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Chapter 27: Planting and Aesthetic Design

FDM 27-1-1 General

November 15, 2022

1.1 Originator

The Director of the Bureau of Highway Maintenance (BHM) is the originator of this chapter.

1.2 Objective

Science, technology, sound engineering, and landscape architecture must all be incorporated to create functional, economical, safe, environmentally compatible, and aesthetically pleasing transportation facilities. This chapter provides guidance about when and how to incorporate the principles of landscape architecture into the facilities development process.

1.3 Overview

WisDOT employs landscape architects and landscape architect consultants to address vegetation management and aesthetic concerns related to transportation facilities.

Landscape architecture is more than placing vegetation on the land for aesthetic or functional purposes. The American Society of Landscape Architects defines landscape architecture as the application of “artistic and scientific principles to the research, planning, design, and management of both the natural and built environments. Practitioners of this profession apply creative and technical skills and scientific, cultural, and political knowledge in the planned arrangement of natural and constructed elements on the land with a concern for the stewardship and conservation of natural, constructed and human resources. The resulting environments shall serve useful, aesthetic, safe, and enjoyable purposes.”

Chapter 443.01 (3r) of the Wisconsin Statutes further defines the role of this profession as the “. . . planning of a road, bridge or other structure with respect to the aesthetic requirements of the area on which it will be constructed.” WisDOT landscape architects make design recommendations regarding corridor selection, alignment, grading, and structure details. They also recommend mitigation measures for any negative impacts that construction may have on the landscape, and address vegetation preservation and restoration.

1.4 Management Strategies

WisDOT manages the highway landscape from planning to maintenance, through two interrelated strategies.

- Vegetation management deals with existing and planted vegetation on highway rights-of-way.
- Aesthetic design deals with visual quality or aesthetics. It provides a more pleasurable experience for the traveler, as well as for those who view the highway corridor from adjacent lands.

These strategies stem from philosophical bases WisDOT has adopted and are implemented in accordance with various federal and state laws involving the highway landscape (see FDM 27-1-15). The actual tools, techniques and policies related to landscape architectural design and the two strategies can be found in this manual and in the following documents.

Document	Source
Standard Specifications for Highway and Structure Construction Construction & Materials Manual	Landscape Architect Contact (LAC) in the Bureau of Highway Maintenance (BHM).
Highway Maintenance Manual Transportation Landscape Design Handbook	Landscape Architect Contact (LAC) in the Bureau of Highway Maintenance (BHM).

LIST OF ATTACHMENTS

Attachment 1.1 Glossary

FDM 27-1-5 Aesthetic Design

April 23, 1999

5.1 Philosophy

Aesthetic design principles are applied to land within and affected by transportation corridors. The goal is to integrate transportation facilities into their surroundings while preserving visual quality and protecting the environment. In an ideal transportation corridor, designers take advantage of opportunities to enhance the surroundings and mitigate negative impacts on those who use the highway and those who use adjacent lands.

Designers should consider both the view from and the view of the facility, respecting the contrast between highway scale and human scale. A quality design is appropriate to the site, its functions and environs, and contributes to motorist safety, comfort and enjoyment. To meet these goals, the principles of landscape architecture must be considered at the beginning of the development process.

5.2 Elements of Deign

The following elements of design are important to apply during landscape plan development:

5.2.1 Color

Color is a very powerful design tool and most people would identify it as having the greatest impact on aesthetics. It is very complex because it is related to light reflection, absorption, and superposition. Color affects feelings and distance perception. Red, for example, is perceived more quickly than other colors and therefore appears to advance. In contrast, blue, green and violet colors seem to recede. Color is related to texture, which affects how it is perceived. Color is also perceived differently under varying light conditions and may change as the sun advances throughout the day.

5.2.2 Texture

Texture is a surface characteristic of materials that varies from fine to coarse. The perception of texture differs depending on whether a surface is viewed alone or with other surfaces, such as leaves on a tree. Texture is tactile, affecting the sense of touch as well as sight. Much like color, texture also has the ability to alter depth perception. Coarse textures make objects appear closer than they really are; fine textures make objects appear farther away.

Texture has been called the “fourth dimension of color” because surface characteristics determine whether light is absorbed or reflected. Texture in design has the potential to improve the quality of what is built.

5.2.3 Form

Form is the bulk or volume of an object or a group of unified objects. A mass of closely spaced trees viewed from a distance appears as a long, low form, whereas individual trees have an entirely different form when seen in close proximity. Plantings must also be large in form to be noticeable to drivers moving at highway speeds. The larger the individual plant, the fewer plants are needed to produce a sufficiently large form.

5.2.4 Line

Line is a very important element in design. It can define the edges of forms or direct the eye to a distant point.

Plants in the landscape may be seen as either horizontal lines and vertical lines, depending on the viewing distance. From a distance of several hundred feet, a long row of tall, narrow-growing trees planted closely together on the right-of-way may appear as a mass forming a horizontal line. However, as the viewer approaches, the mass transforms into individual trees, appearing as a row of vertical lines.

5.2.5 Additional Design Elements

Scale - Scale refers to the size of humans relative to their environment, or objects in the environment relative to each other.

Movement - Movement incorporates highway distance and speed with scale. Spaces and distances are perceived differently depending on the speed of travel. A driver traveling at 10 mph will not experience distance and scale in the same way as a driver traveling at 60 mph.

Rhythm - Rhythm is created by elements that repeat at regular intervals. Evenly spaced street trees or fence posts in a field create different rhythms. Vertical lines heighten the sense of speed, so drivers may believe they

are traveling faster than they actually are. This concept is sometimes used to slow traffic down in critical areas.

Contrast - Contrast is a comparative measure of differences in color, texture, or form. Contrast also compares differences between elements and their environment.

Proportion - Proportion concerns the sizes or numbers of objects as related to each other. If elements are too far out of proportion with each other the visual effect is likely to be unbalanced.

Balance - Balance is related to objects or space in the landscape. It can be attained through the use of numbers of objects, proportions of objects, texture and perceived or physical weights of objects.

Variety - Variety in the landscape can increase driver alertness. It can be achieved by using diverse vegetation and varying road alignment. However, too much variety can be confusing or distracting for drivers, so moderation is best for maintaining balance in the landscape.

5.3 Design Considerations

Aesthetic design combines visual aspects of the highway such as corridor selection, alignment, terrain fit, right-of-way, erosion control, utilities, and clearing limits. It also incorporates the visual aspects of structures such as buildings, bridges, retaining walls, utilities, signs, planters, and site furniture.

5.3.1 Corridor Selection

The ideal transportation corridor balances:

- Transportation goals
- Public needs and desires
- Environmental impacts
- Terrain fit
- Project cost

Government regulations require that an Environmental Impact Statement (EIS) be filed for projects that will have a significant effect on the surrounding natural or cultural environment. When an EIS is required, predicted visual impacts on the environment must be explored and documented. This may occur in one of several formats, ranging from a general statement of predicted effects to a more rigorous process such as a Visual Impact Assessment. FDM 20-30 details which situations require an EIS.

5.3.2 Alignment

Transportation facility alignment is both an art and a science. The following factors are important to apply to corridor alignment:

- Terrain fit
- Driver safety
- Visual variety
    - Scenic views and visual resources
    - Adjacent land uses and user groups

Highway alignment must comply with the standards found in Chapter 11 of this manual, which regulates vertical and horizontal curves, independent roadways and terrain fit. Ideally, corridor alignment

- Follows existing topography
- Preserves scenic views, thereby enhancing visual resources
- Avoids environmentally sensitive areas
- Heightens driver awareness by providing visual and directional variety
- Enhances existing visual resources
- Blends into the local contexts of adjacent land uses and users

5.3.3 Terrain Fit

Transportation facilities should be integrated with topographic features in natural and built settings. Variations in terrain can enhance the corridor but they may pose challenges for designers. Designers should look for opportunities to use contours and cross sections to create interesting views and directional or elevation patterns. They also evaluate the potential for erosion and runoff problems in proposed project locations and develop solutions for those problems.

5.3.4 Context

If the selected corridor requires structures such as bridges, information centers or restroom facilities, these structures should be appropriate to the environmental context, whether urban or rural. They should be designed to be compatible visually and structurally with adjacent land use, and provide a unifying element in the project area

5.3.5 Right-of-Way

Right-of-Way aesthetic design issues include:

- Adjacent land uses
- Protection or enhancement of existing views
- Screening of unpleasant views
- Vegetation preservation

Designers should consider adjacent land use early in the design process. For example, if an apple orchard borders the right-of-way, landscape plantings should not include red cedar junipers or other species that act as the alternate host for the fungal disease cedar-apple rust.

Existing scenic views should be preserved and if possible, enhanced. Right-of-way plantings can be used to frame a scenic view or screen an unpleasant view. Retaining desirable existing vegetation preserves the integrity of the setting and saves the cost of re-vegetating later.

5.3.6 Erosion Control

Erosion control is a very significant consideration in grading and terrain fit issues. Practical solutions for drainage and runoff problems that are aesthetically pleasing, cost effective, and environmentally sound are vital to a project's success. Failure to properly address erosion or runoff problems can lead to severe and expensive problems in the future. See Chapter 10 for a detailed description of erosion control practices.

5.3.7 Utilities

Although utilities have crucial functions they can detract from the visual quality of transportation corridors. Designers should mitigate adverse visual impacts caused by existing utilities and plan for the long-term impact of new utilities (see Chapter 18). This may be accomplished by burying the utility or siting it in a location that is not so visible to the traveling public or screening the utility. Sometimes, negotiation with relevant utility companies may produce a mutually beneficial compromise.

5.3.8 Clearing Limits

Sufficient space must remain after clearing for grading activities such as rounding slopes for good drainage, erosion control and naturalized contouring which blends into the existing topography.

Desirable vegetation of good quality should be preserved where possible for aesthetic and functional reasons. Retaining these plants can help absorb extra runoff, provide wildlife habitat and prevent erosion. Clearing edges should be irregular for a natural appearance.

FDM 27-1-10 Vegetation Management *November 15, 2022*

Vegetation management is a series of activities that all promote the establishment and long-term viability of a plant community. These activities include but are not limited to:

- preservation of valuable existing vegetation,
- selecting and planting new vegetation,
- maintaining the vegetation (watering, fertilizing, pruning, etc.)

Roadside vegetation is an integral part of transportation systems. Since roadsides lie within the motorist's field of view, they should complement or enhance, not compete with, what lies beyond the edge of the right-of-way. Roadsides should also provide a smooth, gradual transition between the roadway and the environment beyond the right-of-way.

Vegetative cover on the roadside consists of living plants that require careful, regular, and well-timed management. Vegetation management plans are developed for new planting projects as part of the project design. Any important existing plantings or plant communities must be incorporated into these plans.

Planning and programming of landscape planting projects ensures that they are evenly distributed and prioritized throughout the state, so the right thing is done in the right place at the right time. Projects are

evaluated and prioritized based on the function of the proposed planting, but they are also designed to enhance the aesthetics of the highway. This requires cooperation between the Bureau of Highway Maintenance (BHM) landscape architects and the region staff.

Vegetation management programs compete with other programs for funding in the transportation budget. Limited budgets and priorities within the system determine the amount of funding allocated to vegetation-related design, construction and maintenance activities. Partly to defray costs, the WisDOT encourages partnerships with entities such as local municipalities or civic organizations to help in developing planting projects and providing long-term maintenance. Vegetation management dollars must be expended effectively to ensure that investments in new landscape plantings and vegetation management are protected.

10.1 Vegetation Management Mission

The Comprehensive Roadside Vegetation Management Plan Statement of Vision, Mission and Objectives states that the Vegetation Management mission is to utilize an integrated vegetation management system to foster sustainable, ecologically sound and visually pleasing roadside vegetation in a cost-effective manner.

10.2 Natural Roadsides Philosophy

"The most reliable natural indications of the . . . capabilities of a district are to be found in its native vegetation. The natural flora may be regarded as the result of nature's experiments in crop raising through the thousands of years that have elapsed since the region became covered with vegetation. If we set aside the inherent nature of the several plants, the native vegetation may be regarded as the natural correlation of the combined . . . influences of soil, climate, topography, drainage and underlying formations and their effect upon it. The native vegetation therefore merits a careful consideration, none the less so because it is rapidly disappearing and a record of it will be valuable historically."

T.C. Chamberlin (1877)

For over three decades highway landscape management has been guided by the Natural Roadsides philosophy. This philosophy recognizes advantages that native and (in some cases) naturalized species provide over non-native plants, as well as benefits provided by maintaining the topographical and geological character of the landscape.

WisDOT is committed to the Natural Roadsides philosophy and has adopted policies and procedures that encourage the preservation and regeneration of native plants and native plant communities. Policy 07-01-01 of the highway Maintenance Manual states that plant species planted along state highways shall be native to that area. Also, 23 CFR Part 752.11 (b) requires that at least .25% of funds expended on federally funded landscaping projects be used to plant native wildflowers (see FDM 27-25-15).

In keeping with these goals, some areas are intentionally left un-mowed, and native plants are normally used in landscape plantings. Landscape plantings are designed and installed to look as though they exist as a result of natural processes.

Native species are defined as those existing in the area prior to settlement, ca 1848. Naturalized species are those that are not native but have escaped cultivation or have been accidentally introduced to an area and adapted to the local environment, occurring abundantly in non-cultivated situations. WisDOT prefers to use native species, but when this is not possible, naturalized species may be an option. The variety of species present in natural roadsides offers a rich aesthetic landscape, full of forms, textures and colors enhanced by seasonal changes.

The Natural Roadsides concept also applies to the topography and geology of an area. Maintaining the visual character of an area is important in project design and can be accomplished through both preservation and mitigation.

Although the Natural Roadsides philosophy generally applies to all WisDOT vegetation management, it is understood that projects in an urban environment may require a more formal planting concept.

10.3 Benefits of Using Native Species

Native species require minimal maintenance. While they cannot be completely neglected, these species do not require intense management.

Native species reflect the natural vegetation of the surrounding environment. An example of a plant community adapted to the southern half of Wisconsin is the prairie. Prairie plants usually possess the following qualities:

- Drought tolerance due to their thick deep roots

- Erosion prevention particularly on poor, droughty soils
- The ability to compete well against invasive species
- The ability to provide wildlife habitat, such as nesting grounds for birds

The Natural Roadsides program also preserves rare and endangered native species and encourages their regeneration, thereby promoting ecological integrity and Wisconsin's natural heritage.

10.4 Strategies

The following strategies help WisDOT meet its vegetation management and aesthetic design implementation goals.

- All development and maintenance activities will comply with federal and state legislative mandates and will be consistent with WisDOT policies, procedures and directives.
- The Natural Roadsides philosophy will continue to be emphasized through management practices and facility designs that complement the natural environment.
- BHM Landscape Architect Contacts (LACs) and region staff will work cooperatively in planning and programming landscape planting projects.
- BHM LACs and region staff will work together in incorporating aesthetic design into improvement projects.
- A structured approach to the planning and programming of landscape planting projects will ensure that those projects are evenly distributed and prioritized throughout the state--in essence a "widely and wisely" approach. Factors that will be considered in this approach are:
    - Relative size of projects - Regions will be encouraged to use their allotted landscape planting spending authority on several small- to medium-sized projects rather than on projects which require large budgets. (Note: Size refers to the amount of dollars spent, not to amount of area covered by the project.)
    - Average Daily Traffic (ADT) volume - Projects on highways with higher ADTs will receive higher priority than those with lower ADTs.
    - Stand-alone vs. Incorporated projects - Planting projects can either stand alone or be incorporated into a larger highway construction project. Regions will be encouraged to develop stand-alone projects.
- Planting projects will be evaluated and prioritized based on the function of the proposed planting. Functions in order of priority are:
    1. Revegetation - Providing replacement plantings where existing plants were removed as the result of a highway construction project.
    2. Safety - Providing plantings which make the highway environment safer.
    3. Aesthetics - Providing plantings which reduce the negative impacts of the highway for the users of adjacent land.
- Plantings installed strictly for the purpose of improving aesthetics will be allowed only when funds for construction and long-term maintenance are provided exclusively from federal and/or local sources.
- Landscape planting projects will be designed to require minimal maintenance.
- Vegetation management plans will be developed as part of project design development and will be included as part of the end product along with the Plans, Specifications and Estimates (PS&E).
- Management plans will also be developed for important existing plantings or plant communities, such as prairie remnants or special seeding areas.
- Region Operations personnel will commit to funding the appropriate level of follow-up maintenance to plantings before the project is let.
- Partnerships or pilot projects with other entities such as local municipalities, civic organizations, private industry or other agencies will be encouraged in order to achieve common vegetation management goals.

FDM 27-1-15 Authority *April 23, 1999*

Numerous state and federal laws, rules and policies, support using the principles of landscape architecture in transportation facility development. Some of these are presented below.

To uphold these laws and policies, WisDOT incorporates landscape architectural design throughout the facilities development process, from inception to construction. The assumption that landscape architecture issues can be dealt with late in the design process only leads to expensive add-on solutions as well as missed opportunities to enhance the safety, pleasure and enjoyment of the traveling public.

Authority

- Wisconsin Statute 84.04 defines roadside improvement as "…the application of the principles of landscape architecture to highway planning, design, location and construction."
- Chapter 443.01 (3r) of the Wisconsin Statutes states that the role of landscape architects includes the "…planning of a road, bridge or other structure with respect to the aesthetic requirements of the area on which it will be constructed."
- The National Environmental Policy Act (NEPA) and the Wisconsin Environmental Policy Act (WEPA) both state that it is the government's responsibility "to use all practicable means to assure for all Americans safe, healthful, productive, and aesthetically pleasing surroundings."
- United States Code, Title 23, Section 109 (h) reads as follows: " . . . the Secretary . . . shall . . . promulgate guidelines designed to assure that possible adverse economic, social, and environmental effects relating to any proposed project on any Federal-aid system have been fully considered . . . taking into consideration . . . the costs of eliminating or minimizing such adverse effects and the following: . . . 2) destruction or disruption of . . . aesthetic values . . . "
- United States Code, Title 23, Section 319 calls for the ". . . acquisition of interests in and improvement of strips of land necessary for the restoration, preservation, and enhancement of scenic beauty adjacent to such highways."
- 23 CFR Part 752.11 (b) requires that at least .25% of funds expended on federally funded landscaping projects be used to plant native wildflowers.
- Section 752.2 (a) of 23 Code of Federal Regulations states that "highway aesthetics is a most important consideration in the Federal-aid highway program. Highways must not only blend with our natural, social and cultural environment, but also provide pleasure and satisfaction in their use."
- The purpose of Trans 280 is to ". . . establish uniform procedures for increasing the number of hardy and aesthetically pleasing trees planted on highway rights-of-way . . ." The goals of Trans 280 include the following: "(1) plant trees to enhance roadside aesthetics, maximize oxygen production and improve air quality. (2) Promote the ecological integrity of the state's natural heritage through the planting of native trees on state highway roadsides. (3) Tree planting should be consistent with a vegetation management plan to . . . (a) preserve and encourage the regeneration of native vegetation on roadsides." Trans 280 also calls for the identification and classification of vegetation and other roadside features for . . . "potential enhancements, including reforestation, aesthetic improvement opportunities, erosion control prevention and native vegetation opportunities." Finally, Trans 280 requires the Department to "develop roadside tree planting plans based on the principles of landscape architecture as applied to highway design in accordance with American Association of State Highway and Transportation Officials (AASHTO) guidelines, the Department's Facilities Development Manual, and Highway Maintenance Manual."

FDM 27-1-20 Organization Relationships

November 15, 2022

20.1 Background

The planning, programming, design, construction and maintenance of landscape plantings and aesthetic design work require cooperation between region personnel and Bureau of Highway Maintenance (BHM) landscape architects. Consultant landscape architects, either through the master contract process or standard contracting methods, may also assist in design and construction-related activities.

20.2 Landscape Architect Contacts (LACs)

Since landscape architecture is so specialized, and the landscape planting and aesthetics program should receive a statewide focus, the BHM LACs must be directly involved in various aspects of program development, design, construction and maintenance. Specifically, the BHM LACs will be responsible for:

- Developing, updating and interpreting policy, procedures and guidelines related to landscape planting and aesthetics.
- Monitoring compliance with policy, procedures and guidelines related to landscape planting and aesthetics.

- Providing guidance and assistance to regions and landscape architectural consultants.
- Providing training for issues related to landscape planting and aesthetics.
- Maintaining a list of pre-qualified landscape architectural consultants for region use.
- Selecting landscape architectural consultants for master contracts to be administered through the BHM.
- Aiding the regions in selecting landscape architectural consultants for design, construction and maintenance activities and rating their performance.
- Determining fiscal year landscape planting program budget limits.
- Determining, in conjunction with the regions, which projects will be considered for landscape planting, and establishing priorities through the Landscape Planting Project Selection Process.
- Determining, in conjunction with the regions, which improvement projects may benefit from an emphasis on aesthetic design (see FDM 27-1-5, and FDM 27-20-5).
- Aiding in the planting plan development process (see FDM 27-20-1).
- Monitoring landscape planting expenditures to ensure that spending is within established caps.
- Aiding the project construction phase by providing guidance and hands-on field expertise when necessary, such as reviewing staking of plant locations, inspecting plants and planting techniques, and monitoring plant care and survival during the plant establishment period (see CMM 10-14).
- Aiding in maintaining plantings by providing guidance and hands-on field expertise when necessary for activities such as pruning, mulching, watering, weeding and removing stakes, wires and rodent control devices.
- Monitoring compliance with maintenance plans.

20.3 Region Personnel

Region staff are responsible for:

- Following and enforcing policies, procedures and guidelines related to landscape planting and aesthetics.
- Selecting landscape architectural consultants for design, construction and maintenance activities and rating their performance.
- Determining, in conjunction with the BHM LACs, which projects will be considered for landscape planting and establishing priorities through the Landscape Planting Project Selection.
- Determining, in conjunction with the BHM LACs, which improvement projects may benefit from an emphasis on aesthetic design (see FDM 27-1-5, FDM 27-20-1 and FDM 27-20-5).
- Managing the planting plan development process (see FDM 27-20-1).
- Monitoring landscape planting expenditures to ensure that spending is within project limits.
- Administering planting plan construction projects.
- Implementing landscape maintenance plans.

20.4 Consultants/Master Contracts

Landscape architectural consultants can be contracted directly by the regions or through the BHM Master Contracts. Landscape architectural consultants can perform a variety of functions such as:

- Developing planting plans.
- Providing guidance on aesthetic design.
- Providing construction administration/supervision.
- Developing Visual Impact Assessments.
- Developing maintenance plans.
- Developing environmental mitigation designs.

The regions and the BHM should use landscape architecture master contracts for small, low-cost projects or projects that must begin on short notice.

Use the following process when employing a master contract landscape architectural consultant:

1. The region develops a scope of work and cost estimates and forwards them to the appropriate LAC for review. See FDM 27-1-1 for specific contacts for each region.

2. If the LAC determines that a master contract consultant is appropriate, the region will direct a master contract consultant to develop a draft work order.
3. The region will negotiate and approve the draft work order in accordance with FDM 8-20-1.
4. When the draft work order has been approved, the region directs the consultant to prepare the final version and send two signed originals and three copies to the region.
5. After receiving the signed work orders from the consultant, the region will review, sign, and keep one copy, and distribute the originals and remaining copies as follows:
    - original to the consultant
    - original to WisDOT Highways Central Files
    - copy to the Bureau of Financial Services Expenditure Accounting
    - copy to the LAC
6. When the work specified in the work order is completed, the region will close out the project and notify the LAC who, in turn, will notify the Landscape Development Program Manager.

A change in scope, time or payment is sometimes required. When this occurs, the following process is used:

1. The region or consultant (the entity requesting the change) prepares the proposed amendment which the region forwards to its LAC for review.
2. The region negotiates the final language of the proposed amendment.
3. The region directs the consultant to prepare the final version of the amendment and send two signed originals and three copies to the region.
4. After receiving the signed amendments, the region will review, sign, and keep one copy, sending the originals and copies as per #5 above:

Master contracts may also be used by various other sections within the department that may need the services of a landscape architect. In such a case, these sections would follow the two processes as outlined above, taking on the region's usual responsibilities. The appropriate LAC for the project should be contacted.

Glossary

AASHTO	American Association of State Highway and Transportation Officials.
aesthetic planting	Plantings that enhance the visual quality of the corridor.
allelopathic	Capable of secreting a toxin from the roots into the surrounding soil which impedes growth of other plants. Examples of allelopathic plants are black walnut, Canada thistle, leafy spurge, and spotted knapweed.
ASLA	American Society of Landscape Architects. The purpose of the Society shall be the advancement of knowledge, education, and skill in the art and science of landscape architecture as an instrument of service in the public welfare.
average daily traffic volume	The total traffic volume during a given period of time, expressed in full days, where the time period being measured is greater than one day and less than one year, divided by the number of days in the period.
clear zone	The area immediately bordering the roadway beginning at the outer edge of the pavement. The purpose of the clear zone is to provide an area free of obstructions where errant vehicles may safely come to a stop (see FDM 11-15-1 of this manual).
CDR	The Concept Definition Report
cultural features	Typical cultural features include: villages, towns or cities, commercial facilities, industrial facilities, residential buildings, agricultural buildings, institutional buildings, agricultural buildings, community buildings, exercise or sports facilities, local, state, national or recreational parks, historic or archeological features, billboards, signs, bridges, dams, docks or piers, salvage yards, landfills, cemeteries, utilities, fences, walls, airports, railroads, recreational paths, parking areas or structures and roadside sites.
delineate alignment	The use of vegetation to show a road's direction even though the actual roadway cannot be seen. This technique is useful where the roadway disappears from a driver's line of sight (around a curve or near the crest of a hill).
design speed	The maximum safe speed that drivers can maintain over a particular stretch of roadway when weather and other conditions are favorable for driving.
estimate	A list of bid items, quantities and anticipated unit prices. See FDM 19-5-1.
Facilities Development Process	The process of designing and constructing transportation facilities.
Forbs	Broadleaf (non-grasslike) herbaceous plants. The DOT primarily uses this term to refer to wildflowers.
functional planting	Plantings that have a specific purpose, such as blocking headlight glare or defining the end of a road. These plantings are designed to be aesthetically pleasing as well as functional.

highway alignment The actual path followed by the highway through the landscape.

highway corridor A broad strip of land that is evaluated for transportation purposes.

impact attenuation Providing a cushion or barrier to slow or stop errant vehicles before they crash into a permanent structure.

integrated roadside vegetation management A decision-making and quality management process for maintaining roadside vegetation that integrates the following:

- needs of local communities and highway users
- knowledge of plant ecology (and natural processes)
- design, construction, and maintenance considerations
- monitoring and evaluation procedures
- government statutes and regulations
- technology

with cultural, biological, mechanical, and chemical pest control methods to economically manage roadsides for safety plus environmental and visual quality. (National Roadside Vegetation Management Association)

invasive weeds Plants that invade an area and out-compete more desirable plants, eliminating them from the species mix. As defined by the ASLA, invasive plants are often allelopathic. Examples of invasive plants are garlic mustard, phragmites, spotted knapweed and tansy. Wisconsin Administrative Code, Department of Natural Resources, Chapter NR 40, Invasive Species Identification, Classification and Control defines “Invasive species” as having the meaning given it in s. 23.22 (1) (c), Stats.

key features Key features consist of landforms, water, vegetation or cultural features of visual importance.

key views Significant views of panoramic scenes. These may be visually pleasing or displeasing views from locations along the roadway or of the roadway from adjacent lands.

LAC Landscape Architect Contact. The landscape architect in the Bureau of Highway Operations (BHO) who has the liaison responsibility for the specific district.

landforms Landforms in Wisconsin include: steep hills or ridges, rolling hills, plains or flatland, valleys or basins, cliffs or bluffs, beaches, ravines and rock outcrops.

landscape architecture The application of “artistic and scientific principles to the research, planning, design and management of both the natural and built environments.

