Improving Existing Pasture

I. Introduction

The first thought of many is to plow up and reseed old pasture areas. However in most cases it may be best to try to work with and improve some or all of the pasture rather than to start over. This approach offers several advantages:

- It is often hard to get neighboring farmers to do the tillage and planting in a timely manner because they have their own tillage and planting to do in the spring. If seeding is not done in a timely manner, there is increased probability of stand failure with the result that the pasture will be low in productivity and weedy for the season and may need to be reseeded.
- Improving existing pasture is often less conflicting with the spring planting crunch. Improvements will be done over a period of time. In the interim, the pasture is still there to graze. So there is less risk of pasture loss for a season.
- Improving a pasture often costs less than starting over and reseeding
- Improving a pasture keeps sod cover in place so erosive losses are less.

The first step is to decide what you want the pasture to look like when done:

- Do you want a particular grass or legume species?
- Do you want to get rid of some weeds and keep existing grass species?
- Do you want to add legume to your grass pasture?

If you wish to get rid of cool season grasses to plant prairie grasses, it may be necessary to kill all existing pasture and start over. Similarly, if you want to take tall fescue or reed canarygrass out, it will be necessary to kill all of the pasture and start over. (In fact killing, and waiting a year before reseeding is often the best to allow the seed of the unwanted grasses to germinate before seeing the desired species. An annual grass such as Italian ryegrass can be seeded on the interim year to provide forage.) Most other desired changes can be achieved by pasture improvement rather than killing all and reseeding.

The are three steps to improving existing pasture will be described below:

II. Step one: Control perennial weeds and brush

Before any pasture improvement can be done we must first get rid of perennial and brushy weeds. This largely means plants like thistle (all kinds), multiflora rose, brush, etc. Fertilization, reseeding, and most other pasture improvement techniques will be of little success until the weeds are under control. The perennial weeds are there with deep, established root systems and will out-compete any grass or legume as long as the weeds are present. However, once removed, good pasture management will keep these weeds from re-establishing.

Pasture that has not been grazed or harvested in five or more years will often have small trees of cottonwood, boxelder, or other species volunteering. If trees are less than six feet high, they will be quickly killed by grazing. Bigger trees and, especially, especially toxic trees should be removed by sawing or some other method. Be careful not to leave short tree stumps that will later puncture truck and tractor tires.

Thistles and multiflora rose are the most common serious weed problems. While these plants can be controlled by frequent mowing, a clean pasture will often be achieved faster and more cost effectively by judicious use of herbicides. The important thing is to identify the weed type exactly (e.g. which thistle) because different weeds have different methods of control. Also timing is everything. For example, biennial thistles require different timings of herbicide applications to be killed than perennial thistles. Applying herbicide at the wrong time will not kill the desired weed.

III. Step two: Soil Test and Fertilize Pasture

All plants need nutrients to grow. Lack of good soil fertility will reduce pasture yield, especially in late season, and will give a competitive edge to weedy plants.

The first step is to take a soil sample and have it tested to determine the nutrient status of the soil under the pasture. There are three important things to remember about soil tests:

A) Fields are variable so it is important to take several samples across the area you will fertilize and lime similarly. The results for the soil testing laboratory will then be an 'average' of the nutrient content and needs of the pasture or field. If some field or portion of the field is considerably different from the rest (such as a low spot or sandy knoll), it should be soil sampled separately and fertilized differently than the rest of the area.

B) A soil test is based on sampling to a 6-inch depth. Soil varies considerably from the soil surface down to the sixth inch, so it is important that the soil sample contain equal amounts of soil from each inch down to the 6-inch depth

C) Different crops require different soil pH and amounts of nutrients. So the fertilizer recommendations in the soil test results are based on the crop to be grown. When turning in a soil sample specify either "Pasture, managed" or "Pasture, legume-grass." Pasture, managed is for grass pasture and Pasture, legume-grass is for a mixed grass and legume pasture. The latter will recommend more phosphate and potash fertilizer and may recommend more lime which is required for the legume portion of the pasture.

To take a soil sample follow this procedure:

1. Use a soil sampling probe. This is approximately a 1-inch diameter tube with a 'T' handle (shown at right). Often one can be borrowed from the county extension office or the local coop. A clean shovel is also acceptable.

2. Soil tests results are based on sampling uniformly to a 6-inch depth. When using a probe mark six inches on the outside and push it this far into the ground. A shovel can be used to take a sample provided you first make a small hole in the soil and then shave off a slice of uniform thickness to a 6-inch depth. Be sure the shovel is clean prior to taking soil samples. Manure or other organic material remaining on the shovel will contaminate the soil sample and cause inaccurate results. Also, put samples into a plastic container because a metal container may contaminate the sample.

