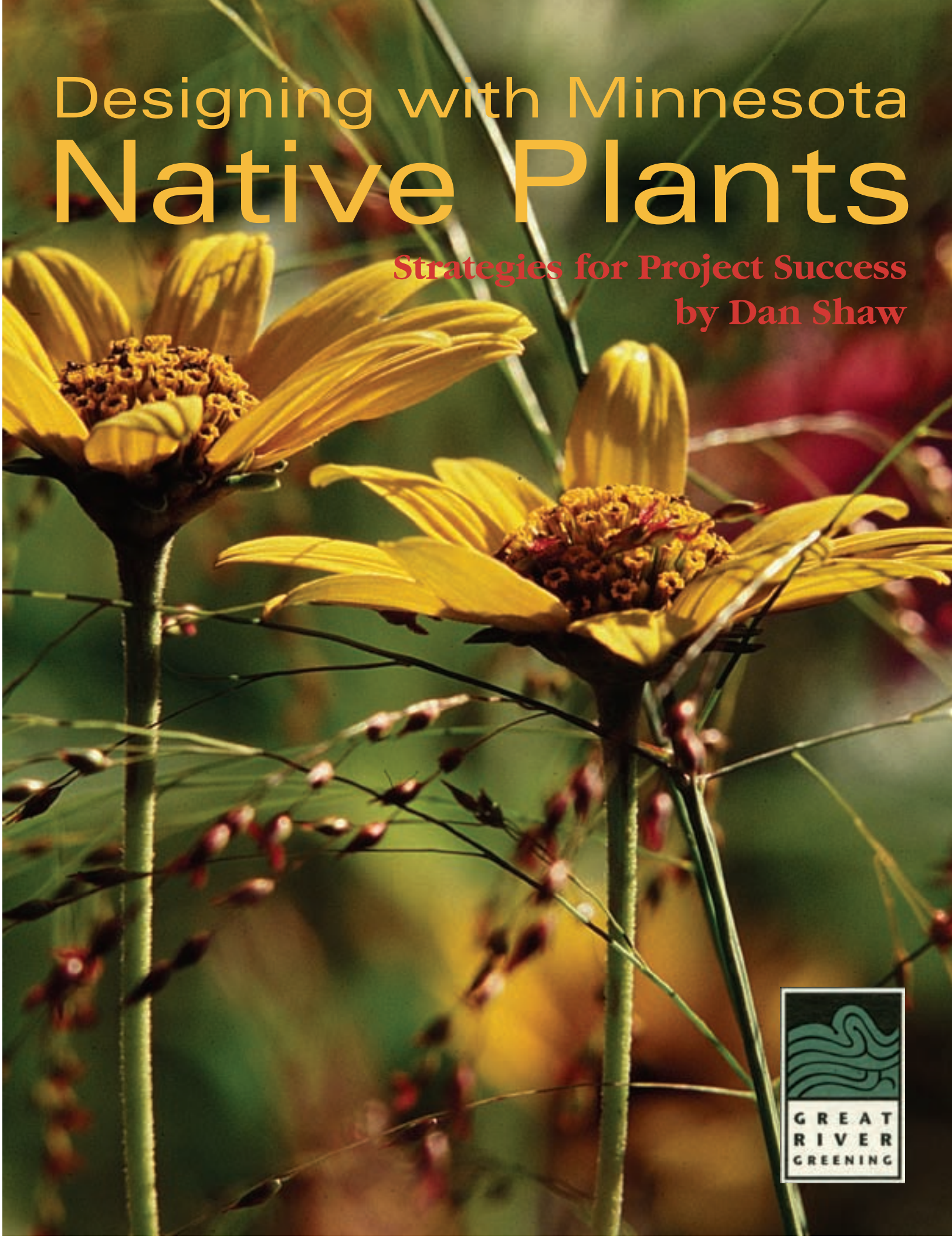

Designing with Minnesota Native Plants

Strategies for Project Success

by Dan Shaw

GREAT RIVER GREENING

Designing with Minnesota

Native Plants

Strategies for Project Success

by Dan Shaw
Landscape Ecologist
Great River Greening

October 2005
Cover photo by Jeff Shaw
Graphic design by Sandra Martin

The staff at Great River Greening hopes you find the information in this guidebook helpful and that it will inspire you to incorporate native plants in your landscape designs. We plan to update the information in this guidebook and welcome your comments and suggestions.

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Table of Contents

	Great River Greening Information	Page 2
	Acknowledgments	Page 4
	About the Author	Page 5
	Executive Summary & Introduction	Page 6
Chapter 1	History of Native Planting Design	Page 13
Chapter 2	What is a Native Plant?	Page 17
Chapter 3	Benefits of a Natural Approach	Page 19
Chapter 4	Types of Native Plantings	Page 25
Chapter 5	The Design Process	Page 29
Chapter 6	Native Planting Strategies	Page 35
Chapter 7	Other Design Considerations	Page 45
Chapter 8	Installation and Maintenance Considerations	Page 49
	References and Resources	Page 53
	Guidelines for Native Plant Installation and Maintenance Specifications	Page 57

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Dan is a Landscape Ecologist for the environmental nonprofit organization Great River Greening. He is involved in wetland, forest and prairie restoration work, as well as erosion control, planting and interpretive design projects. Dan has also worked for several years as an ecologist and designer in the private sector and for state government, and is the author of many publications including, "Plants for Stormwater Design: and "Native Vegetation in Restored and Created Wetlands." He is also an adjunct assistant professor at the University of Minnesota, teaching plant identification and planting design classes.

PUBLICATIONS:

- *Cherokee Park Prairie: Ecological Inventory And Restoration Management Plan,* Great River Greening, 2002.
- *Crosby Park Trail Study and Reconstruction Plan,* Great River Greening, 2004.
- *Mississippi River Gorge, Ecological Inventory and Restoration Management Plan,* Great River Greening, 2002.
- *Native Vegetation in Restored and Created Wetlands: Its Establishment and Management in Minnesota and the Upper Midwest,* Minnesota Board of Water and Soil Resources, 2000.
- *Plants for Stormwater Design, Species Selection for the Upper Midwest,* Minnesota Pollution Control Agency, 2003.
- *Rain Checks, Architecture Minnesota, March - April, 2004.*
- *West Side Bluffs: Ecological Inventory and Vegetation Management Plan,* Great River Greening, 2001.

Great River Greening

Our mission at Great River Greening is to lead and support community-based restoration of natural areas. Since its beginning in 1985, Greening has involved more than 15,000 volunteers, planted over 40,000 native trees and shrubs and 165 acres of prairie grasses and wildflowers, and cut nearly 350 acres of invasive non-native buckthorn. Greening has worked on both public and private lands, including more than 80 commercial business properties. Our professional staff provide natural resource management planning and ecological landscape design services to support our nonprofit mission.

Planting Design
by Meg Arnosti of
Windsor Companies

Executive Summary

As part of our educational goals at Great River Greening, we have developed this guidebook for designers, developers, landscapers and the general public to demonstrate how native plants can be used effectively in planned landscapes. This document provides information about the important role native plantings serve in renewing our landscape, and also includes successful strategies for native planting design.

