

Chapter Four:
Landscaping with Native Plants
A Gardeners Guide for Missouri



Introduction

Gardening with native plants is becoming the norm rather than the exception in Missouri. The benefits of native landscaping is fueling a gardening movement that says no to pesticides and fertilizers and yes to biodiversity and creates more sustainable landscapes. Novice and professional gardeners are turning to native plants in unprecedented numbers because these plants can reduce maintenance when used correctly. This manual will show you how to use native plants to reduce maintenance, create and maintain diverse and beautiful spaces. It describes new ways to garden lightly on the earth.

Chapter four: Landscaping with Native Plants is intended to provide gardeners with the tools they need to create and maintain successful native plant gardens. Whether you are establishing a new garden or expanding an existing one, the information included here provides practical tips and details to ensure successful low-maintenance landscapes.

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 are right. Today native plants are used in residential and commercial landscaping, highway projects, habitat restoration, storm-water erosion control, for parks and corporate office buildings.

Why Use Missouri Native Plants ?

Locally native ecotype plants:

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



life in prairies, wetlands, river-bottom forests, glades and upland savannas. They have evolved to deal with the extremes of our climate, a wide array of pathogens and a variety of soil and moisture types. These elements have tempered a palette of durable and showy Missouri native plants that can be 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 homeowner flower beds. Gardeners who use locally grown native plants from Missouri have more success than plants that come 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.

Native plants reduce maintenance:

Compared with lawns and mulched tree, shrub and perennial plantings, landscapes planted with appropriate native plants can be low in maintenance. They do not need watering (except during establishment and drought periods), nor do they require chemical fertilizers or pesticides. They also can create the least amount of maintenance relative to the amount of beauty and wildlife they attract. Characteristics of native plants that reduce maintenance include...

- Longevity: plants that live for many decades
- Four-season interest: plants that look good all year long
- 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 eliminate weeds
- Seediness: plants that do not spread readily from seed

(See bottom of document for a list of native plants that require little maintenance)

Wildlife diversity:

Since European settlement, natural landscapes in the United States have been transformed into less diverse landscapes. For instance, there are more than 40 million acres of turf in the U.S. That equals the size of Missouri. There are about 350 million acres of crop land which is four times the size of California, and 790 million acres of range and pasture land, which is about 40% of all the land in the lower 48 states. The result is less habitat for birds, butterflies and other living creatures. A viable solution is to reverse the process. Move some pasture and crop land into the conservation reserve program. Mow less lawn and create landscapes that are friendly to wildlife. Whether you live on a quarter acre or 100, no landscape is too small to make a difference in enhancing biodiversity. Here is how it works. Plant diversity is the key to attracting the widest array of wild-



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

life visitors. Landscaping with Missouri native plants helps to restore the habitat necessary to sustain wildlife, providing needed food, water, shelter and nesting sites.

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

Mulched Groundcover Planting

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



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

Standard Mulched Planting Bed

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

Some native plants are resistant to deer browse:

For those who live in deer country, gardening can be a challenge. 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. So it makes sense that plants with aromatic foliage deter deer. Plants such as wild bergamot (*Monarda fistulosa*) and round-leaved groundsel (*Senecio obovatus*). Some plants repel deer because of their texture: coarse, rough, hairy, or spiny. 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 so that deer are confused and move on.

(See bottom of document for a list of deer resistant native plants)

Native plants offer a sense of place:

People who have lived in one place for a while develop deeply set images of their home that create a sense of belonging and familiarity. Those who have lived in rural Missouri know about flowering dogwoods. Its blossoms and berries

have made their mark in the hearts and thoughts of so many Missouri residents that it is the state flower. As a result, it likely is the most common small flowering tree in yards across the state. Many people have recognized this heart-felt connection with nature that is sometimes referred to as sense of place, more often referred to as home.

Determine Goals

Because native plants are hardy and well-adapted, they are logical choices for solving many landscape problems. Assess your site to determine if there are problematic areas. Some commonly encountered landscape situations are listed here. In addition, consider how you will use the space. For example, you may want to create a habitat favorable for birds and but-



*The proper handling of stormwater runoff is a significant issue that homeowners, neighborhoods and communities are having to deal with. 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).*

terflies, design an 'outdoor room' for entertaining or educational purposes, or you might want a low-maintenance natural landscape. All of these considerations help develop a plant list for the project. The plant lists in this manual include many plant attributes and cultural requirements to help to compile a list that addresses your needs.

