

FORAGE VARIETIES FOR MICHIGAN IN 2002

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Forage is defined as “edible parts of plants, other than separated grain, that can provide feed for animals, or that can be harvested for feeding.” Over 2.5 million acres of Michigan farmland is dedicated to forage production with a total value of the forage harvested or grazed from this land of approximately \$600 million. By acreage, forages are the number one crop in the state. Perennial forages crops also help prevent soil erosion and protect water quality. In addition, forages add an eye appealing green landscape and open space across the state of Michigan.

Many Michigan farmers are faced with equipment, land and labor costs that are increasing exponentially, while the value of the products sold off the farm gain slowly, holds or declines. Increasing the profit margin requires good management and improved varieties to increase yields.

Michigan State University has established over twenty-five research trials in five locations across the state to evaluate management practices and varieties in an unbiased manner. Yield, persistence, and forage quality are the primary factors that are compared in these trials.

2002 Conditions

The 2002 growing season was again marked by weather extremes. Excess rain was received throughout much of the state in May and early June, resulting in delayed seeding and first cutting. During the months of August and September very little rainfall was received across the northern Lower Peninsula resulting in a poor third cutting. The Upper Peninsula received above average rainfall amounts throughout the growing season resulting in above-average yields.

EVALUATIONS OF ALFALFA VARIETIES IN MICHIGAN

Michigan State University has seeded more than 90 commercially available alfalfa varieties in its alfalfa variety trials since 1994. Plant breeders, developers, and marketers submit both commercial and experimental alfalfa varieties to MSU for testing. Varieties in these trials are evaluated for yield and persistence for at least three years. Alfalfa trials have been established at East Lansing in southern Lower Michigan, Lake City in central northern Michigan, Sandusky in the Thumb of Michigan, and Chatham in the Upper Peninsula.

More than 95 percent of the varieties entered are evaluated at East Lansing. Trials at East Lansing are usually two to three times larger than trials in other sites in the state. Yield data are expressed as a percentage of check variety (Vernal) averaged over two or three years for 98 alfalfa varieties seeded at East Lansing from 1994-1999 (Table 1). Lake

City data from 1996-1999 is provided in Table 2. Yield data from trials seeded in 2000 are presented in tables 3,4, and 5.

Selecting an appropriate alfalfa variety for an environment requires careful consideration. Yield and persistence of an alfalfa variety are only a part of establishing and maintaining an alfalfa stand. Good management practices are also important. Even the best alfalfa variety will not perform well under poor management conditions. Establish good stands on adequately drained soils. Adjust soil pH a full year prior to seeding. Fertilize before seeding and broadcast annually with phosphorous and potassium as recommended by soil tests. The appropriate cutting management system depends on the location, yield goal, forage quality desired, and desired stand life.

Three cuttings per year:

Three cuts per year is the best cutting system in Michigan for long-term stands with good yields if fertilized adequately with potassium. Forage quality in a three-cut system should be adequate for beef cows, dairy replacement heifers and dry cows but may be too high in fiber (over 40% NDF) for high producing dairy cows. Alfalfa stands intended for long-term use, greater than five years, should not be cut more than three times per year. In addition, alfalfa stands in northern Michigan should not be cut more than three times per year. Recommended dates of the third and final cutting is different for northern and southern Michigan. Cutting schedules and approximate stages of maturity with three cuttings are:

Southern Lower and Central Michigan:

1st cutting -- June 1-5 (early bloom)

2nd Cutting -- July 10-20 (1/10 bloom)

3rd Cutting -- August 25-October 15 (1/10 to full bloom)

Upper Peninsula and Northern Lower Peninsula:

1st Cutting -- June 10-20 (late bud to early bloom)

2nd Cutting -- July 25 - August 15 (1/10 to 1/5 bloom)

3rd Cutting -- September 30 - October 15 (1/10 to full bloom)

Four cuttings per year:

Four cuttings per year are recommended for the highest yields of high quality alfalfa for three- to five-year stands in southern Lower Michigan. Four cuttings will usually produce 15 percent higher yields than the standard three-cut system and with higher forage quality. Best results are achieved with excellent drainage and high fertility of phosphorous and especially potassium. Four cuttings per year are not recommended for areas in northern Lower Michigan (north of Clare) or the Upper Peninsula. A four-cut harvest schedule in northern Michigan may result in lower yields, decreased stand life, and increased weed invasion after the first year. A four cut schedule will result in a more ideal forage quality of 20% crude protein, 30% acid detergent fiber, and 40% neutral

detergent fiber (20-30-40). Alfalfa with a nutritive value of (20-30-40) is ideal for high producing dairy cows.

The cutting schedule for four cuts per year in Southern Michigan south of Clare is:

- 1st Cutting -- late May - June 5 (late bud to very early bloom)
- 2nd Cutting -- July 5-15 (early bloom to 1/10 bloom)
- 3rd Cutting -- August 15-25 (early to 1/10 bloom)
- 4th Cutting -- mid to late October (1/10 to full bloom; with little or no regrowth after cutting)

Selection of an Alfalfa Variety

I. SELECTION FOR SHORT-TERM STANDS -- UP TO FIVE YEARS.

Most alfalfa stands in Michigan are left for three- to four-years. Varieties selected for short-term stands should be: 1) at least moderately winterhardy, 2) high yielding, and 3) resistant to bacterial wilt (BW) and anthracnose (AN). Resistance to Phytophthora root rot (PRR) is desirable when alfalfa is grown on fine-textured soils prone to waterlogging.

II. SELECTION FOR LONG-TERM STANDS -- OVER FIVE YEARS.

Winterhardiness is of primary importance for long-lived stands. Winterhardy varieties may be slower to recover than moderately hardy varieties after a mid-September cutting. Compared to moderately hardy varieties, winterhardy varieties may flower three to five days later in the first cutting. Winterhardy varieties may be lower in yield than moderately hardy varieties in three- to five-year stands but are usually higher yielding after about five years, especially in northern Michigan.

Select high-yielding winterhardy varieties resistant to PRR for long-lived stands. Varieties in dormancy groups 1 and 2 are more likely than moderately hardy varieties (dormancy groups 3 and 4) to establish "permanent" cover.

III. SELECTION FOR PASTURES

Alfalfa varieties used in pastures should be selected for long-lived stands with resistance to Phytophthora root rot. Allowing adequate rest periods of 30-35 days between grazing cycles will enhance longevity of alfalfa for pastures. In addition, allowing a rest period in the fall will allow the alfalfa crop to store up needed carbohydrates and proteins for better winter survival. Several commercial varieties are being marketed with improved tolerance to grazing. Alfalfa-grass mixtures in pastures will usually result in better meat and milk gains compared to grass monocultures. The grass component will reduce the risks of bloat in ruminant animals as well. In addition, alfalfa will provide needed nitrogen for the grass through nitrogen fixation.

Winterhardiness and Fall Dormancy Ratings

Fall dormancy ratings are determined by the amount of regrowth after a mid-September cutting. The higher the rating, the more regrowth and the less winterhardy. Non-hardy varieties used in the West have ratings of 5, 6, or 7. Non-hardy alfalfa varieties are usually not well adapted for Michigan, even for short-term stands.