3. Avoid sampling from unusual areas in the field, i.e. under a tree, along a stream bank, near lime or manure piles or animal droppings, etc. Don't sample too close (within 25 feet) of fences or roads

4. Take a minimum of 5 soil samples from a field or pasture.

5. Take at least one sample for every 5 acres.

6. Mix samples and place subsample (approximately 0.5 lb) into labeled bag (either paper or plastic).

7. Keep records to show where samples were taken from in the field or pasture.

8. Fill out soil test information sheet and mail or take to soil testing laboratory.

Pasture lime and fertilizer needs

The standard soil test results report soil pH (acidity), phosphorus, and potassium and then make recommendations for lime, and phosphate and potash fertilizer.

Soil Acidity

If you want to have a healthy component of legumes in the pasture, soil pH (acidity) is the first consideration. Many soils of Wisconsin and eastern U.S. are acid (pH 4.5 to 5.5). While this doesn't often bother the grasses, clovers need a pH of 6.0 or higher to grow well. Thus, the need for aglime will depend on whether or not you intend to include legumes in the pasture. Other benefits of liming include:

- more activity of nitrogen-fixing *Rhizobium* bacteria on clovers,
- added calcium and magnesium,
- improved soil structure and tilth,
- increased availability of phosphorus and molybdenum , and
- decreased manganese, iron and aluminum toxicity.

Because aglime reacts very slowly with soil acids, it should be applied 12 months—preferably longer—before seeding. This allows more time for reaction with the soil.

Liming materials come in several forms. Calcitic products contain calcium-based neutralizers while dolomitic sources contain both calcium and magnesium. Both are equally effective for changing soil pH. Some claims are made that when the calcium to magnesium ratios in the soil are low, calcitic limestone should be used. Research evidence does not support these claims, as virtually all Midwestern and northeastern soils have ratios within the optimal range. Dolomitic limestone itself has a calcium to magnesium ratio within the normal range for plant growth. The addition of calcitic limestone or gypsum for the purpose of adding calcium or changing the calcium/magnesium ratio is neither recommended nor cost effective.

Lime effectiveness is determined by its chemical purity and the fineness to which it is ground. To achieve the same pH change, coarse aglime must be applied further in advance and at higher rates than fine aglime but is usually less expensive per ton and the effect of the lime lasts longer. Aglime is most commonly ground at 60 to 80 mesh.

Aglime should be broadcast on the surface of the soil, disked in, and then plowed under for maximum distribution and neutralization of acids in the entire plow layer. Plowing without disking may deposit the lime in a layer at the plow sole rather than mixing it through the soil. For high rates of lime (>6 tons/acre), apply half before working the field; work the remaining half into the soil after plowing or other field preparation.

If you have a pasture already established and need to raise the soil pH, this can be by done by surface applying a finely ground lime (e.g. 100 mesh) or using one of the more soluble products such as paper mill sludge. Since the relative effectiveness of byproduct materials is highly variable, be sure you know its effective neutralizing power.

Soil Nutrients

All plants need nutrients to grow. The most commonly deficient nutrients for pastures are phosphorus, potassium, and nitrogen. The amounts of each nutrient needed will depend on the soil type, previous use of field, and previous nutrients added either through fertilizer or manure. The soil test will take all these factors into account and recommend the amount and type of fertilizer needed.

Phosphorus is a nutrient that is very immobile in the soil. Fertilizer of this nutrient is most effective if incorporated. This means it is best to apply the amount needed prior to any seeding and tillage if possible. If no tillage is occurring, surface applications will work but are less effective. One should be careful because this nutrient will move into streams as the soil is eroded and is a major source of stream and lake pollution. Therefore apply the minimum amount needed and try to avoid applying it to areas that are eroding.

Phosphorus is necessary to establish new seedings. It is particularly important for encouraging root growth. Phosphorus is also necessary for continued production of both grass and legumes within pastures

Potassium is need by both grasses and legumes (though legumes need more) for high yield and for winter survival. It is a soluble nutrient that can be surface applied whenever needed.

