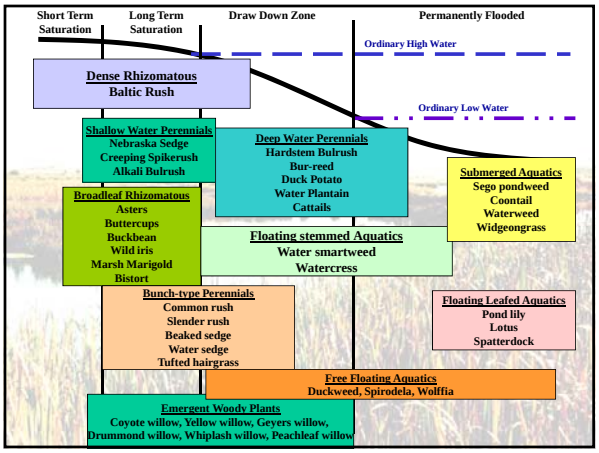
Herbaceous Vegetation: Sources, Propagules, and Techniques

Objectives

- List of propagule types available for revegetation of herbaceous wetland types
- List the keys to successful wetland plantings
- List six options for active revegetation of emergent wetland types
- Describe techniques used specifically for revegetation of the major wetland plant community types



HERBACEOUS VEGETATION
Sources and options

- Donor Topsoil
- Sodmats
- Plugs
- Wild Hay
- Transplants
- Containerized

Planting with Donor Topsoil

Disadvantages
- Some topsoil can have significant weeds in the soil propagule "bank"
- Can be fairly costly as requires heavy equipment to move soil around
- Plant roots may not end up with the right orientation
- Establishment is not as complete and quick as sod-mats
- Requires a large area of donor soil

Advantages
- Local seed sources and genotypes
- Introduces many species simultaneously
- Cheaper and easier than sod-mat moving

Spreading Donor Topsoil

Spreading Donor Topsoil
- Scrape top 8-10 inches of soil from the donor wetland
- Minimize handling, overturning, or trampling
- Spread to no more than 6 inches thick
- Plant at the same hydrologic zone

Stockpiling Donor Topsoil

1) Place on site within a few hours
2) Stockpiling has limited success
   - Propagules may deteriorate
   - Stockpiled soil will compost
3) Rules of Thumb
   - Stockpile soil for less than 4 weeks
   - Stockpile should be less than 3x3 ft
   - Cover stockpiled soil with plastic

Inoculating with Donor Soil

INOCULATION TECHNIQUES

1. Remove a few feet of topsoil.
2. Collect topsoil from several different wetlands
3. Remove topsoil from each hydrologic zone separately
4. Conduct inoculations over several years
5. Problems with weeds and invasive vegetation

Sodmats

Large pieces of wetland substrate from a donor wetland are placed into a wetland to be restored.

Disadvantages

- Some topsoil can have significant weeds in the soil propagule "bank"
- Need a good donor site to get materials from
- Can be very costly as requires heavy equipment to move soil mats around

Advantages

- Local seed sources and genotypes
- Introduces many species simultaneously
- Can take advantage of donor sites that are slated for destruction
- Can get good complete and quick cover of plants

Methods for Sodmat Establishment

1. Cut sodmat from donor wetland
   - Shovels
   - Front-end loader modified with sharp-edged steel plate
   - Load on to flatbed trucks for transport
2. Place sod pieces in matching hydrologic conditions
   - Fit back together like sodding a yard
   - Do not leave gaps between the sodmats
3. Best when soils are moist
4. Impacts areas of donor wetlands

Sedge and Rush sodmat installed in transition zone

Wild Hay

Cutting and collecting mature vegetative material from a natural wetland and spreading the material on a restoration site.

Disadvantages

- Need a very clean donor site for materials
- Donor site might have significant weeds composition
- May not get good soil to seed contact
- Establishment my be fairly slow

Advantages

- Local seed sources and genotypes
- Introduces many species simultaneously
- Relatively cheap and easy

Wild Hay Techniques

Transplants from donor wetlands

Active planting of:

- Sprigs
- Rhizomes
- Tubers
- Plugs

Sprigs

Small transplants obtained by breaking or cuttings multistemed plants into smaller clumps with 1 to 5 stems

Rhizomes

Underground stems capable of resprouting from pieces of root that contain at least one meristem or node.

Cattail Rhizome

Tubers

Underground storage organs, such as a swollen underground stem tip, produced by some plants

- A **Stem tuber** forms from thickened rhizomes or stolons.
- Large tubers should be planted in a hole at the depth of about twice the size of the tuber.
- Small tubers maybe broadcast on a site and raked into the soil.
- Examples are Arrow Arum and Duck Potato.

Wildling Plugs

Wildling Plugs are larger intact wetland plant material that includes roots and tops.

