

# Plants of Mediterranean-Type Climates<sup>1</sup>

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The mediterranean-type climate of wet, mild winters and hot, dry summers occupies only about 3% of the land area of the world. However, because this climate is so favored by man, the density of the population and the development of such large cities as Athens, Rome, Cairo, Jerusalem, Los Angeles, San Diego, Capetown, Santiago, Perth, and Adelaide make the five regions of mediterranean-type climate far more important than their limited areas would suggest. The Mediterranean Basin itself, and immediately adjacent areas, was the cradle of western civilization.

The distribution of the mediterranean-type climate is widely disjunct on each of the six occupied continents, the Mediterranean Basin, the Californias, central Chile, the Cape Region of South Africa, and southwestern and southern Australia, each area lying approximately between 30° and 40° of latitude north and south of the equator on the western side of the continents, but extending east in the Mediterranean Basin and Australia. This distribution is controlled indirectly by the existence of cold ocean currents, the Portugal, Canary, California, Peruvian (Humboldt), Falkland, Benguela, and Western Australian currents; and more directly by the juxtaposition of the middle latitude cyclonic storm belts and high-pressure air masses. In winter the middle latitude cyclones and moist maritime polar air masses usually combine to create relatively adequate rainfall; in spring the subtropical high-pressure system shifts poleward, mostly preventing summer cyclonic storms and insuring hot, dry summers. This transitional regime between temperate and dry tropical climates is characterized by variable winter precipitation, summer drought, mild to hot summers, cool to cold winters, and marine fog and high humidity along the coasts. Each mediterranean area is immediately adjacent to deserts or semideserts, as

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the Sahara, Arabian-Central Asian, Mojave and Sonoran, Atacama, Central Australian, and Karoo deserts.

The similar mediterranean climate has developed in these five widely disjunct areas remarkably similar vegetation types, dominated largely by woody shrubs with evergreen, sclerophyllous (leathery) leaves but varying from shrublands (variously called maquis, chaparral, matorral, renosterveld, and mallee) to sclerophyllous, broad-leaved forests, conifer forests, heathlands, and semidesert scrub. Most of this vegetation is fire-prone and fire-adapted, except in the Mediterranean Basin and central Chile. With increasing aridity or human disturbance, the vegetation becomes lower, more open and scattered, more drought-deciduous, more shrubby and subshrubby, and with more succulents and semisucculents (except in Australia). This more arid scrub is called variously garrigue, phrygana, batha, jaral, coastal sage, or renosterveld. Under more mesic conditions the shrublands merge with evergreen sclerophyllous broad-leaved woodlands and forest, and with increasing altitude with conifer woodlands and forest, and if high enough, with subalpine scrub. On acid soils low in such nutrients as phosphorous, nitrogen, and trace elements, as in South Africa and Australia, the shrublands are replaced by heathlands (called variously fynbos, sand heath, landes, brezel, and brughiera). On relatively fertile soils, herbs and grasses become more abundant in savannas, parklands, and open woodlands.

On the other hand, the floras of the various mediterranean-climatic regions are very distinct due to the extreme and long isolation of each of the areas from the others and the different phylogenetic heritages of each region. Other causes of this biotic heterogeneity are the differences in topography, soil types, water availability, marine fogs, rain-shadow effects, paleoclimatic changes, and degradation and desertification by man. Although the mediterranean climate is probably no older than Pleistocene, certainly many of the plants have a long history of preadaptation to semiarid or arid conditions stretching back to Tertiary time. Many other species, especially the annuals and herbaceous perennials, appear to be of postglacial vintage.

Most similar in position, physiography, oceanic currents, north-south orientation, mixture of temperate and tropical biotic elements, carbon-gaining strategies, Spanish settlement, etc., are Chile and California. Also there has been some interchange of plants via long-distance dispersal and migration along the Andean and other mountain chains. Yet their floras are very diverse, with high endemism in each flora. Central Chile has more rainfall and richer soils, is more



oceanic, is more isolated, has more links with southern hemisphere biota, has more diversity of growth forms and more open, diverse, stratified vegetation with more spiny shrubs and succulents, and more intensive impact by man. Also it lacks Santa Ana-like winds with less fire-prone, flammable vegetation, and no post-burn annuals. California has greater floristic links with the Mediterranean Basin, an onshore archipelago with highly developed island chaparral and many island endemics, well-developed conifer woodlands and forests and generally more montane forests, and its shrub germination is fire-stimulated.

Australian and South African mediterranean-climate regions are most atypical because of their more subdued, ancient landforms, acid, nutrient-poor soils, monsoonal summer storms, mild winters and low thermal amplitude, lack of poleward contacts with temperate climates, and flora originating from some common tropical ancestors preadapted by poor soil nutrients, fire, and water stress. Their very rich mediterranean-area floras are dominated in large part by members of the Proteaceae, Fabaceae, Rutaceae, and Restionaceae, with strong representation in the Rhamnaceae, Thymelaeaceae, Santalaceae, Orchidaceae, and other families. Yet, their floras are highly distinctive with numerous endemic families restricted to Australia or Africa. The Cape Region has a more diversified topography and stronger winds, but a much more compressed mediterranean-type climatic zone.

The Mediterranean Basin is more diversified and extended eastward than the other regions just discussed. Its flora is closest in affinity to the California region, with great importance of conifers, oaks, and mints, as in California. Because it abuts upon the Atlantic Ocean and several seas, and contains numerous islands, peninsulas, and other highly irregular coastline, it has 40,000 km of shore and nearly half the shrublands of all the mediterranean-climate regions. But it has long been a crossroads for humans, and has suffered greater devastation and desertification than the other regions. Over-grazing by goats and other browsers, over-cultivation, tree cutting, soil erosion (often total loss of soil with only bare rock left), marine pollution, heavy tourist visitation (about one-third of all international tourism), and other effects of over-population have had a horrendous impact on this type-region of mediterranean climate.



## SUGGESTED READINGS

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