

# The Prairie Garden

a step-by-step guide to creating a  
shortgrass prairie garden

by Rick Brune

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Courtesy of  
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# Contents

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|                                                          |           |
|----------------------------------------------------------|-----------|
| <b>Introduction.....</b>                                 | <b>1</b>  |
| <b>Getting Started .....</b>                             | <b>3</b>  |
| Weed Control.....                                        | 3         |
| Prairie Placement .....                                  | 5         |
| Watering .....                                           | 5         |
| <b>Plant Selection .....</b>                             | <b>6</b>  |
| <b>Planting Grasses .....</b>                            | <b>7</b>  |
| Soil Preparation .....                                   | 7         |
| Seeding Rates .....                                      | 7         |
| Planting Buffalograss .....                              | 8         |
| Planting Blue Grama .....                                | 8         |
| Seed/Soil Contact .....                                  | 9         |
| Other Grass Species .....                                | 9         |
| Watering .....                                           | 10        |
| Weeding .....                                            | 11        |
| <b>Planting Wildflowers .....</b>                        | <b>12</b> |
| Wildflower Sources.....                                  | 12        |
| Method 1: Unknown, Moderate, or Severe Weed Problem..... | 13        |
| Method 2: Minimal Weeds .....                            | 13        |
| Planting .....                                           | 13        |
| Direct Seeding.....                                      | 14        |
| Transplanting .....                                      | 15        |
| Watering and Plant Establishment .....                   | 15        |
| Suggested Wildflower Species.....                        | 16        |
| Notes on potential problem species .....                 | 18        |
| <b>Maintenance.....</b>                                  | <b>19</b> |
| Grazing (mowing).....                                    | 19        |
| Fertilizing .....                                        | 20        |
| Watering .....                                           | 21        |
| Trampling.....                                           | 21        |
| Pruning .....                                            | 21        |
| Weeding .....                                            | 21        |
| Fire .....                                               | 23        |
| Recordkeeping .....                                      | 23        |
| <b>Little Bluestem in the Landscape .....</b>            | <b>24</b> |
| <b>Selected readings and references.....</b>             | <b>26</b> |

# Introduction

Viewing the lawns of exotic grasses (Kentucky bluegrass, fine fescue, perennial rye, etc.) surrounding us, it is easy to forget that our cities, suburbs, and lawns east of the foothills were once attractive prairies. Today, the prairie remains an appropriate landscape element. Using our imagination, and depending on circumstances, a little or a lot of work (really a labor of love), we can create a landscape resembling that lost prairie. Once established, our homegrown prairie will result in a great reduction in mowing, fertilizing, and watering, while providing many enjoyable hours of investigation and observation.

Although there is controversy about whether shortgrass prairie is a climax ecosystem or a disclimax caused by overgrazing, this plant community is very appropriate to try to recreate here. Seed availability makes the creation of either a blue grama-buffalograss prairie (*Bouteloua gracilis*–*Buchloë dactyloides*\* Shortgrass Prairie is the formal plant association) or a blue grama prairie the most practicable. These two prairie types are named for the dominant plants that give them their overall character. Both are well adapted to most eastern Colorado soils except aeolian (wind-deposited) sand or gravelly or very rocky

soils. (Note: You may see buffalograss listed in current sources as *Bouteloua dactyloides*.)

Blue grama and buffalograss are easily seeded into realistic-looking prairies. These shorter grasses fill in quickly and suppress weed growth. Many species of wildflowers grow very well in this shortgrass environment.

Dozens of other prairie types occur in Colorado. Some, such as tallgrass prairies, climax sandhills prairies, and loess prairies, are on the verge of extirpation here. Most of these other prairies contain attractive taller elements which conservative Colorado neighborhoods may not be ready to accept. Use them in smaller areas at first. There is always, for example, that too-big vegetable garden, part of which could become a tallgrass prairie project! Tallgrass prairie plantings are now increasingly popular landscape elements in yards of the Midwest—so with time perhaps there's hope here as well.

Depending on our sense of perfection, tallgrass prairie species (for example, big bluestem, *Andropogon gerardii*, and Indiangrass, *Sorghastrum nutans*) need to be set out as individual plants if we want to grow them in small areas in realistic climax-approximating densities. The spaces between individual tallgrass plants are open to weeds for several years until the grasses mature and shade the ground. At this stage, a tallgrass prairie is probably more resistant to weeds than a shortgrass prairie. The elegant beauty of the tallgrasses and their attractive fall foliage should earn them a place in every garden.

Prairies dominated by mid-grasses (about knee-high) usually have large quantities of needle grasses such as needle-and-thread (*Stipa comata*). The very sharp seeds of the



Pronghorn panorama at Pawnee National Grassland. Dense stands of white-stem evening primrose (*Oenothera albicaulis*) are indicative of disturbance, such as an overgrazed prairie.

Stipas greatly reduce their desirability in the prairie garden if the gardener enjoys walking barefoot in the grass in late spring. Later in the year, the sharp pointed seeds will have buried themselves in the grass and will no longer be a problem. Stipas are still a desirable addition, however. Try some New Mexico feathergrass (*Stipa neomexicana*), with its long, plumose awns.

The prairie garden is only one imaginative step away from planting a buffalograss and/or blue grama lawn. Detractors of buffalograss lawns complain that this species doesn't stay 'green' year-round. Neither does the prairie garden. However, many of these same detractors live in a temperate climate because they enjoy the other changes the seasons bring—fall colors in leaves, spring bulbs, skiing, etc. Our prairie landscape doesn't just turn brown in fall and winter. It becomes every warm and cheerful shade of yellow, gold, bronze, maroon, purple, and red.

In short, a golden winter prairie provides a mental lift during winter that you can't get from a dingy-green traditional lawn. On wintry nights, your tawny prairie will glow among the dark holes of neighboring yards.

Our homegrown prairie will never be a true replica of the real prairie. John Weaver, in *North American Prairie* (1954), states that:

“Climax prairie is the outcome of thousands of years of sorting out of species and adaptations to the soil and climate. The vegetation represents not only an evaluation of the present environmental conditions but also those of the past. It is exceedingly complex and remarkably stable.”



*Rick Brune in his recreated tallgrass prairie.*

When we plant our prairie, we can take advantage of some of those thousands of years of sorting out, but we can't recreate the vegetative history in the soil, climate, and plants, or the effects of herbivores and carnivores, large and small, that are part of the real prairie. It's infinitely better to preserve existing prairie than to try to recreate it.

What can we expect from our homegrown prairie? Certainly expect the frustrations of weeding that are part of any new garden, but also expect the satisfaction of watching weeds succumb to the vigor of prairie plants. Expect the disappointment of seeing your hard-earned seedlings damp off, but also the thrill of coming home from an evening stroll to the fragrance of the evening-blooming sand verbena (*Abronia fragrans*) permeating your house and yard. We will anxiously wait three years for the first spectacular bloom on our bush morning-glory (*Ipomoea leptophylla*) and wonder why we only planted one. We will learn that there are hundreds of prairie plants we can use in the landscape, each fascinating in its own right. **Most important**, we will be educating people to appreciate and conserve the Colorado native flora.

# Getting Started

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Nearly all seed companies now offer some sort of enticing “wildflower” mix in a can, bag, etc. The implication is that you simply sow the mixture, and your weed problem magically becomes a beautiful wildflower meadow.

**Review the species list carefully, making certain it includes only native prairie species.** Unless you’re careful, you will get a flower display containing anything but prairie species. You won’t get a prairie.

In the natural world, prairies revegetate disturbed sites such as abandoned roads, fields, and prairie dog towns in a fairly well prescribed succession. The earliest successional stage is characterized by the dominance of annual species such as six-weeks fescue (*Vulpia octoflora*), white-stem evening primrose (*Oenothera albicaulis*), common pigweed (*Chenopodium album*), and exotic weeds such as Russian-thistle (*Salsola kali*) and cheatgrass (*Bromus tectorum*). This stage is followed by stages with longer-lived species such as sand dropseed (*Sporobolus cryptandrus*), Indian ricegrass (*Oryzopsis hymenoides*), bahia (*Bahia oppositifolia*), and evening star (*Mentzelia nuda*). Later stages have long-lived plants including blue grama (*Bouteloua gracilis*), big bluestem (*Andropogon gerardii*), leadplant (*Amorpha canescens*), prairie coneflower (*Ratibida columnifera*), white penstemon (*Penstemon albidus*) and copper mallow (*Sphaeralcea coccinea*). The longer-lived plants can appear at any successional stage but become prominent in later stages.

The rate at which succession proceeds depends on many factors. The length of time a site is disturbed by activities such as plowing influences the rate of succession. Prairie species can survive as seeds and plants in plowed fields for several years. A field plowed for only a year will revert to prairie more quickly

than one plowed for ten years. Sites where all vegetation is effectively destroyed will move toward a late succession stage at a rate highly influenced by the proximity of a native seed source upwind and by the amount of rainfall. A potential prairie site downwind from an area like Denver, where essentially all native prairie vegetation has been destroyed, may require decades if not centuries to advance beyond all but the earliest successional stages. With average rainfall, succession may proceed quite slowly because periods of drought will kill many seedling perennial plants. Above average rainfall will greatly speed succession and enhance plant establishment.

