

Propagation of Wetland Species

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INTRODUCTION

Getting Started with Wetland Species. Three years ago I started researching constructed wetlands. Today, Flowerwood Liners is producing over 50 species and more than 200 cultivars of aquatic plants. From water lilies to native grasses, we are developing our own aquatic program to go along with our standard woody ornamental and liner production materials. Most of these plants are easily produced but there are few written resources on how to propagate these plants. Mike Kane (see the *Comb. Proc. Intl. Plant Prop. Soc.*, Vol. 44) reported on the progress being made in tissue culture production of aquatics. In this paper, I will present a general overview of the uses and propagation techniques of some of the other wetland species.

The Three Distinct Markets for Aquatic Plants. There are many uses for both native and exotic aquatic plants. There are three distinct markets for aquatics: mitigation or restoration, constructed wetlands, and ornamental water gardens. Each market has its own specific needs.

Mitigation. Mitigation is the reconstruction or enhancement of a natural native habitat because of construction or destruction by natural or unnatural causes. In the past this has been a very unpredictable market due to a lack of standardized regulations and enforcement by federal agencies. This unpredictability is a problem because of rapid growth of aquatic plants and, therefore, the short sales period before these plants become overgrown and pot bound and lose their marketability.

Constructed Wetlands. These are wetlands constructed not to recreate an environment but to clean up waste water. This area of aquatic nursery production, in my opinion, has the greatest growth potential. These systems are usually installed not as a primary, or solitary treatment for waste waters, but as the final stage treatment for many different types of waste water. Constructed wetlands are used in the treatment of municipal and rural sewage; agriculture—including swine, poultry, and dairy facilities; acid mine drainage, and landfill leachate. These are only a few examples of constructed wetland uses. Almost any type of waste water can be treated with a constructed wetland system.

Ornamental Water Gardens. These are as small as cut-off whiskey barrels and as large as 2 acres, and are being created specifically for the aesthetic beauty of the plants and animals that they possess. Water gardens are probably the hottest trend in the nursery industry. You can't open a trade journal without finding an article on how to build one or how to sell related products. Plants, such as water lilies with blue and purple blooms and night-blooming tropicals that only bloom after 8 PM, are some of the most beautiful works of art that God created. Of all the aquatic plants, water garden plants are more satisfying to grow, and give the grower a better appreciation of nature.

In the production of aquatic plants, there are generally three types: trees, shrubs, and herbaceous species. Flowerwood Liners has focused on the herbaceous species, mainly because of their ability to be used in all three markets: mitigation, constructed wetlands, and water gardens.

Propagation Techniques. In describing propagation techniques, it is important to have an understanding of the plant's growth characteristics and use. The propagation of some representative aquatic species is reported below.

***Sagittaria lancifolia* (arrowhead)** is a common native wetland species in the southeast U.S.A. It is prolific in fresh water marshes and shallow bays. This plant has an arrow or lance shaped leaf, is herbaceous in nature and can grow in 31 to 46 cm (12 to 18 inches) of water. Arrowhead is a hardy perennial that blooms all summer with attractive white petals and golden-yellow stamens. Propagation is fairly easy with the species. They can be propagated by seed or by division. To mass produce them from seed, collect the seed when the head is just about to shatter. Don't place them in cold storage, but keep them dry and out of the sun. In Dec., I place flats on old camellia rooting tables. The flats are filled with a bark mix that has the highest water holding capacity that I can find. The seeds are spread evenly over the trays and a thin layer of peat moss is sprinkled on top to keep them from drying out. I keep the soil saturated by irrigating at least 1 h per day. Within a couple of months seedlings come up. All *Sagittaria* species look the same at this stage, so it is important to label your trays so that there are no mix ups when transplanting.

***Sagittaria latifolia* (duck potato)** is named for its tuber. Ducks love to dig through the soft mud at the bottom of ponds and swamps to eat the tubers of this plant. It can be propagated with the same method described for arrowhead. Duck potato may be easier to propagate from their tubers than by seed, but we have found that seeds give us a more uniform crop.

