

Example Plan for Using Native Plantings for Storm Water Infiltration

The following information is provided to serve as a general guide for establishing native plantings especially for storm water infiltration. This guidance has been compiled from information provided by staff at Waukesha County's Retzer Nature Center and by consultants. This document is not intended to replace the guidance that would be provided by **contracting with a qualified professional to prepare a site-specific plan** and to direct or perform the plan implementation. Planting scenarios include:

- The site is a subdivision or commercial development, with site grading operations starting in early summer.
- The storm water practices are either: infiltration basins that are excavated in native soil; bioretention basins utilizing engineered soils; or rain gardens.
- Basins are often roughed in during the summer, serve as temporary sediment traps, and may be completed and planted in late fall or early spring.
- Planting may be with seed, plant plugs, or a combination of seed and plugs (recommended).
- The topsoil is stripped and stockpiled, the infiltration areas are rough graded, the topsoil is reapplied, and the basins are then planted.
- Bioretention basins may use engineered soil with compost in lieu of topsoil.

Phase I - Site Preparation

Site preparation is key to a successful planting, including: the suppression of invasive or nonnative species; optimizing the condition and health of the soil; and minimizing construction sediment.

1. First, topsoil stripping and rough grading are completed. Infiltration basins are rough graded, but runoff is diverted around the basins.

It is essential to **keep sediment out of the basin**, as it may bury seeds too deep for them to germinate. In addition, fine sediment may seal the bottom of the basin, causing water to pond for extended periods of time, drowning the plantings.

Following basin construction, if possible, **keep the basin off-line** for a growing season, to give the plants a chance to germinate and become established. Ways to do this include use of diversion swales or berms coupled with sediment traps, and conveying water from the pre-treatment best management practice (BMP) through the infiltration area via a temporary pipe.

If the basin cannot be taken off-line, **implement erosion control measures** as rigorously as possible. In particular, stabilize disturbed areas at the earliest opportunity.

2. To **avoid excessive soil compaction**, minimize use of heavy equipment on basin bottom, especially with rubber tires, which have a higher ground-pressure than tracked equipment. Use excavators to dig from the side of the basin. Mitigate compaction by deep-tilling with a frost tooth, ripper plow, chisel plow, or subsoiler.

3. **Minimize the amount of time topsoil is stockpiled**, as biological activity declines rapidly in anaerobic soil conditions.

Following grading, topsoil is reapplied. Test the topsoil for microbial activity. This may require having a consultant perform a carbon dioxide /respiration test on the stockpile. Local USDA and Extension staff may also be able to help. As microbial activity will likely be diminished, **plan on amending the topsoil** with leaf compost or a proprietary pro-biotic soil conditioner.

4. If time permits, allow the weed seeds in the topsoil to germinate, and apply herbicide (preferably twice) to **deplete the weed seed bank** and reduce the amount of post-planting weed suppression that will need to be done. Some common annual weeds like velvetleaf may not be a concern, and may provide temporary cover and stabilization.
5. If planting with natives is not immediate, **seed with a cover crop** of oats or native Elymus rye grass. Annual rye (which may contain perennial rye) and winter wheat may compete with or suppress later native seeding. A cover crop improves soil structure, prevents erosion, and suppresses weeds.

Phase II – Planting

1. **Clean/Firm Seed Bed:** The seedbed needs to be clean and relatively firm before planting.
 - a. **Equipment:** Tractor with rock bucket/rock picker/hydraulic rake for removing rocks. A roller or cultipacker implement is needed for compaction. A 4-wheel drive vehicle may be used to pack an area.
 - b. The best seedbed will be free of sticks, grass clumps, and rocks. You can plant over some of these if your equipment will make it past them. It will also be level and firm.
 - c. Planting over disked soil can work well if the disking is not too deep. If the soil has been deeply disked or tilled, seeds may settle too deep for new shoots to reach the surface.
 - d. If the soil is too loose (footprints press into soil more than ½ inch), a roller or cultipacker is required to compact the bed. If the area is small, vehicle tires will do the same job. It is important to achieve good seed-to-soil contact which greatly increases the likelihood of successful seed germination.
 - e. Spot treatment of non-native species prior to seeding is highly recommended.
2. **Seed Drill Planting:** If your site contains few problem weeds, you can save a few steps by planting with a seed drill or slit seeder. After you have accomplished initial weed control, **and wait 2 weeks** to be certain it is safe to plant after spraying, you may plant using a seed drill without having to till up the soil.

