



GUIDELINES FOR HERBACEOUS STAND EVALUATION

AGRONOMY TECHNICAL NOTE MISSOURI 40

April 2013

The purpose of Agronomy Technical Note MO 40 is to provide guidelines and tools that can determine stand adequacy. After an herbaceous (grasses, forbs & legumes) planting has been made, a follow-up visit may be needed to determine the stand is adequate for the applied practice.

In determining stand adequacy, there are two major considerations:

- 1) Adequate protection of the soil resource.
- 2) Adequate stand for the planned conservation practice.

Protection of the soil resource is determined by the percentage of the soil surface that is protected by vegetative cover.

One of the objectives of any herbaceous planting should be to obtain an adequate stand as soon as possible to keep soil loss at a minimum especially during the establishment period.

Factors affecting establishment

How rapidly a seeding develops and the density of the stand is dependent on several factors. Proper seeding dates, poor seedbed condition, lack of moisture, hot temperatures, too deep of planting, poor seed soil contact, seeding rate, seed quality (% germination and % purity), weed pressure, insects, and diseases take their toll either on the seed or the seedlings. 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.

Even after a good dense stand is established, the stand density will continue to decrease through "survival of the fittest" from competition for space, moisture, and sunlight. Most cool season grass-legume stands reach their climax density within two years while native warm season grasses, legumes, and forbs reach their climax density after three years. After that time, an established seeding will maintain the same density indefinitely if properly managed and not affected by severe weather conditions or attack by insects or diseases.

Pure stands (monocultures) of grasses and legumes naturally reach a climax density when mature. The density will depend on the management applied to the stand. Stands of most grasses that are mowed 3 to 5 times a year will generally have a higher plant density than a stand that is never mowed or mowed only once a year. Legume stands mowed 2 or 3 times per year are likely to have a higher plant density.



Determining stand adequacy:

If stands are obviously adequate or inadequate by visual observation, then a formal stand evaluation is not necessary. However, if the stand is questionable by visual observation or documentation is required, the following procedures will be used to document the seeding certification as meeting NRCS conservation practice standards and specifications.

Knowledge of plant identification and the vegetative characteristics of the planned species (Plants Database at <http://plants.usda.gov/>) are necessary to ensure accuracy in making a stand evaluation. Only those planned plants that are well rooted and properly identified will be counted and used in determining the stand density.

Begin to sample in a systematic manner starting with sparse portions of the stand. If these areas have adequate vegetation established, then the entire area is considered adequate. Be sure to check important areas such as outlets of waterways or potentially erosive areas. Avoid end rows or turn around areas that may have been double seeded. If a portion of the field has had a different cropping history, fertilization program or major differences in soil types or slopes, the samples should be identified and the average plant densities kept separate for the different areas.

Frame Method

A one-square foot frame (12 inches x 12 inches) is easily constructed with a variety of materials and shapes. A circular one-square foot frame will present the least error from edge to area ratio with a circumference of 42.5 inches. One can be constructed from 3/16 inch plastic covered cable or high tensile wire. The ends can be joined with a crimping sleeve.

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. 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 and walk towards it 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 a diagonal or 45° angle to the drill rows or the direction the seeding was done.

When the number or pre-determined steps have 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.



Selecting a landmark for your transect.



This procedure is not time consuming, and ten counts can be made in a matter of 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.

Tabular entries should be made after each frame count to ensure accuracy. Stands can be evaluated anytime during the growing season, but late fall works well for most species. From the sample stand evaluation worksheet (see example that precedes Table 1), compute the percent composition for each species.



While completing the transect, count this as one plant (it contains multiple stems).

Table 1 provides guidelines to help determine if a stand is adequate, or inadequate, based on species planted. The number values in Table 1 will indicate if a stand is adequate or inadequate.

If the stand is a mixture of species, all values in Table 1 will be reduced by the ratio of the percentage of each planned species in the mixture. For example, if the planned seeding is to result in a mixture of 50% alfalfa and 50% orchardgrass, 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.



This is an example of the stand count within the 1 ft circle ring: three grasses and four Crimson Clovers. The black arrows represent the grass, and the red arrows represent the clover.

If the stand density is less than the values listed in Table 1, the stand is considered inadequate. Inadequate stands may need more time and should be re-evaluated and/or management techniques recommended to the producer to ensure the plants become adequately established. Where introduced or cool season species are seeded, an evaluation during the first full growing season should give a good indication of what the final stand will be. If it is still inadequate, then reseeding should be recommended. For native (warm season) species (they are usually slower becoming established), an evaluation should be done during the second growing season. If a stand is still inadequate after this time, then reseeding should be recommended.

