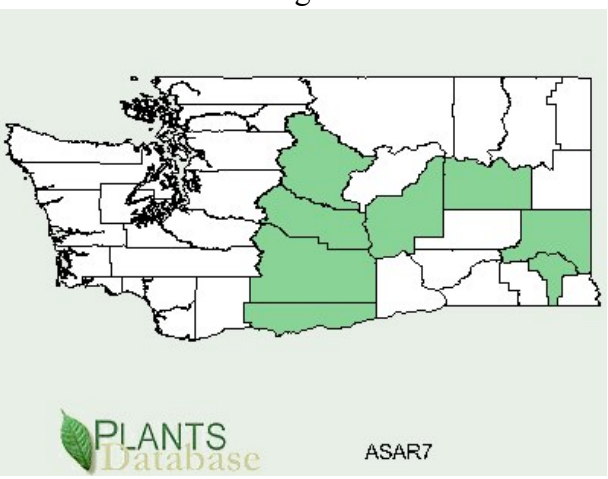
Plant Propagation Protocol for *Astragalus arrectus*
ESRM 412 – Native Plant Production
Spring 2011

North America Distribution

Washington Distribution



Source: USDA PLANTS Database (2)

TAXONOMY	
Family Names	
Family Scientific Name:	Fabaceae
Family Common Name:	Legume Family
Scientific Names	
Genus:	*Astragalus*
Species:	*arrectus*
Species Authority:	A. Gray
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)	*Astragalus palousensis* Piper (2, 3), *Phaca arrecta* Piper (3), *Tium arrectum* Rydb. (3, 6)
Common Name(s):	Palouse milkvetch
Species Code (as per USDA Plants database):	ASAR7
GENERAL INFORMATION	
Geographical range (distribution maps for North America and	Eastern Washington (1, 7, 8), Idaho (1, 6, 7, 8)

Geographical range (distribution maps for North America and Washington state)	Eastern Washington (1, 7, 8), Idaho (1, 6, 7, 8) See maps.
Ecological distribution (ecosystems it occurs in, etc):	Palouse milkvetch is found in sagebrush to open Ponderosa pine forest (1, 7, 8), open Douglas-fir forest (8), moist meadow steppe (5), grassy hillsides (6, 7, 8), and river bluffs (7, 8). Soil conditions dry and rocky to moist and rich (8). Fire may play a role in population dynamics and this species also seems to occur in substrates with low nitrogen content (8).
Climate and elevation range	Elevation: 1000-4000 feet (8)
Local habitat and abundance; may include commonly associated species	Found in moist meadow steppe, in *Festuca idahoensis*/*Symphoricarpos albus* Zone (5) with *Festuca idahoensis*, *Agropyron spicatum*, *Koeleria cristata*, *Poa ampla*, *Achillea millefolium*, *Geum triflorum* var. *ciliatum*, *Hieracium albertinum*, *Potentilla gracilis*, *Helianthella uniflora* var. *douglasii*, *Iris missouriensis*, *Geranium viscosissimum*, *Castilleja lutescens* (5), *Symphoricarpos albus*, *Balsamorhiza sagittata*, *Lupinus sericeus*, (5, 8), *Brodiaea douglasii, Purshia tridentate*, and *Holodiscus discolor* (8).
Plant strategy type / successional stage (stress-tolerator, competitor, weedy/colonizer, seral, late successional)	Nitrogen-fixer (8)
Plant characteristics (life form (shrub, grass, forb), longevity, key characteristics, etc)	Mature plant is an erect perennial (7), 30-60 cm high (6), with a woody taproot and numerous stems (7). Leaves are 9-22 cm long (7) with 13-21 oblong to elliptic leaflets (6, 7), peduncles longer than leaves (6, 7), and flowers are dense, erect racemes (6, 7). Pods are slightly grooved (6, 8) and hairy (8), with bean-shaped, olive-brown seeds (6) and hard seed coats (4). Flowers are present from late April to early July (8).
PROPAGATION DETAILS **Native Plant Network (1)**	
Propagation Goal (Options: Plants, Cuttings, Seeds, Bulbs, Somatic Embryos, and/or Other Propagules):	Plants
Propagation Method (Options: Seed or Vegetative):	Seed
Product Type (options: Container (plug), Bareroot (field grown), Plug + (container-field grown hybrids, and/or Propagules (seeds, cuttings,	Container (plug)

