Designing Natural Landscapes:

Garden Design with Native Prairie Plants

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With more than 40 years of experience in the research and establishment of native plant communities, Neil is an internationally recognized pioneer in the use of North American plants in contemporary landscapes. He is a regular keynote speaker on topics such as establishing prairie meadows, designing with native plants, and the benefits of converting resource-intensive landscapes into self-sustaining ecological sanctuaries.

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Ecological Structure of the North American Prairie Grassland

The North American Prairie is a grassland ecosystem. It is composed of hundreds of different flowers and grasses, but is dominated by a few vigorous and adaptable grasses:

Botanical Name	Common Name	Prairie Habitat
Andropogon gerardii	Big Bluestem	Dry to Wet Prairies
Bouteloua curtipendula	Side Oats Grama	Dry Prairies
Elymus canadensis	Canada Wild Rye	Dry to Wet Prairies
Panicum virgatum	Switchgrass	Dry to Wet Prairies
Schizachyrium scoparium	Little Bluestem	Dry to Medium Prairies
Sorghastrum nutans	Indiangrass	Dry to Medium Prairies
Sporobolus heterolepis	Prairie Dropseed	Dry to Medium Prairies
Spartina pectinata	Prairie Cordgrass	Wet Prairies

Although dozens of other grasses, sedges (Carex), and rushes (Scirpus) can be found on the American Prairie, the grasses listed above are the most commonly occurring and widespread across the entire prairie region. These grasses are most commonly used in prairie landscape design due to their adaptability and visual appeal.

Dozens of species of forbs (wildflowers) and a few small shrubs are interspersed among the prairie grasses in a natural prairie. The grasses typically dominate the flowers in remnant prairies, with the average ratio being approximately 80% grasses to 20% flowers in terms of stem density, although this ratio can vary widely from prairie to prairie.

The average Wisconsin prairie contains approximately 65 different species of higher plants, including flowers, grasses, sedges, and shrubs. Typically, five to fifteen different grasses and sedges are present in any given prairie, with the balance composed of flowers and small shrubs. Thus, the ratio of the number of flower species to graminoid species is approximately 80% flowers to 20% grasses, the reverse of the stem density for each of these two components.

The North American Prairie is recognized as being a tightly-knit, stable ecosystem that resists invasion by weeds. This is due to two primary factors:

1. The root systems of the prairie grasses are deep and densely fibrous, and nearly completely occupy the upper three feet of the soil rooting zone. Combined with the many deep-rooted flowers (some with roots up to twenty feet deep), the prairie forms a dense sod that resists invasion by other plants.
2. Most prairie plants are long-lived perennials that tend to persist for many years, often decades. Plant turnover and replacement in a mature prairie is very low, often with little or no change from year to year.

Once established, the prairie becomes a low maintenance, natural perennial garden or meadow. By applying the principles of plant ecology in the prairie garden design process, the plants are selected and associated together to create a stable, functional ecosystem.

This is the secret to creating successful low maintenance prairie gardens and meadows.

Garden Design Principles Using Prairie Plants

The basic principles of garden design and installation apply to prairie gardens. With a knowledge and understanding of the characteristics and behavior of each species, beautiful gardens can be designed, installed, and maintained with a minimum of maintenance and cost.

General Garden Design Principles

- Select only those plants that are adapted to growing in the soil type, moisture conditions, and light intensities on the planting site.
- Choose plants to match the scale of the site. In small gardens, shorter plants (less than three feet) are the best choice, as they will fit the space well. Taller flowers and grasses can be used along walls, fences, and woodland edges to good effect.
- Repeat some of the same plants in selected areas of the garden to provide a sense of unity and harmony throughout the planting.
- Position plants so they will show off best at their particular time of the year. Place shorter, early blooming plants toward the front, not in back behind taller plants. Plants with small flowers should be in the foreground; those with big, bold flowers can be located in the background.
- Use larger, specimen plants to draw the eye to specific focal centers of interest.
- Combine textures so that they complement and play off one other. The fine leaves of the grasses are a perfect foil for the bold foliage of large-leaved prairie flowers such as Silphiums, Baptisias, and Eupatoriums.
- Combine flower colors to create a pleasing effect. For instance, white flowers mix well with pastel blues, purples, reds, and pinks. Strong yellow flowers generally mix best with colors opposite them on the color wheel, such as bright blues and purples.
- Prepare the site thoroughly prior to planting so that all weeds and other plant growth have been eliminated. No perennial weeds should be present on the planting site, as they can rapidly colonize the new garden jeopardize success. Proper site preparation greatly reduces post-planting maintenance by preventing weed problems in advance.
- Consider the longevity of each species. Plant primarily long-lived perennials (5 years or more), as opposed to shorter-lived perennials (3-5 years) and biennials (2 years). This reduces future plant replacements and results in a stable, low maintenance garden.
- Use a diversity of species, with complementary bloom times for interest throughout the seasons. The prairie flowers provide spring, summer and early fall color. The prairie grasses, with their red and gold fall colors, become the focal point in autumn and well into the winter.

