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CC165 Revised 1962 How to Establish New Pastures

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How to Establish New Pastures



- Use Strains Adapted to Local Climatic and Soil Conditions
- Use Smother Crop to Control Weeds and Provide a Mulch Cover
- Plant at the Right Time of Year and at the Proper Depth
- Pack the Soil Firmly Around the Seed

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How to Establish New Pastures

E. C. Conard¹

Many Nebraska pastures produce such small returns that they contribute little to farm income. They have been depleted by a combination of excessive, continuous use and drought. Instead of desirable forage, they produce mainly weeds and low-value grasses. Livestock gains or milk production are small. Lack of cover creates erosion hazards. For maximum returns, such pastures should be re-established or replaced by other pastures.

Success in establishing pastures depends on: (1) planting good quality seed of adapted varieties and strains of grasses and legumes, (2) planting at the proper time of the year, (3) proper seedbed preparation, (4) planting the seed at the proper depth, and (5) careful management of the new stand.

When planning to seed, consider the overall pasture and feed resources of your farm in relation to the needs of your livestock. Usually, the proper balance between pastures of cool-season and of warm-season grasses will provide a relatively uniform supply of high quality pasturage throughout the grazing season. Local conditions will determine the best practices in establishing and managing a new pasture. Ask your County Agricultural Agent and Soil Conservation Service Technician for more specific recommendations for your farm.

KINDS OF PASTURE

Most of our important pasture grasses can be classified into one of two groups, cool-season or warm-season, based on the season in which they make their maximum growth. A knowledge of this classification will help you understand why certain practices are recommended.

Cool-season grasses begin to grow early in the spring, as soon as the soil thaws. They grow most during the spring and mature their seed in early summer. These grasses grow slowly, if at all, during the hot summer weather. They will start growing again in late summer, if moisture is available, and continue to grow until freezing weather in late October or November. Seedlings of cool-season grasses generally will withstand heavy frosts with little or no injury.

Important cool-season grasses are: the wheatgrasses, bromegrasses, fescues, bluegrasses, and needlegrasses.

Warm-season grasses begin growing later in the spring than do cool-season grasses, usually the last of April or first of May in Nebraska. Growth is confined to the frost-free period of the growing season. These grasses generally become dormant in the short days and cool nights of early fall. A heavy frost can kill seedlings of the warm-

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season grasses if it occurs before they develop a good crown and secondary root system.

Most of our important native grasses are warm-season grasses. They include the bluestems, switchgrass, indiagrass, sand lovegrass, the grama grasses, buffalograss, and others.

Some forage species, particularly orchardgrass, tall fescue, alfalfa, and birdsfoot trefoil, are intermediate in their reaction to temperature. They are cool-season in many respects, but produce good yields of forage through the summer if moisture is available. Their seedlings are less frost-resistant than those of the other cool-season grasses.

Cool-season grasses will provide abundant, nutritious forage during the spring and again from late summer until the end of the growing season, if moisture is available. The warm-season grasses produce large amounts of good quality forage for summer grazing, from mid-June to mid-September. In central and western Nebraska, some of the warm-season grasses (the grama grasses and buffalograss in particular) cure well standing in the field and provide good forage for winter grazing.

Legumes are important in mixtures for permanent pasture where moisture and soil conditions are favorable for their growth. Legumes will (1) increase the total yield of forage, (2) increase the protein content of the grasses and of the total forage, (3) result in more uniform forage yield throughout the grazing season, and (4) reduce, or eliminate entirely, the need for nitrogen fertilizer on the pasture.

SOME SUGGESTED PASTURE MIXTURES

Several mixtures for cool-season and warm-season pastures are suggested in Table 1. One or more of these may be well suited to your particular conditions of climate, soil, and intended use. A range in planting rates is shown for each grass. The lowest rates usually will be adequate under good conditions of seedbed preparation and weather; but often, one or more seasons may be required for stands to thicken up to the desired density. The higher rates of seeding are recommended to get a full, usable stand quickly. If you can't decide on the best mixtures and seeding rates, ask your County Agricultural Agent or local Soil Conservationist.

