

Site Preparation and Prairie Seeding Methods



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I) Site Preparation

Site preparation 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 existing vegetation and weeds 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 black or clear plastic for a full growing season
- 2) Smothering with a single layer of cardboard or multiple layers of newspaper, covered with leaves or grass clippings for a full growing season
- 3) Planting a summer buckwheat smother crop, followed by fall planting of winter wheat, usually for two successive seasons

- 4) Repeated deep soil tillage every three weeks for a full growing season
- 5) Sod removal on lawns with no weeds, using a sod-cutter
- 6) Bulldozing all vegetation and their roots and rhizomes from the site
- 7) Herbicide treatment using Roundup or similar glyphosate herbicide, with added broadleaf herbicides to kill Roundup-resistant weeds, if necessary

If perennial weeds are well established one to two years may be required to completely kill them. This can be accomplished using year-long smothering, repeated applications of herbicides, or regular, repeated tillage with equipment that uproots and kill perennial weeds. After the perennials have been eliminated in the first year, weed seeds that are harbored in the soil can be allowed to germinate and killed by application of herbicides in the second year. Tilling weed seedlings to kill them is generally ineffective, since every time the soil is disturbed new weed seeds are brought to the surface where they can germinate.

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. This allows for the elimination of the perennial vegetation in the first growing season, and control of the weed seeds in the soil in the second year by spraying every 6-8 weeks, without tilling or disturbing the soil.

Smothering with Black Plastic or Cardboard

Smothering is a cheap and effective method for killing herbaceous vegetation. Rolls or sheets of black or clear plastic can be staked into the ground to deprive weedy vegetation of moisture, and in the case of black plastic, light. A full growing season of smothering is required to kill perennial weeds, and some pernicious species such as Canada Thistle (*Cirsium arvense*), Field Bindweed (*Convolvulus arvensis*), and Crown Vetch (*Coronilla varia*) will often require two or even three years of smothering to deplete their extensive root reserves and kill the plants.

There are a number of drawbacks to using plastic as a smothering material. First, it is produced from petroleum products. Secondly, it is difficult to recycle. Thirdly, it is subject to puncturing, especially by deer hooves, digging animals, and pets. Other options for smothering materials include old carpets, cardboard, and newspapers. Carpets are good for smothering small areas. Newspapers are subject to blowing, and can only be applied on a calm day and must be covered immediately with mulch such as lawn clippings, leaves, or logs to hold them in place.

An excellent smothering material is cardboard. It is often available for free, covers large areas, is less subject to blowing than newspapers, and decomposes to add organic matter to the soil (as do newspapers). Large appliance shipping boxes are often available at local stores for the asking. They make the job of smothering quick and easy. Cover the cardboard with lawn clippings or leaves to hold them in place for the full growing season.

If you are going to seed the area that has been smothered, the plastic, newspapers, or cardboard will usually have to be pulled up to expose the soil. However, if the organic material that was applied



over newspapers or cardboard has decomposed to humus, and the smothering material below it has disintegrated, seed can be applied directly into the upper organic humus material. This provides an excellent seed germination environment.

If installing transplants, simply move the organic material away to expose the old newspapers or cardboard. It should be damp and easy to cut through. Make an incision into the mulch material to expose the soil and dig a hole for the plant. After installing the plant, return the mulching material around it to hold in moisture and prevent weed seed germination. This is one of the easiest and environmentally friendly methods of installing a prairie garden (or any garden for that matter).

Please note that smothering does nothing to control the weed seeds in the soil, as they remain basically unaffected. If possible, it is best to plant seeds directly into the decomposed leaves or other organic material that was applied over the cardboard or newspaper when seeding a prairie. Inorganic materials such as plastic, carpet, etc. must be removed prior to installing either plants or seeds.

Smother Crops

Smother Crops are annual plants that deprive other plants and weeds of sunlight to kill them. Smother crops have the benefits of requiring no herbicides, and they add organic matter to the soil. Two successive years of smother crops are required to control weeds in abandoned fields that have grown up to a variety of perennial weeds and grasses.

