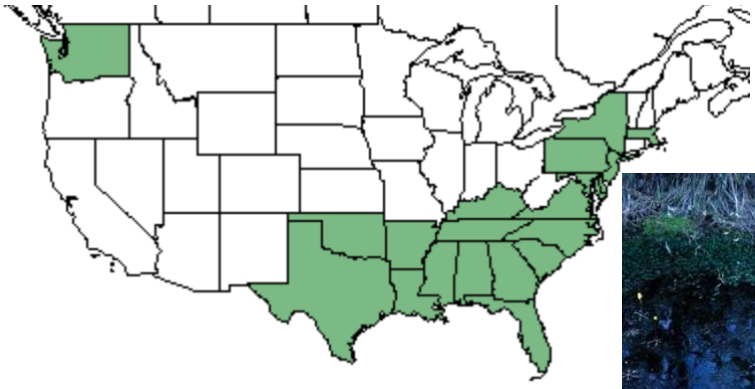
Plant Propagation Protocol for *Utricularia inflata*
ESRM 412 – Native Plant Production
Protocol URL: https://courses.washington.edu/esrm412/protocols/*UTIN*.pdf



TAXONOMY	
Plant Family	
Scientific Name	Lentibulariaceae
Common Name	Bladderworts
Species Scientific Name	
Scientific Name	*Utricularia inflata* (Walter) or *Utricularia inflata* (Walt.)
Varieties	None
Sub-species	None
Cultivar	None
Common Synonym(s)	None
Common Name(s)	Swollen bladderwort, (Large) floating bladderwort, inflated bladderwort
Species Code (as per USDA Plants database)	UTIN

All images taken from invasiveplantatlas.org [3]

GENERAL INFORMATION	
Geographical range	This species has inaccurate information on the USDA database that it's native status in all the lower 48 states. It is native to mostly the Southeastern U.S. in the states of Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, New Jersey, and Oklahoma. In more recent years it has spread to Pennsylvania, New York, Massachusetts, and Washington. [4,5,9,10,11] Maps taken from [11]
Ecological distribution	Freshwater, Calm freshwater, Slow moving freshwater [2,7]
Climate and elevation range	Climate Tolerances: Can survive down to freezing in a dormant state, no apparent thermal maximum. Elevation: Mostly low altitude habitats, mostly at sea level or on coastal plains ~150m. However, given its unexpected success in lakes in the Adirondacks, its maximum elevation range is unknown. [2,5,8,10]
Local habitat and abundance	Most common in lakes, swamps, bogs, ponds, slow moving rivers, and other small freshwater sources. Common interaction with other species of *Utricularia*, where invasive is often associated then outcompetes native isoetids. [6,8,9]
Plant strategy type / successional stage	Competitor, weed (in some locations), it is a carnivorous plant so it has high stress tolerance for most freshwater water conditions including acidic, oligotrophic, and eutrophic waters. [7,8,10,12]
Plant characteristics	This is a perennial forb/herb that is often free floating or loosely anchored in sediment. The plant is supported by a submerged float consisting of narrow, tapering spokes (4-10 spokes) 4-9 cm in length that have the carnivorous bladders (around 3mm long when mature) along them that use trigger hairs to fire and capture invertebrates and small fish. There is a branched stem that shoots up from this underwater foliage that can grow up to 2m long; flowers bloom off the stem that are yellow and snapdragon like in appearance, are usually ~20mm wide, and each plant most frequently grows 3-14 flowers when in bloom. [1,3,6,8,9,11]
PROPAGATION DETAILS	
Ecotype	Still or slow-moving freshwater
Propagation Goal	Plants
Propagation Method	Vegetative
Product Type	Bareroot plant (though this plant doesn't have true roots)
Stock Type	Bareroot plan
Time to Grow	Growth rates vary by temperature and day length, but generally given a winter dormancy (~3 months), and relatively fast growth-rates, fully grown plants can be produced in 6-9 months. If grown indoors, *U. inflata* can continue growth year round. [2,6,8]
Target Specifications	Stems 2-3mm in diameter and greater than 0.25m in length, plant producing flowers, bulbs/bladders 1mm, 4 spokes minimum on the float
Propagule Collection Instructions	Collect 1 cm long fragments from wild at any time of year from the lateral foliar unit (the floats)
Propagule Processing/Propag	1 cm fragments have been shown to have a 100% survival rate, so no propagule processing should be necessary. Given the survival/growth rate of these vegetative