USE ADAPTED SPECIES AND STRAINS

Plant only grasses and legumes adapted to your soil, climate, and intended intensity of use. Consult your County Agricultural Extension Agent for latest recommendations concerning improved strains or varieties. Use certified seed of improved, recommended varieties if it is available.

Table 2 shows varieties of perennial pasture grasses that are certified in Nebraska and the kind of soil to which each one is best adapted

Table 1. Some suggested pasture mixtures.

Cool-season Pastures	Pure live seed per acre (Pounds)	Warm-season Pastures	Pure live seed per acre (Pounds)
Smooth bromegrass	7-10	Big bluestem	5- 7
Alfalfa ¹	3	Sand lovegrass ²	1- 2
Intermediate wheatgrass	10-12	Big bluestem	3- 4
Alfalfa	3	Indiangrass	2- 3
Smooth bromegrass	3- 5	(or switchgrass)	(1- 2)
Intermediate wheatgrass	5- 6	Sand lovegrass	1- 2
Alfalfa	3	Big bluestem	3- 4
Smooth bromegrass	3- 5	Indiangrass	1- 2
Intermediate wheatgrass	5- 6	Switchgrass	1- 1
Crested wheatgrass	5- 7	Sand lovegrass	1- 2
Crested wheatgrass	2- 3	Side-oats grama	4- 6 ⁴
Western wheatgrass	5- 6	Sand lovegrass	1- 2
Russian wildrye	5- 7	Big bluestem	3- 4
Smooth bromegrass and/or		Side-oats grama	2- 3 ⁴
Intermediate wheatgrass	6- 8	Sand lovegrass	1- 2
Orchardgrass ³	3- 5	Side-oats grama	2- 3 ⁴
Alfalfa	3	Blue grama	2- 4

¹ In the eastern 1/4 of Nebraska and in irrigated pastures across the state, birdsfoot trefoil may be used instead of the alfalfa in pasture mixtures.

² Sand lovegrass has increased the yield of warm-season pastures during the first three to four years after seeding on clay-loam soils at Lincoln. This grass is well adapted to sandy soils throughout the state.

³ Orchardgrass is recommended only in the eastern 1/4 of Nebraska and for irrigated purposes throughout the state.

⁴ Pure live seed on the basis of spikes and/or broken spikes as the seed unit.

in the different districts of the state. The districts are outlined on the accompanying map (Figure 1).

The original source of strains of native grasses (that is, the location from which they were first collected) is important in determining their adaptation to your conditions. For best results, obtain seed of warm-season native grasses originating from local sources or from areas up to 150 miles south. It is a poor practice to move seed more



Figure 1. Adaptation districts for perennial forage grasses.

Table 2. District of adaptation of recommended perennial forage grass varieties.

Variety	Adaptation District						
	1	2	3	4	5	6	7
Cool-Season Grasses							
Smooth Bromegrass							
Lincoln	HSBI	HSBI	HSBI	HBI	BI	BI	I
Lyon	HSBI	HSBI	HSBI	HBI	BI	BI	I
Lancaster	HSBI	HSBI	BI	BI	...	...	...
Intermediate Wheatgrass							
Nebraska 50	HSBI	HSBI	HSBI	HSBI	HSBI	SBI	SBI
Tall Wheatgrass							
Nebraska 98526	HBIWAHBIWA	BIWA	BIWA	BIWA	BIWA	IWA	IWA
Crested Wheatgrass							
Nordan	...	...	...	H	HB	HB	HB
Russian Wildrye							
Vinall	...	...	...	H	HB	HB	HB
Reed Canarygrass							
Ioreed	BIW	BIW	IW	IW	IW	IW	IW
Warm-Season Grasses							
Big Bluestem							
Kaw	...	HSBI	HSBI	BI	...	I	...
Switchgrass							
Nebraska 28	HSBIW	HSBIW	SBIW	HSBIW	SBIW	SBIW	SBIW
Indiangrass							
Holt	HSBIW	...	...	HSBIW	SBIW	SBIW	SBIW
Nebraska 54	...	HSBIW	SBIW	BIW	...	IW	...
Side-Oats Grama							
Butte	HS	...	...	HBI	HBI	HBI	HBI
Trailway	...	HSBI	HSBI	HBI	...	BI	...
Sand Lovegrass							
Nebraska 27	HSBI	HSBI	SBI	SBI	SBI	SI	SI

Explanation of code letters:

H = Hardlands; the heavier, or finer-textured, upland soils of a district.