The most commonly used smother crop is buckwheat (*Fagopyrum esculentum*). It is often used in conjunction with winter wheat (*Triticum aestivum*). Buckwheat grows rapidly and produces many layers of large leaves along its stems that deprive plants below of sunlight. It was commonly used in agriculture as a rotational crop for controlling weeds prior to the advent of herbicides.

The area to be planted to buckwheat should be plowed under in mid to late spring after the weedy vegetation has begun to grow. This will set back the weeds, and provide a competitive advantage to the buckwheat. Smooth the field in preparation for seeding. Plant the buckwheat at a rate of 50 pounds per acre in June, after all danger of frost has passed (buckwheat is intolerant of freezing temperatures). Allow the buckwheat to grow until it begins to flower, usually in mid to late August, about two months after seeding. Cut it down when in full flower, before seeds begin to form. If seeds are allowed to form and drop to the ground, buckwheat will return in the next two to three years, and can compete with future prairie seedings.

After cutting down the buckwheat in August, it should be immediately plowed under to add organic matter to the soil. Allow it to sit for two to three weeks to decompose, as the green stems can give off ammonia that may affect your next crop seeding. In mid September, smooth the soil and plant a crop of winter wheat to help hold the soil over winter and to reduce weed competition from any remaining weeds.

When the winter wheat comes up the following spring, allow it to grow and produce early seedheads, usually in late May to early June. Cut it down, plow it under, and allow it to sit for a



week or two to decompose. Then plant a second crop of buckwheat before July 1 to control any remaining weeds. When the buckwheat is in full flower, cut it down and plow it under, as in the previous year. The area should now be ready to seed to prairie that autumn. If seeding in late fall, the site should be lightly disked before seeding to kill any weeds that have germinated from seeds in the soil seed bank.

If seeding in spring, plant a second crop of winter wheat in the second fall. Cut it down the next spring, plow it under, and prepare the field for seeding your prairie.

Soil Tillage

Soil Tillage is an option for killing weeds on level sites that are not subject to erosion. The ground can be worked using a chisel plow, cultivator, a rototiller, or similar implement that reaches down at least six inches into the soil to disturb the roots of undesirable plants. With repeated tillage, their root reserves are eventually depleted and the plants die. The strategy is to allow the plants to regrow three to six inches tall after each tillage event. This requires the roots to expend energy to produce new leaves, weakening them. Tilling at this point, preferably on a hot sunny day, destroys their new growth, further damages their roots, and dries the plants out.

A disc does not usually reach sufficiently deep into the soil, and does not bring up the roots to the soil surface where they can be dried out. A cultivator or tiller can be set to go six to eight inches deep, rips up the roots, and exposes them to the sun. A chisel plow works better than a moldboard plow as it reaches deep down into the soil. A moldboard plow can be used to work the field up the first time, but cannot be used repeatedly due to its inability to operate in the furrows that it creates during the initial plowing.

The disadvantages to soil tillage are that it consumes large amounts of fuel to operate the tractor, only works on level ground where erosion is not a concern, and each successive tillage event brings up a new batch of dormant weed seeds to the soil surface. Soil tillage also does not kill tap-rooted weeds, since they extend deeply and vertically into the soil where cultivation equipment cannot reach them.

Sod Cutting

Sod Cutting can be used on weed-free lawns to remove the sod in preparation for planting. Mechanical sod cutters can be rented at most equipment rental stores. The sod is disposed of after cutting by rolling it up and composting it, taking it to a yard waste recycling center for organic materials, or giving it to a neighbor who needs a new lawn!

Once the sod has been removed, the soil can be lightly tilled and the prairie seeds planted. If the soil under the sod is heavy clay with little or no topsoil, amendment with two inches of loose, weed-free loam is advisable to create a good germination medium. Since the area will be about two inches below the original grade after removing the sod, filling with clean topsoil will not cause problems with grading or drainage.



