



Forage variety update for Wisconsin

Dan Undersander, Mike Bertram, Jeff Breuer, Jason Cavadini, Arin Crooks, and Heathcliffe Riday

2017 trial results

Legumes

alfalfa
birdsfoot trefoil
red clover

Grasses

meadow brome
meadow fescue
orchardgrass
reed canarygrass
ryegrass
smooth brome
tall fescue
timothy



Contents

Introduction	1
2017 in review.	1
Figure 1. Variety trial test sites	1
Figure 2. Comparison of 2017 alfalfa yields with historic averages in Arlington, Lancaster, and Marshfield, WI.	2
Figure 3. Comparison of 2017 grass yields with historic averages, Arlington, WI	2
Legumes	3
Alfalfa	3
Table 1. Soil types and number of cuts of alfalfa variety trial sites	3
Table 2. Yield as a percent of check averages and fall dormancy of alfalfa varieties (established stands)	4
Table 3. Disease resistance, winterhardiness, and marketers of alfalfa varieties.	5
Birdsfoot trefoil	6
Red clover	6
Table 4. Birdsfoot trefoil yields, expressed as a percent of Norcen	6
Table 5. Red clover yields, expressed as a percent of check variety.	7
Grasses	8
Meadow brome grass.	8
Meadow fescue	8
Orchard grass	9
Figure 4. Winterhardy vs. winter-killed orchard grass varieties	9
Reed canary grass.	9
Ryegrass.	9
Smooth brome grass	10
Tall fescue	10
Timothy.	11
Selecting grass varieties	11
Figure 5. Seasonal distribution of orchard grass varieties	11
Table 6. Yield of orchard grass, meadow fescue, tall fescue, and timothy varieties expressed as a percent of the check variety	12
Pasture seeding mixtures	13
Table 7. Seeding rates into existing sod	13
Table 8. Seeding rates for pasture seeding mixtures (lb./acre)	13
Table 9. Planting rate and date for forages in Wisconsin	14
Seed marketers	15

This publication and other forage information can be found on the forage website at <https://fyi.uwex.edu/forage>. To print or order other publications from the University of Wisconsin-Extension, visit learningstore.uwex.edu.

Introduction

Wisconsin's more than four million acres of hay and haylage contribute greatly to the state's economy and to environmental quality. Because 85% of this production is fed to livestock on farms, most farmers receive returns from these forages by selling livestock and livestock products, rather than by selling the forage itself. However, hay is also gaining importance as a cash crop for dairies and the horse industry.

Farmers generally minimize feed costs by producing high yields of high-quality forage. Some farmers strive for long stand life, but many take advantage of short rotations with forage to gain rotational effects and nitrogen credits. This, in turn, increases the yield of the following corn crop for either grain or silage. All farmers benefit from planting newer, improved varieties that will return the seed cost many times in increased yield and stand life.

For hay and silage/haylage crops, legumes are preferred in most situations because they offer a high yield of high-quality forage. However, grass fields may be desired where manure is applied frequently. Interest has continued in planting alfalfa/grass mixtures. Farmers should choose grass varieties carefully to match with alfalfa. Most farmers are choosing tall fescue, meadow fescue, or orchardgrass varieties. The grass variety of the selected species needs to be high-yielding, late-maturing, winter-hardy, and rust-resistant.

While grasses provide the base for most pastures, interseeded legumes increase the forage quality of pastures, reduce nitrogen fertilization needs, and provide more growth during a grass' summer slump.

This publication summarizes the performance of forage varieties in Wisconsin. The performance data was collected from trials conducted by the University of Wisconsin at UW Agricultural Research Stations and in farmers' fields. More detailed and historic information is available on the University of Wisconsin Team Forage website at <https://fyi.uwex.edu/forage>, where you can also select any two alfalfa varieties and see how they compared in any or all regions of the Midwest (select "Compare Alfalfa Varieties").

Figure 1. Variety trial test sites



2017 in review

Growing conditions

Alfalfa generally came through winter in good condition. Spring growing conditions were fair with temperatures below average and rainfall above average.

Overall rainfall was above average through July, which delayed harvesting in many fields by as much as a month. Rainfall was sufficiently high that some fields, particularly those in western Wisconsin, were flooded through June.

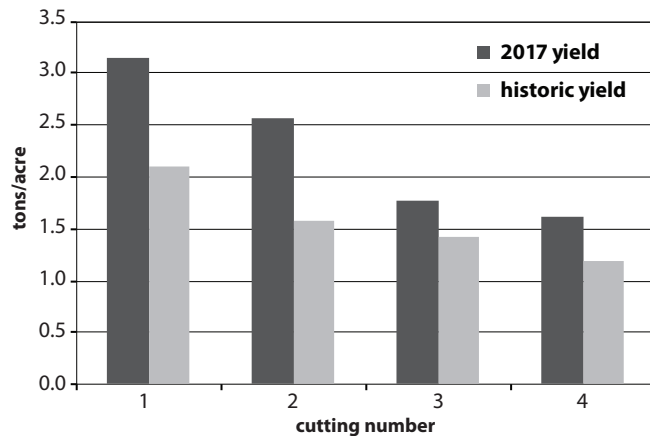
Average and below average summer temperatures worked to the advantage of grasses and red clover while slightly reducing alfalfa yields.

August rainfall was low, reducing fall growth of many forages, especially grass fields and pastures.

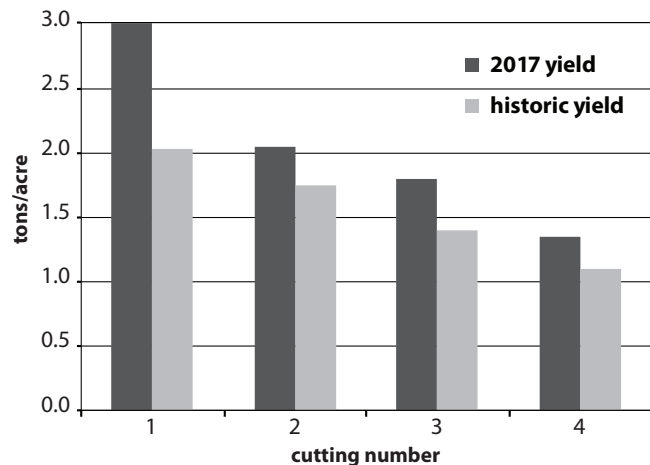
Current hay prices are available at <https://fyi.uwex.edu/forage/h-m-r/>.