Although some gardeners may find growing plants of the different successional stages interesting, most of our neighbors will not. The goal with our prairie garden is to end up with a planting resembling a climax prairie, not a weed field. Note, however, that planting large amounts of early successional species with a light seeding of the climax species is used successfully in the Midwest. This is a viable, and probably necessary, approach to successful large-scale restorations.

## Weed Control

The thrill of growing thousands of wildflowers in your own prairie is increased many-fold by one thing— CONTROLLING THE WEEDS FIRST! Nothing else you do will increase your chance of success as much. If you have weeds in your yard and you rototill them under and plant a prairie, you will grow a superior weed crop and, very likely, no prairie. Remember, you will never again be able to use any broadcast herbicides on your yard without disastrous consequences for your wildflowers. Controlling the weeds first is the most important advice I can give to ensure success. (Sometimes I regret not

following my own best advice.) If you really do have a weed-free turf except for a few dandelions, consider renting a sod cutter and removing the sod. Be sure you remove all bluegrass rhizomes and be especially sure you are not leaving any quackgrass (*Agropyron repens*) rhizomes. Both will cause havoc in your prairie. The resulting surface can be immediately rototilled and planted with generally weed-free results. If you are less than positive about remaining rhizomes, water and wait two weeks to see if any grasses sprout, then dig them out.

Starting with bare soil of unknown weed seed content, a few sessions of watering to germinate seeds, followed by hoeing or tilling, will provide some control. It will also give an indication of the severity of your weed problem. Pay particular attention to the presence of bindweed (*Convolvulus arvensis*), Canada thistle (*Cirsium arvense*), and perennial grasses. Control them before planting.

If you are working with less than a golf-green quality setting, with the usual contingent of weeds and a little bindweed and thistle here and there, the following procedure works well but requires the use of a glyphosate herbicide, such as the commercially available Roundup®.\* Spray the area to be planted with herbicide following the label directions. This will kill bluegrass, quackgrass, and other common turf grasses and damage, but probably not kill, bindweed and thistle.

Weekly during the rest of the growing season, religiously chase down and spray or dig every sprout of anything green that appears. It is *especially important* that every growing weed be sprayed about two weeks before the first frost. At this time the weeds are most actively transporting nutrients (and herbicides) to all underground parts. The result is effective control. At the end of the summer, if it hardly seems worth the effort to mix an ounce of Roundup to spray a few weeds, you are on your

way to success. However, if you are still lugging around a two-gallon sprayer, plan on another year of weed control before you plant.

Do not be tempted to use soil sterilants to kill your crop of weed seeds. It is difficult to predict the persistence of sterilants in the soil, and they can cause trouble for years afterward. They also kill or damage distant plants whose roots extend into the treated area—far beyond the drip-line of the tree. Don't use pre-emergent weed killers either.

It is not necessary to use herbicides to kill pernicious weeds such as bindweed. They can be controlled by almost constant tilling. However, the time needed to exhaust the root system may be as long as three years.

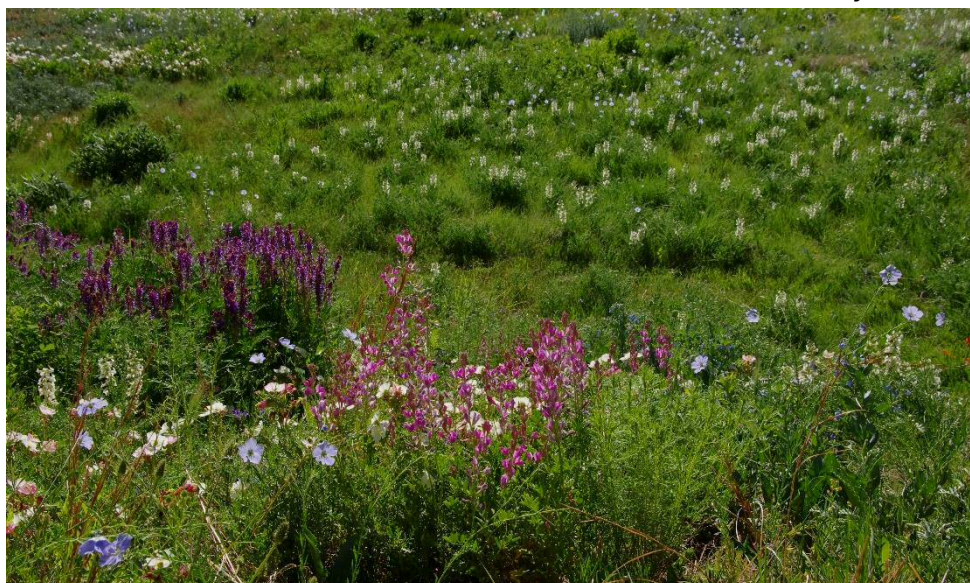
I began my prairie planting in 1987 by spraying a weedy, bluegrass lawn with glyphosate. Today, 37 years later, the worst weeds are Kentucky bluegrass and bindweed. They were present at the beginning. Bluegrass, a cool season grass, gets a head-start by beginning growth before the native, warm season grasses.

\* There is wide difference of opinion on the desirability of herbicide use. Each project or planting should be carefully evaluated to assess the need for herbicides. Tradenames are provided here for reference only. No endorsement of products is implied.

## Prairie Placement

While pondering your weed problem, think about the size and placement of your prairie. Shade is not part of the native prairie. A prairie garden will not succeed if sun is not available nearly all day. In my experience, two or three hours of shade at mid-day will prevent the development of stolons by buffalograss.

Native prairies are spacious ecosystems that flow away from the observer to the distant horizons. For visual effect and the enjoyment of wandering around your homegrown prairie, plan it as big as your yard, enthusiasm, energy, and spouse allow. *Any size* prairie you plant will be rewarding and educational.



View of author's backyard featuring milkvetch (*Astragalus biculcatus*), sweetvetch (*Hedysarum boreale*), blue flax (*Linum lewisii*), sophora (*Vexibia sericea*), and others in bloom.

## Watering

Watering required to establish a prairie is initially no different than that required for any lawn grass. Therefore, carefully consider how large an area you can water before starting your prairie project. An installment-type planting is probably best if planting a large area. You will also have time to learn what works best for your situation. You can apply your hard-earned knowledge to future plantings. Annually

planting a plot which can be watered by two oscillating sprinklers (about 1000 to 1200 sq ft) provides ample challenge if your site is at all weedy.

With your prairie in the planning stage and while you are CONTROLLING THE WEEDS, look carefully at a natural shortgrass prairie to see how it is put together botanically. A good prairie to study is one that lacks exotic species such as cheatgrasses (*Bromus* spp.), Russian-thistle (*Salsola* spp.), Russian knapweed (*Centaurea repens*), or crested wheatgrass (*Agropyron cristatum*). Most species should be long-lived perennials such as milkvetch (*Astragalus* spp.), shrubby buckwheat (*Eriogonum effusum*),

prairie coneflower, and copper mallow. There should be few early successional natives such as six-weeks fescue, Indian ricegrass, or snakeweed (*Gutierrezia sarothrae*). In a healthy prairie, plants will not be growing on small soil pedestals above ground level, a situation which indicates active soil erosion.

For designing your own prairie, observe characteristics such as

- which plants form colonies or
- which grow seemingly at random;
- which plants associate with certain other plants;
- preferred slopes (upper, middle, lower);
- preferred aspect, or exposure (N, S, E, W);
- soil types (sandy, clay, rocky).

# Plant Selection

What should a prairie re-creation look like? I know of no good definitive description of eastern Colorado prior to settlement. Descriptions in early journals need to be viewed in the context of the authors' previous experiences. For example, early westbound travelers described the lush tallgrass prairies of the Midwest as barren and unsuitable for use—because they lacked trees! How they would describe eastern Colorado isn't hard to imagine. Other people marveled at the numbers and beauty of prairie wildflowers.

Serious prairie research began about 1920. Unfortunately, much of the prairie in Colorado was described as overgrazed as long ago as the 1880s. Most of these studies ignore the diversity of prairie types in Colorado and lump everything under “shortgrass plains.”



*Geyer's larkspur (Delphinium geyeri) is a bright addition.*

Bill Baker (1984) published a bibliography of all the literature describing the natural vegetation of Colorado. The bibliography describes many diverse types of prairies and also reveals that few published articles quantitatively describe pure prairie types in eastern Colorado.

Species densities are nonexistent except for a few of the most common plants.

Although a species is often essentially the same in appearance over its entire range, genetically it can be quite different. Genetic differences associated with geographical distributions may show themselves as lack of hardiness. For example, seeds of a species that grows in New Mexico may not produce plants hardy in Colorado even though the same species grows here.