If tap-rooted or deep-rooted rhizomatous weeds are present in the lawn, the sod cutter will not remove them completely. They can re-sprout from the lower roots and reinfest the area. These roots will need to be dug out individually prior to seeding when using a sod-cutter.

Bulldozing

Bulldozing is an extreme method of soil preparation that is often used to clear new building sites. The topsoil is usually stockpiled and re-spread after the area has been re-graded and the building completed. If topsoil is stock piled for more than a month or two, it invariably grows a nice crop of weeds. These should not be allowed to grow, as they will later infest the areas where the stockpiled topsoil is later spread. A simple way to prevent this problem is to spray the pile with Roundup every six to eight weeks during the growing season. This will kill most perennial weeds, and prevent annual weeds from completing their life cycles and producing seeds that will compete with the prairie seedlings.

Herbiciding

Herbiciding is usually the most efficient and effective method for eliminating weeds on large sites. Most weeds are readily killed by one or more applications of glyphosate herbicides ("Roundup"). A few weeds are resistant to glyphosate herbicides. To kill them requires the addition of a broadleaf herbicide such as 2,4-D, Garlon, Trimec, or other formulations that are labeled for killing broadleaf herbaceous vegetation.

Broadleaf herbicides are far more biologically active than glyphosate, and should be used with the utmost of care. Some are quite toxic, while others are suspected of causing various cancers, birth defects, etc.. These are the kinds of herbicides that lawn care companies apply to turf. Notice that their employees wear head to toe protective gear There is a very good reason for this!

Site preparation protocols using herbicides are listed below for a variety of situations:

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. Alfalfa fields usually require a full year of preparation using herbicides, as they almost always contain perennial weeds such as quackgrass and other cool season weeds. Alfalfa fields should be sprayed three times, every 6-8 weeks starting in late May or early June. The second application should occur in mid-July, and the third in early to mid- September. This should eliminate the alfalfa and all cool season grasses.

Lawns are easily to kill, either by smothering, repeated tilling, sod-cutting, or spraying with Roundup (glyphosate) herbicide in spring or fall when lawn grasses are actively growing. The biggest issue with converting lawns to prairies is the difficulty in breaking up the thick sod. Rototillers tend to bounce off of intact sod without digging in. Even dead sod is resistant to tilling. One way to address this problem is to smother the lawn for a full growing season. This



allows sufficient time for the sod to deteriorate and become easily workable. Another method is to treat the lawn with Roundup in the early fall, let it sit over winter to break down, and work the soil the following spring.

PREPARING LAWNS USING "ROUNDUP" HERBICIDE:

- 1) Spray with Roundup in September. If Roundup resistant broadleaf weeds are present, a broadleaf herbicide can be mixed with the Roundup to kill everything.
- 2) For fall seedings, the dead thatch can be burned off, or thoroughly de-thatched to remove dead grass material. 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. Cover the seeded area with one to two inches of clean, weed-free winter wheat straw.
- 3) For spring seedings, till the dead turf early the following spring after it has had a chance to break down over fall and winter. The area can be seeded after tilling, or more weed control can be accomplished using steps 4 below.
- 4) After spring tilling, allow weeds to germinate. Spray with Roundup ONLY when weeds are 2-3 inches tall to kill them. Do not use broadleaf herbicides in spring, as their residual effects in the soil will prevent the germination of prairie flowers, and can kill them.
- 5) When the sprayed weeds turn yellow and die, seed ASAP with a minimum of soil disturbance. Rake very lightly, apply the seed, and roll it into the soil. Apply one inch of clean, weed-free winter wheat straw over the seeded area. If desired, the seed can be scattered on the soil surface without raking, covered with one inch of clean straw, and watered daily in the early morning (unless soil is already damp). This will stimulate germination of seeds under the mulch on top of the soil, without bringing up new weed seeds by raking or tilling.

