There is no single, correct way to seed native vegetation and there is no substitute for experience. Successful planting is the result of getting familiar with the equipment and developing the “art” – one’s own way of working with natives. As a wise man once said: “It won’t grow in the bag.” The message: Don’t worry so much about how to plant it. Get out there and start seeding.

**Basic steps to successful seeding:**

- Use good seed.
- Place seed in direct contact with the soil.
- Don’t bury seed more than ¼ in. deep.
- Pack seed tightly to the soil.
- Include erosion control measures where necessary.
- Mow weeds during the first growing season.
- Conduct prescribed burns every three to five years.

![Broadcast seeding in mid-fall following a ditch cleanout.](image)

**Timing**

May and June are ideal seeding months, but road construction projects are rarely ready for seeding at this time. The following seeding calendar provides suggestions for protecting slopes and improving seeding success throughout the year.

**January to mid-March**

Winter months occasionally present windows of opportunity for frost seeding, a practice that originated as a way of incorporating seed into the soil when a native grass drill was not available. Seed is spread over bare soil made friable (loose or porous) by a cycle of freezing and thawing. Results can be good, but opportunities can be brief.

- Be ready to jump on it.
- Include oats as cool-season nurse crop.
- Do not frost seed on areas covered with ice or snow.*
- Frost seeding on slopes is not recommended.

*Occasionally native seed is sown on top of snow. Technically this is not frost seeding, but can be an effective seeding method on relatively level sites.
Late March through April
If site conditions permit (ground not frozen or too sloppy) this can be a good time for seeding. Warm-season grasses won’t germinate until soil temperatures reach 60°. Include oats as cool-season nurse crop.

May and June
This time of year provides the best soil temperature and moisture conditions for germination and survival of warm-season species, including most prairie grasses and wildflowers.

July and August
Although every county can point to successful plantings during these months, hot, dry summer conditions are generally less favorable for planting natives. Consider a temporary seeding at this time, with the permanent, native seeding in the fall or the following spring.

If natives must be seeded now:
- Drill, rather than hydroseed, for maximum seed to soil contact.
- Increase seeding rate 25%.
- Include appropriate nurse crop.
- Mulch with straw, and crimp or tack straw into place.

September and October
Native seed germinating this late in the season is unlikely to develop enough root reserves to overwinter. Yet some of these plantings do succeed, maybe because a lot of the seed does not germinate until spring. Research is needed.
- Erodible sites must be stabilized with winter wheat.
- Increase seeding rate 25%.

November and December
Dormant seeding, considered a good option on level ground, is more complicated on erodible slopes. Cover crops seeded this late won’t provide erosion control until spring. The majority of native seed will remain dormant over winter. While some forb species do better when dormant seeded, some of the native grass seed planted at this time will deteriorate over winter.
- Erodible sites must be stabilized with hydromulch or crimped/tacked straw.
- Increase warm-season grass rate 25%.
Site Preparation

Site preparation enhances seed to soil contact, helps ensure proper planting depth and can even provide erosion control.

Prior to working the site

- Walk the site looking for gullies, culverts and other hazards (e.g., logs, stones, stumps, etc.).
- If weed growth is excessive, mow and disk stubble into the soil, if possible.
- Check with utility companies before disking.
- Calculate the size of the area to be planted and the amount of seed it will take.
- Size up the watershed and the site’s erosion potential.

Seedbed preparation for drill seeding

Ideal seedbeds are friable, firm and smooth.

- To reduce soil erosion, don’t smooth up the site until just before planting.
- Relatively level sites can be worked with a disk, chain-tooth harrow or similar equipment.
- To avoid excessive clodding, don’t work the site while it’s too wet.
- Cultipacking can help firm the seedbed and reduce clods.

Seedbed preparation for hydroseeding

Seedbeds can be left rougher to reduce soil erosion.

- Steep slopes can be ripped with a wide-track dozer.
- Directional tracking can be used to interrupt water flow.
- Work the site perpendicular to the slope to interrupt water flow.

Heavily compacted soils

- Try to work the site to a depth of 3 in.
- A heavy disk might be necessary.
- Some sites may need to be worked with long bulldozer tines.

A variety of implements can be used to prepare a seedbed. The most appropriate equipment depends primarily on slope, soils and seeding method.

The diagram at right illustrates directional tracking: dozer treads create grooves perpendicular to the slope.
Cover Crops

There are two kinds of cover crops. Cover crops planted along with the permanent seed mix are called nurse crops or companion crops. Those planted by themselves pending a better time to plant the permanent mix are referred to as temporary seedings or stabilizer crops.

