

Species Selection for Pasture

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Species selection is an important first step in obtaining high yielding, long lasting pastures. There are a large number of productive pasture grasses and legumes to choose from. Each has advantages and disadvantages. Below is a brief description of the most common pasture grasses and legumes in Wisconsin.

Grass Species Descriptions

Festulolium is the result of a cross between meadow fescue (*Festuca*) and Italian Ryegrass (*Lolium*). It has better forage quality than tall fescue and better winter hardiness than ryegrass. It has vigorous growth and recovers quickly after grazing. While winter hardiness is improved it is still less than optimum and stands may be lost in harsh winters.

Kentucky bluegrass is a sod-former with excellent winter hardiness. It has superior grazing tolerance and is able to persist in overgrazed pastures. Bluegrass productivity is limited due to its intolerance to hot, dry conditions. In addition, palatability is reduced as grass matures. Bluegrass is not a good choice for high producing pastures particularly in Southern Wisconsin.

Meadow bromegrass is a winter hardy bunchgrass well adapted to dry conditions. It has earlier growth in spring than other grasses and faster recovery from grazing than smooth bromegrass.

Meadow Fescue has greater winter hardiness and improved palatability compared to tall fescue. It is persistent and has good grazing tolerance. It is not infected with the same endophyte and so does not contain the toxins found in tall fescue. It is a vigorous grass with rapid recovery rates.

Orchardgrass is a very productive bunchgrass. It recovers rapidly from grazing so can be grazed frequently. It is only moderately winter hardy and stands tend to thin over time and become “clumpy”. Inclusion of a second, sod forming grass such as bromegrass or reed canarygrass will help avoid this but care must be taken not to overgraze them. Select late maturing orchard grass varieties.

Perennial ryegrass is a very high quality grass tolerant of close, frequent grazing. It lacks sufficient winter hardiness to be used as the only grass species in a pasture. More winter hardy grasses should be included in a mixture or, if the only grass, acreage should be limited.

Reed Canarygrass is a persistent, sod-forming grass. It is high yielding and tolerant of both dry and wet soils. It recovers rapidly from grazing but cannot tolerate close grazing. Older varieties contain alkaloids that reduce palatability. More recent varieties are free of these compounds and should be selected for pasture seeding. Reed canary grass is invasive and should not be planted near waterways. Care should be taken not to let seeds form.

Smooth bromegrass is a sod forming species with excellent winter hardiness. Under proper management (proper grazing heights and rest periods) bromegrass pastures are long lasting and

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productive. Brome grass is slower to recover from grazing than other grasses. If not managed properly, brome grass pasture production suffers and stand longevity is severely reduced.

Tall Fescue contains an endophytic fungus that produces compounds that reduce performance of animals consuming it. In addition, it has stiff, jagged-edged leaves that reduce palatability and intake. It is only moderately winter hardy. For these reasons endophyte infected tall fescue is not a good choice for pasture. Recently, improved varieties of tall fescue have become available.

Endophyte free tall fescue varieties do not contain the toxic compounds and so animal performance is increased.

Soft-leaf tall fescue varieties have shown increased intake by grazing animals. Leaves have a softer feel which increases palatability.

Novel endophyte tall fescue is infected by the endophytic fungus but doesn't produce toxic compounds. Intake and rates of gain are improved over the infected types.

Timothy is a winter hardy bunchgrass. Under proper grazing management it can be productive but lacks persistence, is intolerant of dry conditions and has long recovery periods after grazing. It is also susceptible to overgrazing. Due to these drawbacks it is not widely used by grazers desiring high producing pastures.

Table 1. Characteristics of Some Common Pasture Grasses

| Species | Ease of Establishment | Grazing Tolerance | Winter hardiness | Drought Tolerance | Regrowth Potential | Persistence |
|--------------------|-----------------------|-------------------|------------------|-------------------|--------------------|-------------|
| Festulolium | Excellent | Good | Fair | Fair | Excellent | Fair |
| Kentucky Bluegrass | Good | Excellent | Excellent | Fair | Good | Good |
| Meadow Brome grass | Good | Fair | Excellent | Good | Good | Good |
| Meadow Fescue | Excellent | Good | Excellent | Fair | Excellent | Good |
| Orchardgrass | Good | Good | Fair | Fair | Excellent | Good |
| Perennial Ryegrass | Excellent | Excellent | Poor | Fair | Excellent | Poor |
| Reed Canary Grass | Poor | Good | Excellent | Excellent | Good | Excellent |
| Smooth Brome grass | Good | Fair | Excellent | Fair | Fair | Good |
| Tall Fescue | Excellent | Good | Fair | Fair | Excellent | Fair |
| Timothy | Good | Fair | Excellent | Poor | Fair | Poor |