A slit seeder or turf over-seeder can be used for installing the seed. However, calibration of these machines can be difficult when using prairie seeds. To overcome this problem, mix the seed with a larger volume of 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 seeding without tilling, beware of poor "seed to soil contact" due to thatch buildup in the turf. The 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. Covering the seeded area with winter wheat straw also helps to hold in moisture, allowing one to skip the de-thatching step. Irrigating the planting in the spring of the first year for a month or so during germination can greatly improve germination and seedling survival, and is strongly recommended.

Weedy Old Fields. Old fields and weedy meadows may require one to two years of regular spraying with herbicides in order to eliminate weeds prior to seeding your prairie meadow. One

of the advantages of repeated application of herbicides is that they not only kill the existing vegetation, they also kill weed seeds that germinate. One of the most effective methods of establishing a prairie meadow on weedy sites is to spray the area for every two months during the growing season for two consecutive years, and then using a no-till seed drill or hand-broadcasting seed into the dead sod. This minimizes weed growth because many weed seeds have been eliminated, and no new weeds are brought up by tilling the soil prior to seeding.

PREPARING WEEDY OLD FIELDS USING "ROUNDUP" HERBICIDE:

Old abandoned fields are among the most difficult to prepare for seeding, due to the presence of well-established perennial weeds and a storehouse of dormant weed seeds in the soil. Extensive preparation is required to eliminate the weeds and optimize the chances for success with a prairie seeding. One and half to two years of preparation is recommended, whether using smother crops or herbicides, as outlined below:

- 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, Field Bindweed, Crown Vetch, Canada goldenrod, or other Roundup-resistant species 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, and spray with Roundup herbicide, with broadleaf herbicide if necessary.
- 5) If the seedbed is rough and uneven, re-grade it after the spring spraying to prepare the final seedbed. Thick dead vegetation can be burned off or mowed prior to grading. This will be the final grading in preparation for seeding. Weed seeds will be allowed to germinate, so they can be killed during the summer in preparation for fall seeding.
- 6) Allow weeds to re-grow. Spray when 6 to 12 inches tall. This will likely be around mid-July.
- 7) Allow weeds to re-grow one more time, and spray with Roundup ONLY in late August or early September. The site is now ready for fall seeding.
- 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 prairie seedings are "dormant" seedings. Few if any of the prairie seeds will germinate until the next spring, so a nurse crop should be used to hold the soil in place. Oats or annual rye makes good nurse crops. Seed the oats at a rate of 64 lbs/acre in spring, and 128 lbs/acre in fall. Annual rye should be seeded at 5 lbs/acre in spring and 15 lbs/acre in fall. Do not use winter rye or winter wheat as a nurse crop, as they produce plant toxins in the soil that inhibit germination of other plants.



New Construction. The soils that result from newly excavated and back-filled areas are like Pandora's box: one never knows what evil things might emerge. As noted above in the section on Bulldozing, the roots of all perennial weeds are not necessarily removed in the process, and may remain in the soil below where they can re-sprout and re-infest the area.

Topsoil that has been stockpiled and re-applied may contain living weed roots, as well as a plethora of weed seeds. Unless one is certain that all weeds have been removed and clean topsoil applied to a site, it is best to assume the worst.

Intact roots of weeds will usually emerge within one week to a month after bulldozing or after the re-application of topsoil during the growing season. Weed seeds will begin germinating after a week or so in spring and early summer. Beware: Most weeds germinate in the first half of the growing season, and many will not come up after mid- July. Some weeds germinate in fall, others in early spring. It is difficult, if not impossible, to determine the level of weed seeds lurking in the soil by observing weed germination rates after July 15.

To be on the safe side, it is best to wait and see what weeds appear on newly constructed sites to determine how much site preparation will be required. If construction was completed late in the season, wait until the following spring to evaluate weed levels, as little growth will occur in the latter part of fall. If the area is on a slope and subject to erosion, a cover crop of oats can be seeded in spring or summer to stabilize temporarily the soil. Winter wheat is a good choice for seeding in September and October, as it will over-winter and provide cover into the next spring, at which time it will need to be eliminated along with any weeds that appear.

