Getting Started

in

Prairie Revegetation

A RECIPE FOR SUCCESS

North Dakota Game and Fish Department

NRCS Natural Resources Conservation Service

USDA-NRCS
Plant Materials Center
Bismarck, North Dakota

Native prairies (rangelands) are complex ecosystems. Revegetation is an initial step in restoring the native habitat of disturbed prairies. Close attention to details of "key ingredients" is essential in creating a successful "recipe" for prairie revegetation.

Key Ingredients:

- **Objectives**
- **Site characteristics**
- **Adapted species and varieties**
- **Site preparation**
- **Seeding rates**
- **Seeding equipment**
- **Post seeding management**

• Objectives

Most native plantings have multiple uses and benefits. The long-term ecological objectives must be defined, and planning must begin well in advance of the actual seeding for successful revegetation. What is the major use of the planting? Will it be used primarily as forage for grazing or native hay production? During what season will the planting be used to provide that forage resource? If the planting is primarily for wildlife habitat, target the appropriate species and plan the seed mix accordingly. Germplasm preservation or prairie landscaping use may be other considerations when selecting species.

• Site characteristics

Soils, aspect, slope, and climatic factors influence which plant species are suitable for the site. Identify the soils and select species that will perform well on these soils. If the site is comprised of many different soil types, a sculptured seeding should be considered. A sculptured seeding matches the species to particular soils and sites. Sculptured seedings require increased planning, but provide a more diverse, natural-looking landscape. Landscape aspect should also be considered. A south facing slope will generally be drier and hotter than a north facing slope. Will the planting be on lower ground and subject to frequent flooding? Use species that are known to grow and survive in specific precipitation and climatic zones.

Sharptailed grouse and other upland birds benefit from native prairie revegetation.

Photo by C. Grondahl, NDGFD

• Adapted species and varieties

Cost and availability should be considered in the initial planning. Seed of some native species may be in short supply. Determine how much you are willing to spend and plan the native mix accordingly. Costs of these mixes can be reduced by substituting lower priced alternative species or by lowering the percentages in the mix. The original objective of the planting may need modification if alternative species are used. Shop for a reputable seed vendor and ask lots of questions. References and seed samples can also be requested before purchasing seed from a specific vendor.

Native Grass Seed Sources

Performance and adaptation of native grass varieties differ by point of origin. Natural selection occurs due to environmental conditions such as temperature, day length, growing season, etc. Experience in the Northern Plains and upper Midwest has shown that seed from a native harvest can generally be moved about 300 miles north or 200 miles south of its origin without serious adaptation

Bismarck Plant Materials Center Cooperative Releases of Native Plants	
Name	***Origin***
Badlands Ecotype little bluestem	ND, SD
Itasca Germplasm little bluestem	MN, ND, SD
Bad River Ecotype blue grama	SD
Bison big bluestem	ND
Bonilla big bluestem	SD
Dacotah switchgrass	ND
Forestburg switchgrass	SD
Lodorm green needlegrass	ND
Mandan Canada wildrye	ND
Pierre sideoats grama	SD
Red River Germplasm prairie cordgrass	MN, ND, SD
Rodan western wheatgrass	ND
Tomahawk Indiangrass	ND, SD
Bismarck Germplasm narrow-leaved purple coneflower	ND
Bismarck Germplasm purple prairieclover	ND
Bismarck Germplasm stiff sunflower	ND
Medicine Creek Germplasm Maximilian sunflower	SD

difficulties. Cool-season grass species such as western wheatgrass and green needlegrass have broader areas of adaptation. Movement east or west is influenced primarily by precipitation and elevation. An increase of 1,000 feet in elevation is equivalent to a move of about 175 miles north of its origin. Use certified seed to assure varietal identity and genetic purity. As an alternative, use common seed of adapted species harvested from local populations.

Seeding Dates

Grasses are designated either cool-season or warm-season based on their growth cycle. Cool-season grasses can be planted when temperatures are cooler and day lengths are shorter. Warm-season grasses need warmer air and soil temperatures and longer day lengths to grow. Following are recommended planting dates for cool-season and warm-season grasses. Most prairie plantings are a mixture of both and should be seeded to favor the warm-season species.