Specific Design Principles for Prairie Gardens

- Use at least 33% to 50% grasses in the garden design. The grasses help to squeeze out the weeds, lend support to the prairie flowers (eliminating the need for staking), and provide late season interest with their fall colors. A 100% prairie flower garden can be created, but will require more maintenance than a garden that includes grasses to help control weedy invasion.
- Use low-growing, showy, clump-forming prairie grasses (up to three feet tall) to allow the flowers to show off. The best grasses for prairie gardens are Little Bluestem (Schizachyrium scoparium), Prairie Dropseed (Sporobolus heterolepis), Side Oats Grama (Bouteloua curtipendula) and Junegrass (Koeleria macrantha).
- Beware of planting the taller prairie grasses with shorter species, as they can spread aggressively by seed and take over the garden. Sod-forming tall grasses such as Big Bluestem (Andropogon gerardii) and Switchgrass (Panicum virgatum) should be used sparingly, if at all, in gardens that are to have a strong flower component.
- Tall prairie grasses are best used in large sweeps and masses in background areas, mixed with other robust, tall prairie flowers. Plant tall species at a distance from short flowers and grasses to prevent invasion of the short prairie garden by taller neighbors.
- Plant flowers with bulbs, corms, and taproots in close association with grasses to provide complementary fibrous roots to reduce weeds. These include Onions (Allium spp.), Leadplant (Amorpha canescens), Butterflyweed (Asclepias tuberosa), Canada Milkvetch (Astragalus canadensis), Wild Indigos (Baptisia spp.), Poppy Mallows (Callirhoe spp.), Wild Hyacinth (Camassia scilloides), New Jersey Tea (Ceanothus americanus), Prairie Clovers Dalea spp), Larkspurs (Delphinium spp.), Coneflowers (Echinacea spp.), Blazingstars (Liatris spp.), Lupine (Lupinus perennis), Wild Petunia (Ruellia humilis), Catchflies (Silene spp.), Compassplant (Silphium laciniatum), Prairie Dock (Silphium terebinthinaceum), and Spiderworts (Tradescantia spp).
- When massing flowers, intersperse them with short prairie grasses. Most prairie flowers, even those with fibrous roots, benefit from having grasses adjacent to them to help provide support and control weeds. Side Oats Grama grass is a good companion for flowers, as it is low-growing (2-3 ft.), and covers the surface soil without competing heavily with the flowers.
- Prairie grasses that stand up best over winter for architectural interest are Switchgrass and Little Bluestem. Indiangrass stands up well if not knocked down by ice or snow. Other prairie grasses such as Big Bluestem and Canada Wild Rye tend to fall over by late autumn or early winter and do not provide good winter interest.
- Place plants an average of one foot on center. This spacing will fill in the garden completely, leaving little room between plants for weeds to grow. Some plants with an upright growth habit require less room and can be planted more closely together. These
- Include the Blazingstars, Wild Onions, Prairie Smoke (Geum triflorum), Prairie Clovers, Wild Petunia, and Spiderworts. Larger plants require more room and should be planted 1.5 to 2 feet apart. These include Prairie Dropseed grass, Leadplant, the Wild Indigos, New Jersey Tea, Queen of the Prairie (Filipendula rubra), Rose Mallow (Hibiscus moscheutos), and the various members of the genus Silphium.

