

Plant Propagation Protocol for [Insert Species]

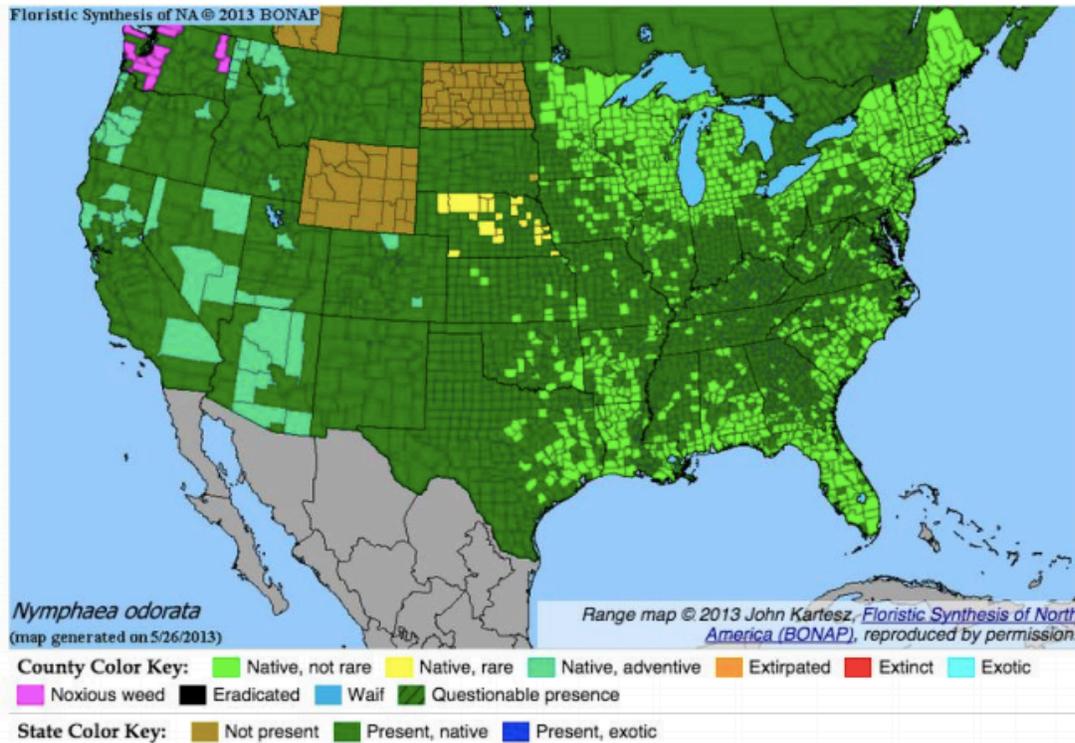
ESRM 412 – Native Plant Production

URL: <http://courses.washington.edu/esrm412/protocols/2021/NYODO.pdf>

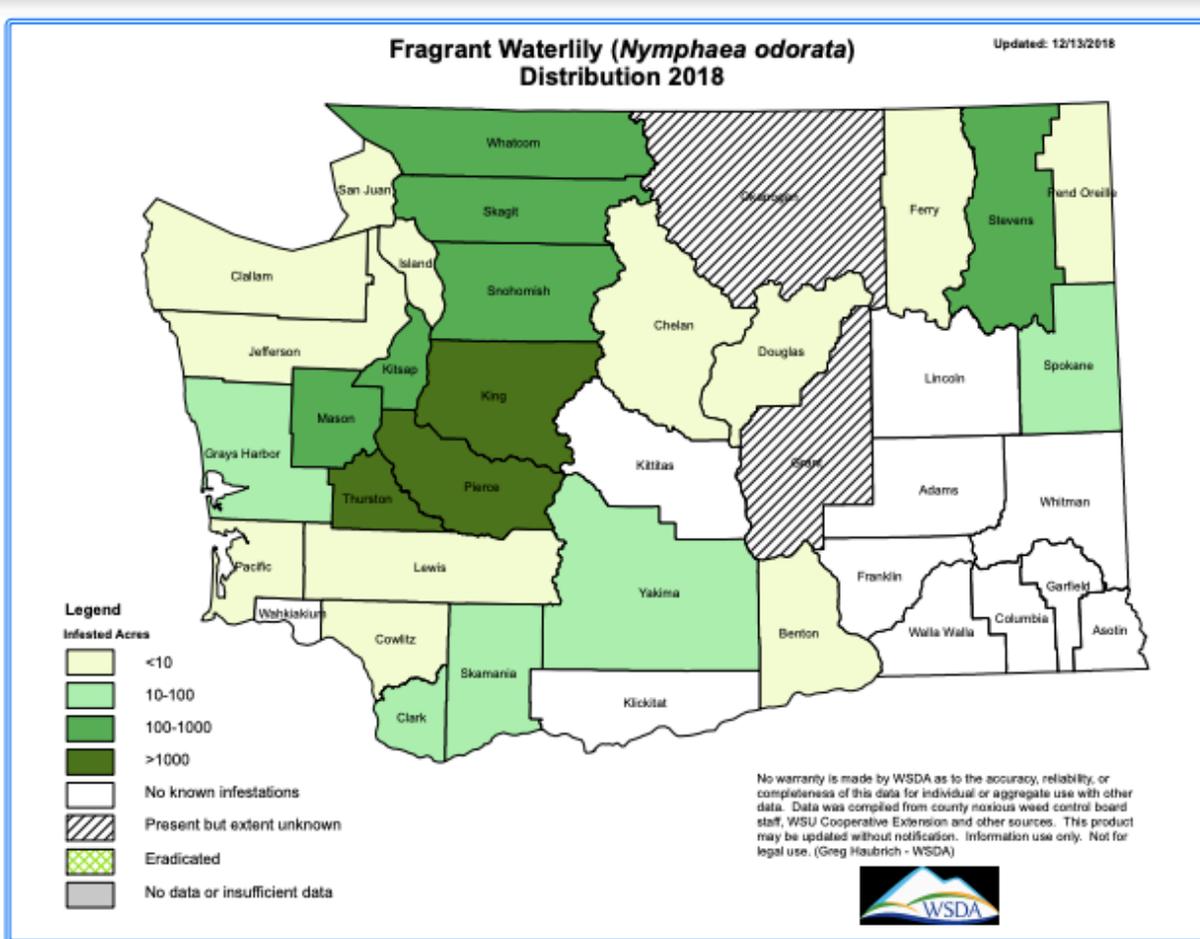
This propagation protocol template was modified by Hannah Carter from that available at: <http://www.nativeplantnetwork.org/network/SampleBlankForm.asp>