Weeds may also be inventoried during the sampling process; however, they should not be counted as part of the sample to determine stand establishment. As the field is being sampled, the observer has the opportunity to spot weed infestations, which may need to be controlled before they cause seedling competition and mortality. The stand evaluation worksheet should

be used as a management tool as well as a means of documenting stand establishment.

The information obtained from sampling plant density can be used as a reference point when assisting a land user making management decisions or evaluating seedings for program purposes. In some cases, it may be determined that spot seeding is necessary because of a non-uniform stand. Examples on pages 6 and 7 show how the field was evaluated and the drawing shows the sampling pattern.

(EXAMPLE) STAND EVALUATION WORKSHEET

Conservationist **Stan Counter** _____ Landowner **Mr. Grassman** _____
 Date **9-10-2012** _____ Program **EQIP- 25 acre field** _____
 Farm # 100 Tract # 10 Practice Name **Forage and Biomass Planting** Code **512**__

Plant Species & Variety	From Table 1 Adequate	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Total	Avg.
Big Bluestem- OZ-70	2	0	0	0	1	0	1	1	0	0	1	0	1	0	0	1	0	0	0	1	1	0	0	1	1	0	10/25	0.4
Little Bluestem- Ozark	2	1	0	0	0	1	0	0	0	1	1	0	1	0	0	0	1	1	0	0	1	1	0	1	0	0	10/25	0.4
Partridge Pea- NA.	6	1	1	1	1	0	1	1	2	1	0	1	0	1	1	0	0	1	0	1	2	0	2	0	1	1	20/25	0.8
Total ÷ # of Species	10÷3	2	1	1	2	1	2	2	2	2	2	1	2	1	1	1	1	2	0	2	4	1	2	2	2	1	40/25	1.6
Average Species Required	3.3/ft²																											
Green foxtail	-	2	2	0	2	3	0	2	1	1	1	0	0	2	0	1	0	1	2	2	0	0	1	1	2	2	28/25	1.1
Pigweed	-	0	0	1	0	0	1	0	0	0	1	0	1	1	0	0	0	1	1	0	0	1	1	1	0	0	10/25	0.4
lambsquarter	-	0	1	0	0	1	0	0	1	1	1	1	0	0	0	1	0	0	1	1	0	0	1	1	0	1	12/25	0.5
Total weed species	-	2	3	1	2	4	1	2	2	2	3	1	1	3	0	2	0	2	4	3	0	1	3	3	2	3	50/25	2.0
Stand count weeds optional	-																											

Planting Date **4-20-2012** Soil Type(s) **Menfro silt loam** _____
 Age of seeding 5 yrs 5 months
 Seeding direction **East and West**, _____
 Average Density of seeded species **1.6 plants/sq'**
 Total number of plant counts 25 Total acres sampled 25
 Plant vigor **Good** Avg. Plant Height **5 inches**
 Stand is Adequate X Inadequate
 Weed Competition **Grass weed of foxtail is most prevalent within the stand.**

NOTE: All values in Table 1 should be reduced by the ratio of each species planned percentage in the mixture. In this example of seeded species each species should be at an average of 1/3 or av.0.66/species/sq'.

NOTE: With native warm season grasses, legumes and forbs species you may not be able to determine stand adequacy until after the 2nd growing season at that time a determination should be made.

