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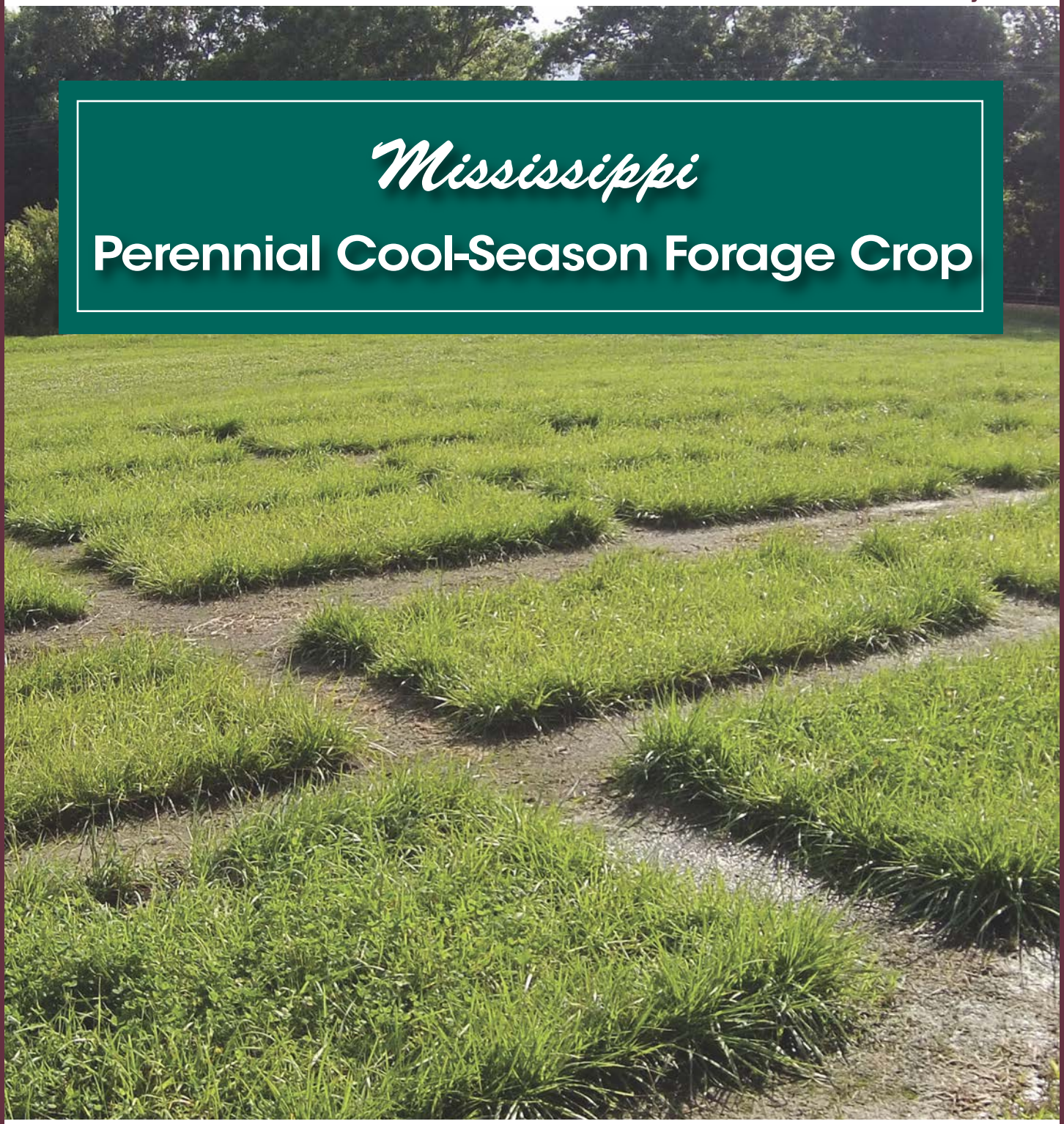

Mississippi Perennial Cool-Season Forage Crop

VARIETY TRIALS, 2016

MISSISSIPPI'S OFFICIAL VARIETY TRIALS

MISSISSIPPI STATE UNIVERSITY™
MS AGRICULTURAL AND FORESTRY EXPERIMENT STATION

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This report contains data generated as part of the Mississippi Agricultural and Forestry Experiment Station. Joint sponsorship by the organizations listed on page 10 is gratefully acknowledged.