Cool-Season Grasses	Warm-Season Grasses (and mixtures)
Spring (early May)	Late spring (mid May-late June)
Late summer (late August)	Late summer is generally not recommended
Late fall as a dormant planting (end of October or later)	Late fall/dormant is generally not recommended

Native Forb and Legume Seed Sources

Native forb and legume seed sources should originate from as close to the planting site as possible. Local sources or adapted varieties/germplasms are available for many, but not all, species. Seed originating from beyond the immediate site should be documented northern origin, free of invasive weed species, and purchased from a reputable vendor.

Diverse mix of native forb seed

• Site preparation

Native seedings usually include very diverse mixes of native warm- and cool-season grasses, forbs and shrubs. Once seeded, weed control becomes difficult due to this diversity. Weed control prior to seeding is critical. Weed control can be achieved by burning, herbicide application, grazing, mechanical tillage, or clipping of the field. Depending on the site history, it may require 1 to 3 years of weed control to adequately reduce the competition. If aggressive species are still present after control measures, delay the seeding and intensify the weed control effort. Altering the species in the mix may also allow for additional weed control options. Prior work has shown that applying glyphosate to a native seeding early in the spring will reduce smooth bromegrass, Kentucky bluegrass, and other cool-season invaders, but will also reduce your cool-season native component.

Firm, prepared seedbed (notice human footprint)

Preparing a firm seedbed is as important as controlling the weeds. Seeding can be successful in clean-tilled or no-tilled seedbeds. On clean-tilled soil, the site needs to be packed. A rule of thumb is that an adult heel print should barely be seen on the surface of the packed seedbed. Firming the seedbed can be accomplished by various methods. A packer, a harrow, or pulling a grain drill with its packer wheels across the field are common ways to firm the seedbed. If planned in advance, no-tilling into last year's standing clean crop residue is an option. This provides optimum moisture storage, and a firm seedbed that was developed during the winter months. No-till seeding into chemically killed sod can be effective, unless heavy residue and dense root mass remain. This method shows excellent results and should be given priority in areas that receive limited moisture. Regardless of field preparation method, a firm seedbed will assure optimal seed to soil contact.

A burned, chemically killed site shortly after no-till seeding

• Seeding rates

Seeding rates vary by region or state. Factors that affect seeding rates include: precipitation, seed size, seedling vigor, and seed conditioning. Most species in North Dakota are seeded at a rate of 25 to 30 seeds per square foot.

Lower seeding rates are generally recommended in western North Dakota due to drier conditions. Higher seeding rates are generally recommended in eastern North Dakota where moisture conditions are greater. Following is a table showing seeding rates for commonly used native species in North Dakota. These rates are for drill planting with a row spacing of 12 inches or less, the recommended row spacing for most grass plantings. Full seeding rates are shown in pure live seed (PLS) pounds per acre. Mixture composition is determined by multiplying the full seeding rate times the desired percentage of each species. Seeding rates are quite variable, and information should be obtained from NRCS and local agencies.

Seeding Rate Guide (North Dakota)*	
Species	*lbs/ac PLS*
Native Cool-Season Grasses	
Green needlegrass	6.0-7.5
Slender wheatgrass	5-5.5
Western wheatgrass	8-10
Canada wildrye	6.5-7.5
Native Warm-Season Grasses	
Big bluestem	6-7.5
Little bluestem	4-4.5
Sand bluestem	9.5-12
Prairie cordgrass	7
Blue grama	2-2.5
Sideoats grama	6-7.5
Indiangrass	5.5-7
Prairie sandreed	4-5
Switchgrass	3.5-4.5
Common Native Forbs	
Black-eyed susan	0.8
Blanket flower	7
Lewis flax	3.8
Canada milkvetch	4
Narrow leaf purple coneflower	9
Prairie coneflower (yellow)	1.5
Maximilian sunflower	1
Plains coreopsis	0.7
Purple prairieclover	3.8
Stiff sunflower	12.8
Western yarrow	0.4
White prairieclover	3.9

*Contact your local NRCS field office for seeding rates in other states.