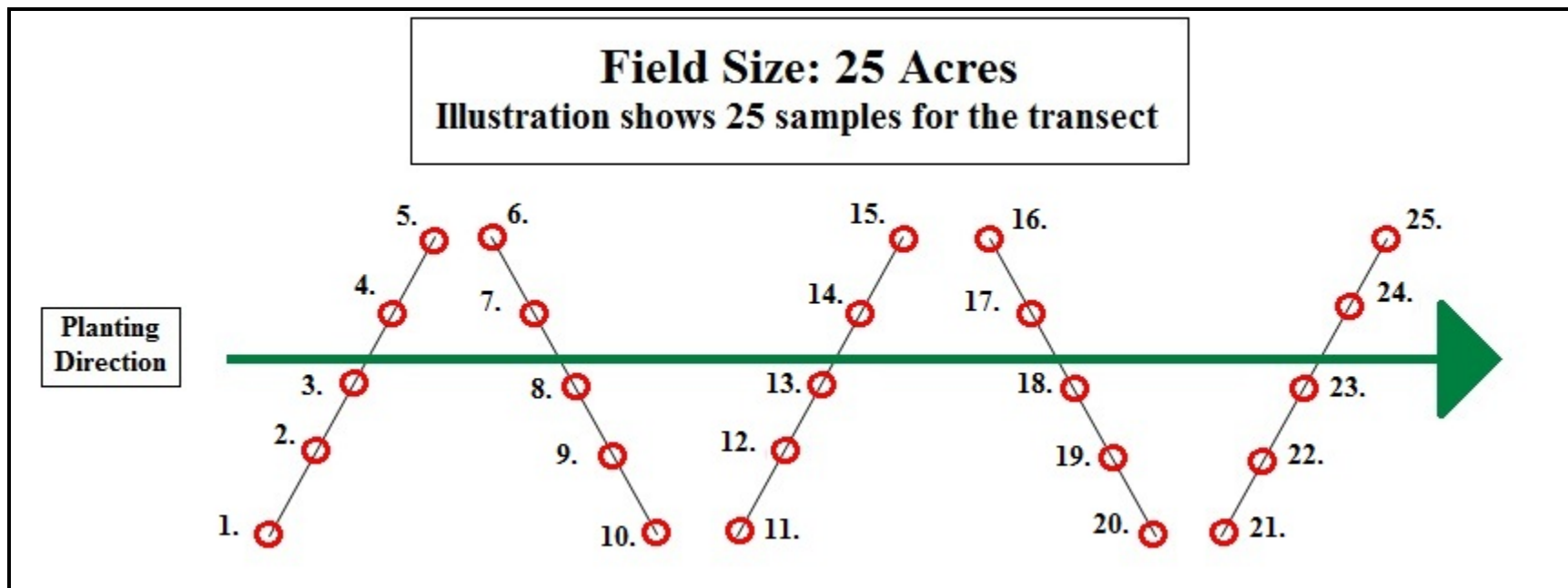
Comments
Drought poor soil moisture stand density is not adequate could be more dormant seed will germinate next year. Will need to provide best management to control weeds and keep stand open to prevent weed shading of grass species; however mowing will set back partridge pea and prevent reseeding.

Recommendations to Cooperator
Next year a pre emergent herbicide to control foxtail and other broadleaf weeds.

Guidelines

- 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 diagonal or at a 45° angle to drill rows - use a 1 ft² circle frame
- use Table 1 to determine adequacy

Sketch how field was sampled.



All values in Table 1 should be reduced by the ratio of each species planned percentage by species in the mixture.

**TABLE 1 – COOL SEASON SPECIES NEEDED PER SQUARE FOOT
 THE 1ST GROWING SEASON
 WARM SEASON SPECIES NEEDED PER SQUARE FOOT
 THE 2ND GROWING SEASON
 FOR HERBACEOUS STAND EVALUATION**

	Critical Areas (342) Riparian Herbaceous Cover (390) Filterstrip (393) Field Borders (386)	Forage and Biomass Planting (512) Field Borders (386)	Conservation Cover (327) Upland Wildlife Habitat Management (645) Restoration and Management Rare Declining Habitat (643) Field Borders (386)
SPECIES	Planted within 12 months if species is greater than >or= equal to species number below. Then the stand is adequate. Based on planting 80 seeds per square foot	Planted within 12 months if species is greater than >or= equal to species number below. Then the stand is adequate. Based on planting 50 seeds per square foot	Planted within 12 months if species is greater than >or= equal to species number below. Then the stand is adequate. Based on planting 40 seeds per square foot
Cool Season Legumes			
Birdsfoot trefoil	12	8	6
Alsike clover	10	6	5
Ladino clover	10	6	5
Red clover	12	8	6
Kura clover	8	4	2
Alfalfa	12	8	6
Warm Season Legumes			
Common Lespedeza	12	8	6
Illinois Bundleflower	7	4	2
Partridge Pea	10	6	5
Purple Prairieclover	10	6	5
Roundhead Bushclover	6	4	3
Showy Tick trefoil	5	3	2

Cool Season Grasses			
Canada Wildrye	8	5	4
Virginia Wildrye	6	4	3
Kentucky Bluegrass	10	6	5
Orchardgrass	8	5	4
Perennial Ryegrass	8	5	4
Redtop	10	6	5
Reed Canarygrass	8	5	4
Smooth Brome	5	3	2
Tall Fescue	8	5	4
Timothy	10	6	5
Warm Season Grasses			
Bermudagrass	1	0.6	0.5
Big Bluestem	3	2	2
Oldworld Bluestem	8	5	4
Composite Dropseed	6	4	3
Eastern Gamagrass	1	0.6	0.5
Indiangrass	5	3	2
Little bluestem	3	2	2
Sideoats Grama	6	4	3
Southern Crabgrass	4	3	2
Switchgrass	4	3	2
Warm Season Forbs			
Gray-headed Coneflower	10	6	5
Pale Purple Coneflower	8	5	4
Ox-eye False Sunflower	10	6	5
Wild Bergamot	10	6	5
Foxglove Beardtongue	10	6	5