ule Characteristics	propagules, the number of fragments that should be collected should be the same as the number of plants that are desired [10]
Pre-Planting Propagule Treatments	Fragments are relatively resilient, and can remain dormant until the following growing season, but nonetheless should be introduced to growth media as soon as possible [10]
Growing Area Preparation / Annual Practices for Perennial Crops	This plant should be grown in a relatively large freshwater container with water at least 0.5m deep. Water temperature maintained at 23ºC is ideal, and water should be relatively well aerated. This plant grows best in the presence of other aquatic plants and in water containing peat or other naturally occurring freshwater sediments. Ideally this should be grown outdoors, allowing aquatic insects and other organisms to become common in the water, and providing the plant with a source of food that will help it grow larger and faster. [1,2,8,10]
Establishment Phase Details	N/A, this plant will begin active growth directly from the fragment with no germination required.
Length of Establishment Phase	N/A
Active Growth Phase	Maintain conditions described in the "Growing area preparation" section. Plants should be provided full sunlight if possible, though partial sun will also allow plants to grow successfully. Do not allow water to freeze. [2,8,10]
Length of Active Growth Phase	If temperatures and conditions are maintained year round at 23ºC as recommended, growth should continue year round. The plant will continue to grow, and as it does, older parts of the plant may "decay" and produce new fragments, which would likely lead to new plants being produced. This decay will limit the final size of the plant, but growth should be continuous. [8,10]
Hardening Phase	N/A, this plant only experiences active growth and dormancy and has no hardening phase.
Length of Hardening Phase	N/A
Harvesting, Storage and Shipping	Plants need to be kept in water, so duplicate the media conditions in a small, portable container for transport. Transfer plant from main growth medium container to portable container by lifting it out of the water (should be easy since plant is free-floating). Transportation should be done as quickly and efficiently as possible, with minimal disturbance to the plant, maintaining ideal temperature and humidity.
Length of Storage	Information not available
Guidelines for Outplanting / Performance on Typical Sites	This plant has never been intentionally introduced and outplanted to a field site, but the goals should be the same as the target specifications (Stems 2-3mm in diameter and greater than 0.25m in length, plant producing flowers, bulbs/bladders 1mm, 4 spokes minimum on the float). Given previous data, percent survival should be extremely high, approaching 100%. Flowers should bloom in June or July in Washington, and January at the earliest in the more southern parts of its range. [8,10]
Other Comments	It should be noted that this plant is invasive to Washington and listed as a noxious weed by the WA Department of Ecology. For this reason, the sale, purchase, or transport of this plant is illegal in Washington state, so while propagation is feasible, if you are a resident of Washington you cannot and should not propagate this plant species. [8]

INFORMATION SOURCES	
References	Aquatic Plant Identification Manual for Washington's Freshwater Plants (Ed.). (n.d.). Utricularia inflata. Retrieved from https://fortress.wa.gov/ecy/gisresources/lakes/AquaticPlantGuide/descriptions/utrinf.html [1] Cultivating Carnivorous Plants: Utricularia. (2015). Retrieved from https://publicism.info/gardening/carnivorous/24.html [2] Floating Bladderwort Utricularia inflata Walter. (n.d.). Retrieved from https://www.invasiveplantatlas.org/subject.html?sub=18686 [3] Howard Morgan, V., 2019, *Utricularia inflata* Walter: U.S. Geological Survey, Nonindigenous Aquatic Species Database, Gainesville, FL, and NOAA Great Lakes Aquatic Nonindigenous Species Information System, Ann Arbor, MI, https://nas.er.usgs.gov/queries/GreatLakes/FactSheet.aspx?SpeciesID=238, Revision Date: 9/14/2011, Access Date: 5/29/2019 [4] Mitchell, R. S., Maenza-Gmelch, T. E., & Barbour, J. G. (1994). Utricularia inflata Walt. (Lentibulariaceae), New to New York State. *Bulletin of the Torrey Botanical Club,121*(3), 295. doi:10.2307/2997184 [5] Reinert, G. W., & Godfrey, R. K. (1962). Reappraisal of Utricularia inflata and U. radiata (Lentibulariaceae). *American Journal of Botany,49*(3), 213. doi:10.2307/2439543 [6] Robinson, M. (2017). *Swollen Bladderwort: An Exotic Aquatic Plant*[PDF]. Commonwealth of Massachusetts - Department of Conservation and Recreation. https://www.mass.gov/files/documents/2017/09/06/swollen-bladderwort.pdf [7] Scholl, W. (2007). *Swollen Bladderwort*[PDF]. University of Washington. http://depts.washington.edu/oldenlab/wordpress/wp-content/uploads/2013/03/Ultricularia-inflata_Scholl_2007R.pdf [8] Taylor, P., & Luteyn, J. L. (1991). The Genus Utricularia-A Taxonomic Monograph. *Brittonia,43*(1), 68. doi:10.2307/2807184 [9] Urban, R. A., & Dwyer, M. E. (2016). Asexual Reproduction and Its Potential Influence on the Distribution of an Invasive Macrophyte. *Northeastern Naturalist,23*(3),408-419. doi:10.1656/045.023.0308 [10] Utricularia inflata Walter. (n.d.). Retrieved from https://plants.usda.gov/core/profile?symbol=UTIN [11] Utricularia - The Bladderwort. (n.d.). Retrieved from https://botany.org/Carnivorous_Plants/Utricularia.php [12]
Other Sources Consulted	
Protocol Author	Micah Adams
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