S = Sandy soils; the lighter, or coarser-textured, soils of a district.

B = Bottomlands; lowlands with more favorable moisture conditions than uplands (H) but that do not remain excessively wet for long periods during the season.

I = Irrigated lands.

W = Wet lands; poorly drained lands subject to frequent overflow or with high water tables which cause the soil surface to remain wet for long periods.

A = Alkali and salty soils.

than 100 miles south or 250 miles north from its original source. Most strains from northern sources are early maturing, low in forage yield, and highly susceptible to diseases, particularly leaf and stem rusts. Strains from southern sources generally are later maturing and produce good yields of forage. However, strains moved too far north usually are not winter-hardy and stands are injured or lost completely in the more severe winters.

SELECTING SEED OF SUTABLE QUALITY

Germination of seed may vary according to maturity, method of harvesting, storage conditions, frost damage, or age. Old seed may have been damaged by improper storage or by insects, resulting in low

germination and poor seedling vigor. Old seed may germinate satisfactorily in the laboratory, yet produce only weak seedlings or fail to germinate when planted in the soil. Seeds of some grasses are dormant following harvest.

Newly harvested seed of switchgrass, indiagrass and sand lovegrass, if it contains a high percentage of dormant seeds, should be kept in dry storage for 18 months before planting. This will insure maximum germination in a minimum time after planting in the field.

Purity refers to the trueness of the seed to variety and the presence or absence of weed seeds, seeds of other crops, and inert matter such as stems, leaves, dirt, stones, and damaged seeds. Inert matter does not harm the seed but it is an unnecessary expense to the buyer. It is a bad practice to plant weed seeds under any condition.

The law requires that germination and purity be shown on the tag of every bag of seed offered for sale. Seed should be purchased and planted on the basis of pure-live-seed content (abbreviated P.L.S. or PLS). The percent of Pure Live Seed in any given lot is found by multiplying the percent of germination times the percent of purity divided by 100. For example, seed with 84% purity and 92% germination would contain 84×92 or 77.28% Pure Live Seed (PLS).

100

The following example illustrates the importance of buying and planting seed on the basis of Pure Live Seed.

Seed No. 1 (Poor quality)	Seed No. 2 (Better quality)
Purity 50%	Purity 80%
Germination 40%	Germination 50%
Pure Live Seed 20%	Pure Live Seed 40%
It will take 5.0 pounds of this seed to make 1 pound of pure live seed.	It will take only 2.5 pounds of this seed to make 1 pound of pure live seed.

If seed No. 1 sells for 60¢ per pound, then seed No. 2 is worth \$1.20 per pound because it contains twice as much pure live seed (PLS) as the No. 1 lot. Conversely, if the No. 2 lot of seed sells for 80¢ per pound, the No. 1 lot is worth only 40¢ per pound. For more information about the PLS method see Nebraska Agricultural Extension Circular E. C. 61-135, "Pure Live Seed Method for Determining Requirements for Grass Seedings," by D. F. Burzlaff and J. C. Swinbank. You may obtain a copy of this circular from your County Agricultural Extension Office.

INOCULATE LEGUME SEEDS

Inoculate legume seeds with nitrogen-fixing bacteria to assure (1) that nodulation will occur early in the life of the plant, and (2) that the most efficient strains of nitrogen-fixing bacteria are available to the

plants. Inoculate the seed just before planting and only the amount of seed that will be planted that day.

Birdsfoot trefoil must be heavily treated with inoculum specially prepared for this species. It is believed that the bacteria for nitrogen fixation by birdsfoot trefoil are not naturally present in Nebraska soils. Use skim milk or some other sticking agent to moisten the seed when inoculating birdsfoot trefoil seed.

