

**Plant Propagation Protocol for *Philadelphus lewisii***

ESRM 412 – Native Plant Production

Protocol URL: <https://courses.washington.edu/esrm412/protocols/PHLE4.pdf>



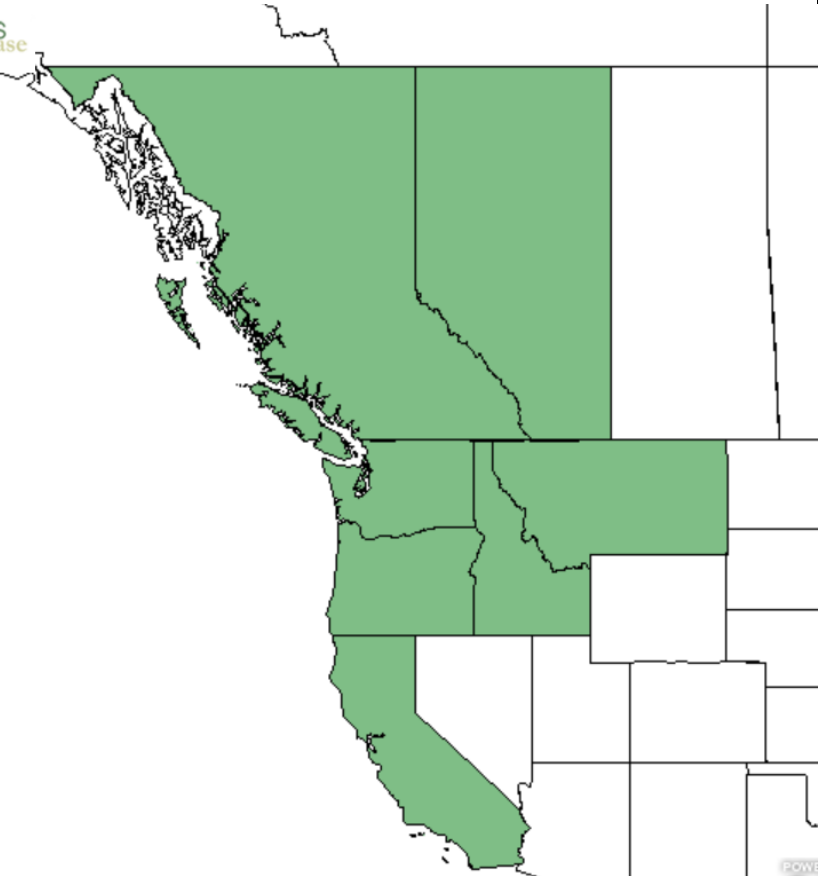
[2]

<b>TAXONOMY</b>	
<b>Plant Family</b>	
Scientific Name	<i>Hydrangeaceae</i>
Common Name	Hydrangea
<b>Species Scientific Name</b>	
Scientific Name	<i>Philadelphus lewisii</i> Pursh (Hydrangeaceae)
Varieties	<i>Philadelphus lewisii</i> var. <i>angustifolius</i> (Rydb.) Hu <i>Philadelphus lewisii</i> var. <i>ellipticus</i> Hu <i>Philadelphus lewisii</i> var. <i>gordonianus</i> (Lindl.) Jepson <i>Philadelphus lewisii</i> var. <i>helleri</i> (Rydb.) Hu <i>Philadelphus lewisii</i> var. <i>intermedius</i> (A. Nels.) Hu <i>Philadelphus lewisii</i> var. <i>lewisii</i> Pursh <i>Philadelphus lewisii</i> var. <i>oblongifolius</i> Hu <i>Philadelphus lewisii</i> var. <i>parvifolius</i> Hu <i>Philadelphus lewisii</i> var. <i>platyphyllus</i> (Rydb.) Hu [5]

Sub-species	Philadelphus lewisii subsp. californicus (Benth.) Munz. [5]
Cultivar	
Common Synonym(s)	
Common Name(s)	Lewis' Mockorange; Mockorange; Indian arrowwood; Syringa [7]
Species Code (as per USDA Plants database)	PHLE4

