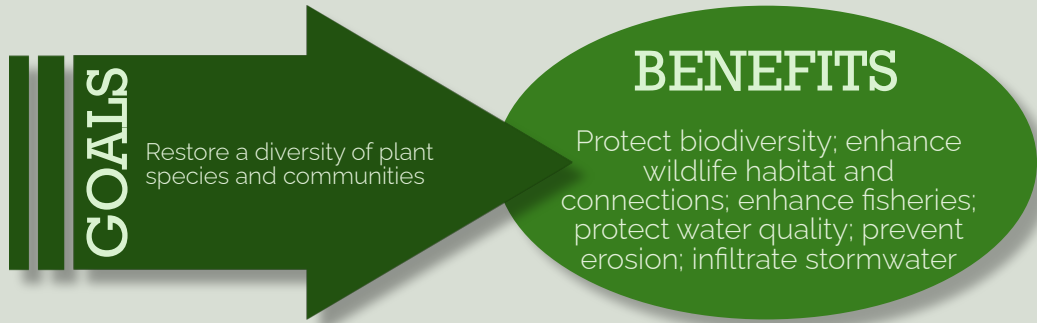


3.3 Wetland Revegetation and Enhancement

Wetland Revegetation and/or enhancement involves re-establishing site-appropriate natural community characteristics using plantings and/or natural revegetation. This is a low-tech practice that can use on-site native plant materials or a combination of on-site and locally sourced native plant materials. This practice complements most other wetland restoration strategies.



- 1 Develop Planting Plan
- 2 Secure Materials
- 3 Implement & Install
- 4 Monitor for Success

DEFINITIONS

Natural Communities: Plants and animals growing and living together in landscapes characterized by specific soil, water, and climate conditions.*

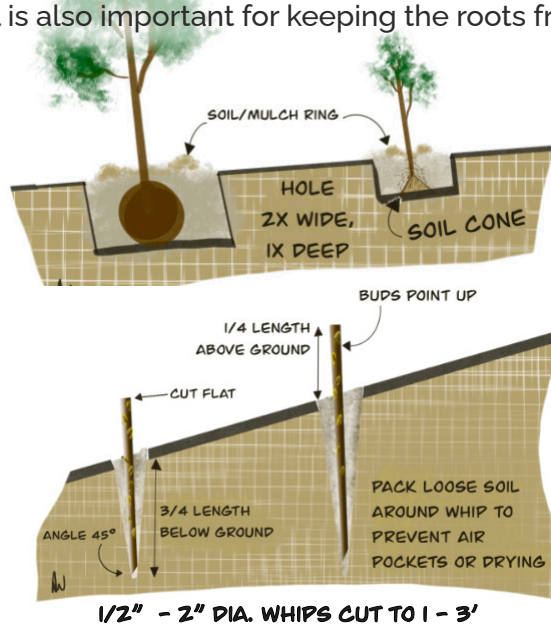
Biodiversity: The abundance and mix of different plant and animal species in an area.

*See the book *Wetland, Woodland, Wildland, or the Agency of Natural Resources' online Natural Community Fact Sheets.*

General Planting Guidelines

Tree and shrub plantings for wetland restorations are typically either container, bareroot, or live stakes/whips. Site preparation is critical to the success of plantings. One of the most common errors in tree planting is incorrectly planting the root ball by either digging the hole too deep or too shallow. Maintaining the integrity of the root ball is also important for keeping the roots from drying out.

- Container and Bareroot Plantings: Dig a hole twice as wide and to the depth of the root ball; loosen and detangle the roots a bit (for bareroot plants, make a cone of soil in the base of the hole to spread the roots around); fill soil in and tamp down with your fingers; mulch; and create a soil or mulch ring to hold water.
- Live Stakes/Whips: Harvest whips and install within 24 hours or store in cool, moist, shady conditions wrapped in burlap for up to 2 weeks. Soak stakes in a bucket for a day or two prior to planting. Plant stakes 1 to 3 feet apart.



