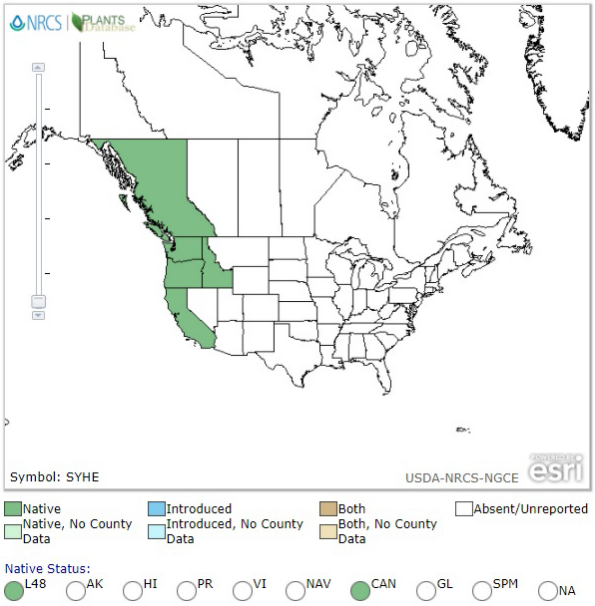
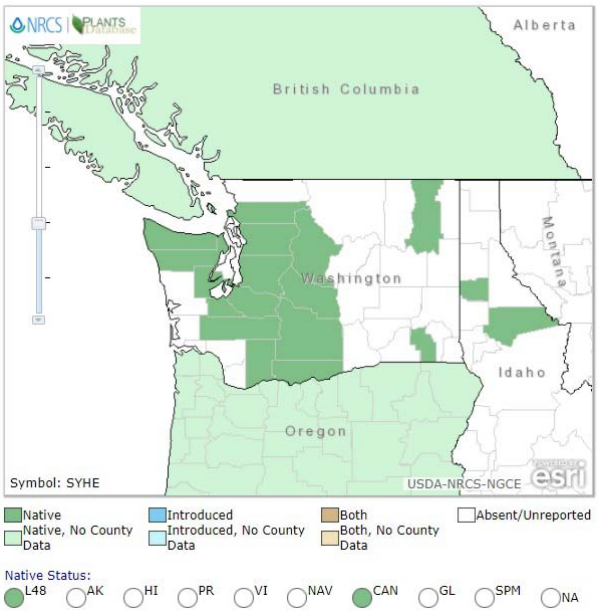
Plant Propagation Protocol for *Symphoricarpos hesperius*
ESRM 412 – Native Plant Production
Spring, 2018

North America Distribution



Washington State Distribution



Source: https://plants.usda.gov/core/profile?symbol=SYHE (USDA Plant Database)

TAXONOMY	
Plant Family	
Scientific Name	Caprifoliaceae (USDA Plant Database)
Common Name	Honeysuckle family (USDA Plant Database)
Species Scientific Name	
Scientific Name	*Symphoricarpos hesperius* G.N. Jones (USDA Plant Database)
Varieties	None
Sub-species	None
Cultivar	None
Common Synonym(s)	1. *Symphoricarpos mollis* Nutt. ssp. *hesperius* (G.N. Jones) Abrams ex Ferris (USDA Plant Database) 2. *Symphoricarpos mollis* Nutt. var. *hesperius (*G.N. Jones) Cronquist (USDA Plant Database) 3. *Symphoricarpos acutus* (A. Gray) Dieck (Bell and Dempster, 2012)
Common Name(s)	1. Trailing snowberry (USDA Plant Database) 2. Creeping snowberry, trip vine (Bell and Dempster, 2012)
Species Code	SYHE (USDA Plant Database)
GENERAL INFORMATION	
Geographical range	1. It is found in western North America from British Columbia (SE Vancouver Island, the Gulf Islands and the lower Fraser Valley) to California inland to Nevada and Idaho (Calscape: California Native