Important Diseases in Michigan

An alfalfa variety consists of a population of plants, which are genetically different from each other. Varieties are described according to the mean response of all plants, such as average yield, and as a frequency of certain types of plants, such as the percentage of plants resistant to some pest or disease. Thus, even in a "resistant" variety, only a portion of the plants will be resistant. Moderate resistance, for example, means that 15 to 30% of the plants are resistant but 70 to 85% are susceptible. Even a variety classified as resistant may suffer damage from a disease. Moderate resistance is generally considered adequate for good alfalfa production. Even resistant varieties, however, are susceptible to PRR or Pythium diseases in the seedling stage. Table 9 contains a table of disease resistance ratings for varieties evaluated for yield at MSU.

Bacterial Wilt (BW). BW is present in all of Michigan. All of the named varieties sold in Michigan are adequately resistant to BW. "Common" alfalfa varieties sold by some seed companies are not recommended since the seed may be from susceptible plants.

Phytophthora Root Rot (PRR). This fungus disease, first found in Michigan in 1972, is now one of the state's most important alfalfa diseases. PRR occurs on heavy or poorly drained soils. Any soil, however, when saturated during a rainy period of seven to ten days may result in severe injury, especially to one- to two-month old seedlings. Seed companies have been treating alfalfa seed with the fungicide *Apron* for several years. Seed treating with *Apron* may be helpful in improving stands of resistant varieties. Treating a susceptible variety, such as Vernal, is probably not helpful. Most of the highest yielding varieties entered in our tests are resistant to PRR.

Anthracnose (AN). This disease, first found in Michigan in 1976, is becoming more severe each year. It occurs during hot, moist summers and is most common in the southern 1/3 of Lower Michigan. The fungus infects stems and crowns and may kill some plants. It is now recommended that only anthracnose resistant varieties be planted in Michigan.

Verticillium Wilt (VW). First detected in Michigan in 1982, VW has not increased in severity as expected. It is generally introduced with infected seed. It usually is not a problem until the third year, and then primarily in the first cutting. Growing alfalfa for three to four years in rotation with corn will help break the disease cycle. Resistance to verticillium is recommended if planting alfalfa after alfalfa.

Stem/bulb nematode *Ditylenchus dipsaci* is a pest that is less common than the aforementioned but can potentially reduce older alfalfa stands. Stem nematode is a microscopic pest that occurs in the soil. Symptoms of nematode damage include stunted plants and club-like stems. Crop rotation is the best method for controlling stem nematode.

Statistics Explained

The statistic that may be most useful is the average or mean. Comparing selected varieties to the mean is a simple way to determine which preformed the best. The CV% or coefficient of variation may also be useful in determining the precision of a trial. A high CV is a result of greater variation between replications. The LSD or least significant difference is the minimum value between varieties for a “real” difference to exist.

Table 1. Yield of alfalfa varieties expressed as a percentage of Vernal at East Lansing

Variety	Marketer	FD*	3-yr. Ave.					2-yr. Ave
			Seeding year					
			1994	1995	1996	1997	1998	1999
			% of Vernal					
620	Garst, AgriPro Seed, Interstate Seed	2	112	116	-	-	-	-
ABT 205	LaCrosse Forage and Turf Seed	2	-	-	108	-	-	-
Columbia 2000	LG Seed, LaCrosse Forage and Turf Seed, Kaltenberg Seed Farms	2	-	-	113	-	-	-
Dividend	Agway/Allied Seed	2	-	-	114	-	-	-
DK 122	Monsanto	2	101	-	-	-	-	-
DK 124	Monsanto	2	-	-	-	-	118	-
Evolution	Mycogen	2	103	-	-	-	-	-
Iroquois	Public	2	-	-	105	102	-	-
Mariner	Allied Seed	2	-	117	-	-	-	-
Oneida	Public	2	-	-	108	106	-	-
Pioneer var. 5262	Pioneer Hi-Bred	2	-	111	-	-	-	-
Quantum	Renk Seed	2	100	-	-	-	-	-
Sterling	Cargill	2	100	115	-	-	-	-
Vernal	Public	2	100	100	100	100	100	100
Viking I	Novartis Seeds	2	104	-	-	-	-	-
WL 232 HQ	FS Growmark, L.L. Olds Seed	2	-	-	-	-	115	-
WL 252 HQ	FS Growmark, L.L. Olds Seed	2	103	-	-	-	-	-
645	Garst	3	108	-	-	-	-	-
6420	Garst	3	-	-	-	-	-	132
9326	LG Seeds	3	-	-	112	-	-	-
9701	Geertson Seed	3	-	-	-	-	-	134
A 395	MBS	3	-	-	-	-	126	-
Abound	Monsanto	3	-	-	-	-	-	120
Ameriguard 302+Z	America's Alfalfa	3	-	-	-	-	-	94
Ciba 2444	Novartis Seeds	3	-	-	-	114	-	-

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Variety	Marketer	FD*	3-yr. Ave.					2-yr. Ave
			Seeding year					
			1994	1995	1996	1997	1998	
% of Vernal								
Ciba 2888	Novartis Seeds	3	-	110	117	-	-	-
Demand	Agripro	3	101	-	-	-	-	-
DK 127	Monsanto	3	108	116	114	109	-	-
DK 134	Monsanto	3	-	-	-	-	106	122
Forecast 3001	Dairyland	3	-	-	-	-	-	141
FQ 314	Cargill Seeds	3	-	-	-	-	124	-
FQ 315	Cargill Seeds	3	-	-	119	-	-	126
GH 788	Golden Harvest Seed	3	-	-	120	-	-	-
GH 794	Golden Harvest Seed	3	95	-	-	-	-	-
GH 797	Golden Harvest Seed	3	-	112	-	-	113	-
Green Field	Beck's	3	104	-	-	-	127	-
Imperial	ABI Alfalfa	3	-	-	117	-	-	-
Innovator + Z	America's Alfalfa, Fronteirsman	3	108	116	-	-	-	-
Magnum III WET	Dairyland Seed	3	-	108	-	-	-	-
Mainstay	Ag Venture	3	-	-	-	-	126	-
Max 329	SeedMart	3	-	-	113	-	-	-
Nemesis	Renk Seed	3	-	-	-	110	-	-
Pioneer var. 5312	Pioneer Hi-Bred	3	-	115	-	114	-	116
Pioneer var. 53Q60	Pioneer Hi-Bred	3	-	-	-	-	140	131
Pioneer var. 53V63	Pioneer Hi-Bred	3	-	-	-	-	103	-
Pointer	Dahlco Seed	3	-	-	-	-	-	134
Rainier	Novartis Seeds	3	-	-	110	-	-	-
Spirit	MBS	3	-	-	-	-	121	-
Stampede	Agway/Allied Seed	3	-	113	-	-	-	-
Synergy	Crow's Hybrid	3	-	-	-	-	115	-
Target II+	Producers Hybrid	3	-	-	-	-	124	-
TMF Multiplier II	Mycogen Seed	3	-	-	107	-	-	-
Total + Z	America's Alfalfa, Fronteirsman	3	95	-	-	-	-	-
Vitro	North-Gro Seed, M&M Biotechnologies	3	-	-	117	-	-	-
Webfoot MPR	Great Lakes Hybrid	3	-	-	110	-	-	-
Wintergreen	Renk Seed	3	-	-	115	-	-	-
WL 325 HQ	FS Growmark, L.L. Olds Seed	3	108	-	111	-	133	-
405	LaCrosse Forage and Turf Seed	4	-	113	-	-	-	-
630	Garst	4	110	-	119	-	-	-
631	Garst	4	105	114	-	114	-	119
9429	LG Seeds	4	-	-	121	-	-	-
Ace	UAP Seeds, Otilie Seeds	4	-	-	112	-	-	-
Affinity+Z	America's Alfalfa, Fronteirsman	4	-	-	112	-	117	-
Alpha 2001	Great Lakes Hybrid	4	-	110	-	-	-	-
Amerigraze 401+Z	America's Alfalfa, Fronteirsman	4	-	-	109	-	-	-
Apollo Supreme	America's Alfalfa, Fronteirsman	4	102	-	-	-	-	-