**GENERAL INFORMATION**

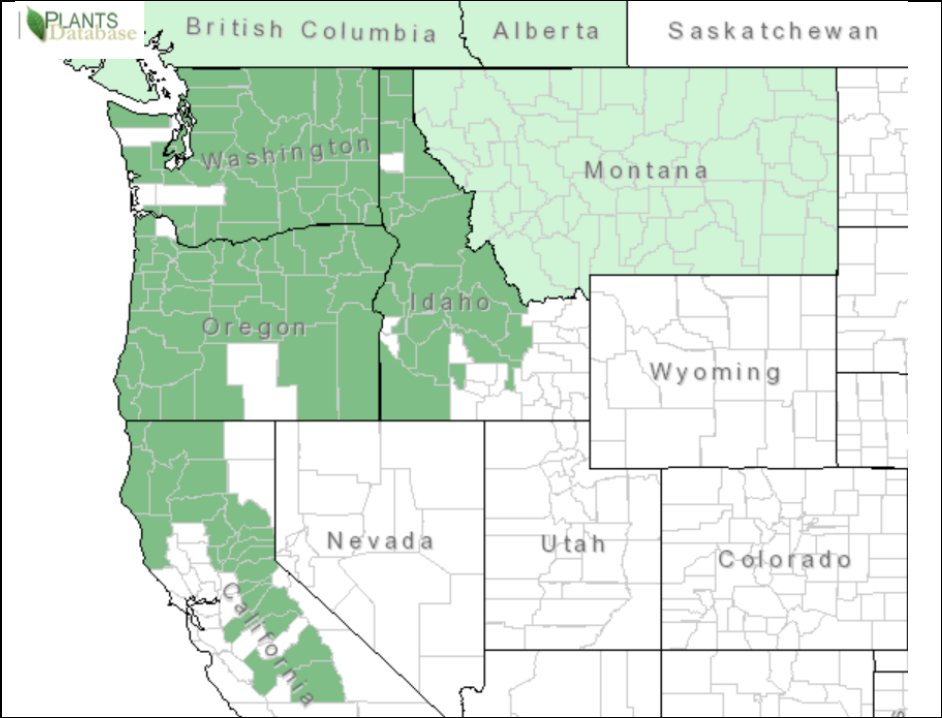
Geographical range      Distributed throughout the western side of the United States and southwest Canada. Primarily in Washington, Idaho, and Oregon; also found in California and Montana. [8]



PHLE4

USDA-NRCS-NGCE



	
Ecological distribution	Prefers open woods and stream sides. Also found on bluffs and moderately dry rocky slopes [7]
Climate and elevation range	Sea-level to 8000 ft elevation range. [6]
Local habitat and abundance	Riparian zones, wooded ravines, forest edges, dry hillsides, chaparral, and fir/pine communities are the preferred habitat of Mockorange. [7] Mockorange is most abundant in the Pacific Northwest but is still found in Montana and California. Associated with beaked hazelnut, oceanspray, poison-oak, Indian plum, and red-osier dogwood (depending on the environment it is found in. [5]
Plant strategy type / successional stage	They are fire resistant and will regrow from root crowns and the built-up seed bank in the soil after a fire. It favors a northern and eastern exposure. Likes full sun to moderate shade and soil that is moist, well-draining, and coarse to medium textured (rich, loamy). [7] Mockorange is an important winter forage species for elk and deer [5]. USDA Zone 4 [2]
Plant characteristics	Erect to spreading deciduous shrub. Grows 4 to 12 ft tall and can be 3 to 9 ft wide. Oblong and broadly lanced shaped leaves that are opposite. The leaves are 1-3 in. long and have smooth to sparsely toothed margins. Blooms from May to June, with scented white flowers (1-1.5 in wide) that have 4 petals. The flowers can be solitary or clustered (3 to 15). The flowers produce a small, light brown, 4-celled capsule fruit. The shrub has light brown-grey bark that can be shredded or scaly. [6]
<b>PROPAGATION DETAILS [9]</b>	
Ecotype	Open, rocky slope, Glacier National Park