TIME OF YEAR TO PLANT

The season of growth and the resistance of the seedlings to frost, heat, and drought determine the correct planting date for each kind of grass. The cool-season grasses and grass-legume mixtures should be planted in late summer for fall establishment, if soil moisture conditions are favorable. Or, they may be planted in early spring. In central and western Nebraska, it is a good practice to plant the wheatgrasses during the late fall and winter (December-March) for early spring germination on nonirrigated fields. Generally, annual weeds are much more of a problem with winter and spring seeding than with late-summer planting.

Because the warm-season grasses are not frost-resistant in the seedling stage, it is best to plant them in midspring, April 10 to May 15. Choice of planting date depends on the kind of grass. The bluestems, switchgrass, and indiangrass should be planted in mid-April because they germinate slowly. The grama grasses may be planted in early May, after a crop of annual weed seedlings has been killed. Legumes may be included if desired.

SEEDBED PREPARATION

A well prepared seedbed is necessary for satisfactory establishment of the small-seeded grasses and legumes. This does not necessarily mean a lot of extra tillage work, but rather, advance planning so that each operation will be most effective in developing the kind of seedbed desired.

A good seedbed is very firm, but well pulverized and mellow. It is not cloddy nor puddled from working the soil when it is too wet.

Another important requirement for a good seedbed is a mulch of plant residues on the surface of the soil. This will help to control both wind and water erosion. It will reduce evaporation and keep the soil moist around the seeds longer than if the surface is bare. Close-drilled sorghum or sudangrass stubble and corn stalks make good cover for winter or spring seeding. Oats stubble provides good protection for late summer seedings. Wheat or rye stubble is not so good because volunteer plants from the shattered grain will compete with the grass and legume seedlings throughout the fall, spring and early summer.

The seedbed should be free of weeds and weed seeds. Thoroughly cultivate or mow to prevent weed seed production for one or two seasons prior to planting pasture. Avoid deep tillage that will bring a new supply of weed seed to the surface just before planting. Plant the cool-season grasses in late summer to avoid much of the weed problem generally encountered with winter and spring plantings.

Use a **smother crop** to reduce the weed problem and to provide a mulch cover for winter and spring seedings. Drill sudangrass or other sorghum in late June or early July to provide a dense stand. This will smother out any weeds that germinate and prevent a new crop of weed seeds. A part of the crop may be harvested for hay or silage, or by grazing, but it should be cut 10 to 14 inches high to leave enough stubble for a good mulch cover. Plant into this seedbed the following spring, or during the winter, without further preparation. Stirring up the soil deeper than about an inch before planting the grasses will bring more weed seeds to the surface where they can germinate and grow. This will defeat the purpose of the **smother crop** as a weed control measure.

Do not let the sudangrass or sorghum **smother crop** produce seed. Volunteer sudangrass or cane plants are worse than many of the common annual weeds in a new pasture seeding.

A good seedbed will have a good supply of moisture in the soil—enough that one light rain after planting will germinate the seed and establish the seedlings. Summer fallow in dry years to conserve moisture for late summer planting. Use tillage methods that will keep a good stubble mulch on the surface of the soil during the fallowing operations. This will reduce evaporation and runoff and conserve more moisture than bare fallow.

DEPTH OF PLANTING

The proper depth to plant grass and legume seed is determined by the size of the seed, soil texture, and moisture conditions. Generally, the seed should be planted $\frac{1}{4}$ to $\frac{3}{4}$ of an inch deep in heavier soils and $\frac{1}{2}$ to $1\frac{1}{4}$ inches deep in the sandy soils (see Table 3 for recommended depth of planting for several species). Small-seeded grasses and legumes have a relatively limited supply of food in the seed itself. If they are planted too deep, seedling emergence is delayed, or the seedlings may not be able to reach the surface.

PLANTING METHODS AND EQUIPMENT

The equipment needed to plant pastures will depend on the condition of the seedbed and kind of seed. The principal requirements in planting grasses and legumes are (1) to distribute the seed evenly at the desired rate per acre, (2) to place the seed at the proper depth, and (3) to pack the soil firmly around the seed. Both drilling and broadcasting have proven satisfactory when done properly.

