

Chapter Four:
Landscaping with Native Plants
A Gardener's Guide for Missouri



Introduction

Gardening with native plants is becoming the norm rather than the exception in Missouri. The benefits of native landscaping are fueling a gardening movement that says “no” to pesticides and fertilizers and “yes” to biodiversity and creating more sustainable landscapes. Novice and professional gardeners are turning to native landscaping to reduce maintenance and promote plant and wildlife conservation. This manual will show you how to use native plants to create and maintain diverse and beautiful spaces. It describes new ways to garden lightly on the earth.

Chapter Four: Landscaping with Native Plants provides tools gardeners need to create and maintain successful native plant gardens. The information included here provides practical tips and details to ensure successful low-maintenance landscapes. The previous three chapters include *Reconstructing Tallgrass Prairies*, *Rain Gardening*, and *Control and Identification of Invasive Species*.

History of Native Landscaping

An early proponent of native landscaping was Wilhelm Miller who was appointed head of the University of Illinois extension program in 1912. He published a number of papers on the



Native landscapes in the Whitmire Wildflower Garden, Shaw Nature Reserve.

use of native plants in residential garden design, farming, parks, roadsides, and prairie restoration. Miller called his work “The Prairie Spirit in Landscape Design”.

One of the earliest practitioners of Miller’s ideas was Ossian C. Simonds, a landscape architect who worked in the Chicago region. In a lecture presented in 1922, Simonds said, “Nature

teaches what to plant. By going to the neighboring woods and seeing the trees and plants and shrubs they contain, one can tell pretty accurately what plants will do well in any given locality." Nearly 100 years ago Simonds, Miller, and others understood that native plants are a good choice for use in landscaping and they were right. Today native plants are used in residential and commercial landscaping, highway projects, habitat restoration, storm-water management, for parks and corporate office buildings.

Why Use Missouri Native Plants?

Local Ecotype Native Plants

Missouri's natural plant communities offer a diversity of native plants to gardeners. For thousands of years, they have been adapting to life in



prairies, wetlands, river-bottom forests, glades and upland savannas. They have evolved with the extremes of our climate, a wide array of pathogens and a variety of soil and moisture types, creating a palette of durable and showy Missouri native plants that are the focus of landscape gardening. Plants such as yellow wild indigo (*Baptisia sphaerocarpa*), native to the tallgrass prairie, and white-tinged oak sedge (*Carex albicans*), which grows in dry woodlands, are easy-to-grow beauties being showcased in botanical garden displays, Metro St. Louis Sewer District rain gardens, and homeowners' flower beds. Gardeners who use Missouri native plants have more success than those who use plants from other regions of the United States.



A typical Missouri creek in the Ozarks (left) and rocky glade (right) are homes to many native plants that are useful in native landscaping.

Eight Reasons to Use Native Plants

For a Sense of Place

People who have lived in one place for a time develop images of their home that create a sense of belonging and familiarity. Those who have lived in rural Missouri know about flowering dogwood. For instance, its blossoms and berries have made their mark in the hearts and thoughts of so many Missouri residents that it is the state tree. Many people have recognized this heart-felt connection with nature, and it often is referred to as "sense of place".

For Beautification

Wildflowers, flowering vines, shrubs and trees offer a wide range of colors, textures and forms to create dynamic seasonal displays. Grasses and sedges have interesting flowers and seed heads and yellow-orange fall color. Shrubs and trees have fall color and berries that persist into the winter. Choosing a wide assortment of plants

ensures seasonal interest, with the bonus of attracting colorful birds, butterflies and insects.

For Stormwater Management

Rain gardens, bioretention and wetland detention basins are a few best management practices in use. They slow down and absorb rain water, thus reducing the quantity and velocity of stormwater runoff while improving water quality.

See Chapter Two – Rain Gardening and Storm Water Management for details on planning, constructing and maintaining rain gardens.

For Educational Opportunities

Native plant gardens present endless opportunities for learning about seasonal cycles, wildlife, and plant life cycles. Quiet spaces outside can be used for art and reading classes. Environmental and conservation topics are taught best outdoors.



Left: Luna moth perched on wood poppy. Right: Sulphur butterfly getting nectar from a New England aster blossom.



Bioretention seeding in Columbia, Missouri reduces maintenance costs associated with mowing, mulching, and weeding.

For Erosion Control

Siltation is a main source of water pollution. Soil loss can be reduced by using plants with strong, deep roots in place of turf, rock or concrete. Plants hold the soil, absorb water and slow the flow of water over the surface. Replacing turf with native plantings is an effective way to help control erosion.

To Create Wildlife Habitat

A native plant garden with a diversity of trees, shrubs, perennials and grasses provides food and shelter for insects, birds, amphibians and mammals throughout the growing season. Leaving seed heads and plant structure throughout winter provides continuing food and shelter for many creatures and provides opportunities to observe nature up close.

For Resistance to Deer Browse

Deer are adaptable and eat a wide variety of plants. Fortunately there are many native plants that deer avoid. Deer rely on their sense of smell to determine whether an area is safe and which plants are desirable to eat. For instance, plants with aromatic foliage such as

wild bergamot (*Monarda fistulosa*) and round-leaved groundsel (*Senecio obovatus*) deter deer. Some plants repel deer because of their coarse, rough, hairy or spiny textures. This group includes rattlesnake master (*Eryngium yuccifolium*) and prickly pear cactus (*Opuntia humifusa*). A deer-resistant garden includes a high percentage of these types of plants.

See pages 32-33 for a list of deer resistant native plants.

For Less Maintenance

Compared with lawns and mulched tree, shrub and perennial plantings, landscapes planted with appropriate native plants require less maintenance. They require minimal watering (except during establishment and drought periods) and they need no chemical fertilizers or pesticides.

Characteristics of native plants that reduce maintenance include:

- Longevity: plants that live for many decades
- Three to four-season interest: plants that are appealing most of the year
- Variable conditions: plants that tolerate a wide range of light and moisture conditions
- Small and compact: plants that are in scale with a given space
- Weed elimination: plants that grow into dense groupings and eliminate weeds
- Seediness: plants that do not spread readily from seed

See page 24 for a list of top performing native plants that reduce the amount of maintenance.

This list provides many reasons to use native plants in a landscape, but before you begin planting, think about what you want the landscape to do for you. You may want to reduce time and money spent mowing a large expanse of turf. Or you may want to reduce the expense of installing annual flower beds. These numbers put the cost of mowing grass and maintaining standard planting beds into perspective.

Cost comparisons:

Turf

- Average turf installation per acre (seed): \$3,000
- Average turf installation per acre (sod): \$8,000
- Annual turf maintenance per acre: \$1,000
- Annual turf maintenance for homeowner: \$500

Native Prairie Seeding

- Average prairie seeding per acre: \$1,500
- Annual prairie maintenance per acre: \$200



*The proper handling of stormwater runoff is a significant issue for homeowners, neighborhoods and communities. Left: a rain garden planted with Missouri native plants at the Missouri Methodist Conference Center in Columbia, Missouri. Right: Missouri Botanical Garden bioretention best management practice (BMP) planted with natives in the main entry parking lot (oak sedge (*Carex albicans*) in foreground).*

Mulched Groundcover Planting

- Average planting per 1,000 sq. ft. \$2,500
- Annual maintenance per 1,000 sq. ft. \$200

Standard Mulched Planting Bed

- Average planting per 1,000 sq. ft. \$3,500
- Annual maintenance per 1,000 sq. ft. \$400

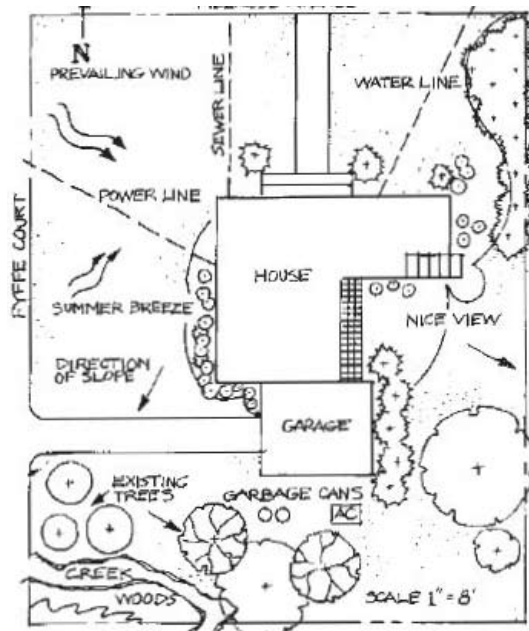
Native groundcovers require the least amount of maintenance because they establish quickly, are long-lived, suppress weeds and require little mulch once established. Native groundcovers also are an excellent alternative to invasive wintercreeper euonymus, English ivy and periwinkle that have escaped cultivation and invaded many natural woodlands in Missouri.