Beautification:

Wildflowers, flowering vines, shrubs and trees offer a wide range of color and form constantly changing to create a dynamic seasonal display. Grasses and sedges have interesting flowers and seed heads and yellow-orange fall color. Many shrubs and trees have fall color and berries that persist into the winter. Choosing from a wide assortment of plants ensures interest all season, with the bonus of attracting colorful birds, butterflies and insects.

Stormwater runoff:

Rain gardens are an aesthetic landscape feature intended to slow down and absorb rainfall, thus reducing the quantity and velocity of runoff while improving water quality. (See Chapter Two – Rain Gardening and Storm Water Management)

Education:

Native plant gardens present endless opportunities for learning. Seasonal cycles, animal groups, and

plant life cycles are just a few possibilities. Quiet spaces outside can be used for art and reading classes. Environmental and conservation topics are taught best in outdoor classrooms.

Erosion Control:

Siltation because of soil erosion 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 down the flow of water over the surface. Replacing turf with native plantings is an effective way to help control erosion.

Low Maintenance:

Use native plants on sites that are difficult to mow, such as slopes and wet areas, and eliminate the need to mow. After the initial establishment of new plantings, supplemental irrigation is not necessary. Native landscapes also reduce or eliminate the need for pesticides and fertilizer. A diversity of plants encourages a diversity of beneficial insects and animals, creating a natural balance that discourages major pest problems. A light application of compost each year provides most of the nutritional needs. Leaving seed heads and plant structure in winter provides food and shelter for many creatures.

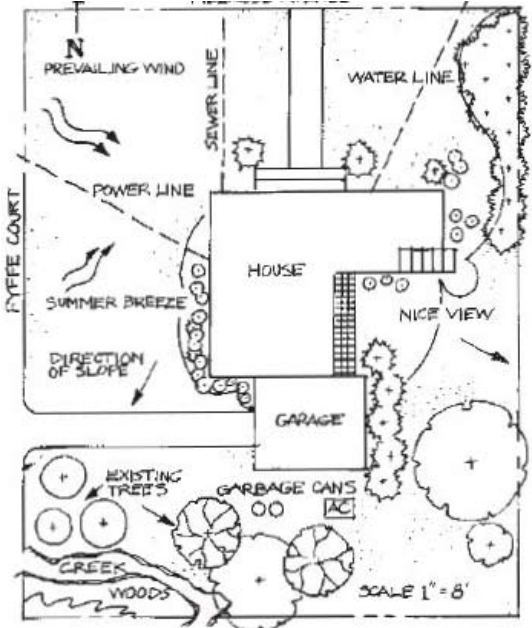
Wildlife Habitat:

A native planted garden with a diversity of trees, shrubs, and perennials attracts many insects, birds, amphibians and mammals, providing opportunities to observe nature up close. Lost habitat is replaced and the world we live in is richer as a result.

Site Evaluation

Map the Area

A diagram of the site is helpful in planning and phasing in landscape projects. 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 and/or rain garden (see Chapter Two - Rain Gardening and Storm Water Management). Indicate location of structures, utility lines (call 1-800-DIG-RITE) and traffic use. Specify the north-south aspect, soil types (clayey, rocky etc.) 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 evolves. As possibilities are pulled together, remember the saying, "Don't fight the site". Most conditions encountered in a landscape have a list of plants that will thrive there. It is simpler and less expen-



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

sive 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 also 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 (see Propagating Native Plants from Seed). The site may be covered with shrubs, vines or weedy vegetation. If so, determine what vegetation should be removed (see Chapter 3 -

Control and Identification of Invasive Species). Identify which trees and shrubs will remain, and remove weaker and undesirable species. Enlist the help of an arborist if you are unsure of what tree species are beneficial to the overall design.

Sunlight

Determine the quality of light in a particular location. If shade exists on the site, 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 the 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

Attain a general analysis of your garden soil through a basic soil test. Soil sample information forms are available at all 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 the macronutrients nitrogen, phosphorus and potassium. A more complete soil test yields levels of the micronutrients in the soil (boron, magnesium, copper, etc.). Annual addition of compost adds much of the necessary nutrition a soil needs.

