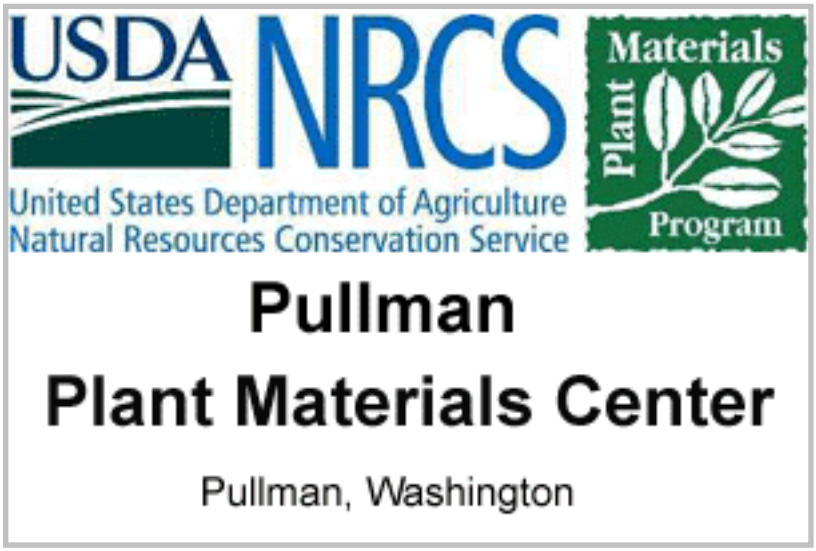
Protocol Information

Dave Skinner
PMC Farm Manager
Pullman Plant Materials Center
Room 211A Hulbert Hall
WSU
Pullman,
Washington 99163-6211

509-335-9689
509-335-2940 Fax
abbie@wsu.edu



Family Scientific Name:	**Polemoniaceae**
Family Common Name:	**Phlox**
Scientific Name:	***Ipomopsis aggregata*(Pursh) V. Grant ssp. *aggregata***
Common Synonym:	***Gilia aggregata* (Pursh) Spreng.**
Common Name:	**Scarlet gilia, skyrocket**
Species Code:	**IPAGA3**
Ecotype:	**Paradise Creek drainage near Pullman, Washington.**
General Distribution:	**Dry, open areas from shrub-steppe to open, dry forests from British Columbia to northern California and east to Montana and New Mexico. Mean annual precipitation range is from 10-15 inches (USDA NRCS 2007).**
Known Invasiveness:	**not invasive**
Propagation Goal:	**Plants**
Propagation Method:	**Seed**

Product Type:	**Container (plug)**
Stock Type:	**10 cu. in.**
Time To Grow:	**4 Months**
Target Specifications:	**Tight root plug in container.**
Propagule Collection:	**Because the plants flower indeterminately and the capsules dehisce forcefully upon ripening, collecting seed is difficult and time-consuming. The seed is gray in color and must be collected as it ripens but before the capsules dehisce.** **Plants in seed increase plantings can be cut and dried under cover on tarps or in bags. Wild plants should never be collected whole.** **Small amounts can be dried in paper bags at room temperature with the top of the bag covered with open weave cloth. Larger amounts are dried on tarps in a greenhouse or shed. Plants are covered with garden row cover to prevent seed loss. Fans can be used to assure good air circulation. Stems and leaves are green at this point and mold will occur with poor air circulation.**
Propagule Processing:	**Most of the seed will shatter in the bag or on the tarp. Plant parts are discarded and the seed collected from the bottom of the bag or tarp. Very little seed is left in the inflorescence and recovering it is not worth the time and effort required.** **Small amounts are cleaned with an air column separator. Larger amounts are cleaned with air screen equipment.** **Clean seed is stored in**

controlled conditions at 40 degrees Fahrenheit and 40% relative humidity.
There is wide variation in seed size depending mostly on pollinator effectiveness and therefore the number of seeds set per capsule (Wolf et al 1986).

We determined 362,416 seeds/lb for this ecotype.

Pre-Planting Treatments: **Seed from montane Oregon germinated poorly under all conditions (Link 1993). Rose et al (1998) reported that no pretreatment is necessary.**

For this ecotype, 45 days of cold moist stratification is required.
Unpublished data from trials conducted at the Pullman Plant Materials Center revealed that 5% emergence occurred without stratification. 45 days of cold, moist stratification resulted in 90% emergence. 90 or more days of cold, moist stratification did not increase emergence. Slightly higher emergence was obtained from plants grown outdoors under cool, fluctuating growing conditions but these plants were not ready to be transplanted to the field the same spring.

