



How to Establish a Native Plant Community Using Seed

Nature makes it look simple and beautiful, but the many complicated human decisions and actions required to establish a successful native plant community can prove daunting, even to more experienced gardeners or landscapers. This guide seeks to make this process simpler by discussing it as an eight-step endeavor. Since it is not possible to cover all of the variables here, we encourage you to study this section carefully, apply it to your project, and then call us with questions. One-on-one conversation is the most efficient way to address the complexities of specific site conditions and plans.

Included in this custom-designed, diverse, tall, mesic mix shown above are: White Wild Indigo, Black-eyed Susan, Prairie Blazing Star, Wild Bergamot, Pale Purple Coneflower, Culver's Root, Rattlesnake Master, Yellow Coneflower, Purple Prairie Clover and Purple Coneflower.

Eight Steps toward Achieving a Natural Landscape in Three to Five Years

- 1. Assess Your Site**
- 2. Define Your Objectives**
- 3. Set Your Budget**
- 4. Plan Your Native Plant Community**
- 5. Prepare the Site**
- 6. Sow the Seeds**
- 7. Control the Weeds**
- 8. Long-Term Management**

STEP 1: Assess Your Site

Learn as much as you can about the site you've chosen for your planting. What is its sun exposure? What is the quality of the soil and how long does it hold moisture? Is erosion a problem? What is growing there now? Determine the size of your planting by pacing or measuring the area. Length in feet multiplied by width in feet equals area in square feet. *43,560 square feet = one acre*

STEP 2: Define Your Objectives

What do you hope to accomplish with your project? We recommend designing a native plant community to emulate the high diversity of interdependent or complementary species found in thriving natural ecosystems.

Considerations that are specific to your site requirements or aesthetic vision will determine your best plan. For example, if your site already has a significant number of native species present, you might consider simply enhancing it by inter-seeding or transplanting bare-root plants of appropriate diverse species into the remnant population. A combination of seeding and transplanting may be most effective.

If your site is overgrown with brush or scrub trees or dominated by invasive species, it is a more likely candidate for restoration than rehabilitation. This will require more aggressive site preparation and extensive planning.

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STEP 3: Set Your Budget

Realism is a critical component of the planting process. Knowing your limitations can greatly increase your project's likelihood of success. Determine early what you are able to devote to your planting in terms of time, energy and money. A realistic appraisal may lead you to an incremental approach, planting in stages over several seasons. We can give you better advice and recommendations if you know your project budget when you call.

STEP 4: Plan Your Native Plant Community

Choose native species that are appropriate to the sun exposure, soil type and moisture level of your site. We have pre-designed seed mixes for many different habitat conditions and several Midwest regions (see pages 52–60). We can help you choose the correct mix for your site conditions. We also can help design a special custom mix. We charge no extra for designing custom mixes that are valued over two hundred dollars. We do charge a fee for designing and assembling very small mixes.

STEP 5: Prepare the Site

Eliminating competition and correct seedbed preparation are early steps that are essential to the success of your native planting. Consider devoting an entire growing season (or two) to addressing your site's weed problems before planting. It may try your patience, but it can greatly accelerate the long-term establishment of your native species.

Learn to identify the common weeds in your area. Undesirable shrubs, small trees and non-native plants and weeds should be destroyed by hand cultivation or selective application of herbicides. If a controlled spring burn is an option for your site, it can help to eliminate brush cover and some undesirables.

Do not underestimate the weed seed bank potential of your soil. The weed seed bank holds the accrued deposits of dormant weed

seeds that have been falling on the soil, sometimes for decades.

There often are thousands of weed seeds in each square foot of soil. Their dormancy can be broken by optimal soil temperature and a brief exposure to light. If the area you are planting already is dominated by weeds, you should consider an aggressive site preparation regime.

Choose a preparation strategy that is suited to your site and circumstances, one that you can fully execute. Consider the pros and cons of the different approaches discussed below. It is not possible for us to address every situation here. Please call us if you need more specific advice.