Soil Type and Infiltration Testing

There are two ways to determine soil type. First is an infiltration test and second by feeling it with your hands (see soil texture below). To do an infiltration test, dig a hole one foot deep and 8 inches wide. Fill it with water and observe how quickly the water disappears. *Note: do infiltration tests when soil is moist, the day after a soaking rain or watering.*

- If water drains within an hour or so you have well-drained sandy or loamy soils. Select dry-loving native plants listed at the bottom of this guide.
- If it takes a 12 hours or more to drain, you have poorly drained clay soils and should use native wetland species. See chapter two of this landscaping series: Rain Gardening

and Storm Water Management for a list of appropriate plants.

- Soils that drain within 3-6 hours are considered satisfactory for growing most native plants.

Soil Texture

Soil texture refers to the size of soil particles. To determine the soil type 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 referred to 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 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 longer 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



Plants in nature inhabit vastly different habitats. Left: yellow-fruited fox sedge growing along a soggy wetland. Right: shortleaf pine sprouting out of rock on a dry bluff.

mature.

Plant Selection

First develop a plant list that reflects the cultural requirements of the plants and the environmental conditions of the site. Match conditions in the garden to a native habitat equivalent for a successful planting. Plants flourish with minimum maintenance when appropriately chosen. Careful observation leads to understanding your property and gives insight into which plants will thrive where and helps you put the right plant in the right place.

For example, if the list is for a shady location with moist soil, plants such as ostrich fern (*Matteuchia struthiopteris*), palm sedge (*Carex muskingumensis*), creek oats (*Chasmanthium latifolium*) and squaw weed (*Senecio*

aureus) are good choices. Trying to grow these plants in dry, rocky soil results in poor growth, if the plants grow at all. Likewise, plants that love sunny, dry and rocky sites will die when planted in moist, rich soil.

Use regionally native plants for maximum hardiness. Field guides are especially helpful as they indicate where the plant grows naturally, giving the habitat information for each plant listed. Another valuable source of information is gained from careful observation in natural areas. Note light conditions, elevation and soil types – experience gained from these



insights can be translated into garden conditions. (see the Resources list at the end of this chapter.)

Sunny Environments

Prairies

Prairie, derived from the French word for meadow or grassland, 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*), asters, goldenrods and many Silphium species to name a few. Some prairies have wet soils and host 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 the soil is dry and glade-like. Shorter



plants predominate, for example little bluestem (*Schizachyrium scoparium*), sideoats grama (*Bouteloua curtipendula*) and butterfly milkweed (*Asclepias tuberosa*).

Glades

Thin, rocky topsoil combined with outcroppings of shallow bedrock creates this desert-like environ-

ment. Glades typically are found on south- and southwestern-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, rocky slopes and rock gardens in the landscape are examples of landscape situations where glade plants will thrive. When planted in rich soil, common in many gardens, these plants deteriorate and die. Plants found in this 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. Soils 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.) comprise a large percent of the plant list. Wetlands offer wide biodiversity in plants, birds, mammals and insects. Frogs and other amphibians are frequently seen (and heard) residents. Wetland plant lists are useful for rain gardens, bioswales and low areas that remain wet for long periods. (See Chapter



2-Rain Gardening and Stormwater Management for more information)

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 at a time. 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 scar-*



iosa) as well as many asters and goldenrods are appropriate choices in this case.

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 bluebells (*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.

Spacing

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

Plant Spacing Table

sq.ft.	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

Note: There are a number of plant calculators on the internet. www.classy-groundcovers.com is one of the easiest to use.



Planning and Site Preparation

Layout and Estimating Square Footage

Outline the area to be planted with a hose or line. 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. This calculation helps determine how many plants will be needed.

Estimating Plant Quantities and

Removing Existing Vegetation

This 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 Tall Grass Prairie. For identification and removal of invasive species, refer to Chapter 3 – ID and Control of Invasive Species.

Always wear safety glasses/goggles, gloves and protective clothing when applying herbicides.

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 Round-up. Use Rodeo instead of Round-up 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.



- Place a thick layer of compost or wood chips placed 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. Do not till in uncomposted leaves, bark or wood chips as they will cause 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 to add compost and earthworm castings to the soil to replenish the microbial populations.