Native plants are not only beautiful specimens in themselves; they also offer an ever-changing environment of color, light, texture, sound and motion that echoes our natural heritage. Their hardiness, ability to attract wildlife, seasonal change and winter interest all capture the essence of our region's unique beauty and character. Designing with native plantings can have a positive impact on any landscape project and is capable of enriching everyday life and sense of place.

Switch grass and
Common Ox-eye
photo by Jeff Shaw

Installing native landscaping is also a cost-efficient way to benefit air and water quality because it eliminates or reduces the need for fertilizer, pesticides, watering and lawn maintenance equipment. Pesticides and fertilizers can contaminate rivers and lakes, and gasoline-powered lawn equipment is responsible for five percent of the nation's air pollution. Native plants are the key component of natural stormwater treatment strategies such as vegetated swales, detention basins and rain gardens.

Grey Cloud Dunes
Scientific and Natural Area
photo by Dan Shaw

This guidebook is one of the first to address directly some common reservations people have about using native plants. These include issues of aesthetics, costs, weeds and maintenance. The primary goal of this document is to outline design and maintenance strategies that will give native plantings an orderly, neat appearance.

As part of the project we asked design firms and nurseries throughout the region to send us images that illustrate the successful use of edge treatments, formal plantings, controllable natives, combinations of native and cultivated species, and other strategies of native-plant design. Major sections of the document will be available as PDF files on our website at **www.greatrivergreening.org**.

Introduction

Native plants are an essential component of Minnesota's ecosystems, providing important habitat for wildlife species and key benefits for regional environmental quality. But, less than one percent of Minnesota's native prairies and less than half of

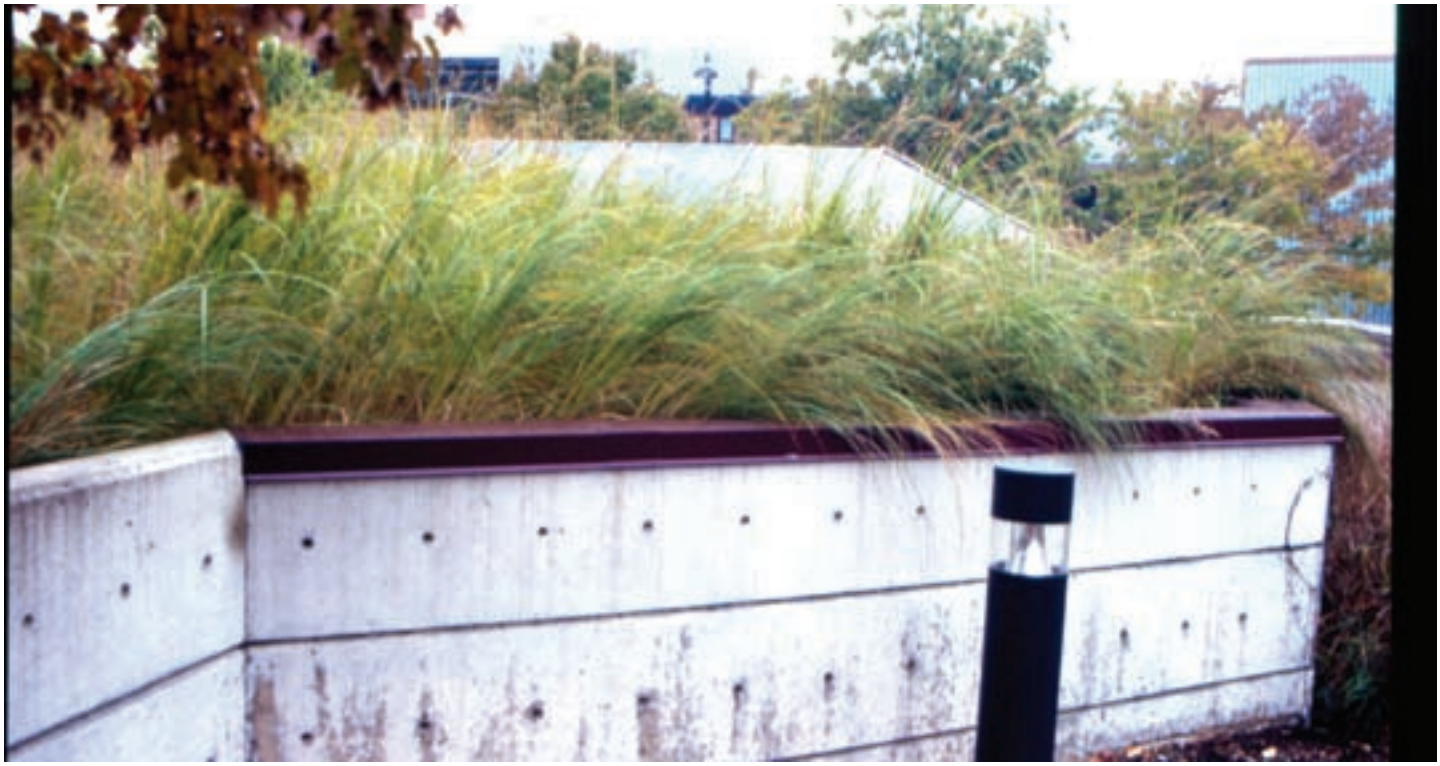
the state's wetlands remain from the era before white settlement. Few truly natural environments remain in the region today, a fact that underscores the need to preserve remnants and introduce native species into the landscape whenever possible.

The purpose of this guidebook is to offer specific strategies for successful reintroduction of native species and to encourage the widespread use of native plants in landscape design. It is sometimes argued that native species are unsuitable for planned landscapes because they are "wild" or "messy". The strategies in this book illustrate how to embrace the "wildness" of native plants by selecting species best suited to site conditions and incorporating them into functional, aesthetically-pleasing plantings.

Minneapolis Rain Garden
photo by Dan Kalmon

Great River Greening strongly encourages landscape designers to freely experiment with native plants, and develop a deep knowledge of native species as well as weeds and invasive species. We've included a separate section on preparing sites and maintaining plantings - critical steps in project success. The concepts presented in this guidebook can be applied to formal gardens, stormwater systems, naturalized plantings or any other project where aesthetics come into play.

Prairie Cord Grass
photo by Dan Shaw



The Importance of Using Native Plants

Diversity and unique vegetation are defining characteristics of Minnesota's landscape. A key reason for using native plants in landscape design is to develop a strong sense of regional identity and endow urban and residential settings with the beauty of the natural landscape. Also, native plantings are hardy and long-lasting, reducing the amount of maintenance required. And, they nurture natural processes that promote a healthy environment. For example, native plants cleanse the water and air, generate oxygen, add nutrients to the soil and reduce soil erosion, fostering diverse healthy plant communities. They are an important part of what are commonly called Best Management Practices or BMP's. These are strategies such as rain gardens, buffer strips, vegetated swales, detention basins and shoreline plantings that are designed to improve environmental quality.

Moreover, native plants are vitally important to local wildlife species that depend on local plants for food and shelter. The more abundant native plants are in a particular landscape, the more birds, animals and insects they can support. The Audubon Society has reported that almost 30 percent of bird populations in North America face "significant decline" and much of this decline is believed to stem from habitat loss. Native planting projects restore lost habitat and also help buffer natural areas. These buffers provide additional wildlife habitat and can minimize the impact of non-native, invasive species.