• Seeding equipment

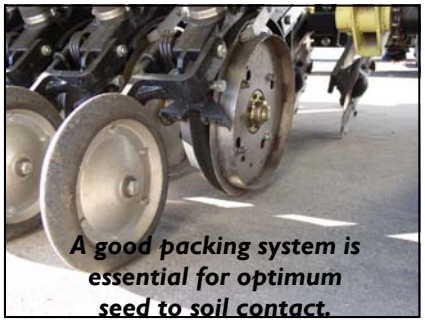
Control of seed distribution, seeding depth, and seed/soil contact are essential when planting grasses and forbs. Equipment varies in ability to regulate these factors. Seeds of different species vary in shape, size, and texture. Components found on available equipment and seed characteristics must be considered when selecting species to seed. Drills generally have from one box to three boxes. A grass drill generally includes a grain box, a fluffy box, and a legume box. A **legume box** allows accurate seeding of smooth, small-seeded species like switchgrass and most wildflowers. The **grain box** holds larger, smooth seed that flows easily such as wheatgrass. The **fluffy box**, used for awned seeds, usually has some type of **picker wheel** and agitation to aggressively pull seed down the larger tubes. Grain drills generally feature the grain box and a legume box. The quality of seed also affects seed distribution.


Fluffy big bluestem seed

The degree of seed processing varies greatly among seed lots. It is often desirable to obtain a small sample of the seed prior to purchasing to determine seed quality. Debearding of fluffy seed such as big bluestem, little bluestem, and Indiangrass also affects flowability. Depending on the degree of debearding, seed may flow through a grain box rather than requiring a fluffy box. Seed for mixes packaged separately by species offer the opportunity to separate to different boxes for planting. Mixed seed does not.


Conditioned (debearded) big bluestem seed

Generally, as seed gets smaller, depth of seeding becomes more critical. Seeding equipment with **depth bands** help prevent grass and forb seed from being placed deeper than the recommended placement of 1/2 inch or less. An **agitation system** within the seed box helps maintain even flow when seeding. Good seed to soil contact is also critical for successful seedings. A good **packing system** to firm the soil after seeding will improve seed to soil contact. Packing can be achieved by packer wheels on the drill or some type of firming by other equipment such as a cultipacker or roller.


A good packing system is essential for optimum seed to soil contact.

• Post seeding management

A long-term management plan is needed to keep a prairie seeding healthy and functioning as a native ecosystem. Planned grazing, routine prescribed burns, managed haying, and weed control help maintain a healthy, vigorous native plant community.

Monitoring the seeding for weeds in the first year is critical. Timely clipping may be necessary to control weed pressure. If clipping is needed, weeds should be clipped at a height equal to or slightly above any new seedlings. Proper clipping will reduce shading and prevent weeds from producing seed. Herbicides can also be applied for weed control, depending on the seed mix.

The second year may require spot clipping or herbicide applications for weed control. Bare areas should be reseeded at this time. Native forbs and legumes may be interseeded into planted grasses.

The third year should be rewarded with a good composition of native species. Planted forbs should be more visible and increasing in size and number. The old plant residue will be reaching levels that will require some method of reduction. Planning for a prescribed burn, haying, or grazing will help reduce the residue and open up the canopy. Excessive litter should be avoided on your planting as it will eventually reduce the vigor of the native stand and promote invasion of undesirable species such as Kentucky bluegrass and smooth bromegrass. Litter buildup is more rapid on tall grass species than mid-grass and short-grass species. Litter should be removed every 3 to 4 years, if the site is not annually grazed or hayed.

Properly applied native stand management insures quality habitat will be available for upland species like this prairie chicken.

Photo by C. Grondahl, NDGFD

Consult your local Natural Resources Conservation Service or Soil Conservation District office for additional information or assistance specific to your area.

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Prairie Revegetation Study

The USDA-NRCS Bismarck Plant Materials Center cooperated with the North Dakota Game and Fish Department (1998-2002) on a study to investigate various techniques associated with the no-till establishment of diverse, native mixes into existing stands of introduced cool-season species, primarily smooth bromegrass. The following information provides a brief overview of the results of the study.