*Blue grama (Bouteloua gracilis) will be a major component of the prairie garden.*

Likewise, species growing widely different elevations, on different soil types, or under different moisture conditions may not thrive when any of these conditions are drastically changed. For maximum hardiness in the prairie garden, local genotypes should be grown. Indeed, there is serious concern that the mixing of genotypes now occurring when species from widely separated areas are grown may be reducing the genetic variation that is so important for species' survival.

# Planting Grasses

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Planting a shortgrass prairie garden involves two basic types of planting: broadcast seeding of native grasses in high density plantings, and planting wildflowers and shrubs in lower densities as individual specimens. This section deals with establishing the dominant grasses, blue grama (*Bouteloua gracilis*) and buffalograss (*Buchloë dactyloides*), with perhaps a lighter seeding of other species, such as wallflower (*Erysimum asperum*) and tansy aster (*Machaeranthera tanacetifolia*).

The next section discusses the pros and cons of different methods for planting wildflowers including planting wildflowers at the same time as the grasses. I suggest you consider waiting one year after planting grass before planting wildflowers. This allows more options for weed control.

## Planting Time

Prairie grass seeds may be sown in spring or fall. The main advantage to fall planting is that the seed will germinate at the earliest possible date, and you can thus take advantage of early spring moisture. Because we will provide supplemental watering, this is less important. The disadvantage to fall planting is that the seed is left out over winter to be eaten or washed or blown away. Also, cool-season weeds may germinate before warm-season grasses

In my experience, spring planting from about May 1 to early June works very well. Planting after mid-June during very hot weather may result in poor germination. Prairie seed germinating during hot weather just before the onset of summer drought is unlikely to survive. Most such seed was probably removed from the gene pool long ago through natural selection. Spring planting also provides one more opportunity for weed control.

## Soil Preparation

Rototilling the site is the only soil preparation required. Unlike turf grasses, prairie grasses establish best on a lumpy seed bed. Lots of one-inch lumps are great. Just level the seed bed after tilling. I do not recommend adding any soil amendments or fertilizer. Blue grama shows a negative response to nitrogen. Because it is a very immobile element in alkaline soil, most of our yards probably still contain enough phosphorus to be mined. Potassium deficiencies are rare in Colorado.

## Seeding Rates

Buffalograss lawns are seeded at rates of 2 to 5 lbs/1000 sq ft for cover in one year. Blue grama seed is much lighter and produces a thick turf at rates of 1 lb/1000 sq ft or more. At rates of 0.5 lbs/1000 sq ft or less, it gives more of a bunchgrass appearance.

In a shortgrass prairie, blue grama is usually more abundant than buffalograss. A typical ratio is about 6:1. Planting 0.5 lbs blue grama and 1 lb buffalograss per 1000 sq ft gives a ratio around 18:1. This is accurate enough for our purposes and produces a turf thick enough to exclude most weeds the second year, if not the first.

If you expect a serious weed problem, plant 1 lb of each per 1000 sq ft. This will produce a nice lawn if you don't proceed with your prairie garden. You may want to sow only blue grama in some areas and only buffalograss in others for different effects. By planting only blue grama in a two-foot border around your prairie garden, you can create a neat edge free of advancing buffalograss stolons.

If you purchase rather than collect your seed, try to get local genotypes or at least avoid cultivars selected for their unusual height, vigor, etc. Unfortunately, most selections don't look like the native species you see in the field. Collections labeled "native" are usually harvested from the wild but may contain some weeds. If you are lucky, they may also contain some pleasant surprises. You may wish to contact your SCS (NRCS) office for information on cultivated varieties of native grasses. Grass varieties are often selected for "leafiness" in addition to selecting the correct genotype for the location (Alderson and Sharp, 1995). Leafiness usually implies it produces more forage for domestic animals. These varieties may appear more robust than what grows naturally.

My first attempt planting a tallgrass prairie included Blackwell switchgrass (*Panicum virgatum*) in the grass mix. This is a more aggressive form of switchgrass. The result was switchgrass and nothing else. There were enough bales of switchgrass to fill my truck. Sally White and I decided to take it up to the Denver Mountain Parks bison pasture on Genesee Mountain. The bison should be delighted to feast on this native hay. No—they preferred their alfalfa pellets and used the switchgrass to lie on!



*Improved varieties like this Blackwell switchgrass (Panicum virgatum), are often selected for volume of forage produced and may be too aggressive for the prairie garden.*

A good way to ensure uniform seed coverage when hand-seeding small areas is to divide the seed into quarters, then sow each quarter over the whole area. You can also mix the seed with sand to have more bulk to spread around.

## Planting Buffalograss

Buffalograss should be planted 0.5 to 0.75 inches deep. I plant buffalograss by making furrows about one inch deep and 6 to 12 inches apart, then broadcasting the seed and raking it in across the furrows. This ensures that much of the seed is buried deeper than you get it by just raking it in. Any appearance of planting in rows will quickly disappear.

Buffalograss seed treated with potassium nitrate, recognizable by its blue-green color, germinates in 7 to 10 days. Untreated seed germinates over a period of 3 years. Use treated seed.

If I was doing this again, I would try to collect native buffalograss plants and/or seeds and increase them through propagation until plugs could be transplanted into the prairie. I have two genotypes of buffalograss: Sharp's Improved and a native collection. They look very different.



*Colorful flowers of male buffalograss (Buchloe dactyloides) plants stand above the foliage, but*



*... female flowers nestle in the crown of the plant.*

## Planting Blue Grama

Although blue grama can be planted almost as deep as buffalograss, I get excellent germination and coverage by broadcasting it over the area just seeded with buffalograss. Rake it in also. Germination requires four to five days.

It is difficult to collect adequate blue grama seeds by hand for planting. I haven't tried growing native clumps and dividing them. Blue grama doesn't spread like buffalograss so it would require many more plants.

## Seed/Soil Contact

After sowing and raking in the grass seed, roll the area with a lawn roller if possible. Light compaction will improve germination by providing good seed-to-soil contact and moisture absorption. You don't need to put two hundred pounds of water in the roller to be effective. An empty roller is heavy enough.

## Other Grass Species

Lightly seeding other shortgrass species will add variety but is not necessary. I recommend initially planting only warm-season grasses to maintain a uniform appearance. This also makes it easier to spot cool-season weeds such as quackgrass (*Agropyron repens*) and bluegrass (*Poa pratensis*).

Sideoats grama (*Bouteloua curtipendula*) is an attractive warm-season mid-grass growing about two feet tall in shortgrass prairies. Consider sowing 0.5 ounces/1000 sq ft in a few streaks or open patches when you seed the buffalograss. Seed can also be sown in pots and transplanted.

Western wheatgrass (*Agropyron smithii*) is an important cool-season mid-grass in shortgrass prairie. It is the dominant grass in the Western Wheatgrass Mixed Prairie. It may grow dense

enough to exclude nearly all other species. Its close relative, quackgrass, is a vigorous and noxious lawn and garden weed that is familiar to many people. Spreading by rhizomes, western wheatgrass, like quackgrass, may not be appropriate for small areas. See notes on problem species, page 19.

As a cool-season grass, western wheatgrass begins growth when warm-season species are still dormant. In dry years, it may consume all available soil moisture before warm-season species begin growth. During the 1930s drought, it replaced huge areas of tallgrass prairie by beginning growth early and consuming all winter moisture. With all available moisture used by wheatgrass, none remained during summer drought for warm-season species like big bluestem (*Andropogon gerardii*) and Indiangrass (*Sorghastrum nutans*).

Wheatgrass grows poorly during hot weather. With moisture at this time, warm-season species can compete. Its growth is also retarded by fire when warm-season plants are dormant. Due to its vigor and invasiveness, I recommend avoiding western wheatgrass in prairie plantings smaller than several acres—at least initially.

For example, Jim Borland's buffalograss/wildflower planting, which contained a seemingly innocuous amount of western wheatgrass, was taken over by wheatgrass even though no supplemental watering was applied. With wheatgrasses present, an unmowed prairie garden or lawn may not meet some weed control ordinances restricting the height of unmowed grass.

Other common grasses in shortgrass prairie include galleta (*Hilaria jamesii*), alkali sacaton (*Sporobolus airoides*), and needle-and-thread (*Stipa comata*).

## Watering

Most seedlings of perennial prairie species succumb to drought. The degree of revegetative success on bare soil is probably determined more by rainfall than anything else.

Although we are planting drought-tolerant species, their successful establishment requires above average rainfall, which we must supply by watering. Establishing a good cover of blue grama and buffalograss initially requires the same watering as a bluegrass lawn.

If your grass doesn't seem to be growing very fast, don't worry. Prairie species devote their energy to establishing a good root system before putting energy into top growth. Next year these roots will allow abundant top-growth. Try not to mow the grass while it is growing during the first year. It is the leaves that are the food factory for developing roots.



