

Plant Propagation Protocol for *Thuja plicata*
 ESRM 412 – Native Plant Production

URL: <https://courses.washington.edu/esrm412/protocols/2021/THPL.pdf>



<http://nativeplantspnw.com/wp-content/uploads/2014/01/IMG0162-624x832.jpg>

Woody cones and scale-like leaves held tightly to the branchlets

<http://nativeplantspnw.com/wp-content/uploads/2014/01/IMG0161-1024x788.jpg>

The tips of branches will often swoop upward

<https://mapping.uvic.ca/sites/mapping.uvic.ca/files/westredcedar.jpg>

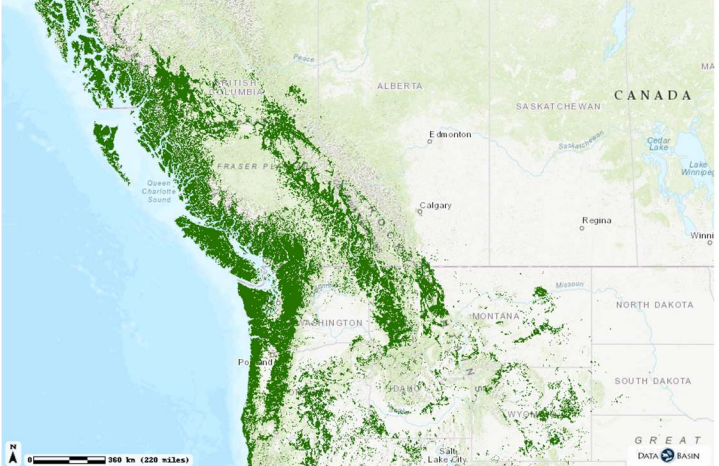
<https://friendsofpierpark.org/wp-content/uploads/2015/01/cedar-trunk.jpg>

Bark is in vertical stripes of red and grey

TAXONOMY

Plant Family	
Scientific Name	Cupressaceae
Common Name	Western redcedar
Species Scientific Name	
Scientific Name	<i>Thuja plicata</i> Donn ex D. Don
Varieties	<i>atrovirens</i> , <i>fastigiata</i> , <i>pendula</i>
Sub-species	
Cultivar	Atrovirens, Can Can, Excelsa, Fastigiata, Grune Kugel, Hogan Fastigiata, Stoneham Gold, Sunshine, Virscens, Zabrina (Breen, P. 2021)
Common Synonym(s)	<i>Thuja gigantea</i> , <i>menziesii</i> , <i>lobbii</i>
Common Name(s)	Western redcedar, Arborvitae, Giant arborvitae, Western arborvitae, Giant red-cedar, Pacific red-cedar, Shinglewood, Canoe cedar
USDA Plant Species Code	THPL

GENERAL INFORMATION

<p>Geographical range</p>	 <p style="text-align: center;">Mathys, A., Coops, N.C., and Waring, R.H. 2014</p>
<p>Ecological distribution</p>	<p>Western redcedar can be found throughout the Pacific Northwest ranging from the Pacific Coast of northern California to southern Alaska; the Cascade Mountain range of Oregon and Washington; and throughout the Rocky Mountains from southeastern British Columbia to western Montana (Brand, G. J., et al. 2008).</p>
<p>Climate and elevation range</p>	<p>Shade tolerant and prefers cool summers with wet mild winters from 0-2000 meters elevation (Nelson, G., & Moore, L. 2017).</p>
<p>Local habitat and abundance</p>	<p>Western redcedar is well adapted for moist environments and prefers ravines, depressions, forest swamps, and streams but can also be found on a variety of landforms including rocky slopes (Nelson, G., & Moore, L. 2017). This species develops extensive roots with a dense network of fine roots (Brand, G. J., et al. 2008). They usually occur in mixed coniferous forests and are rarely in pure stands.</p>
<p>Plant strategy type/successional stage</p>	<p>Often present in pioneer, seral, and climax stages of forest succession. Vegetative regeneration may be predominant in ecologically stable communities, but wide seed distribution allows it to invade disturbed areas. Western redcedar is highly shade tolerant and is well suited for reforesting high brush risk areas near the coast (Nelson, G., & Moore, L. 2017).</p>

