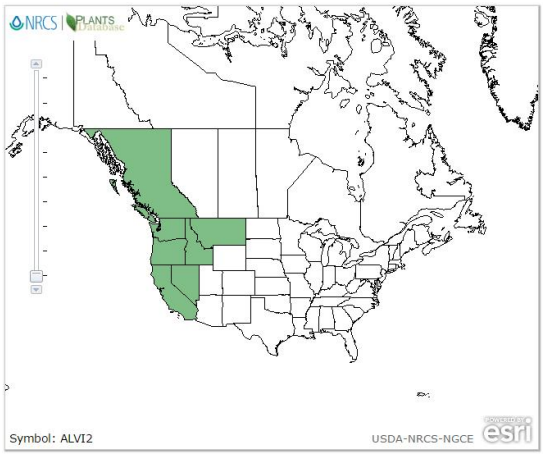
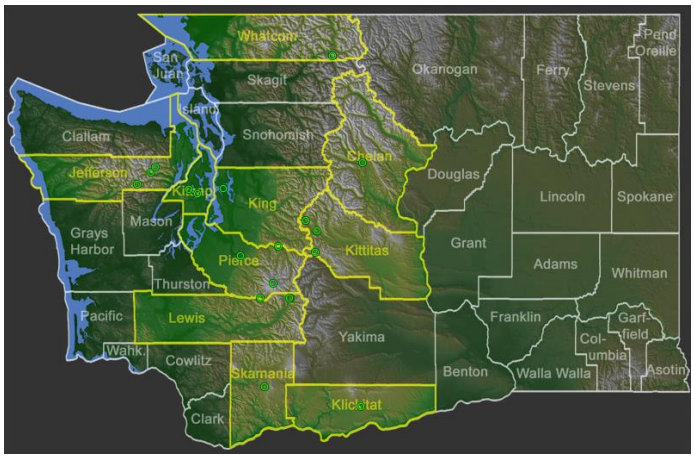
Plant Propagation Protocol for *Allotropa virgata*
ESRM 412 – Native Plant Production
Protocol URL: https://courses.washington.edu/esrm412/protocols/ALVI2.pdf

Allotropa virgata [2]





Left: Native distribution of *Allotropa virgata* in the United States according to the USDA [1].
Right: Native distribution by county of *Allotropa virgata* in the state of Washington. Regions in yellow are counties in which the species are known to occur in. Green rings are where the species has been identified on site. Information & map provided by the burke museum [3].

TAXONOMY	
Plant Family	
Scientific Name	Monotropaceae (a subfamily in the Ericaceae family)
Common Name	Monotrope Family (a subfamily of the Heath family)
Species Scientific Name	
Scientific Name	*Allotropa virgata* Torr. & A. Gray ex A. Gray
Varieties	N/A
Sub-species	N/A
Cultivar	N/A
Common Synonym(s)	N/A
Common Name(s)	Sugarstick, Candystick, (can be called Barber's Pole or Devil's Wand) [4].
Species Code (as per USDA Plants database)	ALVI2
GENERAL INFORMATION	
Geographical range	*See maps on first page.
Ecological distribution	Often found in rich humus soils in conifer forests [4].
Climate and elevation range	Low to mid-elevations in shady humid forests [4].
Local habitat and abundance	This species is native from British Columbia south into Washington, Oregon, California, as well as in Nevada, Idaho, and Montana [1]. In Washington State this species is found on either side of the Cascade Mountain Range (more common on the western side) [5]. This species is said to be a saprophyte; feeding off dead/decaying organic materials in conifer forests through mycorrhizae [6] though Jonathan Leake believes this to be a myth since there is no scientific data to prove they feed off of organic material, but rather he believes they get nutrients from fungal connections [9]. It is common under Ponderosa/Douglas Fir forests.
Plant strategy type / successional stage	As it mainly occurs as a parasitic plant in nature, requiring first the correct mycorrhizal fungi and proper host conifer before it germinates, *A. virgata* is late successional.
Plant characteristics	*Allotropa virgata* is a parasitic herbaceous flowering perennial species that is one of a kind and the only one in its genus. *A. virgata* forms an erect red and white striped stem that grows to 50 cm tall. Leaves of this species are scale-like and often lanceolate up to 3.5 cm long. Leaves crowd the stem-base and are more spread out further up the main stem. [4] Flowers usually bloom anywhere from May – August. [3] Flowers bloom with white, red, or brown sepals, without petals. Each flower has 5 sepals, around 5mm long and

