

# Forage Management; Perennial Forage Species for Pasture and Hay

## ***Introduction:***

Fall, more specifically the first half of September, is the best time for the reseeding of pastures and hay fields. Selecting the right species is the fundamental first step in forage management. When selecting forage species factors such as the type of animal that will be grazing, whether the field is used as pasture or for hay production, soil condition, and geographic characteristics need to be considered. The characteristics of some perennial legumes and grasses that are suitable to grow in Massachusetts are described below.

## ***Perennial Legumes***

Most legumes grown for forages have taproots and broad, compound leaves (composed of a number of leaflets) that are arranged alternately on the stem. New shoots originate from the crown of the plant, and the growing point of each shoot is located at the top of the shoot. As a family, legumes produce higher quantities of protein than grasses.

If properly inoculated, legumes have the capacity to use atmospheric nitrogen, eliminating the need to apply nitrogen from commercial sources. Legumes also supply a considerable amount of nitrogen to the grass portion of the mixture.

## **Alfalfa**

Alfalfa is the most frequently grown forage legume and the highest-yielding perennial forage crop grown in many countries. It produces more protein per unit area than other forage legumes and can be grown alone or in combination with various grass species. For high yields and persistence, alfalfa requires well-drained soil, a pH above 6.1, adequate fertility and proper harvest management. Well-managed alfalfa normally persists for 3 or more years. The protein and energy levels of alfalfa-based forage are determined by stage of growth at the time of cutting. Alfalfa has a 6-week critical fall harvest period that should be observed to avoid winterkill.

## **Birdsfoot Trefoil**

Birdsfoot trefoil is a non-bloating legume best suited for permanent pasture situations. It will reseed itself, making it an excellent choice for steep or stony land not suitable for cultivating. Although individual plants live for only a few years, stands of birdsfoot trefoil have remained productive for 10 or more years when allowed to go to seed. It is also well adapted to soils with marginal drainage. Birdsfoot trefoil has a lower yield potential and is more difficult to dry than alfalfa, so it is recommended for hay production only in areas where alfalfa will not grow well. Since birdsfoot trefoil seedlings are slow to establish, at least a year is required to get a satisfactory stand. Birdsfoot trefoil, similar to alfalfa, has a critical fall harvest period, beginning about 10 days earlier than alfalfa.

## **Red Clover**

Red clover is a short-lived perennial. Yields are good the year after establishment but are often quite low the following year. It can be grown in fields that are too wet or too acidic for alfalfa. When seeded in mixtures, red clover can suppress the establishment of other legumes. As a feed crop, red clover is most often stored as silage since it is difficult to dry, and often results in "dusty" or "moldy" hay.

There are two general types of red clover: double-cut or "medium" red clover and single-cut or "mammoth" red clover. Double-cut will flower in the seeding year, with vigorous regrowth after cutting. Single-cut is slower growing and matures about 2 weeks later than double-cut. Single-cut does not flower in the seeding year or after the first cut in succeeding years.

Use of red clover as a plow down (cover crop) has become an important practice on many farms.

## **White Clover**

White clover is used mainly in pastures. It is a short-lived perennial that can reseed itself. There are three general types of white clover: ladino, white Dutch, and small wild white. All three are similar in appearance but differ in size, with wild white being the smallest and ladino the largest. All have stolons, which are stems that creep on the ground, with branches that are erect or upward slanting. Roots are shallow and fibrous and develop from nodes of the creeping stolons. White clover has low tolerance to drought but is relatively tolerant to frequent grazing and has good palatability. White clover can be frost seeded or no-tilled into existing grass pastures to improve forage quality and yield.

## **Sweet Clover**

Sweet clover is a slow-growing biennial often used to alleviate compaction. Sweet clover does not flower in the year of establishment. In the spring of the second year, it grows quickly to become a tall, coarse-stemmed plant. The presence of coumarin in sweet clover makes it less palatable to livestock.

There are two types of sweet clover: white-flowered and yellow-flowered. White sweet clover is deeper rooted, taller and coarser, which makes it more suitable as cover crop than for forage. The yellow-flowered is more palatable to livestock and more attractive to bees. Moldy sweet clover hay may contain dicoumarol, which can prevent normal blood clotting and result in the death of livestock from bleeding.

## **Alsike Clover**

Alsike clover is a perennial although it is often treated as a biennial. It can grow on soils that are acidic and poorly drained. Alsike produces only one cut of hay per year and is not normally a preferred forage legume. Alsike clover can cause photosensitivity and liver damage in horses, so it should not be included in horse hay or pasture mixtures.

## **Kura Clover**

Kura clover is a relatively new pasture legume. Kura clover has poor seedling vigour and is difficult to establish. However, once established, kura clover is very persistent, winter-hardy and can tolerate less-than-ideal drainage, fertility, pH and grazing management. It spreads by underground stems called rhizomes, has an extensive root system and thickens with time. Proper seedbed preparation and seeding methods are important. Kura clover must be inoculated with the correct strain of Rhizobium bacteria.