Trade names of commercial and public varieties tested in this report are included only for clarity and understanding. All available names (i.e., trade names, experiment code names or numbers, chemical names, etc.) and varieties, products, or source seed in this research are listed on page 10.

Mississippi Perennial Cool-Season Forage Crop Variety Trials, 2016

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Find variety trial information online at ***mafes.msstate.edu/variety-trials***.

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INTRODUCTION

Varieties of forage crops are evaluated every year in MAFES small-plot trials. Seed for the entries are provided by seed companies and state universities and tested at one or more locations across Mississippi. All entries from privately owned companies are tested on a fee basis. Standard varieties were added by MAFES as a reference for comparison purposes. In addition, varieties of interest were also added when applicable. Seed sources are presented in Table 12. This report contains data from four wildrye species (*Elymus L.*) and 12 tall fescue varieties (*Festuca arundinacea)*, six perennial clovers varieties (white clover, *Trifolium repens*; red clover, *Trifolium pretense*), and four alfalfa varieties (*Medicago sativa*)—all established in fall 2015. Tall fescue entries include endophyte-infected, endophyte-free, and novel-endophyte types. Alfalfa entries include both Roundup Ready® and conventional varieties, and the perennial clover trial includes red and white clovers. Locations include the North Mississippi Branch Experiment Station at Holly Springs, H. H. Leveck Animal Research Farm Forage Unit at Starkville, Coastal Plain Branch Experiment Station at Newton, and White Sands Research Unit at Poplarville.

STAND ESTABLISHMENT AND PERSISTENCE

The tall fescue and wildrye trials in Starkville suffered considerable stand loss in 2016. The prolonged drought in the fall led to decreased stand ratings (Table 12) in Starkville for the tall fescue varieties compared with other locations. Across all location, wildrye plots were rated the lowest compared with tall fescue.

In Poplarville, the wet summer and dry fall led to stand failures across all the perennial clover and alfalfa varieties by the beginning of December, when stand ratings were taken. A dry summer and fall in Holly Springs led to inadequate growth for harvest during 2016, but stands retained persistence by December. In Starkville, however, perennial clover and alfalfa stands were persistent throughout the summer and did not decrease during the fall drought.

Data presented in Tables 4–12 can be used to evaluate the performance of each forage variety or species within that test. Comparisons were statistically evaluated by using the LSD (least significant difference). The LSD represents the amount of yield that must be observed between any two varieties to determine if the differences observed were due to variety variation alone. Coefficient variation (CV) describes the accuracy of the test compared to other tests. Highly variable results between replications will be reflected in a high CV.

Table 1. Monthly rainfall totals for Poplarville, Starkville, Newton, and Holly Springs, 2016.

Location	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	in	*in*	*in*	*in*	*in*	*in*	*in*	*in*	*in*	*in*	*in*	*in*
Poplarville	3.54	6.57	11.82	6.71	3.47	3.46	7.75	7.51	5.17	0.06	0.66	2.04
Starkville	4.48	8.34	7.73	4.34	3.21	3.88	3.54	3.46	2.75	0.04	0.15	0.00
Holly Springs	0.81	1.33	8.37	0.67	1.30	0.09	7.12	3.21	1.37	2.30	3.59	3.23
Newton	3.14	5.44	9.98	6.69	3.29	4.43	4.89	5.03	0.56	0.00	3.93	2.17
MS 30-yr. avg.	4.96	4.76	5.04	4.96	4.37	4.13	4.80	4.25	3.03	3.94	4.76	5.16

Table 2. Mean high and low temperatures by month for Poplarville, Starkville, Newton, and Holly Springs, 2016.

