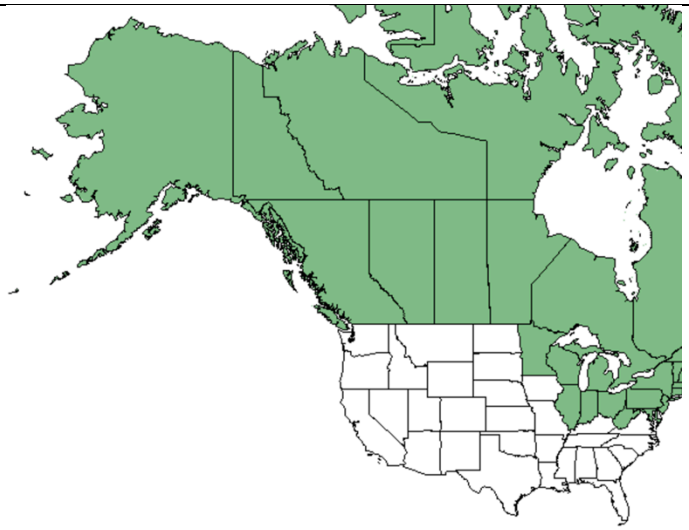
Plant Propagation Protocol for *Larix laricina (Du Roi) K. Koch*
ESRM 412 – Native Plant Production
Protocol URL: https://courses.washington.edu/esrm412/protocols/*[USDASpeciesCode.pdf]*

https://commons.wikimedia.org/wiki/File:Larix_laricina.jpg

TAXONOMY	
Plant Family	
Scientific Name	Pinaceae
Common Name	Pine family
Species Scientific Name	
Scientific Name	*Larix laricina* (Du Roi) K. Koch
Varieties	None Listed in USDA plants database.
Sub-species	None Listed in USDA plants database.
Cultivar	Dwarf varieties (commonly used as a Bonsai): 'Blue Sparkler' – bluish foliage 'Deborah Waxman' – up to 4 feet tall 'Lanark' – grows low and wide

	'Newport Beauty' – up to 2 feet tall (2).
Common Synonym(s)	Larix alaskaensis = Larix laricina var. Alaskensis Alaskan populations used to be considered a separate species based on narrow cone, but variation is noted within the species (1).
Common Name(s)	Tamarack, eastern, American, or Alaska larch, and hackmatack (1).
Species Code (as per USDA Plants database)	LALA
GENERAL INFORMATION	
Geographical range)	 (1) No distribution within Washington state.
Ecological distribution	A species of the lowland boreal forests and subarctic most commonly found on peaty soils in swamps and muskegs (3).
Climate and elevation range	Tamarack can grow under extremely varied climatic conditions. Average winter temperatures range from -30° to -1° C (-22° to 30° F) and summer temperatures from 13° to 24° C (55° to 75° F). The lowest recorded temperatures range from -29° to -62° C (-20° to -79° F); the highest, from 29° to 43° C (85° to 110° F). Annual precipitation ranges from 180 mm (7 in) to 1400 mm (55 in). Of this less than half is in the frost-free period. The average frost-free period for tamarack ranges from probably less than 75 days over much of its range to 180 days along its southern limits. In the western portion of the range it is found between 180 and 520 m (4).

Local habitat and abundance	It occurs commonly with *Picea mariana*, *P. glauca*, *Abies balsamea*, or *Pinus banksiana*; boreal broad leaved trees such as *Populus tremuloides* and *P. balsamifera* occur usually after disturbance, Betula may be represented with tree and shrub species. The shrub layer is often well developed, with various ericaceous species (3).
Plant strategy type / successional stage	Colonizing species (often first to colonize after fire) shade-intolerant, and wet soil conditions (1).
Plant characteristics	Deciduous conifer tree. Grows to 20 meters tall, strongly self-pruning, with a straight, slender trunk and narrow, open, pyramidal crown that occupies one-third to one-half the bole length 25-30 years; branches whorled, horizontal or slightly ascending; short (spur) shoots prominent on twigs 2 years or more old. Bark of young trees is gray, smooth, becoming reddish brown and scaly. Leaves are deciduous, needlelike, 1-2 cm long, pale blue-green, produced in clusters on short shoots or singly along the long shoots, yellowing and shed in the fall. Seed cones are 1-2 cm long, upright; seeds winged, the bodies 2-3 mm long (1).
PROPAGATION DETAILS	
Ecotype	Eastern populations
Propagation Goal	Plants
Propagation Method	Seed
Product Type	Container (plug)
Stock Type	Open ground or 4x4 cm container
Time to Grow	2 years (5).
Target Specifications	9 to 18 inches (4).
Propagule Collection Instructions	Larch cones should be collected as soon as they ripen (early autumn) (5). Tamarack bears good seed crops at intervals of 3 to 6 years. Tamarack seeds are 3 mm (0.12 in) long and have light chestnut-brown wings 6 mm (0.25 in) long (4).
Propagule Processing/Propagule Characteristics	There are between 550,000 and 710,000 cleaned seeds per kg, on average (4). Cones should be spread out in thin layers to dry in sun or in well-ventilated cone sheds. The cones may be opened by solar heat, by heating in a cone kiln, or in a heated room, or mechanically. If using kiln, 8 hours at 120˚ F is recommended. After opening seeds can be removed by running through shaker and dewinging with a dewinging machine, or by treading in a grain sack or hand-rubbing. Finally seed can be cleaned with a blower or fanning mill (5).