## ***Perennial Grasses***

Grasses have many long, slender leaves that are borne on a stem. They have very fibrous roots that help bind the soil together, thereby reducing erosion. Some grasses have rhizomes or underground stems that produce new shoots at each node. Grasses with rhizomes are capable of thickening up a stand. Grasses without rhizomes are known as bunch grasses.

Grass species differ in their competitiveness with legumes. This will influence the grass-to-legume ratio of an established stand. Grasses such as orchardgrass and the ryegrasses tend to be more competitive with alfalfa than timothy or brome grass. Grasses are lower in protein than legumes when cut at a similar stage of development.

## **Timothy**

Timothy is the most widely sown forage grass in New England and is commonly grown in mixtures with alfalfa or birdsfoot trefoil. It is a bunchgrass with limited tillering ability, which makes it non-aggressive when sown with other species. It is easy to establish in early spring or late summer and is adapted to heavier soils and variable drainage. Timothy is palatable and high yielding in first cut. Although some varieties have been developed for improved regrowth, regrowth after first-cut and mid-season production is not as high as that from either brome grass or orchardgrass.

## **Smooth Brome grass**

Smooth brome grass is an earlier, more aggressive grass than timothy. Better drought tolerance results in more regrowth in second cut. It spreads by rhizomes, and the stand can thicken over time. Smooth brome grass is palatable and tends to retain its nutritional value with increasing maturity better than most grasses. Its major drawback tends to be its large fluffy seed, which makes it difficult to seed through the small seed box of drills. It does not establish well if it is either surface seeded or seeded deeper than 5 cm (2 in.).

## **Meadow Brome grass**

Meadow brome grass is useful as a pasture species because of its early spring growth and faster recovery rate after grazing. It is best used in rotational grazing.

## **Orchardgrass**

Orchardgrass develops earlier and is much more aggressive than timothy or brome grass. It is palatable when young but loses palatability and digestibility more quickly than other grasses. Plant breeders have developed newer varieties that are later maturing, do not decline in palatability and digestibility as early and match more closely the maturity of other species in a mixture. Orchardgrass will grow much more vigorously in the warm, dry conditions of midsummer than timothy or brome grass, resulting in a greater proportion of grass in the second and third cutting of alfalfa-grass mixtures. Orchardgrass is not as winter-hardy as either timothy or brome grass and will not persist in wet soils. Its aggressive seedlings make orchardgrass easy to establish. It is recommended for intensively managed pastures or as very early-cut haylage.

## **Reed Canarygrass**

Reed canarygrass is best known for its ability to tolerate poorly drained soils. It can, however, provide high yields on well-drained soils and will produce higher yields than other grass species during dry conditions. Reed canarygrass spreads by rhizomes. It develops coarse stems and leaves, and quickly loses palatability and digestibility after heading. Regrowth is vegetative and does not form a seed head, so second- and third-cuts can be high quality. Reed canarygrass is slow to establish and is not competitive in the year of seeding.

In the past, livestock have performed poorly on reed canarygrass because of certain alkaloids it contained. Current recommended reed canarygrass varieties are free of tryptamine and carboline alkaloids, which cause poor performance. Some varieties are lower in the gramine alkaloids that reduce palatability, intake and animal performance. In Massachusetts reed canarygrass has been considered as invasive species and buying and selling seeds is prohibited.

## **Tall Fescue**

Tall fescue is a coarse, leafy grass that is useful in long-term pastures and erosion control. It is adapted to most soil types, tolerates imperfect drainage and withstands animal traffic well. Its ability to maintain good feed quality into late fall makes it useful in "stockpile grazing" or fall-saved pasture for deferred grazing. A seed-borne systemic fungus (an endophyte) has been linked to poor animal performance on tall fescue pasture. Once introduced by infected seed, the fungus cannot be controlled in an established stand of tall fescue. All recommended varieties are endophyte-free.

## **Meadow Fescue**

Meadow fescue is a hardy grass used in hay and pasture mixtures. It grows best on deep, fertile soils, but will tolerate variable drainage and low fertility. Meadow fescue yields well during the summer and fall and maintain its feed quality later into the season than most grass species. Meadow fescue is shorter, has finer leaves and a shallower root system than tall fescue and is not as persistent.

## Perennial Ryegrass

Perennial ryegrass is a short-lived perennial that comes in turf, pasture and hay-adapted varieties. The pasture-adapted varieties tend to have finer leaves, smaller and more numerous tillers, and are later maturing than the hay varieties. Turf-type perennial ryegrasses contain endophytes, so they should not be used for forage. Perennial ryegrass is early and vigorous in the spring, and grows well into the fall, but is unproductive during the hot, dry summer months. Excessive top growth of perennial ryegrass can result in winterkill, in alfalfa mixtures that are left to over-winter. Perennial ryegrass is not well suited to areas with prolonged ice cover and extreme cold without adequate snow cover.

