

Plant Propagation Protocol for *Juniperus maritima*

ESRM 412 – Native Plant Production

Protocol URL: <https://courses.washington.edu/esrm412/protocols/JUMA10.pdf>



Photo taken by Ben Legler

Source: <http://biology.burke.washington.edu/herbarium/imagecollection/taxon.php?Taxon=Juniperus%20maritima>

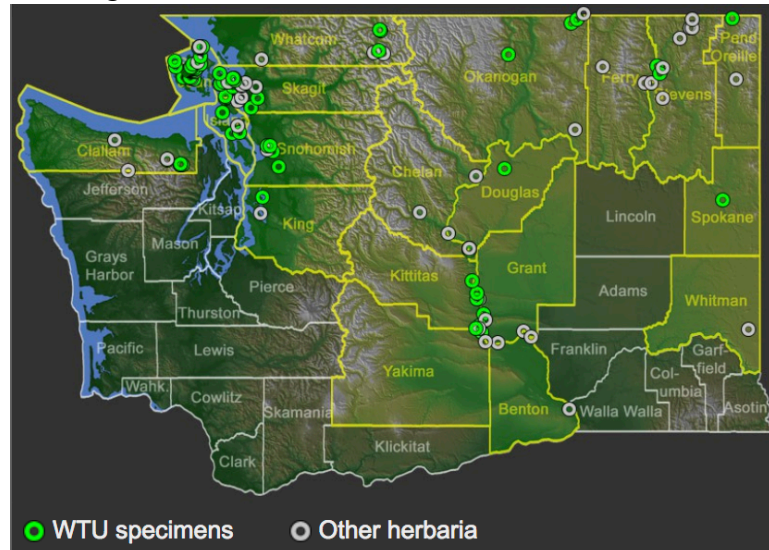
TAXONOMY	
Plant Family	
Scientific Name	Cupressaceae
Common Name	Cypress family
Species Scientific Name	
Scientific Name	<i>Juniperus maritima</i> R.P. Adams ⁹
Varieties	None recognized by USDA Plants database.
Sub-species	None recognized by USDA Plants database.
Cultivar	n/a
Common Synonym(s)	None recognized by USDA Plants database. Prior to 2007 this species was not considered taxonomically distinct from <i>Juniperus scopulorum</i> . ¹
Common Name(s)	Puget Sound juniper seaside juniper ¹
Species Code (as per USDA Plants database)	JUMA10 ⁹
GENERAL INFORMATION	
Geographical range	<u>North American Distribution</u> This species is endemic to the Puget Trough of Washington State and Georgia Basin in British

Columbia.⁵ It is found near the Puget Sound from Whidbey Island north to Lesqueti Island and along coast of Vancouver Island.¹



Map from USDA Plant database⁹

Washington State Distribution




Map from Burke Herbarium Image Collection *Juniperus maritima* page.⁵ Map includes collections of related *Juniperus scopulorum*. No distribution map of solely *Juniperus maritima* is available for Washington state. *Juniperus maritima* will only be found nearby the Puget Sound and Georgia Strait.¹

Ecological distribution

This species grows on dry granite or sandy soils near the sea in Puget Sound and Georgia Strait (“Saalish Sea”). There is only one known population growing on sand dunes, near Cranberry Lake, Whidbey Island, WA.¹

Climate and elevation range

Grows in open areas at low elevation to mid-elevation in the mountains.⁵ This species tolerates ocean wind and salt

	spray. ¹ It thrives in a Mediterranean climate with cool summers. ²
Local habitat and abundance	This species is endemic to SW British Columbia and NW Washington. It has been collected in few locations, indicating its habitat is fairly restricted. ¹ Herbarium collections indicate this species has been found in association with: <i>Pseudotsuga menziesii</i> , <i>Holodiscus discolor</i> , <i>Lomatium martindalei</i> , <i>Microsteris gracilis</i> , <i>Berberis aquifolium</i> , <i>Viola adunca</i> , <i>Cryptantha intermedia</i> , <i>Fragaria virginiana</i> , <i>Fritillaria affinis</i> , <i>Arctostaphylos uva-ursi</i> , <i>Achillea millefolium</i> , <i>Eriophyllum lanatum</i> ⁶
Plant strategy type / successional stage	This species is not weedy and considered relictual with older trees and fewer or no seedlings. ¹
Plant characteristics	Evergreen tree. ⁹ This species has obtuse leaf tips and leaves that overlap less than 1/5 the length. It has smooth reddish brown branchlets. The seed cones are uniform, and they mature in one year. Seed are usually exserted from the cone. ² Very hard to distinguish from <i>Juniperus scopulorum</i> . ⁷
	 <p>Photo taken by Ian Barclay, October 2009 at Washington Park Arboretum. Source: http://www.arthurleej.com/p-o-m-May10.html</p>

