

Redwood (disambiguation).

## Sequoioideae



*Sequoiadendron giganteum*

## Scientific classification

Kingdom:     Plantae  
Division:     Pinophyta  
Class:         Pinopsida  
Order:        Pinales  
Family:       Cupressaceae  
Subfamily:   Sequoioideae

## Genera

- Sequoia
- Sequoiadendron
- Metasequoia

## General

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The three redwood subfamily genera are: Sequoia and Sequoiadendron of California and Oregon, USA ; and Metasequoia in China. The redwood species contains the largest and tallest trees in the world. These trees can live to an age of thousands of years. This is an endangered subfamily due to habitat losses from fire ecology suppression, logging, and air pollution.<sup>[citation needed]</sup>

Only two of the genera, Sequoia and Sequoiadendron, are known for massive trees. Metasequoia, with the living species *Metasequoia glyptostroboides*, are much smaller.

Record holders[edit]

- The tallest tree in the world is a *Sequoia sempervirens*, the Hyperion Tree.
- The largest tree in the world, by volume, is a *Sequoiadendron giganteum*, the General Sherman Tree.

## Evolution

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Multiple studies of both morphological and molecular characters have strongly supported the assertion that the Sequoioideae are monophyletic.<sup>[2][3][4][5]</sup>

Most modern phylogenies place Sequoia as sister to Sequoiadendron and Metasequoia as the out-group.<sup>[3][5][6]</sup> However, Yang et al.<sup>[5]</sup> went on to investigate the origin of a peculiar genetic artifact of the Sequoioideae—the polyploidy of Sequoia—and generated a notable exception that calls into question the specifics of this relative consensus.

Evidence for reticulate evolution in Sequoioideae[edit]

Polyploidy has come to be understood as quite common in plants—with estimates ranging from 47% to 100% of flowering plants and extant ferns having derived from ancient polyploidy.<sup>[7]</sup> Within the gymnosperms however it is quite rare. *Sequoia sempervirens* is hexaploid ( $2n = 6x = 66$ ). To investigate the origins of

this polyploidy Yang et al.<sup>[5]</sup> used two single copy nuclear genes, LFY and NLY, to generate phylogenetic trees. Other researchers have had success with these genes in similar studies on different taxa.<sup>[5]</sup>

Several hypotheses have been proposed to explain the origin of Sequoia's polyploidy: allopolyploidy by hybridization between Metasequoia and some probably extinct taxodiaceous plant; Metasequoia and Sequoiadendron, or ancestors of the two genera, as the parental species of Sequoia; and autohexaploidy, autoallohexaploidy, or segmental allohexaploidy.

Yang et al. found that Sequoia was clustered with Metasequoia in the tree generated using the LFY gene, but with Sequoiadendron in the tree generated with the NLY gene. Further analysis strongly supported the hypothesis that Sequoia was the result of a hybridization event involving Metasequoia and Sequoiadendron. Thus, Yang et al. hypothesize that the inconsistent relationships among Metasequoia, Sequoia, and Sequoiadendron could be a sign of reticulate evolution (in which two species hybridize and give rise to a third) among the three genera. However, the long evolutionary history of the three genera (the earliest fossil remains being from the Jurassic) make resolving the specifics of when and how Sequoia originated once and for all a difficult matter—especially since it in part depends on an incomplete fossil record.<sup>[6]</sup>

## Range

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Young but already high redwood trees.

The entire subfamily is endangered. Sequoiadendron giganteum and Sequoia sempervirens are Vulnerable species, and Metasequoia glyptostroboides is an endangered species on the IUCN Red List.

## Cultural impact[edit]

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John Steinbeck wrote about the redwood, "The redwoods, once seen, leave a mark or create a vision that stays with you always. No one has ever successfully painted or photographed a redwood tree. The feeling they produce is not transferable. From them comes silence and awe. It's not only their unbelievable stature, nor the color which seems to shift and vary under your eyes, no, they are not like any trees we know, they are ambassadors from another time."<sup>[12]</sup>

## Additional images

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Green mature Giant Sequoia cones



Dry empty Giant Sequoia cones