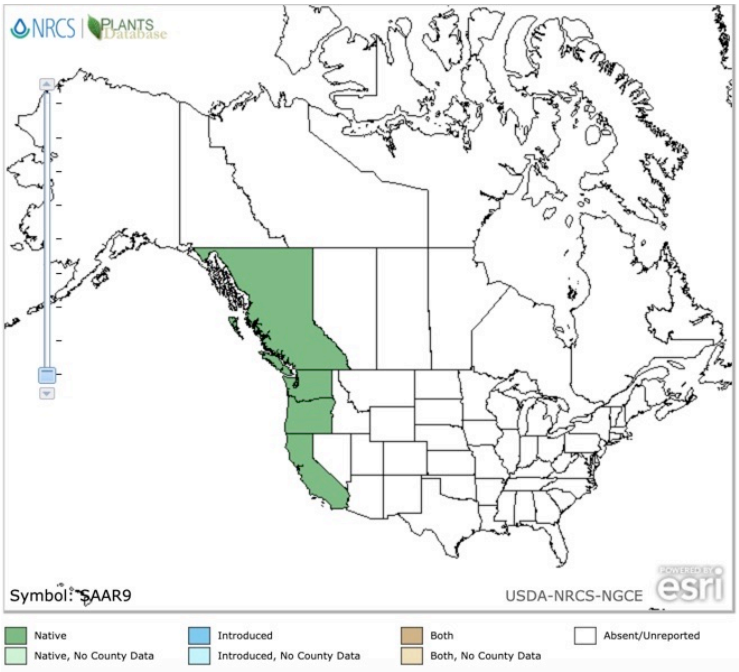
Plant Propagation Protocol for *Sanicula arctopoides*
ESRM 412 – Native Plant Production
Protocol URL: https://courses.washington.edu/esrm412/protocols/*[SAAR9.pdf]*

Sanicula arctopoides (footsteps of spring)


[8]

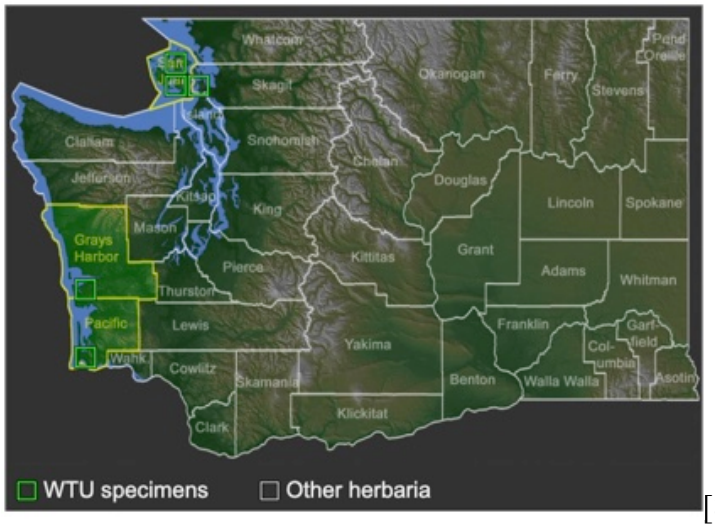

[2]

North American Distribution



[11]

Washington State Distribution



[8]

TAXONOMY	
Plant Family	
Scientific Name	Apiaceae
Common Name	Carrot Family[1,11]
Species Scientific Name	
Scientific Name	*Sanicula arctopoides* Hook. And Arn.
Varieties	None listed
Sub-species	None listed
Cultivar	