***Schoenoplectus validus* (syn. *Scirpus validus*) (soft-stem), *Scirpus americanus*, (three square), *Scirpus acutus* (hard-stem), and *Scirpus californicus* (giant bulrush)** are all *Scirpus* species that can be easily propagated by division. Divisions should be kept wet and cannot be allowed to dry during any stage of the division process as this could be fatal. They are fresh water species that usually persist in coastal marshes and in some cases, fresh water swamps in upland regions. Soft-stem and three square are found in the southeastern U.S.A. in water up to 0.6 m (2 ft) deep. The hard-stem is a more northern USA species, has much the same growth habit and is indistinguishable from soft-stem, except for the bloom structure. Giant bulrush is well named—a very large species that can grow to the height of 3.7 m (12 ft), with stems up to 8 cm (3 in.) in diameter. *Scirpus californicus* is commonly used in agriculturally constructed wetlands, where high ammonia levels would normally kill most other wetland species. Division for all species is virtually the same. Each crown or rootstock can be divided into numerous divisions, with a minimum of one growing point per division.

***Pontederia cordata* (pickerel weed)**, in my opinion, was unfairly named. It is a herbaceous perennial that grows in much the same environment as the *Sagittaria* species but unlike most native aquatics, it has a purple flower spike that persists all summer. Propagation is done either by division or by seed. Seed is normally not

the chosen method because germination tends to be sporadic. Division can be done, as with Louisiana iris. The rhizome should be cut into sections that include at least one leaf stem. Carefully placed cuts can create many plants from only a few stock plants. They should be placed in water so that the rhizome does not dry out and until roots are established.

***Juncus effusus* (soft rush)** is similar, yet very different from the *Scirpus* species. Each plant has the same upright habit with tubular stems, but where soft-stem tends to spread in a downward and linear direction from the base, the soft rush has a clumping characteristic. All of the propagation that we have done has been by division with generally 100% survivability. We have collected seed and plan to study seed production over the next year. Soft rush grows in fresh water swamps and along streams throughout the southeastern U.S.A. They are very tolerant and have been found to even withstand grazing by cattle. Division is done by separating the rhizomes that grow in perpendicular sections with 6 to 8 stems per section. Do not divide these sections into pieces with less than five stems, because smaller sections are not viable. Plant in a saturated soil and fertilize monthly. Growth is slow at first but will become rapid after 2 months.

***Cyperus involucratus* (syn. *C. alternifolius*) (umbrella palm)** is native to the southeastern U.S.A., and grows in roadside ditches and shallow depressions. It can be seen in low-land areas on trips to Houston or Florida. Propagation is quite simple. The leaf structure is much like an umbrella with a central leader and blades radiating out like spokes from a hub. The head should be cut with about ½-inch of the main leader attached. This is pressed into saturated soil so that all of the central leader is buried. You can place the head upside down on the soil with overhead mist, but with this method you are at the mercy of the wind. Any slight wind can blow the cuttings off of the soil and destroy your propagation attempts. Umbrella palm will root within 1 month. The only care needed is constant watering.

***Spartina alterniflora* (smooth cordgrass)** is the most commonly used plant of all wetland species and grows in salt to brackish water environments. No plant comes more highly recommended than smooth cordgrass, which is the primary species used in Louisiana for shoreline erosion control planting. The Coastal Restoration Division favors it because it does not spread from the break water area. It also retains soil, protecting fresh water marshes from salt water intrusion during high water periods. Propagation has been primarily by seed. Other than our own collections, the only source that we have found is a northern supplier. We have started stock beds of *S. alterniflora* 'Vermillian', which is a Louisiana selection that was found to be superior during field trials when compared to other selections from the East Coast. Propagation by division has not been as successful, but there are a few tips I can give. Make sure not to break the brittle root stock. Plant the root stock as soon as the division is finished. Don't plant them too deep to avoid rotting at the stem. The root system, like the soft-stem bulrush tends to grow down into the soil. *Spartina* differs from other species that we grow because it sends a spike directly below its root system. This spike then grows into another plant or offset, and pushes deeper into the soil than the parent. Hence the plant is less susceptible to washing out and is excellent for erosion control.

