

Wetland Restoration for Mitigation

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Document Purpose – This fact sheet is a companion to BWSR’s Native Vegetation Establishment and Enhancement Guidelines and provides detailed considerations for project planning and design with an emphasis on vegetation selection, installation and management.

Introduction – Native vegetation in restored and created wetlands plays an important role in the successful restoration of wetland functions. Vegetation establishment takes careful planning of site preparation, installation and management strategies. Invasive species abundance and proposed control is often a major consideration in the vegetation establishment plan. In addition to seeding native species, seed that establishes from the native seedbank can play an important role in revegetation efforts.

Site Selection – Wetlands present a wide array of functions that provide natural resource benefits when they are restored. Conservation organizations and government entities target projects to achieve specific natural resource goals including improving habitat for specific wildlife species, increasing biological diversity, plant community reconstruction, water quality improvement, and flood damage reduction. Goals may also include specific replacement of wetland functions that are lost when a wetland impact is approved through state and/or federal programs. Once goals are established, sites and projects capable of meeting them are investigated. Various methods are used to identify potential project sites. Some agencies and organizations conduct an extensive inventory and assessment of potential sites using map reviews and Geographic Information Systems (GIS) data. Others identify project criteria and solicit landowner participation via public announcements and workshops.

For regulatory purposes, permit requirements motivate private companies or individuals to seek out landowners and sites to conduct restoration projects. These types of projects need to meet certain well-defined regulatory requirements to generate replacement wetland credit. There are several existing wetland “banks” in Minnesota that have been approved and certified, and credits generated are sold as a transaction between private parties and tracked through BWSR’s Wetland Banking Program. A number of potential project sites may be evaluated and screened before finding one that best fits the defined criteria.

General Planning Considerations – Wetland restoration projects typically involve planning teams that include wetland specialists, project engineers, biologists/vegetation specialists and environmental planners. Mitigation programs provide guidance for goals related to native vegetation establishment in wetlands. Projects associated



Shallow marsh restoration

with wetland regulatory programs require documentation of specific outcomes, referred to as “performance standards”, that can be verified through measurement and monitoring.

Invasive species such as reed canary grass, hybrid cattails, buckthorn and phragmites can be challenging for wetland projects and often need management to allow diverse native vegetation to thrive. Native seedbank plays an important role in the establishment of wetland vegetation as a primary source of native vegetation. The viability of native seedbank can vary depending on the number of years a site has been in agricultural production, the amount of sediment that has accumulated and weed invasion. A wide variety of wetland species are also becoming commercially available for seeding wet meadows and shallow marshes and restoration professionals are learning how to effectively conduct wetland seeding.

The [Minnesota Wetland Restoration Guide](#) contains detailed information about wetland planning, site assessment and evaluation, engineering design, vegetation establishment, monitoring and maintenance.

Structural Design Considerations – Engineers are often involved in the restoration of hydrology for wetland restoration projects which includes hydrologic modeling and planning for restoring methods such as ditch plugs, disabling tile or embankments to restore wetland hydrology. It is important that engineering and ecological staff work closely together.

Plant and Seed Selection – Wetland grasses, sedges, rushes, forbs and woody species all play important roles in providing habitat for a wide range of wildlife species. Some research has shown that higher diversity levels can also aid in water quality functions such as denitrification in open water areas and increase carbon sequestration rates. BWSR has several seed mixes located here <http://www.bwsr.state.mn.us/seed-mixes>. The BWSR upland prairie, wet meadow, wet prairie, shallow marsh and deep marsh seed mixes are commonly used for mitigation projects. Ensuring sufficient control of invasive species will aid native species establishment and ensure long-term sustainability of ecological functions.

Native seedbank refers to seed that is found naturally in the soil from previous populations of native plants. The seed of some wetland species can remain in the soil for over 100 years and germinate after the restoration of wetland hydrology. The seedbank may supplement wetland restoration projects, but seedbanks are sometimes unpredictable, and not all species do well from the seedbank. Most wet meadow seed mixes contain around 25-50 species. Shallow marsh communities may be seeded with mixes of 15-25 species. Higher diversity mixes will help support pollinators and other invertebrates that play a key role in the health of wetland habitats. It is also common to use containerized plants when establishing emergent species, as it is difficult for seedlings to grow from seed along the edge of open water where waves and water level fluctuations can inhibit growth.

Trees, shrubs, grasses, forbs, sedges, rushes and ferns are all commonly used as part of wetland restoration projects, and common species are listed in the table below. Species must be selected that are native to the area and well adapted to site conditions.