PROPAGATION DETAILS

Juniperus maritima is endemic to a relatively small area and was not considered its own species distinct from *Juniperus scopulorum* (Rocky Mountain Juniper) until 2007. Propagation information specific to *J. maritima* is lacking in the literature. Propagation details for the closely related *J. scopulorum* are provided below. While *J. maritima* and *J. scopulorum* are nearly identical in appearance, an important difference between the two species is that *J. maritima* seed cones reach maturity in 12-14 months opposed to the 2 years to maturity observed in *J. scopulorum*. There are also differences in the plants terpenoids and internal transcribed spacer genetic sequence data. It should be considered that *J. maritima*

and *J. scopulorum* grow in markedly different climates and habitats, so dormancy breaking requirements may differ.¹

Seed, as described by Kasten Dumroese.³

Ecotype	Northern Idaho
Propagation Goal	Plants
Propagation Method	Seed
Product Type	Container(plug)
Stock Type	45/340 Copperblocks
Time to Grow	2 Years
Target Specifications	30 to 40 cm(height), 5.7 mm(Root-collar diameter), firm root plug.
Propagule Collection Instructions	Fleshy ovulate cones are filled with resinous pulp. Cones or “berries” are globose to subglobose, 4 to 8 mm in diameter, and are solitary at the tips of branches. Each cone or “berry” contains 1 to 3 (up to 12) round seeds that are 2 to 5 mm in diameter.
Propagule Processing/Propagule Characteristics	Do not store cones for long periods of time, or store surface dried cone in a well-ventilated place at 1 to 3°C and 80-90% humidity. Resinous pulp in cones is very sticky and seed cleaning requires presoaking in weak lye solution or citrus hand cleaner. Seeds should be soaked and rinsed until they no longer feel sticky. Viable seeds can be sorted out by flotation. There are 17850 to 42100 seeds/lb.
Pre-Planting Propagule Treatments	Seed requires scarification and warm moist followed by cold moist stratification. Seeds were soaked in a running water rinse for 24 hours, then sown into 66 ml pine cells. They are placed in an unheated greenhouse for 60 days, then moved to 1-2°C conditions for 60 to 90 days. In the end of December trays are moved back into the greenhouse for germination.
Growing Area Preparation / Annual Practices for Perennial Crops	<p>Seeds were grown in climate-controlled greenhouses where photoperiod was extended. Seeds were irrigated by overhead travelling boom system, fertilizers were applied through irrigation water. Temperatures in the greenhouses were maintained at 24 to 27°C in daytime and 15 to 21°C at night.</p> <p>Seeds were germinated in 66ml pine cells. Growing media consisted of 1:1 volume ratio of Sphagnum peat moss and vermiculite. Seeds were covered with shallow layer of white grit or forestry sand. In order to prevent damping-off disease a low pH medium was used, irrigation water was acidified, relative humidity was kept low, and under bench air circulation and heating were applied.</p>

Establishment Phase Details	Seedlings received acidified water for the first 2 weeks after germination. Between weeks 3 to 9 seedlings were fertilized with Peters Conifer Starter. If seedlings are grown in early winter, supplemental nighttime lighting should be used.
Length of Establishment Phase	9 weeks
Active Growth Phase	Seeds were fertilized twice a week with Peters Conifer Grower. Containers were irrigated when blocks weighed 80-85% of saturated weight. Seedlings were top pruned in the second year of growth to promote denser shoot growth.
Length of Active Growth Phase	20 weeks first year of growth; 15 weeks second year of growth.
Hardening Phase	During hardening phase Peters Conifer Finisher was applied every other irrigation along with micronutrients, phosphoric acid, and calcium nitrate. Temperatures and photoperiod were no longer regulated. It is preferable for daytime temperature to be below 27°C during the day, and as cold as possible. In the referenced protocol minimum greenhouse temperatures were -20°C.
Length of Hardening Phase	18 to 22 weeks
Harvesting, Storage and Shipping	In the fall of their second year of growth seedlings were extracted from storage. Seedlings were packed in plastic bags inside wax boxes or plastic tubes stored at 0.5°C and nearly 100% relative humidity. Seedlings should be well watered but foliage dry before packing. Inspection for storage molds is necessary.
Length of Storage	4 to 5 months
Guidelines for Outplanting / Performance on Typical Sites	Information not provided.
Other Comments	Seedlings grown with liquid fertilizer had similar or better morphology, higher nitrogen concentrations and contents, and higher Nitrogen-use efficient than seedlings grown with control-release fertilizer.
Vegetative, as described by Kasten Dumroese.⁴	
Ecotype	Northern Idaho
Propagation Goal	Plants
Propagation Method	Vegetative
Product Type	Container(plug)
Stock Type	Information not provided.
Time to Grow	1 year
Target Specifications	Information not provided.
Propagule Collection Instructions	Cuttings were taken from 150 dormant 2 and 4-year-old stock plants in mid-November.
Propagule Processing/Propagule Characteristics	A cutting size trial suggests that the optimum cutting length for shoot tip hardwood cuttings is 12 cm.

