6.0 Vegetation and Landscaping

6.1 General

This chapter sets forth general requirements and recommendations for the installation and use of vegetation in the Storm Water Best Management Practices (BMP's) listed in this manual (Chapter 4). This chapter has been organized to lead the designer through the plant selection and plant design process that takes place subsequent to the selection of a specific BMP. The intent is to help the designer consider the unique hydrological characteristics of a BMP which can affect the ability of vegetation to grow and survive. By reviewing this chapter the designer will have a better understanding of factors that can impact plantings in a BMP which in turn will help ensure that BMP plant selection and placement is successful.

The function of plants in water quality improvement is important to consider when selecting the most appropriate vegetation types for a given BMP. This is because the role of vegetation in water quality improvement is complex and requires combining soil types, hydrology and plants to achieve a desired resultant water quality parameter. Generally, water quality function of plants may be attributed to a combination of bio-geo-chemical processes such as adsorption to plants or detritus, nutrient uptake by plants, settling and filtration, and creation of certain oxidizing or reducing environments to facilitate change in the state of nutrients, metals, or other substances. Other important functions of plants in BMPs include aesthetics, wildlife habitat, biodiversity, and safety or accessibility. However, without healthy plants the overall BMP structure will probably fail to achieve its design goals. **Therefore, Charlotte-Mecklenburg has determined that the emphasis in this manual should be on selecting plants with high survival and low maintenance requirements with some consideration given to aesthetic appeal.** This approach is considered the core component to a successful BMP design and requires a paradigm shift for developers and homeowners who typically select plants for use in new developments based soley on their aesthetic appeal.

With the above in mind, developing the vegetation portion for a BMP plan begins with review of an approved list of plants that will satisfy water quality requirements. Factors to consider in selecting appropriate plants are discussed in section 6.2. Once plants are selected the designer can then determine vegetation placement and develop a planting plan using general guidance provided in section 6.3 along with BMP specific information provided in Chapter 4 of this manual. In completing this process the designer is reminded that the requirements and recommendations set forth in this chapter are based on the best available information. Changes and improvements in the process of establishing BMP vegetation are ongoing and it is incumbent on the designer to maintain professional awareness of those changes.

6.2 General Plant Selection Criteria

A list of plants meeting the criteria for high survival and low maintenance is provided in Appendix A of this manual. Use of specific plants on this list, for a specific BMP, is dependent on multiple factors including environmental conditions (ability of plant to survive in a particular environment), suitability (the suitability to a location and the plants relationship to the surrounding landscape) and aesthetic considerations (attractiveness to the viewing public). These factors have been prioritized in order of importance which allows the designer to systematically select the appropriate plants. **The priority of plant selection is: survivability first; suitability (with respect to plant height and form vs. BMP location); and finally aesthetics.** Indicators for each of these factors are tabulated by plant and can be used to develop the plant list for a specific BMP at a specific location. Taking the following in sequence will allow the designer to effectively select plants for a BMP:

- **Survivability.** Survivability of plants will be determined by its tolerance of water, soils, and salinity (with respect to storm water that contains deicing salts) coupled with anticipated exposure (or lack of exposure) to sun. Tolerance of water will be determined by location in each BMP with respect to soil moisture or, in case of wet ponds, depth of water. Plants placed in conditions that are not suited will not survive. The listed factors for survival in Appendix A include Planting Zone;

Wetland Indicators; Water Tolerance; Salinity Tolerance and Shade Tolerance. These factors are considered the primary selection criteria for vegetation. *Failure to account for these listed survival factors when developing the planting plan may result in failure of the vegetation to become established and failure of BMP to function properly.*

