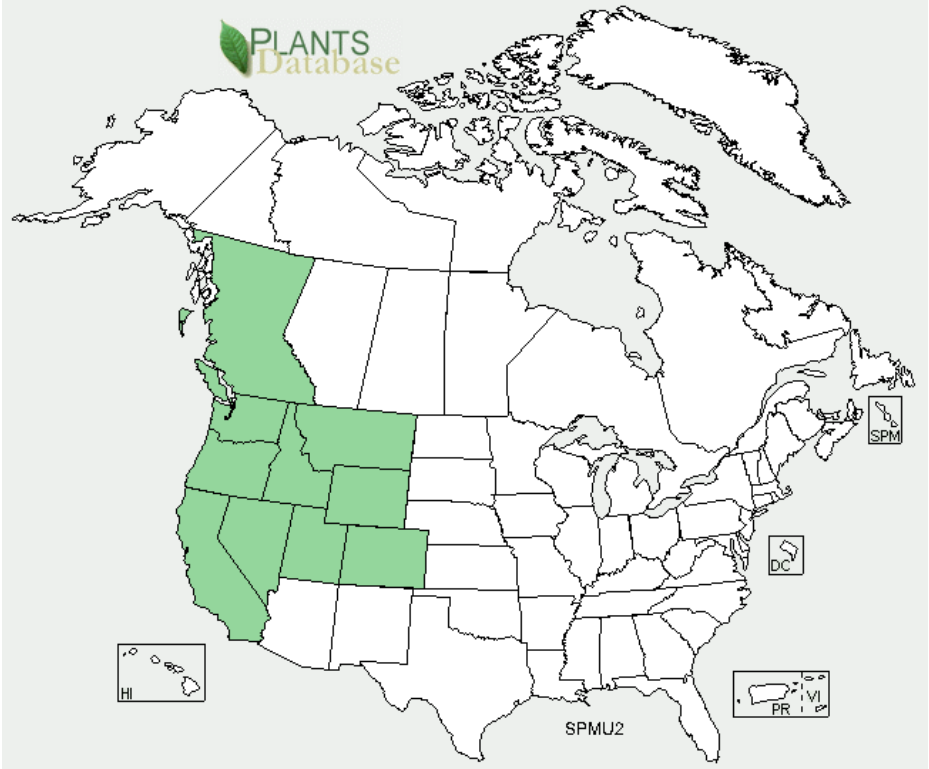
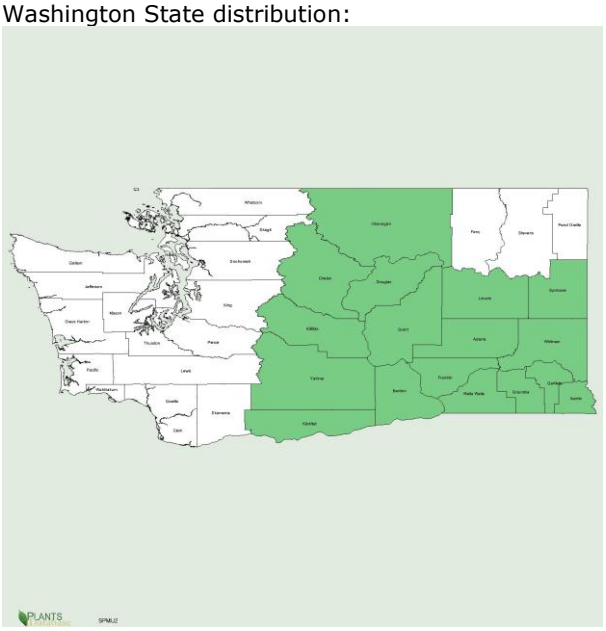
Plant Propagation Protocol for *Sphaeralcea munroana*
ESRM 412 – Native Plant Production