	Plant Society; E-Flora BC). 2. See the detail map above (USDA Plant Database).
Ecological distribution	1. It is a plant of chaparral ecosystems, especially along coastlines. It is often found in dry open places (Calscape: California Native Plant Society) and in meadows, grasslands, forests (Gresh and Bradley, 2017), ridges, slopes, open places in woodland (Bell and Dempster, 2012). 2. It is a common understory shrub in dry sites within the western hemlock zone (Dyrness and Acker, 1993 and 1994).
Climate and elevation range	1. According to some literatures, it most commonly occurs on dry, sunny slopes at low to mid elevations, coarse sands and gravels, sandy alluvium deposits, fine sandy-loam and silt loams, and moderately deep floodplains and terraces. In British Columbia, it occurs in maritime and submaritime climates on moderately dry nitrogen-medium soils. It can tolerate both intense sun and constant shade. (Snyder, 1991; Calscape: California Native Plant Society). 2. Elevation: 13 to 11,042 feet (Calscape: California Native Plant Society). 10 to 800 m (E-Flora BC). 9 to 3,000 m (Bell and Dempster, 2012). California: 1,000 to 5,000 feet and Oregon: 1,000 to 6,480 feet (Snyder, 1991). 3. Precipitation: annual 11.1 to 152.2 inches, summer 0.14 to 5.8 inches (Calscape: California Native Plant Society). 4. Temperature: coldest month 22.9 to 57° F, hottest month: 45.1 to 78.8° F (Calscape: California Native Plant Society).
Local habitat and abundance	1. It is a dominant shrub in some forest communities. Some overstory associates with creeping snowberry include big leaf maple (*Acer macrophyllum*), California hazel (*Corylus cornuta*), incense-cedar (*Calocedrus decurrens*), red alder (*Alnus rubra*), white fir (*Abies concolor*), red fir (*A. magnifica*), western hemlock, and Douglas-fir. Some understory associates include redstem ceanothus (*Ceanothus sanguineus*), salal (*Gaultheria shallon*), red huckleberry (*Vaccinium parvifolium*) oceanspray (*Holodiscus spp.*), rhododendron (*Rhododendron spp.*), mahonia (*Berberis spp.*), currant (*Ribes spp.*), rattail fescue (*Festuca myuros*), and silver hairgrass (*Aira caryophyllea*) (Snyder, 1991). 2. According to Dyrness and Acker (1993 and 1994), in the western Cascades of Oregon, it is almost always present in the *Pseudotsuga menziesii* / *Holodiscus discolor* association. Other species it occurs with include *Acer circinatum*, *Corylus cornuta*, *Berberis nervosa*, *Linnaea borealis*, *Trientalis latifolia*, *Whipplea modesta*, and *Festuca occidentalis*. It also occurs frequently in seral communities in the western hemlock zone (e.g. *Acer macrophyllum* / *Symphoricarpos mollis*). 3. Its occurrence is reported to decrease with increasing latitude, elevation, precipitation, and continentality (Dyrness and Acker, 1993 and 1994).

Plant strategy type / successional stage	1. Creeping snowberry mainly reproduces by rhizomes, especially following fire. It is typically not a seed banker as seeds "probably are not viable for long or do not survive fire". If it is reproduced by seeds, birds and small mammals help to disperse seeds (Snyder, 1991). Spreading low shrub with pink flowers in June and white berries (Gresh and Bradley, 2017). 2. It is an indicator in some forest communities of the Pacific Northwest. It is indicative of warm and dry sites. It becomes a dominant shrub in Monterey pine (*Pinus radiata*) stand openings. (Snyder, 1991). 3. It is usually top-killed by fire. Some researchers consider it to be a weak sprouter after fire because rhizomes in the humus layer can be destroyed, but some individuals indeed sprout from rhizomes following fire (Snyder, 1991). 4. It is expected to increase its occurrence with tree removal. Its ability to sprout from underground plant parts indicates an ability to thrive after fire disturbance (Dyrness and Acker, 1993 and 1994). 5. *Symphoricarpos spp.* shrubs, in particular *S. orbiculatus*, use a unique sexual reproductive mechanism known as layering where vertical stems droop and the tips root upon contact with the soil (Scasta *et al.*, 2014).
Plant characteristics	1. Creeping snowberry is a trailing shrub about 1.5 to 2 feet (0.3 to 1.5 m) high. Its branches trail from 3 to 6 feet (1 to 3 m). Leaves are opposite on hairy twigs; flowers form clusters. It produces a white, round fruit with two nutlets. Flowering date is June through July in Oregon and March through August in Southern California (Snyder, 1991). 2. Petioles are 1 to 3 mm long. The opposite leaves are elliptic or ovate, generally 1 to 3 cm long and 5 to 20 mm wide, entire or sometimes with a few coarse teeth or shallow lobes, upper surfaces are glabrous, and lower surface is sparsely to moderately hirsute – puberulent. Flowers in dense, terminal racenes appear during June and July. The characteristic white fruit (5 to 6 mm long) matures during August and September (Dyrness and Acker, 1993 and 1994). 3. Creeping snowberry is a perennial deciduous shrub with long-lived (>10 years), branching stems. It can reproduce both sexually through the production of berries and asexually by rooting at nodes located along the stems. New stems are initiated from lateral buds, making identification and aging of annual increment simple. Creeping snowberry produces stems that frequently become rooted through layering. Layering occurs when stems contact the ground and produce adventitious roots along the stem. Subsequently, newly rooted stems may break off and become independent clonal fragments (Nesmith *et al.*, 2006).
PROPAGATION DETAILS **Propagation by Seed** **(Details for *Symphoricarpos hesperius* are rare. Some information are**	