Using Native Plants in Design

Prairie Flowers
photo by Jeff Shaw

There is no better way to learn how to design with native plants than to spend time in natural settings, particularly in healthy plant communities. Field visits help landscape designers understand the environmental conditions that specific native plants require, what other species share that environment, and how weeds and invasive species affect the well-being of plant communities. Visiting sites with someone experienced in plant identification and ecology can speed the learning process. The more species you know, the better chance you have of creating successful designs.

There are roughly 2,400 species of native plants in Minnesota. Although native species have not been bred for specific foliage characteristics, long bloom times or predictable growth forms, the wide variety of commercially available species gives designers viable options for almost any design situation.

Shoreline Planting by
Hilscher Design and Ecology, Inc.
photo by Tony Hilscher

Because native species often grow more aggressively than cultivated species, they are frequently considered "wilder" in appearance, particularly if they are planted in a naturalized arrangement. A 1995 University of Minnesota study looked at how the general public views native plantings in a residential setting.

The researchers found that native plantings (prairie plantings or shrub masses) are more likely to be considered attractive if they look neat and well tended. People associate neatness with a well-cared-for landscape; define naturalness as the presence of trees, shrubs, flowers and grasses; and only see native plantings as unattractive if they are too extensive relative to the amount of lawn framing the plantings. (Nassauer et. al.). Significantly, the plantings in the study did not include strategies such as massed plantings and formal arrangements to create order - topics that will be covered later in this guidebook. The researchers did note that important "cues to care" included mowed lawns, flowering plants and trees, edging, bold patterns, trimmed shrubs, linear planting designs, fences and other structural features.

Bergamot

Chapter 1

History of Native Planting Design

"In the 19th century, we devoted our best minds to exploring nature. In the 20th century, we devoted ourselves to controlling and harnessing it. In the 21st century, the best minds are working on how to restore nature."

Author Stephen Ambrose

Modern appreciation for native plants arose from the Arts and Crafts movement (1870-1900), which drew its inspiration from regional differences in topography, climate and vegetation. Contemporary landscape designers such as Ossian Cole Simonds and Jens Jensen aligned themselves with Frank Lloyd Wright and other "Prairie School" architects who studied the regional landscape and incorporated floral and other natural forms in their designs.

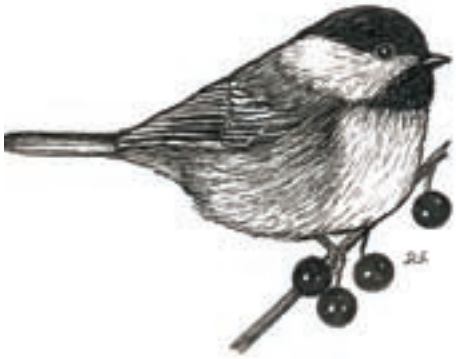
Danish-born Jens Jensen was one of the first landscape architects to champion a design style based on regional distinctiveness. He wanted people to experience the subtle beauty and seasonal cycles of the land. In 1888 he planted what he called his "American Garden" in a corner of Union Park in Chicago. A hit with the public, it contained mostly perennial wildflowers that he had gathered in the countryside. Jensen learned to use indigenous plants effectively and rejected imported species.

Jens Jensen
Courtesy of the Archival Collections of The Morton Arboretum, Lisle Illinois
photo by Herbert Georg Studios

Rough Blazing Star
photo by Jeff Shaw

The influence of English gardens, the Arts and Crafts movement and Prairie School style in America created the ideal of a "wild garden" - a cultivated area meant to embody an idealized vision of untrammeled nature. By the early 20th Century, Americans were ready to embrace the wilderness their ancestors despised. Burgeoning automobile travel fostered the notion of roadsides as wild gardens and expressions of American nature. Popular magazines and books promoted the restoration of native flora along roads, and roadside meadows as models for urban gardens.

The last decade has seen a resurgence of interest in native plants, primarily because of their ecological benefits. "The use of native plants not only protects our native heritage and provides wildlife habitat," former President Bill Clinton remarked in a 1994 memo, "but can also reduce fertilizer, pesticide, and irrigation demands and their associated costs because native plants are suited to the local environment and climate."



Chickadee

Chapter 2

What is a Native Plant

The term “native plant” generally refers to a species that is indigenous to a geographic area. It is important to select plants that are a local ecotype for native planting projects. An ecotype is a population of a species that differs genetically from other populations of the same species because local conditions have allowed certain unique physiological or morphological characteristics to dominate.

Many native plant nurseries consider a species native if it grows no more than 200 miles from a project site. Because climate varies so much with latitude, a maximum range of 150 miles north-south and 200 miles east-west is also common. Many scientists argue that species that grow in isolated patches, and particularly those that do not widely distribute seeds, should come from sources as close as possible to a project site. This is a good rule of thumb for native-plant design.

Many nurseries carry cultivars of native species, plants that are bred to retain distinct, uniform characteristics. However, planting cultivars is risky because there is generally little genetic diversity among individual plants. If cultivars are planted near natural areas with native populations of the same species, their uniform genes may change the local ecotype for the worse, making native plants more susceptible to disease and insects. Because many cultivars are bred for aggressiveness, they may pass along that trait to their wild counterparts or out-compete them for light and nutrients.

Cardinal Flower (Lobelia Cardinalis)
photo by Jeff Shaw

Chapter 3

Benefits of a Natural Approach

Vegetated swale at H.B. Fuller Headquarters (pictured left)
photo by Sara Morse

Designing with native plants requires a departure from the typical strategy used for horticultural species - adapting a project site to accommodate standard cultivated species. This approach, in which the same plants are used repeatedly in projects throughout the country, can result in a loss of regional identity and biological diversity.

In contrast, native landscaping selects plants that were historically found at a site or that are best suited to site conditions. This method requires less site preparation and chemical application, and cuts weeding and irrigation costs. The use of native species also has a positive influence on the broader ecosystem by increasing diversity and providing habitat for birds, butterflies and other wildlife. All projects will have an influence on the larger landscape, but utilizing native plants in combination with Best Management Practices can ensure that the effect on the regional landscape will be positive.

Cardinal Flower and Sphinx Moth
photo by Rebecca Chesin

A Yale University graduate student found that Americans apply approximately 70 million pounds of pesticides to residential lawns, trees and shrubs annually - roughly 10 times more per acre than the amount applied to agricultural lands. A significant problem with heavy use of chemical pesticides and herbicides is that they can seriously degrade downstream lakes, ponds and streams. These products also harm bird, insect and animal populations. The U.S. Environmental Protection Agency has estimated that more than five percent of urban air pollution results from gas-powered landscape equipment. Traditional horticultural landscapes also consume large amounts of water - as much as two-thirds of urban freshwater is used for grounds maintenance in some cities.

In addition to minimizing resources consumption, the financial savings of native plantings provide a compelling argument: once established, native plants mean less care, fewer problems and lower costs, not to mention year-round beauty. In contrast, many non-native plants cannot survive without costly and harmful fertilizers and chemicals, irrigation and constant care.

Great River Greening
Forest Grove
Planting (left) and
Two Years Later (right)

The chart below compares the costs of installing a lawn versus prairie and forest reconstruction. These figures, developed by Great River Greening, demonstrate the cost savings of using native plants instead of turf. Choosing native plants saves money and generates community goodwill for property owners who demonstrate a commitment to environmental stewardship.