Table 1. Yield of alfalfa varieties expressed as a percentage of Vernal at East Lansing

Variety	Marketer	FD*	3-yr. Ave.					2-yr. Ave
			Seeding year					
			1994	1995	1996	1997	1998	
			% of Vernal					
Aspen	Brown Seed Farms	4	-	-	-	108	-	-
Award	Monsanto	4	-	-	110	-	-	118
Awesome	LG Seeds	4	-	-	-	-	-	116
Big Horn	Cargill Seeds	4	117	-	-	-	-	-
Choice	FFR Cooperative	4	-	113	116	111	112	-
Cimarron 3i	Great Plains Research	4	-	-	-	111	-	-
Depend +EV	Agripro Seeds	4	-	-	114	-	-	-
DK 133	Monsanto	4	106	-	114	-	-	-
DK 140	Monsanto	4	-	-	-	113	135	132
DK 141	Monsanto	4	-	-	118	110	120	114
Emperor	ABI Alfalfa	4	-	-	-	-	125	-
Enhancer	BPR	4	-	-	-	-	-	130
Excalibur	Allied Seed	4	-	-	111	-	-	-
Forecast 1001	Dairyland	4	-	-	-	-	-	132
Gem	FFR Cooperative	4	-	-	111	111	-	-
Geneva	Novartis	4	-	-	-	-	124	-
Magnum IV	Dairyland Seed	4	111	110	-	-	-	-
Magnum V	Dairyland Seed	4	-	-	-	-	136	114
Ovation	LG Seeds	4	105	109	-	-	-	-
Pioneer var. 5454	Pioneer Hi-Bred	4	-	120	117	116	-	-
Pioneer var. 54V54	Pioneer	4	-	-	-	-	-	135
Platinum	Midwest Seed Genetics	4	-	-	-	-	-	121
Pristine	Trelay	4	-	-	-	-	123	-
Radiant	AMPAC seed, CISCO	4	-	-	-	112	-	-
Rocket	FFR Cooperative	4	-	-	-	-	-	138
Rushmore	Novartis Seeds	4	103	-	-	-	-	-
Saranac	Public	4	-	-	108	-	89	-
Target II	Producers Hybrid Wilken Bio.	4	-	-	119	-	-	-
WinterGold	Renk Seed	4	-	-	117	-	-	130
WL 323	FS Growmark, L.L. Olds Seed	4	-	112	-	-	-	-
WL 326 GZ	FS Growmark, L.L. Olds Seed	4	-	-	115	-	-	-
WL 327	WL Research	4	-	-	-	-	-	132
Ave. yield of Vernal (DM tons/acre)			6.01	6.29	6.89	5.17	4.46	5.57

Table 2. Yield of alfalfa varieties expressed as a percentage of Vernal at Lake City.

Variety	Marketer	FD*	1996	Seeding Year		1999
				1997	1998	
				3-yr. ave		2-yr. ave
% of Vernal						
8920 MF	Pickseed Canada	2	96	-	-	-
Avalanche +Z	America's Alfalfa	2	104	-	-	-
Defiant	ABI Alfalfa	2	97	-	-	-
Dividend	Allied Seed	2	96	-	-	-
DK 122	Dekalb	2	96	-	-	-
DK 124	Dekalb	2	-	-	93	-
Evolution	AgriPro	2	101	103	-	-
Garst 620	Garst	2	103	104	-	-
Iroquois	public	2	97	-	-	-
Oneida	public	2	107	-	-	-
Sterling	Cargill	2	96	-	-	-
TMF 421	Mycogen	2	-	-	101	-
Webfoot	Great Lakes	2	104	-	-	-
2888	Mycogen	3	99	-	-	-
Abound	Asgrow	3	-	-	-	101
DK 127	Dekalb	3	103	95	-	-
DK 134	Dekalb	3	-	-	100	85
FQ 315	Cargill	3	-	-	-	97
Garst 645	Garst	3	101	-	-	-
GH 797	Golden Harvest	3	-	105	-	-
Innovator +Z	AgriBiotech	3	-	95	-	-
Magnum III Wet	Dairyland	3	103	-	-	-
Mainstay	AgVenture	3	-	-	105	-
Oneida VR	NY AES	3	-	-	-	85
Pioneer 5312	Pioneer	3	-	100	-	91
Pioneer 53Q60	Pioneer	3	-	-	-	102
Rainier	Novartis	3	95	-	-	-
Saranac	Public	3	100	94	105	91
TMF Multiplier II	MBS, Inc	3	103	-	-	-
Aspen	Brown Seeds	4	-	94	-	-
Award	Asgrow	4	-	-	-	90
Columbia 2000	Allied Seed	4	96	-	-	-
DK 133	Dekalb	4	104	-	-	-
DK 140	Dekalb	4	-	98	104	101
DK 141	Dekalb	4	-	98	107	104
Garst 630	Garst	4	101	-	-	-
Garst 631	Garst	4	103	-	-	-
Geneva	Novartis	4	-	-	99	-
Magnum IV	Dairyland	4	103	-	-	-
Magnum V	Dairyland	4	-	-	107	-
Pioneer 5454	Pioneer Hi-Bred	4	101	98	-	-
Pioneer 54V54	Pioneer Hi- Bred	4	-	-	-	103
Pristine	Trelay	4	-	-	100	-
Webfoot MPR	Great Lakes	4	96	-	-	-
Vernal- dry-matter yield(tons/acre)		2	3.24	2.41	2.33	1.93

*FD- Fall Dormancy

Table 3. 1999 Sandusky alfalfa trial, reseeded August 2000.