- **Suitability.** Consideration for planting in specific BMPs must take into account plant height, type (tree, shrub etc.) minimum size and typical on-center spacing. While not critical to survival, these factors allow the landscaper/designer to select those plants that will provide functional vegetative cover that does not interfere with public activity in the vicinity of the BMP or create a safety hazard by restricting sight lines with respect to traffic or criminal activity. The listed factors for suitability include form, mature height/diameter, typical on-center spacing and minimum size.
- **Aesthetics.** The final selection criteria include aesthetic considerations. While aesthetics is a lower priority for the function of BMPs, the vegetative component of the BMP may be a primary determining factor in the public perception of BMP success. Public perception is difficult to predict, but may be positively influenced by planning for traditional aesthetic features associated with showy flowers, attraction of desirable wildlife (e.g., birds, butterflies, and dragonflies), and evergreen. These aesthetic characteristics can be determined by reviewing suitably factors (listed above) and the additional information provided in Appendix A related to showy flowers, fall foliage or fruit color to the unique characteristics of the plants.

6.3 General Planting Criteria

The selection of plants is supported in the design process with the development of a planting plan, planting specifications and other design considerations. The designer will need to consider a broad range of issues relating to spacing, plant mix, etc. Therefore, this section sets forth general planting requirements and recommendations, for storm water BMP facilities presented in this manual that address those issues. The information presented in this section is generally applicable to all planting scenarios and should always be considered in the design process. The issues discussed include the following:

- **6.3.1 Design Considerations** General design recommendations that should be considered in developing plans and specifications
- **6.3.2 Site Preparation and Vegetation Management During Construction** General recommendations and requirements for procuring and handling plant material and steps required or recommended during the construction process
- **6.3.3 Herbivore Control** Actions taken to avoid invasive or herbivore damage to the newly constructed BMP
- **6.3.4 Other landscaping considerations** Additional considerations that should be considered by the designer
- **6.3.5 Importance of Using Native Plant Species** General discussion on why a designer must consider native plants

These five subject areas are all important components of the BMP design process and the designer should be familiar with each one to the extent that he can then successfully provide a viable and practical vegetation design for a BMP.

6.3.1 Design Considerations

Site Inventory

During the earliest design phases, the designer should visit and inventory the proposed BMP site so as to gain a better understanding of the factors that may impact his final design. Factors to consider and review include:

- Identify on-site and nearby sources of invasive vegetation (if any), in order to plan for their eradication, and to prevent their return later, when they may damage the newly-installed plantings.
- Consider design features which limit herbivory – 6.3.3 by wildlife, including buffers and edge plantings and placement of enclosure fencing,

- Review and consider aesthetics that can help to blend the BMP facilities with the surrounding landscape, as well as possibly enhance ease of maintenance.

Plant Spacing and Placement Considerations

General spacing and placement considerations are important for trees and /or woody vegetation in a BMP design. The recommended placement guidelines presented here are applicable to most cases. However, the final design spacing may be adjusted to account for BMP type, slope and overall width of BMP. The guidelines are as follows:

- Trees, shrubs, and woody vegetation are not allowed on any embankment impounding water.
- Trees and shrubs should be planted at least 15 feet away from the toe of slope of a dam and at least 25 feet away from principal spillway structures.
- Trees or shrubs known to have long taproots should not be within the vicinity of the earth dam or subsurface drainage facilities.
- For embankments used to impound water, herbaceous plantings should be limited to 10 inches in height. Species selection is critical in order to prevent maintenance costs.
- To reduce thermal warming, shade inflow and outflow channels as well as southern exposures of ponds. If areas to be shaded are near embankments, non-woody vegetation should be used so that embankment stability is not compromised.

Note: Spacing may also be influenced by BMP type, slope, and overall BMP width.

Erosion Control with Vegetation

The designer should also consider the following recommendations when developing BMP plans and specifications. These recommendations are provided as supplemental steps and will enhance the survivability of new planted material and the long term integrity of the BMP.

- Root material should be fibrous and substantial.
- Divert flows temporarily from seeded areas until fully stabilized if attainable.
- Stabilize aquatic and safety benches with emergent wetland plants and wetland seed mixes.
- Plant stream and water buffers and filter strips with trees, shrubs, grasses, and other herbaceous materials where possible, to stabilize banks and provide shade.
- Provide a planting area that can withstand the compaction of vehicles using maintenance access roads.
- Use plants to prohibit pedestrian access to pools or steeper slopes in areas where foot traffic would cause excessive erosion.

