

TECHNICAL NOTES

U.S. DEPARTMENT OF AGRICULTURE STATE OF COLORADO NATURAL RESOURCES CONSERVATION SERVICE

PLANT MATERIALS TECHNICAL NOTE NO. 74

September 2011

To: All Field Offices and Area Offices

From: Christine Taliga, Colorado Plant Materials Specialist

Re: Seedbed Preparation for Conservation Plantings

This Technical Note details the appropriate seedbed preparation methods for planners, producers and consultants for the successful establishment of conservation plantings in Colorado. These methods should be utilized for both irrigated and non-irrigated sites, as applicable, to plan and apply conservation practices such as the following:

Conservation Cover (327)
Contour Buffer Strips (332)
Critical Area Planting (342)
Cross Wind Trap Strips (589C)
Field Border (386)
Filter Strip (393)

Forage and Biomass Planting (512)
Herbaceous Wind Barriers (603)
Range Planting (550)
Vegetative Barrier (601)
Vegetated Treatment Area (635)

Please contact Christine Taliga, Colorado Plant Materials Specialist, for questions and additional information related to conservation plant establishment at (720) 544-2840, or christine.taliga@co.usda.gov.

Colorado Plant Materials Program Resources, September 2011

"Seedbed Preparation"

In part, excerpted from: [Seedbed Preparation](#). Lloyd-Reiley. 2010. STPMC, Kingsville, TX. 2010. [Technical Note 6 -- Seedbed Preparation](#). Plant Materials staff. 2005. USDA-NRCS- Pullman Plant Materials Center, Pullman, WA.

Successful establishment of conservation plantings from seed requires proper seedbed preparation, proper seeding techniques, and quality seed. Failure to establish conservation plantings can be attributed to many factors including:

- Poor or inadequate seedbed preparation - including looseness (figure 2), dryness near the surface, and excessive weed competition.
- Seeding too deep - usually because of a poorly prepared seedbed or improper equipment with no depth control.
- Time of seeding - seedbed preparation began too late, moisture was not kept near the surface, and the expected rains either did not occur or were of insufficient duration.
- Poor quality seed – due to low germination, inadequate storage or short shelf-life.
- Seed dormancy – inadequate timing of seeding (see Plant Technote 59) due to vernalization requirements.
- Poor luck – weed competition, drought, poor seed, and rodent and insect predation.

"Increasing the seeding rate does not compensate for poor seedbed preparation."

Good seed to soil contact required

Seeds require water and favorable temperatures for germination. Maintaining soil moisture is critical for optimal germination.

Germination is a three-step chain reaction which includes: 1) imbibitions of water; 2) enzymes turn the endosperm into useable fuel for cell growth; and 3) plant cells begin dividing and growing (figure 1).

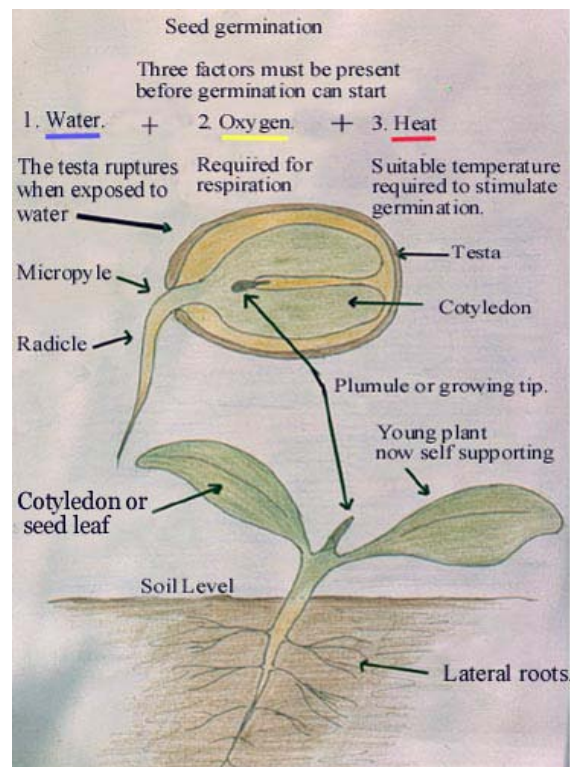


Figure 1 : Diagram of Seed Germination; excerpted from Plant Technote #6, Seedbed Preparation, 2005, Pullman Plant Materials Center.

I. Reasons for preparing a seedbed:

- a. To save moisture by eliminating competing vegetation.
- b. To create a firm soil surface that allows seeds to be planted at the proper depth to ensure contact with moisture.
- d. To eliminate competition for light and nutrients by killing undesirable plants before desirable plants are planted.

II. How to prepare a spring seedbed (conventional).

Mechanical site preparation should be considered when plans involve using a conventional grassland drill (i.e. without no-till capacity), or using a broadcast seeder. It should not be considered if any potential erosion problems exist (see Rangeland Planting 550 specification). Mechanical site preparation should be considered if the producer needs to prepare a site heavily infested with undesirable vegetation. Mechanically prepared sites should be clean, weed-free, firm, moist, and smooth prior to planting.