*Blazing star, or gayfeather, makes a colorful late summer display.*

*Liatris punctata is the common prairie species of gayfeather on the plains of Colorado. It's an excellent plant for pollinators.*

Prairie grass seed must be kept constantly moist for the first three weeks. This may require watering several times per day, especially during hot, windy weather. After three weeks watering can be reduced to every two or three days. Avoid water stress as indicated by inrolled leaves and a grey appearance, or wilting. Eventually reduce watering to one deep watering per week to promote a deep root system and good drought resistance.



## Weeding

With grasses at the 3 to 4 leaf stage, the prairie garden can be walked upon for hand weeding. Moistening the soil first may be necessary in order to pull weeds without also pulling up chunks of soil and grass. Large weeds are best cut off below soil level with a sharp knife. Water after hand-weeding to resettle loosened plants.

If hand-weeding appears hopeless, mowing at the height of the grass will reduce weed competition. Prostrate species such as knotweed (*Polygonum aviculare*) and portulaca (*Portulaca oleracea*) are little affected by mowing. Both will smother large areas of grass if not controlled.

When physical control of weeds is impossible, broad-leaved herbicides containing 2,4-D, such as Weed-B-Gon, can be sprayed very lightly when grass plants have three or more

leaves. Use extreme care NOT to spray to the point of run-off. This is mainly effective against seedlings and will have little impact on larger plants of knotweed, portulaca, mallow (*Malva neglecta*), bindweed (*Convolvulus arvensis*), or thistle (*Cirsium* sp.). Bindweed and thistle can be controlled by Roundup®, recognizing that you will have bare spots where you spray. Protect grasses and other plants with several layers of newspaper or cardboard as much as possible when using Roundup®.

Do not let bindweed grow uncontrolled. Even if you can only pull it by hand, it's better than nothing. Don't use herbicides containing Banvel® or Dicamba because of their persistence in the soil.

Above all, look forward to next year when, believe it or not, most of the annual weeds will disappear, and the grasses will flourish in your evolving prairie.

# Planting Wildflowers

Diverse, healthy prairies may contain fifteen or more species per square yard. We are often not aware of this diversity because all of the species do not bloom or even grow at the same time. To recreate this variety in a prairie garden would require considerable time and numerous plants. However, the effect of a prairie can be achieved in a few years if we first concentrate on planting the showiest wildflowers and those that reproduce readily by seed or rhizomes.

## Wildflower Sources

Visiting a wildflower-laden prairie will result in a long 'wish-list' of species you want to plant. Because many of these will not be available commercially, you will need to grow many of your own. *It is not the purpose of a prairie garden to create one prairie by digging up and destroying another.* Besides, except for a few rhizomatous species, few prairie plants can be successfully transplanted. Anyone wanting to attempt transplanting will find plenty of 'FOR SALE' signs indicating areas of future development where all remaining prairie species will soon be bulldozed. Conducting salvage in such areas, with permission, will provide appropriate opportunities for spending your energy on transplanting experiments.

Collecting your own seed is another option. Many prairie wildflowers have a notorious tendency to become all but invisible when not in bloom. You will be hard-pressed, for example, to find one plant of Nuttall's violet (*Viola nuttallii*) in seed on a site where you saw hundreds of them in bloom a few weeks earlier. Other species, such as gayfeather (*Liatris punctata*), are conspicuous in seed.

Labeling potential seed plants with stakes tall enough that you can relocate them (but

vandals can't) is another possibility. I once used 12-inch-tall labels on dozens of potential seed plants, but I couldn't relocate *any* of them after the grasses grew up. The stakes showed up later after the grasses were flattened by rain or snow, but the seeds were long since dispersed. Visiting your potential seed plants at least weekly is the best way to keep track of them and ensures your presence when the seeds are ready. An added bonus is that you can observe the plant throughout its season and learn to identify it when it is not in flower, which is very rewarding. Few of us need even that much incentive to take a hike!

Several approaches to planting wildflowers in your prairie are possible. Except for a few short-lived species such as gaillardia (*Gaillardia pinnatifida*) and tansy aster (*Machaeranthera tanacetifolia*) that produce abundant seed, it is a waste of your hard-earned seed to broadcast it along with the grass seed. I usually start wildflower seed in pots or protected rows in the ground to get the maximum number of seedlings by controlling watering, temperature, and weeds. Protect rows with a cover of hardware cloth to keep out rabbits, squirrels, raccoons, and other critters.



*Golden Banner (Thermopsis rhombifolia): Some rhizomatous species can become problems, outcompeting other wildflowers.*

The following planting methods and combinations thereof work well for small prairie recreations.

### **Method 1: Unknown, Moderate, or Severe Weed Problem**

If weeds may be a problem, spending a year on weed control after planting grasses and before planting wildflowers will be most rewarding. The second year, prairie grasses will crowd out most annual weeds, allowing you to concentrate on adding wildflowers and shrubs. The main disadvantages of this method are that it requires watering many individual wildflower plants, and that competition for light and moisture is intense.

When planting during the second and later years, first use all of the available bare areas where weeds prevented the establishment of grasses in earlier years. Bare areas six inches or more in diameter will allow plants to get established rapidly with minimal competition from existing grasses. Clipping grasses within a 12-inch circle to one inch in height will help reduce competition for light. Most bare areas this size will fill in with grasses by the end of the second year. During this period, I sometimes find it helpful to remove encroaching buffalograss stolons from areas where wildflowers are planted.

Eventually blue grama and buffalograss will form a thick sod that is extremely difficult to plant in. When this happens, use a narrow spade to remove plugs of sod about six inches in diameter and six inches deep to provide a space to plant. Replace this soil with similar soil from elsewhere in your yard. Do not add compost, peat, or fertilizer—doing so will produce a lush, fast-growing plant lacking hardiness. A few species don't grow well in heavy clay. For them I amend some soil with 50% or more (by volume) 3/4-inch top-size

gravel. This works well for bush morning-glories if amended to a depth of about three feet.

### **Method 2: Minimal Weeds**

With minimal weed problems, planting as many wildflowers as possible when you seed the grasses will produce the quickest bloom on your prairie. The big advantages to this method are that everything can be watered at once, and competition from grass is initially low. The disadvantage is that your only weed control option will be hand-weeding. It is possible to mow weeds above the height of the wildflowers, but if you have enough weeds to require mowing, your wildflowers may be getting crowded out.

Using this method, wildflower plants are placed in the ground after the area is seeded with grass and rolled but before any watering is done. Don't worry about walking on the newly seeded area to plant but try not to stir up the seedbed except where you plant. If grass doesn't germinate within a three- or four-inch radius of your plant, that's great. It will quickly fill in and the wildflower will have less competition in the meantime.

Because grasses provide so much initial competition, eliminating grass seed from the area of a new plant will speed establishment. Before seeding grasses, try laying out 6-inch diameter pieces of cardboard or the bottoms of tin cans to keep broadcast grass seed off selected areas of soil. After rolling the seedbed, remove these covers as you plant the wildflowers in seed-free soil.

### **Planting**

Our experiences with flower and vegetable gardens teach us to set out plants when they reach a nice size in 2 1/4-inch pots, 6-packs, etc. For years I grew wildflowers and transplanted the seedlings to pots, let them

grow another six weeks or so, then finally planted them in the garden. Why? From habit! This habit, I am discovering, wastes a lot of time and energy. The reason we transplant our tomatoes, peppers, and others is that they are frost-sensitive plants with long growing seasons. We protect them and lengthen their growing season by keeping them indoors in larger and larger pots. Natives apparently don't need this babying and, of course, why should they?

Native prairie species can be transplanted directly from the seed flat or row to the garden when quite small if kept watered. Gayfeather (*Liatris punctata*) transplants directly while still at the cotyledon-leaf stage with nearly 100% survival. White-flowered penstemon (*Penstemon albidus*) and narrow-leaved penstemon (*P. angustifolius*) can be directly transplanted when they have two pairs of stem leaves. Prairie coneflower (*Ratibida columnifera*), evening-primrose (*Oenothera caespitosa*), Easter daisy (*Townsendia exscapa* and *T. grandiflora*), spreading wild buckwheat (*Eriogonum effusum*), and others also can be directly transplanted to the garden without problems.

Direct transplanting offers other advantages in addition to saving labor. Many prairie species have deep, relatively straight taproots. When grown in a pot, this taproot becomes coiled like a spring. After planting, forces induced by freezing and thawing can uncoil the taproot, allowing the plant to be frost-heaved from the ground. By directly transplanting, the taproot grows as a straight anchor into the soil and heaving is nearly eliminated.

Direct transplanting also means plants get into the ground earlier and become drought tolerant sooner. They also get the advantage of early spring moisture. If necessary, I insert a 1-inch-wide by 12-inch-long piece of cedar shingle next to the plant and incline it slightly to provide a bit of sun and hail protection.

