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Establishing Dryland Forage Grasses

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Preparation, seed selection, seedbed preparation, fertilization, methods of seeding, time and rate of seeding, weed control and more are covered in this NebGuide.

Grass pastures provide more total nutrients to cattle, sheep, horses and many other livestock in Nebraska than any other feedstuff. However, many areas often face a shortage of pasture during certain seasons of the year.

In eastern Nebraska abundant cool-season pasture usually is available during spring and fall, but during July and August there is little or no grass growth. Conversely, warm-season native range provides much forage during summer in central and western Nebraska, but not in spring and late fall.

Cool-season grasses begin growth early in spring and often produce 70 to 80 percent of their herbage by July 1. They are unproductive during the hot summer months unless irrigated. If moisture is available in fall, they will grow again until freezing.

Warm-season grasses start growth about one month later in spring than cool-season grasses and grow slowly until soil temperatures exceed 65°F and air temperatures exceed 80°F. As a result, spring soil moisture is conserved and used from June 1 to Sept. 1 when growth is most rapid. Grasses become dormant in the fall.

Preparation

Plan ahead to establish new pastures. Little grazing is available from cool-season pastures during the seeding year. Warm-season grasses establish even more slowly, sometimes taking two or more years to develop an adequate stand. Plan your grazing and livestock feeding program accordingly to allow sufficient time to establish new pastures successfully.

Begin preparation one or two years before seeding. Select sites that are likely to be productive, have access to livestock water, and can be fenced adequately. Sow crops that will permit control of problem weeds, but avoid use of herbicides that could result in carryover damage to new forage seedlings. Complete any major soil modifications well in advance of seeding.

Use research and experience-tested procedures for grass establishment to reduce seeding failures. Seeding failures are costly in terms of seed and labor, as well as lost forage the following year.

Seed Selection

The many grass species and varieties available can make it difficult to choose the proper one(s) for each situation. Wheatgrasses, bromegrasses and orchardgrass are excellent choices for pasture and/or hay during spring and fall. For summer pasture or range select switchgrass, indiangrass, the bluestems and gramas. Improved varieties of most of these species are available that are adapted to the soils and climate of your area.

Varieties and species adapted to all areas of Nebraska are listed in *EC120, Certified Perennial Grass Varieties Recommended for Nebraska*, available from your local Extension educator or online at *http://extension.unl.edu/publications*.

Select clean seed that has high germination. Seeding failures often are blamed on weather, fertility and other causes when the real problem is poor quality seed. Use certified seed whenever possible to assure varietal purity, vigorous seedlings, and to eliminate the possibility of introducing weed seeds. Certified seed initially may cost more, but it is usually well worth it — poor seed is never a bargain.

Seedbed Preparation

Good seed-to-soil contact is essential to maintain adequate moisture near the seeds. This moisture is necessary for germination and for the small root systems of young grass seedlings. Good seed-to-soil contact is obtained by preparing a seedbed that is firm, well-packed, and free of large clods with just enough loose surface soil for proper seed coverage. Such a seedbed enhances proper seed placement, infiltration of rainfall and storage of moisture to help prevent the drying out of the upper layer of soil. Any preparation method that accomplishes this seedbed is satisfactory.

Untilled, weed-free soybean stubble is one of the best seedbeds. The seedbed remains firm, the stubble and mulch provide some protection, moisture is conserved, and weed seeds are less likely to germinate.

A mulch of plant residues often is used to conserve moisture or where wind or water erosion is a problem. Mulch also helps control the growth of some weeds, and is especially helpful when establishing warm-season grasses.

Small grain stubble provides an excellent mulch for late summer seeding of cool-season grasses. Excessive straw sometimes must be removed before seeding. Seeding into small grain stubble is not effective, however, if weedy annual grasses or volunteer grain plants are abundant. Small grain stubble, especially rye, sometimes suppresses growth of new grass seedlings. Removal of excess straw and delaying planting until at least 30 days have past following small grain harvest often reduces this problem.

Corn, sorghum, sudangrass or millet stubble or residue makes good cover for winter and spring seedings, especially when rows are perpendicular to the prevailing winds or slope. Leave 12 to 18 inches of stubble to adequately protect seedlings from erosion and drying out as well as to capture snow for winter protection and to promote spring growth. If more than 18 inches of stubble remain, harvest and remove the extra

growth by clipping or grazing. Use properly equipped drills to seed through the mulch with no additional tillage.

Moldboard plowing often is necessary on sites having an existing cover of perennial species. Disking often follows plowing, but also may be done several times without plowing where perennial species can be killed without plowing or where a plant residue mulch is desired to reduce wind or water erosion. Avoid deep tillage shortly before seeding because it will dry the soil.