Propagation Goal	Cuttings
Propagation Method	Vegetative
Product Type	Container (plug)
Stock Type	800 ml containers [9]
Time to Grow	18 months
Target Specifications	Firm plug of root systems in containers Cutting height 15 cm[9]
Propagule Collection Instructions	Collect mid-June Collect from healthy field plants [9]
Propagule Processing/Propagule Characteristics	Cutting must be kept moist and refrigerated before pre-treatment. Vegetative propagation: pre-rooting Type of cutting: summer softwood stem cuttings [9]
Pre-Planting Propagule Treatments	Cuttings are re-cut and terminal buds removed To remove surface pathogens, cuttings were dipped for 2 minutes into domain fungicide bath. Then treated with 2000 ppm liquid IBA rooting hormone. Stuck, with at least 2 nodes below the surface, in rooting medium that had bottom heat. Rooting is ~ 70% [9]
Growing Area Preparation / Annual Practices for Perennial Crops	Outdoor mist-bed covered with shade cloth – automatic mist applied for 6 second intervals every 6 minutes (over misting will result in the cuttings rotting) 21°C bottom heating by heating cables 12 cm below rooting media Rooting Media: 50% perlite and 50% sand [9]
Establishment Phase Details	Once rooted, they are transplanted into 800 ml containers <ul style="list-style-type: none"> <li>- 50 % 1:1 milled sphagnum peat, perlite, and vermiculite</li> <li>- 50 % sand with fertilizer (rate of 2 g of Osmocote and 1.0 g of Micromax/container</li> </ul> <p style="text-align: center;">Osmocote controlled release fertilizer (13N:13P2O5:13K2O; 8 to 9 month release rate at 21C)</p> <p style="text-align: center;">Micromax fertilizer (12%S, 0.1%B, 0.5%Cu, 12%Fe, 2.5%Mn, 0.05%Mo, 1%Zn)</p> Placed in shadehouse for the remaining duration of the growing season [9]
Length of Establishment Phase	8 weeks
Active Growth Phase	After transplanting from mistbed to container, growth is moderate Multi-stemmed and root tight (1.5 L container) in 1.5 years. [9]
Length of Active Growth Phase	8 weeks
Hardening Phase	One final irrigation before overwintering [9]
Length of Hardening Phase	4 weeks
Harvesting, Storage and Shipping	1.5 years to Harvest Harvest: September

	Storage Conditions: Winter in outdoor nursery under insulating foam cover and snow
Length of Storage	5 months
Guidelines for Outplanting / Performance on Typical Sites	
	Hardwood cuttings: early spring Cuttings: 20cm in length, treated with 2500-8000 ppm liquid IBA, placed 15cm deep in rooting medium
<b>PROPAGATION DETAILS</b>	
Ecotype	
Propagation Goal	Seeds
Propagation Method	Seed
Product Type	propagules
Stock Type	
Time to Grow	18 months
Target Specifications	
Propagule Collection Instructions	Collect dried capsules in late summer. Crush to release the seed [7]
Propagule Processing/Propagule Characteristics	5,300,000 seeds/lb (plantguide) [7]
Pre-Planting Propagule Treatments	Cold-moist stratification in sand for 8 weeks at 5°C to overcome dormancy [6]
Growing Area Preparation / Annual Practices for Perennial Crops	May sow seeds on site in fall for germination in spring Container beds of rich, loamy textured soils that are well draining [7]
Establishment Phase Details	Germinate in spring
Length of Establishment Phase	4 weeks
Active Growth Phase	Rapid Transplant to 800 ml container after 8 weeks
Length of Active Growth Phase	8 weeks
Hardening Phase	
Length of Hardening Phase	4 weeks
Harvesting, Storage and Shipping	Harvest late summer
Length of Storage	5 months
Guidelines for Outplanting / Performance on Typical Sites	
Other Comments	
<b>INFORMATION SOURCES</b>	
References	1 California Native Plant Society. <i>Mock Orange, Philadelphus lewisii</i> . Retrieved 6 May 2020, from <a href="https://calscape.org/Philadelphus-lewisii-()">https://calscape.org/Philadelphus-lewisii-()</a>