- Remove sod with a desodding shovel or a desodding 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 can 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.

Selecting the Right Plants

Selecting the right plants for the right garden area requires planning. Here is



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

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

- **Local ecotype plants** are plants that originate from wild populations in your region. They will outperform non-local ecotype plants in most cases because they are acclimated to our growing conditions. For Missouri gardeners local ecotype plants come from Missouri or neighboring states.
- 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 use of mulch.
- 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 maintenance.
- 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

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 the Plant Selection Guide at the end of this booklet for detailed lists of plants for various garden conditions)

Soil Compaction and Grading

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

Avoid compacting soil with heavy equipment or foot traffic. Compacted soil drains poorly, has low oxygen and is difficult to plant in. If soil become 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

planting soil that is easy to plant in.

Final soil grading is typically done by hand on small areas with stiff garden or grading rakes following tilling. On large areas this is done with a skid-steer (Bobcat) 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 fabric available in garden centers. They are typically made of straw, wood shavings, coconut fiber, or 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 ft. or less drop in a 20 ft. distance. Gentle slopes are ideal and easy to work with and do not require erosion control fabric.

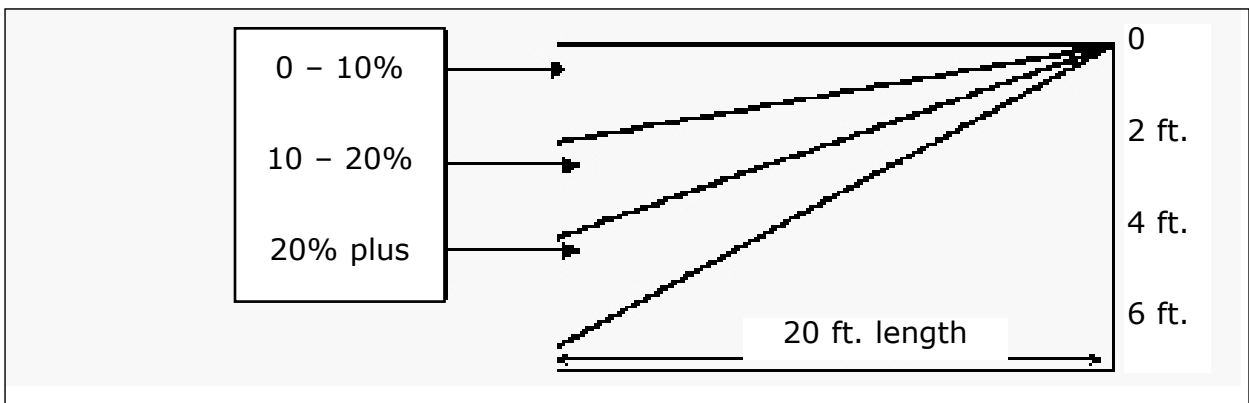
10 – 20% slope: 4 ft. or less drop in a 20 ft. distance. Steeper slopes can present a challenge and use of erosion control fabric should be considered.

Above 20% slope: 5 ft. or less drop in a 20 ft. distance. Once the percent slope is above 20%, erosion control is strongly recommended. (See graph below)

Planting

Planting Seasons

Spring and fall is the best time 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. Do not attempt to divide plants from June to early



September. If water is not available, plant between late February and April.

Lay Out Plants

Lay out all the 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:

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X      X      X      X      X      X
      X      X      X      X      X
X      X      X      X      X      X
  
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When working 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. Do not step on or bury plants with mulch.

Insert the plant so no artificial potting mix is exposed to the mulch or air, as this may allow the rootball to 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 and loostened topsoil handy to backfill planting holes. Backfilling with hard clay clods leaves air pockets that may lead to dessication 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 first and then plant, do not exceed the mulch depths listed here and do not



Left: Carefully remove plant from container. If roots are spiraling around inside the pot, cut the roots to prevent further spiraling. Middle: Remove any loose potting soil from the top of the potting soil ball. Insert container so that 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 plant down to remove any air pockets. Cover topsoil with 1-2 inches of mulch and water immediately.

leave soil on top of the mulch as this encourages weeds. Also be sure that plant roots are inserted in soil.

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 the following recommendations to prevent over-mulching or burying plants too deep 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 will lead 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 inch of rainfall). 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 established water during dry or drought periods during summer.