Cultivating Unwanted Plants: Any soil disturbance is followed by more weed growth, so cultivation needs to persist through an entire growing season. Stubborn weeds may require two seasons and some deep-rooted rhizomatous weeds, like Canada thistle, may not yield to cultivation.

Weeding with hand tools is best suited to small areas. For larger areas, cultivating with conventional farm machinery can be an effective way to eliminate established perennial weeds from rich, heavy soils. If your large site was previously a cropped farm field (therefore free of perennial weeds) or if it contains deep sand or gravel soils that do not support heavy weed growth, several diskings prior to sowing seed may be all the cultivation needed.

For more common, weed-prone soils, cultivation of large sites should begin with fall plowing. If the soil is subject to erosion, however, defer the initial plowing until spring. When soil can be worked the following spring, cultivate with a disk to a depth of four to five inches. Cultivate every two weeks until fall in an effort to destroy the roots of perennial weeds.

For quack grass or other rhizomatous species, follow the initial disking with a spring-tooth harrow or digger to bring roots to the soil surface, where sunlight and drying will kill them. After all weed roots are dead, switch to shallow cultivations timed to eliminate freshly germinated weed seedlings.

Guidelines for Planning a Plant Community:

- Planting a complete ecosystem, including forbs (wildflowers) and grasses, creates a more natural effect. Once established, the dense, fibrous roots of the native grasses and forbs keep new weeds from finding a home.
- Where weeds may be a problem, select a taller, more aggressive mix of flowers and grasses. Heavy, rich soils support larger plants. Mixes featuring shorter species prefer drier habitats and thus can be difficult to establish in heavy soils.
- Diversity is the key to many native landscape requirements. All of our designed mixes have species that bloom throughout the growing season, attracting birds, butterflies and other wildlife to your site all year. Diversity also will create structure or texture for your planting. Once mature, it will have pockets of taller and shorter vegetation, giving your planting a natural appeal.
- For a more interesting landscape, intersperse different mixes as appropriate to create transition zones. If transitioning from one site condition to another—for example, from a dry to a wet area—combine portions of two site-specific seed mixes and plant that blend for a transition zone.
- Well-designed mixes contain flowers that bloom throughout the season, from spring to fall, and provide different colors and textures. Many grasses are at their prime in late fall and continue to display interesting forms even in the dead of winter, when the flowers are gone.



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STEP 5: Prepare the Site (continued)

Repeated shallow cultivations one or two inches deep through two growing seasons can deplete the shallow weed seed bank without exposing weed seeds from deeper in the soil.

If you are planting your large site to native species in the fall, use a harrow or drag to produce a smooth, clod-free seed bed.

If your soil is subject to erosion, consider deferring your planting until spring and first plant a winter cover crop in the fall. In spring, several shallow cultivations will eliminate the winter cover crop and any freshly germinated weeds. After a final dragging, the soil will be ready to plant. Another option is explained under the heading "Seeding Erosion-Prone Sites."

Smothering Nuisance Plants:

For preparing sites smaller than a few thousand square feet, smothering weeds can be effective. It is a simple technique that requires no chemicals or special equipment.

The idea behind smothering is simple: A plant can't live without sunlight, so covering the soil surface for a full growing season will kill the unwanted plants underneath. Some weeds need to be covered for two years. Smothering a lawn takes less time; usually it can be killed in two months by a close mowing before covering.

Black plastic is a common choice for a smothering material, but it has a tendency to deteriorate over time. It may blow away if not properly anchored and can be punctured by sharp weed debris left underneath.

More economical choices might be salvaged or recycled wood paneling or industrial-weight tarps. Other suitable materials include newspapers or cardboard covered with leaves or grass clippings. Old carpeting works, too, but if left too long can decay and become difficult to remove. While smothering will eliminate plants, a large weed seed bank may remain.

Herbicide Application:

We at Prairie Moon take seriously the issue of agricultural chemical use. We are proud of our organic farming legacy but we also view the responsible and judicious use of herbicides as an effective tool for native ecosystem establishment.