TAXONOMY	
Family Names	
Family Scientific Name:	Malvaceae
Family Common Name:	Mallow
Scientific Names	
Genus:	*Sphaeralcea*
Species:	*Munroana*
Species Authority:	(Douglas) Spach
Variety:	
Sub-species:	Ssp. *Monroana*, ssp *subrhomboidea*
Cultivar:	
Authority for Variety/Sub-species:	(Rydb.) Kearney
Common Synonym(s) (include full scientific names (e.g., *Elymus glaucus* Buckley), including variety or subspecies information)	None
Common Name(s):	Orange Mallow, Munro's globemallow, white stem globemallow, prairie mallow. (USDA,2012)
Species Code (as per USDA Plants database):	SPMU2

GENERAL INFORMATION

Geographical range (distribution maps for North America and Washington state)	United States and Canada Distribution:  Image courtesy of USDA Plants Database Washington State distribution:  Image courtesy of USDA Plants Database

Ecological distribution (ecosystems it occurs in, etc):	Widely distributed east of the Cascades in Washington, southeast British Columbia and Montana, south to California (USDA, 2012).
Climate and elevation range	Found in mid to low elevations in full sun and not tolerant of shade.
Local habitat and abundance; may include commonly associated species	This species is abundant and has a conservation status of no concern. (Giblin, 2012). These species are found in desert plains and open lower mountain slopes. They are quite abundant in these areas. (USDA, 2012)
Plant strategy type / successional stage (stress-tolerator, competitor, weedy/colonizer, seral, late successional)	This high drought tolerant, medium fire tolerant species is adapted to course and medium textured soils. Ph levels for this forb are between 6.3 to 8. It needs minimal moisture, between 8 to 16 inches of annual rainfall. It prefers sunlight and is intolerant to shade. It has a low tolerance level to salinity and prefers a low fertility soil (USDA, 2012).
Plant characteristics (life form (shrub, grass, forb), longevity, key characteristics, etc)	This herbaceous perennial forb grows to a height of 2.5 feet. It is a sub shrub that forms thick roots. These plants bloom in the months of May through July and the flowers are pink and orange. (Lady Bird Jonson, 2012) Seeds begin to germinate in the spring and are grown by summer. (Kildisheva, 2012) Growth rate is moderate as compared to other similar species. Root depth is 16 inches. This plant is more common in volcanic soils. It is a dry area native species. The life cycle is that of a perennial, meaning they live for longer than 2 years. (USDA, 2012) This species is susceptible to a fungal rust pathogen (*Puccinia sherardiana*). Seed can be damaged by weevils of the genus *Macrorhoptus.* (USDA, NRCS, 2012)
PROPAGATION DETAILS	
Ecotype (this is meant primarily for experimentally derived protocols, and is a	Seeds come from collection only.

description of where the seed that was tested came from):	
Propagation Goal (Options: Plants, Cuttings, Seeds, Bulbs, Somatic Embryos, and/or Other Propagules):	Plants.
Propagation Method (Options: Seed or Vegetative):	Seed or seedling
Product Type (options: Container (plug), Bareroot (field grown), Plug + (container-field grown hybrids, and/or Propagules (seeds, cuttings, poles, etc.))	Propagules (seeds)., also suitable for containers. (VanDerZanden, 2012)
Stock Type:	
Time to Grow (from seeding until plants are ready to	Active growth period is in the spring and summer months. The after harvest re growth rate is low. Water this species 2 – 3 times deeply the first summer. Growth rate is moderate as compared to other similar species. Root depth is 16 inches. This plant is more common in volcanic soils. The life cycle is that of a perennial, meaning they live for longer than 2 years. It is a dry area native

