The Evolution of Mediterranean Landscapes

Bioclimate Delineation of the Sclerophyll Forest Zone

The sclerophyll forest zone (SFZ) of Mediterranean climates covers all those regions that exhibit similar climatic characteristics of warm to hot dry summers, with high solar irradiation and high rates of evaporation, and mild to cool wet winters with low solar irradiation and low rates of evaporation. In these conditions, broad-leaved and mostly evergreen trees and shrubs with thick, but mostly small, leathery leaves, reach their optimum development and distribution. Forests dominated by such plants are considered the zonal vegetation. Köppen (1923) called this the olive climate because around the Mediterranean Basin the distribution of the (cultivated) olive tree—a typical broad-leaved evergreen sclerophyll tree—corresponds quite well with this climate type.

In addition to the Mediterranean, four other widely separated regions of the world, chiefly between 30° and 40° north latitude and south latitude on the west coasts of continents have similar bioclimates with comparable sclerophyll vegetation types; these regions are California, central Chile, southwestern and part of southern Australia, and the Cape Region of South Africa. This zone makes up roughly 1% of the world's terrestrial vegetation, about half of this concentrated around the Mediterranean Sea.

In France it is called maquis, in Italy macchia, in Spain and Chile matorral, in Greece xerovoni, in Israel choresh, in California chaparral, in South Africa fynbos, in Australia mallee, heath, and scrub. The terminology of the lower and more xeromorphic vegetation types is even more confusing, and sometimes the same term is used in different countries for different formations.
As shown in Figure 4-1, Ashmann (1973), on the basis of the minimum and maximum growth requirements of these sclerophylls, restricted the sclerophyll forest zone in bioclimatic terms to regions having not more than 900 mm annual precipitation, with not less than about 250 mm in coastal regions and 350 mm in warmer interior regions; at least 65% of precipitation is concentrated in the winter half. But he also emphasized the great climatic diversity and peculiarity of each of these regions, which is hard to express in generalized climatic classifications.

Such a classification was attempted by UNESCO (1963). In it, the SFZ was subdivided into a drier “xerothermic” part that merges into the subdesert, (see also Meigs, 1964, for a subdivision of semiarid Mediterranean climates) and into a wetter accentuated thermomediterranean part, merging into the attenuated thermomediterranean, in which tall conifer and mixed broad-leaved summer-deciduous forests with higher moisture demands and greater cold resistance become the zonal vegetation. The SFZ is thereby confined chiefly to the xerothermic climatic index of 125-200 biological dry days. This is the “true mediterranean fire climate” (Naveh, 1973), in which acute fire hazard prevails for dense sclerophylls and conifers, as well as for dry herbaceous vegetation from four to eight months.

In this zone, the difficulties of defining ecological homoclimes by single indices can be overcome only by closer comparisons of patterns of temperatures and their diurnal amplitudes, and of rainfall distributions and their reliability during the main growth season. For such comparisons valuable climatic diagrams have been used by Walter (1973) in his lucid ecophysiological description of this zone, by Horvat et al. (1974) in their perceptive description of this zone in southeastern Europe, and by Zohary (1973) in his broad geobotanical overview of the Middle East. They were also very illustrative in a detailed climatographic comparison of mediterranean ecosystems in California and Chile (di Castri, 1973), as well as in other comparisons between these countries.

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As has been described in more detail in a special volume on the structure and origin of mediterranean ecosystems (di Castri and Mooney, 1973), the Mediterranean Basin, California, and central Chile are relatively young orographic systems that gained their present high, sharp, folded and faulted landforms of mountain and hills, often rising close to the coast, by violent uplifting in the late Tertiary and early Quaternary Periods. Being highly dissected, complex, and partly unstable, with many steep slopes and shallow rocky soils, they are very vulnerable to sheet and gully erosion if their protective natural vegetation

\[ P \leq \frac{1}{2} T \]

[Following Gaussen, a xerothermic index \((x)\) is calculated from the sum of monthly indices of dry months in which total precipitation \((P)\) mm is equal to or lower than half the temperatures \((T ^\circ C)\): \( P \leq \frac{1}{2} T \). For this purpose, all biological dry days without rain, mist, dew, or fog (or half days with) are multiplied by a coefficient of relative humidity \(H\), ranging from 1 \((H = 40\%)\) to 0.5 \((H = 100\%).\)]