

A small tree on a rocky outcrop on Vinalhaven Island, Maine [C.J. Earle, Jul-2003].



Foliage on the above tree. The "tufted" appearance distinguishes this species from *Picea glauca* or *P. mariana* [C.J. Earle, Jul-2003].



Detail of twigs and foliage from a tree on Mt. Mitchell, North Carolina [C.J. Earle, 25-Oct-2004].



Current year cones on the above tree. Cone size is intermediate between *Picea glauca* and *P. mariana* [C.J. Earle, Jul-2003].



Previous year cones on the above tree [C.J. Earle, Jul-2003].



## *Picea rubens* Sargent 1898

### Common Names

Red spruce, eastern spruce, yellow spruce, épinette rouge (Canadian French) (Taylor 1993).

### Taxonomic notes

Syn: *Picea australis* Small 1903; *P. nigra* (Aiton) Link var. *rubra* (DuRoi) Engelmann; *P. rubra* (DuRoi) Link 1831, not A. Dietrich 1824. In eastern Canada this species hybridizes to a limited extent with *P. mariana* (Taylor 1993).

### Description

Trees to 40 m tall and 100 cm dbh; "crown narrowly conic. Bark gray-brown to reddish brown. Branches horizontally spreading; twigs not pendent, rather stout, yellow-brown, densely pubescent to glabrate. Buds reddish brown, 5-8 mm, apex acute. Leaves 0.8-2.5(3) cm, 4-angled in cross section, somewhat flexuous, yellow-green to dark green, not glaucous, bearing stomates on all surfaces, apex mostly acute to sharp-pointed. Seed cones 2.3-4.5(5) cm; scales broadly fan-shaped, broadest near apex, 8-12 × 8-12 mm, stiff, margin at apex entire to irregularly toothed.  $2n=24$ " (Taylor 1993). Cones ovoid, glossy, orange-brown (c.f. *P. mariana*), fusiform, matte.

### Range

Canada: Ontario, Québec, Prince Edward Island, New Brunswick, Nova Scotia; France: St. Pierre and Miquelon; USA: Maine, New Hampshire, Vermont, Massachusetts, Connecticut, New York, Pennsylvania, New Jersey, Maryland, Virginia, West Virginia, North Carolina and Tennessee; at 0-2000 m in upper montane to subalpine forests (Taylor 1993). See also Thompson *et al.* (1999). USDA hardiness zone 3.

### Big Tree

Height 37 m, dbh 137 cm, crown spread 12 m, located in Great Smoky Mountains National Park, North Carolina and Tennessee (American Forests 1996). The tallest known one is also in Great Smoky Mountains National Park; it is 46.33 m tall (Rucker 2003).

### Oldest

On 19-Oct-2005, the New Brunswick Telegraph-Journal published an account describing how Ben Phillips, a graduate student at Mount Allison University, had found a tree 445 years old while studying the Fundy basin fog forest in New Brunswick, Canada. His major professor, Colin Laroque, informed me that "The tree had a very complex life. We crossdated it with other trees in the stand for about 300 years, and these trees crossdated very well with our other samples from the region. We then crossdated it back for about another 100 years using chronologies from dated and undated historical structures that we had in our database from the region. The tree(s) helped lock in a few floaters and so we are very confident it crossdates back to nearly the pith of the tree. The tree was 13.5 cm from pith to bark on one side and slightly longer on the other. The core was taken at breast height and so it is older than the 445, but we do not want to speculate on how long it took to reach DBH" (Colin Laroque e-mail 23-Oct-2005).

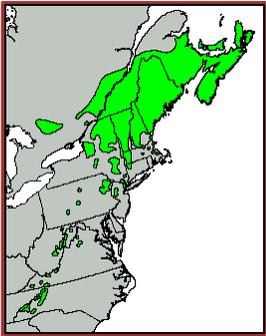
Formerly, the oldest known individual was 405 years (crossdated) for a specimen from Nancy Brook, NH collected by Paul Krusic (Brown 1996).



