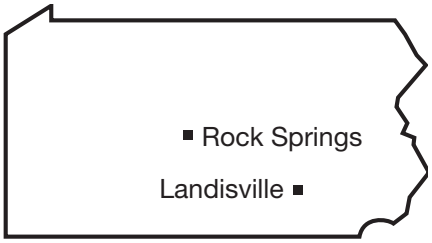
2016 Forage Trials Report

SUMMARY

The *2016 Forage Trials Report* summarizes performance data collected from ongoing forage trials at two sites in Pennsylvania. The report includes data from alfalfa and cool-season (forage) grass trials established at the Russell E. Larson Agricultural Research Center at Rock Springs and/or the Southeast Research and Extension Center at Landisville.



Summary of Forage Growing Conditions and Insect Pressure in 2016

Weather in April for forage planting was excellent across much of Pennsylvania. Then spotty heavy rains caused some soil crusting, which resulted in poor stands in some areas. More normal weather patterns occurred in May, which allowed a lot of first crops to be harvested without getting wet. The weather patterns then became mixed over much of the state with adequate rainfall in some areas and devastating drought in others. Ultimately, many forage producers were heading into the fall with a forage shortage. Fortunately, weather conditions during September and October were ideal for forage growth, which provided a saving final harvest for some producers.

Alfalfa weevil populations were generally low with few reported outbreaks. Potato leafhopper infestations were average across most of the state, but the dry weather in some areas caused leafhopper damage to be more pronounced than in areas with adequate precipitation. Cereal leaf mite damage continues to be a problem for timothy production in some areas.

Criteria for Reporting Varieties

Many varieties listed in this report are eligible for certification by seed-certifying agencies and are marketed in Pennsylvania (see Tables 1, 10, and 14). Some entries are experimental and may or may not be marketed in the future. Proprietary and public varieties are included; blends and "commons" are not included.

Interpreting Yield Data and Stand Scores

Yield summaries and stand scores for individual trials appear in Tables 2 through 9, and 11 through 18. Although the trials contain up to 40 total entries, many of these are advanced experimental varieties or not currently offered for sale in Pennsylvania. After these entries are named and/or become available for purchase in Pennsylvania, they will be included in future reports.

Experimental alfalfa entries that become named varieties will be footnoted as such. Newly named varieties will be published in the *Forage Trials Report* only if they are entered as a commercial variety in the next available trial.

Varieties are ranked according to their yield performance. In addition, yield totals for the previous harvest years are reported, as well as average yields over the life of the stand. It is important to evaluate the average yields as well as the yields obtained this year because performance over a three- to four-year period is valuable in a long-term forage rotation.

The stand score, a visual estimation of the amount of groundcover, is given following harvest in the fall. The stand score is reported on a scale from 1 to 100, with 100 considered a perfect stand. This score is valuable as an indicator of varietal persistence.

Please keep in mind when reviewing the yield and stand tables that differences between varieties are significant only if the least significant difference (LSD) between varieties is exceeded. LSD is the minimum difference between any two varieties necessary for us to be 95 percent confident that this difference is not attributable to mere chance. For example, if variety A is 0.50 ton per acre higher in yield than variety B, then this difference is statistically significant if the LSD is 0.50 or less. If the LSD is 0.51 or greater, then we cannot be confident that variety A really yields higher than B under given environmental and management conditions.

The value for coefficient of variation (CV) is a measure of relative variation useful in evaluating the precision achieved in an experiment. In grain and forage trials, for example, the CV for yield often is between 5 and 20 percent. Acceptable levels of the CV vary for each trait measured. Confidence in the reliability of the experimental results declines as the CV increases. Uncontrollable or immeasurable variations in soil fertility, soil drainage, and other environmental factors contribute to increased CV levels.