Cover crops help hold the soil and are recommended on slopes 3:1 or greater. Oats *Avena sativa*, annual rye *Lolium multiflorum* and winter wheat *Triticum aestivum* are excellent cover crops because they are inexpensive, easily established and not overly competitive.

**Recommended Nurse Crops/Companion Crops** (planted with the native seed) – per acre

- **Spring**
  - 1.5 bushels oats or
  - 1 bushel oats and 5 lb. annual rye

- **Summer**
  - 2 bushels oats or
  - 1 bushel oats and 10 lb. annual rye

- **Fall**
  - 30 lb. winter wheat

**Recommended Temporary Seedings/Stabilizer Crops** (native seeding to follow in the spring) – per acre

- **Summer**
  - 1 bushel oats plus 10 lb. annual rye and one of the following warm-season species:
    - 5 lb. piper sudan grass
    - 10 lb. millet (Japanese or Pearl varieties)
    - 30 lb. sorghum (grain or forage)

- **Fall**
  - 20 lb. annual rye or
  - 60 lb. winter wheat

Caution: For native plantings, winter wheat is preferred over winter rye. Winter rye* is taller, more persistent and possibly allelopathic, chemically inhibiting the growth of wildflowers. Do not seed piper sudan grass, millet or sorghum too heavily. One good rain can cause mass germination. Piper sudan may cause concern among landowners as it is sometimes confused with shatter cane.

*There are many kinds of rye: annual rye *Lolium multiflorum*; perennial rye *Lolium perenne* and winter rye, cereal rye and grain rye (all names for the same plant) *Secale cereale*.

<table>
<thead>
<tr>
<th>Species</th>
<th>Lbs. in a bushel</th>
<th>Seeds in an oz.</th>
<th>Seeding at 1 bushel/A results in:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oats</td>
<td>32</td>
<td>910</td>
<td>10 seeds/ft.²</td>
</tr>
<tr>
<td>Winter wheat</td>
<td>60</td>
<td>937</td>
<td>20 seeds/ft.²</td>
</tr>
<tr>
<td>Annual rye</td>
<td>-</td>
<td>12,710</td>
<td>Seeding at 10 lb./A results in 46 seeds/ft.²</td>
</tr>
</tbody>
</table>
Mixing Seed

Native seed can be ordered pre-mixed. If species come individually bagged, they will have to be mixed thoroughly. Mechanical seed mixers are available. Otherwise hand mix as follows:

- On a calm, dry day seed can be mixed outdoors on a smooth, concrete surface. Otherwise select a well-ventilated building with a hard, smooth floor.
- Wear dust mask and safety glasses.
- Prop the door open wide and turn on the exhaust fan.
- Measure out the seed with a scale and dump it in piles.
- Mix seed with scoop shovels.
- After mixing, put seed in trash cans for hauling to the site.
- Seed that won’t be planted right away must be kept cool and dry.

Seeding Methods

There are three seeding methods: drill seeding, broadcasting and hydroseeding. Each has advantages and disadvantages.

Drill Seeding

Seeding with a native grass drill is the preferred method on level rights-of-way. Drilling is a one-step process, and is quicker and cheaper than hydroseeding. Drills do a better job establishing native grasses and produce faster results overall.

Drills do not work well on slopes. At 3:1 or steeper, the drill will try to slide sideways causing the disk openers to dig in and bury the seed. Projects with silt fences present another challenge; maneuvering a tractor and drill around these fences is difficult.

Drill seeding tips

- Calibrate the drill in the shop and set the rate a little lighter than what you actually want. Bouncing over the ground, a drill set at 6.5 lb. to the acre might actually seed 8 lbs. to the acre.
- When planting very clean seed with an older drill, use a filler to slow it down. Bulk-harvested seed or fluffy little bluestem works well.
- For good seed distribution, use the small seed box for fine seed and the fluffy seed box for grasses, large forb seed and seed that hasn’t been well-cleaned. Alternatively, sprinkle a portion of the forb seed on top of the other seed in the drill’s middle hopper, then add more forbs every other round or two.
- Do not plant native seed deeper than ¼ in. Most native seed is small and lacks the energy to emerge if planted too deep.
Hydroseeding

Hydroseeding is ideal for bridge approaches, cleanouts, culverts and wet or steep slopes. In most cases, the entire project can be hydroseeded from the shoulder. Other hydroseeding advantages—hydromulch reduces soil erosion; the risk of seeding too deep is eliminated; colored mulch on the soil makes a positive impression on the public.