Figure 2. Comparison of 2017 alfalfa yields with historic averages in Arlington, Lancaster, and Marshfield, Wisconsin

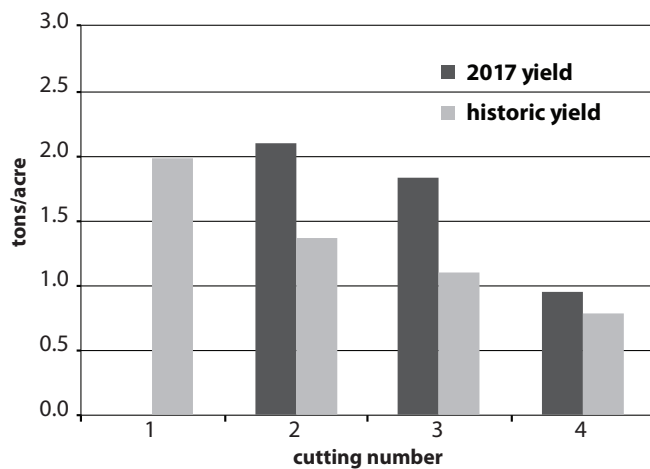
Arlington



Lancaster



Marshfield



Forage yields

Forage yields in the Arlington variety trial were roughly average at 8 to 9 tons dry matter per acre. However, yields at Lancaster were about 10% below the historic average and yields at Marshfield were 20% or more below historic averages. The yield reductions were largely due to wet soils and inability to get in to harvest the crop. The 2017 average statewide alfalfa yield is expected to be less than in 2016.

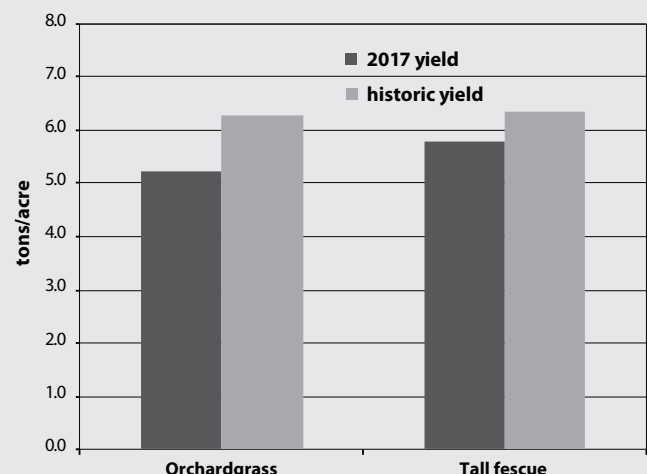
Pastures were slow to green up due to a cool spring. However, growth was generally good with the cooler temperatures early in the season. Late summer dry periods reduced pasture growth in most regions of the state.

Production trends and demand

Hay prices fell slightly during the growing season with Wisconsin's high production. Hay prices remained at \$188 for 150 RFQ or higher hay throughout the fall. Prices remained high due to general lack of production due to wet conditions.

Current hay prices are available at <https://fyi.uwex.edu/forage>. Hay in small square bales (40 to 50 lb) is the highest price hay and is used primarily in the horse market. It should be noted that round bales sell for \$35 to \$65 less per ton than 3'x3' square bales depending on the quality. If selling hay is the objective, it may be worthwhile to hire a custom harvester to bale the hay.

Figure 3. Comparison of 2017 grass yields with historic averages in Arlington, Wisconsin





This publication reports varietal characteristics and performance data collected from trials conducted in Wisconsin and gives criteria for selecting varieties. The University of Wisconsin forage variety testing program tests alfalfa at many sites representing the major soil types and climatic conditions of the state (see table 1). Red clovers are tested at Prairie Du Sac. Grasses are tested at Arlington and Spooner. All plots are established in conventionally prepared seedbeds with a post-emergent herbicide. All seed is inoculated, and alfalfa is treated with metalaxyl (Apron) fungicide prior to planting.

All sites are managed for maximum yield. Fields have a soil pH of 6.8 or higher and are fertilized according to UW soil tests. Weeds and insects are controlled as necessary. Alfalfa is harvested at the mid- to late-bud stage and red clover and birdsfoot trefoil are harvested at 25–50% bloom. All yields are reported on a dry matter basis.

Alfalfa

Alfalfa and alfalfa-grass mixtures are grown for hay or silage on more than three million acres in Wisconsin. Alfalfa is the foundation of successful feeding programs for Wisconsin's dairy cattle, replacement heifers, beef cattle, sheep, and horses. For more information on growing alfalfa, see Extension publication *Alfalfa Management Guide* (A4075).

Selecting alfalfa varieties

Experience emphasizes the need to select high-yielding alfalfa varieties with adequate winter survival and disease resistance. Use the following steps to help select the best varieties for your location.

1. Select a group of top-yielding varieties using the average yield

(shaded column of table 2). Yield is the major factor in determining profitability of an alfalfa stand. Look for varieties with high average yields across sites and years (the number of site-years is in brackets). All varieties tend to yield most the year after seeding. Therefore, compare only varieties with more than three site-years to ensure that data from more than the first year is included in the mean. Higher site-year averages indicate greater confidence. This is important because of variations in weather from one year to the next, in soil type, etc. Thus, a variety with yield stability over a broad range of conditions will most likely perform well, regardless of soil type and growing condition differences.

2. Check the yield at the variety trial site most like your conditions

to make sure that the variety also did well under conditions most like those on your farm.

3. Compare disease resistance and stand persistence.

Stand persistence is an estimate of the stand remaining after two or more winters. These ratings consider all factors relating to stand survival and are the best estimates of stand life. Persistence ratings may not be available for varieties that are too new to have been grown in the trials for at least two years. Frequently, the most persistent varieties are not the highest yielding, and tradeoffs must be made.

