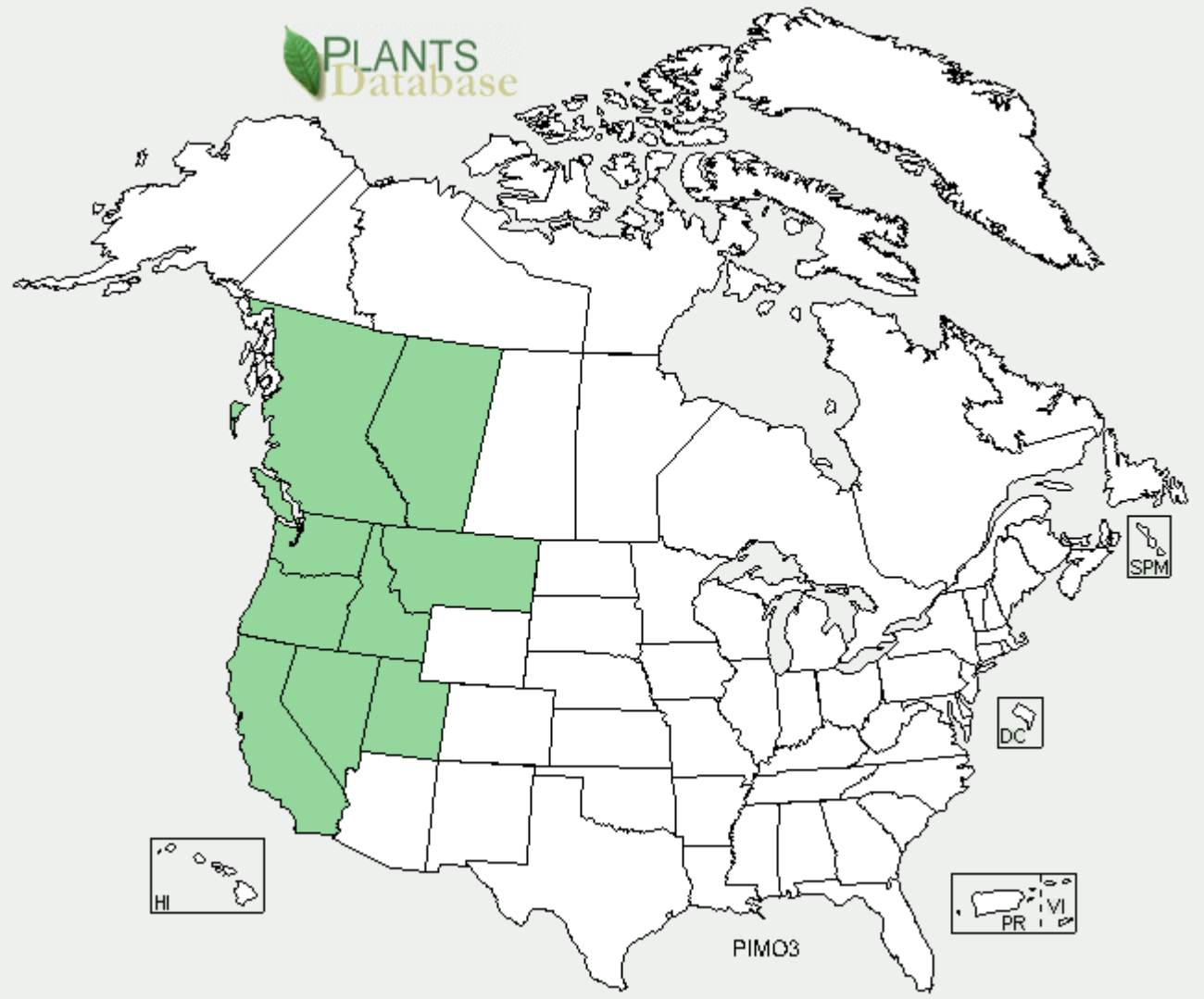
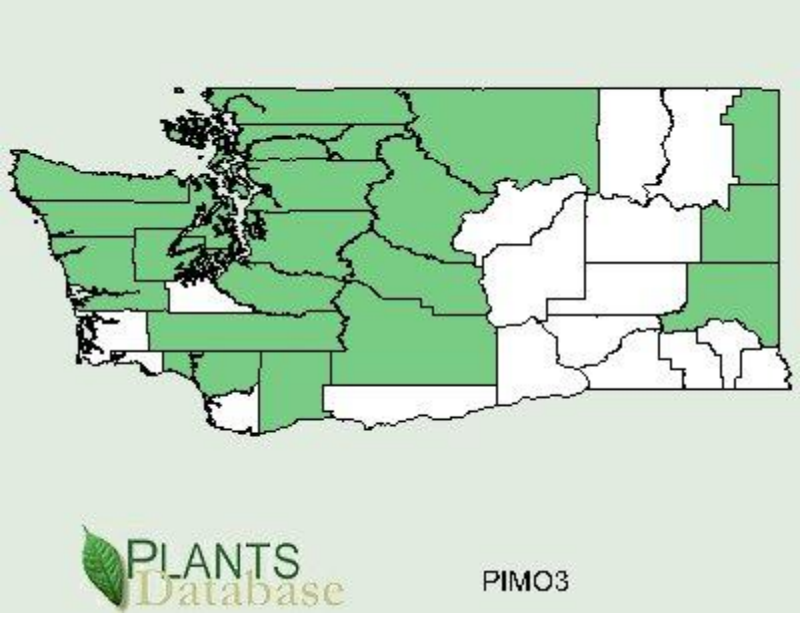
Plant Propagation Protocol for *Pinus monticola*
ESRM 412 – Native Plant Production





