Plant Propagation Protocol for *[Hackelia venusta]*
ESRM 412 – Native Plant Production


(Legler)

TAXONOMY	
Family Names	
Family Scientific Name:	Boraginaceae (Plants Profile: *Hackelia venusta* (Piper) H. St. John)
Family Common Name:	Borage family (Plants Profile: *Hackelia venusta* (Piper) H. St. John)
Scientific Names	
Genus:	*Hackelia* Opiz (Plants Profile: *Hackelia venusta* (Piper) H. St. John)
Species:	*Hackelia venusta* (Piper) H. St. John (Plants Profile: *Hackelia venusta* (Piper) H. St. John)
Species Authority:	
Variety:	
Sub-species:	
Cultivar:	
Authority for Variety/Sub-species:	
Common	

Synonym(s) (include full scientific names (e.g., *Elymus glaucus* Buckley), including variety or subspecies information)	
Common Name(s):	Lesser showy stickseed (Plants Profile: *Hackelia venusta* (Piper) H. St. John) Wild Forget-me-nots (Kruckeberg)
Species Code (as per USDA Plants database):	HAVE4 (Plants Profile: *Hackelia venusta* (Piper) H. St. John)
GENERAL INFORMATION	
Geographical range (distribution maps for North America and Washington state)	Local endemic; Chelan County, WA (Washington Natural Heritage Program)  (Plants Profile: *Hackelia venusta* (Piper) H. St. John)
Ecological distribution (ecosystems it occurs in, etc):	Tumwater Canyon in the eastern Cascades in Washington (CPC National Collection Plant Profile). Only two populations of true Hackelia venusta have ever been found, within about 12 mi. (20 km) of each other in Chelan County, Washington. The plant was first discovered in 1920 in Tumwater Canyon. In 1948 an occurrence of Hackelia venusta was reported near Merrit, Washington, but recent efforts to relocate this site have been unsuccessful (CPC National Collection Plant Profile). This species of *Hackelia* is only found in Chelan County in the Washington

	Cascade Mountain Range (Edson).
Climate and elevation range	*Hackelia venusta* grows on steep slopes (25-70 degrees) composed of loose, well-drained granitic sand and broken rocks at an elevation of approx. 1600 to 2500 ft (480 -765 m) in the dry eastern slopes of the Washington Cascades. The plants grow in openings within the Ponderosa pine and Douglas-fir forests which are maintained by occasional wildfires (CPC National Collection Plant Profile). *Hackelia venusta* is found on open, steep slopes (minimum 80 percent inclination) of loose, well-drained, granitic weathered and broken rock fragmented soils, and on ledges and cracks on granitic cliff faces, at elevations between 472 meters (1,550 feet) to 823 meters (2,700 feet) (U.S. Fish and Wildlife Service). *Hackelia* are best grown in the more arid regions, where winter moisture can be minimized (Kruckeberg).
Local habitat and abundance; may include commonly associated species	*Hackelia venusta's* habitat is on rocky slopes with ponderosa pine (Washington Natural Heritage Program). The Showy stickseed is restricted to an area of less than two and a half acres on a slope within 330 feet of a major state highway. The slope that they grow on is extremely unstable, and susceptible to landslides and disturbance by hikers and potential plant collectors, or even those only wanting to take photographs (CPC National Collection Plant Profile).
Plant strategy type / successional stage (stress-tolerator, competitor, weedy/colonizer, seral, late successional)	Can not tolerate noxious weeds and does not grow well in densely populated tree cover so thinning trees can help provide the plants with more light (The Showy Stickseed).
Plant characteristics (life form (shrub, grass, forb), longevity, key characteristics, etc)	A robust plant about 30cm tall with grayish-green, hairy foliage. The leaves are five times as long as they are wide. There are showy, white clusters of flowers. Identifiable May through June (Washington Natural Heritage Program). Forb/Herb (Plants Profile: *Hackelia venusta* (Piper) H. St. John) Fruit: There are four nutlets attached to the base of the style, with small prickles (Knoke). Perennial herb (Knoke). The showy stickseed has been moving steadily towards extinction, having declined from more than 1,200 individuals in the early 1980s to about 500 plants in 2001 (The Showy Stickseed).
PROPAGATION DETAILS	
Ecotype (this is meant primarily for experimentally derived protocols, and is a description of where the seed	Dry, eastern slopes of Cascade Mountain range with ponderosa pine (Edson). There are many threats in the Tumwater Canyon area such as wild fire, low seedling establishment, and low reproductive capacity, were threats that changes in Washington State Department Of Transportation management practices would not help, but other threats, such as competition from non-native and/or state-listed noxious plant species, mass-wasting, soil erosion,