Compaction from heavy equipment is often a problem on new construction sites, especially on heavy clay soils. Compacted soils restrict the infiltration of air and water into the soil, and prevent root penetration into the subsoil. To determine if your soil has been compacted, use a sharp spade to dig down six to twelve inches deep. If it is difficult to penetrate the soil with the spade, it may be compacted. Look for horizontal layers of soil that form "sheets" and are hard to break apart. Most compaction occurs in the upper six inches, but if topsoil has been applied check at least a half a foot below the topsoil for signs of compacted zones in the subsoil.

II) Planting Time and Method

Prairie seeds can be successfully planted during the following times:

- Spring thaw through June 30
- September 1 through soil freeze-up ("Dormant Seeding")
- Winter "frost seedings" on a thin layer of snow

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

Spring and early summer plantings tend to favor the "warm season" prairie grasses. Many prairie flowers also germinate well with spring seeding. Those that do not will often remain dormant



in the soil and come up the following spring. If possible, irrigate spring seedings in the first two months after planting to encourage high seed germination and survival. Always water early in the morning, never late in the day or at night. Residual moisture on seedlings often results in mortality due to a fungal disease called “damping off.” Watering early in the morning allows sufficient time during the day for the seedlings to dry out before evening when high humidity conditions favor the growth of fungus.

Fall plantings are referred to as “Dormant Seedings,” since the seeds will not come up in fall when planted, but overwinter in the soil and germinate the following spring. Dormant seedings typically result in higher germination of most prairie flowers, and lower germination rates for warm season prairie grasses. Cool season prairie grasses usually do well with fall dormant seedings; Some will germinate in September or early October. The inclusion of a fast growing “nurse crop” that germinates in fall, such as oats or annual rye, is generally recommended with fall seedings to help protect the soil from erosion over winter and early spring (see the upcoming section on nurse crops).

A third option is to do a “frost seeding” on top of snow in winter. When the snow melts, the seed is carried down to the ground where it works its way into the soil during the spring “freeze-thaw” cycle. When soil freezes, it opens up little cracks into which the soil drops. When it thaws, the soil closes in around the seed, similar to raking the seed into the soil. Frost seedings are best done on thin layers of soft snow. Seed can blow across crusted snow and be lost. If deep snow melts rapidly in spring, it can puddle and seeds can be swept away as the water runs off.

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

- 1) No-till seeder for multi-acre plantings
- 2) Broadcast seeder (such as “Brillion” double box agricultural model)
- 3) Hand broadcast for small areas of one acre or less

No-Till Seeder for Multi Acre Plantings

No-Till Seed Drills minimize soil disturbance and reduce the number of weed seeds at the soil surface that might germinate. The Truax no till native seed drill has been specially designed to handle the wide variety of seed sizes and characteristics of various prairie species. Most Truax seed drills have three boxes (although some only have two): one for the fluffy grasses, one for hard, round seeds, and one for a nurse crop. The calibration of the Truax drill requires some experience, and the seed depth bands and coulters must be set precisely to ensure that the seed is not planted too deeply.

Broadcast Seeders

Broadcast Seeders require that the soil be tilled prior to seeding, in order to ensure firm seed to soil contact. Brillion double box seeders provide excellent “seed to soil” contact, especially in loose sandy soils, due to its heavy cast iron packing wheels. For best results, the Brillion seeder should have “brushes” outfitted in the larger seed box to properly agitate and deliver the grass seeds, which are often fluffy and do not flow well with the standard wire agitator that comes with the Brillion seeder. Annual rye nurse crop can be pre-mixed and loaded with the grass seed.



Non-fluffy, small hard flower seeds are placed in the smaller “legume” box. Small round grass seeds such as Switchgrass and Prairie Dropseed should be mixed with the flower seeds and placed in the small seed box. Large seeds, such as those of the genus *Silphium*, should be kept separate from the other flower seeds and mixed with the fluffy grasses and placed in the larger grass box. Large seeds cannot be safely delivered when placed in the smaller legume box with its relatively narrow, fluted rollers, which can crush these larger seeds.