Aphanomyces occurred across the Midwest, even where resistant varieties had been planted. This likely indicates infection by aphanomyces race 2–resistant varieties.

4. Check the selected varieties for winter survival

(table 3). A number of alfalfa varieties are being released with improved winter survival. These varieties will survive more difficult winters and tolerate October harvest with less yield reduction the following spring.

Your location in the state plays an important role in the needed winter survival rating. Generally, in central Wisconsin, especially where snow cover is not dependable, varieties with very good to superior winter survival should be grown. In northern Wisconsin, which has better snow cover, and in southern Wisconsin, varieties with adequate to good winter survival may be grown.

More intensive cutting schedules may increase the need for varieties with more winter survival. If you harvest in the fall, we strongly suggest using alfalfa varieties with superior winter survival.

Where direct measurements of winter survival are lacking, fall dormancy may be used to estimate winter survival. Lower fall dormancy numbers generally indicate greater winter survival. However, some varieties may have better winter survival than the fall dormancy would indicate.

5. Compare forage quality of varieties.

Use milk per acre to select the variety that best combines traits of high yield and high forage quality. Also, consider planting some fields to high-quality varieties and some to standard varieties to spread the harvest window in the spring. The standard varieties will be ready to harvest first and the high-quality varieties may be harvested later.

Table 1. Soil types and number of cuts of alfalfa variety trial sites

Site	Soil type	Number of cuts	Date of last cut
Arlington	Plano silt loam	4	8/24/17
Lancaster	Sattre loam	4	8/31/17
Marshfield	Withee silt loam	3	9/12/17

Blends

Many companies sell blends at a reduced price from named varieties. A blend is a mixture of two or more varieties. Blends may do as well as the best varieties or very poorly. Since these blends may have been derived in various ways, their performance depends on the skill and integrity of the seed company. Disease resistance, winter survival, and other characteristics may change within a blend from lot to lot or year to year.

Using *certified* seed of adapted, high-yielding varieties best assures trueness to name.

Table 2. Yield as a percent of check averages and fall dormancy of alfalfa varieties (established stands)

Variety	FD ^a	Average	Arlington		LAN	MAR
		[site-years] ^b	'14 ^c	'15	'14	'15
Conventional weed management						
54Q14	4	107 [2]	.	106	.	107
55Q27	5	111 [17]	108	113	103	127
55V50	5	111 [26]	102	118	96	124
HYBRIFORCE-3400**	4	116 [17]	.	107	.	107
MARINER IV	4	105 [7]	.	.	99	.
Nuton	4	107 [8]	106	.	104	.
VERNAL	2	97 [2839]	100	100	100	100
Glyphosate weed management						
55VR06	5	101 [7]	98	.	102	.
55VR08	5	113 [3]	.	84	.	109
DKA40-51RR	4	103 [10]	97	87	98	112
DKA43-22RR	4	99 [8]	91	.	93	.
DKA44-16RR	4	99 [13]	93	70	98	105
RR501	5	96 [8]	92	.	98	.
Check average ^d (tons/acre)	.	.	8.53	8.89	8.55	4.16

Abbreviations: FD = fall dormancy; LAN = Lancaster; MAR = Marshfield

^a Fall dormancy scale: 1 = least fall growth; 11 = greatest fall growth.

^b Average yield as a percent of check varieties, including concluded studies not listed. Number in brackets is number of site-years (e.g., 3 years at 2 sites=6 site-years). Higher site-year values indicate greater confidence.

^c Years at top of column indicate seeding year.

^d Check variety is Vernal.

** Entered as an experimental.

For seasonal distribution of yield results, visit <https://fyi.uwex.edu/forage>.

Table 3. Disease resistance, winterhardiness, and markers of alfalfa varieties

Variety	Disease resistance ^a			Winterhardiness ^c	RR ^d	Marketer(s)
	DRI ^b	Aphanomyces				
		Race 1	Race 2			
55VR06	29	HR	HR	2	RR	Pioneer/DuPont
54Q14	34	HR	.	2	.	Pioneer/DuPont
55Q27	35	HR	R	2	.	Pioneer/DuPont
55V50	36	HR	HR	1	.	Pioneer/DuPont
55VR08	34	HR	.	1	RR	Pioneer/DuPont
DKA40-51RR	36	HR	HR	1	RR	Monsanto/DeKalb
DKA43-22RR	30	HR	.	2	RR	Monsanto/DeKalb
DKA44-16RR	30	HR	.	2	RR	Monsanto/DeKalb
HYBRIFORCE-3400	30	HR	R	2	.	Dairyland Seed Co.
MARINER IV	35	HR	R	2	.	La Crosse Forage & Turf Seed Corp.
Nuton	35	HR	HR	2	.	NuTech Seed
RR501	25	HR	.	1	RR	Channel
VERNAL	11	S	.	2	.	WI AES/USDA

^a Resistance ratings: HR=highly resistant (> 50% of plants have resistance); R=resistant (31–50%);

MR=moderately resistant (15–30%); LR=low resistance (6–14%); S=susceptible (< 6%).

^b DRI=disease resistance index (30=highest; 6=lowest).

^c Winterhardiness: 1=extremely winterhardy; 2=very winterhardy

^d RR=RoundUp Ready variety.

For more detailed disease resistance, visit <https://fyi.uwex.edu/forage>.

Birdsfoot trefoil

Birdsfoot trefoil is a deep-rooted, winter-hardy legume that is useful in permanent pastures. It is best used on soils that are marginal for alfalfa production and where drought is not too severe. Seedling establishment is slower than alfalfa and red clover. Birdsfoot trefoil is best grown in mixtures with Kentucky bluegrass or timothy. For more details on growing this legume, see the forages website at <https://fyi.uwex.edu/forage>.

Red clover

Red clover is grown in pastures across the state and for hay and haylage in northern and eastern Wisconsin on soils that are not adequately drained or limed or where soils cannot be practically improved for alfalfa. Red clover is well suited for short rotation and for plow-down in rotations with potatoes. Although as difficult to dry as hay, red clover makes excellent low-moisture silage when properly managed and harvested between late-bud and early-bloom stage. Because of its easy and rapid establishment, red clover is an excellent choice for interseeding into sod pastures to improve forage yield and quality. For details on growing this legume, see Extension publication *Red Clover—Establishment, Management, and Utilization* (A3492).