	coming from densely flowered spikes to 15cm long. Urn-shaped flowers with 10 red, showy stamen [5]. Fruits are round capsules up to 5mm in diameter [4]. Bee-pollinated plant [8].
PROPAGATION DETAILS	
Ecotype	N/A
Propagation Goal	Goal is to successfully propagation *Allotropa virgata* with the species of mushroom known as *Tricholoma murrillianum* [9]. Propagation in the field is much more likely to occur due to both the mycelium species and the *Allotropa* sp. needing very strict conditions that occur in old growth forests. Once established, *Allotropa virgata* is able to spread by rhizomes with its adventitious buds in the root system. Buds will then develop into a new crown that is a clone of the mother plant [8].
Propagation Method	Propagation by seed.
Product Type	Bare-root planting in a conifer forest zone.
Stock Type	N/A
Time to Grow	N/A
Target Specifications	N/A
Propagule Collection Instructions	Seeds are abundant, and contain more than 100 per capsule. They are normally wind-dispersed, so should be collected during late summer or autumn when the seeds are being produced on the plant [7]. Autumn is also the time in which mycorrhizal fungi (which help *Allotropa virgata* establish) are most adapted and organic matter and carbohydrates are also in abundance [7]. Planting should follow as quickly as possible in the autumn to mimic wind dispersal and give seeds time for dormancy before germination.
Propagule Processing/Propagule Characteristics	N/A
Pre-Planting Propagule Treatments	Seeds do not need to be dormant for long since they will be able to germinate and create a relationship with mycorrhizal fungi to supply it with enough nutrients [7].
Growing Area Preparation / Annual Practices for Perennial Crops	Soils rich in hummus in conifer forests are best for planting [4]. There should also be large mycorrhizal systems currently adapted in the forest.
Establishment Phase Details	Plant must establish a mycorrhizal association immediately after germination or the plant will die. It requires this relationship to gain nutrients [7]. Once established, plant should do well on its own in the natural environment with help from the fungi.
Length of Establishment Phase	N/A
Active Growth Phase	N/A
Length of Active Growth Phase	N/A

Hardening Phase	N/A
Length of Hardening Phase	N/A
Harvesting, Storage and Shipping	Harvesting of seeds should take place in late summer and autumn [7].
Length of Storage	N/A, for safe measures should be as little as possible if trying to propagate in nature right away. This species has had no success as of 1995 in a lab setting [7]. I was not able to find any other information on the species in a lab setting, thus believe this is still the case.
Guidelines for Outplanting / Performance on Typical Sites	Suspected that the time in between germinating and flowering can be many years [7].
Other Comments	Collecting of seeds can occur where allowed (check national/state park law regarding collection to be sure it is allowed when collecting on those sites. Disperses many seeds from one plant.
INFORMATION SOURCES	
References	[1] *Plants Profile for Allotropa Virgata (sugarstick)*. N.p., n.d. Web. 23 May 2017. https://plants.usda.gov/core/profile?symbol=ALVI2 [2] Carr, Gerald D. "Allotropa Virgata." *Oregon Flora Project*. N.p., 10 July 2008. Web. 23 May 2017. http://www.botany.hawaii.edu/faculty/carr/ofp/all_vir.htm [3] "Collections Databases." *Collections Databases	Burke Museum*. N.p., n.d. Web. 21 May 2017. http://biology.burke.washington.edu/ [4] MacKinnon, A., Jim Pojar, and Paul B. Alaback. *Plants of Coastal British Columbia Including Washington, Oregon, British Columbia, & Alaska*. Edmonton: Lone Pine Pub., 2004. Print. [5] Lyons, C. P., and Bill Merilees. *Trees, Shrubs & Flowers to Know in British Columbia & Washington*. Redmond, WA: Lone Pine Pub., 1995. Print. [6] Lyons, C. P. *Wildflowers of Washington*. Renton, WA: Lone Pine, 1999. Print. [7] Lichthardt, Juanita. *Conservation Strategy for Allotropa Virgata (Candystick), U. S. Forest Service, Northern and Intermountain Regions* (n.d.): n. pag. Idaho Department of Fish and Game, Oct. 1995. Web. 24 May 2017. <https://fishandgame.idaho.gov/ifwis/idnhp/cdc_pdf/allvircs.pdf> [8] Weber, Sonja. *Candystick or Sugarstick (Allotropa Virgata)*. N.p., 10 Nov. 1998. Web. 24 May 2017. https://www.blm.gov/or/plans/surveyandmanage/MR/VascularPlants/section1.htm [9] Leake, Jonathan R. "Plants Parasitic on Fungi: Unearthing the Fungi in Myco-Heterotrophs and

	Debunking the 'Saprophytic' Plant Myth."*Mycologist*. 3rd ed. Vol. 19. United Kingdom: British Mycological Society, 2005. 113-22. Print.
Other Sources Consulted	[10] Jones, George Neville. *The Flowering Plants and Ferns of Mount Rainier*. Seattle: U of Washington, 1960. Print. [11] Hartmann, Hudson T., Dale E. Kester, Robert Geneve, and Fred T. Davies, Jr.*Hartmann & Kester's Plant Propagation Principles and Practices*. 8th ed. Upper Saddle River: Pearson Prentice Hall, 2011. Print. [12] Alden, Peter. *National Audubon Society Field Guide to the Pacific Northwest*. New York: Knopf, 1998. Print. [13] Thompson, Peter, and Josie Owen. *Creative Propagation*. 2nd ed. Portland: Timber, 2005. Print. [14] Bewley, J. Derek, Michael Black, and Peter Halmer. *The Encyclopedia of Seeds: Science, Technology, and Uses*. Wallingford (UK): CABI, 2008. Print. [15] Toogood, Alan R. *Plant Propagation: The Fully Illustrated Plant by Plant Manual of Practical Techniques*. New York: DK Pub., 1999. Print. [16] Bidartondo, M. I. *Fine-Level Mycorrhizal Specificity in the Monotropoideae (Ericaceae): Specificity for Fungal Species Groups*. *Molecular Ecology*. By T. D. Bruns. 3rd ed. Vol. 11. N.p.: Blackwell Science, 2002. 557-69. Print.
Protocol Author	Alec Roseto
Date Protocol Created or Updated.	5/24/17