

Engelmann spruce (Picea Engelmannii)

The Engelmann spruce is the most widespread spruce tree in America, and is one of the important forest trees of the southern Rocky Mountain forest ecosystems. Engelmann spruce grows in areas of considerable moisture, usually above 8400 feet (2560 m). It is most often found in high forests, covering nearly 10 million acres of the southern Rockies. Subalpine fir is its most common associate. Engelmann spruce also grows in pure stands, or mixed with Lodgepole pine and other evergreens.

Common from 9300 to 11000 feet (2800 to 3400 m) and treeline in Colorado, the uniform spruce-fir woodlands sweep in broad undisturbed belts along many Colorado mountain chains. A climb up almost any peak in the Colorado Rockies will reveal the dark spruce-fir forest wrapping around the sides of all the surrounding mountains. A typical spruce-fir forest is on the western slopes of the Front Range from Berthoud Pass north to Rocky Mountain Park.

Below 9300 feet Engelmann spruce are found in moist locations. Large individuals grow at 8400 feet (2500 m) on the shores of Grand Lake. It can be found in streamside habitats as low as 7700 feet (2300 m). In Colorado and Wyoming it grows to 100 or 120 feet in height (30 to 36 m), to three feet in diameter (1 m), and may attain an age of 500 to 600 years. Trees 16 to 22 inches in diameter (40 to 56 cm) are often 350 to 450 years old. Engelmann spruce does best in rich deep moist soils.

Engelmann spruce lives longer than Subalpine fir. Consequently more of the large older trees in the spruce-fir forest are Engelmann spruce. Engelmann spruce attains the spire-like form typical of spruces, though it is not so slender as the Subalpine fir. Some Engelmann spruce closely resemble the Blue spruce, even possessing the silvered or faintly bluish foliage.

Seed production begins after about 20 years. Cones with seeds are produced in moderate numbers, and released seeds are carried by the wind. They do better falling on soil than on dry forest litter. Some sun helps the young trees grow. Young Engelmann spruce do not tolerate either full shade, or dry sunny spots. Engelmann spruce can recolonize some burned areas.



The needles of the Engelmann spruce, while somewhat stiff, are not so stiff and sharp as those of the Blue spruce, and you can distinguish this tree from the Blue spruce by grasping the needles without a painful result. Other distinguishing features are the cones which are half the size of blue spruce cones though similar otherwise, and the bark on mature trees. New needles on Engelmann spruce may have the blue color associated with Colorado blue spruce, a species closely related to Engelmann spruce.

The scientific name of Engelmann spruce is "*Picea engelmannii* Parry ex Engelmann". The genus name *Picea* for the spruces is from the Latin picis for pitch. The species name honors George Engelmann, a notable nineteenth-century German-born physician and botanist, aresident of Saint Louis, and an authority on the conifers, cacti, vines, and wine grapes.

The seeds are eaten by many species of birds and the foliage is heavily browsed by bighorn sheep, deer, and porcupine. Spruce provides important cover for animals in the winter. Spruce is used for lumber, plywood, pulp, and even stringed musical instruments though little or no Colorado wood finds its way into such an exotic use.

Twisted Trunks

Bare trunks of Engelmann spruce, dead and stripped of bark, often show an unusual feature: the grain twisted along the entire trunk, in the same pattern as a candy cane. A twist may be noted in some living trees as well. Trunks with both right-handed and left handed twists can be found. I believe this is not caused by a biological growth characteristic, but is caused by a torque, atwisting force, imparted by wind. Clearly a tree fully exposed to wind is not twisted so much as bent and shaken. What happens in the spruce-fir forest is this. Most strong mountain winds are from one direction, usually from due west in the Colorado high country (except were surface topographic relief steers winds from purely westerlies). Due to some kind of obstruction – other trees or a rock outcrop for example – one side of a particular tree is more exposed to the perennial strong winds from one direction than the other side. The other side of the tree may be exposed to the same wind, but less so. The net force of the persistent wind, stronger on one side of the tree than the other, makes a twisting force which constantly tries to rotate the tree as it grows. The direction of the twist depends on which side of the tree was most exposed to the wind, and on which way the wind blows. Twisted trunks are found in other kinds of mountain trees as well.





The Colorado Spruce Beetle Outbreak 1997 - 2012

San Juan Mountains 2012; many spruce are dead. Photo by Susanna Gross © 2012.

An epidemic of spruce beetle has been killing Engelmann spruce across Colorado for several years. The spruce beetle, *Dendroctonus rufipennis*, is a close relative of the mountain pine beetle which is destructive of Lodgepole pines and other pines in the Rockies.

Spruce beetles can get a foothold in dead and downed trees. Swaths of trees felled by winds since 1997 have provided at least two such sources in Colorado. Logging which leaves abundant debris on the forest floor is ideal habitat for the beetles to establish themselves, and the beetles later move to nearby living trees.