Figure 1. 2016 Precipitation at Rock Springs

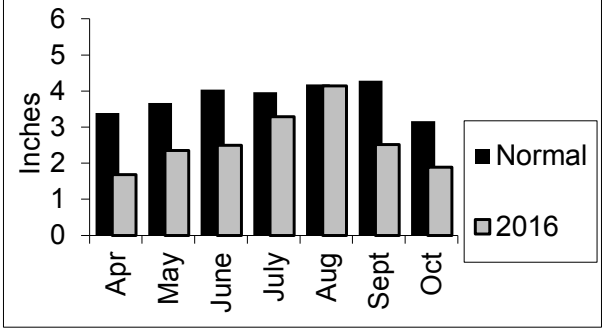


Figure 2. 2016 Precipitation at Landisville

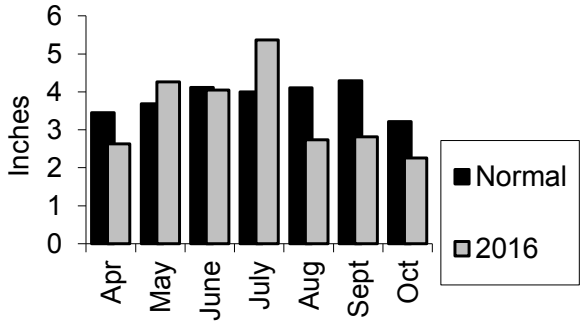


Figure 3. 2015 Precipitation at Rock Springs

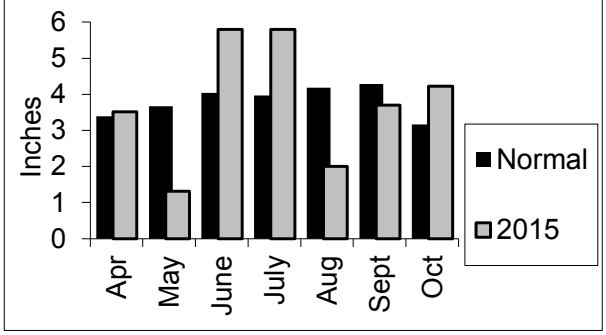


Figure 4. 2015 Precipitation at Landisville

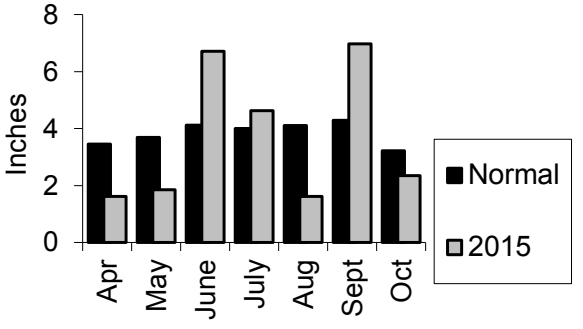


Figure 5. 2014 Precipitation at Rock Springs

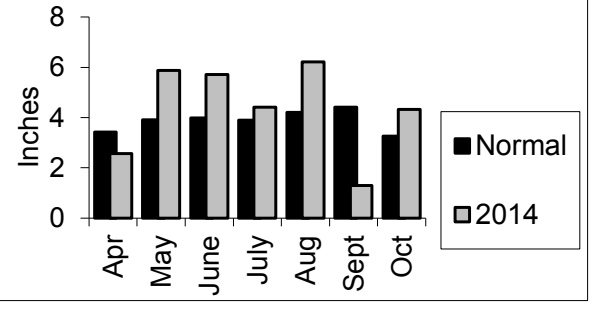


Figure 6. 2014 Precipitation at Landisville

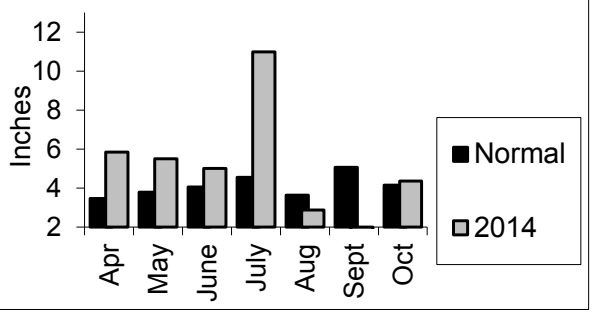


Figure 7. 2013 Precipitation at Rock Springs

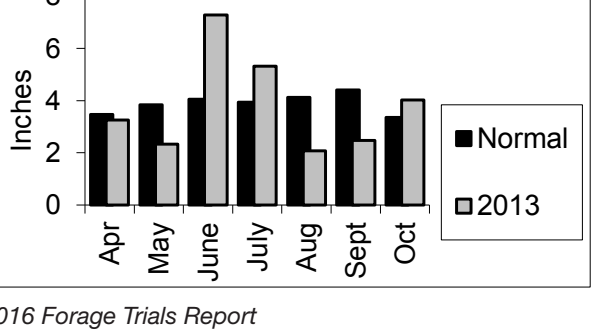
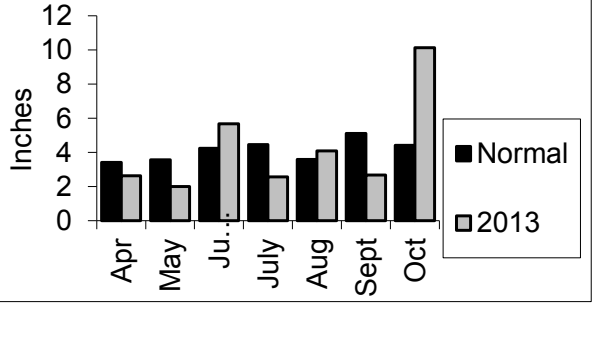


Figure 8. 2013 Precipitation at Landisville



ALFALFA

Many varieties of alfalfa exist, and selection of the appropriate variety is an important management decision. This report lists performance data for those varieties included in the Penn State Alfalfa Variety Testing Program. Evaluation trials include both commercially available and advanced experimental varieties. Trials are initiated each year at the Rock Springs and Landisville research stations. In each trial, collection of yield, stand, and other data continues for a maximum of four years or until the stand becomes so depleted that data collection is no longer worthwhile.

Trials at both locations are established on well-drained Hagerstown silt loam soils. Major site differences are likely to be reflected in the longer growing season, slightly elevated temperatures, and tendency toward late summer drought at the Landisville site.

Keep the following points in mind when evaluating alfalfa variety performance data:

- Selection of a variety on the basis of yield performance alone is generally less satisfactory than selections that also consider stand score and pest resistance.
- Conditions on most farms are such that several varieties may perform nearly equally. It usually is not necessary to rely on a single variety.
- No variety, regardless of its excellence, can thrive under poor management. Good management considers all aspects of alfalfa production, including seedbed preparation, lime and fertilizer, seeding, pest control, harvest, storage, and postharvest treatment. Many modern varieties are adapted to intensive management.

Fall Dormancy

Fall dormancy ratings of alfalfa range from 1 (very dormant) to 9 (having no dormancy). Varieties that have less fall dormancy (higher numerical rating) regrow faster after harvest and exhibit greater growth in the fall compared to those varieties with more fall dormancy (lower numerical rating).

Pest Resistance

Disease and insect resistance may be the most important attributes of an alfalfa variety. The ratings for pest resistance given in this report can serve as a good indicator of a variety's potential performance in your area. Be aware of your pest resistance needs and choose the appropriate varieties.

Sclerotinia stem and crown rot is becoming a serious concern for growers throughout the state because there is little plant resistance to the disease. Late summer no-till seedings seem to be more susceptible to the disease. Newly established seedlings are very susceptible to infection in the fall when the fungus is active. Plants are attacked rapidly by the pathogen and die the following spring. Plants established in the spring are more resistant to the pathogen and are not as severely damaged as the younger plants. The fungus survives as hard, black structures (sclerotia) on or near the soil surface. In the fall, the sclerotia produce spores that cause infection. Plowing buries sclerotia, thus reducing inoculum and subsequent infection.

Resistance to *Aphanomyces* can be found in some of the newest varieties. *Aphanomyces eutiches* is a soilborne fungus with behavior and requirements similar to *Phytophthora*. It is a wet-soil seedling pathogen and can be expected to thrive under cool, waterlogged conditions. Resistance may be beneficial when growing alfalfa on poorly drained soils. More specific information about many alfalfa diseases is included in the current *Penn State Agronomy Guide*.

Crown and root rot complex is still a problem. Because of the complexity of the pathogens involved, resistance to this disease is not very high in any variety. Good management slows the progress of this disease. More specific information is included in the current *Penn State Agronomy Guide*.

Plant breeders develop alfalfa varieties by selecting from genetically diverse populations. Within such populations, individual plants may vary widely in their response to a particular disease or insect. Some may be highly resistant and others very susceptible. A particular pest resistance rating usually reflects the response of the majority of plants in the variety. In our trials, varieties with the most pest resistance ratings of "moderate" or higher usually have shown better long-term performance.

Guidelines for Selecting Alfalfa Varieties

To select alfalfa varieties based on the trial results, follow these suggestions:

1. Determine which of the trial sites most resembles your farm in terms of soil and growing season. Performance data of varieties at this site are likely to provide more relevant selection information.
2. Look at the performances of the varieties at both trial sites. Varieties that do equally well at both sites are probably adapted to a wider range of environmental conditions.
3. Performance data over several years can be very useful in selecting a variety since some varieties seem to decline with age more rapidly than others.
4. For long-term rotations, the most recent harvest-year data should receive major consideration. If you plan to harvest the alfalfa for three years or less, then high performance during the early years should be given major consideration.
5. Disease- and pest-resistance ratings should be examined in relation to yield, especially if your area is known to have problems with alfalfa diseases and pests. For example, Phytophthora root rot resistance may be exceptionally important on farms with moderately to poorly drained soils.

Table 1 lists the marketers of alfalfa varieties included in this report, as well as the trial table numbers in which the varieties appear. Also included are fall dormancy ratings and selected disease- and insect-resistance ratings. Tables 2 through 9 offer guidelines for assessing the production potential of various alfalfa varieties.

Table 1. Alfalfa varieties marketed in Pennsylvania and listed in this report.

Fall dormancy ratings of alfalfa range from 1 (very dormant) to **9** (having no dormancy). Varieties that are less fall dormant (higher numerical rating) regrow faster after harvest and exhibit greater growth in the fall compared to those varieties with greater fall dormancy (lower numerical rating).

BW = Bacterial Wilt, **VW** = Verticillium Wilt, **FW** = Fusarium Wilt, **AN** = Anthracnose, **PRR** = Phytophthora Root Rot, **APH1** = Aphanomyces Race 1.

The Fall Dormancy and Pest Resistance Ratings in this table are from the National Alfalfa Alliance and/or the alfalfa variety breeder and have not been verified by Penn State.

Resistance Key (%): **S** = 0 to 5%; **LR** = 6 to 14%; **MR** = 15 to 30%; **R** = 31 to 50%; **HR** = 51% or greater; **—** = information not available.