Location	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	°F	*°F*	*°F*	*°F*	*°F*	*°F*	*°F*	*°F*	*°F*	*°F*	*°F*	*°F*
Poplarville												
High	53	65	68	74	83	93	92	86	80	77	73	76
Low	35	42	52	55	61	65	75	71	63	55	56	45
Newton												
High	57	60	66	77	82	92	94	89	86	79	71	72
Low	31	37	43	52	56	68	71	82	68	58	46	39
Starkville												
High	52	61	70	76	82	92	94	90	93	85	70	70
Low	31	37	46	53	58	70	73	70	68	55	40	42
Holly Springs												
High	61	62	68	72	78	78	92	91	90	84	73	51
Low	24	30	38	51	56	72	70	70	59	50	38	25
MS 30-yr. avg.												
High	56	60	69	76	83	89	92	92	87	77	67	58
Low	35	38	45	52	62	69	72	71	65	53	44	37

PROTOCOL

Tall fescue, perennial clovers, and alfalfa trials across the state were established September 23 to October 9, 2015. Soil samples from each location were taken and analyzed at the Mississippi State University Soil Testing Lab. Each trial area was fertilized with lime, phosphorus (P_2O_5), and potassium (K_2O) according to soil test recommendations. Recommendations for phosphorus and potassium in grass were usually fulfilled with one application of 13-13-13. Tall fescue trials were fertilized with 350 pounds per acre of 13-13-13 at planting, followed by 50 pounds per acre of N using urea ammonium sulfate (33-0-0S) after each harvest. Plot dimensions were 6 feet × 10 feet and planted using a precision cone seeder on a prepared seedbed. The experimental design was a randomized complete block replicated four times. Recommended seeding rates were based on pure live seed (PLS) and are presented in Table 3. All grass plots were harvested when 75% of the plots achieved 15 inches of growth. Alfalfa was harvested at 50% bloom, and clovers were harvested when 75% of plots were 10–15 inches in height. Perennial clovers, alfalfa, and tall fescue were harvested to a stubble height of 4 inches. Plots were harvested using a Ferris "Zero-Turn" commercial mower with a bagging system collecting a 53-inch by 10-foot swath to calculate total yield. A subsample was collected and dried at 131°F until dry to calculate dry matter percentage (DM). Data were analyzed using the general linear model (PROC GLM) of SAS, and mean separation was conducted using the least significant difference (LSD) at $\alpha = 0.05$.

Table 3. Seeding rates used in 2016 variety trials.[1]

Variety	Seeding rate (PLS)
	lb/A
Alfalfa	20
Red Clover	12
Tall Fescue	20
White Clover	3
Wildrye	15

[1]PLS = Pure Live Seed.

PERENNIAL CLOVER AND ALFALFA

Alfalfa is a perennial legume common in the Midwest. It is irrigated in the West and North. Alfalfa varieties have been bred for more southern climates, but stand persistence can be a problem. Several diseases and pests, such as crown rot (*Sclerotinia trifoliorum)*, stem rot (*Phytophthora medicaginis*), alfalfa weevils (*Hypera hostica*), and leafhoppers (*Empoasca solana*), are major problems. Alfalfa is also very sensitive to soil pH and should be maintained at 6.5 or greater. It needs 65 pounds of P_2O_5 per acre per year and 350 pounds of K_2O per acre per year as fertilizer input. Planting should take place between September and October at a seeding rate of 20 pounds per acre on a firm seedbed. Most of the yield distribution for alfalfa is in early summer to early fall. Protein concentration of alfalfa ranges from 12–18%, acid detergent fiber (ADF) from 30–40%, and neutral detergent fiber (NDF) from 40–50%. Alfalfa can also be successfully established in warm-season sod grasses to increase hay quality and yield distribution, especially in low-nitrogen-input situations.

