Naturalized Stormwater Management Facility

Design, Planting and Management Plan Guidelines

Village of Montgomery, Illinois

Prepared by:

Planning Resources Inc.
402 West Liberty Drive
Wheaton, Illinois 60187
Telephone: 630-668-3788
Facsimile: 630-668-4125

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Landscaping a stormwater management facility with native vegetation is a component of the Environmental Protection Agency's National Pollutant Discharge Elimination System (NPDES) Phase II Best Management Practices (BMPs) for stormwater management.

The purpose of this document is to promote the benefits of stormwater management facilities within the Village of Montgomery, Kane County, Illinois, by incorporating naturalized features as a BMP for local development. For this discussion, stormwater management facilities consist of stormwater retention, detention, and compensatory storage basins. These facilities retain stormwater to control runoff and improve water quality in developed areas. Downstream areas benefit by a reduction in the amount of nutrients, sediment, hazardous substances, and other pollutants.

> "A lack of designer familiarity with the biological processes that govern aquatic systems has frequently led to the creation of ponds that fail to meet their intended aesthetic objectives."
>
> (Keller 1994)

While turfgrass may look tidy, it doesn't provide effective slope stabilization or filter pollutants. Native landscaping provides a distinctive landscape that enhances stormwater filtration, infiltration, and bank stabilization. Native vegetation within the bottom of the basin will absorb nutrients, sediments, and pollutants from surrounding upland runoff. The vegetation filters and absorbs nutrients that stimulate high algal levels. Designed plantings will protect the basin banks from local runoff, fluctuating water levels, and erosion around inlets and outlets due to flow conditions. A secondary benefit of naturalized basins is that they discourage use by Canada Geese (which can produce unhealthy levels of fecal bacteria) and advocate resting and foraging habitat for desirable migratory waterfowl and other native wildlife.

To facilitate use, this document is divided into the following four sections:

- **Section One** covers basic design criteria, including the type of basin and the importance of water levels in establishing aesthetic plants within a basin.
- **Section Two** discusses planting specifications, including site preparation, planting timetables, and protection of installed materials.
- **Section Three** addresses minimum performance monitoring approaches, reporting requirements, and performance standards
- **Section Four** outlines the minimum requirements for short- and long-term management for naturalized stormwater basins.

Installation, Management and Monitoring Fee-In-Lieu Option

The developer has the option to install, manage and monitor the stormwater management facility per the requirements herein **or** the developer may request to pay to the Village of Montgomery a fee-in-lieu thereof. The fee in lieu shall be for the Village to contract directly with a professional management firm (or utilize its own staff resources) for the initial installation, management and monitoring of said stormwater management facility for the first 5 years of said facility. ***The Village may choose to accept or not accept a fee in lieu request at its discretion.***

The exact timing of the Village acceptance of these contracting responsibilities will vary and will need to be coordinated on a case by case basis at the discretion of the Village (It is anticipated that the developer may be required to install the basic grading and contouring of said facility and installation of appropriate soils prior to take over by the Village). Once the exact timing and exact amount of said fee in lieu are determined, the developer and Village shall memorialize and agree in writing to said specifications. The undertaking by the Village of this limited purpose shall not constitute final acceptance of the public improvements, which shall only occur by separate resolution of the Village.

If the developer elects the fee-in-lieu option, the fee will be determined based on cost estimates for the installation as well as management and monitoring for a minimum of five (5) years plus a ten (10) percent contingency for unpredictable natural occurrences that can't be controlled (for example die off of plants from extreme flooding events or droughts). The fee-in-lieu shall be paid prior to issuance of a site development (grading/stormwater) permit.

If the fee-in-lieu is paid, the Letter of Credit or Bond requirements will be reduced to the extent of the responsibilities that are transferred to the Village under the fee-in-lieu agreement except that a ten (10) percent contingency shall be included with the LOC or Bond as an added security for unpredictable natural occurrences; this is in addition to the agreed to fee-in-lieu contingency payment.

This fee in lieu of installation/initial maintenance does not affect the continuing obligation of the developer/landowner to perform long term maintenance. For those responsibilities, a Special Service Area (either active or backup as determined by the Village) shall be created pursuant to other sections of the ordinances of the Village and Illinois statutes.

NATURALIZED STORMWATER MANAGEMENT FACILITY
Design, Planting and Management Plan Guidelines

SECTION 1.0 BASIN DESIGN CRITERIA

This section is not intended to cover all considerations appropriate to designing wet bottom stormwater management facilities. The Kane County Technical Guidance Manual BMP's (2007), Schueler (1987, 1992) and others (e.g., CWP 2001, NRCS 1995, NCSU et al. 2001, MDEP and MOCZM 1997) provide detailed information on design criteria for wet ponds and wetland basins. Instead, this section emphasizes selected features relevant to water quality functions and development of basins as visual amenities. Collectively, design features such as sediment basin pretreatment structures, proper routing of stormwater, appropriate basin depth and shoreline, and establishment of emergent vegetation can help achieve low maintenance costs and long-term preservation of the aesthetic quality of the basin.

1.1 SEDIMENTATION BASINS

> "The basic design and maintenance of a good stormwater pond deters mosquito production."
>
> (McClean 2000)

Most of the sediments and pollutants entering a stormwater basin occur during the more frequent storm events. Using sedimentation basins to capture this "first flush" will extend basin life, reduce algae, and divert routine maintenance activities from the basin or contain it within a portion of the basin. Sedimentation basins should capture and detain the volume of water associated with frequent storm events for a period of 18 to 24 hours. Use of pre-treatment measures can delay the need for basin dredging by up to 40 years.

1.2 STORMWATER ROUTING AND POND DEPTH

Stormwater basin design should maximize the distance between inlet and outlet structures. The minimum length:width ratio is 3:1. In addition, the design should discourage short-circuiting that would reduce the distance between the inlet and outlet. Short-circuiting creates areas where inflow does not displace existing pond water (i.e., dead storage areas), which promotes stagnant water that can breed mosquitos and develop algae.

Pond depth should average between four to six feet, except for a shallow aquatic bench (e.g., safety shelf) adjacent to the shoreline. Average pond depths shallower than four to six feet allow sunlight to reach the basin bottom, which encourages growth of algae and underwater floating plants. In contrast, deeper ponds (e.g., minimum depth of 10 feet) are appropriate if fish habitat is desired. However, deeper ponds tend to have layers of different water temperatures and can have an oxygen-deprived layer that may result in fish kill under certain conditions.

1.3 BASIN DESIGN ALTERNATIVES

The amount of vegetated shoreline around the basin directly affects both the amount and quality of biological activity in the basin. An elongated or irregular shoreline with nooks and bays provides greater aquatic habitat diversity and protection from shoreline erosion. The stormwater basin

footprint should avoid a rigid geometric configuration. An irregular shoreline should be incorporated into the naturalized basin design. There are two general concepts for wet-bottom basins: Wetland Pond and Wetland Bottom. These are briefly described herein.

Wetland Pond Concept

Exhibit 1 illustrates the Wetland Pond concept in cross-section. With this design, the basin consists of an open-water feature with vegetated shorelines. At normal water level (NWL), at least 30 percent of the basin should be 10 feet deep. This design includes a five-foot-wide level safety shelf at a depth of 2.5 to three feet but may be combined within the emergent zone. To increase the shoreline protection, aquatic bed vegetation may be planted below the emergent zone.

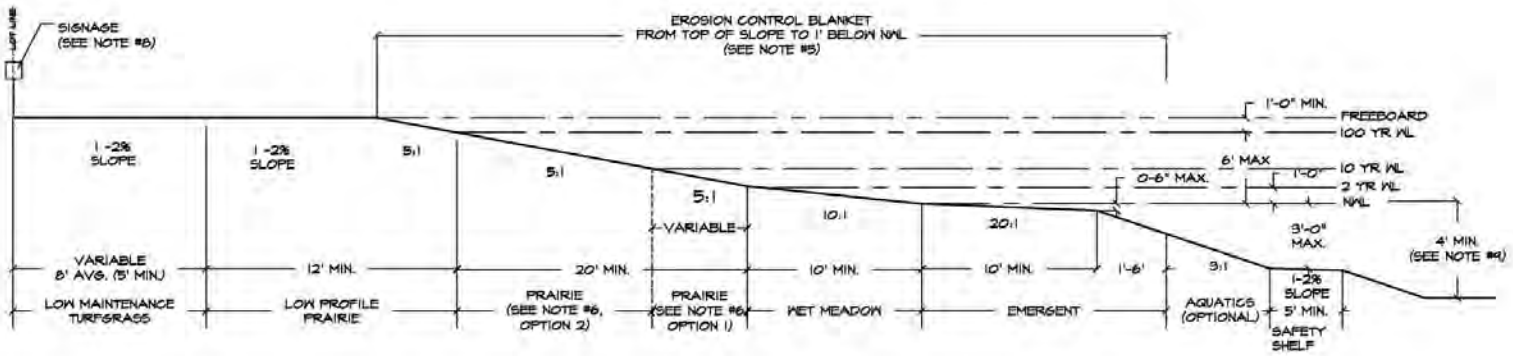
Wetland Bottom Concept

Site conditions may not warrant excavation up to 10 feet deep within a stormwater basin or costs may make the Wetland Pond design prohibitive. As an alternative design, the stormwater basin may have shallow inundation across a greater portion of the basin bottom (i.e., the majority being between three to six inches depth at NWL), with pockets of deeper water for settling zones. This is the Wetland Bottom concept (**Exhibit 2**). Settling zone areas should be at least five feet deep and linked together by a shallow swale to promote water movement within the basin. At a minimum, a settling area should be located at each inlet and outlet to the basin and should be sized appropriately to prevent inflow from creating turbidity. With this concept, emergent zone would cover all areas with inundation to approximately one foot deep. The balance of the basin design (e.g., slopes, vegetation zones, etc.) would be consistent with the Wetland Pond concept, thereby maintaining continuity in the visual appearance and management practices for the naturalized basins.

1.4 HYDROPERIOD ANALYSIS

Typically, a project engineer sizes a basin to accommodate the required stormwater storage and release rates. However, to achieve the benefits of naturalized plantings, the engineer also needs to consider the hydrologic limitations of the proposed vegetation. A basic tool for this is a hydrograph that relates water surface elevation to time. At a minimum, graphs for the 5- and 100-year, 24-hour storm events are required submittals to the Village (example: **Exhibit 3**). Preparation of graphs for the 2-year and 10-year, 24-hour storm events is recommended as well, because water surface elevations associated with those events can help determine the appropriate elevations for the planting zones. Hydrology information is fundamental to determining which plants can survive the frequency and extent of inundation expected in the various vegetation zones. The graph should indicate the maximum elevation of each curve or be accompanied by a table indicating that information and be provided to the landscape architect/ecologist to assist with developing the planting plan.

The persistence of desirable plants can be negatively influenced by the frequency and depth of extended inundation within a stormwater basin. The higher the “bounce” and the more time needed for water to return to NWL, the more likely that hydrologic conditions will produce an unsightly “bathtub ring” or zone lacking vegetation (or dominated by weedy plants). Over time, erratic water levels can be expected to produce an eroded shoreline and undermined banks. Where a basin is in a subdivision or a highly-visible setting, these conditions raise safety and aesthetic concerns.



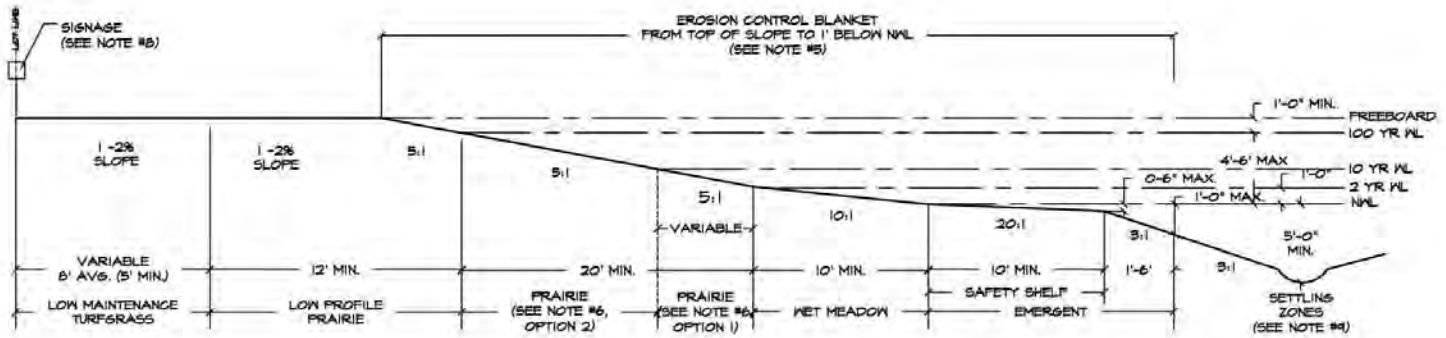
Notes:

1. Entire basin from the emergent zone to the lot line will contain a minimum of 12 inches clean topsoil.
2. Minimum length:width ratio of 3:1.
3. Maximize distances between inlets and outlets.
4. For planting and management specifications, refer to the Stormwater Management Facility Design, Planting and Management Plan Guidelines, dated March 2004, prepared by Planning Resources Inc.
5. Erosion Control blanket:
   - Any season: NAG SC150 (or comparable) from 3 feet above to 1 foot below NWL
   - Fall/winter: NAG SC150 (or comparable) on slopes
   - Spring/summer: NAG S75 (or comparable) on slopes
6. Naturalized Planting Options:
   - Prairie option #1
     a. Wet-mesic prairie
     b. Low-profile prairie
     c. Tallgrass prairie (recommended only if basin size ≥ 1.5 acres)
   - Prairie option #2
     a. Wet-mesic prairie
     b. Low-profile prairie
7. Seeding zones above NWL should have 1 foot of overlap.
8. Define lot boundary with signage, fencing, or woody plantings.
9. 30 percent of area @NWL shall be ≥ 10' deep.