Before seeding, firm the seedbed by rolling or cultipacking if the soil is loose. When rolling or cultipacking are not possible, wait for rainfall to settle the loose seedbed before seeding. On a properly prepared seedbed you should sink no more than one-half inch when walking across the field. This helps prevent seeding too deeply, and allows good seed-to-soil contact. Do not over-prepare a seedbed on fine textured soils as crusting of the soil surface may occur.

Fertilization

Successful establishment is associated with soils having favorable pH and fertility. Always take soil tests well in advance of seeding to allow time to correct any deficiencies before or at seeding.

Grass establishes best if soil pH is between 5.5 and 8.0. Extremely acid soils should be limed at least six months before seeding. Lime corrects soil acidity, supplies calcium and magnesium, and makes other minerals more available to the plant.

Phosphorus is particularly important for grass establishment to encourage rapid root development. Incorporate phosphorus prior to seeding or place with the seed at seeding time when needed. Nitrogen should not be applied at seeding except in soils that are very deficient in nitrogen. Even small amounts of nitrogen will stimulate weed growth and slow the establishment of the grasses. However, where a labeled herbicide such as Plateau has been used and excellent weed control is expected, small amounts of nitrogen may encourage seedling growth.

Methods of Seeding

Grass seeds should be covered 1/8 to 1/2 inch deep in fine textured soils and from 1/2 to 1 inch deep in sandy soil. Many stands fail because seed was planted too deeply.

Use the proper equipment. It is best to use a grassland drill specifically designed to seed grasses. These drills are equipped with a large seedbox that contains agitators to prevent light and chaffy seed from bridging over the seed openings. The drill should have a positive feed mechanism to meter seed out uniformly to produce even stands. Seeds should pass freely through the seedtubes into furrows opened by double disk openers with attached depth bands. Packer wheels should be present to firm soil around the seed. A roller may be towed immediately behind the drill if it doesn't cover seeds too deeply.

On smooth, residue-free fields where moisture is expected to be plentiful, specialized cultipacker seeders that seed and pack in one operation work well with seed that is not fluffy. Seed drops freely from a seedbox mounted above and between two corrugated rollers. The rollers firm and pack soil around the seed. This type of equipment is not suited to sandy soils.

To obtain uniform stands on rough surfaces and reduce the chance of skips it sometimes is helpful to drill half of the seed in one direction and the remainder at right angles to it. This also allows faster seedling growth and quicker, dense stand development.

Broadcast seeding is not recommended. However, when grass seed is broadcast rather than drilled, rolling after seeding provides some good contact between seed and soil. This helps to partially overcome some of the disadvantages of broadcast seedings. Higher seeding rates also can help, but increased seeding rates cannot replace proper establishment practices.

Time and Rate of Seeding

Seed warm-season grasses between April 1 and May 15. Early seeding provides for faster establishment. If a severe weed problem is expected, use light tillage or herbicides to kill successive weed crops, followed by seeding around May 15.

In some areas of Nebraska, winter or dormant seedings of warm-season grasses also can be successful if soils are dry and soil temperatures are too cool for germination (about 45°F). Dormant seedings usually are made between Nov. 15 and April 1.

Cool-season grasses are seeded most successfully between Aug. 1 and Sept. 15, but depend on late summer and fall rains for establishment. Do not seed into dry soil. Spring seedings often are successful when done between March 1 and April 30, but are more likely to have problems with summer annual weeds. Dormant seedings of cool-season grasses are less successful because soil temperatures often exceed the germination temperature (about 35°F) for several days during the "dormant" period.

Although only one or two species usually are seeded together for dryland pastures or hay to simplify management, mixtures that contain four or more species of either cool-season or warm-season grasses often provide more stable and consistent productivity. Mixtures of both warm- and cool-season grasses are especially difficult to manage, however, and are not recommended except for certain range seedings. Most range seedings should contain at least five species to assure adaptability and persistence in these more diverse and harsh environments, especially in central and western Nebraska.

Seeding rates listed in *Table I* and *Table II* are based on pure live seed (PLS). Always purchase and sow grass seed on the basis of PLS in order to accurately compare prices of different seedlots and to ensure accurate seeding rates. The percentage of PLS of a seedlot is determined by multiplying the germination percentage by the purity percentage and then dividing by 100. Germination and purity percentages are listed on the seed tag. To determine the recommended seeding rate of bulk seed, divide the recommended seeding rate *(Table I)* by the percentage of PLS and then multiply by 100.

For example, when seed is 90 percent pure and has 80 percent germination, what seeding rate will give 9 pounds of PLS per acre?