Red clover is a short-lived perennial in Mississippi, rarely surviving the summers. In central to southern Mississippi, it should be treated as an annual. Red clover tolerates wet, acidic soils and withstands shading during the seedling stage, which gives it potential to be overseeded in sod grasses. When seeding in an established pasture system, it is best to plant between October 15 and November 20. In grass mixtures, plant red clover at 4–8 pounds per acre, but in pure stands, 12 pounds per acre will be sufficient. Red clover performed well when 60 pounds of P_2O_5 per acre and 40 pounds of K_2O per acre are applied and pH is above 5.5. Two to three harvests can be expected if cutting for hay in late spring to early summer.

White clover is more persistent than red clover, but yields are typically less. It does offer more opportunity in grazing situations than in hay harvest because of its prostrate growth habit. White clover is tolerant of wet soils and prefers a pH of 6 or above. Plant white clover at 3–4 pounds per acre in pure stands or 2–3 pounds per acre in mixtures between September and October. White clover is responsive to K_2O, and a starter fertilizer of 20-60-20 will aid in establishment. Like red clover, white clover acts as an annual in the southern part of the state, but it has a greater reseeding potential. Both species of clovers have excellent forage quality, but white clover tends to have a greater potential to cause bloat. When grazing white clover, it is recommended to interseed with grass to reduce bloat potential.

Table 4. Dry matter yields of alfalfa, red clover, and white clover varieties in Starkville, 2016.[1]

Variety	4/29/16	6/13/16	7/20/16	8/23/16	12/2/16	Total
	lb/A	*lb/A*	*lb/A*	*lb/A*	*lb/A*	*lb/A*
Alfalfa						
Alfagraze 600 RR	2935	2283	1817	864	1401	9298
Bulldog 505	3132	2233	2955	970	1562	10852
GAMS1405FSH	3318	2607	2095	877	1753	10648
NF12ALF0073	2632	2264	2148	1029	1429	9501
Red Clover						
IS- TP 12	3946	2479	1704	553	—	8682
Renegade	3205	1887	1660	649	—	7401
Southern Belle	3851	2374	1686	528	—	8438
White Clover						
Durana	2537	1702	723	—	—	4962
IS-TR 12	2167	1879	1255	—	—	5301
Neches	2934	2222	842	—	—	5998
Patriot	1887	1918	1012	—	—	4817
Mean	2959	2168	1627	781	1536	7809
$LSD_{0.05}$	NS	497	480	292	NS	761
CV%	31	15	20	24	38	12

[1]NS: Not Significant
Planted: October 1, 2015 Soil: Marietta Fine Sandy loam Fertilized: 1 ton per of lime at planting
Herbicide: Paraquat after each harvest at 1 pt/A; Pursuit (ammonium salt of imazethapyr) at 4 oz/A after first harvest

Table 5. Dry matter yields of alfalfa, red clover, and white clover varieties in Newton, 2016.[1]

Variety	5/16/16	9/15/16	Total
	lb/A	*lb/A*	*lb/A*
Alfalfa			
Alfagraze 600 RR	2134	1033	3166
Bulldog 505	3551	1210	4761
GAMS1405FSH	2208	1367	3575
NF12ALF0073	2562	1166	3727
Red Clover			
IS- TP 12	3165	—	3165
Renegade	2611	—	2611
Southern Belle	3066	1090	4156
White Clover			
Durana	2817	—	2817
IS-TR 12	2581	—	2581
Neches	2336	—	2336
Patriot	3023	—	3023
Mean	2732	1173	3265
$LSD_{0.05}$	NS	NS	1133
CV%	28	23	29

[1]NS: Not Significant
Planted: October 7, 2015 Soil: Prentiss Sandy loam Fertilized: 1 ton per acre of lime at planting
Herbicide: Paraquat after each harvest at 1 pt/A; Pursuit (ammonium salt of imazethapyr) at 4 oz/A after first harvest

Table 6. Dry matter yields of alfalfa, red clover, and white clover varieties in Poplarville, 2016.[1]