EXHIBIT 1. WETLAND POND DESIGN CROSS-SECTION

SCALE: 1/8"= 1'-0"

*Note #4 is amended to reference the current amended document dated January 2010 and any future amendments.



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7. Seeding zones above NWL should have 1 foot of overlap.
8. Define lot boundary with signage, fencing, or woody plantings.
9. Five (5) percent of the area below NWL will have pockets at least five feet deep. These setting zones are to be located near each inlet/outlet structure and linked by a shallow swale.

EXHIBIT 2. WETLAND BOTTOM BASIN CROSS-SECTION

SCALE: 1/8"= 1'-0"

*Note #4 is amended to reference the current amended document dated January 2010 and any future amendments.

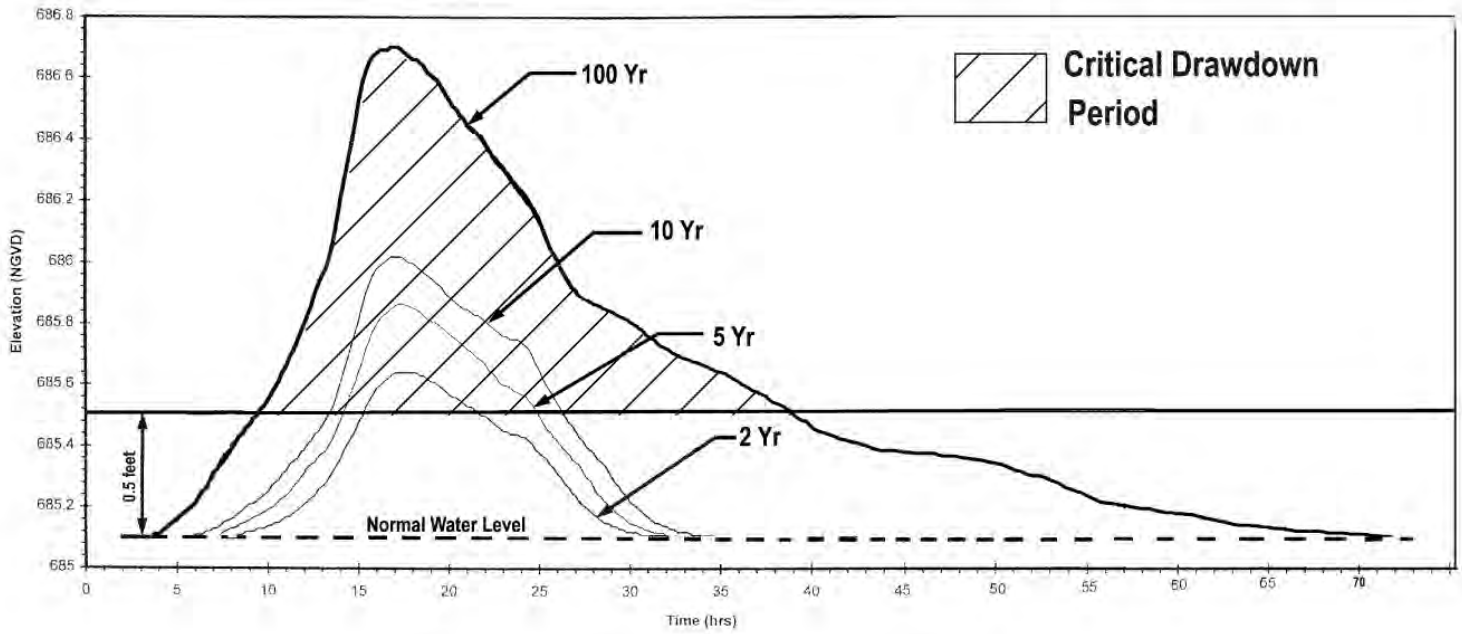

EXHIBIT 3. HYDROGRAPH SHOWING CRITICAL DURATION

Basins designed to support native vegetation should have hydrologic conditions exhibiting less than three feet of fluctuation, with the water surface elevation not exceeding six inches above NWL for more than 36 hours under the 10-year, 24-hour storm event. As a rule, the smaller the bounce and the faster the drawdown time, the better.

1.5 PLANT COMMUNITY DESIGN

As indicated in the introduction of this document, the Village of Montgomery is promoting the use of best management practices in the design and landscaping of local stormwater management facilities. A key component is the use of naturalized landscaping, which will enhance soil stability, improve water quality, provide season-long visual interest, and promote wildlife habitat diversity. The type of plant material will be determined by many factors, including adjacent land uses; however, the Village has established a general standard that provides wetland communities within the basin bottom and prairie vegetation on the basin slopes. Landscape designers are encouraged to review and adjust the species and quantities as appropriate for site-specific soil, light, and hydrologic conditions. The *Native Plant Guide for Streams and Stormwater Facilities in Northeastern Illinois* (USDA NRCS et al. 1997) is a valuable resource for making selections that reflect plant tolerances.

The landscape design should include a clear and permanent means of defining the boundary between the basin and adjacent properties. This may be done by fencing, signage, or by less intrusive means such as woody plantings. Where used, signage should be consistent with the Village standard (see **Appendix G**). Split rail corner posts are a less expensive alternative to full split-rail fencing.

Slope Vegetation

To promote increased aesthetics in residential developments, vegetation on the basin slopes should reflect use of seed mixes with both prairie grasses and wildflowers. As a general standard, residential basins would reflect the use of Low-Profile Prairie and (as appropriate) Tall Grass Prairie (**Appendix A, Tables 1** and **2**). These mixes are suited for areas expected to be primarily dry. To maintain views of the water, Tall Grass Prairie should be installed below the elevation of the five-year storm or avoided altogether in residential settings where the basin bottom covers less than an acre. The developer may wish to tailor a native wet-mesic seed mix for the area between NWL and HWL to accommodate site-specific hydrologic conditions. Doing so may prove more cost-effective than overlapping the wet meadow and prairie mixes over that zone.

Developers of non-residential multiple lot subdivision sites (i.e. Blackberry Creek Retail, Ogden Hill etc.) may elect to landscape the basin slopes similar to residential area basins (i.e., containing both prairie grasses and flowers) or they may choose a Grass-Only Prairie.

Developers of non-residential single lot development sites are not required to comply with these standards but may wish to use an alternative landscape for smaller stormwater basins. The Conservation Mix is an example alternative seed mix. When the alternate landscape is non-native, the developer must implement other best management practices to comply with Section 203(h)(5) of the Kane County Stormwater Ordinance.

On average, an eight-foot-wide zone (five feet minimum) of No-Mow Turf Grass (**Appendix A, Table 3**) should be established to transition between turfgrass lawns on adjacent properties and the Low-Profile Prairie. This transition zone also will provide a natural “burn break” for management purposes and should be clearly marked to discourage encroachment.

Under most conditions, native plantings will be successful even in residential areas. However, The Village recognizes that typical maintenance procedures for native plantings (e.g., prescribed burning) may not be appropriate in all situations. Therefore, the Village will, on a case-by-case basis, accept a no-burn prairie planting (**Appendix A, Table 4**) or vegetation other than the standard native landscaping.

Basin Bottom Vegetation

A stormwater management facility with a consistently wet bottom and/or regularly inundated lower side slopes (based on design goals) should be planted with a combination of emergent (**Appendix A, Table 5**) and wet meadow vegetation (**Appendix A, Table 6**). The emergent plant community should be developed in saturated to shallowly inundated soils. For the wetland pond design, the emergent zone will average 10 feet in width, with no portion less than five feet wide. For the wetland bottom design, emergent vegetation will be installed in all areas having up to six inches of standing water at NWL. As the plants mature, emergent vegetation will expand out to approximately one foot below NWL.

Wet meadow vegetation should be installed in saturated to moist soils up to one foot above NWL (i.e., the approximate elevation of the two-year, 24-hour storm event). These erect grasses and forbs will provide soil stabilization, protect the shoreline from the erosive forces of wave action, increase filtration of sediment and pollutants from stormwater, and provide habitat for various wildlife.

Optional Components

In deeper water areas at 2.5 to three feet below the NWL, an optional aquatic bed community may be included to decrease wave action that causes shoreline erosion and provide feeding habitat for dabbling ducks. **Appendix A, Table 7** lists species appropriate to an aquatic bed community.

Woody plantings can be used on basin slopes to define the lot boundaries, increase wildlife habitat diversity, and improve aesthetics. However, species selection and placement must be done in a manner that minimizes conflict with prairie establishment and maintenance. **Appendix A, Table 8** lists species appropriate for use with naturalized stormwater basins. Woody vegetation should be clustered in groups, rather than scattered individually across the slope.

If desired, other elements may be selectively included in the stormwater basin design to promote access for passive recreation while minimizing impacts to the slope vegetation. Optional components may include such features as water features, stone outcrops, flower beds (incorporating native species or their cultivars), and low-maintenance turfgrass paths.

"In any long-term solution, the greatest investment of time and money is up front. [Naturalized] planting … will pay off in the long run with less work, more wildlife activity, cleaner water, and lots of aesthetic appeal."

(Henderson et al. Not dated.)

1.6 PLANT MATERIALS

Seed vs. Plugs

Plugs or tubers should be used rather than seed in the emergent community if standing water is present at the time of installation. The use of plugs to supplement seed in the wet meadow community is strongly encouraged. Live plants and/or root masses (e.g., tubers, rhizomes) should be planted along the shoreline and in shallow open water zones. Plug

should have at least one-third to half of the plant material above the water surface after planting. If plant root parts are used, fresh mud conditions are essential, as many wetland plants will not germinate and grow under submerged conditions.

Genetic Material

All tubers, plugs, seed, containerized, bare root, and balled and burlapped (B&B) materials are to be guaranteed true to name and variety. To maintain the local ecotype, their origin should be from EPA Ecoregion 54, preferably from within a 150-mile radius of the project location, and species/subspecies native to Kane County, Illinois (other than for cover crop species). Plant origins beyond a 150-mile radius need Village approval.

Because stormwater basin plantings are not efforts to recreate the historic plant communities, selective use of cultivars and horticultural varieties is acceptable in planting plans, subject to Village approval. However, horticultural varieties of invasive plants (e.g., purple loosestrife, reed canarygrass) may not be used. The Kane County technical manual indicates that no grass cultivars should be used.

SECTION 2.0 CONSTRUCTION AND PLANTING GUIDELINES

This section covers topics pertinent to construction and planting naturalized stormwater basins, which have soil moisture contents ranging from standing water in the basin bottom to dry upper slopes around the basin. The following is a multi-step process for preparing the stormwater basin for planting, installing seed and plugs, and protecting installed materials:

2.1 GRADING AND SOIL PREPARATION

- Topsoil should be stripped and stockpiled prior to grading. Following excavation of the stormwater wetland volume, the basin should be graded to create major internal components (e.g., micropool, sediment forebay, safety shelf, deepwater channels, etc.).

- Topsoil should be placed on the basin slopes and bottom (except in deeper pools) to achieve final grade. Topsoil should be spread at a minimum thickness of 12 inches. Soils with a higher sand or silt content than clay (e.g., sandy loam, silt loam, etc.) provide the best planting substrate. Heavy clay soils can be physically amended with sand or chemically amended with gypsum to improve infiltration and reduce their tendency to compact.

- Earthwork should be performed in a manner that limits soil compaction. Tilling should be delayed when the ground is wet; soil should be sufficiently dry that it breaks apart when tilled. This is critical ensuring that wetland plants and seeds survive. Basins with a high degree of soil compaction or containing topsoil with a high clay content should be deep disked with a chisel plow.

- Following final grading, the outlet structure should be closed and the basin allowed to fill. The water levels should be evaluated. Based on that information, adjustments can be made to reflect the altered depths or the availability of plant materials. Also, all slopes should be stabilized with vegetation (see Section 2.2) and erosion blanket (see Section 2.4).

- Erosion and sediment controls should be strictly applied throughout the construction, planting, and vegetation establishment periods.

- In preparation for seeding, the topsoil should be scarified by rototilling, disking, or other means prior to applying seeds in the planting zone. The seedbed should be tilled so that the soil surface is loosened to a depth of one to three inches. For optimal results, the seedbed needs to be free of clods, stones and other debris larger than one-half inch in diameter. Final preparation of soil with mechanical equipment or planting during wet weather can have a considerable negative impact on the success of plant germination and establishment. Prior to planting, all rill erosion features need to be repaired. If present, gully erosion features should also be repaired and drainage improvements made to prevent the gullies from recurring.

- A temporary cover crop is to be installed on all slopes immediately upon completion of detention pond grading (Kane County 2002). Cover crop species must be non-persistent and not allelopathic. If the temporary cover crop cannot be immediately installed upon completion of grading, erosion blanket or heavy mulch (e.g., weed-free straw) must be installed to prevent erosion. Hay mulch should not be used, as it contains weed seeds that will result in increased management costs. See the following Section for discussion of the relationship between installation of the cover crop and long-term vegetation.