## Kentucky Bluegrass

Kentucky Bluegrass is a highly palatable grass that tolerates heavy traffic and close, frequent grazing better than other cool-season grasses, making it well adapted for permanent pastures. It grows best during cool, moist weather on well-drained, fertile soils. It is slow to establish but spreads to form a dense sod. It is relatively low yielding and has poor drought and heat tolerance. When properly fertilized and managed, Kentucky bluegrass production can be markedly improved, especially during spring. In pastures, they serve as a bottom grass that controls weed invasion, withstands close grazing and tramping, and fills in when other species thin out.

Characteristics of Perennial Forage Species Suitable to Massachusetts				
Species	Suitability	Persistence (years)	Strengths	Cautions
<b>Legumes</b>				
Alfalfa	Stored Feed	3-4	Excellent quality Excellent yield	May cause bloat Poor persistence under grazing Low tolerance to acidic or variably drained soil Needs fall rest period
Birdsfoot trefoil	Pasture Stored feed	5+ (may reseed itself)	High quality No bloat hazard Good tolerance to acidic & variably drained soil	Slow to establish Slow spring growth and regrowth Needs fall rest period Unpalatable to horses
Red clover	Pasture Stored feed Cover Crop	1-3	Excellent first-year yield Easy to establish High quality Good tolerance to acidic or variably drained soil	Difficult to dry for hay May cause bloat Stand thins rapidly May cause temporary infertility in grazing sheep Very competitive, especially with other legumes

White clover	Pasture	5+	Excellent quality and palatability Good tolerance to close grazing	May cause bloat Low drought tolerance
Kura clover	Pasture	5+	Persistent High quality	Difficult to establish May cause bloat
Alsike clover	Pasture Stored feed	1-2 (may reseed)	Very good tolerance to wet, acidic soils Good quality	Lower yield than red clover Regrowth yields low Stand thins rapidly May cause bloat
Sweet clover	Cover crop Stored feed	2	Excellent soil builder Opens up subsoil Excellent bee pasture	Low palatability unless harvested early Coumarin content in older varieties causes feeding difficulties Only 1 harvest-year
<b>Grasses</b>				
Timothy	Stored feed	5+	Easy to establish Good tolerance to variable drainage Seed is inexpensive	Poor summer production Poor persistence of late-heading varieties under three-cut harvest system
Smooth brome grass	Pasture Stored feed	5+	Excellent spring/fall yield Good regrowth Better quality retention with maturity	Large seed size may cause seeding challenges
Meadow brome grass	Pasture Stored feed	5+	Early spring growth Fast recovery after cutting or grazing Good winter-hardiness Good palatability	Large seed size may cause seeding challenges Sensitive to flooding Spreads less by rhizomes than smooth brome grass
Orchardgrass	Pasture Stored feed	5	Very early pasture Excellent regrowth Good drought tolerance Good tolerance to close grazing Very responsive to nitrogen	Rapidly loses quality and palatability with maturity Very competitive with other species Poor tolerance to variable drainage and icing

Reed Canarygrass	Pasture Stored feed	5+	Excellent yield on both variably drained and dry soils Good regrowth Very responsive to nitrogen	Slow to establish First-cut rapidly loses quality and palatability with maturity Poor tolerance to close grazing or frequent cutting
Meadow fescue	Pasture Stored feed	5+	More suitable for managed grazing than as stored feed Grows in early spring and late fall Tolerant to variably drained soil More palatable than tall fescue Prevents erosion in waterways	Coated seed required Very competitive with other species Low drought tolerance Low quality with maturity Less persistent and lower yielding than tall fescue
Tall fescue	Pasture Stored feed Grass Waterways	5+	High yield Good summer growth Good feed quality in fall for stockpile grazing Good tolerance to acidic soil	Coarse leaves and low palatability Need endophyte-free seed
Perennial ryegrass	Pasture Stored feed	2-3 S. Ont.	Excellent quality and palatability Establishes very quickly Good tolerance to close grazing	Poor drought and heat tolerance Poor tolerance to variably drained soils Variable persistence
Kentucky bluegrass	Pasture Grass Waterways	5+	Good quality and palatability Good tolerance to close grazing	Poor summer production Very slow to establish Low seasonal yield

Tis factsheet was prepared by Masoud Hashemi

This publication has been funded in part by Mass. Dept. of Agricultural Resources in a grant to the Massachusetts Farm Bureau Federation, Inc. and by Mass. Dept. of Environmental Protection, s319 Program.