	<p>2 <i>Philadelphus lewisii</i>   Landscape Plants   Oregon State University. Retrieved 6 May 2020, from <a href="https://landscapeplants.oregonstate.edu/plants/philadelphus-lewisii">https://landscapeplants.oregonstate.edu/plants/philadelphus-lewisii</a></p> <p>3 The Jepson Herbarium, UC Berkeley. <i>Philadelphus lewisii</i>. (2020). Retrieved 6 May 2020, from <a href="https://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=37691">https://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=37691</a></p> <p>4 U.S. Department of Agriculture, Forest Service. 1937. Range plant handbook. Washington, DC. 532 p.</p> <p>5 US Forest Service. <i>Philadelphus lewisii</i>. Retrieved 06 May 2020, from <a href="https://www.fs.fed.us/database/feis/plants/shrub/philew/all.html">https://www.fs.fed.us/database/feis/plants/shrub/philew/all.html</a></p> <p>6 USDA NRCS. <i>Plant Fact Sheet: LEWIS MOCKORANGE Philadelphus lewisii Pursh</i> [Ebook]. Retrieved 06 May 2020, from <a href="https://plants.sc.egov.usda.gov/factsheet/pdf/fs_phle4.pdf">https://plants.sc.egov.usda.gov/factsheet/pdf/fs_phle4.pdf</a></p> <p>7 USDA NRCS. <i>Plant Guide: LEWIS' MOCKORANGE Philadelphus lewisii Pursh</i> [Ebook]. Retrieved 06 May 2020, from <a href="https://plants.usda.gov/plantguide/pdf/pg_phle4.pdf">https://plants.usda.gov/plantguide/pdf/pg_phle4.pdf</a></p> <p>8 USDA NRCS. Plants Profile for <i>Philadelphus lewisii</i> (Lewis' mock orange). Retrieved 6 May 2020, from <a href="https://plants.sc.egov.usda.gov/core/profile?symbol=PHLE4">https://plants.sc.egov.usda.gov/core/profile?symbol=PHLE4</a></p> <p>9 Wick, Dale. 2001. Propagation protocol for production of Container (plug) <i>Philadelphus lewisii</i> Pursh plants 800 ml containers; USDI NPS - Glacier National Park West Glacier, Montana. In: Native Plant Network. US Department of Agriculture, Forest Service, National Center for Reforestation, Nurseries, and Genetic Resources. Retrieved 06 May 2020, from <a href="https://npn.rngr.net/renderNPNProtocolDetails?selectedProtocolIds=hydrangeaceae-philadelphus-317&amp;referer=wildflower">https://npn.rngr.net/renderNPNProtocolDetails?selectedProtocolIds=hydrangeaceae-philadelphus-317&amp;referer=wildflower</a></p>
Other Sources Consulted	Wittinger, W. T.; Pengelly, W. L.; Irwin, L. L.; Peek, J. M. 1977. A 20-year record of shrub succession in logged areas in the cedar-hemlock zone of northern Idaho. <i>Northwest Science</i> . 51(3): 161-171. Retrieved 06 May 2020.
Protocol Author	Kaitlin Allen
Date Protocol Created or Updated	Updated 05/06/20. Updated 04/28/08. Original 05/06/03.