See page 26 for a list of native groundcovers.

Site Evaluation

Map the Area

Now that you've thought about why to use native plants and what your goals are, it's time to make a map. A map, drawn to scale, aids in determining plant numbers as well as placement and the amount of compost and mulch needed. Slope, drainage and potential for erosion should be noted and reviewed for a possible bioswale or rain garden. Indicate location of structures, utility lines and traffic use.



A site plan of your property will help you decide where to place gardens, walkways, patios and stormwater features.

Indicate north, south, east, and west, soil types, existing vegetation and patterns of shade and sunlight. Make copies of the drawing so various versions of the planning process can be kept as the design changes. As possibilities are pulled together, remember the saying "don't fight the site." For most conditions encountered, there is a list of plants that will thrive there. It is simpler and less expensive to use this approach than to alter the site.

Survey of Existing Vegetation

A plant survey of the area may reveal remnants of the plant community that once existed on the site. These remnant species are good sources for seed to use in establishing new landscapes. For example, if native wetland grasses and forbs grow nearby or on the site, include those in the plant list. Keep a close eye on the ripening seeds of these plants for collecting. The site may be covered with shrubs, vines or weedy vegetation. If so, determine which vegetation should be removed. Identify trees and shrubs that will remain and remove weaker and undesirable species. Enlist the help of an arborist if you are unsure of which tree species are beneficial to the overall design.

Sunlight

Determine the quality of light on the site. If shade exists, note when the shade occurs. Afternoon shade or dappled, occasional sunlight provides a good environment for many savanna and woodland species. In contrast, hot afternoon or all-day sun is best suited to prairie, wetland and glade species, depending on soil type.

Soil

Many native plants are generalists; they tolerate a wide range of soil types. However, there are some, such as the glade coneflower (*Echinacea simulata*) or rose verbena (*Glandularia*

canadensis), that thrive in dry, rocky soils but suffer in compost-rich soils. By considering your soil, its structure, fertility and pH, you will be able to compile an appropriate plant list for any soil type encountered.

Soil Fertility and pH

Get a general analysis of your garden soil with a basic soil test. Soil sample information forms are available at University of Missouri Extension offices and online at www.extension.missouri.edu. When filling out the form select a general analysis.

pH is a measurement of a soil's acidity or alkalinity on a scale where 7.0 is neutral. Results below 7.0 indicate an acid (sour) soil, and soils above 7.0 are alkaline (sweet). Many plants do well in one or the other environment, while a wide assortment thrive in the pH range of 6.5 - 7.5. Basic soil tests also give a soil's content of macronutrients such as nitrogen, phosphorus and potassium. A more complete soil test yields levels of the micronutrients in the soil (boron, magnesium, copper).

Testing Water Infiltration to Determine Soil Types

To determine soil type and how quickly water drains through soil, do an infiltration test. First, dig a hole one foot deep and eight inches wide. Fill it with water and observe how quickly the water disappears. *Note: do infil-*

tration tests when soil is moist, the day after a soaking rain or watering.

- If water drains within an few hours the soil is a well-drained sandy or loamy soil. Select dry-loving native plants listed on page 32.
- If it takes 24 hours or more to drain, it is a poorly drained clay soil, typical of where native wet-land species thrive. See chapter two of this landscaping series: Rain Gardening and Storm Water Management for a list of appropriate plants.
- Soils that drain in less than six hours are considered satisfactory for growing most native plants.

Soil Texture

Another way to determine soil type is by feeling it with your hands. Hold a small wet piece of soil in your hand and rub it between your thumb and index finger.

Sandy soil has obvious sand particles that feel and look like sand. It drains well because of a large particle size that is irregularly shaped. It feels coarse and doesn't compact easily. This soil type has low fertility because of its low organic content. Soil color typically is light tan.

Clay soil feels sticky and forms ribbons when forced between your thumb and index finger. It has microscopic, flat-shaped particles. The shape and size of clay particles contribute to compaction, with little space for air or water movement. Because

of this, clay soil has poor drainage and lower fertility. Clay soils often are described as being heavy. The characteristic color is reddish or grayish.

Silty soil feels smooth and silky but does not form a ribbon like clay. It has particles much smaller than sand. Fertility is slightly higher than sandy soil. It drains relatively well and has a tan color.

Sandy loam soil is considered the ideal garden soil for the widest range of plants. It is sold as topsoil. The soil color is dark-brown and particle size varies. It is among the healthiest of soil types since it is well-draining with ample air spaces, has good organic content and fertility and has an abundant population of beneficial soil organisms.

Soil Structure

Soil structure indicates the effect soil has on the movement of water, amount of air in the soil and how well roots are able to penetrate into the soil. It works in conjunction with soil texture and is easy to determine. A simple way is to form a ball of damp soil in your hand by squeezing it. If you can't make a ball, the soil is sandy. If it is crumbly and has dark color, it is a sandy loam. Clay soil remains in a ball. Soil structure can be improved with the addition of compost. This increases particle size and encourages beneficial soil-borne organisms.

Soil Moisture

The moisture level in soil is determined by a combination of topography and soil structure. For example, a low-lying area with organic or clay soil stays moist for long periods of time. Wetland species are an appropriate choice for this situation. The converse is a rocky soil with low organic content at or near the top of a rocky slope. These sites dry quickly after a rainfall. In this case, upland prairie, savanna and glade species are the best choices.

Supplemental watering may be necessary until plants are established and mature.

Plant Selection

Right Plant, Right Place

Plants flourish with minimum maintenance when appropriately chosen for a certain location. For small gardens and landscapes, determine sunlight and soil moisture conditions by observing sun

patterns and storm water flow during and after a heavy rain. Note sunny and shady areas and where water drains and puddles. The plant list section on pages 24-34 groups plants by sunlight, soil types and tolerance to flooding and drought.

Here is a list of landscape situations and solutions that will help you select the right plants for your garden:

- If you have limited time to garden keep the landscape style simple and use **native groundcovers**. Reduce plant diversity and mass single species in larger spaces. Native groundcovers are an excellent alternative to high-maintenance turf. They cover areas quickly, suppress weeds and reduce amounts of mulch needed.
- If you like to spend time in the garden, you can incorporate higher **plant diversity**, more garden features and a more complex design layout. This requires increased time, labor, plants and maintainance.
- If you have exposed boulders, **rocky or gravelly soil**, or plants that grow sparsely, choose plants that grow on rocky glades.
- If you have **hard clay**, select plants



*Low-maintenance native groundcovers are used in simple massed plantings. When fully mature they suppress weeds and reduce the amount of mulch needed. Left: yellow fox sedge (*Carex annectans*) Right: prairie alumroot (*Heuchera richardsonii*)*



Plants growing in nature give us clues as to where they may be suited in a man-made landscape like a rain garden. Left is yellow-fruited fox sedge growing in a sunny creek bottom. Right is cardinal flower growing at the edge of a shady creek.

that tolerate low fertility and poor drainage.

- If your garden is in a **low, wet area**, create a rain garden.
- If **whitetail deer** are a problem, select native plants they avoid.

See pages 24-34 for detailed lists of plants for various garden conditions.

including prairie, woodland, wetland, etc. Regional plant field guides typically describe general plant habitats in the front of the book. Once you determine your habitat type(s), begin selecting appropriate plants. Not all plant species are available for sale so it is best to refer to nursery catalogs as you select plants by habitat.

Select Local Ecotype Plants

These plants originate from wild populations in your region, which means they are adapted to Missouri's climate. This does not mean the plants you purchase come directly from the wild. Wild harvested plants should be avoided because they deplete native plant populations. Local ecotype plants will outperform non-local ecotype plants in most cases because they are acclimated to Missouri's soils, weather and pests.

Plants for Larger Landscapes

You may be able to select plants by identifying the original habitat type

Sunny Environments

Prairies



A prairie is an ecosystem of grasses with herbaceous forbs. Few trees or shrubs exist in this habitat. Typical prairie plants include Indian grass (*Sorghastrum nutans*), big bluestem

(*Andropogon gerardii*), rattlesnake master (*Eryngium yuccifolium*), aster, goldenrods and many *Silphium* species. Some prairies have wet soils and are host to plants such as prairie cord grass (*Spartina pectinata*), wild bergamot (*Monarda fistulosa*) and marsh milkweed (*Asclepias incarnata*). Upland prairies exist where the bedrock is shallow and soil is dry and glade-like. Shorter plants predominate, such as little bluestem (*Schizachyrium scoparium*), sideoats grama (*Bouteloa curtipendula*) and butterfly milkweed (*Asclepias tuberosa*).