- a. Timing:
 1. SPRING – Late April through June 30. **Wait 2 weeks after herbicide application.**
 2. Planting in July and August is not recommended due to drought and winter kill following late germination.
 3. FALL- November through soil freeze-up. **Wait 2 weeks after herbicide application.** There is some risk that frost heave may move seeds up or down in the soil profile. Some seeds also require a season of being frozen to germinate.
 - b. Equipment: Tractor and a seeder/cultipacker pull-behind implement. The Truax Trillion and the Brillion seeders can be specifically adapted for the seed size and seed depth of native plants.

 The **seed drill must be metered and calibrated for the seed mix** and filler / carrier material, if any filler is used. The drill must be set for seeding at a ¼ to ½ - inch depth.

 Conventional seeding equipment may insert the seeds too deep to germinate, or may dump the tiny native seeds in a single spot due to improper aperture sizing.
 - c. Seed rates: For commercial seed mixes, use the seeding rates recommended by the seed vendor.

Include a cover crop of oats or native Elymus rye grass, at 2-3 lb/ac,.. Cover crop seeds may need to be seeded, separately, or may be combined as filler in seed mix.
 - d. Other: If the planting area has vegetative growth, mow down the plants prior to seeding
3. **Broadcast Seeding**: This method requires fresh, open soil to be successful. Seed is dispersed by hand, machine, or hydroseeder as evenly as possible over the prepared ground. You need to **wait a minimum of 2 weeks** after herbicide application.
- a. Timing: Same as above.
 - b. Equipment: For areas less than one acre you can effectively hand broadcast the seed, or

 Tractor/truck and Truax Wildflower Seeder/salt spreader/inverted cone spreader/etc., or

 Hydroseeder equipped with tank agitator to keep seed in suspension. It may be necessary to combine with a cellulose-type mulch.

- c. Mixing: Hand-cleaned seed contain much chaff and pappus (fluff) with the seeds. With most seeding equipment, hand-cleaned seed needs to be mixed with about the same amount (by volume) of moist sand or wood shavings (i.e. carrier). Torpedo sand is a good size for this. After mixing, plant immediately as the moisture will cause seeds to germinate if left too long with the carrier.
 - d. Seed rates: See above
 - e. Other: After non-hydromulch applications, roll or drag seed area, preferably with cultipacker.
- 4. **Straw**: This can add to your planting survival rate. We suggest certified weed-free straw. **DO NOT USE hay, “marsh hay,” or reed canary grass hay**, which contain seeds that will cause problems with your planting. Landscape netting is expensive but also works well. It is especially useful and necessary on steep slopes.
 - a. Timing: Immediately after you plant. Do this before you cultipack.
 - b. Equipment: Mostly by hand but tailgate straw mulcher/blowers do exist.
 - c. Rate: 1.5 tons/acre, per WDNR CPS 1058.
- 5. **Cultipacking**: This further improves germination and survival rates by providing better seed-to-soil contact. It also presses/crimps straw into the seedbed.
 - a. Timing: Immediately after you plant (or immediately after you apply straw).
 - b. Equipment: Tractor and shallow-toothed cultipacker/roller/crimper. A 4-wheel drive vehicle may also be used to pack an area.
- 6. **Matting**: In bioretention basins the State design standard calls for hardwood mulch, however:
 - a. Only use mulch with plugs.
 - b. As this tends to float, a preferred alternative is to use a Class II Type C jute mat or mat containing wood excelsior from the WDOT Product Acceptability List. The mat is designed to last at least three years, and must have openings large enough to insert the young plants or for plants growing from seed to push up through.
 - c. Consult with a restoration ecologist to determine whether any proposed matting may inhibit native plant growth.

