

Plant Propagation Protocol for *Caltha palustris* L.

ESRM 412 – Native Plant Production

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Protocol URL: [https://courses.washington.edu/esrm412/protocols/\[CAPA5.pdf\]](https://courses.washington.edu/esrm412/protocols/[CAPA5.pdf])



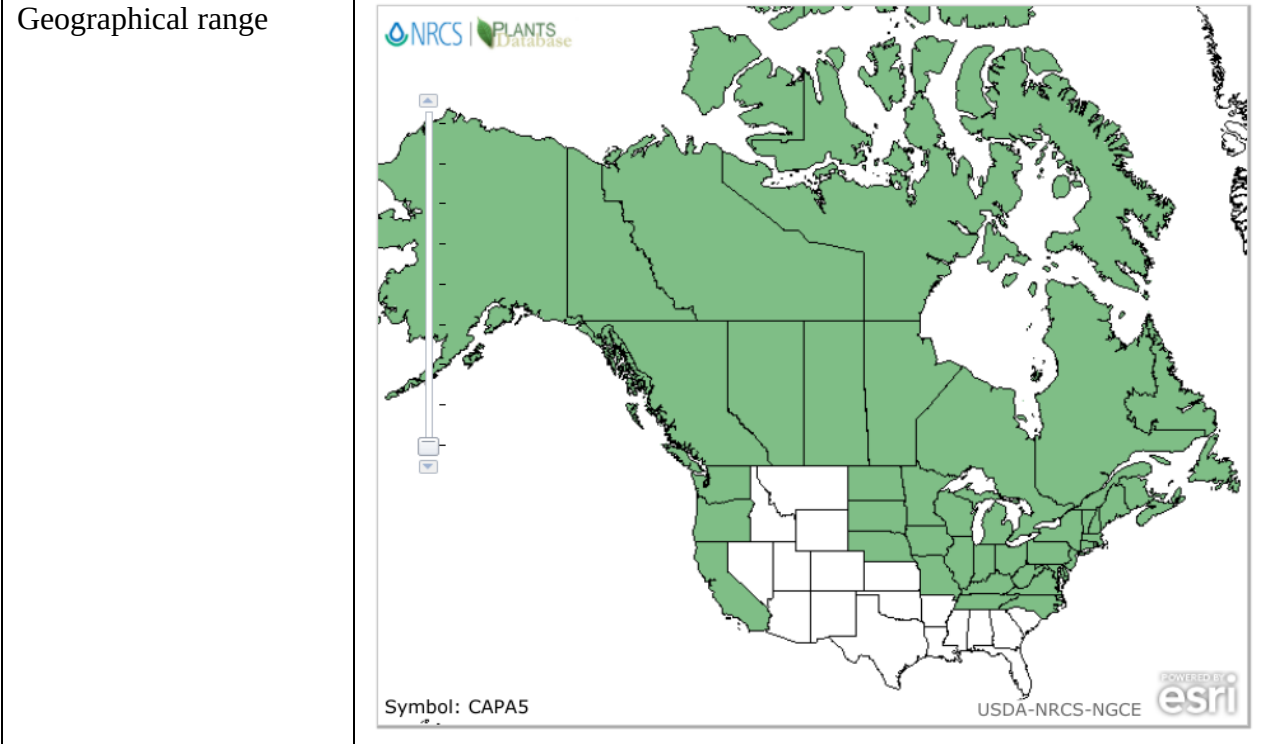
Image by Dave Anderson: <https://www.nhpr.org/post/marsh-marigold#stream/0>


TAXONOMY

Plant Family	
Family Scientific Name	<i>Ranunculaceae</i>
Family Common Name	Buttercup
Species Scientific Name	
Scientific Name	<i>Caltha palustris</i> Linnaeus
Varieties	N/A
Sub-species	<i>Caltha palustris</i> var. <i>palustris</i> <i>Caltha palustris</i> var. <i>radicans</i>
Cultivar	N/A

Common Synonym(s)	<i>Caltha asarifolia</i> de Candolle var. <i>radicans</i> = var. <i>flabellifolia</i> (Pursh) Torrey & A. Gray, var. <i>arctica</i> (R. Brown) Huth
Common Name(s)	Marsh marigold, Yellow Marsh Marigold, Western Marsh Marigold, King Cup,, May Blobs, Clowslip
Species Code (as per USDA Plants database)	CAPA5