be outplanted):	species. Seedlings can be produced by sowing treated seed in containers in a green house in January and hardened off for 2 to 4 weeks prior to transplanting to a prepared field site in spring. Seed should be planted with a drill into a weed free seed bed. (VanDerZanden, 2012)
Target Specifications (size or characteristics of target plants to be produced):	
Propagule Collection (how, when, etc):	Seeds are produced in dry fruits with multiple capsules that form a sphere, with one seed per capsule (Larrison, 1974).
Propagule Processing/ Propagule Characteristics (including seed density (# per pound), seed longevity, etc):	
Pre-Planting Propagule Treatments (cleaning, dormancy treatments, etc):	*S. munroana* and other members of the *Sphaeralcea* genus have an impermeable seed coat which causes challenges for plant production. Cold moist stratification with no other pretreatment is unlikely to result in satisfactory germination. At the Pullman Plant Materials Center, seed of three accessions was planted into containers in mid October 2009, stratified outside for 90 days and moved into a greenhouse. Seed germinated within 7 to 14 days and achieved germination rates of 6%, 14% and 25% respectively. Significant germination improvements for *S. munroana* seed (84% average germination) following the combination of scarification (nicking the seed) and a 6 week cold stratification. Kildisheva and Davis (2011) examined the effects of seed piercing with a steel blade, 6 week cold stratification (4.6±0.02 C) and combined scarification plus stratification. Germination was significantly improved with both the scarification (35 %) and the combined scarification and stratification (44 %) treatments. Kildisheva and Davis (2011) also compared the effects of scarification with a steel blade, submergence in a 100 ppm gibberellic acid (GA3) solution, submergence in deionized water, and the combination of these treatments. Scarification alone and scarification followed by a 24 hour water or GA3 soak achieved the highest germination (87%, 93 % and 88 %, respectively) at the end

	of the 21 day period. Seeds soaked in distilled water for 24 hours achieved significantly higher germination than those soaked for 48 hrs. However, a similar relationship did not exist between scarified seeds soaked in GA3. Although mechanical scarification can be an effective dormancy treatment, many mechanized techniques can cause embryo damage, primarily a result of scarification severity. (USDA, NRCS, 2012). In summary, the seeds can be cleaned by processing with a brush machine or hammer mill and air screening equipment. Physical dormancy breaking procedure for this plant is boiling water scarification. This will dis lodge the cap like structure in the occlusion of the water gap. This water gap inhibits imbibition. Results have shown that the highest germination rate of 93% was achieved by mechanical scarification of previously stored seeds. (Kildisheva, 2011).
Growing Area Preparation / Annual Practices for Perennial Crops (growing media, type and size of containers, etc):	Plants should be spaced 10 to 30 inches apart. For optimal seed production in the field, pollination by bees is required. (USDA, NRCS, 2012)
Establishment Phase (from seeding to germination):	The ideal time to start the establishment stage is in early January.
Length of Establishment Phase:	It takes two to four weeks to go from seeding to germination. (Kildisheva, 2011)
Active Growth Phase (from germination until plants are no longer actively growing):	Seeds begin to germinate in the spring and are grown by summer (Lyons, 1995). The seed has an impermeable seed coat and should be scarified using boiling water or other treatment prior to planting if a high initial germination rate is desired. (USDA, NRCS, 2012)
Length of Active Growth	Total amount of time to grow from seeds to full growth is from May to August, 4 months. (Giblin, 2012)

Phase:	
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):	This plant has a life span of over two growing seasons (Turner, 2012).
Length of Hardening Phase:	
Harvesting, Storage and Shipping (of seedlings):	Seed harvesting to occur in late December.
Length of Storage (of seedlings, between nursery and outplanting):	Seedlings can be produced by sowing treated seed in containers in a green house in January and hardened off for 2 to 4 weeks prior to transplanting to a prepared field site in spring. (USDA NRCS, 2012)
Guidelines for Outplanting / Performance on Typical Sites (eg, percent survival, height or diameter	Mature height is 2.5 feet and 30 inch width. Do not over water. To encourage extended blooming, trim off old stalks (Giblin, 2012).