Variety	5/5/16	5/27/16	6/29/16	Total
	lb/A	*lb/A*	*lb/A*	*lb/A*
Alfalfa				
Alfagraze 600 RR	3755	652	682	5089
Bulldog 505	4661	617	695	5972
GAMS1405FSH	3859	709	740	5308
NF12ALF0073	3721	651	1178	5550
Red Clover				
IS- TP 12	5496	390	741	6627
Renegade	3430	339	693	4462
Southern Belle	7377	333	794	8503
White Clover				
Durana	2250	377	702	3328
IS-TR 12	2536	329	644	3509
Neches	2851	319	487	3656
Patriot	3098	300	516	3913
Mean	3912	456	716	5083
$LSD_{0.05}$	1214	158	265	1263
CV%	21	24	25	17

[1]NS: Not Significant
Planted: October 1, 2015 Soil: Grenada silt loam Fertilized: 1 ton per acre of lime at planting
Herbicide: Paraquat after each harvest at 1 pt/A; Pursuit (ammonium salt of imazethapyr) at 4 oz/A after first harvest

Table 7. Stand ratings of alfalfa, red clover, and white clover varieties in Starkville, Newton, Poplarville, and Holly Springs, 2016.[1]

Variety	Starkville	Newton	Poplarville	Holly Springs
Alfalfa				
Alfagraze 600 RR	4	2	1	2
Bulldog 505	4	3	1	2
GAMS1405FSH	5	2	1	1
NF12ALF0073	4	3	1	2
Red Clover				
IS- TP 12	3	2	1	1
Renegade	2	2	1	1
Southern Belle	2	2	1	1
White Clover				
Durana	4	1	1	4
IS-TR 12	4	2	1	2
Neches	4	2	1	5
Patriot	3	2	1	4

[1]Stands evaluated between December 15 and December 20, 2016
Ground cover/plant survival rating: 1 = 0–20%, 2 = 21–40%, 3 = 41–60%, 4 = 61–80%, and 5 = 81–100%

TALL FESCUE AND WILDRYE

Tall fescue, a perennial grass with short rhizomes, is primarily grown in the northern part of the state. It does well on poorly drained soils, making it popular in lowland areas. Tall fescue should be established from September to October at a seeding rate of 15–20 pounds per acre. During the establishment year, avoid grazing below 4 inches to minimize stand failure. Tall fescue tolerates soil pH of 5.8–7.5 and responds well to nitrogen. Tall fescue requires 60–70 pounds per acre per year of P_2O_5 and K_2O. Endophyte toxicity can be a problem, but grazing management, the inclusion of clovers, and the use of novel-endophyte and endophyte-free varieties can be used to mitigate the harmful effects of the toxin.

Table 8. Dry matter yields of tall fescue and wildrye varieties and ecotypes in Starkville, 2016.[1]

Variety/Ecotype	3/24/16	5/3/16	6/13/16	Total
	lb/A	*lb/A*	*lb/A*	*lb/A*
Tall Fescue				
Cajun II	2362	3539	2206	8107
DLFPS-FTF 54 Happe	1801	2477	1745	6022
DLFPS-FTF 82	1865	2625	1843	6333
DLFPS-FTF 93	1004	1729	1860	4592
DLFPS-FTF 96	1714	1907	1913	5533
DLFPS-FTF73	1046	2193	1951	5189
Dominate	1646	2458	1779	5883
K31	1274	2280	1944	5498
Marin 2 Protek	890	2100	1636	4626
MSU Exp RL	1902	2682	1724	6308
Texoma MaxQ	1457	2185	1705	5346
Tower Protek	688	5590	1774	8051
Mean[2]	1471	2647	1840	5958
$LSD_{0.05}$[2]	NS	1348	NS	2176
CV %[2]	46	35	16	25
Wildrye				
Canada	282	925	893	2100
River Bank	975	1706	1405	4086
Southeastern	930	1460	1058	3447
Virginia	447	2410	933	3790
Mean[3]	659	1625	1072	3356
$LSD_{0.05}$[3]	NS	868	350	NS
CV%[3]	56	33	20	34
Overall Mean[4]	1268	2391	1648	5307
Overall $LSD_{0.05}$[4]	NS	1207	404	2011
Overall CV%[4]	41	35	17	26

