

Guidelines for Herbaceous Stand Evaluation

Agronomy Technical Note #MN 17



Natural Resources Conservation Service (NRCS) - Minnesota



After an herbaceous (grasses & legumes) planting has been made, the question arises as to whether the stand is adequate. The purpose of this technical note is to provide some guidelines and tools that may be helpful in determining stand adequacy.

If stands are obviously adequate or inadequate by visual observation, a formal stand evaluation is not necessary.. However, if the stand is questionable by visual observation and / or documentation is required, the following procedures will be used to substantiate the actual condition.

In determining stand adequacy, there are two major considerations: 1) adequate protection of the soil resource, and 2) adequate stand for the planned purpose.

Protection of the soil resource is determined by the percentage of the soil surface that is protected from wind and water erosion by the vegetative cover. The wind and water erosion equations are used to determine the degree of protection needed or amount of soil loss that might be expected. One of the objectives of any herbaceous planting should be to obtain an adequate stand as soon as possible to keep soil loss to a minimum, especially during the establishment period.

The second consideration is whether the stand is “adequate” for the planned purpose. The most common purposes for herbaceous plantings are for the production of forage crops, wildlife habitat or critical area plantings to protect the soil from erosion. Because of economic considerations, early establishment and density of a stand of desirable species is usually more important for a production planting than for a planting made on idle land only for protection. Rapid establishment on a critical area planting (such as a waterway or dam) is also important because of the erosive nature of the site.

How rapidly a seeding develops and the density of the stand is dependent on several factors, including weather (temperature and moisture) after seeding, seedbed conditions, planting depth, seed – soil contact, seeding rate, seed quality (germination and % purity), insects and diseases. Also, the amount of time after the seeding was made and when the seeding is evaluated will make a difference as to the density of the stand.

Historically, “adequate stand” has been determined subjectively. An objective means of determining grass and / or legume stand emergence and establishment is needed at times to help make a decision whether a stand is adequate or needs to be reseeded, and for documentation and reference purposes. Determining stand density can be done in an accurate manner and a short period of time by using a frame count technique. Correct plant identification is necessary to ensure accuracy. Knowledge of the vegetative characteristics of the species to be sampled is essential. If the field is sampled soon after emergence, a plant can often be uprooted with the seed attached to aid in identification.

A one square foot frame is easily constructed with a variety of materials and shapes. A circular frame will present the least edge to area ratio. Error due to sampling increases as the ratio of edge to area increases, and the smaller the sampling unit, the greater the edge error. A circular one square foot frame will have a circumference of approximately 42.5 inches. One can be constructed from 3/16 inch plastic covered cable. The ends can be joined with a short section (1 inch) of .25 outside diameter copper tubing.

The number of samples required depends on factors such as stand uniformity and the number of species to be counted. Generally a minimum of 10 counts or samples per 10 acres or less of field size would result in a representative sample. An effort must be made to avoid end rows or turn around areas that may have been double seeded. The observer must not be biased by dense or sparse stands, but needs to sample equally in a systematic manner.

To begin a sampling transect, select a landmark on the horizon to walk towards in a straight line. The sampling pattern should be such that a representative plant density is obtained. A pre-determined number of steps should be taken on a line that is diagonal or perpendicular to the drill rows. When the number of pre-determined steps has been taken, drop the frame at the toe of your shoe on the final step. Only those plants that are rooted within the frame will be counted and used in determining the stand density.

This is not a time consuming procedure, and ten counts can be made in a matter of fifteen to thirty minutes, depending on the number of species to be counted. If the stand is

spotty and includes skip areas, then more samples than the minimum may be required. Ten counts per 10 acres of field should be used only as a starting point. For example, 70 – 80 acres of pasture planting with a uniform stand may be sampled accurately using 30 – 40 counts. Enough counts must be made so a representative sample is obtained. If a portion of the field has had a different cropping history, fertilization program or major differences in soil types or slopes, the sampling should be stratified and the average plant densities kept separate for the different areas. Tabular entries should be made after each frame count to ensure accuracy. In these types of situations, it is likely that more than the minimum number of sample units would be required to accurately determine plant density.

