Changes in forests and woodlands

The structure and composition of California's forests and woodlands have changed over the past 80–year period.

Compared to the 1930s, today's forests and woodlands have more small trees and fewer large trees. Their species composition has also changed: pines occupy less area across the state, and oaks cover larger areas in certain parts of the state and smaller areas in others. The decline in large trees and the increased abundance of oaks have been linked to changes in water availability associated with climate change. One measure of the water stress experienced by trees is "climatic water deficit." During warmer temperatures, plant water demand increases while soil moisture decreases, especially during years of low rain or snowfall.

The changing nature of California's forests and woodlands can have profound economic and ecological consequences, including the loss of timber, recreational areas, and wildlife habitat.

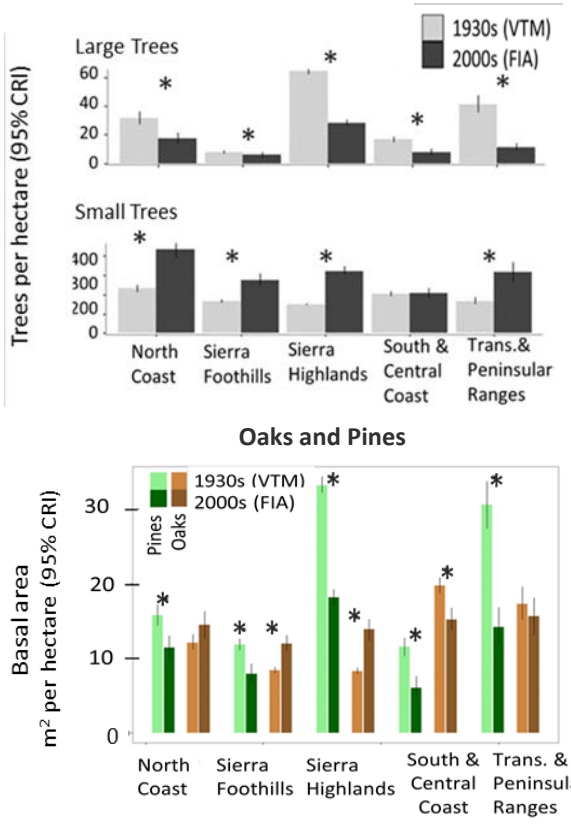
What does the indicator show?

The graphs on the right compare the structure (the size of trees) and composition (the species of trees) of historical and modern forests in five regions of California (see map). Historical data are from a 1930s survey of California's vegetation, documented in the Wieslander Vegetation Type Map (VTM). The VTM serves as a valuable resource for examining how California's forest structure and species composition have responded to climate change. Modern data are from the Forest Inventory Analysis (FIA).

Compared to the 1930s, forests across much of California today have lower densities of large trees, and higher densities of small trees (see top graph). Small trees are 4 to 12 inches in diameter, while large trees are over 24 inches in diameter (as measured at a height of 4.5 feet).

The bottom graph compares the abundance of oaks and pines in the 1930s and the 2000s. In today's forests, pines have declined in all regions, while oaks have increased in two Sierra Nevada regions but decreased in the South and Central Coast ranges.

Water stress, which increases in a warming climate, poses a greater risk to large trees and pines than to small trees and oaks. Other factors that influence forest structure and composition include fire suppression, logging practices and wildfires.



Note: "Basal area" refers to the area occupied by tree trunks in square meters per hectare. Asterisks (*) denote statistical significance.

Source: McIntyre et al. 2015

Why is this indicator important?

The pine and oak-dominated forests and woodlands of California provide timber, serve as habitat for wildlife, control soil erosion, store carbon, and offer recreational opportunities. These are important products and services that are vital to human and ecological communities. .

Although also influenced by other factors, changes to the structure and composition of the state's forests and woodlands are a response to warming and drying conditions. Monitoring these changes provides valuable insight into future forest responses to climate change. There is evidence that wildfires, which are projected to increase in frequency and severity in the western United States, can accelerate these changes. At elevations up to about 5,000 feet, where pines and oaks grow together, wildfires have been shown to remove dominant conifers (including pines but also other needle-leafed trees), allowing resident oaks and chaparral to establish and become the dominant vegetation.

Old growth stands of sugar pine and white fir with Ponderosa pine and incense cedar near Yosemite National Park entrance, Big Oak Flat Road, taken June 1941. From the Wieslander Vegetation Type Mapping Collection.

Photo: Courtesy of the Marian Koshland Bioscience and Natural Resources Library, University of California, Berkeley, www.lib.berkeley.edu/BIOS/vtm

For more information about this and other climate change indicators, visit:
https://oehha.ca.gov/climate-change/report/2018-report-indicators-climate-change-california