***Spartina patens* (saltmeadow cordgrass)** is widely used, more in the regions of Virginia and Maryland than in Alabama, Georgia, or Florida. This is a very

hardy plant, which grows well and is easily propagated by division. The stems are very small, and straw like. They are deceiving because even the smallest will be a viable bib if not split during division. The rootstock is separated at the base into single bibs and placed into a fine bark mix that has been thoroughly moistened. In 1 to 2 months a well rooted plant with new growth is produced. This species is tolerant of salt to brackish water, and grows right along the coast. It usually grows in tussocks that are submerged, although they have been seen growing on berms that were hard, packed, and dry.

***Juncus roemerianus* (black needle rush)** is another salt-tolerant species. When planted on brackish mud flats, black needle rush will spread, cover, and out-compete both smooth and salt-meadow cordgrass. The rhizome is linear and tends to spread in one direction at first. Propagation has not been a simple process, since this plant is not easily divided into small rhizome sections. Cooperative research is currently going on with Charles Gilliam and Gary Keever at Auburn University, studying hormone and growth regulator treatments that will promote root growth and establish smaller rooted cuttings for liner production. Black needle is needed in large quantities for mitigation work, but the larger plants required to maintain viability make availability limited.

***Orontium aquaticum* (golden club)** is a strap-leafed fresh water aquatic plant that can grow totally submerged or with only moist soil. Propagation from seed is effective. The best time to collect seed is during late April to early June. The seeds are round, bean-like capsules that when floated in water will readily sprout. What works best is to separate out the viable seed by allowing them to float and germinate in a bucket of water. The viable seedlings are then transplanted. Digging and collection of plant from its natural habitat is not recommended because of its deep root system. Even small plants can have a root system as deep as 30 cm (12 inches) in clay soils. Due to its gold bloom spike, it is mainly used as a water gardening plant. Because it is native, it can be used in both constructed wetlands and mitigation sites. When grown submerged, the leaves and stems have a reddish coloration.

***Equisetum hyemale* (horsetail, scouring rush, snake grass, and moses reed)** are just a few of the names that this plant has acquired over time. Horsetail grows in slow-moving streams all over the United States. It was used to clean dishes in the 1800s because of its vicinity to water and the cleaning ability of silicone filaments in its stems. The stems have an attractive segmented appearance. To obtain rooted divisions, lengths of the segmented foliage are cut and placed in a shallow pan of water. Within three weeks there will be small growing points at each node of the stem. It is best to let these rooted plantlets grow for a few weeks to get fully established before transplanting. Care should be taken during transplanting to prevent plantlets from drying out. Horsetail is very susceptible to desiccation and will die very quickly.

***Typha laxmannii* (dwarf cattail)** is a non-native species that is easily propagated by division. It is desirable because it develops a smaller form of the typical seed head of the cattail, and grows to a smaller mature height of only 1.2 m (4 ft).

***Nelumbo* (water lotus)** is one of the most interesting plants that I have had the opportunity to work with. It can be propagated either by vegetative division of the

banana-like tubers, or by collection and sowing of the seed. There is a species native to the United States, *N. lutea*, that can be found in slow-moving streams and marshes. The native water lotus has a yellow bloom and can reach 1.8 to 3.1 m (6 to 10 ft) in height. Cultivars that we propagate are hybrids that have a range of colors from pink to yellow, and dwarf forms that only reach 1.2 m (4 ft). Propagation is done by division to keep true-to-type hybrids. To divide the rhizome, wash the loose soil away, carefully lift, and cut the rhizome leaving two nodes on each section. The most important thing to remember is if the growing tip is broken the plant will die. A fungicide dip is recommended. Do not let them dry out during division or they will lose viability.