Glades



Thin, rocky topsoil combined with outcroppings of shallow bedrock creates this desert-like environment. Glades typically are found on south- and southwest-facing slopes and ridgetops in the Ozark Highlands. These areas are hot and sunny because the shallow, well-draining soil does not support growth of large trees. Sunny south or west-facing slopes with thin soil and exposed rocks are areas in your landscape where glade plants will thrive. When planted in rich soil, common in many gardens, glade plants deteriorate and die. Plants found in a glade environment include rose verbena (*Verbena canadensis*), Missouri evening primrose (*Oenothera macrocarpa*)

and aromatic aster (*Aster oblongifolius*). Many species encountered in dry upland prairies also are found in glades.

Wetlands



Missouri has an abundance of wetlands, from river edges to lake shores and wet meadows. The list of plants well-adapted to these alternating wet and dry conditions is extensive. In addition, there are many plants that flourish in permanently wet areas and in ponds. Soil types range from clayey to sandy loam and are subject to fluctuating moisture levels. A few representative plants include the mighty swamp oak (*Quercus bicolor*) and bald cypress (*Taxodium distichum*), beautiful irises such as blue flag (*Iris virginica*) and copper iris (*Iris fulva*) as well as cardinal flower (*Lobelia cardinalis*) and rose mallow (*Hibiscus lasiocarpus*). Sedges (*Carex spp.*) and rushes (*Juncus spp.*) compose a large percentage of the plant list. Wetlands offer a wide diversity of plants, birds, mammals and insects. Frogs and other amphibians are heard and seen frequently. Wetland plant lists are useful for rain gardens, bioswales and low areas that remain wet for long periods.

Shady Environments

Upland Savannas



Many areas of Missouri were savannas with widely spaced trees, predominantly oak and hickory species. Savannas are dominated by grass species and are interspersed with forbs (herbaceous flowering plants) that fill the woodland floor. The quality of light is bright, dappled shade with areas that receive sunlight for short periods. Typically savannas occupy the higher and drier soils of upper slopes and ridges of hills and are maintained with prescribed fire or annual mowing. The park-like setting of suburban properties are reminiscent of savannas. Plants such as smooth hydrangea (*Hydrangea arborescens*), coneflower (*Echinacea purpurea*), blazingstar (*Liatris scariosa*) as well as many asters and goldenrods are appropriate choices for savanna-like settings.

Riverbottom and North-sloping Forests



Riverbottom and north-sloping woodlands tend to have soils that are rich in organic matter and hold moisture. The tree canopy is heavy and produces medium to dark shade, with a thick understory. Typical species include ferns, wild geranium (*Geranium maculatum*), Virginia bluebell (*Mertensia virginica*) and wild sweet William (*Phlox divaricata*). Specific species vary according to where they exist in the woodland - top of ridge versus bottom of hill or north versus south facing slopes.

Planning and Site Preparation

Layout and Estimating Square Footage

Outline the area to be planted with a hose or rope. It is easier to move a hose or line than to make changes after digging has occurred. Stakes are another way to create an outline. Once you are happy with the layout, measure and multiply the length and width to get a rough square footage. Most spaces have round edges so keep in mind that this is a rough estimation.



Remove Existing Vegetation

Removal of existing vegetation is important for the successful establishment of new plants and can be done in a number of ways. For killing weeds on large properties, refer to Chapter One – Seeding a Tallgrass Prairie. For identification and removal of invasive species, refer to Chapter 3 - ID and Control of Invasive Species.

For smaller properties, the first step is to mow or string-trim tall weeds down to 4-12 inches. The second step includes one or more of the following techniques.

Herbicides Read herbicide labels before use. Apply a glyphosate herbicide such as Roundup. Use Rodeo instead of Roundup if the area is near a pond or creek. Less herbicide is required if vegetation has been mowed short. In two weeks, the vegetation will brown and die. Leave the dead stubble to prevent erosion, especially on slopes. It also will decay and add organic content to the soil. Shredded leaf or bark mulch may be applied over the dead vegetation.

Estimating Plant Quantities and Spacing

If your garden layout is 10 feet by 10 feet you have 100 square feet of space (10x10=100). If you choose to plant on 12-inch centers, you need 100 plants.

Plant Quantity Calculator

	Spacing in Inches				
	8"	12"	18"	24"	36"
50	100	50	22	12	5
100	225	100	45	25	11
150	350	150	67	37	16
200	450	200	90	50	22
250	550	250	112	62	28
300	675	300	135	75	33
400	900	400	180	100	44
500	1100	500	225	125	55
600	1350	600	270	150	66
700	1550	700	315	175	77
800	1800	800	360	200	88
900	2000	900	405	225	99
1000	2250	1000	450	250	110

Left column is total square feet.

There are a number of plant calculators on the internet. www.classygroundcovers.com is one of the easiest to use.



Always wear safety glasses or goggles, gloves and protective clothing when applying herbicides. Read herbicide labels before use.

Use a thick layer of compost or wood chips over existing vegetation to smother it. In smaller gardens, a layer of newsprint can be used before mulching. It takes a couple of months for the vegetation to die. This method works well for small to medium size gardens. Once undesired vegetation is killed, do not till in uncomposted leaves, bark or wood chips as they will cause the new plants to turn yellow or die.

Put clear plastic over the mowed vegetation, and sunlight will create heat that kills the vegetation. However, microorganisms in the upper layer of soil are affected adversely so add compost and earthworm castings to the soil to replenish the microbial populations.

Remove sod with a desodding shovel or machine. The top few inches of roots and soil are removed, exposing the underlying soil.

Soil Preparation

Amending soil should be done only under the most difficult circumstances because there are native plants that tolerate a wide variety of tough soil conditions.

- Severe clay subsoil that is remaining after construction should have a minimum of 3 inches of topsoil added and tilled into the surface.
- Severely compacted topsoil should be loosened by hand with a shovel or with a backhoe or mini-excavator for larger areas.
- Fertilizing is not normally recommended unless you have clay subsoil and choose not to add topsoil.
- If planting in clay subsoil, remove soil unearthed while planting and

backfill with topsoil. This eliminates air pockets and drought-related mortality and reduces establishment time.

Soil Compaction and Grading

Before grading soil or planting, it is important to contact the Missouri-1 Call System to locate underground utilities. Call 1-800-DIG-RITE three days before breaking ground. They will mark underground utilities with colored spray paint and flags.

Avoid compacting soil with heavy equipment or foot traffic. Compacted soil drains poorly, has low oxygen content and is difficult to plant in. If soil is compacted, loosen the soil before planting. Severe compaction may require digging deeply with shovels or in large areas with a mini excavator or backhoe. This is necessary for proper drainage. Then till soil to create a loose soil that is easy to work with.

Final soil grading typically is done on small areas by hand with stiff garden or grading rakes after tilling. On large areas this is done with a skid-steer-mounted tiller or soil conditioner. During the grading process, tough clods of dirt, clay, rocks, roots and stems are raked out and removed. Steep soil grades require the application of erosion blankets.

Stabilizing Steep Slopes

There are several brands of erosion control blankets available in garden centers. They typically are made of straw, wood shavings, coconut fiber or



Unroll erosion control blankets from top of slope to bottom and overlap edges to attain complete coverage. Pin down blankets securely.

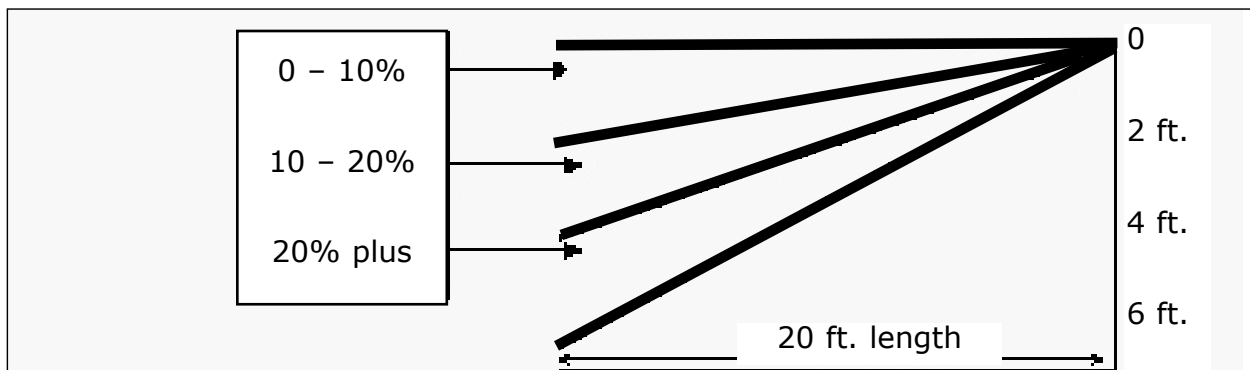
jute and are woven into a plastic mesh that should be biodegradable. Avoid non-biodegradable or permanent fabrics because birds and reptiles get tangled in the mesh.