GENERAL INFORMATION



	 <p>Symbol: CAPAS</p>
Ecological distribution	Grows widely across Northern hemisphere, USDA zone 3a (8), Appears in marshes, fens, ditches, moist forests (4). Occur almost exclusively in wetlands (1).
Climate and elevation range	30 to 60 inches of precipitation (1), 0 to 1300 meters above sea level (2)
Local habitat and abundance	Commonly associated with Alder (6)
Plant strategy type / successional stage	Highly polymorphic (4), adapting various morphological traits depending on location (11). Shown to be highly adaptable in changing its resource allocation between vegetative and generative reproduction strategies depending on the conditions present at a particular site (6).
Plant characteristics	<p>Perennial forb (1) with conspicuous deep yellow flowers 16 to 50 mm in diameter with five to eight petal-like sepals (4), blooming from April to June (5). Contains 5-13 pistils and numerous stamen. Leaves are basal, reniform, ovate, or corvate in shape with crenate, or smooth margins, 12.5 by 19 cm at the largest. Shoots are erect or sprawling (2). Grows to a maximum height of 2 feet (1), reaching maturity at 2 years at the earliest in cultivation settings and 3 to 4 years in the wild (10).</p> <p>Self-incompatible (7). Reproduces naturally both vegetatively and by seed. Forms short rhizomes, growing in clumps (6). Visited by a variety of insects, while primarily pollinated by hoverflies (9). Seeds are brown (1), elliptic and 1.5 to 2.5 mm in length (2).</p>

	Aggregate fruits with many pods producing numerous seeds (17) with varying follicle shape (11).
PROPAGATION DETAILS: FROM SEED Adapted from Lundqvist: The self-incompatibility system in <i>Caltha palustris</i> (Ranunculaceae) (7) and Nichols: The influence of exposure to winter temperatures upon seed germination in various native American plants (15)	
Ecotype	Lundqvist sourced plants from a moist forest from both shaded pools and sunny ditches (7) Nichols collected seeds from the bank of a lake (15)
Propagation Goal	Plants
Propagation Method	Seed
Product Type	Container
Stock Type	Container
Time to Grow	<i>C. palustris</i> reaches maturity at 2 years in cultivation settings (10). If using cold stratification method, planting in late fall, seeds germinate will the following spring (15), so approximately 2 years and 3 months should be allocated.
Target Specifications	Not noted
Propagule Collection Instructions	Lundqvist harvested entire mature plants during Spring and transplant in lab setting to collect seeds from periodically (7). Seeds are ripe in late spring to early summer, around the second week of June when pods open (17).
Propagule Processing/Propagule Characteristics	Individual plants can produce more than 200 seeds (7) Seeds have been shown to demonstrate morpho-physiological dormancy (14)
Pre-Planting Propagule Treatments	Sterilize in 8% hydrochlorite for five to ten minutes, rinse with water six times (7) Use of fresh seeds is recommended by some (12) (17) (18) although Nichols recommends air drying followed by cold moist stratification for 71 to 112 days by placing seeds sterilized soil in an outdoor cold frame (15)
Growing Area Preparation / Annual Practices for Perennial Crops	Lundqvist advises housing plants in unheated greenhouse at 20 to 25° C during the warm season to protect plants from insects and placing outdoors during winter. Does not note size of containers (7). USDA notes minimum root depth of 8 inches (1), so the chosen container should exceed this depth.
Establishment Phase Details	Germinate in late spring (16) or early fall in Petri dishes with 0.8% agar. Transplant into pots after germination and provide ample water to maintain moist conditions (7).