***Cyperus papyrus* 'Nanus' (syn. *C. haspan*) (dwarf papyrus)** is viviparous and easy to propagate, thus the same method for rooted cuttings can be followed as described for the umbrella palm. Papyrus may be grown from seed, but propagation by cuttings is effective and easy. It is an attractive plant for the water garden having stems that reach 0.6 to 0.9 m (2 to 3 ft) and tufts of foliage that add a fine texture to the garden. With the viviparous seed, the mature flower heads are cut off the plant (after the germinated seedlings have developed roots) and then pressed into moist soil. The seedlings develop quickly.

***Cyperus papyrus* (Egyptian papyrus)**. Currently, the only method of propagation that has been successful for us has been vegetative division of the root stock or crown. The flower head does not readily root when placed in moist bark like dwarf papyrus, but seed are prolifically produced during the season. We are working on seed production and hope to include this in our cultural techniques soon. Some sources advise that when floated upside down in water, the head will root, however, we have not been successful with this method.

***Thalia dealbata* (hardy thalia)** is an attractive specimen plant having an elliptic cup shaped leaf. *Thalia* or "praying hands" has a mature height of 2.1 to 3 m (7 to 10 ft). The bloom looks like a bird of paradise, but with a purple waxy color. Propagation may be done by collecting seed or division of the rootstock. Divide the rootstock or crown with the same method that is used to divide Egyptian papyrus. Tillers will develop along the original root stock and intensive division will provide steadily smaller and more uniform plantlets. Seed will sprout readily when placed in water.

***Colocasia esculenta* (elephant ear)** is one of the more common plants that we are dealing with and is very adaptable. It can be grown in most landscape situations including rich soils, as well as submerged in 8 cm (3 inches) of water. Propagation is best done by plantlets formed at the end of stolons. These stolons can be up to 3 m (10 ft) long and have as many as one or two nodes per 30 cm (1 ft). Stolons are prolific along the base of each plant. Taro can be produced by placing the stolon in a tray of water. After a few weeks, plantlets will sprout at each node along the stolon. There are a number of variegated and colored cultivars more popular than the nonvariegated green cultivars, though propagation seems to be slower with these cultivars.

CONCLUSION

Aquatic plants are a focal point for many aspects of our society, with their ability to enhance water quality, reestablish and maintain wetlands habitats, and add

ornamental value to landscapes. Mitigation, constructed wetlands, and water gardens are becoming nursery trends. Hydro-Perfect Vegetation®, the aquatic division of Flowerwood Liners, will continue to develop the propagation procedures needed to produce the product that our market demands.

A selected list of aquatic plants for mitigation, constructed wetlands, and water gardens is included at the end of this article.

Selected aquatic plants for mitigation

Juncus effusus
J. roemerianus
Pontederia cordata
Sagittaria lancifolia
S. latifolia
Schoenoplectus validus (syn. *S. validus*)
Scirpus acutus
S. americanus
S. californicus
Spartina alterniflora
S. patens
Zizaniopsis miliacea (syn. *Zizania miliacea*)

Selected aquatic plants for constructed wetlands

Acorus gramineus 'Variegatus'
Canna flaccida
Colocasia esculenta
Cyperus involucratus (syn. *C. alternifolius*)
C. papyrus 'Nanus' (syn. *C. haspan*)
Equisetum hyemale
Juncus effusus
J. effusus
Pontederia cordata
Sagittaria lancifolia
S. latifolia
Scirpus californicus
Typha laxmannii
Zizaniopsis miliacea

Selected aquatic plants for water gardens

Acorus gramineus 'Variegatus'
Canna flaccida
Colocasia esculenta
Cyperus involucratus (syn. *C. alternifolius*)
C. papyrus
C. papyrus 'Nanus' (syn. *C. haspan*)
Equisetum hyemale
Juncus effusus
Orontium aquaticum
Pontederia cordata
Thalia dealbata
Typha laxmannii