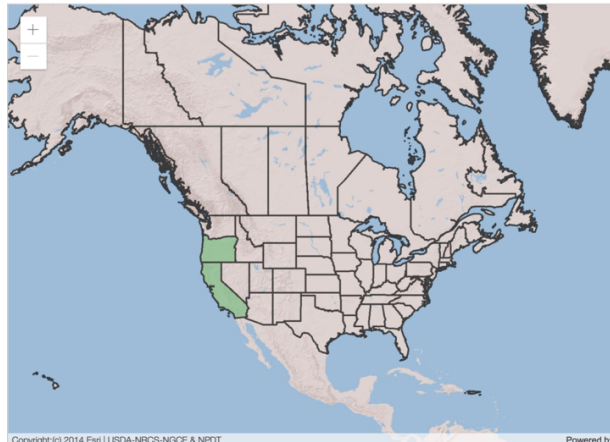


Plant Propagation Protocol for *Pinus muricata*

ESRM 412 – Native Plant Production

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

TAXONOMY	
Plant Family	
Scientific Name	Pinaceae
Common Name	Pine Family
Species Scientific Name	
Scientific Name	<i>Pinus muricata</i> D. Don
Varieties	none
Sub-species	Missing
Cultivar	Missing
Common Synonym(s)	<i>Pinus muricata</i> D. Don var. <i>borealis</i> Axelrod ex Farjon <i>Pinus muricata</i> D. Don ssp. <i>borealis</i> Axelrod ex Silba <i>Pinus muricata</i> D. Don var. <i>muricata</i> <i>Pinus muricata</i> D. Don var. <i>remorata</i> (H. Mason) Silba <i>Pinus muricata</i> D. Don var. <i>stantonii</i> Axelrod ex Farjon <i>Pinus muricata</i> D. Don ssp. <i>stantonii</i> Axelrod ex Silba <i>Pinus remorata</i> H. Mason [7]
Common Name(s)	Bishop Pine, prickly pinecone, Obispo pine, Santa Cruz pine and dwarf marine pine, California swamp pine
Species Code (as per USDA Plants database)	PIMU
GENERAL INFORMATION	
Geographical range	Oregon and California This pine has a restricted range and is mostly found in California and in some places in the Channel Islands and in Baja



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Native Introduced Both
 Native, No County Data Introduced, No County Data Both, No County Data

Native Status:

L48 AK HI PR VI NAV CAN GL SPM A

Distribution of Bishop pine. Map courtesy of USDA, NRCS. 2018. The [PLANTS Database](#). National Plant Data Team, Greensboro, NC [2018, June 19] [43].

[6,7]

Ecological distribution	Dry ridges to coastal, wind shorn forests, often in or around bogs
Climate and elevation range	It is found almost always along the coast at sea level
Local habitat and abundance	Local to California coast ranges, it is associated with sword fern, salal and western poison oak. In Mexico this pine is an endangered species
Plant strategy type / successional stage	Perennial tree Prefers disturbed unvegetated areas where it does not have competition from oaks and shrubs



[2]

It is a coniferous evergreen tree that grows to approximately 15-25 m and can have a trunk diameter of 1.2m. When growing in rough coastal exposure the tree grows stunted and twisted. It grows on dry, rocky soil. The needles are long and come in pairs. Cones occur in

clusters of one to five. The cones have adapted to avoid predation by squirrels and fire damage by developing tough and spikey scales on its cones which make it difficult to eat and fire is necessary for the seeds to be released from these tough cones [3,7]



[2]

PROPAGATION DETAILS

Ecotype	Collected in 1978 from the native bishop pine populations in Sonoma and Mendocino Counties in California [4]
Propagation Goal	Plants
Propagation Method	Seed
Product Type	plug
Stock Type	Container stock
Time to Grow	1 year
Target Specifications	0.2-0.3 m tall
Propagule Collection Instructions	Open pollinated seeds were collected from cones
Propagule Processing/Propagule Characteristics	Missing
Pre-Planting Propagule Treatments	Fresh seeds need no treatment; stored seeds 1 mo. Stratification [4]
Growing Area Preparation / Annual Practices for Perennial Crops	Seeds were germinated in the summer in 25cm ³ plastic containers filled with light potting soil in a greenhouse [4]
Establishment Phase Details	Missing