Nymphaea odorata spp. *odorata* in bloom. Courtesy Lady Bird Johnson Wildflower Center. https://www.wildflower.org/plants/result.php?id_plant=nyod



Distribution of *N. odorata* in United States, courtesy John Kartesz: <http://www.minnesotawildflowers.info/flower/american-white-water-lily>



County level map of *Nymphaea odorata* presence in Washington State. Courtesy NWCB
<https://www.nwcb.wa.gov/weeds/fragrant-water-lily>

TAXONOMY	
Plant Family	
Scientific Name	Nymphaeaceae
Common Name	American white waterlily
Species Scientific Name	
Scientific Name (A full scientific name consists of <i>Genus</i> , <i>epithet</i> , and authority- e.g., <i>Elymus glaucus</i> Buckley. Protocols are prepared for species, which may include multiple varieties, sub-species, and/or cultivars.)	<i>Nymphaea odorata</i> Aiton. ⁷
Varieties (those varieties that are recognized in the USDA Plants database; report name and authority for each variety)	

Sub-species (those sub-species that are recognized in the USDA Plants database; report name and authority for each sub-species)	<i>Nymphaea odorata</i> Aiton ssp. <i>odorata</i> <i>Nymphaea odorata</i> ssp. <i>tuberosa</i>
Cultivar	
Common Synonym(s) (include full scientific names, including variety or subspecies information)	<i>Castalia lekophylla</i> Small <i>Castalia minor</i> (Sims) Nyar <i>Castalia odorata</i> (Aiton) Alph. Wood <i>Castalia reniformis</i> (Walter) Nash, nom. utique rej. <i>Nymphaea minor</i> (Sims) DC. <i>Nymphaea odorata</i> Aiton var. <i>gigantea</i> Tricker <i>Nymphaea odorata</i> Aiton var. <i>godfreyi</i> Ward <i>Nymphaea odorata</i> Aiton var. <i>minor</i> Sims <i>Nymphaea odorata</i> Aiton var. <i>rosea</i> Pursh <i>Nymphaea odorata</i> Aiton var. <i>stenopetala</i> Fernald <i>Nymphaea odorata</i> Aiton var. <i>villosa</i> Caspary <i>Nymphaea reniformis</i> Walter, nom. utique rej.
Common Name(s)	American white waterlily, American white water-lily, fragrant waterlily, fragrant white waterlily, white water lily. ²
Species Code (as per USDA Plants database)	NYODO. ⁷
GENERAL INFORMATION	
Geographical range (distribution maps for North America and for the Pacific Northwest (generally available at county level for Washington/Oregon)	This species is native to Eastern and Southeastern USA and Canada. It has been introduced to all states except WY and SD, although it may have existed there historically. ⁵ In Canada, it does not occur in Alberta, Northern Territories, Nunavut, or Yukon Territories but exists otherwise introduced to BC and native to the eastern part of the country. ⁷
Ecological distribution (ecosystems it occurs in, etc)	Widespread in wetland riparian areas, lakes, lake margins, quiet lake and river bays, ponds. ⁵ Weedy in Eastern USA and listed as a noxious weed in Washington. ⁴
Climate and elevation range	Lowland, steppe, and lower montane zones from 0 to 1,710 m. ⁴
Local habitat and abundance (may include commonly associated species)	Occurs in stagnant or slow-moving water with a minimum depth of 18 inches, and 5-6 feet on average. Prefers water body substrate to be mucky or silty, with neutral pH. ⁴ Ssp. <i>odorata</i> prefers stagnant lakes, ponds, bogs, fens up to 1m and ssp. <i>tuberosa</i> prefers slow moving slightly alkaline water up to 1m. Abundant when present. ²
Plant strategy type / successional stage (stress-tolerator, competitor,	Weedy/colonizer ⁵

