

**Plant Propagation Protocol for *Cardamine angulata***  
ESRM 412 – Native Plant Production  
Spring 2019



*Figure 1 Photo by Dana York from CalPhotos Web. 25 May 2019*

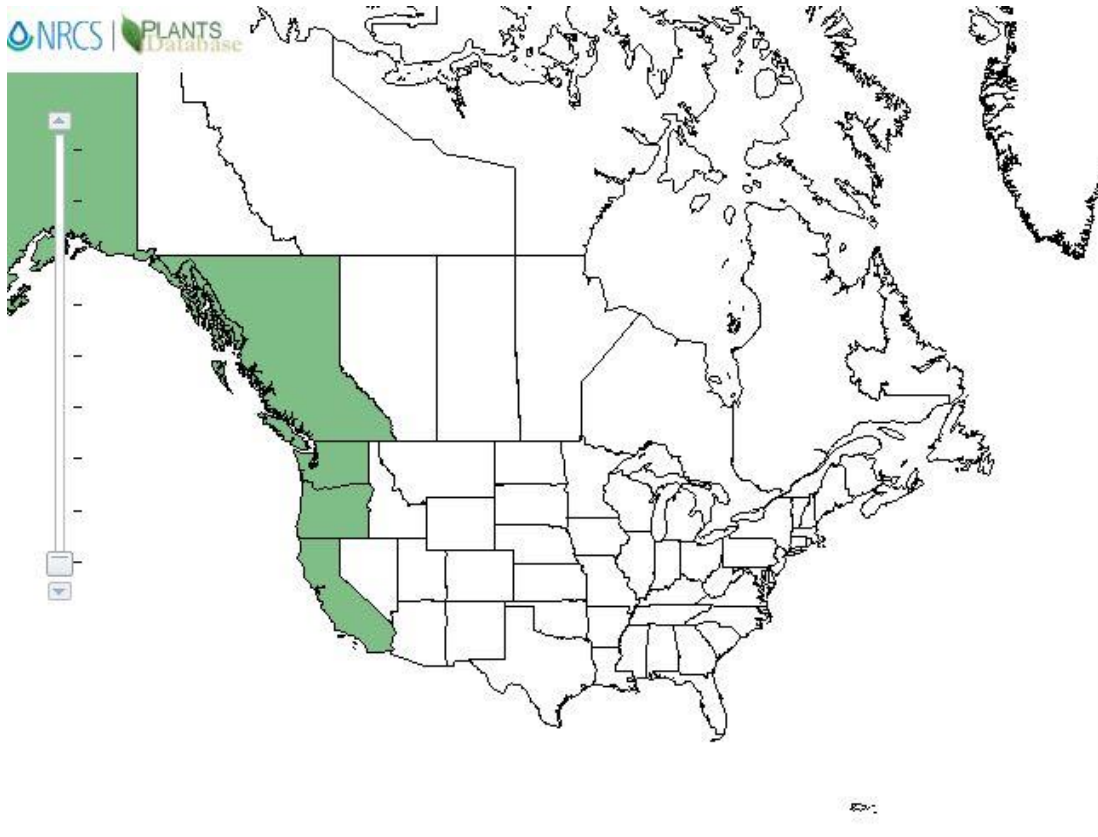


Figure 2 "*Corallorhiza striata*." Plants Database. USDA, n.d. Web. 23 May 2019



Figure 3 "*Corallorhiza striata*." Plants Database. USDA, n.d. Web. 23 May 2019

<b>TAXONOMY</b>	
<b>Plant Family</b>	
Family Scientific Name	Brassicaceae
Family Common Name	Mustard
<b>Species Scientific Name</b>	
Genus	<i>Cardamine</i>
Species	<i>angulata</i>
Authority	Hook.
Varieties	
Sub-Species	<i>Cardamine pulcherrima</i> <i>Cardamine pratensis</i>
Cultivar	
Common Synonym(s)	
Common Name(s)	Seaside bitter-cress Angled bitter-cress Cuckoo-flower
Species Code (as per USDA Plants database)	CAAN5 (Plants Database USDA)
<b>GENERAL INFORMATION</b>	
Geographical range	N. America. See above map from USDA Plants Database for N. America and Washington State
Ecological distribution	Moist forests, wetlands and streambanks at low elevations (Pojar)
Climate and elevation range	Shady thickets, moist forests and streambanks at low elevations (< 900 m sea level) (Consortium of California Herbaria)(Ihsan)
Local habitat and abundance	Along west coast from North California to Alaska (Consortium of California Herbaria)(Plants Database USDA)
Plant strategy type / successional stage	Shade tolerant (Pojar)
Plant characteristics	70cm tall perennial herb with slender rhizomes and unbranched stems. There are a few basal leaves however most leaves are on the stem; The leaves are lobed, compound and 7cm long. The flowers' petals are white to pink with four 1.2cm long petals terminally clustered. The fruits are 4cm long, erect siliques (Pojar)
<b>PROPAGATION DETAILS</b>	
<b>(NAME OF PROPAGTION)</b>	
Ecotype	Redwood Forest, Mixed Evergreen Forest, Wetland-riparia (Consortium of California Herbaria)
Propagation Goal	Plants