Filling the hydroteeder takes time, so drilling or broadcasting are usually quicker for larger projects. Other hydroseeding disadvantages—mulch is expensive and can double the cost of a seeding; the seeding rate is harder to control; hydroseeding is strictly a bare-ground application.

- The trash plow attachment on a native grass drill should just scratch the surface. If it’s making furrows, it’s planting too deep.
- For uniform coverage, drill seed at a light rate and go over the area twice.
- Multiple passes packs the seed well and creates more rills that hold seed and interrupt water flow.
- To prevent seed from being buried too deep, disconnect the lower end of the drill’s seed tubes. Some of the seed will land on the soil surface and not be buried in the furrow. Some people prefer to unhook only every other tube. Others unhook only the tubes coming from the small seed box.

Top right: Ditch cleanouts can leave a steep foreslope. By angling the gun and using a concentrated stream, seed will be embedded in the slope. Bottom right: Hydroseeders can be very useful for challenging sites. Bottom left: Using a loader tractor to load mulch bales saves time and backs.

Disconnecting every other tube from the small seed box allows seed to be scattered more naturally and prevents the smaller seed from being buried too deep.
Hydroseeding tips

- It’s best to seed after a rain, not just before. Seed and mulch stick better on moist soils. Some moisture is captured under the mulch. Mulch needs time to set up before it rains.
- Increase overall seeding rate by 25% to compensate for seed damaged going through hydroseeder mechanics and for seed that gets hung up in the mulch.
- The “shadow areas” behind larger dirt clods sometimes get no seed. For better coverage, try to seed in two passes, one from each direction. Seed lightly – so the seeding rate is not doubled – at 7 to 8 mph, with flow rate reduced.
- An 800-gallon hydroseeder is the minimum recommended size. A 1,500-gallon hydroseeder can cover 1/3 acre per load. With a machine of this size, seven 50-lb. bales, or 350 lb. of mulch per load, yields about 1,000 lb./acre.
- Seed the area farthest from the road first.
- On steep slopes, try to embed the seed by using a more concentrated stream and holding the gun at a sharper angle.
- For the sake of efficiency, most county roadside managers apply seed and mulch in one pass. The “two-pass” method – seed applied first, hydromulch to follow – results in better establishment since more seed is in direct contact with the soil.

Hydromulching rates:

- 1,000 lb./acre – a token amount to help carry the seed and show what area has been seeded
- 2,000 lb./acre – appropriate for most 3:1 slopes
- 3,000 lb./acre – very heavy rate for long, steep slopes

Broadcast seeding

Broadcast seeding is a viable option now that commercially available native seed is cleaner and less fluffy than it once was. When applied with broadcast seeding equipment, this debearded seed flows better and slings farther and truer than in the past.

Broadcast seeding tips

- Broadcasting finer-seeded species prevents them from getting buried under too much soil.
- For very clean seed, the Vicon™ broadcaster can be adjusted down to the “nth” degree. For fluffy seed just open the gate a lot wider.
- A broadcast seeder on a 3-point is more compact than a drill and easier to get in and out of ditches.
- Broadcasters can be backed up to silt fences to sling seed on both sides.
**Hand seeding**
Scattering seed by hand followed by light raking is very effective for smaller sites and prevents fine seed from being planted too deeply.

- To improve distribution, mix the seed with some kind of carrier. Sand is best. Kitty litter or oats are also used.
- Mix the seed and carrier in a bucket and scatter it over the site by hand.
- Many wet prairie species have fine seed and should be seeded this way.

**Packing the seed**
Packing seed tightly to the soil ensures a more consistent flow of moisture from the soil to the seed. The result is better germination and better seedling survival.

- Packing is most important after broadcast seeding, but is always beneficial.
- A 4-ft. cultipacker section on a 3-point is very effective and will go places the tractor and drill can’t.

**Converting Non-native Roadsides to Native**
Occasionally a landowner will contact the county IRVM program to request a native planting adjacent to his/her property. If the site is conducive to a successful native planting, some counties accommodate these requests. Converting non-native vegetation to native requires eliminating the existing vegetation, usually by application of glyphosate. Cool-season grasses such as brome, fescue and bluegrass can be persistent and might require more than one application.