Bark on 30 cm (above) and 35 cm (below) dbh trees on Mt. Mitchell in North Carolina [C.J. Earle, 25-Oct-2004].



Trees in habitat on Grandfather Mountain, North Carolina [C.J. Earle, 26-Oct-2004].



Distribution map (USGS 1999).

## Dendrochronology

Quite a few tree-ring studies were done in studies of the effects of acid rain on tree growth; examples include work by Adams et al. (1990), Cook et al. (1992), and Johnson and Siccama (1989). It has also been used in many forest decline studies and environmental chemistry studies that grew out of the acid rain work, studies of spruce budworm, studies of climate variation, growth-and-yield studies, forest history studies, and a few methodological and miscellaneous ecological studies.

## Ethnobotany

The long roots were pulled up by native peoples, peeled and split for lacing. The pitch was used for patching holes and leaking seams (**Native Tech**). The gum was formerly collected and processed for chewing gum (Hart 1959). Early settlers (and no doubt some modern homebrewers) used the fresh green foliage to flavor fermenting beer. It is still harvested for timber.

## Observations

Can be readily seen in high elevation forests of the Appalachian Mountains, including the Great Smokies National Park (NC/TN), the White Mountains (NH) and the Adirondacks (NY).

## Remarks

Air pollution, including both acid precipitation and nitrogen deposition, has been implicated in extensive dieback of red spruce forests in the Appalachian Mountains (Eagar and Adams 1992). "Up to now, acid rain has been associated with the decline of forests in certain specific locations. DeHayes and colleagues, UVM senior researcher Gary Hawley and USDA Forest Service scientist and UVM adjunct faculty Paul Schaberg previously documented the mechanism through which acid rain depletes calcium and weakens high elevation red spruce trees, making them more vulnerable to winter freezing injury. Their new work shows that this mechanism is also applicable to other tree species, including balsam fir, white pine, and eastern hemlock. Because calcium is a critical ingredient in the plant's stress response system, acid rain's depletion of cellular calcium may suppress the capacity of trees to survive environmental stresses" (Science Daily, 18-Jul-2002). There is a huge literature on this subject; to get a sampling, try " acid rain red spruce " in your search engine.

Red spruce is the provincial tree of Nova Scotia (**Taylor 1993**).

## Citations

Adams, H.S., McLaughlin, S.B., Blasing, T.J., Duvick, D.N. 1990. A survey of radial growth trends in spruce in the Great Smokey Mountains National Park as influenced by topography, age, and stand development. Oak Ridge National Laboratory Publication TM-11424. 62 pp.

Cook, E.R. and Zedaker, S.M. 1992 The dendroecology of red spruce decline. P. 192-231 in *Ecology and Decline of Red Spruce in the Eastern United States* (C. Eagar and M.B. Adams, eds.). New York: Springer-Verlag.

Hart, Arthur C. 1959. *Silvical characteristics of red spruce*. Paper No. 124. Durham, NH: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 18 p.

Johnson, A.H. and Siccama, T.G. 1989. Decline of red spruce in the high-elevation forests of the northeastern United States. P. 191-234 in *Air Pollution's Toll on Forests and Crops* (J.J. MacKenzie and M.T. El-Ashry, eds.). New Haven: Yale University Press.

## See Also

**Burns & Honkala 1990.**

Eagar, C. and M.B. Adams (eds.). 1992. *Ecology and Decline of Red Spruce in the Eastern United States*. Ecological Studies 96. New York: Springer-Verlag.

**Elias 1987.**

**Farjon 1990.**

**Little 1980.**

**FEIS database.**

Mello, Robert A. 1987. *Last Stand of the Red Spruce*. Island Press. Washington, DC. 199 pp.

**Morgenstern and Farrar 1964.**

**Sargent 1922.**

Seymour, Robert S. 1995. Northeastern Spruce-Fir Forests. In *Status and Trends of the Nation's Biological Resources*. USGS electronic publication.

<http://biology.usgs.gov/s+t/SNT/noframe/ne121.htm>, accessed 3-Sep-2002.

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