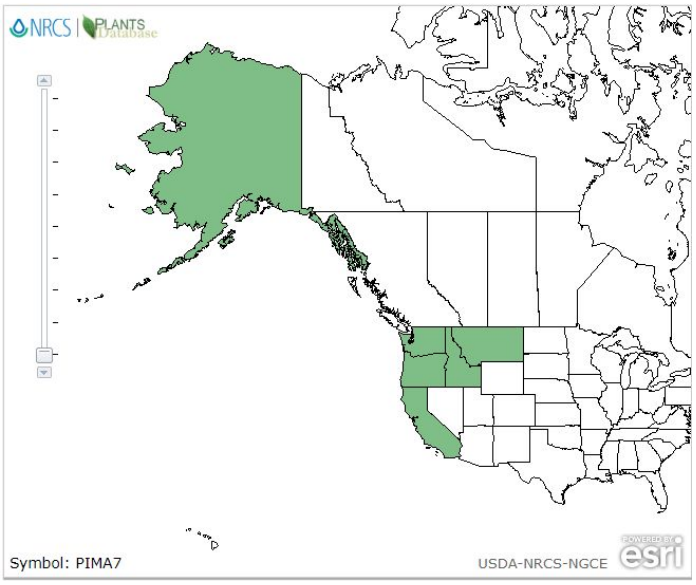
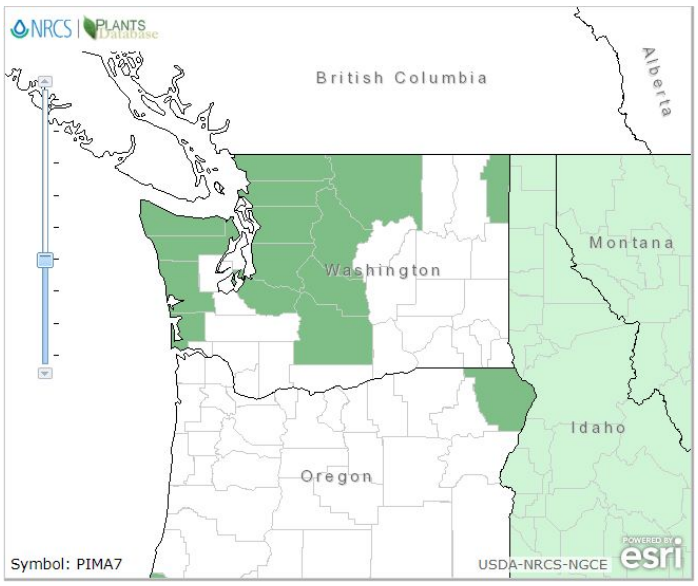
Plant Propagation Protocol for *Pinguicula macroceras*

ESRM 412 – Native Plant Production

Protocol URL: https://courses.washington.edu/esrm412/protocols/*[USDASpeciesCode.pdf]*

TAXONOMY	
Plant Family	Lentibulariaceae
Scientific Name	Pinguicula macroceras
Common Name	California butterwort
Species Scientific Name	
Scientific Name	*Pinguicula macroceras* Link
Varieties	*Pinguicula macroceras* Link var. *Macroceras* *Pinguicula macroceras* Link var. *microceras* (Cham.) Casper
Sub-species	*Pinguicula macroceras* Link var. *Macroceras* *Pinguicula macroceras* Link var. *microceras* (Cham.) Casper
Cultivar	

Common Synonym(s)	*Pinguicula vulgaris* ssp. *Macroceras* *Pinguicula macroceras* ssp. *Nortensis* *Pinguicula macroceras* ssp. *macroceras*
Common Name(s)	California Butterwort, Horned Butterwort
Species Code (as per USDA Plants database)	PIMA7
GENERAL INFORMATION	
Geographical range	Cascade Mountains of California, Oregon, and Washington; Alaska, British Columbia, Japan, and Russia  *North American Distribution*

	 *WA State Distribution*
Ecological distribution	Freshwater wetlands, bogs/fens, wetland-riparian, serpentine soils
Climate and elevation range	Elevation < 1830 m; USDA climate zones 5a-9a, Sunset Western Zones 1A-5
Local habitat and abundance	Moist slopes, wetlands, serpentine soils lacking in nutrients. [1,2]
Plant strategy type / successional stage	Plant uses carnivorous feeding to replace soil nutrients. Overwinters as hibernacula.
Plant characteristics	Herbaceous perennial forb. Bloom time mid to late spring. Leaves are elliptic to ovate 2--5 cm long, arranged in rosettes pale green to dark brown, and covered with sticky hairs for trapping and digesting insects. 1--5 inflorescences per rosette, each about 10--20 cm tall. Flowers are 5-lobed, hairy-throated, and pale blue to violet with a white center of the lower lip. Lobes are obovate. The corolla (including spur) is 13--21 mm, and the spur alone is 6--9 mm[2,3]

PROPAGATION DETAILS	
Ecotype	
Propagation Goal	Primarily cultivated by carnivorous plant enthusiasts as terrarium or outdoor potted specimens.
Propagation Method	Seed (Cold temperate *Pinguicula* sp. like *P. macroceras* are propagated by seed, gemmae cuttings, and through micropropagation methods.[4])
Product Type	Container
Stock Type	
Time to Grow	1 year
Target Specifications	2-5 cm rosettes
Propagule Collection Instructions	No specific seed collection information found, but some informal sources (blogs, forum posts, etc.) mention that fruits will dry out and split open when seeds are ready to harvest.