- Beware of planting aggressive rhizomatous species in the prairie garden. Although most prairie plants are well behaved, a few can spread aggressively by rhizomes. These include Canada Anemone (Anemone canadensis), Common Milkweed (Asclepias syriaca), Frost Aster (Aster pilosus), Prairie Coreopsis (Coreopsis palmata), Flowering Spurge (Euphorbia corollata), Sunflowers (Helianthus spp.), Bergamot (Monarda fistulosa), Obedient Plant (Physostegia virginiana), Western Spiderwort (Tradescantia occidentalis), and Prairie Cordgrass (Spartina pectinata).
- Be careful when planting species that tend to seed aggressively, as they may take over sections of the garden. This includes the prairie grasses Big Bluestem, Switchgrass, and Indiangrass. Flowers that are known to self-sow readily include Common Milkweed, Pale Indian Plantain (Cacalia atriplicifolia), Purple Coneflower (Echinacea purpurea), Ox Eye Sunflower (Heliopsis helianthoides), Yellow Coneflower (Ratibida pinnata), Brown Eyed Susan (Rudbeckia triloba), Rosinweed (Silphium integrifolium), Cupplant (Silphium perfoliatum) Stiff Goldenrod (Solidago rigida), and the Vervains (Verbena spp.)

Integrating the Prairie Garden into the Landscape

The prairie garden can be either structured or "wild." The structured prairie garden is designed so that it appears and functions like a typical perennial garden, using prairie plants. It can be an island garden within a lawn, a border along a wall, fence, or building, or as a "theme garden" with specific textures or colors, such as whites, pastels, etc. An all grass garden can also be created, taking advantage of the various heights, forms, leaf textures, and fall colors of the various prairie grasses.

The transition from the formal landscape into the prairie garden should be seamless. Prairie gardens that border a lawn should be designed with shorter-growing flowers and grasses in the foreground. An excellent plant for a transitional border between lawn and prairie is the highly ornamental grass, Prairie Dropseed. This fine-textured, emerald green grass can be planted at the forward edge of the prairie garden, one or more "rows" deep, to gradually introduce larger, bolder plants behind it. Placed 20 to 24 inches apart, in rows or curvilinear sweeps, it serves as an excellent border between formal and "wild." Prairie Dropseed is a slow-growing, long-lived, well-behaved clump-forming grass. The foliage grows about one foot tall, with seedheads that reach to three feet in August and September. The deep green foliage takes on a golden color with the first frosts of fall.

Weed Control and Maintenance

Weed Control in the Prairie Garden

The easiest method of weed control in the prairie garden is to design it so that the "plants do the work for you" by completely occupying the soil rooting zone and aboveground foliar zone. However, two to three years is required for the prairie garden to reach maturity. In the interim, weed control is essential to both the early success and long-term performance of the garden.

If permissible, the use of pre-emergent herbicides at the time of planting is invaluable in preventing germination of weed seeds lurking in the soil. Pre-emergent herbicides are required only at the time

of installation of the plants, and should be applied immediately after planting. Do not apply pre-emergent herbicides prior to installing plants, as the herbicide can find its way into the planting hole and cause "clubroot" in the transplants which can severely stunt and even kill them.

The use of mulches to prevent weeds is a great organic approach to weed control, and can be used in conjunction with pre-emergent herbicides. Apply mulch about three inches deep around new transplants. This prevents weed seed germination by depriving them of light at the soil surface, and also helps retain soil moisture. This greatly reduces weeding and watering.

Mulches composed of clean straw, grass clippings, and composted leaves are best. Cocoa bean hulls and rice hulls are also excellent mulches, and are easy to apply. However, cocoa bean hulls are toxic to some pets. Bark chips and other tree-derived mulches are not recommended. Prairie plants do not respond well to most woody mulches, as they often rob the soil of nitrogen, retain excess moisture at the soil surface, and may exude chemicals that are toxic to some plants. A light layer of shredded hardwood bark mulch can be used if no other mulches are available, but this is not generally recommended. Pine bark nuggets have been shown to severely retard the growth of many prairie plants. Never use field hay as mulch. It invariably contains high concentrations of weed seeds that can thoroughly infest your new garden.

In the second year some re-mulching may be necessary between plants in order to keep weeds down. The need for on-going mulching depends upon the plants used and their spacing. Gardens with low percentages of prairie grasses usually have more weed problems and require more mulching. If the plants were installed more than an average of one foot apart, there will likely be areas of open soil where weeds can become established. The only way to prevent weed invasion in these open areas is to re-apply pre-emergent herbicides or add a new layer of mulch every spring, or to hand-weed the garden.

In a properly designed prairie garden, the plants should be in full control of both the soil and foliar zones by the third growing season, leaving few openings for weeds to become established.