Hand Broadcast for Small Areas

Hand Broadcasting Seed is a good choice for small areas of less than one acre. The prairie seed is mixed with a much larger volume of inert “carrier” material to ensure good seed coverage. Since the typical seeding rate for a prairie is around 10 PLS (Pure Live Seed) pounds of seed per acre, it is not possible to distribute the seed evenly without first diluting it.

Sawdust from a sawmill is the easiest, cheapest and simplest material to use for this purpose. It is lightweight, easy to transport, and usually available for free. Select fresh, orange-colored sawdust that is damp, but not saturated with water. The moisture in the sawdust adheres to the seed, ensuring good distribution. Mix the seed thoroughly with the sawdust. This can be done in the back of a pickup truck or trailer, on a smooth concrete slab, or on a heavy duty tarp. Once the seed and sawdust have been homogenized, place the mixture in five gallon plastic pails and scatter the seed as if you were “feeding the chickens.”

To ensure that you do not run out of seed prematurely, divide and mark the area to be seeded into four equal areas (same amount of square feet). Divide the seed and sawdust mixture into four even-sized piles. Use one of the four piles to cover the first quarter of the area. By breaking the area down into smaller zones, it is easier to estimate how much seed to spread across each area, and the risk of running out prematurely is prevented.

If sawdust is not available, peat moss, perlite, and vermiculite make reasonable substitutions, although they must be purchased and sawdust is often free for the taking. Avoid using sand as a carrier, as it is dense and very hard on the back and arms.

VOLUME OF CARRIER MATERIAL REQUIRED FOR HAND SEEDING

Area to Seed	No. of Bushels	Cubic Feet	Cubic Yards
1000 sq. ft.	2	2.5	0.10
2000 sq. ft.	4	5.0	0.20
3000 sq. ft.	6	7.5	0.30
4400 sq. ft (1/10 Acre)	8	10.0	0.40
11,000 sq. ft. (1/4 Acre)	20	25.0	1.00
22,000 sq. ft. (1/2 Acre)	30	37.5	1.40
33,000 sq. ft. (3/4 Acre)	45	56.0	2.10
44,000 sq. ft (1 Acre)	60	75.0	2.80



Areas to be hand broadcasted with seed should be worked up lightly to create a good seedbed. Once the seed has been broadcast, rake lightly to cover it. Firm the seed into the soil by rolling with a roller or cultipacker, or simply drive a vehicle, tractor, ATV or other wheeled vehicle over it, using the tires to firm the seed into the soil.

If seeding in fall, the seed can be broadcasted over the dead sod or soil without tilling. This prevents exposing weed seeds from the subsoil that can germinate and compete with the prairie plants. The seed will work its way down into the soil over winter as the soil freezes and thaws. Although this method has the advantages of reducing weed germination and does not require soil tillage, it is less efficient than tilling and seeding. It is recommended that seeding rates be increased 25-50% when using this method to ensure good results.

Nurse Crops

A nurse crop is an annual plant, usually a grass, that does not interfere with the germination, growth, and development of the desired crop. Nurse crops provide a number of benefits, including erosion control, shade for the slower-growing prairie seedlings to reduce moisture stress, and reduced weed growth by occupying the same ecological niche as weeds.

Grasses make the best nurse crops because their upright growth does not block sunlight at the soil level, as do broadleaf plants. They also have fibrous root systems that help reduce the amount of open soil in which weeds can flourish. The two most commonly used nurse crops in prairie seedings are annual rye (*Lolium multiflorum*) and oats (*Avena sativa*).

Oats are killed by a hard freeze and will not return in the following spring. Annual rye is more cold tolerant, and often will survive the winter in USDA Hardiness Zones 5 and higher. Left unmanaged, it will grow to maturity in the second year. In the event fall-seeded annual rye survives the winter, keep it mowed to a height of 6 inches during the first year as part of the standard weed control program for the first growing season.