We are not experts on herbicide use, so we are reluctant to give specific instructions. Always read labels on herbicide products and follow the manufacturer's directions and cautions when working with these powerful chemicals. A number of new, "lower-impact" herbicide formulas have appeared on the market in recent years. If you are interested in an herbicide designed to be less toxic to the user and to the environment, consider researching the alternative products now available. (See page 69 for more information).

Herbicides are absorbed by plants during their active growing cycles. For large-area site preparation, herbicides can be very effective. The most common are glyphosphates. If perennial weeds or woody shrubs and vines are a problem, then a broadleaf herbicide such as 2, 4-D may be mixed with the glyphosphate.

A successful herbicide strategy must be two-pronged, designed to eliminate existing weeds and to deplete the soil's weed seed bank by killing successive "blooms" of weeds. Treatments should be customized to the specific site conditions. Farm fields that have been growing corn or beans may need only one glyphosphate treatment in late spring, just prior to planting. Old fields that have been "let go" and have heavy weed populations may need several years of regular spraying.

Beginning site preparation with a controlled burn in spring can help to expose weed seeds and spur germination. If your weeds already are several feet tall and you cannot start with a burn, begin by cutting or mowing the vegetation to about one foot in height. Apply herbicide after the plants begin growing again. In two or three weeks, you can follow the initial die-off with a controlled burn.

However you start, you will need to apply herbicide three or four times in a growing season, waiting six to eight weeks between treatments. Sometimes this is all that's needed before planting in the fall. If you plant the following spring, apply another treatment in late spring, about a week before seeding.

Seeding into Live or Dead Sod:

Dormant season inter-seeding into established mowed stands of cool-season grasses is one alternative to planting on bare cultivated soil. Its advantages include less site preparation, fewer weeds and better control of erosion on slopes.

Not killing existing vegetation may slow your planting's progress by several years, but the wait may be worthwhile, especially if you are inter-seeding an area that already has desirable plants. For quicker results, one or two herbicide applications to the sod can reduce competition but often leads to increased weeds. Sites with low-growing grasses, especially with poor soils, can be seeded without killing the grass. For taller, aggressive grasses, such as reed canary grass, herbicides are needed. Overall, our experience has shown that not spraying out the existing grasses, such as brome and blue grass, results in dramatically fewer weeds. It has become our preferred method of installation. These plantings should be burned every spring for the first 5-7 years.

Large areas can be seeded easily with a Truax drill, a tractor-pulled seeding machine, with a no-till trash plow. Sites to be hand sown must be raked by hand to expose just enough bare soil for good seed contact.

Seeding Erosion-Prone Sites:

Hillsides and other erodible areas are good candidates for restoration with native plants because deep-rooted native perennials hold soil firmly in place once they are established. Since erodible areas cannot be left bare for extended periods, it is difficult to prepare such sites by eliminating existing vegetation.

Repeated herbicide applications on erodible sites can attack the weeds but leave their dead root material to hold the soil. Once an erosion-prone site is cultivated, it should be planted with a cover crop or a native seed mix with cover crop. Do not cultivate if it's too late in the fall to establish a cover crop.

Finish your site preparation by mid- to late summer, then establish a cover crop before planting your native mix in the fall. Sow a crop of oats between August 15 and September 15. A hard freeze will kill the oats in late fall.

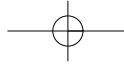
In late October, hand seed a native mix into the standing oats. Do not rake or drag. Frost action will work the seed into the soil surface. The dead oats will mat during the winter, helping to prevent soil erosion and providing good conditions for spring germination.

STEP 6: Sow the Seeds

Timing:

Seeds can be planted in the fall, spring or dead of winter. See the accompanying "Planting Timetable Options" chart below for a list of the pros and cons of each season.





Fall planting in the Upper Midwest begins in mid-October. Native grass seed sown earlier may germinate in ten days in unseasonably warm weather. If this occurs, seedlings may be winter-killed.

