

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. It has been compiled from information provided by staff at Retzer Nature Center – Waukesha County Department of Parks and Land Use. It 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. It is assumed that:

- The site is a typical subdivision or commercial development, with site grading operations starting in early summer.
- The storm water practices are infiltration basins that are excavated in native soil, and with native plants that are grown from seed. However, this guidance may largely apply to bioretention basins utilizing engineered soils and to rain gardens, where plant plugs are often used instead of seed.
- The topsoil is stripped and stockpiled, the infiltration areas are rough graded, the topsoil is reapplied, and the basins are then planted.

A separate outline is available upon request that discusses sites where no earth-moving is planned. That outline places more emphasis on weed-suppression prior to planting.

Site preparation is key to a successful planting, including the removal of invasive or nonnative species.

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 BMP through the infiltration area via a temporary pipe. It is essential to keep sediment out of the basin, as it may bury seeds too deep for them to germinate.

Phase I - Site Preparation

1st year June – Topsoil stripping and rough grading are completed. Infiltration basins are rough graded, but runoff is diverted around the basins. *(Note: To avoid soil compaction, minimize use of heavy equipment on basin bottom, especially with rubber tires.)*

Phase II – Planting

At this point two options are available:

Option 1: Topsoil is reapplied and the native planting is performed starting with the procedures outlined in Clean/Firm Seed Bed and proceeding with the rest of the outlined steps. If this option is chosen, it is imperative that effective erosion control measures are implemented on the rest of the site.

Option 2: Topsoil is reapplied and the site is planted with an annual cover crop (annual rye or oats). **Native** planting will occur in the fall starting with the procedures outlined in Seed Drill Planting.

1. **Clean/Firm Seed Bed:** The seedbed needs to be clean and relatively firm before planting. 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. 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. If the soil is too loose, a roller or cultipacker is required to compact the bed. If the area is small, vehicle tires will do the same job. This whole procedure is about achieving good seed-to-soil contact which greatly increases the likelihood of successful seed germination. Spot treatment of non-native species prior to seeding is highly recommended.
 - 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. **Other:** If time permits, allowing the weeds to germinate (preferably twice), and spraying them with herbicide will greatly reduce the weed seed bank, and reduce the amount of post-planting weed suppression that will need to be done during the planting's establishment phase.

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**-May through June 30 **Wait 2 weeks after herbicide application.**
 2. **FALL**- November through soil freeze-up. **Wait 2 weeks after herbicide application.**
 - b. **Equipment:** Tractor and a Truax seed drill/slit seeder pull-behind implement. If used, cultipacker must be shallow-toothed. The seed drill must be metered and calibrated for the seed mix and carrier material (gypsum, Milorganite, chaff, wood shavings, sand, or lime). The drill must be set for seeding at a ¼-1/2-inch depth. .
 - c. **Seed rates:** **Seeding** rates and mixes shall conform to WisDOT Roadway Standard Section 630.
 - d. **Other:** You may drill over a disked/cultipacked prepared bed if you wish. A seed drill will pack the soil over the furrows as it goes. There is no need to cultipack afterwards.

3. **Broadcast Seeding:** This method requires fresh, open soil to be successful. Seed is dispersed by hand or by machine as evenly as possible over the prepared ground. You need to **wait a minimum of 2 weeks** after herbicide application.
 - a. Timing:
 1. **SPRING**- May through June 30.
 2. **FALL**- Again in late October and November through seasonal ground frost. **Wait 2 weeks after herbicide application.**
 - b. Equipment: Tractor/truck and Truax Wildflower Seeder/salt spreader/inverted cone spreader/etc.
 - 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: Seeding rates and mixes shall conform to WisDOT Roadway Standard Section 630.
 - e. Other: The Truax Wildflower Seeder will cultipack behind it as you plant.

4. **Straw:** This can add to your planting survival rate. We suggest weed-free straw. **DO NOT USE HAY.** Hay contains enough seeds to 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. As this tends to float, an alternative is to use a Class II Type C jute mat from the WDOT Product Acceptability List. The mat is designed to last at least three years, and must have openings large enough for the young plants to push up through.