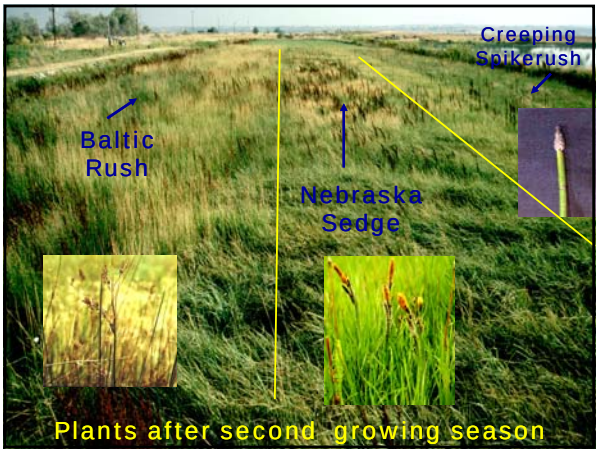
Greenhouse Grown Plugs

22 cu. in. Plug of Nebraska Sedge

Planting Plugs

Plugs planted in ripped furrows

TNC Constructed Wetland System
Hagerman, Idaho



Timing of Planting

- Sprigs, rhizomes, and tubers
  - Early spring
  - Predation – as late as early July
  - Late Fall – frost heaving
- Bare-root materials
  - Dormant season (fall, winter, and early spring)
- Containerized stock
  - any time of year depending upon temperatures and water

Bare-root Plants

- Generally grown in dense nursery beds
- Minimum 18 in. / 3/8 in. collar (conservation grade)
- Roots
  - Large fibrous root mass
  - Root mass should equal shoot mass
- Planting
  - Plant with collar at ground surface of slightly below
  - Are generally lifted from the nursery beds when dormant and need to be planted immediately (early spring and fall are often best planting times)
  - Check with nursery for time that plants are lifted)

Storing Bare-root Plants

- Cold storage - 34° F to 39° F
- Store out of the sun and wind
- Temporary storage of seedlings on site
- Dense shade – few days
- Do not allow roots to freeze
- Do not allow the roots to dry out
  - Cover roots with good mulch

Bare Root Plants

Pros

- Lower cost per seedling
- Some planters are more familiar with planting
- Slightly more tolerant to deeper planting
- More available in some areas, i.e. Oregon

Cons

- Typically have lower survival than container (average 65% survival)
- More restrictive planting window
- More difficult to hand plant
- Shorter storage time
- Need refrigerated storage

Planting in the Field

- **Take only what will be planted in one day**
- **Do not let the roots dry out**
- **Make the hole big enough for the roots**
- **Prevent air pockets around the roots**

Signs of Poor Handling

- **Dry Roots**
- **White Root Tips**
- **Hole deep enough for roots**
- **Plant in mineral soils**
- **Swollen or Burst Buds**
- **Mold on Plants**
- **Broken/Crushed Stems**
- **Ripped or Crushed Bags/Boxes**

CONTAINERIZED PLANTS

Containerized Plants

- Seedlings are grown in containers.
- Each container contains a seedling, soil, and nutrients.
- These containerized seedlings are planted just about any time the soil is unfrozen.
- Spring and fall are generally the best times.
- Containerized seedlings have not experienced the root trauma of bare root stock when they are harvested.

Container examples

Containerized Plants

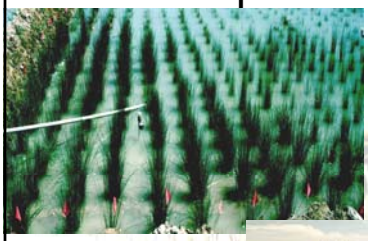
Pros

- Higher survival than bareroot
- Lower cost per surviving plant
- Easier to hand plant
- Store better and for longer periods
- Have a wider planting window
- Higher availability in some areas, i.e., Oregon, Georgia, Florida and Alabama

Cons

- Higher cost per plant
- Less tolerant of deep planting
- More bulky and thus more expensive to ship and plant

Spacing



after 1 growing season

Seeding

Using seed for herbaceous vegetation establishment on wetlands

Four types of Herbaceous vegetation

- Wetland Plants
- Wetland Forbs
- Wetland Grasses
- Upland grasses

Not all wetland plants can be planted by seed

- Wetland plants include but are not limited to Bulrushes, sedges, spikerushes, rushes, and cattails. Not drilled, broadcast only if seeded at all.
- Wetland forbs include but are not limited to Beggerstick, marsh marigold , marsh bedstraw, swamp aster, Joe-Pye Weed, etc.
- Wetland grasses include but are not limited to Rice cutgrass, Bluejoint reedgrass, Eastern gamma grass, wildryes, and Tuffed hairgrass. Commonly seeded with a drill or broadcast.
- Upland grasses include but are not limited to Wheatgrasses, fescues, bluegrasses, bromes, and ryegrasses. Commonly seeded with a drill, rarely broadcast.