Pre-Planting Propagule Treatments	Containers were sterilized by being dipped in 75 to 85°C water for 15 to 30 seconds. A fresh cut 45° leaf axis was made on shoot tip cuttings. Cuttings were dipped in 1g/L benomyl and dipped in commercial auxin concentrations of hormones IBA and NAA. Cuttings were then inserted into 1.5 cm deep dibble holes in a 3:1:1 mixture of peat, perlite, and vermiculite. After a year of growth, cuttings treated with 1.6 or 3.0% IBA yielded the highest rooting percentages.
Growing Area Preparation / Annual Practices for Perennial Crops	Trays with cuttings were on benches in the greenhouse under 60% shade. Temperatures in the greenhouse ranged from 15°C to 25°C and relative humidity was 86% at a minimum. Rooting medium was periodically misted.
Establishment Phase Details	Roots typically formed in 2 months. Treatment with 1.6% and 3.0% IBA accelerated rooting of 2 year old cuttings.
Length of Establishment Phase	1 year
Active Growth Phase	Information not provided.
Length of Active Growth Phase	Information not provided.
Hardening Phase	Information not provided.
Length of Hardening Phase	Information not provided.
Harvesting, Storage and Shipping	Information not provided.
Length of Storage	Information not provided.
Guidelines for Outplanting / Performance on Typical Sites	Information not provided.
Other Comments	Top pruning can increase bushiness of seedlings. Cuttings had high survival rate (97%).
Seed, as described by Mark Majerus.⁸	
Ecotype	Numerous northern Plains seed sources from Montana, North Dakota, and Wyoming.
Propagation Goal	plants
Propagation Method	Seed
Product Type	Bareroot (field grown)
Stock Type	2+0 or 3+0 bareroot plants.
Time to Grow	2 years
Target Specifications	Information not provided.
Propagule Collection Instructions	Cones were collected by hand in late fall to mid-winter. Fruit maturation requires two years and is dark blue to nearly black in color. **Note: <i>Juniperus maritima</i> cones reach maturity in just 12-14 months, time to maturity is a distinguishing trait between <i>Juniperus scopulorum</i> and <i>Juniperus maritima</i> . ¹ Fruit was stored in sacks in a cooler. It is ideal to clean cones while skin has not dried out and become tough.

Propagule Processing/Propagule Characteristics	Seed requires presoaking in weak lye solution or citrus hand cleaner. Light seed and debris can be floated off clean seed by continuously rinsing seed with water. Spread seeds on kraft paper and allow to dry for 24 to 48 hours. Seeds can be stored in paper envelopes or woven sacs and should be stored in a cool environment. Seed density and longevity information is not provided.
Pre-Planting Propagule Treatments	Warm moist stratification followed by cold moist chilling is recommended for breaking dormancy of this species. Limited trials found germination is improved by a 30 to 60 minute acid scarification prior to stratification. A cold:warm:cold stratification schedule has also resulted in higher germination rates, although the dormancy breaking period is not shortened.
Growing Area Preparation / Annual Practices for Perennial Crops	Planting area should be rototilled to break up clods and loosen soil in the seedbed. Seed can be sown with belt seeder or drill. Prior to sowing seedbed should be packed with a roller so soil surface is soft. Sow 25 to 50 seeds per linear foot to a depth of 0.25 to 0.5 inches. Seed was sown in October or November. Seed beds were covered with excelsior mat to keep soil moist and deter animal predation.
Establishment Phase Details	Information not provided.
Length of Establishment Phase	Information not provided.
Active Growth Phase	Information not provided.
Length of Active Growth Phase	Information not provided.
Hardening Phase	Information not provided.
Length of Hardening Phase	Information not provided.
Harvesting, Storage and Shipping	2-0 or 3-0 bareroot plants are harvested in early spring as soon as the ground thaws. Roots are trimmed to a uniform length and packed in moist sphagnum or peat moss wrapped in plastic. Plant are stored in cooler maintained at 1°C to 3°C and 80% relative humidity. They are shipped priority mail in heavy wax coated boxes.
Length of Storage	If plants are fully dormant they can be stored in the cooler for several weeks.
Guidelines for Outplanting/ Performance on Typical Sites	Information not provided.
Other Comments	n/a
INFORMATION SOURCES	
References	See below
Other Sources Consulted	See below
Protocol Author	Kyra Matin
Date Protocol Created or Updated	08/16/18