	2001				
Entry	31-May	06-Jul	09-Aug	10-Oct	Total
Dry hay/acre					
FQ314	1.92	2.84	0.53	1.50	6.78
Geneva	2.07	2.50	0.64	1.43	6.63
DK141	1.84	2.71	0.53	1.53	6.61
Pioneer 54V54	1.76	2.65	0.77	1.33	6.51
TMF421	1.96	2.67	0.44	1.41	6.49
Platinum	1.92	2.46	0.57	1.52	6.47
Abound	1.70	2.68	0.52	1.41	6.32
Rocket	1.69	2.63	0.51	1.40	6.28
Award	1.70	2.55	0.52	1.48	6.24
Pioneer 53Q60	1.61	2.43	0.72	1.45	6.21
Vernal	1.60	2.54	0.55	1.47	6.16
TMFMultiplier II	1.83	2.48	0.44	1.41	6.08
ABT350	1.65	2.45	0.47	1.46	6.02
DK134	1.59	2.48	0.41	1.45	5.93
Pioneer 5312	1.58	2.38	0.45	1.38	5.80
DK140	1.49	2.35	0.47	1.43	5.73
OneidaVR	1.52	2.27	0.41	1.36	5.56
WL327	1.84	2.59	0.53	0.60	6.55
Mean	1.74	2.54	0.53	1.44	6.26
CV (%)	20	9	43	6	9
LSD(5%)	0.42	0.29	0.34	0.11	0.80

Table 4. Sandusky alfalfa variety trial, seeded August 2000.

	2001				
Entry	31-May	06-Jul	09-Aug	10-Oct	Total
Dry hay/acre					
Multiplier 3	1.92	2.73	0.75	1.29	6.70
Pioneer 5312	1.82	2.65	0.77	1.39	6.64
Vernal	1.73	2.48	0.64	1.51	6.37
Garst 6420	1.77	2.55	0.56	1.46	6.33
Garst 631	1.70	2.52	0.62	1.48	6.31
Haygrazer	1.61	2.47	0.65	1.52	6.25
Pioneer 54V54	1.60	2.51	0.68	1.31	6.10
Saranac	1.69	2.37	0.47	1.33	5.86
Mean	1.73	2.55	0.66	1.41	6.37

CV	10	5	28	7	7
LSD(5%)	0.22	0.16	0.23	0.13	0.60

Table 5. East Lansing alfalfa variety trial, seeded July 2000.

					2001
Entry	23-May	28-Jun	07-Aug	02-Oct	Total
Dry hay tons/acre					
Somerset	2.62	2.00	2.37	1.58	8.58
Pioneer 54V54	2.71	2.00	2.30	1.51	8.52
Radiant	2.78	1.94	2.24	1.51	8.48
DK134	2.67	2.03	2.13	1.52	8.35
Geneva	2.70	1.99	2.04	1.59	8.32
BPR380	2.88	1.99	1.90	1.52	8.29
Pristine	2.69	1.89	2.17	1.48	8.23
GH788	2.65	1.88	2.12	1.48	8.12
Ripin	2.69	1.98	1.95	1.40	8.03
Goldleaf	2.62	1.95	2.01	1.44	8.02
Magnum V Wet	2.57	1.89	1.90	1.50	7.86
4200	2.36	1.91	1.97	1.35	7.60
Webfoot Supreme	2.69	1.64	1.74	1.47	7.54
Phabulous	2.41	1.81	1.81	1.50	7.53
Pioneer 5312	2.52	1.63	1.67	1.47	7.30
Vernal	2.45	1.53	1.56	1.51	7.05
Saranac	2.31	1.31	1.40	1.34	6.37
Mean	2.61	1.85	1.96	1.48	7.89
CV%	8	11	23	9	9
LSD 5%	0.21	0.20	0.46	0.15	0.77

Evaluation of Potato Leafhopper Resistant Alfalfa Varieties

Potato leafhopper (PLH) is an insect reduces alfalfa yield each year in Michigan. It is currently the most damaging insect to alfalfa production in Michigan. Carried by the gulf-stream air currents, this pest “rains” down on alfalfa fields in mid to late June. It damages alfalfa by injecting a piercing mouth-part (stylet) into the stem and petiole of alfalfa. The insertion of the stylet and subsequent injection of toxic saliva girdles the plant. The result is decreased flow of nutrients and eventually stunting. “Hopperburn” is the term used for the yellowing that occurs from leafhopper damage. Yield can be reduced greatly when sufficient numbers of PLH exist. For information on insecticide control of potato leafhopper in alfalfa consult your local extension office.

In 1997, several alfalfa seed marketers released “potato leafhopper resistant” alfalfa varieties. The resistance levels of varieties released in 1997 varied greatly but most were

under 25%. Even though alfalfa varieties are resistant to potato leafhoppers, they may benefit from additional insecticide applications especially in the establishment year. Some work is being conducted in other states to determine new economic thresholds for determining when to apply insecticides. Many of these varieties (commercial and experimental) were entered into variety trials established in East Lansing in 1997 and Kellogg Biological Station (KBS) in 1998 and 1999. Since 1997, several varieties of alfalfa with increased resistance to potato leafhopper have been released. Varieties with increased resistance have been established in trials from 1998-1999 at (KBS). Yield data from the MSU PLH-resistant variety trial established in 1998 and 1999 (KBS) are presented in table 6 and 7, respectively. No insecticide was applied to these trials. The potato leafhopper resistant alfalfa trial in East Lansing established in 1997 compares (8) released PLH-resistant varieties to (4) non-resistant check varieties under spray and no spray management. Yield from this trial is reported in table 8.

Table 6. Yield of PLH Resistant Alfalfa Varieties at Hickory Corners, seeded 1998

Cultivar	22-May	26-Jun	01-Aug	01-Oct	2001	2000	1999	3-yr
					Total	Total	Total	Total
Dry hay tons/acre								
DK 131 HG	2.24	1.27	1.31	1.20	6.02	6.28	6.24	18.55
TMF 4355 LH	2.26	1.26	1.26	1.23	6.01	6.56	5.97	18.54
DK 121 HG	2.17	1.18	1.05	1.19	5.60	6.19	6.00	17.79
Pioneer 53V63	2.19	1.18	0.94	1.10	5.41	6.11	5.75	17.27
ABT 227 LH	2.14	1.10	0.72	1.15	5.11	6.17	5.59	16.87
Vernal	2.05	1.06	0.73	1.11	4.95	5.78	5.72	16.42
Clean Sweep 1000	2.13	0.84	0.68	1.21	4.86	6.06	5.19	16.11
Average	2.18	1.16	1.00	1.20	5.52	6.22	5.82	17.50
CV (%)	5	13	14	7	6	5	11	5
5% LSD	0.12	0.16	0.15	0.09	0.36	0.39	0.79	1.16

Table 7. Yield of PLH resistant alfalfa varieties at Hickory Corners, seeded 1999

Cultivar	22-May	26-Jun	01-Aug	01-Oct	2001	2000	2-yr
					Total	Total	Total
Dry hay tons/acre							
DK 131 HG	2.22	1.02	0.96	1.42	5.63	6.33	11.96
4r37	2.32	1.05	0.97	1.45	5.80	6.15	11.94
Pioneer 53V63	2.25	1.10	0.86	1.30	5.51	6.11	11.63
Garst 6310	2.32	0.90	0.88	1.41	5.50	6.02	11.53
Pioneer 5312	2.43	1.05	0.74	1.30	5.52	5.90	11.42
Cimarron SR	2.12	1.03	0.59	1.56	5.30	5.80	11.10
Oneida	2.48	0.95	0.61	1.24	5.29	5.78	11.07