Pre-Planting Propagule Treatments	Seeds germinate fairly well without pretreatment (4) (6), although physiological dormancy has been noted by some (7). Seeds can be stored for up to 4 years, at a moisture content of 2 to 5%, at -8 to -6 ˚C (18 to 22˚ F) temperature (5), and up to 18 years at 0 to 2 ˚C (8). Seeds can placed in cold moist stratification at o to 5 ˚C (32 to 41 ˚F) for 14 to 42 days. Germination occurs at 30˚C day /20˚C night (86˚F day /68˚C night) alternating temperature cycle. Germination is greater in light than in dark (7).
Growing Area Preparation / Annual Practices for Perennial Crops	Sown in fall (no pre-treatment of seeds) and covered with 1/8- to 1/4-inch soil. Fall-sown beds should be covered with mulch for the first winter. (5). If using stratified seed, sow in Spring in containers (plug) and cover with 1/8- to 1/4-inch soil. (7).
Establishment Phase Details	29 days (5).
Length of Establishment Phase	
Active Growth Phase	
Length of Active Growth Phase	
Hardening	
Length of Hardening Phase	
Harvesting, Storage and Shipping	
Length of Storage	
Guidelines for Outplanting / Performance on Typical Sites	
Other Comments	

PROPAGATION DETAILS	
Ecotype	Thunder Bay, Northwestern Ontario and Lake States (specific conditions not described in study).
Propagation Goal	Plants
Propagation Method	Vegetative
Product Type	Container (plug)
Stock Type	
Time to Grow	10 to 12 months
Target Specifications	20 cm
Propagule Collection Instructions	Take cuttings 6 to 10 cm in length from the lower crown of trees less than 5 years old in Spring, around the time of bud break (mid-summer cuttings may work, but subject to more overwintering stress) (9) (10).
Propagule Processing/Propagule Characteristics	Treat roots with indolebutyric acid to promote rooting (optional).
Pre-Planting Propagule Treatments	
Growing Area Preparation / Annual Practices for Perennial Crops	*L. laricina* will grow in many soil conditions. Rooting media experiments show little difference in rooting success between pure peat, pure perlite or a 50:50 mix of peat and vermiculite (10).
Establishment Phase Details	Place cuttings on mist bench (6). Mist duration of 5 seconds every 5 minutes have been successful (10). Expose to natural photoperiods.
Length of Establishment Phase	6 weeks
Active Growth Phase	Continue growing cuttings on mist bench.
Length of Active Growth Phase	6 weeks.
Hardening Phase	Gradually reduce misting (6).
Length of Hardening Phase	2 weeks (6)
Harvesting, Storage and Shipping	
Length of Storage	Overwinter spring cuttings in outdoors or in a cool greenhouse.
Guidelines for Outplanting / Performance on Typical Sites	
Other Comments	The time of collection of cuttings may influence how the plants are overwintered in a nursery setting (6) (9). If collected in mid to late summer, may be more susceptible to overwintering stress if not enough roots have developed, so overwintering in a moderated environment may help. If cuttings were taken in spring, overwintering outside should be sufficient.

INFORMATION SOURCES	
References	1. Nesom, Guy. "Larix Laricina (Du Roi) K. Koch." *USDA Plants Database*. Accessed April 25, 2017. https://plants.usda.gov/core/profile?symbol=LALA. 2. Brand, Mark. "Larix Laricina, Tamarack, Eastern Larch - Plant Database - University of Connecticut." *University of Connecticut Plant Database*, 2015. http://www.hort.uconn.edu/plants/detail.php?pid=247. 3. Farjon, Aljos. *A Handbook of the World's Conifers*. Leiden ; Boston: Brill, 2010. 4. Johnston, W.F. "Larix Laricina." In *Silvics of North America*, R.M. Burns and B.H. Honkala (technical coordinators) . 1:141–51. Agriculture Handbook (United States. Department of Agriculture) ; No. 654. Washington: USDeptof Agriculture, Forest Service : For sale by the Suptof Docs, USGPO, 1990 5. Rudolf PO. *Larix* Mill., larch. In: Schopmeyer CS, tech. coord. Seeds of woody plants in the United States. Agric. Handbk. 450. Washington, DC, 1974. 6. Reinholt, Ronald. "A Vegetative Propagation System for Tamarack." *Northern Journal of Applied Forestry* 3, no. 3 (1986): 91–93. 7. Baskin, Jerry M., and Carol C. Baskin. "Native Plant Network — Reforestation, Nurseries and Genetics Resources." *Propagation Protocol for Production of Container (Plug) Larix Laricina (Du Roi) K. Koch,* 2002. https://npn.rngr.net/renderNPNProtocolDetails?selectedProtocolIds=pinaceae-larix-1426. 8. F. T. Bonner, Robert P. Karrfalt, and United States. Forest Service. *The Woody Plant Seed Manual*. Agriculture Handbook (United States. Department of Agriculture) ; No. 727. Washington, D.C.]: USDeptof Agriculture, Forest Service, 2008. 9. Pottinger, A. J., and E. K. Morgenstern. "An Investigation of Factors Influencing the Successful Propagation of Young Tamarack Stem Cuttings." ProQuest Dissertations Publishing, 1985. 10. Carter, Katherine K. "Notes: Rooting of Tamarack Cuttings." *Forest Science* 30, no. 2 (1984): 392–394.
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