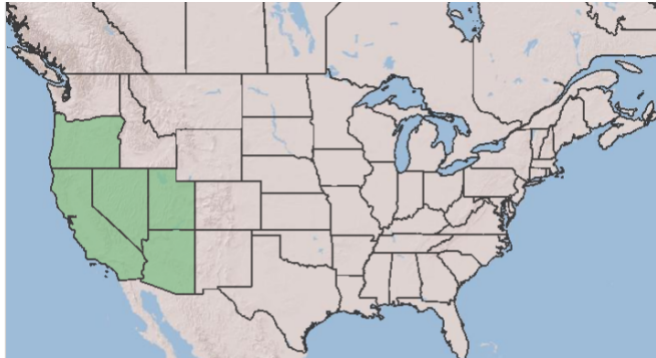


Plant Propagation Protocol for *Neogaerrhinum filipes*
 ESRM 412 – Native Plant Production
<https://courses.washington.edu/esrm412/protocols/2021/NEFI.pdf>



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TAXONOMY	
Plant Family	
Scientific Name	<i>Scrophulariaceae</i>
Common Name	Figwort family
Species Scientific Name	
Scientific Name	¹ <i>Neogaerrhinum filipes</i> (A. Gray) Rothm.
Varieties	There are currently no varieties that are recognized in the USDA Plants database.
Sub-species	There are currently no sub-species that are recognized in the USDA Plants database.
Cultivar	Not applicable
Common Synonym(s)	¹ <i>Antirrhinum filipes</i> A. Gray <i>Antirrhinum cooperi</i> A. Gray <i>Asarina filipes</i> (A. Gray) Pennell
Common Name(s)	Yellow twining snapdragon Filipes' snapdragon Tangled snapdragon
Species Code (as per USDA Plants database)	NEFI
GENERAL INFORMATION	
Geographical range	² This species distribution is across Arizona, California, Nevada, Oregon, and Utah. ³ Significant populations are primarily identified in the southwest in California. There are currently no distribution maps available for Washington and Oregon

	but it is native to (and confined in) western North America.
Ecological distribution	<p>²NEFI can be found in hardiness zones 9 through 11 in arid, desert-like plateaus and rocky slopes to bush scrubs and woodland areas with high sun and low annual precipitation.</p> <p>³It is also seen on shrubs, debris, on sandy plains and slopes, and generally in washes.</p>
Climate and elevation range	² This species elevation range is 360 to 5380 feet.
Local habitat and abundance	² This species is expected to be found throughout eastern Washington especially in roadsides and waste places at lower elevation in well-draining soils in the Okanogan- Wenatchee wilderness. It is very similar in appearance and habitat to a perennial, noxious weed <i>Linaria dalmatica</i> , dalmatian toadflax, that is highly competitive and threatening to the native species. Its presence in central and southern Oregon is more common though.
Plant strategy type / successional stage	³ NEFI is relatively early successional and seen in the first two stages of forest development in woodland areas where other vegetation such as grasses and forbs are populating the sparse understory. In desert climates it is considered sub-climatic. It has a strong tolerance for drought and consistently dry seasons, and in the inverse of that is highly susceptible to root rot. Unlike other species that are perennial and spread vegetatively, NEFI relies on self-seeding which it does readily with its characteristic pods.

Plant characteristics



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²© 2012 Keir Morse

⁴*Neogaerrhinum filipes* is an annual vining herbaceous plant with much more subtle flowers than other species. NEFI is found primarily in arid regions, so it does not have the showy display of other snapdragons as it invests just enough into its flowers to attract native bees to its nectar while not sacrificing precious water. Its flowers are also much farther apart than similar species in its family. ⁵It can be small and shrubby in appearance when young or in harsher conditions, being as little as $\frac{1}{3}$ of a foot high and crawling. It can reach a maximum height of over 3 feet tall.

⁷The flowers are brilliant yellow, but the plant itself tends to be inconspicuous; it has many slender stems that twine through other vegetation and it often goes unnoticed, obscured by the leaves and stems of other brush. The flowers are bilaterally symmetrical, growing on thread-like stalks that extend from leaf axils. ³The stems can be over 3 feet long and are glabrous except for being wooly at the base. The leaves are usually opposite, but become progressively alternate towards the distal end. They are linear to ovate and a fourth of an inch to two inches long. The length of leaves reduces towards the distal end as well. The leaf surface has prominent, pinnate veins. The flowers are five lobed and two lipped with the lower lipped rounded and larger than the upper lip, sometimes bearing dark or brick red spots. The flowers are borne solitary in the axils. Flowers may initially present closed, small, and white before maturity. The resulting fruits are $\frac{1}{3}$ of an inch to $\frac{1}{2}$ of an inch long in spheric capsules with equal chambers. The capsules are incredibly brittle and dehiscent with irregular bursting. The seeds held within are ovoid to spheric, $\frac{1}{3}$ of an inch wide, and black with four to six thick, wing-like ridges. ⁶It blooms February through May. ²Its growing season is five to nine months long. It tolerates up to four months of rain out of the year with annual