Phase III – Establishment

1. 1st year:

- a. Native perennials put all their growing efforts below ground for the first few years. **Mowing cover crops and weeds** in the first two years ensures they get enough sun and are not crowded out. **Spot treatment** of biennial and perennial weeds with herbicide during the initial establishment phase is also critical for the new planting.
- b. Mowing timing and height: Mow the planting each time the average height reaches 12 inches. To prevent damage to the native plants, **do not mow below a 6-inch height**. Expect to mow at least three times in the first year (June, July and early August). Remove excessive accumulation of clippings to avoid smothering seedlings.
- c. Equipment: Adjustable lawn mower of Tractor/Skid Steer/ASV with Flail/Woods/Davco mower, or handheld string trimmers.
- d. Other: **Spot treatment of biennial and perennial weeds** through mechanical (cutting) or chemical (herbicide) methods is critical. If only broadleaf weeds are an issue, use a selective broadleaf-specific herbicide (e.g. triclopyr). Some areas may require the use of an aquatic-approved herbicide.
- e. Watering: If germination is followed by inadequate rainfall, **watering will be necessary to prevent loss of the plantings**. Be prepared to truck water or to put a pump in a forebay or other water source.

2. 2nd year:

- a. May – **Bring basins on-line**, assuming rest of site is well-stabilized. Sediment from home construction can still damage basins, and enforcement by building inspectors of the residential erosion control requirements may help limit sedimentation.
- b. Mow in the second year even if the majority of the vegetation is comprised of planted natives. These are likely early-succession plants and many late-succession species still need help competing at this stage. **Mow the planting to a height of 10-12” (no lower) each time the average height reaches 24”**. Mowing too low in the second year of establishment can significantly set your native species back.
- c. **Spot treatment** of biennial and perennial weeds through mechanical (cutting) or chemical (herbicide) methods is critical. If only broadleaf weeds are an issue, use a selective broadleaf-

specific herbicide (e.g. triclopyr). Some areas may require the use of an aquatic-approved herbicide.

3. **3rd-4th year, and Long-Term Maintenance**

- a. Prescribed burn. Burning should be done annually at this point, alternating between spring and fall burns. The intent is to stimulate plant reproduction and flowering vigor. Burning every other year is discouraged as it may help biennial weeds. **Note:** In order to avoid disrupting nesting activities for grassland bird species, it is recommended to **avoid burning or mowing activities from May 15 through August 1.**
- b. If you cannot or do not wish to burn you can perform a simulated burn. This is accomplished by **mowing the planting as low to the ground as possible** without hitting the soil surface.
- c. Be sure to **remove the cuttings**. Do not leave them to create a mulching effect.
- d. Invasive plant species shall be managed in compliance with Wisconsin Administrative Code Chapter NR 40. This may require **eradication of invasive species** in some cases. The following list of non-native species are typical “problem species” within storm water management area plantings and should be controlled immediately upon introduction to a site (in addition to any species listed as Prohibited by NR 40).
 - i. Canada Thistle
 - ii. Common and Cut-leaved Teasel
 - iii. Crown Vetch
 - iv. Birds-foot Trefoil
 - v. Everlasting Pea
 - vi. Japanese Knotweed
 - vii. Leafy Spurge and Cypress Spurge
 - viii. Purple Loosestrife
 - ix. Spotted Knapweed
 - x. Yellow Sweet Clover and White Sweet Clover
 - xi. Wild Parsnip
 - xii. Common Reed Grass
 - xiii. Japanese Stilt Grass
 - xiv. Reed Canary Grass
 - xv. Smooth Brome Grass

4. **Verification of plantings** by LA or qualified professional, such as a restoration ecologist. (See Marker Species discussion and Line Intercept and Subjective Evaluation Methodologies discussion below).