Vernal	2.48	1.00	0.63	1.33	5.44	5.53	10.97
Average	2.33	1.01	0.78	1.38	5.50	5.95	11.45
CV (%)	9	13	20	13	8	8	7
LSD (5%)	0.28	0.18	0.20	0.22	NS	0.58	NS

Table 8. Yield of Potato Leafhopper Resistant Alfalfa Varieties at East Lansing. Seeded 1997

	2000 Total		1999 Total		1998 Total		3-yr Total	
	No spray	Spray	No spray	Spray	No spray	Spray	No spray	Spray
Tons of dry hay/acre								
Rhino	5.08	5.55	5.73	6.08	6.77	6.79	17.57	18.42
5347 LH	4.86	5.14	5.30	5.90	6.45	6.40	16.60	17.45
Clean Sweep 1000	4.66	5.11	5.39	5.43	6.51	6.34	16.55	16.88
Arrest	4.86	5.24	4.98	5.62	6.54	6.51	16.39	17.32
Interceptor	4.75	5.01	5.02	5.62	6.27	6.23	16.04	16.86
Safeguard	4.55	5.18	4.93	5.71	6.29	6.49	15.80	17.37
Ameriguard 301	4.66	5.04	4.93	6.09	6.02	6.77	15.62	17.90
DK 121 HG	4.46	5.14	5.04	5.49	5.75	6.26	15.25	16.88
8-variety average	4.74	5.18	5.17	5.74	6.32	6.47	16.23	17.39
Magnum III WET	5.45	5.65	5.65	6.15	6.39	6.41	17.48	18.20
Innovator + Z	5.28	5.54	5.52	6.10	6.28	6.79	17.42	18.42
Pioneer 5454	5.25	5.68	5.44	5.96	6.29	6.53	16.98	18.17
Vernal	5.06	5.35	4.98	5.26	6.34	5.94	16.38	16.56
4-Variety Average	5.26	5.56	5.40	5.87	6.33	6.42	17.07	17.84
CV %	5		9		7		5	
LSD(5%) within column	0.37	0.27	0.54	0.52	0.6	0.56	0.99	1.0
LSD(5%) between columns	0.08		0.16		0.43		0.30	

Table 9. Disease resistance ratings for alfalfa cultivars in MSU variety trials (BW = Bacterial Wilt, PRR = Phytophthora Root Rot, AN = Anthracnose, VW = Verticillium Wilt, FW = Fusarium Wilt)

<i>Variety</i>	<i>BW</i>	<i>PRR</i>	<i>AN</i>	<i>VW</i>	<i>FW</i>
2444	HR	HR	HR	R	HR
2833	HR	HR	HR	R	HR
2888	HR	HR	HR	R	HR
2980	HR	HR	R	R	R
3324	HR	HR	HR	R	HR
4200	HR	HR	HR	HR	HR
8920	HR	HR	HR	R	HR
9323	HR	HR	R	R	HR
9326	HR	HR	R	R	HR
9429	R	HR	HR	R	HR
9701	R	HR	R	R	HR
A 295	HR	HR	R	R	HR
A 395	HR	HR	HR	R	HR
Abound	HR	HR	HR	HR	HR
ABT 205	HR	HR	HR	R	HR
ABT 227 LH	HR	HR	HR	R	HR
ABT 350	HR	HR	HR	HR	HR
ABT 400 SCL	HR	HR	HR	HR	HR
ABT 405	HR	HR	R	HR	HR
Accolade	R	R	R	HR	R
Ace	HR	HR	HR	R	HR
Achieva	R	HR	HR	R	HR
Action	R	R	HR	MR	R
AF 21	HR	R	HR	R	R
Affinity + Z	HR	HR	HR	HR	HR
Aggressor	HR	HR	HR	R	HR
Agriboss	HR	HR	HR	MR	HR
Alfagraze	MR	LR	MR	-	R
Allegiance	R	R	HR	R	R
Allegro	HR	HR	HR	R	HR
Alpha 2001	HR	HR	HR	HR	HR
Amerigraze 401+Z	HR	HR	HR	R	HR
Ameriguard 301	HR	HR	HR	R	HR
Ameriguard 302+Z	HR	HR	HR	HR	HR

Table 9. Disease resistance ratings for alfalfa cultivars in MSU variety trials (BW = Bacterial Wilt, PRR = Phytophthora Root Rot, AN = Anthracnose, VW = Verticillium Wilt, FW = Fusarium Wilt)

<i>Variety</i>	<i>BW</i>	<i>PRR</i>	<i>AN</i>	<i>VW</i>	<i>FW</i>
Apollo Supreme	HR	R	HR	R	HR
Applause	HR	R	HR	R	HR
Arrow	HR	HR	MR	R	HR
Aspen	HR	HR	HR	R	HR
Asset	HR	HR	R	R	R
Attainer	HR	HR	HR	HR	HR
Avalanche +Z	HR	HR	HR	HR	HR
Award	HR	HR	HR	HR	HR
Awesome	HR	HR	HR	HR	HR
Belmont	HR	HR	HR	HR	HR
Benchmark	HR	HR	HR	R	HR
BH 330	HR	HR	HR	R	HR
Big Horn	HR	HR	HR	R	HR
Blazer XL	R	HR	HR	R	HR
Bolt ML	R	HR	HR	HR	R
BPR380	HR	HR	HR	R	HR
Break Thru	HR	HR	MR	R	HR
Bronco	HR	HR	MR	R	HR
Callahan 501	R	R	R	R	R
Centurion	HR	R	R	R	R
Chief	HR	HR	R	R	R
Choice	HR	HR	R	HR	R
Cimarron	HR	MR	R	LR	HR
Cimarron 3i	HR	HR	HR	R	HR
Cimarron SR	HR	HR	HR	HR	HR
Cimarron VR	HR	MR	HR	R	HR
Class	R	MR	-	MR	HR
Clipper	HR	R	R	R	HR
Clean Sweep 1000	HR	HR	HR	R	HR
Columbia 2000	R	MR	MR	MR	R
Columbo	R	R	R	HR	-
Crown II	HR	HR	HR	R	HR
Crystal	HR	HR	R	R	HR
Cut `N` Graze	HR	R	MR	LR	HR
Dart	HR	HR	R	R	HR

Table 9. Disease resistance ratings for alfalfa cultivars in MSU variety trials (BW = Bacterial Wilt, PRR = Phytophthora Root Rot, AN = Anthracnose, VW = Verticillium Wilt, FW = Fusarium Wilt)