2.2 INSTALLATION

- Most wetland plants can tolerate variable inundation once established; however, they are more sensitive to water levels while becoming established. Where possible, water levels should be controlled during the first two months after planting/seeding to optimize vegetation development.

- Drill seeding with a rangeland-type native grass and wildflower seed drill is the preferred method for installing seed on the slopes because it provides optimal seed-soil contact. If site conditions preclude the use of drill seeding, broadcast application may be performed *at double the seeding rate* for drill seeding. Following broadcast seeding, the soil needs to be lightly raked to ensure the proper seed-soil contact necessary for rapid seed germination.

- If the long-term (i.e., permanent matrix) vegetation is not planted with the temporary cover crop, it should be planted in the first available growing season appropriate to each species. To decrease the time needed for establishing prairie vegetation (and thereby reduce the cost of maintenance needed to establish the naturalized landscape), plugs may be installed to supplement seeding. Spacing on five-foot-centers is recommended, with approximately 60 percent of the plugs being native grasses to provide the fuel matrix that will support prescribed burning.

- Planting zones should overlap by one foot to encourage natural sorting. If the Village accepts a basin design with greater bounce and slower drawdown than the standard, the landscape plan should reflect a larger amount of overlap between the prairie and the wet meadow mixes.

- Plugs (minimum 2.5-inch diameter potted plants), bare root material, or tubers should be installed within areas having up to six inches of inundation and installed at a rate of 3,500 to 4,000 plants/acre for emergent communities. Individual plants within each grouping should be placed on no greater than two-foot centers.

- Seed should be planted prior to installation of the erosion blanket; plug materials should be installed after the erosion blanket has been placed.

2.3 INSTALLATION TIMETABLE

- In general, seeding may occur any time between 15 October and 30 June, provided site conditions afford good soil-seed contact and workable soils. As previously indicated, wet soils should not be worked, as doing so results in compaction, poor seed germination, and increased erosion problems. Ideally, seeding should occur when soil is moist to dry-damp and be timed such that rainfall occurs within 48 hours of seeding. One advantage to fall seeding is that the seed is in place at the correct time for spring germination. Also, fall planting tends to promote flowers, while spring planting favors grasses. However, dormant seeding may not be appropriate for wetter portions of the basin that are likely to flood and flush seed away.

- If earthwork is completed in late spring to late summer, the temporary cover crop indicated in the planting lists and erosion control measures should be installed. Unless regular watering will be provided, installation of the permanent seed matrix is not recommended, as this period is often too hot and dry for successful germination and establishment. Likewise, seed should not be installed when snow cover is present although under certain conditions, frost seeding may be appropriate.

- Tuber and plug materials should be installed in spring. Depending on weather and soil moisture conditions, plant installation should occur between 15 April and 15 June. This allows the roots to establish prior to the warmer, drier conditions that occur later in the season. If installed materials receive supplemental watering to ensure their survival, plugs may be planted through August 1. Plug installation in late summer/fall is not recommended, as root systems may not have sufficient time to develop before a hard frost/winter.

- If woody plantings are included in the stormwater basin landscape, they should be installed in spring or fall as appropriate to the proposed species. Installation should not occur after 15 June unless provisions are made for watering.

2.4 SEED AND PLANT PROTECTION

Erosion blanket is required from the top of the slope to one foot below NWL. Under no circumstances may hydromulch be used as the sole means of slope protection. The time of year in which basin grading is completed and the location requiring protection will determine the type of blanket.

- Spring/summer: Use North American Green S75 (or comparable) matting to prevent erosion and enhance moisture for germinating seedlings.

- Fall/winter: Use North American Green SC150 (or comparable) matting to allow for greater soil and seed protection over winter and early spring months.

- Any season: Use North American Green SC150 (or comparable) matting along the toe of the slope and shoreline with matting up to three feet above and one foot below NWL. This matting is necessary to protect the unvegetated shoreline from erosive wave action and ice scour.

The phrase “or comparable” means comparable to test performance data by the Texas Transportation Institute. Approval for the use of comparable products must be obtained from the Village and supporting

documentation submitted for review. Wood-fiber blankets should no be used as they can swell when wet and prevent vegetation from germinating and emerging through the blanket.

Installation of erosion blanket is to follow manufacturer's guidelines. Because proper installation and stapling is fundamental to the success of an erosion control blanket, installation specifications should stipulate that the staple pattern be sprayed onto the blanket. Where mowing will be used as a standard maintenance practice rather than prescribed burning, wooden stakes or bio-stakes are recommended to secure blankets rather than metal staples.

Installation of temporary measures to protect emergent plantings from herbivory by geese, grass carp, and muskrats while young plants establish is strongly encouraged. Planting pods prevent herbivores from swimming, walking, and/or flying into a planted area. This increases the installation costs but can help prevent or reduce the cost of replacement plantings. Some treatments are more effective than others are. Use of an ineffective treatment increases installation costs with no real protection benefit. A study published in *Ecological Restoration* Vol. 26(3):184-186, September 2008, indicated that fencing-footer treatment was most effective. This involves installation of a three-foot tall poultry wire fencing with one-inch wide hexagonal openings and an 18-inch footer section extending from the bottom of the vertical fencing, laid flush with the substrate, and secured to the substrate with six-inch metal turf staples. Monofilament line should be woven from stake to stake to create a zigzag or crisscross pattern over the top of the pod.

The landscape plan should include details of planting pods and of proper installation for trees and shrubs (as applicable). Plans also should include a requirement for removal of posts and chicken wire protective pods following establishment and acceptance by the Village and that all necessary erosion control and plant protection devices be provided and maintained until the native plantings have established.

SECTION 3.0 MONITORING GUIDELINES

Consistent with Article 6 of the Kane County Stormwater Technical Manual (Kane County 2002), naturalized detention ponds need to be monitored to determine if plantings meet performance standards (see Section 3.3). Monitoring must be performed by a qualified consultant and occur for five years. Formal monitoring and reporting is not required in Year 1; however, a qualified consultant should visit and assess the site. Developers can reduce landscape establishment costs by identifying, preventing, and/or correcting problem conditions (e.g., erosion, weeds, etc.) early. This helps promote timely sign-off.

Formal monitoring is to begin the second year after planting is substantially completed and occur in Years 3, 4, and 5, or until performance standards have been met and the Village grants a "finding of compliance." The Village may, at their discretion, grant early finding of compliance in Years 3 or 4.

3.1 MONITORING METHODOLOGY

- Monitoring is to be performed on a semi-annual basis. Spring monitoring is to occur in May or June while fall monitoring may be performed in August, September, or early October.

- Monitoring is to be conducted using the meander survey search methodology, with visual estimates of species dominance and cover. The meander survey will review at least 20 percent of each vegetative community (per location). Observations shall be made to identify

specific management strategies necessary to reach design goals, and representative photographs shall be taken.

- Monitoring shall identify the following for each basin:

  1) All plant species (native and non-native) by community (e.g., basin slopes, basin bottom/shoreline, etc.);
  2) The three most dominant species within each community;
  3) The total percent cover by vegetation in each community;
  4) The relative percent coverage by acceptable species in each community;
  5) The cumulative percent cover by common buckthorn, glossy buckthorn, reed canarygrass, purple loosestrife, or common reed in the basin bottom community/shoreline;
  6) Erosion and/or sedimentation problems;
  7) Water level or drainage problems; and
  8) Areas of bare soil (i.e., less than 10 percent vegetative cover) larger than 0.25 square-meter.

3.2 REPORTING

- Within 10 working days following completion of stormwater basin plant installation, the developer or their designated contractor is to submit written notice to the Village that revegetation has been completed. Nursery packing lists indicating the species and quantities of materials installed will accompany this notice. Upon receipt of as-built landscape documentation, the Village will inspect the work. If the work is consistent with the approved plan, the Village will issue a letter indicating the start of the five-year establishment monitoring period.

- An annual monitoring report must be prepared and submitted to the Village and the Village's wetland consultant by 28 February of the following year; hard copies and a PDFs of the report shall be submitted. This report will be used to determine if the stormwater management facility is meeting design goals based on the required performance standards. The monitoring results and progress relative to performance standards are to be summarized in tabular format.

- The monitoring report is to include the following components:

  1) A vegetative map (e.g., a copy of the approved planting plan),
  2) A tabular summary of monitoring results (see Table 1 in **Appendix F**),
  3) A description of management performed during the year,
  4) A tabular summary of annual progress relative to performance criteria per community (see Table 2 in **Appendix F**),
  5) Recommendations for management in the upcoming year,
  6) Representative photographs, and
  7) Annual (spring/fall) floristic inventories for each community, per basin, as well as a cumulative floristic inventory for the each basin.

- Reporting requirements and the responsibility for rectifying any deficiencies should be provided as outlined in Article 6 of the Kane County Technical Guidance Manual (2002).

3.3 PERFORMANCE REQUIREMENTS

Cover Requirements

- Within three months of seed installation (or three months after the start of the growing season following dormant seeding), at least 90 percent of the seeded areas, as measured by aerial cover, shall be stabilized by vegetative cover, primarily of the temporary erosion control seed mix or installed seed.

- There shall be no individual seeded area that has more than 0.25 square-meter devoid (i.e., less than 10 percent cover) of vegetation, as measured by aerial coverage.

- Seeded areas shall not contain rills or gullies greater than four inches wide by four inches deep.

- The shoreline shall not have more than six inches of cut because of erosion.

- Areas seeded to turfgrass shall have at least 95 percent ground cover by appropriate species.

- Ground cover by acceptable* perennial species, as measured during August/September/early October, shall be as follows per basin: an average of 50 percent (minimum 35 percent) for the emergent community, at least 75 percent for the wet meadow community, and at least 75 percent for the upland prairie community.

  The following percentages are recommended to ensure the site is progressing toward the acceptance criteria:

Monitoring Year	Minimum Percent Ground Cover by Acceptable Species		
	Emergent	Wet Meadow	Upland Prairie
Year 2	25%	25%	25%
Year 3	35%	35%	35%
Year 4	45%	60%	60%

* Acceptable species are those species seeded or planted for the permanent matrix and/or native species with a C-value of 2 or greater, per Swink and Wilhelm (1994, or more current version).

Presence Requirements

- Minimum presence by acceptable perennial species shall be 50 percent for each basin, per community. This value should be determined using the FQA data.

  The following percentages are recommended to ensure the site is progressing toward the acceptance criteria:

Monitoring Year	Minimum Presence
Year 2	20%
Year 3	30%

Year 4	40%

- The percent of native species present in each community, per basin, shall increase over the five-year monitoring period.

- All (100 percent) of the installed woody materials shall be alive, in healthy condition, and representative of the species during each year of monitoring.

Quality Requirements

- The native mean C-value for the area (i.e., per basin) should increase each year. Sites experience natural fluctuations in plant quality. The intent is that the data should reflect an overall trend toward improving values. So long as the mean C-value is no more than 10 percent below the previous year's value and the overall trend is positive, this criterion is considered met.

- The native FQI value for the area (i.e., per basin) should increase each year. Sites experience natural fluctuations in diversity. The intent is that the data should reflect an overall trend toward improving values. So long as the value is no more than 10 percent below the previous year's value and the overall trend is positive, this criterion is considered met.

- By the end of the fifth year, no more than 25 percent of any plant community, per basin, shall be individually or collectively dominated by non-native or weedy species. Note: Cattails (*Typha* spp.) do not count toward this criterion, provided they represent no more than 20 percent cover. Redtop (*Agrostis alba*) does not count toward this criterion.

- Per each community within a basin, none of the three-most dominant species may have a C-value below 2, unless perennial and part of the approved plantings for the given community.

3.4 FORMAL ACCEPTANCE

- The Village may periodically inspect the basins during the first five (5) years/establishment period of the basins.

- When the developer believes the basin(s) have met the performance criteria they shall contact the Community Development Department to schedule a joint inspection with the Village, the Village's wetland consultant, the developer and the developer's consultant.

- A formal letter will be issued indicating the Village's findings. If the acceptance criteria are met and the basin(s) will be turned over to the Village to manage the developer shall follow the Village's normal turnover and acceptance process for public infrastructure which requires a resolution by the Village Board. If the acceptance criteria are not met recommendations will be made to correct the deficiencies and a follow up inspection will be required.

- As a condition for site acceptance, a long-term Operation and Maintenance Plan consistent with Section 4.0 will be submitted for Village review and approval and will be used as a guide for long term management and maintenance. This can be incorporated into the landscape plan.

Like any planting, vegetation in naturalized stormwater basins needs management. Only the methods differ from traditional garden and lawn maintenance.

SECTION 4.0 MANAGEMENT AND MAINTENANCE GUIDELINES

Management of a naturalized stormwater basin is essential to realize its functional and habitat benefits. It cannot be stressed too strongly that parties who specialize in native landscape maintenance should perform the needed tasks. Standard maintenance practices for turfgrass will promote weeds in a prairie. **Appendix B** contains a list of contractors who have the experience and expertise to perform appropriate management.

