

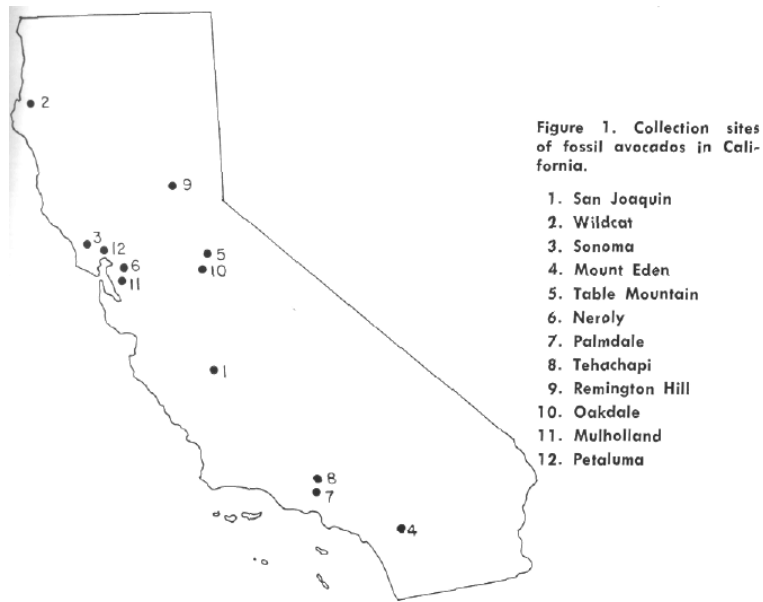
## PREHISTORIC AVOCADOS IN CALIFORNIA

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The original avocado found in the area now designated California can be related to prehistoric times, namely the middle Eocene and Pliocene epochs which have been determined by geologists to be approximately 10 to 60 million years ago. The history of these progenitors of the modern avocado and close botanical relatives in our current *Persea* species is recorded in fossil remains embedded in rocky outcroppings and in formations exposed comparatively recently by the work of man as he sought gold in California. Hydraulic mining practiced to excavate and wash the mountains of the mother-lode country released many fossil specimens which had been buried deep in the soil and revealed numerous plant materials which indicate the extensive and probable dense semi-tropical flora that once existed. The semi-tropical climate of this period was much in contrast with the more arid climate of today which provides the sclerophytic-xerophytic chaparral and open pine associations now prevalent in the Sierra foothills.

The descriptions of the fossil flora of California and nearby Nevada are provided primarily in the researches by Axlerod (1-7), MacGinitie (11), Chaney (8), Condit (9-10), and Putnam (12) who have studied the fossil records of collections in the extensive holdings of the University of California Museum of Paleontology at Berkeley and at other museums in California. This report is primarily a brief account of their extensive studies.



The abundant evidence that the climate of California has undergone dramatic modification since prehistoric time is deduced from the paleobotanic and geological studies of several sites in California and Nevada. The slow evolution of climatic changes which has occurred through the ages is reflected in the types of flora and the specific plant and animal materials associated with the collections and interpreted in light of knowledge of present day similarities. The presence of avocado-like plants has been clearly established in the fossil collections from Central and Northern California, and they are particularly numerous in the Palmdale area. Those paleobotanic studies have been made entirely on fossil leaf remains which are in some cases most excellently preserved in the rock. Unfortunately, the more fragile flowers and fruits have not been preserved, hence were lost during the formation of the fossil bearing soils.

Distribution of ancient avocados probably extended throughout the present state of California is indicated by collections made in such widely separated areas as Mint Canyon near Palmdale, Mulholland near Oakland and Nevada City, California. That the species *Persea coalingensis* and other botanical relatives extended beyond the present California borders is evident from the collections in Middlegate, Nevada (12) and in Oregon (8). While the avocado is found as a representative among the flora in several areas, it possibly was a dominant species in some areas such as in the site near Palmdale where it comprised 68% of the total specimens preserved under these specific conditions. Other species associated with *Persea* but in lesser numbers near Palmdale were *Populus* (cotton wood), *Quercus* (live oak) and *Platanus* (sycamore). Axlerod (7) indicates that *Persea* "lived in large numbers along the river banks and lake borders of the region". The density of ancient avocado in other areas of California possibly was 10% or less of the total flora.