Landscape features Landscape features fall into four categories: landforms, water, vegetation and cultural features.

maintenance commitment	Willingness to expend the funds and dedicate the time necessary to maintain roadside vegetation.
match lines	Lines put on a plan that indicate where the actual plan stops on one sheet and continues on the next sheet.
mitigate	To provide landscape elements that make an unacceptable part of the highway environment acceptable to the user.
mitigation methods	Methods of moderating adverse effects on the landscape. There are many mitigation techniques. These techniques include but are not limited to minimizing the clearing of vegetation along the right-of-way, grading interchange areas to produce natural-appearing contours, screening unpleasant views, installing vegetation to soften construction lines or structures, etc.
multi-lane highway	A highway having two or more lanes serving each direction of travel. Travel directions may be separated by a paved or vegetated median.
native species	Species existing in an area prior to settlement, ca 1848. Cultivars (named cultivated varieties generally propagated vegetatively) of native species will normally be considered native for roadside planting purposes.
naturalized species	Species that are not native but have escaped cultivation or been accidentally introduced to an area and adapted to the local environment where they occur abundantly in non-cultivated situations. Some may be considered noxious or non-noxious weeds.
natural regeneration	The re-establishment of vegetation in a disturbed area through natural processes such as self-seeding of existing plants or the growth of root stock remaining in the soil. Disturbance must be prevented in the future to ensure long-term success of the plant community.
natural roadsides	Roadsides where the landscape has been preserved or restored such that the topography, geology, hydrology and vegetation appear to have been produced by nature, blending into the character of the surrounding landscape. This is achieved by preservation, natural regeneration or revegetation.
neighbors	Those outside the highway right-of-way who are affected by the highway. They may occupy adjacent land, be located where the highway is within their viewshed, be affected by noise from highway traffic, etc.
non-native species	Species and cultivars of species that did not exist in an area prior to settlement, ca 1848.
noxious weeds	Plants which are declared by state statute Wisconsin Legislature: 66.0407 to be noxious weeds are Canada thistle, leafy spurge and field bindweed. They may not be propagated or sold in the state and existing plants are required to be destroyed.
nuisance weeds	Plants which are declared by state statute to nuisance weeds are purple loosestrife and multiflora rose. They may not be propagated or sold in the state but are not required to be destroyed.
plant establishment period (PEP)	The time following installation of plants during which the contractor is responsible for performing the necessary maintenance to keep the plants in a healthy, viable condition.
prairie	An open area, dominated by grasses and forbs with less than one mature tree per acre.
preservation	Various processes used to maintain plants or plant communities in an existing condition.
P. S. & E.	Plans, Specifications and Estimates. This is the final product, consisting of the plans, an estimate, special provisions, and necessary exhibits.
regeneration	See Natural Regeneration

Remnant	An intact (or fairly undisturbed) plant community that was present before settlement. In Wisconsin, the term is usually applied to undisturbed prairie or savannah communities.
restoration	Re-introducing native plants or plant communities by artificial processes (such as seeding or planting) into an area where they once existed.
revegetation	Introducing plants or seeds of native or non-native species into areas disturbed by construction.
roadside	The area between the outside edges of the shoulders and the right-of-way boundaries, unpaved median areas between inside shoulders of divided highways and areas within interchanges.
roadside sites	Developed areas within the highway right-of-way, such as rest areas and waysides, that offer travelers a place to rest and be refreshed.
roadside vegetation	Trees, shrubs, vines, forbs and grasses (both desirable and undesirable) growing in the highway right-of-way.
rural highway	A highway traversing a rural area featuring agricultural, open or forested areas with minimal residential, commercial or industrial development.
savanna	A grassland characterized by scattered trees, having more than one tree per acre but less than 50% total tree canopy.
scenic highway	A highway located such that travelers are exposed to scenic views and/or pleasurable experiences.
scoping	A communications process that investigates major issues and options.
six-year highway improvement program	A WisDOT program published every two years that lists upcoming WisDOT state highway projects (improvements or new construction) over the next six years.
slope aspect	The direction towards which the slope faces.
special details	Construction details which are unique to the project and for which no standard details exist.
special plantings	Plantings (trees, shrubs, vines, herbaceous plants and special seeding) installed by a contractor or by county forces. Seeding for erosion control is not included.
Special provisions	See FDM 19-15-1.
Statewide Landscape Planting Spending Authority	The annual maximum limit that may be spent on landscape planting. This limit applies only to projects using State Transportation Funds.
Stationing	See FDM 15-1-1 and FDM 15-1-35.
reference lines	See FDM 9-50-1, FDM 9-50-5 and FDM 11-10-5.
transitional highway	A highway traversing a moderately developed area between a rural area and an urban area.
transportation facility	Any of four key elements: highways, railroads, airways and waterways.
urban highway	A highway traversing an urban area, which may be a city, town, community or other highly developed, heavily populated concentration of residences, commerce and industry.

user groups	Recreational travelers, commuters, haulers or other groups of people using the highway right-of-way.
vegetation management	Activities affecting the quality and quantity of roadside vegetation, from the initial design through long-term maintenance.
viewer awareness	The level of attention the viewer is paying to the landscape. It can be affected by internal factors and external factors.
viewer groups	Viewer groups are those who use the roadway. They consist of neighbors, who are local (such as residential, commercial, industrial, agricultural, recreational and civic subgroups) or who are travelers in the area (commuting, hauling, touring or exercising subgroups).
viewer sensitivity	The interaction between viewers and the landscape they see. Viewer sensitivity is affected by a number of factors, both internal and external. Internal factors include the viewer's values, the activity they are involved in when they see the landscape, and their level of awareness when they see the landscape (e.g. are they distracted or focused, etc.). External values include the volume of traffic, the roadway use type (e.g. commuter or scenic route), the roadway design speed, and the roadway designer's perception of viewer sensitivity for a specific roadway.
viewer sensitivity levels	A subjective measure of viewer sensitivity local management contacts who know the population in question can determine viewer sensitivity. Levels for a particular stretch of roadway by using the viewer sensitivity categories above.
viewshed	The surface visible from the roadway out to surrounding lands and of the roadway from adjacent lands.
vision triangle	A triangular area located at at-grade intersections which must remain free of visual obstructions so drivers can see approaching traffic.
visual character	The visual character of an area is created by the blend of landscape features present on the site. See 'landscape features'.
visual environment	Usually determined by the viewshed of the facility (see 'viewshed').
visual impact	The positive or negative visual effect that the roadway will (or does) have upon the surrounding natural and built environment. The extent of the projected affects can be calculated by examining the average daily traffic volume of the area, the design speed, the facility use type, the types and sizes of user groups and the peak season/time of day use of the facility. Projected changes in the visual character and visual quality of the area should be a major focus when gauging what the effects will be.
visual impact assessment	A process whereby the projected effects of a new highway corridor upon the surrounding landscape are assessed, a project alternative is chosen, and mitigation methods are implemented.
visual quality	The overall impression (positive or negative) that is retained after viewing a landscape.
visual quality rating system	The VQRS establishes a system whereby visual quality levels are quantified so trained assessors can evaluate landscapes for visual quality. The baseline measurement of a landscape can then be used to determine the degree to which a new or expanded roadway could visually impact the area.
visual resources	Views of hills, lakes, forests, cliffs, valleys, cultural features, etc.
visually sensitive resource	Any object with a pleasing view that could lose its aesthetic qualities by the introduction of man-made features into its surroundings. This quality applies to either the view of the object or the view from the object. Examples are lakes, forests, hills, etc.

volunteer plants Plants growing in an area as a result of natural processes such as wind-blown, water-borne or animal-transported seeds.

weeds Plants growing where they are not wanted.

FDM 27-10-1 General

December 30, 2002

1.1 Visual Analysis Legal Mandates

Over 20 years ago a cooperative agreement between the Wisconsin Department of Transportation (WisDOT) and the Wisconsin Department of Natural Resources (DNR) was initiated with the goal of minimizing the environmental impacts of WisDOT transportation projects. Protecting Wisconsin's land, water and wildlife while still providing the public with a safe, cost-effective and aesthetically pleasing transportation system is part of the WisDOT mission.

Section 30.455 (2) (b) of the 1989 Wisconsin Act 31 states that "To the extent it is economically and technically feasible, WisDOT shall minimize the visual impact of the activity and any resulting highway or structure."

The term 'activity' in this case refers to highway construction, repair, maintenance, operation or modification. WisDOT is required to prepare an Environmental Impact Statement (EIS) for major projects that will have a significant effect on the environment. The EIS must address the project's effects on visual quality. This discussion may range from a statement of 'no impact' to a detailed study of predicted visual impacts. One method of exploring and documenting predicted visual and environmental effects is to prepare a Visual Impact Assessment (VIA).

1.2 When to Consider Conducting A VIA

A Visual Impact Assessment (VIA) will be conducted when there are potentially significant adverse visual impacts. To anticipate when a VIA should be considered, the following guidance is provided. Conduct a VIA if any one, or any combination, of the following elements are present on or within view of your project.

The road:

1. affects important cultural features (note: important may be defined by other agencies or the people of that area)
2. affects important natural or physical features (note: important may be defined by other agencies or the people of that area). Natural or physical features may include, but are not limited to
   - landforms (cliffs/bluffs, rock outcrops, steep hills/ ridges, rolling hills, ravines, valleys/ basins, plains/ flatlands, beaches etc.)
   - water (bays/inlets, lakes/ponds, rivers/streams, wetlands, waterfalls/rapids, etc.)
   - vegetation type (plantation, orchard, pasture, cropland, prairie remnant, coniferous forest, deciduous forest, etc.)
3. is a National or State Scenic Byway
4. is part of the Coastal Zone Management areas of Lake Michigan/ Lake Superior
5. is part of a Main Street Program
6. intersects with a Rustic Road
7. is located within the lower Wisconsin River Way
8. is in an area dependent on tourism
9. affects scenic waysides or overlooks
10. travels by a significant historical building
11. is within or crosses a significant historic district.

This is not an all-inclusive list.

The WisDOT landscape architects listed below are available to help determine whether a VIA is needed.

All VIAs will be conducted by consultants who have training and are WisDOT approved. For a copy of the VIA Approved Consultant list contact WisDOT.

1.3 General

The construction of transportation facilities always has some effect on the visual quality of an area. Effects range from negative to positive, and from major to minor in scale. It is WisDOT's goal to minimize disturbance to the landscape when transportation corridors are selected, and to mitigate any negative effects on the landscape.

The VIA allows designers to anticipate how a proposed project will visually affect the landscape (both favorably and adversely) and guides the design process from inception to completion. The VIA provides:

- Information that can be useful for selecting project alternatives (corridors, alignments, etc.).
- Information that provides direction for more detailed design work.
- A documentation process to ensure that aesthetics are considered during project construction.
- A documentation process to ensure that scheduled maintenance procedures will support aesthetic mitigation efforts and enhancement measures on a long-term basis.
- A performance measure for evaluating the long-term success of aesthetic components in projects.

Visual factors are important to transportation facility projects in two ways:

1. The view from the facility
2. The view of the facility

The VIA process can improve the view both from the facility and of the facility. Designers use the VIA process to minimize negative effects on the physical landscape and preserve visual resources.

The visual landscape must be assessed early in the Facilities Development Process. The initial steps of the VIA produce recommendations regarding the aesthetic quality of project alternatives.

Once the preferred alternative has been selected, the VIA recommends detailed mitigation measures to minimize negative effects at the project site.

The following is an outline of the Visual Impact Assessment process:

1.4 Inventory

- Identify and briefly describe the landscape.
- Identify and briefly describe existing key views and features.
- Identify and briefly describe the viewer groups and the relative size of each group.

1.5 Evaluation

- Assess the visual quality of the landscape.

1.6 Analysis

- Determine how the project would affect the visual quality of the existing and proposed landscapes.
- Determine how and to what degree the project would affect the viewer groups.

1.7 Identify General Mitigation Methods

- Identify general design solutions for avoiding, minimizing or mitigating adverse effects for each alternative.
- Identify general design solutions for creating, including and enhancing positive effects for each alternative.

1.8 Recommend the Most Effective Aesthetic Treatment for Each Alternative

- Recommend general design options based on the overall visual impacts for each alternative and the degree to which negative effects can be mitigated.

1.9 Recommend Detailed Mitigation Method for The Selected Alternative

- Provide detailed design solutions for avoiding, minimizing or mitigating adverse visual effects for the selected alternative.
- Provide detailed design solutions for creating, including and enhancing favorable visual effects for the selected alternative.

FDM 27-10-5 Inventory

December 30, 2002

5.1 General

The inventory provides a baseline list of aesthetic components that exist on the site. This baseline is used to

predict project effects on the visual environment, visual resources, and different viewer groups. The Visual Impact Assessment (VIA) provides designers with the tools needed to evaluate the extent of the visual changes arising from proposed design alternatives.

The visual environment is typically determined by the viewshed of the facility, defined as the surface visible from the facility and of the facility from adjacent lands. The viewshed is composed of landscape units and subunits that are homogenous in vegetation, or landform, cultural features or water cover. If the project area is large or diverse in vegetation or landforms, it may be desirable to divide it into smaller landscape units to map the visual character of the site.

The inventory should convey the visual character of the landscape, note visually sensitive resources, catalog key views and key features and list the composition and sizes of viewer groups.

5.2 Visual Character

The visual character of an area is created by its composition of landscape features. Landscape features are divided into four feature types:

1. Landforms: Visual character information should include predominant landforms. Typical landform features in Wisconsin include:
    - Steep hills or ridges
    - Rolling hills
    - Plains or flatland
    - Valleys or basins
    - Cliffs or bluffs
    - Beaches
    - Ravines
    - Rock outcrops
2. Water: Water features located within the project area should be inventoried, along with the type and degree of any recreational uses the water bodies may have. Water features in Wisconsin include:
    - Bays and inlets
    - Rivers and streams
    - Lakes and ponds
    - Wetlands
    - Waterfalls and rapids
3. Vegetation: Record the type and relative magnitude of vegetative cover, noting predominant types. These categorizations (such as ‘heavily forested’) will be relative measures that are specific to the site and not intended to be compared with measures from other sites. Wisconsin vegetation categories include:
    - Coniferous forests
    - Hardwood forests
    - Plantations (such as pine plantations)
    - Orchards
    - Pasture
    - Old field
    - Cropland
    - Prairie remnants or native seeded areas
    - Green space
    - Gardens
4. Cultural features: Catalog the type and magnitude of cultural features. Note the predominant types and data relating to predicted or future uses. Typical cultural features include:
    - Villages/towns/cities
    - Commercial facilities
    - Industrial (factory/plant) facilities

- Institutional (school/hospital/) facilities
- Residential buildings
- Agricultural buildings
- Local/state/national parks
- Historic/Archeological features
- Billboards
- Signs
- Bridges
- Dams
- Docks/piers
- Salvage yards
- Landfills
- Cemeteries
- Utilities
- Fences
- Walls
- Airports
- Railroads
- Recreational paths
- Roadside sites (such as waysides and rest areas)

5.2.1 Documentation

Use field surveys and map analyses to describe the visual character of the landscape. Documentation methods include:

- Inventories listing the features.
- Text describing the features.
- Maps illustrating feature locations.
- Photographs identifying features and their settings.

5.3 Visually Sensitive Resources

Visual resources (such as views of hills, lakes, forests, etc.) are classified according to predicted viewer sensitivity levels. Viewer sensitivity levels are determined by the interaction between viewers and the landscape they see. Viewer sensitivity is affected by a number of factors, both internal (values related to the viewer) and external (related to the viewed resource).

Internal factors include:

- Activity
- Awareness
- Values

If viewers are experiencing a scenic drive in light traffic (no congestion) versus a heavy traffic jam, they will be more likely to pay attention to the landscape beyond the roadside. Viewer awareness ties in with activity, but it also can be heightened by changes in the landscape. The transition from urban to rural settings or from rocky bluffs to wooded areas heightens viewer awareness since change captures attention more than uniformity. In contrast, a monotonous landscape can be visually ‘tuned out’ after long exposure. Values and preferences also affect viewer sensitivity. Objects or views with cultural significance due to their history are highly regarded by the local public and therefore considered visually sensitive. Projects which diminish those resources are not likely to be well-received by locals. Project designers must identify which viewer groups will be most affected by the new facilities, and tailor their designs accordingly. Sensitivity level classifications should be determined by local management contacts who know the affected population, although non-local users should be considered as well.

External factors affecting viewer sensitivity include:

- Volume of traffic
- Type of use

- Design speed
- Designer's perception of viewer sensitivity

If the volume of traffic is high, but still uncongested, more users will see the area. Therefore, it may be classified as a highly sensitive visual resource. If the area is classified as a scenic route, it is also considered highly sensitive. If the design speed is low, viewers have more time to observe the landscape, therefore it is considered more sensitive than a landscape with a higher design speed. Finally, the degree to which designers perceive the user population to be sensitive to a particular view may affect the sensitivity level they assign to that view, and the treatment that the area receives.

5.4 Key Views

Key views are important views of panoramic scenes. They encompass pleasing or displeasing views from locations along the facility as well as views of the facility from adjacent lands. Documentation includes:

- Inventories listing key views.
- Text describing key views.
- Maps illustrating the location of key views.
- Photographs identifying key views and their settings.

5.5 Key Features

Key features are landform, water, vegetation or cultural features of visual importance. They may be visually pleasing or displeasing and can be seen from various locations along the facility as well as from neighboring properties. Documentation methods for key features are the same as for key views above.

5.6 Viewer Groups

To understand and predict the visual effects of a proposed project, the opinions of viewer groups who will see the altered landscape must be ascertained. Viewers consist of two major groups:

- Neighbors: Neighbors may be divided into residential, commercial, industrial, agricultural, recreational, and civic subgroups.
- Travelers: Travelers may be divided into commuting, hauling, touring, and exercising (joggers, bicyclists, etc.) subgroups.

Population and traffic statistics, as well as field surveys, should be used to compile descriptive inventories and maps of these subgroups. This information need not be identified numerically but could be identified by relative, site-specific quantifiers such as low, medium, high, etc. This is the same concept previously addressed in the section on estimating vegetative cover.

As an example, a rural community's subgroups might be described using the following quantifiers:

- Low = 1-100 viewers
- Medium = 100-1000 viewers
- High = Greater than 1000 viewers

Continuing the example, if the population of viewers in the rural community is found to have 50-80 commuters, the VIA inventory could describe the population as having a low proportion of commuters. In a major urban center, the numbers of viewers in the low, medium, and high categories would be much greater.

LIST OF ATTACHMENTS

Attachment 5.1 Sample Inventory

FDM 27-10-10 Evaluation

December 30, 2002

10.1 Visual Quality and Evaluation of Landscapes

Visual quality is measured by the overall impression, either positive or negative, retained during and after viewing an area. The evaluation step determines the visual quality of the landscape that a proposed project may affect. The visual quality of the existing landscape serves as the basis for determining what those impacts will be and how they can be mitigated.

10.2 The Visual Quality Rating System (VQRS)

Visual quality is a subjective issue; there is no exact science for assessing the visual quality of a particular landscape or view. The recommended technique to use for assessing the general landscape is the Visual

Quality Rating System (VQRS). The VQRS establishes a visual quality level classification system for a landscape. Persons who use the VQRS will have received WisDOT training in classifying and rating the features of landscapes so that the system will be more objective.

A landscape is composed of some combination of one or more of the four feature types: water, landforms, vegetation and cultural features. Each feature type can be further divided into actual features: bluffs, lakes, agricultural crops, industrial complexes, etc.--see FDM 27-10-5. These are more easily rated for visual quality than an entire landscape.

The VQRS allows trained assessors to systematically rate features based on how visually pleasing or displeasing they are. The assessor makes an educated personal or team decision when assigning a visual value to the features. These values are chosen from a pre-set numerical scale (see Attachment 10.1, the VQRS Rating/Inventory Sheet). The rating assigned by the assessor is multiplied by the frequency of occurrence of the feature in a particular landscape. The more often a feature appears, the more of an impression it makes--whether positive or negative. The ratings for each particular feature type are averaged. Then, these averaged scores are added together, resulting in a Visual Quality Rating (VQR) for the entire landscape. The VQR is used to assign a high, medium, low, or adverse scenic quality classification to the landscape.

This system was developed based on the range of features and scenic quality throughout Wisconsin, and may not be appropriate for locations with landform, water, vegetation and cultural features that vary greatly from this state. The actual applications of this classification will be explained in the analysis and mitigation steps.

LIST OF ATTACHMENTS

Attachment 10.1 Sample Visual Quality Ratings/Inventory Sheet

FDM 27-10-15 Analysis

December 30, 2002

15.1 General

The analysis step brings together information gathered in the Inventory and Evaluation steps and uses it to produce a set of project alternatives. The analysis should determine:

- How the project will affect the existing and proposed landscapes (negative and positive effects)
- How and to what degree viewer groups will be affected

15.2 Effects

Designers should generate a list of predicted negative and positive effects on potential corridor sites and the extent to which existing conditions will be affected. The list is used to create workable site alternatives from which a selection can be made. Designers should address the following site features (and effects upon them):

- Key views
- Vegetation
- Landforms (topography)
- Water bodies
- Cultural features
- Transportation facility use (commuter route, scenic route, etc.)
- Adjacent land uses

If the project is initiated to modify an existing transportation facility, it may be useful to examine the following statistics to help determine the extent of various impacts for each project. Most of these statistics are also examined in producing a new facility.

- Average Daily Traffic volume—existing and future (ADT)
- Design speed (how long users have to experience different views)
- Existing facility usage (scenic route, commuter route, etc.)
- User groups (commuters, tourists, haulers, residents, etc.)
- Peak season usage (spring, summer, autumn or winter)

The analysis should focus on predicted changes in the visual character and visual quality of the site, particularly in reference to views from and views of the transportation facility. Designers should evaluate the existing visual character and visual quality of the site (see FDM 27-10-5 and FDM 27-10-10) as well as the predicted impacts on the visual quality and visual character.

Attachment 15.1, an example from the Visual Impact Assessment (VIA) for State Trunk Highway 57 (WisDOT, 1996, p. 11-12, and 23-24), illustrates this process for Corridor Alternative B.

15.3 Viewer Groups

Viewer groups consist of persons who have views from or of the transportation facility. They are usually classified into two major groups: neighbors and travelers. These groups are further divided into sub-groups, based on their activities. Classifications may overlap when people switch from one activity to another. The number of people affected by the project can be calculated by examining population and traffic statistics. In this way, the relative size of each viewer group can be estimated (see FDM 27-10-5).

15.3.1 Neighbors

Neighbors may be:

1. Residential
2. Rural
3. Retail
4. Commercial
5. Industrial
6. Recreational
7. Civic

Each of these sub-groups perceives transportation facilities as being either compatible or incompatible with the local cultural and natural visual resources. Their perception of visual quality is tied to their values and beliefs, their self-interest and learned preferences. If the new facility is to meet local expectations and gain community support, designers must consider the preferences of the affected community during the design process. The following list of neighbors includes some common preferences which may be helpful in understanding their attitudes and motivations.

1. **Residential** neighbors see the highway from their residences. They tend to favor existing natural and cultural features greatly and are often resistant to the development of new transportation facilities, even if they are greatly needed.
2. **Rural** neighbors are primarily farmers (who are both residential and commercial neighbors) or rural residents. They usually value natural features highly, and cultural features and transportation facilities less.
3. **Retail** neighbors consist of business owners and employees who serve community residents and tourists. Generally, they prefer cultural features and highway facilities more than the natural environment because highway facilities provide access to their businesses.
4. **Commercial** neighbors include people who work in offices, warehouses, factories, farms, etc. who do not retail goods or services directly to the public. They commonly favor cultural features and transportation facilities over than natural features.
5. **Industrial** neighbors consist of people who create and market products to be sold outside the local community. Typically, they have the same preferences as retail and commercial neighbors.
6. **Recreational** neighbors are generally visitors to the area, (such as boaters or hikers) although they may also be members of the local community. They tend to favor natural and cultural features much more than transportation facilities. The roadway may be viewed negatively, as an intrusion on their activities.
7. **Civic** neighbors work in or use public facilities such as schools, libraries, city offices, or other government workplaces. They usually prefer cultural features the most. Buildings they work in or use may be local landmarks that reflect the community's identity. Natural features are valued as a setting for the community's cultural resources. If the highway environment enhances and is well integrated with cultural and natural resources, it is likely to receive the support of civic neighbors.

15.3.2 Travelers

Travelers may be:

1. Commuters

2. Haulers
3. Tourists
4. Exercisers

Travelers' perceptions of the visual and highway environments vary with their travel activities, but all favor a safe, well-designed highway environment. Travelers may be commuters, haulers, tourists or exercisers:

1. **Commuters** prefer the highway over natural and cultural features. Highways should provide safe, clearly marked, rapid routes to their destination and integrate well with cultural resources that commuters use as landmarks to mark progress toward their destination.
2. **Haulers** are comparable to commuters in their use of the highway and are often placed in the same category as commuters for VIA purposes.
3. **Tourists** travel to experience the unique aspects of different communities and tend to prefer local natural and cultural resources highly. However, they also use the highway for views of interesting landscapes and cultural resources. A particular route may be chosen for travel if it contains scenic overlooks and turnouts. The highway is viewed as part of the journey, and if the facility is well designed and integrated with the local character of the community, it can enhance tourists' experiences.
4. **Exercisers** include joggers, bikers, rollerbladers, and people who are walking dogs or pushing strollers. This group values natural and cultural resources, but also a smooth well-lighted clear pathway. This group generally prefers pathways that do not border heavily traveled roads.

Estimating the composition and size of the different viewer groups can give the designer an idea as to whether the planned transportation facility will be received positively or negatively. Viewer group data is valuable both for design and presentation purposes when working with the local community.

LIST OF ATTACHMENTS

Attachment 15.1 Sample Visual Impact Assessment

FDM 27-10-20 Identify General Mitigation Methods *December 30, 2002*

The fourth step in the Visual Impact Assessment (VIA) process identifies general mitigation techniques for each of the various alternatives. Mitigation is defined as the act of moderating or making less severe. This step addresses the major effects on visual quality that each alternative could cause and identifies any favorable views or features that could be preserved or enhanced. General design solutions should avoid, minimize, or compensate for adverse effects and preserve or enhance existing desirable conditions.

- Avoiding adverse effects or preserving desirable existing conditions is the best solution. For example, an existing stand of trees could be preserved in order to screen an unsightly salvage yard.
- Minimizing adverse effects or undesirable existing conditions involves design methods, which lessen those impacts or conditions. This can be as simple as minimizing the clearing of vegetation in the right-of-way.
- Compensating for adverse effects involves adding items to replace visual resources that were removed as a result of the project. Depending on the result being mitigated, compensation may or may not include the same materials on the same scale. For example, if a planting is removed that screened an unfavorable view; compensation may include replacing the plants with fewer, smaller, more, or larger plants, or changing the alignment of the roadway so the unpleasant view is hidden.
- Creating, including, or enhancing favorable effects or existing conditions improves the project setting. For example, a favorable view may be created as a result of highway re-alignment and selective cutting may improve the degree or duration of that view.

LIST OF ATTACHMENTS

Attachment 20.1 Example of General Mitigation Methods

FDM 27-10-25 Recommend the Most Effective Aesthetic Treatment for Each Alternative *December 30, 2002*

After the inventory, evaluation and analysis of project effects on the landscape and viewer groups have been conducted, a project alternative can be recommended. The following recommendations result from information derived from the inventory, evaluation and analysis steps:

- Avoid landscapes with high visual quality. Ideally, a project in such a landscape would overlook or

border the area but avoid traversing a significant viewshed. Proximity would grant visual access but avoid excessive impact on the landscape.

- Avoid landscapes with low or adverse visual quality, in order to provide a pleasant driving experience. Monotonous driving experiences tend to be less safe since they may lead to driver fatigue. However, if an area with low visual quality can be enhanced via design methods to create a landscape with moderate visual quality, it would be an acceptable project site.
- Recommend alternatives that are located in areas of moderate visual quality. These sites should provide an aesthetic experience and cause only acceptable effects on the landscape.
- Recommend alternatives that offset negative effects with positive effects. Another option is to recommend alternatives that cause more negative effects, but the effects are more easily mitigated than projects with fewer negative effects.

Although selecting an alternative with the least adverse effects seems to make the most sense, it is often difficult to do in practice, as visual resources and viewer groups can be affected differently by various alternatives. Regardless of the alternative chosen, some viewer groups will be affected negatively and others positively.

FDM 27-10-30 Recommend Detailed Mitigation Methods for the Selected Alternative *December 30, 2002*

The final step of the Visual Impact Assessment (VIA) occurs during the conceptual and preliminary plan portions of the Facilities Development Process.

Mitigation methods consist of design solutions which:

- Avoid adverse effects and adverse existing conditions.
- Minimize adverse effects and existing conditions.
- Compensate for adverse effects.
- Create, include and enhance favorable effects and favorable existing conditions.

Mitigation methods for adverse effects and existing conditions include but are not limited to the following:

- Allow terrain, vegetation, and water bodies to influence the alignment and profile of the project.
- Vary the backslope to avoid impacting the existing topography and vegetation.
- Avoid abrupt changes in alignment.
- Avoid alignments which focus tangents or long curves on adverse features or views.
- Consider bridges and tunnels in lieu of prominent excavation and embankment slopes.
- Minimize rock cuts by varying setbacks and creating irregular benches.
- Minimize the clearing of trees and shrubs along the right-of-way.
- Use forms, materials and finishes that reflect those in the natural and the built environments.
- Provide split level medians, wide medians and independent roadways on multi-lane projects to add interest and relieve the monotony of parallel roadways.
- Flatten slopes and provide vegetation to soften construction lines.
- Grade interchange areas to create graceful, natural-looking contours.
- Avoid traversing a high quality viewshed. If the area must be crossed, look for the least visible route or the route with the least negative impact.
- Mitigate the effects of the project on existing views with plantings, earthforms, color, placement structures (such as retaining walls) and buffer vegetation.
- Screen unpleasant views.
- Select alignments which provide outstanding views of both cultural and natural features.
- Provide vista points or turn-outs for outstanding views.
- Selectively thin out trees or brush to open up scenic vistas or provide a natural-looking boundary between forest and cleared areas.
- Develop planting plans that integrate the project into the environment.
- Manipulate roadside vegetation and planting to create interest by leaving groupings of plants in the median, feathering the edges of clearings, or installing accent plantings.
- Give special attention to bridges, walls, buildings, and other structures to provide visual interest in otherwise nondescript settings.
- Manipulate alignments to focus tangents on favorable views or features.

1. Existing Visual Character

This corridor varies from gently rolling terrain to steep topography. A ravine exists at County Line Road. Green Bay may be viewed from various locations. An intermittent stream exists in the ravine but is not visible. Crop land occurs quite frequently as well as scattered deciduous forest lots. Deciduous forest is also prevalent in the ravine. This corridor passes through the edge of Dyckesville. There are numerous existing and proposed homes throughout and various businesses, which exist near the north end of the corridor. Very few farm buildings exist. The medium scale utility lines cross the corridor twice and are within viewing range at times. Small-scale utility lines are within viewing range quite frequently. A historic roadside chapel exists at the intersection of CTH S and Badger Road. (See Photo 7).

2. Existing Key Landscape Features

a. Positive

- Historic roadside chapel (see photo 7)
- Ravine
- Scattered forest lots

b. Negative

- Small and medium scale utility lines

3. Existing Key Views

a. Positive

- Distant view of Green Bay at Badger Road

b. Negative

- No negative key views were identified along this or any corridor throughout the project site.

4. Existing Visual Quality

This corridor option was determined to have a medium visual quality rating (10.1). Although this corridor offers a view of the historic roadside chapel (see Photo 7) and pleasing variation in topography, the multiple utility lines decrease the quality, and the views of Green Bay are limited and not very spectacular relative to the rest of the project area.

5. Viewer Groups

a. Viewers from the facility

- Primarily tourists
- Many commuters
- Some commercial haulers

b. Viewers of the facility

- Primarily residential neighbors
- Scattered agricultural neighbors
- Scattered retail neighbors

VISUAL QUALITY RATING / INVENTORY SHEET

District	County	Date
3	Brown, Kewaunee	August 16, 1995
Highway	**Corridor**	
57	Corridor B	

FREQUENCY (MULTIPLIER)

0 = Does not Occur
1 = Singular occurrence or seldom occurring
2 = Occurs quite frequently
3 = Occurs constantly or within viewing range at all times

VISUAL VALUE

3 = Extremely Pleasing
2 = Moderately Pleasing
1 = Slightly Pleasing
0 = Neither Pleasing nor Displeasing
- 1 = Slightly Displeasing
- 2 = Moderately Displeasing
- 3 = Extremely Displeasing

VISUAL QUALITY RATING

Less than 0 = Adverse Visual Quality
0 – 7.99 = Low Visual Quality
8 – 11.99 = Medium Visual Quality
12 or more = High Visual Quality

LANDFORM						
FEATURES	**FREQUENCY**	**X**	**VISUAL VALUE**	**=**	**FEATURE VQR**	
Cliffs / Bluffs						
Rock Outcrops						
Steep Hills / Ridges	1		2		2	
Rolling Hills	2		2		4	
Ravines	1		2		2	
Valleys / Basins						
Plains / Flatland						
Beach						
				TOTAL	8	AVG. = 2.6

WATER						
FEATURES	**FREQUENCY**	**X**	**VISUAL VALUE**	**=**	**FEATURE VQR**	
Bays / Inlets	1		3		3	
Lakes / Ponds						
Rivers / Streams						
Wetlands						
Waterfalls / Rapids						
Swamp						
				TOTAL	3	AVG. = 3

VEGETATION						
FEATURES	**FREQUENCY**	**X**	**VISUAL VALUE**	**=**	**FEATURE VQR**	
Plantation						
Orchard						
Pasture	1		1		1	
Crop Land	2		2		4	
Prairie Remnant						
Coniferous Forest						
Deciduous Forest	2		2		4	
				TOTAL	9	AVG. = 3

VISUAL QUALITY RATING / INVENTORY SHEET

District	County	Date
3	Brown, Kewaunee	August 16, 1995
Highway	**Corridor**	
57	Corridor B	

FFEQUENCY (MULTIPLIER)

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VISUAL QUALITY RATING

Less than 0 = Adverse Visual Quality
0 – 7.99 = Low Visual Quality
8 – 11.99 = Medium Visual Quality
12 or more = High Visual Quality

CULTURAL						
FEATURES	**FREQUENCY**	**X**	**VISUAL VALUE**	**=**	**FEATURE VQR**	
Village / City / Town						
Commercial	1		1		1	
Industrial (Factory / Plant)						
Institutional (School/Hosp.)						
Residential	2		2		4	
Farm Buildings	2		2		4	
Local/State/National Parks						
Historic / Archeol. Features						
Billboards						
Signs						
Bridges						
Dams						
Docks / Piers						
Salvage Yards						
Landfills						
Cemeteries						
Utilities	1		-3		-3	
Fences						
Walls						
Airports						
Railroads						
Recreational Paths						
Roadside Sites						
Forest Clearcuts						
Quarries						
				TOTAL	6	AVG. = -1.5

AVERAGE FOR EACH FEATURE	
LANDFORM	2.6
WATER	3
VEGETATION	3
CULTURAL	1.5
VISUAL QUALITY RATING	**10.1**

1. Effect on Visual Character

The placement of a four-lane facility through this corridor may alter the farming and small-town community setting of the Dyckesville area. The result may be a more developed, suburban character.