Vegetation Management

The designer should carefully consider the long-term vegetation management strategy for the BMP, keeping in mind the maintenance legacy for the future owners. Make sure the facility maintenance agreement includes requirements to ensure vegetative cover in perpetuity. The following should be considered by the designer:

- Avoid plantings that will require routine or intensive chemical applications (i.e. turf area).
- Use plants to prohibit pedestrian access to pools or steeper slopes to avoid damage to plants by heavy foot traffic, but do not block maintenance access to structures with trees or shrubs.
- Provide signage to help educate the public and to designate maintenance limits.
- The natural cycle of decay will lead to the accumulation of plant material in detention ponds. The designer should consider that this material may reduce capacity of the BMP and require periodic removal.
- Decrease the areas where managed grass (turf) is used. Use low maintenance ground cover to absorb run-off.

Planting Zone Considerations

Specific requirements for planting are dependent on planting zone and plant type. The following paragraphs define the general specifications of each planting zone. Table 6.1 provides an additional summary of the planting zone specifications. Specific planting zone identification and discussion is provided in this chapter.

- **ZONE 1 - Deep Water Area.** The Deep Water Area is permanently inundated, where water depths range between 1-3 feet in depth below the permanent pool elevation. Permanent inundation is defined as inundation or saturation for 76 – 100% of the growing season.
- **ZONE 2 - Shallow Water Bench.** The Shallow Water Bench Area is permanently inundated, where water depths range between 0.5-1 foot in depth below the permanent pool elevation. Permanent inundation is defined as inundation or saturation for 76 – 100% of the growing season.
- **ZONE 3 - Shoreline Fringe**. The Shoreline Fringe Area is regularly inundated and ranges between 0.5 feet below to 0.5 feet above the permanent pool elevation. Regular inundation is defined as inundation or saturation for 25-75% of the growing season.
- **ZONE 4- Riparian Fringe**. The Riparian Fringe Area is periodically or seasonally inundated in all BMP systems and ranges from 0.5 feet above the pool elevation, to approximately the 2-year storm water surface elevation in the BMP systems. Periodic or Seasonal inundation is defined as inundation or saturation for 13-25% of the growing season.
- **ZONE 5- Floodplain Terrace.** The Floodplain Terrace is infrequently or irregularly inundated in all BMP systems and ranges from approximately the 2-year storm water surface elevation to approximately the 10-year storm water surface elevation in the BMP systems. Infrequent or irregular inundation is defined as inundation or saturation for 5-13% of the growing season.
- **ZONE 6- Upland Slopes.** The Upland Slope Area is seldom or intermittently inundated in all BMP systems and ranges from approximately the 10-year storm water surface elevation and higher in the BMP systems. Intermittent inundation is defined as inundation or saturation less than 5% of the growing season.

Table 6.1 Planting Zones

Plant. Zone No.	Planting Zone Name	Water Regime	Percent of Year Inundated or Saturated	Water depth (where applicable)	Occurs in Systems which include BMP Types					
					1. Bio retention	2. Wet Ponds	3. Treat. Wetlands	4. Enh. Grass Swale	5. Grass Channel	8. Extended Dry Det.
1	Deep Water	Permanent Inundation	76 to 100%	3.0 to 1.0 feet	NO	YES	YES	NO	NO	NO
2	Shallow Water Bench	Permanent Inundation	76 to 100%	1.0 to 0.5 feet	NO	YES	YES	NO	NO	YES
3	Shoreline Fringe	Regular inundation	26 to 75%	0.5 below to 0.5 above	YES	YES	YES	YES	YES	YES
4	Riparian Fringe	Periodic or Seasonal Inundation	13 to 25%	0.5 feet above to 2 Yr. WSE [define]	YES	YES	YES	YES	YES	YES
5	Floodplain Terrace	Infrequent or Irregular Inundation	5 to 12%	2 Yr. WSE to 10 Yr. WSE	YES	YES	YES	YES	YES	YES
6	Upland	Seldom or Intermit. Inundation	< 5%	Above the 10 Yr. WSE	YES	YES	YES	YES	YES	YES

Listed below are those factors the designer must consider when developing the vegetation plan:

Grasses, Forbs, and Sedges in Zones 1, 2 and 3. Plant selections should be appropriate for the field environmental conditions of the planting site. The approved plant species, minimum acceptable sizes, and minimum spacing, including a spacing chart, are listed in the plant list or planting information.