The distribution of *Persea coalingensis* in the Pliocene deposits of California together with such species as *Juglans* (walnut), *Platanus* (sycamore), *Quercus* (live oak) and *Salix* (cottonwood) together with fossil horses, camels and antelope is interpreted to indicate the semi-arid woodland habitat with considerable grassland in the vicinity (5). Species of *Magnolia* and *Persea* presently found in the semi-arid areas of northern Mexico indicate a relationship to the fossil specimens from California. This has been interpreted to indicate that the ancient flora of California was historically a relic of the Caribbean Element comprising a dominant feature in Central California in the Eocene and surviving in the more coastal situations in the late Tertiary (8). The common Pliocene fossil species *P. coalingensis* is related to the living *P. padenia* Blake of the Sierra Madre Occidentale in Sonora and Durango, Mexico (8).

The botanical relatives within the family Lauraceae abundant in early Tertiary consisted of possibly more than eight species. Some of these have living relatives in various parts of the world today but only one, *Umbellularia californica* Nutt, has survived in California. Among the fossil specimens found in California are *Cinnamomum acrodomum*, *Cryptocarya praesamarensis*, *Laurophyllum fremontensis*, *Neolitsea lata*, *Persea praelinque*, *P. pseudo-carolinensis*, *P. coalingensis* and *Umbellularia salicifolia* (8). These species were scattered throughout the present State of California in prehistoric times and are represented today only by botanical relatives found in Sonoran Mexico and the remnant related species, *Persea borbonia*, the swamp bay of the Southern Gulf States.

The association of ancient *Persea* with such genera as *Magnolia* provides evidence for the existence of a climatic condition such as that encountered today in the warmer and more humid areas of the Gulf states of Mississippi, Alabama and Georgia.

Among the most ancient of plant fossils which have been collected and identified from California were those from sites in the San Francisco Bay area. These specimens are representatives of a semi-tropical flora including the fan palm (*Sabalites*), magnolia, sebestena (*Coraza*), huanchal (*Cupania*) and avocado (*Persea*) (8). The vegetative characteristics of these genera are generally large and thick leaves compared to the smaller, thin leaves of species from the temperate regions. The nearby presence of fossil marine animals indicates the probable existence of swamps or lagoons which again provides evidence suggesting climatic conditions of high rainfall and relatively high atmospheric humidity.

The criteria of diagnosis and identification of genera and species in fossil leaf specimens consist of morphological variations in leaf form and the detailed pattern of the venation, the angle of departure of secondary veins from the midrib, the straightness or curvature of secondary veins and the characteristics of primary nerves which arise from the leaf base.

Identification of fossil impressions is made by comparison with present day living species or botanical relatives. *Persea carolinensis*, an extinct species, for example, is quite similar in leaf form and venation to the living types, *Persea borbonia* or *Persea paulustria*, the Swamp or Bull Bays, presently extending from Florida to Texas in the Gulf Coast area.

The remaining living botanical relatives of the ancient California avocado, *Persea*, is *Umbellularia californica* Nutt., commonly called the California bay, California laurel, Peppernut, or California myrtle. This bushy tree may attain a height of 6 to 15 meters, 18-48 feet. The long lanceolate leaf has a strong penetrating odor when crushed. The fruit is a small inedible drupe about 2 cm. long. The seed can be eaten after roasting. This species is found commonly in dry cismontane canyons below 5,000 feet elevation from San Diego County to Oregon. The wood from older, larger specimens is used for turning howls and other art objects as it has a beautiful grain and takes a good polish. This wood is sometimes called California or Oregon myrtle.