2. Effect on Visual Quality

The visual quality of this corridor would not be greatly affected. Although a four-lane facility would be placed where no highway exists today, resulting in a change in the farming and small town community character, the corridor should retain most of the positive features and views, which led to its medium VQR.

3. Effect on Viewer Groups

a. Viewers from the facility

The placement of a four-lane facility through this corridor would have a favorable effect on the visual experience of the traveler. This positive effect would result from the pleasing views of Green Bay, the scattered deciduous forest lots and the ravine at the southern end of the corridor.

b. Viewers of the facility

The placement of a four-lane facility through this corridor may have an effect on the visual experience of the surrounding agricultural, commercial and residential neighbors due to changes to the visual character and quality. While the agricultural and residential neighbors may be displeased with the change, the commercial neighbors may not show much concern, as their main interest is typically maintaining visual and physical access to their establishments.

Example of General Mitigation Methods

- Bridge ravines or align the highway within viewing distance of ravines to provide views of the natural ravine systems.
- Design horizontal and vertical alignments at Badger Road and CTH S to maintain views of Green Bay.
- Design independent alignments to reduce the negative visual impact of the 4-lane facility on adjacent residential areas.
- Incorporate berms or vegetative screens to reduce the negative visual impact the 4-lane facility will have on adjacent residences.
- Design alignment to avoid the historic roadside chapel while maintaining views of it from both the facility and surrounding roadways.
- Due to the rugged nature of the terrain, slopes should be designed and graded to reflect the unique natural conditions of the adjacent terrain.
- Incorporate retaining walls where the aesthetic impacts of large cut/fill slopes are unacceptable or re-vegetate the slopes with shrubs to heal the scars more quickly.
- Provide for clearing and grubbing practices which reflect the surrounding natural vegetation habitat.

FDM 27-20-1 Planting Plan Development Process

November 15, 2022

1.1 Overview

This section presents the steps involved in developing planting plans. It outlines which documents are required in each stage of plan development and addresses proper formatting.

Historically, WisDOT landscape architects developed planting plans for state highway projects. However, consultants are now the primary plan producers, and the number of consulting firms doing this work has greatly increased. This has resulted in a variety of plan styles and formats that cause inefficiency, time delays and confusion for those involved in examining, bidding on and constructing the plans. A standard WisDOT Planting Plan Development process is established here for use on projects authorized by the planting project ranking process. The planting plan development process is summarized in Attachment 1.1.

1.2 Scoping

Planting projects should follow the same basic scoping process as highway improvement projects. Refer to FDM 3-1 Attachment 1.1.

In addition to these activities, the region project manager, the landscape architect consultant, and the Landscape Architect Contact (LAC) should tour the site of the project to become familiar with the project location and to discuss various options. After the site tour these same people should meet to establish a project work program. This document identifies the tasks to be done, who will do them, and when they will be done. Finally, the group will be able to complete the Project Information Form.

1.3 Site Inventory Analysis

The site inventory is based on a second, more thorough site visit that familiarizes the designer with the site. The inventory documents existing site conditions and features that affect the planting design. It also verifies previously documented information (e.g. aerial photos, roadside vegetation inventories, or base maps). The region's Development staff and Maintenance staff may be able to provide further information related to site conditions or features. Conduct the site inventory in accordance with the Site Inventory/Conceptual Plan Checklist (see Attachment 1.2). Record any additional pertinent information gathered in the field but not listed on this checklist.

The site analysis determines how the inventoried conditions will affect the design and, conversely, how the design will affect the conditions. In addition to these items, the site analysis notes the site context. For example, a rural highway may require a much different style than an urban freeway.

Note information derived from the site inventory/analysis on aerial photos. For urban projects, a scale of 1" = 200' (1:2000 metric) is used. For rural projects, a scale of 1" = 400' (1:4000 metric) is used. Note significant features or conditions and ways in which they impact the project (see Attachment 1.3). A landscape photo log may be prepared to better document site features.

The site inventory/analysis is NOT used for presentation purposes, so it should consist only of field notes. At this point, documentation should be general. Later in the process more specific information is recorded on the plan sheets. Some conditions or features to note in the inventory/analysis stage include:

- Existing Vegetation: Note species and locations of existing vegetation on both sides of the right-of-way line, to develop a feel for local plant communities and associations. Identify plant communities considered "native" to the area and note individual plants or plant groupings that should be preserved or transplanted. For some highways, information on existing vegetation may be found in WisDOT's Roadside Inventory. Contact the BHO LACs for access to this data. There are some non-profit groups with an interest in native plant rescue. For more information on native plant rescue, contact the BHO LACs.
- Existing/Potential Viewsheds: Note aesthetically pleasing views so they may be preserved or enhanced. This may require action (selectively clearing trees and shrubs to create/enhance a view), or inaction (avoiding installation of plantings that would screen the view).
- General Lay of the Land: Items to note include, but are not limited to drainage, slopes, soil types and water bodies.
- Micro-climate: Note any significant micro-climate issues, such as heat from sunlight being reflected off

the light-colored facade of a building or paved surface.

- Existing Improvements: Items to note include, but are not limited to adjacent land uses, access, right-of-way lines, fence lines (if different from right-of-way lines), building locations, outdoor advertising sign locations, underground and overhead utility locations, names of side streets and roads, transportation structures (noise walls, guard rails) and clear zones.
- Areas Appropriate for Planting: Identify areas where plantings may be installed to provide headlight screening, visual buffering, erosion control, snowdrift control, impact attenuation, noise barriers and delineation of road alignment.
- Areas Appropriate for Native Seeding: Highly visible areas have the most potential for native seeding. However, a steep slope stabilized by existing vegetation, even if highly visible, should remain undisturbed so as to avoid erosion. Native species normally require more time to become established, thus increasing the possibility of initial erosion problems.

1.4 Conceptual Plan

Using information gathered during the scoping and site analysis, the designer will prepare a conceptual plan consisting of a written narrative of three pages or less, prepared in accordance with the Narrative Checklist (see Attachment 1.4), and an actual plan, created on aerial photos if possible, in accordance with the Site Inventory/ Conceptual Plan Checklist (Attachment 1.2). The conceptual plan should contain site information such as the existence of an unsightly salvage yard or areas of extreme snow drifting (see Attachment 3).

The narrative provides information regarding the limits and context of the site, the general intent of the planting project, insight into the construction schedule, and maintenance requirements or concerns. For a sample narrative, see Attachment 1.5.

The steps involved in the conceptual plan stage are as follows:

1. The designer prepares the conceptual plan (preferably on aerial photos) and a written narrative which will address the design philosophy and include maintenance considerations (Attachment 1.5).
2. At least one week prior to the review meeting, the designer sends a copy of the conceptual plan to the region representative and the LAC for internal review.
3. The designer, region representative and LAC meet to review the conceptual plan

A preliminary plant list should be included as part of the narrative checklist (see Attachment 1.6). Also include a rough estimate of the quantities and sizes of plants to be included in the contract, (see Attachment 1.7) using the following categories:

- Large (>35'or >11 m), medium (15-35' or 5-11 m) and small (<15'or <5 m) deciduous trees
- Large (>30' or >9.15 m) and small (10-30' or 3.05-9.15 m) evergreen trees
- Large (>10' or >3.05 m), medium (4-10' or 1-3.05 m) and small (<4' or <1.2 m) deciduous shrubs
- Evergreen shrubs (<10' or <3.05 m)
- Vines
- Special Seeding

Provide a rough estimate of the required quantity of seed in pounds or acres (kilograms or hectares metric). Finally, include a very rough cost estimate so all parties understand the budgetary constraints. This may help to avoid design decisions resulting in cost overruns later.

The conceptual plan should also provide the general location of plant masses, along with an explanation stating the purpose of each planting (snow drift control, framing a view, etc.). The exact species to be used at each proposed planting location need not be determined at this time. However, do include a list of suggested species and/or seed mixes in the narrative.

The conceptual plan does not need to be a refined product. It is a working plan, not a presentation plan. The content should be well-considered, but no more effort should be put into presentation than needed to convey general ideas. Often, the conceptual plan simply consists of a slightly refined or cleaned-up version of the site analysis with some design solutions.

After the conceptual plan is complete, the designer, region representative, and LAC meet to review it. Send a copy of the plan to the region and LAC at least one week prior to the meeting to allow for internal review.

1.5 Preliminary Plan

The preliminary plan is developed after the conceptual plan has been agreed upon by all parties.

The steps involved in the preliminary plan stage are as follows:

1. The designer develops the preliminary plan (see Preliminary Plan Checklist Attachment 1.8) consisting of plan sheets, a Plant Data Chart (see Attachment 1.9), a Miscellaneous Quantities Chart (see Attachment 1.10), the cost estimate (see Attachment 1.7), any special details and a draft of Special Provisions
2. At least two weeks prior to the site tour, the designer sends a copy of the preliminary plan to the region representative and LAC for internal review
3. The designer, region representative and LAC meet to review the preliminary plan and discuss any concerns
4. The designer, region representative, and LAC visit the site to review the preliminary plan

For plan base sheets on urban projects, use a scale of 1" = 50' (1:500 metric). For rural projects, use a scale of 1" = 100' (1:1000 metric), unless otherwise agreed upon by all parties. The plans should be more detailed as to exact plant locations and species. The designer will begin filling out a Plant Data Chart, which includes information about the types and sizes of plants and the root handling method (bare-root, balled-and-burlapped, etc. (see FDM 27-25-1). However, complete information may not be available at this time.

Complete the Miscellaneous Quantities Chart and a cost estimate to the extent possible. The designer should provide preliminary drafts of any special details or Special Provisions relating to the project.

Designers and region representatives involved in developing the planting plan should be aware that the LAC requires three weeks to review such plans. The plan should be sent to the LAC two weeks prior to the site tour, and internal review may continue for one week after the site tour. Designers and region staff should be aware of this so they can schedule their project timetable to allow the LAC adequate time to review the plans.

At this time the designer, region representative and LAC should discuss long-term maintenance of the plantings and any maintenance partnerships with local communities or interest groups. The designer should prepare a draft maintenance plan to lay out the agreed-upon maintenance activities.

1.6 Final Plan

After the Preliminary Plan Review Meeting, the designer will incorporate comments and prepare the final plans. At this point the plan sheets, Plant Data Chart, Miscellaneous Quantities, proposal estimate (Attachment 1.11) and Special Provisions should be in final form.

The estimate prepared at this stage should be in accordance with the example found in Section 5 of Chapter 19. For specific information relating to planting estimates see Attachment 1.11. Designers must use AASHTOWare software to create their estimates.

The steps involved in the final plan stage (See Final Plan Checklist, Attachment 1.12) are as follows:

1. The designer prepares final plans, incorporating the preliminary plan review comments.
2. The designer sends a copy of the final plans to the region representative and LAC, allowing for two weeks of internal review.
3. The region representative and LAC review the final plans and submit comments or concerns to the designer so they can be incorporated prior to submitting the PS&E package.

1.7 Submitting the P. S. & E.

To avoid possible complications in the PS&E process, all interested parties (LAC, region representative and designer) should review the final plans prior to submitting the PS&E package.

Also prior to submitting the PS&E, the Region Development Section and/or the consultant must obtain a signed commitment (in the form of a signed document or email) from the Region Maintenance Section supervisor responsible for that section of the highway to provide funding for the maintenance needs given in this outline and in the maintenance plan.

For specific information regarding the submittal of plans for P. S. & E. see FDM Chapter 19.

A maintenance plan, is not technically a part of the P. S. & E. package but it needs to be submitted to the region project manager along with the P. S. & E. The following outline lists maintenance concerns to be addressed in the maintenance plans.

OUTLINE OF MAINTENANCE PLAN

TO BE FURNISHED WITH

P. S. & E.s FOR LANDSCAPE PLANTING PLANS

1, List of anticipated needs and activities beyond the 2-year Plant Establishment Period including:

- Pruning
- Watering
- Fertilizing
- Weeding
- Mulching
- Replacing dead plant material
- Applying pesticides
- Removing planting accessories (tags, guy wires, etc.)

2, Timeline with frequency and types of maintenance activities needed after the Plant Establishment Period ends.

3. Estimates of time in man-hours and projected cost.

4, Exceptions (if any) to Maintenance Manual policies in the following areas:

- Mowing
- Woody plant control
- Controlled burns
- Pesticide applications

If special maintenance tasks are required in addition to those provided for by general policy, the designer must also submit maintenance plans to the BHO LACs at the same time the final P. S. & E. is submitted to central office. They should contain the same information appearing in this list.

5. Exception locations graphically represented on plan sheets showing boundaries of areas requiring special maintenance.

1.8 Maintenance Plans

Maintenance is a facet of design that is often overlooked. Maintenance or vegetation management activities compete for funding with other highway maintenance needs. Therefore, every effort should be made to design for low maintenance plantings in landscape plans.

After the Plant Establishment Period has expired (see FDM 27-25-10), little if any additional maintenance will typically be performed, except in rare cases such as in urban areas which may have more sophisticated plantings. Even in those instances, care will likely be minimal at best.

Plan designers should be familiar with Chapter 7 of the Highway Maintenance Manual which deal with roadside maintenance and vegetation management, respectively. They cover the policies and procedures governing these activities and directly affect the successful installation and establishment of landscape plantings.

Landscape elements requiring an on-going high level of maintenance should only be included in the plan after carefully considering the ramifications. As an example, mulched plant beds may be quite attractive while the contractor keeps the mulched area weed-free. The beds may not be visually acceptable after the plant establishment period if weeds are no longer controlled. If weeds are not acceptable, mulch the plants individually rather than mulching the entire bed. Similarly, flower beds that might be acceptable in highly maintained areas such as safety rest area plazas, should not be designed for no/low maintenance areas along roadsides.

It is recognized that some maintenance will eventually be required to maintain plant health and preserve the integrity of the design. To this end, the following guidelines have been established:

1.8.1 Guidelines for Rural Areas

- Remove remaining planting aids such as tree wrap, braces and guys, rodent protection, etc., during the summer following the expiration of the contract plant establishment period (PEP).
- Remove dead plants, especially evergreens, as soon as death is apparent.
- Three to five years after the PEP expires, replace significant plants that have died.
- Water plants during extreme drought periods if they occur during the first five years after the PEP expires.

1.8.2 Guidelines for Urban Areas

Apply these guidelines in addition to the Guidelines for Rural Areas.

- Weed and re-mulch shrub beds as needed to keep them weed-free until the shrubs are large enough to suppress weed growth on their own approximately three to five years after the PEP expires.
- Prune specimen plants within three to five years after the PEP to promote good branch structure.
- Rejuvenate appropriate shrubs by renewal pruning (removing 1/3 of the older canes completely) approximately every three to five years.

1.8.3 Mowing

The department's mowing policy is defined in Policy 07-05-35 and 07-05-40 of the Highway Maintenance Manual. Do not place plantings in areas likely to be mowed. However, plants with a mature size of no more than four inches in diameter may be planted in the clear zone if there is a safety-related reason to do so, such as impact attenuation. Appropriate plantings may be located in un-mowed areas without concern about mower damage.

If exceptions to the mowing policy are necessary during the construction phase of a planting contract, the contractor should be required to do the mowing. For example, an exception could occur where periodic mowing is required to facilitate growth of native grasses and forbs seeded under contract.

The region Maintenance Section must be notified of the exception. If proposed exceptions are of longer duration than the normal plant establishment period required by the contract, contact the Region Maintenance Manager and the BHM LAC for concurrence and incorporate the exceptions into the maintenance plan.

LIST OF ATTACHMENTS

Attachment 1.1	Planting Plan Development Process
Attachment 1.2	Site Inventory/Conceptual Plan Checklist
Attachment 1.3	Sample Aerial Photo with Labeled Areas (Conceptual Plan)
Attachment 1.4	Narrative Checklist
Attachment 1.5	Sample Narrative
Attachment 1.6	Preliminary Plant List
Attachment 1.7	Preliminary Cost Estimate
Attachment 1.8	Preliminary Plan Checklist
Attachment 1.9	Sample Plant Data Chart
Attachment 1.10	Sample Miscellaneous Quantities Sheet
Attachment 1.11	Sample Proposal Estimate of Planting Costs
Attachment 1.12	Final Plan Checklist

FDM 27-20-5 Planting Design Issues *November 15, 2022*

5.1 Overview

The traveling public no longer considers highways to be just a means of getting from one place to another. Recreational travelers expect highways to be both safe and visually pleasant. The Federal Highway Administration regards planting as an integral part of federally funded project development, and federal agencies or other state agencies may require that plantings be included in proposed projects before granting project approval. This is based on the need to mitigate anticipated adverse environmental effects a project may cause. The public involvement process often highlights the need for special plantings or seeding along sections

of proposed projects.

The Bureau of Highway Maintenance landscape architects are available to assist in the planting plan development process (see FDM 27-20-1). See FDM 27-1-1 for their names and telephone numbers/email addresses.

5.2 Planting Context

Generally, plantings should be arranged informally and reflect local native plant communities in their species composition, restoring the appearance of the area as it looked prior to settlement. Ideally, the area should seem to be the result of nature. For example, in the southern part of the state where prairies and savannas were common, limit the number of large trees to a range from one tree per acre up to the equivalent of less than 50% canopy cover. In northern areas, plant groups of trees that reflect the forested character of the area. Avoid over-planting; plant only at the locations needed, in the quantities and sizes necessary to achieve the desired result. Arrange shrubs in large masses for a natural appearance. Exceptions to these guidelines may occur in urban areas where a more formal look is desired or less space is available.

An informal planting scheme features undulating edges and curvilinear lines. Use irregular, random spacing in individual groups and the overall planting scheme. Exceptions occur when plants function as snowdrift control or screening. In those cases, regular spacing may be necessary for optimum performance; however, beds may be planted in a curvilinear fashion and the width of the planting may vary where right-of-way width and topographic conditions have no negative impact on snow storage capacity.

5.3 Highway Context

Planting context partly depends on whether a highway is considered to be rural, urban or transitional as follows:

5.3.1 Rural Highways

Are located in rural areas. In general, a constant speed is posted, and adjacent lands are mostly agricultural or wooded with little residential, commercial or industrial development except for occasional farmsteads. Plantings are usually minimal and arranged in informal groups.

5.3.2 Urban highways

Are found in highly developed areas, usually within the corporate limits of one or more municipalities. The high traffic volume increases the need for safety features. Good highway design includes features that help increase driver alertness and reduce driver reaction time. This can be accomplished in part by designing well-aligned horizontal and vertical curves and installing functional plantings. While informal planting arrangements are the norm in an urban setting, more formal plantings, such as regularly spaced street trees, may be more appropriate in some situations.

Planting space may be limited by narrow rights-of-way, underground and overhead utilities and the need to provide visual access to intersections, frontage roads, and adjacent businesses. Since planting sites may be limited, it may be desirable to plant heavily in available sites. Interstate highways and freeways present more opportunities for planting because of their wider rights-of-way.

5.3.3 Transitional Highways

Pass through areas between undeveloped rural areas and highly developed urban areas. Development varies in intensity and the cultural environment has more influence on the design process. Signs, utilities, and development are often close to the road, thereby limiting planting space in the right-of-way. Space and physical constraints may dictate that designers use a more formal, geometric planting design.

5.4 Planting For Functional Purposes

Planting for a functional purpose means that the plantings serve a particular practical function at that location other than aesthetics. Depending on the purpose the planting is to serve, plant sizes may need to be large enough to provide immediate benefit, or smaller so as to stay within budget or increase chances of plant survival. Plantings may serve any of the following functions.

5.4.1 Visual Screens

Screening reduces or completely hides a scene or object from view. Screening may be accomplished with plants alone or in combination with fences and earth berms. Often, the designer has the responsibility of determining whether it is necessary to screen a particular object or view completely. It may be adequate to provide just enough of a barrier to draw attention away from the distracting object or scene.

Evergreens are the most effective plant material for screening. They do not lose their foliage in winter, so they are effective year-round. Regardless of plant type, the more closely the plants are spaced, the more effective

the screen will be. Contact the LAC for guidance on plant spacing.

When spacing plants closely to form masses, use plants which are aesthetically pleasing when massed and tend to grow in masses naturally, such as grey dogwood or American plum. Consider the general form of the plants when determining suitability for massing. For instance, masses of arborvitae or junipers are more pleasing than masses of pines or spruce. Arborvitae and junipers have a 'softer' form that blends well into a mass, while pines and spruce have a stiff branching structure and a distinct spire at the top of each tree which remains as an individual shape and does not blend well into a mass.

Screening is often used in the following situations.

Headlight Glare - Screening against headlight glare may be total or partial. A total screen is desirable if headlights from on-coming traffic shine directly into the driver's eyes (see Attachment 5.1).

Note- Any plantings around intersections must consider a driver's need to see oncoming vehicles on other intersection approaches. Therefore, nothing shall be planted in intersection vision triangles that will hinder a driver's ability to see or be seen. Refer to FDM 11-5-10 for more guidance on vision triangles.

If headlights are distracting but unlikely to blind the driver, a partial plant screen that limits on-coming headlight glare to intermittent flickers of light may be adequate. This lets drivers know that a separating device divides their respective roadways, as on frontage roads where cars travel in the opposite direction to the right of the driver (see Attachment 5.2).

Junkyards - A junkyard is defined as an area where 10 or more hulks are permanently stored. The Federal Highway Beautification Act of 1965 requires that all junkyards within 1000 feet (305 m) of and visible from a Federal Aid Primary System highway (now National Highway System Primary Highways) be completely screened from view unless they are in a zoned or un-zoned industrial area.

Also, State Statute 84.31 enacted June 11, 1976 states that if a legal junkyard pre-existed the 1976 law, federal and state funds will be used to either screen or relocate it. Recently, federal funds have not been allocated to do the work, so the junkyard screening program has been inactive.

If the junkyard came into existence after the law was passed, the junkyard owner is responsible for screening.

An exception occurs when a legal junkyard exists and becomes visible from a highway as a result of highway relocation. In that case, the Department is responsible for screening and will make a good-faith effort to provide living screens, berms, fencing or a combination thereof when it can be done as part of a larger landscape planting contract in the vicinity, or a landscape planting project planned for the right-of-way in the area.

Other unsightly areas - Areas that might be considered unsightly include unkempt or abandoned buildings or farmsteads, industrial areas, gravel pits or other areas which don't qualify as junkyards but would still be perceived by the public as visually displeasing. The designer must decide whether the site requires a total screen or limited or intermittent screening.

5.4.2 Visual Buffers

Visual buffers are similar to visual screens, but their purpose is to provide a psychological separation between the highway and an adjacent land use. A buffer planting draws attention away from the surrounding environment enough to psychologically soften or even separate it from the highway environment. Buffer plants should draw attention because of their aesthetic qualities--such as form, texture, flowers or fall color. There is usually no immediate critical need for these plants to perform this function so smaller sizes may be planted.

5.4.3 Noise Barriers

As a rule, vegetation is inefficient as a noise barrier. To be effective, a plant grouping must be very dense, wide and high. However, simply blocking the source of the noise from view may reduce awareness of the problem, and thereby effectively "reduce" noise levels. As with any type of noise barrier, the height of the plantings must exceed the height of the imaginary line between the source of the noise and the people affected.

Plants may be used in conjunction with other noise barrier structures if there is enough room between either the structure and the highway, or the structure and the right-of-way line. Plants will help to absorb sound waves and soften the visual impact of the structure.

5.4.4 Impact Attenuators

Multi-stemmed shrubby plants may be used as supplemental impact attenuators in conjunction with other systems. Individual stems of mature plants used for this purpose must not be capable of exceeding four inches in diameter. Shrubs should be planted closely enough together to form a mass so that individual plants are not recognizable. The mass should be as large as space allows.

5.4.5 Delineators

Plants can often be used to delineate changes in the horizontal alignment of highways. They are typically used on the outside of curves where the combination of vertical and horizontal alignments combine and may confuse the driver as to where the road goes (see Attachment 5.3). At "T" intersections or cul de sacs, particularly if a previous through street has been cut off (see Attachment 5.4), plants used as delineators should be large enough to perform their function immediately. They must have enough mass to indicate visually that the roadway direction changes just out of the driver's sight.

5.4.6 Snowdrift Control

Mass plantings of trees and/or shrubs, are very effective for controlling drifting snow. They are relatively long-lived and require little maintenance once the plants have become established.

Each site will have its own unique set of factors which will affect the shape and storage capacity of the snow drift. The following is some general information which will help in understanding the dynamics of snowdrift control.

Plant Variety: Whenever large numbers of plants are planted in close proximity, use a variety of species rather than a single species. This helps prevent heavy plant losses in the event of insect or disease problems which may affect an individual species.

Choose species that have between 45% and 55% twig density especially at ground level. Maximum drift depth decreases slowly with decreasing twig density down to a density of about 20%. See Attachment 5.5 for a list of plants that are particularly well-suited for use as living snow fences.

Evergreen trees are not recommended for snowdrift control; they should be used only in exceptional cases when shrubs are not appropriate. During the period of their greatest effectiveness, evergreens form a very dense mass which causes more drifting on the windward side. However, their pyramidal shape limits their effectiveness when small, and as they approach maturity they become less effective as they lose their lower branches. If evergreen trees must be used, plant at least one row of shrubs on the highway side of the planting to extend the useful life of the snow fence. Evergreens should be planted 8 feet (2.4 m) apart in rows that are 6 feet (1.8 m) apart for maximum effectiveness.

Right-of-Way Snow Storage Capacity: This is the critical factor in selecting living snow fence locations. Drifting occurs on the leeward side of the plantings for a distance of at least 15 times their height and may extend up to 35 times the height.

For example, if the plants are expected to grow to 5 feet (1.5 m) tall, a minimum of 75 feet (22.5 m) of open space is required under ideal conditions to store the drifted snow between the near edge of the roadway and the closest plants. However, situations are often encountered where a living snow fence is desirable but the ideal width necessary for snow storage is not available. In such cases the snow fence planting may be installed with the understanding that if the drift reaches its maximum potential, the downwind edge may need to be plowed. When three rows of shrubs are proposed, the minimum width between the security fence and the near edge of the pavement should be 70-75 feet (21-22.5 m). Drifting distance on the windward side of the snow fence may also reach up to 15 times the snow fence height but it will be only about half as deep as the snow fence height (see Attachment 5.6). Storage capacity is proportional to the square of the snow fence height. Thus, an eight-foot-tall snow fence will store four times as much snow as a four-foot-tall snow fence.

Plant Spacing: Use multiple rows of plants for snowdrift control plantings. Three or more rows are desirable, but one or two rows may be used where space is limited. Space the shrubs four feet apart, in rows which are also four feet apart, and stagger the spacing from row to row.

End Effect: Snowdrifts are rounded near the end of a snow fence (see Attachment 5.7). This "end effect" extends inward toward the center of the fence for a distance of about 12 times the fence height. Rounding significantly reduces snow storage capacity over the affected portion of the fence. Therefore, it must be factored in when determining where the fence end points are located. The snow fence ends should be located at least 12 times the height of the snow fence past the area where drifting snow is a problem.

Snow fence length: Drift length, depth and volume decrease as snow fence length decreases. Therefore, a long snow fence is more effective than a series of short snow fences. Snow fence lengths should be at least 30 times their height, and the longer the better. Avoid openings in the snow fence. Where openings must be provided, separate the snow fence lines by three times the height and overlap two times the height. See Attachment 5.8 for an illustration of this principle.

Topography and Drift Shape: Roadside topography influences the location and design of the snow fence in the following ways.

- The windward drift is very sensitive to topography. Only very small windward drifts form on hill crests and windward-facing slopes steeper than about 10%. See Attachment 5.9.
- Windward drifts are deeper on slopes that are downward in the direction of the wind, causing a tendency for snow fences to become buried on slopes steeper than about 10%. See Attachment 5.9.
- Upward slopes in the approach zone (the area leading up to the fence on the windward side) increase snow storage capacity by increasing drift depth. Upslopes and hills in the exhaust zone (the area on the leeward side of the fence) generally decrease fence capacity. Maximum snow storage capacity is achieved by placing fences on hill crests and ridge tops. See Attachment 5.9.
- The surface of the drift is not affected by topographic unevenness underneath. As a result, depressions such as stream channels can greatly augment snow storage capacity, while mounds or hills reduce storage capacity. See Attachment 5.10.
- Downward slopes on the lee side of a snow fence increase storage capacity (a 15% to 20% estimated increase in capacity for each degree of slope).

Snow Fence Placement and Orientation: After the distance of maximum effectiveness has been passed, snow fence effectiveness decreases in proportion to its distance from the area to be protected. In general, snow fences should not be placed more than 70 times the height of the fence from the area to be protected. Align snow fence parallel to the road for winds that are within 25 degrees of perpendicular to the road. Otherwise, orient snow fences perpendicular to the prevailing wind direction. Snow fences should extend far enough on either side of the area to be protected to intercept winds from 30 degrees on either side of the prevailing wind.

5.4.7 Erosion Control

Vegetation is the most cost effective and aesthetic means of erosion control. Existing vegetation on the construction site should be preserved where practical. If this is not possible, vegetation should be re-established using grasses, forbs (such as wildflowers) and woody plants. The Department's Natural Roadside Policy requires the use of native species as much as possible. See FDM 10-10-3, FDM 10-10-5, FDM 10-10-7, and FDM 10-10-9 for further guidance regarding vegetation as erosion control.

5.5 Planting for Aesthetic Purposes

Although most planting has a functional purpose, there are situations where planting may be done for aesthetic reasons if a partnership is formed with another agency or local community in which that agency or community agrees to fund all construction and future maintenance costs. Opportunities for aesthetic planting are identified during the site analysis, in the initial phases of plan development (see FDM 27-20-1). See FDM 27-1-5 for more guidance regarding aesthetic design.

The following list identifies situations where planting for aesthetic reasons may be justified.

5.5.1 Adding Interest to Landscape

Evergreen trees add color, as do large trees and groups of tall shrubs with brightly colored twigs or fruit. Plants with attractive flowers during the spring and summer months or bright fall coloration also add visual interest. For example, plants could be used to create visual interest in a large interchange area, which might seem bleak without plantings, especially during winter.

Plants provide color in a number of ways.

Leaves: Leaves contribute to the perception of color in the landscape. Most landscape plants WisDOT uses have green leaves, in conformance with the Department's Natural Roadsides Policy.