Photos Courtesy of: http://plants.usda.gov/java/profile?symbol=PIMO3

TAXONOMY	
Family Names	
Family Scientific Name:	Pinaceae
Family Common Name:	Pine Family
Scientific Names	
Genus:	*Pinus*
Species:	*Monticola*
Species Authority:	Douglas ex D.Don[13]
Variety:	
Sub-species:	
Cultivar:	
Authority for Variety/Sub-species:	
Common Synonym(s):	
Common Name(s):	Western White Pine, Mountain White Pine, Idaho White Pine, Silver Pine
Species Code:	PIMO3
GENERAL INFORMATION	
Geographical range:	See above map[8]. The Northern Boundary of the species is at Quesnel Lake, British Columbia, latitude 52 deg. 30 min. N. The Southern boundary lies in Tulare County, California, latitude 25 E. 51 min. N. On the Western side,

	the boundary is the Pacific Oceans, and on the East, Glacier National Park, Montana. [9]
Ecological distribution:	Dry slopes to moist valleys. Low and high elevations[6]. The trees prosper best in river bottoms and gentle, low, slopes.[9,10]. Can, however, survive in a wide range of ecological conditions. [9,10].
Climate and elevation range	Full sun, or light shade, low or high elevations[6]. Elevations range from 0ft (British Columbia, Vancouver Island, Washington) to 10,990 ft (California).[9,]
Local habitat and abundance; may include commonly associated species	Grow in Communities that are rich in herbaceous flora. Pacific silver fir, noble fir, whitebark pine, foxtail pine, limber pine, sugar pine, Jeffrey pine, quaking aspen, and paper birch.[9,11]
Plant strategy type:	Competitor. [9]
Plant characteristics:	Tree. This species has widely spaced branches with bluish-green needles in bundles of five, 2-4 inches long.[5,9] Tree is expected to be long-lived (400+ years), and can reach a mature height of 200ft.[9,11]
PROPAGATION DETAILS	
Ecotype:	Larch/Douglas-fir forest, West Glacier, Glacier National Park, Flathead Co., MT.[12]
Propagation Goal:	Plants
Propagation Method:	Seed
Product Type	Container (plug)
Stock Type:	172 mL containers.[12]
Time to Grow:	Spring. [7] Duration is 20 months.[12]
Target Specifications:	The seedlings should reach a height of 7 cm, with a caliper measurement of 7mm.[12]
Propagule Collection:	Collect from June – August.[5]. Cones grow on high branches and turn a yellowish/dark brown when ripe.[5]
Propagule Processing/Propagule	The storage period for the seeds is 20 years.[7] The seed mass of the species is 7% (0.66 lbs seed/100 lbs of cone) . [7] The average seed density is 27,000 seeds/lb.[7,9]
Pre-Planting Propagule Treatments:	Air dry the cones to remove seeds. 5-7 days in open air; 14hrs at 43C in kiln.[7] Seeds may then require 1-4 months cold stratification before germination. [5]
Growing Area Preparation:	Seeds are grown in greenhouse, using a direct sowing method.[12] When planting seedlings outside, mound the seedbed, and pack the soil lightly around the seedling.[9]
Establishment Phase:	Keep plants moist during germination. The period of initial germination may continue sporadically for four weeks.[12] Seed coats will be shed 17 to 21 days after emergence.[12]
Length of	28 days.[7]

