

FIVE STEPS TO SUCCESSFUL PRAIRIE MEADOW ESTABLISHMENT

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Prairie meadows are becoming an increasingly popular alternative to traditional high maintenance landscapes. Our native prairie flowers and grasses are stunning both as individuals, and as a complete prairie plant community. Perhaps best of all, the prairie helps us to re-connect with the earth, and creates a haven for the native plants and animals with which we share this beautiful planet.

Prairie meadows require no fertilizers or fungicides and few, if any, herbicides. The prairie grasses and flowers create high quality habitat for birds, butterflies, and other beneficial wildlife. The deep-rooted prairie plants encourage infiltration of rainwater into the soil, helping to reduce stormwater runoff and flooding. Prairies can also serve as excellent buffer strips between maintained turf and wetland areas, such as ponds, waterways, and marshes. The cover provided by the prairie grasses also complements adjacent wetlands, improving the environmental quality of existing water features.

The initial costs of a prairie seeding are often a little higher compared to turf seedings, but significant long-term savings result due to greatly reduced maintenance requirements. Any additional initial costs are usually recovered by the second year. Maintenance savings continue to accrue in following years, yielding very low “life cycle” costs for prairie meadows. Because native prairie flowers and grasses are almost exclusively perennials, they return to bloom year after year. A properly installed and maintained prairie meadow is a self-sustaining plant community that will provide landscape beauty for decades to come.

Installation of prairie meadows is not quite as simple as tilling up the soil and sprinkling some seed in the ground. There are five critical steps that must be followed to ensure success with this new landscaping style. By following each step carefully and completely, outstanding results can be achieved, even by those who have little or no experience in establishing native prairies.

The Five Steps to Successful Prairie Meadow Establishment

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| 1) Site Selection | Sunny, well-ventilated, with low weed densities |
| 2) Plant Selection | Match plants to the soil and growing conditions |
| 3) Site Preparation | Kill <u>ALL</u> the weeds before planting! |
| 4) Planting Time & Method | Spring vs. fall, no-till vs. broadcast, nurse crops |
| 5) Post-Planting Maintenance | Mowing, burning, and spot herbicide treatment |

1) Site Selection

The area to be planted to prairie must be sunny, open, and well-ventilated. Prairie plants require at least a half a day of full sun. Full sun is best, especially for wet soils or heavy clay soils. Good air movement is also critical, as prairie plants are adapted to open sites that are not subject to stagnant air. Poor air circulation in closed in areas can lead to fungal diseases, which are seldom a problem on sunny, open sites.

Areas with a history of heavy weed growth should be avoided, if possible. This is especially true if a site has well-established perennial noxious weeds. A full year or longer will be required to properly prepare such a site for planting. Good candidates for seeding to prairie meadows include areas presently in turf, cornfields, soybean fields, and alfalfa fields. Beware of residual herbicides that may have been applied to agricultural fields. Always check the herbicide history of the past two to three years, and test the soil for residual herbicide activity if in doubt. Areas of open soil that result from new construction are usually good sites for prairies, provided the soil is not compacted or composed of raw subsoil, and that there are no residual weeds remaining.

Beware of planting meadows in locations with adjacent weedy vegetation that cannot be eliminated or controlled. Although an established prairie meadow is resistant to invasion by most weeds, three to four years of growth is required for full development. During these first few years, weed seeds can blow into the meadow and become established. Rhizomatous weeds such as quackgrass, Canada goldenrod, and Canada thistle can creep into the meadow from immediately adjacent areas. If herbaceous perennial weeds are located near the new meadow site, they should be mowed once or twice a year before they set seed, or eliminated and replaced with non-invasive plants.

If “weed” trees such as Box Elder and Cottonwood occur nearby, they often self-sow aggressively onto open soil. The best solution is to cut them down and replace them with higher quality native trees, thus preventing problems in the prairie and replacing low quality trees with better species.

2) Plant Selection

Every plant is adapted to a certain set of growing conditions. Some will grow only on well-drained sandy or gravelly soils, while others prefer heavy clay. Some require moist soils, while others demand dry growing conditions. A few species can grow in almost any soil, be it dry sand, rich loam, or damp clay.

A prairie meadow is very different from a garden; in a meadow the plants are essentially on their own. A prairie is a low maintenance landscape that requires minimal (but specific) care. The plants of the meadow will have to fight it out with the weeds in the first few years as they become established. Therefore, it is essential to select plants that are adapted to the specific site conditions.

