

## Blue Oaks Adapt to Dry Summer

Blue oaks have evolved to withstand disappointing years of little rain and high temperatures. According to the *Oaks of California* by Bruce Pavlik, Pamela Muick, Sharon Johnson and Marjorie Popper and published by the California Oak Foundation, while other oaks are resistant to drought, few of them combine all the mechanisms of conservation, tolerance and resiliency that are present in the blue oak. The following information on the variety of characteristics of blue oaks that prepare them for long seasons of no rain is derived from the *Oaks of California*.

The leaves of blue oak are moisture conserving by their nature. They are covered on their upper surface by a waxy coating that gives the tree its characteristic bluish cast. Also the canopy of leaves remains proportionately smaller in blue oaks than in other less drought-tolerant species.

When water from the soil becomes very scarce, the blue oak exhibits a remarkable array of drought-coping behaviors. Leaves become reinforced with cellulose and lignin (the chemical component of wood) to withstand stresses imposed by the progressive dehydration. Photosynthetic cells adjust their internal salt content so that wilting is prevented even if their leaves lose up to 30% of their water to the bone-dry atmosphere. This ability surpasses that of some desert trees, such as the mesquite and ironwood.

The dry summer sky steadily drains water from the soil through evaporation from the leaves. Vessels that conduct water in stems and roots must be able to withstand great internal tensions, just as a drinking straw must withstand the vacuum created by sucking a thick drink. As summer drought progresses, newly formed oak vessels become progressively thicker, harder and more compact, decreasing the likelihood of collapse as roots withdraw the last droplets of soil-bound moisture.

If water finally becomes too scarce, blue oaks simply drop their leaves, a condition known as drought deciduous. Drought-deciduous leaves are a common feature of chaparral and desert shrubs, but rare among oaks and trees in general. Yet in extremely hot and dry years, blue oaks resort to such dormancy. They may look skeletal, but they are merely dormant, and they continue to fill their acorns with previously stored food. Most of the trees do not resume growth with arrival of fall rains, but wait until spring to produce a new crop of leaves. This ability to endure allows blue oaks to dominate nearly half of all oak-covered lands in California. Aren't we lucky to have them grace our hillsides?



**Native Oaks Poster**  
Illustrator Michael Lee  
Good Nature Publishing

**Oaks of California**  
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California Oak Foundation/  
Cachuma Press

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