- Kill existing vegetation with a 2% solution of glyphosate in April or May.
- If thistles and other broadleaves are present, apply a Transline/Telar mix the fall prior to glyphosate in the spring.
- Apply the herbicide when existing vegetation is green and growing but no more than 12 in. tall.
- If there is still green grass after ten days, apply the herbicide a second time.
- Consider keeping the top 4 ft. of the foreslope unsprayed, leaving it stabilized with mowable, cool-season grasses.
- A native grass drill is most effective for planting into the dead stubble, disturbing the dead turf as little as possible while getting seed in direct contact with soil.
- Keep the entire planting mowed during the first growing season because weeds will likely be released once the existing cover has been destroyed.
- In subsequent years, spot-spray weeds as they appear.
**Establishment mowing**

During the first growing season, native seedlings remain small and can suffer losses due to competition by tall, thick weeds.

- Mow the planting three or four times during the first growing season.
- Don’t wait until weeds are too tall.
- A mowing height of 4 in. is good but to avoid scalping, 8 in. is better.

*Ditch bank and boom mowers with flail heads are useful for establishment and spot mowing.*

**Evaluating new plantings**

First-year native seedlings are small, making them hard to find and even harder to identify. As a result, people often worry or assume the planting is a failure.

- If the site was drill-seeded, look for anything growing in rows.
- Seedling ID books are available. (See *Supplemental Material* in the Appendix.)
- If the success of a seeding is being challenged, hire a botanist to look for seedlings.
- Unless a planting is washed out by heavy rains, allow two full growing seasons before giving up and starting over.

*Black-eyed Susans bloom in a young planting (far left). Most native species are slower to appear, establishing roots before above-ground growth becomes obvious.*

*A first-year seeding may look like the photo at left where weeds are taking advantage of moisture in the drill rows. Establishment mowing and patience are required.*
Comments

Timing

Fall seeding works great unless there’s a lot of snow that winter. Everything will wash away in the spring unless the area is flat. *Joe Kooiker, Story County, 2006*

If a wet area needs to be traditionally seeded, wait until after freeze up. *Joe Kooiker, Story County, 2006*

We begin dormant seeding in October once the 4” soil temperature reaches 50 degrees. *Jim Utte, James Devig, Dallas County, 2010*

I don’t seed in September or October. I wait until November, then drill into a cover crop and mow the following spring. If weather conditions deteriorate in November, I can still seed in the spring. *Wes Gibbs, Jones County, 2011*

I don’t intentionally wait to frost seed. I might consider it, but only on flat areas in perfect conditions. Another time I might frost seed: If I’ve dormant seeded an area in the fall, I might go back in and frost seed over the top. Two types of stratification seem to produce better diversity. *Wes Gibbs, Jones County, 2011*

Site Preparation

Watch out when preparing the seedbed. Working the soil too much promotes weeds and erosion. *Joe Kooiker, Story County, 2006*

On hard, smooth ditch cleanouts, at the very least, try to rough it up. A small cultipacker on a 3-point works pretty well in most ditches. If nothing else, the corner of the cultipacker will dig and rip the ground and the tires will spin and the bottom of the tractor will scuff, creating a rougher surface where the seed can catch and hang on. *Joe Kooiker, Story County, 2006*

For hydroseeding we prefer the site to be rough and a little soft. We seed immediately after the loader has left, with no additional seedbed preparation. The rough texture keeps the seed in place and the softness allows for better root penetration. However, for drill seeding, firmness is the most important factor. It is easy for seed to get buried too deep in soft seedbeds, either during or post planting. *Doug Sheeley, Dallas County, 2006*

Cover Crops

Sometimes cover crops are as much for public perception as they are for erosion control. Engineers, farmers and people in general like to see something green. Weeds can be a good nurse crop too, if kept from getting too tall. *Joe Kooiker, Story County, 2006*
The nurse crop can be added to the slurry in the second pass with good success. Wheat and oats are very difficult to keep in suspension in pure water, so it’s better to include mulch in the second pass. 

*Wes Gibbs, Jones County, 2010*

Unless soil has been aggressively ripped, or cultipacking occurs after seeding, oats and winter wheat do not perform well as nurse/cover crops when one-pass hydroseeding. We think ryes germinate best. We use annual rye when from April through September. Since annual rye will not overwinter as seed and needs sufficient growth to overwinter as a plant, we use grain rye from October through March. We also use pearl millet as a hydroseeding cover crop, if conditions warrant, and we may throw in a pound of timothy also – a fairly non-aggressive, cool-season perennial – to help in very steep areas. 

*Jim Uthe, James Devig, Dallas County, 2010*

In addition to increasing our native grass rate on very steep slopes, we also may consider increasing our cover crop rate. Since grain rye exhibits some allelopathic tendencies, its use likely affects overall diversity. But as we’ve already said, diversity takes a back seat to stabilization on steep slopes. 