Still, it is possible to contrast differing shades of green. Interspersing evergreen trees among deciduous species creates a visually pleasing contrast in color, form and texture. Of course, evergreens also retain their color in winter. Use native evergreen species or, in more urban locations, use species that blend with plantings on adjacent properties.

In addition, many deciduous trees and shrubs have spectacular fall color, such as sugar maple, ash species, viburnums, sumacs, paper birch and serviceberry species.

Bark: The bark of many native plants is quite colorful and can \add interest to the landscape, particularly during dormancy. Examples include the white bark of the paper birch and the red bark of redosier dogwood.

Flowers: Although flowering is usually of short duration, many plants, such as flowering crabapples and various viburnum and dogwood species, have flowers that are very attractive and are easily seen from the highway.

Fruit: Many plants have small but nevertheless quite colorful fruit that persist well into the winter months. These include some viburnum, dogwood, crabapple, and hawthorn species, among others.

5.5.2 Framing

Plants may be used to create a frame which enhances a distant view or a structure such as a bridge.

5.5.3 Softening

Structures with harsh edges or large surface areas, such as concrete or block retaining walls, look softer and more pleasing if vines are growing on them or plants are placed in front of them. Plants break up the larger surface into smaller surfaces and provide three-dimensional variety.

5.5.4 Blending

Plantings that reflect or expand upon vegetation occurring either naturally or as landscape plantings on the right-of-way or on adjacent land can create a more harmonious landscape. The same principle can be used to blend wide median areas in with vegetation on either side of the right-of-way.

5.5.5 Highlighting

Plantings can draw attention to or enhance the view of geologic or cultural features within the view shed.

5.5.6 Historic Building Restoration

Occasionally there is an opportunity to provide plantings around historic buildings that are being restored as part of a WisDOT project. It is best to choose plants which were commonly used during the historic period to which the building is being restored. It may be possible to identify actual species used at the site during the period in question through old photos or by observing plants still existing on the site.

5.5.7 Vegetation Removal

There are also occasions when views can be created or enhanced by selectively removing vegetation. For example, a roadway may be located next to a river, but vegetation obstructs the driver's view of the river. If possible, remove enough of the vegetation to provide adequate, safe viewing time. Consider purchasing easements if the vegetation exists off the right-of-way. There may be similar situations where a distant view of the surrounding countryside could be opened up by selectively removing vegetation.

5.6 Physical Constraints

Designers should be aware of physical constraints which may limit the amount or type of plantings which can be installed. Awareness of the following constraints may help avoid problems in the future.

5.6.1 Utilities

Utility lines, whether underground or overhead, may severely limit the space available for planting, especially in urban situations. Buried telephone or electrical cables or conduit, gas lines, and sewer or water pipes will all restrict planting, as will overhead telephone or power lines.

Attachment 5.11 contains guidelines for planting near overhead electrical distribution or transmission lines. As the chart indicates, the minimum distance from the centerline of the power line at which planting may occur may be correlated to the number of bells on the insulators holding the lines to the poles or towers.

Although similar guidelines have not been developed for underground utilities, space must be provided for future line maintenance so undue damage to plantings does not occur.

5.6.2 Outdoor Advertising Signs

Placement of outdoor advertising signs is regulated under Section 84.30 Wisconsin Statutes, and TRANS 201 and 280, Wisconsin Administrative Code. Chapter 07-35-01 of the Highway Maintenance Manual describes how plantings are treated in relation to outdoor advertising signs. This section also defines conditions under which signs are considered to be screened. Generally, if vegetation screening an outdoor advertising sign was in place before the sign was erected, the vegetation will be allowed to remain. If the sign was legally erected before the vegetation was planted, the vegetation may be removed unless there is an overriding reason (i.e. highway safety) for leaving it in place.

The department receives many requests from sign owners to remove vegetation screening their signs, so care must be taken not to plant anything that might screen existing signs and lead to a request for plant removal.

5.6.3 Ditches and Drainage Ways

Vegetation that could impede water flow must not be planted in ditches or other drainage ways. This includes trees, shrubs, and thick or tall grasses and ground covers. Show ditch and drainage way locations on the plan. A detail or note to the project manager and the contractor should specify that plants must not be located where

they might cause drainage problems.

5.6.4 Bridges

Vegetation growing too close to bridge abutments reduces the space available for maneuvering equipment used in performing bridge safety inspections. Therefore, a minimum clear distance of 5 feet (1.5 m) must be maintained between the bridge and the anticipated drip line of the vegetation. Generally, this can be accomplished by planting no closer than 10 feet (3 m) from the bridge structure, but if wide-spreading plants are specified, a greater distance may be necessary.

5.6.5 Right-of-way

Woody plants should be kept back from the right-of-way line so they do not encroach upon neighboring property. If the right-of-way is fenced, keep woody plants pruned back so they do not harm the fence or interfere with fence maintenance.

5.6.6 Deicing Salt

Designers need to be aware of salt used as a de-icing agent on roadways. Both airborne and soilborne salt can be a hazard to some plants. The effects of salt spray carried by prevailing winds are of greater concern on the south and east sides of the roadway. Designers should use salt-tolerant species when planting in these areas, especially within 100 feet of the edge of pavement. For a list of the salt tolerance levels of commonly used woody plants see Attachment 5.12.

5.7 Safety Considerations

5.7.1 Clear zone

The clear zone is defined as the roadside border, starting at the edge of the traveled way, that is available for safe use by errant vehicles. The width of the clear zone is determined based on design speed, traffic volume and certain site-specific conditions such as the history of accident occurrences. Guidance on clear zones and methods for calculating clear zone widths based on design standards appears in FDM 11-15-1. Guidance on clear zones from a maintenance perspective appears in Policy 07-10-00 of the Highway Maintenance Manual. Plants capable of attaining a trunk diameter greater than four inches should not be planted within the clear zone. Plants that are not capable of growing over four inches in diameter may be planted in the clear zone if there is a safety-related reason to do so, such as impact attenuation. A guideline for planting woody plants near clear zones is to plant a minimum of 50 feet (15 m) from the edge of the pavement--preferably farther if space is available. It increases the chances of survival for the plants as well as preventing the psychological feeling of encroachment for travelers.

5.7.2 Vision Corners

A vision corner may be defined as a triangular area located at the intersection of two roads that is free of obstructions that would hinder a driver's view of one road from the other. These areas should be kept free of plant material that could block vision of on-coming traffic.

FDM 11-10 Attachment 5.11 gives guidance for determining dimensions for vision triangles. Also, the “Function, Operation and Safety” section of the Transportation Landscape Design Handbook contains more information and illustrations on this subject.

5.7.3 Inside of Horizontal Curves

The roadside on the inside of horizontal curves must also be kept free of visual obstructions where passing is allowed on the curve. FDM 11-10 Attachment 5.6 provides a formula for determining the sight distance to be maintained on horizontal curves.

5.7.4 Encroachment

Vegetation planted too close to the road causes the psychological feeling that the road is narrowing. This may cause drivers to crowd the centerline, creating a hazardous situation.

5.8 Effects of Plantings on the Environment

5.8.1 Winter Shading

Tall-growing trees, particularly on the south or west sides of the highway, may cast shadows on the roadway, even during the warmest part of the day in the winter months. This constant or nearly constant shade prevents the sun from melting ice on the paved surface. Groups of tall-growing trees must be sited carefully, so they do not create icing problems upon attaining their mature height. Individual trees or widely spaced trees are not as likely to cause problems because sunlight can filter through the branches and warm the highway surface.

Attachment 5.13 is a shadow length and direction chart which determines approximately where shadows will be cast by plants at different times of the year.

5.8.2 Snowdrift Control

Plants should not be placed in areas where they may cause snow to drift and accumulate on the highway. Consult the region Maintenance Section to determine which locations may be problematic.

5.9 Construction Considerations

Delaying the design of the planting project, at least until after the highway has been graded, allows the designer to better understand conditions as they will exist after highway construction is complete. Therefore, it is recommended that plantings be stand-alone projects rather than incorporated into a highway grading or paving project. The following items should be considered:

5.9.1 Planting Locations

During the initial site investigation, enough information should be gathered for the designer to develop a planting plan that will not create problems in the field during construction. For example, plants should not be planned for an area where they would interfere with utilities, or in locations where the contractor might have difficulty gaining access.

5.9.2 Plant Sources and Substitutions

The contract Special Provisions should require that plants furnished under contract come from sources within Wisconsin or portions of contiguous states. Check several nursery catalogs from this region to verify that species and sizes selected are reasonably available in the nursery trade. This will help ensure that the project manager will receive minimal substitution requests.

5.9.3 Details

Include cross sections showing plant locations in relation to topography and the roadway so the project manager and the contractor clearly understand the designer's intent. For the same reason, SDD 14A2, the Tree Planting Detail, is required for every plan which contains woody plant materials. The Project Development section of the Transportation Landscape Design Handbook contains a Shrub Bed Detail Sheet to be used when appropriate. Additional detail drawings may be appropriate when specialty items or unusual design features are included.

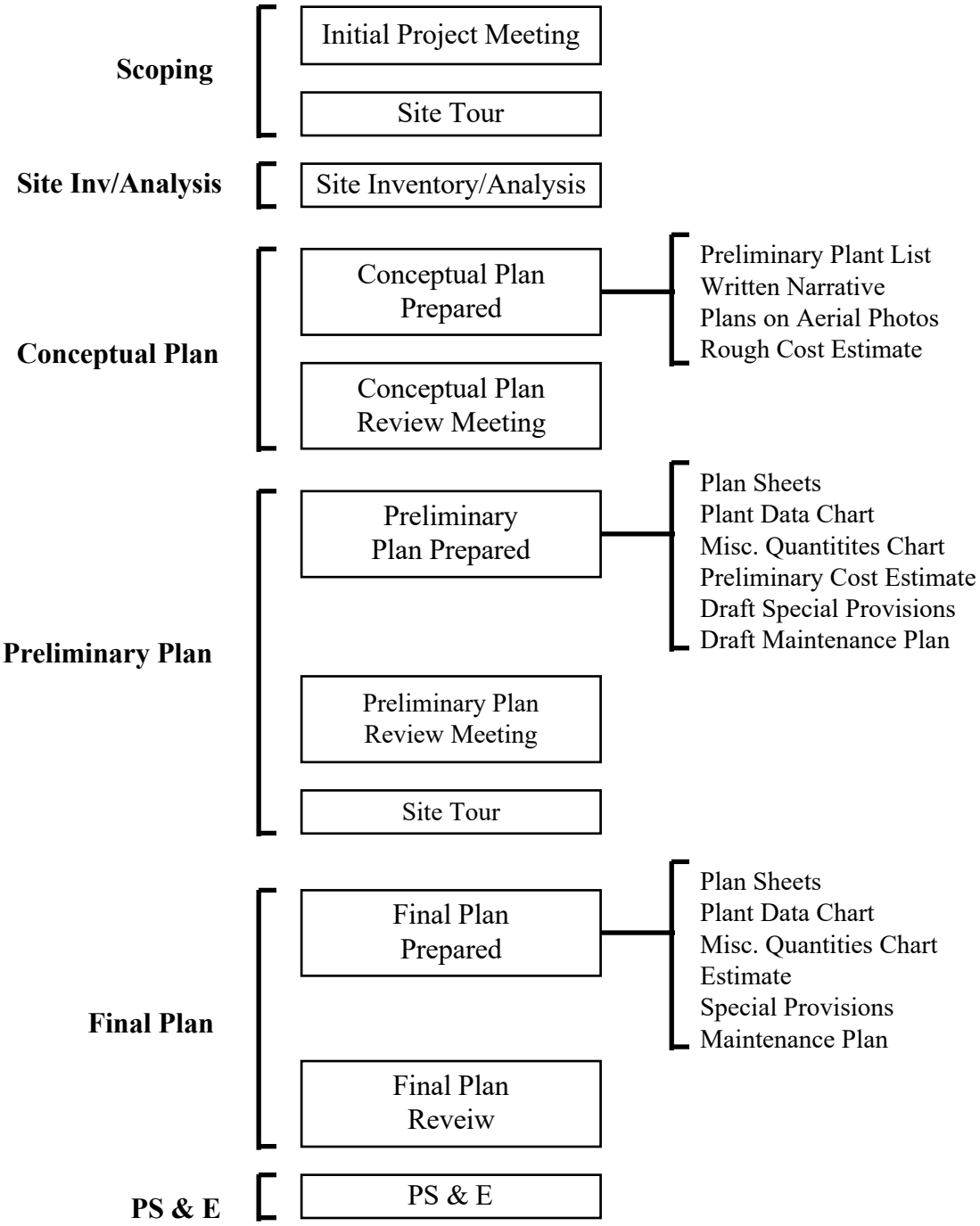
5.9.4 Plant Establishment Period

Unless otherwise specified, a two-year period.

LIST OF ATTACHMENTS

Attachment 5.1	Plantings as Glare Screens
Attachment 5.2	Partial Plant Screening
Attachment 5.3	Plantings as Delineators
Attachment 5.4	Delineating Cut-off Roads
Attachment 5.5	Plants Suitable for Snow Drift Control
Attachment 5.6	Snow Fence Size & Drift Distance
Attachment 5.7	Snow Drift End Effect
Attachment 5.8	Snow Fence Overlap
Attachment 5.9	Topography and Drift Shape
Attachment 5.10	Topography and Snow Storage
Attachment 5.11	Guidelines for Planting Trees Near Overhead Power Lines
Attachment 5.12	Salt Tolerance Chart
Attachment 5.13	Shadow Length and Direction Chart

Planting Plan Development Process



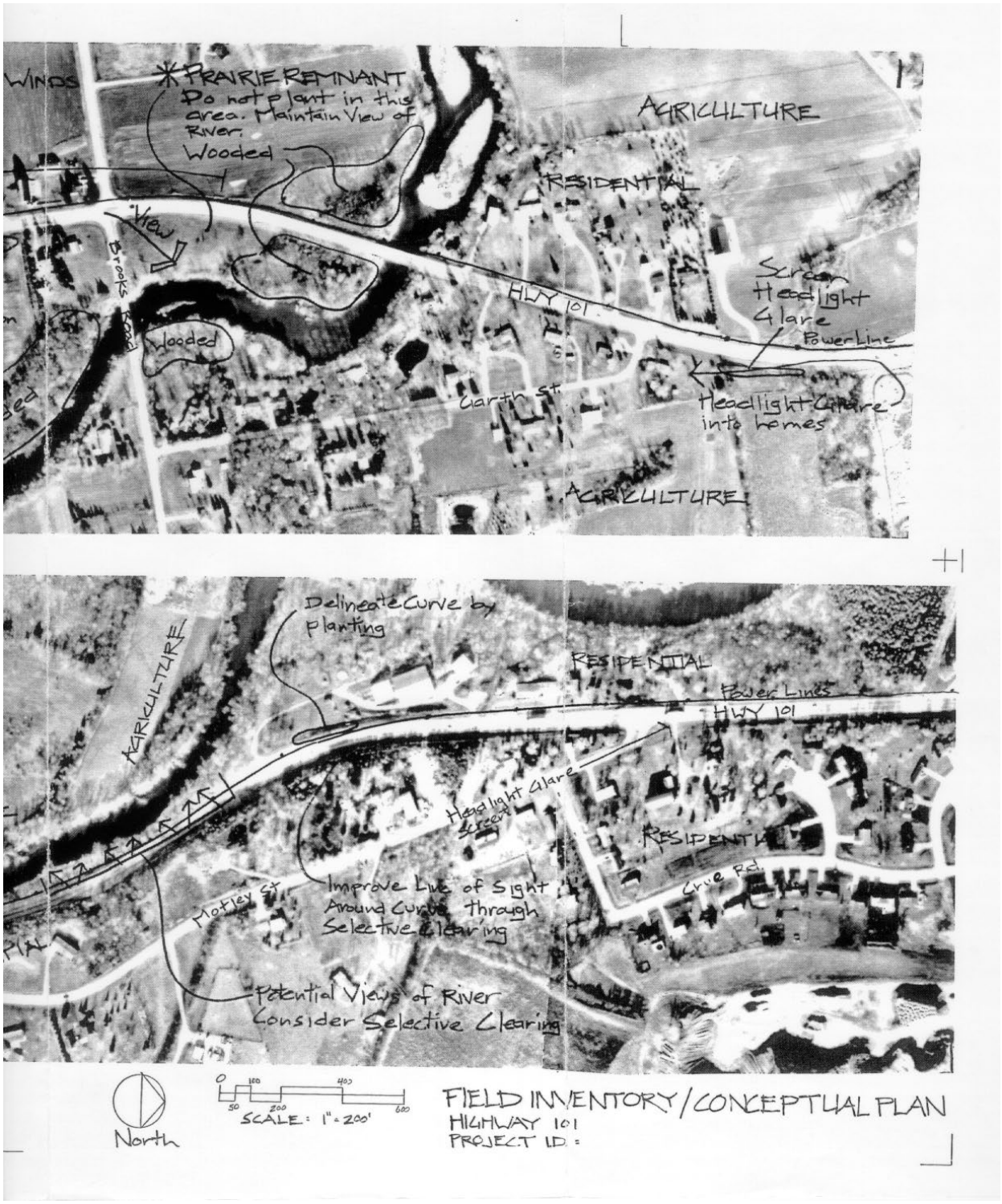
Site Inventory/Conceptual Plan Checklist

To be done on an **aerial mosaic**
Scale: 1" = 200' (1:2000 metric) for urban projects
1" = 400' (1:4000 metric) for rural projects

Show and Label:

1. Adjacent Land Uses
2. Access
3. Views
4. Existing Terrain
5. Slopes and Slope Aspect
6. Soils
7. Existing Vegetation on and off the Right-of-Way (Check Vegetation Inventory)
    a. Major Species
    b. Vegetation to Transplant or Save
    c. Areas for Selective Clearing
8. Identify General Areas for Planting
9. Drainage Ways and Ditches
10. Water Bodies
11. Micro-Climate
    a. Highway Orientation
    b. Prevailing Winds
    c. Winter Shading
12. Problem Areas
    a. Erosion
    b. Headlights
    c. Noise
    d. Snow Drifting
    e. Unpleasant Views
    f. Buffer Adjacent Land Uses
    g. Junk Yards
    h. Roadway Alignment (Curves, Dead Ends)
13. Utilities (Underground, Overhead)
14. Outdoor Advertising Signs
15. Side Streets and Road Names
16. Structures (Noise Walls, Guard Rails)


*NOTES - TERRAIN - VERY GENTLY ROLLING
WOODED AREAS - SILVER MAPLE, RIVER BIRCH, WILLOW
THIS SECTION OF HWY - ALL FILL SLOPE
AGRICULTURE
PREVAILING WINDS
Snow Drifting Problem
Plant Living Snowfence
HWY 101
Powerline
Potential
Prairie
Restoration
Vicws
Junk Pile
Screen/Remove
AGRICULTURE
Flooded
AGRICULTURE
WETLAND
Snow Drifting Problem
Plant Living Snowfence
AGRICULTURE
Power Lines
HWY 101
AGRICULTURE
RESIDENTIAL


WINDS
*PRAIRIE REMNANT
Do not plant in this area. Maintain View of River.
Wooded
AGRICULTURE
RESIDENTIAL
View
Brooks Road
HWY 101
Screen Headlight Glare
Power Line
Wooded
Garth St.
Headlight Glare into homes
AGRICULTURE
Delineate Curve by Planting
AGRICULTURE
RESIDENTIAL
Power Lines
HWY 101
Headlight Glare
Screen
RESIDENTIAL
Motley St.
Improve Line of Sight Around Curve through Selective Clearing
Potential Views of River Consider Selective Clearing
North
SCALE: 1" = 200'
FIELD INVENTORY/CONCEPTUAL PLAN
HIGHWAY 101
PROJECT I.D.:

Narrative Checklist

I. Introduction
   - A. Location
   - B. Purpose
   - C. Scope of Work

II. General Description of Route
   - A. Terrain
   - B. Vegetation
   - C. Development
   - D. Character
   - E. Adjacent Land Use
   - F. Views
   - G. Features

III. Note Significant Considerations
   - A. Impact of Improvement

IV. Proposed Landscape Treatments
   - A. Trees, Shrubs, Evergreens and Vines
   - B. Special Seeding
   - C. Inert Ground Cover

V. Construction Schedule
   - A. Dates

VI. Draft Maintenance Plan (general)
   - A. Based on DOT Maintenance Policy or Pre-Arranged Maintenance Agreement with Local Governments

VII. Preliminary Plant List

Sample Narrative

Project LSF 03-1 (60)

I.D. 1101-4-00

The ZOO Freeway

West Florist Avenue to West County Line

U.S.H. 45, Milwaukee County

Conceptual Plan

Proposed Highway Planting

I. Introduction

Location

The Zoo Freeway, U.S.H. 45 from West Florist Avenue to the West County Line.

Purpose

To improve the freeway corridor by providing supplemental planting which will functionally and aesthetically complement and enhance the adjacent lands.

Scope of Work

The work will include planting woody plants (trees, shrubs, and vines), seeding a special seed mix, and placing inert ground cover material in defined areas.

II. General Description of Route and Proposed Landscape Treatment

This segment of U.S.H. 45, the Zoo Freeway, is part of a major transportation link between Milwaukee and areas to the north, especially the Fox River Valley, Green Bay, and north central areas. It is primarily made up of two large interchanges which collect and distribute traffic from local collectors and major arterials, primarily U.S.H. 41 and S.T.H. 145.

Lands adjacent to the freeway are gently rolling rural lands made up of wooded and open areas. The largest wooded area is public land occupied by the Menomonee River Parkway. Suburban residential development at Florist Avenue gives way to scattered residential units or clusters of units through rural lands to the north.

Florist Avenue to West Green Tree

This area is occupied by the south interchange, a major directional facility providing access to and from U.S.H. 41 and S.T.H. 175. Plantings through this section should look natural and blend with the adjoining lands. They should serve as guides to identify and define changes in alignment or dominant features of the highway. Plant masses will block out the view of traffic movements on some frontage roads and ramps which might distract the motorists. The size of the areas within this inter-change dictates that much of the planting consist of groupings of tall-growing trees.

Green Tree to West County Line

The south part of this segment consists of two partial clover leaf interchanges which provide access to and from Good Hope Road and S.T.H. 100. A short distance further north, S.T.H. 145, the Fond du Lac freeway, intersects U.S.H. 45 and 41 to complete the north interchange. Lands adjacent to the freeway are primarily open agricultural lands or wooded areas. The mostly wooded Menomonee River Parkway occupies much of the land west of this segment, while lands to the east are open or partially wooded.

Proposed plantings in this interchange complex are massed to complement vegetation of adjacent lands and to provide visual separations between the various interchange roadways, ramps, and frontage roads. Combinations of deciduous trees, shrubs, and coniferous evergreens will make up most of the plant groupings.

III. Proposed Landscape Treatment

Trees, Shrubs, and Vines

The major part of the work consists of planting these major plant types. The planting layouts are designed to harmonize with landscaping done to the south on U.S.H. 45 and with existing native and introduced vegetation in the project area. Fairly large groups of tall-growing trees, in smaller sizes are proposed where feasible to complement the scale of the large interchange areas. The attached plant list is based on specific types of plants which have proven to be reliable under freeway conditions in the project area.

Seeding

Although grass is considered the basic living ground cover throughout the project, some areas presently covered in grass will be seeded with a special native grass and wildflower mix. The mix will add new dimensions through texture and color contrasts as well as providing a low maintenance cover in selected locations, especially high visibility areas. In addition to the special mix, a seed mixture containing salt-tolerant grasses is proposed for some selected areas.

Inert Ground Cover

This treatment is proposed for relatively small areas just off the shoulders or behind curbs which no longer sustain suitable grass cover. These areas will be designed to present a well-defined shape of uniform texture between the shoulder or curb and the healthy grass.

IV. Construction

The project will be prepared for letting under one contract. Present plans provide

for a 2001 fall letting, with work to be done during the 2002 spring planting season.

The project should be completed in the fall of 2004.

V. Maintenance

Present practices provide that the contractor care for the installation for two growing seasons. Thus, plants will have survived for two growing seasons and become established. Maintenance after the proving period is based on the premise that the plant material selected should become well-established after two or three growing seasons. Watering will be provided by watering trucks. Some plants which have a wide tolerance range and become established quite readily would only be watered in extreme situations.

Weed control is accomplished through the carefully controlled use of herbicides and re-mulching. This requirement diminishes as the plantings mature. Region Maintenance personnel have agreed to budget for and provide necessary on-going maintenance after the Plant Establishment Period has expired. There are no local groups willing to assume maintenance responsibilities.

Preliminary Plant List

Project I.D. 1151-1-68

Lombardi Ave. to Velp Ave.

U.S.H. 41, Brown County

Large Deciduous Trees: **Mature Height >35' or > 11m**

Common Name	*Caliper or Height When Planted*	*Root Zone Mode*
Ash, Green	1 ¾ "cal. **(45 mm)** or 8' **(2.4 m),** 5' **(1.5 m)** ht.	B & B or BR
Ash, White	1 ¾ "cal. **(45 mm)** or 8' **(2.4 m),** 5' **(1.5 m)** ht.	B & B or BR
Honeylocust, Thornless	1 ¾ "cal. **(45 mm)** or 8' ht. **(2.4 m)**	B & B or BR
Linden, American	1 ¾ "cal. **(45 mm)** or 8' ht. **(2.4 m)**	B & B or BR
Maple, Norway	1 ¾ "cal. **(45 mm)** or 8' ht. **(2.4 m)**	B & B or BR
Maple, Silver	8' ht. **(2.4 m)**	BR
Maple, Sugar	1 ¾ "cal. **(45 mm)** or 8' **(2.4 m),** 5' **(1.5 m)** ht.	B & B or BR
Maple, Red	1 ¾ "cal. **(45 mm)** or 8' **(2.4 m)**	B & B or BR
Oak, Red	5' ht. **(1.5 m)**	B & B

Medium to Small Deciduous Trees: Mature Height 15 - 35' or 5 - 11 m

Common Name	*Caliper or Height When Planted*	*Root Zone Mode*
Birch, River	6' ht. **(1.8 m)**	B & B
Hawthorn (Thicket, Washington)	5' ht. **(1.5 m)**	B & B
Ironwood	6' ht. **(1.8 m)**	B & B
Plum, American	3' ht. **(900 mm)**	BR
Serviceberry	5' ht. **(1.5 m)**	B & B only

Large and Small Evergreen Trees: Mature Height 10 - 30' + or 3.0 - 9.1 m

Common Name	*Caliper or Height When Planted*	*Root Zone Mode*
Arborvitae, American	2' ht. **(600 mm)**	B & B
Fir, White	3' ht. **(900 mm)**	B & B
Juniper, Virginia Varieties	2 ½' ht. **(750 mm)**	B & B or CG
Pine, Red and White	12" transplants* **(300 mm)** or 2 ½' ht. **(750 mm)**	B & B only
Spruce, White	12" transplants* **(300 mm)** or 2 ½' ht. **(750 mm)**	B & B only

Large, Medium and Small Deciduous Shrubs: Mature Height 4 - 20' or 1.2 - 6.1 m

Common Name	*Caliper or Height When Planted*	*Root Zone Mode*
Buffaloberry, Silver	2' ht. **(600 mm)**	BR
Dogwood, Grey	2' ht. **(600 mm)**	BR
Dogwood, Redosier	2' ht. **(600 mm)**	BR
Maple, Amur	2' ht. **(600 mm)**	BR
Peashrub, Siberian	2' ht. **(600 mm)**	BR
Sumac, Fragrant	2' ht. **(600 mm)**	BR
Sumac, Smooth	2' ht. **(600 mm)**	BR
Sumac, Staghorn	2' ht. **(600 mm)**	BR
Viburnum, American	2' ht. **(600 mm)**	BR

Vines

Common Name	*Size When Planted*	*Root Zone Mode*
Bittersweet, Common	2-year, No. 1	CG
Ivy, Engelmann	2-year, No. 1	CG

Preliminary Estimate of Cost for
Proposed Planting Based on the Conceptual Plan for
the Gallifrey Freeway
East Lorien Avenue to East County Line

Type Classification and Common Name	***Estimated Plant Quantities***	***Size When Planted and Root Zone Mode***	***Average Unit Price***
Large Deciduous Trees			
Ash, Honeylocust, Oak, Maple Hackberry, Linden	50 12	½" cal. **(12.7 mm)** B & B 2 ½" cal. **(63.5 mm)** B & B	$120.00 $345.00
Medium Deciduous Trees			
Birch, Japanese Tree Lilac, Serviceberry, American Hornbeam	25 25	1 ½" cal. **(38 mm)** B & B 1 ¾" cal. **(45 mm)** B & B	$195.00 $230.00
Small Deciduous Trees			
Flowering Crabs, Hawthorns	10	1 ½" cal. **(38 mm)** B & B	$275.00
Large Evergreen Trees			
Pine, Spruce	40 15	6' **(1.83 m)** B & B 15' **(4.57m)** B & B	$225.00 $1,400.00
Small Evergreen Trees			
Arborvitae, Red cedar	30 75	3' **(900 mm)** B & B 4' **(1.22 m)** B & B	$135.00 $150.00
Large Deciduous Shrubs			
Viburnum, Redosier Dogwood	20	4' **(1.22 m)** B & B	$90.00
Medium Deciduous Shrubs			
Rose, Spiraea	50	18" **(460 mm)** CG	$25.00
Small Deciduous Shrubs			
Black Chokeberry, Bush Cinquefoil	10	24" **(610 mm)**	$30.00
Evergreen Shrubs			
Junipers, Bird's Nest Spruce	25	18" **(460 mm)** CG	$40.00
Vines			
Bittersweet, Engelmann Ivy	50	No. 1, 2 -year CG	$25.00
Special Seeding (Prairie)			
Prairie Grasses and Forbs	96 lb. **(43.54 kg)**	Seed	$350.00 lb. **($771.62 kg)**

Preliminary Plan Checklist

To be done on a base map
Scale: 1” = 50’ (1:500 metric) for urban projects
1” = 100’ (1:1000 metric) for rural projects

1. Label:
    a) Stationing and Reference Line
    b) North Arrow
    c) Scale
    d) Adjacent Land Uses
    e) Highway, Road, and Street Names
    f) Utilities (underground and overhead)
    g) Views
    h) Structures
    i) Right-of-Way Lines
    j) Fence where Different from Right-of -Way Lines
    k) Drainage Structures and Culverts
    l) Match Lines
    m) Any Other Information Pertinent to Planting

2. Show outlines of existing vegetation on and off the right-of-way.
3. Identify proposed individual plants and plant groupings.
4. Draw plant symbols to standard sizes representing mature plants and label with names and quantities.
5. Identify shrub beds.
6. Identify areas to be seeded.
7. Provide preliminary
    a) Quantities
    b) Plant Data Chart
    c) Draft Special Provisions (to supplement Standard Specifications)
    d) Cost Estimate
    e) Maintenance Plan