Variety	Marketer	Pest Resistance Ratings							Appears in Table No.
		Fall Dormancy	BW	VW	FW	AN	PRR	APH1	
54QR04	DuPont Pioneer	4	HR	HR	HR	HR	HR	HR	3,7
55H94	DuPont Pioneer	5	HR	HR	HR	HR	HR	HR	3,7
55Q27	DuPont Pioneer	5	HR	HR	HR	HR	HR	HR	3,4,7,8
55V12	DuPont Pioneer	5	R	HR	HR	HR	HR	HR	8
55V50	DuPont Pioneer	5	HR	HR	R	HR	HR	HR	3,4,7,8
6585Q	NEXGROW	5	HR	HR	HR	HR	HR	HR	3
Crave	T.A. SEEDS	4	HR	HR	HR	HR	HR	HR	2,6
DG 4210	Dyna-Gro Seed	4	HR	HR	HR	HR	HR	HR	3,7
DKA 34-17 RR	DEKALB	4	HR	HR	HR	HR	HR	HR	2,6
DKA 41-18 RR	DEKALB	4	HR	HR	HR	HR	HR	HR	2,3,4,6,7,8
FF42.A2	La Crosse Seed	4	HR	HR	HR	HR	HR	HR	5,9
FSG 403 LR	SEEDWAY	4	HR	HR	R	HR	HR	HR	3,7
FSG 408 DP	SEEDWAY	4	HR	R	HR	HR	HR	HR	3,5,7,9
FSG 415 BR	SEEDWAY	4	HR	HR	HR	HR	HR	HR	5
FSG 424	SEEDWAY	4	HR	HR	HR	HR	HR	HR	3,5,7,9
FSG 426	SEEDWAY	4	HR	HR	HR	HR	HR	HR	5,9
428 RR	SEEDWAY/GROWMARK FS	4	HR	HR	HR	HR	HR	HR	3,5,7,9
FSG 505	SEEDWAY	5	HR	HR	HR	HR	HR	HR	2,6
FSG 524	SEEDWAY	5	HR	HR	HR	HR	HR	HR	3,7
GA 535	Merit Seed	5	HR	HR	HR	HR	HR	HR	3,7
Gemstone	Chemgro Seeds	4	HR	HR	HR	HR	HR	HR	2,6
Hi-Gest 360	Chemgro Seeds	3	HR	HR	HR	HR	HR	HR	8
HybriForce-3400	Dairyland Seed	4	HR	HR	HR	HR	HR	HR	6
L-449APH2	Legacy Seeds	4	HR	HR	HR	HR	HR	HR	2,6
L-455HD	Legacy Seeds	4	HR	HR	HR	HR	HR	HR	3,7
Magnitude	FS Seed	4	HR	HR	HR	HR	HR	HR	2,7
Magnum 7	Dairyland Seed	4	HR	HR	HR	HR	HR	HR	2
Magnum 7-Wet	Dairyland Seed	4	HR	HR	HR	HR	HR	HR	2
Mariner IV	FS Seed	4	HR	HR	HR	HR	HR	HR	2,7
Oneida VR	Public	3	R	HR	HR	MR	MR	—	2,3,5,6,7,8,9
Persist III	Doebler's	4	HR	HR	HR	HR	HR	HR	2,4,5,6,8,9
PGI 529	Alforex Seeds	5	HR	R	HR	HR	HR	HR	2,6
Plus III	Doebler's	4	HR	HR	HR	HR	HR	HR	5,9
Profusion HX	King's AgriSeeds	4	HR	HR	HR	HR	HR	HR	7
ReNew+	T.A. SEEDS	—	—	—	—	—	—	—	5
Shockwave BR	BrettYoung Seeds	4	HR	HR	HR	HR	HR	HR	2
Stockpile	Dairyland Seed	4	HR	HR	HR	HR	HR	HR	6
SW 5512Y	S&W Seed Company	5	HR	HR	HR	HR	HR	HR	5,9
SW 5909	S&W Seed Company	5	HR	HR	HR	HR	HR	HR	5,9
Vernal	Public	4	R	S	MR	S	S	S	2,3,4,5,6,7,8

Alfalfa Marketers Listed in This Report

Alforex Seeds
Woodland, CA 95695
Phone: 530-666-3331
Web: www.alforexseeds.com

BrettYoung Seeds
Winnipeg, MB M3V 1L5, Canada
Phone: 204-261-7932
Web: www.byseeds.com

Chemgro Seeds
E. Petersburg, PA 17520
Phone: 800-346-4769
Web: www.chemgro.com

Dairyland Seed
West Bend, WI 53095
Phone: 800-236-0163
Web: www.dairylandseed.com

DEKALB
St. Louis, MO 63167
Phone : 800-768-6387
Web: www.asgrowanddekalb.com

Doebler's
Jersey Shore, PA 17740
Phone: 570-753-3210
Web: www.doeblers.com

DuPont Pioneer
Elizabethtown, PA 17022
Phone: 717-367-9055
Web: pioneer.com

Dyna-Gro Seed
Holtwood, PA 17532
Phone: 717-284-5350
Web: www.dynagroseed.com

FS Seed
Bloomington, IL 61701
Phone: 309-557-6000
Web: www.fssystem.com

King's AgriSeeds
Ronks, PA 17572
Phone: 717-687-6224
Web: kingsagriseeds.com

La Crosse Seed
La Crosse, WI 54603
Phone: 608-783-9560
Web: www.lacrosseseed.com

Legacy Seeds
Scandinavia, WI 54977
Phone: 866-791-6390
Web: www.legacyseeds.com

Merit Seed
Millersburg, OH 44654
Phone: 330-893-3196
Web: meritseed.com

NEXGROW
Minnetonka, MN 55305
Phone: 800-445-0956
Web: www.plantnexgrow.com

S&W Seed Company
Fresno, CA 93720
Phone: 559-884-2535
Web: swseedco.com

SEEDWAY
Mifflinburg, PA
Phone: 800-338-2137
Web: seedway.com

T.A. SEEDS
Jersey Shore, PA 17740
Phone: 570-753-5503
Web: www.taseeds.com

Table 2. 2012 alfalfa variety trial—Rock Springs.

Variety	2016 Yield	2015 Yield	2014 Yield	2013 Yield	Four-year Average	Stand 9/19/2016
PGI 529*	11.05	12.47	9.98	7.98	**10.43**	87
Gemstone*	10.11	12.21	9.75	7.05	**9.77**	84
Persist III*	10.05	11.32	9.50	7.54	**9.66**	84
Magnitude*	9.10	10.92	8.91	6.90	**9.03**	83
Magnum 7*	8.90	9.92	8.54	6.93	**8.54**	82
DKA 41-18 RR	8.73	10.09	8.31	6.71	**8.46**	82
Crave*	8.28	9.58	8.22	7.16	**8.35**	82
Magnum 7-Wet	8.51	10.11	8.41	6.26	**8.29**	80
Shockwave BR*	8.78	9.68	7.89	6.54	**8.22**	83
Mariner IV	8.07	9.40	8.17	6.85	**8.12**	84
DKA 34-17 RR	8.17	10.17	7.69	6.21	**8.09**	81
FSG 505	7.70	9.56	7.66	6.27	**7.82**	83
L-449APH2	7.03	8.68	7.48	6.35	**7.42**	83
Vernal	6.23	7.88	6.62	5.22	**6.46**	81
Oneida VR	5.82	7.69	6.50	5.53	**6.37**	80
5312**	5.59	7.20	6.87	5.79	**6.30**	79
GRAND MEAN	**8.32**	**9.87**	**8.18**	**6.64**	**8.27**	**82**
CV (%)	**11.89**	**7.84**	**8.17**	**7.76**	**7.56**	**1.99**
LSD (p = 0.05)	**1.39**	**1.08**	**0.93**	**0.72**	**0.88**	**2.53**

*Variety tested with experimental seed that may or may not give performance similar to commercially available seed.
**Not commercially available.