growth, elapsed time before flowering):	
Other Comments (including collection restrictions or guidelines, if available):	Due to this species seed's hard coat and levels of dormancy, volunteer plants are problematic during the years of production because they interfere with between-row cultivation operations and have high amounts of green growth at harvest. Furthermore, volunteer plants will emerge in succeeding crops for many years. The volunteers cannot be controlled with applications of pre-emergent herbicides or glyphosate. Commercial seed producers have also found the plant's indeterminance to be problematic. With summer precipitation or irrigation, Munro's globemallow will remain green and continue to flower throughout the growing season. Compounding this problem, seeds will shatter soon after ripening. Munro's globemallow can easily be harvested with a combine, however small amounts of seed harvestable at one time causes production to be economically unviable. In areas where irrigation is the only source of summer moisture, it may be possible to manipulate the plant's determinance by shutting off irrigation early in the growing season. (USDA, NRCS, 2012)
INFORMATION SOURCES	
References (full citations):	Giblin, D. WTU Image Collection: Plants of Washington Lichens of Washington. Burke Museum of Natural History and Culture, University of Wa Herbarium,(http://biology.burke.washington.edu/herbarium/imagecollection.php?Genus=Sphaeralcea&Species=munroana, April 17 2012) Images reference: *Sphaeralcea munroana.* USDA, NRCS. 2012. The PLANTS Database (http://plants.usda.gov, 17 April 2012). National Plant Data Team, Greensboro, NC 27401-4901 USA. Kildisheva, O., Dumroese R, Davis A. (2011) Overcoming Dormancy and Enhancing Germination of *Sphaeralcea munroana* Seeds. Hort Science 46: 1672-1676. Lady Bird Johnson Wild Flower Center, 2012, Native plant database, (http://www.wildflower.org/plants/result.php?id_plant=SPMU2, accessed 26 May 2012) Larrison, Patrick, Baker, Yaich, (1974) Washington Wildflowers, Portland, Seattle Audubon Society, p. 173-175 Lyons, C., Meriless, B., Trees, (1995) Shrubs & Forests to Know in British Columbia and Washington. Vancouver; Lone Pine Publishing, P. 259 Turner, M., Wildflowers, Turner Photographics, (http://www.pnwflowers.com/flower/sphaeralcea-munroana, April 17, 2012),

	USDA, 2012. The PLANTS Database (http://plants.usda.gov, 17 April 2012). National Plant Data Team, Greensboro, NC 27401-4901 USA. USDA, NRCS, 2012 Plant materials Center. Plant Guide, Munro's Globemallow Sphaeralcea munroana (Douglas) Spach Plant symbol = SPMU2, Pullman (http://plants.usda.gov/plantguide/pdf/pg_spmu2.pdf, April 17, 2012) VanDerZanden, A., (http://extension.oregonstate.edu/mg/botany/cycles.html, April 18, 2012) Master Gardner Handbook, Plant life cycles annuals biennials, perennials.
Other Sources Consulted (but that contained no pertinent information) (full citations):	Chambers, J.C., (2000), Seed Movements and Seedling Fates in Disturbed Sagebrush Steppe Ecosystems: Implications for Restoration, Ecological Applications. 10: 1400-1413. Mackinnon, A., Pojar, J. and Coupe, R. (1992) Plants of Northern British Columbia, Edmonton, Ministry of Forests and Lone Pine Publishing. Pojar, J. and Mackinnon, A. (2004) Plants of the Pacific Northwest coast: Washington, Oregon, British Columbia & Alaska. Vancouver; Lone Pine Publishing. Whitney, S., (2003) Field Guide to the Cascades & Olympics, Seattle; The Mountaineers Books.
Protocol Author (First and last name):	Robert Edsforth
Date Protocol Created or Updated (MM/DD/YY):	05/27/12

Note: This template was modified by J.D. Bakker from that available at: http://www.nativeplantnetwork.org/network/SampleBlankForm.asp