- a. Deep-cultivate in the fall for spring seeding (following range or pasture, consider allowing one or two intervening crops before seeding).
- b. Leave the field rough over the winter, where appropriate; refer to Rangeland Planting specification 550 for additional requirements.
- c. Harrow or shallow-cultivate early in the spring to break down large clods. If applicable, control of weeds following intervening crops is very important.
- d. Apply an all-purpose herbicide such as glyphosate (following label specifications) to kill weeds a few days prior to planting.
- e. Cultipack the field just before seeding if the soil is loose. If the soil is dry, do not attempt to pack.



Figure 2: Example of seed planted in a loose seed bed, resulting in a poor stand of wheat. Photo courtesy the University of Nebraska Institute of Agriculture and Natural Resources Cooperative Extension.

III. How to prepare a spring seedbed (no till). Chemical site preparation should be considered when plans involve using a no-till grassland drill to install seeds or when it's important to maintain

some type of cover on the field for erosion control. This type of site preparation should not be used if you are planning on broadcasting seeds. A chemically-prepared seedbed should also be considered if the producer has no or inadequate tillage equipment available.

- a. Control weeds in the fall by mowing followed with an application of glyphosate while plants are still actively growing.
- b. Control weeds in the spring with an application of glyphosate. Do not disturb the residue.
Warning: mowing, light tillage, or a light harrowing will dislodge residue that will rake up in the drill. Loose plant material will get caught in the drill unit and scrape the ground, preventing good seed-to-soil planting.

IV. How to prepare a fall seedbed (conventional):

- a. Deep-cultivate the preceding fall if weeds or residues are extremely high and dense.
- b. Delay deep-cultivation until spring if residues are light and weed densities are low.
- c. Fallow the soil for at least one growing season, where appropriate (refer to Rangeland Planting specification 550). Expect loose, dry soil the following fall.
- d. If early fall rains occur, harrow the soil to firm it and control emerging weeds. If rains do not occur, let the field set.
- e. Apply an all purpose herbicide such as glyphosate a few days prior to planting to kill weeds.
- f. Delay seeding until after the soil temperatures cool and adequate soil moisture has been attained.
- g. Cultipack the field just before seeding if the soil is loose. If the soil is dry, do not attempt to pack.

V. How to prepare a fall seedbed (no till):

- a. Control weeds the preceding fall by mowing followed with an application of glyphosate or short-lived soil active herbicide.
- b. Control weeds in the spring and summer with repeated applications of glyphosate. Do not disturb the residue. Warning: mowing, light tillage, or a light harrowing will dislodge residue that will rake up in the drill.
- c. Delay seeding until after the soil temperatures cool and adequate soil moisture has been attained.

VI. A good seedbed is:

- a. Uniformly firm, well packed underneath with small clods and/or light mulch on the surface to prevent erosion.
- b. Has moisture near the surface so that shallowly-planted seeds can begin and continue to take up soil moisture
- c. Free from weeds and competing vegetation.

VII. Where erosion from irrigation is a concern:

- a. Plant seed into stubble or herbicide treated sod.
- b. Plant companion crops if adequate water is available (see Plant Technote 59).

VIII. Where water and wind erosion of non-irrigated sites is a concern:

Seedbeds are required to have satisfactory protection by one of the following methods or conditions as selected and approved by the local conservationist:

- a. Seed into a standing preparatory dead litter stubble cover of sterile forage sorghum, long-season grain sorghum, sudangrass or other approved cover to provide protection from blowing
- b. Seed into an existing sorghum or other NRCS approved small grain cover harvested the previous season in place of a cover crop, as long as the stubble height is maintained at 12 inches or more and weeds and volunteer grain are controlled. If weeds and volunteer grain are not controlled, tillage and cover crop planting are required before grass seeding.

- c. On fields with slopes averaging 6% or more, establish a sterile wheat or oat cover crop and seed directly into the standing cover crop residue after the first hard freeze.

Refer to the Forage and Biomass Planting (512) and or Range Planting (550) standards and specifications for additional planning guidance where water and wind erosion may be a concern in irrigated and non-irrigated seeding applications.

XI. Summary:

- a. Dry seedbeds do not pack.
- b. Beware of drilling on hard surfaced ground. Good soil coverage over the seed can be difficult to obtain. Monitor how the drill is performing throughout the planting and make adjustments as needed.
- c. Correct firmness is when an adult footprint is only slightly visible (1/4") on the prepared bed prior to the seeding operation. A firm seedbed is essential for all planting situations, both irrigated and dryland.
- d. At seeding time, there should be no actively growing weeds.
- e. Increasing pounds of seed/acre does not compensate for poor seedbed preparation.
- f. Small seeds that germinate will not have enough nutrient reserve to reach the surface if planted too deep.
- g. Most native species (some exceptions apply, such as Indian Ricegrass) should be planted at a shallow depth of 1/4 inch. (seed is planted too deep if you cannot see a few on the soil surface as shown in figure 1), a general rule of thumb for planting depth is 2.5 times the width of the seed size.



Figure 3: Correct firmness of a well prepared seedbed demonstrated by an adult footprint no deeper than 1/4 inch in the soil.

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