Traditional vs. Native Landscaping Cost Comparison

Summary Table							
Landscaping Scenario	Installation Materials	Installation Labor	Maintenance Cost per Year	Total Cost Over 5 Years[2]	Net Present Value[3]	Total Cost Over 10 Years[2]	Net Present Value[3]
Seeded Turf	$5,850	$1,400	$5,380	$34,150	$31,272	$61,050	$49,223
Sodded Turf	$11,550	$10,500	$5,380	$48,950	$46,072	$75,850	$64,023
Seeded Prairie[5]	$450[8]	$3,150	$1,530	$11,250	$10,432	$18,900	$15,537
Seeded Prairie with Plugs[6,7]	$3,350[8]	$7,450	$1,530	$18,450	$17,632	$26,100	$22,737
Woodland Trees & Shrubs	$21,850[9]	$11,600[10]	$800	$37,450	$37,022	$41,450	$39,691

Note:

1. All estimates are on a per acre basis: the larger the acreage, the more economies of scale come into play based on fixed costs.
2. Assumes a 6% cost of capital and payments made at the beginning of each year.
3. Net Present Value = an estimate of the amount of money that would be needed now to fund a series of future payments.
4. Turf installation and maintenance estimates include the installation and upkeep of an irrigation system.
5. Seeded prairie = Approximately 5 grass species, and 15 wildflower species, no plugs.
6. Seeded prairie with plugs = Approximately 6 grass species, and 20 wildflower species seeded, 2,500 plugs.
7. Plug = small plant in a 1x1x2" container.
8. Prairie installation includes herbicide treatment, tilling, seeding and packing: variables include the higher cost of flowers and plugs.
9. Woodland material estimate includes a necessary plant warranty of $3,100, and 104 10-gallon trees, 788 5-gallon shrubs, and 650 cubic yards of mulch ($5/yard) spread to a depth of 5".
10. Woodland labor estimate includes installation at $30/hour and 70 hours of prep, including spraying, drilling, and layout at $30/hour.

* Contact Great River Greening for a more detailed narrative describing landscaping totals.

Ecological vs. Traditional Stormwater Treatment Costs

Costs are generally 10-40% lower for ecological systems vs. traditional curb and gutter systems.

Note:
Because stormwater treatment costs vary greatly depending on site conditions, it is very difficult to make generic estimates for installation materials, labor and maintenance.

More nurseries in the Midwest are carrying native plants as demand for these species rises. We are particularly fortunate in Minnesota to have many nurseries that specialize in native plants. Large regional nurseries also carry some active plant species, but they are often cultivars and originate more than 200 miles away. It is a good idea to ask nurseries where they purchase their plants to ensure you are getting plants from a local source.

Warbler


FOR RENT

Chapter 4

Types of Native Plantings

Versatile and widely available, native plants can be used in a variety of settings from formal gardens to native area restorations. Native plants are important in a variety of landscape settings, including:

Native gardens Native gardens are primarily created for aesthetic purposes, but also benefit wildlife and local ecosystems. They range in style from very formal to naturalized and vary widely in diversity of plant species.

Woodland Garden by Hilscher Design and Ecology, Inc. (pictured right)

Native Garden in Wayzata, MN photo by Mike Evenocheck (pictured left)

Functional plantings This type of planting filters stormwater, controls erosion, improves soil conditions, draws pollutants from the ground or performs some other vital ecological function in the landscape. Functional plantings range from formal gardens to reconstructed plant communities and most are considered Best Management Practices.

Reclamations and reconstructions Reclamation generally refers to returning disturbed land to a useful purpose. Native species are commonly used in reclamation projects to stabilize the soil and provide habitat and food for wildlife. Reconstructions return native plant communities to sites that no longer have a natural, intact ecosystem. Converting a cornfield to a prairie is an example of a reconstruction project. Reclamation and reconstruction projects generally involve the partial restoration of plant community structure and function.

Rain Garden in Maplewood, MN (above)

Before (below left) and After (below right)
Pictures of a large Great River Greening
Forest Reconstruction Project

Restorations Ecological restoration involves the recovery of an ecosystem that has been degraded, damaged or destroyed. Restoration projects involve the complete functional and structural return to a pre-disturbance state.

This guidebook discusses a variety of project types, including developing naturalized plantings. In most cases such projects are considered reconstructions. We do not cover restoration in detail here, but there are many good resources on this topic. (See References and Resources)

Great River Greening Savanna Restoration in Minneapolis, MN (below left)

Great River Greening Prairie Restoration in Saint Paul's Swede Hollow (below right)

Chapter 5

The Design Process

The steps in the process include site analysis, concept planning, and planting plan development. This guide offers only an overview of these steps and focuses on aspects that relate to native planting design. There are many books on planting design that explore the design process in more detail. (See References and Resources)

Analyzing the site

Site analysis, the first step in the design process, involves thoroughly studying the physical characteristics of the project site. The information that is gathered will be very useful in selecting appropriate species for the project. Elements that should be investigated include:

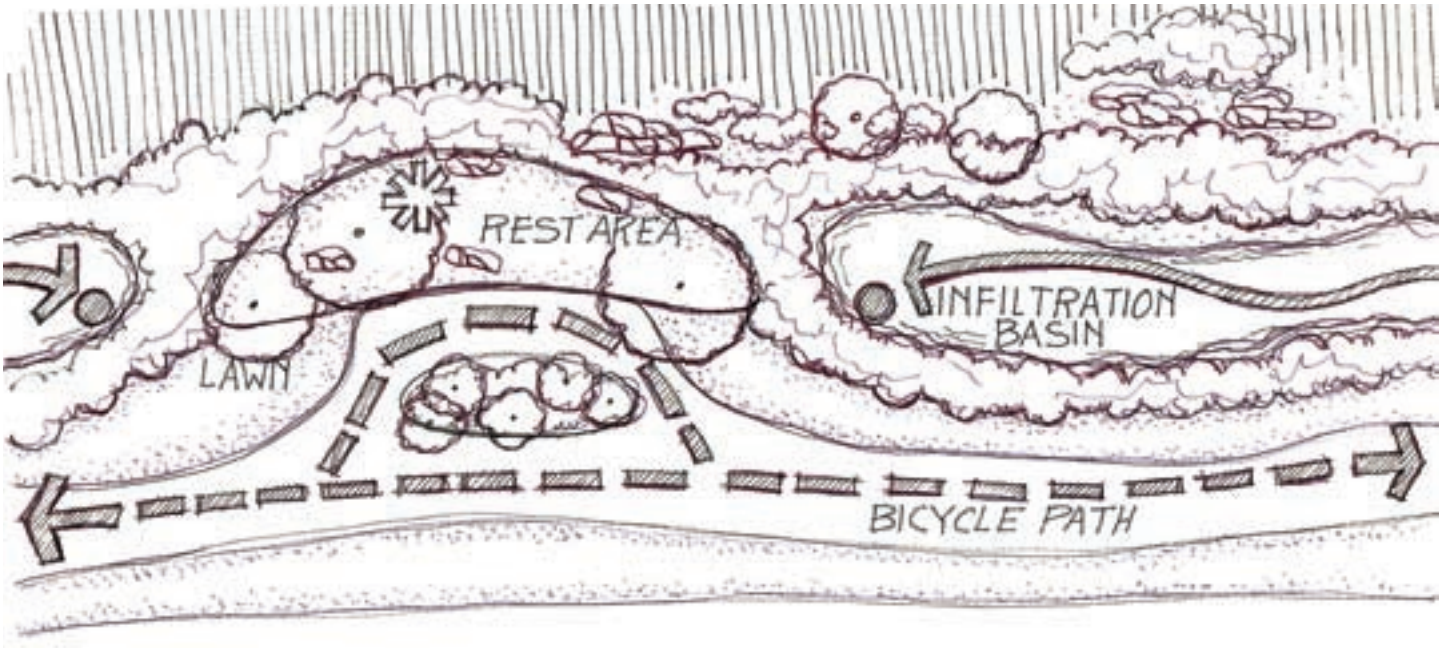
- Geology (bedrock characteristics and depth, surficial geology)
- Soils (texture, drainage, pH, soil profile)
- Landform (topography, aspect)
- Hydrology (water bodies, surface flow, subsurface flow, depth to water table, impervious surfaces)
- Vegetation (presettlement vegetation, existing vegetation, presence of invasive exotic species, presence of high-quality habit remnants)
- Wildlife (common megafauna and microfauna, endangered/protected animal species, pest species)
- Climate (wind direction, sunlight, temperature range, microclimate conditions)
- Cultural context (land use, roads/trails, land ownership/property lines, structures, impact of human use on vegetation and wildlife)