<i>Variety</i>	<i>BW</i>	<i>PRR</i>	<i>AN</i>	<i>VW</i>	<i>FW</i>
Dawn	R	R	R	R	HR
Defiant	HR	HR	HR	HR	HR
Demand	HR	HR	HR	R	HR
Depend +EV	HR	HR	HR	HR	HR
Dividend	HR	HR	HR	R	HR
DK 120	HR	R	LR	-	R
DK 121 HG	HR	HR	HR	R	HR
DK 122	HR	HR	HR	R	R
DK 124	HR	HR	HR	HR	HR
DK 125	HR	R	HR	R	R
DK 127	HR	HR	HR	R	HR
DK 131 HG	HR	HR	HR	HR	HR
DK 133	HR	HR	HR	R	HR
DK 134	HR	HR	HR	HR	HR
DK 140	HR	HR	HR	R	HR
DK 141	HR	HR	HR	HR	HR
Dominator	HR	HR	HR	R	HR
Dynasty	HR	R	MR	R	R
Echo	R	R	MR	R	R
Emerald	R	R	MR	MR	R
Emperor	HR	HR	HR	HR	HR
Empress	HR	HR	R	R	HR
Encore	HR	HR	HR	R	HR
Enhancer	HR	HR	R	R	HR
Enterprise	HR	HR	R	R	HR
Envy	R	-	-	MR	-
Evolution	HR	HR	HR	R	HR
Excalibur	R	LR	MR	R	HR
Excalibur II	HR	HR	HR	R	HR
Feast	HR	HR	HR	R	HR
Flagship 75	HR	HR	R	R	HR
Flint	R	R	HR	LR	HR
Forecast 1000	HR	HR	R	R	HR
Forecast 1001	HR	HR	R	R	HR
Forecast 3000	HR	R	R	R	HR

Table 9. Disease resistance ratings for alfalfa cultivars in MSU variety trials (BW = Bacterial Wilt, PRR = Phytophthora Root Rot, AN = Anthracnose, VW = Verticillium Wilt, FW = Fusarium Wilt)

<i>Variety</i>	<i>BW</i>	<i>PRR</i>	<i>AN</i>	<i>VW</i>	<i>FW</i>
Forecast 3001	HR	HR	R	R	HR
Forerunner	HR	HR	HR	HR	HR
Fortress	R	HR	R	R	R
FQ 314	HR	HR	HR	HR	HR
FQ 315	HR	HR	HR	R	HR
G 2841	HR	R	HR	R	HR
G 2852	HR	R	HR	R	R
Garst 620	HR	HR	HR	R	R
Garst 630	HR	R	MR	MR	R
Garst 631	HR	HR	R	R	R
Garst 636	HR	R	MR	R	R
Garst 645	HR	HR	HR	R	R
Garst 6310	HR	HR	HR	HR	HR
Garst 6420	HR	HR	HR	HR	HR
Gem	HR	HR	HR	R	HR
Genesis	HR	HR	HR	R	HR
Geneva	HR	HR	HR	HR	HR
GH 737	R	HR	MR	R	R
GH 755	HR	HR	HR	R	HR
GH 777	HR	HR	R	R	HR
GH 787	HR	HR	HR	R	R
GH 788	HR	HR	HR	R	HR
GH 794	HR	HR	HR	R	HR
GH 797	HR	HR	HR	HR	HR
Goldleaf	HR	HR	R	R	HR
Gourmet Hay	HR	R	HR	R	HR
Green Field	HR	HR	HR	R	HR
Haygrazer	HR	R	R	R	HR
Haymark	R	R	HR	-	HR
Homestead	HR	HR	HR	R	R
Husky	R	MR	MR	-	R
HYGain	HR	HR	R	R	HR
Hyland	HR	HR	R	R	HR
Impact	HR	R	MR	R	HR
Imperial	HR	HR	HR	R	HR

Table 9. Disease resistance ratings for alfalfa cultivars in MSU variety trials (BW = Bacterial Wilt, PRR = Phytophthora Root Rot, AN = Anthracnose, VW = Verticillium Wilt, FW = Fusarium Wilt)

Variety	BW	PRR	AN	VW	FW
Innovator +Z	HR	HR	HR	R	HR
Iroquois	HR	-	-	-	-
Jade	HR	HR	R	R	HR
Key	HR	HR	HR	HR	HR
Laser	HR	HR	R	R	HR
Legacy	HR	HR	R	R	HR
Legend	HR	R	HR	R	HR
LegenDairy	HR	HR	HR	HR	HR
MagnaGraze	HR	HR	R	R	HR
Magnum III	R	R	MR	MR	R
Magnum III WET	R	R	MR	MR	R
Magnum IV	HR	HR	R	R	HR
Magnum V	HR	HR	R	R	HR
Magnum V WET	HR	HR	R	R	HR
Mainstay	HR	HR	HR	HR	HR
Majestic	HR	R	HR	HR	-
Mariner	R	HR	MR	MR	HR
Max 329	HR	HR	HR	HR	HR
Medallion	HR	R	R	R	-
Milkmaker	R	MR	MR	-	HR
Mohawk	HR	-	HR	-	MR
Monument II	R	R	S	LR	HR
Multi-Gem	HR	R	R	R	R
MultiKing 1	HR	HR	HR	R	-
Multiplier	HR	HR	HR	R	-
Multiplier 3	HR	HR	HR	R	HR
MultiQueen	HR	HR	HR	R	HR
Multistar	HR	HR	HR	R	HR
Nemesis	R	HR	HR	HR	HR
Nordic	HR	HR	R	R	R
Oneida	HR	HR	-	-	R
Oneida VR	R	MR	MR	HR	HR
Ovation	HR	HR	HR	HR	HR
Pacesetter	HR	HR	HR	R	R
Paramount	HR	HR	HR	R	HR

Table 9. Disease resistance ratings for alfalfa cultivars in MSU variety trials (BW = Bacterial Wilt, PRR = Phytophthora Root Rot, AN = Anthracnose, VW = Verticillium Wilt, FW = Fusarium Wilt)

<i>Variety</i>	<i>BW</i>	<i>PRR</i>	<i>AN</i>	<i>VW</i>	<i>FW</i>
Patriot	R	R	R	R	R
Phabulous	HR	HR	HR	HR	HR
Pioneer var. 5151	R	-	-	-	R
Pioneer var. 5246	HR	HR	R	HR	HR
Pioneer var. 5262	HR	R	-	LR	MR
Pioneer var. 5312	HR	HR	HR	HR	HR
Pioneer var. 5364	R	MR	MR	MR	R
Pioneer var. 5373	HR	MR	HR	R	HR
Pioneer var. 53H81	HR	HR	HR	HR	HR
Pioneer var. 53Q60	HR	HR	HR	R	HR
Pioneer var. 53V63	HR	HR	HR	HR	HR
Pioneer var. 5432	HR	MR	-	R	HR
Pioneer var. 5454	R	HR	HR	MR	HR
Pioneer var. 5472	HR	MR	MR	MR	HR
Pioneer var. 54V54	HR	HR	HR	HR	HR
Platinum	HR	HR	HR	HR	HR
Pointer	HR	HR	HR	R	HR
Precedent	HR	HR	R	R	HR
Prism	HR	HR	HR	R	R
Pristine	HR	HR	HR	R	R
Pro-Cut	HR	HR	R	R	HR
Pro-Cut 2	HR	HR	R	R	R
Profit	HR	R	MR	R	HR
Promise	HR	HR	HR	R	HR
Proof	HR	HR	HR	R	HR
Quantum	HR	HR	HR	HR	HR
Quest	HR	HR	R	R	HR
Radiant	HR	HR	HR	HR	HR
Rainier	HR	HR	HR	R	HR
Ram Rod	R	R	MR	R	R
Recovery	R	R	R	R	R
Resistar	R	HR	R	HR	HR
RFV 2000	HR	HR	HR	R	HR
Ripin	HR	HR	R	R	HR
Rocket	HR	HR	HR	HR	HR