A rough concept of the age of prehistoric avocado in California is depicted in Figure 2. The geological time scale expressed in the great epoch terminology suggests the presence of avocado in the Eocene, possibly 50 million years ago. The flora of that period probably varied much as it does today but some of the genera maintained their presence until Lower Pliocene about 10 million years ago. The close botanical relative, *Umbellularia*, survived the interval from Late Miocene through the Pliocene and Pleistocene and appears today somewhat modified but vigorous and plentiful in the coastal and mountain valleys as our California Bay tree. Man appeared on the earth only in very recent geological time. His active presence in California probably can be well established only to three or four hundred years ago.

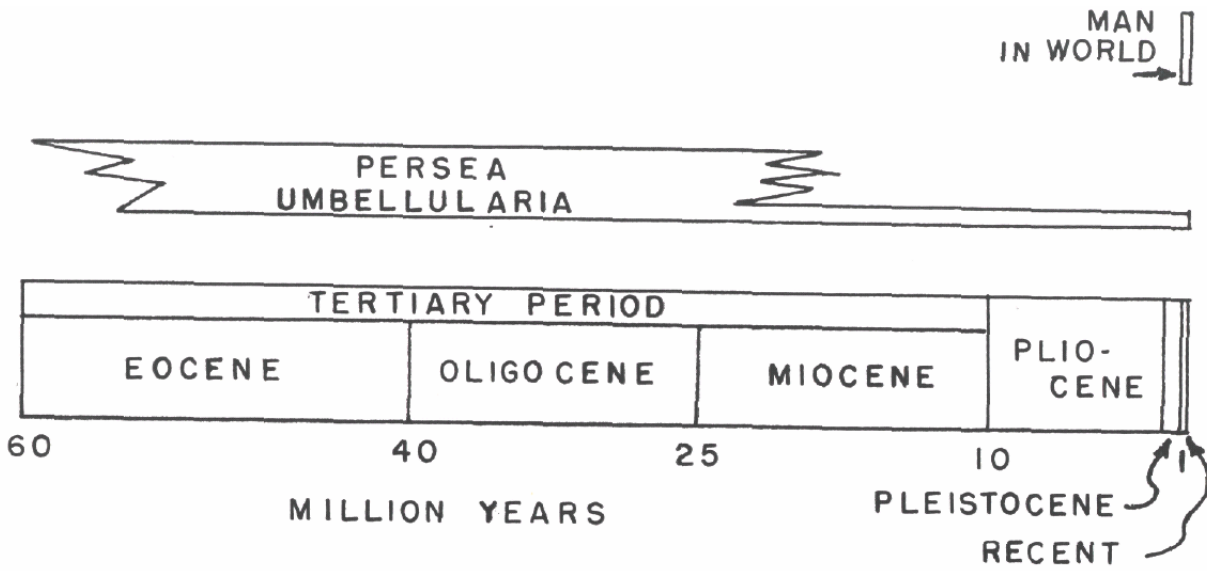


Figure 2. Comparative age of prehistoric avocado and man in California geological history.