Time to Grow (from seeding until plants are ready to be outplanted):	4 months
Target Specifications (size or characteristics of target plants to be produced):	Tight root plug in container.
Propagule Collection (how, when, etc):	Seed pods are collected in late July or early August when pods are beginning to split and seeds are hard and brown. Each pod contains several seeds, which will be lost if pods are left long enough that they shatter.
Propagule Processing/Propagule Characteristics (including seed density (# per pound), seed longevity, etc):	Seeds are not overly brittle, so large amounts can be threshed with a hammer mill then cleaned with air screen equipment. Small amounts can be crushed by hand and cleaned with an air column separator.
Pre-Planting Propagule Treatments (cleaning, dormancy treatments, etc):	Stratification is recommended to increase germination. Hot water scarification can be effective, but rubbing seeds between pieces of sandpaper has achieved better results.
Growing Area Preparation / Annual Practices for Perennial Crops (growing media, type and size of containers, etc):	Seeds require inoculation with the proper *Rhizobium* species. Scarified seeds are sown in the greenhouse in January in 10 cu. In. Ray Leach Super cell Cone-tainers filled with Sunshine #4 and lightly covered. A head space of 0.25-0.5 inches is left to allow deep watering. A thin layer of pea gravel is added at the top of the Cone-tainers to keep seeds from floating. Seeds are be watered deeply.
Establishment Phase (from seeding to germination):	Medium is kept moist until seeds germinate. Most seeds will germinate within 2-3 weeks, but some will germinate earlier (7-8 days) or later (more than 1 month).
Length of Establishment Phase:	3 weeks
Active Growth Phase (from germination until plants are no longer actively growing):	Plants are watered deeply every other day and fertilized once every week with a complete, water-soluble fertilizer that contains micro-nutrients.
Length of Active Growth Phase:	3 months
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):	Plants are moved to a cold frame in April (depending on weather conditions) and watered every other day (during cold weather) or every day (during hot, dry spells).
Length of Hardening Phase:	2 weeks
Harvesting, Storage and Shipping (of seedlings):	
Length of Storage (of seedlings, between nursery and outplanting):	
Guidelines for Outplanting / Performance on Typical Sites (eg,	Transplanting is done in early May using an electric drill with a portable generator to drill 1.5 inch diameter

Guidelines for Outplanting / Performance on Typical Sites (eg, percent survival, height or diameter growth, elapsed time before flowering):	Transplanting is done in early May using an electric drill with a portable generator to drill 1.5 inch diameter holes in the soil at outplanting sites. Survival and vigor may decrease when transplanting into sites with existing vegetation depending on weather conditions following outplanting.
Other Comments (including collection restrictions or guidelines, if available):	Seed increase plantings with no competing vegetation average 80% survival.
INFORMATION SOURCES	
References (full citations):	See below.
Other Sources Consulted (but that contained no pertinent information) (full citations):	See below.
Protocol Author (First and last name):	Natalie R. Schmidt

References:

(1) Skinner, David M. 2005. Propagation protocol for production of container *Astragalus arrectus* Gray plants; USDA NRCS - Pullman Plant Materials Center, Pullman, Washington. In: Native Plant Network. URL: http://www.nativeplantnetwork.org (accessed 5 May 2011). Moscow (ID): University of Idaho, College of Natural Resources, Forest Research Nursery.

(2) USDA Natural Resources and Conservation Service Website. Plant Profile for *Astragalus arrectus*. URL: http://plants.usda.gov (accessed 4 May 2011). http://plants.usda.gov/java/profile?symbol=ASAR7

(3) Tropicos.org. Missouri Botanical Garden. 05 May 2011. URL: http://www.tropicos.org/Name/13013699 (accessed 4 May 2011).

(4) Young, J. A. and C. G. Young. 1986. Collecting, Processing and Germinating Seeds of Wildland Plants. Timber Press. Portland, Oregon. Pg 167.

(5) Franklin, J. F. and C. T. Dyrness. 1988. Natural Vegetation of Oregon and Washington. Oregon State University Press. Corvallis, Oregon. Pg 220.

(6) St. John, H. 1937. Flora of Southeastern Washington. Outdoor Pictures. Escondido, California. Pg 240.

(7) Hitchcock, C. L., A. Cronquist, M. Ownbey, and J. W. Thompson. 1961. Vasular Plants of the Pacific Northwest, Part 3: Saxifragaceae to Ericaceae. University of Washington Press. Seattle, Washington. Pg 251.

(8) Washington Natural Heritage Program and U.S.D.I. Bureau of Land Management. 1999. *Field Guide to Selected Rare Vascular Plants of Washington*. Profile for *Astragalus arrectus*. URL: http://www1.dnr.wa.gov/nhp/refdesk/fguide/pdf/asar.pdf (accessed 6 May 2011).

Other Sources Consulted:

(1) Niehaus, T. F. and C. L. Ripper. 1976. A Field Guide to Pacific States Wildflowers. Houghton Mifflin Company. Boston, Massachusetts.

(2) Jolley, R. 1988. Wildflowers of the Columbia Gorge. Oregon Historical Society. Portland, Oregon.

(3) Kozloff, E. N. 2005. Plants of Western Oregon, Washington, and British Columbia. Timber Press. Portland, Oregon.

(4) Kruckeberg, A. R. 1982. Gardening With Native Plants of the Pacific Northwest. Second Edition. University of Washington Press. Seattle, Washington.

(5) Art, H. W. 1990. The Wildflower Gardener's Guide, Pacific Northwest, Rocky Mountain, and Western Canada Edition. Storey Communications, Inc. Pownal, Vermont.

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