Frost-seeding during snow-free winter periods works well on prepared sites. Seed can be hand-broadcast or machine-planted on the soil surface with no tillage. Freezing and thawing will mix the seed with the soil. This also is an effective method of adding new species to established plantings. Seed can be sown into snow on warmer days when it can melt into the snow pack.

Mid-May to mid-June is the optimal time for spring seeding. Since most native grasses germinate readily then, spring plantings often are dominated in their early years by grasses and those forbs that don't require moist cold stratification or wintering over.

Moist stratifying forb seed, (see Germination Code C on page 5) before spring planting will improve germination during the first year, but we recommend it only if the site can be irrigated. If seed is sown untreated in the spring, some species will not germinate until the following spring after wintering over.

Planting:

Seeds can be hand-broadcasted or sown with mechanical seeders. Neither technique is appropriate for all plantings and each has unique advantages and drawbacks. Both methods may be needed to plant certain sites.

By Hand:

Since one person can seed about one acre in a day, hand-broad casting is practical only for areas of one or two acres or smaller, unless a large planting crew is available. Broadcast-seeding a prairie is much like planting lawn seed. Hand-cranked cyclone seeders will not work well with native seed mixes, since the larger seeds tend to plug the device while the smaller seeds flow too quickly.

Even distribution is an important seeding goal. Scatter seed slowly, trying not to run out before completely covering the site. To improve distribution, increase the volume of what you are broadcasting by adding to your seed mix a filler material such as moistened sawdust, compost, peat moss or coarse-grade vermiculite. Sand can be used for very small plantings but is too heavy for large areas.

Use one-half to one bushel of filler per 1000 square feet. A bushel equals eight gallons or 1.24 cubic feet. If seeding a large area, use six or more bushels per acre.

Dividing your planting area and seed mix into smaller parts can facilitate even seed distribution. Mark off areas of an acre or less into four equal parts, and larger areas into ten or more zones. Divide your seed mix into the same number of portions. Any small spots missed when sowing seed will fill in as the planting matures.

Hand-planting allows great flexibility. Specific mixes for different areas of the planting can add variety and interest. Spot sowing can

Planting Timetable Options



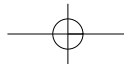
A fall interseeding: establishing a new production field of Pale Purple Coneflower. Humphrey is checking that the Truax drill follows the previous pass.



The drill needs to be periodically checked to see how much seed is left in the seed box.

TIME	ADVANTAGE	DISADVANTAGE
FALL (start to plant mid October until the ground freezes)	<ul style="list-style-type: none"> • Clay soils are easier to work in the fall than the spring. • Higher sedge and forb germination in the first growing season. • High moisture conditions at time of germination. Less watering needed. • Eliminates the need for cold moist stratification of seed. 	<ul style="list-style-type: none"> • Early establishment of warm season grasses can be inhibited. • Cool season weeds become competition for new seedlings in spring. • Erosion prone sites need cover crop seeding which is earlier and separate from the native sowing.
FROST (start to plant in early winter just before snowfall or snow free periods until spring)	<ul style="list-style-type: none"> • No raking or packing of site. • Higher sedge and forb germination in the first growing season. • High moisture conditions at time of germination. Less watering needed. • Eliminates the need for cold moist stratification of seed. 	<ul style="list-style-type: none"> • Early establishment of warm season grasses can be established. • Cool season weeds become competition for new seedlings in spring. • Erosion prone sites need cover crop seeding which is earlier and separate from the native sowing.
SPRING (start to plant in May until June)	<ul style="list-style-type: none"> • Cool season weeds can be eliminated before planting. • On erosion prone sites a cover crop can be mixed and planted at the same time as the natives. • Optimal for warm season grasses. • More time to do thorough soil preparation and spring weed control. 	<ul style="list-style-type: none"> • Clay soil is more difficult to work with. • Need of additional early mowing May 15 to June 7. • More watering is needed especially if you cold moist stratify the seed. • Delayed (1yr) germination for those forbs and sedges which require cold moist stratification or over wintering.