- Zone 1 - Deep Water Emergents: The designer should employ a method of “triangular spacing”, and an approximate density of about 0.5 plants per square foot. A minimum of 2 herbaceous species shall be selected, for placement in each of the Zone 1 planting areas.

- Zone 2 - Shallow Water Bench Emergents: The designer should employ a method of "triangular spacing", and an approximate density of about 0.5 plants per square foot. A minimum of 3 herbaceous species shall be selected, for placement in each of the Zone 2 planting areas.
- Zone 3 - Shoreline Fringe: The designer should employ a method of "triangular spacing", and an approximate density of about 0.5 plants per square foot. A minimum of 4 herbaceous species shall be selected, for placement in each of the Zone 3 planting areas.

Grasses, Forbs, and Sedges (Seed Mixes) in Zones 4, 5 and 6. Plant selections should be appropriate for the field environmental conditions of the planting site. The approved species mixes, and minimum acceptable seeding rates are listed in the plant list, Appendix C.

- Zone 4 – Riparian Fringe, Zone 5 – Floodplain Terrace and Zone 6 - Planting zones shall receive preparation and seeding, with an appropriate seed mix, for establishing Native Wet Meadow, or Native Dry Meadow as set forth in Appendix C.

Trees, Shrubs, and Vines in Zones 4, 5 and 6 (ALL BMP's EXCEPT BIORETENTION): In designing and executing the plantings for Zone 4 – Riparian Fringe, Zone 5 – Floodplain Terrace and Zone 6 - Upland Plantings, the designer should consider the following:

- Employ a method of "random spacing", and a density of 400 stems per acre. A full 10% of the species shall be Large Maturing Deciduous Tree species, and 90% shall be Small Maturing Deciduous Tree, Evergreen Tree, Deciduous Shrub, or Evergreen Shrub species, chosen from the list of approved species.
- A minimum of 5 Large Maturing Deciduous Tree species shall be selected for each planting area and a minimum of 3 Small Maturing Deciduous Tree, Evergreen Tree, Deciduous Shrub or Evergreen Shrub species shall be selected for each planting area.
- The use of 3 plants of the same genus does not constitute the minimum selection and should be avoided.
- In addition to the 5 large stock tree and the 3 small stock tree requirements, each planted area shall contain, interspersed randomly among the stock, trees chosen from the Large Maturing Deciduous Tree List at a planting density of 20 trees per acre, and a minimum size of two-inch caliper (2" cal.).

Trees, Shrubs, and Vines in BIORETENTION AREAS ONLY: In designing and executing the plantings for Bioretention Areas, the designer should consider the following:

- Employ a method of "random spacing", and a density of 1000 stems per acre. A maximum of 10% of the species shall be Small Maturing Deciduous Tree species, and 90% shall be Evergreen Tree, Deciduous Shrub, or Evergreen Shrub species, chosen from the list of approved species. As an alternative option, bioretention areas may have 10% Small Maturing Deciduous Trees, 70% Shrubs, and 20% Herbaceous Plants.
- A minimum of 3 Small Maturing Deciduous Tree species shall be selected for each planting area, and a minimum of 3 Evergreen Tree, Deciduous Shrub or Evergreen Shrub species shall be selected for each planting area.
- The use of 3 plants of the same genus does not constitute the minimum selection and should be avoided.