## Direct Seeding

Although broadcast seeding of wildflower seed may be wasteful, direct seeding of appropriately scarified or stratified seed is not. Try planting labeled groups of several seeds based on expected germination rates. This works especially well when weed problems are minimal (Method 2). For example, planting scarified seed of groundplum (*Astragalus crassicaarpus*) in groups of two or three with three inches between seeds will usually result in at least one healthy plant. Drummond's milkvetch (*Astragalus drummondii*) doesn't survive for me when transplanted, but with direct seeding about two out of three seeds produce plants. Silky sophora (*Sophora sericea*, now *Vexibia nuttalliana*) produces a plant from nearly every seed. Slim-flowered scurfpea (*Psoralea tenuiflora*) also establishes well this way. Direct seeding works best with larger seeds, especially legumes, that have high germination rates. Very small seeds may require thinning, and this may result in wasted seedlings.

With very small seed, such as western wallflower (*Erysimum asperum*), try planting very small pinches of seeds in fall or late winter. Lightly drag your finger shallowly through the soil for an inch or two to spread the seed. Then give the area a solid whack with your hand to keep the seeds in place (at least for a while). My pinch of *Erysimum asperum* is on the order of 30 to 40 seeds. I've never needed to thin them. This also works well for *Penstemon angustifolius* and *P. grandiflorus*, just plant a little deeper. A little water after the seeds germinate helps if it is very dry. *Erysimum* typically does fine without any attention after planting.

Very small amounts of seed, or seeds difficult to obtain, are best planted under more controlled conditions.

## Transplanting

Two species common in shortgrass prairies are copper mallow (*Sphaeralcea coccinea*) and scarlet gaura (*Gaura coccinea*). I find them difficult to grow from seed in any quantity. Fortunately, both survive abuse and can be collected from areas about to be destroyed by development.



Scarlet gaura, *Gaura coccinea*

Copper mallow, an abundant colorful wildflower and nutritious forage plant, is one of the most drought-resistant flowers on the prairie. Scarlet gaura produces numerous small, fragrant flowers that open white but turn reddish-pink when exposed to sunlight. Rhizomes of both species can be collected and planted immediately in your developing prairie. It is important to water them all season long in their first year. Although neither will show much if any new top growth, roots and rhizomes will be advancing underground. Usually all of the gaura and about 50% of the copper mallow will survive.

Other rhizomatous species that can be rescued by transplanting include bush peavine

(*Lathyrus eucosmus*) and probably other *Lathyrus* species, prairie milkweed (*Asclepias pumila*), and Britton's skullcap (*Scutellaria brittonii*).

I prefer planting bare rhizomes as this eliminates the possible introduction of unwanted species such as quackgrass (*Agropyron repens*), western wheatgrass (*A. smithii*), and seeds of exotic weeds. When transplanting rhizomes, use a one-gallon plastic bottle filled with water, with a pinhole (or two or three) in one corner to provide a day-long drip to keep rhizomes moist. This technique also works well with other species sensitive to drying out. Drip bottles can also be used to provide slow deep watering for individual plants during establishment.

## Watering and Plant Establishment

Wildflowers planted at the same time as the grasses will generally do well with the water regime described for grasses during the first year. During the second year, plants should be watered enough to prevent them from becoming dormant. Clipping back grasses the second year will speed establishment of wildflowers by reducing competition. Most plants should survive the third year with the possibility of needing one or two deep waterings if it is unusually dry. Although drought-induced dormancy is normal on the prairie, during the first two or three years, it may be difficult to tell this from death until it is too late.

A good general rule to judge establishment is that a plant that exceeds the grasses in height can compete for light and moisture. A rule of thumb used in prairie restorations in the Midwest is that a plant having three or more stems can compete on its own.

## Suggested Wildflower Species

The species list that follows (Table 1) is far from perfect and is in no way complete. Planting densities are poorly documented, and some are based on unscientific observations, i.e., guesses. Increasers and early succession species such as snakeweed (*Gutierrezia sarothrae*) and tansy aster (*Machaeranthera tanacetifolia*) are probably too heavily weighted. Highly palatable decreasers such as groundplum (*Astragalus crassicaupus*) are likely underweighted. I've seen a reference to groundplums growing so abundantly that they gave the prairie a rose tint. A density of 0.1 per square yard certainly won't do this. These suggested densities can easily be adjusted by a factor of ten either way and not be too far wrong.

As mentioned earlier, the following species list is not all inclusive. All the species listed can be successfully grown in the prairie garden; I have

grown all of them. Add your own observations to the list. Species in parentheses are usually not found in shortgrass prairie, or if they do occur, it is on a soil type usually associated with another prairie type. They are attractive additions to any prairie garden, however.

I have included species lists for two different, but in many ways similar, shortgrass prairies. The blue grama/buffalograss shortgrass prairie is typically found on the heavier, shale-derived soils of the Colorado Piedmont where the original High Plains surface has been removed (Chronic 1980). The blue grama shortgrass prairie is found on the somewhat lighter soils of the High Plains where the original mountain outwash surface remains.

As with grasses, named cultivars/varieties of wildflowers and shrubs are usually named for

features not found naturally or that are much less frequent in natural populations. These may differ from the typical wild plant by having more intensively colored flowers or a color infrequently seen; larger flower size; or different growth form such as stem length or shape. Others may be named for collection location or collector. For example, a native low-growing form of sand cherry discovered at Pawnee Buttes in Colorado by Jim Borland and Panayoti Kelaidis is named *Prunus besseyi* 'Pawnee Buttes' (Pawnee Buttes Sand Cherry).



Above: Examples of species grown by Rick Brune.

Top row:

*Senecio tridenticulata*

*Viola nuttallii*

*Hedysarum boreale*

Bottom row:

*Oenothera albicaulis*

*Tradescantia occidentalis*

*Lithospermum incisum*

**Table 1. Suggested planting densities for Blue grama-Buffalograss prairie and Blue grama prairie.**

Number/sq.yard refers to published number in literature. See Hazlett 1998 and Hazlett 2004 for more ideas.

( ) = very attractive species but wrong soil type, possibly amend or replace soil. These occur in sandy or gravelly areas.

Species with blank density specifications are likely present. Key to propagation methods below.