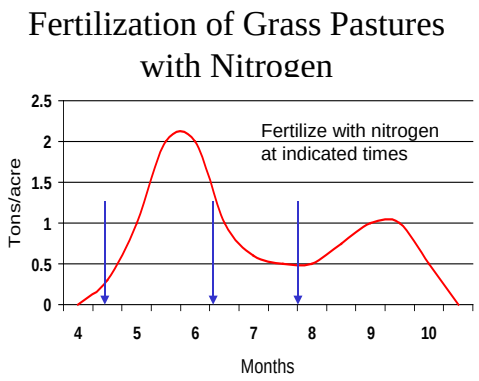
Potassium is required for all plant growth but especially legumes. It is a very soluble nutrient. It is primarily in urine and not in feces of manure.

Applications of sulfur may be necessary in some areas for good yield and growth, particularly of legumes. Much sulfur previously came from the acid rain. Now that acid rain is reduced, more areas need sulfur fertilization than previously.

Nitrogen is needed by grasses but not legumes if they are properly inoculated with nitrogen-fixing *Rhizobium* bacteria. So the amount of nitrogen fertilizer needed depends amount of legumes in the pastures. Pastures with over 40% legume generally need no additional nitrogen fertilizer. Too much nitrogen fertilizer will cause the legumes to be less competitive and be crowded out by the grasses in the pasture.

Nitrogen is very soluble in water and moves quickly into and out of the soil. This means that whatever amount of nitrogen fertilizer is applied moves rapidly (with the first rainfall exceeding half an inch) into the soil and is taken up by the next cycle of growth. The mobility of nitrogen also means that, if applications are made above the recommended amount, excess nitrogen will simply be taken up by the plant (and largely not available for next cycle of growth) or the nitrogen may move into and pollute the water table.

In theory, for maximum yield, an application of nitrogen should be applied immediately after each grazing cycle or mowing. This is usually not practical and the normal compromise is to apply 50 units of nitrogen per acre three times during the year at times shown in the graph at the right. This works out to approximately applying nitrogen fertilizer after every other grazing cycle. (Note: the recommendation is 50 units of nitrogen per acre, not 50 lbs of fertilizer. If the fertilizer analysis is 45-0-0, 111 lbs of this fertilizer must be applied to provide 50 units of nitrogen. The amount to apply is calculated by the nutrient need (50 lbs) divided by the percent nutrient in the fertilizer (45 in this example).)



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With three applications, we are also meeting the need for different portions of the summer. For maximum tonnage the first application should be in early spring just ahead of or at spring greenup. This will encourage high yields in during the spring growth period and is especially important on any fields from which hay will be made. The second application should be in early to mid June, after the spring heading, to encourage growth over summer. The third application should be approximately Aug 1 to encourage later summer and fall growth. The second peak of growth shown on the graph will not occur without the August application.

It is also important to remember that applications of nitrogen fertilizer preceding previous growth periods (or lack thereof) have no effect on future growth. So, if no hay is harvested in the spring, one may skip the first application of nitrogen, if sufficient pasture growth will occur anyway, and then apply the next two applications of fertilizer. Basically, put nitrogen fertilizer on ahead of when you need additional forage and skip applications for periods when plenty of pasture growth occurs. It also means that if you have a low stocking rate, pasture yield may be less of a consideration and you may apply less nitrogen fertilizer.

Remember that manure is a good source of nitrogen, phosphorus and other nutrients. It may be feasible to make arrangements with neighboring dairy farms to accept some of their manure rather than to buy commercial fertilizer.

IV. Step three: Institute a good grazing program

There are two parts to good grazing management: to graze at an appropriate stocking rate and to graze rotationally.

The stocking rate for grazing should be in the range 1000 pounds of horse per two to four acres. As stated previously, forage consumption is the same per pound regardless of horse size. So two 500-lb horses eat about a same as one 1000-lb horse. This stocking rate is a range that is conservative so that adequate forage should be present during summer and mild droughts. Less than 1000 pounds of horse per 4 acres is not recommended because the horse(s) will not be able to keep up with the forage and the pasture will be overtaken by weeds.

Rotational grazing is key to managing pastures because:

1. it increases utilization of pasture forage by concentrating animals and making them eat a higher percentage of what is present

2. it allows pastures to rest and recover from grazing, increasing stand and yield.

3. it keeps animals from grazing and regrazing certain areas. This keeps some spots short with low leaf area and little ability to grow while other areas of the pasture are maturing and losing forage quality.

Some rotational grazing systems have large number of pastures and move animals frequently (especially for dairy) but this is not necessary for horses. Any number of divisions are better than using just one none. Three to four paddocks are probably sufficient for most situations. Horses only need be moved to new paddocks once a week. The general recommendation would be to rest paddocks after grazing for at least two weeks before grazing again.

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