- Burning the site to remove litter and duff layer is essential.
- Chemical control (glyphosate) of existing cool-season introduced grasses is necessary. Depending on introduced species and stand diversity, several applications of chemical may be necessary to provide desired control.
- Warm-season species were favored by spring seeding and cool-season species were favored by fall dormant seeding.

Canada wildrye favored a dormant seeding.

- No-till seeding into killed standing residue provided a very desirable, drought tolerant environment for seedling growth and development.

Establishment was poor when seeded into dead Kentucky bluegrass sod (bare area).

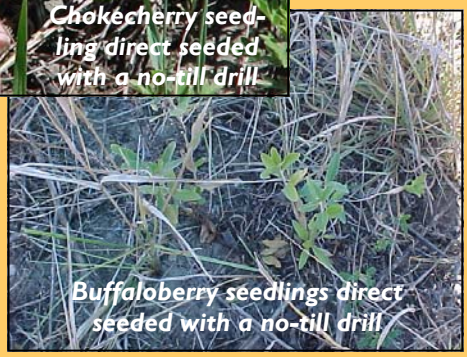
- Dead bluegrass sod provided an undesirable seedbed for no-till seeding. Heavy thatch and dense root mass (inset photo above) prevents proper seed/soil contact essential for germination.

Native no-till seeding, second growing season

- Some species of native forbs and legumes such as purple prairieclover, yellow coneflower, and Lewis wild flax showed tolerance to glyphosate.

- Native prairie species can be successfully established in one growing season by burning, chemical application, and no-till seeding into an existing cover of cool-season introduced species.

Chokecherry seedling direct seeded with a no-till drill



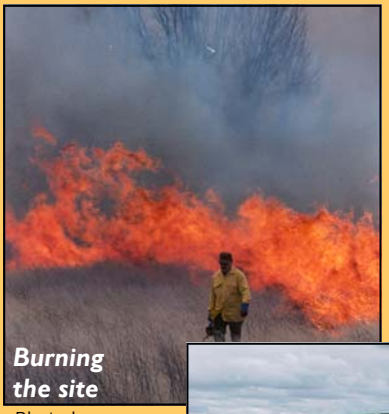
Buffaloberry seedlings direct seeded with a no-till drill

- No-till seeding of native shrub seed (chokecherry, prairie rose, leadplant, western snowberry, and buffaloberry) may be successful on selected sites with proper weed control and good moisture conditions.

A long-term management plan is essential for a successful revegetated native prairie.

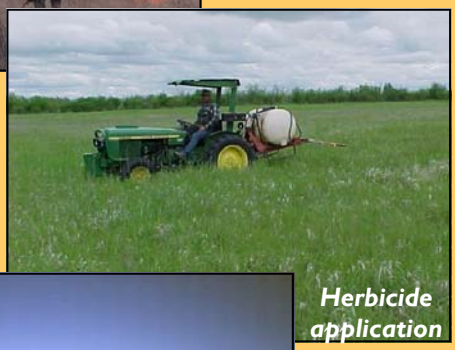
- Specific management schemes are necessary following establishment to maintain native species diversity and prevent introduced cool-season invasion.

A PICTURE OF SUCCESS



Burning the site

Photo by Bonnie Dewald

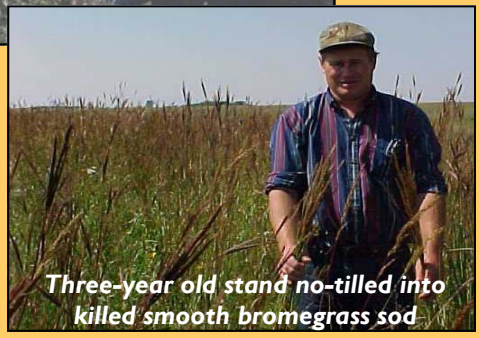


Herbicide application

No-till seeding

Stand of natives three months after no-till seeding

Native forbs appeal to people as well as wildlife



Three-year old stand no-tilled into killed smooth bromegrass sod

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