obtained from the species, *Symphoricarpos albus*, in the same genus)	
Ecotype	Numerous Glacier National Park seed sources, western Montana and Wyoming ecotypes (from *Symphoricarpos albus* (Scianna, 2003a,b)).
Propagation Goal	Plants (from *Symphoricarpos albus* (Scianna, 2003a,b))
Propagation Method	Seed (from *Symphoricarpos albus* (Scianna, 2003a, b))
Product Type	1. Container (plug) (from *Symphoricarpos albus* (Scianna, 2003a)) 2. Bareroot (field grown) (from *Symphoricarpos albus* (Scianna, 2003b))
Stock Type	2+0 or 3+0 bareroot (from *Symphoricarpos albus* (Scianna, 2003b))
Time to Grow	2 Years (from *Symphoricarpos albus* (Scianna, 2003b))
Target Specifications	No information.
Propagule Collection Instructions	1. Seeds mature during August and September (Dyrness and Acker, 1993 and 1994) and should be collected from September through October (Snyder, 1991). 2. The information below is obtained from the species, *Symphoricarpos albus*, in the same genus (Scianna, 2003a, b): (1) Seeds are collected from 4-year-old cultivation which is propagated from root cutting. Totally, 53 plants produced 385 lb of fruit and cleaned to 14.11 lb of seed (89% tetrazolium viability). (2) Deer will remove most of fruit from each snowberry plant in the late fall/early winter. Fruit maturation varies from year to year and occurs in Bridger, Montana from mid-October to mid-November. (3) The fruit is white and persistent and can be left on the plant until most fruit are white. Avoid waiting too long because if the fruit turns dark brown and soft, it is difficult for collection and storage. Harvest berry by hand and remove leaves (Remember to wear gloves). Firm and white berries can store well for several weeks in woven, nylon sacks and avoid overfilling each sack because the weight may cause leakage and molding. And then store berries in a 34 to 37°F cooler at 80+% relative humidity. It will sometimes soften the fruit skin and improve processing.
Propagule Processing / Propagule Characteristics	1. The fruit is dispersed by mammals and birds. Seeds germinate in the spring after an over-winter cold period (Dyrness and Acker, 1993 and 1994). 2. Number of seeds per pound: 47,850 (from *Symphoricarpos albus* (Barner, 2009)).
Pre-Planting Propagule Treatments	1. Soak in concentrated H_2SO_4 for 1 hour (or 3 to 4 months warm stratification) and 4 to 6 months cold stratification (Calscape: California Native Plant Society). 2. Seed needs two winters to germinate (Gresh and Bradley, 2017; Grotta, 2014). 3. Seeds can be treated with sulfuric acid and stratified for 6 months in sand or soil at temperatures between 36 to 46 °F (2 to 8 °C) to break dormancy (Snyder, 1991).