Adapted From 'Pastures for Profit' University of WI Ext. Pub. A3529

Legume Species Descriptions

Alfalfa is the most widely grown forage legume in Wisconsin. It is less popular among grazers due to higher cost and somewhat reduced grazing tolerance. Alfalfa requires a higher soil pH than most other pasture legumes which adds to the production cost. Alfalfa tends to become somewhat stemmy and so intakes are reduced if not pastures are not well managed. Grazing types of alfalfa are available that reduced this affect.

Birdsfoot Trefoil is the only commonly grown pasture legume that does not cause bloat. It is difficult to establish but extremely persistent due to natural reseeding. It is a high quality legume but is intolerant of dry soils and is easily overgrazed. Prostrate or semi-prostrate varieties are the best for grazing.

Kura Clover is a rhizomatous legume that is winter hardy and persistent. It's growth habit makes it tolerant of frequent grazing. It is difficult to establish, particularly when interseeded into an existing pasture. Care must be taken to provide an adequate seedbed and control competition to allow kura clover time to establish adequately.

Red Clover is the most widely used legume in Wisconsin pastures. It is tolerant of low pH soils and can be easily frost seeded or interseeded to maintain stands. This is important as red clover lacks long term persistence.

White Clover is very tolerant of close grazing and is one the most common legumes in poorly managed, over grazed pastures. While individual plants do not persist, stands are long-lived due to natural reseeding and new plant establishing from stolons. It is relatively low yielding.

Table 2. Characteristics of Some Common Pasture Legumes

| Species | Ease of Establishment | Grazing Tolerance | Winter hardiness | Drought Tolerance | Regrowth Potential | Persistence |
|-------------------|-----------------------|-------------------|------------------|-------------------|--------------------|-------------|
| Alfalfa | Good | Good | Good | Excellent | Good | Good |
| Birdsfoot Trefoil | Poor | Good | Excellent | Poor | Fair | Excellent |
| Kura Clover | Poor | Excellent | Excellent | Good | Excellent | Excellent |
| Red Clover | Excellent | Good | Good | Poor | Fair | Fair |
| White Clover | Excellent | Excellent | Excellent | Good | Good | Excellent |

Adapted From 'Pastures for Profit' University of WI Ext. Pub. A3529

Species Mixtures and Seeding Rates

A frequently asked question is "What species should I plant in my pasture?" There is no one simple answer to this question. The answer depends on animal species, soil types, grazing systems, level of management and other factors. In general, inclusion of a number of different species helps even out production and makes the pastures able to respond to environmental changes.

There are two approaches to achieving this kind of diversity. One is to include a large number of species in a pasture mix and plant that mixture throughout the farm. Different species will excel in different areas of the farm or at different times of the year.. Many complex mixtures are prepackaged and sold this way. This has the advantage of ease of planting. The disadvantage of this approach is that species with very different grazing requirements will be mixed together making for difficulty in management.

A second approach would be to plant a number of different mixtures in different paddocks through out the farm. This allows for more specific and easier pasture management. The disadvantage of this approach is more complexity in obtaining pasture mixes, calibration and planting. Table one lists several important characteristics of many common pasture grasses and legumes. Use this table to select similar species, particularly in regard to grazing tolerance. This will allow the use of simple (one grass + one legume) or complex mixtures with the advantage that all species will be able to be managed similarly. Table 3 lists recommended seedingrates for these species.

