

PROPAGATION OF WETLAND SPECIES

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There is a growing interest today in nursery production of wetland plants. With some overlap in species, the trade in wetland plants is basically divided into two groups (for the purposes of this paper, true aquatics are not being included, although many of the same propagation techniques can be used):

- 1) Species used for ornamental horticulture, i.e. water gardens, bog gardens, and landscaped areas associated with wetlands. The emphasis in this group is on plants that have ornamental qualities, yet can survive under wet conditions. Almost all species in this category are herbaceous.
- 2) Species grown for restoration, wetland replication, or revegetation purposes. This group includes naturally occurring woody and herbaceous plants, and many species in this group would not be considered ornamental in the usual horticultural sense.

The relatively recent interest in revegetation has raised several issues that should be taken into account by nurseries growing plants for restoration. The first issue is genotype. Most plants used in revegetation at the present time come from nurseries or wild areas hundreds of miles away, usually from Wisconsin or the Lake States. There is, however, a growing interest in using plants grown from local genotypes (phenotypes) for revegetation. Several nurseries catering to trade in local species have recently sprung up, and several other established firms are beginning to add local genotypes to their offerings. With the exception of research papers on a handful of species, little is known about where a genotype for a particular species begins or ends or if, in fact, there is a difference in genotype from, say, the U.S. Midwest to the Eastern Seaboard. Nonetheless, increasingly, many ecological engineers and land planners are attempting to locate sources of material in approximately the same area when revegetation is necessary. This recent trend, which makes good sense from an ecological standpoint, has the potential to add a source of revenue to local nurseries throughout the country.

Another issue involved in propagation of wetland species for revegetation is the issue of soil saturation during cultivation. It has long been known that root systems of woody species develop differently under saturated conditions than if they are grown under normally-aerated conditions. In wetlands, there is often little if any oxygen available to the roots. Herbaceous species seem to be

able to pump oxygen to the roots of the plants when the soil is saturated, and although woody species apparently are not able to perform this function as well, they are able to develop different root systems (as well as make use of different strategies) to survive. However, a woody plant that is grown under aerated soil conditions will not develop this tolerance to saturated soil easily. Often a container-grown woody plant that is normally considered a wetland species will expire within one year of being placed in the saturated soil of a wetland. Figures of between 30 to 50% mortality in the first year of planting have been quoted by wetland experts in the Northeast. However, other wetland scientists say that the type of wetlands being planted is also a factor in the survival of woody species coming from normal nursery stock.

To increase the survival of wetland species, many nurseries are growing their woody plant in containers inside frames lined with plastic and filled with water, so that when the material is transplanted to the wet area, the root systems will already be adapted to the low oxygen, saturated situation. Other growers have stated that trees and shrubs grown in the usual fashion but with extra heavy irrigation will also survive. However, it is not clear if the same type of shallow root system prevalent in the "wet cultured" plants can be developed by simply heavy irrigation. More research is needed to determine if "wet-cultured" woody material has a better survival rate in the field, and also if increased irrigation alone can acclimate the plant successfully for survival.

PROPAGATION OF WETLAND SPECIES FOR ORNAMENTAL HORTICULTURE

Almost all species in this group are herbaceous and are propagated by division. Many can be divided year-round if kept in a greenhouse above freezing. Although many species can be started in the usual nursery in containers or seed flats, growing these plants underwater provides better growth according to some growers. All are considered emergents—that is, they can grow under water to varying depths depending on the species. Plants are often grown in dug-out, shallow ponds or frames lined with plastic. These ponds and frames are often drained in winter.

The following plants are all listed in the nursery trade and division is the main method of propagation. Other notes on propagation are also given for each species. All plants in this list are hardy in Zone 6 or better.

Acorus calamus, *A. calamus* 'Variegatus'—also rhizome cuttings

Butomous umbellatus—sow seed as soon as ripe

Caltha palustris, *C. palustris* 'Alba', *C. palustris* 'Monstruosa'—seed should be sown fresh, a warm/cold period is needed

Dulichium arundinaceum [syn. *Cyperus arundinaceus*]—dried seed germinates well

Eleocharis montevidensis
Equisetum hyemale, *E. scirpoides*
Eriophorum angustifolia [syn *Scirpus angustifolius*]—dried seed germinates well.
Glyceria maxima 'Variegata'—no pretreatment necessary.
Hibiscus moscheutos—softwood cuttings, seed does better after a hot water soak
Houttuynia cordata and cultivars
Iris fulva, *I. sibirica*, *I. laevigata*, *I. pseudacorus*, *I. versicolor* and cultivars of these species—most seeds need a moist/cold period for germination
Juncus effusus, *J. effusus* 'Spiralis', *J. effusus* var *glaucus*—no pretreatment of seed is required
Lobelia cardinalis, *L. siphilitica*—seed stored under dry refrigeration germinates well
Lysichiton americanum, *L. camtschaticense*—seed must be sown as soon as collected for best germination; very slow growth
Marsilea species
Mentha aquatica, *M. × piperita* var. *citrata*—softwood cuttings also
Menyanthes trifoliata—dried seed sown outside in fall will germinate in spring
Mimulus ringens—soft wood cuttings, dried seed germinates
Myosotis palustris—no pretreatment of seed is needed
Myriophyllum aquaticum
Orontium aquaticum—seed germinates immediately if freshly sown.
Peltandra arundinaceum, *P. virginica*—mixed results from seed, seed kept moist germinated best after moist/cold.
Pontedaria cordata—freshly cleaned seed germinates best.
Sagittaria latifolia, *S. sagittifolia* 'Flore Pleno' [hort. syn *S japonica*]—moist/cold for best germ.
Saururus cernuus—moist/cold for best germination.
Scirpus albescens [syn. *S. inundatus*] *S. americanus*, *S. lacustris*—dried seed may be more difficult to germinate—moist/cold treatment.
Typha angustifolia, *T. latifolia*, and cultivars—no pretreatment necessary

PROPAGATION OF SPECIES FOR WETLAND RESTORATION

The following species are often used or are requested in wetland restoration. Most of the trees and shrubs are propagated by seed or cuttings, established in containers, and then grown on under saturated soil condition so that they are adapted to wetland soils. It should be noted that building up stock through collection of seed from a number of different local sites is the best way to insure as large a measure of genetic variation as possible.