[1]Planted: October 1, 2015 Soil: Marietta fine sandy loam
Fertilized: 100 lb/A of 13-13-13 at planting and 50 lb/A of N using urea ammonium sulfate after harvest
Herbicide: GrazonNext (aminopyralid + 2,4-D) at 1 pt/A
[2]Mean, $LSD_{0.05}$, CV%: Considers tall fescue values only. NS: Not Significant.
[3]Mean, $LSD_{0.05}$, CV%: Considers wildrye values only.
[4]Mean, $LSD_{0.05}$, CV%: Considers wildrye and tall fescue values.

Table 9. Dry matter yields of tall fescue and wildrye varieties and ecotypes in Newton, 2016.[1]

Variety/Ecotypes	3/16/16	4/10/16	5/24/16	Total
	lb/A	*lb/A*	*lb/A*	*lb/A*
Tall Fescue				
Cajun II	1646	600	1492	4251
DLFPS-FTF 54 Happe	1135	560	1806	4052
DLFPS-FTF 82	1028	592	1605	3300
DLFPS-FTF 93	1520	794	2715	5214
DLFPS-FTF 96	1710	790	1815	4128
DLFPS-FTF73	1218	588	1758	3564
Dominate	2180	579	1392	3011
K31	937	442	2116	4195
Marin 2 Protek	1787	829	1902	4518
MSU Exp RL	1285	804	1600	3087
Texoma MaxQ	923	564	1702	3081
Tower Protek	1420	659	2298	4387
Mean[2]	1399	650	1850	3899
$LSD_{0.05}$[2]	634	NS	513	1241
CV %[2]	31	32	19	22
Wildrye				
Canada	177	188	1155	1519
River Bank	282	187	2146	2615
Southeastern	607	320	1838	2471
Virginia	328	305	2340	3267
Mean[3]	348	250	1870	2468
$LSD_{0.05}$[3]	240	NS	581	625
CV%[3]	43	45	19	15
Overall Mean[4]	1136	550	1855	3541
Overall $LSD_{0.05}$[4]	555	270	496	1101
Overall CV%[4]	34	34	18	21

[1]Planted: October 7, 2015 Soil: Prentiss Sandy Loam
Fertilized: 100 lb/A of 13-13-13 at planting and 50 lb/A of N using urea ammonium sulfate after harvest
Herbicide: GrazonNext (aminopyralid + 2,4-D) at 1 pt/A
[2]Mean, $LSD_{0.05}$, CV%: Considers tall fescue values only. NS: Not Significant.
[3]Mean, $LSD_{0.05}$, CV%: Considers wildrye values only.
[4]Mean, $LSD_{0.05}$, CV%: Considers wildrye and tall fescue values.

Table 10. Dry matter yields of tall fescue and wildrye varieties and ecotypes in Holly Springs, 2016.[1]

Variety/Ecotype	5/10/16	6/21/16	Total
	lb/A	*lb/A*	*lb/A*
Tall Fescue			
Cajun II	2254	2327	4581
DLFPS-FTF 54 Happe	2093	1986	4079
DLFPS-FTF 82	2321	2329	4650
DLFPS-FTF 93	2670	1984	4654
DLFPS-FTF 96	2810	2876	5686
DLFPS-FTF73	1888	2017	3905
Dominate	2910	2409	5319
K31	2094	2099	4193
Marin 2 Protek	2366	2263	4630
MSU Exp RL	1975	1451	3426
Texoma MaxQ	2521	2114	4635
Tower Protek	2623	2442	5065
Mean[2]	2377	2191	4569
$LSD_{0.05}$[2]	NS	NS	NS
CV %[2]	24	34	25
Wildrye			
Canada	1313	1696	3010
River Bank	1130	1180	2310
Southeastern	1850	1879	3728
Virginia	2117	1506	3623
Mean[3]	1603	1565	3168
$LSD_{0.05}$[3]	741	NS	NS
CV%[3]	29	26	25
Overall Mean[4]	2183	2035	4179
Overall $LSD_{0.05}$[4]	777	NS	1540
Overall CV%[4]	24	32	25

