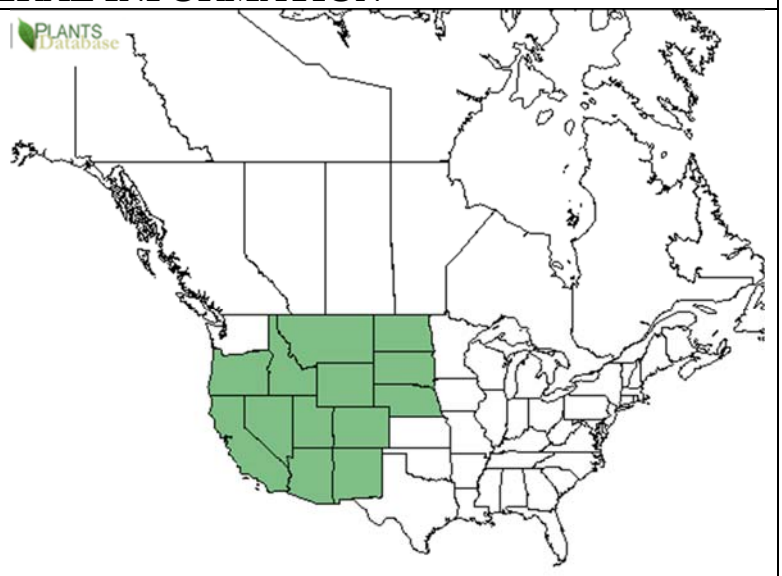
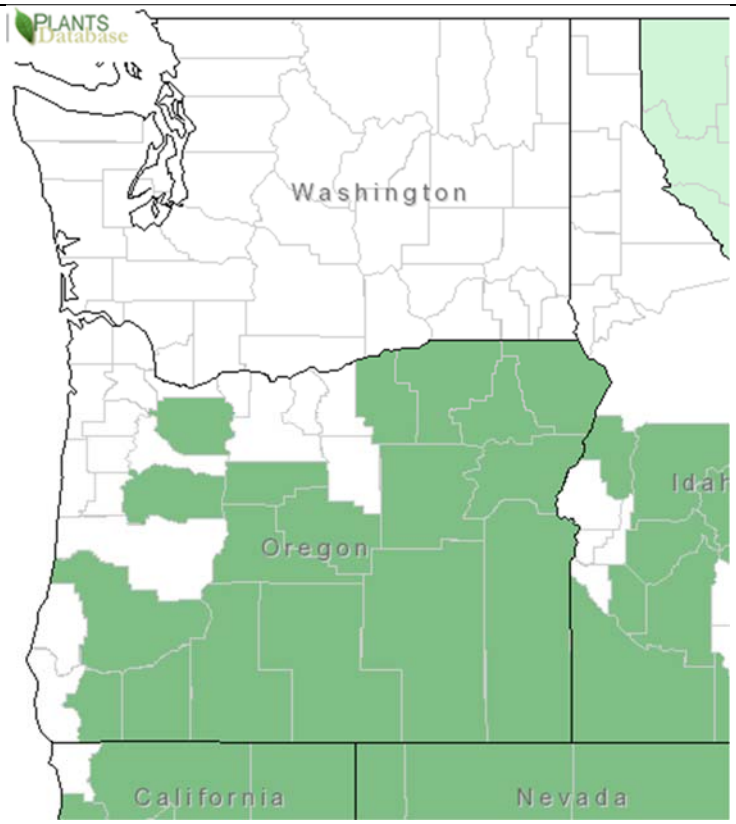
Plant Propagation Protocol for *Fritillara atropurpurea*
ESRM 412 – Native Plant Production
Protocol URL: https://courses.washington.edu/esrm412/protocols/FRAT.pdf

