

Increasing Pasture Quality and Sward Density

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Having thick stands of high quality forage species is critical to the success of any grazing operation. Dense forage stands improve intake, increase carrying capacity and help to lengthen the grazing season. While thin pastures can be plowed and re-established, most graziers prefer to attempt to thicken existing pasture. There are several techniques available to accomplish this, including livestock seeding, frost seeding, interseeding and no-till pasture renovation.

Livestock Seeding

Livestock seeding involves feeding or allowing livestock to ingest seed from mature plants, then distributing that seed through manure. This method of seeding is best for legumes as grass seeds show poor survival when passed through an animal's digestive tract. Legume seed survival depends on the level of hard seed in the seed lot. Higher levels of hard seed will result in greater survival. Livestock seeding will not result in uniform stands as manure is typically not uniformly distributed in a pasture. While germination of seed within a manure pat may be high, actual plant establishment may be much lower depending on the extent to which roots actually reach and penetrate the soil surface. Another consideration is seed inoculation. If a species has not been grown in a pasture before nitrogen fixing bacteria should be introduced. This is typically done along with the seed at planting. This is difficult to accomplish through livestock seeding.

Frost Seeding

Frost seeding is a common method of thickening existing pastures. Frost seeding involves distributing seed onto the soil surface in very early spring when the soil surface is frozen in the morning but thaws during the day. This freeze/thaw cycle helps



to incorporate the seed. In addition, the early season moisture and low competition from existing species helps seedlings establish prior to rapid growth of existing plants. Preparation for frost seeding begins in fall of the prior year. At this time pasture to be seeded should be grazed closely. This helps reduce residue in spring and ensures seeds come in contact with the soil surface. Seed can be distributed in a number of ways including hand seeders, Cyclone type seeders mounted on tractors or 4-wheelers and by grain

drills. Grain drills provide the most uniform seed distribution but can be difficult to use at the time when frost seedings are done. It is important to mix seed thoroughly and often during seeding as seeds of different species can segregate in the hopper resulting in strips of species rather than an even distribution.

Species vary in their ability to establish when frost seeded. West and Undersander examined the ability of several grass species to frost seed.(4) The most vigorous species were orchardgrass and perennial ryegrass while the least were reed canarygrass and brome grass. Timothy was intermediate. (Table 1). Cosgrove likewise frost seeded three legume species. Red clover was the most vigorous in the trials and alfalfa the least.

Average establishment percentage (number of established plants/number of seeds sown) from frost seeding is significantly lower than for stands established in a prepared seedbed. Average percent establishment from frost seeding is about 10% compared to 60% or higher in a prepared seedbed. (1) Table 2 shows recommended seeding rates for several forage species and the number of plants expected based on a 10% establishment rate. Establishment rates may be higher or lower than this depending on several factors including:

Amount or plant residue - The lower the residue the greater the seed/soil contact

Depth and duration of freeze/thaw cycles - In years when there is little frost and a rapid spring warm up, frost seeding will be less successful.

Seeding Rate - While calibrating frost seeding equipment can be difficult it is the only way to know for sure how much seed is actually being delivered.

Seed Distribution - Even distribution of species result in more satisfactory results.

Soil Moisture after Seeding - While usually beyond our control, adequate soil moisture after seeding will increase establishment.

Management after seeding - Pastures should be grazed or clipped regularly following frost seeding. Grazing is a balance between removing competition with new seedlings and not grazing so closely as to remove them. A residual height of 4 inches should be adequate in most cases. Be careful not to graze these newly seeded paddocks when they are wet.

Interseeding

Interseeding involves no-till seeding directly into a living sod. This technique requires more effort but is typically more consistently successful than frost seeding. Like frost seeding, preparation begins the previous fall with close grazing of existing plants. This helps proper seed placement and minimizes shading. Pastures should be seeded as early as possible in spring to help seedlings establish prior to shading by existing plants. There are several types of no-till drills available which work well for interseeding. All have a disc or some type of colter ahead of the seed openers and press wheels behind. The drills are typically heavy which helps penetrates residue or sod.

