best, the composition of any forest—and the composition determines the type—varies with both these conditions. Leaving out of account, for the immediate purpose of this discussion, such other factors as soil constituents and soil structure, it is easy to see that any given set of climatic conditions will exclude from the forest all but a certain number of species, which are capable of competing with each other under the given conditions.

The combination of conditions in parts of southern California results in a selection of certain species to form a dwarf forest which, on the one hand, leaves out the species generally characteristic of northern latitudes, and, on the other hand, the distinctively tropical vegetation. It includes neither the species characteristic of Canada nor those characteristic of the lowlands of Mexico. It is therefore

differentiated, both from the dwarf growth of high mountains and from the mesquite and other dwarf forms of vegetation which extend into the United States from the subtropical areas. Some of the species which make up this type of forest are found, it is true, widely distributed throughout the western United States, but wherever they are found, it is within their limits of moisture and temperature.

The sclerophyllous woodland formation is recognized by ecologists as occurring when, at a medium latitude and altitude, with insufficient precipitation, we have a wet-winter, dry-summer climate. Dr. Schimper, in his "Plant Geography," describes the various regions and presents maps showing them. They are located between 30° and 40° latitude, either north or south, and are therefore almost midway, heliocentrically, between the equator and the poles. After a chapter on "Warm temperate moist summer districts," Dr. Schimper says:

Sclerophyllous woodland in general.—Whilst the districts referred to in the previous chapter resemble the Tropics climatically in the coincidence of the rainy season with high temperatures, and accordingly possess a vegetation similar to that of the Tropics, this likeness entirely ceases in countries where the precipitation coincides with low temperatures and at the same time the hot season is quite rainless or nearly so. Here the totally different aspect of the vegetation corresponds to the sharp difference in climatic conditions, and finds no analogy within the Tropics. The mild temperate districts, with winter rain and prolonged summer drought, are the home of evergreen xerophilous woody plants, which, owing to the stiffness of their thick, leathery leaves, may be termed sclerophyllous woody plants.¹

The sclerophyllous formation is found, outside of southern California, in South America on part of the coastal region of Chile; in Europe and Asia along the borders of the Mediterranean and eastward into Turkestan; in Africa on a small area to the west of the Cape of Good Hope; and in Australia in the southern and southwestern coastal region, including part of Tasmania. The flora differs in each of these widely separated regions. It has many local names: Scrub, elfin-wood, bush-forest, heath-scrub, maqui, shrub-steppe, etc., inclusive terms covering all the plants. There are also many terms which refer to pure growth of a single species—a not uncommon occurrence. Such are brigalow; mulga-scrubs, composed of acacias; malle-scrub, composed of dwarf eucalypts; manzanita, a species of arctostaphylos; and chamisal, the grease-wood, *Adenostoma fasciculatum*.

Concerning the chaparral type Dr. Schimper says as follows:

Sclerophyllous woodland in California.—The California littoral is stocked chiefly with evergreen shrubs, among which isolated trees raise themselves. The most important of the trees, which in dry situations occur also as shrubs,

¹ Schimper, Plant Geology Upon a Physiological Basis, Oxford, 1903, p. 507.

are *Quercus agrifolia*, Nee; *Q. chrysolepis*, Leibm.; *Q. dumosa*, Nutt.; *Q. oblongifolia*, Torr.; and several others, all of them evergreen species having small leathery leaves with entire margins, or provided with sharp teeth; two evergreen trees of different affinity accompany them, the California laurel (*Umbellularia Californica*, Nutt.) and the chinquapin (*Castanopsis chrysophylla*, A. DC.). The shrubs composing the main mass of the vegetation, which forms a hardly penetrable thicket on the lower mountains and hills, consists, like the corresponding formations of other sclerophyllous districts, of representatives of the most diverse families, such as oaks, Compositæ, Rosaceæ (*Adenostoma fasciculatum* Hook. et Arn., *Prunus ilicifolia*, Walp.), Zygophyllaceæ, Anacardiaceæ (species of *Rhus*), Rhamnaceæ (*Ceanothus cuneatus*, Nutt.; *C. papillosus*, Torr.), Leguminosæ, Hydrophyllaceæ, Ericaceæ (*Arctostaphylos tomentosa*, Lindl.), Labiatæ. Succulent plants are commoner than in other sclerophyllous districts, and are represented by various Cactaceæ. Bulbous and tuberous plants here again occur in great numbers as associates in the sclerophyllous woodland.¹

Dr. Warming, in his "Oecology of Plants," says:

The term "sclerophyllous" is employed by Schimper in connection with xerophytic bushland and bush forest in subtropical regions where the rain falls in winter. It refers to the small, thick, coriaceous, entire leaves, which are so extremely common in these regions. * * * The prolonged summer drought is hostile to vegetation. Hence the rarity of larger trees. The trees are small, with gnarled trunks and boughs; and most of them may occur in the guise of dwarf trees and shrubs. The leaves of the trees and shrubs are, as a rule, evergreen and protected from desiccation in various ways, yet their structure is not so extreme as that of desert plants. * * * Winter and spring form the true vegetative season of sclerophyllous vegetation, even though brief cold periods sometimes cause a lull.²

Thus chaparral as a type of sclerophyllous woodland is distinguished by its different species from:

- (a) The dwarf forests of the North and of high altitudes.
- (b) The dwarf forests of the tropics and subtropics.
- (c) The dwarf forests (if we may call them so) of the sagebrush desert.

It is also distinguished by a different character of forest due to the effect on these species of a particular set of climatic conditions from:

- (d) The sometimes so-called chaparral of other regions in the southwestern United States, though composed of the same species.

Under the sclerophyllous woodland formation, chaparral is differentiated from other types belonging to the same formation by its composition.

The word "chaparral," in Castillian or Mexican, means specifically evergreen scrub oak or oak brush. In early Spanish California it was applied to *Quercus dumosa*, which is found along the coastal region from latitude 31° to latitude 39° 30', and also in a few small

¹ Schimper, Plant Geology Upon a Physiological Basis, Oxford, 1903, p. 535.

² Warming, Oecology of Plants, Oxford, 1906, p. 303.