6.3.2 Site Preparation and Vegetation Management during Construction

Site preparation and vegetation management during construction are critical to the overall success of a well constructed BMP. Therefore, the following items should be considered by the designer and specified in construction plans and documents:

Existing Vegetation Management

A key factor to consider in the construction process is managing existing vegetation on site to avoid follow-on problems with invasive species or the needless damage/destruction of existing vegetation that can enhance or complement a BMP. Issues to consider are as follows:

- Where appropriate and cost effective, transplant individual specimen trees or shrubs that cannot be saved to a permanent location on site.
- Identify and protect significant populations of, and individual specimens of trees and shrubs. This will include incorporating vegetation protection measures into initial erosion and sediment control plans, or site protection plans.
- Hire a professional to locate invasive species listed in Appendix B and eradicate them prior to beginning site clearing, or other land disturbing operations. This will prevent the unneeded propagation of these plants within the BMP site.
- Never chip and redistribute chipped plant parts from clearing operations when invasive species are present, as they may re-infest the site through spreading of the mulch.

Soil Preparation

Preparation of soils is critical for successful establishment of vegetation within a BMP. Recommendations listed here will help ensure that the site is properly prepared for introduction of plant material:

- **Soil Testing**. Soil testing for existing soils and prepared soils to be used for planting is recommended in order to determine types of soil amendments required that will bring the soil within the correct ranges for optimum plant growth. The designer could test soils for:
    - pH,
    - major soil nutrients, including Nitrogen (N), Phosphorus (P) and Potassium (K).
    - organic content

  Soil testing is required for certain parameters for soil planting mixtures used in bioretention areas and enhanced grass swales in accordance with the table contained in section 4.1.4.H. If soils are amended, a second soil test is needed prior to planting. If imported soil is used a manufacturer certification is required.

- **Soil amendment.** Whenever possible, topsoil should be spread to a depth of eight to twelve inches (deeper for balled and burlaped trees) and lightly compacted to minimum thickness of six inches. This provides organic matter and important nutrients for the plant material. The use of topsoil allows vegetation to become established faster and roots to penetrate deeper. If topsoil has been stockpiled for a long period of time, it may be necessary to re-adjust the soil pH, and supplement major soil nutrients to achieve the minimum acceptable standards.

New Plant Procurement

All plants should be well grown and healthy, and free from disease and infestation by invasive species. All plants, whether supplied in nursery container, balled-in-burlap, small plant container or plug, shall conform to the specifications in The American Standards for Nursery Stock, ANSI Z60.1 - 2004, or latest edition. The document is available from the American Nursery and Landscape Association, for purchase of the hard copy, or for downloading (free) from their website at www.anla.org.

- **Seeding.** Seed mixes for stabilization are commercially available for a wide variety of terrestrial habitats, including basin bottoms, wet meadow, and dry meadow, to name several. Wetland mixes of seeds for herbaceous emergents, such as those plantings for planting in aquatic zones 1, 2 and 3, have met with very limited success as some species need a wintering period. It is preferable to confine the use of seed mixes to wet meadows, upland seeding, and other habitat areas above the permanent or temporary pools of most of the BMPs described in this manual. BMPs' which

incorporate extended dry detention are the exception to this rule, where Wetland Seed Mix – Appendix C for the basin bottoms may be appropriate.

- **Plugs and Container-Grown Plants.** In all zones, plugs and container grown plants are favored, and may be installed at the correct time of the season (see 6.3.4), however planting in the winter and early spring allows the greatest chances for establishment. Container-Grown Plants installed late in the spring may not have adequate time for establishment, and may be more likely to require replacement the following year. Plugs should be planted after the last Spring frost and prior to Fall.
- **Balled-in-Burlap Plants.** In Bioretention areas, and in Zones 4, 5, and 6 where appropriate, Balled-in-Burlap plants may be installed at the correct time of the season (see 6.3.4), however planting in the winter and early spring allows the greatest chances for establishment. Plants installed late in the spring may not have adequate time for establishment, and may be more likely to require replacement the following season.

