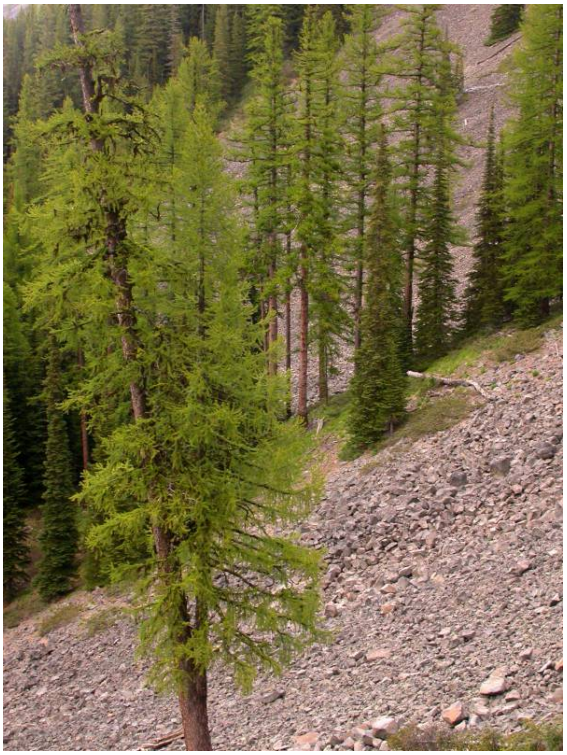
**Plant Propagation Protocol for *Larix occidentalis*, Western larch**
ESRM 412 – Native Plant Production
URL: https://courses.washington.edu/esrm412/protocols/*2022*/*LAOC.pdf*

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| **TAXONOMY** | |
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| Plant Family | |
| Scientific Name | Pinaceae |
| Common Name | Pine Family |
| Species Scientific Name | |
| Scientific Name | *Larix occidentalis* Nutt. |
| Varieties | N/A |
| Sub-species | N/A |
| Cultivar | N/A |
| Common Synonym(s) | N/A |
| Common Name(s) | Western larch, western tamarack, hackmatack, or mountain larch (5). |
| Species Code (as per USDA Plants database) | LAOC |
| **GENERAL INFORMATION** | |
| Geographical range | *Larix occidentalis* grows from southeastern British Columbia and western Alberta down to the eastern slopes of the Cascades in Washington and Oregon, the |

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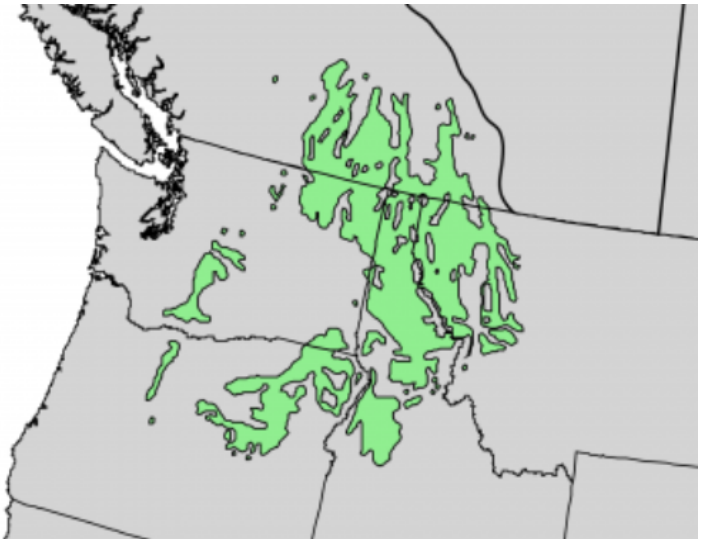
| | Upper Columbia Basin in western Montana, the Blue Mountains of southeast Washington and northeast Oregon, and northern and west-central Idaho (2).<br>  <br>Range map of *Larix occidentalis* (2) |
| Ecological distribution | Western larch grows in regions from foothills to mid-montane, with rare subalpine sites (4). |
| Climate and elevation range | Western larch grows in moist conditions at elevations from 650-2450 meters (4). It prefers deep, well-drained and fairly nutrient-rich soils, with soil types ranging from glacial till to volcanic ash (3). Its range is limited by low temperatures in higher elevations and low moisture in lower elevations (1). Mean annual temperature within the larch zone is about 7° C (45° F), but annual maximums average 29° C (84° F) and minimums average -9° C (15° F) (5). |
| Local habitat and abundance | Western larch is rarely found in pure stands, and most often occurs with Douglas-fir (*Pseudotsuga menziesii*). It is associated with Ponderosa pine in drier, low-elevation areas and can be found with grand fir (*Abies grandis*), western hemlock (*Tsuga heterophylla*), western redcedar (*Thuja plicata*), and western white pine (*P. monticola*) in warmer, moist forests (2). In cool, moist, subalpine forest types Engelmann spruce (*Picea engelmannii*), subalpine fir (*A. lasiocarpa*), lodgepole pine (*Pinus contorta*), and mountain hemlock (*Tsuga mertensiana*) are more common (1).<br><br>Hardwoods that occur with western larch include paper birch (*Betula papyrifera*), black cottonwood (*Populus* |