Table 4. Birdsfoot trefoil yields, expressed as a percent of Norcen

Variety	—————% of Norcen check variety—————					Seed source ^b
	Ashland 97/99 ^a	Ashland 97/98	Marshfield 96/97–98	Arlington 95/96	Ashland 94/95–96	
BONNIE	.	.	.	.	85	Deer Creek Seed
BRIGHT	104*	113*	.	.	.	Pickseed Canada
BULL	104*	94	.	.	.	Pickseed Canada
DAWN	92	79	85	90	99*	Deer Creek Seed
EMPIRE	.	.	.	83	.	New York - (Public)
GEORGIA I	.	.	.	.	69	Deer Creek Seed
LEO	91	96	99*	.	95	FarmPure Seeds
NORCEN	100*	100*	100*	100*	100*	North Central States - (Public)
STEADFAST (ARS 2620)	80	57	75	.	.	USDA-ARS, Univ MO
TREVIG	109*	100*	92*	.	.	USDA-WI - (Public - Exp)
UPSTART	96*	89	.	.	.	Pickseed Canada
VIKING	108*	73	78	100*	93	New York - (Public)
WITT	100*	90	93*	104*	94	USDA-WI - (Public - Exp)
NORCEN ^c	2.71	2.76	8.79	2.22	5.65	.

* Varieties not significantly different from highest value in column.

^a Seeding year/harvest year(s).

^b Source of seed for testing purposes. Check with seed source supplier or local extension agent for marketer of seed.

^c Norcen birdsfoot trefoil cumulative yield in tons dry matter per acre.

Table 5. Red clover yields, expressed as a percent of check variety. Yields taken in 2016 from stated planting dates.

Variety	Marshfield 2014			Prairie du Sac 2013		Prairie du Sac 2014			Average [site-years] ^b	Marketer(s)
	2014 ^a	% stand, 11/2/16	2017	yield	% stand, 10/24/16	yield	% stand, 10/24/16	2016		
ABERCLARET	.	.	.	73	6	.	.	.	81 [3]	Brett-Young Seeds
CARDINAL II	101	81	.	.	.	95	61	.	99 [6]	Allied Seed
CINNAMON PLUS	108	43	101	89	24	102	73	101	102 [21]	Allied Seed
EMARWAN	.	.	.	73	14	.	.	.	89 [5]	Rose Agri-seed, Inc; dba Pure Seed
FF9615	.	.	107	.	.	.	.	98	98 [1]	Forage First
FREEDOM	.	.	.	98	28	.	.	.	92 [8]	Barenbrug USA
FREEDOM! MR	92	40	97	102	40	98	73	101	102 [17]	Barenbrug USA
FSG 402	96	69	.	.	.	96	81	.	101 [10]	La Crosse Forage & Turf Seed, Farm Science Genetics
GO-MER	110	59	.	.	.	77	18	.	89 [6]	Grassland Oregon
MARATHON	98	71	94	92	24	99	53	97	101 [156]	Allied Seed
MILVUS	114	89	.	.	.	90	20	.	97 [7]	Byron Seeds
STARFIRE II	102	76	105	119	50	98	86	102	104 [21]	Ampac Seed
TEMPUS	.	.	.	67	3	.	.	.	84 [6]	Pickseed Canada
Check mean	4.39	.	.	2.27	.	3.03	.	3.38	.	.

^a Seeding year.^b Average yield as a percent of check varieties, including concluded studies not listed. Number in brackets is number of site-years (e.g., 3 years at 2 sites=6 site-years). Higher site-year values indicate greater confidence.**For seasonal distribution of yield results, visit <https://fyi.uwex.edu/forage>.**



Perennial cool-season grasses have long been an important part of the Wisconsin forage program. Perennial grasses have very diverse uses, ranging from hay, silage, and pasture to sod for roadsides and animal lots. Smooth brome grass, orchardgrass, timothy, tall fescue, and reed canarygrass fertilized with nitrogen will provide both early-season and September grazing for beef, sheep, goats, and horses. While productive in the spring and fall, grasses usually experience a “summer slump” (period of reduced growth) when the weather turns hot and/or dry. Including a legume in mixture with grass tends to improve forage quality and reduce the effects of summer slump. Grasses are used in pure stands, in grass/grass mixtures, and legume/grass mixtures.

Grass species differ in several important characteristics that influence suitability to a particular situation. The most important characteristics are maturity (how quickly the grass produces heads in the spring), winter hardiness and survival, disease resistance, heat and drought tolerance, and grazing or traffic tolerance. For example, tall fescue is well-suited to a high-traffic lot, while timothy will not survive under high traffic because its crowns are very sensitive to hoof damage and will not produce new stems. Orchardgrass would be a poor choice for drainage ditches or waterways because it is a bunch-type grass, and, rather than forming a sod, it forms clumps that are interspersed with bare ground or weeds.

Table 6 presents yield and palatability data for many varieties. Palatability may be more beneficial for lactating dairy cows than for beef and sheep production because of dairy cows’ high level of feed intake. For marketers’ addresses and telephone numbers, see the list at the end of this publication.

Wisconsin has many bluegrass pastures and quackgrass hay fields or pastures. However, producers rarely seed these species; both are considered unimproved pasture. Bluegrass productivity is extremely low. Quackgrass can produce good quality and tonnage of hay or pasture.

For each cultivated grass species used in Wisconsin today, many varieties are available with wide-ranging characteristics. The most important grasses in Wisconsin today are discussed in more detail below. For color photos of grass seeds, seedlings, and mature plants, as well as additional management information, consult *Identifying Pasture Grasses* (A3637).

Meadow brome grass

General characteristics and advantages

Meadow brome grass is a cool-season perennial bunch grass. It is widely used in Canada and in some western states to mix with legumes for hay crops and in pastures. It starts spring growth earlier than most other grasses and is ready for grazing at an earlier date. It regrows faster and has more basal leaves than smooth brome grass. The forage quality is similar to that of smooth brome grass. The vegetative growth is very palatable to all classes of livestock as both green forage and cured hay. It yields relatively better than most other grass species in late summer if fertilized. Meadow brome grass is adapted to the same soils and climatic conditions and will grow well wherever smooth brome grass does well. Meadow brome grass has good drought tolerance and excellent winter hardiness. There have been no insect or disease problems observed in fields of meadow brome grass.