Table 3. Recommended dates, depths, and rates of planting for perennial grasses and legumes in Nebraska.¹

Kind of grass	When to plant	Depth in inches		Pure live seed per acre, in pounds
		Heavy soils	Sandy soils	
Cool-season Grasses				
Smooth brome grass	Aug. 15–Sep. 5 April 1–15	1/2–3/4	... ²	6.5–10.0
Crested wheatgrass	Sep. 1–20 Dec.–March	1/2–3/4	3/4–1 1/4	5.0– 7.0
Intermediate wheatgrass	Sep. 1–20 Dec.–March	3/4–1 1/4	3/4–1 1/2	10.0–10.0
Tall wheatgrass	Sep. 1–20 Dec.–March	3/4–1 1/4	... ²	11.0–14.0
Western wheatgrass	Aug. 15–Sep. 10 Dec.–March April 1–15	3/4–1	3/4–1 1/2	8.0–10.0
Reed canarygrass	Aug. 15–Sep. 5	1/4–1/2	1/2–3/4	2.0– 5.0
Orchardgrass	April 1–20	1/4–1/2	... ²	2.0– 8.0
Warm-season Grasses				
Big bluestem	April 1–May 5	1/2–3/4	3/4–1 1/4	6.0– 8.0
Little bluestem	April 1–May 5	1/4–1/2	1/2–3/4	3.5– 6.0
Sand bluestem	April 1–May 5	...	3/4–1 1/2	8.0–10.0
Indiangrass ⁴	April 1–May 5	1/2–3/4	3/4–1 1/4	5.0– 8.0
Switchgrass ⁴	April 1–May 5	1/2–3/4	3/4–1 1/4	3.0– 5.0
Sand lovegrass ⁴	April 1–May 15	1/4–1/2	1/2–3/4	1.0– 2.0
Blue grama	April 1–May 15	1/4–1/2	1/2–3/4	1.5– 5.0
Side-oats grama	April 1–May 15	1/4–1/2	1/2–3/4	4.5– 6.0 ⁵ 1.5– 3.0 ⁶
Legumes				
Alfalfa	Aug. 15–Sep. 1 April 5–25	1/2–3/4	3/4–1 1/4	4.0–10.0
Birdsfoot trefoil	April 1–15	1/2–3/4	...	2.5– 8.0

¹ A range in planting rates is indicated for each species. The lowest rate shown will give approximately 20 live seeds per square foot. This is adequate under good conditions of seedbed preparation and weather. The higher rates are recommended where obtaining a full, usable stand in a minimum time justifies the added cost.

² Not recommended for planting on sandy soils.

³ Not recommended for planting on heavy soils.

⁴ New seed with a high percentage of dormant (hard) seeds should be planted at the earlier date; non-dormant seed may be planted later.

⁵ On the basis of whole or broken spikes as the seed unit.

⁶ On the basis of naked seeds (caryopses) as the seed unit.

Seed of many grasses and legumes can be drilled with an ordinary grain drill equipped with a grass-legume seeder attachment. The small, smooth seeds such as those of switchgrass, sand lovegrass, alfalfa, etc., can be planted through the grass-legume box. The larger seeds such as those of the wheatgrasses and brome grass can be planted through the grain box. Light, chaffy seeds such as brome grass tend to bridge over the seeder openings; therefore, drills must be equipped with special agitators.

Be especially careful not to drill the seed too deep. Grain drills can be made to plant at the proper depth on seedbeds which have only a little or no stubble mulch on the surface and which are well packed and very firm.

There are special grass drills which will plant all kinds of grass and legume seeds including the chaffy, unprocessed seeds of the blue-stems, indiangrass, the grama grasses, etc. These drills have depth-control bands welded onto the furrow-opening disks to keep them from going too deep into the soil. These drills work well in all types of seedbeds, including those with a heavy mulch of crop residues on the surface. Many of the Soil and Water Conservation Districts own one or more of these drills for custom use. Consult your County Agricultural Agent or Soil and Water Conservation District Supervisors to find if they have this type of equipment.