Planting Plan Basic Components

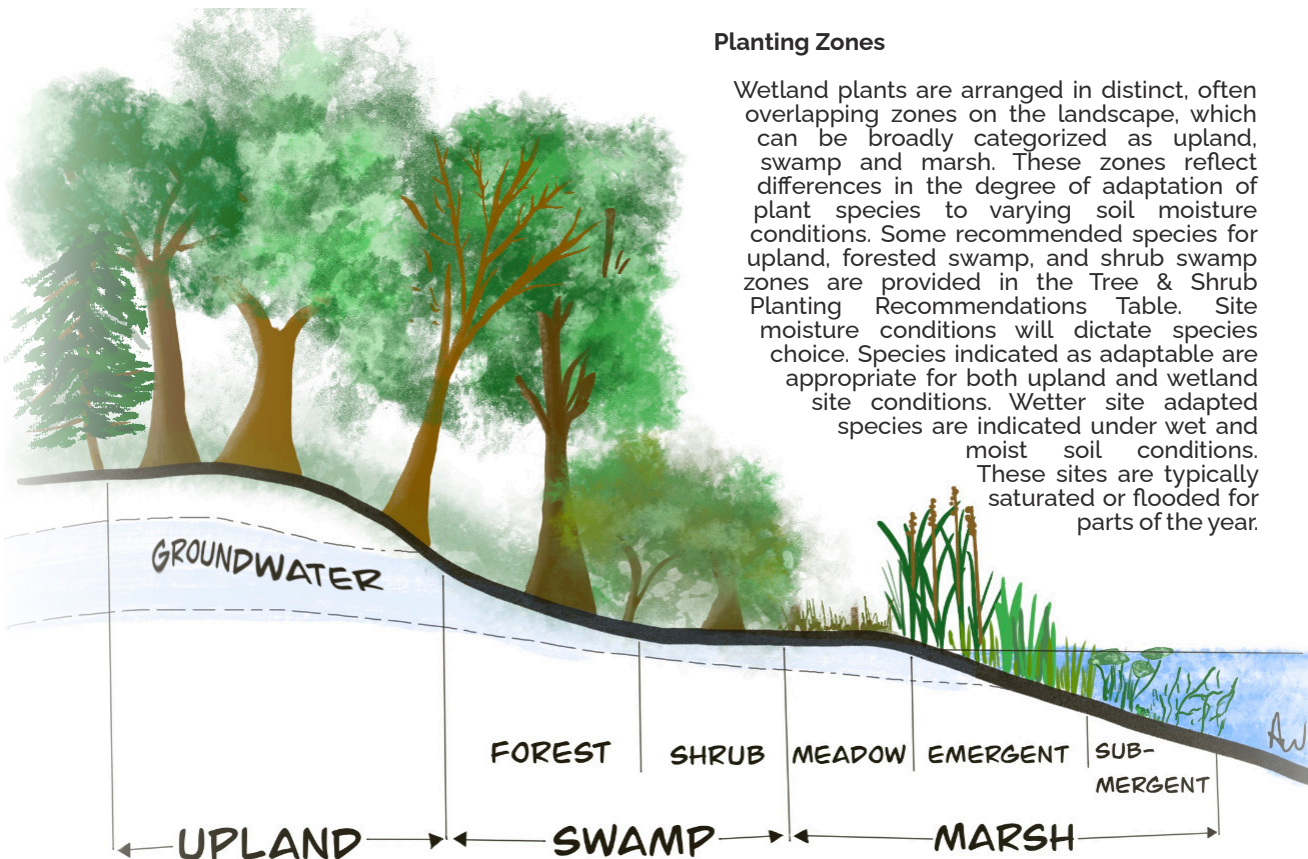
Develop a planting plan well before work begins. The more detail included, the higher likelihood of success. Information collected in the site assessment (such as site topography, historic vegetation, existing native vegetation, existing invasive vegetation, and reference wetlands) will be used in developing the planting plan.