| Species                                  | Common Name                          | Plants/sq.yard<br>Blue grama/<br>Buffalograss prairie | Plants/sq.yard<br>Blue grama prairie | Propagation<br>Method |
|------------------------------------------|--------------------------------------|-------------------------------------------------------|--------------------------------------|-----------------------|
| <i>Abronia fragrans</i>                  | Sand verbena)                        | Absent                                                | Absent                               | MS                    |
| <i>Allium textile</i>                    | Wild onion                           | 0.03                                                  | 0.03                                 | MS                    |
| <i>Amorpha canescens</i>                 | Leadplant                            | 0.01                                                  | 0.02                                 | S, MS                 |
| <i>Antennaria parviflora</i>             | Pussytoes                            |                                                       | 0.05                                 | T                     |
| <i>(Artemisia filifolia)</i>             | Sandsage)                            | 0.01                                                  | 0.01                                 | D                     |
| <i>Astragalus bisulcatus</i>             | Two-grooved milkvetch                |                                                       |                                      | S or H                |
| <i>Astragalus crassicaulis</i>           | Groundplum                           | 0.1                                                   | 0.1                                  | S or H                |
| <i>Astragalus drummondii</i>             | Drummond milkvetch                   |                                                       |                                      | S or H                |
| <i>Astragalus mollissimus</i>            | Woolly locoweed                      |                                                       |                                      | S or H                |
| <i>Astragalus missouriensis</i>          | Missouri milkvetch                   |                                                       |                                      | S or H                |
| <i>Astragalus pectinatus</i>             | Fine-leaved milkvetch                | 0.01                                                  | 0.05                                 | S or H                |
| <i>Berlandiera lyrata</i>                | Chocolate flower                     |                                                       |                                      | D                     |
| <i>Bouteloua curtipendula</i>            | Sideoats grama                       | 0.03                                                  | 0.2                                  | D, MS                 |
| <i>Callirhoe involucrata</i>             | Purple poppymallow                   | 0.02                                                  | 0.4                                  | MS                    |
| <i>Chrysopsis (Heterotheca) villosa</i>  | Hairy golden aster                   | 0.02                                                  |                                      | MS                    |
| <i>Chrysothamnus nauseosus</i>           |                                      |                                                       |                                      |                       |
| <i>nauseosus</i>                         | Dwarf blue rabbitbrush               |                                                       |                                      | D                     |
| <i>Dalea purpurea</i>                    | Purple prairie clover                |                                                       |                                      | S                     |
| <i>Dalea candida</i>                     | White prairie clover                 |                                                       |                                      | S                     |
| <i>Delphinium geyeri</i>                 | Geyer larkspur                       |                                                       |                                      | MS?                   |
| <i>Delphinium virescens</i>              | Prairie larkspur                     | 0.05                                                  |                                      | MS                    |
| <i>Eriogonum effusum</i>                 | Spreading wild buckwheat             | 2                                                     |                                      | MS                    |
| <i>Eurotia lanata</i>                    | Winterfat                            | 0.03                                                  |                                      | D                     |
| <i>Gaura coccinea</i>                    | Scarlet gaura                        | 0.03                                                  | 0.3                                  | T                     |
| <i>Gutierrezia sarothrae</i>             | Golden globe; Snakeweed              | 0.02                                                  |                                      | D                     |
| <i>Haplopappus spinulosus</i>            | Spiny goldenweed                     | 0.02                                                  | 0.02                                 | D                     |
| <i>(Ipomoea leptophylla)</i>             | Bush morning-glory; Man-root)        |                                                       |                                      | S                     |
| <i>Leucocrinum montanum</i>              | Sand lily                            | 0.06                                                  | 0.06                                 | MS?, T                |
| <i>Liatris punctata</i>                  | Gayfeather; Blazing star             | 0.01                                                  | 0.03                                 | D, MS                 |
| <i>Linum lewisii</i>                     | Blue flax                            | 0.04                                                  | 0.03                                 | D                     |
| <i>Lithospermum incisum</i>              | Fringed puccoon                      | N?                                                    | 0.03                                 | MS                    |
| <i>Machaeranthera tanacetifolia</i>      | Tansy aster                          | 0.6                                                   | 0.6                                  | D                     |
| <i>Oenothera albicaulis</i>              | White-stem evening primrose          | 0.2                                                   | ?                                    | ?                     |
| <i>(Oenothera brachycarpa)</i>           | Stemless evening primrose)           | Absent                                                | Absent                               | S, MS                 |
| <i>Oenothera coronopifolia</i>           | Combleaf evening primrose            |                                                       |                                      | T                     |
| <i>Oenothera (Calylophus) serrulata</i>  | Plains yellow primrose               | 0.02                                                  | 0.02                                 | T?, MS                |
| <i>Oxytropis lambertii</i>               | Lambert's locoweed                   | 0.1                                                   |                                      | S                     |
| <i>Oxytropis sericea</i>                 | Silky locoweed                       |                                                       |                                      | S                     |
| <i>Pediomelum (Psoralea) esculenta</i>   | Prairie turnip                       |                                                       | 0.03                                 | S                     |
| <i>Penstemon albidus</i>                 | White beardtongue                    |                                                       |                                      | MS                    |
| <i>Penstemon angustifolius</i>           | Narrowleaf beardtongue               |                                                       |                                      | MS                    |
| <i>Psoralea tenuiflora</i>               | Slim-flowered scurfpea; Wild alfalfa | 0.1                                                   | 0.1                                  | S                     |
| <i>Ratibida columnifera</i>              | Prairie coneflower                   | 0.2                                                   |                                      | D                     |
| <i>R. columnifera f. pulcherrima</i>     | Mexican hat coneflower               | 0.002                                                 |                                      | D                     |
| <i>Scutellaria brittonii</i>             | Britton's skullcap                   |                                                       |                                      | T                     |
| <i>Senecio (Packera) tridenticulatus</i> | Groundsel                            | 0.02                                                  | 0.05                                 | MS; T                 |
| <i>Sophora (Vexibia) sericea</i>         | Silky sophora                        |                                                       |                                      | S                     |
| <i>Sphaeralcea coccinea</i>              | Copper mallow; Cowboy's delight      | 2.5                                                   | 2.5                                  | T, S                  |
| <i>Sporobolus airoides</i>               | Alkali sacaton                       |                                                       |                                      | MS?                   |
| <i>Thelesperma filifolia</i>             | Greenthread                          |                                                       |                                      | D, MS                 |
| <i>Thermopsis rhombifolia</i>            | Golden banner                        |                                                       |                                      | S, T                  |
| <i>Townsendia exscapa</i>                | Easter daisy                         | 0.2                                                   |                                      | D, MS                 |
| <i>Townsendia grandiflora</i>            | Easter daisy                         |                                                       | 0.03                                 | D                     |
| <i>Tradescantia occidentalis</i>         | Spiderwort                           |                                                       | 0.05                                 | MS, T, cuttings       |
| <i>Vicia americana</i>                   | American vetch                       |                                                       |                                      | S, T                  |
| <i>Viola nuttallii</i>                   | Nuttall's violet                     | 0.05                                                  |                                      | MS, T                 |

Propagation methods: D = direct seeding, no treatment; MS = moist stratification; S = scarify; T = transplant or division; H = boiling water. Methods may vary if grown in temperate climate (cold winters) vs. mild climate (mild or no winter).

## Notes on potential problem species

Plants don't always perform the way I expect. Your experience may be entirely different. The size of your planting also plays a part in deciding whether a species is too aggressive. Here are words of caution about a few species that cause problems for me. This is a small percentage of the total species:

### **Golden banner** (*Thermopsis rhombifolia*)

I collected seed from plants growing in a hot, dry, mostly barren site without many other species. My thought was that this rhizomatous species would be well adapted to drought and clay. It would require little care in my garden.

**Wrong!** After planting the seed in 1993, it only took until 1997 to realize it was too aggressive and can crowd out other species. Control might be possible by pulling or digging while numbers are small. Otherwise very selective herbicide use helps to control but it needs to be regular. A physical barrier in the soil, such as a strip of pond liner, might help with this and other rhizomatous species.

### **Silky sophora** (*Sophora* or *Vexibia sericea*)

Seeds were planted in 1989. This species was a favorite – well behaved and photogenic. It spread by rhizomes very slowly. There was no hint of a problem, and I added plants to other areas. Sometime, probably around 2018 to 2019, it began to spread. It is now dense enough in some areas to outcompete other species. I try to pull all of the plants every year but it has deep rhizomes. I have no good solution.

### **Needleleaf sedge** (*Carex duriuscula*)

I planted a small plug of this rhizomatous sedge about 15 years ago. It was planted in a rather dense stand of blue grama. Every year I checked on it to see if it was spreading. I was hoping it would spread but it wasn't. Then,

about 5 years ago, I noticed it beginning to spread. Today (2024) it covers hundreds of square feet. It is extremely aggressive. Most plants it overtakes cannot compete and disappear. It needs a buried barrier of some sort, perhaps the material used for pond liners.

### **Needle-and-thread** (*Stipa comata*)

The long awns of needle-and-thread are very efficient at drilling the seed into the soil. The seeds germinate readily. As a cool-season grass, it begins growth early with little competition from dormant species. It wouldn't take long for large areas to be dominated by needle-and-thread. I try to collect seeds and remove basal rosettes in the spring to control it. *Stipa viridula* behaves the same but is somewhat less aggressive.

### **Wild alfalfa** (*Psoralea tenuiflora*)

A year or two after planting this (ca 1988), I celebrated finding a seedling. Today it spreads aggressively by seeds. Removing the above-ground growth prevents seed set but is time consuming. This is one of the most deeply rooted and drought-tolerant plants on the prairie.

### **Comments on other species**

Not all rhizomatous species are problems. Low milkweed (*Asclepias pumilus*), bastard toadflax (*Comandra umbellata*), American vetch (*Vicia americana*), Britton's skullcap (*Scutellaria brittonii*), and scarlet gaura (*Gaura coccinea*) are all manageable in my experience.

Most early seral species are also not a problem. This includes *Plantago purshii* (*P. patagonica*), six-weeks fescue (*Vulpia* (*Festuca*) *octoflora*), Britton's skullcap (*Scutellaria brittonii*), white-stem evening primrose (*Oenothera albicaulis*), western wallflower (*Erysimum asperum*), and tansy aster (*Machaeranthera tanacetifolia*).

# Maintenance

After the initial year or two of work establishing the prairie garden, the amount of maintenance needed decreases with each passing year. A shortgrass prairie garden with noxious weeds under control requires about one hour of maintenance (mostly weeding and mowing) per year per 200 square feet. This does not include time for adding and tending new plantings, which will vary with each gardener.

Maintaining the garden should be done with an eye toward replicating the natural activities occurring on the prairie. In most cases, our activities will be only a crude approximation of natural activity. The following sections describe some of the natural prairie processes and some ideas for incorporating them into our homegrown prairie.

## Grazing (mowing)

Prairie plants evolved with adaptations to survive despite the demands of large herbivores such as bison, elk, and antelope, and smaller ones such as jackrabbits and grasshoppers. Together these produced a year-round demand for forage. Because the addition of most large and small herbivores is impractical, we must improvise. The best improvisation is the lawnmower or weed-eater.

Summer grazing stimulates the spread of grasses by tillers and stolons. It stimulates sprouting of dormant buds on shrubs to produce a denser habit. Winter grazing of dormant plants affects growth much less. Every few years the prairie garden should be mowed several times during the growing season with the grass clippings collected.

Grass cover on unmowed buffalograss and blue grama prairie recreations begins to thin out after three to four years worth of litter (mulch) accumulation. This litter also slows the spring warming of the soil and regrowth of prairie plants. It also probably reduces self-sowing of prairie plants and weeds. Fall mowing removes the maximum amount of litter-producing grasses.