Plant characteristics	Western redcedar can grow 45 to 60 meters tall and have a DBH of 120 to 240cm. (Harlow and others 1991, cited in Brand, G. J., et al. 2008) Many old specimens have leaders and dead spike tops. The bark has verticle stripes of red and gray bark and the branches swoop upward at the tips. Some trees have a recorded lifespan of 1460 years (Nelson, G., & Moore, L. 2017).
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PROPAGATION DETAILS

Ecotype	The seed bank should be harvested from a similar location as close to the target planting location due to local genetic diversity.
Propagation Goal	Plants
Propagation Method	Seed
Product Type	Container (plug) or bareroot (field grown) dependent on nursery cultural practices
Stock Type	66-164ml container (Olson 1994; Schaefer 1994, cited in Brand, G. J., et al. 2008)
Time to Grow	1-2 years depending on target specifications
Target Specifications	Dependent on use or request
Propagule Collection Instructions	<p>Cones can be picked by hand from standing or recently fallen trees. Cones can also be flailed or stripped into a sheet of canvas, burlap, or plastic.</p> <p>Collect seeds from late August to early September when seeds become firm and most cones have turned from yellow to brown. Peak seed-fall is about 4-6 weeks after the first cones open.</p> <p>Mature trees produce cones prolifically every 3-5 years but all cones do not open at the same time instead they open up gradually.</p> <p>(Brand, G. J., et al. 2008)</p>

Figure 1—*Thuja, arborvitae*: mature cones of *T. occidentalis*, northern white-cedar, with female cone buds on branch tips above the brown mature cones.



(Brand, G. J., et al. 2008)

Propagule Processing/Characteristics

Figure 2—*Thuja, arborvitae*: mature cones and seeds of *T. occidentalis*, northern white-cedar.



(Brand, G. J., et al. 2008)

Thuja, arborvitae seeds can be extracted from cones by either air-drying for 1-3 weeks or spread out to sundry. (VanSickle 1994, cited in Brand, G. J., et al. 2008)

Kiln-drying is more efficient for large quantities but higher temperatures increase probability that seeds will be damaged. Cones can be opened in:

- 24-36 hours at 33°C (Edwards 1986, cited in Brand, G. J., et al. 2008)
- 18-20 hours at 41°C (Owens and Molder 1984, cited in Brand, G. J., et al. 2008)
- 12 hours (Henchell 1994, cited in Brand, G. J., et al. 2008)

Open cones can be extracted in a mechanical cone shaker or tumbler and the seeds can be separated by fanning or gravity. Seeds should not be de-winged. (Edwards and Leadem 1988; Gordon and others 1991, cited in Brand, G. J., et al. 2008)

The average seed per cone can vary, but average at 2.6 seeds/cone.

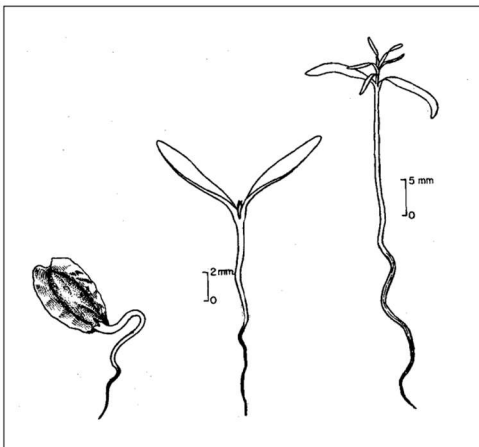
(Briand and others 1992, cited in Brand, G. J., et al. 2008)

One kilogram of clean Western redcedar contains on average 913,000 seeds. A seed aspirator or blower can separate empty seeds from full ones.