New Plant Delivery, Handling and Storage

All plants should be fresh and healthy, and be delivered to the site with their rootstocks preserved in similar conditions to those in the growing nursery.

- Trees and shrubs should be left natural and unpruned prior to delivery. Bark, branches, and root systems should be protected from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage which destroys their natural shape. Protective covering for plants should be provided during shipping and delivery.
- Store bulbs, corms, tubers and rhizomes in conditions similar to those in the growing nursery, at approximately 60 to 65 °F, until planting.
- Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed, set plants in the appropriate exposure for each species (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist. Depending on the length of delay, plants may need to be heeled in.
- Do not remove container-grown stock from containers before time of planting, and water as often as necessary to maintain root systems in a moist condition.

Planting Procedures

Conform to all applicable specifications for plantings of trees and shrubs, as detailed in sections 40.01 through 40.14, inclusive, of the Charlotte-Mecklenburg Land Development Standards Manual (2006). Lay out all plants according to species mixes, and at specified spacings and densities. Herbaceous emergents, grasses and sedges for Zones 1, 2 and 3 are often best laid out at regular spacing in a recognizable pattern. Regular spacings are easier to evaluate and provide for more uniform and rapid coverage. Trees and shrubs in Zones 4, 5 and 6 should also be laid out according to the species mixes, and at the specified spacings and densities, but appear more natural when a “random” pattern of spacings are used, replicating a more natural pattern. Maintaining minimum and maximum distances between plants is necessary for adequate coverage. Please refer to Plant Spacing Guideline Diagram in Appendix D, for an explanation of triangular and square spacing layouts and for an explanation of layout for “random planting”.

Weed and Invasive Species Control

It is strongly advised that any invasive plant species populations be controlled throughout the course of the work. Where bare ground exists, and where mud flats exist in drawn-down wet planting zones, invasive species such as cattail, Japanese Hops, Porcelainberry, and other noxious weeds can easily gain a foothold, quickly displacing the desirable plantings, leading to a partial failure of the planting site. An integrated pest management (IPM) approach is recommended for control of invasive plant species. Monitoring for the presence of invasive species should be a component of all BMP establishment programs. Maintenance, including the removal of invasives can be critical to the success of the plantings and prevents the spread of those species downstream of the BMP. Some weeds may be removed with herbicides used with the “glove technique”.

6.3.3 Herbivore Control

Newly planted vegetation is susceptible to damage by local wildlife especially geese, muskrats, beavers, and deer. There are strategies that can be employed in order to ensure a successful establishment of vegetation. The following is a list of specific actions that can be taken to reduce damage:

Geese Control

- Access to plants from the shore is best controlled by placing a nylon twine fencing at the interface of open water and the planted areas. These "Goose Exclusion Fences", are currently recognized as one of the best ways to keep the geese from swimming into the newly vegetated area, and eating or destroying the new plants (even when geese do not find plants particularly palatable, they may pull them out). Fencing helps prevent the worst of the goose damage. It may be advisable to fence both sides of the planting shelf in Zones 2 and 3 for the BMP. Fences should be between 24 and 42 inches in height.
- To prevent shore line access from the water side it is recommended that the contractor place long strings of nylon twine, marked with flagging across open areas of water, to discourage geese flying in and out of the newly planted area.
- Geese are also known to avoid heavily vegetated areas that may hide predators (i.e. fox). Therefore, in areas geese are known to inhabit, a zone of heavy shoreline vegetation (as opposed to mowed grass lawn, for example) may discourage the geese from entering the newly planted areas of emergent vegetation and destroying the young, tender plants.
- Control of water levels within the BMP is another option for goose control. The approach reduces water levels so that aquatic benches are exposed during vegetation establishment phase while maintaining sufficient soil saturation for healthy plant growth. This approach takes advantage of the geese' preference for swimming, rather than walking, in its feeding area. The technical approach to this design feature is described in this chapter of the manual.

