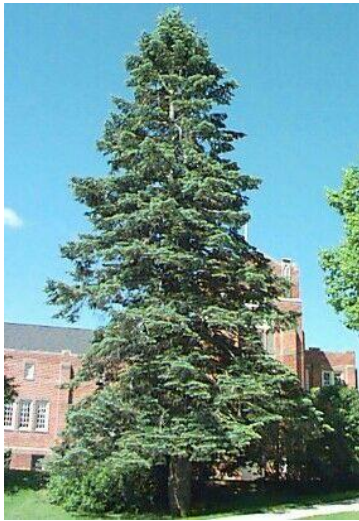


## WHITE FIR

*Abies concolor* (Gord. & Glend.) Lindl. ex. Hildebr.

Plant Symbol = ABCO

Contributed by: USDA NRCS National Plant Data Center



Mark Brand, 2001. The University of Connecticut Plant Database

### Alternate Names

*Abies grandis* var. *concolor*, balsam fir, Colorado white fir, *Picea concolor*, *Pinus concolor*, silver fir, and white balsam. There are two varieties of white fir, sometimes recognized as separate varieties and sometimes grouped under the white fir blanket. They are Rocky Mountain fir (*Abies concolor* var. *concolor*) and California white fir (*Abies concolor* var. *lowiana*, also known as Sierra white fir).

### Uses

*Ethnobotanic:* Native Americans used white fir for medicine, building material, and for making household items. The needles were used to relieve pain caused by rheumatism and pulmonary ailments. The resin was used to heal cuts, sores, and boils and was also decocted for the treatment of venereal diseases. Bark infusions were used to remedy tuberculosis.

Bark was used to dye buckskin a tan color. Branches were used to line storage containers and to make pipe stems. The plant was used to decorate ceremonies and houses.

*Ornamental:* White fir is a popular species in the Christmas tree industry. It is drought and heat resistant and is often used for plantings in the rural and suburb landscapes of the northern United States.

*Rehabilitation:* White fir is used to revegetate disturbed forest sites where it naturally occurs. It is also an appropriate choice for use on roadcuts due to its ability to stabilize soil.

*Wildlife:* White fir habitats are included in the summer and winter ranges of deer, elk, and bear. Mountain beaver habitat use has been correlated to white fir abundance. Many bird species, including bald eagle, northern spotted owl, brown creeper, and red-breasted nuthatches are associated with white fir habitat types.

Mule deer and black-tailed deer browse new foliage in the spring. Porcupines consume white fir bark and can destroy saplings. Mice eat snow-level suckers in the winter while pocket gophers eat seedlings in the winter and fall. Blue grouse consume the needles. Grouse, chipmunks, mice, flying squirrels, chickadees, crossbills, and Clark's nutcracker consume white fir seeds. The Douglas squirrel caches white fir cones during late summer and fall.

Hollowed-out trunks provide protection and shelter for many small mammals including weasels, porcupines, and black bears.

*Wood Products:* White fir wood is used for all-purpose construction materials like framing, plywood, and pulpwood. Its straight grain makes the wood appropriate for use as poles and pilings. White fir is also used for firewood although it does not produce much heat.

### Legal Status

Rocky Mountain white fir (*Abies concolor* var. *concolor*) is protected in Nevada as a Christmas tree. Please consult the PLANTS Web site and your State Department of Natural Resources for this plant's

current status (e.g. threatened or endangered species, state noxious status, and wetland indicator values).

### **Description**

*General:* Pine Family (Pinaceae). White fir is a large coniferous tree, growing up to 55 m tall and having a dbh of up to 1 to 2 m, depending on location. The bark is smooth, whitish-gray, and occasionally blistered with resin vesicles, becoming thick, hard and irregularly furrowed with age. The crown tends to be symmetrical and dome-shaped, although the varieties of white fir may exhibit differences in crown shape. California white fir has a cylindrical crown while Rocky Mountain white fir has a broader crown. Branches are short and stout, arranged in whorls of 4 or 5. Buds are blunt. Leaves (needles) are 3-7 cm long, loosely 2-ranked, rounded at the ends, and curved upward. A waxy covering gives the needles a bluish cast. Needles also have two white lines on their undersides. Cone production varies by site, tree size, and age. White fir trees begin cone production at about 40 years and bear cones at the upper third of the crown. Cones are 10-13 cm long, greenish-yellow becoming dark purple, produce about 185-295 seeds each, and shatter upon maturity. The seeds are released in the fall and germinate in the spring.

Key characteristics of white fir include the similar coloring on both upper and undersides of the needles, smooth bark with resin blisters, long needles (in comparison to other fir species), resinous buds, circular leaf scars, and a citrus odor that is released when the needle is broken.