Site analysis includes walking the site while observing features, taking measurements and notes, and using resources such as soil survey books, historical vegetation maps, U.S. Geological Survey maps and County Biological Survey maps. Observations are recorded to create a basemap that is used to develop a concept plan.

Great River Greening Planting at Mounds Park, Saint Paul, MN
photo by Dan Shaw

The Concept Plan

Concept plans, often drawn on tracing paper, try to capture the essence of the intended design by sketching in the major components of a project. These plans are useful tools in developing strong outdoor spaces. It is common to create several concept drawings while exploring site alternatives. In addition to key features observed during site analysis, concept plans commonly include: locations for planting beds, outdoor rooms and open areas for recreation or entertainment, wildlife areas and views to emphasize or shield.



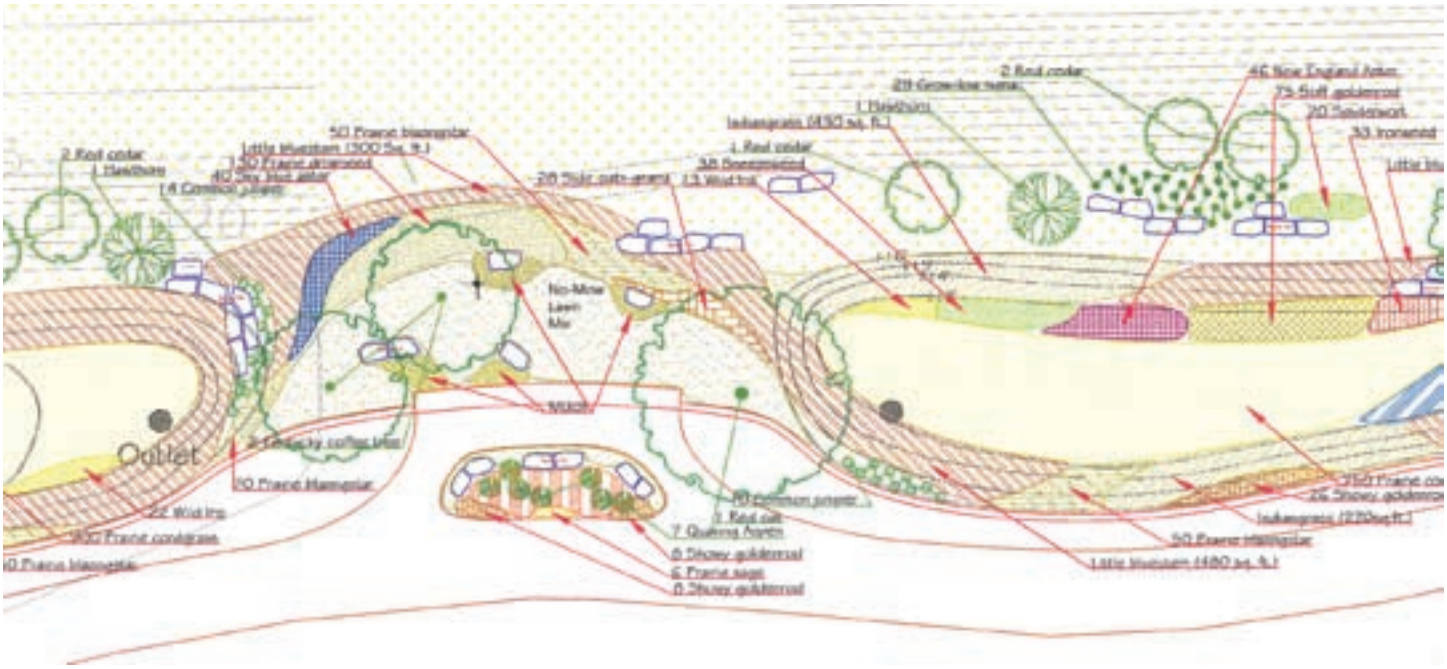
Concept Drawing

In the concept phase you will also need to select an appropriate plant community for your project, based on current site conditions and an understanding of the type of vegetation that existed there in the past. Oak forest, maple-basswood forest, mesic prairie and wet meadow are examples of natural plant communities (see References and Resources for information on native plant communities). It is best to select plants from one or a few plant communities because plants that normally grow together are more likely to thrive than a hodgepodge of unrelated species.

It is also important to consider both the ecological and social context of the project during concept plan development. Plantings should improve the ecological function of the site and promote a healthy environment as much as possible. Selected plants should blend into the urban or neighborhood setting and add beauty.

The Planting Plan

The next step is drawing up a planting plan. While planting plans use the ideas for outdoor spaces and locations for key plants as defined in the concept plan, they are much more detailed. They show the exact location of different species to be planted and note the size and number of individual plants (Planting strategies, including layout ideas, are discussed in the next section of this guide).



Planting Plan

Information gathered during site analysis - geology, soils, landform, hydrology, vegetation, wildlife and climate, as well as the target plant community for a site - will guide the selection of individual plant species for a project. It is useful to visit natural areas to see how plants form interconnected communities and to observe the growth habits of individual species. Also, pay attention to the vertical structure of plant communities - the canopy, subcanopy, shrubs and ground layer species - let this guide your design.

When drawing up a planting plan, it is standard practice to plot the locations of trees first, followed by shrubs and herbaceous vegetation. This order makes sense because the placement of taller plants will determine the pattern of sun and shade on a project site, which in turn determines the placement of shrubs, grasses and forbs. A planting plan should also indicate where ground-layer vegetation or mulch will be used to control weeds. It is a common

Oak Savanna

practice to mass vegetation closely together to suppress weed growth - a type of planting we call “dense initial”. Dense initial plantings cost more for plant materials at the outset, but save money over time by lowering maintenance costs.

Developing planting details and specifications is an essential part of the design process. Planting details demonstrate the correct installation method for contractors, and specifications ensure that quality plant material is used and that the project is installed and maintained in a way that will result in success. Too many contractors use standardized specifications without attending to site-specific conditions, and the plantings degrade over time. Specific issues to watch for include: quality and depth of topsoil, the reliability of the planting or seeding technique, and post-planting care.