Considerations

1. **Plant Plugs:** Planting plugs gives quicker results than planting from seed. A site may be well established after two years by plant plugs instead of three or four for areas that are seeded. Plant spacing should be about one per square foot. However, plugs are generally more costly than seed, and for larger sites the use of plugs may not be affordable. **A mixture of seed and plugs may produce quicker establishment at an affordable cost.** *Plugs will require at least weekly watering for the first couple of months, especially in sandy or engineered soils,* unless adequate water is provided by precipitation.
2. **Persistent Herbicides:** If the land has been cropped, test the soil as early as possible for persistent herbicides such as Atrazine, unless it can be proven that persistent herbicides have not been used. If atrazine has been used, prairie plantings should not be attempted until 18 to 24 months after the most recent application. Starting at 18 months, soil samples should be tested for the herbicide, and test seeding may be attempted using annual rye, radishes, or native species to see if there are any lingering effects.
3. **Seed Mix Composition:** Native plantings for storm water infiltration function by trying to simulate the vegetative diversity that existed across the landscape prior to settlement. Although it is not necessary to establish all of the native plants that may have previously existed on a given site, it is vital to use a mixture of plant species to allow for site-specific limitations and provide visual appeal. A mixture of grasses, sedges, and rushes along with the more showy wildflowers results in a native planting that can withstand the periodic saturations it will receive as a storm water management practice. If strategic planting establishment actions are undertaken as described above, over time, the plants will “sort themselves out” resulting in a functional storm water infiltration device that is also pleasing to look at.
4. **Commercially available mixes** can be obtained from vendors specializing in native plant species establishment.
 - a. These mixes often contain at least 40 different species of wildflowers (forbs), grasses, sedges, and rushes. Choosing a wide variety increases the likelihood that at least several species will thrive.
 - b. Check to see if a cover crop is included in the mix. Annual rye is acceptable, but sometimes includes perennial rye, which will compete with native plants in the long term, as does winter wheat. A cover crop of oats or native Elymus rye grass is preferable.
 - c. For custom mixes, use early and mid-successional species with wide tolerances for soil types and hydrologies. Consult a native plant expert to adjust species lists for specific site conditions and project objectives.

5. If it is decided not to use a commercially available seed mixture, it is important that a proper **ratio of grasses to wildflowers** (forbs) be specified for reasons listed above. The grasses generally provide good weed fighting ability and promote infiltration. The wildflowers provide visual appeal and function well as “marker species” described in more detail below. In general it is recommended that seed mixes specify the following ratios:
 - a. Grasses/sedges/rushes – Maximum 60%/ Minimum 30%
 - b. Wildflowers (Forbs) – Maximum 70%/Minimum 40%
6. **Seeding rates** and mixes shall be specified in the planting plan. Seeding rates shall generally conform to those provided by the seed mix vendor.
7. **Marker Species:** Some species of native plants are fairly easy to establish and are also fairly easy to identify. For these reasons they serve well as “marker species” that can serve a vital role in the establishment of a planting for storm water infiltration. These are plants that are likely to flower in the short-term that provide a very visible indication if the planting took at all. The Planting Verification process requires transect surveys to quantify that the native plants meet the minimum coverage and diversity requirements. Please note the **Suggested Species** section below. Marker species are in bold and show the year in which they should bloom. (**Note: This is the growing season in which they should bloom**). If an area is planted in the fall of 2019, 2020 is the first growing season even though it is the second year. Most commercially available seed mixes already contain a number of the indicated “marker species.” If a seed mix is going to be customized for a given site, it should specify a minimum of 6 marker species with at least 2 being from the grasses/sedges/rushes and the remainder being forbs.

SUGGESTED SPECIES

This list is a sample of the types of plants that are adapted to survive in the varying moisture regimes provided by infiltration practices for storm water management. Since this list is merely a sample of the types of native plants available, it is recommended that a professional be consulted when preparing the restoration plan for a given project site. This list is intended **for a basin with loamy soils**. For a site with sandy soil or an engineered soil mix, a selection of more dry soil- or drought-tolerant species should be considered, omitting wet-soil species.

