

NH Big Tree of the Month

Red Spruce (*Picea rubens*)

Anne Krantz, UNH Big Tree Committee, Hillsborough County Chair

The view of the forest from a northern NH ski lift is predominately a view of snow covered red spruce trees, the slender, cone-shaped conifer that is the essence of the north woods and mountain terrain. This tough tree withstands brutal weather. They can be totally buried in snow and ice on mountain peaks and survive the extreme high winds and low temperatures, although under these fierce conditions they grow slowly with a more scrubby appearance and shape. Since few other trees can tolerate harsh, high elevation climate, it is found abundantly on mountain tops up to elevations around 4,000 feet, where it grows in pure stands of tightly packed saplings. In the Northeast, balsam fir is its main competitor in the high mountains where it does better than red spruce above 4,000. Lower on the mountain sides red spruce grows to 40 – 80 feet and can live 400 years!

Photo A Red Spruce in winter

Unlike white and black spruce trees that extend all across Canada to Alaska, red spruce grows only in the eastern mountains of North America: Catskills and Adirondacks of NY, the Berkshires in MA, the Green Mountains of Vermont, the very tops of the Monadnock Mountains and all through the White Mountains in NH, across all of Maine, and up through Canada from the St. Lawrence region, to New Brunswick and Nova Scotia.

Photo B – Red spruce on Crotched Mt. with view of Mt. Monadnock in distance.

Jon Nute, UNH Extension Hillsborough County Forester has heard this speculation about the NH mountain top patches of red spruce: *"The consensus is that as the glaciers retreated 14,000 years ago, and the forests moved back north, reestablishing themselves 12,000 years ago, these patches of "northern forest" were able to linger behind at these high elevation locations in southern NH. "* It is the only spruce that is found in the US South, growing in isolated patches in the southern Appalachian Mountains.

Red spruce is one of three native spruce trees in NH; the others are white spruce and black spruce. They can be confusing to tell apart. Naturalist Virginia Barlow offers some clues in her article in Northern Woodlands Magazine, Winter 2001, page 35.

(<http://www.northernwoodlands.org/>)

"Our three common native spruces can be easily identified by smelling a handful of the

crushed needles. Red spruce will remind you of orange rind; white spruce smells of polecat or skunk; and black spruce has a medicinal, menthol smell. Another way to tell them apart is to compare the lengths of the needles and cones, which increase in alphabetical order: black spruce is the shortest, red spruce intermediate and white spruce the longest."

All spruces have square needles, while firs like native balsam have flat needles. The rigid square shape of spruces makes them prickly when grabbed while fir needles are softer. The spiky red spruce needles grow around the branch leaning toward the tip, and are the darkest green of the three native spruces.

While hiking in the Whites last fall I noticed collections of pretty, new red spruce cones on the trail. Closer inspection showed a clean cut at the base indicating that they had been 'harvested' by squirrels. Spruce cones hang down while fir cones flip up. The female seed cones grow at the tops of the trees, where they are wind pollinated by the smaller male cones growing from the tips of the very top branches. Without the help of the squirrels the red spruce cones open as they ripen on the tree. The small, light seeds are disbursed by the wind. Unlike black spruce cones that cling on the tree twigs for years, the red spruce cones fall during the year. Cone production is widely variable and peaks every few years.

PHOTO B cones and seeds

The seeds germinate the following spring and do best in moist humus that isn't too thick. The roots grow slowly which makes them vulnerable to drying out and dying. In order to survive, the sprout's roots must reach through the humus layer to the moisture retentive soil below. Once established they can grow quickly in sun, or slowly in shade. An opportunistic pioneer species they thrive in sunny disturbed areas such as forest openings caused by wind throws or timber harvests. If the seeds germinate in shade the shade tolerate sprouts can survive for years under the high trees until the canopy trees topple and allows sun to rejuvenate the old, stunted trees.

Howard Lewis, Nursery Forester, NH State Forest Nursery, <http://www.nhnursery.com/>, who is responsible for the culture and management of the species they grow, reports that the red spruce seedlings sell out quickly. They are already sold out for this year, spring 2013.