Table 3. Recommended Seeding Rates for Common Pasture Grasses and Legumes

| Species | Seeding Rate (lbs/acre) | Species | Seeding Rate (lbs/acre) |
|--------------------|----------------------------|------------------|----------------------------|
| Festulolium | 4 | Tall Fescue | 4 |
| Kentucky Bluegrass | 8 | Timothy | 2-4 |
| Meadow Bromegrass | 3-6 | Alfalfa | 8 |
| Meadow Fescue | 4 | BirdsfootTrefoil | 6 |
| Orchardgrass | 2-4 | Kura Clover | 6 |
| Perennial Ryegrass | 15 | Re d Clover | 6-8 |
| Reed Canarygrass | 5 | White Clover | 1-2 |
| Smooth Bromegrass | 3-6 | | |

Adapted from “Forage Variety Update for Wisconsin” University of WI Ext. Pub A1525

INCREASING PASTURE QUALITY AND SWARD DENSITY

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Having thick stands of high quality forage 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.

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. (West, 1997) 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. (Rankin, 1999) Average percent establishment from frost seeding is about 10% compared to 60% or higher in a prepared seedbed. (George, 1984) 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.

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.

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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.

| TABLE 1 FROST SEEDING ESTABLISHMENT | | |
|--|--------------------------------|------|
| | Seeding Rate (Lbs/Acre) | |
| Species | 4 | 10 |
| | Plants/Ft² | |
| 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 |
| West and Undersander, 1997 | | |

| TABLE 2 RECOMMENDED SEEDING RATES FOR FROST SEEDING INTO AN EXISTING GRASS OR LEGUME STAND | | | |
|--|-----------------------------------|----------------------------|---------------------------------|
| | Rate (lb.acre) | | Expected Established Plants* |
| Species | Seeded Alone | As Part Of Seed Mixture | Plants Established Plants* |
| Red Clover | 4-8 | 3-4 | 2-5 |
| Birdsfoot Trefoil | 4-6 | 2-3 | 6-9 (in 2 nd year) |
| Alfalfa | 5-8 | 3-4 | 4-6 |
| Ladino Clover | 2-3 | 1-2 | 1-2 |
| Alsike Clover | 2-4 | 1-2 | 2-3 |
| Perennial/Annual Ryegrass | 8-15** | 2-3 | 10-12 |
| Orchardgrass | 3-4 | 1-2 | 4 |
| Smooth Bromegrass | 12 | 8-10 | 1-2 |
| Reed Canarygrass | Not recommended for frost seeding | | |
| Timothy | Not recommended for frost seeding | | |
| * Expected plants based on "alone" seeding rates | | | |
| ** Use higher rate in "bare ground" situations and lower rate in existing sods | | | |

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 type 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.

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 brome grass 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).

| TABLE 3 EFFECT OF INTERSEEDING ON PASTURE COMPOSITION | | |
|--|---------------------|--------------------------------|
| Species | Seeding Rate | Stand Count |
| | (Lbs/Acre) | (Plants/Ft²) |
| Alfalfa | 15 | 3 |
| Trefoil | 6 | 5 |
| Red Clover | 11 | 12 |
| Brome grass | 7 | 10 |
| | 15 | 17 |
| Kentucky Bluegrass | 8 | 7 |
| | 14 | 24 |
| Orchardgrass | 4 | 16 |
| | 10 | 27 |
| Timothy | 5 | 17 |
| | 9 | 30 |
| Perennial Ryegrass | 4 | 17 |
| | 10 | 30 |

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| TABLE 4 EFFECT OF INTERSEEDING ON PASTURE YIELD (YEAR AFTER SEEDING) | | |
|---|--------------------------|------------------------|
| Species | Yield (Tons/Acre) | |
| | Alone | With Red Clover |
| Control | 0.72 | - |
| Red Clover | 1.45 | - |
| Brome grass | 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 |

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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 are 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.

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 the most expensive and disrupts the grazing cycle for that season, but has a high likelihood of successfully establishing productive pasture. Greub used this technique in River Falls, WI to renovate an existing bluegrass pasture with birdsfoot trefoil/grass combinations. (Greub, 1998) The impact on yields the year after seeding are shown in Table 6. All combinations were successfully established by this technique.

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.

| TABLE 5 YIELD OF TREFOIL-GRASS MIXTURES FOR RENOVATION (YEAR AFTER SEEDING) | | | | |
|--|---------------------|----------------|--------------|--------------|
| 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 |
| Greub, 1994 | | | | |

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