4.1 OPERATION & MAINTENANCE PLAN

To ensure the naturalized plantings and the stormwater basin function properly, an Operations and Maintenance (O&M) Plan is an integral component of the landscape plan and must be submitted with the landscape plan for Village review and approval. At a minimum, the O&M plan should contain the following information for the stormwater facility and all supporting infrastructure (e.g., storm sewers, swales, etc.):

- The names, addresses, contacts, and telephone numbers of BMP owner(s).

- The names, addresses, contacts, and telephone numbers of the party or parties legally responsible for operations and maintenance. Maintenance activities need to be fully vested with the responsible party through an *enforceable* maintenance covenant for short-term and long-term maintenance, operation, and repair, including the exercise of practices that allow the system to provide the intended function(s).

  If the stormwater management facility will be operated and maintained by a public agency, the O&M plan should include proof that the public agency has accepted such responsibility, including associated capital expenses. If operation and maintenance will be provided by a property owner, business or an association, the O&M plan should include a copy of the terms to demonstrate that the agreement is recorded for all lots and that a dedicated funding source exists.

- A description and/or plan indicating the location of permanent access (public and private) overland flow paths, control structures, etc.

- How and when inspections will be performed.

- A list and schedule indicating how and when maintenance is to be performed, including both routine and infrequent maintenance tasks.

- A list of general tasks or activities that are prohibited within the basin (e.g., dumping of yard waste or debris; replacement of approved vegetation with non-approved materials; construction or placement of structures; pesticide application, fertilizer application an mowing other than for meeting specific management goals; etc.).

- Documentation of the estimated expenses and dedicated source(s) of funding for continued inspection, operation, and maintenance of the BMP(s). For example, a Homeowners Association (HOA)/Business Owners Association (BOA) should include language in the governing documents authorizing for collection of fees for the basin maintenance and outlining the process by which corrective actions will be taken and enforced.

- Acknowledgment that any amendment to the covenants and restrictions that alters the site beyond the original condition must have prior Village approval.

A Citizen's Guide to Maintaining Stormwater Best Management Practices for Homeowners Associations and Property Owners (Lake County SMC 2002) is an excellent on-line resource for identifying various maintenance components and inspection schedule items.

4.2 ESTABLISHMENT MAINTENANCE & MANAGEMENT

During the first five years following planting, a qualified consultant needs to visit the site on a regular basis to evaluate the progress and recommend management and remedial measures to promote successful establishment. In most cases, deficiencies relate to maintenance of structures and general activities such as debris management and erosion control. As with plant selection, specific characteristics of each site will influence how management and maintenance techniques are implemented.

First- and Second-Season Management

Conscientious management to prevent weeds from setting seed and control parent plants during the first two years after installation will ensure prompt establishment and development naturalized vegetation. Delaying treatment of weedy plants until they threaten performance attainment can increase management costs and delay the acceptance process. Depending on the type of plant being targeted, weeding may seek to remove all above ground and below ground stems, roots, and flower masses prior to development of seeds. When present in small quantities, undesirable plants may be controlled by selective cutting prior to the plant setting seed. Pulling is not recommended because the soil disturbance can uproot desirable plants and encourage the growth of more weeds. For certain aggressive weeds (especially biennials and perennials), selective herbicide application (e.g., wick application, not spraying) may be necessary.

Mowing too low and too frequently can be hard on prairie plants.

As a general rule, seeded slopes should be mowed just as the weeds flower or when weed growth is 12 inches high, whichever is earlier. The frequency of mowing will depend on the amount of rainfall and the actual weed density and height. Mowing up to once a month may be expected. The height of the mower blade generally should be raised as the growing season progresses and the stubble should be no shorter than four to six inches high. This allows sunlight to reach the desired plants but is not so low as to encourage weedy plants. A rotary or flail-type mower is preferable to a sickle bar mower because the latter does not chop up the cut material. If clippings shade the ground or smother the remaining plants, they should be bagged for off-site disposal. An alternative to bagging is to cut more frequently so that clippings are small. Incidental top-cutting and crushing of native seedlings will not harm them at this stage of development. The last mow should be timed so that vegetation can grow to a height of eight to 10 inches before winter, as that will reduce frost-heaving.

During the second growing season, the seeded area should be mowed close to the ground as possible in early spring and the cuttings raked or bagged. This low mow allows the soil to warm and encourages growth of native plants. If weeds remain a problem, an additional mow may be performed during mid- to late June, with the mow height set to 12 inches. Short mowing at this stage can harm the native plantings. If there is sufficient fuel, a prescribed burn can be attempted at the end of the second growing season or the following spring.

When weeding, it is important to be able to differentiate between weeds and native seedlings. If uncertain, leave the plant until it has grown enough for positive identification.

Watering during dry conditions in the first six to eight weeks after planting will promote higher seedling germination and survival. After that time, watering should be performed during the first year only in prolonged dry periods. After the first year, watering is not needed and will promote weeds.

Third- through Fifth-Season Management

Typical management of undesirable plant species beginning in the third growing season involves the use of prescribed fire in combination with mechanical and chemical control methods for perennial weeds. Burns should be conducted annually, from mid-October through April as weather and site conditions permit. If burning is not practical, mowing may be a substitute when performed in late fall or very early spring. Fall mowing, however, will deprive wildlife of wintering habitat. To promote sunlight reaching the soil surface the following spring, the mowing should occur at a height of two to four inches and cut material bagged for off-site disposal. As in the first two years, aggressive weeds should be targeted for individual control via selective cutting, digging, and/or herbicide application as appropriate for the species.

4.3 LONG-TERM MANAGEMENT & MAINTENANCE

Long-term maintenance of stormwater facilities must meet the requirements of Sections 600 through 605 of Article 6 in the Kane County Stormwater Ordinance. As the naturalized basin's vegetation matures, management requirements and costs become significantly less than for basins vegetated with traditional turfgrass. Routine maintenance activities include debris management, structure inspections, vegetation maintenance, water level maintenance, and pest species management. Non-routine maintenance and management actions are performed as site-specific conditions warrant and include sediment/pollutant removal, structure replacement, and replanting. Because these basins are water treatment facilities, professionals should be consulted regularly regarding maintenance.

Debris and Litter Management

Debris and litter (e.g., paper, plastic, metal, concrete, grass clippings, brush, etc.) should be removed every other month between 1 March to 31 October. This will prevent floating materials from clogging inlets and outlets. Debris should be disposed of at an appropriate off-site trash receptacle.

Structure Inspections

Stormwater structures should be inspected and maintained every two weeks during the growing season until vegetation has established. Afterwards, inspections may be performed semi-annually (e.g., late March and mid- to late November) and within 24 hours of each major rainstorm (>1 inch rainfall). An engineer should participate in one of these inspections to evaluate the mechanical components of the basin and determine if replacement is needed.

Inspections should include an evaluation on the stability of the outlet, embankments, and inlets. Observations should be made on the presence of erosion, lack of vegetation, or other problems such as soil cracking, the outlet/inlet structure degradation, sink holes, or wet areas on the slopes.

The presence and extent of burrowing animals should be noted and efforts made for their control to prevent loss of slope integrity.

Vegetation Management

The effectiveness of naturalized stormwater basins relies heavily on proper management of native vegetation. Management actions generally involve prescribed burning, herbicide treatment, and mowing, or a combination of practices. Accurate plant identification is essential.

Prescribed Burning. If conscientiously and carefully applied, prescribed burning involves low cost and effort compared to other means of vegetation management. Generally, a new prairie should be burned each year for up to five years after the second growing season. Burning is to be conducted by a qualified burn contractor experienced in grassland fire control and only upon receipt of a permit from the Illinois Environmental Protection Agency. In addition, permission should be sought from the local authorities, including the Village.

Timing of the burn will be determined based on weather conditions and management goals. Burning at the same time each year may allow certain species to dominate inappropriately and limit vegetative diversity; therefore, the season of the burn should be alternated between spring and fall. Large prairie tracts should be divided into management sections and burned on a rotational basis, with only a portion burned each year and the entire area burned over a two- to three-year period.

Nuisance Plant Management. Many plants will volunteer in a naturalized planting; most of the non-native plants will not persist, particularly with routine prescribed burn management. Another group of plants, however, is aggressive and will overtake a natural area without management intervention. This group of "worst offenders" typically includes purple loosestrife (*Lythrum salicaria*), cattails (*Typha* spp.), honeysuckle (*Lonicera* spp.), buckthorn (*Rhamnus* spp.), multiflora rose (*Rosa multiflora*), black locust (*Robinia pseudoacacia*), garlic mustard (*Alliaria petiolata)*, wild parsnip (*Pastinaca sativa*), Canada thistle (*Cirsium arvense*), common reed (*Phragmites australis*), reed canarygrass (*Phalaris arundinacea*), sandbar willow (*Salix interior*), and sweetclover (*Melilotus* spp.).

Mechanical Control — Mechanical control of nuisance plant species typically includes mowing and/or the digging up individual plants by hand. If performed before the seeds mature, this can minimize further spread. Mowing at or very close to the ground surface with a weed-eater or hand-scythe can control sweet clovers, various thistles, and ragweeds. General mowing should be performed no later than the third week of July. Mow height needs to vary depending on the species being controlled but typically should be at 12 to 18 inches height once the naturalized plantings have established. A rotary or flail mower should be used they chop the cut material into fine pieces that will not shade out the native plants. For species such as common reed, purple loosestrife, Canada thistle, and reed canarygrass, mowing actually encourages the spread of underground stems and alternate forms of management should

> "Normal turf management type mowing is inappropriate and will result in the loss of native plantings."
>
> (USDA-NRCS 1997)

be used. Hand pulling or digging of these species and woody undesirables such as multiflora rose can provide control if there are fewer than 100 plants.

Chemical Control — The use of preventative herbicides should be limited to selected problem areas with a dominance of plant species that do not respond well to prescribed burning and/or mechanical control measures. Employed in conjunction with prescribed burning and mechanical control, herbicides can be an important tool for controlling invasive species. Some species, such as purple loosestrife, buckthorn, honeysuckle, reed canarygrass, common reed, sandbar willow, and cattails are controlled more effectively by chemical treatment than by mechanical control measures.

Glyphosate herbicide (trade names Rodeo® or Roundup®) are often recommended for use in native areas. Other herbicides such as Transline®, Plateau®, and Garlon have also been used. Herbicide application should be performed by a licensed professional applicator in strict compliance with all warning labels and applicable codes, standards and best management practices.

Herbicides should be used selectively in order to avoid damaging desirable plants. Generally, wick application is more selective than spray application. Wicking applies herbicide only to individual plants, using a canvas-covered, perforated, chemical filled PVC pipe. Trained personnel walk the area, swinging the eight foot pipe from side to side above the native plants but deliberately striking invasive species. The pipe strikes and bends the weeds, smearing them with the chemical and destroying them within a few days. If used, spray applications should not occur on gusty days because non-target species could be affected.

Biological Control — Special attention should also be given to purple loosestrife control, should it occur on the site. This pervasive and noxious weed is extremely difficult to eliminate once established. Isolated individuals may be physically removed and destroyed before flowering. For larger stands of purple loosestrife, a combination of herbicide and annual burning may be appropriate. Where the plant is abundant, biological control can prove a cost-effective means of management. Through this method, host-specific insects are released to feed on the roots or leaves of purple loosestrife.

Supplemental Planting/Revegetation. Installation of supplemental plugs and/or seed using species in the approved mix (or as modified based on coordination with the Village) should be performed under any of the following circumstances: 1)more than half of the area of emergent plantings does not establish or persist; 2) the slope has any area greater than 0.25 square-meter in size devoid of vegetation; 3) the shoreline has any area more than five feet in length devoid of vegetation; or 4) any area (regardless of size) is actively eroding.

Sediment and Pollutant Removal

Stormwater basins are intended to capture sediment and pollutants. Eventually, this results in a decrease in pool volume and/or water quality (e.g., eutrophication). When either occurs, sediments need to be removed. Because each facility is different, there are no set timeframes for sediment/pollutant removal. However, the following guideline may be used: sediment removal is warranted when the pool volume is reduced by 15 to 20 percent of the design volume. For

smaller basins, sediment removal is generally needed on a more frequent basis while larger basins may be able to go 10 to 20 years before sediments need to be removed.

Pesticide and Fungicide Use

Modern pesticides do not have the immediate impact upon natural area vegetation that most fertilizers and herbicides have. However, long-term use of even the most benign pesticides has effects on wildlife that are still only barely researched. Pesticides should not be used broadly or routinely. Instead, pesticide use should be performed at specific and localized problem areas. Particular care should be exercised in the areas near or directly tributary to surface waters. Standard application procedures and precautions should be followed.

Insecticides and fungicides are generally unnecessary. Few insect problems occur on native plants and insects are part of the natural process, providing key links in the food web. Mosquitoes will breed in shallow water on lawns and in shallow depressions regardless of the length of grass. Rain gutters, tires, barrel planters, neglected pet watering bowls or bird baths are ideal habitat for stagnant water mosquitoes. Eliminating stagnant water reduces mosquito habitat.

Maintaining a healthy and balanced ecosystem will help reduce the number of mosquitoes breeding in the wetland areas by supporting fish, amphibians and avian predators. If public perception or the identification of a specific problem warrants the use of insect controls, biological measures should be considered. This could include stocking the basin with fish that feed on mosquito larvae and/or the use of BTI (*Bacillus thuringiensis israelensis*) to selectively kill mosquito larvae. Habitat structures also could be installed to encourage the nesting and feeding of tree swallows, purple martins, bats, or other insectivorous wildlife. An unmowed area near water does *not* increase the number of mosquitoes. It does, however, increase the area where mosquito predators such as dragonflies can rest or feed.