	4. The information below is obtained from the species, *Symphoricarpos albus*, in the same genus (Scianna, 2003a, b): (1) Soften snowberry in a DybvigT cleaner and a light-gauge welded wire screen inserted in the base of the cylinder may help maceration. After that, wash the seed repeatedly in a bucket to clean and float off debris and light seed. Spread the seed on kraft paper in a warm dry location for 24 hours. Package in a paper envelope or finely woven cotton sack and store in a cool and dry place. (2) Seed requires a warm and moist stratification of 45 to 90 days followed by 5 to 6 months of cold moist chilling. For container production, warm and moist stratify the seeds at 70°F for 45 to 90 days followed by 6 months of cold moist chilling at 34 to 37°F. (3) For field production, sow mid-summer to meet warm moist stratification requirement. Fall sowing usually results in germination the second spring.
Growing Area Preparation / Annual Practices for Perennial Crops	1. Use a well drained commercial peat-lite mix (from *Symphoricarpos albus* (Scianna, 2003a)). 2. Plow the soil to a fine and fluffy seedbed. If the soil surface is too soft, lightly firm the seedbed prior to sowing. Sow 25 to 50 seeds per linear foot to a depth of 0.25 to 0.5 inches in a 4-ft wide bed (5-ft between beds), and plant 3 to 4 rows of seeds per bed. Cover seeds with excelsior mat to maintain soil moisture and minimize animal predation. Sow fresh snowberry in October or November. Some germination may occur the following spring, but usually occurs the second spring after sowing. (from *Symphoricarpos albus* (Scianna, 2003b)).
Establishment PhaseDetails	No information.
Length of Establishment Phase	No information.
Active Growth Phase	No information.
Length of Active Growth Phase	No information.
Hardening Phase	The information below is obtained from the species, *Symphoricarpos albus* in the same genus (Scianna, 2003a): 1. Move 2-month-old (at least) seedlings from the greenhouse (winter) to an outdoor hoophouse (late spring/early summer). The hoophouse is ventilated but not cooled. The seedlings are exposed to full sunlight for 2 to 4 weeks early in the season and then are covered with a 50% shade cloth until temperatures cool in the fall. 2. Another option is to move them to the shadehouse in late summer, allowing 30 to 60 days of hardening prior to winter and the shade is removed in late summer/early fall and replaced with clear plastic. The

	plants harden-off gradually in the hoophouse prior to winter. Keeps the environment inside the hoophouse relatively mild until winter. In the severely cold weather, a small propane heater is used at keeping temperatures above freezing.
Length of Hardening Phase	A minimum of 30 days of hardening off prior to killing frost, but 60 days is preferred. (from *Symphoricarpos albus* (Scianna, 2003a)).
Harvesting, Storage and Shipping	1. The information below is obtained from the species, *Symphoricarpos albus*, in the same genus (Scianna, 2003a): (1) Store seedlings overwinter in a hoophouse which is ventilated when temperatures reach 35 to 40°F and heated to maintain a temperature of 5 to 10°F. (2) The volume of containers for overwinter is 10 cubic inch which is placed on 2 inches of pea gravel and arranged in a side-by-side pattern. (3) Watered over the fall and winter as needed. If temperatures in the spring are too warm, seedlings are moved to a walk-in cooler (34 to 37°F, 80+% relative humidity) to assure dormancy until shipping. (4) Plants may be shipped with or without containers in heavy waxed boxes. 2. The information below is obtained from the species, *Symphoricarpos albus*, in the same genus (Scianna, 2003b): (1) Harvest 2-0 or 3-0 bareroot plants as soon as the ground thaws in early spring. Seedbeds are undercut in two directions (lengthwise) prior to using the blade to lift the plants. Bundles of 10 to 25 seedlings tied together, trimmed to a uniform size, then the roots packed in moist sphagnum or peat moss wrapped in plastic. (2) The plants are stored in a walk-in cooler (34 to 37°F and 80+% relative humidity) until needed and then shipped in heavy wax coated boxes (from *Symphoricarpos albus* (Scianna, 2003b)).
Length of Storage	Fully dormant bareroot plants store well for several weeks at 34 to 37°F and 80+% relative humidity (from *Symphoricarpos albus* (Scianna, 2003b)).
Guidelines for Outplanting / Performance on Typical Sites	Pruning can encourage more branching (Higgins, 2009).
Other Comments	1. It can be propagated through cuttings or, less successfully, by seed (Snyder, 1991). 2. Rapid growth rate (Higgins, 2009). 3. It is useful for erosion control because of its rhizomes (Snyder, 1991) and works well (Higgins, 2009).