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STEP 6: Sow the Seeds (continued)

allow controlled placement of showy or larger species. Hand-seeding in spring or summer should be followed by a light raking. On areas too large to rake by hand, use a tractor, truck or other vehicle to pull a farm drag set to a shallow cut.

By Machine:

Drill seeders and drop seeders are the machines most commonly used for larger plantings. Drill seeders, including Truax and Tye, plant seeds in rows as they open a slit in the soil. They are good choices for planting old pastures because they do not require the soil to be worked up before planting. If equipped with a no-till attachment, drill seeders can plant sites with existing vegetation.

Drop seeders, including Brillion with brush attachment, should be used only on cultivated soil. They press the dropped seed into the ground with a roller, so the soil must be freshly cultivated to ensure good seed-to-soil contact.

Packing the Site:

Native seeds require firm contact with the soil; without it, germination and seedling survival will be poor. Packing or rolling the newly seeded area firms the soil around the seed and reduces moisture loss, especially important on light, sandy soils. Furthermore, many weed species grow faster in loose soil.

Packing fall or frost plantings is not necessary since snow and rain will have time to settle the soil before seed germination begins in spring. Spring plantings will need packing if soil is loose from cultivation.

As a general guideline, if walking on the soil compacts it more than half an inch, the soil is too loose and will need packing after seeds have been machine-planted or raked in after hand-sowing. This can be done by using your feet on small areas. Medium-sized areas can be packed by driving back and forth with a vehicle. Larger areas can be packed with a farm implement called a culti-packer. If the soil has been deeply cultivated, it may need to be packed both before and after planting.

Watering:

Fall plantings don't need to be watered but spring plantings can be helped by irrigation if conditions are dry. Keeping the topsoil moist for three to six weeks after planting will enhance germination. After this, occasional deep watering will stimulate good root growth. A general guideline through a planting's first year is to give a good soaking (half-inch) if rain has not occurred for a week. Very sandy areas should be watered more often.

Watering will not be necessary in the second year, except during extreme drought. In later years, a drought actually may be beneficial to your native planting by eliminating shallow-rooted exotic species.

STEP 7: Control the Weeds

Weed control is critical during the first few years of a newly planted native plant community. Persistent effort is the main feature of the management techniques described below. Herbicides at this stage should be used only as a last resort.

Mowing:

Maintenance mowing through the first growing season will prevent quick-growing weeds from excessively shading the new native seedlings. Hand-held string trimmers are ideal tools for small areas or sites that are too steep to mow.

Mow each time weed growth reaches 8-10 inches. Cut everything



Mowing Yellow Sweet Clover in full flower when it is too thick to hand-weed.

to a height of 4-5 inches. Don't worry about trimming the tops of native seedlings or crushing them underfoot. Mow frequently to keep cutting debris reduced so that it doesn't smother desirable seedlings.

Stop mowing at the end of the first season. Remove any weed seed heads but don't be concerned with additional vegetative growth. It can help protect native plants through winter by providing plant litter and catching snow. This helps to insulate the soil, reducing the risk of plant loss from frost heaving.

If weeds are thick in the beginning of the second season, mow or spot-mow once or twice. Raise the cutting height to 6-12 inches.

Hand-Weeding:

During the first year of a native planting, any soil disturbance runs the risk of killing tiny native seedlings and spurring germination of weed seeds. This is why we discourage pulling weeds while the natives are getting established.

If aggressive or noxious weeds are present, though, it is better to control them before they spread. For problem situations, a diligent weeding program should begin during a planting's second season.

Learn about the weeds that are common to your locale. Learn their growth habits and how to distinguish them from the young native forbs and grasses that you have planted.

In Prairie Moon's fields, we don't worry about hand-cultivating annual weeds because they usually disappear as the planting matures and native forbs and grasses dominate. We hand-pull problem biennial weeds, most easily after a good rain when the soil is soft. Permanently removing weeds from the planting and preventing re-seeding are the objectives. Many weeds if cut can sprout again, flower and produce seeds that same year, so they must be pulled.