0 – 10% slope: 2 foot or less drop in a 20 foot distance. Gentle slopes are ideal and easy to work with and do not require erosion control fabric.

10 – 20% slope: 4 foot or less drop in a 20 foot distance. Steeper slopes can present a challenge and use of erosion control fabric should be considered.

Above 20% slope: 5 foot or less drop in a 20 foot distance. Once the percent slope is above 20%, erosion control is recommended.

(See graph below)



Planting

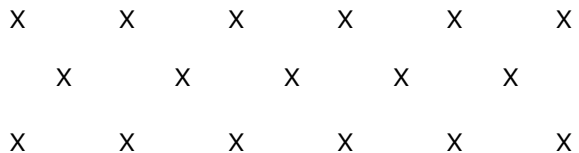
Planting Seasons

Spring and fall are the best times to install native plants, with spring being the first choice. Containerized plants and divisions establish quickly because soil is cooler and moister. That said, you may plant containerized plants in summer as long as you water regularly. If water is not available, plant between late February and April.

Lay Out Plants

Lay out plants (in their containers) on the ground to attain even spacing before planting.

Use a grid pattern similar to this when planting larger areas and groundcovers.



In hot sun keep plants watered as most plastic pots are black and absorb heat. Now is the time to rearrange plants to attain the best spacing.

Planting in the Soil

Plant first and then mulch. This ensures plant roots are in the soil and not just in the mulch.

Insert the plant so the potting mix is not exposed to the mulch or air, so the rootball will not dry out. Cap the potting soil with a thin layer of natural soil to prevent moisture loss.

When planting in hard clay soil, have a bucket or wheelbarrow of rich, loosened topsoil handy to backfill planting holes. Backfilling with hard clay clods leaves air pockets that lead to desiccation or plant death. You may have good topsoil on your property to borrow or you may have to purchase topsoil from a garden center.

If you mulch the planting area before planting, do not exceed the mulch depths listed below and do not leave soil on top of the mulch as this encourages weeds. Also be sure that plant roots are inserted in soil and not in mulch.

Mulching New Plantings

Twice-ground leaf compost is recommended for mulching perennials and grasses. Shredded hardwood (or cedar) bark mulch is recommended for trees and shrubs. Use these recommendations to prevent over-mulching or burying plants too deeply in mulch:

Deep Cell Plugs.....1.5 inches
 Quart Pots.....2 inches
 Gallon Pots.....2.5 inches
 Tree/Shrubs.....3 inches

Do not incorporate mulch into the soil as this leads to poor plant performance and/or death.

Watering New Plantings

Water new plantings immediately! Don't wait for rain since weather can't be predicted from hour to hour.

During the first three weeks, water plantings every four days for about 60 minutes (the equivalent of about 1



Left: Carefully remove plant from container. If roots are spiraling around inside the pot, cut the roots to prevent further spiraling. Middle: Remove loose potting soil from the top of the potting soil ball. Insert plant so the top of the potting soil is level or just below the top of the topsoil and fill in with loose topsoil. Lightly cap potting soil with a thin layer of topsoil. Right: Firmly press down plant to remove air pockets. Cover topsoil with 1-2 inches of mulch and water immediately.

inch of rainfall). A one-hour watering will soak more deeply into the ground than daily 15-minute waterings. In summer increase frequency to every three days.

After three weeks reduce frequency to once per week until plants are established. Plants are established when roots have grown out of the container soil and into the native soil to a depth of two to four inches. This normally takes three to four months for perennials and grasses and six months for trees and shrubs. With trees and shrubs, the larger the root ball the longer it takes to become established. Extremely large trees may take years.

When plants are fully established, watering is only necessary during dry or drought periods during summer.

Planting Seed

It is less expensive to plant large areas with seed than with plants. Seeded areas look natural and are usually in sunny areas (prairie), shady woodlands (savanna), or wet areas (wetlands, rain gardens, bioretention or detention basins). When seeding be certain weeds are eliminated, do not till the soil, sow seed in early winter and keep the seeding mowed to six inches during the first growing season. It takes about three years for most seedlings to mature and flower.

Please read Chapter One, Reconstructing a Tallgrass Prairie for a detailed description of how to sow seed.

Maintenance

There is the misconception that native landscapes require little or no maintenance. In reality, some native gardens require a lot of maintenance and some don't. This list describes what makes a native landscape low-maintenance and why:

- Plants that are long-lived do not need replacing.
- Plants that are selected properly for a site will thrive.
- Plants that have few pest problems require no chemicals.
- Plants that are compact and clump-forming work well in small places and don't flop over.
- Plants that sucker to form solid ground-cover fill large spaces quickly, keep weeds out and require little mulch.
- Plants that do not spread aggressively from seed reduce weeds.
- Plants with clean, dense foliage three to four seasons of the year prevent weeds and require little mulching.

If your goal is to reduce maintenance, keep the landscape style simple and use native groundcovers. Reduce plant diversity and group single species in large masses. Native groundcovers are an alternative to high-maintenance turf and flower beds. They cover areas quickly, suppress weeds and reduce the amount of mulch needed.

As with all gardens, a new planting requires attention as the plants become established. Once root systems are well developed, supplemental watering should be minimal or only in periods of drought.

Weed Control

It is likely weeds will grow in newly planted areas the first and second years. Control them by handpulling or spot spraying with a glyphosphate herbicide such as Roundup. If you have nut sedge, hand-pull repeatedly until it is gone or use the herbicide Sedgehammer.

By the second or third year, plants are more established and able to crowd out weeds. Weeding becomes minimal as the garden matures. Annual applications of compost and mulch in late autumn help suppress weed growth and make handpulling much easier.



Yellow nutsedge is a common garden weed that is difficult to control by hand. Hand pull small infestations or spray the herbicide Sedgehammer for large-scale control.

Fertilization

Fertilizer is not necessary with most native landscapes. The exceptions are sites where topsoil has been removed

down to subsoil clay after new construction. These clay soils are impossible to dig in when dry. In these extreme situations add a minimum of three inches of topsoil before planting.

An application of one to two inches of compost each fall helps maintain an adequate level of fertility and organic matter in the soil, which reduces or eliminates the need for fertilizer.

Insect Problems

In general, native plants are not affected by insect damage. There are exceptions, however. Japanese beetles may devastate native roses, hazelnut and wild grapes in some years. Dogwood sawflies denude swamp dogwood, but only in some years. It is only a matter of time before beneficial insects move in and control the problem naturally.

Developing a tolerance for small amounts of damage and an understanding of the interaction of beneficial insects eliminates the need for pest control. There is a host of desirable caterpillars that nibble native plants. Monarch caterpillars eat milkweed leaves, zebra swallowtails eat pawpaw leaves and giant swallowtails eat wafer ash shrubs. All of these turn into beautiful butterflies.

To control mosquitos use a diversity of native plants in and around water edges. This will attract native aquatic insects and frogs that eat mosquito larvae.

Mulching

Mulch gives gardens a clean, tended and intentional appearance. Other benefits include preventing loss of soil moisture, controlling soil temperature and suppressing weeds. Mulch may be applied from late fall through spring. In areas where you want to encourage seed germination (woodlands, for example), apply mulch after seeds have germinated in spring and are tall enough to transplant.

Never till mulch into topsoil because mulch is not composted. As it breaks down it starves plants of nutrients. Mulch must be fully rotted (black in color, the consistency of sawdust and have no heat) before it can be incorporated into topsoil.

Twice-ground composted leaf mulch is one of the more commonly used mulches and is readily available from compost suppliers or garden centers. It is delivered warm or hot and has a slight to strong sour smell because it is not composted completely. This mulch can float so is not recommended for use near stormwater flows.

Shredded hardwood or cedar bark mulch is also commonly used and available. Cedar lasts much longer than hardwood but costs more. Once rained on, it tends to bind together and will not migrate. It is recommended for use in rain gardens.

River gravel mulch comes in various sizes, from pea-sized gravel to three-inch rock. A medium size of one or two inches works best in rain gardens or where storm water will be flowing. It is heavy to move around.

Pine bark chip mulch has large pieces that migrate on slopes and float. It is recommended for use on flat ground.

Natural tree leaves raked up and reused as mulch save money but do not look clean or intentional in planting beds. They are best used in natural wooded settings.

Wood chips from a tree chipper are coarse, uneven and do not look as clean as ground mulches. They work well, however, and are economical.