Phase III – Establishment

1. 1st year: 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.
2. 
 - a. Mowing timing and height: Mow the planting to a height of 6" (no lower) each time the average height reaches 12". Expect to mow at least three times in the first year (June, July and early August). To prevent damage to the native plants, do not mow below a 6" height. Remove excessive accumulation of clippings to avoid smothering seedlings.
 - b.
 - c. Equipment: Adjustable lawn mower of Tractor/Skid Steer/ASV with Flail/Woods/Davco mower.
 - d. Other: Spot treatment of biennial and perennial weeds through mechanical (hand-pulling) 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.
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.
3. 2nd year 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. 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.
 - a. In the second year, 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. Spot treatment of biennial and perennial weeds through mechanical (hand-pulling) 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.
 - b. Assessment of plantings by Landscape Architect (LA) or qualified professional. **(See Marker Species discussion below).**

4. **3rd-4th year** April / May – Prescribed burn. Burning should be done at this point and once every 3-4 years in the future. The intent is to stimulate plant reproduction and flowering vigor. 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. Be sure to remove the cuttings. Do not leave them to create a mulching effect.

5. Verification of plantings by LA or qualified professional. (**See Marker Species discussion and Line Intercept and Subjective Evaluation Methodologies discussion below**).

6. **Long-Term Maintenance:**
 - **Invasive Weed Control:** This is the most important. Control of species such as Common Buckthorn, Glossy Buckthorn, Purple Loosestrife, Wild Parsnip, etc. is critical to prevent the planting from being dominated by exotics.
 - **Burning:** Once every 3-5 years to stimulate reproduction and flowering vigor.
 - **Simulated Burning:** If you cannot or do not wish to burn, you can mow the area during the dormant season (we recommend April) as low as you can without hitting the soil surface. Be sure to remove your cuttings. Do not leave them to create a mulching effect.
 - **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.

Considerations

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. ***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.

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.

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.

Commercially available mixes can be obtained from vendors specializing in native plant species establishment. These mixes often contain at least 12-15 different species of wildflowers (forbs) and another 5-6 species grasses, sedges, and rushes. Most of these mixes also contain a nurse crop of annual rye that provides quick cover on a site but will not compete with the native species as the planting matures. If a seed mix is going to be customized for a given site, it must contain (at a minimum) 3 grasses, sedges and rushes and a minimum of 12 wildflowers.

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:

Grasses/sedges/rushes – Maximum 60%/ Minimum 10%
Wildflowers (Forbs) – Maximum 90%/Minimum 40%

In some areas it may be desirable to add trees and shrubs to the infiltration plantings. Trees and shrubs can be utilized to provide additional plant diversity, wildlife habitat benefits and add visual appeal. Species selected should be able to tolerate periodic saturation and drought. Future maintenance methods (i.e. burning, mowing, etc.) will need to consider the needs of these species as well. Species planted in loamy or clayey soils will generally need to be water-tolerant plants. Species planted in sandy or engineered soils will need to be more drought-tolerant, prairie plants that thrive in dry soils.

Seeding rates and mixes shall be specified in the planting plan. Seeding rates shall generally conform to WisDOT Roadway Standard Section 630 or those provided by the seed mix vendor.

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. 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 2014,

2015 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 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	
	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 subtomentosa</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	
<i>Zizia aurea</i>	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 torreyii</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>Spartina pectinata</i>	Prairie Cord Grass	
	Common Rush	
	Rice Cut Grass	

Tree and Shrubs (may not be planted on berms)

<u>LATIN</u>	<u>COMMON</u>
<i>Alnus incana</i>	Speckled Alder
<i>Aronia</i> sps.	Chokeberry
<i>Carpinus caroliniana</i>	Musclewood
<i>Cephalanthus occidentalis</i>	Buttonbush
<i>Cornus stolonifera (sericea)</i>	Red Osier Dogwood
<i>Diervilla lonicera</i>	Dwarf Bush Honeysuckle

<i>Ilex verticillata</i>	Winterberry
<i>Quercus bicolor</i>	Swamp White Oak
<i>Sambucus canadensis</i>	Elderberry
<i>Spirea alba</i>	Meadowsweet
<i>Spirea tomentosa</i>	Steeplebush
<i>Viburnum trilobum</i>	Highbush Cranberry

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.

Line Intercept Methodology

Line Intercept Method: This method is also known as the transect method. The first step in using this methodology is to establish a centerline through the approximate middle of the infiltration practice. Transects are then laid out perpendicular to the centerline and should be regularly spaced with a minimum of 8 transects per acre. Transects may be performed using a cord with knots or other markers at one-foot intervals or utilizing a tape measure. Transect length should be a minimum of 20 feet (10 feet on either side of the centerline). Using the markers on the transect cord or the one-foot intervals on the tape measure, the verifier shall note whether the marker was physically touching a plant from the approved planting list and state the species. At the end of sampling, percent coverage shall be calculated by dividing the total number of plants from the planting list on all transects by the number of markers on all transects. A location map showing the transects sampled and a list of plant species found at each marker site along with any observations of potential future maintenance concerns must be submitted with the planting verification letter.