Planting Seed

It is less expensive to plant large areas with seed. 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: a seeding Guide for a detailed description of how to sow seed)

Maintenance

There is sometimes the misconception that 'wildflowers' require little or no maintenance. Some native gardens require a lot of maintenance and some don't. Below is a list of what makes a native landscape low-maintenance:

- Plants that are long-lived.
- Plants that are selected properly

for a site.

- Plants that have few pest problems require no chemicals.
- Plants that are compact and clump-forming work well in small spaces and don't flop over.
- Plants that sucker to form solid ground-cover fill larger spaces, keep weeds out and require little mulching.
- Plants that do not spread aggressively from seed reduce weeds.
- Plants with clean, dense foliage three-four seasons of the year prevent weeds and require little mulching.

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 year. Control them by handpulling or spot spraying with a glyphosphate herbicide like Round-Up. If you have nut sedge hand-pull repeatedly until it is gone or use the herbicide Sedgehammer.

By the second or third year the 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 ea



Yellow nutsedge is a common garden weed that is difficult to control by hand when it gets out of control. 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 annual application of one to two inches of compost in 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 badly affected by insect damage. There are exceptions. Japanese beetles may devastate native roses, hazelnut, and wild grapes in some years. Dogwood sawfly denudes swamp dogwood but only in some years. It likely 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 which 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. Apply mulch 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 it typically is not fully 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 as it is not completely composted. This mulch can float so is not recommended for use near stormwater flows.



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 free but often migrates and may float away where water flow occurs.

Shredded hardwood or cedar bark mulch also is 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.

Raked up or **fallen tree leaves** save time and money but do not look clean or intentional in planting beds. They are recommended for natural wooded settings.

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



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 a sharp blade and be careful not to cut your hand.

Pruning

Pruning is done for various reasons and involves the use of hand pruners, hand saws, loppers, or shears. Here are some reasons to prune.



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.

- **Remove damaged branches.** Ice and wind storms may cause broken branches on trees and shrubs, which 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.

- **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 typically are removed with hand pruners or hand saws on trees like hawthorns, viburnums, fringetree and dogwoods.

- **Shape woody plants.** As young trees, shrubs and vines began 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. This typically is done to flowering dogwood, fringetree, southern blackhaw viburnum, green haw-

thorne, serviceberry, pagoda dogwood and buckeyes.

If a shrubby screen-like appearance is desired, older trunks are removed, leaving young stems. This typically is done to hazelnuts.

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

- **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. This typically is done with hornbeam, southern blackhaw viburnum, spicebush, red buckeye, redbud, pagoda dogwood, yellowwood, and witchazel.

- **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, core-

opsis, black-eyed Susan, and native annuals such as sneezeweed and palafoxia.

This 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 with hedge shears or hand pruners. Plants pruned this way become multi-branched, fuller and shorter overall. Flowering species that respond well to this include asters, Joe-pye weed, sneezeweed,



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

rose mallow, turtleheads, garden phlox, goldenrods, and ironweeds. The grasses include big bluestem, Indiangrass, switchgrass, cordgrass, and eastern gama grass.

Typical Garden Schedule

Summer and Fall - Year 1

- Map out area 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 will help you predict the correct number of plants or materials.
- Remove weeds and undesirable growth by hand removal, with Round-up (glyphosphate) 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 will help maintain soil moisture and steady soil temperatures
- Begin watering new plantings immediately

Winter - Year 1

- October through March is a good time to construct patios, paths, walls, etc.
- 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 are forced to plant after June 1st water periodically during planting and then every three days following until established
- Remove weeds as they appear
- Water as needed
- Top prune perennials and grasses late April through mid May

Summer - Year 2

- Remove weeds - Continue to be vigilant and remove weeds as they appear
- Water as needed – Be sure

to do a deep watering when needed rather than frequent, shallow watering.

Summer planting is more difficult due to heat and unpredictable rainfall.

Fall/Winter - Year 2

- Plant/continue planting and sow seed if desired
- Remove weeds - Continue to be vigilant and remove weeds as they appear
- Water as needed
- Reapply mulch to thin areas. This is to be done after the first frost as the soil begins to cool. Time the mulching, doing it prior to seed sowing so the seeds are not covered up. Be careful not to mulch where you want plants to spread by reseeding.