Establishment Phase:	
Active Growth Phase:	Plants will root tight 27 weeks from the time of germination, and reach a height of 7 cm.[12]
Length of Active Growth Phase:	23 weeks.[12]
Hardening Phase:	Plants may be leached with clear water once before winterization.[12]
Length of Hardening Phase:	4 weeks.[12]
Harvesting, Storage and Shipping:	Harvest in September. May be stored in outside greenhouse.[12]
Length of Storage:	5 months[12]
Guidelines for Outplanting / Performance on Typical Sites:	Few seedlings germinate in the first year because of snow mold, rodents, late season drought, and high soil temperatures.[9] When planting seedlings outside, mound the seedbed, and pack the soil lightly around the seedling.[9] Height and diameter growth begins between May and June.[9]
Other Comments:	Good seed crops occur every 3 to 4 years.[9]
INFORMATION SOURCES	
References:	[6] Robinson, Kathleen; Richter, Alice; Filbert, Marianne. Encyclopedia of Northwest Native Plants for Gardens and Landscapes. Timber Press; Portland, Oregon. 2008. [8] USDA: Natural Resources Conservation Service. http://plants.usda.gov/java/profile?symbol=PIMO3. Accessed 4/18/2011. [9] USDA Forest Service: FEIS. http://www.fs.fed.us/database/feis/plants/tree/pinmot/all.html. Accessed 4/15/2011. [10] Fowells, H. A., compiler. 1965. Silvics of forest trees of the United States. Agric. Handb. 271. Washington, DC: U.S. Department of Agriculture, Forest Service. 762 p. [11] Graham, Russell T. 1990. Pinus monticola Dougl. ex D. Don western white pine. In: Burns, Russell M.; Honkala, Barbara H., technical coordinators. Silvics of North America. Volume 1. Conifers. Agric. Handb. 654.. Washington, DC: U.S. Department of Agriculture, Forest Service: 385-394. [12] Native Plant Network. http://www.nativeplantnetwork.org/network/ViewProtocols.aspx?ProtocolID=238,1422. Accessed 4/19/2011.
Other Sources Consulted:	[1] Pojar and Mackinnon. 1994. Plants of the Pacific Northwest Coast. Ministry of Forests and Lone Pine Publishing. [4] Rose, R., Chachulski, C. and Haase, D. 1998. Propagation of Pacific Northwest Native Plants. Oregon State University Press. Corvallis

	OR. [7] Young, J. and Young, C. 1992. Seeds of woody plants in North America. Dioscorides Press. Portland, OR. [2] Franklin, Jerry; Dyrness, C.T.. 1973. Natural Vegetation of Oregon and Washington. Oregon State University press. [3] Hitchcock, Leo; Cronquist, Arthur. Flora of the Pacific Northwest. University of Washington Press. 1973. [5] Leigh, Michael. Grow Your Own Native Landscape. Washington State University. 1999. [13] IUCN Red List. http://www.iucnredlist.org/apps/redlist/details/42383/0. Accessed 5/2/2011.
Protocol Author:	Ross, Matthew
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Note: This template was modified by J.D. Bakker from that available at: http://www.nativeplantnetwork.org/network/SampleBlankForm.asp