Common Synonym(s)	*Sanicula crassicaulis* Poepp. Ex DC. var. *howellii* (J.M. Coult. and Rose) Mathias[11,7] *Sanicula x howellii* (J.M Coult. and Rose) Shan and Constance[11,7]
Common Name(s)	Footsteps of Spring[11,], Yellow mats[2,3,], Bear's-foot Sanicle[4,5,8]
Species Code (as per USDA Plants database)	SAAR9
GENERAL INFORMATION	
Geographical range	See maps above. North America: Native in continental USA and Canada[7] More specifically: Along the coast in WA, Vancouver Island, B.C., south along the coast to California[8]
Ecological distribution	Coastal bluffs[8], meadows[8], and prairies[6] In Canada: drought-prone maritime meadows at low elevations along shorelines[5]
Climate and elevation range	Maritime[4], Found in range of -75' to 2749'[3]
Local habitat and abundance	Plants experience wide seasonal fluctuations in water availability, with abundant rains typically beginning in mid-autumn, and continuing through autumn and winter, ceasing with the onset of the summer drought, when *Sanicula arctopoides* becomes dormant[5] Commonly grows in vegetation dominated by low (< 20 cm tall) forbs and grasses. A few native species may be relatively common in the vegetation but exotic, invasive forbs and grasses tend to dominate[5] In WA some commonly associated species include: Red fescue (*Festuca rubra*), bracken (*Pteridium aquilinum*), rose (*Ros* a s pp.), western buttercup (*Ranunculus occidentalis*), strawberry (*Fragaria* s pp.), and hooked-spur violet (*Viola adunca*)[4] *Sanicula arctopoides* is rare in B.C[4] and is considered critically imperiled in WA[8]
Plant strategy type / successional stage	As a herbaceous perennial species, *Sanicula arctopoides* survives summer drought and winter cold by dying back to the ground[5] Can tolerate natural herbivory by deer and other grazers[9]
Plant characteristics	See photo above. Perennial, forb/herb[11] Flowering from February/March to May[2,4,8]

	Low tap rooted perennial near salt water; stems branched at the base, prostrate or ascending can range in 5-30 cm long[4] Leaves somewhat succulent, often yellowish; basal leaves rosette-forming, petioles broad; blade 2.5-6 x 2.5-9 cm, 3-cleft, the segments irregularly toothed or cleft, the teeth tipped with soft bristles[4] Ultimate umbels about 1 cm wide at height of flowering; involucel conspicuous , generally larger than the heads, composed of 8-17 oblanceolate, entire to trilobed bractlets 5-15 mm long, slightly fused at the base[4] Flowers yellow, 20-25 per ultimate umbel, with acute calyx lobes 1-2 mm long, fused below the middle[4] Fruit ovoid to sub-globose, 2-5 mm. long and 2-3 mm. wide, covered above with stout, recurved prickles[8] Commonly attracts a variety of butterflies, specifically the silverspot butterfly in Long Beach[12]
PROPAGATION DETAILS : Container (plug) Production[1]	
Ecotype	Coastal, from Clatsop Co, OR
Propagation Goal	Plants
Propagation Method	Seed
Product Type	Container (plug)
Stock Type	Stubby containers
Time to Grow	Weeks
Target Specifications	Well-developed crowns, roots and rhizomes filling soil profile in container
Propagule Collection Instructions	Not specified. Generally collected from seeds[3,10] When available, may be purchased at Oaktown Native Plant Nursery[3,10] A study has shown that clipping and natural grazing of umbels early in the fall does not impact numbers of seed produced or seed mass[9]. However, lots of herbivory decreases seed load by as much as 52%[9], so to maintain adequate natural population levels, maybe

