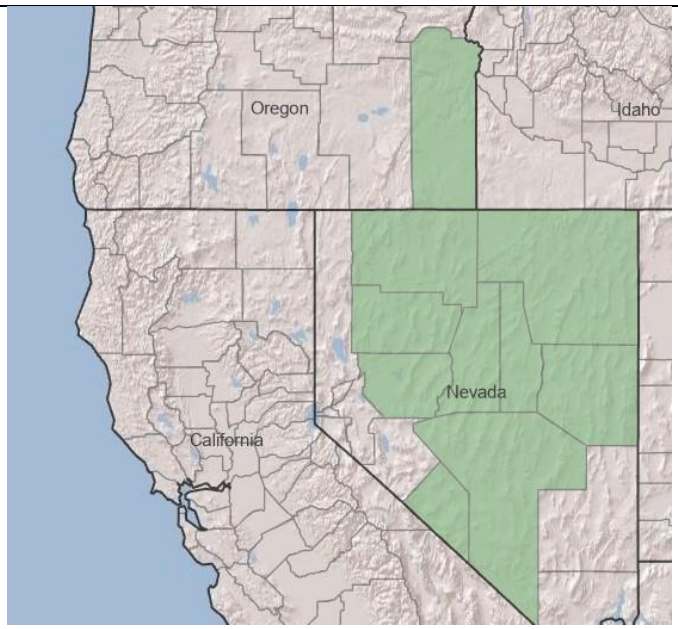
Plant Propagation Protocol for *Penstemon kingii*
ESRM 412 – Native Plant Production
URL: https://courses.washington.edu/esrm412/protocols/*2023*/*PEKI.pdf*

Source: Wildflower Search

TAXONOMY	
Plant Family	
Scientific Name	Scrophulariaceae
Common Name	Figwort family
Species Scientific Name	
Scientific Name	Penstemon kingii S. Watson
Varieties	N/A
Sub-species	N/A
Cultivar	N/A
Common Synonym(s)	Penstemon nyeensis
Common Name(s)	King's beardtongue
Species Code (as per USDA Plants database)	PEKI
GENERAL INFORMATION	

Geographical range	 Source: USDA `Southern Malheur County, Oregon, south in Nevada through the Jackson and Santa Rosa ranges of Humboldt County, the Independence, Adobe, East Humboldt, and Ruby Mts. of Elko County, to the Desatoya Mts. of Churchill County and Gold Mt. of southern Esmeralda County, the Toiyabe, Toquima, Monitor, and Kawich ranges of northern Nye County[3]
Ecological distribution (ecosystems it occurs in, etc)	`Desert ecosystem: adapted to arid and semi-arid desert ecosystem, such as scrub habitats which are characterized by low rainfall, hot temperatures, and sparse vegetation `Woodland ecosystem: pinyon-juniper woodlands located at mid to high elevations, along with shrubs and herbaceous plants `Montane meadows: open grassy area in mountainous regions. There meadows are often located at higher elevation with a cooler climate and higher precipitation
Climate and elevation range	Climate: Penstemon kingii is adapted to arid and semi-arid climates. It is well-suited to hot and dry summers and can withstand low winter temperatures. It thrives in areas with a Mediterranean climate, characterized by hot, dry summers and mild, wet winters Elevation: 1500-2100m[2]
Local habitat and abundance	Sagebrush-juniper woodlands[2] Dry sagebrush valleys and pinyon-juniper wooded hills[5]
Plant strategy type / successional stage	Cold hardy to about 24°F and tolerate temperatures to 90s
Plant characteristics	Duration: Perennial Habit: Herb , Subshrub Fruit Type: Capsule