Left: Shredded hardwood bark mulch binds together to resist washing away. Middle: River gravel mulch will not migrate where water flow is a problem. Right: Wood chip mulch is inexpensive or often free but migrates and may float away where water flow occurs.

Pruning

Pruning involves the use of hand pruners, hand saws, loppers, or shears. Here are some reasons to prune.

- **To remove damaged branches.** Ice and wind storms may cause broken branches on trees and shrubs, that should be removed before they cause harm to people or property. When pruning tree limbs, be cautious as limbs may fall at any time. Contact a certified arborist if you are unsure about safety issues.
- **To remove suckers** and water sprouts. Suckers are fast-growing sprouts that emerge from the ground at the base of a tree or shrub. Water sprouts are similar but emerge from a stem or branch. Both are removed because they give a messy appearance and increase disease problems. They are removed with hand pruners or hand saws on trees like hawthorn, viburnum, fringetree and dogwood.
- **To shape woody plants.** As young trees, shrubs and vines begin to mature and gain height, lower branches may be pruned off to create space for planting beds underneath. Wide-arching side branches are pruned when they grow out of control. While this can be done at anytime, it is best done just after flowering to ensure blooming the next year.

Multi-stemmed trees and shrubs are pruned either to maintain an upright tree or low-bushy appearance. To create a tree-like look, new vigorous

growth is removed and old stems are kept. Dogwood, fringetree, southern blackhaw viburnum, green hawthorne, serviceberry, pagoda dogwood and buckeye benefit from this treatment.

If a shrubby screen-like appearance is desired, older trunks are removed, leaving young stems. Hazelnut, rough-leaved and gray dogwood and sumac are used in this treatment.

- **To rejuvenate shrubs.** Shrubs such as wild hydrangea, Alabama snowwreath, golden currant, and Missouri gooseberry benefit from a rejuvenating pruning every three to five years. First trim back shrub by 40-60% with shears. Then remove one third of the old canes to the ground with hand pruners.



When using hand pruners the cutting blade (black) is always on the side of the cut that remains. The anvil (silver) is to the outside. Always keep the blade sharp and be careful not to cut yourself. Hand pruner cuts are the leading cause of injury in most gardens.

- **Thin growth.** Trees and shrubs growing in full sun often develop dense branching that requires thinning. The same tree, growing in shade, tends to remain open. Remove all crossing, rubbing, dead or damaged stems in the interior of the plant and work outward. It is desirable to open views into the center of a tree or shrub to reveal interesting bark and branching. Hornbeam, southern blackhaw viburnum, spicebush, red buckeye, red-bud, pagoda dogwood, yellowwood, and witchazel benefit from this treatment.

- **Promote reblooming.** Deadheading (removal of spent flowers) on perennials and annuals stimulates more blooming. Be sure to remove faded flowers before seeds ripen since ripe seed is a signal to the plant to stop blooming. This method works well on Missouri evening primrose, rose verbena, coreopsis, black-eyed Susan, and native annuals such as sneezeweed and palafox.

Deadheading also prevents reseeding. If reseeding is a problem, increase mulch frequency and depth or remove the reseeding plant. Keep in mind that birds and small mammals depend on seeds for winter food. Stop deadheading in late summer to allow late crop seeds to ripen.

- **Control height.** Spring top-pruning (or spring haircuts) of the taller, late-summer-to-fall-blooming perennials and grasses reduces plant height and prevents flopping. Remove the top 40-60% of spring growth late April through mid-May, using hedge shears or hand pruners. Plants pruned this way become multi-branched, fuller and shorter overall. Flowering species that respond well to this include aster, Joe-Pye weed, sneezeweed, rose mallow, turtlehead,

garden phlox, goldenrod, and ironweed. The grasses include big bluestem, Indian grass, switchgrass, cordgrass, and eastern gama grass.



When pruning medium-sized branches, always make a small undercut first (left) and then finish the cut with an overcut (right). This prevents the bark from tearing downward when the branch falls.



Taller, late-summer blooming perennials and grasses may be sheared back by 40-60% in late May to control height and prevent flopping.

Typical Garden Schedule

Summer and Fall - Year 1

- Map out the site, noting existing and future use, traffic patterns, utilities, trees, water flows, poorly drained areas, wildlife use, desirable and undesirable views.
- Assess the site for drainage, soil type, sun, shade and utilities.
- Choose the site, the plant palette (plants you want to include), the landscape style and layout for the garden (you likely will be selecting hardscape features like pathways, fences, patios, water features, walls, containers, outdoor pizza ovens and other features at this

- time).
- Layout the garden areas and related elements of the site and calculate square footage for each portion individually. This number helps you predict the number of plants or materials needed.
- Remove weeds and undesirable growth by hand, with Round-up (glyphosate) or by layering newspaper and covering it with mulch.
- Grade and amend soil if necessary; then mulch if you will not be planting right away.
- Autumn is the second best time to plant. Perennials and grasses can be planted in September and October. Plant quart size containers or larger. Trees and shrubs may be planted from September through November.
- Mulch new plantings immediately as mulch helps maintain soil moisture and steadies soil temperature.
- Water new plantings immediately.

Winter - Year 1

- October through March is a good time to construct patios, paths and walls.
- Fall-planted trees and shrubs may need watering during severely dry periods.

Spring - Year 2

- Spring is the best time to plant. Planting may begin in mid-March and continue until the end of May.

If you plant after June 1st, water periodically during planting and then every three days until plants are established.

- Remove weeds as they appear.
- Water as needed.
- Top-prune perennials and grasses late April through mid May to reduce flowering height and prevent flopping.

Summer - Year 2

- Be vigilant and remove weeds as they appear.
- Provide a deep watering when needed rather than frequent, shallow watering.
- Summer planting is not recommended due to heat and unpredictable rainfall.

Fall/Winter - Year 2

- Continue to be vigilant and remove winter weeds as they appear.
- Water newly planted trees and shrubs by hand if winter drought occurs.
- Reapply mulch to thin areas.
- Be careful to not mulch where you want plants to spread by reseeding. This is the trick to getting woodland plants like wood poppy, Virginia bluebells, blue-eyed Mary, wild geranium, bloodroot and others to spread.

Plant Selection Guide

Top Performing Native Plants for Landscaping

Based on:

- 3-4 seasons of interest
- long life expectancy
- compact form or slow growth
- availability from nurseries

Full Sun

Grasses and Sedges:

Carex albicans (oak sedge)

Carex annectens (yellow-fruited fox sedge)

Carex muskingumensis (palm sedge)

Sporobolus heterolepis (prairie dropseed)

Perennials:

Amsonia illustris (shining bluestar)

Asclepias tuberosa (butterfly milkweed)

Aster oblongifolius (aromatic aster)

Baptisia sphaerocarpa (yellow wild indigo)

Callirhoe involucrata (purple poppy mallow)

Heuchera richardsonii (prairie alumroot)

Iris fulva (copper iris)

Pycnanthemum tenuifolium (slender mountain mint)

Rudbeckia fulgida (orange coneflower)

Small Flowering Trees and Shrubs:

Amelanchier arborea (serviceberry)

Callicarpa americana (beautyberry)

Cercis canadensis (redbud)

Crataegus viridis (green hawthorn)

Hydrangea arborescens (wild hydrangea)

Ilex verticillata (winterberry holly)

Ribes odoratum (golden currant)

Part Shade

Aster oblongifolius (aromatic aster)
 Carex albicans (oak sedge)
 Carex eburnea (ivory sedge)
 Carex grayii (bur sedge)
 Carex muskingumensis (palm sedge)
 Echinacea purpurea (purple coneflower)
 Heuchera americana (American alum-root)
 Heuchera richardsonii (prairie alum-root)
 Polygonatum biflorum (Solomon's seal)
 Solidago flexicaulis (broad-leaved goldenrod)
 Spigelia marilandica (Indian pink)

Small Flowering Trees and Shrubs:

Amelanchier arborea (serviceberry)
 Aronia melanocarpa (black chokeberry)
 Callicarpa americana (beautyberry)
 Carpinus caroliniana (hornbeam)
 Cornus florida (flowering dogwood)
 Hamamelis vernalis (Ozark witch hazel)
 Hydrangea arborescens (wild hydrangea)
 Ilex verticillata (winterberry holly)
 Ribes odoratum (golden currant)

Shade

Ferns:

Adiantum pedatum (Maidenhair fern)
 Athyrium pycnocarpon (silvery spleenwort)
 Onoclea sensibilis (sensitive fern)
 Polystichum acrostichoides (Christmas fern)

Grasses and Sedges:

Carex albicans (oak sedge)
 Carex eburnea (ivory sedge)
 Carex grayii (bur sedge)
 Carex muskingumensis (palm sedge)

Perennials:

Asarum canadense (wild ginger)
 Geranium maculatum (wild geranium)

Heuchera Americana (American alum-root)

Iris cristata (dwarf crested iris)
 Polygonatum biflorum (Solomon's seal)
 Solidago flexicaulis (zig-zag goldenrod)
 Spigelia marilandica (Indian pink)

Small Flowering Trees and Shrubs:

Amelanchier arborea (serviceberry)
 Callicarpa americana (beautyberry)
 Cornus alternifolia (pagoda dogwood)
 C. florida (flowering dogwood)
 Dirca palustris (leatherwood)
 Hamamelis virginiana (Eastern witch hazel)

Native Groundcovers



The 12-inch native groundcover field sedge (Carex praegracilis) growing in a solid mass at Shaw Nature Reserve reduces maintenance, tolerates poorly drained clay soils and suppresses weeds.