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| | *balsamifera* ssp. *trichocarpa*), and quaking aspen (*P. tremuloides*) (2).<br><br>Larch forests typically have a rich herbaceous understory (1). Its primary understory associates include common beargrass (*Xerophyllum tenax*), huckleberry (*Vaccinium* spp.), thimbleberry (*Rubus parviflorus*), ninebark (*Physocarpus malvaceus*), serviceberry (*Amelanchier* spp.), and bearberry (*Arctostaphylos uva-ursi*) (2). |
| Plant strategy type / successional stage | Western larch is a fast-growing and long-lived seral species that is always in mixed communities (1). It is not considered a climax species, but is an early successional species (2). It is the most shade-intolerant conifer in the Northern Rockies (1). |
| Plant characteristics | Western larch is a deciduous conifer, growing as tall as 80 m and reaching diameters of 140 cm (3). It is thick-barked and fire-resistant (1), with large, reddish-brown and flaky plates (3). Its needles are thin and light green, 2.5-5 cm long, linear, flattened to triangular in cross section, and occur in whorls of fifteen to thirty at the tips of short spur shoots (6). In autumn, the needles turn golden and fall off the tree (1). Male and female flowers are borne separately on the same tree. Cones are 2-4 cm long and are green brown-purple when ripe. Cones have papery scales with small, pointed bracts extending beyond each scale (3). |
| **PROPAGATION DETAILS** | |
| Ecotype | Intermountain sites (7). |
| Propagation Goal | Plants (2). |
| Propagation Method | Seed (3). |
| Product Type | Container (plug) (4). |
| Stock Type | 172 ml containers (4), though 207 ml containers have been shown to facilitate greater growth in drier soil conditions (7). |
| Time to Grow | 7 to 12 months (4, 3). |
| Target Specifications | Container seedlings should be 15 cm in height and 6 mm in caliper, with root systems forming a firm plug in conetainer (4). |
| Propagule Collection Instructions | Larch cones ripen in the fall and are collected in September and October, when they turn purplish-brown and the scales begin to reflex. Collect cones by cutting branches and store in paper bags (4). |