(Schopmeyer 1974, cited in Brand, G. J., et al. 2008)

Pre-Planting Propagule Treatments

Figure 4—*Thuja occidentalis*, northern white-cedar: seedling development at 1, 5, and 25 days after germination.



(Brand, G. J., et al. 2008)

Western redcedar seeds are orthodox in storage behavior and should be stored in fiber containers with plastic or foil liners. Maintain a moisture content of 5-10% and place them in sealed containers at 0 to 5 °C. They should remain viable for up to 5 years and for longer periods, storage at -18 °C is recommended. (Gordon and others 1991, cited in Brand, G. J., et al. 2008)

The need for stratification uniformly is unclear. Some authors others recommend stratification for 30 to 60 days in moist medium at 1 to 5 °C (Henchell 1994; Schopmeyer 1974, cited in Brand, G. J., et al. 2008). Others report that 2 weeks of stratification will improve germination (Dirr and Heuser 1987, cited in Brand, G. J., et al. 2008).

Germination is tested by placing seeds on top of moist germination paper kept at 20 to 30 °C; no pretreatment is recommended. Germination is epigeal (figure 4).

<p>Pre-Planting Propagule Treatments Continued</p>	<p>The first count of germinated seeds is made after 7 days and the last count after 21 days. (ISTA 1993, cited in Brand, G. J., et al. 2008)</p> <p>Due to the small size and irregular shape, it may be helpful to coat the seeds with a fine-textured material such as clay, sand, charcoal or peat in an attempt to make them more uniform but should only be done just before sowing.</p> <p>Seedlings in larger containers are grown in the greenhouse for 10 to 18 months before outplanting. Seeds sown in the containers are covered with a thin layer (about 0.3 cm) of crushed granite or quartz. (Olson 1994; Schaefer 1994, cited in Brand, G. J., et al. 2008).</p> <p>Seeds should be sown at .15cm and covered with a double layer of hydromulch. Seeds can also be sown directly on the surface and pressed into the soil and covered with shade material. (Edwards and Leadem 1988, cited in Brand, G. J., et al. 2008)</p> <p>50-70% shading is recommended for the first year. Soil moisture must be monitored closely because seeds and seedlings are sensitive to drying. (Henchell 1994, cited in Brand, G. J., et al. 2008)</p>
<p>Establishment Phase Details</p>	<p>Western redcedar seedlings grown in containers and chemically root pruned by painting the inside of the container with latex paint containing copper carbonate showed good height and volume growth when outplanted (Curran and Dunsworth 1988, cited in Brand, G. J., et al. 2008).</p>
<p>Length of Establishment Phase</p>	<p>Unknown</p>
<p>Active Growth Phase</p>	<p>Unknown</p>
<p>Length of Active Growth Phase</p>	<p>Unknown</p>
<p>Hardening Phase</p>	<p>In container grown western redcedar, a mild nitrogen and moisture stress after the seedlings reach 8 to 10 cm produces hardened stock with a balanced root to shoot ratio. (Schaefer 1994 cited in Brand, G. J., et al. 2008)</p>
<p>Length of Hardening Phase</p>	<p>Unknown</p>
<p>Harvesting, Storage, and Shipping</p>	<p>Unknown</p>

Length of Storage	Spring-planted seeds are ready for outplanting in the fall or following spring. Seedlings in larger containers are grown in the greenhouse for 10 to 18 months before outplanting. (Olson 1994; Schaefer 1994, cited in Brand, G. J., et al. 2008)
Guidelines for Outplanting / Performance on Typical Sites	Seedlings grown for 1 year in containers and then transplanted to the nursery bed (plug+1 transplants) are well-balanced and have been successful when outplanted. (Ramirez 1993, cited in Brand, G. J., et al. 2008).
Other Comments	

INFORMATION SOURCES

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