Plant Selections Guide

Native Groundcovers



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

Shade:

Grasses & sedges:

- Carex albicans (oak sedge)
- C. grayii (bur sedge)
- C. jamesii (James' sedge)
- C. muskingumensis (palm sedge)
- C. pennsylvanica (Pennsylvania sedge)
- C. praegracilis (tollway sedge)
- Diarrhena obovatus (beak grass)
- Chasmanthium latifolia (river oats)

Perennials:

- Chelone obliqua (rose turtlehead)
- Helianthus divaricatus (woodland sunflower)
- Hydrophyllum virginianum (Virginia waterleaf)

- Heuchera americana (Amer. alumroot)
- Iris cristata (dwarf crested iris)
- Senecio aureus* (golden groundsel)
- S. obovatus* (round-leaved groundsel)
- Ferns:
- Onoclea sensibilis (sensitive fern)
- Matteuchia struthiopteris (ostrich fern)

Shrubs:

- Arundinaria gigantea* (giant cane)
- Corylus americana (hazelnut)
- Hydrangea arborescens (w. hydrangea)
- Neviusia alabamense (AL snow wreath)
- Zanthoxylum americanum* (toothache tree)

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

Sun:

Grasses and sedges:

- Carex annectans (yellow-fr. fox sedge)
- C. buxbaumii* (Buxbaum sedge)
- C. emorii* (Riverbank sedge)
- C. muskingumensis (palm sedge)
- C. praegracilis* (tollway sedge)
- Panicum virgatum (switchgrass)
- Schizachyrium scoparium (little bluestem)
- Sporobolus heterolepis (pr. dropseed)
- Spartina pectinata* (cordgrass)

Perennials:

- Achillea millefolium (yarrow)
- Amsonia illustris (shining bluestar)
- Anemone canadensis* (meadow anemone)
- Aster oblongifolius (aromatic aster)
- Chelone obliqua (rose turtlehead)
- Fragaria virginica* (wild strawberry)
- Helianthus occidentalis* (western sunflower)
- Heuchera richardsonii (prairie alumroot)
- Iris virginica (southern blue flag)
- Iris fulva (copper iris)

Parthenium hispidum (Amer. feverfew)

Shrubs:

Andrachne phyllanthoides (Missouri maidenbush)

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



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

Grasses and Sedges:

Bouteloua curtipendula (sideoats grama)

Carex annectans (yellow-fruited fox sedge)

Carex muskingumensis (palm sedge)

Schizachyrium scoparium (little bluestem)

Sporobolus heterolopis (prairie dropseed)

Perennials:

Allium cernuum (nodding wild onion)

Allium stellatum (fall glade onion)

Amsonia illustris (shining blue star)

Asclepias tuberosa (butterfly flower)

Aster novae-angliae (New Eng. aster)

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 helianthoide (false sunflower)

Liatris pycnostachya (prairie blazing star)

Liatris spicata (marsh blazing star)

Monarda fistulosa (wild bergamot)

Parthenium hispidum (Amer. 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 (Ar. ironweed)

Zizia aurea (golden Alexander)

Screening with Shrubs

Aronia melanocarpa (black chokeberry)

Arundinaria gigantea (giant cane)

Cornus racemosa (grey dogwood)

Cornus drummondii (rough-leaved dogwood)

Cornus alternifolia (pagoda dogwood)

Corylus americana (hazelnut)

Hydrangea arborescens (wild hydrangea)



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

Hypericum prolificum (shrubby St. Johnswort)
 Ilex decidua (deciduous holly)
 Ilex verticillata (winterberry holly)
 Physocarpus opulifolius (ninebark)
 Rhus copallina (winged sumac)
 Rhus glabra (smooth sumac)
 Salix humilis (prairie willow)
 Sambucus canadensis (elderberry)
 Staphylea trifoliata (bladderpod)
 Viburnum dentatum (arrowwood)
 Viburnum prunifolium (Northern blackhaw)

Hedges

Aesculus pavia (red buckeye 10-15')
 Amsonia illustris (shining bluestar 3-4')
 Andrachne phyllanthoides (Missouri maidenbush 3-4')
 Aronia melanocarpa (black chokeberry 5-6')
 Callicarpa americana (beautyberry 4-5')
 Dirca palustris (leatherwood 3-5')

Ilex verticillata (winterberry 4-6')
 Nevisia alabamensis (Alabama snow-reath 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')
 Yucca glauca (soapweed 2-3')



Shining bluestar (Amsonia illustris) hedge along walkway.