TAXONOMY	
Plant Family	
Scientific Name	Lilaceae [1]
Common Name	Lily Family [1]
Species Scientific Name	
Scientific Name	*Fritillaria atropurpurea* Nuttall [1]
Varieties	N/A
Sub-species	N/A
Cultivar	N/A
Common Synonym(s)	*Fritillaria adamantina* M. Peck [1] *Fritillaria gracillima* Smiley [1] *Fritillaria linearis* J.M. Coulter & Fisher [9]
Common Name(s)	Spotted Fritillary [1] Purple Fritillary [2] Spotted Mountain Bells [5]
Species Code	FRAT [1]
GENERAL INFORMATION	
North American Distribution	 Map courtesy of USDA Plants Database [1]

Distribution in the Pacific Northwest	 Map courtesy of USDA Plants Database [1]
Geographical range	*F. atropurpurea* is the most widespread *Fritillaria* species native to North America [4,9]. The species ranges from Southeast Oregon to Sierran California, eastward through Central and Southern Idaho, the Dakotas and Nebraska, and southward to Colorado and New Mexico [3].
Ecological distribution	Occurs in East-side forests, shrub-steppe, subalpine, and alpine ecosystems in the Pacific Northwest [5].
Climate and elevation range	Found at elevations of up to 7,000-8,000 ft. in the Pacific Northwest [3]. Found at elevations of 3,300 to 10,500 feet throughout its North American range [9].
Local habitat and abundance	Locally uncommon in its habitats [5]. It is found on grassy slopes to rocky mountain ridges and coniferous forests[3]. Often found in alpine screes, light pine and fir woodland, and in clearings and edges [4]. Often found growing among sagebrush [11]. In Southern Oregon and the Northern Rocky Mountains it may be seen with *F. pudica* [4].
Plant strategy type / successional stage	A stress tolerant species, growing in sterile, stony areas and tolerating summer heat [6].
Plant characteristics	A perennial forb [5] with a tall stem, usually 12-60 cm. Leaves are irregularly arranged on the stem, and are long and narrow to broadly linear. Flowers are typically 1-4 per stem, broadly campanulate and drooping. Tepals are

	green-brown to chocolate-brown and mottled yellow or white. Blooms May-July in the Pacific Northwest [3]. There is some morphological variation within this species as it has a very wide geographic range [4,7]. *F. atropurpurea* is sometimes confused with *F. pinetorum* where their ranges overlap in the Sierra Nevadas [9]. *F. atropurpurea* is usually found on dry and stony or sandy soil [4,6] and in areas with good drainage but which retain a slight amount of moisture through the summer months [7].
PROPAGATION DETAILS - SEED	
Ecotype	N/A
Propagation Goal	Bulbs
Propagation Method	Seed
Product Type	Container
Stock Type	Information not found.
Time to Grow	2 years is recommended, with plants being held until the fall dormant period of the second year since sowing before they are outplanted [4,6].
Target Specifications	Mature bulbs nearing 30mm diameter [7].
Propagule Collection Instructions	Seed capsules are 10-17mm, broadly obovoid and acutely angled [10]. Harvest in early summer when they are freshly dry or still slightly green. Capsules disperse quickly and should be collected as soon as possible after maturity [4].
Propagule Processing/Propagule Characteristics	After collection, empty capsules onto a clean tray and separate any chaff. Seeds should sit to dry for an hour in a location with good air circulation before they are packaged [4]. Average 1,000 seed weight is 2.78 grams for air-dried seeds [8].
Pre-Planting Propagule Treatments	Packaged seed can be stored in a cool, dry location until sowing, or in a humidity-controlled refrigerator if stored for more than a few weeks. Germination rates are better when seed is freshly collected and sown as soon as possible in late summer/fall [4]. A period of cold, moist stratification is required, and can be simulated to induce germination if seeds are not naturally stratified outdoors [13].
Growing Area Preparation / Annual Practices for Perennial Crops	Media should be equal parts loam, coarse sand/grit, and peat. Seed should be sown thinly and covered with a ¼ inch layer of grit or coarse sand [4]. Sow in deep flats or containers, as bulbs will naturally want to descend in their containers [11]. Seed can also be sown in a cold frame in the fall for natural stratification and will germinate in