The main thing to keep in mind when developing a planting plan is to have fun! It’s easy to get wrapped up in details, but if you follow the appropriate steps, you will succeed.

Fox Sedge

Chapter 6

Native Planting Strategies

(photo on left)
Metropolitan State University
by Great River Greening
photo by Sara Morse

As noted in the Introduction, one common objection to designing with native plants is their perceived "messy" appearance. Everyone appreciates the beauty of native plants in their natural settings. The challenge for designers is to bring the character of natural communities to the designed environment where the general public is accustomed to more order. The following strategies bring more intention and order to native plantings thereby increasing their acceptance aesthetically.

Edge Treatments
Creating neat edges with plants or other materials is an effective way to establish a sense of order in plantings. Formal edges to naturalized gardens can give a controlled look to the entire planting. Plants that grow low to the ground or stay in tight forms are generally used for front edges.

Benefits: Creates a sense of order.

Limitations: Maintaining a neat appearance may require higher maintenance.

Maintenance requirements: Medium

Edge of a Native Planting at the Science Museum of Minnesota

Fence Bordering Native Planting

Prairie Smoke (Geum Triflorum)
photos by Dan Shaw

Formal Plantings

Native plants generally are not considered for formal plantings, but many are well suited to this use and can provide additional ecological benefits. Native species that stay in neat clumps or grow in predictable forms are best suited for this purpose.

Benefits: Strong sense of order; clean lines, recognizable patterns.

Limitations: Time consuming to install; requires careful plant measurement; constant care needed to keep formal appearance; fewer native species suited to this design compared with other planting strategies.

Maintenance requirement: High

Black Chokeberry (top left)

Native Garden designed by Great River Greening (bottom left)

Alumroot and Woolgrass (far right) photos by Dan Shaw

Controllable Natives
Native species can spread quickly by rhizome or seed, but many species confine themselves in clumps or spread slowly, giving a controlled look. Many of these species are also suitable for edge treatments and formal plantings.

Benefits: Controlled, predictable look.

Limitations: Less diversity of species; greater competition with weeds between plants.

Maintenance requirement: Medium

Little Bluestem (top left)

Wild Geranium (top right)

Soft Rush (bottom)
photos by Dan Shaw

Plant Masses

The use of plant masses is another strategy that can create a sense of order in plantings. This strategy looks most natural with species that are normally found in clumps such as those that spread by rhizome or are commonly found in monoculture stands. While combining masses, one should think about color, texture, line and height combinations.

Benefits: Creates order; many options with free-form design; dense masses reduce weed competition.

Limitations: susceptibility to disease and insects; some species may look insignificant when plants are not blooming or are dormant.

Maintenance requirement: Medium

Black-eyed Susans (top right)
Dwarfbush Honeysuckle (bottom right)
photos by Dan Shaw

Massing of Prairie Species in Saint Paul
photo by Sara Mors (left)

Native Planting Mass with
Black Eyed Susan
photo by Sara Morse

Great River Greening Planting
in St. Paul, MN
photo by Dan Shaw

Naturalized Plantings

Species that tend to spread by seed or spread quickly by rhizome are well suited to naturalized plantings. Generally, naturalized plantings require less organization than other types, so they are suitable for large sites or projects with insufficient resources for intensive maintenance. In many ways naturalized garden plantings resemble restoration plantings and, like restoration plantings, often contain a broad array of native species that help the plant community withstand climatic changes, disease and insect infestations.

Benefits: Less competition from weeds; greater species diversity; less maintenance needed.

Limitations: Less sense of order.

Maintenance requirement: Low

Before and After Pictures of a Great River Greening Planting
at a Disturbed Urban Site (top left and right) photo by Dan Shaw

Naturalized Prairie Planting at the Minnesota Valley Wildlife Refuge
Visitor Center (bottom right) photo by Sara Morse

Naturalized Prairie (bottom left)
photo by Dan Shaw

Groundcovers
There is often a need for groundcover species in landscape design. Many native species such as violets, strawberries and Canada anemone aggressively spread close to the ground. Although generally not native, no-mow fescues that only require mowing a couple times per year are becoming a popular alternative to traditional turf grasses for larger areas.

Benefits: Low maintenance; good replacements for lawn.

Limitations: Generally low diversity; can lack visual interest.

Maintenance requirement: Low

Canada Anemone (top left)

No-mow Fescue Lawn (bottom left)

Little Bluestem Dominated Planting (below right)
photos by Dan Shaw

Combining Native and Non-Native Species
Landscape designers often combine native and horticultural species in their creations. Native species should be used to the fullest extent possible, but there may be instances where clients request certain horticultural species or horticultural species are best suited to a design situation. It is important to choose noninvasive horticultural species that will not harm the environment by altering the genetics of native populations.

Benefits: Many options for plant form; bloom time and flower color.

Limitations: Fewer native species incorporated in the landscape.

Maintenance requirement: Medium

Purple Coneflower and Common Ox-eye (left)

Perennial Garden with Native and Non-native Species (right) photos by Dan Shaw

Rain Garden at the Swede Hollow Lake
in St. Paul, MN (top left)
photo by Dan Shaw

Potted Plants Accenting a Native Garden (middle left)
photo by Jason Aune

Garden with Horticultural and Native Species (top right)

Purple Coneflower and Golden Alexanders
Designed by and photo by Jeff Zeitler (bottom)

Chapter 7

Other Design Considerations

Year-Round Interest

A goal of many projects is to provide year-round visual interest. This can be challenging because prairie plants typically bloom in midsummer, while most woodland species bloom in the spring. Nevertheless, it is possible to find species that bloom at other times of the year or sport eye-catching foliage or fruit. For example, prairie plants such as pasque flower, golden Alexanders, prairie smoke, prairie phlox and spiderwort bloom early in the season. In woodland plantings, year-round interest can be achieved by selecting plants that either keep their foliage all year or bloom later in the season. Examples are wild geranium, ferns, goldenrods, asters and various types of sedges and grasses.

Functional Requirements

Functional requirements of a site include erosion control, stormwater filtering, soil remediation and the creation of wildlife habitat. There are many good reference materials on these topics (see reference list).

Pasque Flower
(Anemone Patens)
photo by Rebecca Chesin (left)

Rain Garden
designed by URS
photo by Rusty Schmidt (right)

Diversity

Putting together a plant list can be a challenging as well as fun aspect of the design process. Generally, the more diverse the plant community in a project, the more resilient the planting will be to changing climatic conditions, disease and insect attacks. For most projects, achieving high diversity is an important goal. There are some instances where less diversity may be preferred, such as when native grasses are planted to stabilize and decrease maintenance needs on a site, or when fewer massed species are used to create a neat appearance.

Canada Wild Rye

Wildlife

Specific steps can be taken to make a project more hospitable to wildlife. For example, recreating the natural vertical structure of canopy, subcanopy, shrub and understory species in a plant community will boost a site's potential for attracting wild creatures. And minimizing impervious surfaces and lawn will maximize the available area for native plants. Wherever possible, link your plantings to other native plantings or habitat corridors surrounding the project.