CV = coefficient of variation
LSD = least significant difference

- Seeded April 5, 2012.
- Yields are given in tons per acre (DM basis).
- Yields indicated represent four cuttings.
- Stand score is based on a scale from 1 to 100. A 100 is considered a perfect stand.
- Grand mean, CV, and LSD values represent 28 total entries.
- Entries are ranked in order of decreasing yield based on the four-year average.
- Means are LSMeans derived from statistical analysis. Therefore, season or multiple-year totals may not be the arithmetic sum of individual cuts or years, respectively.

Table 3. 2013 alfalfa variety trial—Rock Springs.

Variety	2016 Yield	2015 Yield	2014 Yield	Three-year Average	Stand 9/19/2016
55Q27	9.94	11.32	9.11	**10.23**	86
55V50	9.25	10.62	9.33	**9.82**	85
FSG 524	8.96	10.72	9.15	**9.66**	83
DG 4210	9.31	10.52	8.58	**9.54**	90
6585Q	8.93	10.32	8.86	**9.45**	89
428 RR	8.69	10.39	8.90	**9.40**	90
GA 535	9.19	10.18	8.22	**9.24**	90
FSG 408 DP	8.44	9.68	8.73	**9.02**	84
54QR04	8.56	10.02	8.17	**9.00**	86
L-455HD	8.88	9.99	7.95	**8.99**	85
FSG 403 LR	8.39	9.68	8.38	**8.85**	82
DKA 41-18 RR	8.40	9.75	8.09	**8.79**	84
FSG 424	8.43	9.57	7.72	**8.62**	86
5454**	6.99	8.71	7.74	**7.87**	81
55H94	7.12	8.12	8.10	**7.86**	80
5312**	6.72	8.06	7.54	**7.47**	81
Vernal	6.70	7.73	7.20	**7.25**	77
Oneida VR	6.73	6.90	6.29	**6.71**	74
GRAND MEAN	**8.30**	**9.57**	**8.24**	**8.76**	**84**
CV (%)	**13.63**	**10.81**	**13.04**	**11.61**	**7.21**
LSD (p = 0.05)	**1.58**	**1.45**	**1.62**	**1.42**	**6.21**

*Variety tested with experimental seed that may or may not give performance similar to commercially available seed.
**Not commercially available.

CV = coefficient of variation
LSD = least significant difference

- Seeded April 11, 2013.
- Yields are given in tons per acre (DM basis).
- Yields indicated represent four cuttings.
- Stand score is based on a scale from 1 to 100. A 100 is considered a perfect stand.
- Grand mean, CV, and LSD values represent 32 total entries.
- Entries are ranked in order of decreasing yield based on the three-year average.
- Means are LSMeans derived from statistical analysis. Therefore, season or multiple-year totals may not be the arithmetic sum of individual cuts or years, respectively.

Table 4. 2014 alfalfa variety trial—Rock Springs.

Variety	2016 Yield	2015 Yield	Two-year Average	Stand 9/19/2016
55Q27	7.92	9.41	**8.71**	95
AFX065033**	8.04	9.21	**8.66**	96
Sundance III*/**	7.80	9.02	**8.44**	95
55V50	7.86	8.92	**8.43**	95
AFX094017**	7.39	8.65	**8.06**	94
Persist III	7.14	8.73	**7.99**	95
DKA 41-18 RR	6.78	8.68	**7.76**	94
AFX085029**	7.05	8.30	**7.72**	94
Vernal	5.90	7.99	**6.98**	95
GRAND MEAN	**7.32**	**8.77**	**8.08**	**95**
CV (%)	**14.71**	**9.07**	**10.68**	**0.95**
LSD (p = 0.05)	**1.51**	**1.11**	**1.21**	**1.56**

*Variety tested with experimental seed that may or may not give performance similar to commercially available seed.
**Not commercially available.

CV = coefficient of variation
LSD = least significant difference

- Seeded August 27, 2014.
- Yields are given in tons per acre (DM basis).
- Yields indicated represent four cuttings.
- Stand score is based on a scale from 1 to 100. A 100 is considered a perfect stand.
- Grand mean, CV, and LSD values represent 9 total entries.
- Entries are ranked in order of decreasing yield based on the two-year average.
- Means are LSMeans derived from statistical analysis. Therefore, season or multiple-year totals may not be the arithmetic sum of individual cuts or years, respectively.

Table 5. 2015 alfalfa variety trial—Rock Springs.

Variety	2016 Yield	Stand 9/19/2016
FF42.A2	**9.04**	97
SW 5909	**8.85**	97
Persist III	**8.64**	97
Plus III	**8.58**	98
FSG 426	**8.56**	97
ReNew+*	**8.43**	96
SW 5213**	**8.33**	95
4H400**	**8.24**	97
Vernal	**8.15**	96
FSG 408 DP	**8.15**	96
428 RR	**8.07**	95
SW 5512Y	**8.00**	97
FSG 424	**7.75**	96
5312**	**7.53**	95
FSG 415 BR	**7.14**	96
Oneida VR	**6.43**	94
GRAND MEAN	**8.20**	**96**
CV (%)	**9.22**	**1.11**
LSD (p = 0.05)	**1.06**	**2.10**

*Variety tested with experimental seed that may or may not give performance similar to commercially available seed.
**Experimental variety; not commercially available.

CV = coefficient of variation
LSD = least significant difference

- Seeded April 16, 2015.
- Yields are given in tons per acre (DM basis).
- Yields indicated represent four cuttings.
- Stand score is based on a scale from 1 to 100. A 100 is considered a perfect stand.
- Grand mean, CV, and LSD values represent 28 total entries.
- Entries are ranked in order of decreasing yield based on the total yield for 2016.
- Means are LSMeans derived from statistical analysis. Therefore, season or multiple-year totals may not be the arithmetic sum of individual cuts or years, respectively.

Table 6. 2012 alfalfa variety trial—Landisville.

Variety	2016 Yield	2015 Yield	2014 Yield	2013 Yield	Four-year Average	Stand 10/16/2016
Persist III*	11.27	9.06	9.17	6.91	**9.18**	85
Stockpile*	10.37	9.40	8.68	7.14	**8.99**	86
Gemstone*	10.14	9.18	8.47	6.51	**8.70**	86
Crave*	10.31	8.85	8.39	6.77	**8.64**	84
PGI 529*	9.94	9.16	8.13	6.84	**8.60**	86
HybriForce-3400	9.45	8.33	8.31	7.02	**8.18**	83
L-449APH2	9.73	8.38	8.02	6.45	**8.13**	84
DKA 41-18 RR	9.46	8.84	7.86	6.01	**8.11**	83
FSG 505	9.72	8.85	7.60	5.71	**8.03**	86
DKA 34-17 RR	8.96	9.25	8.14	5.57	**7.99**	85
5312**	8.52	8.74	8.15	6.00	**7.84**	84
Vernal	8.10	8.50	7.84	5.12	**7.41**	85
Oneida VR	7.82	7.77	7.17	5.32	**7.01**	84
GRAND MEAN	**9.56**	**8.70**	**8.20**	**6.30**	**8.20**	**84**
CV (%)	**9.29**	**8.84**	**9.09**	**17.25**	**7.85**	**4.11**
LSD (p = 0.05)	**1.24**	**1.08**	**1.18**	**1.52**	**0.90**	**4.14**

*Variety tested with experimental seed that may or may not give performance similar to commercially available seed.
**Experimental variety; not commercially available.