Table 9. Disease resistance ratings for alfalfa cultivars in MSU variety trials (BW = Bacterial Wilt, PRR = Phytophthora Root Rot, AN = Anthracnose, VW = Verticillium Wilt, FW = Fusarium Wilt)

<i>Variety</i>	<i>BW</i>	<i>PRR</i>	<i>AN</i>	<i>VW</i>	<i>FW</i>
Rushmore	HR	HR	HR	R	HR
Sabre	HR	R	HR	HR	-
Salute	HR	R	MR	MR	R
Saranac	R	-	-	-	-
Shield	HR	R	HR	R	R
Somerset	HR	HR	HR	HR	HR
Spredor 3	HR	MR	R	MR	MR
Spirit	HR	HR	R	R	HR
Stampede	HR	HR	R	R	HR
Sterling	HR	HR	HR	R	HR
Stine 9227	HR	HR	HR	R	HR
SuperCuts	HR	HR	HR	HR	HR
Sure	HR	R	HR	R	HR
Surpass	HR	R	MR	R	HR
Synergy	HR	HR	HR	R	HR
Target II	HR	HR	MR	MR	R
Target II+	HR	HR	R	R	HR
Terminator	HR	R	R	MR	-
Thrive	HR	HR	HR	R	HR
Thunder	R	R	MR	-	HR
TMF 421	HR	HR	HR	HR	R
TMF 4355 LH	HR	HR	HR	R	HR
TMF Generation	HR	HR	HR	HR	HR
TMF Multiplier II	HR	HR	HR	HR	HR
Total +Z	HR	HR	HR	R	HR
Trident	R	HR	MR	-	HR
Trident II	HR	HR	R	R	R
Ultimate	HR	R	HR	R	-
Ultimate	HR	R	HR	R	R
Ultra	HR	R	HR	R	HR
Ultraleaf 87	HR	HR	HR	R	HR
Vector	R	R	R	MR	HR
Venture	HR	HR	R	R	HR
Vernal	R	-	-	-	MR
Vernema	MR	LR	LR	MR	-

Table 9. Disease resistance ratings for alfalfa cultivars in MSU variety trials (BW = Bacterial Wilt, PRR = Phytophthora Root Rot, AN = Anthracnose, VW = Verticillium Wilt, FW = Fusarium Wilt)

<i>Variety</i>	<i>BW</i>	<i>PRR</i>	<i>AN</i>	<i>VW</i>	<i>FW</i>
Viking I	R	R	R	HR	HR
VIP	HR	R	R	R	R
Vitro	HR	HR	HR	R	HR
Voyager II	HR	HR	R	R	HR
Webfoot	R	R	LR	-	MR
Webfoot MPR	HR	HR	HR	R	HR
Webfoot Supreme	R	R	R	R	R
WinterGold	HR	HR	HR	HR	HR
Wintergreen	HR	HR	R	R	HR
WL 225	HR	HR	MR	R	HR
WL 232 HQ	HR	HR	HR	HR	HR
WL 252 HQ	HR	HR	HR	R	HR
WL 317	HR	HR	R	R	HR
WL 320	R	R	MR	MR	HR
WL 322 HQ	R	R	MR	R	-
WL 323	HR	HR	HR	R	HR
WL 324	HR	HR	HR	R	HR
WL 325 HQ	HR	HR	HR	R	HR
WL 326 GZ	HR	HR	HR	R	HR
WL 327	HR	HR	HR	R	HR
WL 332 SR	HR	HR	HR	R	HR
Wrangler	R	HR	LR	LR	R
Zenith	HR	HR	HR	R	-

Cool-Season Grasses

Evaluations of grass varieties seeded with birdsfoot trefoil were initiated during 2000 in an attempt to evaluate grasses for yield, persistence, and palatability. During the summer of 2000 20 varieties of five species of cool-season grasses were seeded at Lake City and East Lansing Experiment Stations. Each of the grasses planted, i.e., smooth bromegrass (20 pounds/acre), orchardgrass (15 pounds/acre), timothy (8 pound/acre), perennial ryegrass (30 pounds/acre), and tall fescue (15 pounds/acre) were seeded in small plots (Lake City; 6 x 25', East Lansing; 3 x 25') using four replications. To test palatability and persistence a Simmental beef herd was used for grazing at Lake City. Each plot was rated

visually to determine amount of residue left after grazing. Rest periods were usually 30 to 35 days but varied from year to year and between grazing events depending upon forage re-growth rates. Results from this trial are shown in tables 15 & 16. The following paragraphs provide a summary of the species evaluated.

Festulolium (*Festulolium braunii*, K.A.) is a cross between meadow fescue and either perennial ryegrass or Italian ryegrass. This cross combines the persistence of fescue with the palatability of ryegrass. Legume/ festulolium compatibility studies are currently underway in four locations across the state.

Kentucky bluegrass (*Poa pratensis*) Kentucky bluegrass (*Poa pratensis*) grows 18 to 24 inches tall and is readily identified by its boat-shaped leaf tip. It spreads by rhizomes and tillers and forms a dense sod which allows it to persist in pastures that are grazed continuously.

Orchardgrass (*Dactylis glomerata* L.) is a high-yielding perennial bunch grass that grows rapidly in the early spring will out compete most other forage species in lower Michigan once established. Soils with moderately poor drainage are ideal for this species though it grows on a wide range of soil types. Tillering occurs throughout the growing season which enables quick re-growth following harvest. Orchardgrass has similar nutritive characteristics to timothy and smooth brome and should be harvested during the vegetative stages of growth prior to heading. Alfalfa and orchardgrass are often grown together in Michigan. Late maturing varieties of orchardgrass are preferred when mixed with alfalfa.

Perennial ryegrass (*Lolium perenne* L.) is a bunch grass that is high in forage quality but somewhat lower in total yield. Perennial ryegrass will persist under intensive rotational grazing situations. It is susceptible to injury when grazed as frozen forage. This species is not as winter hardy compared to other cool season grasses, however, because of its high forage quality, many farmers are using it as part of their pasture mix. Soils that are high in fertility and are moderately well drained are ideal for this species. Hot and dry conditions will cause perennial ryegrass to go dormant. Supplemental irrigation can increase perennial ryegrass yields.