Length of Establishment Phase	Missing
Active Growth Phase	Transplant the germinated seedlings into the same soil mixture into 15cm clay pots, fertilized bi-weekly with 10N-8P-7K plus micronutrients. They were grown in a lathhouse. [4]
Length of Active Growth Phase	8 months
Hardening Phase	Missing
Length of Hardening Phase	Missing
Harvesting, Storage and Shipping	Missing
Length of Storage	Missing
Guidelines for Out planting / Performance on Typical Sites	Missing
Other Comments	The seeds that are collected and the plants that are produced from the seed should be planted again in the same area from which the seeds were collected so that the genetic resources of the different populations can be maintained for future studies that look at the genetic distribution of this species and look at how they mix with other species [3] These plants only produce a good seed crop every two to three years and the pines first begin to produce seeds when they reach five or six years of age, these are considerations for seed collection [7]
Propagation Details	
Ecotype	Mendocino and Sonoma Counties, California [4]
Propagation Goal	Plants
Propagation Method	Cuttings
Product Type	plug
Stock Type	Container stock
Time to Grow	10 months
Target Specifications	Full, symmetric root systems [4]
Propagule Collection Instructions	Cuttings collected from juvenile seedlings of “blue” and “green” foliated bishop pine which are classified as the same species but there are two separate populations of this pine. 8-10cm cuttings were taken from seedling and juvenile (1-4 years old) hedge plants and were stuck in nursery containers. For best results take the cuttings from hedges maintained at 0.2-0.3 m. Take cuttings in late winter/ early spring [4]
Propagule Processing/Propagule Characteristics	8-10 cm cuttings taken from the terminal and first order branches

Pre-Planting Propagule Treatments	Immediately after cutting soak the cuttings in a benomyl solution (150 ppm in water) for 30 min and then basally trim them to 6-8 cm. The basal ends of the cuttings were then dipped in an indole-butyric acid solution (4000 ppm in 95% ethanol) for five seconds. [4]
Growing Area Preparation / Annual Practices for Perennial Crops	Grow in rocks dry soil, containers do not need to be large. Strike the cuttings into tubes that contain 2/3 light potting soil and the top third is rooting medium. Strike the cuttings into rooting medium in opaque plastic 25cm ³ containers [4]
Establishment Phase Details	50% of the cuttings root in 6 months They began to root rapidly in late winter/ early spring. Establish on greenhouse benches under intermittent mist and 16-hours of daylight. Cuttings were fertilized weekly with 3N-10P-3K solution [4]
Length of Establishment Phase	6 months for the cuttings to root
Active Growth Phase	Rapid rooting lasted until mid/late summer [6]
Length of Active Growth Phase	2-3 months
Hardening Phase	Missing
Length of Hardening Phase	1-2 months [5]
Harvesting, Storage and Shipping	Missing
Length of Storage	Missing
Guidelines for Out planting / Performance on Typical Sites	85% survival rate [4]

INFORMATION SOURCES

References	<p>[1] "Pinus muricata D. Don." <i>Calflora.org</i>. Berkeley. 2021. https://www.calflora.org/app/taxon?crn=6520.</p> <p>[2] "Pinus muricata." <i>Calphotos.berkeley.edu</i>. University of California, Berkeley. Accessed May 2021. https://calphotos.berkeley.edu/cgi/img_query?query_src=photos_index&where-taxon=Pinus+muricata.</p> <p>[3] "Bishop Pine." <i>Calscape.org</i>. California Native Plant Society. 2010. https://calscape.org/Pinus-muricata-().</p> <p>[4] "Experiments in rooting bishop pine (Pinus muricata D. Don) Cuttings." Constance Millar. <i>Fs.fed.us</i>. https://www.fs.fed.us/psw/publications/millar/psw_1987_millar001.pdf.</p>
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	<p>[5] "Pinus muricata D. Don." <i>eFloras.org</i>. Flora of North America. Accessed May 2021. http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=233500945.</p> <p>[6] "Pinus muricata." <i>Fs.fed.us</i>. Fire Effects Information System (FEIS): Index of Species Information. Accessed May 2021. https://www.fs.fed.us/database/feis/plants/tree/pinmur/all.html.</p> <p>[7] "Pinus muricata D. Don." <i>Usda.gov</i>. United States Department of Agriculture. Accessed May 2021. https://plants.usda.gov/home/plantProfile?symbol=PIMU.</p>
Other Sources Consulted	<p>[8] "Pinus muricata." <i>Conifers.org</i>. The Gymnosperm Database. Accessed June 2021. https://www.conifers.org/pi/Pinus_muricata.php.</p> <p>[9] "Growth of Pinus muricata provenances in the highlands of Ecuador." F. Montenegro et al. <i>sciencedirect.com</i>. https://www.sciencedirect.com/science/article/abs/pii/S037811279603931X.</p> <p>[10] "Pinus muricata." <i>Wildflower.org</i>. TWC Staff. Modified August 2011. https://www.wildflower.org/plants/result.php?id_plant=PIMU.</p>
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