

Forage Establishment: Getting Off to a Good Start

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Profitable ruminant livestock production depends on the production of high-quality forages. High yields can only be obtained from a dense, vigorous stand of an adapted forage species. The first step in obtaining such a stand is establishment. The establishment phase of forage production is critical because all other management practices depend upon a healthy sod. Forage establishment begins long before the actual seeding. Successful forage establishment requires careful planning and attention to detail.

Control weeds. Weeds must be controlled prior to seeding. This is especially important if a mixture of grasses and legumes will be established. There are no herbicides available that control grassy or broadleaf weeds in grass-legume mixtures. In most cases, pasture herbicides are designed to kill either broadleaf weeds (legumes included) in grasses or grassy weeds in legumes. The use of herbicides and cropping sequences that include winter annuals such as small grains and/or summer annuals such as pearl millet or foxtail millet as smother crops prior to seeding can prevent the accumulation of weed seed. Broadleaf weeds can be controlled in pure grass stands using selective herbicides (herbicides that affect only broadleaf plants). Reseeding restrictions need to be taken into account when applying these herbicides. In situations where both undesirable perennial grass and broadleaf weeds are present or when a total burn-down is desired, a nonselective (affects both grasses and broadleaf plants), translocatable herbicide such as glyphosate should be applied prior to seeding. For more information on herbicides for forages see the *Pest Management Guide, Field Crops*, Virginia Cooperative Extension publication 456-016, which is available as a pdf file at <http://pubs.ext.vt.edu/456-016/>.

Adjust soil fertility and pH prior to seeding. Soil acidity is a major factor limiting forage production in Virginia. Soil test pastures and apply the recommended amounts of lime and fertilizer prior to seeding. Cool-season grass pastures should be maintained at a pH of 6.0 to 6.2, while grass-legume mixtures should be kept at a pH of 6.2 to 6.4. Acid soil conditions reduce nutrient availability, root growth, and nitrogen fixation by legumes. Lime not only corrects soil acidity, but also supplies calcium and magnesium while reducing the availability of toxic nutrients such as aluminum and manganese. Lime should be applied six to 12 months before seeding to allow adequate time for it to react with the soil. In conventional seedings where more than two tons per acre of lime are required, one-half should be applied and disked in before plowing, and the remainder should be applied after plowing and then disked. In no-tillage seedings where more than two tons per acre of lime are required, one-half of the lime should be applied before seeding and one-half the following season. For more information on soil testing and fertility see the *2000 Agronomy Handbook*, Virginia Cooperative Extension publication 424-100, which is available in pdf format at <http://pubs.ext.vt.edu/424-100/>.

Choose an adapted forage species. A forage species must be adapted to the soil conditions in the pasture and the region where it will be grown. If the forage is not regionally adapted, the chance of successfully establishing and maintaining a healthy sod is low. It is also important to select a forage species that is adapted to the desired end use. For example in pastures that are not rotationally grazed, tall fescue is a better choice than orchardgrass. Use certified seed or a proprietary variety that is adapted to your climatic region. This will ensure you are getting high-quality, weed-free seed with adequate germination and minimal dormancy. For more

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information on adapted species see the *2000 Agronomy Handbook*, Virginia Cooperative Extension publication 424-100, which is available in pdf format at <http://pubs.ext.vt.edu/456-100/>.

Inoculate legume seed. Legumes form a symbiotic relationship with nitrogen-fixing bacteria in which nitrogen from the air is converted into a plant-available form. There is no need to add nitrogen fertilizer when legumes make up more than 25 percent of a pasture or 35% of a hay stand on a dry-matter basis. A visual rating of clover percentage is a good estimate for taller growing species such as ladino or red clover, but often overestimates common (Dutch) white clover. Therefore, in pastures where the predominant clover is common white clover, nitrogen fertilization may be required even when a visual rating indicates more than 25 percent clover. Legume seed should always be inoculated with the proper strain of nitrogen-fixing bacteria before seeding unless it is pre-inoculated. If the seed is not pre-inoculated or has been exposed to adverse conditions (high temperatures), a prepackaged inoculum should be mixed with the seed just prior to planting.

Prepare seedbed. For conventional seedings, a fine and firm seedbed should be prepared by plowing or heavy disking followed by other tillage tools that shape and smooth the soil. Do not overwork the soil. Overworking the soil can result in the formation of a hard layer on the soil surface which inhibits seedling emergence. A firm seedbed serves two purposes. First, it allows capillary action to draw water to the soil surface. This will provide needed moisture for seeds to germinate and help to sustain small seedlings during dry periods. Second, a firm seedbed allows for accurate seed placement. In many cases, a soft seedbed allows seed to be placed too deep, resulting in poor emergence and weak stands. A general rule is that if you walk across the seedbed and sink past the sole of your shoe, the seedbed is too soft and should be refirmed.

No-till seedbeds must also be prepared by suppressing the existing sod and reducing the surface residue prior to seeding. This can be accomplished by grazing pastures very close in the late fall and early spring. Vegetation can also be suppressed by using a low rate of nonselective herbicide and removing the remaining residue prior to seeding. For more information on seeding methods see *No-Till Seeding of Forage Grasses and Legumes*, Virginia Cooperative Extension publication 418-007, which is available online at <http://pubs.ext.vt.edu/418-007/>.