Sample Plant Data Chart

SYM.	Common Name	Scientific Name	Type	Ave. Mature Height	Size (cal. or ht.) When Planted	Root Zone Mode
	Large Deciduous Trees					
WA	Ash, White	Fraxinus americana	1	75’	1 ¼” cal.	BR
WAA	Ash, Autumn Purple	F. Amer. Autumn Purple	1	50’	1 ¼” cal.	BR
AL	Linden, American	Tilia americana	1	80’	2” cal.	B&B
RM	Maple, Red	Acer rubrum	1	75’	8’ ht.	BR
SM	Maple, Sugar	Acer saccharum	1	75’	2” cal.	B&B
SM	Maple, Sugar	Acer saccharum	1	75’	8’ ht.	BR
BO	Oak, Bur	Quercus macrocarpa	1	75’	1 ½” cal.	B&B
	Medium Deciduous Trees					
QA	Aspen, Quaking	Populus tremuloides	1	60’	8’ ht.	BR
PB	Birch, Paper	Betula papyrifera	1	50’	1 ¼” cal.	B&B
	Small Deciduous Trees					
AF	Filbert, American	Corylus americana	3	20’	4’ ht.	BR
DH	Hawthorn, Downy	Crataegus mollis	3	25’	5’ ht.	B&B
	Large Evergreen Trees					
CH	Hemlock, Canadian	Tsuga canadensis	4	50’	3’ ht.	B&B
EWP	Pine, Eastern White	Pinus strobus	4	75’	3’ ht.	B&B
	Small Evergreen Trees					
AA	Arborvitae, American	Thuja occidentalis	6	30’	3’ ht.	*B&B
	Large & Med. Decid. Shrubs					
RD	Dogwood, Redosier	Cornus sericea	2	8’	3’ ht.	BR
SS	Sumac, Smooth	Rhus glabra	3	15’	2’ ht.	BR

BR: Bare Root
B&B: Balled and Burlapped
CG: Container Grown

* Container Grown (CG) may be substituted

Note: Names of plants should be listed in alphabetical order using the common name
Example: Ash, Green

Sample Plant Data Chart

Minimum Size					Brace or Guy	Fert. Units Req'd.	Rodent Protct Req'd.	Mulch Ring Diam.	PLT BED DTL
Ball/Pot		Root Spread	Plant Hole						
Diam.	Depth		Diam.	Depth					
-	-	20"	32"	14"	BRACE	3	YES	44"	
-	-	20"	32"	13"	BRACE	3	YES	44"	
24"	16"	-	36"	16"	GUY	4	YES	48"	
-	-	18"	30"	14"	BRACE	3	YES	42"	
24"	16"	-	36"	16"	GUY	4	YES	48"	
-	-	18"	30"	14"	BRACE	3	YES	42"	
20"	14"	-	32"	14"	BRACE	3	YES	44"	
-	-	18"	30"	14"	BRACE	3	YES	42"	
18"	14"	-	30"	14"	BRACE	3	YES	42"	
-	-	16"	28"	12"	NO	3	NO	40"	
16"	12"	-	28"	12"	NO	3	NO	40"	
14"	11"	-	26"	11"	NO	3	NO	38"	
14"	11"	-	26"	11"	NO	3	NO	38"	
14"	11"	-	26"	11"	NO	2	NO	38"	
-	-	14"	26"	11"	NO	2	NO	BED	C
-	-	11"	Accom. Roots		NO	1	NO	NONE	

Sample Quantities by Sheet (Miscellaneous Quantities)

SYM.	Common Name	Size When Planted	Root Zone Mode	Sheet Numbers					
				1	2	3	4	5	Totals
				Each	Each	Each	Each	Each	Each
WA	Ash, White	1 ¼" cal.	BR	7		9	3		19
WAA	Ash, Autumn Purple	1 ¼" cal.	BR		6		8	7	21
AL	Linden, American	2" cal.	B&B	4	9	4		3	20
RM	Maple, Red	8' ht.	BR		3		1		4
SM	Maple, Sugar	2" cal.	B&B	4					4
SM	Maple, Sugar	8' ht.	BR		8		2	6	16
BO	Oak, Bur	1 ½" cal.	B&B		6	5	3		14
QA	Aspen, Quaking	8' ht.	BR	1		4		6	11
PB	Birch Paper	1 ¼" cal.	B&B	4				7	11
AF	Filbert, American	4' ht.	BR	8				2	10
DH	Hawthorn, Downy	5' ht.	B&B	1		4			5
CH	Hemlock, Canadian	3' ht.	B&B		7	3	1		11
EWP	Pine, Eastern White	3' ht.	B&B	1		3	2	5	11
AA	Arborvitae, American	3' ht.	B&B	10			20	12	42
RD	Dogwood, Redosier	3' ht.	BR		15		33	22	70
SS	Sumac, Smooth	2' ht.	BR	65	22		40	17	144

WISCONSIN DEPARTMENT OF TRANSPORTATION PAGE: 1
DATE: 02/09/99
PROPOSAL ESTIMATE REVISED:

CONTRACT: C0001-01-10
PROJECT(S): 0001-01-10
FEDERAL ID(S): N/A

CONTRACTOR :_____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE DOLLARS	UNIT PRICE CTS	EST AMOUNT DOLLARS	EST AMOUNT CTS
	SECTION 0001 LANDSCAPE PLANTINGS				29,900.00	
0010	61910 MOBILIZATION	(1.000) EACH	2,500.00000		2,500.00	
0020	63201 TREES, ASH, WHITE, 1.5-INCH CAL, B&B	5.000 EACH	235.00000		1,175.00	
0030	63202 TREES, HACKBERRY, COMMON, 2-INCH CAL, B&B	12.000 EACH	285.00000		3,420.00	
0040	63203 TREES, SPRUCE, WHITE, 3-FT CAL, B&B	22.000 EACH	175.00000		3,850.00	
0050	63261 SHRUBS, DOGWOOD, REDOSIER, 3-FT HEIGHT, BR	54.000 EACH	20.00000		1,080.00	
0060	63262 SHRUBS, VIBURNUM, AMERICAN CRANBERRYBUSH, 4-FT HEIGHT, B&B	35.000 EACH	95.00000		3,325.00	
0070	63281 VINES, IVY, ENGLEMANN, 2-YEAR, NO. 1, CG	40.000 EACH	20.00000		800.00	
0080	90033 MISC 90033A MULCHING, RED GRANITE	500.000 S.Y.	7.50000		3,750.00	
0090	90036 MISC 90036A SEEDING, SPECIAL	200.000 LB.	50.00000		10,000.00	
	TOTAL ESTIMATE				29,900.00	

( ) WILL BE BID AS LUMP

Final Plan Checklist

1. Title sheet (if a stand-alone project)
2. Typical sections and standard detail sheets
   a. Typical section of highway and planting
   b. Standard Tree - Planting Detail Sheet (SDD 14A2)
   c. Any other special details

3. AASHTOWare estimate

4. Miscellaneous quantities
   a. Plant and seed quantities by location and totaled
   b. Any other miscellaneous quantities

5. Plant data chart

6. Right-of-way plat if necessary

7. Plan sheets
   a. Same base map and scale as preliminary plan
   b. Place informal page numbers under the title block on the standard plan sheet
   c. Include a legend showing plant symbols and common names on each page

8. Standard Detail Drawings
   a. List the numbers of required standard detail drawings on the first typical sections and detail sheet.
9. Cross-sections (when appropriate)

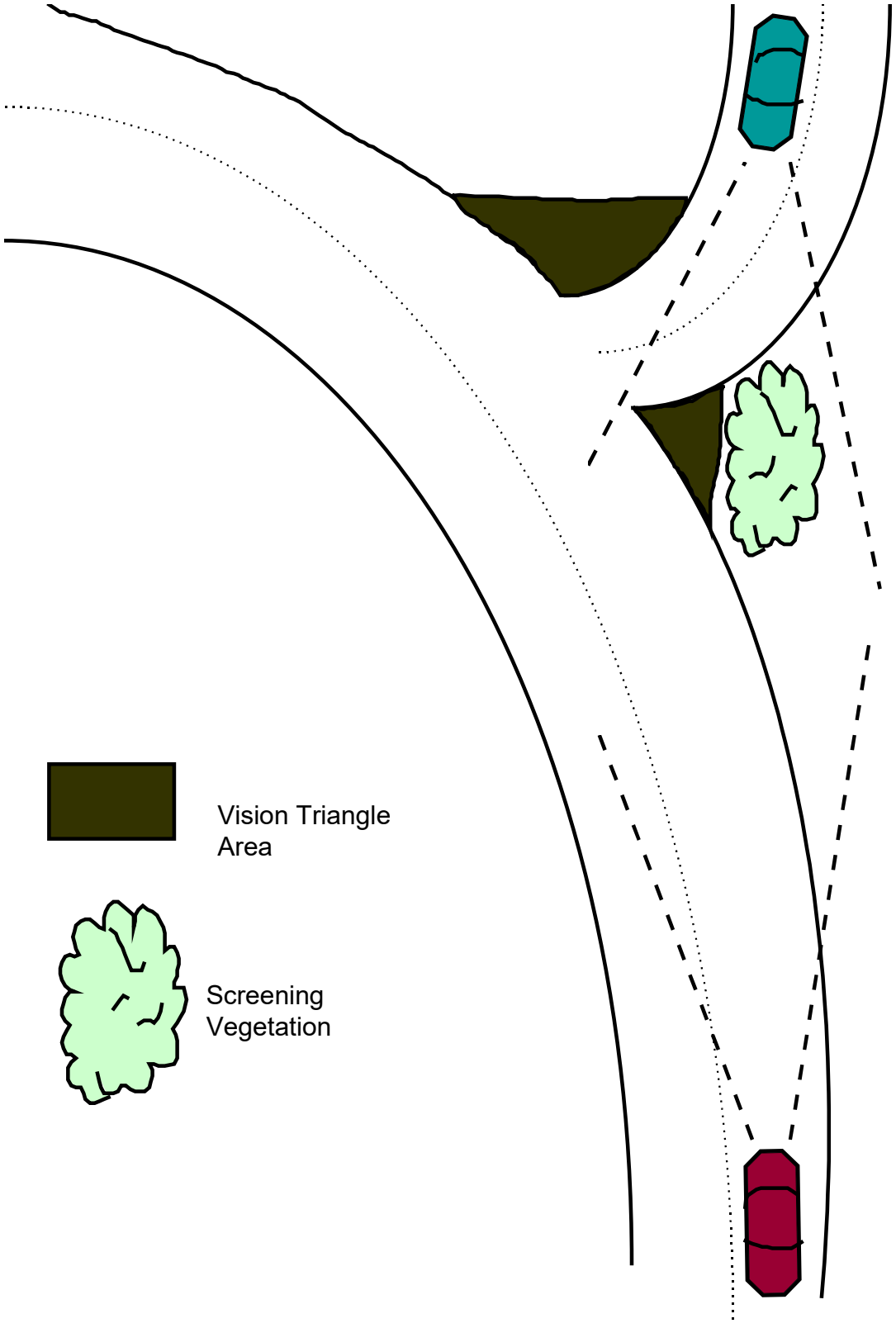
10. Plan letter
    a. Include for a stand-alone project if the consultant and the district agree it is the consultant's responsibility.
    b. Include for a project that is part of a larger project, and supply the district with any special information about the landscaping

11. Specifications and Special Provisions

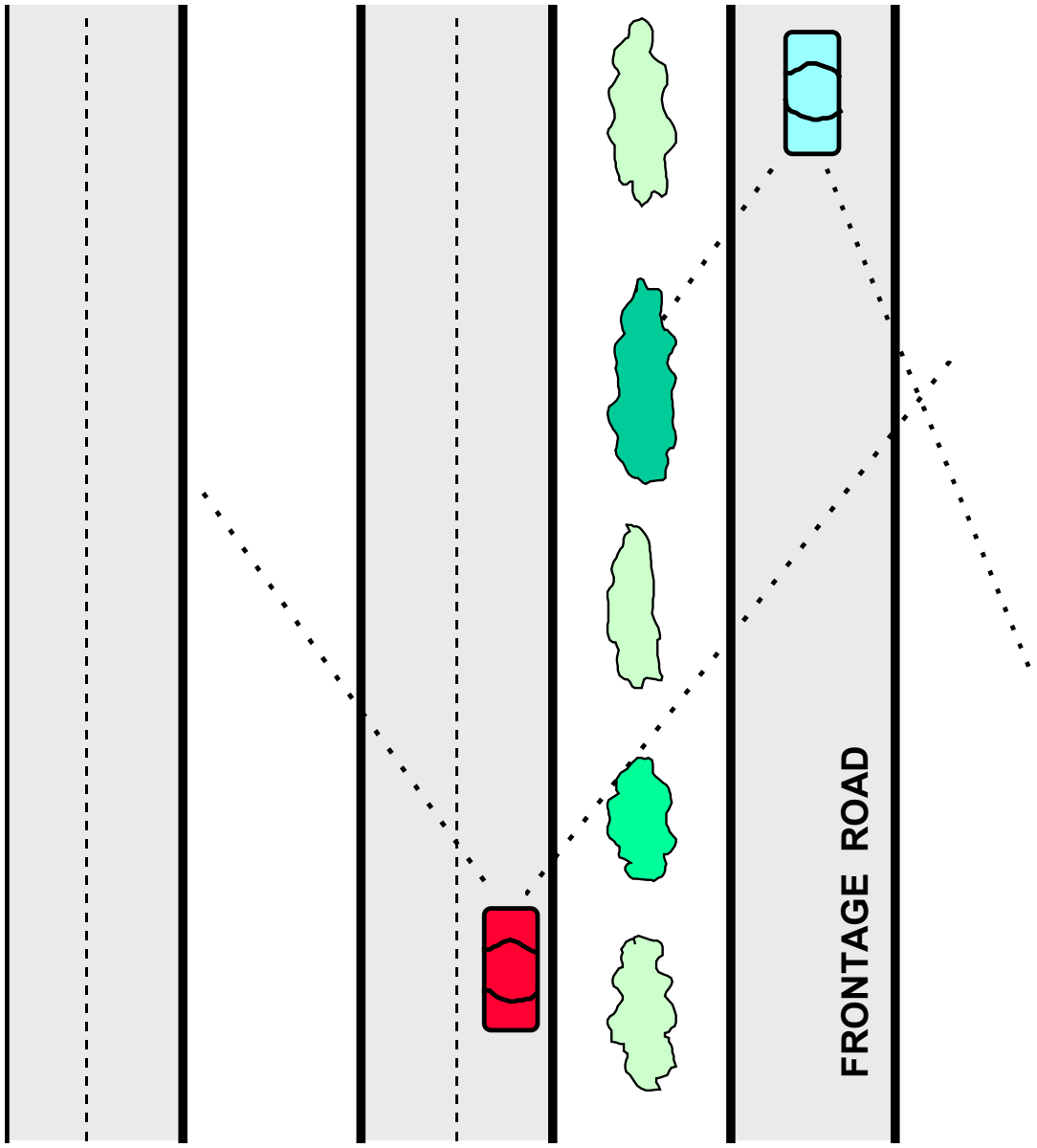
12. Contract Time for Completion form (see FDM 19-10 Attachment 30.1)

13. Maintenance Plan (not part of the PS&E package)

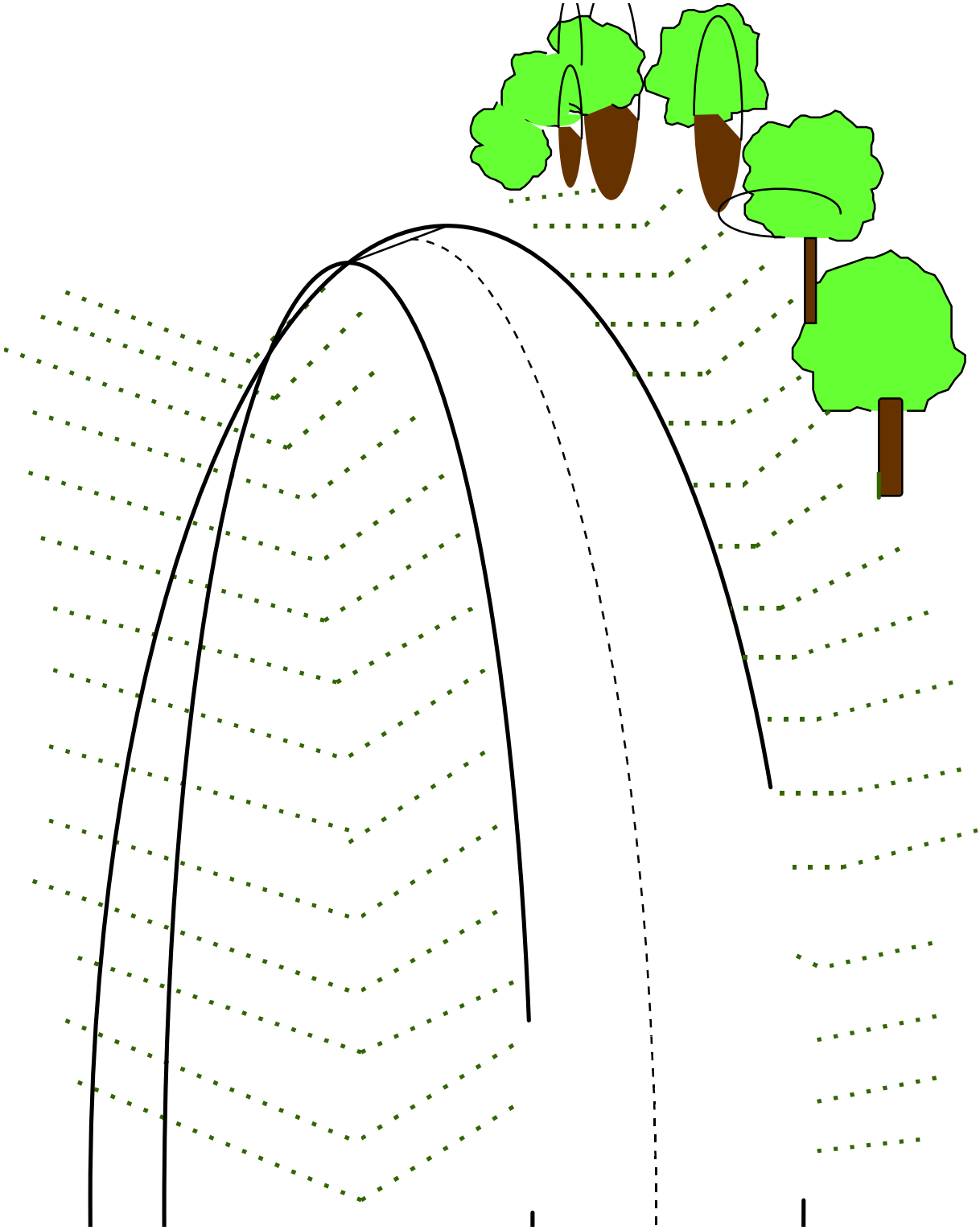
Plantings as Glare Screens



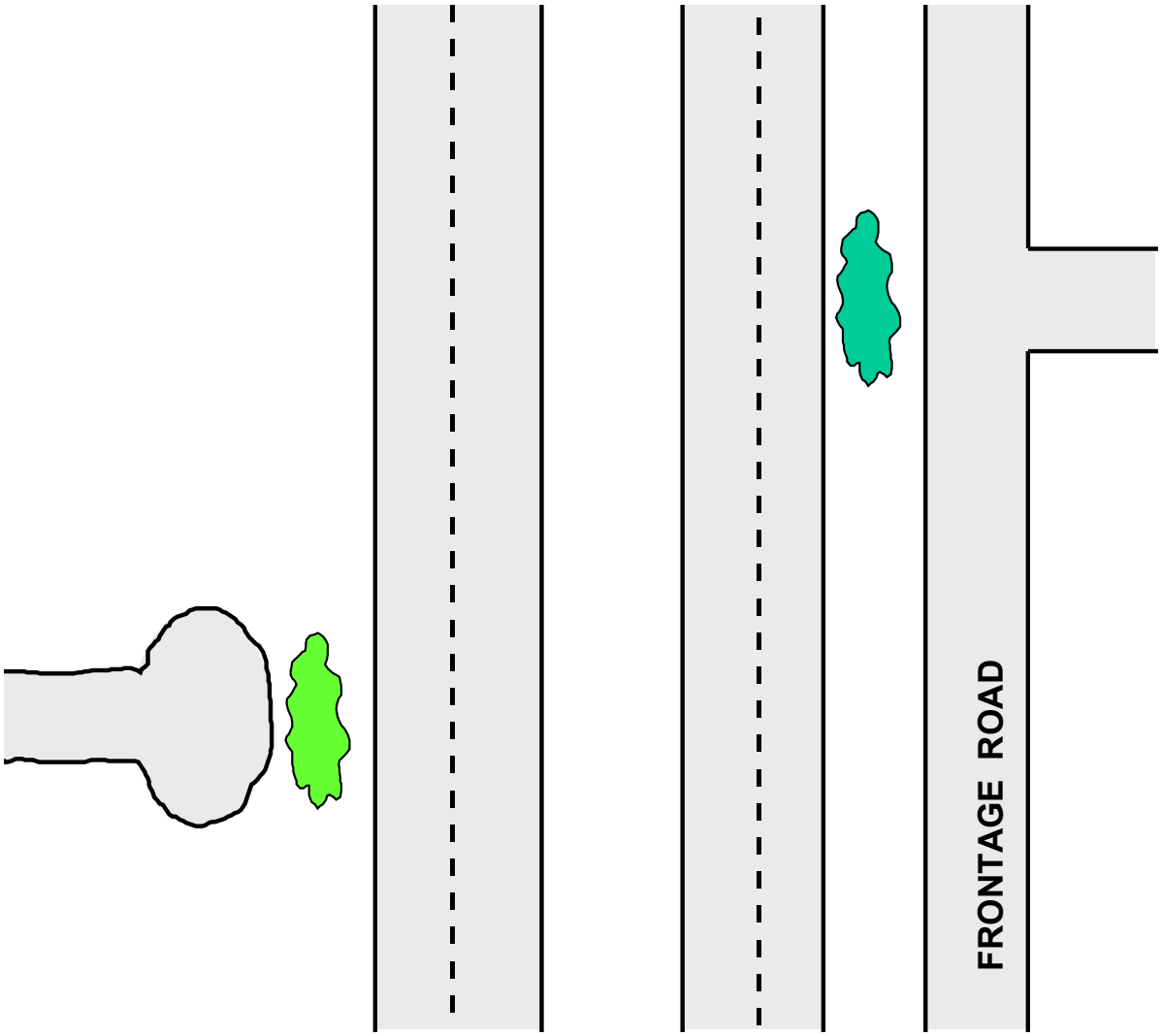
Partial Plant Screening



Plantings as Delineators



Delineating Cut-off Roads



Deciduous Woody Shrubs Suitable for Snowdrift Control

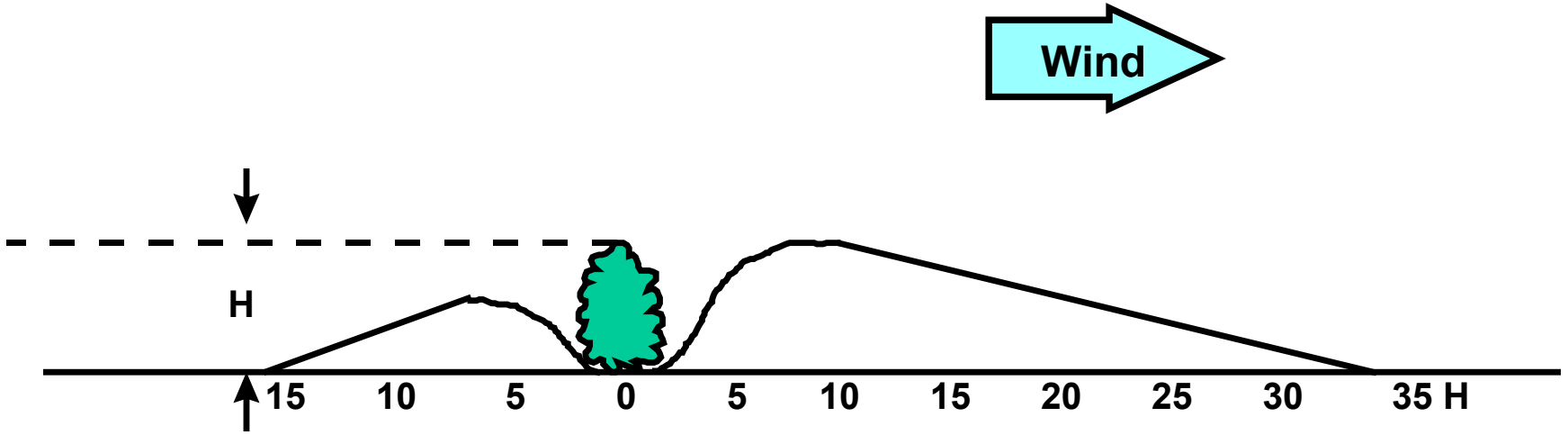
Common Name	Latin Name	Mature Height	Soil Moisture Tolerance	Winter Hardiness
Dogwood, Silky	Cornus amomum	10' **(3 m)**	Wet to dry mesic	South half of the state
Dogwood, Grey	Cornus racemosa	10' **(3 m)**	Wet mesic to dry	Statewide
Dogwood, Redosier	Cornus sericea	8' **(2.5m)**	Wet to dry mesic	Statewide
Filbert, American	Corylus americana	8' **(2.5m)**	Wet mesic to dry	Statewide
Ninebark, Common	Physocarpus opulifolius	10' **(3 m)**	Wet to dry	Statewide
Plum, American	Prunus americana	15' **(4.5 m)**	Mesic to dry	South half of the state
Viburnum, Nannyberry	Viburnum lentagp	30' **(9 m)**	Wet mesic to dry mesic	Statewide
Viburnum, American Cranberrybush	Viburnum trilobum	12' **(4 m)**	Wet to dry mesic	Statewide

Evergreen Trees Suitable for Snowdrift Control

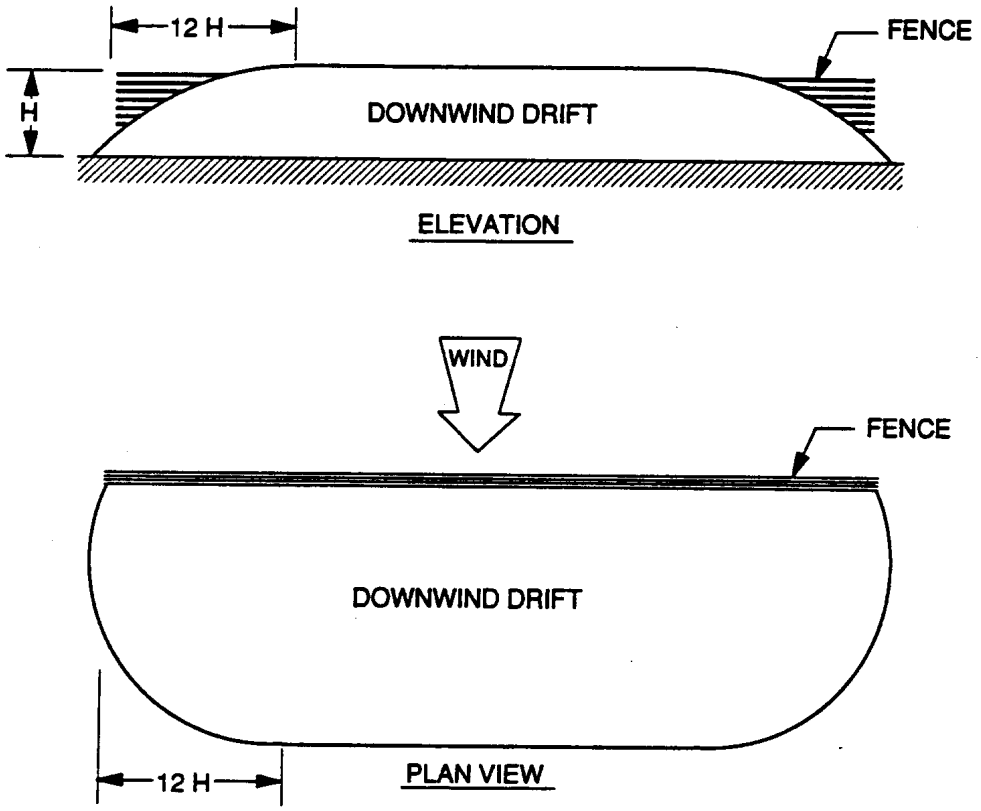
Common Name	Latin Name	Mature Height	Soil Moisture Tolerance	Winter Hardiness
Spruce, White	Picea glauca	50' **(15 m)**	Wet mesic to mesic	North half of the state
Pine, Red	Pinus resinosa	80' **(24.4 m)**	Mesic to dry	North half of the state
Pine, White	Pinus strobus	100'+ **(30.5 m)**	Wet mesic to dry mesic	* North half of the state

* White pine is susceptible to salty spray and other types of pollution. Use only on the side of the road upwind for the prevailing wind direction. Plant a minimum of 75' from the near edge of the roadway.