Special needs and disadvantages

Meadow brome grass seedlings have better vigor than smooth brome grass, so establishment is equal or slightly quicker. However, horizontal spread of established plants is slower, so ground cover will be less rapid.

Meadow fescue

General characteristics and advantages

Meadow fescue is a cool-season perennial bunch grass that has been widely used in Canada. It originated in northern Europe, while tall fescue originated in southern Europe. It may be more useful than tall fescue in northern managed grazing systems, which are typically based on forage mixtures in which relatively unpalatable species are chronically refused. This species can tolerate frequent grazing or mowing better than most grass species. It has “softer” leaves and greater palatability than tall fescue. Meadow fescue is a diploid forage grass widely adapted to lowlands. It grows under cool, moist conditions and tolerates wet and occasionally flooded soils. Once established, it also performs under drier conditions for making hay or silage. Meadow fescue is also a good growing companion for alfalfa. While yield may be less than for tall fescue, animal intake and performance may be higher. It yields relatively better than most other grass species in late summer if fertilized.

Special needs and disadvantages

Meadow fescue is slow to establish and is best seeded in spring. It is very susceptible to leaf rust.

Orchardgrass

General characteristics and advantages

Orchardgrass is a moderately hardy bunch-type grass. It regrows quickly and is commonly grown in mixtures with alfalfa. It performs well in mixtures with other grasses, such as smooth bromegrass and reed canarygrass, when fertilized with nitrogen for early- and late-season grazing.

Special needs and disadvantages

For alfalfa orchardgrass mixtures, carefully select both varieties to ensure a stable hay or silage mixture. The alfalfa variety should be a quick-recovery type to help it compete with the fast-growing orchardgrass. Select medium- to late-maturing varieties of orchardgrass for mixture with alfalfa. If they are not available, reduce the orchardgrass seeding rate to half of the recommended amount. Common orchardgrass seed (that which has no variety name) should not be mixed with alfalfa. It matures too early, meaning it will have very mature seed heads when the alfalfa needs to be cut, and it is more competitive than later-maturing varieties. Mature seed heads reduce the nutritive value of the hay or silage, and the competitiveness reduces alfalfa stands. Select varieties for rust resistance for good yield and animal consumption.

Reed canarygrass

General characteristics and advantages

Reed canarygrass is a very hardy sod-forming grass especially well suited for permanent hay or pasture on peat or muck soils. It is also very useful for disposing of liquid manure and canning-crop refuse, producing high yields when nitrogen is present in these applications. It is very drought-tolerant and is a good grass for dry, upland soils once established. It is also an excellent choice as a cover crop for wild game or for waterways. Reed canarygrass is invasive to wetlands and should be managed to minimize distribution of seeds and vegetative material to those areas.

Special needs and disadvantages

Reed canarygrass establishes almost as slowly as smooth bromegrass. Little forage will be produced in the first year, with either a late-summer or a spring seeding. Reed canarygrass requires careful management for maximum productivity under grazing or hay production. For grazing, it requires rotational grazing with rest periods to allow regrowth and will not tolerate close grazing. For hay production, it should be cut at least three times per year. To maximize the production of high-quality forage, the first cut should be as soon as possible after heads appear in whorl, but before emergence. Plant low-alkaloid types for grazing.

Leaves and stems of all reed canarygrass varieties have alkaloids that affect animal performance and health when grazing. Select varieties that do not have tryptamine-type alkaloids (gramine) to avoid certain animal disorders and to maximize animal weight gains. Alkaloids are destroyed during curing, so absence of alkaloids is not an important variety selection criterion when using the crop for hay or silage.

Ryegrass

General characteristics and advantages

Ryegrass can be used for overseeding pasture or, in northern Wisconsin, for hay or silage production in mixture with alfalfa or red clover in short-term rotations (2–3 years). It is high in forage quality. Tetraploid types are more palatable and tend to be more winter hardy.

Special needs and disadvantages

Ryegrass should not be seeded alone in Wisconsin because of its susceptibility to winter-kill. Few ryegrass varieties are available on the market. If a choice is available, hybrid or intermediate ryegrasses or festuloliums have the best combination of high summer yields, good persistence in mixture with alfalfa, ability to survive usually for 2–3 years, and excellent forage nutritive value. Select varieties for rust resistance to get good yield and animal consumption.

Figure 4. Winterhardy vs. winter-killed orchardgrass varieties



Types

- **Perennial ryegrasses** (diploid and tetraploid) are the hardiest of the ryegrasses, but are also the lowest yielding. Tetraploids usually have greater yields than diploids. Few diploid varieties perform well in Wisconsin. They usually go dormant between late June and mid-August, when conditions are hot and dry. They have excellent nutritive value and yield in spring and fall. Perennial ryegrass can be used with legumes to create high-yielding hay or silage mixtures.
- **Italian ryegrasses** (frequently called *annual ryegrasses*) are not true annuals. Italian ryegrasses are perennial under the right circumstances, which in Wisconsin requires either mild winter conditions or continuous snow cover. They have excellent spring, summer, or fall productivity relative to other ryegrasses. They also have excellent seedling vigor. Many Italian ryegrasses do not produce stems and heads in the seeding year. We recommend planting only late-maturing types because these have better yield distribution throughout the growing season. Frost seeding Italian ryegrass is an excellent way to improve the yield and quality of pastures. The procedure is to broadcast seed during March onto a pasture that has been closely grazed the previous fall.
- **Hybrid (intermediate) ryegrasses** are hybrids between perennial and Italian types. They have intermediate performance for nearly all of the above-mentioned characteristics.
- **Festuloliums** are derived from hybrids between Italian ryegrass and meadow fescue. They have the winter hardiness and disease resistance of meadow fescue, combined with the high nutritive value and high, season-long productivity of Italian ryegrass.

