Plant Propagation Protocol for Solidago missouriensis Nutt.
ESRM 412 – Native Plant Production
Protocol URL: https://courses.washington.edu/esrm412/protocols/SOMI2.pdf

North America Distribution

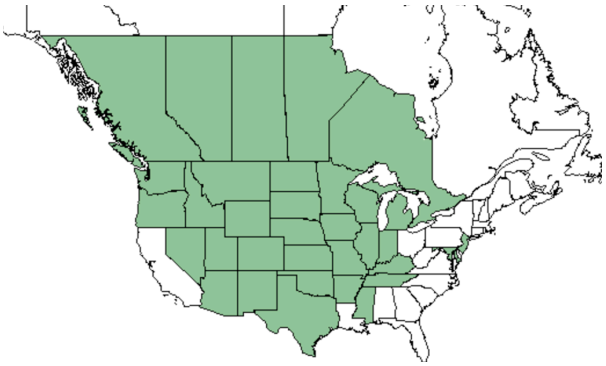
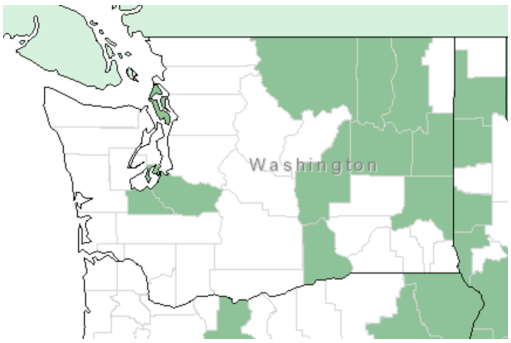


Image Source: Image Source: USDA PLANTS Database

Washington Distribution



TAXONOMY	
Plant Family	
Scientific Name	Asteraceae[7]
Common Name	Aster, Sunflower[7]
Species Scientific Name	
Scientific Name	Solidago missouriensis Nutt.[5]
Varieties	Solidago missouriensis Nutt. var. extraria A. Gray Solidago missouriensis Nutt. var. fasciculata Holz. Solidago missouriensis Nutt. var. missouriensis Solidago missouriensis Nutt. var. tolmieana (A. Gray) Cronquist[3]
Sub-species	
Cultivar	
Common Synonym(s)	
Common Name(s)	Prairie goldenrod Missouri goldenrod[7] Tolmie's goldenrod[4]
Species Code (as per USDA Plants database)	SOMI2[5]
GENERAL INFORMATION	
Geographical range	Can be found from Washington, Oregon, and British Columbia: east to southern Ontario; south to Tennessee and Arkansas; and west to Arizona.[7] In eastern Washington it is usually found in dry areas

	of open grassland and open Ponderosa pine forest.[6]
Ecological distribution	Inhabits rather dry, open places on the slopes of valleys and on plains, and reaches moderately high elevations in mountains. It is also found in sparsely wooded areas, on grassy roadsides, on rocky slopes, and in open communities where sod is broken along railroads, ditches, and fences.[7]
Climate and elevation range	Prairie goldenrod occurs at the following elevations:[7] CO: 3,700-10,000 (1,128-3,048) MT: 3,200-9,000 (975-2,743) UT: 4,200-8,600 (1,280-2,621) WY: 3,700-10,600 (1,128-3,231) Missouri goldenrod is adapted to areas receiving 30 to 90 cm (12 to 35 in) of annual precipitation at elevations up to 3,200 m (10,600 ft).[4]
Local habitat and abundance	Plants grow well in sandy loam to clay loam soils, and poorly in gravel and dense clay. Plants are tolerant of weakly acidic to moderately basic and weakly saline conditions and not tolerant of extremely acidic and saline conditions. Plants in the dormant state are adapted to fire.[4] Prairie goldenrod shows weak competitiveness in dense grasslands, but in more open cover shows moderate aggressiveness and ability to invade and dominate.[7]
Plant strategy type / successional stage	Facultative Seral Species[7] Often establishes in open, disturbed sites, but is also tolerant of partial shade.[4]
Plant characteristics	Prairie goldenrod is a warm-season native perennial forb.[7] Stems grow singularly or in groups from a woody base or creeping rhizome. Stems are reddish-green, smooth, slender, and erect and are 8 to 36 inches tall. Leaves are alternate, triple-nerved and have entire or sparsely serrated edges. Basal leaves are up to 12 inches long and 1 inch wide, and have short petioles. Upper leaves are smaller and sessile. Numerous inflorescences form on curved panicle branches. Inflorescences have 7 to 13 yellow disc flowers and 8 to 13 yellow ray flowers, and bloom July through October.[5]