Morphological and chemical characters, such as needle tip shape, stomatal arrangement, and terpene content, separate the two white fir varieties.

*Distribution:* White fir is native to the western United States, from Idaho, south through Colorado and New Mexico, and west through California and Oregon. The Great Basin creates the gap between the varieties. Rocky Mountain white fir occurs in the central portion of the white fir range, from southeastern California, Arizona, and New Mexico to southeastern Idaho and Colorado. It has also been planted in the New England states. California white fir occurs from central California into western portions of Nevada and southwest Oregon. It has been reported in southern California, although there is no confirmation that these plants are not the Rocky Mountain variety.

For current distribution, please consult the Plant Profile page for this species on the PLANTS Web site.

*Habitat:* In the mixed conifer forests of California and southern Oregon, white fir may form pure stands or share dominance with species such as incense-cedar, ponderosa pine, lodgepole pine, sugar pine, Jeffrey pine, and Douglas pine. It is also a secondary species in subalpine woodlands represented by whitebark pine, limber pine, mountain hemlock, lodgepole pine, western white pine and foxtail pine. California white fir is one of the coniferous dominants of the California hardwood forests. In the mixed-conifer forest of the Sierra Nevada Mountains, it may share dominance with incense cedar, ponderosa pine, sugar pine, and Douglas fir. The mesic sites at upper elevations of the Sierra Nevada Mountains are referred to as the white fir zone.

Within the Cascade Range of northern California and central Oregon, the white fir zone occurs at elevations above 1500 m. It is the dominant species, having 18 known associations with species like lodgepole pine, western serviceberry, mountain hemlock and Pacific rhododendron. It is also found within mixed conifer stands at mid-elevations. White fir is an indicator species of the lower elevation limit of montane forest vegetation in the Klamath Mountains of California and Oregon. At higher elevations, white fir shares dominance with red fir. In the mountain ranges of southern California, white fir becomes the dominant species at higher elevations. It is associated with sugar pine, incense cedar, and western juniper.

The white fir series in the major mountain ranges in the southwest can have any mixture of white fir with Douglas fir, Engelmann spruce, blue spruce, subalpine fir, ponderosa pine, and southwestern white pine. It is a dominant or climax species of several habitat types and series in Arizona, New Mexico, Utah, and Colorado.

In Utah, white fir occurs throughout the higher mountain ranges of the northwestern region and increases in importance through southern Utah. It occurs in subalpine zones with Engelmann spruce and blue spruce in the Douglas fir series and ponderosa pine habitat types.

In southern Colorado and northern New Mexico, white fir is a co-climax species with Douglas fir and is associated with blue spruce, limber pine, ponderosa pine, Engelmann spruce, subalpine fir, quaking aspen, and Rocky Mountain juniper. The white fir-

Douglas fir-ponderosa pine series is the most widespread and one of the most varied types in Arizona and New Mexico. In mixed conifer forests, dominated by the white fir-gambel oak habitat type, white fir shares climax status with Douglas fir. Other associates include Chihuahua pine, Rocky Mountain lodgepole pine, Mexican pinyon, and New Mexico locust.

White fir is widespread in riparian areas of Utah, Wyoming, Colorado, Arizona, and New Mexico. It is associated with boxelder and narrowleaf cottonwood in Utah, blue spruce and lodgepole pine in Wyoming, and with blue spruce, cottonwood species, and Rocky Mountain maple in Colorado, Arizona, and New Mexico. More detailed habitat descriptions can be found in Zouhar (2001).

### **Adaptation**

The USDA hardiness zones of white fir range from 3 to 7. It occurs at varied elevations, ranging from 900 m to over 3000 m. Annual precipitation varies among white fir sites from 350 mm to 1240 mm. White fir tends to occupy more mesic sites at lower elevations and more xeric sites at upper elevations. It grows on acidic soil, most types of parent material, and is tolerant of a wide range of soil conditions, nutrient availability, and pH. It grows best on moderately deep and well-drained sandy- or clay-loam soils. It is moderately sensitive to excess soil moisture and is less tolerant of shade compared to associated true firs. Dense shade will decrease the growth rate, but will not kill the tree.

### **Establishment**

Germination and early growth are best if seeds have fallen on bare mineral soil before the permanent snow cover has fallen. Root systems are longer, heavier, and have more mycorrhizal root tips if grown in bare mineral soil. Seedlings are best established in partial shade, but can also establish in dense shade. Once established, it grows best in full sun.

### **Management**

White fir is easily killed by fire. Low branches provide a ladder for understory fire to reach the canopy. Prescribed burning is recommended if pure stands of white fir are not desired and to reduce fuel loading. Burns will promote suckering of other tree species so that pure stands of white fir will not form.