Strong preconceptions exist about mosquitoes and vegetation. However, it is a myth that grass needs to be mowed to prevent mosquito problems. "In general, functional stormwater wetlands are less likely to produce mosquitoes than are nutrient-laden secondary sewage… or ponds that do not have frequent turnover."

Fertilizer Use

Native plantings actually *look better* if they are <u>not</u> fertilized. Fertilizers (especially nitrogen) encourage weeds and tall, rank growth that falls over and looks unsightly. In addition, fertilizers can cause algal blooms by elevating the concentrations of dissolved nutrients (especially phosphates). For ecological reasons, turf management chemicals should <u>not</u> be used on native plantings except as directed by an ecologist or wetland consultant.

Other Management Actions

Other potential responsibilities could include, but are not limited to, fence upkeep, access restriction enforcement, and wildlife management (e.g., including control of carp, muskrats, and geese). The need for other management actions should be determined a semi-annual basis when performing other general maintenance visits.

4.4 SCHEDULE OF MAINTENANCE ACTIVITIES

Appendix E provides a table summarizing typical maintenance and management tasks and schedules. In particular, the establishment period (approximately five years) requires regular inspection and monitoring of vegetation and hydrology.

4.5 LONG-TERM MONITORING

Every 10 years after the Village has confirmed that sign-off performance standards have been met, the party responsible for long-term management and maintenance of the stormwater basin facility will contract the professional services of an ecologist or other qualified person to inspect the basin. A report on the condition of the stormwater management facility and vegetative evaluation relative to sign-off performance requirements will be prepared and submitted to the Village. If standards are not achieved, the report is to indicate management actions and a proposed schedule for implementation. The basin is to be reevaluated and documentation provided to the Village demonstrating that deficiencies have been corrected.

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Appendix A

Plant List Tables

Table 1.

Montogmery Naturalized Stormwater Basin Plantings		
Low Profile Prairie with Wildflower Accents		
Description: This is a mesic/dry prairie mix that emphasizes low-profile native grass and forb species. The mix reaches a height of approximately 24 to 36 inches. This mix should be used on compacted slopes of stormwater basins and other areas of poor to medium soils where a low-profile, drought tolerant mix is desired.		
Common Name	Scientific Name	Quantity (bs/ac)
COVER CROP		
Seed oats	*Avena sativa*	32.00
Partridge pea	*Cassia fasciculata*	0.250
Canada wildrye	*Elymus canadensis*	1.500
Annual ryegrass	*Lolium multiflorum*	5.000
Subtotal		38.750
GRASSES		
Little bluestem	*Andropogon scoparius*	3.500
Side-oats grama	*Bouteloua curtipendula*	4.000
Virginia wildrye	*Elymus virginicus*	0.250
Indiangrass	*Sorghastrum nutans*	0.500
Subtotal		8.250
FORBS		
Smooth blue aster	*Aster laevis*	0.125
Heath aster	*Aster ericoides*	0.031
New England aster	*Aster novae-angliae*	0.093
Sand coreopsis	*Coreopsis lanceolata*	0.500
Broad-leaved purple coneflower	*Echinacea purpurea*	0.500
Rattlesnake master	*Eryngium yuccifolium*	0.125
False sunflower	*Heliopsis helianthoides*	0.063
Round-headed bush clover	*Lespedeza capitata*	0.125
Foxglove beard tongue	*Penstemon digitalis*	0.125
Purple prairie clover	*Petalostemum purpureum*	0.125
Prairie cinquefoil	*Potentilla arguta*	0.031
Gray-headed coneflower	*Ratibida pinnata*	0.125
Black-eyed Susan	*Rudbeckia hirta*	0.500
Sweet black-eyed Susan	*Rudbeckia subtomentosa*	0.015
Rosinweed	*Silphium integrifolium*	0.031
Hairy grass-leaved goldenrod	*Solidago graminfolia*	0.063
Stiff goldenrod	*Solidago rigida*	0.062
Showy goldenrod	*Solidago speciosa*	0.031
Common spiderwort	*Tradescantia ohiensis*	0.063
Hoary vervain	*Verbena stricta*	0.125
Golden alexanders	*Zizia aurea*	0.063
Subtotal		2.921
TOTALS		49.92

Table 2.

Montogmery Naturalized Stormwater Basin Plantings		
Economy Low Profile Prairie with Accent Flowers		
Description: This is a mesic/dry prairie mix that emphasizes low-profile native grass and forb species. The mix reaches a height of approximately 24 to 36 inches. This mix should be used on compacted slopes of stormwater basins and other areas of poor to medium soils where a low-profile, drought tolerant mix is desired. Because of the lower seeding rate, timely and effective weed control during the first few years is imperative.		
Common Name	Scientific Name	Quantity (lbs/ac)
COVER CROP		
Seed oats	*Avena sativa*	32.00
Partridge pea	*Cassia fasciculata*	0.125
Canada wildrye	*Elymus canadensis*	1.500
Annual ryegrass	*Lolium multiflorum*	5.000
Subtotal		38.625
GRASSES		
Little bluestem	*Andropogon scoparius*	2.500
Side-oats grama	*Bouteloua curtipendula*	3.000
Virginia wildrye	*Elymus virginicus*	0.250
Indiangrass	*Sorghastrum nutans*	0.500
Subtotal		6.250
FORBS		
Smooth blue aster	*Aster laevis*	0.031
New England aster	*Aster novae-angliae*	0.031
Sand coreopsis	*Coreopsis lanceolata*	0.250
Broad-leaved purple coneflower	*Echinacea purpurea*	0.250
False sunflower	*Heliopsis helianthoides*	0.031
Foxglove beard tongue	*Penstemon digitalis*	0.032
Purple prairie clover	*Petalostemum purpureum*	0.125
Prairie cinquefoil	*Potentilla arguta*	0.031
Gray-headed coneflower	*Ratibida pinnata*	0.063
Black-eyed Susan	*Rudbeckia hirta*	0.188
Stiff goldenrod	*Solidago rigida*	0.062
Hoary vervain	*Verbena stricta*	0.062
Golden alexanders	*Zizia aurea*	0.031
Subtotal		1.187
TOTALS		**46.06**

Table 3.

Montogmery Naturalized Stormwater Basin Plantings		
Tall Grass (Wet-Mesic) Prairie with Wildflower Accents		
Description: This mix emphasizes taller native grasses and diverse flowers and reaches a height of approximately 48 to 72 inches by autumn. This mix is suitable for use on compacted slopes or other areas where drought-tolerant vegetation is desired. This mix was designed to accommodate a broad spectrum of moisture conditions, from mesic to dry soils that receive a half-day to a full day of sun.		
Common Name	Scientific Name	Quantity (lbs/ac)
COVER CROP		
Seed oats	*Avena sativa*	32.00
Partridge pea	*Cassia fasciculata*	0.125
Canada wildrye	*Elymus canadensis*	1.500
Annual ryegrass	*Lolium multiflorum*	5.000
Subtotal		38.625
GRASSES and GRASSLIKE		
Creeping bent	*Agrostis alba palustris*	1.000
Big bluestem	*Andropogon gerardii*	0.250
Little bluestem	*Andropogon scoparius*	3.000
Side-oats grama	*Bouteloua curtipendula*	2.000
Virginia wildrye	*Elymus virginicus*	0.500
Prairie switchgrass	*Panicum virgatum*	0.250
Dark green rush	*Scirpus atrovirens*	0.125
Indiangrass	*Sorghastrum nutans*	0.500
Subtotal		7.625
FORBS		
Smooth blue aster	*Aster laevis*	0.062
New England aster	*Aster nova-angliae*	0.062
Broad-leaved purple coneflower	*Echinacea purpurea*	0.281
Rattlesnake master	*Eryngium yuccifolium*	0.188
Round-headed bush clover	*Lespedeza capitata*	0.125
Blue lobelia	*Lobelia siphilitica*	0.031
Wild bergamot	*Monarda fistulosa*	0.031
Purple prairie clover	*Petalostemum purpureum*	0.125
False dragonhead	*Physostegia virginiana*	0.062
Mountain mint	*Pycnanthemum* spp.	0.063
Yellow coneflower	*Ratibida pinnata*	0.125
Black-eyed Susan	*Rudbeckia hirta*	0.250
Rosinweed	*Silphium integrifolium*	0.063
Compass plant	*Silphium laciniatum*	0.188
Old-field goldenrod	*Solidago nemoralis*	0.125
Stiff goldenrod	*Solidago rigida*	0.062
Common spiderwort	*Tradescantia ohiensis*	0.063
Hoary vervain	*Verbena stricta*	0.125
Culver's root	*Veronicastrum virginicum*	0.006
Common ironweed	*Vernonia fasciculata*	0.188
Golden alexanders	*Zizia aurea*	0.031
Subtotal		2.256
TOTALS		**48.51**

Table 4.

Montogmery Naturalized Stormwater Basin Plantings		
Economy Tall Grass (Wet-Mesic) Prairie with Wildflower Accents		
Description: This mix emphasizes taller native grasses and diverse flowers and reaches a height of approximately 48 to 72 inches by autumn. This mix is suitable for use on compacted slopes or other areas where drought-tolerant vegetation is desired. This mix was designed to accommodate a broad spectrum of moisture conditions, from mesic to dry soils that receive a half-day to a full day of sun. Because of the lower seeding rate, timely and effective weed control during the first few years is imperative.		
Common Name	Scientific Name	Quantity (lbs/ac)
COVER CROP		
Seed oats	*Avena sativa*	32.00
Partridge pea	*Cassia fasciculata*	0.125
Canada wildrye	*Elymus canadensis*	1.000
Annual ryegrass	*Lolium multiflorum*	5.000
Subtotal		38.125
GRASSES and GRASSLIKE		
Creeping bent	*Agrostis alba palustris*	0.500
Big bluestem	*Andropogon gerardii*	0.250
Little bluestem	*Andropogon scoparius*	2.000
Side-oats grama	*Bouteloua curtipendula*	1.750
Virginia wildrye	*Elymus virginicus*	0.250
Prairie switchgrass	*Panicum virgatum*	0.250
Dark green rush	*Scirpus atrovirens*	0.063
Indiangrass	*Sorghastrum nutans*	0.250
Subtotal		5.313
FORBS		
Smooth blue aster	*Aster laevis*	0.031
New England aster	*Aster nova-angliae*	0.031
Broad-leaved purple coneflower	*Echinacea purpurea*	0.188
Wild bergamot	*Monarda fistulosa*	0.031
Mountain mint	*Pycnanthemum* spp.	0.032
Yellow coneflower	*Ratibida pinnata*	0.125
Black-eyed Susan	*Rudbeckia hirta*	0.250
Rosinweed	*Silphium integrifolium*	0.032
Compass plant	*Silphium laciniatum*	0.063
Stiff goldenrod	*Solidago rigida*	0.062
Hoary vervain	*Verbena stricta*	0.125
Common ironweed	*Vernonia fasciculata*	0.188
Golden alexanders	*Zizia aurea*	0.031
Subtotal		1.189
TOTALS		**44.63**

Table 5.

Montogmery Naturalized Stormwater Basin Plantings		
No-burn Prairie with Wildflower Accents		
Description: This is a mesic/dry slope mix that combines native grass and forb species with cool-season fescue to achieve a no-burn, semi-naturalized character. The mix reaches a height of approximately 24 to 36 inches, with accents up to 54 inches. Proper management involves mowing (and bagging cuttings) in mid-June at a height of 6 inches and again in early September. This mix will not provide comparable wildlife and water quality benefits as the prairie mixes (particularly over the winter), but does offer increased benefits over a complete cool-season turfgrass mix and should discourage Canada geese when combined with a wetland shoreline treatment.		
Common Name	Scientific Name	Quantity (plants or lbs/ac)
COVER CROP		
Seed oats	*Avena sativa*	32.00
Redtop	*Agrostis alba*	2.50
Canada wildrye	*Elymus canadensis*	1.000
Annual ryegrass	*Lolium multiflorum*	5.000
Subtotal		40.500
GRASSES		
Slender wheatgrass	*Agropyron trachycaulum*	1.000
Virginia wildrye	*Elymus virginicus*	0.500
Sheep fescue	*Festuca ovina*	12.000
Indiangrass	*Sorghastrum nutans*	0.500
Subtotal		14.000
FORBS		
New England aster	*Aster novae-angliae*	0.031
Sand coreopsis	*Coreopsis lanceolata*	0.500
Broad-leaved purple coneflower	*Echinacea purpurea*	0.250
Round-headed bush clover	*Lespedeza capitata*	0.125
Wild bergamot	*Monarda fistulosa*	0.031
Foxglove beard tongue	*Penstemon digitalis*	0.125
Gray headed coneflower	*Ratibida pinnata*	0.125
Black-eyed Susan	*Rudbeckia hirta*	0.188
Rosinweed	*Silphium integrifolium*	0.031
Stiff goldenrod	*Solidago rigida*	0.125
Common spiderwort	*Tradescantia ohiensis*	0.063
Hoary vervain	*Verbena stricta*	0.125
Golden alexanders	*Zizia aurea*	0.063
Subtotal		1.782
TOTALS		**56.28**

Table 6.

