

# The Gymnosperm Database

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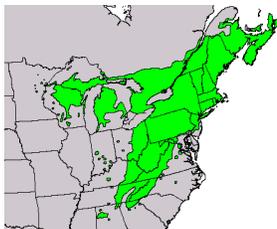
Large, old tree growing at milepost 309 along the Blue Ridge Parkway, North Carolina [C.J. Earle, 2004.10.26].



Cone and foliage from a tree growing near Linville Gorge, North Carolina [C.J. Earle, 2004.10.27].



Adaxial side of foliage specimen shown above [C.J. Earle, 2004.10.27].



Distribution map ([USGS 1999](#)).

## Tsuga canadensis

(Linnaeus) [Carrière 1855](#)

### Common names

Eastern hemlock, Canada hemlock, pruche du Canada ([Taylor 1993](#)), hemlock spruce.

### Taxonomic notes

Syn: *Pinus canadensis* Linnaeus 1763 ([Taylor 1993](#)).

### Description

Trees to 30 m; trunk to 150 cm dbh; crown broadly conic. Bark brownish, scaly and fissured. Twigs yellow-brown, densely pubescent. Buds ovoid, 1.5-2.5 mm. Leaves (5)15-20(25) mm, mostly appearing 2-ranked, flattened; abaxial surface glaucous, with 2 broad, conspicuous stomatal bands, adaxial surface shiny green (yellow-green); margins minutely dentate, especially toward apex. Seed cones ovoid, 1.5-2.5 × 1-1.5 cm; scales ovate to cuneate, 8-12 × 7-10 mm, apex ± round, often projected outward.  $2n=24$  ([Taylor 1993](#)).

### Range

Canada: All provinces east from Ontario, except Newfoundland; USA: All states E from Minnesota, Wisconsin, Indiana, Kentucky, Tennessee and Alabama except Florida; at 600-1800 m elevation. Habitat moist rocky ridges, ravines, and hillsides ([Taylor 1993](#)). See also [Thompson et al. \(1999\)](#).

The species is currently experiencing catastrophic range reduction as a result of infestation by the hemlock wooly adelgid, *Adelges tsugae*. This insect pest, introduced to North America from Asia in 1924, has been responsible for widespread dieback of *Tsuga canadensis* forests. The adelgid was a relatively minor pest until the mid-1980s, confined to parts of Virginia, Pennsylvania, New Jersey, New York and Connecticut. Recently it has begun rapid range extension and now occurs throughout much of the range of *Tsuga canadensis* from Georgia to Maine along and east of the Appalachian cordillera (USFS 2007). For further information, see also [HWA at the Eastern Native Tree Society](#).

### Big tree

The big tree story for this species is one of death and decline. Each giant tree has successively fallen victim to the hemlock wooly adelgid, and each successive living giant is smaller than the one before. Every one of the 15 largest trees that had been identified by about 2007 is now standing dead, and in a few years more they will be mere logs.

The largest hemlock recorded was located in late April 2007 after it had died; it was located in upper Caldwell Fork, Cataloochee, North Carolina and was 46.94 m tall with an estimated volume of 48.1 m<sup>3</sup> (Will Blozan email 2007.05.05).

From 2006 to 2009 the largest living hemlock was the Laurel Branch Leviathan, dbh 175 cm, height 46.6 m, stem volume 44.8 m<sup>3</sup>. See Blozan (2006) for these data, along with a great story and photos about climbing this giant tree. On June 2, 2009, Blozan revisited this tree and found that it had succumbed to the adelgid despite a concentrated program of efforts to save it by use of an appropriate pesticide treatment (Will Blozan email 2009.06.14).

At this time (July 2009) the largest hemlock is not known but may be the LeConte Creek Hemlock in the Great Smokies. When last seen in July 2007, this tree had a volume of 33.8 cubic meters (Will Blozan email 2009.06.14).

The tallest specimen on record was the Usis Hemlock near Cataloochee, North Carolina, which was 52.8 m tall, but which succumbed to the hemlock wooly adelgid in the summer of 2007 (Will Blozan email 2007.11.01). Blozan (2007) provides the details, along with story and photos about climbing this tree. The tallest known living tree is now the Noland Mountain hemlock, slightly more than 51.8 m tall (Will Blozan email 2007.11.01).

## Oldest

The oldest tree on record was specimen O39021, collected near Tionesta, Pennsylvania by Ed Cook in 1978. The oldest ring on this sample was crossdated to 1425, making it at least 554 years old (NCDC 2006). The same site had two other trees with over 500 years of record.

Another long record had a ring count of 515 for a recently cut tree 15 inches diameter in an old-growth stand at Angola-by-the-Lake in Erie County, New York (Vogel 1997). I would guess from the small size of the tree, in a stand dominated by trees 30 to 40 inches in diameter, that it spent a good part of its life as advance regeneration.

The oldest tree on the basis of a simple ring count made at a stump was 618 years (Hough and Forbes 1943).

One tree, sampled in the mid-1980s, had 385 rings at a point approximately 16 m above the base; the center was destroyed by rot below that height. The tree had fallen at that time and is thus dead. The time it took to grow to a 16 m height could have been anything from a few decades to several centuries, since hemlocks have the capability of persisting as understory trees for a very long time before a canopy disturbance permits them to grow into forest dominants. This old tree grew in the Alan Seeger State Forest Monument in central Pennsylvania, in a cove forest that somehow escaped the loggers ([Gove and Fairweather 1988](#), J.H. Gove e-mail 1999.02.22).

## Dendrochronology

Work has been done as early as 1941 (Meyer 1941). As of February 1999, there are approximately 60 studies involving this species. They primarily involve a diverse suite of ecological problems including site quality, stand development, insect attack, acid rain, historical land use, and impacts of anthropogenic climate change. It has also seen some use in reconstructing climate variation, archeological studies and numerous relatively esoteric topics. Incidentally, thanks to its distinctive pollen morphology, it is also an extremely important species in reconstructing postglacial vegetation change in the eastern U.S. and Canada.

## Ethnobotany

The wood is used extensively as construction lumber, and tannins produced by the bark were at one time used for tanning leather. The wood, however, tends to be brittle and inferior to that of the other North American hemlocks. Numerous cultivars of *Tsuga canadensis* have been developed, including compact shrubs, dwarfs, and graceful trees ([Taylor 1993](#)).

Eastern hemlock (*Tsuga canadensis*) is the state tree of Pennsylvania ([Taylor 1993](#)).

## Observations

I have seen it in locations from the Great Smokies National Park (Tennessee) to Killarney Provincial Park (Ontario). Some of the best examples I have seen were along the Blue Ridge Parkway in the Grandfather Mountain area, where it can be seen with [Pinus strobus](#) and [Pinus pungens](#).

## Remarks

## Citations

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## See also

[Burns and Honkala \(1990\)](#).

[Farjon \(1990\)](#).

[Prasad and Iverson \(1999\)](#).

The [Tsuga Search Project](#) of the Eastern Native Tree Society, accessed 2007.03.30.