Forbs

<u>LATIN</u>	<u>COMMON</u>	<u>MARKER</u> <u>YEAR</u>
<i>Asclepias incarnata</i>	Marsh Milkweed	
<i>Aster laevis</i>	Smooth Blue Aster	

<i>Aster lucidulus</i>	Swamp Aster	
<i>Aster novae-angliae</i>	New England Aster	3
<i>Aster simplex</i>	Marsh Aster	
<i>Eupatorium maculatum</i>	Joe Pye Weed	
<i>Eupatorium perfoliatum</i>	Boneset	
<i>Helenium autumnale</i>	Sneezeweed	3(2)
<i>Helianthus grosseserratus</i>	Sawtooth Sunflower	
<i>Heliopsis helianthoides</i>	Early Sunflower	2
<i>Liatris pycnostachya</i>	Prairie Blazing Star	
<i>Liatris spicata</i>	Marsh Blazing Star	
<i>Lycopus americanus</i>	Cut-leaved Horehound	
<i>Monarda fistulosa</i>	Wild Bergamot	3
<i>Oenothera biennis</i>	Evening Primrose	2
<i>Pycnanthemum virginianum</i>	Virginia Mountain Mint	
<i>Ratibida pinnata</i>	Gray-headed Coneflower	3
<i>Rudbeckia hirta</i>	Black-eyed Susan	2(1)
<i>Rudbeckia laciniata</i>	Green-headed Coneflower	
<i>Rudbeckia subto mentosa</i>	Sweet Black-eyed Susan	2
<i>Rudbeckia triloba</i>	Brown-eyed Susan	2(1)
<i>Silphium integrifolium</i>	Rosin Weed	
<i>Silphium laciniatum</i>	Compass Plant	
<i>Silphium perfoliatum</i>	Cup Plant	
<i>Solidago juncea</i>	Early Goldenrod	
<i>Solidago ohioensis</i>	Ohio Goldenrod	
<i>Solidago patula</i>	Fen Goldenrod	
<i>Solidago riddellii</i>	Riddell's Goldenrod	
<i>Solidago speciosa</i>	Showy Goldenrod	
<i>Tradescantia ohiensis</i>	Spiderwort	
<i>Verbena hastata</i>	Blue Vervain	2
<i>Veronia fasciculata</i>	Ironweed	
<i>Veronicastrum virginicum</i>	Culver's-root	

Zizia aurea

Golden Alexanders

Grasses, Sedges and Rushes

<u>LATIN</u>	<u>COMMON</u>	<u>MARKER</u> <u>YEAR</u>
<i>Calamagrostis Canadensis</i> Blue Joint Grass		3
<i>Andropogon gerardii</i>	Big Bluestem	
<i>Carex bebbii</i>	Bebb's Sedge	
<i>Carex hystericina</i>	Porcupine Sedge	
<i>Carex vulpinoidea</i>	Fox Sedge	
<i>Elymus canadensis</i>	Canada Wild Rye	2
<i>Elymus virginicus</i>	Virginia Wild Rye	2
<i>Juncus torreyi</i>	Torrey's Rush	
<i>Muhlenbergii mexicana</i>	Mexican Satin Grass	
<i>Panicum virgatum</i>	Switchgrass	
<i>Scirpus atrovirens</i>	Green Bulrush	
<i>Scirpus Cyperinus</i>	Wool Grass	
<i>Scirpus pendulus</i>	Red Bulrush	
<i>Sorghastrum nutans</i>	Indian Grass	
<i>Juncus effuses</i>	Common Rush	
<i>Leersia oryzoides</i>	Rice Cut Grass	
<i>Spartina pectinata</i>	Prairie Cord Grass	

Evaluation of a Vegetative Stand Establishment for Storm Water Infiltration

In order for the storm water infiltration practices to function as intended, it is vital that the plant species identified in the seed mix become well established. In addition, return of the financial assurance collected from the permit holder is contingent upon verification of planting success by a professional qualified to evaluate percent cover and species diversity. A successful planting will have at least 70% cover and at least four of the species included in the approved restoration plan by the end of the third growing season. Ultimately it is the obligation of the permit holder to retain a professional whose qualifications have been accepted by LRD staff to verify the success of a native planting establishment for both percent vegetative cover and intended species diversity.

Please see the “Planting Verification Procedure” document for information on conducting planting verification surveys.