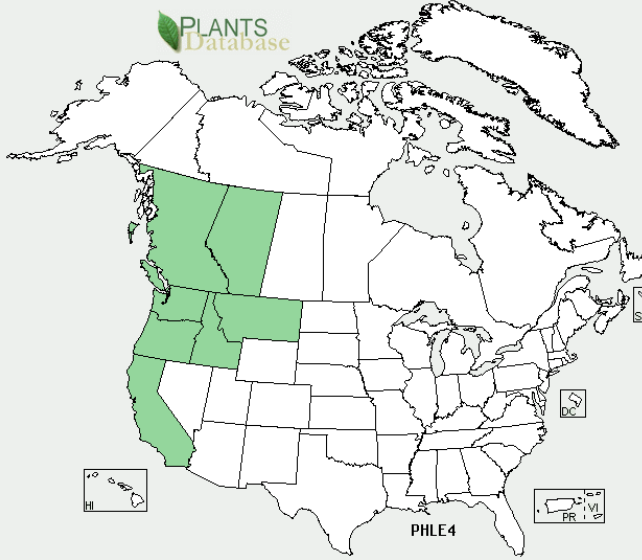
**Plant Propagation Protocol for *Philadelphus lewisii***  
 ESRM 412 – Native Plant Production  
 Spring 2008



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<b>TAXONOMY</b>	
<b>Family Names</b>	
Family Scientific Name:	Hydrangeaceae or some consider Philadelphaceae
Family Common Name:	Hydrangea
<b>Scientific Names</b>	
Genus:	<i>Philadelphus</i>
Species:	<i>lewisii</i>
Species Authority:	Pursh
Common Synonym(s) (include full scientific names (e.g., <i>Elymus glaucus</i> Buckley), including variety or subspecies information)	<i>Philadelphus lewisii</i> var. <i>angustifolius</i> (Rydb.) Hu <i>Philadelphus lewisii</i> var. <i>ellipticus</i> Hu <i>Philadelphus lewisii</i> var. <i>gordonianus</i> (Lindl.) Jepson <i>Philadelphus lewisii</i> var. <i>helleri</i> (Rydb.) Hu <i>Philadelphus lewisii</i> var. <i>intermedius</i> (A. Nels.) Hu <i>Philadelphus lewisii</i> var. <i>lewisii</i> Pursh <i>Philadelphus lewisii</i> var. <i>oblongifolius</i> Hu <i>Philadelphus lewisii</i> var. <i>parvifolius</i> Hu <i>Philadelphus lewisii</i> var. <i>platyphyllus</i> (Rydb.) Hu  <i>Philadelphus lewisii</i> ssp. <i>californicus</i> (Benth.) Munz. <sup>1</sup>
Common Name(s):	Mockorange; Lewis' mockorange; Syringa; <sup>2</sup>
Species Code (as per USDA Plants database):	PHLE4
<b>GENERAL INFORMATION</b>	
Geographical range (distribution maps for	BC, Alberta, Cascade Mountains of WA, OR to



<p>North America and Washington state)</p>	<p>northern CA, eastward to MT.</p> 
<p>Ecological distribution (ecosystems it occurs in, etc):</p>	<p>Open woods, dry bluffs, and riparian.<sup>2.</sup></p>
<p>Climate and elevation range</p>	<p>Sea level to 2100m<sup>3.</sup></p>
<p>Local habitat and abundance; may include commonly associated species</p>	<p>Likes dry desert to moist.<sup>4.</sup> Occurs more infrequent west of Cascades in open Doug fir forest, especially near the coast. East of the Cascades in basalt rimrock and talus with bushes more floriferous. Abundant along rocky walls of Yakima Canyon.<sup>5.</sup></p>
<p>Plant strategy type / successional stage (stress-tolerator, competitor, weedy/colonizer, seral, late successional)</p>	<p>Deer browse on twigs and foliage. Flowers attract butterflies and bees. Removing suckers from the base of old plants is an easy means of obtaining a few new plants.<sup>6.</sup> Lewis' mockorange is tolerant of moderate shade. It is an early to mid-seral species, and is often present in seral shrub communities. Mockorange tolerates fire and persists in forested environments where fire frequency is 5 to 45 years. It resprouts from adventitious buds in the root crown after top kill by fire.<sup>7.</sup></p>
<p>Plant characteristics (life form (shrub, grass, forb), longevity, key characteristics, etc)</p>	<p>Woody shrub. 1.5 to 3 meters tall. Shreddy bark, notable straight twigs with right angles, pubescent opposite leaves with marginal teeth. Showy white flowers in late May/June very fragrant citrus smell.<sup>2.</sup></p>
<p><b>PROPAGATION DETAILS</b></p>	
<p>Ecotype (this is meant primarily for experimentally derived protocols, and is a description of where the seed that was tested came from):</p>	<p>The following methods were used by growers in Flathead Lake, Flathead County, MT.</p>