White fir can be managed for timber harvest. Shelterwood methods have the best regeneration results. Some overstory removal provides enough

light for white fir regeneration, but also provides enough shade to prevent the regeneration of other species. Many white fir stands have been managed using even-aged management techniques.

Mycorrhizal associations are important to the growth and health of white fir. Bare mineral soils promote these associations that aid in establishment on poor sites.

Lack of management in white fir stands may increase the trees' chances of susceptibility to insect pests and diseases.

### **Pests and Potential Problems**

Dwarf mistletoe is a common pest of white fir. The parasitic plants germinate on white fir branches and force their roots into the phloem of the host branch. Dwarf mistletoe weakens the tree and leaves it susceptible to fungal infections and insect attacks. It also creates stem cankers that leave the wood weak and unsuitable for use as lumber.

Wounding, as a result of mechanical injuries, fire, insects, or frost cracks, promotes or provides entrance for fungi into white fir trees. *Annosus*, *Armillaria*, laminated root diseases, yellow cap fungus, Indian paint fungus, and white pocket rot reduce plant productivity and cause wood decay and mortality. Fungal infections also promote susceptibility to insect infestations.

The fir engraver beetle (*Scolytus ventralis*), a member of the bark beetle family, causes high mortality in white fir stands. The beetle bores holes into the main stem, often in bark crevices at the branch and trunk junctions. Once under the bark, adults engrave egg galleries into the sapwood, disrupting the flow of water and nutrients to that portion of the plant. The appearance of yellowed or reddened branches on an otherwise green tree is early evidence of fir engraver infestation. Fir engravers can kill the plant. The only known preventative is proper maintenance of white fir trees.

White fir in shallow soils can be damaged by strong winds. The chances of windthrow are increased when neighboring trees are removed.

### **Seeds and Plant Production**

White fir is produced by seeds. Seeds are ready for collection when the cone easily breaks apart. A cold stratification period up to 60 days is required. Germination will occur under an alternating temperature cycle of 30°C daytime and 20°C nighttime temperatures.

White fir is easily transplanted, although it is somewhat sensitive to being transplanted in autumn. If planted in autumn, care should be taken to fertilize, thoroughly water, adequately mulch, amend the soil, and avoid winter salt spray. These care practices will enhance the chances for survival during the first winter.

### **Cultivars, Improved, and Selected Materials (and area of origin)**

The USDA NRCS Plant Materials Program has not released white fir cultivars for conservation use.

Ornamental cultivars are somewhat available from commercial growers in ball and burlap form:

'Blue Cloak'	'Dwarf Blue'
'Blue Globe'	'Gables Weeping'
'Blue Select'	'Glenmore'
'Candicans'	'Nana'
'Compacta'	'Sherwood Blue'
'Conica'	'Winter Gold'

### **References**

Agricultural Research Center. 2004. *GRIN taxonomy* (<http://www.ars-grin.gov/cgi-bin/npgs/html/index>, 29 June 2004). USDA, Beltsville.

Aldworth, S.J. 1998. *Abies concolor*. ([http://project.bio.iastate.edu/trees/campustree/ISU\\_trees.html](http://project.bio.iastate.edu/trees/campustree/ISU_trees.html), 29 June 2004). Iowa State University, Ames.

Baskin, C.J., J.M. Baskin. 2001. *Propagation protocol for production of container Abies concolor (G&G) Lindl. plants*. (<http://www.nativeplantnetwork.org>, 29 June 2004). College of Natural Resources, University of Idaho, Moscow.

Brand, M. 2001. *University of Connecticut plant database* (<http://www.hort.uconn.edu/plants/>, 29 June 2004). University of Connecticut, Storrs.

Earle, C.J. 2004. *Gymnosperm database* (<http://www.conifers.org/index.htm>, 29 June 2004). Department of Botany, University of Bonn, Germany.

Heatley, R. 1999. *Ornamental plants plus*, Version 3.0 (<http://www.msue.msu.edu/imp/modzz/masterzz.html>, 29 June 2004). Michigan State University Extension, East Lansing.

Rhodes, T. 2002. *PlantFacts database* (<http://plantfacts.osu.edu/>, 29 June 2004). The Ohio State University, Columbus.

Virginia Tech Forestry Department. 2003. *Dendrology tree fact sheets* (<http://www.cnr.vt.edu/dendro/dendrology/factsheets.cfm>, 29 June 2004). Virginia Polytechnic Institute and State University, Blacksburg.

Zouhar, K. 2001. *Abies concolor*. (<http://www.fs.fed.us/database/feis/>, 29 June 2004). Rocky Mountain Research Station, USDA Forest Service, Missoula.

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