Planting Map	Identify planting zones to distinguish different vegetation communities and planting approaches, including areas to be left to naturally revegetate. Use site topography and hydrology to inform the design of planting zones (i.e. emergent marsh zone within low depressions prone to ponding water).
Plant List by Zone	Create a plant list for each planting zone. This can be done by assigning each planting zone a target natural community or vegetation mix based on expected pre-disturbance vegetation, existing vegetation, and reference wetland vegetation. Target communities can also be inferred from the ANR Atlas mapped soil series, which link to reports that indicate associated vegetation. The wetland indicator status of species can also be used to guide planting design. Show locations and quantities of plantings on the planting map. 500 woody stems per acre is a reasonable planting goal for shrub and tree dominated natural communities. Expect about 20-25% losses.
Planting Materials	Plants should be acquired from nurseries or growers who can provide locally sourced native trees and shrubs. Make sure to provide complete scientific names (genus, species, and subspecies if appropriate) to avoid inadvertently introducing non-native plants. Check availability of desired plants early in the planning process, because nurseries often run out. Another option is to harvest native material on site (or locally from a willing landowner) to save on costs and promote local genetic diversity. This is appropriate for live stakes and seeds, but it is generally not a good idea to dig up and transplant whole plants.
Protection Strategies	Protect plantings from herbivores (deer, rodents, rabbits, cattle, etc.). Options include fencing the planted area, installing wire cages around planted seeds, roots, or shoots, and putting seedlings in plastic tubes.
Site Preparation	Describe site work to be done prior to planting. This will be informed by the other restoration practices you choose to implement. Strategies for weed control in post-agricultural areas can also include disk and/or cultivation (sometimes repeatedly) to remove seedlings and break up roots. Soil amendments can include weed-free compost or mulch (such as straw or bark).
Planting Schedule	Spring (April-June) or Fall (September-October) are the optimum times to plant. Phasing the planting plan is often encouraged, especially in situations where invasive species and/or weeds are being removed from the site. Time plantings to avoid disturbance from other restoration activities.
Maintenance	Provide a schedule for follow-up work including watering, weeding, re-seeding/re-planting.
Seed Mixes	Purchase locally sourced native seed mixes and follow manufacturer's instructions. Wetland seed mixes are typically applied at higher rates and not buried. Apply evenly to avoid bare spots where invasive species can colonize. If the restoration planting is being phased, use of cover crop seed may be necessary for site stabilization between phases.
Containerized and Bareroot Plantings	These plantings have well established root systems and are often used in combination with seeding. Spring planting is generally encouraged.
Live-Stakes/Whips	Native willows and dogwoods are reliable candidates for live staking, and material can be purchased or harvested. Species happy to be a stick in the mud include pussy willow, black willow, red osier dogwood, silky dogwood, and gray dogwood. Harvest and plant during dormancy while the ground is not frozen (mid-October to mid-November and between mid-April and mid-May).



Tree & Shrub Planting Recommendations

	Common Name	Taxa	Soil conditions	Growth Rate	Mature Height
Trees	Green ash	<i>Fraxinus americana</i>	moist	fast growing	50-70'
	N. White cedar	<i>Thuja occidentalis</i>	moist	slow growing	20-60'
	Black willow	<i>Salix nigra</i>	wet, moist	fast growing	25-40'
	Swamp white oak	<i>Quercus bicolor</i>	wet, moist	slow growing	50-70'
	Red maple	<i>Acer rubrum</i>	adaptable	fast growing	35-50'
	Cottonwood	<i>Populus deltoides</i>	adaptable	fast growing	80-100'
	Silver maple	<i>Acer saccharinum</i>	adaptable	fast growing	90-120'
	Eastern hemlock	<i>Tsuga canadensis</i>	adaptable	slow growing	60-80'
	Balsam fir	<i>Abies balsamea</i>	adaptable	slow growing	35-60'
	Yellow birch	<i>Betula papyrifera</i>	adaptable	slow growing	40-60'
Shrubs	Buttonbush	<i>Cephalanthus occidentalis</i>	wet, moist	fast growing	3-8'
	Silky dogwood	<i>Cornus amomum</i>	wet, moist	fast growing	3-8'
	Red osier dogwood	<i>Cornus sericea</i>	wet, moist	fast growing	3-8'
	Sweetgale	<i>Myrica gale</i>	wet, moist	fast growing	2-6'
	Winterberry	<i>Ilex verticillata</i>	wet, moist	slow growing	4-10'
	Elderberry	<i>Sambucus nigra, racemosa</i>	adaptable	fast growing	4-8'
	Arrowwood	<i>Viburnum dentatum</i>	adaptable	fast growing	6-10'
	High bush blueberry	<i>Vaccinium corymbosum</i>	adaptable	slow growing	3-8'