Montgomery Naturalized Stormnwater Basin Plantings		
Wet Meadow/Wet Prairie		
Description: This is a saturated soil/wet shoreline mix that emphasizes native wetland species adapted to fluctuating, dirty-water conditions typical to urban shorelines. The mix reaches a height of 24 to 36 inches, with accents of taller plants.		
Common Name	Scientific Name	Quantity (lbs/ac)
COVER CROP		
Redtop	*Agrostis alba*	2.000
Seed oats	*Avena sativa*	32.000
Canada wildrye	*Elymus canadensis*	2.500
Subtotal		34.000
GRASSES and GRASSLIKE		
Creeping bent	*Agrostis alba palustris*	2.000
Bebb's sedge	*Carex bebbii*	0.063
Porcupine sedge	*Carex hystericina*	0.063
Common fox sedge	*Carex stipata*	0.063
Fox sedge	*Carex vulpinoidea*	0.125
Red-rooted spikerush	*Eleocharis erythropoda*	0.125
Virginia wildrye	*Elymus virginicus*	1.000
Dudley's rush	*Juncus dudleyi*	0.063
Torrey's rush	*Juncus torreyi*	0.063
Rice cutgrass	*Leersia oryzoides*	1.000
Prairie switchgrass	*Panicum virgatum*	0.500
Dark green rush	*Scirpus atrovirens*	0.125
Woolgrass	*Scirpus cyperinus*	0.063
Great bulrush	*Scirpus validus creber*	0.250
Prairie cordgrass	*Spartina pectinata*	0.125
Subtotal		5.628
FORBS		
Common water plantain	*Alisma subcordatum*	0.063
Swamp milkweed	*Asclepias incarnata*	0.125
New England aster	*Aster novae-angliae*	0.125
Nodding bur marigold	*Bidens cernua*	0.063
Common beggar's ticks	*Bidens frondosa*	0.063
Sneezeweed	*Helenium autumnale*	0.125
False dragonhead	*Physostegia virginiana*	0.094
Water smartweed	*Polygonum amphibium stipulaceum*	0.25
Common arrowhead	*Sagittaria latifolia*	0.125
Cup plant	*Silphium perfoliatum*	0.188
Blue vervain	*Verbena hastata*	0.125
Common ironweed	*Vernonia fasciculata*	0.125
Subtotal		1.471
TOTAL		**41.10**

Table 7.

Montgomery Naturalized Stormnwater Basin Plantings		
Emergent Marsh Seed		
Description: This is an emergent seed mix that emphasizes native species adapted to fluctuating, dirty-water conditions typical to stormwater wetlands. The mix has variable height, with taller emergent plants reaching heights of approximately 60 inches but the majority being 36 inches or less. This mix should be applied only if fresh mud soil conditions can be maintained for at least two months after installation, otherwise plugs (Table 5) should be installed.		
Common Name	Scientific Name	Quantity (lbs/ac)
GRASSES and GRASSLIKE		
Redtop	*Agrostis alba*	1.500
Bristly sedge	*Carex comosa*	0.375
Spikerushes	*Eleocharis spp.*	0.125
Fowl mannagrass	*Glyceria striata*	0.032
Soft rush	*Juncus effusus*	0.063
Rice cutgrass	*Leersia oryzoides*	0.500
Hardstem bulrush	*Scirpus acutus*	0.063
River bulrush	*Scirpus fluviatilis*	0.125
Common three-square	*Scirpus pungens*	0.125
Softstem bulrush	*Scirpus validus creber*	0.250
Common burreed	*Sparganium eurycarpum*	0.500
Subtotal		3.658
FORBS		
Sweet flag	*Acorus calamus*	0.250
Common water plantain	*Alisma subcordatum*	0.094
Blue flag	*Iris virginica shrevei*	0.250
Pickerelweed	*Pontederia cordata*	0.063
Sago pondweed	*Potamogeton pectinatus*	0.063
White water crowfoot	*Ranunculus longirostris*	0.063
Common arrowhead	*Sagittaria latifolia*	0.500
Subtotal		1.283
TOTAL		**4.941**

Table 8.

Montgomery Naturalized Stormwater Basin Plantings		
Low-Maintenance Turfgrass		
Description: This mix was developed for use as transition between more formally landscaped areas and native and/or natural-appearing areas. This mix will form dense turf in areas of sun to partial shade and requires little, if any, fertilizer or watering. The mix will provide a soft four- to six-inch tall flowing carpet of grass that requires mowing only twice a year.		
Common Name	Scientific Name	Quantity (lbs/1,000 s.f.)
GRASSES		
SR5100 Chewings fescue	*Festuca rubra* "Chewings"	1.15
Sheep fescue	*Festuca ovina*	1.15
SR3100 hard fescue	*Festuca longifolia* ""SR3100"	0.50
Scaldis hard fescue	*Festuca longifolia* "Scaldis"	0.50
Creeping red fescue	*Festuca rubra*	0.50
Dawson red fescue	*Festuca rubra* "Dawson"	0.50
Perennial ryegrass	*Lolium perenne*	0.70
TOTAL		5.00

Table 9.

Montogmery Naturalized Stormwater Basin Plantings		
Short-term Wildflower Mix		
Description: This optional mix contains various quick-appearing native and non-native wildflowers suited to full sun conditions with mesic to dry soils. Plants in this mix reaches an average heights of between 24 to 36 inches. This mix may be istalled concurrently with initial seeding or throughout the life of the stormwater landscaping to provide an extra burst of flowers.		
Common Name	Scientific Name	Quantity (percent of mix)
FORBS		
White yarrow	*Achillea millefolium*	2%
Bishop's flower	*Ammi majus*	3%
Poor man's weather glass	*Anagallis arvensis caerulea*	2%
Prairie aster	*Aster tanacetifolius*	3%
Dwarf cornflower blue	*Centaurea cyanus*	10%
Sand coreopsis	*Coreopsis lanceolata*	5%
Dwarf plains coreopsis	*Coreopsis tinctoria*	5%
Broad-leaved purple coneflower	*Echinacea purpurea*	5%
Blanket flower	*Gaillardia aristata*	5%
Indian blanket	*Gaillardia pulchella*	5%
Annual baby's breath	*Gypsophila elegans*	8%
Standing cypress	*Ipomopsis rubra*	3%
Dense blazing star	*Liatris spicata*	5%
Baby snapdragon	*Linaria maroccana*	3%
Scarlet flax	*Linaria grand rubrum*	5%
Lemon mint	*Monarda citridora*	3%
Evening primrose	*Oenothera lamarkiana*	3%
Corn poppy	*Papaver rhoeas red*	5%
Purple prairie clover	*Petalostemum purpureum*	5%
Red Mexican hat	*Ratibida columnaris bicolor*	5%
Black-eyed Susan	*Rudbeckia hirta*	5%
Catchfly	*Silene armeria*	5%
TOTALS		4.00

Table 10.

Montgomery Naturalized Stormnwater Basin Plantings				
Emergent Marsh Plugs				
Description: This is an emergent mix that emphasizes native species adapted to fluctuating, dirty-water conditions typical to stormwater wetlands. The mix has variable height, with taller emergent plants reaching heights of approximately 60 inches but the majority being 36 inches or less.				
Common Name	Scientific Name	Quantity (plants/ac)	Water Depth	
			0-4 in.	4-12 in.
GRASSES and GRASSLIKE				
Bristly sedge	*Carex comosa*	600	x	
Soft rush	*Juncus effusus*	600	x	
Hardstem bulrush	*Scirpus acutus*	100	x	x
River bulrush	*Scirpus fluviatilis*	200	x	
Common three-square	*Scirpus pungens*	600	x	
Softstem bulrush	*Scirpus validus creber*	100	x	x
Prairie cordgrass	*Spartina pectinata*	100	0"	
Common burreed	*Sparganium eurycarpum*	200	x	
Subtotal		2,500		
FORBS				
Sweet flag	*Acorus calamus*	300	x	
Blue flag	*Iris virginica shrevei*	500	x	
Pickerelweed	*Pontederia cordata*	100		x
Common arrowhead	*Sagittaria latifolia*	100	x	
Subtotal		1,000		
TOTAL		3,500	plugs/ac	

Table 11.

Montgomery Naturalized Stormnwater Basin Plantings		
Aquatic Bed Plugs		
Description: This is a planting list for shallow aquatic areas and emphasizes native species adapted to fluctuating, dirty-water conditions typical to stormwater wetlands. This mix is appropriate for installation in areas with up to three feet of inundation at normal water level.		
Common Name	Scientific Name	Quantity (plants/ac)
FORBS		
White water lily	*Nymphaea tuberosa*	50
Pickerel weed	*Pontederia cordata*	100
Water knotweed	*Polygonum amphibium*	100
Sago pondweed	*Potamogeton pectinatus*	200
White water crowfoot	*Ranunculus longirostris*	200
Subtotal		650
TOTAL	plugs/ac	**650**

Table 12.

Montgomery Naturalized Stormwater Basin Plantings

Woody Planting Options

Description: This is a list of various canopy trees, ornamental trees,and shrubs suited to naturalized stormwater basin areas with wet to mesic soil conditions. Not all species will perform well over that range of moisture; some species should be installed only where wet conditions occur and others only where mesic conditions occur. Species provide structure, habitat, and food sources for various birds and small mammals. Woody species should be located in clusters rather than individually spaced. Also, consideration should be given to the effect that shading will have on prairie development and placement and quanitites of woody plants should be designed to minimize that effect.

Common Name	Scientific Name	Size Options
OVERSTORY AND ORNAMENTAL TREES		
Black alder	*Alnus glutinosa*	5-7 ft. clump
Speckled alder	*Alnus rugosa*	6-7 ft. clump
Shadblow serviceberry	*Amelanchier arborea/canadensis*	4-6 ft.
River birch	*Betula nigra*	5-7 ft. clump
Blue beech	*Carpinus caroliniana*	4-6 ft.
Hackberry	*Celtis occidentalis*	1.75", 2.5" cal.
Redbud	*Cercis canadensis*	2", 5-7 ft. clump
Cockspur hawthorn	*Crataegus crus-galli*	7-8 ft.
Thornless hawthorn	*Crataegus crus-galli inermis*	5-6 ft.
White ash	*Fraxinus americana*	2.5" cal.
Black ash	*Fraxinus nigra*	2.5" cal.
Green ash	*Fraxinus pennsylvanica*	2.5" cal.
Kentucky coffee tree	*Gymnocladus dioica*	2.5" cal.
Hop hornbeam	*Ostrya virginiana*	5-6 ft.
Sycamore	*Platanus occidentalis*	2.5" cal.
'Siouxland' Eastern cottonwood	*Populus deltoides* 'Siouxland'	2.5" cal.
American plum	*Prunus americana*	3-4 ft.
Black cherry	*Prunus serotina*	1.25" cal.
White oak	*Quercus alba*	1.5", 2" cal.
Swamp white oak	*Quercus bicolor*	1.5", 2" cal.
Bur oak	*Quercus macrocarpa*	1.5", 2" cal.
Black willow	*Salix nigra*	1.5" cal.
American linden	*Tilia americana*	2.5" cal.
SHRUBS		
Indigo bush	*Amorpha fruticosa*	5 gal.
Red chokeberry	*Aronia arbutifolia*	5 gal., 24", 30", 36"
Black chokeberry	*Aronia melanocarpa*	24", 30", 36"
Buttonbush	*Cephalanthus occidentalis*	5 gal., 24", 36"
Silky dogwood	*Cornus amomum/obliqua*	24", 36"
Red-osier dogwood (and native varieties)	*Cornus stolonifera/sericea*	24", 30", 36"
American hazelnut	*Corylus americana*	30", 36"
Dwarf honeysuckle	*Diervilla lonicera*	5 gal., 24", 30", 36"
Burning bush	*Euonymus atropurpureus*	5 gal.
Witch hazel	*Hamamelis virginiana*	5 gal., 36"

Table 12.

Common Name	Scientific Name	Size Options
Winterberry	*Ilex verticillata* (both male & female plants)	5 gal., 24", 30", 36"
Spicebush	*Lindera benzoin*	5 gal., 24", 30", 36"
Ninebark	*Physocarpus opulifolius*	5 gal., 30", 36"
Shrubby cinquefoil	*Potentilla fruticosa*	24", 30", 36"
Dwarf fragrant sumac 'Gro-lo'	*Rhus aromatica* 'Gro-lo'	5 gal., 18", 24", 30"
Wild gooseberry	*Ribes missouriensis*	5 gal.
Pasture rose	*Rosa palustris/carolina*	5 gal.
Pussy willow	*Salix discolor*	24", 36"
Elderberry	*Sambucus canadensis*	5 gal.
Meadowsweet	*Spirea alba*	5 gal., 24", 36"
Maple-leaved arrowwood	*Viburnum acerifolium*	5 gal.
Withe rod	*Viburnum cassinoides*	5 gal., 24", 30", 36"
Arrowwood viburnum	*Viburnum dentatum*	24", 30", 36"
Nannyberry	*Viburnum lentago*	5 gal., 24", 30", 36"
Black haw	*Viburnum prunifolium*	36"
Highbush cranberry (and native varieties)	*Viburnum trilobum*	5 gal., 24", 30", 36"

Table 13.