Percentage of PLS = (90x80) ÷ 100 = 72 percent

Seeding rate of bulk seed = (9 ÷ 72) x 100 = 12.5 lbs/A

Most dryland grass plantings in Nebraska should provide at least 30 PLS per square foot when planting only one species, and at least 20 PLS per square foot when a mixture is planted. However, individual establishment characteristics of some grasses will cause some recommendations to be slightly lower or substantially higher than these general recommendations.

Companion Crops

Companion crops can be used for seedling protection and to reduce soil erosion. Sandy soils or hilly sites are most likely to benefit from companion crops. Do not fertilize or manage companion crops for grain or high forage yields because this creates extreme competition for grass seedlings. Graze or cut hay from companion crops early to reduce competition.

Table I. Seed weights and seeding rate of selected perennial grasses seeded alone.

	Seeds per pound, thousands	*Pounds of PLS/acre to provide 30 PLS per square foot*	*Recommended seeding rates, PLS lbs/acre*
Cool-season grasses			
Smooth brome	134	9.7	8-12
Orchardgrass	590	2.2	4-8
Meadow brome	90	14.5	10-15
Intermediate wheatgrass	88	14.9	12-15
Tall fescue	230	5.7	10-15
Festulolium	230	5.7	15-20
Perennial ryegrass	230	5.7	20-30
Crested wheatgrass	190	6.9	6-10
Western wheatgrass	110	11.9	10-12
Tall wheatgrass	79	16.5	12-18
Timothy	1,230	1.1	3-6
Reed canarygrass	550	2.4	5-10
Creeping foxtail	750	1.7	4-6
Green needlegrass[1]	185	7.1	6-10
Warm-season grasses			
Switchgrass	390	3.4	2.5-5
Big bluestem	160	8.2	6-9
Indiangrass	175	7.5	5-8
Eastern gamagrass	60	21.8	10-12
Little bluestem[1]	260	5.0	3.5-6
Sand bluestem[1]	110	11.9	8-12
Sideoats grama[1]	200	6.5	4.5-7
Prairie sandreed[1]	275	4.8	3-5
Blue grama[1]	850	1.5	2-3
Sand lovegrass[1]	1,300	1.0	1-2

[1]Rarely seeded alone, usually used in mixtures.

The most desirable companion crop for fall- or spring-seeded cool-season grasses is oats. When seeded in the spring at 15 to 20 lb/A (pounds per acre) and cut for hay before heading, adequate protection is provided without the oats becoming too competitive with grass seedlings. Fall-seeded oats will winter-kill, eliminating its competition to grass seedlings. Wheat, rye and barley usually are too competitive to seedlings to be used as companion crops.

Companion crops are not recommended for establishing warm-season grasses. Where soil or seedling protection is needed, stubble seeding and mulches are more effective.

Weed Control

Grass seedlings grow slowly and compete poorly with weeds. **The most frequent cause of seeding failure and slow establishment of warm- and cool-season grasses is poor weed control.**

Late summer seeding of cool-season grasses will avoid many summer annual weed problems, although winter annual grasses still can be a problem. Otherwise, seeding in spring before weeds germinate offers the best opportunity to establish warm- and cool-season grasses before weed competition becomes severe.

Competition for light by taller weeds is the most common risk to new seedlings. Mowing can be used to reduce competition from grassy weeds. Mow early and frequently enough as well as at a safe stubble height to permit light to reach young seedlings without smothering these seedlings with clippings. If weed density is low, mowing may not be needed at all. But when weed density is high, it may be necessary to mow whenever weed height is about twice the height of the new grass seedlings using a stubble height that removes just a small amount of the tops of new seedlings. If possible, use mowing equipment that chops clippings into small pieces that will slide to the soil past young grass seedlings as the clippings dry. Avoid clipping warm-season grass seedlings after Aug. 1 and cool-season grass seedlings after Aug. 30.

When establishing many warm-season grasses, except switchgrass, Plateau herbicide at 2 to 4 oz/A can be applied either pre-emergence or early post emergence to control many weeds. Many legumes and wildflowers also will tolerate Plateau, especially when applied post-emergence.

Broadleaf weeds can be controlled in grass seedings using 2,4-D ester at a rate of 1 pt/A (4 lbs of acid equivalent/gal). Do not spray 2,4-D until grass seedlings have at least five leaves or the weed canopy is so dense that nearly all the herbicide spray will be intercepted by the weeds with little herbicide contacting the small grass seedlings below the canopy.

On CRP acres weeds can be controlled by some herbicides not permitted for use on other sites. These include Paramount, Pursuit, Ally and Buctril. Current recommendations for these special uses are listed in the extension circular *EC130, Guide for Weed Management in Nebraska*, available at local Extension offices or online.