Smooth brome grass Tall fescue

General characteristics and advantages

Smooth brome grass is extremely hardy, long-lived, and well-adapted to the entire state. It can be grazed or cut for hay or silage. It forms a solid sod that makes it suitable for roadsides or waterways. It has good drought and heat tolerance and is generally capable of higher yields under extreme heat and drought than most other grasses. Thus it may be the most versatile choice for southern and western Wisconsin.

Special needs and disadvantages

Smooth brome grass is very slow to establish. Spring seedings are recommended, and it is best to use a variety that has seedling resistance to Pythium damping off disease. Make late-summer seedings by mid-August. These seedings rarely provide a productive crop until the second year. Brown leafspot is the most serious disease, but resistant varieties are available. Smooth brome grass has low tolerance for three- and four-cut systems in an alfalfa/brome grass mixture, but some varieties have been bred for better persistence under these conditions.

General characteristics and advantages

Tall fescue is a hardy sod-forming grass that is an excellent choice for use in terraces, waterways, roadsides, feed lots, and other areas where you need a coarse, vigorous sod or ground cover. It is very tolerant of intensive grazing and heavy animal traffic. Tall fescue can provide 2–3 hay cuttings in a typical year. It requires minimal maintenance, and there are turf-type varieties that can be used to make a lawn stay green in mid-summer, when bluegrass and ryegrass are brown.

Special needs and disadvantages

Tall fescue is not frequently used for forage production in Wisconsin. This may be partly because of its undeserved reputation as having poor winter hardiness and partly because of its tendency to cause disorders in grazing animals. The animal disorders have been positively linked to an endophyte, a fungus living in stems of tall fescue. Once the fungus infects a plant, it stays as a permanent resident. The fungus is believed to provide the host plant with a mechanism for resisting diseases, insects, and winter and summer stresses. Thus, tall fescue seed for use in lawns, roadways and waterways should have the endophyte. Tall fescue seed for use in establishing pastures should not have the endophyte. Tall fescue varieties with novel endophyte are generally not sufficiently winterhardy for Wisconsin. We recommend endophyte-free varieties. Select varieties for rust resistance to get good yield and animal consumption.

Timothy

General characteristics and advantages

Timothy is a very hardy bunch-type grass used primarily in mixture with red clover in central and northern Wisconsin. It is best adapted to cooler climates and performs better in the central and northern parts of the state than in the south. It can also be used in mixture with alfalfa and is recommended for seeding with birdsfoot trefoil. Most varieties appear to have good disease resistance.

Special needs and disadvantages

Timothy can be grazed, but it requires long rest periods and a rotational grazing system for maximum productivity and persistence. It does not form sod and has low tolerance for traffic, so it is not well-suited for feed lots, roadways, or waterways. For mixtures with red clover, select late-maturing varieties to best match the growth pattern and cutting schedule of red clover. For alfalfa, select early-maturing varieties, because they are more tolerant of the frequent cutting that is used for alfalfa-grass hay or silage production. Timothy is not well suited to drought or heat-prone areas.

Selecting grass varieties

The grass species differences previously described are important and can help narrow your choices, but selecting the best-fitting grass variety within a species may have a more significant impact on whether a particular grass suits your needs.

Use the following steps to help select the best grass for your needs.

1. Select high-yielding varieties to get up to four tons per acre additional yield per year. This data is available in table 6 and, for more detail, visit the forages website at <https://fyi.uwex.edu/forage>. For both hay and pasture, it's generally best to avoid the traditional choices of smooth brome grass (with high yield, but 60–70% of yield in first cutting and little growth the rest of season) and timothy (short-lived at 2–4 years and lowest-yielding grass). Instead, select newer varieties of tall fescue and orchardgrass with higher yield potential and better yield distribution during the growing season.

2. Select tested varieties to ensure adequate winter hardiness. The light-colored rectangles in trials shown in figure 4 are orchardgrass varieties that died due to insufficient winter hardiness. Selecting varieties tested for winter hardiness is especially important since most grass varieties are developed in other parts of the world with less need for winter hardiness than in Wisconsin.

3. Select medium- to late-maturing varieties.

Cheap seed generally consists of early-maturing varieties that head before alfalfa is ready to cut or clover is ready to graze. Some varieties (late types) head out up to two weeks later than others (early types); medium to late types are the best choices.

4. Select a variety with more consistent yield throughout the growing season.

Table 6 lists the β for each variety. The β is a measure of the yield distribution throughout the season. A value near 0 means that the yield was evenly distributed throughout the season, while a β value less than -3 means that most of the yield was in first growth with little growth the rest of the season. Figure 5 shows the yield by month of two grass varieties. According to the seasonal yield distributions shown, variety A would have a very negative (low) β value, while variety B would have a higher β value and be a better choice. Select varieties with a β of greater than -2 for consistent yield throughout the season (assuming the yield is not limited by drought or unusually high temperatures). The β value for grass varieties tested but not listed in this publication can be found on the forages website at <https://fyi.uwex.edu/forage>.

5. Select orchardgrass, tall fescue, and meadow fescue varieties with rust resistance.

The orange particles that coat shoes and pants when walking through fields in July and August are rust spores. Rust will reduce animal intake and possibly animal health, as well as forage yield.

Figure 5. Seasonal distribution of orchardgrass varieties

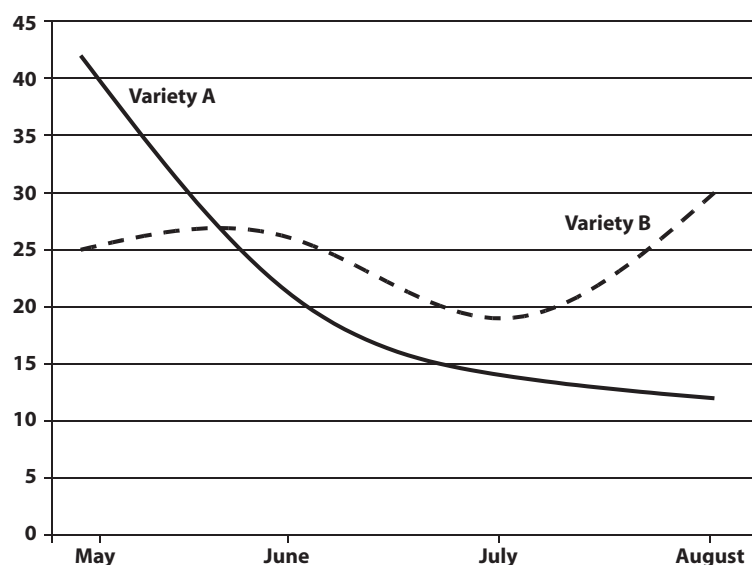


Table 6. Yield of orchardgrass, meadow fescue, tall fescue, and timothy varieties expressed as a percent of the check variety