Wetland plants

Seeding most wetland plant seeds is more difficult than wetland grasses

- Seeds require heat, moisture, and light
- Broadcast seeder without drag chain
- Press in with packer wheels, but don't bury

Seeding most wetland forb seeds is more difficult than wetland grasses

- Seeds **can be varying sizes and shapes - from dust-sized to pumpkin-sized seed**
- **Make seed mixtures for varying hydrologic zones e.g. emergent, vernal pool, wet prairie, etc.**

Collection of Wetland Plant

Wetland plant seed stratification

- Many wetland seeds require stratification
- Mix 50 parts seed and 1 part water
- Store just above freezing (35-38 degrees F)

Wetland and Upland Grasses

Site Preparation

- Inadequate weed suppression
- Firm seedbed is important
  - Footprint penetrates ¼ to ½ inch deep
  - Soil readily forms into a ball
- Determine previous herbicide usage
  - Residues may prevent establishment
  - Delay planting for recommended interval

Methods of Site Preparation

- Row crop previous year
  - Shallow spring disking 2 to 3 times
  - Last disking just before seeding
- Former pasture or dominated by weeds
  - Late summer mowing to a height of 12 inches
  - Fall plow to a depth of at least 8 inches
  - Spring disking at 2 to 3 week intervals until planting

Methods of Site Preparation

- Treat with herbicide, as needed, to reduce weed bank and keep surface fallowed
  - no disking or other soil disturbance
  - Followed by no-till drill or broadcast seeding

Methods of Seed Applications

- Direct Seeding
  - Direct placement of seeds in the soil
  - Precise soil depth
  - Large areas
- Broadcasting
  - Seeds are spread over the soil surface, water surface, or its edge
  - Cheap
  - Double seed rate
  - Poor seed to soil contact
- Hydroseeding
  - Slurry of seed, fertilizer, mulch, and water is sprayed onto the substrate
  - Reduces establishment time
  - Poor seed to soil contact

Grass seed drills

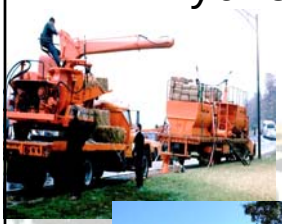



Broadcast Seeding






Hydroseeding




Seeding Dates

- Dormant Fall planting - Plant from early September to first freeze
- Early spring planting - Plant from March to April
- Late spring planting - Plant from May to end of June
- Cool season grasses
  - Late fall to early spring
- Warm season grasses
  - Late May to mid-June

Designing a Seed Mix

- Determine different species and density
- Seeding Rate = Square foot basis
- Native seeding establishment = 20% PLS
- Determine forb-to-grass ratio
  - 80-90% grasses = grass dominated
  - 50-60% forbs = diverse community
- Decide percentage each species will occupy

Obtaining Seed Commercially

Pure Live Seed (PLS) =
(% pure seed) x (germination) ÷ 100

Example

- Seed Analysis Report:
  - 95 percent pure seed
  - 89 percent germination
- 95 x 89 ÷ 100 = 84 percent PLS
- 84 percent of seedlot contains viable seeds

Seed Mix Example

- Seedlot = 90% PLS
- Seed/lbs = 389,000
- Density = 10 plants per ft^2
- Establishment = 20% PLS
- Seeding Rate = Density per ft^2 ÷ (%PLS x 0.20)

Seeding rate = 10 ÷ (0.80 x 0.20) = 56 PLS seeds per ft^2

Seeds per acre = 56 x 43,569 = 2,439,360

Pounds per acre = 2,439,360 seeds/acre = 6.3 lbs
389,000 seeds/pound

Seeding in Phases

- Phase 1: Plant species most capable of competing with weeds on site
  - Will establish cover quickly
  - Help to control problem species
- Phase 2: Two to three years, seed less aggressive grasses and forbs
- Phase 3: Transplant additional species to increase diversity
  - Target species difficult to establish

Seeding in Phases - Prairies

- Phase 1: Plant forb species first and get them established (grasses tend to dominate many plant communities)
  - For ultimate diverse plant community
  - Can use grass-specific herbicides
  - Prevalent weed species may determine whether you attempt this approach
- Phase 2: One to three years, seed grasses and more aggressive forbs
- Phase 3: Transplant additional species to increase diversity
  - Target species difficult to establish

Monitoring

Compare Project site with the established success criteria

- Estimate percent cover
- Determine plant density
- Determine species diversity

Summary

- Vegetation establishment process
- Restoration techniques
- Handouts