Propagule Processing/Propagule Characteristics	Many *Pingucula* species produce very few seeds and of the seeds produced, only a small number are viable. [5–7]
Pre-Planting Propagule Treatments	Cold moist stratification In experimental micropropagation protocols for similar *Pinguicula* species, seeds were sterilized by immersion in a solution of commercial bleach at 15% (v/v) (5% of sodium hypochlorite) with a few drops of Tween-20 for 15 min, and washed 3 times in sterile water.[5,6] Collector and enthusiast protocols shared no such information.
Growing Area Preparation / Annual Practices for Perennial Crops	Mix of one part sand, one part peat moss, and one part perlite. Also recommended were slow-growing sphagnum moss, or a similarly moist, well-draining and aerating, nutrient-poor mix.[8,9]
Establishment Phase Details	Cold temperate *Pinguicula* seeds need temperatures from -10°C to 5°C (14°F to 40°F) for 8 to 12 weeks to germinate. In regions with cold winter temperatures seeds can be sown in situ or outdoors at the beginning of autumn in a mix of one part sand, one part peat moss, and one part perlite. slow-growing sphagnum moss, or a similarly moist, well-draining and aerating, nutrient-poor mix. For indoor germination seeds should be artificially stratified for 8-12 weeks. Place seeds in a plastic bag with a few inches of damp peat. Seasonal light cycles are extremely important, so artificial stratification should happen during the winter.[8,9]

Length of Establishment Phase	Early fall to spring
Active Growth Phase	Germination should occur March through May. Plants should be placed in bright to dappled sun. Growing media should be kept damp at all times using only mineral-free water. After the first growing season, plants should be separated to prevent competition.[8,9]
Length of Active Growth Phase	Spring to early fall
Hardening Phase	Seasonal lighting and temperature changes should trigger dormancy processes in the plant, causing leaf dieback and hibernacula formation. In experimental micropropagation protocols for similar *Pinguicula* species, plantlets were maintained in a growth room for 3 weeks under controlled conditions and then gradually exposed to reduced humidity over a period of 3 weeks.[5,6] Collector and enthusiast protocols shared no such information.
Length of Hardening Phase	Early fall to early winter
Harvesting, Storage and Shipping	No data found
Length of Storage	No data found

Guidelines for Outplanting / Performance on Typical Sites	No outplanting data found, only references to sowing in situ[8,10] Some resources mention repotting or replanting during hibernacula dormancy but it is not recommended as roots are easily damaged.[11,12]
PROPAGATION DETAILS	
Ecotype	N/A
Propagation Goal	Primarily cultivated by carnivorous plant enthusiasts as terrarium or outdoor potted specimens.
Propagation Method	Vegetative (Cold temperate *Pinguicula* sp. like *P. macroceras* are propagated by seed, gemmae cuttings, and through micropropagation methods.[4])
Product Type	Container
Stock Type	
Time to Grow	1 year
Target Specifications	2-5 cm rosettes
Propagule Collection Instructions	In fall to early winter, once summer leaves have died back, gemmae will form around the base of the hibernaculum. Gemmae should be carefully

	detached and placed on container media surface, then cold stored for dormancy.[11]
Propagule Processing/Propagule Characteristics	Gemmae can be as small as 1mm, and difficult to see. Propagule locations should be marked before stratification storage.[11]
Pre-Planting Propagule Treatments	Cold moist stratification
Growing Area Preparation / Annual Practices for Perennial Crops	Mix of one part sand, one part peat moss, and one part perlite. Also recommended were slow-growing sphagnum moss, or a similarly moist, well-draining and aerating, nutrient-poor mix.[8,9]
Establishment Phase Details	Once hibernacula are open, the propagules can be removed from cold stratification.
Length of Establishment Phase	Early fall to spring
Active Growth Phase	Keep in bright light, and keep media moist through the growing season.
Length of Active Growth Phase	Spring to early fall
Hardening Phase	Seasonal lighting and temperature changes should trigger dormancy processes in the plant, causing leaf dieback and hibernacula formation. In experimental micropropagation protocols for similar *Pinguicula* species, plantlets were maintained in a growth room for 3 weeks under controlled conditions and then gradually exposed to reduced humidity over a period of 3 weeks.[5,6]

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Other Comments	The vast majority of data regarding propagation of cold temperature *Pinguicula* species is compiled and disseminated by collector and carnivorous plant enthusiasts. Formal protocols, restoration-focused information, and outplanting data is lacking.

INFORMATION SOURCES

References	1. Plants Profile for Pinguicula macroceras (California butterwort). https://plants.usda.gov/core/profile?symbol=PIMA7. 2. Pinguicula macroceras. https://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=38246. 3. Pinguicula macroceras Calflora. https://www.calflora.org/cgi-bin/species_query.cgi?where-calrecnum=10227.

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Other Sources Consulted	PHITO CARNIVORES. "How to Pollinate Pinguicula Flowers," July 6, 2019. https://phito.be/how-to-pollinate-pinguicula-flowers/.

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Protocol Author	Lauren Homer
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