CV = coefficient of variation
LSD = least significant difference

- Seeded April 5, 2012.
- Yields are given in tons per acre (DM basis).
- Yields indicated represent five cuttings.
- Stand score is based on a scale from 1 to 100. A 100 is considered a perfect stand.
- Grand mean, CV, and LSD values represent 24 total entries.
- Entries are ranked in order of decreasing yield based on the four-year average.
- Means are LSMeans derived from statistical analysis. Therefore, season or multiple-year totals may not be the arithmetic sum of individual cuts or years, respectively.

Table 7. 2013 alfalfa variety trial—Landisville.

Variety	2016 Yield	2015 Yield	2014 Yield	Three-year Average	Stand 10/16/2016
Profusion HX*	10.63	9.48	9.73	**10.47**	87
GA 535	11.47	10.33	8.57	**10.45**	86
55Q27	11.49	9.39	8.83	**10.33**	85
FSG 403 LR	10.89	9.58	8.84	**10.19**	85
FSG 424	10.86	9.43	8.36	**10.01**	85
FSG 524	11.29	9.06	8.37	**9.83**	88
FSG 408 DP	10.48	9.60	8.05	**9.80**	85
L-455HD	10.66	9.33	7.97	**9.69**	85
Magnitude	10.33	10.26	7.32	**9.68**	84
Mariner IV	9.52	9.68	8.18	**9.54**	83
55V50	9.72	9.36	8.36	**9.52**	82
LS 905**	10.44	9.62	7.74	**9.42**	85
DKA 41-18 RR	9.31	9.65	7.74	**9.31**	83
54QR04	9.90	9.04	7.65	**9.21**	81
DG 4210	9.90	8.94	7.49	**9.17**	85
5454**	9.08	9.14	7.72	**9.01**	85
428 RR	9.84	8.40	7.78	**9.00**	83
5312**	7.83	9.27	7.78	**8.68**	84
55H94	8.38	9.48	7.36	**8.66**	84
Vernal	8.30	9.80	6.72	**8.65**	84
Oneida VR	8.14	9.68	7.10	**8.59**	82
GRAND MEAN	**9.90**	**9.35**	**8.05**	**9.47**	**84**
CV (%)	**11.00**	**13.44**	**9.68**	**7.22**	**3.45**
LSD (p = 0.05)	**1.52**	**1.76**	**1.09**	**0.96**	**3.21**

*Variety tested with experimental seed that may or may not give performance similar to commercially available seed.
**Experimental variety; not commercially available.

CV = coefficient of variation
LSD = least significant difference

- Seeded April 5, 2013.
- Yields are given in tons per acre (DM basis).
- Yields indicated represent five cuttings.
- Stand score is based on a scale from 1 to 100. A 100 is considered a perfect stand.
- Grand mean, CV, and LSD values represent 28 total entries.
- Entries are ranked in order of decreasing yield based on the three-year average.
- Means are LSMeans derived from statistical analysis. Therefore, season or multiple-year totals may not be the arithmetic sum of individual cuts or years, respectively.

Table 8. 2014 alfalfa variety trial—Landisville.

Variety	2016 Yield	2015 Yield	Two-year Average	Stand 10/23/2016
55Q27	11.51	12.87	**12.27**	96
55V50	11.76	11.55	**11.64**	96
AFXA113010**	12.05	11.45	**11.45**	95
AFX134089**	10.98	11.60	**11.39**	95
55V12	10.95	11.98	**11.21**	94
Hi-Gest 360*	9.79	11.88	**11.16**	95
Persist III	9.83	10.87	**10.77**	94
NY 13-30**	9.90	11.74	**10.73**	93
DKA 41-18 RR	9.98	11.19	**10.58**	94
Oneida VR	8.86	11.14	**9.97**	96
Vernal	8.70	10.63	**9.36**	96
NY 1233/38**	7.80	10.10	**9.20**	91
GRAND MEAN	**10.18**	**11.42**	**10.81**	**95**
CV (%)	**15.06**	**6.59**	**7.38**	**1.23**
LSD (p = 0.05)	**2.15**	**1.05**	**1.12**	**1.67**

*Variety tested with experimental seed that may or may not give performance similar to commercially available seed.
**Not commercially available.

CV = coefficient of variation
LSD = least significant difference

- Seeded April 5, 2014.
- Yields are given in tons per acre (DM basis).
- Yields indicated represent five cuttings.
- Stand score is based on a scale from 1 to 100. A 100 is considered a perfect stand.
- Grand mean, CV, and LSD values represent 12 total entries.
- Entries are ranked in order of decreasing yield based on the two-year average.
- Means are LSMeans derived from statistical analysis. Therefore, season or multiple-year totals may not be the arithmetic sum of individual cuts or years, respectively.

Table 9. 2015 alfalfa variety trial—Landisville.

Variety	2016 Yield	Stand 10/23/2016
FSG 408 DP	**11.15**	98
FSG 426	**10.83**	99
Persist III	**10.81**	98
SW 5909	**10.61**	98
428 RR	**10.58**	98
NY 1428*	**10.56**	98
Plus III	**10.53**	97
FF42.A2	**10.35**	99
SW 5512Y	**10.29**	98
Oneida VR	**10.10**	98
5312*	**10.08**	98
FSG 424	**10.07**	98
GRAND MEAN	**10.52**	**96**
CV (%)	**7.10**	**1.32**
LSD (p = 0.05)	**1.04**	**2.24**

*Not commercially available.

CV = coefficient of variation
LSD = least significant difference

- Seeded April 15, 2015.
- Yields are given in tons per acre (DM basis).
- Yields indicated represent five cuttings.
- Stand score is based on a scale from 1 to 100. A 100 is considered a perfect stand.
- Grand mean, CV, and LSD values represent 16 total entries.
- Entries are ranked in order of decreasing yield based on the total yield for 2016.
- Means are LSMeans derived from statistical analysis. Therefore, season or multiple-year totals may not be the arithmetic sum of individual cuts or years, respectively.

COOL-SEASON GRASSES

Tables 10 and 14 list cool-season perennial grass varieties in our testing program that are currently marketed in Pennsylvania or may be available in the near future (check with marketers for availability). Tables 11 through 13 and 15 through 18 offer guidelines for assessing the production potential of various grass varieties.

Perennial Cool-season Trial

Many farmers in Pennsylvania could benefit from including some cool-season grasses as an integral part of their forage program. The following tables summarize the yield potential of many perennial grass varieties in our research trials at Penn State's Russell E. Larson Research Center at Rock Springs.