PROPAGATION DETAILS

Propagation by Vegetative

(Details for *Symphoricarpos hesperius* are rare. Some information are obtained from the species, *Symphoricarpos albus*, in the same genus)

Ecotype	1. Lodgepole pine forest, West Glacier, 1000m elev., Glacier National Park, Flathead Co., MT. (from *Symphoricarpos albus* (Lapp *et al.*, 2008)). 2. Numerous Glacier National Park seed sources, western Montana and Wyoming ecotypes. (from *Symphoricarpos albus* (Scianna, 2003a)).
Propagation Goal	Plants (from *Symphoricarpos albus* (Lapp *et al.*, 2008; Scianna, 2003a))
Propagation Method	Vegetative (from *Symphoricarpos albus* (Lapp *et al.*, 2008; Scianna, 2003a))
Product Type	Container (plug) (from *Symphoricarpos albus* (Lapp *et al.*, 2008; Scianna, 2003a))
Stock Type	3L containers (from *Symphoricarpos albus* (Lapp *et al.*, 2008)
Time to Grow	18 Months (from *Symphoricarpos albus* (Lapp *et al.*, 2008)
Target Specifications	The height of target plant is 30 cm and the caliper is 8 mm. Root System firmly plug in 3L (1 gallon) container (from *Symphoricarpos albus* (Lapp *et al.*, 2008)).
Propagule Collection Instructions	1. Types of cutting are hardwood and softwood stem cuttings. Hardwood cuttings are collected late March to April and May to late June for softwood cuttings. All the cuttings must be collected from healthy donor field plants and then stem tip cuttings are 15 cm in length and 5 mm in caliper (from *Symphoricarpos albus* (Lapp *et al.*, 2008)). 2. Take dormant hardwood stem cuttings, 6 to 8 inches in length and at least pencil diameter in size, from December through February. Cuttings are put in Ziplock and lightly moistened with water. And then store in a cooler or refrigerator slightly above freezing. In this condition, cuttings can be stored for several weeks. (from *Symphoricarpos albus* (Scianna, 2003a)).
Propagule Processing / Propagule Characteristics	1. Once the seedling is established by seed, it is highly likely spread vegetatively. Vegetative regeneration is both by layering at nodes and sprouting from roots and rhizomes (Dyrness and Acker, 1993 and 1994). 2. Cuttings are kept under refrigeration and moist prior to pre treatment (from *Symphoricarpos albus* (Lapp *et al.*, 2008)).
Pre-Planting Propagule Treatments	1. Easily propagated from cuttings or divisions (Calscape: California Native Plant Society). 2. Take hardwood cutting in late summer or early fall and put in soil (Gresh and Bradley, 2017). 3. Take hardwood cuttings in late fall/early winter and treat with hormone and then put in soil to root (Grotta, 2014). 4. The information below is obtained from the species, *Symphoricarpos albus*, in the same genus (Lapp *et al.*, 2008): (1) Re-cut the cuttings at the base and terminal buds. And then remove one third of basal leaves or buds. (2) Cuttings are dipped into a fungicide bath to remove pathogens and treated liquid IBA (5 second quick-dip) and stuck into rooting medium with at least 2 nodes below the surface.

	(3) Hardwood cuttings are treated with 2,000 ppm liquid IBA and the rooting percentage is 50 to 71% in 4 to 5 weeks. Softwood cuttings are treated with 8,000 ppm liquid IBA and the rooting percentage is 91 to 98% in 4 weeks. 5. The information below is obtained from the species, *Symphoricarpos albus*, in the same genus (Scianna, 2003): (1) Cuttings are 5 to 6 inches in length. Remove buds, leaves, and branches from half to one third of the basal each cutting and flowers and fruit as well when present. (2) Cuttings are stored in moistened paper towels during processing. Re-cut the base of each stem cutting at an angle and wound the basal end of the stem just below the cambium layer with a shallow 1 to 1.5 inch wound. (3) Dip cuttings in fungicide and allow to dry. Lightly spray the wound with water, shake off excess water, and then insert the base into 1,000 to 3,000 ppm IBA talc rooting compound. Remove excess hormone by lightly tapping the end of the cutting on a hard surface.
Growing Area Preparation / Annual Practices for Perennial Crops	1. Cuttings are put on the outdoor mistbed which has automatic intermittent mist (6 second intervals every 6 minutes) and is covered with shadecloth during rooting. Bottom heat is provided at 21°C with heating cables buried 12 cm beneath rooting medium. Rooting medium is 1:1 perlite: sand (from *Symphoricarpos albus* (Lapp *et al.*, 2008)). 2. Media is well drained and sterile which is 100% sand, 50:50 sand: perlite, 50:50 sand: vermiculite, or 50:50 perlite: vermiculite. Bottom heat (70 to 80°F) is used for the root initiation stage (first 4 to 6 weeks). Overhead intermittent mist controlled by a Mist-o-maticT, 16-hour photoperiods, and the days and nights temperatures in the greenhouse are 75 to 80°F and 60 to 65°F, respectively (from *Symphoricarpos albus* (Scianna, 2003a)).
Establishment Phase Details	1. Transplant in the 5th week from mistbed when cuttings generate roots at the nodes (from *Symphoricarpos albus* (Lapp *et al.*, 2008)). 2. It easily propagates from dormant hardwood cuttings taken in December to February. Rooting success exceeds 80% (from *Symphoricarpos albus* (Scianna, 2003a)).
Length of Establishment Phase	5 weeks (from *Symphoricarpos albus* (Lapp *et al.*, 2008)).
Active Growth Phase	1. The information below is obtained from the species, *Symphoricarpos albus*, in the same genus (Lapp *et al.*, 2008): (1) After 5 weeks, they are lifted from mistbed and transplanted into 3L (1 gallon) containers. (2) Growing medium was changed to 70% 6:1:1 milled spaghnum peat, perlite, and vermiculite and 30% sand. (3) Osmocote controlled release fertilizer and Micromax fertilizer