weedy/colonizer, seral, late successional)	
Plant characteristics (life form (shrub, grass, forb), longevity, key characteristics, etc.)	Perennial forb/herb which reproduces rhizomatously and by seed. ⁴ Floating, leaved, and rooted aquatic plant which has leathery green (but red on bottom) floating leaves up to 10 inches with a basal slit. The leaf stalk is attached to the base of the slit. The flowers are fragrant, showy, up to 10 inches wide and range from white to pink, borne on a stalk which corkscrews when the flower has been fertilized and begins to sink under water. There are about 25 or more petals per flower, and they have 72-107 stamens. Each flower blooms for only three days. Seeds are leathery capsules with numerous small seeds inside which mature 4 weeks after pollination. ⁵
PROPAGATION DETAILS (SEED)	
Ecotype (this is meant primarily for experimentally derived protocols, and is a description of where the seed that was tested came from)	Not given
Propagation Goal (Options: Plants, Cuttings, Seeds, Bulbs, Somatic Embryos, and/or Other Propagules)	Plants
Propagation Method (Options: Seed or Vegetative)	Seed
Product Type (options: Container (plug), Bareroot (field grown), Plug + (container-field grown hybrids, and/or Propagules (seeds, cuttings, poles, etc.))	Plug (container-field grown hybrids)
Stock Type	Not given
Time to Grow (time from seeding until plants are ready to be outplanted)	Not given
Target Specifications (size or characteristics of target plants to be produced)	Long enough for leaves to float while rooted in substrate (0.5 to 1 m). ⁶
Propagule Collection Instructions (how, when, etc.)	Collect throughout the blooming season (June-October). ² Wrap a muslin or plastic bag around the fruit 2 weeks after bloom, securing the bottom around the base of the fruit. The fruit will burst, ejecting multiple small seeds which should be collected about 4 weeks later. ¹

Propagule Processing/Propagule Characteristics (seed density (# per pound), seed longevity, etc)	Seeds will remain viable for a year but have a higher chance of survival when sowed sooner. ¹
Pre-Planting Propagule Treatments (cleaning, storage, dormancy treatments, etc.)	<i>N. odorata</i> seeds germinate more rapidly when crowded together (60-100 seeds) due to a release of ethylene gas triggering simultaneous germination. Seeds are dormant and may be stratified at 4.4 C for 5 months. ¹ Germination inhibited by freezing or drying >1 day Store in water with <20 seeds per vial, may be stored for up to 1 year but storage encourages seed rot. ¹
Growing Area Preparation / Annual Practices for Perennial Crops (growing media, type and size of containers, etc.)	Plant in 12 cm x 8 cm plastic inserts with commercial potting soil with 4 cm x 4 cm divisions. Plant four seeds per subdivision (total of 6 subdivisions). Plant inserts at depths of water 30-90 cm. ⁶
Establishment Phase Details (cultural practices from seeding to germination)	Germinate seeds in vials of 60-100 seeds. Allow ample sunlight. ⁶
Length of Establishment Phase (time from seeding to germination)	1-2 months. ^{1,6}
Active Growth Phase (cultural practices from germination until plants are no longer actively growing)	Plant germinants in growing area. ⁶
Length of Active Growth Phase (time from germination until plants are no longer actively growing)	3 months. ⁶
Hardening Phase (cultural practices from end of active growth phase to end of growing season; primarily related to the development of cold-hardiness and preparation for winter)	<i>N. odorata</i> enters the hardening phase once it produces a floating leaf. ⁶
Length of Hardening Phase (time from end of active growth phase to end of growing season; primarily related to the development of cold-hardiness and preparation for winter)	Not given
Harvesting, Storage and Shipping (of seedlings)	Roots must be kept moist or stored in water. ⁶
Length of Storage (of seedlings, between nursery and outplanting)	Not given
PROPAGATION DETAILS (VEGETATIVE)	
Ecotype (this is meant primarily for experimentally derived protocols,	Not given