Our soil fertility program is designed around maintenance applications of phosphorus and potash to meet the soil test requirements. Seventy pounds of available nitrogen are applied in early April with an additional 50 pounds applied after each harvest except the last one.

The first cutting in the perennial cool-season forage grass trials is made when an individual variety reaches mid- to late boot. Subsequent harvests are then made at intervals of 35 to 40 days, with the exception of the final harvest, when all plots are harvested on the same day. All plots are harvested four times throughout the growing season, weather permitting, except in the establishment year.

Although production for each cutting in a given year varies among species, most varieties produce one-third to one-half of the total annual production in the first cut. Yields are not greatly reduced if a three-cut system is used. Quality will be increased by early and frequent cutting. Choose a species that fits the farm's capabilities and the operator's management scheme. See the current *Penn State Agronomy Guide* for specific recommendations about establishment, fertilization, and other management considerations.

Table 10. Cool-season grass varieties marketed in Pennsylvania and listed in this report.

Species/Variety	Ploidy/Species	Marketer	Appears in Table No.
Bromegrass			
AC Success	Hybrid Brome	Allied Seed	11
Peak	Brome, Smooth	SEEDWAY/GROWMARK FS	11
York	Brome, Smooth	Ampac Seed Company	11
Meadow Fescue			
Cosmonaut	*Festuca pratense*	Barenbrug USA	12
Liherold	*Festuca pretense*	DSV-Eurograss	12
Pradel	*Festuca pretense*	Barenbrug USA	12,13
Tall Fescue			
Bardelice	Fescue, Tall	Barenbrug USA	13
Bardoux	Fescue, Tall	Barenbrug USA	13
BarElite	Fescue, Tall	Barenbrug USA	12
Bariane	Fescue, Tall	Barenbrug USA	13
Dominate	Fescue, Tall	Allied Seed	12
Jesup MaxQ	Fescue, Tall	Pennington	11
Kentucky 31	Fescue, Tall	Public	11,12
Lipalma	Fescue, Tall	DSV-Eurograss	12
Texoma MaxQ II	Fescue, Tall	Pennington	11
Tower	Fescue, Tall	DLF International Seeds	12
Festulolium			
Fedoro	Festulolium	DSV-Eurograss	12
Fojtan	Festulolium	DLF International Seeds	11,12
Gain	Festulolium	SEEDWAY	11
Mahulena	Festulolium	DLF International Seeds	12
Rebab	Festulolium	DLF International Seeds	12
Orchardgrass			
Bounty		SEEDWAY	11
Endurance	Dactylis	DLF International Seeds	11
Extend		SEEDWAY	11
Haymaster		GROWMARK FS	11
Inavale	Dactylis	DLF International Seeds	11
Olathe	Dactylis	DLF International Seeds	11
Pawnee		SEEDWAY	11
Pennlate		P.L. Rohrer	11,12
Ryegrass			
Albion	Tetraploid Perennial	Grassland Oregon	11,12
AstonChieftain	Diploid Perennial	DSV-Eurograss	12
Barvitra	Tetraploid Perennial	Barenbrug USA	13
Boost	Tetraploid Perennial	Allied Seed	11,12
Intrada	Tetraploid Perennial	DSV-Eurograss	12
Payday	Tetraploid Perennial	Mountain View Seeds	12,13
Pomposo	Tetraploid Perennial	DSV-Eurograss	12
Remington	Tetraploid Perennial	Barenbrug USA	13
TetraPrime	Tetraploid Perennial	Mountain View Seeds	12
Toronto	Diploid Perennial	DSV-Eurograss	12

Species/Variety	Ploidy/Species	Marketer	Appears in Table No.
Timothy			
Barfleo		Barenbrug USA	13
Climax		Public	11,12
Crest		SEEDWAY	11
Derby		GROWMARK FS	11
Presto		DSV-Eurograss	12
Summit		SEEDWAY	11
Tenho		Barenbrug USA	13
Mixes			
Equi-Gold		American Grass Seed Producers	12
GrassPro	Tall Fescue (49.7%), Orchardgrass (35.1%), Timothy (11.7%)	King's AgriSeeds	12
Tri-Star	Tall Fescue (39.8%), Festulolium (33.0%), Orchardgrass (25.2%)	King's AgriSeeds	12

Forage Grass Marketers Listed in This Report

Allied Seed
Macon, MO 63552
Phone: 800-880-8127
Web: www.alliedseed.com

American Grass Seed Producers
Tangent, OR 97389
Phone: 541-926-4611
Web: www.agsp.us

Ampac Seed Company
Tangent, OR 97389
Phone: 541-928-1651
Web: www.ampacseed.com

Barenbrug USA
Tangent, OR 97389
Phone: 541-926-5801
Web: www.barusa.com

DLF International Seeds
Halsey, OR 97348
Phone: 800-445-2251
Web: www.intlseed.com

DSV-Eurograss
Lipstadt, Germany
Web: www.dsv-saaten.de

Grassland Oregon
Salem, OR 97305
Phone: 503-566-9900
Web: www.grasslandoregon.com

GROWMARK FS
York, PA 17402
Phone: 800-338-4769
Web: www.growmarkfs.com

King's AgriSeeds
Ronks, PA 17572
Phone: 717-687-6224
Web: www.kingsagriseeds.com

Mountain View Seeds
Salem, OR 97305
Phone: 503-588-7333
Web: www.mtviewseeds.com

Pennington
Madison, GA 30650
Phone: 800-285-7333
Web: www.pennington.com

P.L. Rohrer & Bro.
Smoketown, PA 17576
Phone: 717-299-2571
Web: www.rohrerseeds.com

SEEDWAY
Mifflinburg, PA 17844
Phone: 800-338-2137
Web: www.seedway.com

Table 11. 2013 cool-season grass variety trial—Rock Springs.

	First Cut Date*	2016 Yield	2015 Yield	2015 Yield	Three-year Average	Stand 10/28/2016	30-hour NDFD
Bromegrass							
York		3.41	3.56	6.90	**4.63**	85	81
AC Success		3.42	4.12	6.31	**4.62**	85	83
Peak		3.17	3.52	6.55	**4.41**	83	82
GRAND MEAN		**3.33**	**3.74**	**6.59**	**4.55**	**84**	**82**
CV (%)		**11.86**	**11.02**	**7.52**	**7.05**	**6.57**	
LSD (p = 0.05)		**ns**	**ns**	**ns**	**ns**	**ns**	
Tall Fescue							
PPG-FTF-101**	5/12	4.07	5.60	8.52	**6.06**	96	71
Texoma MaxQ II	5/12	3.64	5.61	8.76	**6.01**	96	74
Jesup MaxQ	5/12	3.50	4.99	9.30	**5.93**	97	73
KYFA9821/AR584**	5/12	3.81	5.12	8.62	**5.85**	97	75
KYFA9301/AR584**	5/12	3.95	5.19	8.12	**5.75**	96	75
AGRFA-200 AR584**	5/19	3.48	5.04	8.12	**5.55**	96	78
Kentucky 31	5/16	2.96	5.23	8.26	**5.48**	96	78
GT213 AR584**	5/16	3.02	4.95	8.47	**5.48**	96	75
AGRFA-179 AR584**	5/16	3.16	5.12	7.65	**5.31**	95	78
AGRFA-178 AR584**	5/16	3.00	5.17	7.69	**5.29**	97	79
PPG-FTF-104**	5/16	2.76	4.67	7.99	**5.14**	96	74
GRAND MEAN		**3.39**	**5.16**	**8.32**	**5.62**	**96**	**75**
CV (%)		**14.18**	**9.47**	**10.35**	**7.71**	**0.90**	
LSD (p = 0.05)		**0.69**	**0.71**	**1.24**	**0.62**	**1.25**	
Festulolium							
Fojtan	5/12	3.25	6.16	8.11	**5.84**	91	78
Gain	5/19	2.84	3.63	6.26	**4.24**	81	84
GRAND MEAN		**3.04**	**4.90**	**6.56**	**5.04**	**86**	**81**
CV (%)		**22.19**	**6.31**	**11.85**	**10.05**	**4.85**	
LSD (p = 0.05)		**ns**	**0.70**	**1.35**	**1.14**	**9.40**	
Orchardgrass							
Endurance	5/12	4.24	5.60	8.77	**6.20**	91	76
Pennlate	5/12	4.15	5.22	8.41	**5.93**	92	76
Olathe	5/12	3.84	5.43	8.46	**5.91**	92	79
Pawnee	5/12	3.88	5.37	8.47	**5.91**	91	79
PPG-OG-103**	5/16	4.01	5.52	8.08	**5.87**	92	78
Extend	5/12	3.74	5.22	8.53	**5.83**	90	78
Bounty	5/12	3.96	4.82	8.65	**5.81**	93	78
Haymaster	5/12	3.74	4.89	8.68	**5.77**	91	79