	inspect herbivory/grazing intensity before collecting seed.
Propagule Processing/Propagule Characteristics	Not specified. The apparent short life of seed banks in the soil suggests that the species is not adapted to extended, multi-year, periods of conditions unsuited to germination[5].
Pre-Planting Propagule Treatments	Sanicula arctopoides seeds germinate only after a warm treatment followed by a cold treatment to break dormancy. This is further improved if there is a period of warmth before the cold treatment. Data has shown 0% germination when the seeds went directly to the warm treatment, but once those same seeds were placed in the cold treatment (35 degrees F) for 90 days and again placed in the warm growth box (75 degree F) this number shot up to 85% overall germination.
Growing Area Preparation / Annual Practices for Perennial Crops	Not Specified.
Establishment Phase Details	Not Specified.
Length of Establishment Phase	Not Specified.
Active Growth Phase	Not Specified.
Length of Active Growth Phase	Not Specified.
Hardening Phase	Not Specified.
Length of Hardening Phase	Not Specified.
Harvesting, Storage and Shipping	Not Specified.
Length of Storage	Not Specified.
Guidelines for Outplanting / Performance on Typical Sites	Not Specified. According to COSEWIC assessment and status report there has been no known records of attempts to plant out propagated *Sanicula arctopoides* into natural environments[5]
Other Comments	The Silverspot Butterfly Enhancement Project has been able to successfully grow *Sanicula arctopoides* for planting in an area north of Long Beach[12]. The project involved college students working in a nursery to propagate and grow rare native plants, and travel to the meadow to weed, plant, and collect seed[12]. The project has been completed, however, no specific details were provided or readily available on the propagation protocol of *Sanicula arctopoides* or on the out planting success rate.
INFORMATION SOURCES	

References	See Below.
Other Sources Consulted	
Protocol Author	Lia Koklic
Date Protocol Created	05/29/19

Works Cited:

1. Bartow, Amy (2014) Corvallis Plant Materials Center and Native Plant Network: Propagation protocol for production of container (plug) *Sanicula arctopoides* plants. Available at: https://rngr.net/npn/propagation/protocols/apiaceae-sanicula-3982 Accessed: 05/27/19

2. Calflora Database (2019) *Sanicula arctopoides.* Available at: https://www.calflora.org/cgi-bin/species_query.cgi?where-calrecnum=7329 Accessed: 05/27/19

3. California Native Plant Exchange (2019) *Sanicula arctopoides* Yellow mats. Available at: http://www.cnplx.info/nplx/nplx?page=mdetail&taxon=Sanicula+arctopoides Accessed: 05/27/19

4. Camp, Pamela and Gamon, John (2011) *Sanicula arctopoides* Hook. And Arn. Bear's-foot sanicle. *Field Guide to the Rare Plants of Washington.*

5. Fairbarns, Matt (2016) COSEWIC Assessment and status report on the Bear's-foot Sanicle *Sanicula arctopoides* in Canada. *Committee of the Status of Endangered Wildlife in Canada.*

6. Holzman, Barbara (2019) San Francisco State University: Coastal Prairie and Rangeland. Available at: http://online.sfsu.edu/bholzman/ptreyes/tripcpr.htm Accessed: 05/27/19

7. ITIS Report (2019) *Sanicula arctopoides* TSN 29846. Available at: https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=29846#null Accessed: 05/27/19

8. Knoke, Don and Giblin, David (2019) Burke Museum Herbarium: *Sanicula arctopoides.* Available at: http://biology.burke.washington.edu/herbarium/imagecollection/taxon.php?Taxon=Sanicula%20arctopoides Accessed: 05/27/19

9. Lowenberg, Gregory J (1994) Effects of Floral Herbivory on Maternal Reproduction in Sanicula Arctopoides (Apiaceae). *Ecology* 75(2): 359-369.

10. Oaktown Native Plant Nursery (2019) Foot Prints of Spring *Sanicula arctopoides.* Available at: http://oakrails.oaktownnursery.com/plant/476?link=false Accessed: 05/27/19

11. USDA Plants Database (2019) *Sanicula arctopoides* Hook. and Arn. Available at: https://plants.usda.gov/core/profile?symbol=SAAR9 Accessed: 05/27/19

12. Washington Wildlife and Recreation Coalition (2019) Silverspot Butterfly Enhancement. Available at: https://wildliferecreation.org/projects/silverspot-butterfly-enhancement/ Accessed: 05/28/19