*Jim Uthe, James Devig, Dallas County, 2010*

The majority of our regraded slopes are steep. I regularly use 2.5 bushels of oats, 6 lbs. of annual rye and 3 lbs. of timothy along with the permanent seed mix. This provides a better chance of stabilizing the slopes while the permanent seeding establishes, and I haven’t noticed any detrimental effect to the planting’s long-term success. 

*Linn Reece, Hardin County, 2011*

On large, contracted projects we fertilize the cover crop to DOT specs; the flush of weeds has usually subsided by the time we plant natives in the fall or following spring. On smaller, in-house projects and ditch cleanouts we don't fertilize. I wouldn't recommend fertilizer with natives, but it does help cover crops planted in nutrient-deficient soils. 

*Wes Gibbs, Jones County, 2011*

In typical Iowa soils, fertilizer and plant growth hormones aren't needed. However, we've used Finn's HydroMax along with starter fertilizers and various other amendments on steep slopes and channels with poor soil, and have had very good results. It's cheaper to quickly establish a cover crop than to spend the time and resources repairing or redoing a project. It's also good PR with the engineering staff and public to see a quick green-up. Again, we only use this practice on areas of very poor soil with a lot of erosion potential, or to protect a high-dollar project. 

*Jim Uthe, Dallas County, 2011*

Seeding Methods

Vicon fertilizer spreaders work great for broadcast seeding native seed. They can go on the tractor, on the trailer, and down the road with a one-ton pickup. 

*Joe Kooiker, Story County, 2006*

When hydroseeding try to carry enough mulch with you to finish the project. We lightly disk the seedbed before hydroseeding, if possible; cultipack after we seed; then apply mulch (two-pass method). Hydroseeding works well with combine-run seed. 

*Joe Kooiker, Story County, 2006*

Don’t trust your drill to meter your seed. Know your acreage and equally distribute the seed. 

*Wes Gibbs, Jones County, 2011*
When filling a hydroseeder from a creek, know your source. Don’t fill from an area with invasives (e.g., purple loosestrife). Jim Uthe, James Devig, Dallas County, 2010

Filling near the site with a trash pump has drastically improved the efficiency of the process. We mounted the pump on the seeder, so we simply drop a fill line into the water and turn on the pump. Josh Brandt, Cerro Gordo County, 2010

When hydroseeding, be sure to mix seed thoroughly in the water, both initially and periodically during application. Our Finn hydroseeder can reverse the mechanical agitation, which is helpful. Jim Uthe, James Devig, Dallas County, 2010

We have better germination with lighter hydromulch rates (400-500 lbs./acre). Dave Sedivec, Chickasaw County, 2010

There’s been some concern about high mulch rates affecting seed germination. I don’t think that’s an issue with large grass seeds, and even small seeds aren’t affected when dormant seeding with a high mulch rate since the mulch softens and breaks down over the winter. The seed can’t germinate if it’s washed away, so use enough mulch to get the job done right. Jim Uthe, James Devig, Dallas County, 2010

When mixing seed, we mix 10 acres worth of the fluffy grass (sideoats, big blue, Indian, little blue and Canada wild rye) and put it in large, plastic garbage cans. Then we mix 10 acres worth of the forbs and the two slick grass seeds (rough dropseed and switch) and put that in a large Rubbermaid tote. This year our fluffy grass rate is 12.2 lbs/acre and our forb and slick seed is 4.6 lbs/acre.

When hydroseeding, we bump these rates an extra 30 to 50% at times depending upon site conditions and current climatic factors. We pretty much always seed with mulch and we typically use 1500 lbs. of a blended mulch per acre. Our 3300-gallon unit seeds about 0.9 acres pretty well with 1350 lbs. of mulch in it (3600 gal. of material per acre). Some people I know put 1500 lbs. in a 3300 gallon seeder and seed a full acre, but we always seem to run a little short doing it that way. Jim Uthe, Dallas County, 2011

When hydroseeding, you initially have to know how much area you are covering with a full load. With our Finn T-90, I cover a third of an acre per load. That may be more than is recommended for that size machine, but it means fewer loads per job and quicker to finish. With our 22-foot wide ROWs (average), we travel 660 feet to make that 1/3 of an acre. With practice you can become pretty accurate — arriving at 660 feet with an empty hydroseeder. If we use UNI’s recommended rates, then big bluestem at 1.5 lbs per acre, for example, uses 0.5 lbs per load. We weigh out the amount of each species needed for a 1/3 of an acre and put it in one bag ahead of time. Then we can just dump the bag in each load. This holds true for the nurse and temporary crops as well. Linn Reece, Hardin County, 2011

Chapter 3 - SEEDING