	were used at the rate of 5 grams of Osmocote and 2.0 grams of Micromax per container. (4) Cuttings are also fertilized with 13-13-13 liquid NPK at 100 ppm weekly. (5) Container cuttings are placed in shadehouse for 4 weeks and then moved to full sun exposure for the remainder of the growing season. (6) It is important to obtain as much root growth as possible prior to overwinter storage. 2. Cuttings are well rooted in 16 weeks and then transplanted into 40-cubic-inch to 1-gal containers with a commercial peat-lite mix. The seedlings are grown for another 2 months in the greenhouse and then moved to a shade house for hardening (from *Symphoricarpos albus* (Scianna, 2003a)).
Length of Active Growth Phase	16 weeks (from *Symphoricarpos albus* (Lapp *et al.*, 2008)).
Hardening Phase	1. Irrigation is gradually reduced in September and October and then the final irrigation is applied prior to overwintering (from *Symphoricarpos albus* (Lapp *et al.*, 2008)). 2. See the "Hardening Phase" in the "Propagation by Seed" for details (from *Symphoricarpos albus* (Scianna, 2003a)).
Length of Hardening Phase	1. 6 weeks (from *Symphoricarpos albus* (Lapp *et al.*, 2008)). 2. A minimum of 30 days of hardening off prior to killing frost, but 60 days is preferred. (from *Symphoricarpos albus* (Scianna, 2003a)).
Harvesting, Storage and Shipping	1. The information below is obtained from the species, *Symphoricarpos albus*, in the same genus (Lapp *et al.*, 2008): (1) Total harvest time is 18 months from cuttings in 3L (1 gallon) containers. The best harvest season is fall. (2) Cuttings require additional protection by placing them in an unheated greenhouse to promote additional root growth in late fall and to protect stems from breakage from heavy snowload. 2. See the "Harvesting, Storage and Shipping" in the "Propagation by Seed" for details (from *Symphoricarpos albus* (Scianna, 2003a)).
Length of Storage	5 months (from *Symphoricarpos albus* (Lapp *et al.*, 2008)).
Guidelines for Outplanting / Performance on Typical Sites	Pruning can encourage more branching (Higgins, 2009).
Other Comments	See "Other Comments" in the "Propagation by Seed" for details.
INFORMATION SOURCES	
References	Barner, J. 2009. Propagation protocol for production of Propagules (seeds, cuttings, poles, etc.) *Symphoricarpos albus* (L.) Blake seeds USDA FS - R6 Bend Seed Extractory Bend, Oregon. In: Native Plant Network. URL: http://NativePlantNetwork.org (accessed 2018/05/14). US Department of Agriculture, Forest Service, National Center for Reforestation, Nurseries, and