To save you time, we have designed prairie seed mixes to match a variety of soil conditions. These mixes are carefully balanced between showy flowers and ornamental grasses. Some people prefer to select specific plants for a given mix. However, it is very important to include a wide variety of different flowers and grasses to ensure year-round interest in the prairie meadow. If a custom-designed seed mix is desired, please feel free

to call us. We specialize in designing prairie mixes to match specific site conditions, and in providing solutions for difficult problem sites.

3) Site Preparation

This is a critical step that, if overlooked, can lead to disaster in short order. This is especially true of areas with a history of weedy growth. All the weeds and existing vegetation must be killed prior to seeding. It takes only a few rhizomes of quackgrass, bromegrass, Canada thistle, or Canada goldenrod to quickly re-colonize the planted area. The mantra for soil preparation when preparing a site for a prairie planting is simple:

“TAKE NO PRISONERS!”

There are many different methods of preparing a site for seeding to a prairie meadow:

- 1) Smothering with old rugs, or black or clear plastic for a full growing season
- 2) Smothering with layers of newspapers or cardboard covered with compost, tree leaves or grass clippings for a full growing season
- 3) Planting a summer smother crop of buckwheat, followed by fall planting of winter wheat. This rotation can be done for two successive years to kill most weeds
- 4) Repeated deep soil tillage every three weeks for a full growing season
- 5) Removing the sod on lawns using a sod-cutter (this will not kill tap-rooted weeds)
- 6) Herbicide treatment using Roundup or similar glyphosate herbicide for one application to three applications over a two-year period, depending on the weeds

Perennial weeds must be killed, requiring year-long smothering, repeated sprayings with herbicides, or repeated tillage with equipment that can uproot and kill perennial weeds. Then weed seeds that are harbored in the soil must also be allowed to germinate, so that they can be killed, either by tillage or by spraying. If a weedy “old-field” is selected for planting to prairie flowers and grasses, one full year of site preparation is a minimum. Sometimes one and a half to two years of site preparation may be required to get weeds under control before planting.

Some rhizomatous perennial weeds are difficult to kill using smothering, repeated deep tillage, or glyphosate herbicide. These include Canada Thistle, Field Bindweed, and Crown Vetch. All require two, or even three years of smothering to completely eliminate them. Canada Thistle has deep roots that cannot be killed with a single season of tillage. Field Bindweed and Crown Vetch are densely rhizomatous, and are also difficult, if not impossible to eliminate using tillage. All these pernicious weeds are resistant to glyphosate herbicide, and the appropriate broadleaf herbicide must be added to the herbicide tank mix at the recommended rate along with glyphosate in order to kill them:

Canada Thistle	Aminopyralid; Clopyralid; Metsulfuron methyl
Field Bindweed	Triclopyr; Quinclorac
Crown Vetch	Aminopyralid; Clopyralid; Triclopyr; Metsulfuron methyl

Other less environmentally friendly herbicides such as 2,4-D, Picloram, and Dicamba and are also effective, but are considered higher risk than the herbicides listed above.

A) Old fields with heavy weed growth can be prepared using “Roundup” as follows:

- 1) Mow field in late July and allow vegetation to re-grow
- 2) Spray with Roundup at 3% solution in early September when re-growth is one foot tall. If noxious broadleaf weeds such as Canada thistle, Canada goldenrod, or similar are present, mix an appropriate broadleaf herbicide with the Roundup tank mix.
- 3) Allow area to sit undisturbed over winter. Do not till.
- 4) When weeds reach one foot tall in following spring, spray with Roundup, and broadleaf herbicide if necessary.
- 5) If site is uneven, re-grade to prepare final seedbed after spraying. Burn or mow off dead vegetation prior to grading. This will be the final grading before planting. As dormant weed seeds germinate, they will be killed by spraying them during summer.
- 6) Allow weeds to re-grow. Spray when 6 to 12 inches tall, usually around mid-July.
- 7) Allow weeds to re-grow one more time, and spray in late August or early September with Roundup ONLY. The site is now ready to seed.
- 8) Planting can occur any time after Sept 1st. No-till seeding is best, as it minimizes soil disturbance and brings up fewer weeds than tilling and broadcast seeding. Fall seedings are “dormant” seedings, so a nurse crop should be used to hold the soil.
- 9) On erosion-prone slopes, annual rye (*Lolium multiflorum*) or oats serves as excellent nurse crops to provide cover and help hold the seed and soil in place. Seed annual rye at a rate of 5 lbs/Acre in spring or early summer, and 15 lbs/Acre in fall. Do not use winter rye (*Secale cereale*), as it produces toxins in the soil that inhibit germination of other plants. Oats (*Avena sativa*) can also be used as a nurse crop, seeded at 64 lbs/acre in spring or 128 lbs/acre in fall.