Propagation Method	Seed: Siliques are mature in May when the fruits turn yellowish-brown, become stiff and fall off of the mother plant.
Product Type	Plug container (Bartow)(Baskin)(Young)
Stock Type	3'x4'x1' container (Bartow)
Time to Grow	Late spring (Turner)
Target Specifications	Root System is established and fill container. (Young)
Propagule Collection Instructions	Collect siliques when they are stiff and yellowish-brown and place in sterilized cheesecloth sac. Pick 3-5 siliques from a single mother plant leaving the rest for natural germination. Only pick from one plant out of 4 species in the collection zone. Siliques are easily split in half revealing seeds. (Young)
Propagule Processing/Propagule	Seeds are rubbed over an air screen machine to remove chaff. (Young) Seeds should be kept dry and stored in a refrigerator at 4 C. (Bartow)
Pre-Planting Propagule Treatments	Brassicaceae seeds commonly have physiological dormancy. Seeds need to be warm and cold stratified for a month between 8 C and 4 C. Seeds are sown into plug containers with peat-based medium with micro-nutrients and a slow release fertilizer. (Baskin)(Bartow)
Growing Area Preparation /Annual Practices for Perennial Crops	After 6-weeks, containers are moved into 3'x4'x1' containers with 6-8" of peat-based medium with micro-nutrients and a slow release fertilizer. Then place the plants in a shade house. (Bartow)
Establishment Phase Details	Seeds germinate ~30 days after sowing and containers are filled with roots within 6-weeks. (Bartow)
Length of Establishment Phase	6 weeks (Bartow)
Active Growth Phase	After seedlings are well established (6 weeks), move to shade house for continued growth. (Bartow)(Young)
Length of Active Growth Phase	6 weeks (Bartow)
Hardening Phase	Plants are dormant by mid-summer and re-emerge in early fall. (Bartow)
Length of Hardening Phase	N/A
Harvesting, Storage and Shipping	Seeds should be kept dry and stored in a refrigerator. Keep plants in shade house after establishment. (Bartow)(Baskin)(Young)
Length of Storage	N/A
Guidelines for Outplanting / Performance on Typical Sites Other Comments	N/A
<b>INFORMATION SOURCES</b>	

References	<p>Bartow, Amy L. 2006. Propagation protocol for production of Container (plug) <i>Cardamine penduliflora</i> Schulz plants USDA NRCS - Corvallis Plant Materials Center Corvallis, Oregon. In: Native Plant Network. URL: <a href="http://NativePlantNetwork.org">http://NativePlantNetwork.org</a> (accessed 2019/05/02). US Department of Agriculture, Forest Service, National Center for Reforestation, Nurseries, and Genetic Resources.</p> <p>Baskin, Jerry M.; Baskin, Carol C.. 2002. Propagation protocol for production of Container (plug) <i>Cardamine concatenata</i> (Michx.) Sw. plants University of Kentucky Lexington, Kentucky. In: Native Plant Network. URL: <a href="http://NativePlantNetwork.org">http://NativePlantNetwork.org</a> (accessed 2019/05/02). US Department of Agriculture, Forest Service, National Center for Reforestation, Nurseries, and Genetic Resources.</p> <p>Consortium of California Herbaria. 2019. Berkeley, California: The Calflora Database Available: <a href="https://www.calflora.org/">https://www.calflora.org/</a> (Accessed: Apr 27, 2019).</p> <p>"Corallorhiza striata." Plants Database. USDA, n.d. Web. 23 May 2017</p> <p>Ihsan A. Al-Shehbaz 2012, <i>Cardamine angulata</i>, in Jepson Flora Project (eds.) <i>Jepson eFlora</i>, <a href="http://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=17120">http://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=17120</a>, accessed on April 27, 2019.</p> <p>Turner, Mark. "Cardamine Angulata   Angled Bittercress   Wildflowers of the Pacific Northwest." <i>Turner Photographics</i>, Turner Photographics, 2 May 2019, <a href="http://www.pnwflowers.com/flower/cardamine-angulata">www.pnwflowers.com/flower/cardamine-angulata</a>.</p> <p>Pojar J., McKinnon A., 1994 Plants of the Pacific Northwest: Washington, Oregon, British Columbia and Alaska, B.C. Ministry of Forests and Lone Publishing, Canada</p> <p>Young, Betty. 2007. Propagation protocol for production of Container (plug) <i>Cardamine californica</i> (Nutt.) Rollins plants 2 inch pot; San Francisco, California. In: Native Plant Network. URL: <a href="http://NativePlantNetwork.org">http://NativePlantNetwork.org</a> (accessed 2019/05/02). US Department of Agriculture, Forest Service, National Center for Reforestation, Nurseries, and Genetic Resources.</p>
Other Sources Consulted	
Protocol Author	Kaitlyn Sweeney
Date Protocol Created or Updated	05/25/2019