	spring [4].
Establishment Phase Details	Seedlings may not appear for up to six months after seed is sown [6].
Length of Establishment Phase	Information not found.
Active Growth Phase	After germination in spring, bulblets will push themselves deeply into their containers [6]. During the spring growing period water plants regularly. Allow media to dry slightly during the summer, and to stay cool and well-drained through winter [4,14].
Length of Active Growth Phase	Information not found.
Hardening Phase	In the wild, bulbs are typically protected from freezing temperatures as they overwinter under snowpack at higher elevations [7]. During their first winter, seedlings should be given a minimum of 40°F [10].
Length of Hardening Phase	Information not found.
Harvesting, Storage and Shipping	Bulbs require careful handling as they are fragile and are easily bruised or desiccated [10,14]. Store in an area with controlled humidity and wrap bulbs if they are to be shipped [14].
Length of Storage	Bulbs do not store well for a long period of time, and should be planted soon after harvesting or kept in a container with lightly moist peat [4].
Guidelines for Outplanting / Performance on Typical Sites	Plants typically take 4 years from germination to flowering [4].
Other Comments	Seed is the preferred method of cultivation for this and other *Fritillaria* species due to conservation concerns [6, 12].
PROPAGATION DETAILS - VEGETATIVE	
Ecotype	N/A
Propagation Goal	Bulbs
Propagation Method	Vegetative (Bulblets)
Product Type	Container
Stock Type	Information not found.
Time to Grow	Can be grown to flowering size one year more quickly than plants propagated from seed [4].
Target Specifications	Mature bulbs nearing 30mm diameter [7].
Propagule Collection Instructions	Bulblets can be separated from mature bulbs in late summer or autumn when plants are dormant [4,12]. Mature bulbs should be carefully dug from containers as soon as their foliage and stems have faded [4].
Propagule Processing/Propagule Characteristics	Mature bulbs are comprised of few fleshy scales [10,11] and are round to pear-shaped with up to 50 “rice grain” bulblets at the base [4]. Bulblets are fragile and need to be sorted and brushed off carefully [4].
Pre-Planting Propagule	None

Treatments	
Growing Area Preparation / Annual Practices for Perennial Crops	Sow bulblets in a similar method to seeds, but with a deeper covering of sand or grit [4].
Establishment Phase Details	Sow bulblets in late summer to fall for emergence in spring [4].
Length of Establishment Phase	Information not found.
Active Growth Phase	Water regularly through the growing season, and allow media to stay drier during summer months [4].
Length of Active Growth Phase	Information not found.
Hardening Phase	See above Hardening Phase for Seed.
Length of Hardening Phase	Information not found.
Harvesting, Storage and Shipping	See above Harvesting, Storage and Shipping for Seed.
Length of Storage	Information not found.
Guidelines for Outplanting / Performance on Typical Sites	Time until flowering will be roughly 3 years, and generally a year shorter than plants started from seed [4].
Other Comments	Wild collection of bulbs and bulblets for propagation is not recommended due to conservation concerns [6]. Bulblets should only be harvested from plants originally grown from seed [12].
INFORMATION SOURCES	
References	[1] USDA Plants database. *Fritillaria atropurpurea*. Retrieved from: https://plants.usda.gov/core/profile?symbol=FRAT Last accessed 21 April 2018. [2] Kozloff, E. N. (2005). *Plants of Western Oregon, Washington & British Columbia*. Portland, OR: Timber Press, Inc. [3] Hitchcock, C. L., Cronquist, A., Ownbey M., & Thompson J. W. (1969). *Vascular Plants of the Pacific Northwest Vol. I: Vascular Cryptogams, Gymnosperms, and Monocotyledons.* Seattle, WA: University of Washington Press. [4] Pratt, K. & Jefferson-Brown, M. (1997). *The Gardener's Guide to Growing Fritillaries*. Portland, OR: Timber Press, Inc. [5] Turner, M. & Gustafson, P. (2006). *Wildflowers of the Pacific Northwest*. Portland, OR: Timber Press, Inc. [6] Kruckeberg, A. R. (1996). *Gardening With Native Plants of the Pacific Northwest.* (2nd Ed.). Seattle, WA: University of Washington Press.

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	of Forests and Lone Pine Publishing.
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