Deer Control

- In less developed areas, deer control may be required to reduce browse on newly planted vegetation. Protection of vegetation is typically attempted through the use of fencing. The preferred approach, where practical, includes the use of randomly placed 'zigzag' fencing through the planted site. However, it is important to remember that deer can clear a fence that is as high as 8 feet. Any deer control in which fencing is considered should be planned with this in mind. Deer may avoid twin, parallel fences which are less than 8 feet in height, and which are 4 or 5 feet apart. This option may be preferred in locations where a higher fence would be unsightly or impractical.
- Past approaches to deer control have included various chemical sprays, however, there is little evidence that chemical sprays deter deer browsing for long enough to get the plants established. Therefore, chemicals sprays are not recommended for use on BMP vegetation.
- There is some encouraging research to suggest that certain chemical deterrents (systemic) can be sown along with the trees and shrubs. These are taken up by the plant root systems, and which render the plants unpalatable to the browsing deer. The use of these types of chemical deterrents can be approved on a case-by-case basis by the PCCO Administrator.
- An alternative to fencing for deer control, is the use of tree shelters. Tree shelters are translucent plastic tubes, several feet in height and several inches in diameter. They can damage young trees and shrubs if left in place too long, but do provide a good measure of protection until the young plants have gained sufficient height to withstand deer browsing. Tree shelters cannot be used on certain tree types.

6.3.4 Other Landscaping Considerations

Mulching

Mulching for herbaceous emergents located in areas which will be permanently or regularly inundated is not desirable. The mulch can float away in the first rain event, potentially clogging BMP outlets, or smothering young plants. Trees and shrubs in bioretention areas, and in Zones 4, 5 and 6, will benefit from mulching, however, because it maintains adequate moisture in the root zones for plant

establishment, and keeps down competition from weedy species. Mulch will need to be replenished if it floats away.

Watering

Regardless of the plant zone, when plants do not receive at least an inch of water from rainfall each week, or when soils in which the herbaceous emergent plants are located is no longer in a saturated state, it will be necessary to water the plantings. This will differ according to the age of the plants. Once established, no watering is anticipated. Also, balled in burlap stock will need more water than one gallon or herbaceous stock. Potable water is preferable, unless the source of the water is known to be free of impurities and the salinities are suitable for the species being grown. City water from hydrants, or water trucks, or water pumped from safe sources are all potentially useful in keeping the plantings alive during the establishment period. A moisture meter installed and maintained by a landscape professional is strongly encouraged to determine watering needs as too much water can cause problems as well.

Planting Seasons

For planting seasons, conform to the following general guidelines:

- Seeding Grasses and Meadows: Fall Season
- Installing Plugs (Herbaceous Emergents) Spring, Summer
- Installing Container Grown Plants: Dormant Season
- Installing Balled-in-Burlap Plants Dormant Season

6.3.5 Importance of Using Native Plant Species

An invasive species is defined as an alien or non-native species, not under human control, whose introduction does or is likely to cause economic or environmental harm or harm to human health. An invasive species may have an unfair competitive advantage due to lack of natural controls (i.e.herbivores). Invasive weeds can harm the overall function and appearance of storm water BMPs when the invasive plants are able to out-compete native plants, remove the function of planted vegetation, and displace the associated animal communities.

For this chapter of the manual, a native plant species is defined as one that originates (or originated) or occurs (or occurred) naturally in a particular region, such as the Southeastern United States, or the Piedmont region of the eastern United States. The use of native plant species should always be specified for storm water BMP projects. The use of the plants listed in Appendix A will satisfy this requirement and preclude the accidental introduction of invasive plant species into an otherwise well-designed BMP. The importance of avoiding invasive species cannot be over-emphasized as the ultimate success of a BMP can be impacted by use of non-native plants

Invasive plants should be identified at the earliest stages of planning, and eradicated prior to site clearing and disturbance. Following planting, it is often necessary to control weeds and other invader plants to ensure the successful establishment of the desired vegetative communities.

A list of invasive plant species to avoid when preparing the designs for BMP projects, and to eradicate when possible during pre-construction and post construction maintenance, is included as Appendix B in this chapter.

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