	<p>Seeds sown directly into soil exhibit low germination rate (7), but if sowing, use a moist peat medium (12)</p> <p>Nichols sowed seeds in soil during late fall in an outdoor cold frame for cold-moist stratification, yielding a germination rate of only 5 percent (15).</p>
Length of Establishment Phase	Approximately 112 days for cold stratification method (15)
Active Growth Phase	Referenced protocols do not describe a specific watering regime, but other sources note that <i>C. palustris</i> will become dormant in the summer without adequate moisture (5) (17). Since the species is usually found in wetlands (1) and able to grow in standing water (17), soil should be kept very moist.
Length of Active Growth Phase	<i>C. patustris</i> reaches maturity at 2 years in cultivation settings (10).
Hardening Phase	Winter outdoors, keep very moist (7)
Length of Hardening Phase	Not noted
Harvesting, Storage and Shipping	Not noted
Length of Storage	<i>C. patustris</i> reaches maturity at 2 years in cultivation settings (10)
Guidelines for Outplanting / Performance on Typical Sites	<p>Outplanting site must be very moist, with full sun optimally, although some report success in partial shade (4). A natural depression into which water drains is a good habitat (11) (17).</p> <p>Leng and others found that mowing of the outplanting site helps <i>C. palustris</i> with seed dispersal when performed in late spring (May 15th in this experiment) (16).</p>
Other Comments	Plant morphology varies greatly depending on the location of source population, so seeds should ideally be collected across different ecosystem types and individuals to obtain a broad range of traits (11). Werpachowski found that plants sourced from open areas as opposed to forested regions have been shown to produce higher volumes of more germinable seeds (6).
<p>PROPAGATION DETAILS: DIVISION METHOD Adapted from Falińska: Variability of <i>Caltha palustris</i> L. populations in garden culture (11)</p>	
Ecotype	meadow, springwood, floodplain forest, Alder forest (11)
Propagation Goal	Plants
Propagation Method	Vegetative
Product Type	Cuttings
Stock Type	Bareroot
Time to Grow	<i>C. patustris</i> reaches maturity at 2 years in cultivation settings (10).

Target Specifications	Falińska found significant variety in morphology between plants sources from different ecosystems, sustained long after their establishment in the experimental garden. Cuttings from the floodplain exhibited shorter shoot length than the other ecotypes and 90 percent of individuals showed some trailing shoots. 90 percent of the cuttings from the Alder forest showed erect shoots only. Propagules from the springwood ecosystem had the shortest petioles. Plants from the floodplain and Alder forests had more flowers and fruits than the other ecotypes (11).
Propagule Collection Instructions	Aggregate can be broken up, divided carefully at the crown after the plant has flowered (3) (17). Falińska advises collecting vegets before they have rooted but does not note the time of year. Based on the morphological differences between ecotypes he observed (11), sourcing vegetative propagules from an Alder forest ecotype may be advised to conserve space and produce a greater number of flowers.
Propagule Processing/Propagule Characteristics	Generative shoots formed from rhizomes become independent from mother plant after 1 year, ceasing to exchange resources (6).
Pre-Planting Propagule Treatments	Not noted by Falińska (11)
Growing Area Preparation / Annual Practices for Perennial Crops	Falińska created plots of 1 by 2.6 meters with 26 individuals each filled with soil sourced from fertile Alder forest with a channel filled with water around the perimeter (11). This yields 2 rows of 13 plants each 10 cm apart. The USDA notes a planting density of between 1,700 and 4,800 individuals per acre (1).
Establishment Phase Details	N/A
Length of Establishment Phase	N/A
Active Growth Phase	Spring (1), dormant in summer (5)
Length of Active Growth Phase	Approximately 2 years in cultivation setting (10)
Hardening Phase	Keep very moist (7)
Length of Hardening Phase	Not noted
Harvesting, Storage and Shipping	Not noted
Length of Storage	Falińska observed his vegetatively propagated specimen for 3 years before harvesting (11). Another source notes that the plant can be divided again after a few years (18).

Guidelines for Outplanting / Performance on Typical Sites	See outplanting guidelines above in direct seeding method protocol.
Other Comments	Werpachowski found that populations growing in forested ecosystems may be more likely to allocate more resources to producing vegets than to producing seeds compared with those in open areas (6). Outplanted divided shoots are shown to maintain the morphological variation from the source population once relocated (11).
INFORMATION SOURCES	
References	See list below
Other Sources Consulted	See list below
Protocol Author	Abigail Lovell
Date Protocol Created or Updated	05/06/20

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