and is a description of where the seed that was tested came from)	
Propagation Goal (Options: Plants, Cuttings, Seeds, Bulbs, Somatic Embryos, and/or Other Propagules)	Plants
Propagation Method (Options: Seed or Vegetative)	Vegetative
Product Type (options: Container (plug), Bareroot (field grown), Plug + (container-field grown hybrids, and/or Propagules (seeds, cuttings, poles, etc.))	Bareroot (field grown)
Stock Type	Not given
Time to Grow (time from seeding until plants are ready to be outplanted)	Not given
Target Specifications (size or characteristics of target plants to be produced)	Long enough for leaves to float while rooted in substrate (0.5 to 1 m). ⁶
Propagule Collection Instructions (how, when, etc.)	Not given
Propagule Processing/Propagule Characteristics (seed density (# per pound), seed longevity, etc)	Not given
Pre-Planting Propagule Treatments (cleaning, storage, dormancy treatments, etc.)	Not given
Growing Area Preparation / Annual Practices for Perennial Crops (growing media, type and size of containers, etc.)	Not given
Establishment Phase Details (cultural practices from seeding to germination)	Not applicable
Length of Establishment Phase (time from seeding to germination)	Not applicable
Active Growth Phase (cultural practices from germination until plants are no longer actively growing)	Not given
Length of Active Growth Phase (time from germination until plants are no longer actively growing)	3 months. ⁶
Hardening Phase (cultural practices from end of active growth phase to end of growing season; primarily	<i>N. odorata</i> enters the hardening phase once it produces a floating leaf. ⁶

related to the development of cold-hardiness and preparation for winter)	
Length of Hardening Phase (time from end of active growth phase to end of growing season; primarily related to the development of cold-hardiness and preparation for winter)	Not given
Harvesting, Storage and Shipping (of seedlings)	Roots must be kept moist or stored in water. ⁶
Length of Storage (of seedlings, between nursery and outplanting)	Not given
Guidelines for Outplanting / Performance on Typical Sites (e.g., percent survival, height or diameter growth, elapsed time before flowering)	Outplant in containers lodged in substrate to limit unwanted vegetative reproduction. One plant can spread 15-20 ft. ⁵
Other Comments (including collection restrictions or guidelines, if available)	Noxious weed in many western states, contact authorities before collecting seeds and rhizomes. Get permission to collect seeds on private property. Contact authorities before outplanting.
INFORMATION SOURCES	
References (full citations)	See below
Other Sources Consulted (but that contained no pertinent information) (full citations)	See below
Protocol Author (First and last name)	Hannah Carter
Date Protocol Created or Updated (MM/DD/YY)	05/20/21

¹Baskin, Jerry M.; Baskin, Carol C.. 2003. "Propagation protocol for production of Container (plug) *Nymphaea odorata* Ait. Plants". University of Kentucky Lexington, Kentucky. In: Native Plant Network. URL: <https://rng.net/npn/propagation/protocols/nymphaeaceae-nymphaea-2639>

²Calflora. "Nymphaea odorata". Water lily. Plant Characteristics and Associations. Accessed 20 May 2021. URL: <https://www.calflora.org/entry/plantchar.html?crn=5876>

³Else, Mary Jane and Donald Riemer. 2012. "Factors Affecting Germination of Seeds of Fragrant Water Lily (*Nymphaea odorata*)". In: J; Aquatic Plant Mnaagement 22: 22-25. Accessed 20 May 2021. URL: <https://www.apms.org/wp/wp-content/uploads/2012/10/v22p22.pdf>

⁴King County Noxious Weed Control Program. “Fragrant Water Lily”. In: Best Management Practices. Accessed 22 May 2021. URL:

https://www.nwcb.wa.gov/images/weeds/fragrant-water-lily-control_King.pdf

⁵Northey, Allison. 2014. “*Nymphaea odorata*, fragrant Water Lily, tuberous water lily, white water lily”. In: Pacific Northwest Invasive Species. UW Fisheries Science. URL:

https://depts.washington.edu/oldenlab/wordpress/wp-content/uploads/2015/09/Nymphaea_odorata_Northey_2014.pdf

⁶Richards, Jennifer and Carla Cao. 2011. “Germination and early growth of *Nymphaea odorata* at different water depths”. In: Aquatic Botany. Department of Biological Sciences, Florida International University, Miami. Accessed 24 May 2021. URL:

<http://www.evergladeshub.com/lit/pdf12/Richards12-AqBot98.12-19-NymphOdorataDepth.pdf>

⁷USDA. “*Nymphaea odorata* Aiton spp. *odorata*”. American white water lily. USDA PLANTS Database. Accessed 20 May 2021. URL:

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