	First Cut Date*	2016 Yield	2015 Yield	2015 Yield	Three-year Average	Stand 10/28/2016	30-hour NDFD
PPG-OG-106**	5/16	3.27	5.43	8.54	**5.74**	91	79
Inavale	5/12	3.69	4.74	8.63	**5.69**	90	81
GRAND MEAN		**3.85**	**5.22**	**8.52**	**5.86**	**91**	**78**
CV (%)		**13.35**	**10.53**	**7.49**	**6.69**	**2.74**	
LSD (p = 0.05)		**0.75**	**0.80**	**ns**	**ns**	**3.63**	
Ryegrass							
Boost	5/25	3.38	4.05	6.26	**4.56**	90	81
GO-AX12**	5/25	3.81	4.21	5.55	**4.52**	83	78
PPG-LHF-104**	5/31	2.83	4.44	5.80	**4.36**	88	80
Albion	6/6	2.11	2.40	5.83	**3.45**	92	76
GRAND MEAN		**3.03**	**3.77**	**6.56**	**4.22**	**88**	**79**
CV (%)		**15.07**	**9.07**	**11.85**	**7.87**	**2.22**	
LSD (p = 0.05)		**0.73**	**0.55**	**1.35**	**0.53**	**3.13**	
Timothy							
TM0801**	5/19	5.54	5.33	9.20	**6.69**	85	76
Derby	5/19	4.38	4.19	8.34	**5.64**	83	78
Summit	5/19	4.41	4.79	7.35	**5.45**	92	78
TM0802**	5/25	3.59	4.63	7.67	**5.30**	90	73
Crest	5/25	4.08	4.16	7.03	**5.15**	90	75
Climax	5/31	3.60	4.00	6.85	**4.81**	90	72
GRAND MEAN		**4.26**	**4.52**	**7.74**	**5.50**	**88**	**75**
CV (%)		**15.82**	**15.00**	**10.48**	**10.92**	**7.27**	
LSD (p = 0.05)		**1.02**	**1.02**	**1.53**	**0.91**	**ns**	
Overall							
GRAND MEAN		**3.60**	**4.78**	**7.73**	**5.39**	**91**	**77.40**
CV (%)		**17.90**	**11.17**	**11.63**	**10.01**	**4.31**	
LSD (p = 0.05)		**0.90**	**0.75**	**1.26**	**0.75**	**5.50**	

*Date when the first cutting was made in 2016. First cutting was made at the early boot stage.
**Experimental variety; not commercially available.

CV = coefficient of variation
LSD = least significant difference
ns = not significant

- Seeded April 26, 2013.
- Yields are given in tons per acre (DM basis).
- The overall grand mean, CV, and LSD values represent 37 total entries.
- Variety means are derived from LSMeans.
- Yields indicated represent the sum of four cuttings.

Table 12. 2014 cool-season grass variety trial—Rock Springs.

	First Cut Date*	2016 Yield	2015 Yield	Two-year Average	Stand 10/15/2016	30-hour NDFD
Meadow Fescue						
Cosmonaut	5/19	3.69	5.57	**4.63**	92	71
Liherold	5/16	3.77	5.23	**4.50**	91	77
Pradel	5/19	3.29	5.58	**4.43**	92	69
GRAND MEAN		**3.58**	**5.46**	**4.52**	**92**	**72**
CV (%)		**13.37**	**6.60**	**7.09**	**1.93**	
LSD (p = 0.05)		**ns**	**ns**	**ns**	**ns**	
Tall Fescue						
Tower	5/15	4.37	8.13	**6.25**	98	66
FSG 402 TF	5/12	4.93	7.25	**6.09**	98	71
DLFPS FTF 82**	5/12	4.76	7.27	**6.01**	95	66
Kentucky 31	5/13	4.29	7.55	**5.92**	97	71
FAF3/08-139**	5/19	4.47	7.29	**5.88**	98	63
TF0705SL**	5/13	4.48	7.16	**5.82**	97	71
DLFPS FTF 84**	5/12	4.40	7.09	**5.75**	98	68
Dominate	5/12	4.57	6.76	**5.66**	97	66
BarElite	5/16	4.67	6.47	**5.57**	97	62
Lipalma	5/12	4.23	6.71	**5.47**	98	66
BAR FAF 131**	5/12	4.39	6.36	**5.38**	98	66
BAR FABLD**	5/13	4.04	6.70	**5.37**	98	69
GRAND MEAN		**4.47**	**7.06**	**5.76**	**97**	**67**
CV (%)		**12.17**	**7.79**	**7.32**	**1.66**	
LSD (p = 0.05)		**0.78**	**0.79**	**0.61**	**2.30**	
Festulolium						
Mahulena	5/12	4.71	7.51	**6.11**	97	65
Rebab	5/19	3.90	6.32	**5.11**	97	67
Fojtan	5/12	3.94	5.84	**4.89**	97	68
Fedoro	5/19	3.28	6.03	**4.65**	93	66
GO-13GX**	5/19	3.37	4.64	**4.00**	94	75
GRAND MEAN		**3.84**	**6.07**	**4.95**	**96**	**68**
CV (%)		**8.51**	**8.34**	**4.92**	**1.36**	
LSD (p = 0.05)		**0.50**	**0.78**	**0.38**	**2.00**	
Orchardgrass						
FSG 506 OG	5/12	5.59	6.84	**6.22**	94	80
OGO604WH**	5/12	5.09	6.76	**5.93**	94	78
Pennlate	5/12	5.16	6.30	**5.73**	93	78
GRAND MEAN		**5.28**	**6.63**	**5.96**	**93**	**79**
CV (%)		**5.39**	**8.55**	**5.89**	**1.34**	
LSD (p = 0.05)		**0.49**	**ns**	**ns**	**ns**	