Agricultural fields (corn, soybeans, and small grains) with low weed densities can usually be seeded after only one or two sprayings with Roundup. If perennial weeds are present on such sites, a full year of site preparation prior to seeding is recommended.

Areas established to turf are easily sprayed out using Roundup. Follow the instructions below for best results.

B) Site Preparation for Turf using Roundup:

- 1) Spray with Roundup in September. If broadleaf weeds are present, mix broadleaf herbicide into Roundup tank mix.
- 2) For fall seedings, the dead thatch can be burned off, or thoroughly de-thatched to remove dead grass material. Prairie seed can be distributed directly onto the resulting mineral soil, and winter frost action will position the seed in the lower soil for spring germination. A no-till turf over-seeder can also be used, as described in (5) below.
- 3) For spring seedings, till dead turf thoroughly after it turns brown after the fall spraying. This will encourage decomposition of thatch over winter in preparation for spring seeding.
- 4) Allow weeds to germinate in spring. Spray in late May with Roundup ONLY to kill germinated weed seeds.
- 5) When weeds are dead, seed ASAP with a minimum of soil disturbance. A turf over-seeder can be used for applying the seed. However, calibration of these machines can be difficult when using prairie seeds. To overcome this problem, mix the seed with pelletized lime. This will dilute the seed to ensure more even application, and will also improve the flow of the seed through the machine.

When preparing dead turf for a fall seeding, beware of poor “seed to soil contact” due to thatch buildup in the turf. Thatch can prevent the seed from contact with mineral soil, and must be removed prior to seeding. Thatch can also wick moisture out from the seedbed and cause seedling mortality. Burning the thatch off prior to planting is the best method, as it typically will burn away the thatch and sod below. De-thatching is a good second choice. Irrigating the planting in the spring and summer of the first year during germination can greatly improve seedling development and survival, and is strongly recommended.

4) Planting Time and Method

Prairie seeds can be successfully planted during the following times:

- Spring and Early Summer: April through June 30
- Fall “Dormant Seeding:” September 1 through soil freeze-up (“Dormant Seeding”)
- Late Winter “Frost Seeding:” February and early March

Planting in July and August is generally not recommended. Drought is common during these months, and late-planted seeds often do not have sufficient time to develop strong root systems before the onset of winter. If irrigation is available, planting can be extended until July 15.

Spring and early summer plantings tend to favor the “warm season” prairie grasses. Many prairie flowers will germinate with spring plantings, while others will remain dormant in the soil and come up the following spring. Watering the planting in the first two months after a spring planting encourages higher seed germination and survival.

Fall plantings are referred to as “Dormant Seedings,” as the seeds will not come up in fall when planted, but will overwinter in the soil and germinate the following spring. Dormant seedings typically result in higher germination of prairie flowers, and lower germination of warm season prairie grasses. Fall seeded prairies do not require watering, as the seed will germinate the next spring when soil moisture is typically optimal.

“Frost Seedings” are done in late winter onto open ground or over a few inches of non-crusting snow. The seed will work its way down into the soil during the spring “frost heaving” of the soil that results from thawing during the day and freezing at night. The soil expands and contracts, and seeds fall into the small crevices created by this process. Avoid seeding onto crusted snow, as the seed can blow away on the smooth, hard surface.

An advantage of frost seeding is that it typically provides sufficient exposure to cold damp soil conditions to break dormancies in many forb seeds, without the large reduction in germination rates of the warm season grasses associated with fall dormant seedings. Cool season grass nurse crops to help prevent erosion can be included in a frost seedings, although they will not germinate and provide soil protection until they germinate and grow to sufficient size to hold the soil in place (see below).

The inclusion of a fast growing “nurse crop” that germinates readily in spring, summer, and early fall is recommended to provide soil stabilization and to reduce the vigor of

weeds. Two commonly used nurse crops are oats (*Avena sativa*) and annual rye (*Lolium multiflorum* – NOT Winter Rye (*Secale cereale*). Oats will die out over winter, and annual rye usually, but not always die in winter in USDA Hardiness Zones 1-4. Oats never re-seeds in the following year. If annual rye is seeded in fall as a nurse/cover crop and does not die over winter, it can be mowed along with weedy growth in the first growing season at a height of 6 inches to prevent it from shading the prairie seedlings and from producing seed that could germinate that fall and potentially become re-established.