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 (Amer. feverfew)
 Pycnanthemum tenuifolium (slender mountain mint)
 Salvia azurea (blue salvia)
 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)

Trees & Shrubs:

Ilex decidua (possum haw)
 Physocarpus opulifolius (ninebark)
 Ptelea trifoliata (wafer ash)
 Cercis canadensis (redbud)
 Quercus mulenbergii (chinquapin oak)



Prairie dropseed (Sporobolus heterolepis) growing in a high limestone environment (gravel and concrete) in clay soil.

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 wing-stem)

Trees and shrubs:

Amelanchier arborea (serviceberry)
 Polygonella americana (jointweed)
 Quercus coccinea (scarlet oak)
 Nyssa sylvatica (black gum)
 Rhododendron prinohhyllum (mountain azalea)
 Pinus echinata (shortleaf pine)

Deep 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)
 Cacalia atriplicifolia (pale Indian plantain)
 Cacalia meuhlenbergii (great Indian plantain)
 Caulophyllum thalictroides (blue cohosh)
 Claytonia virginica (spring beauty)
 Collinsia verna (blue-eyed Mary)
 Delphinium tricorne (dwarf larkspur)
 Erigeron philadelphicus (Philadelphia fleabane)
 Geranium maculatum (wild geranium)
 Hydrophyllum appendiculatum (woolen breeches)
 Iresine rhizomatosa (bloodleaf)
 Magnolia accuminata (cucumber-tree)
 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 spi-

derwort)
 Tradescantia subaspera (zigzag spiderwort)
 Uvularia grandiflora (bellwort)
 Viola pubescens (yellow violet)
 Viola striata (cream violet)

Part Shade with Dry Soil
 (morning or afternoon shade)



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

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 beak-grain)

Perennials:

Amsonia tabernaemontana (bluestar)
 Anemone virginiana (thimbleweed)
 Aquilegia canadensis (wild columbine)
 Arisaema dracontium (green dragon)
 Aruncus dioicus (goatsbeard)
 Asarum canadense (wild ginger)
 Asclepias purpurascens (pur. milkweed)
 Asclepias quadrifolia (four-leaved milk-

Aster anomalus (soft blue aster)
 Aster drummondii (Drummond aster)
 Aster oblongifolius (aromatic aster)
 Aster patens (purple daisy)
 Aster turbinellus (prairie aster)
 Baptisia bracteata (cream wild indigo)
 Blephilia ciliata (Ohio horsemint)
 Bromus pubescens (woodland brome)
 Camassia scilloides (wild hyacinth)
 Campanula americana (American bellflower)
 Caulophyllum thalictroides (blue cohosh)
 Cimicifuga racemosa (black cohosh)
 Cirsium altissimum (tall thistle)
 Claytonia virginica (spring beauty)
 Collinsia verna (blue-eyed Mary)
 Delphinium exaltatum (tall larkspur)
 Delphinium tricorne (dwarf larkspur)
 Echinacea purpurea (purple coneflower)
 Elymus hystrix (bottlebrush grass)
 Erigeron philadelphicus (Philadelphia fleabane)
 Erigeron pulchellus (Robin's fleabane)
 Gentiana andrewsii (bottle gentian)
 Geranium maculatum (wild geranium)
 Heuchera parviflora (downy alumroot)
 Heuchera villosa (alumroot)
 Hydrastis canadensis (goldenseal)
 Iris cristata (dwarf crested iris)
 one)
 Lonicera flava (yellow honeysuckle)
 Melica nitens (tall melic grass)
 Monarda bradburiana (Bradbury bee-balm)
 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)
 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 (broad-leaved goldenrod)
 Solidago ulmifolia (elmleaf goldenrod)
 Spigelia marilandica (Indian pink)
 Stylophorum diphyllum (celandine poppy)
 Tradescantia subaspera (zigzag spiderwort)
 Uvularia grandiflora (bellwort)
 Verbesina helianthoides (yellow wing-stem)
 Waldsteinia fragarioides (Appalachian barren-strawberry)
 Zizia aurea (golden Alexander)