Wet meadow restoration

Commonly Used Native Species in Wetland Restoration

Trees:	Tamarack, Black spruce, Red maple, Silver Maple, Black ash
Shrubs:	Willows, Red-osier dogwoods, Nannyberry viburnum, Spiraea sp., High bush Cranberry, Bog birch, Blueberry, Buttonbush
Grasses:	American slough grass, Prairie cordgrass, Manna grasses, Fowl bluegrass, Rice-cut grass, Canada blue-joint grass
Forbs:	Marsh milkweed, Culver’s root, Blue lobelia, Cup plant, Mountain mint, Grass-leaved goldenrod, Joe-pye weed, Boneset, Red-stemmed aster, Sneezeweed, Panicked aster, Giant goldenrod, Giant-bur reed, Sweet flag, Wild iris
Sedges:	Tussock sedge, Bottlebrush sedge, Lake sedge, Slough sedge, Porcupine sedge, Pointed-broom sedge
Rushes:	Torrey’s rush, Riverbulrush, Soft-stem bulrush, Spikerushes, Green bulrush, Soft rush, Three-square bulrush
Ferns:	Sensitive fern, Marsh fern

Plant Source Considerations – Local resource staff must be involved in decision making about source distance for individual projects. The source sequence in Section 2 of BWSR’s Native Vegetation Establishment and Guidelines is recommended for BWSR funded projects and wetland mitigation projects.



Wetland with restored hydrology and seeded vegetation

Note: The following seeding specifications are recommended for wetland mitigation projects to help ensure the quality and success of the restoration project and to protect the integrity of local plant communities:

- Substitution of species in the specified seed mixes/species lists must be approved by the project manager and Technical Evaluation Panel (TEP) .
- All seed for projects must follow the seed source sequence in Section 2 of BWSR's Native Vegetation Establishment and Enhancement Guidelines.
- Yellow tag seed which has a verifiable source should be prioritized for projects unless a more local/site appropriate seed is available.
- All seed that is supplied for projects must be labeled according to the requirements of the Minnesota Seed Law, [section 21.82](#):
 - Each species in the mix should be listed on the label along with the origin of seed to provide verification of original (generation 0) seed source. The smallest known geographic area (township, county, ecotype region, state, etc.) shall be identified. Each species should also show the source lot and the percentage of pure seed, germination, and hard (dormant) seed.
 - The label should also include the percentage of other crop, weed seed, inert matter for the mixture and a listing of the [restricted and prohibited weed seeds](#) by name and number per lb. Seed labelers are required to determine if any amaranth contaminants in the lot are Palmer amaranth using a genetic test.
 - Seed must be cleaned to an extent sufficient to allow its passage through appropriate seeding equipment.
- All wild harvest mixes must be tested and labeled and list the origin, and percentages of pure seed, germination, hard (dormant) seed, for each species that is more than 5% and percentages of other crop, weed seed, inert matter, and restricted and prohibited noxious weeds by name and number per lb in the mixture. Any Amaranth species in wild harvest mixes must be identified and have the same genetic testing required for seed that is produced. Unless otherwise requested, small, large, and cover crop seeds should be packaged separately.
- All seed delivered to sites must have a complete label and include information about individual component seed lots. Project managers will save the seed tags as part of project record keeping. Installers must allow MDA staff to take seed samples if they arrive for a random inspection.
- Project contracts provided to landowners must state that if it can be determined that seed labelers or installers were responsible for introducing regulated state noxious weeds into plantings, seed installers will be responsible for controlling or eradicating noxious weeds on those properties for a time that is sufficient to be effective.

Note: When using these specifications for bidding, it is also recommended to include a seed zone map. Upon project installation retain and file all seed information.

Vegetation Establishment – Wetlands are typically dormant seeded in the fall or seeded in spring after hydrology conditions have stabilized. An advantage of fall dormant seeding is that forb and sedge seed is allowed to stratify over winter. Most wetland seed is very small and should be planted near the soil surface, so it is common to broadcast wetland seed. Emergent wetland species may be seeded but are also commonly planted on the edge of open water and allowed to move to deeper areas on their own.

Operations and Maintenance – Similar to prairies, wet meadow restoration also benefit from mowing during the first couple years of establishment, particularly in dry conditions where agricultural weeds may be common. Mowing should not be conducted where rutting and soil disturbance will occur. It is common to spot treat problematic perennial weeds such as reed canary grass, and Canada thistle with herbicide. Aquatic safe herbicides and surfactants should be used in areas of standing water. Biocontrol is commonly used for purple loosestrife. Cattails may be controlled depending on project diversity and wildlife goals.

Information Sources

Minnesota Wetland Restoration Guide www.bwsr.state.mn.us/publications/restoration_guide.html

BWSR What's Working for Conservation Website: <https://bwsr.state.mn.us/whats-working-conservation>