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| | Spread cones out in thin layers to dry after collection, then open with heat (either in a kiln at 45° C for 8 hours, or stored in a heated room) or by opening by hand (3). |
| Propagule Processing/Propagule Characteristics | Clean seeds with a blower or fanning mill (3).<br>Seeds can be stored for over 7 years if stored in sealed containers at 0° C.<br>Western larch seed dormancy is classified as physiological dormancy (4).<br>Seed condition may be determined by seed morphology and anatomy. The cutting test for determining seed condition is recommended (10).<br>Seed density (seeds/Kg) is 300,000/kg, % purity is 100%, and % germination is 70% (4). |
| Pre-Planting Propagule Treatments | Western larch seeds should be soaked in cold running water for a minimum of 24 hours before starting stratification (4).<br><br>It has been shown that long cold stratification is ideal for seedling growth, up to 80 days. Longer stratification leads to higher germination rates and more consistent seedling growth (9). |
| Growing Area Preparation / Annual Practices for Perennial Crops | Western larch is produced in a greenhouse and outdoor nursery growing facility (3).<br>Seeds should be direct-sown, covered lightly with media and watered thoroughly (4).<br>A low-density growth media composition improves post-transplant seedling growth (7). Seedlings are hand watered and remain in the greenhouse until mid May. Seedlings are then moved to an outdoor nursery for the remainder of the growing season (4). |
| Establishment Phase Details | Germination media is kept moist, and seeds shed their coats 7 to 10 days after emergence (4). |
| Length of Establishment Phase | Establishment phase lasts around 2 weeks (4). |
| Active Growth Phase | Western larch seedlings reach active growth phase after about 6 weeks, then are fertilized and can be inoculated with mycorrhizal fungi (4). |
| Length of Active Growth Phase | 20 weeks, with average height of 10 cm (4). |
| Hardening Phase | Trees are fertilized from August to September, and irrigation is gradually reduced in September and October. Plants are leached with clear water before winterization (4). |
| Length of Hardening Phase | 4 weeks (4). |
| Harvesting, Storage and Shipping | Total time to harvest Western larch is 6.5 months, with harvest date in September. Seedlings should be stored |

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| | in an outdoor nursery, under insulating covers and snow (4). |
| Length of Storage | 5 months (4). |
| Guidelines for Outplanting / Performance on Typical Sites | Outplanting is done in spring (4). Western larch seedlings may be tolerant of colder temperatures, leading to earlier spring planting dates (7). Some sources say to wait to plant after one year (3).<br><br>Seedlings should be planted in sites with high light availability, as survival decreases with decreasing light (8). |
| Other Comments | Only allowed to take up to 10% of the seeds (9). |
| **INFORMATION SOURCES** | |
| References | (1) Burns, R. M. and Honkala, B. H. 1990. Silvics of North America Vol. 1, Conifers. Washington: U.S. Dept. of Agriculture, Forest Service.<br>(2) Scher, J. S. 2002. Larix occidentalis. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory.<br>(3) Rose, Robbin, Dr. 1998. Propagation of Pacific Northwest Native Plants. Oregon State University Press.<br>(4) Luna, T., Evans, J., Wick, D., Hosokawa, J. 2008. Propagation protocol for production of Container (plug) Larix occidentalis Nutt. USDI NPS - Glacier National Park West Glacier, Montana. US Department of Agriculture, Forest Service, National Center for Reforestation, Nurseries, and Genetic Resources.<br>(5) Schmidt, W. C. and Shearer, R. C. 1976. Western Larch. U.S. Dept. of Agriculture, Forest Service.<br>(6) Funda, T., Chen, C., Liewlaksaneeyanawin, C., Kenawy, A. 2008. Pedigree and mating system analyses in a western larch (Larix occidentalis Nutt.) experimental population. Annals of Forest Science 65.<br>(7) Aghai, M. M., Pinto, J. R., Davis, A. S. 2014. Container volume and growing density influence western larch (Larix occidentalis Nutt.) seedling development during nursery culture and establishment. New Forests, 45.<br>(8) Chen, H. Y., and Klinka, K. 1998. Survival, growth, and allometry of planted Larix occidentalis seedlings in relation to light |

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| | availability. Forest Ecology and Management, 106.<br>(9) Sorensen, F. C. 1990. Stratification Requirements for Germination of Western Larch (Larix occidentalis Nutt.) Seed. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.<br>(10) Owens, J. N. 2008. The Reproductive Biology of Western Larch. Forest Genetics Council of British Columbia and the Inland Empire Tree Improvement Cooperative. |
| Other Sources Consulted | 1. Rehfeldt, G. 1995. Genetic variation, climate models and the ecological genetics of Larix occidentalis. Forest Ecology and Management, 78. |
| Protocol Author | Jessica Matyas |
| Date Protocol Created or Updated | 5/4/22 |