Varieties	Arlington ave. yield (site-years) ^b				Mat. ^c	Rust ^d stem/crown	Marketer(s)
	2014 ^a	2015	2016	2017			
ORCHARDGRASS							
ELSIE	.	94	88	102	ML	.	Rose Agri-Seed
PERSIST	.	.	.	110	E	.	.
POTOMAC	.	.	.	100	E	.	.
check yield (tons/acre)	.	.	.	5.16	.	.	.
MEADOW FESCUE							
LIHEROLD	.	5.54	5.74	5.08	.	.	.
TALL FESCUE							
CAJUN II	96*	96	105	97	E	.	DSV-Eurograss
COWGIRL	94*	94	106	92	E	yes/yes	Pure Seed
LIPALMA	93*	93	0.94	96	.	.	DSV-Eurograss
TETON II	91*	91	98	96	ME	.	Mountain View Seeds
KY 31(check variety)	100	100	100	100	E	.	Pennington
check yield (tons/acre)	7.27	7.99	5.04	5.79	.	.	.
TIMOTHY							
PESTO	.	.	.	5.14	.	.	.

* Varieties not significantly different from highest value in column within each species.

^a Years at top of column indicate seeding year.

^b Maturity: E=early, ME=medium early, M=medium, ML=medium late, L=late, rating is relative within a species.

^c Resistant to rust.

For seasonal distribution of yield results, visit <https://fyi.uwex.edu/forage>.

Pasture seeding mixtures

For seeding into existing sod

Under most circumstances, only legumes should be seeded into an existing sod because the grass sod is normally too competitive against grass seedlings to allow their establishment. These rates may be used for either frost seeding or no-till seeding. Be sure to remove the cover crop as seedlings emerge again periodically during the season.

For seeding into tilled or sod-killed fields

Seeding mixtures should have three components: a long-lived grass, a legume, and a rapid-establishing cover crop. The cover crop may be a small-seeded grain, although annual or perennial ryegrass is recommended.

Table 7. Seeding rates into existing sod

Legume	Rate (lb/acre)	Comments
Alfalfa	3–4	Best for droughty soils
Birdsfoot trefoil	2–3	Best for wet soils
Red clover	3–4	Easiest to establish

Table 8. Seeding rates for pasture seeding mixtures (lb/acre)
(Select a column based on water drainage.)

Mixture	Well-drained soils				Less well-drained soils				Poorly drained	
	1	2	3	4	5	6	7	8	9	10
Long-lived grass										
Bromegrass		3–6		3–6	3–6			3–6		
Orchardgrass	2–4		2–4			2–4				
Reed canarygrass										6
Timothy					2–4		3–4	2–4	2–4	
Legume										
Alfalfa	4–6	4–6								
Alsike clover								3		
Birdsfoot trefoil									6	
Ladino clover								1		
Red clover			4–6	3–6	6	6	6			
Cover crop										
Ryegrass	2	2	2	2	2	2	2	2	2	2

For example, if choosing mixture 1, seed 2–4 lb. orchardgrass, 4–6 lb alfalfa, and 2 lb ryegrass per acre.

Table 9. Planting rate and date for forages in Wisconsin

Crop	Bushel weight (lb) ^a	Seeds/pound (number)	Seeding rate (lb/acre)	Seeding date ^b
Alfalfa alone with grass	60	199,000	12–15 8	Early spring or late summer
Barley	48	14,300	60–85	Early spring
Big bluestem	—	150,000	10	Late May through June
Birdsfoot trefoil alone with grass	60	372,000	8 6	Early spring or late summer
Bluegrass	14	2,200,000	15	Early spring or late summer
Bromegrass alone in mixtures	14	136,000	16 3–6	Early spring or late summer
Canarygrass , annual	50	58,000	30	Early spring
Clover , alsike in mixtures	60	653,000	3	Early spring to August 10
kura	60	230,000	6	Early spring
red alone	60	252,000	10	Early spring to August 10
red with grass	60	252,000	6–8	Early spring to August 10
white in mixtures	60	784,000	1–2	Early spring to August 10
Crown vetch	—	140,000	5–10	Late April through June
Fescue, meadow , alone in mixtures	24	230,000	15 6	Early spring or late summer
Fescue, tall , alone in mixtures	24	230,000	15 6	Early spring or late summer
Fieldpea alone with 1½–2 bushels of oats	60	3,000	180 50	Early spring
Indiangrass	—	170,000	10	Late April through June
Kale	—	140,000	4	Early spring to July 1
Millet , barnyard	35	155,000	20	June 1 to July 15
foxtail	48	218,000	15	June 1 to July 15
pearl	—	85,000	20	June 1 to July 15
proso	56	65,000	20	June 1 to July 15
Oats alone seeded with alfalfa	32	16,200	80 32–48	Early spring
Orchardgrass alone in mixtures	14	653,000	10 2–4	Early spring or late summer
Rape forage	50	145,000	4	Early spring to July 1
Reed canarygrass alone in mixtures	46	526,000	6 5	Early spring or late summer
Ryegrass , Italian	24	227,000	20–25	Early spring
perennial	24	230,000	20–25	Early spring
in mixtures			2	Early spring
Sorghum 18- to 40-inch rows 6- to 14-inch rows	56	15,000	10–12 15	May 20 to June 5 for grain
Soybeans for forage	60	2,500	90	Late spring to July 1
Sudangrass 18- to 40-inch rows 6- to 14-inch rows	40	44,000	20 20–30	May 20 to June 10
Sweet clover	60	240,000	12	Early spring
Switchgrass	28	370,000	6	Late May through June
Timothy alone in mixtures	45	1,234,000	8 2–4	Early spring or late summer
Turnip	—	190,000	1.5	April to August 1
Vetch, hairy	60	21,000	20	Early spring
Winter rye or wheat	56	15,000	60	September

Rates are based on normal seedbeds and on normal-size, good-quality seed.