Annual Maintenance of the Prairie Garden

The prairie garden can be allowed to stand over winter to highlight the prairie grasses. This provides winter habitat and food sources for songbirds. In mid-spring, the prairie garden can either be burned off, or mowed closely to the ground and the cut material raked off to expose the soil to the warming rays of the sun. Removing the previous year's dead growth in spring tidies up the garden and promotes new plant growth.

Most prairie flowers and grasses are "warm season" plants and grow best in warm soil. To provide maximum advantage to these plants, the soil should be exposed in mid-spring to

foster their growth. Cool season weeds often become established and can present competitive problems if the previous year's plant growth is left standing. The old growth shields the soil from the sun and delays its warming up in spring, slowing the emergence and growth of the prairie plants. Burning the prairie garden in mid-spring after the cool season weeds have grown about six inches

tall (usually in mid to late April) is the best management choice for prairie gardens and meadows. Where burning is not an option, as in urban environments, the garden can be mowed to the ground in mid-spring and the cut material raked off to expose the soil to the sun.

Plant Usage List for Prairie Gardens

SELECTED SPECIMEN PLANTS

Leadplant	Amorpha canescens (small shrub)
Butterflyweed	Asclepias tuberosa
New England Aster	Aster novae-angliae
Blue False Indigo	Baptisia australis
White False Indigo	Baptisia lactea
Wild Senna	Cassia hebecarpa
New Jersey Tea	Ceanothus americanus (small shrub)
Rattlesnake Master	Eryngium yuccifolium
Tall Joe Pye Weed	Eupatorium fistulosum
Joe Pye Weed	Eupatorium maculatum
Sweet Joe Pye Weed	Eupatorium purpureum
Queen of the Prairie	Filipendula rubra
Turks Cap Lily	Lilium superbum
Orange Coneflower	Rudbeckia fulgida
Sweet Black Eyed Susan	Rudbeckia subtomentosa
Compassplant	Silphium laciniatum
Cupplant	Silphium perfoliatum
Prairie Dock	Silphium terebinthinaceum
Ohio Goldenrod	Solidago ohioensis
Tall Ironweed	Vernonia altissima
Culvers Root	Veronicastrum virginicum

FLOWERS FOR MASSING

Nodding Pink Onion	Allium cernuum	Bulb
Shootingstar	Dodecatheon meadia	Fibrous; goes dormant early Purple
Prairie Clover	Dalea purpurea	Taproot
Pale Purple Coneflower	Echinacea pallida	Taproot Purple
Coneflower	Echinacea purpurea	Fibrous
Wild Iris	Iris shrevei	Corm (bulb-like)
Blue Flag	Iris versicolor	Corm (bulb-like)

Blazingstars	Liatris spp.	Corm (bulb-like)
Wild Quinine	Parthenium integrifolium	Tap root
Penstemons	Penstemon spp.	Fibrous
Orange Coneflower	Rudbeckia fulgida	Fibrous
Stiff Goldenrod	Solidago rigida	Fibrous
Ohio Goldenrod	Solidago ohioensis	Fibrous
Spiderworts	Tradescantia spp.	Fibrous

Note: Always combine bulbs, corms, and taproots with short prairie grasses when massing.

GROUNDCOVER PLANTS THAT CREEP BY RHIZOMES

Canada Anemone	Anemone canadensis	Forms an aggressive mat
Heath Aster	Aster ericoides	Creeps slowly, forms “bush”
Stiff Coreopsis	Coreopsis palmata	Creeps slowly to forms a mat
Wild Geranium	Geranium maculatum	Prefers shade; creeps slowly
Prairie Smoke	Geum triflorum	Dry soils: creeps slowly
False Dragonhead	Physostegia virginiana	Creeps slowly but inexorably

BORDER EDGE PLANTS

Prairie Dropseed Grass	Sporobolus heterolepis

BIG BOLD PLANTS

New England Aster	Aster novae-angliae
Blue False Indigo	Baptisia australis
White False Indigo	Baptisia alba (lactea)
Pale Indian Plantain	Cacalia atriplicifolia
Wild Senna	Senna hebecarpa
Tall Joe Pye Weed	Eupatorium fistulosum
Joe Pye Weed	Eupatorium maculatum
Sweet Joe Pye Weed	Eupatorium purpureum
Compassplant	Silphium laciniatum
Cuppplant	Silphium perfoliatum
Prairie Dock	Silphium terebinthinaceum

FLOWERS FOR DRY SANDY OR GRAVELLY SOILS

Leadplant	Amorpha canescens
Butterflyweed	Asclepias tuberosa
Sky Blue Aster	Aster oolentangiensis