Nurse crops are seeded at higher rates in the fall than in spring, so as to provide quick cover during the short window of opportunity for growth before the onset of winter. In order to achieve sufficient root growth of fall-seeded nurse crops, they should be seeded, along with the prairie seed, no later than Oct. 1st in the Upper Midwest, and Oct. 15 in more southerly climates. Recommended nurse crop seeding rates are listed below:

NURSE CROP SEEDING RATES

Nurse Crop	Spring Seedings	Fall Seedings
Annual Rye	5 lbs per acre	15 lbs per acre
Oats	64 lbs per acre	128 lbs per acre



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 areas subject to water flow should be protected with erosion blankets, selected to match the expected water volumes and velocities. Fall planting on erodible sites should be completed by Sept 15 in order to encourage sufficient growth of nurse crops to stabilize the soil.

Hydro-seeding prairies is not recommended. Native wildflowers and prairie grasses require firm contact with the soil for good germination. Attempts to establish prairie meadows using hydro-seeding have typically resulted in poor results. The one exception to this rule is with fall seedings. Prairie seed can be mixed with a minimum amount of carrier and no tackifier in the hydroseeder tank mix and sprayed onto a properly prepared seedbed in fall (not spring). After application of the seed, a hydromulch can be applied over the seeded area. The prairie seed will work its way down into the soil over winter as the soil freezes and thaws and small crevices open for the seed to drop down into prior to spring germination. This method is not recommended for spring seedings, as the soil will not experience the freeze-thaw cycle that allows the seed to work its way down into the soil.

Straw Mulch

Seeded areas can be protected from erosion by the application of chopped and blown straw mulch. Winter wheat is the best choice, as it typically contains the lowest amount weed seeds compared to spring wheat or oats. Avoid rye straw, as any residual seeds in it that germinate will produce plants that exude toxins into the soil that can restrict the growth of the prairie seedlings.

Mulch protects the soil by breaking the force of raindrops that can cause puddling, the suspension of soil particles that leads to erosion. It also helps retain moisture in the soil, improving seedling germination and survival. DO NOT use shredded bark, bark chips, bark nuggets, sawdust, or other mulch products derived from wood. They not only can physically restrict the emergence of seedlings, they rob the soil of nitrogen and can stunt plant growth. Avoid using lawn clippings or tree leaves as mulch on prairie seedings, as these tend to form impenetrable mats that prevent proper seedling emergence.

Note: The sawdust that is used to dilute prairie seed for hand broadcasting has no negative effect on the soil or seedling germination and survival. The amount of sawdust applied during the seeding process is miniscule in comparison to the total soil area covered, and will not cause a problem.

Seed Quality: A Critical Factor

There are no seed quality standards enforced by state or federal agencies for prairie flower seeds at this time. There can be significant variation in seed quality among seed suppliers. Many prairie seeds are sold mixed with leaves, stems, fluff, and other non- seed plant parts. Often the actual percentage of germinable seed can be 50% or less.

The only guarantee you have is to know your seed supplier, and the quality of the products they offer. The only real assurance you have that you are getting your money's worth is to buy seed on



a Pure Live Seed (PLS) basis. Seed sold as Pure Live Seed has a “correction factor” that has been calculated based on the purity and germination rate of the seed lot. The amount of bulk seed that you receive is equivalent to the full weight of pure, germinable (live) seed, as the example below shows:

LET US ASSUME FOR A GIVEN SEED LOT THE FOLLOWING CHARACTERISTICS:

PURITY: 98.50%
 GERMINATION: 90.00%

$$\text{Bulk Wt. lbs per PLS lb} = \frac{1}{\% \text{ Purity} \times \% \text{ Germ.}} = \frac{1}{0.985 \times 0.90} = \frac{1}{0.8865} = 1.13 \text{ Bulk lb}$$

If you receive seed that contains foreign material and non-seed plant parts (including the pappus, or seed “flyers”), there is a good possibility that the seed is of low purity and quality. The success of your project 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!

With careful attention to every step of the site preparation and planting process, and the use of high quality, tested native seeds, you can achieve excellent results with your prairie meadow establishment.