*Maintaining the garden should be done with an eye toward replicating the natural activities occurring on the prairie. Once established, watering is rarely needed.*

I mow my prairie garden in mid-November. This allows time to appreciate all of the attractive seed heads and the nice fall colors. Even after mowing, much of the warm fall color remains. I set my gas-powered bison to graze at a height of two and one-half to three inches. The clippings can be used for mulch in the garden, although this results in some buffalograss seed germinating in the garden. If it snows and you can't mow, don't worry about it. When mowing, try to mow around some of the prairie plants, especially shrubs, to provide some variety in height during the winter. This also allows shrubs and wildflower seeds to disperse back into the prairie garden. Each fall when I mow,

I suddenly realize that I should leave enough space between plants for the mower when I plant. Unfortunately, this is usually forgotten by spring. I hope you'll do better.

Another suggestion is to plant in some sort of grid to facilitate mowing. With care and attention to orientation it should be possible to do this and maintain a natural appearance. Simply avoid planting any one species in a straight line. The grid concept is only needed for species you don't want to mow anyway.

Consider collecting seed from any wildflowers that will be mowed. The seed can then be resown over the prairie garden after mowing and will not be lost with the clippings. A few species, such as prairie coneflower (*Ratibida columnifera*), spread rapidly by seed. Collect all or most of the seed of this and similar species depending on the desired result.



*Planting legumes like these Astragalus provides nitrogen in your prairie garden, and the flowers attract pollinators.*

Annual mowing and collecting the clippings from six-inch-tall grass is slower than normal mowing, but goes surprisingly fast. Remember how much time you would spend mowing and watering the same area once per week all summer if it was a bluegrass lawn!

## Fertilizing

Removing grass clippings removes an unknown amount of nutrients from the prairie garden each year. The most significant is probably nitrogen. In the case of a bluegrass lawn, about 30 percent of the applied nitrogen is removed when clippings are collected. Nutrients historically removed by herbivores on the prairie were recycled back to prairies as waste (buffalo chips) and, eventually, carcasses.

The addition of nitrogen fertilizer has been studied at the Central Plains Experimental Range in northeast Colorado. This study was done on a blue grama shortgrass prairie growing on sandy loam. The rate of fertilization was 0.5 pounds of nitrogen per 1000 square feet, which was broadcast annually in October. Ammonium nitrate fertilizer was used.

Nitrogen fertilization temporarily mobilizes carbohydrate reserves in grasses, which may stimulate growth too early in the spring, and reduce carbohydrate reserves in the grass. Apparently because of this, fertilizing blue grama reduces drought hardiness. This report states for fertilizing blue grama that “the practice is potentially disastrous to blue grama stands.” The general conclusion of this report with regard to other species studied is that nitrogen “fertilization was primarily deleterious to the stands of perennial species and beneficial to the annuals.” Other people have also reported that fertilizing increases weeds in prairie plantings. Significant research on this subject could be done in a prairie garden. Before you fertilize, experiment to determine the consequences and remember that the

effects may not be apparent until a dry year. I don't fertilize. Rely on lots of legumes and rainfall for your nitrogen.

## Watering

By the second year, one or two deep supplemental waterings are all that is required for most prairie grasses to remain green season-long. Areas with poor grass cover (usually because of weeds the first year) will fill in if given two or three waterings. By the third year you can essentially forget about watering the grasses.

Wildflowers in their second and third years can be encouraged to outcompete grasses. Give them a few slow, deep soakings using one gallon plastic bottles with pin holes in the bottom for a slow drip. Again, cutting grasses very short next to flowers reduces competition for light and water.

During 1990, none of the species I planted in 1989 got more than two supplemental waterings. Many got none. Nothing planted in 1988 was watered in 1990. All plants that were healthy in the fall of the year that they were planted survived. In 1994, the hottest year on record for Denver and also a very dry year, I did not water. The only noticeable effect was that the blooms on the dwarf blue rabbitbrush weren't as showy as usual.

## Trampling

Besides grazing, large mammals also disturb soil with their hooves. This stimulates vegetative reproduction by grasses. It buries and possibly scarifies seeds. It has been suggested that old, thinning buffalograss lawns might be invigorated by going over them very lightly with a rototiller. Gas-powered dethatchers, which damage bluegrass lawns, might also work since they rip up a lot of grass. Any experimenting you do here will be original research.



*Providing nectar and pollen to garden visitors is a side benefit of the prairie garden. Honeybee on sundrops, *Calylophus serrulatus*.*

## Pruning

Many shrubs on the prairie are palatable to one herbivore or another. Pruning by browsing animals usually occurs at the ends of branches and creates a denser habit. Shrubs may be pruned to ground level by very heavy browsing, girdling by small mammals, or by fire. The prairie species of rabbitbrush (*Chrysothamnus* species), *Prunus* species, rose species, and sage species can be cut off near the ground without ill effect. In general, pruning will injure none of the shrubs that threaten to outgrow the scale of your garden.

## Weeding

The battle with exotic weeds seems never-ending in our disturbed environment. In the prairie garden, our battle with annual and biennial weeds is usually reduced to small skirmishes once good grass cover is in place. Blue mustard (*Chorispora tenella*) is nearly completely eliminated by preventing seed set

for one year. Knotweed (*Polygonum aviculare*) is a persistent annual apparently from seeds in the soil as it reappears in the same place each year. It competes quite well in a thick buffalograss/blue grama turf and you will need several years to eliminate it. Prickly lettuce (*Lactuca serriola*) appears randomly each year. Whether seeds blow in or are in the soil, I don't know. It is easily controlled and usually appears after a rainy period. Cheatgrass (*Bromus tectorum*) and Japanese brome (*B. japonicus*) are controlled readily by preventing seed set. Again, annual and biennial weeds are rarely a problem after good grass cover is established.

Perennial weeds can be especially pernicious. Among the worst are bindweed (*Convolvulus arvensis*), Canada thistle (*Cirsium arvense*), and quackgrass (*Agropyron repens*). All are quite tenacious. Dandelions (*Taraxacum officinale*), of course, thrive everywhere.

Canada thistle is the easiest to control. Spot spraying or painting with Roundup® as soon as new shoots appear may eliminate it. If not, it will weaken it so that by the second or third year it will be killed by cutting off new sprouts several inches underground as soon as they appear.



Wild onion. *Allium textile*, in a bed of blue grama.

Quackgrass is more tenacious. You know you have quackgrass (or its close relative western wheatgrass, *Agropyron smithii*) when you see green grass shoots appearing in your dormant

prairie in late March or early April. If very little is present, the rhizomes can sometimes be dug out successfully. Any undug or unpulled leaves you neglect are feeding spreading rhizomes underground. Recently, I noticed that rhizomes of quackgrass in five-year-old parts of the prairie garden are very shallow, often just beneath the accumulation of litter. These can be effectively removed by careful pulling and cutting with a knife. It's a satisfying feeling to extract a 12-inch-long quackgrass rhizome.

Quackgrass is often too abundant to dig. When warm-season grasses are dormant, but quackgrass is green and growing, you can spray small areas of warm-season grasses lightly with Roundup® to selectively kill quackgrass and other introduced, cool-season grasses. CAUTION: It will also kill native cool-season grasses, if present. It is imperative that warm-season grasses be dormant, or you will kill them also. Mid-April is usually about the latest for this approach, but each year is different. This also kills bluegrass (*Poa pratensis*). This technique cannot be used on wildflowers without disastrous results.

Bindweed, in my opinion, is the toughest of all perennial weeds to eliminate. Pulling or mowing it often has little effect. Gather the vines on a thick layer of newspaper or cardboard to protect the grass beneath and spray with Roundup®. After the herbicide dries, remove and discard the paper. After the leaves dry up or severely wilt, pull them up and discard them also. If it rains or if you water, the herbicide will wash off and kill the grass underneath. It will grow back, or you may use the bare spot for a wildflower. Again, this is most effective about two weeks before frost, but you cannot leave noxious weeds unchecked to spread during the growing season. At least pull them to keep them from increasing in vigor even if it does not reduce them.

Mallow (*Malva neglecta*) is a persistent weed on bare soil. Pulling it out or cutting it off below ground will control it eventually. It is usually not a severe problem once grass is established.

Smooth brome (*Bromopsis inermis*) is another problematic, cool-season exotic grass you may get. It forms nearly solid colonies to the exclusion of most other species and spreads rapidly by rhizomes. It is controlled with difficulty by digging or Roundup®. Unfortunately it is used widely as a reclamation and pasture grass to the detriment of most native plant communities.

Native grass seed usually contains a few surprises with some potential to become weeds. I find I get some native, early successional prairie species such as tumblegrass (*Schedonnardus paniculatus*) and dropseed (*Sporobolus* species) when I plant. Although these have never been a problem, I am always a little suspicious of these species adding to my collection of weeds in the vegetable garden so I pull them occasionally for good measure.