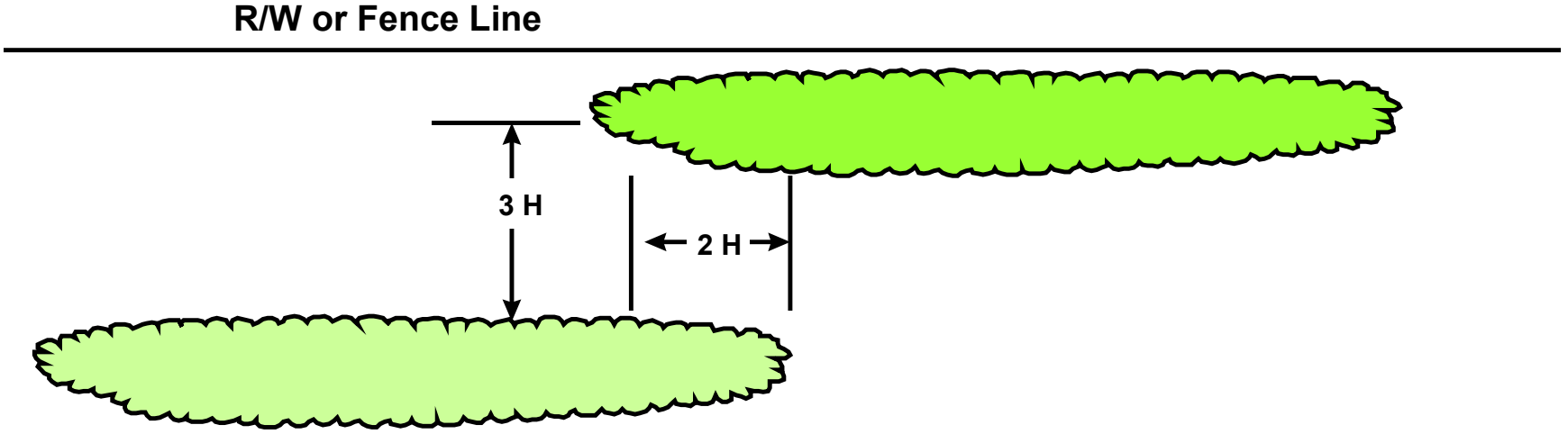
Snowfence Size and Drift Distance



Snowdrift End Effect

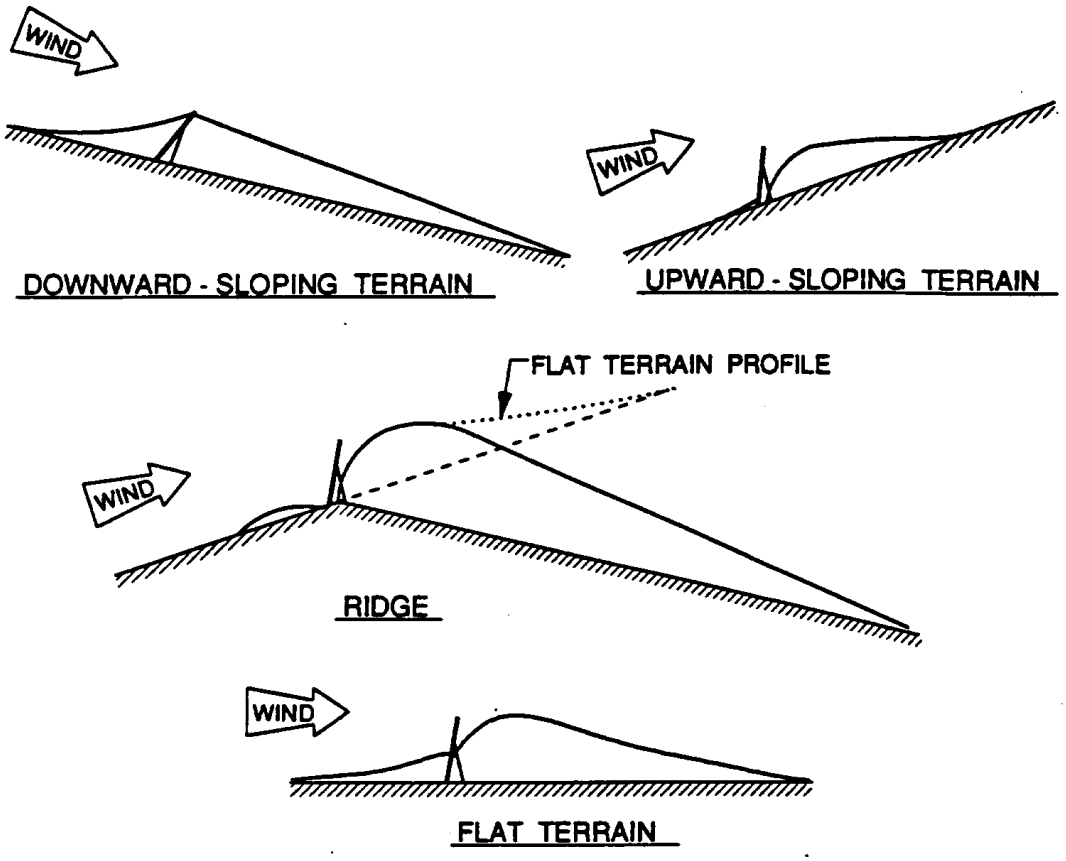


Snowfence Overlap

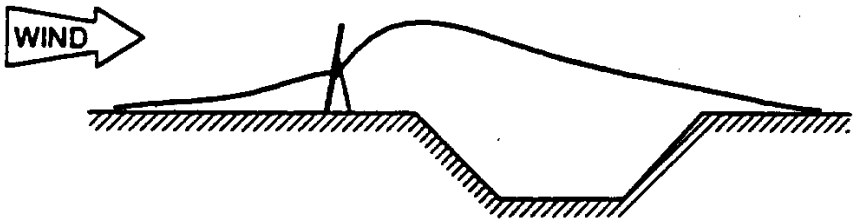


H = Height of Mature Plants

Topography and Drift Shape



Topography and Snow Storage



DEPRESSION UNDER DRIFT

FOOT OF EMBANKMENT

FLAT TERRAIN

Guidelines for Planting Trees Near Overhead Power Lines

Distribution Lines

Planting Distance From Line Center	Low-growing Trees (Less than 20' tall)	Medium Height Trees (20' - 40' tall)	Tall Trees (Over 40' tall)
	Underneath line is okay	25' **(8 m)**	40' **(12 m)**

* Distribution lines serve residential, rural, commercial and small industrial customers

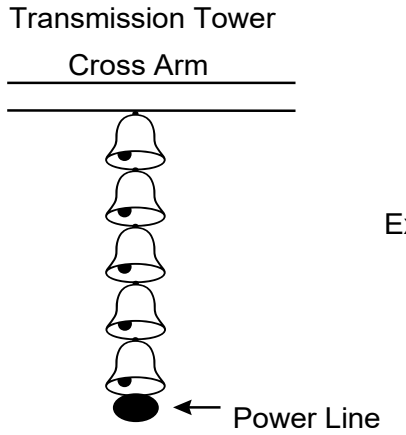
Transmission Lines

Planting Distance From Line Center	Low-growing Trees (Less than 20' tall)	Medium Height Trees (20' - 40' tall)	Tall Trees (Over 40' tall)
69 KV Line	Underneath line is okay	40' **(12 m)**	40' **(12 m)**
115 KV Line	Underneath line is okay	50' **(15 m)**	50' **(15 m)**
138 KV Line	Underneath line is okay	50' **(15 m)**	50' **(15 m)**
161 KV Line	Underneath line is okay	60' **(18 m)**	60' **(18 m)**
230 KV Line	Underneath line is okay	75' **(23 m)**	75' **(23 m)**
345 KV Line	Underneath line is okay	75' **(23 m)**	75' **(23 m)**

** Transmission lines serve large industrial customers and tie sources of power supplies

How to Identify Transmission Line KV Ratings (Length of Insulators)

69 KV = 5 Bells
115 KV = 8 Bells
138 KV = 10 Bells
161 KV = 12 Bells
230 KV = 15 Bells
345 KV = 20 Bells



Example of a 5 - Bell Configuration

Aerial Salt Spray Tolerance of Deciduous Trees

Intolerant (I)	Intermediate (M)	Tolerant (T)
Acer palmatum (Japanese Maple) +	**Acer campestre** (Hedge Maple) +	**Acer platanoides** (Norway Maple) *^+
Carpinus betulus (European Horbeam) +	**Acer ginnala** (Amur Maple) *(^I) +	**Acer saccharinum** (Silver Maple) *(^M) +
Carpinus caroliniana (Blue Beech, Ironwood) *^+	**Acer rubrum** (Red Maple) *^+	**Aesculus hippocastanum** (Horsechestnut) *^+
Carya ovata (Shagbark Hickory) *^(+M)	**Acer saccharum** (Sugar Maple) *^+	**Caragana arborescens** (Siberian Pea Tree) ^+
Cercis canadensis (Redbud) *+	**Alnus incana** (White Alder) *^+	**Elaeagnus angustifolia** (Russian-olive) *^+
Corylus avellana (European Filbert) ***+**	**Alnus rugosa** (Speckled Alder) *(^I) +	**Fraxinus americana** (White Ash) *^(+M)
Crataegus crusgalli (Cockspur Hawthorn) ***^+**	**Amelanchier** spp. (Serviceberry) *(^I) (+I)	**Gleditsia triacanthos** (Honeylocust) *(^I) (+I)
Celtis occidentalis (Hackberry) ***^+**	**Betula alleghaniensis** (Yellow Birch) *(^T)	**Gymnocladus dioica** (Kentucky Coffeetree) +
Fagus grandifolia (Beech) ***+**	**Betula lenta** (Sweet Birch) *(^T)	**Juglans nigra** (Black Walnut) *(+M)
Fagus sylvatica (European Beech) **+**	**Betula nigra** (River Birch) *	**Morus** spp. (Mulberry) *(^I) (+I)
Gingko biloba (Gingko) *	**Betula papyrifera** (Paper Birch) *^+	**Populus alba** (Silver-leaved Poplar) *^+
Liriodendron tulipifera (Tuliptree) *+	**Betula populifolia** (Grey Birch) *(^T) +	**Populus deltoides** (Eastern Cottonwood) *^+
Malus spp. (Flowering Crabapple) *^+	**Catalpa speciosa** (Catalpa) *+	**Populus grandidentata** (Bigtooth Aspen) *^+
Ostrya virginiana (American Hophornbeam) *	**Cladrastis lutea** (American Yellowwood) +	**Populus nigra** (Black Poplar) *^+
Prunus serotina (Black Cherry) ***^+**	**Fraxinus pennsylvanica** (Green Ash) *^+	**Populus tremuloides** (Quaking Aspen) *^+
Prunus virginiana (Chokecherry) *(+M)	**Pyrus** spp. (Ornamental Pear) *+	**Robinia pseudoacacia** (Black Locust) *^+
Quercus alba (White Oak) *^+	**Quercus macrocarpa** (Bur Oak) *^+	**Sorbus** spp. (Mountain Ash) *(^I) (+M)
Quercus bicolor (Swamp White Oak) ^+	**Quercus robur** (English Oak) *(+I)	**Syringa reticulata** (Japanese Tree Lilac) *(+M)
Quercus palustris (Pin Oak) *^+	**Salix alba** (White Willow) *^+	
Quercus rubra (Red Oak) *^+	**Salix nigra** (Black Willow) *+	
Tilia cordata (Littleleaf Linden) *(^T) +	**Tilia americana** (American Linden) *(^I) +	
	Ulmus americana (American Elm) *^+	
	Ulmus pumila (Siberian Elm) *+	

* from UWEX bulletin A2970 "Salt Injury to Landscape Plants", Ed Hasselkus and K.A. Delahaut
^ from Technical Bulletin 303-Forestry Series 20 "Effect of Deicing Salts on Woody Vegetation Along Minnesota Roads", Edward Sucoff
+ from "Yard and Garden" HO-142, a publication of the Horticulture Dept., Cooperative Extension Service, Purdue University, Ruth Kvaalen
If information is missing from one or more of the three sources for a particular plant, the source had no information for the plant in question
I= Intolerant of salt spray, M= Intermediate tolerance of salt spray, T = Tolerant of salt spray.

Aerial Salt Spray Tolerance of Deciduous Shrubs and Vines

Intolerant (I)	Intermediate (M)	Tolerant (T)
Berberis thunbergii (Barberry) *^+	**Berberis koreana** (Korean Barberry) *^(+I)	**Euonymus alatus** (Winged Euonymus) *+
Chaenomeles speciosa (Japanese Flowering Quince) *+	**Forsythia** X **intermedia** (Forsythia) *+	**Parthenocissus quinquefolia** (Virginia Creeper) *^+
Cornus spp. (Dogwood) *^+	**Ligustrum vulgaris** (Common Privet) *^(+I)	**Philadelphus** spp. (Mockorange) *^
Corylus spp. (Filbert) *^+	**Physocarpus opulifolius** 'nanus' (Dwarf Ninebark) ^	**Potentilla fruticosa** 'Jackmanni' (Jackman P.) ^
Euonymus europaea (European Spindletree) *^+	**Spiraea bumalda** 'Froebeli' (Froebel Spiraea) ^	**Rhus aromatica** (Fragrant Sumac) *
Kolkwitzia amabilis (Beauty Bush) +	**Syringa vulgaris** (Common Lilac) *(^I) (+I)	**Rhus glabra** (Smooth Sumac) *(^M)
Prunus besseyi (Sand Cherry) *	**Viburnum dentatum** (Arrowood Viburnum) *(+I)	**Rhus trilobata** (Skunkbush) +
Rosa virginiana (Virginia Rose) ^+	**Viburnum lentago** (Nannyberry Viburnum) *(+I)	**Rhus typhina** (Staghorn Sumac) *+
Sambucus canadensis (American Elder) *^+	**Vib. opulus** (European Cranberrybush Vib.) *(^I) (+I)	**Ribes alpinum** (Alpine Currant) *^+
Sambucus racemosa (European Red Elder) *^+	**Vib. trilobum** (American Cranberrybush Vib.) * (^I) (+I)	**Rosa rugosa** (Rugosa Rose) *(^I) (+I)
Symphoricarpos orbiculatus (Indiancurrant Coralberry) *^+		**Symphoricarpos albus** (Snowberry) *(^M) (+M)
Viburnum lantana (Wayfaringtree Viburnum) *^+		**Tamarix ramosissima** (Five-stamen Tamarisk) ^+
Weigela spp. (Weigela) *		

* from UWEX bulletin A2970 "Salt Injury to Landscape Plants", Ed Hasselkus and K.A. Delahaut
^ from Technical Bulletin 303-Forestry Series 20 "Effect of Deicing Salts on Woody Vegetation Along Minnesota Roads", Edward Sucoff
+ from "Yard and Garden" HO-142, a publication of the Horticulture Dept., Cooperative Extension Service, Purdue University, Ruth Kvaalen
If information is missing from one or more of the three sources for a particular plant, the source had no information for the plant in question
I= Intolerant of salt spray, M= Intermediate tolerance of salt spray, T = Tolerant of salt spray

Aerial Salt Spray Tolerance of Evergreen Trees

Intolerant (I)	Intermediate (M)	Tolerant (T)
Abies balsamea (Balsam Fir) *^+	**Pinus ponderosa** (Ponderosa Pine) *^	**Abies concolor** (White Fir) +
Metasequoia glyptostroboides (Dawn Redwood) **+	**Pseudotsuga menziesii** (Douglasfir) *(^I) (+I)	**Juniperus virginiana** (Eastern Redcedar) *(^M) +
Picea abies (Norway Spruce) *^+		**Larix decidua** (European Larch) *^+
Picea glauca (White Spruce) *+		**Larix leptolepis** (Japanese Larch) ^+
Pinus resinosa (Red Pine) *^+		**Picea pungens** (Colorado Spruce) *^
Pinus strobus (White Pine) *^+		**Pinus banksiana** (Jack Pine) *+
Pinus sylvestris (Scots Pine) *^+		**Pinus mugo** (Mugo Pine) *+
Thuja occidentalis (Arborvitae) *(^M) +		**Pinus nigra** (Austrian Pine) *(^M) +
Tsuga canadensis (Eastern Hemlock) *^+		

Aerial Salt Spray Tolerance of Broadleaf and Needled Evergreen Shrubs

Intolerant (I)	Intermediate (M)	Tolerant (T)
Buxus sempervirens (Boxwood) *	**Juniperus horizontalis** (Creeping Juniper) *	**Juniperus chinensis** (Chinese Juniper) *
Rhododendron spp. (Rhododendron) *		
Taxus spp. (Yew) *+		

* from UWEX bulletin A2970 "Salt Injury to Landscape Plants", Ed Hasselkus and K.A. Delahaut
^ from Technical Bulletin 303-Forestry Series 20 "Effect of Deicing Salts on Woody Vegetation Along Minnesota Roads", Edward Sucoff
+ from "Yard and Garden" HO-142, a publication of the Horticulture Dept., Cooperative Extension Service, Purdue University, Ruth Kvaalen
If information is missing from one or more of the three sources for a particular plant, the source had no information for the plant in question
I= Intolerant of salt spray, M= Intermediate tolerance of salt spray, T = Tolerant of salt spray

To Determine Shadow Length for a Given Date and Hour:

1. Find the date at the bottom of the chart.
2. Move up the chart to the solid line representing the hour in question.
3. Move left or right to the Shadow Factor scale (the inside scale on each side of the chart).
4. Shadow Length = (Height of Tree) x Shadow Factor.

Example

Given: A tree with a mature height of 40 feet.

Find: The length of shadow it will cast at 9:00 a.m. on January 25.

Solution:

Find 25 January on the bottom of the chart and move up to the 9 o'clock line, then move left to the shadow factor scale on the left side of the chart. The shadow factor is about 3.75. The length of shadow on this date would then be calculated as:

25 January, 40 ft x 3.75 = 150 ft

To Determine the Direction in Which the Shadow will be Cast:

1. Select a date at the bottom of the chart.
2. Move up the chart to the dashed line representing the hour in question*.
3. Move left for a morning hour and right for an afternoon hour to the outside vertical scales for shadow direction.

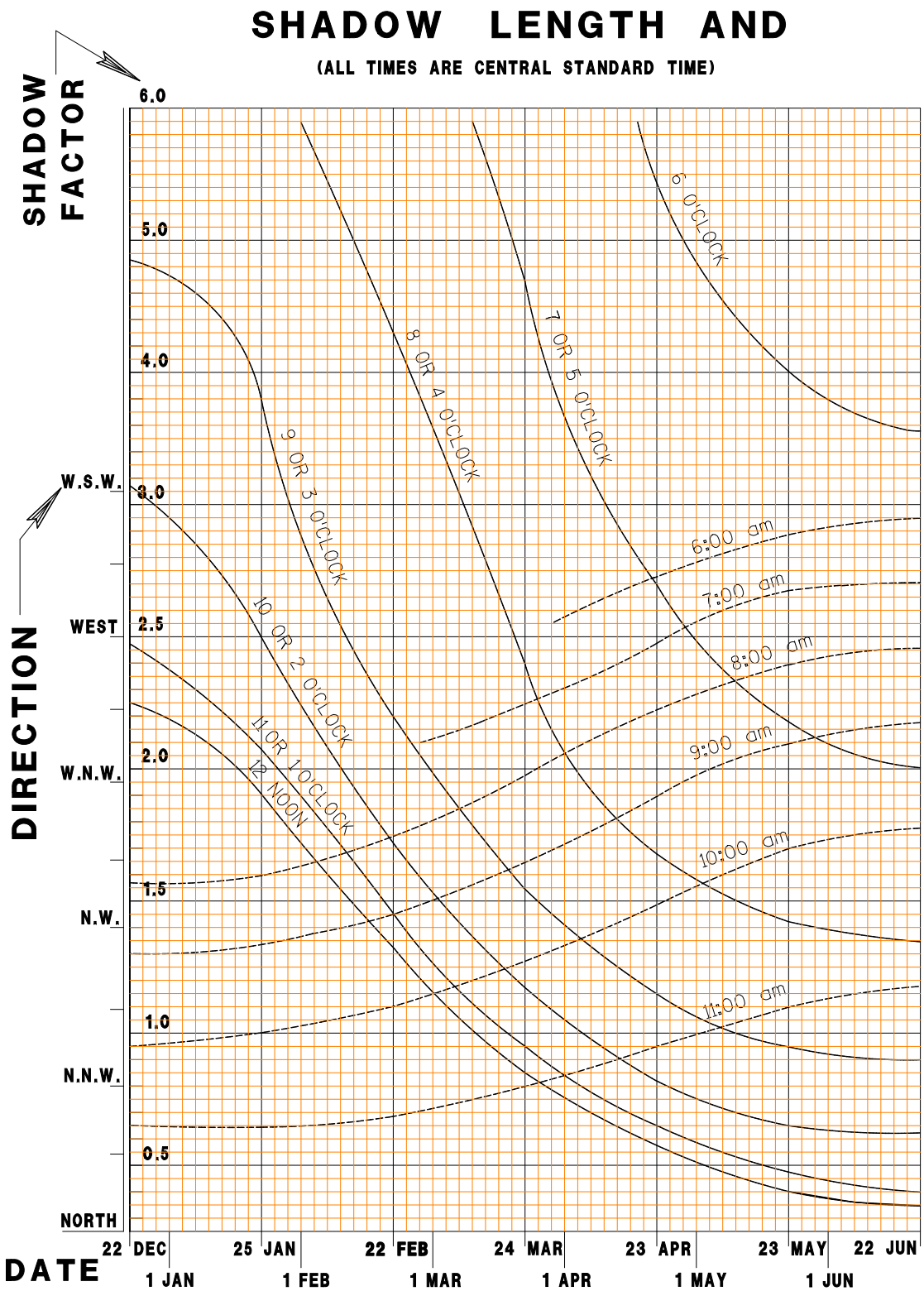
Example

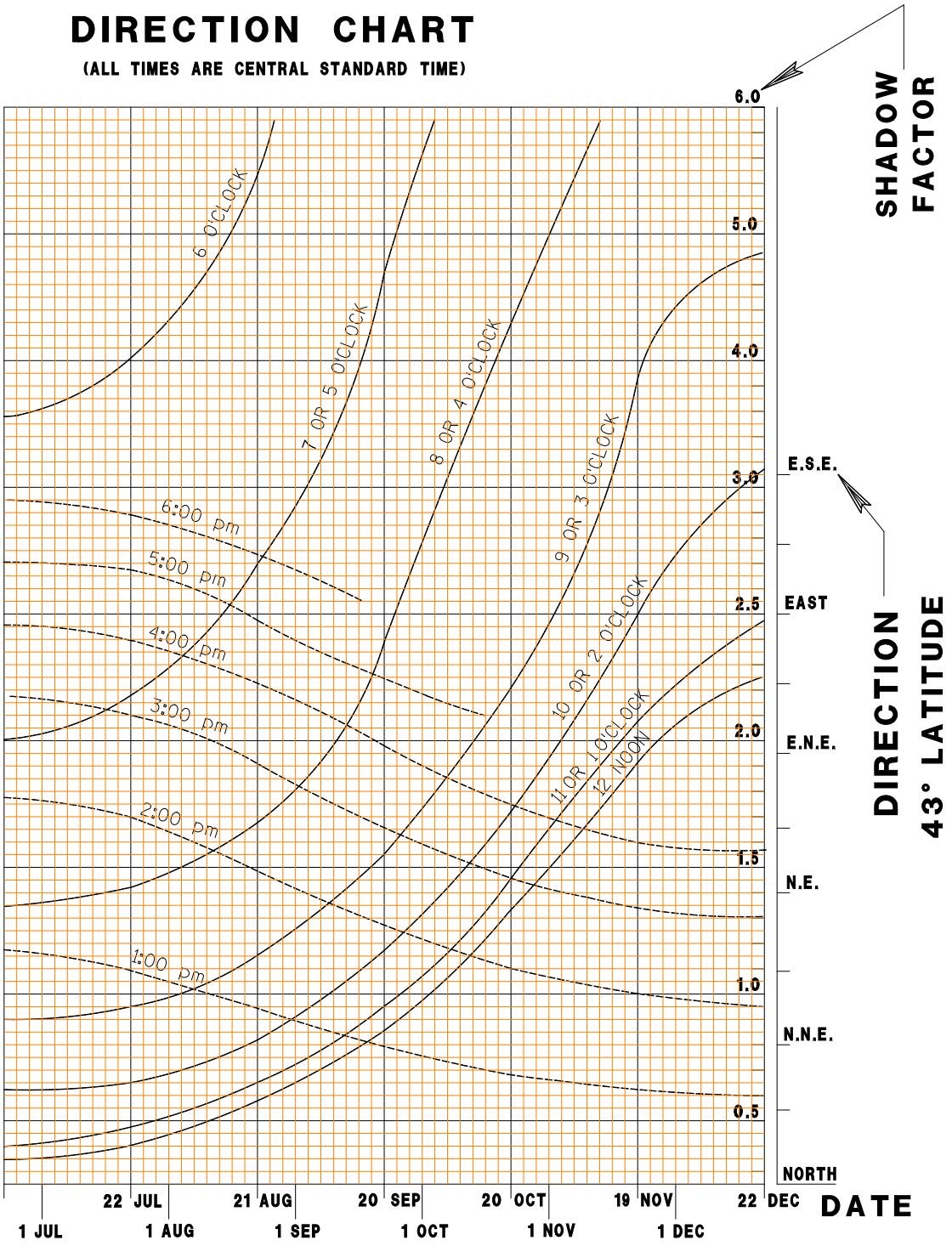
Given: The example started above.

Find: The shadow direction.

Solution: Find January 25 then read up to the dashed line labeled 9 o'clock. Since this is in the morning, read left to the outside scale. The shadow is being cast to the northwest. If you wanted the shadow direction for 3:00 pm then you would go to the same point on the same dashed line, but you would read to the right to get a direction of northeast in this case.

*Note: Each dashed line represents a pair of hours (one on either side of noon). For example, the 9:00 am line is the same as the 3:00 pm line (3 hours either side of noon). If you wanted to determine the shadow direction at 3:00 pm on January 25 you would go to the dashed line that represents both 9:00 am and 3:00 pm but this time you would read to the right to get a direction of northeast.


SHADOW LENGTH AND
(ALL TIMES ARE CENTRAL STANDARD TIME)
SHADOW FACTOR
6.0
5.0
4.0
3.0
2.5
2.0
1.5
1.0
0.5
DIRECTION
W.S.W.
WEST
W.N.W.
N.W.
N.N.W.
NORTH
6 O'CLOCK
7 OR 5 O'CLOCK
8 OR 4 O'CLOCK
9 OR 3 O'CLOCK
10 OR 2 O'CLOCK
11 OR 1 O'CLOCK
12 NOON
6:00 am
7:00 am
8:00 am
9:00 am
10:00 am
11:00 am
DATE
22 DEC
25 JAN
22 FEB
24 MAR
23 APR
23 MAY
22 JUN
1 JAN
1 FEB
1 MAR
1 APR
1 MAY
1 JUN


DIRECTION CHART
(ALL TIMES ARE CENTRAL STANDARD TIME)
6 O'CLOCK
7 OR 5 O'CLOCK
8 OR 4 O'CLOCK
9 OR 3 O'CLOCK
10 OR 2 O'CLOCK
11 OR 1 O'CLOCK
12 NOON
6:00 pm
5:00 pm
4:00 pm
3:00 pm
2:00 pm
1:00 pm
6.0
5.0
4.0
3.0
2.5
2.0
1.5
1.0
0.5
SHADOW FACTOR
E.S.E.
EAST
E.N.E.
N.E.
N.N.E.
NORTH
DIRECTION
43° LATITUDE
1 JUL
22 JUL
1 AUG
21 AUG
1 SEP
20 SEP
1 OCT
20 OCT
1 NOV
19 NOV
1 DEC
22 DEC
DATE

FDM 27-25-1 Woody Plant Materials

November 15, 2022

1.1 Overview

This procedure will address the preservation of existing woody plants and the selection of the new ones. There is often desirable vegetation at a proposed project site. Plants may be desirable because they:

- have an attractive form or color
- are located in a strategic place
- have historical or cultural significance

It is best to preserve plants in place if it can be done without damaging them during construction and they will not interfere with construction. A second option is to transplant the plants into a new location on the site if their size is suitable for tree-transplanting machines.

The Bureau of Highway Maintenance (BHM) conducted a partial inventory of roadside vegetation along various sections of the state trunk highway system. If the inventory is complete for the section of highway being considered, it may assist in identifying existing plant communities and individual species in preliminary investigations. However, a detailed field inventory will still be necessary later to select individual woody plants for preservation.

The roadside vegetation inventory information is available from the region offices or the BHM Landscape Architect Contacts (LACs). The BHM LAC telephone and email numbers are listed in FDM 27-1-1.

1.2 Plant Preservation Criteria

Some of the criteria used to evaluate potential candidates for preservation are:

1.2.1 Species

A stately oak tree with sturdy, wide spreading branches and an expected life span of 150 to 200 years or more warrants preservation, whereas a silver maple of the same size might not because it is inherently weak-wooded and has a much shorter life span.

Attachment 1.1 lists tree species that often warrant preservation. Though it is not all-inclusive, these plant species, both native and non-native, perform well along Wisconsin's roadsides. This list should be used as a guide only, since other factors such as condition, age, size and location must also be considered.

Shrubs are generally not preserved unless they are performing a particular function related to highway safety.

1.2.2 Condition

A plant’s condition can often be determined by casual observation. A healthy plant has normal-sized leaves with normal coloration, very few dead branches, and no evidence of decay or rotting. If any of these symptoms are apparent, consult with the BHM LACs.

1.2.3 Age

In general, long-lived trees warrant preservation more than short-lived trees. Short-lived trees tend to grow rapidly and be more weak-wooded. In contrast, trees with a longer life span tend to grow more slowly and have stronger wood.

1.2.4 Size

Plants of any size should be preserved in place if it can be accomplished without budgetary or logistical problems. Large specimen trees may be particularly worthy of extra effort.

1.2.5 Location

All plants beyond the grading limits should be preserved unless there is some overriding reason to eliminate them. Include a notation in the Special Provisions requiring the contractor's employees and project administration staff to stay out of and protect designated sensitive areas during construction. When feasible, include plan sheets showing these areas and provide for exclusionary fencing around these sensitive areas.

Preserve individual plants within the grading limits that serve a functional purpose such as headlight screening or snowdrift control. Plants within the grading limits that are of specimen quality should also be preserved in place if possible. Otherwise, consider transplanting them to another location.

Remember: It is better to preserve existing vegetation than to try to re-establish it once it is gone.

1.3 Preserve In Place

If a plant is to be preserved in place, do not disturb the ground within the drip line. If this is not possible, tree wells or retaining walls can be built to accommodate grade changes. SDD 14A1 illustrates these procedures. Remember that the greater the number of roots removed when the grade is lowered and the greater the amount of fill added when the grade is raised, the less likely the plant's chances of survival.

1.4 Transplant Existing Vegetation

Tree transplanting is a viable and valuable option, particularly if there is an appropriate site within the project limits where trees can be relocated. Shrubs have a faster growth rate and a relatively short life span, so they are less appropriate for transplanting unless they are particularly valuable specimens.

A general rule to apply when transplanting trees is that the smaller the tree and the larger the ball of earth removed with it, the more likely it is to withstand the shock of transplanting.

Standard spec 632.2.2.9.6 and standard spec 632.3.7 describe transplanting trees with a machine. SDD 14A2 also contains a detail illustrating machine tree transplanting.

1.4.1 Identifying Trees to be Transplanted

Species: Attachment 1.2 is a guide for determining whether a given species is considered feasible for transplanting.

Size: Trees of any caliper (trunk diameter) up to eight inches may reasonably be considered for transplanting. However, transplanting trees smaller in caliper than approximately 1½ or 2 inches is usually not cost effective, since nursery stock of the same species and size is usually less expensive and less risky in terms of plant survival. Consult the BHM LACs for assistance in evaluating the potential of moving trees.

While it is possible to transplant very large trees (well over 12 inches in caliper), the process is extremely expensive. Tree-transplanting machines large enough to perform this work are not generally available, so it must be done by hand and by machines not designed for that purpose. Therefore, trees over 12 inches in caliper generally should not be considered for transplanting.

Condition: Trees in poor condition, either structurally or from a health standpoint, should not be transplanted. Structural deformity may be caused by poor health, age, vandalism, storm damage, or poor pruning techniques. It is usually obvious but check for broken branches and splits in crotches that might not be visible to the casual observer. Poor health is manifested as decay, dead or dying branches or leaves, foliage discoloration, and loose or split bark. Usually, a tree in poor condition should not be considered for preservation or transplanting.

Location: Evaluate quality trees within the grading limits for transplanting potential. Trees outside the grading limits should be preserved in place. Trees selected for transplanting must be growing in a fairly flat location since tree-transplanting machines are mounted on trucks or trailers and have limited capability to maneuver the digging blades on slopes so that the tree will remain plumb when planted in its new location.

Trees in a forested location are usually not desirable for transplanting. They are often tall and spindly, and not typical of their species in structure and form. Trees accustomed to growing in shade but transplanted into direct sun will usually be stressed and suffer damage or simply die.

Lone Tree vs Groups: - Trees growing close together in groups must be evaluated for shape as well as location. They often lack space to develop normally and consequently, their form may be unsatisfactory.

Also, it is difficult to position the digging blades of tree-transplanting machines around trees that are growing close together, or those that have stout branches near the ground. Low-growing branches must be tied up so the blades can be properly positioned. Branches that are too stout to be bent must be cut off or they will be broken. Retain low-growing branches on evergreen trees to preserve their natural character.