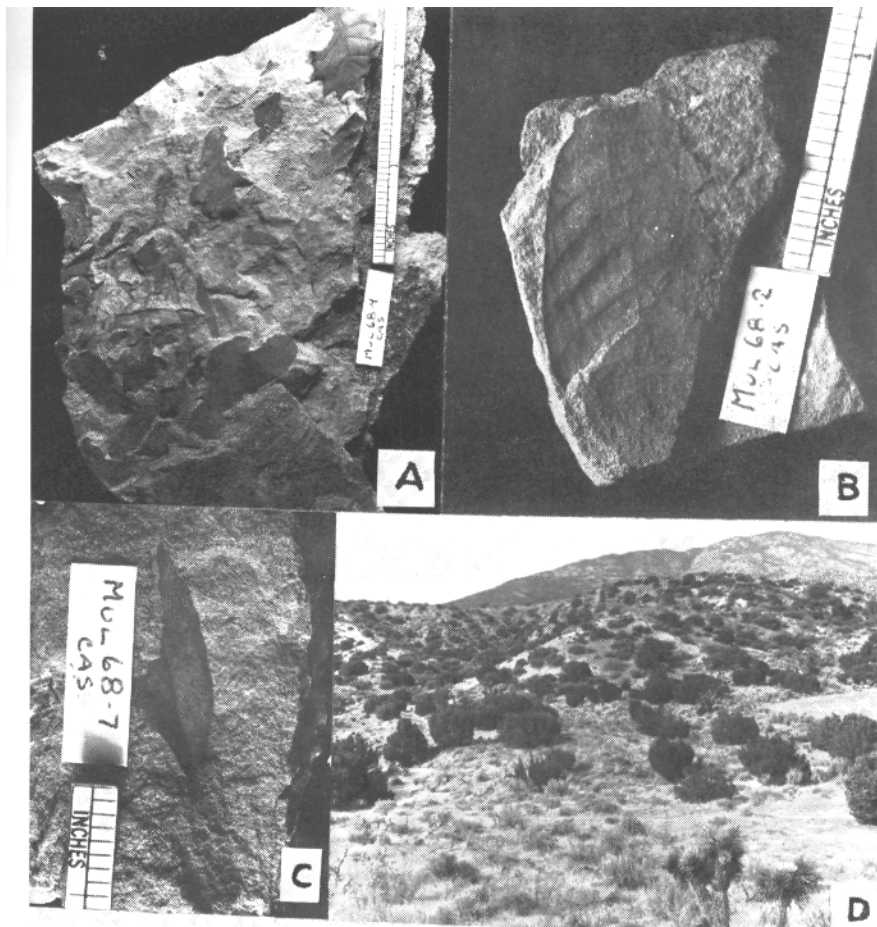


Figure 3. A. Fossil leaf fragments from Mulholland site of Middle Pliocene. Note leaf of live oak in upper right hand corner.

B. Fossil of Valley oak leaf (*Quercus moragensis* from Mulholland site.)

C. Fossil leaf of *Umbellularia* (?) from Mulholland site.

D. Present flora near Palmdale where fossil *Persea* leaves have been found in abundance. Note Juniper and *Yucca* which are dominant in the area.

## LITERATURE CITED

1. AXLEROD, D. I. 1939 A Miocene Flora for the Western Border of the Mojave Desert. Carnegie Institute, Washington Contrib. Paleo. Publ. 516.
2. AXLEROD, D. I. 1944 The Sonoma Flora. In: Chaney, R.W., Pliocene Flora of California and Oregon. Carnegie Instit., Washington Publ. 553. pp. 167-200
3. AXLEROD, D. I. 1944 The Mulholland flora. Carnegie Inst. Wash. Publ. 553, pp. 103-140.
4. AXLEROD, D. I. 1950 A Sonoma Florule from Napa, California. Carnegie Instit. Washington. Publ. 590. pp. 25-71.
5. AXLEROD, D. I. 1950 Further Studies of the Mount Eden Flora. Carnegie Instit. Washington. Publ. 590. pp. 75-158.
6. AXLEROD, D. I. 1950 The Piru Gorge Flora of Southern California. Carnegie Instit. Washington Publ. 590. pp. 161-214.
7. AXLEROD, D. I. 1950 Anaverde Flora of Southern California. Carnegie Instit. Washington. Publ. 590. pp. 121-158.
8. CHANEY, R. W. 1951 Prehistoric forests of the San Francisco Bay area. In: Jenkins, O. P., Geologic Guidebook of the San Francisco Bay Counties. Calif. Div. of Mines. Bul. 154: 193-202. 1951.
9. CONDIT, C. 1944 The Remington Hill Flora. In: Chaney, R. W., Pliocene Flora of California and Oregon. Carnegie Instit. Washington. Publ. 558. p. 21-55.
10. CONDIT, C. 1944 The Table Mountain Flora. In: Chaney, R. W., Pliocene Flora of California and Oregon. Carnegie Instit., Washington. Publ. 558, pp. 57-90.
11. MAC GINITIE, H. D. 1941 A Middle Eocene Flora for the Sierra Nevada. Carnegie Instit. Washington Contrib. Paleo. Pub. 534.
12. PUTNAM, W. C., C. DURRELL and G. TOMEL 1956 Mio-Pliocene Floras from West-Central Nevada. Univ. Calif. Publ. Geol. Sci., Vol. 33.