that was tested came from):	and use of roadway anti-icers and deicers, were identified as threats that could be addressed through best management practices (Carey).
Propagation Goal (Options: Plants, Cuttings, Seeds, Bulbs, Somatic Embryos, and/or Other Propagules):	Other propagules (Edson).
Propagation Method (Options: Seed or Vegetative):	Vegetative (Edson).
Product Type (options: Container (plug), Bareroot (field grown), Plug + (container-field grown hybrids, and/or Propagules (seeds, cuttings, poles, etc.))	Propagules: seeds, cuttings, and poles (Edson). Container: plug (Edson).
Stock Type:	Micropropagated plantlets (Edson). 165 ml capacity Hillson Rootrainers (Edson).
Time to Grow (from seeding until plants are ready to be outplanted):	12 weeks (Edson).
Target Specifications (size or characteristics of target plants to be produced):	For Professor Davis at the University of Idaho Forest Research Nursery of Moscow his group had a goal to multiply explants and obtain microshoots that were at least 2 cm in height and ready to be rooted (Edson).
Propagule Collection (how, when, etc):	Professor Davis and his group excised 1.5 to 2.5 cm long shoot tips from newly emerging plants just after the snow melted in the Cascade Range. Shoot tips were refrigerated and transported to the micropropagation lab in Moscow, Idaho (Edson). Avoid collection! (Kruckeberg) Primarily collectors who desire the plant because of its rarity and remove plants from the wild threaten the stickseed. The collection of the plant or its parts a federal offense (The Showy Stickseed).
Propagule Processing/Propagule Characteristics (including seed density (# per pound), seed longevity, etc):	

Pre-Planting Propagule Treatments (cleaning, dormancy treatments, etc):	In a lab, shoot tips should be immediately defoliated and surface sterilized for 20 minutes in a 1% solution of NaClO and then rinsed three times in sterile distilled water (Edson). Germination testing by Ransom Seed Laboratory found that, out of 35 viable seeds, none germinated without treatment. Four germinated when cut through the cotyledons (seed leaves), 26 germinated when cut through the cotyledons and then exposed to 400 parts per million gibberillic acid, and 5 were determined to be viable only through tetrazolium staining results confirm that seeds of *Hackelia venusta* are dormant, and explain the difficulty that others have experienced in germination trials. Germination trials by the Center for Urban Horticulture at the University of Washington found that cold stratification alone for 30 to 60 days did not result in successful germination. Only when seeds were left in cold stratification for up to 4 months did 50 percent of the seeds germinate, and those seeds may have been the result of unintended previous crosses of *H. venusta* with the unnamed high elevation blue-flowered *Hackelia* (U.S. Fish and Wildlife Service).
Growing Area Preparation / Annual Practices for Perennial Crops (growing media, type and size of containers, etc):	The loose, rocky soil characteristically supports little competing vegetation and contains low levels of soil-organic matter. This early successional habitat is maintained by occasional burning and minor habitat disturbances (CPC National Collection Plant Profile).
Establishment Phase (from seeding to germination):	
Length of Establishment Phase:	One month (Edson).
Active Growth Phase (from germination until plants are no longer actively growing):	
Length of Active Growth Phase:	Two months (Edson).
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):	

Length of Hardening Phase:	One month (Edson).
Harvesting, Storage and Shipping (of seedlings):	
Length of Storage (of seedlings, between nursery and outplanting):	Shoots can be stored in a refrigerator until ready for rooting. They could be stored up to 5 months in a dark cooler with minimal damage. It is best if shoots can go directly into the next phase, i.e. additional multiplication or rooting (Edson).
Guidelines for Outplanting / Performance on Typical Sites (eg, percent survival, height or diameter growth, elapsed time before flowering):	Research into the specific habitat needs of *Hackelia. venusta*, identification of reintroduction sites, and development of propagation and outplanting protocols must all take place before new populations are likely to be successful because the population is small and vulnerable (U.S. Fish and Wildlife Service). *Hackelia venusta* is found on open, steep slopes with loose, well-drained granitic weathered and broken rock with fragmented soil. The soil is very low in organic matter. Erosion and landslides can dislodge soil as well as the soil (Jones).
Other Comments (including collection restrictions or guidelines, if available):	Threats: Logging, grazing, overcollection (Washington Natural Heritage Program). Hackelia venusta, occurs within the Washington State Department of Transportation adjacent to SR 2, in Tumwater Canyon, along with four other rare plant species (Carey).
INFORMATION SOURCES	
References (full citations):	Carey M. 2004. Management of a federally listed plant species in the highway right of way. In: Proceedings of the 2003 International Conference on Ecology and Transportation, Eds. Irwin CL, Garrett P, McDermott KP. Center for Transportation and the Environment, North Carolina State University, Raleigh, NC: p. 488. CPC National Collection Plant Profile: *Hackelia venusta.* 16 December 2009 Center for Plant Conservation. 10 May 2009 <http://www.centerforplantconservation.org/ASP/CPC_ViewProfile.asp?CPCNum=2109>. Edson, John L.; Brusven, Annette D.L.; Wenny, David L.; Everett, Richard L. 2001. Propagation protocol for vegetative production of *Hackelia venusta* (Piper) St. John propagules (micropropagated plantlets); University of Idaho - Center for Forest Nursery and Seedling Research, Moscow, Idaho. Knoke, Don. *"Hackelia venusta"*. The Burke Museum of Natural History and Culture. 9 May 2009. <http://biology.burke.washington.edu/herbarium/imagecollection.php?Genus=Hackelia&Species=venusta.>. Kruckeberg, Arthur R. Gardening with Native Plants of the Pacific Northwest: An illustrated Guide. Seattle and London. University of Washington Press. 1982. Legler, Ben. "Lesser Showy Stickseed." Online Image.

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Other Sources Consulted (but that contained no pertinent information) (full citations):	
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Date Protocol Created or Updated (MM/DD/YY):	05/13/2009

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