Managing New Seedings

New grass seedlings, especially warm-season grass seedlings, lack sufficient vigor to recover rapidly from grazing or clipping. Do not graze or clip warm-season grasses during the seeding year except for emergency weed control. If weeds have been controlled well and a vigorous stand develops with many plants developing seedheads, some light grazing may be possible in October or November, preferably after frost.

Where stands of warm-season grasses are slow to establish or weeds are not controlled well the first season, two or three years may be necessary to establish a vigorous stand. Dormant seeds that did not germinate the first year may germinate during year two to help thicken stands.

Controlled burning of warm-season grass plantings during the years following establishment often hastens development of thick stands. Conduct these burns when established warm-season grasses break dormancy (about late April or early May) on sites that contain sufficient fuel to carry a fire and where proper safety measures can be followed.

Graze spring sown cool-season grasses during the first season just often enough to reduce competition from companion crops and weeds. Avoid grazing during wet weather. Do not graze beyond Sept. 1 during the first full grazing season to allow plants a chance to store energy and harden for winter. Use light, rotational grazing that leaves a 4 to 6 inch stubble the season following seeding.

Following the first winter, more herbicide options are available for use on established grasses, especially for broadleaf weeds. Effective weed control during the second season will help develop thicker, more vigorous grass stands.

Additional Information

Establishing grass can be complex and confusing. Government and other organizational programs frequently will help with the cost of seeding grasses for range, wildlife and conservation purposes. To remain eligible for payments, however, certain cultural practices may need to be followed that differ from those recommended here. Contact your local Extension office, the Natural Resource Conservation Service, or an FSA office for more information *before* seeding, especially if you are considering cost-sharing or you need assistance to plan, develop seed mixtures, or fine-tune cultural practices.

Table II. Seeding rates of selected mixtures of cool- or warm-season grasses.

	Grass mixture	*Area of adaptation or range site*	*Recommended seeding rate, lbs PLS/acre*
Cool-season grasses			
1)	Smooth brome	Eastern 2/3 of state	4-8
	Orchardgrass		3-4
2)	Orchardgrass	Eastern 1/3 of state	3-4
	Tall fescue		5-8
3)	Smooth brome	Eastern 2/3 and non-sandy western 1/3 of state	3-4
	Orchardgrass		2-3
	Intermediate wheatgrass		4-5
4)	Reed canarygrass	Wetlands	4-6
	Creeping foxtail		3-5
Warm-season grasses[1]			
1)	Big bluestem	Eastern clayey, silty and subirrigated	1.5-5.5
	Indiangrass		1.2-5.0
2)	Big bluestem	Eastern clayey, silty and subirrigated	1.4-4.5
	Indiangrass		0.8-4.0
	Sideoats grama		0.4-1.6
	Sand lovegrass		0-0.5
3)	Switchgrass	Eastern clayey, silty and subirrigated	.5-1
	Big bluestem		1.0-5
	Indiangrass		.5-3
4)	Big bluestem	Silty overflow, clayey overflow and silty upland	1-3
	Indiangrass		.5-2
	Switchgrass		.3-1
	Little bluestem		.3-.5
	Sideoats grama		0-1
	Western wheatgrass[2]		0-2
5)	Big bluestem	Silty and limy upland	.6-2
	Indiangrass		.5-1
	Switchgrass		.2-.5
	Little bluestem		.5-1
	Sideoats grama		.4-1
	Blue grama		0-.4
	Buffalograss		0-.6
	Western wheatgrass[2]		0-2
6)	Sand bluestem	Sands, sandy and sandy lowland	1.2-2.5
	Sand lovegrass		.1-.3
	Prairie sandreed		.2-.8
	Little bluestem		.3-.8
	Switchgrass		.2-.6
	Blue grama		0-.2
	lndiangrass		0-1
	Western wheatgrass[2]		0-1.5
7)	Big bluestem	Subirrigated	1.2-3
	Indiangrass		.5-2
	Switchgrass		.3-1.2
	Little bluestem		.3-.6
	Creeping foxtail[2]		0-.2
	Western wheatgrass[2]		0-1
8)	Blue grama	Western clayey	.2-.5
	Sideoats grama		0-1.2
	Little bluestem		0-.8
	Western wheatgrass[2]		2-5
	Green needlegrass[2]		.5-2

[1]Lowest and highest rates provide approximately 10 and 40 PLS per square foot, respectively. The mixture actually seeded should contain at least 20 PLS per square foot.
[2]Cool-season grass used in range mixture.

UNL Extension publications are available online at *http://extension.unl.edu/publications*.

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