Propagation Goal (Options: Plants, Cuttings, Seeds, Bulbs, Somatic Embryos, and/or Other Propagules):	Can use seeds or vegetative cuttings.
Propagation Method (Options: Seed or Vegetative):	Vegetative propagation requires softwood cuttings in June or July, dip in 1000ppm IBA solution, stick in peat:perlite 1:1; mist. Hardwood cuttings in fall or spring to a length of 20cm. Treat with 2500-8000 ppm IBA and insert 15cm deep into sandy soil. Fall plantings should be mulched. <sup>8</sup>
Product Type (options: Container (plug), Bareroot (field grown), Plug + (container-field grown hybrids, and/or Propagules (seeds, cuttings, poles, etc.))	Container (plug) <sup>9</sup> .
Stock Type:	Seed: 172 ml conetainer Vegetative: 800ml container
Time to Grow (from seeding until plants are ready to be outplanted):	18 months
Target Specifications (size or characteristics of target plants to be produced):	Container seedling 15-20cm, firm plug in container.
Propagule Collection (how, when, etc):	Fruit matures late summer. Oval, woody capsules about ¼ inch long. <sup>10</sup> Collect capsules when brown and dehiscing. Keep in brown paper bag, dry and well ventilated prior to cleaning.
Propagule Processing/Propagule Characteristics (including seed density (# per pound), seed longevity, etc):	Seeds per kg: 7,716,045 – 17,636,685 <sup>11</sup> . Veg: softwood kept moist/cool, use pre-rooting treatment. Seed longevity unknown. Estimated 50-60% germination. <sup>9</sup>
Pre-Planting Propagule Treatments (cleaning, dormancy treatments, etc):	Extract seeds by lightly crushing dried capsules and passing through aspirator. Stratify at 5° C for 8 weeks followed by 22-26° C. <sup>11</sup> Cuttings should be re-cut, terminal buds snipped, fungicide bath, IBA, rooting medium with bottom heat covered with 2 nodes below medium. <sup>9</sup>
Growing Area Preparation / Annual Practices for Perennial Crops (growing media, type and size of containers, etc):	Seed growing media used is 70% 6:1:1 milled sphagnum peat, perlite, and vermiculite and 30% sand with Osmocote controlled release fertilizer (13N:13P2O5:13K2O; 8 to 9 month release rate at 21C) and Micromax fertilizer (12%S, 0.1%B, 0.5%Cu, 12%Fe, 2.5%Mn, 0.05%Mo, 1%Zn) at the rate of 1 gram of Osmocote and 0.20 gram of Micromax per 172 ml conetainer. Conetainers are sown in late fall and irrigated thoroughly prior to