Blue Karner Butterfly

The more diverse the plantings on a site and the more distinct habitats it contains, the more wildlife species it will draw. Wet or moist areas can attract a wide array of birds, animals, amphibians and other wildlife species (One effective way to create rain gardens or small backyard ponds is to collect water from building down-spouts.). Avoid erecting walls or other barriers that could impede the movement of small animals such as turtles and salamanders.

Budget
The amount of money you have to spend often determines the type and number of plants used in a project. Seed is inexpensive but generally used only on large, not highly visible sites. Seed can be combined with containerized plants to increase the chances of success. Bare-root plants are becoming increasingly popular because they're inexpensive and come in a variety of sizes. However, the bare-root planting season is generally restricted to the spring and fall.

Containerized plants are used in most garden plantings. They are readily available and can be planted throughout the growing season as long as they are sufficiently watered. The most common container sizes are plugs, 2-inch containers, 4-inch containers and gallon containers. The larger the container size, the more quickly plants will mature. Plugs are the cheapest option but the small plants require more initial care.

Allergies and Pests
Most plants that are responsible for common allergies are not native species. Ragweed is an exception but is not included in native planting projects. Regarding pests, most rodents and raccoons are attracted to food sources such as garbage and not native plantings. Mosquitoes do not breed in native plantings but in water left standing for at least ten days.

Weed Laws
The intent of weed laws is to prevent poorly-maintained property. Well-designed native landscapes do not result in a poorly-maintained look. Many municipalities have modified weed laws to allow natural landscaping and, in some cases, they promote the use of native species versus turf. A strip of lawn is sometimes required to indicate that the native landscape is planned. Designers should check on weed laws with local municipalities before initiating a large natural landscaping project.

Front Yard Planting
photo by Rebecca Chesin

Chapter 8

Installation and Maintenance Considerations

Proper site preparation is critical to any native planting, whether it is a garden planting or restoration. Compacted soil and invading weeds can doom a project if care is not taken at the outset to give plants a healthy start.

Soil Compaction

Even native species are not adapted to send roots into compacted soil, which impedes plant growth by blocking the flow of water and nutrients through the soil. Soil should be loosened up before planting, if necessary with a chisel plow - a 3-foot long tooth that is dragged through the ground. In new developments, every effort should be made to keep the building footprint as small as possible and to keep heavy equipment outside the drip line of trees that will remain on the site.

Science Museum of Minnesota Plantings
photo by Libby Johnston

Weeds and Invasive Species

Sites with sandy soil are generally less prone to weed invasion than rich organic soil. However, invasive species such as spotted knapweed will invade sandy soil. Selecting weed-resistant species is important. Prairie plantings dominated by native species such as big bluestem and Indian grass tend to monopolize available nutrients, effectively suppressing weeds. But when short-grass species are planted in rich organic soil they can be overrun by large, aggressive weeds. The key is to thoroughly eliminate existing undesirable vegetation as well as the threat of weeds germinating in the future.

Applying herbicide is the most common method of killing vegetation. Laying down black plastic for the growing season and repeated tilling can also be effective. Another technique for eliminating sod is to lay down cardboard or about 15 sheets of newspaper, then pile three to four inches of wood chip or composted leaves on top. Tilling can be problematic in gardens because weed seeds germinate readily in tilled soil. Great River Greening has found that planting directly into dead sod works better.

Wood chips or composted leaves play an important role in suppressing weeds in native plantings. We recommend applying five to six inches of wood mulch for tree and shrub

Susan Overson Residence

plantings, and three to four inches for herbaceous plantings. In addition to suppressing weeds, the mulch acts as a big sponge helping to retain soil moisture. Mulch also helps rebuild soil and promote root growth - particularly important in woodland plantings. Composted leaves (found naturally on the forest floor) are ideal for woodland plantings.

Maintenance

Many beautifully designed native projects have been ruined by lack of maintenance and weed invasions. The best weed control strategy is to eliminate them when they are small, which requires frequent visits to the site. Applying chemicals is the most common method of destroying weeds, but because chemicals often harm the environment, mechanical removal is preferred whenever possible. Repeated monitoring can help prevent weed infestation before it threatens young plants. Frequent visits can also help you assess watering needs and head off problems such as erosion, plant disease and trash dumping. (See Guidelines for Native Plant Installation and Maintenance Specifications)

Mulch Paths Defining Plant Masses
photo by Rebecca Chesin (bottom left)

Densely Planted Rain Garden
photo by Dan Shaw (bottom right)

Bullrush

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Vervain

Guidelines for Native Plant Installation and Maintenance Specifications

Please note that these specifications apply to many native planting projects but will need to be adapted for specific project conditions.

I. GENERAL SPECIFICATIONS

CONTRACTOR SPECIFICATIONS
Contractors must have at least three years experience installing similar types of projects.

II. SEEDING SPECIFICATIONS

A. SITE PREPARATION
Site preparation shall consist of the following:

a. Mow or burn seeding areas prior to first herbicide application if stubble/grass is above six inches.
b. After mowing or burning wait until vegetation is actively growing and then apply a glyphosate herbicide to all vegetation within the delineated seeding areas follow ing herbicide manufacturer's directions. Use Rodeo in aquatic areas. Application of herbicide to be done by a licensed pesticide applicator.
c. In the spring till the soil with a disc or harrow; sometimes a burn is conducted beforehand to reduce thatch. Ensure that the area to be seeded is not compacted.
d. Allow the area to green-up after tilling and then apply a glyphosate herbicide to all vegetation within the delineated seeding area.
e. Wait at least one week after this herbicide application and then till the site again to prepare the seedbed.

B. SEED QUALITY
1. Native grass seed: use fresh, clean, dry new-crop seed complying with the Association of Official Seed Analysts' "Rules for Testing Seeds" for purity and germination tolerances.
2. Seed mixes shall be blended by the contractor using the specified species and ratios. Seed mix species and ratios shall be guaranteed by the contractor to be true to specifications as required. The contractor shall supply and plant native seed as pure live seed (PLS). See planting plan for planting schedule.
3. All seed shall conform to the following requirements:
    a. All seeds shall originate from as close to the project site as possible and within a 200-mile radius of the project site.
    b. All seeds shall have the proper stratification and/or scarification to break dormancy for spring planting. No treatment required for seed used in summer and fall plantings.

C. SEED INSTALLATION

Note: this is one of several methods of seeding prairie species. The use of no-till drill is also common.

1. Determining the seeding season will be based on current and predicted weather conditions. Seeding shall occur no earlier than May 15, to allow for proper site preparation and no later than June 20, for spring installation. If fall seeding is required, seeding shall occur between September 20 and winter freeze-up.
2. Prairie grass seeding method shall conform to the following guidelines:
   All prairie grass seed shall be installed onto the prepared seedbed with a Brillion- or Truax-type seeder or by broadcasting. (Ideally, broadcasting will include packing after the grass is set down but before the forbs are set down.) Grass seed shall be uniformly planted at a rate no less than ten pounds PLS per acre. Forb seed shall be uniformly planted at a rate of no less than five pounds PLS per acre (Note: seeding rates may vary considerably depending on site conditions and project goals.)

D. COVER CROP

If site preparation is done in the spring, use a cover crop of oats, wheat or annual rye grass. For a fall planting use a cover crop of winter wheat. See planting plan for cover crop seeding rates. If cover crop is planted during the growing season, mow it before it goes to seed.