One exception is Canada thistle, a rhizome-forming perennial whose roots are impossible to pull completely. We cut this plant at ground level when it is in the bud or early flower stage; rarely does it grow enough to flower again that same year. Likewise, sweet clover rarely re-sprouts after being cut at ground level in full flower (see photo above). We use a hand tool called a weed hook and, for larger infestations, a string-trimmer with a blade attachment.

Diligent weeding during a planting's first two to three years can reduce aggressive weed species to a manageable level, but annual vigilance will be necessary to prevent new problem weed flare-ups.

The Last Resort:

Avoid spraying herbicides in native plantings! Aerosol drift from spraying can kill desirable plants and leave dead areas that will be vulnerable to new weed infiltration. If you encounter a weed problem that stubbornly resists other control techniques, try the following methods as a last resort.

Mix a strong solution of glyphosate or other appropriate herbicide in a no-spill container. Wear a pair of rubber gloves and pull over them a pair of absorbent cotton gloves. Cutting the tips of the cotton glove's fingers can help the fit. Saturate the cotton glove with the herbicide solution, squeezing out the excess so that it doesn't drip. Grab the leaves and stem of the targeted weed, applying the herbicide to that plant only. Do not touch adjacent desirable plants or they will be killed.

Another tactic with stubborn weeds such as burdock and Canada goldenrod is a wick-type application of glyphosate. Use a small paintbrush to carefully apply the herbicide to the plant's cut stalk. The same treatment can be used on Canada thistle, but a stronger chemical may be needed.

Use these methods with great caution and only on cooler, windless days. Herbicides volatilize on hot days. Even a light breeze can blow a killing mist onto adjacent plants.

STEP 8: Long-Term Management

Most native plantings, after two or three growing seasons, need to be burned annually for the next five or more years to become well established. Burning yields better growth and more flowers. Mature prairies with no weed problems may need burning only once every three years.



When a large planting reaches maturity, it can be divided and burned in different sections each year, thereby protecting over-wintering butterflies and other insects.

When a large planting reaches seven years, it can be divided into three sections with mowed paths between them. Burn a different section each year, thereby protecting over-wintering butterflies and other insects.

If a planting is not periodically burned, a thatch layer can build up over the years, causing some native species to grow poorly or even to die out completely. Burning is the single most important management practice for native plantings.

Burning in March or April will stimulate growth of native plants and give them a competitive edge over weeds. Always use caution and common-sense when burning. Follow local fire regulations, obtain permits and have plenty of tools and help on hand. For more detailed information, we recommend the booklet *How to Manage Small Prairie Fires* by Wayne R. Pauly (see page 72). More good burning information is available from the Prairie Enthusiasts, www.theprairieenthusiasts.org.

Always plan fire safety into plantings, even if you will not be using burn management. Prairie fires, accidental or intentional, can burn very rapidly during spring or fall dormancy. Use existing features, such as roads, driveways, streams, lakes and mowed lawns, as firebreaks.

Include a wide path around the perimeter as well as paths through your planting. We advise a mowed lawn buffer at least 40 feet wide between buildings and prairie.

An Alternative to Burning:

If burning is not permitted at your site or if you prefer not to use this method, you can mow or manually remove thatch in early spring (late February to mid-April). Last year's dead stems will not hide the new growth and flowers, and the sun's rays still will be able to warm the soil.



Steve follows a spring savanna burn. Stimulation of existing native species and suppression of encroaching brush and trees was the accomplished goal.

A Note on Diversity

Use a high diversity of native species matched to your site conditions. When stressors such as drought, flooding, insect invasion, pollution, or fungal outbreak occur, odds are good that only a few individual species of plants will be particularly hard hit. If this is the case, the remaining plants will fill in the void and the affected species will hardly be missed. The same cannot be said for a planting of only a few species, where the loss of one species would be immediately noticeable. What's more, a planting that features dozens of species adds extra variety for the eye.

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