Montogmery Naturalized Stormwater Basin Plantings		
Commercial/Industrial Site: Grass-Only Prairie		
Description: This is a mesic/dry prairie grass mix that reaches a height of approximately 36 to 60 inches. This mix is intended for commercial/industrial basin application, where inclusion of a flowering component is not important to landscape aesthetics.		
Common Name	Scientific Name	Quantity (plants or lbs/ac)
COVER CROP		
Seed oats	*Avena sativa*	32.00
Partridge pea	*Cassia fasciculata*	0.125
Canada wildrye	*Elymus canadensis*	1.500
Annual ryegrass	*Lolium multiflorum*	5.000
Subtotal		38.625
GRASSES		
Little bluestem	*Andropogon scoparius*	3.000
Side-oats grama	*Bouteloua curtipendula*	2.500
Virginia wildrye	*Elymus virginicus*	1.500
Prairie switchgrass	*Panicum virgatum*	0.750
Indiangrass	*Sorghastrum nutans*	1.500
Subtotal		9.250
TOTALS		47.88

Table 14.

Montogmery Naturalized Stormwater Basin Plantings		
Commercial/Industrial Conservation Mix (No-burn Prairie)		
Description: This is a mesic/dry slope mix that combines cool-season non-native grasses with select native grasses to achieve a no-burn, semi-naturalized character. The mix reaches a height of approximately24 to 36 inches, with accents up to 54 inches. Proper management involves ocasional mowing (and bagging cuttings), with one cut during mid-June at a height of 6 inches and a second cut in early September. Typical broadleaf plant control is also needed. This mix will not provide comparable wildlife or water quality benefits as the prairie mixes (particularly over the winter) but does offer more benefits than traditional cool-season turfgrass and, when combined with a wetland shoreline treatment, should help discourage Canada geese. This mix can be combined with the Short-term Wildflower Mix for a pop of color.		
Common Name	Scientific Name	Quantity (lbs/ac)
COVER CROP		
Seed oats	*Avena sativa*	50.0
Subtotal		50.0
GRASSES		
Redtop	*Agrostis alba*	5.0
Turf-type fescue	*Festuca spp.*	100.0
Canada wildrye	*Elymus canadensis*	5.0
Perennial rye	*Lolium perenne*	25.0
Indiangrass	*Sorghastrum nutans*	5.0
Subtotal		140.0
TOTALS		190.00

Appendix B

Installation & Maintenance Companies for Native Landscapes

Installation and Maintenance Companies for Native Landscapes*

Applied Ecological Services
Rt 3 Smith Road
PO Box 256
Broadhead, WI 53520
608-897-8641

Conservation Land Stewardship
375 W. First Street
Elmhurst, IL 60126
630-559-2035

Encap, Inc
12961 State Route 38
Cortland, IL 60112
815-758-6821

J.F. New & Associates
708 Roosevelt Rd
Walkerton, IN 46574
219-586-3400

LaFayette Home Nursery
R.R. 1 Box 1A
Lafayette, IL 61449
309-995-3311

McGinty Bros
3744 RFD Cuba Rd
Long Grove, IL 60047
847-438-5161

Midwest Ecological Services
591 E. Charles Mound Rd
Scales Mound, IL 61075
815-845-2209

Pizzo & Associates, Ltd.
10729 Pine Rd
Leland, IL 60531
815-495-2300

V3 Construction Group
7325 Janes Ave, Suite 100
Woodridge, IL 60517
630-724-9300

***Disclaimer: This list is not exhaustive and additional companies providing these services can be obtained from the information sources listed in local business directories. This list is provided for informational purposes only. No endorsement or recommendation is intended. It is provided as an aid to those seeking guidance on native landscaping installation and management.**

Appendix C

Examples of BMP Stormwater Basin Design

Photo 1 – Wetland bottom basin with mesic prairie buffer slopes.

Photo 2 – View of wetland pond stormwater basin with an aesthetically pleasing, low maintenance landscape that incorporates woody plantings with prairie groundcover.

Photo 3 – Overview of a wetland pond adjacent to a residential subdivision. There is a broad emergent/deep-water emergent zone but the prairie slopes have been mowed and converted to turfgrass, reducing water quality benefits. Photo courtesy of EnCAP, Inc.

Photo 4 – Naturalized stormwater management facility (wetland pond) adjacent to a residential subdivision. Photo courtesy of EnCAP, Inc.

Photo 5 – Naturalized slopes associated with a large stormwater facility in a residential area. Photo courtesy of Landscape Resource Inc.

Photo 6 – Low profile prairie slopes around a wetland pond (fall.)

Photo 7 – Wetland bottom basin with mesic prairie slopes and variable width emergent and shoreline plantings (early summer).

Photo 8 – Wetland bottom basin with broad emergent shelf and wet-mesic prairie slopes with clusters of woody vegetation. Note the irregular shape of the basin and the habitat nest box in the background (early summer).

Photo 9 – Low-profile prairie on slopes of a wetland pond with bicycle path in the background (late spring)

Photo 10 – Mesic prairie slopes on wetland pond basin (early summer).

Photo 11 – Recently installed low-profile prairie with dense screening of woody plants on two of the four slopes.

Photo 12 – Wetland bottom basin with prairie slopes; note the absence of open water due to the presence of emergent plants.

Photo 13 – Wetland pond with shoreline emergent zone, mesic prairie slopes, and clusters of shrubs and trees (fall).

Photo 14 – Wetland bottom basin with mesic prairie slopes and variable width emergent and shoreline plantings (early summer).

Photo 15 – Wetland pond with mesic prairie slopes and emergent shoreline plantings (fall).

Photo 16 – Low profile prairie slopes around a wet bottom basin (early summer).

Appendix D

Examples of Poor Stormwater Basin Design

Photo 1 – View of wetland pond with eroded shoreline and static woody plantings.

Photo 2 – View of stormwater wetland pond. Note the slumping associated with the basin margin due to shallow roots of the bluegrass turf.

Photo 3 – Erosion on the shoreline and mowed turfgrass. Lack of emergent vegetation reduces the visual appeal of the water feature as well as limits wildlife habitat and water quality benefits.

Photo 4 – View of stormwater pond lacking shoreline vegetation and showing erosion on the lower slope where turfgrass has failed.

Photo 5 – View of dry bottom detention facility with mowed turfgrass. This type of basin does not offer the range of water quality and habitat benefits provided by a wetland bottom stormwater facility or a wetland pond. Turfgrass basis also have a high cost for maintenance over the life of the basin.

Appendix E

Planned Management & Maintenance Tasks

Table E-1. Installation and Establishment Management & Maintenance Tasks for Naturalized Landscapes.

Activity	Schedule																						
	Frequency									Calendar													
	2x /month	Every other month	Semi-annual	Annual	After major storms *	As needed	Year 1	Year 2	Years 3-5	J	F	M	A	M	J	J	A	S	O	N	D
Debris/Litter Management																							
Remove trash (e.g., paper, plastic, brush, grass clippings, etc.) from inlet/outlet structures, basin slopes, and bottom and dispose in appropriate off-site location.		x			x		x	x	x			x		x		x		x				
Stormwater Structure Management																							
Structural inspection and clean-out/repair and dispose of debris in an appropriate off-site location.	stable)						x					x	x	x	x	x	x	x	x			
Structural inspection and clean-out/repair and dispose of debris in an appropriate off-site location.			x		x			x	x			x							x			
Note if the NWL design elevation is being maintained and the original depth zones are stable.			x				x	x	x						x			x				
Inspect basins and ponds for damage and note erosion on banks or bottom.			x		x		x	x	x			x							x			
Repair damage to embankment, undercut, or eroded areas if >1 m2 or >5 linear ft.						x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Perform corrective maintenance any time the pond takes longer than design time to return to +6 inches of NWL.						x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
ESC Management																							
Maintain ESC devices in functional condition at all times and correct deficiencies immediately.						x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Conduct inspection within 24 hours of 1" storm event.					x		x	x	x			x	x	x	x	x	x	x	x	x		
Repair damage to embankment, undercut, or eroded areas if >1 m2 or >5 lin. ft.						x	x			x	x	x	x	x	x	x	x	x	x	x	x	x
Repair and revegetate eroded areas.						x	x	x	x				x	x	x				x	x		
Vegetation Management																							
General Weed Management																							
Control invasive/non-invasive weeds as appropriate to each species. This may require different treatment times for different plant species. Treatment mechanisms may include mowing, hand cutting, prescribed burning, herbicide application, or a combination of methods. Species include but are *not limited to* the following:						x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Buckthorn						x	x	x	x	x	x	x										x
Thistles						x	x	x	x						x				x			
Cattails						x	x	x	x					x	x							
Common reed						x	x	x	x								x					
Bush honeysuckle						x	x	x	x	x	x	x										x
Purple loosestrife						x	x	x	x					x	x	x	x	x				
Reed canarygrass						x	x	x	x			x	x	x					x	x		

Activity	Schedule																						
	Frequency									Calendar													
	2x /month	Every other month	Semi-annual	Annual	After major storms *	As needed	Year 1	Year 2	Years 3-5	J	F	M	A	M	J	J	A	S	O	N	D
Prescribed burning																							
Have a qualified burn contractor conduct prescribed burning as fuel and weather conditions allow. If conditions prevent burning, conduct a high mow the following growing season.				X					X		X	X	X							X	X		
Mowing																							
Conduct variable-height mowing to prevent weed seed production.			X			X	X	X							X	X							
Conduct single-season mow in place of prescribed burning.						X			X			X				or					X		
Harvesting																							
Harvest wetland plants that have been choked out by sediment build up and dispose of at an appropriate off-site location.						X	X	X	X		X	X									X	X	
Replanting																							
Replace/supplement wetland and upland vegetation to meet performance standards.						X	X	X	X				X	X									
Other Management Actions																							
Manage wildlife and control mosquitos.						X	X	X	X			X	X	X	X	X	X	X	X				
Vegetation Monitoring																							
Conduct routine vegetation monitoring for compliance with performance standards, note progress of vegetation development and presence and extent of invasive plants.			X				X	X	X						X		X	X					
Reporting																							
Establishment																							
Prepare and submit to village an annual monitoring report.				X			X	X	X		X												
Growing Season: 1 March to 31 October																							
* Precipitation events >1 inch within a 24-hour period.																							

Table E-2. Long-term Management & Maintenance Tasks for Naturalized Landscapes.

Activity	Schedule																					
	Frequency									Calendar												
	Weekly	Every other month	Semi-annual	Annual	As needed	After major storms*	Every 2 to 3 years	Every 5 to 7 years	Every 10 to 20 years	J	F	M	A	M	J	J	A	S	O	N	D
Debris/Litter Management																						
Remove trash (e.g., paper, plastic, brush, grass clippings, etc.) from inlet/outlet structures, basin slopes, and bottom and dispose in appropriate off-site location.		x				x						x		x		x		x			
Structural Management																						
Structural inspection and clean-out/repair and dispose of debris in an appropriate off-site location.			x									x							x		
Note if the NWL design elevation is being maintained and the original depth zones are stable.			x												x						
Inspect basins and ponds for damage and note erosion on banks or bottom.			x									x			or				x		
Repair damage to embankment, undercut, or eroded areas if >1 m2 or >5 linear ft.					x					x	x	x								x	x
Perform corrective maintenance any time a basin takes longer than design time to return to +6 inches of NWL.					x					x	x	x	x	x	x	x	x	x	x	x	x
Remove sediment and return basin to original grades when plants are choked with sediment, pool volume has become significantly reduced (>20 percent), or basin becomes eutrophic.					x				x	x	x	x								x	x
Vegetation Management																						
General Weed Management																						
Control invasive/non-invasive weeds as appropriate to each species. This may require different treatment times for different plant species. Treatment mechanisms may include mowing, hand cutting, prescribed burning, herbicide application, or a combination of methods. Species include but are *not limited to* the following:					x					x	x	x	x	x	x	x	x	x	x	x	x
Buckthorn					x					x	x	x									x
Thistles					x										x				x		
Cattails					x									x	x						
Common reed					x												x				
Bush honeysuckle					x					x	x	x									x
Purple loosestrife					x									x	x	x	x	x			
Reed canarygrass					x						x	x	x						x	x	
Prescribed burning																						

Activity	Schedule																					
	Frequency									Calendar												
	Weekly	Every other month	Semi-annual	Annual	As needed	After major storms*	Every 2 to 3 years	Every 5 to 7 years	Every 10 to 20 years	J	F	M	A	M	J	J	A	S	O	N	D
Have a qualified burn contractor conduct prescribed burning as fuel and weather conditions allow. If conditions prevent burning, conduct a high mow the following growing season.							x				x	x	x						x	x	x
Mowing																						
Conduct a high mow (12 inches) to prevent weed seed prodution.					x										x							
Conduct single-season mow in place of prescribed burning.					x							x			or					x		
Harvesting																						
Harvest wetland plants that have been choked out by sediment build up and dispose of at an appropriate off-site location.					x						x	x							x	x		
Replanting																						
Install supplemental plugs and/or seed when a) more than half of the emergent plantings do not persist, b) the slope has any area greater than 0.25 sq. m. devoid of vegetation, c) the shoreline has any area more than 5 ft long devoid of vegetaion, or d) any area is actively eroding.					x								x	x					x	x		
Supplement native grasses and wildflowers with showy annual flower mix (optional).								x					x	x					x	x		
Other Management Actions																						
Review inspection program and checklists to determine if more detailed inspections or other information are needed, to determine if fees cover maintenance costs, and to update phone numbers and addresses of inspectors, contractors, etc.				x						x												
Maintain and upkeep fencing, refresh planting beds, enforce access restrictions, etc.					x		x						x	x	x	x	x	x	x	x	x	
Manage wildlife (muskrats etc).					x								x	x	x	x	x	x	x	x		
Vegetation Monitoring																						
Conduct more formal vegetation assessment (e.g., contract a specialist to evaluate status of vegetation development, determine the presence and extent of invasive plants, make recommendations for management, and prepare a status report).									x								x	x				
Growing Season: 1 March to 31 October																						
* Precipitation events >1 inch within a 24-hour period.																						