Spring Nurse Crop Seeding Rates

Oats: 50-64 lbs. per acre
Annual Rye 5 lbs. per acre

Fall Cover Crop Seeding Rates

Oats: 100-128 lbs. per acre
Annual Rye 10-15 lbs. per acre

Seeding Methods

Planting prairie seeds can be accomplished by a variety of methods:

- 1) No-till seeder for multi-acre plantings. ‘Truax’ or ‘Tye’ Native Seed Drill
- 2) Double box broadcast seeder: ‘Brillion Sure Stand’ tractor-mounted seeder
- 3) Broadcast spreader, such as an ‘Agra-Fab’ pull behind spreader
- 4) Hand broadcast for small areas of one acre or less

No-till planters minimize soil disturbance, typically resulting in less weeds. The seeder should be set so that the seed is placed ¼ inch deep in the soil. A level seedbed is essential to ensure seeds are not planted too deeply in higher areas, or dropped onto the soil surface in lower areas.

Brillion seeders require soil tillage prior to planting, but provide excellent seed to soil contact. This is particularly important on loose, sandy soils. On very loose soils, it is helpful to run the heavy packer wheels of the Brillion seeder over the seeded area an additional one to two times after the seed has been planted, to further firm the soil. Load the Brillion seeder by placing the fluffy prairie grass seeds (Bluestems, Indiangrass, Side Oats Grama, Prairie Cordgrass, etc.) and large seeds of the genus *Silphium* in the larger seedbox. Place the non-fluffy, flower seeds and small round grass seeds (Switchgrass and Dropseed species) in the small “legume” box. Annual rye nurse crop can be pre-mixed with the fluffy prairie grasses and loaded in the front box.

Pull behind broadcast spreaders usually require that the seed be diluted with a cheap, flowable carrier, such as pelletized lime or cracked corn. The seeder can be calibrated by loading a loading it with a measured weight or volume of the carrier material and running the seeder until it runs out. The square footage of the area covered can be calculated by multiplying the width and length that the carrier material was spread. The total amount of carrier required can then be calculated by dividing the total area to be seeded by the area covered with the test run, and then multiplying that number times the weight or volume of material used for the calibration test.

Erosion-prone sites should be planted with a nurse crop and covered with weed-free straw mulch (winter wheat is best) to prevent seed and soil loss. Steep slopes and drainageways subject to water flow should be protected with light duty erosion blankets filled with either straw or wood shavings (excelsior). A good general use blanket is American Excelsior's 'Curlex 1' blanket. It is durable and holds up well on slopes and in ditches and bioswales. The openings in the upper mesh of the erosion blanket should be no smaller than $\frac{3}{4}$ " x $\frac{3}{4}$ " to allow for emergence of larger prairie flower seedlings, especially members of the genus *Silphium*. Fall planting on erodible sites should be completed by Sept 15 to encourage sufficient growth of nurse crops to stabilize the soil.

Hydro-seeding is generally not recommended. Native wildflowers and prairie grasses require firm contact with the soil for good germination. Hydro-seeding places the seeds on the soil surface, where they are more subject to drying out. Attempts to establish prairie meadows using hydro-seeding have typically resulted in poor results.

However, hydro-seeding in fall can be effective when done correctly. The seed should be mixed in a slurry with little or no cellulose carrier and no tackifier (a substance added to the hydro-seed slurry to make it stick in place). The seed mixture is blown onto an open, weed-free site. By using little or no carrier material, the seed is placed in direct contact with the soil, rather than suspended in the hydromulch material where it can dry out. The hydromulch can then be blown over the seed in a second application. The seed will work its way down into the soil over the winter, the same as with hand-broadcast seedings onto prepared, weed-free sites.

Seed Quality: A Critical Factor

Make sure to purchase prairie seed on a PLS basis (PLS = 'Pure Live Seed.'). This is defined as the amount of bulk seed required to provide an equivalent amount of 100% pure seed with a 100% germination rate.

The success of your planting is a direct function of the quality of the seed you plant. Do not accept cheap, low quality seed if you want your prairie planting to be successful!

5) Post-Planting Maintenance

Prairies are low maintenance, but not "No Maintenance." A few simple maintenance procedures are all that is usually required for success. In the first two years, annual and biennial weeds will grow much faster than the slow-growing perennial native plants. By the third year, the wildflowers and grasses should begin to win out over the weeds. Many flowers and grasses will mature in the third growing season.