"We make our collections of seed from squirrel cuts on Mount Kearsarge in the fall during cone years. The cones take some time to open in the greenhouse, but the seed seems to germinate easily. They are very susceptible to a damping off fungus that attacks the tiny

seedling just after germination. Our numbers of red spruce for sale are nowhere near what they are for white, Norway, or blue spruce because of the difficulty in obtaining seed."

Another reason seed is hard to find is that mice and voles like the seeds too and consume and store significant amounts. They are not partial to balsam fir seeds which results in more balsam seedlings and fewer spruce seedlings in naturally regenerated stands. Birds eat the seeds too and white-winged crossbills have a beak uniquely designed to pry apart the cones scales to retrieve the seeds at the base.

The shallow reddish roots that can be seen on worn hiking trails, do not anchor the trees well making them vulnerable to windthrow that can destroy pure stands.

Red spruce dieback from acid rain and air pollution is a problem most noticed in the southern Appalachian locations but it is seen throughout its range.

A few summers ago, I noticed that the tender new tips that were just a few inches long on some red spruce trees were dead and had turned a reddish color. In fact I first thought they were cones. The new growth seemed to have been nipped by a severe June frost. This same phenomenon caught forester and writer for *Northern Woodlands Magazine*, Michael Snyder's eye too. Read his alarming findings in his article *Why do Some Spruce Trees Appear Reddish in Winter?* January 27th 2012, <http://northernwoodlands.org/articles/article/spruce-decline> He explains how acid rain, fog and snow change the soil chemistry leading to a depletion of calcium that is needed for red spruce trees' winter hardiness.

Fire is another enemy of red spruce which accounts for its narrow range in the wet and cloudy regions of the Northeast. The tree's thin bark, shallow roots and flammable needles do not protect it from fire. Pitch pine, in contrast, is the most fire adapted tree in the northeast because it forms thick bark at a young age.

Spruce resin or gum collects slowly from trunk wounds and was used by Native Americans as an antiseptic for skin sores. Lumbermen discovered that it could be chewed as gum. Dave Fuller wrote "*Remembering Spruce Gum*" in *Northern Woodlands*, September 23rd 2011; http://northernwoodlands.org/knots_and_bolts/remembering-spruce-gum
"In the 1800s, an entire industry developed around the product. Maine was the largest producer of gum in the Northeast and had about 20 companies between 1848 and 1910."

Today red spruce is harvested for, pulpwood, plywood and in Canada for structural lumber. It is also used in boat building

Because of its straight tight grain and light weight red spruce wood is valuable for making musical instruments; the sounding board or top board in stringed instruments and in organs and pianos.

The largest Red Spruce in the *NH Register of Big Trees* is in Randolph, Coos County. It is 86 feet tall, with a circumference of 96 inches. There are only two other red spruces listed, another in Randolph, and one in Carroll County.

To see the list go to:

<http://extension.unh.edu/fwt/documents/CompleteListingofNHChampionTrees.pdf>

If you find red spruce trees of comparable or larger size in other NH counties, submit a nomination form so your newly discovered tree can be measured by members of the Big Tree Team in your county. It will be an automatic county champ! For instructions go to the NH Big Tree web site:

<http://extension.unh.edu/fwt/BigTrees.htm>

Here is a list of eight counties with possible mountains sites for finding red spruce trees to inspire hikers to be looking. While out on the trail carry a tape measure or a piece of string or so you can measure circumference at breast height (CBH). And of course get a GPS reading so you can direct others to the tree for official measuring.

Hillsborough: Pack Monadnock - 2,280,' Temple Mtn. – 2,081,' Crotched Mtn. – 2,055'

Cheshire: Mt. Monadnock – 3,165'

Sullivan: Croyden Peak 2,781'

Merrimack: Mt. Sunapee – 2,743, Mt. Keasarge – 2,937,' Raged Mt. – 2,240'

Belknap: Belknap Mt. 2,384'

Grafton: Cardigan Mt., 3,121,' White Mt National Forest

References:

http://plants.usda.gov/factsheet/pdf/fs_piru.pdf

http://www.na.fs.fed.us/pubs/silvics_manual/Volume_1/picea/rubens.htm