	<p>winter stratification.</p> <p>Cuttings: Bottom heat is maintained at 21C with heating cables 12 cm beneath rooting media. Rooting media is 50% perlite and 50% sand.<sup>9</sup></p>
Establishment Phase (from seeding to germination):	<p>Seeds germinate outdoors when temperature reaches 21° during day. Germination to true leaf stage is 2 weeks. Seedlings thinned and transplanted.</p> <p>Cuttings: After cuttings have rooted they are potted into 800 ml containers using 50%6 :1:1 milled sphagnum peat, perlite, and vermiculite and 50% sand with Osmocote controlled release fertilizer (13N:13P2O5:13K2O; 8 to 9 month release rate at 21C) and Micromax fertilizer (12%S, 0.1%B, 0.5%Cu, 12%Fe, 2.5%Mn, 0.05%Mo, 1%Zn) at the rate of 2 grams of Osmocote and 1.0 grams of Micromax per container and placed in shadehouse for the rest of the growing season.<sup>9</sup></p>
Length of Establishment Phase:	Seeds: 4 weeks; Cuttings: 8 weeks;
Active Growth Phase (from germination until plants are no longer actively growing):	<p>Seeds: Rapid once established. Fertilize using 20-20-20 (100ppm) once a week during this phase. Up-pot at 8 weeks to 800ml container</p> <p>Cuttings: Moderate following transplant from mistbed to 1.5L containers. Multistemmed and root tight at 18 months.<sup>9</sup></p>
Length of Active Growth Phase:	8 weeks for either.
Hardening Phase (from end of active growth phase to end of growing season; primarily related to the development of cold-hardiness and preparation for winter):	<p>Seeds: In September, use 10-20-20 fertilizer reducing through fall months.</p> <p>Cuttings: Plants were given one final irrigation before overwintering.<sup>9</sup></p>
Length of Hardening Phase:	4 weeks for both.
Harvesting, Storage and Shipping (of seedlings):	<p>18 months for 800ml container stock. Harvest seeds June or July. Overwinter under insulation foam cover.</p> <p>Harvest cuttings September.<sup>9</sup></p>
Length of Storage (of seedlings, between nursery and outplanting):	5 months
Other Comments (including collection restrictions or guidelines, if available):	<p>Grows in moist well drained soils to dry soils.<sup>10</sup></p> <p>Hardwood cuttings can be taken in early Spring. Should be 20cm in length and treated as mentioned above.</p>

## INFORMATION SOURCES

References (full citations):	<p>1. Carey, Jennifer H. 1995. <i>Philadelphus lewisii</i>. In: Fire Effects Information System; U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: <a href="http://www.fs.fed.us/database/feis/">http://www.fs.fed.us/database/feis/</a></p> <p>2. Jacobson, Arthur Lee; <u>Wild Plants of Greater Seattle, 2<sup>nd</sup> Ed.</u>; 2008. Arthur Jacobson Publishing.</p> <p>3. Harris, HT; <i>Philadelphus Lewisii</i>. In: Fischer, William C. The Fire Effects Information System. USDA Forest Service – Missoula, MT; Intermountain Fire Sciences Library. <a href="http://www.fs.fed.us/database/feis/plants/Shrub/PHILEW">http://www.fs.fed.us/database/feis/plants/Shrub/PHILEW</a>.</p> <p>4. Helliwell, R; <i>Forest Plants of the Warm Springs Indian Reservation</i>. Warm Springs, OR; Confederated Tribes of Warm Springs.</p> <p>5. Kruckeberg, Arthur R; <u>Gardening with Native Plants of the Pacific Northwest, 2<sup>nd</sup> Ed.</u> 2000. University of Washington Press.</p> <p>6. Hartmann, Hudson T; Kester, Dale E; Davies, Jr., Fred T; Geneve, Robert L; <u>Plant Propagation Principles and Practices, 7<sup>th</sup> Ed.</u>; 2002. Prentice Hall. Pearson Education Inc.</p> <p>7. Crowder, Wayne; USDA NRCS, Plant Materials Center, Pullman, Washington <a href="http://Plant-Materials.nrcs.usda.gov">http://Plant-Materials.nrcs.usda.gov</a></p> <p>8. Dirr, MA and Heuser, JR, CW; <u>The Reference Manual of Woody Plant Propagation: From seed to Tissue Culture</u>. 1987. Varsity Press, Athens, GA</p> <p>9. Wick, Dale. 2001. <i>Propagation protocol for production of container Philadelphus lewisii</i>; USDI NPS - Glacier National Park, West Glacier, Montana. <a href="http://www.nativeplantnetwork.org">http://www.nativeplantnetwork.org</a> ; Moscow (ID): University of Idaho, College of Natural Resources, Forest Research Nursery.</p> <p>10. Leigh, Michael; <u>Grow Your Own Native Landscape</u>. Rev 1995. Reprinted 2005. WSU Extension – Thurston County.</p> <p>11. Stickney, PF; <i>Philadelphus Lewisii</i> Pursh. Lewis Mockorange. Schopmeyer, CS; <u>Seeds of the Woody Plants in the US – Agriculture Handbook 450</u>. 1974. USDA Forest Service.</p>
Other Sources Consulted (but that contained no pertinent information) (full citations):	<p>Pojar, Jim; MacKinnon, Andy; <i>Plants of the Pacific Northwest Coast</i>. 2004. B.C. Ministry of Forests and Lone Pine Publishing.</p> <p>USDA, NRCS. 2008. The PLANTS Database (<a href="http://plants.usda.gov">http://plants.usda.gov</a>, 28 April 2008). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.</p> <p><a href="http://biology.burke.washington.edu/herbarium/imagecollection.php?Genus=Philadelphus&amp;Species=lewisii">http://biology.burke.washington.edu/herbarium/imagecollection.php?Genus=Philadelphus&amp;Species=lewisii</a></p> <p>Rose, Robin; Chachulski, Caryn EC; Haase, Diane L; <u>Propagation of Pacific Northwest Native Plants</u>. 1998. Oregon State University Press.</p>
Protocol Author (First and last name):	Pam Peterson
Date Protocol Created or Updated (MM/DD/YY):	04/28/08 updated. 05/06/03 original submitted by Scott Olmstead.