*Plants that spread rapidly by rhizomes and develop into large colonies. These species require large areas and containment.

Shade

Grasses & sedges:

Carex albicans (oak sedge)
 C. eburnea (ivory sedge)

C. emoryii* (riverbank sedge)
 C. grayii (bur sedge)
 C. jamesii (James sedge)
 C. muskingumensis (palm sedge)
 C. pennsylvanica (Pennsylvania sedge)
 Diarrhena obovata* (beak grass)
 Chasmanthium latifolium (river oats)

Perennials:

Antennaria parlinii (pussytoes)
 Asarum canadense (wild ginger)
 Chelone obliqua (rose turtlehead)
 Erigeron pulchellus (Robin's fleabane)
 Helianthus divaricatus* (woodland sunflower)
 Hydrophyllum virginianum* (Virginia waterleaf)
 Heuchera americana (American alumroot)
 H. parviflora (littleflower alumroot)
 Iris cristata (dwarf crested iris)
 Isopyrum biternatum (false rue anemone)
 Monarda bradburiana (Bradbury beebalm)
 Sedum ternatum (woodland stonecrop)
 Senecio aureus* (golden groundsel)
 S. obovatus* (round-leaved groundsel)
 Solidago flexicaulis (zig-zag goldenrod)

Ferns:

Athyrium pynocarpon (narrow-leaved spleenwort)
 Onoclea sensibilis (sensitive fern)
 Matteuccia struthiopteris (ostrich fern)

Full Sun**Grasses and sedges:**

Carex annectens (yellow-fruited fox sedge)
 C. buxbaumii* (Buxbaum sedge)
 C. emoryi* (Riverbank sedge)
 C. hystericina* (bottlebrush sedge)
 C. lanuginosa* (wooly sedge)
 C. muskingumensis (palm sedge)
 C. praegracilis* (tollway sedge)
 C. stricta* (tussock sedge)
 Panicum virgatum (switch grass)
 Schizachyrium scoparium (little bluestem)
 Sporobolus heterolepis (prairie dropseed)
 Spartina pectinata* (cord grass)

Perennials:

Achillea millefolium (yarrow)
 Amsonia illustris (shining bluestar)
 Anemone canadensis* (meadow anemone)
 Artemisia ludoviciana* (wormwood)
 Aster oblongifolius (aromatic aster)
 Chelone obliqua (rose turtlehead)
 Fragaria virginiana* (wild strawberry)
 Helianthus occidentalis* (western sunflower)
 H. mollis* (ashy sunflower)
 Heuchera richardsonii (prairie alumroot)
 Iris virginica (southern blue flag)
 Iris fulva (copper iris)
 Oenothera macrocarpa (Missouri evening primrose)
 Parthenium hispidum (American feverfew)
 Rudbeckia fulgida (orange coneflower)
 Verbena canadensis (rose verbena)

Shrubs:

Andrachne phyllanthoides (Missouri maid-enbush)
 Hydrangea arborescens (w. hydrangea)
 Ribes odoratum (golden currant)
 Rhus copallina* (winged sumac)

*Plants that spread rapidly by rhizomes and develop into large colonies. These species require large areas.

Clay Soil Conditions

**Plants that tend to spread from seed*

Grasses and Sedges:

Bouteloua curtipendula (sideoats grama)
 Carex annectens (yellow-fruited fox sedge)
 Carex muskingumensis (palm sedge)
 Schizachyrium scoparium (little bluestem)
 Sporobolus heterolepis (prairie dropseed)

Perennials:

Allium cernuum (nodding wild onion)
 Allium stellatum (fall glade onion)
 Amsonia illustris (shining bluestar)
 Asclepias tuberosa (butterfly flower)
 Aster novae-angliae* (New Eng. aster)



Prairie dropseed (Sporobolus heterolepis) growing as a groundcover at Missouri Botanical Garden.



Palm sedge (Carex muskingumensis) tolerates clay soils and can grow in sun or shade.

Baptisia bracteata var. leucophaea (cream wild indigo)
 Coreopsis lanceolata* (lance-leaved coreopsis)
 Coreopsis palmata (finger coreopsis)
 Dalea candida (white prairie clover)
 Dalea purpurea (purple prairie clover)
 Echinacea purpurea* (purple coneflower)
 Eryngium yuccifolium (rattlesnake master)
 Heliopsis helianthoides (false sunflower)
 Liatris pycnostachya (prairie blazing star)
 Liatris spicata (marsh blazing star)
 Monarda fistulosa (wild bergamot)
 Parthenium hispidum (American feverfew)
 Parthenium integrifolium (wild quinine)
 Penstemon digitalis (smooth beard-tongue)
 Polygonatum biflorum var. commutatum (Solomon's seal)
 Ratibida columnifera (Mexican hat)
 Ratibida pinnata* (grayhead coneflower)
 Rudbeckia fulgida (orange coneflower)
 Rudbeckia hirta (black-eyed Susan)
 Silphium integrifolium (rosinweed)
 Silphium laciniatum (compass plant)
 Silphium perfoliatum* (cup plant)
 Solidago rigida* (stiff goldenrod)
 Solidago speciosa (showy goldenrod)
 Tradescantia ohiensis* (Ohio spiderwort)
 Vernonia arkansana (Arkansas ironweed)
 Zizia aurea* (golden Alexander)

Small Flowering Trees and Shrubs:

Aronia melanocarpa (black chokeberry)
 Crataegus viridis (green hawthorn)
 Hamamelis vernalis (Ozark witch hazel)
 Hydrangea arborescens (wild hydrangea)
 Ilex verticillata (winterberry holly)

Screening with Shrubs

Aronia melanocarpa (black chokeberry)
 Arundinaria gigantea (giant cane)
 Cornus racemosa (gray dogwood)
 Cornus drummondii (rough-leaved dogwood)
 Cornus alternifolia (pagoda dogwood)
 Corylus americana (hazelnut)
 Hydrangea arborescens (wild hydrangea)
 Hypericum prolificum (shrubby St. John's wort)
 Ilex decidua (deciduous holly)
 Ilex verticillata (winterberry holly)
 Neviusia alabamensis (Alabama snow wreath)
 Physocarpus opulifolius (ninebark)
 Rhus copallina (winged sumac)
 Rhus glabra (smooth sumac)
 Salix humilis (prairie willow)
 Sambucus canadensis (elderberry)
 S. racemosa (red-berried elderberry)

Staphylea trifoliata (bladdernut)
 Viburnum dentatum (arrowwood)
 Viburnum prunifolium (northern blackhaw)

Hedges

Aesculus pavia (red buckeye 10-15')
 Amsonia illustris (shining bluestar 3-4')
 Andrachne phyllanthoides (Missouri maid-
 enbush 3-4')
 Aronia melanocarpa (black chokeberry
 5-6')
 Callicarpa americana (beautyberry 4-5')
 Dirca palustris (leatherwood 3-5')
 Hydrangea arborescens (wild hydrangea
 3-4')
 Ilex verticillata cultivars (winterberry 4-6')
 Neviusia alabamensis (Alabama snowreath
 6-8')
 Ostrya virginiana (hop hornbeam 15-20')
 Ribes missouriense (Missouri gooseberry
 3-4', thorns)
 Staphylea trifoliata (bladderpod 6-8')
 Viburnum dentatum (arrowwood viburnum
 5-7')
 Viburnum molle (Kentucky viburnum 6-8')



Bladdernut (Staphylea trifoliata) forms a dense screen with dark green leaves and lime-green seed pods in summer.