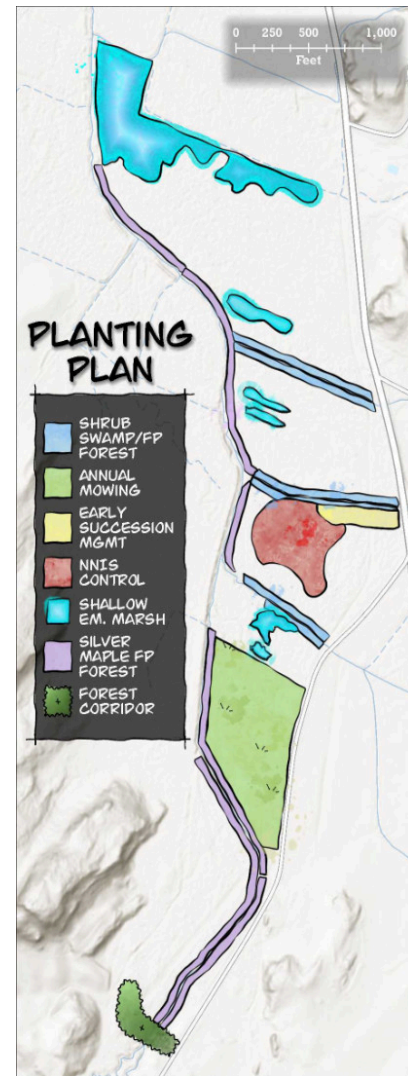
Planting Zones

Wetland plants are arranged in distinct, often overlapping zones on the landscape, which can be broadly categorized as upland, swamp and marsh. These zones reflect differences in the degree of adaptation of plant species to varying soil moisture conditions. Some recommended species for upland, forested swamp, and shrub swamp zones are provided in the Tree & Shrub Planting Recommendations Table. Site moisture conditions will dictate species choice. Species indicated as adaptable are appropriate for both upland and wetland site conditions. Wetter site adapted species are indicated under wet and moist soil conditions. These sites are typically saturated or flooded for parts of the year.






Bare root and container planting
Katie Kain, USFWS



Challenges & Solutions

- Expense: The price of planting material ranges depending on size and volume. Seed mixes for wetland restoration can be expensive, but following the recommended application rates is important to successful establishment of vegetation. To minimize expenses, consider limiting your soil disturbance and subsequent replanting areas, harvesting or growing your own planting materials, or shopping around and contracting with a nursery ahead of time.
- NNIS: Since there is a preponderance of NNIS on the landscape in some areas, there is a high likelihood of infestation, especially on open soils. Ongoing monitoring and management are time consuming and can be costly, but vigilance can save time and resources in the end. Take care to avoid bringing in NNIS plants or seeds during site work and manage nearby populations before breaking ground.
- Herbivory: New tree and shrub plantings are often browsed by animals. Best to assume this will be a problem on your site and prepare in advance with protection strategies. Where heavy browse is anticipated, one strategy is to concentrate and fence plantings in clusters.
- Plant Mortality: 20-25% mortality for woody plantings in the first few years is not uncommon. Provided that enough plants survive and mature, this is OK, but minimize initial losses by choosing site appropriate plants, planting in spring or fall, and protecting against herbivory.
- Irrigation: If site and weather conditions require watering, it can be critical to the success of the project. Planting in already saturated conditions, or timing your planting efforts for the spring or fall most often eliminates the need for watering.

 Don't forget to water! Make sure to water at planting time. Do not select non-native species or cultivars.

Complementary Practices:

