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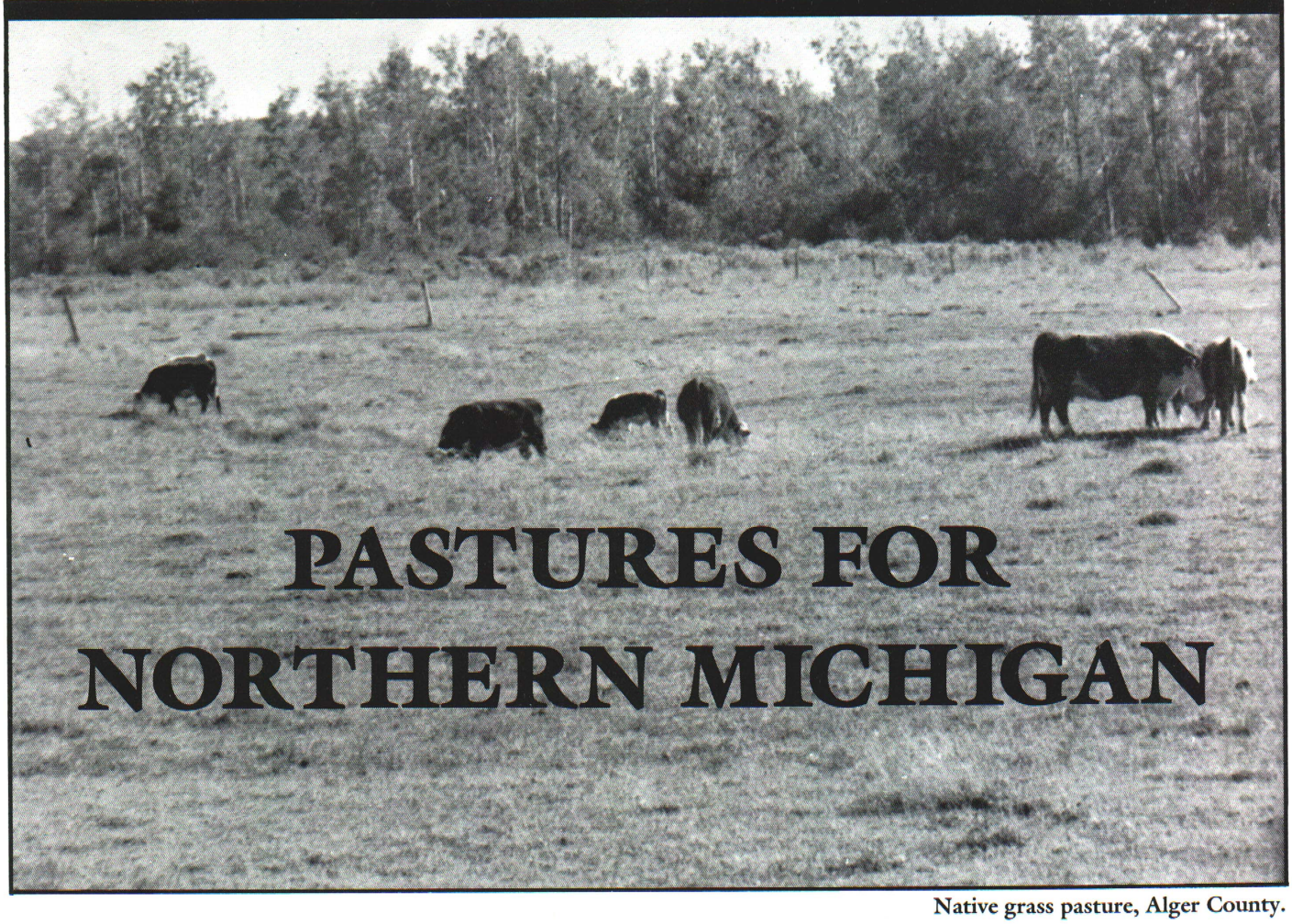

PASTURES FOR NORTHERN MICHIGAN

Native grass pasture, Alger County.

A well-managed and productive pasture can be one of the most profitable segments of a livestock enterprise in northern Michigan. Both climate and soil are well suited for the production of nutritious and palatable forage.

The goal of pasture management is to make maximum quantities of palatable forage available to livestock throughout the growing season, while keeping the pasture plants healthy, vigorous and productive. Good pasture management will produce a surplus of forage in favorable seasons, and an adequate supply in normal seasons.

Animal and Plant Considerations

Most livestock will graze the more palatable plants first in a pasture mixture. This often allows the remaining plants to mature and become unpalatable. Mixtures should include plants of similar palatability to get full usage of the feed supply by grazing animals.

When a plant is grazed or harvested for hay, it is at least partially defoliated. If the plant is an erect-growing forage, such as alfalfa or red clover, essentially all of the leaf tissue is removed. With the leaves gone, the energy for regrowth must come from stored food. If the plant is to survive, it must have time to replenish the food stores used in regrowth. This period of recuperation is called a "rest period."

Some low-growing forage species, such as bluegrass and wild white clover, survive and even flourish under constant grazing. Almost without exception, the grazing animal cannot remove all the leaves from these plants.

Types of Pastures

There are two basic types of pastures, those planned and planted, and those that were not.

A permanent pasture is one maintained indefinitely for grazing. It contains perennial plants, and annual

plants which reseed. Some permanent pastures have been seeded, but most are on nontillable sites and of the "native pasture" type.

Where it is possible to till a permanent pasture, renovation and reseeding will bring it to maximum production more quickly, and allow the introduction of productive forage species which do not occur in the area. In most cases, reseeded permanent pastures and managed permanent pastures will reach the same point after 5-10 years. Many of the introduced forage species tend to be rather short-lived in pastures without careful management.

Making Pastures More Productive

Most pastures in northern Michigan are not productive because of low fertility, shade and competition from brush and trees, and poor grazing management. The lowest-producing fields and the poorest soils are usually left in pasture. Often, the leaves of trees and brush intercept half, or more, of the sunlight necessary for pasture plant growth.

Fertilizing pastures can have a marked effect on their productivity, and can even affect the type of plants growing there. Different fertilizer analyses promote different pasture plants, so select with a definite goal in mind.

Nitrogen is required for growth in all plants. There are two major sources of nitrogen — commercial fertilizer and members of one particular plant family, the "legumes." The legume family includes peas, beans, alfalfa, birdsfoot trefoil and the clovers. Working with a particular strain of bacteria, these plants take nitrogen from the air and use it to meet their own needs for growth. Under favorable conditions, they take more nitrogen from the air than they need; this excess is then available to a neighboring grass plant. The bacteria essential for the process are cultivated commercially and are available for use as inoculum on legume seed.

Ground limestone or "lime" is used to sweeten or neutralize acid soils. Most of the soils in northern Michigan are acid in their natural state and liming is necessary. Limestone, which counters the effects of soil acidity, makes many nutrients more available to the growing plant. The amount of lime required depends on both the characteristics of the soil and the requirements of the particular forage you want to grow. The cost of lime will depend upon the source and distance from applicators.

Phosphorus and potassium are both required by plants. Phosphorus is deficient in most northern Michigan soils and should be included in most fertilization programs. Potassium is supplied by some of the heavier textured clays and clay loams, but is generally more limited on light textured soils — sands and sandy loams.

The best way to establish the need for lime or any fertilizer element is through your local Michigan State University Cooperative Extension Service office.

Topdressed lime, phosphorus, and potassium usually stimulate the growth of legumes. Nitrogen fertilization, on the other hand, favors the grasses, and gives them a competitive advantage at the expense of the legumes. Grasses, without an associated legume, can be kept productive with early spring applications of nitrogenous fertilizers.

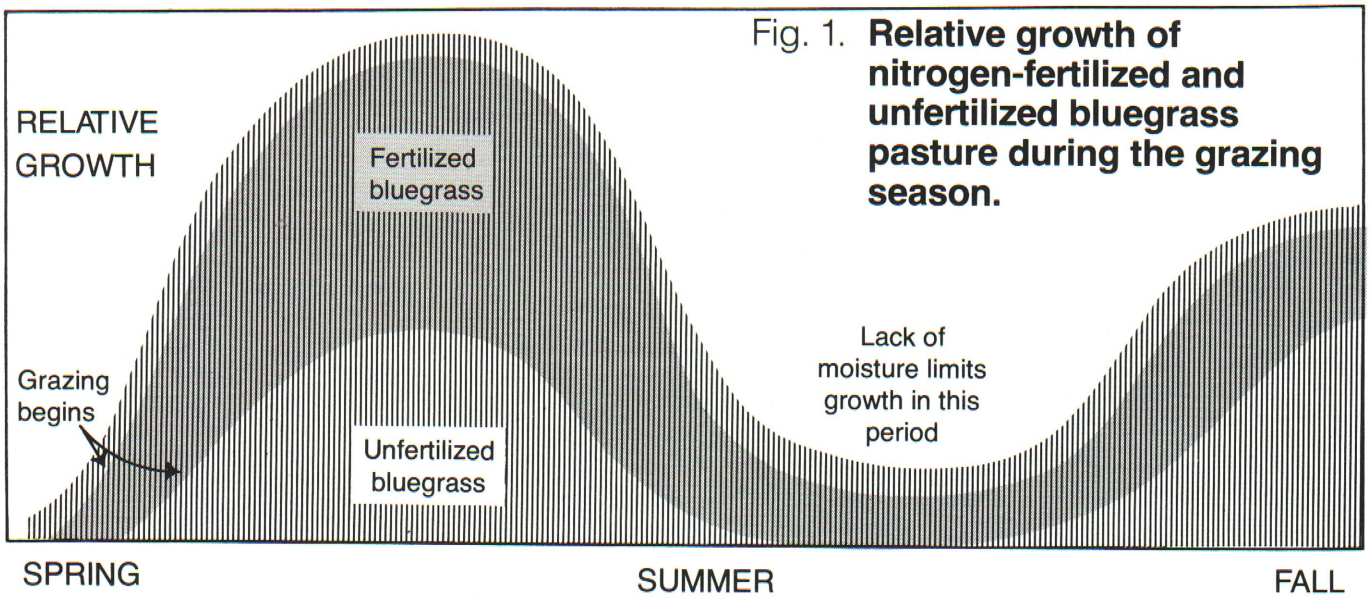

Fig. 1. **Relative growth of nitrogen-fertilized and unfertilized bluegrass pasture during the grazing season.**

Confine such applications to soils containing an adequate supply of phosphorus, potassium and moisture.

Nitrogen fertilization of grasses increases total production. It also stimulates spring growth so grazing can often start 7-10 days earlier. Kentucky bluegrass, which is shallow rooted, is more susceptible to dry weather than the more drought-tolerant, smooth bromegrass. So, carefully select both the species and the site to be fertilized. In many cases, nitrogen fertilization produces more spring growth without much increase in midsummer carrying capacity (Fig. 1). Nitrogen fertilization may be attractive to increase early spring grazing, in an emergency situation, or when more spring grazing is desired.

Cost is the reason more acres of pasture are not topdressed with nitrogen. Purchase nitrogen fertilizer on the basis of cost per pound of actual nitrogen. Recent studies have shown that a 100-pound actual nitrogen application will return 1.5 tons extra hay with improved grass species. Maximum yields were obtained on bluegrass with 50 pounds actual nitrogen giving a 1.0-ton yield increase. These results demonstrate the benefits of nitrogen use on grass pastures.

Spot grazing on an orchardgrass pasture. U.P. Experiment Station, Chatham.

Grazing Management

There are really two basic pasture management programs: **continuous grazing** and **rotational grazing.** Both can be adapted to provide additional pasture in late-July and August. Decreased rainfall and higher temperatures during this midsummer season reduce the growth rate of most pasture plants, especially the shallow rooted types. Whatever system of grazing management is used or type of pasture grazed, there must be some provision for more production of pasture during midsummer. This could come from more acres or use of a second crop from a hayfield.

With continuous grazing, the animals are turned into the pasture and left there throughout the growing season. This practice has two very attractive aspects: it minimizes both the cost of fencing and labor.

The disadvantages of continuous grazing are the wide fluctuations in quality and quantity of feed available. Continuous grazing definitely favors low-growing species at the expense of erect-growing plants.

Selective or "spot" grazing usually produces some preferred areas of use by animals. These spots can vary from a square foot to almost an acre in size. Spot grazing produces both overgrazing and undergrazing in the same pasture at the same time. The undergrazed areas rejected by the grazing animals mature and become tough, dry and unpalatable.

Rotational grazing involves moving the animals from one grazing lot to another, at more or less predetermined intervals. The grazed areas are "rested" or allowed to regrow between grazings. This is usually very desirable for the erect-growing forage types. Consider the length of the rest period when dividing the pasture into lots. The longer the rest period, the more lots required. Unfortunately, this varies from year to year, and even from month to month during the growing season which makes proper management difficult.

In addition to maintaining the erect-growing forage species, this system has the added advantage of flexibility, since excess forage can be

harvested as hay or silage for later use.

Strip grazing is a more intensive form of rotational grazing. The strips are usually divided by electric fences and the animals allotted only the amount they will eat in one day. This practice has the advantages of uniform forage quality, minimum pasture losses, and makes possible the maintenance of erect-growing forages. Rotational grazing and strip grazing have the disadvantages of requiring more fencing and labor.

An undergrazed reed canarygrass pasture. At this stage it is particularly rank and unpalatable, U.P. Experiment Station, Chatham.

Permanent Pastures

A permanent pasture which has been heavily grazed and is reasonably fertile is likely to be predominantly Kentucky bluegrass ("junegrass"). A less intensively grazed pasture will contain more quackgrass, some volunteer timothy and lesser amounts of bromegrass and orchardgrass.

Many of the forage legumes will volunteer in a permanent pasture if lime and fertilizer needs are met. When volunteer legumes are desired, no nitrogen is supplied so the grasses must depend on the legumes for nitrogen.

An excellent stand of wild white clover can be produced (where adapted) in one, and not more than two, growing seasons through a sound fertilization program and intensive grazing to reduce grass competition. Kentucky bluegrass will usually be a constituent of a wild white clover pasture because it can exist under the same conditions.

This program is best adapted to moisture retentive sites, either heavy clay soils or low-lying lighter textured soils, which remain moist throughout the growing season. The growth of wild white clover is often limited by an insufficient supply of phosphorus. Studies have shown that topdressing with 0-20-0 or 0-46-0 fertilizer and close grazing on these moisture retentive areas encourage white clover and Kentucky bluegrass and can, at low cost, produce one of the most productive pastures available.

Semi-Permanent Pastures

Semi-permanent pastures are usually planted to a mixture of taller growing, deeper rooted, productive forage species, maintained as long as possible, then reseeded.

Often, species selected for seeded pastures do not withstand the rigors of heavy, continuous grazing. Most of the species must be grazed rotationally or stocked lightly enough to retain some leaf surface — there will be the usual problem of spot grazing.

When establishing semi-permanent pastures, improve the best soils first. These soils are more responsive to improved management and are the most productive.

Establishing Forages for Grazing

There are entirely too many seeding failures — that can be prevented — with just a little management and care. For the best seeding establishment, follow these procedures.

1. **Lime and fertilize** as necessary for the intended crop. Proper fertilizer analyses and rate of application are best determined with a soil test. Since lime reacts slowly in the soil, apply in the fall before seeding, if possible. A supply of phosphorus has been shown to be particularly important to small, emerging seedlings. Therefore, apply a fertilizer containing phosphorus with the grain drill at seeding time.
2. **Kill the old sod.** Seeding forages directly into an old sod is seldom successful. Even an old, thin, runout sod can compete effectively

with new forage seedlings. Quackgrass and other perennial grasses can be controlled by cultivation or with a herbicide. The out-of-pocket costs are higher using a herbicide, but the total costs are very similar.

3. **Prepare the seedbed.** Where it is possible to plow, there is no better way to begin preparing a seedbed. However, successful seedings can be made without plowing after working with a disc-harrow, springtooth-harrow, or field cultivator. A cultipacker used before seeding is necessary to provide a firm seedbed.

4. **Seed shallow.** A grain drill equipped for band seeding is one of the best ways to get shallow seed placement. It places the seed directly over the band of drilled phosphate fertilizer. Directions for adapting a grain drill for band seeding can be obtained at county offices of the Cooperative Extension Service. Compaction after seeding, with either press wheels or a cultipacker, is necessary.

5. **When to seed.** Most northern Michigan seedings are made in the spring with a small grain companion crop. The small grain competes with the forage seedlings, but helps keep down weed growth.

Recently, there has been interest in making spring seedings without a companion crop, using herbicides to control the existing vegetation. An effective way to make seedings, this requires an out-of-pocket outlay for the herbicide, careful calibration of the sprayer, and an accurate application to be successful.

Summer seedings made without a companion crop during the first two weeks of July in the Upper Peninsula have been particularly successful.

6. **Use good seed, properly inoculated.** Seed costs are usually small compared to the cost of preparing the seedbed. Poor seed is not a bargain at any price.

Properly inoculate all legume seed just before planting.

It is often difficult to get adequate inoculation of birdsfoot trefoil. Use two "1 bushel size" packages of inoculant on each bushel of birdsfoot trefoil seed.

7. **Don't overuse the pasture in the seeding year.** It is usually better not to graze a pasture in the seeding year. However, if it makes enough growth, some grazing probably will not hurt and may even be beneficial. In any event, allow a 4 to 6 week rest before growth stops in the fall, and never graze it closer than 4 to 6 inches.

Alternative Methods for Pasture Renovation

Sod Seeding

Although the procedure just described is the best way of getting good pastures established within a year, there are some situations where other methods work satisfactorily.

An alternative which has given satisfactory results in MSU trials where soil erosion is a problem is to seed either alfalfa or birdsfoot trefoil in a herbicide-treated sod. Sod seeding is generally not recommended for alfalfa unless the soil pH is 6.8 or above. Birdsfoot trefoil is more tolerant of acid soils and will grow well at a soil pH as low as 5.5. The procedure for renovating a pasture by sod seeding is outlined in Extension Bulletin E-956, "Sod Seeding Birdsfoot Trefoil and Alfalfa."

Frost Seeding

Another method of renovating pastures is frost seeding with red clover. Frost seeding with red clover with proper grazing management has given good results in recent Michigan State University trials. The total cost of this method is less than $20 per acre. Follow these procedures to make this practice successful:

1. **Site Selection.** Graze pastures closely the previous year before seeding. The best soil types for this method are loams, silt loams or sandy loams. The grass species composition should not contain more than 50 percent quackgrass to avoid too much competition for the red clover seedlings.

2. **Soil Fertility.** The soil pH should be 5.5 or above. Broadcast 200 pounds of 0-14-42 per acre in the absence of a soil test, soon after the red clover seedlings have emerged. The small amount of phosphorus will stimulate the seedlings and potassium will increase winter survival.

3. **Time of Seeding.** In mid-March to late-April with almost any kind of seeder, broadcast 10 pounds of red clover and 2 pounds of birdsfoot trefoil. Inoculate the seeds just prior to seeding with double strength of both red clover and birdsfoot trefoil inoculant. The natural freezing and thawing of the soil and spring rains will bury the seed for good germination. Mid- to late-November may be a good alternative to spring seeding since some soils may be too wet in the spring to operate equipment.

4. **Grazing Management.** The key to success is a grazing program to reduce grass competition. Grazing should be close the first time in mid- to late-May followed by another close

grazing in mid- to late-June. Repeat the rotational grazing at least four times during the summer.

5. Topdressing. Red clover should be well established the year after seeding, and may double the productivity of the pasture. Topdress with 300 pounds of 0-14-42 per acre in the absence of a soil test.

6. When to Reseed. Repeat reseeding every *two* years, since red clover is a biennial plant. Repeat the same procedures outlined above to insure good stands. The small amount of birdsfoot trefoil seed will help to develop a long-lived perennial in the pasture.

Planning for Summer-long Grazing

No one forage species can be expected to produce season-long grazing by itself. But different species can be effectively used in a sequential grazing program (Table 1).

Table 1.

A sequential grazing program.

Early Spring

Winter rye
Nitrogen fertilized grass, native or seeded

Spring-Early Summer

Permanent pastures
Seeded semi-permanent pastures
Reed canarygrass
Spring-sown small grains

Summer

Seeded semi-permanent pastures
Stockpiled pasture
Regrowth of hay fields
Reed canarygrass

Fall

Permanent pastures
Winter rye
Reed canarygrass
Hayfields to be plowed

Fitting Forages To Soils

Recommended forage species for pastures on soils of differing drainage are presented in Table 2.

Volunteer Forages

Wild white clover volunteers where conditions are favorable. Its low growth habit makes it very tolerant of grazing. In fact, it seems to do best with continuous grazing pressure to limit grass competition. A shallow root system makes it susceptible to drought. There is a marked midsummer slump in growth except on the most favorable sites.

Quackgrass is a common constituent of northern Michigan pastures. It is a noxious weed in Michigan and, therefore, cannot be seeded legally. Quackgrass is a more upright-growing grass and often makes a valuable contribution in pastures, but its creeping rootstocks make it difficult to eradicate. It is responsive to nitrogen fertilization and tends to be weakened under continuous grazing. Midsummer recovery is poor for quackgrass, unless adequate rainfall occurs.

Introduced Forage Legumes

Alfalfa is a high producing, drought tolerant, palatable and potentially long-lived forage legume. The soil requirements for alfalfa are rather exacting. It requires a neutral (sweet) soil which is well drained. Alfalfa is readily defoliated and requires a rest period of about four weeks between grazings. In addition, it should be allowed to reach full bloom at least once during the growing season.

Alsike clover is rather short-lived but grows well on soils too wet and acid for red clover. It usually survives for only two years after seeding, but in pastures often reseeds itself to provide a longer-lived stand.

Birdsfoot trefoil, a long-lived perennial legume, will reseed itself even under continuous grazing. It will grow and produce moderately high yields of forage on a wide range of soils from well-drained sandy loam to fairly wet clays and low-lying sands.

The primary limitation of birdsfoot trefoil is poor seedling vigor. Excellent results have been obtained with good seeding management but the seeds are small and easily buried. However, even the best new stands tend to get better over the first 2 or 3 years.

Ladino clover is the giant form of white clover. Like wild white clover, it has a shallow root system which makes it susceptible to drought.

Ladino clover is seldom seeded as the only legume but is sometimes included in mixtures with another legume and a grass.

Red clover is used more in hay fields than in pastures. It is usually seeded with timothy which matures about the same time. Red clover stands normally last only two years in northern Michigan.

Introduced Forage Grasses

Timothy, an erect-growing forage grass, at one time was most popular as horse hay. It has been sown mostly in mixtures with red clover. Timothy is easy to establish, however, it is weakened by grazing and frequent cutting. It has excellent palatability until heading time.

Smooth bromegrass, a sod-forming forage grass, tolerates grazing rather well. It is the most drought-tolerant forage grass available.

Table 2.

Recommended forages and seeding rates in pounds per acre by soil drainage and pasture type.

	Droughty	Well Drained	Fairly Well Drained	Poorly Drained Wet Soils
Nontillable Permanent Pasture	Encourage volunteer tall growing grasses; requires N fertilization	Encourage volunteer tall growing grasses; requires N fertilization	Encourage volunteer wild white clover with Kentucky bluegrass	Encourage volunteer wild white clover with Kentucky bluegrass or sod seed with Birdsfoot trefoil
Semi Permanent Pasture	Alfalfa (8) Bromegrass (4) or Red Clover (6) Bromegrass (4) (See Note 1)	Alfalfa (8) Bromegrass (4) or Birdsfoot trefoil (5) Bromegrass (4)	Birdsfoot trefoil (5) Timothy (4) or Birdsfoot trefoil (5) and Kentucky blue-grass (volunteer)	Alsike (4) Timothy (4) or Reed Canarygrass (8)
Rotation Pasture	Alfalfa (8) Bromegrass (4) or Red Clover (6) Bromegrass (4) (See Note 1)	Alfalfa (8) Bromegrass (4) or Red Clover (6) Ladino Clover (1/2) Orchardgrass (4)	Birdsfoot trefoil (5) Timothy (4) or Red Clover (6) Timothy (5)	Alsike (4) Timothy (4) or Red Clover (6) Timothy (4) (See Note 2)
Annual Pasture	Winter rye (112) or Spring barley (96)	Winter rye (112) or Barley (96) or Oats (64) or Millet (25) or Rape (6) (See Note 3)	Winter rye (112) or Oats (64) or Millet (25) or Rape (6) (See Note 3)	Oats (64) (See Note 2)

Note 1. Alfalfa-bromegrass is best choice on droughty soils, but alfalfa cannot be grown successfully on acid soils.
Note 2. Poorly drained soils are too wet to be plowed often, and should be in permanent or semi-permanent pasture.
Note 3. Rape is used for sheep pasture.

Orchardgrass, a very rapid-growing productive forage species, grows well in midsummer. However, this grass is difficult to manage. It is not very palatable to livestock, especially when mature. Orchardgrass also regrows so rapidly that it is often too competitive for a legume to do well in the mixture.

Reed canarygrass is very productive, long-lived, and makes some growth all season long. It is well adapted to wet lands, even those too wet for other forages and which may be submerged for portions of the year. However, reed canarygrass is difficult to manage. Even new growth is not very palatable and if allowed to grow taller than 10-12 inches, it becomes particularly rank and unpalatable.

Mowing Pastures

Good grazing management reduces, but does not eliminate the need for mowing pastures. Mowing helps maintain the forages in the same stage of growth and removes the mature, unpalatable forage which has been rejected. It is more beneficial on undergrazed than overgrazed pastures.

Intensive, rotational grazing programs usually require mowing after each grazing. Theoretically, mowing is just as beneficial under less intensive pasture management, but in actual practice few pastures are clipped more than once a year. Mowing pastures in mid- to late-summer helps control weeds and brush. Livestock will often eat the wilted clippings after mowing.

Woods Pasture

Normally, livestock should not be allowed to range through farm woodlots if there is any value placed on the trees for timber. Trampling compacts the soil, excludes oxygen, and causes many of the tree roots to die. This causes the trees to dieback from the top, which results in a high percentage of defective logs from such trees. The trees will eventually die, if the condition is severe.

If shade is a consideration, livestock can be given a piece of woods, preferably on high ground, for a loafing area. The rest of the farm woodlot should be fenced to keep the animals out.

Volunteer wild white clover on a properly fertilized clay loam soil, Chippewa County.

Bloat

Pasture bloat is primarily a problem of livestock grazing lush, legume pasture. The most trouble occurs when animals are removed from the pasture because it is wet and then turned back into the pasture when animals are hungry. A pasture which contains legumes mixed with grasses (25-50%) greatly reduces the problem. Feeding hay to the animals before they are turned onto a legume pasture also reduces the hazard. In severe situations, feed hay to cattle when they are on pasture, or use a commercial bloat preventative (poloxalene).

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