## Plant Data Sheet



Species (common name, Latin name)

Mock-orange, *Philadelphus lewisii*

Range

From B.C. and Cascade Mountains of Oregon and Washington to northern California, eastward to Montana (Rose)

Climate, elevation

Low to middle elevation; sea level to 2100m (Pojar) (Rose)

Local occurrence (where, how common)

Southern Puget Sound region (Pojar)

Habitat preferences

Wide range of habitats; open forest with moist fertile soils to brushy areas on dry, rocky soils; often riparian habitats (Pojar) (Rose)

Plant strategy type/successional stage (stress-tolerator, competitor, weedy/colonizer, seral, late successional)

Early to mid-seral species (Tirmenstein)

Associated species

*Corylus cornuta*, *Holodiscus discolor*, *Toxicodendron diversilobum*, *Rosa gymnocarpa*, and *Mahonia aquifolium* (Tirmenstein)

May be collected as: (seed, layered, divisions, etc.)

Seed and vegetative (Rose)

### Collection restrictions or guidelines

Fruit matures in late summer. Take softwood cuttings in June and July. Collect hardwood cuttings in fall or spring (Rose)

### Seed germination (needs dormancy breaking?)

Crush dried capsules and pass them through an aspirator to get seeds. Stratify at 5°C for eight weeks followed by 22-26°C. Put softwood cuttings in 1000ppm IBA. Put hardwood cuttings in 2500-8000ppm IBA (Rose)

### Recommended seed storage conditions

Seed not planted in the fall can be sown without any pre-treatment, or cold-stratified for eight weeks at 41°F (Leigh)

### Propagation recommendations (plant seeds, vegetative parts, cuttings, etc.)

Seeds are numerous and can be sown directly on-site. Can be grown from root suckers transplanted from salvage sites. (Leigh)

### Soil or medium requirements (inoculum necessary?)

Put in peat:perlite (1:1) medium and mist-softwood; place 15cm deep into sandy soil –hardwood (Rose)

### Installation form (form, potential for successful outcomes, cost)

Plants sold in nurseries may not be from local region. 6-36” seedlings, 12-36” transplants (Leigh) (4<sup>th</sup> Corner Nursery)

### Recommended planting density

Minimum: 692 per acre; Maximum: 1200 per acre (Vegspec)

### Care requirements after installed (water weekly, water once etc.)

Fall plantings should be mulched (Rose)

### Normal rate of growth or spread; lifespan

Moderate; height when mature: 12ft. Lifespan: moderate (Vegspec)

### Sources cited

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Data compiled by (student name and date)  
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