E. STRAW APPLICATION

1. Apply weed-free straw or a native-grass mulch over the seeded area.
2. Disc or crimp the mulch into the soil after seeding.

F. EROSION CONTROL FABRIC

1. To prevent erosion and the washing of seed, install erosion control fabric in areas that receive flowing water from curb cuts, roof drains, swales and slopes that have a slope greater than 3:1.
2. Follow manufacturer's directions for fabric installation.

G. PRAIRIE MAINTENANCE CONTRACT

A three-year maintenance contract should be included in bid.

a. Year One: Mow prairie (use a flail type mower) to a height of 4-6 inches, just above the height of the emerging prairie plants before cool-season weeds go to seed. This could result in two to four mowings in the first season, with an emphasis on mowing in the first half of the growing season.
b. Year Two: Mow prairie in early spring to a height of 6-8 inches; ensure that ruts are not created during mowing. Later in season if weeds persist, mow prairie a second time when vegetative growth reaches a height of 8-12 inches; make sure to stay above the height of emerging natives. Mow before weeds go to seed.
c. Year Three and Beyond: Spot spray any aggressive weeds. A prescribed burn may also be recommended in the third year.

H. MEASUREMENT OF SUCCESSFUL PRAIRIE SEED ESTABLISHMENT

1. By the end of year two, native grasses and forbs from the seed mix should be present at a density of one plant per square foot over 75% of the site.
2. Owner's Representative will conduct monitoring and determination of success by the above listed requirements. The Contractor shall be required to conduct independent monitoring on the total project. The Contractor is responsible for achieving the stated goals in the stated time frame and shall provide approved maintenance tasks to the site to achieve the stated goals.

III. PLANT INSTALLATION SPECIFICATIONS

A. SITE PREPARATION:

1. Site preparation of tree/shrub/plug plantings shall consist of the following:
    a. Mow planting areas prior to first herbicide application.
    b. Wait one to two weeks for exotic vegetation to become actively growing and 8-12 inches tall before applying the first herbicide application. Apply a glyphosate herbicide to all vegetation within the delineated seeding areas following herbicide manufacturer's directions. Rodeo should be used in aquatic areas. Application of herbicide to be done by a licensed pesticide applicator. Allow a minimum of 14 days for effective treatment before beginning other procedures.
    c. After a 14-day period, re-spray with a glyphosate herbicide following the manufacturer's directions to kill exotic vegetation re-growth. Allow a minimum of seven days for effective treatment before starting next procedure.
    d. Till in clean topsoil and organic material as specified by the project designer. (Note: some projects will not specify tilling before plant installation).
    e. Install plant material according to plan specifications.

B. PLANT QUALITY

1. Plant stock shall be in conformance with the latest edition of the American Standard for Nursery Stock, American Association of Nurserymen.
2. Installation:
    a. Mark out bed shapes for approval of Owner's Representative using marking paint or stakes and string. Planting shall be located where shown on the drawings. Stake out and identify plant locations with small wooden stakes. Verify planting bed and planting locations with Owner's Representative before excavating. Prior to the excavation of planting areas or pits, or placing tree stakes, locate all utility lines, electric cables, sprinkling systems and conduits so that proper precautions may be taken not to disturb or damage subsurface improvements. Should obstructions be found, the Contractor shall promptly notify the Owner's Representative.
    b. The installation of prairie plugs shall occur after the seeding of prairie species is conducted. Prairie plugs shall be watered as often as necessary after installation to ensure their establishment.

C. SUBSTITUTIONS

Substitutions will not be permitted. If proof is submitted that any plant specified is not attainable, a proposal will be considered for use of the nearest equivalent size or variety with an equitable adjustment of contract price.

D. MULCH

1. A 5-inch depth of shredded hardwood or composted leaf mulch shall be placed through out the tree and shrub planting beds. Shredded hardwood mulch shall comply with MnDOT 3882 Type 6 modified by using hardwood timber only. Material placement and depth shall be in conformance with the Tree, Shrub and Forb Details on the plan.

E. CLEAN-UP

1. Keep the area clean at all times: Remove any soil, compost, peat or similar material from paved areas promptly.
2. On completion of the work, remove equipment and other articles used from the site. Sweep walkways and street, and leave the area in a clean and neat condition. All ground area disturbed as a result of planting operations shall be restored to original condition or to the desired new appearance. Damaged turf areas are to be graded smooth and seeded with lawn seed mix approved by Owner's Representative. Water and care for seed until established.

IV. ESTABLISHMENT, INSPECTION AND REPLACEMENT SPECIFICATIONS

A. ESTABLISHMENT PERIOD

The Contractor shall maintain the work and care for the installed plants from completion of the initial planting until final acceptance at the end of the 2-year Plant Establishment Period.

The Contractor shall:

a. Maintain adequate soil moisture in conformance with MnDOT specification 2571.3H. At all times, the Contractor shall have sufficient watering equipment and forces available to completely water all plants once each week. Watering intervals shall be varied and based on prevailing soil moisture and weather conditions. It is advised that the Contractor use a soil moisture meter to determine soil moisture levels. The Contractor is not responsible for watering if an irrigation system is in place and working properly.
b. Replace shredded hardwood or composted leaf mulch material as needed to maintain at the specified depth throughout entire planting bed and tree rings in conformance with the Tree, Shrub and Forb Details on plan.
c. Repair, adjust or replace staking materials in conformance with Tree Detail on plan.
d. Maintain the plants in a plumb condition at the appropriate planting depth in conformance with the Tree and Shrub Details on plan.
e. Remove all weeds (top growth and roots) within the planting bed by hand-pulling or spot spraying with a glyphosate herbicide. Weed whips and weed clippers will

not be accepted as weed control.

f. Prune to remove rubbing, dead or diseased branches to maintain plant health.

B. INSPECTION AND ACCEPTANCE

1. The Contractor will provide written notice of the anticipated conclusion of the planting period to the Owner's Representative at least five days prior. The work will be inspected by the Owner's Representative at the conclusion of the planting period. Condition of plant material will be noted and recorded for reference at the end of the guarantee period.
2. Prior to Owner acceptance remove all tags, ribbons, etc. from all plant material.
3. After inspection, the Owner's Representative will notify the Contractor in writing if there are any deficiencies of the requirements for Owner acceptance of the work.

C. GUARANTEE AND REPLACEMENT

1. Contractor will replace all dead, defective or missing plants one time within the first year of the 2-year plant establishment period. When less than a full year remains in the plant establishment period, the Contractor will not be required to replace plants.
2. The Contractor will provide written notice of the end of the guarantee period to the Owner's Representative at least five days prior. The work will be inspected by the Owner's Representative at the end of the guarantee period. Any plant material required under this contract that is dead or not in satisfactory condition, as determined by the Owner's Representative, shall be removed from the site and shall be replaced as soon as conditions permit during the normal planting seasons.
3. If there is a dispute regarding the condition and satisfactory establishment of a rejected plant, the Contractor may elect to allow such plant to remain through another growing season at which time the rejected plant shall be replaced if found to be dead, unhealthy or badly impaired.
4. All replacements of plant material shall be of the same kind and size as specified in the plant list. Replacement cost shall be borne by the Contractor.
5. Replacement plantings required at the end of the guarantee period are not to be guaranteed. These materials are subject to inspection and rejection by the Owner's Representative before and after planting.