Genetic Resources.
Bell, C.D. and Dempster, L.T. 2012, *Symphoricarpos mollis*, in Jepson Flora Project (eds.) *Jepson eFlora*, http://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=45924, accessed on April 19, 2018.
Calscape: California Native Plant Society. Retrieved from http://calscape.org/Symphoricarpos-mollis-(), accessed on May 6, 2018.
Dyrness, C.T. and Acker, S.A. 1993 and 1994. Ecology of Common Understory Plants in Northwestern Oregon and Southwestern Washington Forests. Compiled, edited, and posted as a web-document on the Andrews Forest webpage in 2010. Retrieved from https://andrewsforest.oregonstate.edu/sites/default/files/lter/pubs/pdf/pub4949.pdf, accessed on May 10, 2018.
E-Flora BC: An Initiative of the Spatial Data Lab, Department of Geography UBC, and the UBC Herbarium. Retrieved from http://linnet.geog.ubc.ca/Atlas/Atlas.aspx?sciname=Symphoricarpos%20hesperius, accessed on April 19, 2018.
Gresh, G. and Bradley, M. 2017. Native Plant Identification and Propagation Guide. UC Berkely, Strawberry Creek Restoration Program.
Grotta, A., Wilson, P. and Farris, L. 2014. Propagating native shrubs from seed or cuttings. Retrieved from http://blogs.oregonstate.edu/treetopics/2014/08/26/propagating-native-shrubs-seed-cuttings/, accessed on May 9, 2018.
Higgins, L.V. 2009. Backyard Native Plants: Identification and Treatment of Shrubs and Ground Covers for Fire Safe Landscaping at Lake Tahoe. A Tahoe Conservation Services Publication.
Nesmith, J.C., Hibbs, D.E. and Shatford, J.P. 2006. Clonal growth patterns of creeping snowberry (*Symphoricarpos hesperius* GN Jones) and trailing blackberry (*Rubus ursinus* Cham. and Schlecht) in the western foothills of the Cascade Mountains, Oregon. Northwest Science, 80(4), p.274.
Lapp, J., Luna, T. Potter, R., Corey, S., Evans, J., Wick, D. and Hosokawa, J. 2008. Propagation protocol for production of Container (plug) *Symphoricarpos albus* (L.) Blake plants 3L containers; USDI NPS - Glacier National Park West Glacier, Montana. In: Native Plant Network. URL: http://NativePlantNetwork.org (accessed 2018/05/12). US Department of Agriculture, Forest Service, National Center for Reforestation, Nurseries, and Genetic Resources.
Scasta, J.D., Engle, D.M., Harr, R.N. and Debinski, D.M. 2014. Fire induced reproductive mechanisms of a *Symphoricarpos* (Caprifoliaceae) shrub after dormant season burning. Botanical studies, 55(1), p.80.

	Scianna, J. 2003a. Propagation protocol for production of Container (plug) *Symphoricarpos albus* (L.) Blake plants USDA NRCS - Bridger Plant Materials Center Bridger, Montana. In: Native Plant Network. URL: http://NativePlantNetwork.org (accessed 2018/05/12). US Department of Agriculture, Forest Service, National Center for Reforestation, Nurseries, and Genetic Resources. Scianna, J. 2003b. Propagation protocol for production of Bareroot (field grown) *Symphoricarpos albus* (L.) Blake plants 2+0 or 3+0 bareroot; USDA NRCS - Bridger Plant Materials Center Bridger, Montana. In: Native Plant Network. URL: http://NativePlantNetwork.org (accessed 2018/05/14). US Department of Agriculture, Forest Service, National Center for Reforestation, Nurseries, and Genetic Resources. Snyder, S.A. 1991. *Symphoricarpos mollis.* In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: https://www.fs.fed.us/database/feis/plants/shrub/symmol/all.html [2018, May 9]. USDA Plant Database. Retrieved from https://plants.usda.gov/core/profile?symbol=SYHE, accessed on April 19, 2018.
Other Sources Consulted	Craig, J. 2017. Propagation of trees and shrubs from cuttings, Bulletin: Vol. 1: No. 4, Article 5. Available at: https://lib.dr.iastate.edu/bulletin/vol1/iss4/5, accessed on May 9, 2018. Haeussler, S., Coates, D. and Mather, J. 1990. Autecology of common plants in British Columbia: a literature review (No. 158). FRDA Research Program, Research Branch, BC Ministry of Forests and Lands. Lavender, D.P. 1958. Effect of ground cover on seedling germination and survival. Research note, No. 38, Forest Lands Research Center, State of Oregon. Peck, M.E., 1941. A manual of the higher plants of Oregon. A manual of the higher plants of Oregon.
Protocol Author	Arthur Hsin-Wu Hsu
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