1.4.2 Selecting Destination Site

Accessibility: The destination site must be fairly flat and machine-accessible.

Distance: While tree-transplanting machines are capable of hauling trees a long distance over the highway, the greater the distance, the greater the chance that the roots will loosen from the surrounding soil and affect the tree’s chances for survival. Distance also increases the cost per tree.

1.4.3 Transplanting Protocols

Root pruning: If time and other factors allow, root prune trees being considered for transplanting about one year prior to the actual transplanting time. Bring the tree-transplanting machine to the site and position the digging

blades around the tree as if for transplanting. Plunging the blades into the soil and removing them (without lifting the tree) effectively prunes the roots. This is standard practice in the nursery industry for initiating further rooting in the volume of soil that surrounds and travels with the root ball when the tree is transplanted.

Orientation Marking: Prior to digging, unobtrusively mark each tree so personnel can orient it in the same direction at its new site. Tie a piece of plastic ribbon (do not use paint) onto a branch on the north side of the tree so the tree is planted with the ribboned side facing north in its new location.

Holding Areas: Ideally, trees are transplanted directly from their old location to their new location. Occasionally, this is not possible because work must begin at the old location before the new location is prepared. In that case, transplant the trees into a holding area until their new location is ready. The techniques specified in standard spec 632 must be used during both transplanting operations.

1.5 Plant Selection

There are four variables to consider when selecting plant material. These factors heavily influence the plant's long-term survival:

- Species
- Root zone mode (root treatment used for transplanting)
- Size
- Environment into which the plant will be placed

1.5.1 Species

Natural Roadsides Policy: The species that can be used in a project are partly dictated by the Department's Natural Roadsides Policy as defined in Policy 74.05 of the Highway Maintenance Manual. This policy mandates that species planted along state highways be native to the area. In this context 'native' means the species existed in the area prior to settlement in 1848. The native species requirement may be relaxed somewhat in urban and transitional areas if non-native species or cultivars (improved varieties) will better tolerate certain site-specific conditions. Resources to help identify native plants include:

- "The Vegetation of Wisconsin" by John T. Curtis
- "Original Vegetation Cover of Wisconsin" map by Robert W. Finley
- "Early Vegetation of Wisconsin" map published by the Geological and Natural History Survey.
- Native Trees, Shrubs and Vines for Urban and Rural America" by Gary Heightshoe

Attachment 1.3 is a list of plants that are used for roadside planting in Wisconsin.

Consulting with vegetation specialists familiar with local flora will also provide valuable information, as will field observations.

Cultivars: Cultivars of native species are generally accepted. These varieties have been selected in the nursery trade because of some outstanding characteristic such as: improved branching structure (e.g. 'Marshall's Seedless' green ash)

- exceptional autumn leaf color (e.g. 'Red Sunset' red maple)
- lack of thorns on species that have thorns (e.g. 'Skyline' honey locust)
- a particular form (e.g. Boulevard American Linden)
- Improved hardiness

Avoid gaudy horticultural varieties with variegated or unusually colored leaves that would look artificial in a natural setting.

Availability: Some native species may be hard to find in the nursery trade, especially in large quantities. Check several sources within the acceptable geographic area to make sure the intended species are readily available. Be certain that sources are available before putting the species on the plan.

It is advisable to let contracts no later than October for planting the following spring. If planting is to take place in fall, the contract should be let no later than June. If planting is allowed either in fall or the following spring at the contractor's option, the contract may be let after the month of June. However, the later it is let, the less likely it is that the contractor will be able to gather materials in time to do much fall planting.

Salt Tolerance: Different species vary in their tolerance of airborne salt spray and salt in the soil. See FDM 27-20 Attachment 5.12 for a list of commonly used woody plants and their degree of salt tolerance. Due to the variety of factors that can affect salt tolerance (soil type, soil moisture level, age of the tree, time of year, temperature, etc.) these ratings should be used only as very general guidelines. Call the BHM LACs for more information concerning the mechanisms of salt injury.

Extremely sensitive plants should be avoided. However, moderately sensitive plants may be used under certain conditions. They can be planted on the upwind side of the roadway where they are less likely to receive airborne salt spray than the downwind side. They might also be used where the right-of-way can accommodate planting at least 80 to 100 feet away from the roadway, such as in the central section of a large interchange area. Still, the best option is to select more tolerant species.

Pollution Tolerance: Pollution tolerance has not been well-studied. Consult the BHM LACs regarding the tolerance of specific species.

Susceptibility to Pests: Most plants are hosts for a variety of insect pests and diseases. Some species are more susceptible to certain pests than others, and some pests attack only certain species. Where a certain pest is a serious problem, highly susceptible species should not be planted. For example, Dutch elm disease is so widespread that it has greatly limited the planting of American elm trees in this country. Some cultivars of American elm have been developed that are resistant to the disease, but there is a possibility that the disease may change in time and overcome that resistance. Emerald ash borer has been discovered in Michigan and some sites in other states. This pest has the potential to destroy the ash population of infested areas. Therefore, minimize the use of ash species and cultivars especially in the eastern part of the state.

Some pests are cyclical in nature. While they may be a major problem in certain years, they will not be a constant problem. For instance, spider mites attack a wide variety of plant species, but their populations and damage are most noticeable in hot dry conditions, such as during a drought. Although these types of pests are certainly a factor to consider, they are not sufficient cause to eliminate a species entirely from the plan.

Some pests need two specific species of plants to act as alternate hosts. Cedar-apple rust needs eastern red cedar and apple, crabapple or hawthorn trees to complete its life cycle. To break the life cycle, eliminate one of the species from the design and be sure it is not growing anywhere in the vicinity, whether on or off the right-of-way. For example, if eastern red cedar is to be planted or is already growing in the vicinity, don't plant apple, crabapple or hawthorn.

Diversity: Where large numbers of plants are required for a particular function (such as live snow fencing), several species should be used. Diversity has practical benefits, along with aesthetic appeal. If a pest attacks one species, the others may survive, and the overall effect of the damaged plants is less noticeable. The surviving species will eventually replace the species destroyed by the pest.

Adjacent Land Use: Adjacent land uses may affect the selection of species The Department should not create problems for neighboring landowners. For instance, if there is an apple orchard just off the right-of-way, eastern red cedar should not be planted. Where the landscape on the abutting property is intensively managed, plantings on the right-of-way should complement the style on adjacent land, both in design and in species selected.

1.5.2 Root Zone Mode

Plants are generally provided in one of four ways:

Bare-root (BR) - plants have no soil surrounding the roots after the plant is dug and while it is being stored and transported. BR plants are the least expensive option and are generally very acceptable if there is sufficient quality control during planting time. They are usually dug in the fall after losing their leaves and entering dormancy. They are kept in cold storage and high humidity over the winter. Many species, such as ash trees and maples, may be furnished bare root, at least in the smaller sizes (up to about two inches in caliper).

Balled and Burlapped (B&B) - The more sensitive species, such as oaks and hawthorns, must be furnished B&B so the soil around the root ball in the nursery is dug and shipped along with the plant. B&B plants are the most expensive because it takes extra labor to dig them, prepare the ball, handle and ship them. They are dug as needed, usually while dormant during late fall or early spring. They may be stored over the summer, but extreme care must be taken to prevent injury.

Balled and Potted (B&P) - This is equivalent to B&B, except that the root ball of a B&P plant is dug and placed in a pot rather than wrapped in burlap.

Container-Grown (CG) - Shrubs, and occasionally trees, may also be furnished as container-grown plants. An advantage of this method is that the roots and growing medium remain undisturbed until planting time. CG plants are more expensive than BR plants but are usually less expensive than B&B or B&P plants. Specify CG plants if planting must be done during the summer months that are not normally considered to be part of the spring or fall planting seasons as defined in standard spec 632.

See Attachment 1.4 for American Association of Nurserymen standards on BR, B&B, B&P, and CG plants.

1.5.3 Size

There are two considerations regarding plant sizes that must be made during planting plan development. The first is the mature height and spread of the plant; the second is the size when planted under contract.

Mature Size - Do not select plant species that will out-grow the available space or eventually interfere with other structures such as utility lines or signs. Do select plants that will be large enough at maturity to perform their intended function at highway scale. Small plants have no significant visual impact at highway speeds unless planted in large masses. Low-growing plants may be lost in surrounding tall growing grasses and forbs. Do not use them except in special circumstances such as in mulched beds where the mulch will be maintained.

Size When Planted - When considering sizes of nursery stock to specify, remember that smaller sizes generally withstand the shock of transplanting better than larger sizes and often surpass the size of a tree furnished at a larger size within a few years. This is particularly true for evergreen trees. Smaller sizes are physically easier to handle, especially if balled and burlapped; the larger the plant, the larger the ball. Larger balls are heavier and harder to maneuver without damaging the plant. Thorny plants are also more easily handled in smaller sizes.

Plants must be small enough to be handled easily but large enough to compete against and not be hidden by existing vegetation. The contractor must be able to locate them in order to maintain them properly and the project engineer must have access to them to make the appropriate inspections during the plant establishment period.

Generally, deciduous trees should be specified in the 8-foot height to 2-inch caliper range, evergreen trees in the 2½- to 5-foot height range and shrubs in the 15-inch to 3-foot height range. Evergreen shrubs specified by spread rather than height should be in the 15-inch to 24-inch range.

When there are many large-growing deciduous and evergreen trees in an area, such as in a major interchange, it may be desirable to specify that a few of each type be furnished in a larger size than the rest for immediate visual interest. Larger sizes may also be specified if there is a need for immediate functional purposes, such as a headlight screen.

1.5.4 Environment

Just as different species vary in their tolerance of pollutants, they also vary in their tolerance of soil types, moisture regimes and shade conditions. Many nursery catalogs and green industry publications list plant species that tolerate environmental conditions such as sandy soils, drought, shade, salt, etc. These, along with practical experience, should be used to aid in selecting appropriate species. The BHM LACs are also available as a resource.

The following environmental factors will influence plant species selected:

Soils: Plant species vary in their tolerance of different soil types. Therefore, the soils at the planting site must be considered when selecting species. As part of the site inspection, designers can obtain soils data from the local office of the Natural Resources Conservation Service.

Moisture: Evaluate the species' tolerance of droughty and excessively moist conditions when selecting plants. Factors to consider include:

- The moisture-holding capacity of the soil
- Moisture available from natural and artificial sources
- Moisture requirement of the species

In general, do not place plants in situations where they will not receive enough natural moisture to survive in good condition. Little if any maintenance (including watering) will be devoted to plantings after the plant establishment period expires.

Temperature: Plants also vary in their tolerance of temperature extremes. Each species has upper and lower temperature limits which, when exceeded, will cause injury or death. There may be intermediate temperatures that damage only part of the plant. For example, flowering dogwood for the most part will live in southern Wisconsin, but the flower buds will not survive most Wisconsin winters. Another example is autumn olive which survives undamaged most winters, but above-ground stems die back during harsh winters.

Hardiness: Plant hardiness is affected by the plant's tolerance of temperature and moisture conditions. The US Department of Agriculture publishes Miscellaneous Publication Number 1475, the "USDA Plant Hardiness Zone Map". This publication shows the locations of the different hardiness zones and is the standard reference to be used in determining whether various species are adapted to survive in particular areas. Nursery catalogs also list this information.

Sun and Shade: Most plants will tolerate some variation in the amount of sun and/or shade they receive.

However, extreme conditions such as heavy, constant shade or full, intense sun for most of the day requires plants that are adapted for those conditions. Also, the growth habit or form of some species may be affected by the amount of sunlight they receive. For instance, a particular species may be taller and more "leggy" in shady conditions than in sunny situations.

It should be noted that plant stress caused by sunlight and heat is accentuated by reflective surfaces such as retaining walls and noise barriers.

Slope Aspect: While slope direction may not have a direct bearing on plant survival, in combination with other factors it will have an effect, especially on steep slopes. For example, smooth sumac generally fares better on south-facing slopes than on north-facing slopes. To a certain extent, this is probably a function of the species' tolerance to sun and shade. Slope aspect may also affect soil moisture and a plant's ability to tolerate various pollutants and wind conditions.

1.6 Contractor Qualifications/Experience

Generally, all landscape contractors have experience planting nursery stock. There may be times when the use of pre-qualified landscape contractor for installation and maintenance of woody vegetation nursery stock would be beneficial. Consider the use of a pre-qualified landscape contractor for woody vegetation in following situations.

- Planting for functional purposes as listed in FDM 27-20-5.5.4, especially snow drift control and/or living snow fence projects
- Planting of bare root woody vegetation material is specified
- Consideration for high profile and mega projects as defined in FDM 2-1-1.1.3 Project Organization
- Recommendation by BHM LACs

For details on the list of pre-qualified landscape contractors and recommended special provision language, see FDM 27-25-5.5.7.

LIST OF ATTACHMENTS

Attachment 1.1 Tree Species Preservation Guide

Attachment 1.2 Tree Transplanting Guide

Attachment 1.3 Plants Used for Roadside Planting in Wisconsin

Attachment 1.4 Balling and Burlapping Specifications

FDM 27-25-5 Herbaceous Plant Materials

November 15, 2022

5.1 Overview

This procedure will address the preservation of desirable existing herbaceous plant materials and the selection of appropriate species for new plantings. Herbaceous plants are made up of grasses and broadleaved annuals, biennials and non-woody perennials.

It is best to preserve plants in place by protecting them from damage during construction. A second option is to arrange for a "plant rescue" in which plants are salvaged and transplanted to another location.

The Bureau of Highway Maintenance (BHM) conducted a roadside vegetation inventory along various sections of the state trunk highway system (See FDM 27-25-1). If available, consult this inventory to identify existing valuable plant species and communities. This inventory was conducted several years ago, so designers should field review the project site to confirm the inventory's accuracy.

Traditionally, disturbed areas on the roadside have been seeded with Eurasian grasses along with a few agricultural crop species. This has provided adequate cover in most cases except where the soil is poor or draughty.

The benefits of native species are that, once established, they will provide more substantial cover and better erosion control (especially on poor, draughty soils to which they have adapted over time); they will out-compete invasive weedy species; and they provide an ever-changing variety of colors and textures which enhances the driving experience for motorists.

5.2 Goals

1. Preserve native forbs (wild flowers) and grasses on roadsides and encourage their regeneration.
2. Preserve rare and endangered species and encourage their regeneration.

3. Promote ecological integrity and Wisconsin's natural heritage by planting native grasses and forbs in appropriate places on state transportation facilities.
4. Provide roadside vegetation of an intermediate height to affect a smooth transition from the roadway to taller vegetation at the edge of the highway right-of-way.
5. Provide wildlife habitat.
6. Plant desirable species that will out-compete invasive weedy species.
7. Plant desirable species for erosion control.
8. Meet the requirements 23 CFR Part 752.11(b) that at least 0.25 percent of federal funds expended for landscape planting projects be used to plant native wildflower seeds or plants. This may be accomplished through the wildflower banking system agreement with FHWA initiated by the department in 1998.

5.3 Preservation Criteria

Criteria used to evaluate potential candidates for preservation are:

- Areas that have a history of previous preservation or restoration/renovation efforts.
- Plants that have cultural or historical significance.
- Plants that have environmental or functional significance.
- Rare, endangered or threatened species.
- Plants that significantly enhance the aesthetic character of the area.

5.3.1 Species

Generally speaking, only native species are considered for preservation. Care must be taken to distinguish between native species and naturalized species. Native species are species that existed in the area prior to European settlement, ca. 1848. Resources to help identify native plants can be found in FDM 27-25-1. In addition to those resources listed, catalogs from native seed vendors and field guides such as "A Field Guide to Wildflowers of Northeastern and Northcentral North America" by Roger Tory Peterson and Margaret McKenny are helpful.

Some species are listed on either the state or the federal Endangered and Threatened Species lists. The plants on these lists are protected. A compendium of plants on both the state and federal Endangered and Threatened Species lists can be found at http://dnr.wi.gov/topic/EndangeredResources/.

Naturalized species may or may not be desirable. While they may be attractive, they may also be invasive and have the capability to displace native species. For this reason, it is rarely advisable to preserve naturalized or other non-native species.

5.3.2 Plant Communities

Plant communities are groups of plants that grow together because of their similar habitat requirements. Some of these plant communities were so prevalent in their historical context that they were given names, e.g. prairie, savanna, sedge meadow, etc. With the advent of European settlement, these native plant communities began to disappear as the land was converted to other uses. For instance, the southwestern half of the state was once covered by over 2 million acres of tall-grass prairie and over 7 million acres of oak savanna. Today less than 0.1% of the original prairie and less than 0.01% of the original savanna still exist. Most of these remaining remnants are found in old cemeteries and on older roadsides, particularly where there is a railroad corridor running parallel and in close proximity to the roadway. These remnants should be preserved as part of our natural heritage and because some of the species contained in them could disappear from the state if they are destroyed.

5.3.3 Quality/Condition

Some of these remnant plant communities are still quite high in quality while others exist in a more or less degraded condition. Some of the factors contributing to this degradation are the invasion of non-native weedy species; the inappropriate or careless use of herbicides; the use of motorized vehicles such as ATV's, dirt bikes or snowmobiles within the right-of-way; and unauthorized mowing. The BHM inventory identified several of the high-quality sites. In areas that have not yet been inventoried, a qualified vegetation specialist should determine whether an in-depth inventory should be performed. If there are only a few native species on-site, it is generally not worth preserving, unless an Endangered or Threatened species is encountered. However, if the vegetation is native and fairly diverse, strong consideration should be given to preserving or even enhancing the site.

5.3.4 Location

If a remnant is high in quality, it should be preserved regardless of location. If it is in a degraded condition, reasonable efforts should be made to preserve it if it is still diverse and attractive because of its colors and textures and located where it is visible and can be enjoyed by travelers.

5.4 Preservation Methods

A memorandum from FHWA dated January 24, 2002 states “Context-Sensitive Design (CSD) is an approach that places preservation of historic, scenic, natural environment, and other community values on an equal basis with mobility, safety and economics.” (Emphasis added) Part of the process of determining if a site can be preserved is to apply the principles of Context (or Community) Sensitive Design as explained in FDM 11-3-1 and FDM 11-3-5.

It is also important to delineate on the plan sheets the boundaries of important areas to be preserved. The special provisions should include requirements directed at both the contractor’s personnel and project administration staff that no traffic, equipment or material storage will be allowed within those boundaries. If possible, a physical barrier such as a snow fence should be installed along the perimeter of the area to delineate the area in the field.

5.5 Plant Rescue

If it is not possible to preserve plants on-site as described above, consider carefully removing and relocating them to a different location on the right-of-way which has characteristics similar to the site from which they are to be removed. A tree-moving machine may be used to transplant large chunks of “sod” when a high-quality site with few invasive species is involved. If individual plants are being moved, they may be hand-dug at appropriate times and transplanted to a safe place on the right-of-way or placed in pots.

If an appropriate site for transplanting cannot be found within the right-of-way, the plants may be offered to non-profit volunteer interest groups, such as The Wild Ones http://www.for-wild.org/aboutsit.htm or The Prairie Enthusiasts http://www.theprairieenthusiasts.org/ for use at another public location such as a park or school grounds. Only as a last resort should they be allowed to be used on private property. Under no circumstances should a group or individual be allowed to rescue plants for resale unless the department receives just compensation. If someone other than a contractor performing work for the department removes the plants, they should work with the Region Permit Coordinator who will issue a permit for the work via Form DT1812, Application/Permit to work on Highway Right-of-Way.

5.6 Planting at New Sites

The primary objective for the use of herbaceous plants on highway rights-of-way is to control erosion. However, aesthetics is an important secondary objective.

The seed mixes found in Standard Spec 630 contain both native species and non-native, or Eurasian, species. The native species tend to be bunch-type species that have very deep root systems, but which do not form sod; rather, they remain as individual plants. Many of the Eurasian species are more shallow-rooted and they tend to form sod. In the long run, the native species are more effective at controlling erosion. In fact, because of their deep root systems, they are highly effective at promoting infiltration. The Eurasian species are effective for short-term erosion control because they germinate fairly quickly and produce more above-ground biomass earlier than the native species.

Fertilizer should not be used in conjunction with seeding of native grasses and forbs. They do not normally need the additional nutrients and the fertilizer encourages the growth of invasive, weedy species.

Where seed mixes 70 and 70A are used and where mulching is required, certified weed-free mulch should be specified. Certification is provided by the Wisconsin Crop Improvement Association and a certification tag is attached to each bale of mulch material. Certified weed-free mulch may also be desirable where seed mixes 75 and 80 are specified, particularly where they are used near natural areas or remnants of native plant communities.

5.6.1 Site Selection

Seed mixes containing Eurasian grass or broadleaved species may be used wherever there is bare ground that needs to have cover to control erosion. However, in some areas a seed mix containing native species may be more desirable because many of the natives are more adapted to poor, draughty soils. An example would be the central plain where soils are very sandy.

A seed mix containing both native and Eurasian grasses (i.e. standard seed mix 75 or 80) should be chosen where erosion control is the main issue but where native species are desired. The Eurasian species will germinate quickly and provide short-term erosion control while the native species will give good long-term

erosion control, although they are slower to become established.

Native seed mixes (i.e. standard seed mix 70 or 70A) should be used where there are remnants of native prairie or related plant communities nearby or where DNR personnel prescribe native seeding as part of project mitigation measures. Sites selected for seeding of native grasses and forbs should be visible, where travelers can enjoy the colors and textures provided by the stems, leaves and flowers. In general, wide, fairly flat or gently sloping areas in the right-of-way with good visibility should be selected. Long, narrow sites provide more "edge" for weedy species to invade into the seeded area over time; therefore, they should be avoided.

5.6.2 Standard Seed Mixes

Seed mixes 10 through 80 are each designed for specific uses as noted in Standard Spec 630.2.1.5.1.2.

Seed Mixes 10, 20 and 30 as found in Standard Spec 630 are primarily intended for erosion control in rural areas. Seed mix 40 is most suited for urban areas where a lawn-type sod is desired. Seed Mix 60 is intended to provide cover in wet areas until other appropriate species can be introduced, either through interseeding, planting or natural processes.

Seed Mixes 70 and 70A were designed to be used where native prairie grasses and forbs are desired for aesthetic reasons or are required as part of an agreement with the DNR or local citizens.

Seed mix 75 consists primarily of native grasses with a couple of easy-to-grow forbs included for color. Because the number of forb species is reduced from those listed in seed mixes 70 and 70A, the cost will be significantly reduced. This seed mix is intended for use for erosion control where native grasses are desirable or required but the more expensive forb component is not needed because the areas to be seeded are not particularly visible from the roadway or neighboring development.

Seed mix 80 consists of a combination of native grasses and salt-tolerant non-aggressive, non-native grasses. This seed mix is intended for use on inslopes in areas where native species are desirable or required. For example, the DNR might request that native species be seeded where a highway construction project goes through a state natural area.

The species that make up seed mixes 70, 70A, 75 and 80 are primarily warm-season species, meaning they require the soil temperature to be above about 50 degrees Fahrenheit in order to germinate. The best time to sow these seeds, particularly the forb seed, is in late fall after dormancy has set in since many of them require exposure to a prolonged period of cold temperatures before they will germinate. Seed mixes 70 and 70A should not be sown in the heat of summer or in early fall, between about July 1 and October 15. While not ideal, seed mixes 75 and 80 may be sown during the summer months.

The native species in these mixes tend to spend their first year after germination developing a strong root system so not much above-ground growth will be evident. They will require a certain amount of management until they are established, usually for the first couple of years. This management will normally consist of controlling volunteer weeds, usually by mowing at appropriate times, but possibly by the use of herbicides, hand-pulling or hand-cutting.

5.6.3 Special Seed Mixes

The intent is that seed mixes 70, 70A, 75 and 80 be used to standardize the department's native grass and wildflower seeding activities. They should be adequate for most conditions; however, there may be situations when a special, site-specific seed mix is appropriate such as where perpetually moist or other unusual conditions are encountered. In these instances, ensure that the species selected for the seed mix are native to the area where the site is located and that environmental requirements such as soil type, moisture regime, light requirements, etc. are taken into account. Following is a list of several sources which can help determine what type of plant community existed in a particular area at the time of settlement (ca. 1848) and/or if a certain species is native:

Web sites

- Wisconsin Botanical Information System http://www.botany.wisc.edu/wisflora/search.asp
- Wisconsin State Herbarium http://www.botany.wisc.edu/herbarium/info/psatlas.asp

Books

- Roadside Use of Native Plants, FHWA Office of Natural Environment, 1999
- The Vegetation of Wisconsin, John T. Curtis, University of Wisconsin Press, 1959
- Natures Heartland: Native Plant Communities of the Great Plains, Bill Boon and Harlen Groe, Iowa State University Press, 1990

Maps

- Original Vegetation Cover of Wisconsin, Robert W. Finley, USDA, 1976
- Early Vegetation of Wisconsin, Grant Cottam and O. L. Loucks, University of Wisconsin Extension, 1965

Catalogs - from native seed/plant producers (the endorsement of products from these companies is not implied)

- Agrecol, Madison, Wisconsin
- Oak Prairie Farm, Pardeeville, Wisconsin
- Prairie Nursery, Westfield, Wisconsin
- Prairie Moon Nursery, Winona, Minnesota

There are many cultivars (cultivated varieties) of native species on the market. These cultivars have been selected for some specific trait or traits that make them more desirable in the gardening market, such as flower color, form, etc. However, the environmental community believes that introducing the specialized genes that produce these traits pollutes the gene pool. Therefore, for the purposes of a native seed mix to be used on roadsides, they are not desirable and should not be allowed.

For the same reason, native seeds should be grown or collected relatively near the site to be seeded. Standard Spec 630.2.1.5.1.1 lists areas where acceptable seed must be grown. Care must be taken not to accept seed from outside of this area. A more restrictive area may be specified for a specific project if desired.

Take care to specify only species that are readily available in the native seed trade. Those that are readily available are usually the easiest to grow so are most appropriate for a highway project. This also helps avoid the necessity of choosing substitutes for species that are not available. In addition, they are normally more reasonably priced than the harder-to-grow species.

5.6.4 Roadside Sites

Roadside sites such as safety rest areas, waysides, scenic overlooks, etc. typically have areas that are developed in lawn-type turf around picnic tables, play areas and other areas where pedestrian traffic is likely to be heavy. Often there are other large areas that need not be mowed if they are not infested with invasive weeds. These areas are candidates for native seeding.

In addition, particularly in safety rest areas, there are plaza areas that contain special plantings that highlight the building, provide shade for visitors and contribute to the aesthetics of the site. While there are many native plants that can be used to enhance these areas, the plant palette need not be restricted entirely to native plants. Garden annuals and perennials, as well as ornamental shrubs and small trees, may be used in plaza planter areas.

5.7 Contractor Qualifications/Experience

While most landscape contractors have experience with seeding WisDOT standard seed mixes and planting nursery stock, their work force may not have received training in the proper handling of seed or plant materials. Seeding with native grasses and forbs especially requires specialized knowledge and equipment.

Recommendation is to use a pre-qualified contractor for native seed projects over one acre in size or it's been recommended by BHM LACs.

To help identify and pre-qualify landscape contractors BHM LACs developed a list of pre-qualified landscape contractors through a request for qualifications process. There is a pre-qualified list for three specialized landscape categories: native seed installation and maintenance, woody vegetation installation and maintenance and living snow fence installation and maintenance. These lists can be found on WisDOT's Highway Construction Contract Information (HCCI) webpage, Wisconsin Department of Transportation Highway Construction Contract Information (wisconsindot.gov).

The use of this list should be included in special provisions. Therefore, the special provisions for this work should include a paragraph describing the special qualifications expected of the contractor or subcontractor and their workers. A sample special provision is as follows:

Notice to Contractor, Subcontractor Pre-Certification.

Pre-certification is required for native prairie seeding and/or tree/shrub and/or living snow fence installation (pick one or all that apply).

Subcontractors from each of the pre-certified lists titled “native seed installation and maintenance”, “woody vegetation installation and maintenance” and “living snow fence installation and maintenance” shall perform the work associated with the pertinent items listed further in this article. The same subcontractor is allowed if that subcontractor is on both lists.

The pre-certified lists are located on the department’s Highway Construction Contract Information (HCCI) web site.

Subcontractors or entities not on the department list are not permitted to perform the work.

Native Seed Installation and Restoration Management pre-certification is required for the following pay items:

SPV.XXXX.XXX (Fill in type)

Woody Vegetation Installation and Restoration Management pre-certification is required for the following pay items:

632.XXX Trees (example only)

SPV.XXXX.XXX (Fill in type)

At the preconstruction meeting or 14 days prior to the start of construction, whichever date is earlier, submit the names, positions, experience, and qualifications of any personnel to be used on this project that were not listed in the Request for Qualifications. Any new personnel must be approved by the department before vegetation management work begins.

5.8 Establishment Period

As with trees and shrubs, a two-growing-season Plant Establishment Period should accompany the planting of native or garden perennial plants. Although annuals, by nature, will need to be replanted each spring, the establishment period requirements should provide for the replacement of any that die during the course of the growing season.

Native seeding should also be provided with a modified establishment period as shown in Standard Spec 630.3.3.6 This does not require reseeding but does require periodic mowing and the eradication of certain invasive, weedy species. Without such an establishment period, the native seeding may be crowded out by these weeds and others that come in voluntarily and establish themselves before the native plants can produce enough biomass to compete well with the weeds.

The establishment period may be waived if the contract is for such a short duration that it would serve no purpose.

5.9 Long-term Management

After the contractor’s responsibilities have concluded there may still be a need for continued management, at least on a periodic basis. Care for ornamental plantings in roadside sites will primarily be the responsibility of the crew that maintains the rest of the facility. However, they do not have the training or the equipment needed to properly manage a native seeding.

Management of areas seeded with native species will primarily entail periodic removal of weedy top growth to enhance the growing conditions for the native species, allowing them to out-compete invasive species. In order for the project to be successful, regional operations staff must be willing to provide the necessary management after the contractor has completed his responsibilities until the seeding is well established.

The most effective means of removing the weedy top growth is with prescribed burns. However, if the site is situated such that prescribed burns cannot be safely or effectively accomplished, the area may be mowed, and

the resulting litter removed. Research done for the Minnesota Department of Transportation has shown that mowing without removing the litter is no more effective in accomplishing this goal than not mowing.

If invasive weedy species are encroaching on the areas, it may be necessary to eradicate the weeds by the use of appropriate herbicides. A partial list of invasive species of concern can be found in Standard Spec 630.3.3.6. There may be situations where it is necessary to add species to this list, such as purple loosestrife or reed canary grass which can show up just about anywhere but are especially problematic in wetter areas.

FDM 27-25-10 Plant Establishment Period (PEP) *May 13, 2009*

10.1 Overview

A plant establishment period (PEP) is typically required for all landscape planting projects in accordance with Standard Spec 632.18.1. The PEP normally does not apply to any seeding done as part of a landscape planting contract.

10.2 Two Year (PEP)

Standard Spec 632.18.1.2 states that a two-year PEP will be required for all landscape planting contracts unless otherwise specified. This ensures that new plantings are adequately cared for while they become established. The plants should be able to develop a root system sufficient for survival (with minimal care) after two growing seasons.