Propagation notes will be made only for herbaceous species. Production is usually by division in the case of most herbaceous species, but seeds may be started in flats of moist soil or flats sitting in trays of water until germination. Seedlings are then moved to larger containers in wet beds or frames lined with plastic.

Trees

Acer rubrum, *A. saccharinum*
Chamaecyparis thyoides
Fraxinus nigra, *F. pennsylvanica*
Ilex opaca
Nyssa sylvatica

Pinus taeda
Quercus bicolor, *Q. palustris*
Salix bebbiana, *S. discolor*, *S. lucida*,
S. nigra, *S. sericea*
Ulmus rubra, *U americana*

Shrubs

Alnus rugosa [syn *A. serrulata*]
Cephalanthus occidentalis
Clethra alnifolia
Cornus amomum, *C. racemosa*, *C. sericea* [syn *C. stolonifera*]
Ilex verticillata, *I. laevigata*
Leucothoe racemosa
Lindera benzoin
Lyonia ligustrina
Myrica pensylvanica, *M. gale*
Rhododendron viscosum
Rosa palustris
Salix discolor
Sambucus canadensis
Spiraea tomentosa, *S. alba*, *S. latifolia*
Vaccinium corymbosum
Viburnum cassinoides, *V. lentago*, *V. recognatum*

Herbaceous Perennials

Acorus calamus—rhizome cuttings
Alisma plantago-aquatica—dried seed germinates without pretreatment, blooms first year
Asclepias incarnata—no pretreatment necessary
Aster novae-angliae, *A. novi-belgii*, *A. simplex*—no pretreatment
Bidens frondosa—no pretreatment
Calla palustris—seed must be kept moist, a moist/cold treatment is necessary
Caltha palustris—sown seed as soon as collected, needs warm/cold treatment
Chelone glabra—softwood cuttings, no pretreatment for seed
Cicuta maculata—seed probably needs moist, cold
Eupatorium fistulosum, *E. maculatum*, *E. perfoliatum*, *E. purpureum*—softwood cuttings, no pretreatment for seed
Hibiscus moscheutos—softwood cuttings, soak seed in warm water for best germination
Impatiens capensis, *I. pallida*—sow seed fresh outside
Iris versicolor—moist, cold period for seed germination
Lilium superbum—seed need warm/cold period to germinate, pull scales from bulb after blooming
Lobelia cardinalis, *L. siphilitica*—seed stored dry under refrigeration germinates well
Ludwigia alternifolia—no pretreatment necessary—blooms first year from seed
Lysimachia terrestris—no pretreatment necessary
Mentha arvensis, *M. × piperita*, *M. spicata*
Myosotis laxa, *M. scorpioides*—no pretreatment necessary
Peltandra virginica—germinates better after moist/cold
Phragmites australis [syn *P. communis*]
Polygonum species—no pretreatment necessary
Pontedaria cordata—fresh seed seems to germinate best
Rumex verticillatus
Sagittaria latifolia—seed needs moist/cold treatment
Saururus cernuus—germinates best after moist/cold treatment
Sparganium eurycarpum, *S. americanum*—no pretreatment
Symplocarpus foetidus—seed probably needs to be sown fresh in fall to germinate in spring, rhizome pieces with a node can be successful
Typha angustifolia, *T. latifolia*—no pretreatment necessary

Veratrum viride—sow fresh seed, probably a warm period followed by a cold period is best, but definitely need cold

Verbena hastata—no pretreatment necessary—blooms first year from seed, also softwood cuttings

Vernonia noveboracensis—no pretreatment necessary—softwood cuttings also

Grass species. Most species germinate well if seed is stored dry under refrigeration for several months before sowing. Some need no pretreatment, but light is beneficial for germination

Calamagrostis canadensis

Echinochloa muricata

Glyceria canadensis, *G. obtusa*

Leersia oryzoides

Panicum virgatum

Phalaris arundinacea

Poa palustris

Spartina pectinata

Zizania aquatica

Sedges and Rushes

Carex lurida, *C. rostrata*, *C. stricta*, *C. trisperma*, etc —seeds of almost all species germinate well without pretreatment

Dulichium arundinaceum—no pretreatment necessary

Eleocharis sp

Scirpus americanus, *S. atrovirens*, *S. cyperinus*, *S. fluviatilis* [syn *S. maritimus*]

S. lineatus, *S. validus*, etc —variable in germination, best to use moist-cold pretreatment, but many do not seem to require this

Juncus effusus, *J. militaris*, *J. nodosus*, *J. tenuis*—no pretreatment necessary

Fern Species. Ferns are grown from spores but they are slow. Most plants available in the trade come from the wild.

Onoclea sensibilis

Osmunda cinnamomea

Osmunda regalis

Thelypteris palustris