	Seeding Rate (Lbs/Acre)	
	4	10
Species	Plants/Square Foot	
Reed Canarygrass	0.4	0.4
Bromegrass	0.8	1.3
Timothy	3.0	-
Perennial Ryegrass	3.2	10.8
Orchardgrass	5.0	6.9

Some species are better selections for interseeding than others. Cosgrove used a no-till drill to interseed several species into a thin alfalfa sod. The results are shown in Table 3. The most vigorous grass species were orchardgrass, timothy and ryegrass and the least were smooth bromegrass and Kentucky bluegrass. The most vigorous legume was red clover. Interseeding has little impact on pasture yield and quality in the seeding year. Table 4 shows the impact of this interseeding on pasture yield in the year after seeding. Pasture yield increased in each case, with the introduction of red clover doubling the yield of this pasture. As this seeding was made into an existing alfalfa stand, the impact on quality was minimal as the quality of the existing stand was already quite high. (Data not shown).

Species	Seeding Rate		Stand Count
	(Lbs/Acre)		
Alfalfa	15		3
Trefoil	6		5
Red Clover	11		12
Bromegrass	7	15	10 17
Kentucky Bluegrass	8	14	7 24
Orchardgrass	4	10	16 27
Timothy	5	9	17 30
Perennial Ryegrass	4	10	17 30

TABLE 4 (Cosgrove 1995)
EFFECT OF INTERSEEDING ON PASTURE YIELD
(YEAR AFTER SEEDING)

Species	Yield (Tons/Acre)	
	Alone	With Red Clover
Control	0.72	-
Red Clover	1.45	-
Bromegrass	0.89	1.48
Bluegrass	1.06	1.77
Orchardgrass	1.04	1.40
Timothy	1.14	1.74
Perennial Ryegrass	1.05	1.37

In some special cases, conventional grain drills may be used for interseeding. Success with these implements will be enhanced by a light discing prior to seeding. Cosgrove lightly disced a thin alfalfa stand with a finishing disc, then seeded several legumes and grasses perpendicular to the direction of discing. Results are shown in Table 5. Plant density was lower compared to using a no-till drill but still acceptable. This method is an option only in open sods. In close, grass sods the grain drill will most likely not produce acceptable stands.

As with frost seeding, vegetation management after seeding is critical to interseeding success. Pastures should be grazed on a regular schedule but not grazed so closely as to remove seedlings. Once seedlings firmly rooted pasture may be grazed more aggressively. Another factor which impacts interseeding success is the condition of the existing sod. Open legume sods are much easier to improve through interseeding than tight bluegrass sods.

TABLE 5 (Cosgrove 1995)
EFFECT OF INTERSEEDING ON PASTURE COMPOSITION

Species	Discing/Grain Drill	No-Till Drill
	Plants/Ft ²	
Alfalfa	4	3
Trefoil	6	5
Red Clover	9	12
Bromegrass	10	17
Kentucky Bluegrass	11	24
Orchardgrass	40	27
Timothy	11	30
Perennial Ryegrass	16	30

Pasture Renovation

In some cases such as pastures with severe weed infestations or very tight bluegrass sods where interseeding success is unlikely, renovation may be the best option, Renovation involves killing the existing pasture with an herbicide like Roundup, then seeding a new species mixture with a no-till drill. This approach is most expensive and disrupts the

grazing cycle for that season, but has a high likelihood of successfully establishing productive pasture. Grueb used this technique in River Falls, WI to renovate an existing bluegrass pasture with birdsfoot trefoil/grass combinations. The impacts on yields the year after seeding are shown in Table 6. All combinations were successfully established by this renovation technique.

Species	Seeded Grass	Trefoil	Other	Total
	Tons/Acre			
Orchardgrass	0.8	0.6	1.3	2.70
Bromegrass	0.7	1.1	0.8	2.60
Timothy	1.1	1.0	0.6	2.70
Reed Canarygrass	1.0	1.0	0.75	2.75
Bluegrass	0.6	1.1	0.85	2.55
Perennial Ryegrass	1.6	0.7	0.4	2.7

Several factors influence renovation success. How well the existing sod is killed is critical. Applications of Roundup the fall prior to seeding are more effective and allow for earlier planting in spring. As with the other method discussed here, early seeding is beneficial. Seedings should be made as early as possible. Grazing management after seeding is also important. Seedings should not be grazed until plants are well established and can provide firm footing for grazing animal. This will not be until late summer in most cases.

Literature Cited

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