Stands can be evaluated any time during the growing season, based on the purpose of the seeding. If the above technique or method is used to evaluate a planting for forage production, the first evaluation should be 4-6 weeks after germination. Follow-up evaluations could be at any other pre-determined interval. For seedings made for protection of idles land (like CRP or WRP) or critical areas, 4 – 6 months after seeding may be sufficient.

Table 1 provides some guidelines for the number of seedlings counted per frame to indicate if a stand is adequate, questionable or inadequate, based on species planted and the planned use. Using a frame size of one square foot, the number of seedlings counted per frame compared to the values in Table 1 will indicate if a stand is adequate or inadequate according to the numbers. If the count falls between adequate and inadequate, then the stand is questionable. Inadequate stands will need to be reseeded. Questionable stands will need to be re-evaluated at a later time.

Where introduced or cool season species are seeded, an evaluation after one full growing season or one year after seeding should give a good indication of what the final stand will be. If it is questionable then it will need to be reevaluated after the second growing season before a final evaluation can be made.

For native (warm season) species determined to be questionable or inadequate, final evaluation should not be done until after the third growing season because they are usually slower in becoming established.

If the stand is a mixture of species, all values in Table 1 will be reduced by the ratio of each species planned percentage in the mixture. For example, if the planned seeding is to result in a mixture of 50% orchardgrass and 50% alfalfa then the values in table 1 would be reduced by 50% for both components of the mixture. The percentage of a species in a mixture is based on the number or percentage of pure live seeds of each species to the total pure live seeds planted.

A sample worksheet is included for your information and use. The information obtained from sampling plant density can be used as a reference point when assisting a land user in making management decisions or evaluating seedings for program purposes. A new seeding with low plant count will require more intensive management than a new seeding

with a high plant count. If spot seeding is necessary because of a non-uniform stand, the sketch diagram indicating how the field was sampled should help define the areas in need of reseeding.

As the field is being sampled, the observer also has the opportunity to spot weed infestations which may need to be controlled before they cause seedling mortality. The stand evaluation worksheet should be used as a management tool as well as a means of documenting stand establishment.

Conservationist _____ Landowner _____
Date _____ Program _____
Practice Name _____ Code _____

[illegible]

Comments / Recommendations _____

sample in a systematic and uniform manner
minimum of 10 counts for each 10 acres or less of field size
avoid areas that may have been double seeded
sample perpendicular or diagonal to drill rows – use a 1

sketch how field was sampled:



TABLE 1
Herbaceous Stand Evaluations
Seedlings Needed per Square Foot
(At end of first growing season)

Species	Critical Area		Forage Production		Idle Lane	
	Adequate	Inadequate	Adequate	Inadequate	Adequate	Inadequate
Big Bluestem	>4	<1	>2	<0.5	>1.0	<0.25
Indiangrass	>4	<1.0	>2	<0.5	>1.0	<0.25
Switchgrass	>4	<2.0	>2	<0.5	>1.0	<0.25
Sideoats grama	>4	<1.0	>2	<0.5	>1.0	<0.25
Little bluestem	>6	<1.5	>3.0	<0.75	>1.5	<0.38
Smooth brome	>4	<2	>2	<1	>1	<0.5
Inter. Wheatgrass	>4	<2	>1	<1	>1	<0.5
Tall Fescue	>4	<2	>1	<1	>1	<0.5
Orchardgrass	>8	<4	>4	<2	>2	<1
Tall wheatgrass	>8	<4	>4	<2	>2	<1
Kentucky bluegrass	>10	<5	>5	<2.5	>2.5	<1.25
Redtop	>10	<5	>5	<2.5	>2.5	<1.25
Timothy	>10	<5	>5	<2.5	>2.5	<1.25
Alfalfa, Alsike Clover, Red clover, Birdsfoot trefoil	>12	<6	>6	<3	>3	<1.5

> = greater than < = less than

If the stand is a mixture of species, all values in Table 1 will be reduced by the ratio of each specie's planed percentage in the mixture.