First Year

In the first year the slow-growing prairie seedlings will grow only a few inches tall. Keep weeds mowed back to six inches tall. When weeds grow to 12 inches, mow back to six inches. Do not wait until weeds are taller than one foot tall, as the mowed material can smother the small prairie seedlings. Never mow when soils or plants are wet. Use a flail type mower if possible, as it shreds the vegetation and prevents clumping, as often occurs with rotary mowers. On small plantings, string trimmers are excellent for keeping weeds mowed back. Expect to mow three times in the first year, about once a month in summer (June, July, and August).

Beware of pulling weeds in the first year. The small prairie seedlings are easily disturbed, and are often pulled up along with the weeds. There goes your prairie! If you can tell the prairie seedlings from the weed seedlings, you can pull weeds when they are young. However, be careful not to disturb the young prairie plants during the critical first growing season. Annual weeds seldom present a problem to the long-term health of the prairie when kept under control using mowing in the first year. However, it can be worthwhile to *carefully* pull perennial weeds as they germinate, provided you can tell them apart from the native plant seedlings. On larger areas, this is not an efficient management technique!

Second Year

Annuals will continue to be abundant, and biennial weeds will likely appear as well. These may include such common biennials as Sweet Clover, Burdock, Wild Parsnip, and Queen Anne's Lace. The young prairie plants will grow taller in the second year than the first year, so the weeds should be mowed at a height of about one foot in the second growing season. Biennial weeds should be mowed when in full bloom, but before setting seed, usually around mid-June. This will "break the cycle" of biennial weeds, by preventing seed formation. Because biennials must produce seed to continue the next generation, preventing them from seeding helps prevent re-infestation of the area. Two mowings may be required at a height of 12 inches in the second year when biennials are in full flower, but not yet setting seed.

It is not uncommon for more biennial weeds to appear in the third and fourth year from dormant seeds in the soil. These plants will have to be pulled or cut back before setting seed, on a case by case basis.

If problem perennial weeds appear, they must be controlled immediately, before they have an opportunity to become established. Young perennial weeds can often be carefully pulled in the second growing season, now that the native plants are better established. Be careful not to disturb any adjacent prairie plants. Rhizomatous weeds such as Canada thistle and Canada goldenrod can be hand-treated with herbicide using the "Glove of Death" method. Protect both hands with heavy duty neoprene herbicide gloves. Place a cotton glove over the outside of one of the gloves. Soak the cotton glove in herbicide (such as "Roundup") and apply to the leaves and stems of the weed without touching adjacent desirable plants. One's feet can be used to push prairie flowers and grasses to the side. Make sure they do not swing back into contact with the treated plants. This method should be used on a calm, cool day, so that the herbicide does not volatilize and drift onto nearby prairie plants.

Never spray weeds with herbicides in a prairie. The drift from the spray will kill large patches of desirable plants. Once the prairie plants are dead, weeds typically take over the newly-open soil. These areas must then be prepared for re-seeding by killing everything growing there, essentially starting completely over.

The secret to success with prairie meadows is to establish the native plants across the entire area, so they completely colonize the soil surface and rooting zone. Once the prairie sod is established, usually by the fourth or fifth year, invasion by weeds becomes less of a threat.

Third Year

In the beginning of the third season, the young prairie meadow should be burned off in mid-spring. This is usually between April 15 and May 1 in the Upper Midwest and Northeast US. At latitudes of 45 degrees North and above, and along the Great Lakes, spring comes later, and burning is often best done between May 1 and May 15.

If burning is not possible, due to local restrictions, wet weather, or a lack of sufficient dead grass to carry a fire, the planting can be mowed very closely to the ground instead. The mowed material should be removed from the site to expose the soil directly to the warming rays of the sun.

Exposing the soil surface by burning, or mowing and raking, helps encourage rapid soil warming in the spring. This favors the native “warm season” prairie plants over “cool season” weeds such as quackgrass. Rapid soil warming encourages the prairie plants over the weeds. The best time to burn or mow is when the buds of the sugar maple (*Acer saccharum*) tree are just breaking open in spring. Most prairie plants are still dormant or just beginning growth, and are unharmed by burning or mowing. Cool season weeds will be actively growing at this time, and will be significantly damaged. The advantage goes to the prairie plants.

Conclusion

Establishing a native prairie meadow is not a simple process. However, by following these five steps, anyone can have success, even novices who have never gardened before. Once established, a prairie the perennial flowers and grasses return year after year, serving as a living legacy of the person who plants it. The intrinsic natural beauty, ecological value, and reduced maintenance make prairie meadows an attractive landscape option. Happy Prairie Planting!