	Seeds are brown cylindrical achenes 1 to 2.2 mm (0.04 to 0.09 in) long, are smooth or hairy, and have white bristly pappus 2.5 to 3 mm (0.1 to 0.12 in) long.[4] **Pollinator habitat:** Solidago species provide vital sources of pollen and nectar for bees and other insects in the late summer and fall throughout North America.[5] **Ornamental:** Missouri goldenrod is not typically planted in a landscaped setting due to its spreading rhizomatous growth. However, it may be possible to manage plants by planting in a pot submersed in the ground, or by removing new growth each year. Seed dispersal can be controlled by removing flower heads prior to seed ripening.[4]
PROPAGATION DETAILS Container (plug) Method as Explained by Dave Skinner[6]	
Ecotype	Paradise Creek drainage near Pullman, WA.
Propagation Goal	Plants
Propagation Method	Seed
Product Type	Container (plug)
Stock Type	
Time to Grow	4 Months
Target Specifications	Tight root plug in container.
Propagule Collection Instructions	Fruit is an achene. Seed ripens in late September and early October. It is collected when the pappus begins to expand. Seed is brown in color and wind disseminated, so must be collected before it blows away. Seed maturity is indeterminate. Seed can be collected using a vacuum. This removes only mature seed, leaving immature seed to ripen, and reduces the amount of trash which subsequently must be cleaned from the seed. Harvested seed is stored in paper bags at room temperature until cleaned.
Propagule Processing/Propagule Characteristics	Small amounts are rubbed over a 10 mesh screen to remove the pappus, then cleaned with an air column separator. Larger amounts are threshed with a hammermill, then cleaned with air screen equipment. Sterile rice hulls can be added to the hammermill to facilitate removal of the pappus. This is not necessary if there are stems and leaves collected with the seed. Clean seed is stored in controlled conditions at 40 degrees Fahrenheit and 40% relative humidity. 1,998,238 seeds/lb for this ecotype.
Pre-Planting Propagule Treatments	Germinates well without pretreatment, averaging 85%.

Growing Area Preparation / Annual Practices for Perennial Crops	In January seed is sown in the greenhouse in 10 cu. in. Ray Leach Super cell conetainers filled with Sunshine #4 and covered lightly. Head space of 1/4 to « inch is maintained in conetainers to allow deep watering. A thin layer of pea gravel is applied to prevent seeds from floating. Conetainers are watered deeply.
Establishment Phase Details	Medium is kept moist until germination occurs. Germination usually begins in 7 days and is complete in 12-14 days.
Length of Establishment Phase	2 weeks
Active Growth Phase	Plants are watered deeply every other day and fertilized once per week with a complete, water-soluble fertilizer containing micro-nutrients.
Length of Active Growth Phase	3 months
Hardening Phase	Plants are moved to the cold frame in late March or early April, depending on weather conditions. They are watered every other day if the weather is cool, and every day during hot, dry spells.
Length of Hardening Phase	2-4 weeks
Harvesting, Storage and Shipping	
Length of Storage	
Guidelines for Outplanting / Performance on Typical Sites	
Other Comments	A native leaf-feeding beetle Trirhabda canadensis can cause serious damage if present in high numbers. Plants continue to produce good seed crops in increase plantings for at least 5 years. Jerry and Carol Baskin suggest that the seeds require more than a 4-week cold-moist before initiation of germination.[1] Plants may be propagated by division or by rhizome pieces. This method should only be used for plants growing in cultivation. Plants should not be dug up from stands in the wild.[6] Kingsbury, Noel states that all varieties of Solidago can be propagated from division when dormant, or from cuttings in the spring.[2] Sections of rhizomes should be collected from cultivated plants on approved areas, kept moist during transport, and replanted in a prepared field site.[4]

INFORMATION SOURCES	
References:	1. Baskin, Carol, and Jerry Baskin. Seeds : Ecology, Biogeography, And Evolution Of Dormancy And Germination. 2nd ed. San Diego: Elsevier Science, 2014. Print. 2. Kingsbury, Noel. "Goldenrod". BBC Gardener's World 104.October (1999): 40-41. Print. 3. Knoke, Don. "Solidago Missouriensis". Burke Museum. N.p., 2017. Web. 24 Apr. 2017. 4. Pavek, P.L.S. Plant Guide For Missouri Goldenrod (Solidago Missouriensis). Pullman, WA: USDA-Natural Resources Conservation Service, 2011. 5. Pavek, P. Plant Fact Sheet For Missouri Goldenrod (Solidago Missouriensis).. Pullman, WA: USDA-Natural Resources Conservation Service, 2012. 6. Skinner, David. Propagation Protocol For Production Of Container (Plug) Solidago Missouriensis Nutt. Plants. Pullman, WA: USDA NRCS - Pullman Plant Materials Center, 2004. 7. Walsh, Roberta. Solidago Missouriensis. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, 1994.
Other Sources Consulted (but that contained no pertinent information):	Heistinger, Andrea. The Manual Of Seed Saving : Harvesting, Storing, And Sowing Techniques For Vegetables, Herbs, And Fruits. 1st ed. Portland, OR: Timber Press, 2013. Print. Hitchcock, Leo C, Arthur Cronquist, and Jeanne R Janish. Flora Of The Pacific Northwest. 1st ed. Seattle: University of Washington Press, 1973. Print. Krock, Sarah et al. "Using Smoke-Water And Cold-Moist Stratification To Improve Germination Of Native Prairie Species". Native Plants Journal 17.1 (2016): 19-27. Web.

	Kruckeberg, Arthur R. Gardening With Native Plants Of The Pacific Northwest. 2nd ed. Seattle: University of Washington Press, 1995. Print. Rose, Robin, Caryn E. C Chachulski, and Diane L Haase. Propagation Of Pacific Northwest Native Plants. 1st ed. Corvallis: Oregon State University Press, 1998. Print. Wasowski, Sally. Gardening With Prairie Plants. 1st ed. Minneapolis: Univ. of Minnesota Press, 2002. Print.
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