When a two-year PEP is in force, original plantings may be installed in the fall of one year and/or the spring of the following year. After installation is complete, the contractor is responsible for the plantings for two growing seasons. As an example, if plantings were installed during the fall of 2008 and/or spring of 2009, the contractor would be responsible for their care during the 2009 and 2010 growing seasons. As part of the process, all plant material installed during the fall of 2008 would be inspected in late April or early May 2009. Replacements would be made in spring 2009 along with plant installation not completed the previous fall. All planting would be inspected in the fall of 2009 and again in spring 2010 with replacements made during the respective planting seasons. The final inspection would be made in the fall of 2010 with replacements made during the fall planting season. All work would be complete by the time the ground freezes in 2010.

The two-year PEP is the norm and other alternatives are to be specified only when circumstances clearly preclude the two-year period.

10.3 One Year (PEP)

Occasionally, a one-year PEP may be specified by special provision if it is in the Department's best interest. This may be done if:

- The project is small (20 plants or less)
- The project is located in a remote area
- The project is part of a larger construction contract which would have to be held open for an inordinate amount of time in order to accommodate a two-year PEP.

In these examples the additional cost of providing the extra year, both in terms of the contractor's time and the Department's administrative time, may outweigh the benefits of the second year. The one-year PEP would progress in the same fashion as the two-year PEP, except all work would be complete by the time the ground freezes in 2009 instead of 2010 in the example above.

10.4 Landscape Planting Surveillance and Care Cycles

The item Landscaping Planting Surveillance and Care Cycles is included on all contracts that include plantings. Under this item the landscape contractor is required to properly care for plants from time of planting until final acceptance of the work. Required activities consist of:

- Replacing all plants that die or show evidence of dying at the next planting season
- Disposing of all plants that die during the course of the plant establishment period as their dead condition becomes evident
- Watering the plants periodically
- Pruning
- Weeding around the plantings (especially in mulched areas)
- Controlling insects and diseases, keeping plants in a healthy condition
- Cultivating
- Keeping the plants plumb
- Maintaining accessories (such as bracing and guying stakes and straps, tree wrap and mulch)

- Completing miscellaneous activities needed to keep the plantings healthy and looking well-kept
- Removing and disposing of all bracing and guying materials after the final inspection.

As specified in Standard Spec 632.3.19.2 the department will assess damages in the amount the special provisions specify to cover the cost of performing the work with other forces. Daily damages specified in the special provision should be dependent upon the value of planting items in the contract, as shown in Table 10.1.

Table 10.1 Daily Damages Assessed for Failure to Preform Landscape Planting Surveillance

Value of Planting Items	Daily Damage Assessment
Less than $25,000	$200
$25,000 to $100,000	$500
$100,000 to $250,000	$800
Greater than $250,000	$1,000

For estimating purposes, the number of cycles is typically figured on the basis of 1 cycle in late May, 2 cycles each month from June through September and 1 cycle in early October. The actual number of cycles may vary depending on whether adequate rainfall or drought occurs.

10.5 Waiver

On very rare occasions the PEP may be waived entirely. This occurs only when:

- A few trees are planted as part of a larger construction project
- Neighboring landowners have agreed to care for the plants
- Plants are installed via easement or agreement on private property and it can reasonably be expected that the landowner will care for the plants.

FDM 27-25-15 Native Wildflower Banking *November 15, 2022*

15.1 Program

Section 130 of the 1987 Surface Transportation and Uniform Relocation Assistance Act requires that native wildflowers be planted on landscape projects requiring work code Y003 as reported on form FHWA-37. This act requires that at least 0.25% of federal funds spent on landscaping projects must be expended on native wildflower seeds and/or seedlings unless a waiver has been granted.

Native grass seeds or plants do not fulfill this requirement. If the landscape work is funded exclusively by the state or local entities (no federal funds) this requirement does not apply.

15.2 Exceptions

In some instances, the Wisconsin Department of Transportation (WisDOT) has found that native wildflower planting is not practical. In these situations, a waiver from the Federal Highway Administration (FHWA) may be granted. Examples include:

- Projects in some urban areas
- Rights-of-way that are too narrow to effectively maintain the seeded area
- Projects where landscape expenditures are minimal and the impact of native
- wildflower planting (at 0.25% of a small budget) would likewise be insignificant.

WisDOT Bureau of Highway Maintenance (BHM) Landscape Architect Contacts (LACs) administer the FHWA Native Wildflower Banking program. Its purpose is to allow greater flexibility in complying with the intent of the federal mandate regarding native wildflower planting. The program sets aside the required 0.25% of the budget for sites where it is not practical to plant native wildflowers and keeps it in the “bank” as “credit” to be used on sites where wildflower plantings are appropriate.

The “bank balance” is reflected in dollars; at times the balance will be positive, at other times negative. If the balance is positive, there is “credit” available to do additional work; if negative, WisDOT has exceeded its federal obligation. The program prescribes planting on appropriate sites, resulting in more effective long-term maintenance. Consolidating plantings on fewer sites allows the concentration of maintenance efforts, increases

planting successes and makes more effective use of funding available for vegetation management.

15.3 Banking Process

1. Each October the LACs calculate the amount (dollars) of native wildflower planting needed based on approved projects in the Landscape Planting Project Selection Process.
2. The LACs work with the regions to determine which projects are best suited for native wildflower planting, and which locations within each project are suitable for native wildflower seed and/or seedlings.
3. The LACs will track program funds.

Tree Species Preservation Guide

Common Name	Ave. Life Span (Years)	Worthy of Preservation
Arborvitae (White Cedar)	200 - 300	Possibly *
Ash, Green (& cultivars)	100 - 150	No
Ash, White (& cultivars)	150 - 200	No
Beech	200 - 300	Yes
Birch, River	50 - 75	Possibly *
Birch, White	60 - 75	Possibly *
Boxelder	50 - 75	No
Cherry, Black	150 - 200	Possibly *
Elm, American	150 - 200	No
Elm, Siberian	150 - 200	No
Fir, Balsam	125 - 175	Possibly *
Hackberry	100 - 200	Possibly *
Hemlock	300 - 400	Yes
Hickory	150 - 200	Yes
Honeylocust	100 - 150	Possibly *
Juniper (Redcedar)	200 - 300	Possibly *
Locust, Black	50 - 75	No
Linden (Basswood)	150 - 200	Possibly *
Maple, Norway (& cultivars)	100 -150	No *
Maple, Red (& cultivars)	100 - 150	Possibly *
Maple, Silver	50 - 75	No
Maple, Sugar	75 - 150	Yes
Oak, Black	150 - 200	Yes
Oak, Bur	200 - 300	Yes
Oak, Pin	150 - 250	Possibly *
Oak, Red	200 - 300	Yes
Oak, Swamp White	125 - 175	Possibly *
Oak, White	350 - 400	Yes
Pine, Jack	40 - 60	No

Pine, Red	250 - 350	Yes
Pine, White	300 - 400	Yes
Poplar/Aspen	60 - 75	No
Spruce, Black	125 - 200	No
Spruce, Colorado	225 - 350	No *
Spruce, Norway	75 - 125	No
Spruce, White	250 - 300	Yes
Tamarack (Larch)	150 - 250	Possibly *
Walnut, Black	150 - 250	Yes
Willow	50 - 75	No

* Contact the appropriate LAC for guidance about specific situations.

Tree Transplanting Guide

These Common Trees are Usually Considered Suitable for Transplanting*

BOTANICAL COMMON NAMES LARGE DECIDUOUS TREES	TREE TRUNK **DIAMETER	HEIGHT IN FEET	MINIMUM BALL DIAMETER	OPTIMAL TIME TO TRANSPLANT	COMMENTS SEE LEGEND NEXT PAGE
Acer rubrum (Red Maple)	4-6"	14-24'	66"	same	Red Maple #1
Acer saccharum (Sugar Maple)				same	
Celtis occidentalis (Hackberry)	2-4"	10-16'	44"	Oct. 15 - May 15	#4
	4-6"	12-22'	66"	same	#4
	6-8"		84"	same	#4
Gleditsia triacanthos inermis	2-4"	10-16'	44"	Oct. 15 - May 15	#2,3
(Thornless Honeylocust)	4-6"	14-24'	66"	same	#2,3
	6-8"		84"	same	#2,3

BOTANICAL COMMON NAMES MED. TO SMALL DECIDUOUS TREES	TREE TRUNK **DIAMETER	HEIGHT IN FEET	MINIMUM BALL DIAMETER	OPTIMAL TIME TO TRANSPLANT	COMMENTS SEE LEGEND NEXT PAGE
Betula nigra (River Birch)	2-4"	10-15'	44"	Feb. 15 - May 15	#1
Betula papyrifera (Paper Birch)	2-4"	10-15'	44"	same	#1
Crataegus crusgalli (Cockspur Hawthorn)	2-4"	8-12'	44"	Oct. 15 - May 15	#4
Crataegus intricata (Thicket Hawthorn)	2-4"	8-12'	44"	same	#4
Malus spp. (Crabapple species and cvs)	2-4"	8-12'	44"	Oct. 15 - May 15	#3,4,5

BOTANICAL **COMMON NAMES** CONIFEROUS (EVERGREEN) TREES	**TREE** **TRUNK** ****DIAMETER**	**HEIGHT** **IN** **FEET**	*MINIMUM* **BALL** **DIAMETER**	**OPTIMAL** **TIME TO** *TRANSPLANT*	**COMMENTS** **SEE LEGEND** **NEXT PAGE**
Abies concolor (White Fir)	2-4"	6-12'	44"	Feb. 15 - June 1& Aug. 15 - Oct. 1	#1
Juniperus virginiana (Eastern Redcedar) and cultivars	2-4"	6-10'	44"	Feb. 15 - June 1 & Aug. 15 - Oct. 1	#2,3,4
Picea abies (Norway Spruce) Picea glauca (White Spruce) Picea pungens (Colorado Spruce)	2-4" 4-6"	6-12' 10-18'	44" 66"	Feb. 15 - May 15& Aug. 15 - Oct. 1 same	#3 #3 #3
Pinus nigra (Austrian Pine) Pinus rubra (Red Pine) Pinus strobus (Eastern White Pine) Pinus sylvestris (Scot Pine) **2-4" ONLY**	2-4"	6-12'	44"	Feb. 15 - May 15 & Aug. 15 - Oct. 1 same same	Aus., Red, Scot #2,3 White Pine #1
Pseudotsuga menziesii (Douglas fir)	2-4"	6-12'	44"	Feb. 15 - June 1 & Aug. 15 - Oct. 1	#1

Contact the BHM LACs (see FDM 27-1-1 for your region contact) for information regarding species not featured on this list.

**Caliper

LEGEND

1. Prefers site with moist well-drained soil.
2. Will tolerate dry soil such as on a south or west-facing slope.
3. Transplanting after the optimal time period is generally successful. However, preparation before and extra care before and during transplanting are critical. Evergreens should NOT be disturbed while new growth is tender and light green in color.
4. In general, do NOT plant near a commercial or home orchard.
5. Protect against rodent damage.

OTHER NOTES

The following trees are considered difficult to transplant; survival rates are typically low

1. Carya ovata (Shagbark Hickory)
2. Aesculus spp. (Horsechestnut)

3. Quercus spp. (Oaks)
4. Juglans nigra (Black Walnut)

If the above four tree species are considered for transplanting, use tree sizes smaller and ball sizes larger than corresponding figures in the preceding charts. For instance, a 2-3" caliper tree should have a 44" ball and a 3-6" caliper tree a 66" ball. Handle the trees with the same care as other deciduous trees but keep in mind that the more precautions taken, the more likely the tree is to survive.

The following trees are generally not considered worthy of preservation:

1. Acer negundo (Box Elder)
2. Ulmus spp. (Elm species)
3. Populus spp. (Poplars)
4. Salix spp. (Willows

Plants Used for Roadside Planting in WI

LARGE DECIDUOUS TREES (>40 feet)

Symbol	Common Name	Scientific Name	ANS Type	Note
OB	Buckeye, Ohio	Aesculus glabra	1T	C
BC	Cherry, Black	Prunus serotina	2T	A
KC	Coffeetree, Kentucky	Gymnocladus dioicus	2T	C
CE	Elm, Cathedral	Ulmus x cathedral	2T	C
G	Ginkgo	Ginkgo biloba	1T	C
PSG	Ginkgo, Princeton Sentry	Ginkgo biloba 'Princeton Sentry'	1T	C
H	Hackberry, Common	Celtis occidentalis	2T	A
SH	Shagbark Hickory	Carya ovata	1T	A
TH	Honeylocust, Common Thornless	Gleditsia triacanthos inermis	1T	B
ITH	Honeylocust, Thornless Imperial	Gleditsia triacanthos inermis 'Imperial'	1T	B
STH	Honeylocust, Thornless Skyline	Gleditsia triacanthos inermis 'Skyline'	1T	B
AL	Linden, American	Tilia americana	1T	A
LL	Linden, Littleleaf	Tilia cordata	2T	C
GLL	Linden, Littleleaf 'Greenspire'	Tilia cordata 'Greenspire'	2T	C
RM	Maple, Red	Acer rubrum	1T	A
RSM	Maple, Red Red Sunset	Acer rubrum 'Red Sunset'	1T	A
SM	Maple, Sugar	Acer saccharum	1T	A
GSM	Maple, Sugar Green Mountain	Acer saccharum 'Green Mountain'	1T	A
BO	Oak, Bur	Quercus macrocarpa	1T	A
PO	Oak, Pin	Quercus palustris	1T	C
RO	Oak, Northern Red	Quercus borealis	1T	A
WO	Oak, White	Quercus alba	2T	A
SWO	Oak, Swamp White	Quercus bicolor	1T	A
CP	Poplar, Carolina	Populus canadensis var. eugenei	1T	C
NW	Willow, Niobe Weeping	Salix x blanda	1T	C

Notes:

A - Native to Wisconsin

B - Native to some parts of Wisconsin

C - Not native to Wisconsin

* Tends to be invasive. Use with care in urban areas only.

Plants Used for Roadside Planting in WI

MEDIUM DECIDUOUS TREES (20-40 feet)

Symbol	Common Name	Scientific Name	ANS Type	Note
BA	Aspen, Bigtooth	Populus grandidentata	1T	A
QA	Aspen, Quaking	Populus tremuloides	1T	A
PB	Birch, Paper	Betula papyrifera	1T	B
RB	Birch, River	Betula nigra	1T	A
WB	Birch, Whitespire	Betula platyphylla 'Whitespire'	1T	C
AH	Hornbeam, American	Carpinus caroliniana	3T	A
JTL	Tree Lilac, Japanese	Syringa reticulata	3T	C

SMALL DECIDUOUS TREES (<20 feet)

Symbol	Common Name	Scientific Name	ANS Type	Note
CC	Chokecherry, Common	Prunus virginiana	3T	A
CRC	Chokecherry, Canada Red	Prunus virginiana 'Canada Red'	3T	A
PC	Crabapple, Prairie	Malus ioensis	3T	A
PD	Dogwood, Pagoda	Cornus alternifolia	4T	A
CHW	Hawthorn, Cockspur	Crataegus crusgalli	3T	C
THW	Hawthorn, Thicket	Crataegus intricata coccinea	3T	A
AH	Hophornbeam, American	Ostrya virginiana	2T	A
AMA	Mountainash, American	Sorbus americana	2T	B
SMA	Mountainash, Showy	Sorbus decora	2T	B
APL	Plum, American	Prunus americana	4T	B
ASB	Serviceberry, Allegheny	Amelanchier laevis	3T	A
SBS	Serviceberry, Shadblow	Amelanchier canadensis	3T	A
LW	Willow, Laurel	Salix pentandra	4T	C
CW	Witchhazel, Common	Hamamelis virginiana	4T	A

Notes:

A - Native to Wisconsin

B - Native to some parts of Wisconsin

C - Not native to Wisconsin

* Tends to be invasive. Use with care in urban areas only.

Plants Used for Roadside Planting in WI

LARGE EVERGREEN TREES (>30 feet)

Symbol	Common Name	Scientific Name	ANS Type	Note
CD	Douglasfir, Common	Pseudotsuga menziesii	4E	C
WF	Fir, White	Abies concolor	4E	C
CH	Hemlock, Canadian	Tsuga canadensis	4E	B
EL	Larch, Eastern (Tamarack)	Larix laricina	4E	A
AP	Pine, Austrian	Pinus nigra	4E	C
WP	Pine, Eastern White	Pinus strobus	4E	A
RP	Pine, Red	Pinus resinosa	4E	A
CS	Spruce, Colorado	Picea pungens	4E	C
NS	Spruce, Norway	Picea abies	4E	C
WS	Spruce, White	Picea glauca	4E	B
BHS	Spruce, Black Hills	Picea glauca 'Densata'	4E	B

SMALL EVERGREEN TREES (10-30 feet)

Symbol	Common Name	Scientific Name	ANS Type	Note
AA	Arborvitae, American	Thuja occidentalis	4E	B
PA	Arborvitae, Pyramidal	Thuja occidentalis 'Pyramidalis'	4E	B
TA	Arborvitae, Techny	Thuja occidentalis 'Techny'	4E	B
IJ	Juniper, Iowa	Juniperus chinensis 'Iowa'	4E	C
MJ	Juniper, Mountbatten	Juniperus chinensis 'Mountbatten'	4E	C
ER	Redcedar, Eastern	Juniperus virginiana	4E	A
CER	Redcedar, Eastern Canaert	Juniperus virginiana 'Canaertii'	4E	A

EVERGREEN SHRUBS (<10 feet)

Symbol	Common Name	Scientific Name	ANS Type	Note
AJ	Juniper, Andorra	Juniperus horizontalis 'Plumosa'	1C	C
DJJ	Juniper, Dwarf Japanese	Juniperus procumbens nana	1C	C
HJ	Juniper, Hughes	Juniperus chinensis 'Hughes'	2C	C
MJ	Juniper Maney	Juniperus chinensis 'Maney'	3C	C
MJJ	Juniper, Mint Julep	Juniperus chinensis 'Mint Julep'	2C	C
OCJ	Juniper, Oldfield Common	Juniperus communis var. depressa	3C	A

PJ	Juniper, Pfitzer	Juniperus chinensis 'Pfitzeriana'	2C	C
SGJ	Juniper, Sea Green	Juniperus chinensis 'Sea Green'	3C	C
BRJ	Juniper, Wilton Blue Rug	Juniperus horizontalis 'Wiltonii'	1C	C
MP	Pine, Mugo Swiss Mountain	Pinus mugo var. mugo	3C	C
CY	Yew, Canada	Taxus canadensis	2C	B

Notes:

A - Native to Wisconsin

B - Native to some parts of Wisconsin

C - Not native to Wisconsin

Plants Used for Roadside Planting in WI

LARGE DECIDUOUS SHRUBS (>10 feet)

Symbol	Common Name	Scientific Name	ANS Type	Note
SB	Buffaloberry, Silver	Shepherdia argentea	3S	C
MC	Cotoneaster, Many-flowered	Cotoneaster multiflorus	3S	C
AS	Serviceberry, Apple	Amelanchier x grandiflora	3S	A
SS	Sumac, Smooth	Rhus glabra	3S	A
SH	Sumac, Staghorn	Rhus typhina	3S	A
BV	Viburnum, Blackhaw	Viburnum prunifolium	4S	C
NV	Viburnum, Nannyberry	Viburnum lentago	3S	A
WV	Viburnum, Wayfaringtree	Viburnum lantana	3S	C
ACV	Viburnum, American Cranberrybush	Viburnum trilobum	3S	A
EW	Wahoo, Eastern	Euonymus atropurpureus	4S	A

MEDIUM DECIDUOUS SHRUBS (4-10 feet)

Symbol	Common Name	Scientific Name	ANS Type	Note
GD	Dogwood, Grey	Cornus racemosa	2S	A
RD	Dogwood, Redosier	Cornus sericea	2S	A
ID	Dogwood, Isanti	Cornus sericea 'Isanti'	2S	A
AE	Elder, American	Sambucus canadensis	3S	A
AF	Filbert, American	Corylus americana	3S	A
CN	Ninebark, Common	Physocarpus opulifolius	3S	A
DCN	Ninebark, Dwarf Common	Physocarpus opulifolius 'Nanus'	2S	A
PR	Rose, Prairie	Rosa setigera	3S	B
RR	Rose, Rugosa	Rosa rugosa	3S	C
VS	Spiraea, Vanhoutte	Spiraea x vanhouttei	1S	C
FS	Sumac, Fragrant	Rhus aromatica	3S	A
AV	Viburnum, Arrowwood	Viburnum dentatum	3S	C

Notes:

A - Native to Wisconsin

B - Native to some parts of Wisconsin

C - Not native to Wisconsin

* Tends to be invasive. Use with care in urban areas only.

Plants Generally Used for Roadside Planting in WI

SMALL DECIDUOUS SHRUBS (<4 feet)

Symbol	Common Name	Scientific Name	ANS Type	Note
DB	Bushhoneysuckle, Dwarf	Diervilla lonicera	2S	A
BLC	Chokeberry, Black	Aronia melanocarpa	3S	A
BC	Cinquefoil, Bush	Potentilla fruticosa	1S	A
ABC	Cinquefoil, Bush Abbotswood	Potentilla fruticosa 'Abbotswood'	1S	A
JBC	Cinquefoil, Bush Jackman	Potentilla fruticosa 'Jackmanii'	1S	A
IC	Coralberry, Indiancurrant	Symphoricarpos orbiculatus	3S	B
AC	Currant, Alpine	Ribes alpinum	1S	C
CR	Rose, Carolina	Rosa carolina	3S	A
NWR	Rose, Nearly Wild	Rosa spp. 'Nearly Wild'	3S	A
VR	Rose, Virginia	Rosa virginiana	3S	A
S	Snowberry	Symphoricarpos albus	3S	B
AWS	Spiraea, Anthony Waterer	Spiraea x bumalda 'Anthony Waterer'	1S	C
DWS	Spiraea, Dwarf White	Spiraea albiflora	1S	C
DRS	Spiraea, Dwarf Red	Spiraea x bumalda 'Coccinea'	1S	C
FSP	Spiraea, Froebel	Spiraea x bumalda 'Froebelii'	1S	C
SMS	Spiraea, Snowmound	Spiraea nipponica 'Snowmound'	1S	C
GFS	Sumac, Fragrant Gro-low	Rhus aromatica 'Gro-low'	3S	A

VINES

AB	Bittersweet, American	Celastrus scandens	4V	A
BI	Ivy, Boston	Parthenocissus tricuspidata	4V	C
VC	Creeper, Virginia	Parthenocissus quinquefolia	4V	A
EI	Ivy, Engelmann	Parthenocissus quinquefolia 'Engelmanni'	4V	A

Notes:

A - Native to Wisconsin

B - Native to some parts of Wisconsin

C - Not native to Wisconsin

* Tends to be invasive. Use with care in urban areas only.

Symbols are derived from the first letter of each word in the common name of the plant.
Symbols for plants not shown on this list should conform to this convention.
The first letter of three-letter symbols usually, but not always, represents a cultivar name.
For example, ABC stands for Abbotswood (A), a cultivar of bush cinquefoil.
Cultivars with variegated or unusually colored foliage should not be planted.

BALLING & BURLAPPING SPECIFICATIONS

The following tables represent the recommended minimum sizes for trees which are grown in a nursery under favorable conditions

SHADE & FLOWERING TREES TYPES 1 AND 2*

SIZE (Cal.) WHEN PLANTED	MINIMUM SIZE				MULCH RING DIAMETER
	BALL		PLANT HOLE		
	DIAMETER	DEPTH	DIAMETER	DEPTH	
1/2"	12"	8”	36"	8“	48"
3/4"	14"	9”	38"	9”	50"
1"	16"	10”	40"	10”	52"
1 1/4"	18"	12”	42"	12”	54"
1 1/2"	20"	12"	44"	12”	56"
1 3/4"	22"	13”	46"	13”	58"
2" cal.	24"	14”	48"	14”	60"
2 1/2"	28"	17”	52"	17”	64"
3"	32"	19”	56"	19”	68"
3 1/2"	38"	23”	62"	23”	74"
4"	42"	25”	66"	25”	78"
4 1/2"	48"	29”	72"	29”	84"

* See the American Nursery & Landscape Association standards for definitions of plant types.

SHADE & FLOWERING TREES TYPES 3 AND 4*

SIZE (HT) WHEN PLANTED	MINIMUM SIZE				MULCH RING DIAMETER
	BALL		PLANT HOLE		
	DIAMETER	DEPTH	DIAMETER	DEPTH	
2' ht.	10"	6.5”	34"	6.5”	46"
3' ht.	12"	8”	36"	8”	48"
4' ht.	14"	9”	38"	9”	50"
5' ht.	16"	10”	40"	10”	52"

SIZE (Cal.) WHEN PLANTED	MINIMUM SIZE				MULCH RING DIAMETER
	BALL		PLANT HOLE		
	DIAMETER	DEPTH	DIAMETER	DEPTH	
1 1/2"	20"	12”	44"	12”	56"
1 3/4"	22"	13”	46"	13”	58"
2" cal.	24"	14”	48"	14”	60"
2 1/2"	28"	17”	52"	17”	64"
3" cal.	32"	19”	56"	19”	68"
3 1/2"	38"	23”	62"	23”	74"
4"	42"	25”	66"	25”	78"
4 1/2")	48"	29”	72"	29”	84"

* See the American Nursery & Landscape Association standards for definitions of plant types.

BALLING & BURLAPPING SPECIFICATIONS

The following tables represent the recommended minimum sizes for trees which

are grown in a nursery under favorable conditions

CONIFEROUS EVERGREENS
TYPES 1, 2, 3*

SPREAD WHEN PLANTED	MINIMUM SIZE				MULCH RING DIAMETER
	BALL		PLANT HOLE		
	DIAMETER	DEPTH	DIAMETER	DEPTH	
9"	8"	5”	32"	5”	44"
12"	8"	5”	32"	5”	44"
15"	10"	6.5”	34"	6.5”	46"
18"	10"	6.5”	34"	6.5”	46"
24"	12"	8”	36"	8”	48"
30"	14"	9”	38"	9”	50"
36"	16"	10”	40"	10”	52"
42"	18"	12”	42"	12”	54"
48"	21"	12.5”	45"	12.5”	57"
60"	24"	14”	48"	14”	60"
72"	28"	17”	52"	17”	64"
84"	32"	19”	56"	19”	68"
96"	36"	21.5”	60"	21.5”	72"

* See the American Nursery & Landscape Association standards for definitions of plant types.

CONIFEROUS EVERGREENS
TYPES 4, 5*

SIZE (HT) WHEN PLANTED	MINIMUM SIZE				MULCH RING DIAMETER
	BALL		PLANT HOLE		
	DIAMETER	DEPTH	DIAMETER	DEPTH	
12"	10"	6.5”	34"	6.5”	46"
18"	10"	6.5”	34"	6.5”	46"
24"	12"	8”	36"	8”	48"
36"	14"	9”	38"	9”	50"
48"	16"	10”	40"	10”	52"
60"	20"	12”	44"	12”	56"
72"	22"	13”	46"	13”	58"
84"	24"	14”	48"	14”	60"
96"	27"	16”	51"	16”	63"
108"	30"	18”	54"	18”	66"
120"	34"	20.5”	58"	20.5”	70"
144"	34"	20.5”	58"	20.5”	70"
168"	42"	25”	66"	25”	78"
192"	46"	27.5”	70"	27.5”	82"

* See the American Nursery & Landscape Association standards for definitions of plant types.

BALLING & BURLAPPING SPECIFICATIONS

The following tables represent the recommended minimum sizes for trees which are grown in a nursery under favorable conditions

CONIFEROUS EVERGREENS
COLUMNAR CONIFERS (TYPE 6) *

SIZE (HT) WHEN PLANTED	MINIMUM SIZE				MULCH RING DIAMETER
	BALL		PLANT HOLE		
	DIAMETER	DEPTH	DIAMETER	DEPTH	
12"	10"	6.5”	34"	6.5”	46"
18"	10"	6.5”	34"	6.5”	46"
24"	12"	8”	36"	8”	48"
36"	14"	9”	38"	9”	50"
48"	16"	10”	40"	10”	52"
60"	20"	12”	44"	12”	56"
72"	22"	13”	46"	13”	58"
84"	24"	14”	48"	14”	60"
96"	27"	16”	51"	16”	63"
108"	30"	18”	54"	18”	66"
120"	34"	20.5”	58"	20.5”	70"
144"	34"	20.5”	58"	20.5”	70"
168"	42"	25”	66"	25”	78"
192"	46"	27.5”	70"	27.5”	82"

* See the American Nursery & Landscape Association standards for definitions of plant types.

DECIDUOUS SHRUBS
TYPES 1, 2, 3, 4, 5 *

SIZE (HT) WHEN PLANTED	MINIMUM SIZE				MULCH RING DIAMETER
	BALL		PLANT HOLE		
	DIAMETER	DEPTH	DIAMETER	DEPTH	
12"	8"	5’	32"	5”	44"
18"	9"	6’	33"	6”	45"
24"	10"	6.5’	34"	6.5”	46"
36"	12"	8’	36"	8”	48"
48"	14"	9’	38"	9”	50"
60"	16"	10’	40"	10”	52"
72"	18"	12’	42"	12”	54"
84"	20"	12’	44"	12”	56"
96"	22"	13’	46"	13”	58"
108"	24"	14’	48"	14”	60"
120"	26"	15.5’	50"	15.5”	62"

* See the American Nursery & Landscape Association standards for definitions of plant types.

BARE ROOT SPECIFICATIONS

The following table represents the approved minimum root spread for nursery-grown shade trees

SHADE AND FLOWERING TREES
TYPES 1, 2, 3, 4 *

SIZE (CAL.) WHEN PLANTED	MINIMUM SIZE				MULCH RING DIAMETER
	ROOT		PLANT HOLE		
	SPREAD	DEPTH	DIAMETER	DEPTH	
1/2"	12"	8”	36"	8”	48"
3/4"	16"	9”	40"	9”	52"
1"	18"	10”	42"	10”	54"
1 1/4"	20"	12”	44"	12”	56"
1 1/2"	22"	12”	46"	12”	58"
1 3/4"	24"	13”	48"	13”	60"
2"	28"	14”	52"	14”	64"
2 1/2"	32"	17”	56"	17”	68"
3"	38"	19”	62"	19”	74"

* See the American Nursery & Landscape Association standards for definitions of plant types.

BARE ROOT SPECIFICATIONS

The following table represents the approved minimum root spread for nursery-grown deciduous shrubs.

DECIDUOUS SHRUBS
TYPES 1, 2, 3, 4, 5 *

SIZE (HT) WHEN PLANTED	MINIMUM SIZE				MULCH RING DIAMETER
	ROOT		PLANT HOLE		
	SPREAD	DEPTH	DIAMETER	DEPTH	
18"	10"	6.5”	34"	6.5”	46"
24"	11"	8”	35"	8”	47"
36"	14"	10”	38"	10”	50"
48"	16"	12.5”	40"	12.5”	52"
60"	18"	14”	42"	14”	54"
72"	20"	17”	44"	17”	56"

* See the American Nursery & Landscape Association standards for definitions of plant types.