Old Protocol:

Plant Data Sheet: Western White Pine (*Pinus monticola*)

Range
Western white pine occurs from coastal and mountainous areas of British Columbia south through the Oregon and Washington Cascades and the Sierra Nevadas in California [5].

Climate, elevation
The distribution of western white pine is limited at low elevations by lack of moisture, and at high elevation by low temperatures. Western white pine occurs from sea level to subalpine areas [3].

Local occurrence
Western white pine was once abundant in the Puget Sound region before logging activities and the introduction of white pine blister rust. This fungus has reduced white pine populations, but resistant individuals continue to persist. They can be found scattered throughout the Puget lowlands.

Habitat preferences
Western white pine is found from moist valleys to fairly open and dry slopes [3,5]. It prefers well drained soils, although the species has been found in bogs [2].

Plant strategy type/successional stage
Western white pine is a seral to climax species.

Associated species

Due to its large range and diverse growing conditions, Western white pine has many associated species. These include grand fir, subalpine fir, lodgepole pine, ponderosa pine, Jeffrey pines, western larch, western redcedar, western and mountain hemlock, Douglas-fir, and Engelmann and Sitka spruces [(5)].

May be collected as: (seed, layered, divisions, etc.)

Western white pine is typically propagated by seed. For large-scale forestry applications, it is also propagated via tissue culture or by grafting white pine onto the rootstock of related species. Plants underthree meters in height can be salvaged with success as well [(2)].

Collection restrictions or guidelines

Pollination occurs early in the first season after cone formation. The egg is fertilized early in the second year and the seed is formed during the growing season of the second year. It matures during this period (late summer and fall of the second year). The cones release their seed immediately upon maturity and should be collected promptly to prevent seed loss [(1)]. Collect seed in June-August from cones that are yellowish to dark brown in color [(2)]. Seed should be collected from blister rust resistant individuals if possible.

Seed germination (needs dormancy breaking?)

Fresh seed has been reported to germinate without cold stratification. In most cases, stored seed will require stratification. A two to three month stratification at 45F should provide uniform germination. Soaking the seed for 1 to 2 days in aerated water is also recommended for many pine species [(1)].

Seed life

As a general rule, pine seeds can be stored for long periods of time [(1)].

Recommended seed storage conditions

Seed life is extended when stored at a seed moisture content of around 10% [(1)].

Propagation recommendations

For a general propagationist, propagation by seed is the most practical method. Tissue culture is also an option if resources are available.

Soil or medium requirements

No information on soil requirements was found.

Installation form

Installation of seedlings is common.

Recommended planting density

For restoration activities, trees should be spaced from 6-15 feet on center, depending on the desired density [(4)].

Care requirements after installed

No specific information on post-installation care was found.

Normal rate of growth or spread; lifespan

Western white pine is a medium sized, long lived tree. It typically reaches heights of up to 40 m, although much taller individuals can be found [(3)].

Sources cited

(1) Couvillon, G. http://www.uga.edu/plantprop/index.html. Retrieved April 22, 2003.

(2) Leigh, M. (1999). Grow Your Own Native Landscape: A guide to identification, propagation, and landscaping with western Washington native plants. Washington State University Cooperative Extension.

(3) Pojar, J. & MacKinnon, A (eds.) (1994). Plants of the Pacific Northwest Coast. Vancouver, BC: Lone Pine.

(4) Sound Native Plants. http://www.soundnativeplants.com. Retrieved April 22, 2003.

(5) Tree Guide. http://www.treeguide.com. Retrieved April 22, 2003.

Data compiled by (student name and date)

Sarah Baker (4/23/03)