Trees and Shrubs:
 Cornus florida (flowering dogwood)
 Dirca palustris (leatherwood)
 Morus rubra (red mulberry)

Woodland Plants that Spread by Seed

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

Dry Soils:**Grasses and Sedges:**

Diarrhena obovatus (beak grass)
Chasmanthium latifolia (river oats)

Perennials:

Aquilegia canadensis (Wild columbine)
Geranium maculatum (wild geranium)
Phacelia purshii (Miami mist)
Phlox divaricata (wild sweet William)
Polemonium reptans (Jacob's ladder)
Stylophorum diphyllum (wood poppy)

Moist Soils:**Grasses and Sedges:**

Diarrhena obovatus (beak grass)
Chasmanthium latifolia (river oats)

Perennials:

Aster drummondii (Drummond aster)
Hydrophyllum appendiculatum (woolen breeches)
Iodanthus pinnatifidus (purple rocket)
Mertensia virginica (Virginia bluebells)
Osmorhiza longistylis (sweet Cicely)
Phlox divaricata (wild sweet William)
Phlox paniculata (meadow phlox)
Tradescantia ernestiana (Palmer's spi-

derwort)

Viola pubescens (yellow violet)

Viola striata (cream violet)

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

Bouteloua curtipendula (sideoats grama)
Koeleria macrantha (junegrass)
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)
Clematis fremontii (Fremont's leather flower)
Coreopsis grandiflora (large-flowered coreopsis)
Cunila origanoides (dittany)
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 (long-leaved houstonia)
Liatris mucronata (bottlebrush blazing star)
Manfreda virginica (American aloe)
Marshallia caespitosa (Barbara's buttons)
Mimosa quadrivalvis (sensitivebriar)
Oenothera macrocarpa (Missouri evening primrose)
Onosmodium molle ssp. *hispidissimum* (false gromwell)
Palafoxia callosa (palafoxia)
Parthenium hispidum (American feverfew)
Penstemon cobraea (showy beard-tongue)
Penstemon pallidus (pale beard-tongue)
Phlox bifida (sand phlox)
Phlox pilosa ssp. *Ozarkana* (hairy phlox)
Polanisia dodecandra (clammyweed)
Prenanthes aspera (rough white lettuce)
Pycnanthemum tenuifolium (slender mountain mint)
Ratibida columnifera (Mexican hat)
Rudbeckia missouriensis (Missouri black-eyed Susan)
Ruellia humilis (hairy wild petunia)
Salvia azurea (blue salvia)
Schizachyrium scoparium (little bluestem)
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)
Sporobolus heterolepis (prairie dropseed)
Taenidia integerrima (yellow pimpernel)
Talinum calycinum (rock pink)
Trichostema dichotomum (blue curls)

Verbena canadensis (rose verbena)
Yucca glauca (soapweed yucca)

Resistance to Deer Browse

Highly Resistant:

Achillea millefolium (yarrow)
Adiantum pedatum (maidenhair fern)
Agastache nepetoides (giant hyssop)
Allium stellatum (fall glade onion)
Amsonia ciliata (feathery blue star)
Amsonia illustris (shining blue star)
Andropogon gerardii (big bluestem)
Asclepias incarnata (swamp milkweed)
Asclepias viridis (spider milkweed)
Carex annectens (yellowfruit sedge)
Carex muskingumensis (palm sedge)
Carex stricta (tussock sedge)
Coreopsis tinctoria (plains coreopsis)
Delphinium exaltatum (tall larkspur)
Eryngium yuccifolium (rattlesnake master)
Erysimum capitatum (west. 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 bee-balm)
Onoclea sensibilis (sensitive fern)
Palafoxia callosa (palafoxia)
Panicum virgatum (switchgrass)
Physostegia virginiana (obedient plant)
Polystichum acrostichoides (Christmas fern)
Pycnanthemum pilosum (hairy mountain mint)
Pycnanthemum tenuifolium (slender mountain mint)
Pycnanthemum virginianum (mountain mint)
Salvia azurea (blue salvia)
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:

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 (rosy 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 alum-root)
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 (Ar. ironweed)
Veronicastrum virginicum (culver's root)
Zizia aurea (golden Alexander)



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