Actual establishment will depend on soil moisture, temperature and other environmental conditions during establishment.

Rates used may vary greatly depending on desired stand, seed weight, and seed germination.

Rates are for pure live seed (PLS); if PLS is less than 90%, adjust seeding rate accordingly.

**Pure live seed =
% germination
x % purity**

^a U.S. legal if established. If not established, weight given is that most widely accepted in the United States.

^b For seeding date ranges, early dates are for southern Wisconsin and late dates are for northern Wisconsin.



Seed marketers

Seed marketers	Phone	Web address
Albert Lea Seed House	800-352-5247	www.alseed.com
Allied Seed	800-880-8127	www.alliedseed.com
America's Alfalfa	800-873-2532	www.americasalfalfa.com
Ampac Seed	800-547-3230	www.ampacseed.com
Barenbrug Midwest	319-472-5569	www.barusa.com
Barenbrug USA	888-470-5569	www.barusa.com
Beck's Hybrids	800-937-2325	www.beckshybrids.com
Bio-Plant Research	800-593-7708	
Blue River Hybrids	800-370-7979	www.blueriverorgseed.com
Brett-Young Seeds	800-665-5015	www.brettyoung.ca
Byron Seed Supply Channel	888-836-3697	www.bestforage.com www.channel.com
Columbia Seeds	888-681-7333	www.columbiaseeds.com
Crop Production Services	970-356-4400	www.cpsagu.com
Croplan Genetics	651-765-5712	www.croplangenetics.com
Dairyland Seed	800-236-0163	www.dairylandseed.com
Deer Creek Seed	877-247-3736	www.deercreekseed.com
DeLong Company	800-356-0784	www.delongcompany.com
DLF Pickseed	800-445-2251	www.dlfpickseed.com
Doeblers Hybrids	800-853-2676	www.doeblers.com
DSV-Eurograss	+49 2941 296-307	www.eurograss.com
Elk Mound Seed	800-401-7333	www.elkmoundseed.com
Evergreen Seed	800-235-5575	www.evergreenseed.com
Farm Science Genetics	888-252-7573	www.farmsciencegenetics.com
FarmPure Seeds	306-791-0500	
Forage First Winfield Solutions	800-356-7333	www.foragefirst.com
FS Growmark	309-557-6000	www.growmark.com
Grassland Oregon	503-566-9900	www.grasslandoregon.com
Grassland West	866-214-2947	www.grasslandwest.com
Jacklin Seed	800-688-7333	www.simplot.com/turf_horticulture/jacklin_seed
La Crosse Forage & Turf Seed	800-328-1909	www.lftseed.com

Seed marketers	Phone	Web address
Legacy Seeds	866-791-6390	www.legacyseeds.com
Lewis Seed	541-491-3700	www.lewisseed.com
Monsanto/DeKalb	800-768-6387	www.asgrowanddekab.com
Mycogen Seed	800-692-6436	www.mycogen.com
Naylor Seeds	800-747-7333	www.naylorseed.com
Nexgrow Brand	855-463-9476	www.plantnexusgrow.com
NuTech Seed	800-942-6748	www.yieldleader.com
Pennington Seed	800-285-7333	www.penningtonseed.com
Pickseed Canada	800-661-4769	www.pickseed.com
Pioneer Hi-Bred Intl.	800-247-6803	www.pioneer.com
Preferred Seed Company	877-417-7333	www.preferredseed.com
Producer's Choice	866-744-5710	www.producerschoiceseed.com
ProSeeds Marketing	541-928-9999	www.proseeds.net
Pure Seed	503-651-2130	www.pureseed.com
Renk Seed	800-289-7365	www.renkseed.com
Seed Research of Oregon	800-253-5766	www.sroseed.com
Smith Seed Services	800-826-6324	www.smithseed.com
Specialty Seeds	800-685-4521	www.specialtyturfag.com
Syngenta Seeds	800-248-4767	www.syngenta-us.com
TA Seed	866-813-7333	www.taseeds.com
Turf Merchants	541-926-8649	www.turfmerchants.com
Turner Seed	615-641-7333	www.turnerseedinc.com
Welter Seed	800-728-8450	www.welterseed.com
Wilco Farmers	800-382-5339	www.wilco.coop
W-L Research	800-406-7662	www.wlresearch.com



Copyright © 2017 by the Board of Regents of the University of Wisconsin System doing business as the division of Cooperative Extension of the University of Wisconsin-Extension. All rights reserved.

Authors: Dan Undersander is UW-Extension's forage agronomist. The following authors are UW-Extension and UW-Madison research faculty members: Mike Bertram, Jason Cavadini, and Arin Crooks. Heathcliffe Riday is an honorary associate/fellow in the College of Agricultural and Life Sciences at UW-Madison. Jeff Breuer is a researcher and assistant superintendent at UW-Madison's Arlington Research Station. Produced by Cooperative Extension Publishing. Cooperative Extension publications are subject to peer review.

University of Wisconsin-Extension, Cooperative Extension, in cooperation with the U.S. Department of Agriculture and Wisconsin counties, publishes this information to further the purpose of the May 8 and June 30, 1914, Acts of Congress. An EEO/AA employer, University of Wisconsin-Extension provides equal opportunities in employment and programming, including Title VI, Title IX, and the Americans with Disabilities Act (ADA) requirements. If you have a disability and require this information in an alternative format (Braille, large print, audiotape, etc.), please contact oedi@uwex.uwc.edu. For communicative accommodations in languages other than English, please contact languageaccess@ces.uwex.edu.

If you would like to submit a copyright request, please contact Cooperative Extension Publishing at 432 N. Lake St., Rm. 227, Madison, WI 53706; pubs@uwex.edu; or (608) 263-2770 (711 for Relay).

This publication is available from your county UW-Extension office (counties.uwex.edu) or from Cooperative Extension Publishing. To order, call toll-free 1-877-947-7827 or visit our website at learningstore.uwex.edu.