References:

- ¹Adams, Robert P.. “Juniperus maritima, the seaside juniper, a new species from Puget Sound, North America.” *Phytologia*, vol. 83, no. 3, Dec. 2007, https://www.researchgate.net/publication/254397040_JUNIPERUS_MARITIMA_THE_SEASIDE_JUNIPER_A_NEW_SPECIES_FROM_PUGET_SOUND_NORTH_AMERICA. Accessed July 22 2018.
- ²Ceska, Adolf. “Juniperus maritima.” Klinkenberg, Brian. (Editor) *BC: Electronic Atlas of the Plants of British Columbia E-Flora, Lab for Advanced Spatial Analysis, department of Geography, University of British Columbia, Vancouver, 2017*, <http://linnet.geog.ubc.ca/Atlas/Atlas.aspx?sciname=Juniperus%20maritima>. Accessed July 22 2018.
- ³Dumroese, Kasten. “Propagation protocol for production of Container (plug) Juniperus scopulorum Sarg. Plants USDA Forest Service – Southern Research Station Moscow, Idaho.” *Native Plant Network*. US Department of Agriculture, Forest Service, National Center for Reforestation, Nurseries, and Genetic Resources, 2008, <https://nnp.rngr.net/renderNPNProtocolDetails?selectedProtocolIds=cupressaceae-juniperus-3515>. Accessed August 11 2018.
- ⁴Dumroese, Kasten. “Propagation protocol for production of Container (plug) Juniperus scopulorum Sarg. Plants USDA Forest Service – Southern Research Station Moscow, Idaho.” *Native Plant Network*. US Department of Agriculture, Forest Service, National Center for Reforestation, Nurseries, and Genetic Resources, 2008, <https://nnp.rngr.net/renderNPNProtocolDetails?selectedProtocolIds=cupressaceae-juniperus-3516>. Accessed August 11 2018.
- ⁵Gilblin, Dabvid. “Juniperus maritima seaside juniper.” WTU Image Collection: Plants of Washington, Burke Museum of Natural History and Culture, 2018. <http://biology.burke.washington.edu/herbarium/imagecollection/taxon.php?Taxon=Juniperus%20maritima>. Accessed July 22 2018.
- ⁶“Herbarium Database.” *Burke Museum*, 21 Oct. 2015, www.burkemuseum.org/research-and-collections/botanyandherbarium/collections/database/results.php?SourcePage=search.php&ScientificName=Juniperusmaritima&State=Washington&IncludeSynonyms=Y&SortBy=Year&SortOrder=DESC. Accessed July 22 2018.
- ⁷“Juniperus Maritima (Seaside Juniper) Description.” *Pinaceae (Pine Family, Pinacées, Kieferngewächse, Pináceas, Pináceas, 松科, マツ科) Description - The Gymnosperm Database*, The Gymnosperm Database, 29 Dec. 2012, https://www.conifers.org/cu/Juniperus_maritima.php. Accessed August 16, 2018.
- ⁸Majerus, Mark. “Propagation protocol for production of Bareroot (field grown) *Juniperus scopulorum* Sarg. plants 2+0 or 3+0 bareroot plants; USDA NRCS - Bridger Plant Materials Center Bridger, Montana.” *Native Plant Network*. US Department of Agriculture, Forest Service, National Center for Reforestation, Nurseries, and Genetic Resources, 2003, <https://nnp.rngr.net/renderNPNProtocolDetails?selectedProtocolIds=cupressaceae-juniperus-2779>. Accessed August 11 2018.
- ⁹USDA, NRCS “Juniperus maritima R.P. Adams Seaside Juniper.” *The PLANTS Database*, National Plant Data Team, Greensboro, NC 27401-4901 USA, 2018, <https://plants.usda.gov/core/profile?symbol=JUMA10>. Accessed July 22 2018.

Other Sources Consulted:

- Adams, Robert P. et al. "Discovery and SNPS Analyses of Populations of *Juniperus Maritima* in the Olympic Peninsula, a Pleistocene Refugium?" *Phytologia*, vol. 92, no. 1, Apr. 2010, <http://www.phytologia.org/uploads/2/3/4/2/23422706/92168-81adamsolynatlparkmaritima.pdf>. Accessed July 22 2018.
- Adams, Robert P. *Junipers of the World: the Genus Juniperus*. Trafford Pub., 2004.
- Bradshaw, Alan D. "Seed Catalog." *ALPLAINS Home Page*, www.alplains.com/. Accessed August 16, 2018.
- Farjon, Aljos. *A Monograph of Cupressaceae and Sciadopitys*. Royal Botanic Gardens, Kew, 2005.
- Sheat, W. G. *Propagation of Trees, Shrubs, and Conifers*. Macmillan, 1965.