"Spruce beetle activity in Engelmann spruce was detected on 262,000 acres in Colorado ... in 2011. Since 1996, spruce beetle has affected 1.2 million acres in Colorado and Wyoming. ...

In south central Colorado, spruce beetle epidemics expanded on the San Juan, Rio Grande and Grand Mesa National Forests, and are now being detected on the southern portions of the Gunnison National Forest and on the Wet Mountains in the San Isabel National Forest. Spruce beetle populations are rapidly expanding in some areas causing entire drainages to be infested in the course of one year. In some cases nearly every mature spruce has been killed in multiple drainages, from the creek bottoms all the way up to the high elevation krummholz.

In northern Colorado spruce beetle caused new tree mortality along the Medicine Bow and Rabbit Ears Mountains in Grand, Jackson, and Larimer Counties, with scattered pockets of spruce mortality along various mountain ranges in Routt and Summit Counties of Colorado. Scattered mortality continues to occur in and adjacent to the Mt. Zirkel Wilderness in Routt County which lost much of the mature

spruce to spruce beetles in the early 2000's following a large windthrow event in 1997. "

- USDA Aerial Detection Survey: 2011 Results (<u>http://www.fs.usda.gov/detail/r2/forest-grasslandhealth/?cid=stelprdb5348787</u>, accessed July 10, 2012)

"The outbreak in the northern Rawah Range near the Wyoming border was first discovered in 2005 during aerial forest health surveys. This outbreak has gradually moved south into Cameron Pass, Long Draw Reservoir, the Comanche Peaks Wilderness and Milner Pass in Rocky Mountain National Park. Much of the mature spruce trees in these areas are now dead or dying. Other areas in the state include the San Juan Range, the upper Rio Grande Basin and the Grand Mesa. The outbreak in the Weminuche Wilderness of the San Juan Mountains has been so severe that beetles have begun to attack small diameter stands of krumholz at the edge of timberline. Increased spruce beetle activity is also underway in the Greenhorn Peak area of the Wet Mountains west of Pueblo."

Bill Ciesla, Colorado State University Extension Service, 2012
(<u>http://www.ext.colostate.edu/pubs/columngw/gr120421.html</u>, accessed July 10, 2012)

There also was a severe outbreak from 1941 to 1952 in Colorado.



Engelmann spruce needles



Identifying features of Engelmann Spruce

Needles

Single (not in bundles); square in cross-section (four sided); you can roll them between thumb and forefinger, unlike fir needles which are also single but flat.

Each needle stands on a small woody peg which separates it from the twig. The woody peg-like bases of both Engelmann spruce and Blue spruce remain on the tree after the needles have fallen, so the twigs are rough.

Needles are one-half to 1 1/8 inch long, blunt or sharp pointed, and grow on all sides of twig; usually less than 1 inch long. Usually flexible enough that you can grasp a twig of needles without discomfort, unlike the Blue spruce, but much stiffer than Subalpine fir needles. On new growth white lines on each of the four sides give the needles a pale blue-green color very similar to Blue Spruce. Needles

otherwise usually dark green or dark bluish-green.

Cones

Mature cones are 1.0 to 2.5 inches long; usually 1.5 to 2.0 inches (blue spruce cones are over 2 inches long.) The cones hang down from the branch, whereas fir cones stand upright. After reaching maturity in August to September, the seeds are shed in October and the cone may fall during the winter. Scales of the mature cone are pale brown or red-brown, thin, stiff but flexible, and are diamond-shaped or pointed and have a ragged outer margin. Cones cluster in the upper half or near the top of large trees. Once you know the Engelmann spruce cone, recognizing it is one of the easy ways to identify the tree. Spruce cones lack the papery tongues or brachts of the Douglas-fir tree, though otherwise the cones are somewhat similar.

Bark

Typically in thin scales of pale gray, sometimes showing reddish underneath or turning entirely reddish or orange-brown.

The bark begins smooth and gray with small horizontal scars, not unlike the bark of Subalpine fir with which Engelmann spruce coexists. At diameter 6 inches or more the bark begins to break up into small thin scales which curl off the tree, sometimes orange-brown in color. Sometimes the bark remains entirely gray after scaling up. Often large trees of one or more feet in diameter have bark composed largely of cinnamon-red or orange-brown scales, especially on the sunny side. Such a tree may be gray to black on the other side. This characteristic is similar to the bark of the Lodgepole pine of similar size, which may be a neighboring tree. On the very oldest trees the bark can become deeply ridged or furrowed.

Judging by the bark alone, Engelmann spruce might be confused with Subalpine fir when young, or with Lodgepole pine when mature. The thin scaly bark of mature Engelmann especially spruce, when orange-brown, distinguishes it from Blue spruce, though always other as features are better identifiers than bark.





Engelmann spruce, Gladstone Colorado.

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