Smooth brome (*Bromus inermis* Leyss.) is a rhizomatous, sod-forming grass that is high in forage quality and yield. Smooth brome is one of the most winter hardy grasses and can be grown on a wide range of soil types. Grazing, hay production, and green chop are all common uses for smooth brome. Alfalfa and red clover are legumes that are compatible with smooth brome. Careful consideration need to made when grazing or cutting smooth brome to prevent a reduction in tillering. Smooth brome should not be grazed or cut during stem elongation and early heading.

Tall fescue (*Festuca arundinacea* L.) is a sod-forming grass that is renown for fall growth. Tall fescue persists on many soil types and may produce short rhizomes and tillering when grazed frequently. It has a high relative nutritive value when closely

grazed. All varieties tested were endophyte-free. Tall fescue is a species that persists under heavy traffic from vehicles or animals.

Timothy (*Phluem pratense* L.) is a bunch grass that forms an open sod and persists well under high moisture conditions. It is best known for its winterhardiness and ability to survive when covered by ice. Timothy should be grown with a legume, such as alfalfa, red clover or birdsfoot trefoil. Long rest periods between harvest or grazing are required for timothy to rebuild carbohydrate reserves thus making it more adaptable to a 2 cut system of harvest.

Table 10 .East Lansing Grass variety trial, seeded 2000

Species	Cultivar	04-May % cover	04-May cut 1	30-May cut 2	28-Jun cut 3	23-Jul cut 4	02-Nov cut 5	2001 Total
		Dry hay tons/acre						
Festulolium	Prerun	100	2.24	1.85	2.11	0.82	1.07	8.08
Festulolium	Hykor	100	2.22	1.17	1.51	1.08	1.58	7.56
Festulolium	Spring Green	95	1.97	1.66	1.59	0.50	0.73	6.43
		LSD (0.05)						1.03
Kent. Bluegrass	Lato	45	0.36	0.72	0.65	0.42	0.72	2.86
Kent. Bluegrass	Ginger	38	0.25	0.39	0.57	0.27	0.50	1.98
		LSD (0.05)						0.43
Mixture	Renovator	73	0.70	1.33	1.17	0.47	0.56	4.23
Orchardgrass	Potomac	100	1.92	1.11	1.16	0.85	1.23	6.26
Orchardgrass	Megabite	100	2.00	0.91	0.94	0.75	0.68	5.28
Orchardgrass	Elsie	100	1.58	1.06	0.99	0.75	1.15	5.52
Orchardgrass	Aramis	87.5	0.82	1.09	1.00	0.67	1.30	4.88
		LSD (0.05)						0.44
Perennial Rye	Elgon	100	1.19	1.91	1.08	0.51	2.05	6.73
Perennial Rye	Mara	100	1.43	1.44	1.19	0.40	0.51	4.98
Perennial Rye	Herbie	100	1.10	1.70	0.91	0.50	0.63	4.84
		LSD (0.05)						NS
Tall fescue	Kora	100	2.36	1.24	1.56	0.88	1.30	7.33
Tall fescue	Kokanne	100	2.13	1.43	1.35	0.86	1.31	7.08
Tall fescue	Festival	98	2.20	1.11	1.44	0.86	1.67	7.28
Tall fescue	Fawn	98	2.22	0.95	1.30	0.95	1.02	6.43
Tall fescue	Barolex	98	1.82	1.30	1.20	0.64	1.05	5.99
		LSD (0.05)						1.01
Timothy	Tuukka	98	1.39	1.60	.	1.52	0.70	5.22
Timothy	Climax	76	1.09	1.67	.	1.34	0.52	4.63
		LSD (0.05)						0.51
Grand Mean		88	1.60	1.27	1.20	0.76	0.99	5.76

CV%	9	16
LSD (0.05)	11.2	1.14
Comments:	Drought conditions occurred in summer 2001	

Table 11. Lake City Grass variety trial, seeded 2000

Species	Cultivar	10-May %cover	10-May Graze 1	08-Jun Graze 2	17-Jul Graze 3	01-Oct Graze 4	2001 Total	Graze 1 Palatability	Graze2	Graze4
Dry hay tons/acre							1 to 5*			
Festulolium	Prerun	100	0.80	1.01	0.84	1.33	3.98	4.1	4.8	4.8
Festulolium	Hykor	83	0.93	0.77	0.75	1.60	4.09	2.1	2	3.3
Festulolium	Spring Green	93	1.03	1.18	0.69	0.90	3.86	4	4	4.8
	LSD (0.05)	15	NS	0.28	NS	0.68	NS			
K. Bluegrass	Lato	27	0.69	0.17	0.36	0.77	2.00	1	2.3	5
K. Bluegrass	Ginger	10	0.73	0.33	0.22	0.60	1.89	1	3	5
	LSD (0.05)	NS	NS	NS	NS	NS	NS			
Mixture	Renovator	50	0.74	0.97	0.56	0.99	3.26	3.6	2.8	5
Orchardgrass	Potomac	100	1.16	1.35	0.57	1.36	3.90	2	3	2.5
Orchardgrass	Megabite	100	1.13	0.67	0.68	1.76	4.26	2.8	3.8	3.8
Orchardgrass	Elsie	100	0.89	0.69	0.67	1.35	3.60	2.8	3.3	3.5
Orchardgrass	Aramis	93	0.94	0.64	0.58	1.56	3.73	2.8	3.5	3
	LSD (0.05)	NS	0.20	NS	NS	0.40	0.65			
Perennial Rye	Elgon	100	0.76	1.20	0.74	1.26	3.95	3.6	4.5	4.5
Perennial Rye	Mara	100	0.93	1.38	0.81	1.39	4.51	3.1	4.3	4.8
Perennial Rye	Herbie	93	0.66	1.17	0.67	1.07	3.57	4.3	4.5	5
	LSD (0.05)	NS	NS	NS	NS	0.65	0.82			
Tall fescue	Kora	80	1.03	0.75	0.68	1.95	4.42	2	2.3	3.5
Tall fescue	Kokanne	80	1.03	0.77	0.61	1.68	4.10	2.3	2.3	2.8
Tall fescue	Festival	80	0.99	0.74	0.69	1.45	3.86	2	3.3	3.3
Tall fescue	Fawn	50	0.91	0.44	0.50	1.10	2.97	2.1	2.5	3.5
Tall fescue	Barolex	87	0.75	0.81	0.53	1.36	3.47	2.6	2.5	3.8
	LSD (0.05)	6.5	NS	0.17	0.17	0.56	0.86			
Timothy	Tuukka	70	0.99	0.81	0.31	0.97	3.07	4.3	4	5
Timothy	Climax	70	0.64	0.66	0.42	1.13	2.84	3.9	3.5	5
	LSD (0.05)	NS	NS	NS	NS	NS	NS			
	Grand Mean		0.89	0.77	0.59	1.26	3.51	2.7	3.3	4.1
	CV%		24	21	24	25	13	21	27	22
	LSD (0.05)	15	0.27	0.2	0.17	0.39	0.58	0.8	1.24	1.3

Comments: Extreme drought occurred in the summer of 2001

*Palatability is determined by visual observation following grazing (5 is the most palatable)