Appendix F

Monitoring & Reporting Forms

Appendix F Table 1.
Summary of the Meander Survey Data.

Development Site: _____
Spring Inspection Date: _____
Fall Inspection Date: _____

PARAMETER	Basin #				Basin #			
	Basin Slopes	Basin Bottom	Cumulative Basin	LMT	Basin Slopes	Basin Bottom	Cumulative Basin	LMT
Total number of species identified*								
Number of native species*								
Percent native species*								
Native mean C-value*				n/a				n/a
Native FQI value*								
Percent presence of acceptable perennial species*								
Erosion concerns?								
Sedimentation concerns?								
Water level or drainage problems?								
Bare areas (<10% vegetative cover) larger than 0.25 s.m. present?**								
Dominant three species (in order of decreasing abundance)**				n/a				n/a
Percent total ground cover by vegetation**			n/a				n/a	
Percent total ground cover by acceptable species**								

* Based on cumulative spring and fall monitoring observations.

** Based on fall monitoring observations.

Acceptable species = seeded or planted for the permanent matrix and/or native species with a C-value of 2 or greater, per Swink and Wilhelm 1994 or more current version.

Appendix F Table 2. [LOCATION] Native Landscape Performance Assessment

Criterion	Basin #			Basin #		
	Basin Bottom	**Basin Slopes**	**LMT**	**Basin Bottom**	**Basin Slopes**	**LMT**
Year One						
Within three months of seed installation (or three months after the start of the growing season following dormant seeding), at least 90 percent of the seeded areas, as measured by aerial cover, shall be stabilized by vegetative cover, predominantly of temporary erosion control seed mix or installed seed.						
There shall be no individual seeded area with more than 0.25 square meter devoid (i.e., with less than 10 percent cover) of vegetation, as measured by aerial coverage.						
Seeded areas shall not contain rills or gullies greater than four inches wide by four inches deep.						
The shoreline shall not have more than six inches of cut because of erosion.		n/a			n/a	
Areas seeded to turfgrass shall have at least 95 percent ground cover by appropriate species.	n/a			n/a		
All (100%) of the installed woody materials shall be alive, in healthy condition, and representative of the species.	n/a			n/a		
No more than 25 percent of any plant community, per basin, is*recommended* to be individually or collectively dominated by non-native or weedy species.						
Note: Cattails do not count towards this criterion, provided they represent no more than 20 percent cover. Redtop does not count towards this criterion.		n/a	n/a		n/a	n/a
None of the three most dominant species may have a C-value below 2 unless perennial and part of the approved plantings for a given community.						
Year Two						
There shall be no individual seeded area with more than 0.25 square meter devoid (i.e., with less than 10 percent cover) of vegetation, as measured by aerial coverage.						
Seeded areas shall not contain rills or gullies greater than four inches wide by four inches deep.						
The shoreline shall not have more than six inches of cut because of erosion.		n/a			n/a	
Areas seeded to turfgrass shall have at least 95 percent ground cover by appropriate species.	n/a			n/a		
Ground cover by acceptable[a] perennial species, as measured during August/September/early October, is*recommended* to meet the following, per basin:						
• 25 percent for emergent areas.		n/a	n/a		n/a	n/a
• 25 percent for wet meadow or other wetland area.						
• 25 percent for upland prairie areas.	n/a			n/a		
Minimum presence by acceptable[a] perennial species is*recommended* as 20 percent, per community by basin.			n/a			n/a
The percent of native species present in each community, per basin, shall increase over the five-year monitoring period.			n/a			n/a
All (100%) of the installed woody materials shall be alive, in healthy condition, and representative of the species.	n/a			n/a		
The native mean C-value should increase over the previous year (or be no more than 10 percent below the previous year's value).			n/a			n/a
The native mean FQI-value should increase over the previous year (or be no more than 10 percent below the previous year's value).			n/a			n/a
No more than 25 percent of any plant community, per basin, is*recommended* to be individually or collectively dominated by non-native or weedy species.						
Note: Cattails do not count towards this criterion, provided they represent no more than 20 percent cover. Redtop does not count towards this criterion.		n/a	n/a		n/a	n/a
None of the three most dominant species may have a C-value below 2 unless perennial and part of the approved plantings for a given community.						

Criterion	Basin #			Basin #		
	Basin Bottom	Basin Slopes	LMT	Basin Bottom	Basin Slopes	LMT
Year Three						
There shall be no individual seeded area with more than 0.25 square meter devoid (i.e., with less than 10 percent cover) of vegetation, as measured by aerial coverage.						
Seeded areas shall not contain rills or gullies greater than four inches wide by four inches deep.						
The shoreline shall not have more than six inches of cut because of erosion.		n/a			n/a	
Areas seeded to turfgrass shall have at least 95 percent ground cover by appropriate species.	n/a			n/a		
Ground cover by acceptable[m] perennial species, as measured during August/September/early October, is *recommended* to meet the following, per basin:						
• 35 percent for emergent areas.		n/a	n/a		n/a	n/a
• 35 percent for wet meadow or other wetland areas.						
• 35 percent for upland prairie areas.	n/a			n/a		
Minimum presence by acceptable[m] perennial species is *recommended* as 30 percent, per community by basin.			n/a			n/a
The percent of native species present in each community, per basin, shall increase over the five-year monitoring period.			n/a			n/a
All (100%) of the installed woody materials shall be alive, in healthy condition, and representative of the species.	n/a			n/a		
The native mean C-value should increase over the previous year (or be no more than 10 percent below the previous year's value).			n/a			n/a
The overall trend of the mean C-value should be positive.						
The native mean FQI-value should increase over the previous year (or be no more than 10 percent below the previous year's value).			n/a			n/a
The overall trend of the native FQI-value should be positive.						
No more than 25 percent of any plant community, per basin, is *recommended* to be individually or collectively dominated by non-native or weedy species.						
Note: Cattails do not count towards this criterion, provided they represent no more than 20 percent cover. Redtop does not count towards this criterion.		n/a	n/a		n/a	n/a
None of the three most dominant species may have a C-value below 2 unless perennial and part of the approved plantings for a given community.						

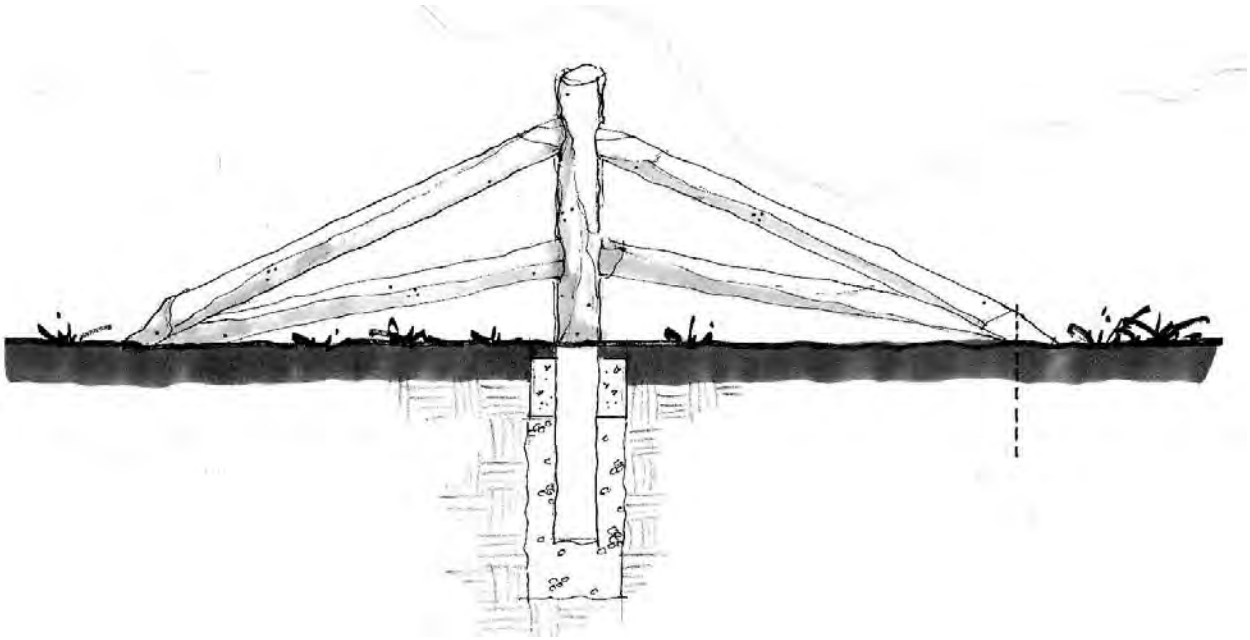
Criterion	Basin #			Basin #		
	Basin Bottom	Basin Slopes	LMT	Basin Bottom	Basin Slopes	LMT
Year Four						
There shall be no individual seeded area with more than 0.25 square meter devoid (i.e., with less than 10 percent cover) of vegetation, as measured by aerial coverage.						
Seeded areas shall not contain rills or gullies greater than four inches wide by four inches deep.						
The shoreline shall not have more than six inches of cut because of erosion.		n/a			n/a	
Areas seeded to turfgrass shall have at least 95 percent ground cover by appropriate species.	n/a			n/a		
Ground cover by acceptable[m] perennial species, as measured during August/September/early October, is *recommended* to meet the following, per basin:						
• 45 percent for emergent areas.		n/a	n/a		n/a	n/a
• 60 percent for wet meadow or other wetland areas.						
• 60 percent for upland prairie areas.	n/a			n/a		
Minimum presence by acceptable[m] perennial species is *recommended* as 40 percent, per community by basin.			n/a			n/a
The percent of native species present in each community, per basin, shall increase over the five-year monitoring period.			n/a			n/a
All (100%) of the installed woody materials shall be alive, in healthy condition, and representative of the species.	n/a			n/a		
The native mean C-value should increase over the previous year (or be no more than 10 percent below the previous year's value).			n/a			n/a
The overall trend of the mean C-value should be positive.						
The native mean FQI-value should increase over the previous year (or be no more than 10 percent below the previous year's value).			n/a			n/a
The overall trend of the native FQI-value should be positive.						
No more than 25 percent of any plant community, per basin, is *recommended* to be individually or collectively dominated by non-native or weedy species.						
Note: Cattails do not count towards this criterion, provided they represent no more than 20 percent cover. Redtop does not count towards this criterion.		n/a	n/a		n/a	n/a
None of the three most dominant species may have a C-value below 2 unless perennial and part of the approved plantings for a given community.						

Criterion	Basin #			Basin #		
	Basin Bottom	Basin Slopes	LMT	Basin Bottom	Basin Slopes	LMT
Year Five (Acceptance)						
There shall be no individual seeded area with more than 0.25 square meter devoid (i.e., with less than 10 percent cover) of vegetation, as measured by aerial coverage.						
Seeded areas shall not contain rills or gullies greater than four inches wide by four inches deep.						
The shoreline shall not have more than six inches of cut because of erosion.		n/a			n/a	
Areas seeded to turfgrass shall have at least 95 percent ground cover by appropriate species.	n/a			n/a		
Ground cover by acceptable* perennial species, as measured during August/September/early October, *shall* be as follows per basin:						
• Emergent areas shall have an average of 50 percent ground cover (minimum 35 percent).		n/a	n/a		n/a	n/a
• Wet meadow and other wetland areas shall have at least 75 percent ground cover.						
• Upland prairie areas shall have at least 75 percent ground cover.	n/a			n/a		
Minimum presence of acceptable* perennial species shall be 50 percent, per community by basin.			n/a			n/a
The percent of native species present in each community, per basin, shall increase over the five-year monitoring period.			n/a			n/a
All (100%) of the installed woody materials shall be alive, in healthy condition, and representative of the species.	n/a			n/a		
The native mean C-value should increase over the previous year (or be no more than 10 percent below the previous year's value).			n/a			n/a
The overall trend of the mean C-value should be positive.						
The native mean FQI-value should increase over the previous year (or be no more than 10 percent below the previous year's value).			n/a			n/a
The overall trend of the native FQI-value should be positive.						
No more than 25 percent of any plant community, per basin, *shall* be individually or collectively dominated by non-native or weedy species.						
Note: Cattails do not count towards this criterion, provided they represent no more than 20 percent cover. Redtop does not count towards this criterion.		n/a	n/a		n/a	n/a
None of the three most dominant species may have a C-value below 2 unless perennial and part of the approved plantings for a given community.						
A Long-term Operation and Maintenance Plan will be submitted for Village review and approval.						

* Acceptable species are those species seeded or planted for the permanent matrix and/or native species with a C-value of 2 or greater, per Swink and Wilhelm (1994 or more current version). Page 4 of 4

Appendix G

Design Details



Split Rail Fence Yard Delineator. Place at corner property lines adjacent to native areas.

Sign Delineator that states “Native Plant Area No Mowing or Dumping”.