Ensure good soil to seed contact. Seeding methods include drilling, broadcasting and dragging/cultipacking, band-seeding, and cultipack-seeding. The type of seeding method will depend on the equipment available and whether a conventional seedbed or no-till seeding will be used. Regardless of the seeding method, the goal is to achieve good soil-seed contact. Good soil-seed contact ensures that the seed will germinate and emerge in a timely manner.

Seed on the correct date. Cool-season grasses normally are established in either early spring or late summer. Spring seedings usually have good moisture, but increased weed pressure. A general rule is that early-spring plantings should be made four weeks before the last average killing frost in the spring. Late-summer seedings are at more risk of failure due to a lack of moisture, but generally have fewer weed problems. If summer annual weeds, such as crabgrass (*Digitaria* species), are a problem, late-summer seedings are desirable since summer annual weeds are not actively growing during the fall. It is critical to allow the seedlings time to reach adequate size before winter; therefore, late-summer plantings should be made at least four to six weeks before the first average killing frost in the fall. Plantings of warm-season grasses should be made in late spring or early summer after the soil has reached a temperature of 65°F at a four-inch depth. This usually occurs when nighttime temperatures remain above 60°F.

Seed at the proper rate. It is not uncommon for less than one-third of the sown seed to produce viable seedlings and only half of those to survive the first season. Therefore, recommended seeding rates apply six to nine times the amount of seed as the desired final stand density. It is important to remember that raising seeding rates above reasonable levels will not compensate for a rough seedbed or poor seeding methods. Having approximately 20 plants per square foot at the end of the seeding year will result in a stand density of six to ten plants per square foot the year after establishment. For information on seeding rates see the *2000 Agronomy Handbook*, Virginia Cooperative Extension publication 424-100, which is available in pdf format at <http://pubs.ext.vt.edu/424-100/>.

Seed at the proper depth. Small-seeded forages have very little energy stored in the seed. Therefore, seed that is placed too deep will germinate, but not have enough stored energy to reach the soil surface. On the other hand, seed that is placed too shallow may not

have adequate moisture to germinate. In general, best results are obtained when a seeding depth of one-quarter to one-half inch is used. As a general rule, never place small-seeded forages deeper than one-half inch. It is important to remember that proper seed placement cannot be obtained on poorly prepared seedbeds. Seedbeds that are too soft will result in the seed being placed too deep.

Control weeds during establishment. Newly emerged forage seedlings are extremely susceptible to weed competition. Weeds compete for water, nutrients, and light. In pure grass stands, broadleaf weeds can be controlled with herbicides once grass seedlings have at least four leaves. In pure stands of alfalfa and clovers, a number of herbicides are available for the control of both grassy and broadleaf weeds. Currently, no herbicides are available for the control of weeds in mixtures of grasses and legumes. Frequent clipping can control weeds during establishment. Weeds are clipped down to a height of just above the desired forage seedlings. Flash grazing can also be an effective weed-management tool. Flash grazing is accomplished by restricting a large number of animals to a relatively small area

for a short period of time. This results in the quick removal of competing vegetation in a uniform manner. In order for clipping and flash grazing to be successful, they must be implemented before weeds become too tall and on a regular schedule until seedlings become established. For more information on herbicides for forage establishment see the *Pest Management Guide, Field Crops*, Virginia Cooperative Extension publication 456-016, which is available as a pdf file at <http://pubs.ext.vt.edu/456-016/>.

Do not graze new stands too early or frequently. Newly established perennial forage stands do not develop into a fully mature sod until the second growing season after establishment. New stands should be grazed only after plants have reached a height of at least six to eight inches and are well anchored. A simple test to determine if the plants are well anchored is to pull several plants with a jerking motion to simulate defoliation by livestock. If roots are not pulled out of the ground then, in most cases, the plants will be okay to graze. Do not graze new stands closer than three to four inches. Light and infrequent grazing can encourage the development of a healthy sod, but overgrazing must be avoided.

Forage Establishment at a Glance

- Control weeds prior to establishment.
- Soil test and adjust fertility six to 12 months prior to establishment.
- Choose a forage species that is adapted to the region, soil conditions in the pasture or hayfield, and desired end use.
- Always use pre-inoculated legume seed or inoculate seed before planting.
- Prepare a fine and firm seedbed for conventional seeding.
- Suppress the sod and reduce surface residue prior to no-till seeding.
- Seed at the appropriate time of year.
- Never place seed deeper than one-half inch.
- Control weeds during establishment.
- Sods require 18 to 24 months to become fully established.
- Do not graze stands too early, closely, or frequently during the establishment period.
- Allow new stands to flower before mowing for hay.
- Fertilize new stands to encourage the development of a healthy sod.

Feeding hay in a dry lot is one recommended way to avoid overgrazing during establishment.

Allow new stands to flower before haying. New stands should not be cut for hay until the plants have flowered. This will allow for the accumulation of food reserves that are used for regrowth and persistence. If weeds are competing with newly established seedlings, clipping at a height just above the seedlings will keep the stand open and encourage forage growth.

Fertilize newly established stands. Plants require nutrients to grow and persist. Lime, phosphorus, and potassium should be applied according to the soil-test results. Pure grass stands will also require nitrogen fertilization. Nitrogen, along with proper grazing management, stimulates tillering and helps new stands form dense sod. Nitrogen is best applied in small, frequent applications when plants are actively growing. Nitrogen should not be applied to legumes or grass-legume mixtures.

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