Heath Aster	Aster ericoides
Smooth Aster	Aster laevis
Cream False Indigo	Baptisia bracteata
Poppy Mallow	Callirhoe triangulata
Harebell	Campanula rotundifolia
New Jersey Tea	Ceanothus americanus
Lanceleaf Coreopsis	Coreopsis lanceolata
Purple Prairie Clover	Dalea purpurea
Pale Purple Coneflower	Echinacea pallida
Prairie Smoke	Geum triflorum
Western Sunflower	Helianthus occidentalis
Rough Blazingstar	Liatris aspera
Lupine	Lupinus perennis
Wild Petunia	Ruellia humilis
Stiff Goldenrod	Solidago rigida
Showy Goldenrod	Solidago speciosa
Spiderworts	Tradescantia spp.

GRASSES FOR DRY SANDY OR GRAVELLY SOILS

Side Oats Grama	Bouteloua curtipendula
Little Bluestem	Schizachyrium scoparium
Prairie Dropseed	Sporobolus heterolepis

FLOWERS FOR CLAY SOILS

Nodding Pink Onion	Allium cernuum
New England Aster	Aster novae angliae
Blue False Indigo	Baptisia australis
White False Indigo	Baptisia lactea
Wild Senna	Cassia hebecarpa
Shootingstar	Dodecatheon meadia
Pale Purple Coneflower	Echinacea pallida
Purple Coneflower	Echinacea purpurea
Rattlesnake Master	Eryngium yuccifolium
Prairie Blazingstar	Liatris pycnostachya
Wild Quinine	Parthenium integrifolium
Smooth Penstemon	Penstemon digitalis
Yellow Coneflower	Ratibida pinnata
Orange Coneflower	Rudbeckia fulgida

Sweet Black Eyed Susan	Rudbeckia subtomentosa
Royal Catchfly	Silene regia
Compass Plant	Silphium laciniatum
Prairie Dock	Silphium terebinthinaceum
Ohio Goldenrod	Silphium ohioensis
Stiff Goldenrod	Solidago rigida
Culvers Root	Veronicastrum virginicum

GRASSES FOR CLAY

Big Bluestem	Andropogon gerardi	(sod-forming and aggressive by seed)
Switchgrass	Panicum virgatum	(sod-forming and aggressive by seed)
Indiangrass	Sorghastrum nutans	(can be aggressive by seed)

FLOWERS FOR MOIST SOILS

Nodding Pink Onion	Allium cernuum
Red Milkweed	Asclepias incarnata
White Turtlehead	Chelone glabra
Tall Joe Pye Weed	Eupatorium fistulosum
Joe Pye Weed	Eupatorium maculatum
Queen of the Prairie	Filipendula rubra
Bottle Gentian	Gentiana andrewsii
Dogtooth Daisy	Helenium autumnale
Wild Iris	Iris shrevei
Blue Flag Iris	Iris versicolor
Prairie Blazingstar	Liatris pycnostachya
Dense Blazingstar	Liatris spicata
Turks Cap Lily	Lilium superbum
Cardinal Flower	Lobelia cardinalis
Great Blue Lobelia	Lobelia siphilitica
False Dragonhead	Physostegia virginiana
Sweet Black Eyed Susan	Rudbeckia subtomentosa
Prairie Dock	Silphium terebinthinaceum
Cupplant	Silphium perfoliatum
Ohio Goldenrod	Solidago ohioensis
Steeplebush	Spiraea tomentosa (small shrub)
Tall Ironweed	Vernonia altissima
Ironweed	Vernonia fasciculata
Culvers Root	Veronicastrum virginicum

PRAIRIE GRASSES FOR MOIST SOILS

Vanilla Sweetgrass	Hierochloe odorata	
Switchgrass	Panicum virgatum	(sod-forming and aggressive by seed)
Prairie Cordgrass	Spartina pectinata	(aggressive by rhizomes)

Conclusion

The American Prairie is a dynamic, yet stable ecosystem that serves as an excellent natural model for creating attractive, ecologically sustainable prairie gardens. An incredible variety of compelling garden designs can be created by selecting the species that are best adapted to your soil and growing conditions, and combining plants in the proper proportions. With careful attention to design, establishment, and management, these adaptable plants can be used to one can create beautiful low maintenance prairie gardens that create an abundance of habitat for birds, butterflies, and other wildlife.