Many satisfactory stands have been obtained with broadcast seeding. Smooth, heavy seeds can be broadcast with a "cyclone" type seeder. Generally, a gravity-flow type fertilizer spreader is used to broadcast the light, chaffy seeds. On seedbeds with little or no mulch, the seed can be covered by using a spike-tooth harrow followed by a corrugated roller to pack the soil around the seed. Usually, small seeds such as those of the grama grasses can be covered deeply enough by just rolling, without harrowing. On seedbeds with a good mulch cover, a treader is needed to work the seed down through the mulch and into the soil. Again, this must be followed by a roller to pack the soil around the seed. This kind of equipment can be hitched in tandem and pulled with one medium-size tractor. Thus, the seeding is completed in one operation (see Figure 2).

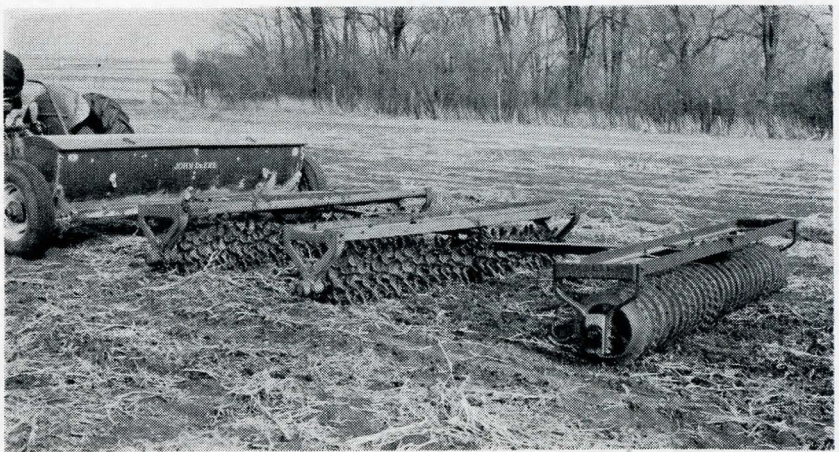


Figure 2. Using a fertilizer spreader, double treader, and roller to plant grass seed into soybean stubble.

WEED CONTROL

Competition from annual weeds often is the greatest hazard to the establishment of perennial grasses and legumes in Nebraska. Therefore, plan weed control measures in advance of seeding. Weed competition can be reduced in many ways. Some of these are:

1. Plant cool-season grasses and legumes in late summer for fall establishment.

2. Use a **smother crop** of close-drilled sudangrass or other sorghums grown the summer before winter or spring seeding of the pasture. Plant the grasses directly into the stubble of the smother crop without disturbing the soil any more than is necessary to cover the seed.

3. Spray with 2,4-D to control broad-leaved weeds in pure grass plantings in which legumes are not included. Spray when the weeds are 10-14 inches high, using $\frac{1}{2}$ to $\frac{3}{4}$ pound of 2,4-D per acre. In grass-legume mixtures, the broad-leaved weeds can be controlled by spraying with 2,4-DB.

4. Mow the weeds in grass-legume seedlings. Weeds must be cut high enough so that the perennial grasses and legumes are not severely injured. Use a cutter that will chop and scatter the weeds, as this will avoid smothering the perennial seedlings under a heavy mat of cut material.

5. Delay planting of the warm-season grasses in the spring until a crop of weed seedlings can be killed by shallow tillage just before seeding. Generally, in Nebraska this means planting in early May. This practice will help reduce weed competition. However, this method allows only the minimum amount of time for seedling establishment before the advent of the hot, dry weather of summer. Therefore, till for the last time and plant as soon as possible after the weed seeds have germinated. Avoid stirring the soil deeply enough to bring more weed seeds up where they can germinate and grow.

Only methods 1 and 2 (above) will satisfactorily control weeds in fields badly infested with seeds of the annual warm-season grass weeds such as the foxtails, crabgrass, stinkgrass, sandburs, and barnyard grass. Mowing may be partially effective in cases where these grass weeds grow considerably taller than the pasture seedlings early in the summer.

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Dean E. F. Frolik,
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