Growing Area Preparation/ Annual Practices for Perennial Crops:	**In late November or early December seed is sown in 10 cu. in. Ray Leach Super cell conetainers filled with Sunshine #4 and covered lightly. A thin layer of coarse grit is applied to the top of the planting soil to prevent seeds from floating during watering. Conetainers are watered deeply and placed outside. Alternately, seed can be moist stratified in a refrigerator for 45 days before sowing in the greenhouse.**
Establishment Phase:	**Containers are moved to the greenhouse in early to mid-January. Emergence usually begins in 4 days and is complete in 8 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. Plants may require water every day during the final part of the active growth period.**
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**

Outplanting performance on typical sites: **Transplanting is done in early May by using an electric drill and portable generator to drill 1.5 inch diameter holes at the planting site.**
Survival in seed increase plantings without competing vegetation averages 90%.
Transplanting into sites with existing vegetation may reduce survival and vigor depending on weather conditions following planting.

Other Comments: ***I. aggregata* is usually considered a biennial, but may remain in the rosette stage for several years before flowering and is probably more properly considered a monocarpic perennial.**
Stem cuttings can be propagated in a frame (Mirov 1939).
Flowers are protandrous (Campbell et al 1991, Mayfield et al 2001), self-incompatible (Wolf et al 1986, de Jong et al 1992, Mayfield et al 2001), and xenogamous (Elam & Linhart 1988).

References:

Campbell, Diane R., Nickolas M. Waser, Mary V. Price, Elizabeth A. Lynch, and Randall J. Mitchell. 1991. Components of Phenotypic Selection: Pollen Export and Flower Corolla Width in *Ipomopsis aggregata*. Evolution 45:1458-1467.

de Jong, Tom J., Nickolas M. Waser, Mary V. Price, and Richard M. Ring. 1992. Plant Size, Geitonogamy, and Seed Set in *Ipomopsis aggregata*. Oecologia 89:310-315.

Elam, Diane R., and Yan B. Linhart. 1988. Pollination and Seed Production in *Ipomopsis aggregata*: Differences Among and Within Flower Color Morphs. American Journal of Botany 75:1262-1274.

Hitchcock, C. Leo, and Arthur Cronquist. 1973. Flora of the Pacific Northwest. University of Washington Press. Seattle, WA. 730 pp.

Larrison, Earl J., Grace W. Patrick, William H. Baker, and James A. Yaich. 1974. Washington Wildflowers. The Seattle Audubon Society. Seattle, WA. 376 pp.

Link, Ellen (ed.). 1993. Native Plant Propagation Techniques for National Parks Interim Guide. USDA SCS Rose Lake Plant Materials Center and USDI National Park Service. East Lansing, Michigan. 240 pp.

Lyons, C.P. 1997. Wildflowers of Washington. Lone Pine Publishing, Renton, WA. 192 pp.

Mayfield, Margaret M., Nickolas M. Waser, and Mary V. Price. 2001. Exploring the "Most Effective Pollinator Principle" with Complex Flowers: Bumblebees and *Ipomopsis aggregata*. Annals of Botany 88:591-596.

Mirov, N.T. 1939. Collecting

and Handling Seeds of Wild Plants. Civilian Conservation Corps Forestry publ. No.5. US Government Printing Office. Washington, DC.

Parish, Roberta, Ray Coupe, and Dennis Lloyd (eds.). 1996. Plants of Southern Interior British Columbia. Lone Pine Publishing, Vancouver, BC, Canada. 463 pp.

Rickett, Harold W. 1973. Wildflowers of the United States: The Central Mountains and Plains. Vol. 6. (3 parts). McGraw Hill, New York.

Rose, Robin, Caryn E.C. Chachulski, and Diane L. Haase. 1998. Propagation of Pacific Northwest Native Plants. Oregon State University Press, Corvallis, OR. 248 pp.

St. John, Harold. 1963. Flora of Southeastern Washington and of Adjacent Idaho. 3rd edition. Outdoor Pictures. Escondido, CA. 583 pp.

Taylor. Ronald J., and Rolf W. Valum. 1974. Wildflowers 2: Sagebrush Country. The Touchstone Press, Beaverton. Oregon. 144 pp.

USDA NRCS. 2007. The PLANTS Database (http://plants.usda.gov, 23 February 2007). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

Visalli, Dana, Walt Lockwood, and Derrick Ditchburn. 2005. Northwest Dryland Wildflowers: Sagebrush-Ponderosa. Hancock House Publishers, Blaine, WA. 96 pp.

Wolf, L.L., F. Reed Hainsworth, T. Mercier, and R. Benjamin. 1986. Seed Size Variation and Pollinator Uncertainty in *Ipomopsis aggregata* (Polemoniaceae). Journal of Ecology 74:361-371.

Citation:

Skinner, David M. 2007. Propagation protocol for production of container *Ipomopsis aggregata* (Pursh) V. Grant ssp. *aggregata* plants (10 cu. in.); Pullman Plant Materials Center, Pullman, Washington. In: Native Plant Network. URL: http://www.nativeplantnetwork.org (accessed 24 February 2007). Moscow (ID): University of Idaho, College of Natural Resources, Forest Research Nursery.