## Fire

The importance of fire in the shortgrass prairie is a subject for debate. It is without a doubt very important for healthy tallgrass prairie. The general restriction of trees and shrubs on the shortgrass prairie to rock outcrops where they are protected from fires indicates fire is a fairly important prairie influence. The presence of the growing points of prairie plants at or below the surface of the ground is both a fire and grazing adaptation. The prairie was regularly burned by native Americans to produce an early spring green-up that attracted bison.

Burning removes litter, recycles some nutrients back to the soil, discourages cool-season plants at certain times of the year, and kills annual weeds. Unfortunately, burning removes

habitat for overwintering insects. Most shrubs are killed back to the ground. Buffalograss is discouraged by fire because it spreads by above-ground stolons; blue grama is encouraged.

Two of my favorite images show the effect of prairie burning at the Denver Botanic Gardens. One shows the Garden's sandhills blackened and burned almost to the ground. The other shows the same area one month to the day later, with grasses and flowers nearly two feet tall and in full bloom.

Tall, dry prairie grasses burn very fast and hot. Short, mowed grasses burn more sedately. Prairie burning is a hazardous task for the inexperienced. Open burning is also illegal in most municipalities.

Our shortgrass prairie gardens will survive, for better or worse, without burning. With the intimate knowledge of your prairie you will gain from weeding, planting, and general enjoyment, you will develop a sense for what your prairie needs and the effects your activities have on it.

## Recordkeeping

Keep a record of your actions and the results. We know very little about the life histories of most prairie plants. How long do they live and under what conditions? What pollinates them and how? Why do they set seed only in certain years? Do plants grow every year or is a 'dead' plant only taking a year off? Do various pollinators appear after a few years and cause plants to set seed for the first time? How do you get seeds to germinate? A prairie garden can begin to answer many questions, and it will generate even more. It will also help to dedicate others to the appreciation and conservation of our native flora.

# Little Bluestem in the Landscape

Little bluestem (*Schizachyrium scoparium*\*) is a highly ornamental native bunchgrass that deserves much more use in our landscapes. Once you have seen the beautiful maroon to red fall foliage, I think you will also be convinced of the value of this warm-season perennial

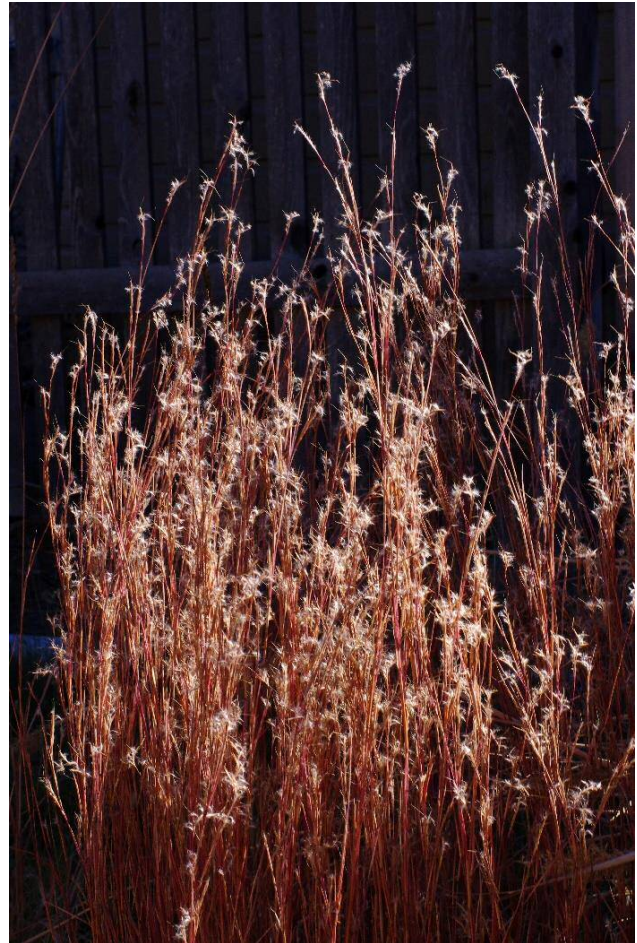
Although many plants add a pleasant touch of fall color to our yards, the first snowfall usually removes the colorful leaves, leaving a scene dominated by greys. Only a few plants provide color in the form of leaves and stems during winter.

The beautiful red stems (culms) and leaves of little bluestem will add a cheery winter accent to any yard or garden. Furthermore, the red color is very permanent, fading very little during winter. The stiffly erect stems are resistant to being flattened by wind or snow. Peak fall color is reached in mid-October, yet in mid-February mine looks almost as good as it did four months before. I expect it to look good at the end of March, too.

Not only are the leaves and stems very attractive shades of red, but they are topped by an inflorescence (flower stalk) made up of many hairy spikelets that are strikingly silver-white when backlit by the sun. In an indoor dried arrangement, or in a vase by itself, little bluestem is in a class with the best. Indoors, the color lasts for years, which is good because your friends will probably be harvesting your outdoor crop for their own use.

Little bluestem grows in every state except California, Oregon, Washington, and Nevada. It reaches its greatest abundance in states formerly covered with tallgrass prairie. The red colors of the tallgrass prairies in fall are due in part to the presence of little bluestem. In Colorado, it is a dominant plant in little bluestem mixed prairie, little bluestem loess prairie, big

bluestem (*Andropogon gerardii*)—little bluestem xeric tallgrass prairie, and it may also be an important part of the understory in piñon-juniper woodland. It typically grows on gravelly hill crests or exposed rocky slopes. It may also be found on heavier soils where additional moisture collects.



*Little bluestem (Schizachyrium scoparium\*) seedheads and stems provide attractive fall color in the home landscape.*

In a mesic tallgrass prairie environment, little bluestem reaches a height of 3.5 feet. On gravel breaks, it is usually 1.5 to 2.0 feet tall. The latter height is typically reached in the home landscape with minimal supplemental watering. Because this is a bunchgrass, its lushness may be controlled by varying the amount of water it receives without having rhizomes sprouting in undesirable places.

Little bluestem is definitely not a turf-grass. It is easily damaged by trampling and should not, therefore, be planted where it will be walked on. It decreases with overgrazing, probably due to the fact that removal of the growing tip will stop growth for the season. Similarly, it should not be mowed during the growing season too often.

During the drought of the 1930s, large areas of little bluestem prairie died. Many 'dead' plants later provided an example of the amazing resiliency of prairie plants. John Weaver of the University of Nebraska reported in his classic work *North American Prairie* that little bluestem began to break its long drought-induced dormancy after only one year of good rainfall. He reported "In 1943 it revived in certain places on dry south slopes where it had not been seen since 1934. At first only a few stems appeared even from large bunches. Often the remainder of the crown was dead."

Little bluestem is easily grown from seed. Moist stratification at 5°C (41°F) is recommended, but I find that I get all the plants I need without stratifying. Seed should be planted about 0.5 inches deep with the soil gently firmed over the seed to insure good contact between the fluffy seed and the moist soil. Daytime temperatures around 27°C (81°F) followed by nighttime temperatures around 17°C (63°F) are reported to enhance germination. Seed germinates within

one week but growth is very slow, and plants may be only one inch tall after six weeks.

Newly seeded little bluestem is very fragile, often barely attached to the ground. Plants remain only two or three inches tall for most of the first growing season. Late August or early September often sees a surge of growth and some first-year bloom, an indication that the slow-growing plants of summer were putting energy into the root system to ensure survival before risking energy for top growth and reproduction. Second-year plants are fairly robust. Plants should be watered enough the second and third years to prevent them from going dormant (or dead). After that, they should be able to take whatever our climate dishes out. Like other prairie plants, it prefers a sunny exposure.

\**Schizachyrium* is derived from the Greek schizein, to split, and achyron, chaff, and refers to the split palea in the type species. Schizophrenia and schizoid are derived from the same Greek root and refer to split personality disorders. The preferred pronunciations are: shiz-a-kirium or skitz-a-kirium. *Schizachyrium scoparium* is synonymous with and often referred to as *Andropogon scoparius*.

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*A family of coyotes awakens after sleeping overnight on a pile of blue grama, buffalograss, and other prairie clippings..*



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## About the Author



Rick Brune has been experimenting with prairie gardens since 1982. He has used the techniques described here in his home prairie in suburban Lakewood, as well as in creating prairie gardens at the Denver Botanic Gardens, Chatfield Arboretum, and other locations. He has also conducted prairie gardening workshops and led many field trips to Colorado prairies.

## About the Society



The Colorado Native Plant Society is a nonprofit organization dedicated to the appreciation and conservation of the Colorado native flora. Membership is open to all with an interest in our native plants.

*Aquilegia* is published four times per year. The Society also sponsors field trips, workshops, research, and other activities through local chapters and statewide. Contact the Society for more information:

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