Limestone Soils (7.5 pH or higher)

Grasses and Sedges:

Bouteloua curtipendula (sideoats grama)
 Schizachyrium scoparium (little bluestem)
 Sporobolus heterolepis (prairie dropseed)

Perennials:

Parthenium hispidum (American feverfew)
 Pycnanthemum tenuifolium (slender
 mountain mint)
 Salvia azurea (pitcher sage)
 Sedum ternatum (wild stonecrop)
 Senecio obovatus (round-leaved ground-
 sel)
 Senna marilandica (wild senna)
 Sporobolus heterolepis (prairie dropseed)
 Verbena canadensis (rose verbena)
 Verbesina helianthoides (yellow wingstem)

Small Flowering Trees and Shrubs:

Andrachne phyllanthoides (Missouri maid-
 enbush)
 Ilex decidua (possum haw)
 Juniperus virginiana (eastern red cedar)
 Physocarpus opulifolius (ninebark)
 Ptelea trifoliata (wafer ash)



Shining bluestar (Amsonia illustris) hedge along walkway.

Cercis canadensis (redbud)
Quercus meuhlenbergii (chinquapin oak)

Acidic Soils (pH of 5.5 or lower)

Grasses and Sedges:

Andropogon gerardii (big bluestem)
Andropogon virginica (broomsedge)
Andropogon ternarius (splitbeard bluestem)
Carex hirsutella (fuzzy-wuzzy sedge)
Juncus biflorus (bog rush)
Schizachyrium scoparium (little bluestem)

Perennials:

Amsonia illustris (shining bluestar)
Chrysopsis camporum (golden aster)
Coreopsis lanceolata (lance-leaf coreopsis)
Juncus tenuis (path rush)
Lespedeza virginica (slender lespedeza)
Lespedeza violacea (violet lespedeza)
Monarda fistulosa (wild bergamot)
Parthenium integrifolium (wild quinine)
Penstemon digitalis (smooth beard-tongue)
Solidago nemoralis (old field goldenrod)
Tephrosia virginiana (goats beard)
Verbesina helianthoides (yellow wingstem)

Trees and shrubs:

Amelanchier arborea (serviceberry)
Aronia melanocarpa (black chokeberry)
Itea virginica (Virginia sweet-spire)
Polygonella americana (jointweed)
Quercus coccinea (scarlet oak)
Nyssa sylvatica (black gum)
Rhododendron prinophyllum (mountain azalea)
Pinus echinata (shortleaf pine)

Full Shade with Rich Moist Soil (all-day shade)

Grasses and sedges:

Carex grayii (bur sedge)
Carex jamesii (grass sedge)

Carex lurida (sallow sedge)
Carex muskingumensis (palm sedge)
Chasmanthium latifolium (creek oats)

Ferns:

Adiantum pedatum (maidenhair fern)
Athyrium filix-femina (lady fern)
Athyrium pycnocarpon (narrow-leaved spleenwort)
Cystopteris fragilis (fragile fern)
Matteuccia struthiopteris (ostrich fern)
Thelypteris hexagonoptera (broad beech fern)
Woodsia obtusa (common wood fern)

Perennials:

Actaea pachypoda (dolls eyes)
Arisaema dracontium (green dragon)
Arisaema triphyllum (Jack-in-the pulpit)
Aruncus dioicus (goatsbeard)
Asarum canadense (wild ginger)
Aster drummondii (Drummond aster)
Cacalia atriplicifolia (pale Indian plantain)
Cacalia muehlenbergii (great Indian plantain)
Caulophyllum thalictroides (blue cohosh)
Claytonia virginica (spring beauty)
Collinsia verna (blue-eyed Mary)
Delphinium tricorne (dwarf larkspur)
Erigeron philadelphicus (Philadelphia fleabane)
Erigeron philadelphicus (Philadelphia fleabane)
Geranium maculatum (wild geranium)
Maianthemum racemosum (Solomon's plume)
Mertensia virginica (Virginia bluebells)
Onoclea sensibilis (sensitive fern)
Osmorhiza longistylis (sweet Cicely)
Phacelia purshii (Miami mist)
Podophyllum peltatum (mayapple)
Polemonium reptans (Jacob's ladder)
Polygonatum biflorum (Solomon's seal)
Sanguinaria canadensis (bloodroot)
Senecio aureus (golden groundsel)
Solidago flexicaulis (broad-leaved goldenrod)
Solidago rugosa (rough-leaved goldenrod)
Spigelia marilandica (Indian pink)

Stylophorum diphyllum (celandine poppy)
 Tradescantia ernestiana (Palmer's spiderwort)
 Tradescantia subaspera (zigzag spiderwort)
 Uvularia grandiflora (bellwort)
 Viola pubescens (yellow violet)
 Viola striata (cream violet)

Small Flowering Trees and Shrubs:

Cornus alternifolia (pagoda dogwood)
 Aesculus glabra (Ohio buckeye)
 A. pavia (red buckeye)
 Aralia spinosa (Hercules' club)
 Lindera benzoin (spicebush)
 Magnolia acuminata (cucumbertree)
 Sambucus racemosa (red-berried elderberry)

Part Shade with Dry Soil

(morning or afternoon shade)

Grasses and Sedges:

Carex albicans (oak sedge)
 Carex eburnea (ivory sedge)
 Carex grayi (globe sedge)
 Carex jamesii (grass sedge)
 Carex muskingumensis (palm sedge)
 Chasmanthium latifolium (creek oats)
 Diarrhena obovata (American beakgrain)
 Elymus hystrix (bottlebrush grass)

Perennials:

Anemone virginiana (thimbleweed)
 Aquilegia canadensis (wild columbine)
 Aruncus dioicus (goatsbeard)
 Asarum canadense (wild ginger)
 Asclepias purpurascens (purple milkweed)
 Aster anomalus (soft blue aster)
 Aster oblongifolius (aromatic aster)
 Aster patens (purple daisy)
 Aster turbinellus (prairie aster)
 Baptisia bracteata (cream wild indigo)
 Blephilia ciliata (Ohio horsemint)
 Camassia scilloides (wild hyacinth)
 Campanula americana (American bellflower)
 Cimicifuga racemosa (black cohosh)
 Claytonia virginica (spring beauty)
 Delphinium exaltatum (tall larkspur)
 Delphinium tricorne (dwarf larkspur)
 Echinacea purpurea (purple coneflower)
 Erigeron pulchellus (robin's plantain)
 Gentiana andrewsii (bottle gentian)
 Geranium maculatum (wild geranium)
 Heuchera parviflora (downy alumroot)
 Heuchera villosa (alumroot)
 Hydrastis canadensis (goldenseal)
 Iris cristata (dwarf crested iris)
 Melica nitens (tall melic grass)
 Monarda bradburiana (Bradbury beebalm)
 Osmorhiza longistylis (sweet Cicely)
 Penstemon pallidus (pale beard-tongue)
 Phlox divaricata (wild sweet William)
 Phlox paniculata (garden phlox)
 Polemonium reptans (Jacob's ladder)
 Polygonatum biflorum (Solomon's seal)



Dry woodlands often have naturally growing white oak, post oak, chinquapin oak, and shagbark hickory.

Polygonum virginianum (Virginia knotweed)
 Porteranthus stipulatus (Indian physic)
 Pycnanthemum albescens (white mountain mint)
 Scutellaria incana (hoary skullcap)
 Scutellaria ovata (heart-leaved skullcap)
 Sedum ternatum (wild stonecrop)
 Senecio obovatus (round-leaved groundsel)
 Senna marilandica (wild senna)
 Silene stellata (starry campion)
 Solidago caesia (blue-stemmed goldenrod)
 Solidago flexicaulis (zigzag goldenrod)
 Solidago ulmifolia (elmleaf goldenrod)
 Spigelia marilandica (Indian pink)
 Stylophorum diphyllum (celandine poppy)
 Tradescantia subaspera (zig-zag spiderwort)
 Uvularia grandiflora (bellwort)
 Verbesina helianthoides (yellow wingstem)
 Zizia aurea (golden Alexander)

Small Flowering Trees and Shrubs:

Amelanchier arborea (serviceberry)
 Bumelia lanuginosa (gum bumelia)
 Callicarpa americana (beautyberry)
 Carpinus caroliniana (hornbeam)
 Cercis canadensis (redbud)
 Cornus alternifolia (pagoda dogwood)
 C. florida (flowering dogwood)
 Dirca palustris (leatherwood)
 Neviusia alabamensis (Alabama snowwreath)
 Ostrya virginiana (hop hornbeam)
 Viburnum molle (Kentucky viburnum)
 V. prunifolium (northern blackhaw)
 V. rufidulum (rusty blackhaw)

Woodland Plants that Spread by Seed

Dry Soils:

Grasses and Sedges:

Bromus pubescens (woodland brome)
 Chasmanthium latifolium (river oats)
 Diarrhena obovata (beak grass)

Elymus hystrix (bottlebrush grass)
 Elymus virginicus (woodland wild rye)

Perennials:

Aquilegia canadensis (wild columbine)
 Aster drummondii (Drummond aster)
 Campanula americana (Amer. bellflower)
 Echinacea purpurea (purple coneflower)
 Geranium maculatum (wild geranium)
 Mertensia virginica (Virginia bluebells)
 Phlox divaricata (wild sweet William)
 Phlox paniculata (meadow phlox)
 Polemonium reptans (Jacob's ladder)
 Scutellaria incana (downy skullcap)
 Solidago caesia (blue-stem goldenrod)
 Solidago flexicaulis (zig-zag goldenrod)
 Stylophorum diphyllum (wood poppy)
 Tradescantia ernestiana (Palmer's spiderwort)
 Viola pubescens (yellow violet)
 Viola sororia (common violet)
 Viola striata (cream violet)



Wood poppy (Stylophorum diphyllum) and Virginia bluebell (Mertensia virginica) spread from seed in the Whitmire Wildflower Garden.