	Size Notes: Up to about 1 foot tall Bloom Color: Blue , Purple , Violet Bloom Time: May , Jun , Jul Bloom Notes: Violet to purple, reddish purple or blue[4]
PROPAGATION DETAILS **(There is no propagation information for Penstemon kingii. The information below is the propagation for Penstemon haydenii as reference.)**	
Ecotype	
Propagation Goal	Plants
Propagation Method	Seed
Product Type	Container plug
Stock Type	Ray Leach Cone-tainers SC10 Super[7]
Time to Grow	`Late March or early April
Target Specifications	`Stems are stout, up to about 1/2 inch in diameter, and usually 6 to 18 inches tall ` The individual flowers are comprised of a 1 to 1-1/2 inches long, tube-shaped corolla that is milky blue, milky lavender or, rarely, white or pink
Propagule Collection Instructions	`Seeds were collected in August from plants growing in Garden County, Nebraska `Seeds were separated from fruiting stalks[9]
Propagule Processing/Propagule Characteristics	N/A
Pre-Planting Propagule Treatments	`Pre-soaking seeds for 12 to 24 h prior to scarification may remove seedcoat inhibitors, Fresh seeds pre-soaked in flowing water needed a longer period of cold, moist stratification than dry seeds did `Breaking seed dormancy requires scarification of the seedcoat and a cold, moist stratification[7] `Wild-harvested seeds were subjected either to moist chilling at 2 to 4 °C (36–39 °F) for 0, 4, 8, 12, and 16 wk or to approximately 2 y of dry storage[8]
Growing Area Preparation / Annual Practices for Perennial Crops	Seeds are covered 1 to 2 mm (0.03–0.07 in) deep with seed mulch of germination mix medium. Greenhouse temperatures are kept at 21 °C (70 °F) during the day and 20 °C (68 °F) during the night[7]
Establishment Phase Details	`Hand- and sulfuric acid scarification significantly enhanced the germination of blowout penstemon seed[10] ` Fourscarifiedseedswereimmediatelyplantedatadepthof1cminseedling tubes (4 cm in diameter and 20 cm long) containing pure, washed, steamed (120 C,120 min) sand. These tubes were used because roots are able to extend to the bottom of the tubes[11]

Length of Establishment Phase	4 weeks
Active Growth Phase	`Irrigation applied more frequently to encourage shoot development `Fertilized every other watering using (20N:10P2O5:20K2O) GP at 300 ppm[7]
Length of Active Growth Phase	`9 weeks[9]
Hardening Phase	`Placed in an outdoor nursery under full sun exposure ` Additional irrigation water is applied only when root plugs have reached low moisture weights `No additional fertilizer is applied during hardening
Length of Hardening Phase	` After sowing, the fully tight root plugs are completed 14 to 16 weeks later[7]
Harvesting, Storage and Shipping	N/A
Length of Storage	N/A
Guidelines for Outplanting / Performance on Typical Sites	`Pinching fertilized plants just prior to transplanting outside may be desirable to stimulate growth[9]
Other Comments	`Sulfuric acid scarification can increase germination percentages from 4 to 90%.[7]
INFORMATION SOURCES	
References	1. USDA plants database. (n.d.). https://plants.usda.gov/home/plantProfile?symbol=PEKI 2. Watson, S., & Freeman, C. C. (n.d.). Penstemon kingii. Penstemon kingii - FNA. http://beta.floranorthamerica.org/Penstemon_kingii 3. NatureServe Explorer 2.0. (n.d.). https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.159986/Penstemon_kingii 4. Plant database. Lady Bird Johnson Wildflower Center - The University of Texas at Austin. (n.d.). https://www.wildflower.org/plants/result.php?id_plant=PEKI 5. Penstemon kingii. Penstemon kingii | Wolfe Lab. (n.d.). https://wolfelab.asc.ohio-state.edu/database/penstemon-kingii 6. Penstemon kingii: King's Penstemon. favicon. (n.d.). https://wildflowersearch.org/search?&tsn=33713 7. Gilbert, R., Luna, T., & Wright, G. (2020). Propagation protocol for blowout penstemon (Penstemon haydenii), a federal endangered species of the Nebraska Sandhills and Wyoming.

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Other Sources Consulted	
Protocol Author	Diya Li
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