	precipitation of seven to forty seven inches. It is not water tolerant and prefers sandy textured, slightly basic soils.
PROPAGATION DETAILS	
<i>Please note: no propagation protocols were found specifically for this species so the below information is interpolated and synthesized from protocols of congeneric species that occur in similar habitats.</i>	
Ecotype	Not applicable
Propagation Goal	Plants
Propagation Method	Seed
Product Type	Container (plug)
Stock Type	⁸ Four inch container, flats, and cone-tainer plugs.
Time to Grow	⁸ Seven months.
Target Specifications	⁸ Firm root plug in container.
Propagule Collection Instructions	Collect seeds when the flowers have ripened into fruit but not fallen off yet or dehisced. The timing of this is incredibly important since the window of opportunity to collect between the time of ripening and natural dispersal is very small. The seed capsules may be collected in canvas or paper bags, since shaking onto canvas sheets generally results in higher seed loss.
Propagule Processing/Propagule Characteristics	⁸ There is no available data on NEFI propagule processing or propagule characteristics such as seed density and longevity. Seeds from related species, however, such as Heart-leaf Keckiella (<i>Keckiella cordifolia</i> (Benth.) Straw) are known to average 0.02 grams per 100 seeds, with germination rates of 37 percent to 57 percent. Seeds may be cleaned using handheld screens or decanting the lighter chaff off of the seeds in water for smaller seed lots.
Pre-Planting Propagule Treatments	⁸ Seeds may be soaked in a fungicide for 3 minutes or a 5 percent bleach solution for three minutes to sterilize the seed coat prior to sowing. After seeds have been clean they should be stored in a refrigerator at 40 degrees Fahrenheit with 40 percent humidity. ⁹ Seeds of this genera that inhabit arid, desert-like environments often have physical dormancy. To break epicotyl dormancy, seeds may be cold stratified at 38 degrees Fahrenheit and germinate around 60 degrees Fahrenheit.

	<p>¹⁰Seeds may also be treated by being placed in a solution of 250 mg/L GA3, soaked for 24 hours, rinsed, and soaked for an additional 4 hours in water. Seeds are sown into trays filled with stabilized medium plugs (Q-plugs). Trays are sealed inside plastic bags and placed into refrigeration at 1 to 3 °C for 60 days. Trays are checked weekly and kept moist throughout the stratification period. If mold is evident, trays should be treated with 1% hydrogen peroxide.</p>
Growing Area Preparation / Annual Practices for Perennial Crops	<p>¹⁰This species should be grown in a greenhouse growing facility. The surface of the sown seeds should be covered lightly with nursery grit. Seedlings are transplanted to target containers approximately 3 weeks following removal from stratification. Growing medium used is 40:20:20:20 peat:composted fir bark:perlite:pumice with Nutricote controlled release fertilizer (18N:6P2O5:8K2O with minors; 180-d release rate at 21C) at the rate of 1.5 gram Nutricote per 262 ml container.</p>
Establishment Phase Details	<p>⁸Seeds are germinated during winter months in a shadehouse were they remain for several weeks.</p> <p>⁸Seeds germinate 2 to 4 weeks after sowing. Flats and containers are filled with a 1 inch layer of special seed germination mix of 1:1 (v:v) Sunshine Professional Growing Mix and sand on top of 4:1:1 (v:v:v) peat, perlite, and organic compost. We incorporate Osmocote time release fertilizer (9 month release rate) (14 N:14P2O5:14K2O) at the rate of « cup per 0.75 cubic yard of medium. Seeded flats are watered with an overhead emitter system as needed.</p>
Length of Establishment Phase	<p>⁸Two months.</p>
Active Growth Phase	<p>¹⁰Germination is not very uniform. After germinating, other options for fertilization include liquid application of soluble fertilizer such as 12-2-14-6Ca-3Mg at 75 to 100 ppm for 2 weeks.</p> <p>⁸After seedlings are well established and have at least 2 true leaves, they are transplanted into containers filled with a growing medium of 4:1:1 (v:v:v) peat, perlite, and organic compost. Osmocote time release fertilizer (9 mo release rate) (14 N:14P2O5:14K2O) is</p>

	incorporated into the medium at a rate of « cup per .75 cubic yards of medium.
Length of Active Growth Phase	⁸ Three months.
Hardening Phase	⁸ Nursery stock grown under shade house conditions are hardened by placing them in full sun exposure for a minimum of 2 weeks prior to outplanting. ¹⁰ Seedlings are generally moved to the outdoor growing area in mid-September.
Length of Hardening Phase	⁸ Two to four weeks.
Harvesting, Storage and Shipping	⁸ Containerized seedlings are over wintered directly in open growing compound.
Length of Storage	⁸ Length of storage is variable and dependent on outplanting date. ¹⁰ Seeds may be outplanted as early as October, and they may be kept in the outdoor growing area for storage until outplanting. Irrigate plants well prior to shipping and ship in containers.
Guidelines for Outplanting / Performance on Typical Sites	⁴ Plants are expected to flower during the following season in spring. Percent survival is not known. The individuals should be at least 1/3 of a foot long with well developed roots in order to have a greater chance of fitness in the outplanting site.
Other Comments	¹¹ The figwort family, <i>Scrophulariaceae</i> , includes 62 genera and approximately 1830 known species with a cosmopolitan distribution. Recent sources cites <i>Neogaerrhinum filipes</i> as a member of the <i>Plantaginaceae</i> family, however, the USDA, NRCS database is either not currently updated to reflect this distinction, or disagrees with these findings. Most sources do agree on one thing, which is that the taxonomy of this genus is complex and not fully resolved. Given the lack of available information on <i>Neogaerrhinum filipes</i> specifically, this propagation protocol should be seen as a general guide and by no means an exhaustive resource.
INFORMATION SOURCES	
References	See below
Other Sources Consulted	See below

Protocol Author	Adrian Eric Bures
Date Protocol Created or Updated	05/05/2021

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