**Well-drained Dry or Rocky Soil
(full sun)****Grasses and Sedges:**

Bouteloua curtipendula (sideoats grama)
 Koeleria macrantha (June grass)
 Schizachyrium scoparium (little bluestem)
 Sporobolus heterolepis (prairie dropseed)

Perennials:

Allium cernuum (nodding wild onion)
 Allium stellatum (fall glade onion)
 Amorpha canescens (leadplant)
 Amsonia ciliata var. filifolia (feathery blue star)
 Asclepias tuberosa (butterfly flower)
 Aster oblongifolius (aromatic aster)
 Aster oolentangiensis (sky blue aster)
 Aster paludosus (prairie aster)
 Baptisia australis (blue wild indigo)
 Calamintha arkansana (calamint)
 Callirhoe digitata (fringed poppy mallow)
 Castilleja coccinea (Indian paintbrush)
 Ceanothus americanus (New Jersey tea star)
 Clematis fremontii (Fremont's leather flower)
 Dalea candida (white prairie clover)
 Dalea purpurea (purple prairie clover)
 Delphinium carolinianum (Carolina larkspur)
 Echinacea pallida (pale purple coneflower)
 Echinacea simulata (glade coneflower)
 Erysimum capitatum* (western wallflower)
 Hedyotis longifolia (longleaf bluet)
 Liatris mucronata (bottlebrush blazingstar)
 Manfreda virginica (American aloe)
 Marshallia caespitosa (Barbara's buttons)
 Oenothera macrocarpa (Missouri evening primrose)
 Palafoxia callosa* (palafoxia)
 Parthenium hispidum (American feverfew)
 Penstemon cobaea (showy beard-tongue)
 Penstemon pallidus (pale beard-tongue)

Phlox bifida (sand phlox)
 Phlox pilosa (hairy phlox)
 Pycnanthemum tenuifolium (slender mountain mint)
 Ratibida columnifera (Mexican hat)
 Rudbeckia missouriensis (Missouri black-eyed Susan)
 Ruellia humilis (hairy wild petunia)
 Salvia azurea (pitcher sage)
 Sedum pulchellum (widow's cross)
 Senecio plattensis (prairie ragwort)
 Silene caroliniana (wild pink)
 Silene regia (royal catchfly)
 Silene virginica (fire pink)
 Silphium terebinthinaceum (prairie dock)
 Solidago gattingeri (Gattinger's goldenrod)
 Taenidia integerrima (yellow pimpernel)
 Talinum calycinum* (rock pink)
 Trichostema dichotomum* (blue curls)
 Verbena canadensis (rose verbena)
 Yucca glauca (soapweed yucca)

Annuals***Small Flowering Trees and Shrubs:**

Callicarpa americana (beautyberry)
 Cercis canadensis (redbud)
 Chionanthus virginicus (fringetree)
 Corylus americana (Hazelnut)
 Cotinus obovatus (Smoke tree)
 Juniperus virginiana (eastern red cedar)
 Rhus aromatica (fragrant sumac)

Resistance to Deer Browse**Most Resistant:**

Achillea millefolium (yarrow)
 Adiantum pedatum (maidenhair fern)
 Agastache nepetoides (giant hyssop)

Allium stellatum (fall glade onion)
Amsonia ciliata (feathery bluestar)
Amsonia illustris (shining bluestar)
Andropogon gerardii (big bluestem)
Asclepias incarnata (swamp milkweed)
Asclepias viridis (spider milkweed)
Carex annectens (yellow-fruited fox sedge)
Carex muskingumensis (palm sedge)
Carex stricta (tussock sedge)
Coreopsis tinctoria (Plains coreopsis)
Delphinium exaltatum (tall larkspur)
Eryngium yuccifolium (rattlesnake master)
Erysimum capitatum (western wallflower)
Helenium autumnale (autumn sneeze-weed)
Hibiscus lasiocarpus (woolly rose mallow)
Iris cristata (dwarf crested iris)
Iris virginica (blue flag iris)
Juncus effusus (soft rush)
Monarda bradburiana (Bradbury beebalm)
Onoclea sensibilis (sensitive fern)
Palafoxia callosa (palafoxia)
Panicum virgatum (switch grass)
Physostegia virginiana (obedient plant)
Polystichum acrostichoides (Christmas fern)
Pycnanthemum pilosum (hairy mountain mint)
Pycnanthemum tenuifolium (slender mountain mint)
Pycnanthemum virginianum (mountain mint)
Salvia azurea (pitcher sage)
Schizachyrium scoparium (little bluestem)
Scutellaria incana (hoary skullcap)
Scutellaria ovata (heart-leaved skullcap)
Sedum ternatum (wild stonecrop)
Senecio obovatus (round-leaved groundsel)
Senna marilandica (wild senna)
Sporobolus heterolepis (prairie dropseed)
Verbena canadensis (rose verbena)
Verbesina helianthoides (yellow wing-stem)

Somewhat Resistant to deer browse:

Aquilegia canadensis (wild columbine)
Aruncus dioicus (goatsbeard)
Asclepias tuberosa (butterfly flower)
Aster oblongifolius (aromatic aster)
Aster oolentangiensis (sky blue aster)
Aster patens (purple daisy)
Baptisia australis (blue wild indigo)
Blephilia ciliata (Ohio horsemint)
Chelone obliqua (rose turtlehead)
Coreopsis lanceolata (lance-leaved coreopsis)
Echinacea simulata (glade coneflower)
Elymus canadensis (Canada wild rye)
Eupatorium purpureum (Joe Pye weed)
Grindelia lanceolata (gum plant)
Helianthus maximiliani (Maximilian sunflower)
Heliopsis helianthoides (false sunflower)
Heuchera richardsonii (prairie alumroot)
Liatris pycnostachya (prairie blazing star)
Lobelia cardinalis (cardinal flower)
Lobelia siphilitica (blue lobelia)
Mimulus ringens (monkeyflower)
Monarda fistulosa (wild bergamot)
Penstemon digitalis (smooth beard-tongue)
Phlox paniculata (garden phlox)
Polemonium reptans (Jacob's ladder)
Rudbeckia fulgida (orange coneflower)
Rudbeckia subtomentosa (sweet coneflower)
Ruellia humilis (hairy wild petunia)
Silene regia (royal catchfly)
Solidago caesia (blue-stemmed goldenrod)
Solidago drummondii (cliff goldenrod)
Solidago nemoralis (gray goldenrod)
Solidago riddellii (Riddell's goldenrod)
Stylophorum diphyllum (celandine poppy)
Vernonia arkansana (Arkansas ironweed)
Veronicastrum virginicum (culver's root)
Zizia aurea (golden Alexander)

Native Vines

Aristolochia tomentosa* (wooly pipe-vine)
 Berchemia scandans** (supplejack)
 Bignonia capreolata* (crossvine)
 Brunnicchia ovata* (ladies eardrops)
 Campsis radicans* (trumpet creeper)
 Celastrus scandens* ** (American bitter-sweet)
 Clematis pitcheri (Pitcher's leather flower)
 Clematis versicolor (pale leather flower)
 Cocculus carolinus (Carolina moonseed)
 Lonicera flava (yellow honeysuckle)
 Mataloa decipiens (climbing milkweed)
 Parthenocissus quinquefolia* (Virginia creeper)
 Passiflora incarnata* (passionflower)
 Passiflora lutea (yellow passionflower)
 Rosa setigera (prairie rose, may be trained like a vine)
 Wisteria frutescens* (wisteria)

**Aggressive spreading, isolate or plant in container*

***Dioecious: Male and female flowers on separate plants. Requires one male and one female plant for fruit production.*

Prairie Plants

see Chapter 1: Reconstructing Tallgrass Prairies

Rain Garden Plants

see Chapter 2: Rain Gardening and Stormwater Management

Invasive Plants

see Chapter 3: Control and ID of Invasive Species



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