[1]Planted: October 2, 2015 Soil: Grenada Silt Loam
Fertilized: 100 lb/A of 13-13-13 at planting and 50 lb/A of N using urea ammonium sulfate after harvest
Herbicide: GrazonNext (aminopyralid + 2,4-D) at 1 pt/A
[2]Mean, $LSD_{0.05}$, CV%: Considers tall fescue values only. NS: Not Significant.
[3]Mean, $LSD_{0.05}$, CV%: Considers wildrye values only.
[4]Mean, $LSD_{0.05}$, CV%: Considers wildrye and tall fescue values.

Table 11. Total 2016 dry matter yields of tall fescue and wildrye from Starkville, Holly Springs, and Newton pooled from across varieties and ecotypes.

Species	Newton	Starkville	Holly Springs
	lb/A	*lb/A*	*lb/A*
Tall Fescue	3898	5920	4568
Wildrye	2467	3355	3167
Mean	3182	4637	3867
$LSD_{0.05}$	552	940	649
CV%	27	31	26

Table 12. Stand ratings of tall fescue and wildrye varieties and ecotypes in Holly Springs, Starkville, and Newton, 2016.[1]

Variety/Ecotype	Holly Springs	Starkville	Newton
Tall Fescue			
Cajun II	4	2	5
DLFPS-FTF 54 Happe	4	3	5
DLFPS-FTF 82	3	3	5
DLFPS-FTF 93	1	4	5
DLFPS-FTF 96	3	3	5
DLFPS-FTF73	2	2	5
Dominate	2	1	5
K31	3	4	5
Marin 2 Protek	2	3	5
MSU Exp RL	5	4	5
Texoma MaxQ	4	5	5
Tower Protek	2	3	5
Wildrye			
Canada	1	1	1
River Bank	1	1	1
Southeastern	1	1	1
Virginia	1	1	1

[1]Stands evaluated between December 15 and December 20, 2016.
Ground cover/plant survival rating: 1 = 0–20%, 2 = 21–40%, 3 = 41–60%, 4 = 61–80%, and 5 = 81–100%

Table 13. 2016 tall fescue, wildrye, alfalfa, and clover seed sources.	
Variety	**Company**
Alfalfa	
NF12ALF0073	The Noble Foundation
Bulldog 505	MSU
Alfagraze 600 RR	MSU
GAMS1405FSH	University of Georgia
White Clover	
Neches	Barenburg
IS-TR 12	DLF
Patriot	MSU
Durana	MSU
Red Clover	
Renegade	DLF
IS-TP12	DLF
Southern Belle	MSU
Tall Fescue	
DLFPS-FTF 54 Happe	DLF
DLFPS-FTF 96	DLF
DLFPS-FTF 93	DLF
DLFPS-FTF73	DLF
DLFPS-FTF 82	DLF
Dominate	Allied Seed LLC
Tower Protek	DLF
Marin 2 Protek	DLF
Cajun II	Smith Seed Services
Wildrye	
Southeastern	MSU
Canada	MSU
Riverbank	MSU
Virginia	MSU

MS AGRICULTURAL AND
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The mission of the Mississippi Agricultural and Forestry Experiment Station and the College of Agriculture and Life Sciences is to advance agriculture and natural resources through teaching and learning, research and discovery, service and engagement which will enhance economic prosperity and environmental stewardship, to build stronger communities and improve the health and well-being of families, and to serve people of the state, the region and the world.

George M. Hopper, Director **www.mafes.msstate.edu**