	First Cut Date*	2016 Yield	2015 Yield	Two-year Average	Stand 10/15/2016	30-hour NDFD
Ryegrass						
TetraPrime	5/31	3.36	6.15	**4.75**	91	73
Intrada	5/31	2.95	5.69	**4.32**	93	68
Boost	5/25	3.70	4.91	**4.31**	92	68
GO-AX-11**	5/31	3.69	4.78	**4.23**	92	71
Toronto	5/25	2.70	5.73	**4.22**	95	70
Payday	5/31	2.93	5.33	**4.13**	95	73
GO-13AXT**	5/25	3.10	5.02	**4.06**	94	73
AstonChieftain	6/6	3.06	4.98	**4.02**	92	67
Albion	6/6	2.58	5.29	**3.94**	92	66
Pomposo	5/31	2.68	5.17	**3.93**	92	67
GRAND MEAN		**3.07**	**5.31**	**4.19**	**93**	**70**
CV (%)		**13.54**	**9.38**	**6.99**	**1.66**	
LSD (p = 0.05)		**0.63**	**0.72**	**0.43**	**2.32**	
Timothy						
Express II	6/6	5.49	7.21	**6.35**	95	65
Climax	6/6	4.90	6.68	**5.79**	94	62
Presto	6/6	4.86	6.38	**5.62**	95	64
GRAND MEAN		**5.08**	**6.76**	**5.76**	**97**	**64**
CV (%)		**8.05**	**6.21**	**7.32**	**1.66**	
LSD (p = 0.05)		**ns**	**0.73**	**0.61**	**ns**	
Mixes						
GrassPro		4.92	6.45	**5.69**	95	75
Tri-Star		4.54	5.97	**5.25**	93	75
BAR FAFP**		3.96	6.14	**5.05**	94	70
Equi-Gold		4.52	5.30	**4.91**	95	78
GRAND MEAN		**4.49**	**5.97**	**5.23**	**94**	**75**
CV (%)		**10.76**	**7.53**	**7.20**	**1.47**	
LSD (p = 0.05)		**0.77**	**0.72**	**0.60**	**ns**	
Overall						
GRAND MEAN		**4.08**	**6.21**	**5.14**	**95**	
CV (%)		**12.74**	**8.02**	**7.23**	**1.84**	
LSD (p = 0.05)		**0.73**	**0.70**	**0.52**	**2.44**	

*Date when the first cutting was made in 2015. First cutting was made at the early boot stage.
**Experimental variety; not commercially available.

CV = coefficient of variation
LSD = least significant difference
ns = not significant

- Seeded April 26, 2013.
- Yields are given in tons per acre (DM basis).
- Grand mean, CV, and LSD values represent 37 total entries.
- Variety means are derived from LSMeans.
- Yields indicated represent the sum of four cuttings.

Table 13. 2015 cool-season grass variety trial—Rock Springs.

	First Cut Date*	2016 Yield	Stand 10/15/2016	30-hour NDFD
Meadow Fescue				
Pradel	5/19	**6.29**	98	63
DSV 15-12**	5/19	**5.83**	98	65
BAR FPF32**	5/19	**5.68**	98	69
GRAND MEAN		**5.93**	**98**	**65.7**
CV (%)		**7.02**	**0.60**	
LSD (p = 0.05)		**0.61**	**ns**	
Tall Fescue				
DLFPS-FTF-73**	5/13	**7.58**	97	62
Bardoux	5/16	**7.45**	98	64
BAR FA 13131**	5/16	**7.00**	97	57
Bardelice	5/19	**6.94**	97	60
DLFPS-FTF-70**	5/13	**6.65**	97	49
Bariane	5/19	**6.22**	97	59
GRAND MEAN		**6.98**	**97**	**58.5**
CV (%)		**5.31**	**0.98**	
LSD (p = 0.05)		**0.56**	**ns**	
Festulolium				
Mahulena	5/12	**7.20**	98	55
GRAND MEAN		**7.20**	**98**	**55**
CV (%)		**ns**	**ns**	**ns**
LSD (p = 0.05)		**ns**	**ns**	**ns**
Orchardgrass				
OG0707**	5/12	**7.79**	98	62
DSV 15-11**	5/12	**6.86**	97	63
DSV 15-10**	5/31	**6.62**	97	56
DSV 15-09**	5/19	**6.04**	97	63
GRAND MEAN		**6.83**	**97**	**61**
CV (%)		**4.90**	**0.51**	
LSD (p = 0.05)		**0.54**	**0.80**	

	First Cut Date*	2016 Yield	Stand 10/15/2016	30-hour NDFD
Ryegrass				
Barvitra	5/12	**8.39**	97	65
LPTNEAROM**	5/31	**7.79**	97	55
DSV 15-03**	5/31	**7.72**	96	53
Remington	5/25	**7.62**	97	61
DSV 15-02**	5/16	**7.16**	97	67
DSV 15-06**	5/31	**7.14**	97	53
Payday	5/25	**6.90**	98	53
DSV 15-05**	6/6	**6.63**	98	53
DSV 15-01**	5/19	**6.57**	97	64
DSV 15-04**	6/6	**6.23**	98	58
GRAND MEAN		**7.21**	**97**	**58.2**
CV (%)		**4.40**	**0.90**	
LSD (p = 0.05)		**0.46**	**1.30**	
Timothy				
Barfleo	6/6	**7.30**	97	45
DSV 15-07**	5/31	**7.00**	96	47
DSV 15-08**	5/25	**6.81**	98	55
Tenho	6/6	**6.67**	97	49
GRAND MEAN		**6.95**	**97**	**49**
CV (%)		**4.46**	**0.84**	
LSD (p = 0.05)		**0.50**	**1.31**	
Overall				
GRAND MEAN		**6.93**	**97**	
CV (%)		**5.65**	**0.88**	
LSD (p = 0.05)		**0.55**	**1.20**	

*Date when the first cutting was made in 2016. First cutting was made at the early boot stage.
**Not commercially available.

CV = coefficient of variation
LSD = least significant difference
ns = not significant

- Seeded September 1, 2015.
- Yields are given in tons per acre (DM basis).
- Overall Grand Mean, CV, and LSD values represent 29 total entries.
- Variety means are derived from LSMeans.
- Yields indicated represent the sum of four cuttings.

2015–2016 Short-lived Cool-season Grass Trial

In fall 2015, a Short-lived Cool-Season Grass Trial was seeded at Rock Springs. The trial was planted on September 18, 2015. There were two different management treatments: a single-cut system and a multi-cut system. The cereal grasses were cut using the single-cut system and the annual ryegrasses were cut using the multi-cut system. Some of the ryegrass varieties were entered in both cutting systems. With the multi-cut system, grasses were cut about every three weeks and the plots were cut three different times based on maturity. The first cut was taken at flag leaf (target 20 inches). The varieties in the single-cut system were cut when they reached the early to mid-boot stage. Cutting started on May 2 and was completed June 13. Our soil fertility program is designed around maintenance applications of phosphorous and potash to meet soil test requirements. Plots received 30 units in the fall, 100 units of nitrogen in the spring at green-up, and 50 units after each cutting for the multi-cut system. See the current *Penn State Agronomy Guide* for specific recommendations about establishment, fertilization, and other management considerations.

Table 14. Short-Lived grass varieties listed in this report.

Variety	Species	Marketer	Appears in Table No.
Annual Ryegrass			
Allegro	Italian Ryegrass	King's AgriSeeds	15
Andes	Annual Ryegrass	DLF Pickseed	15
Attain	Annual Ryegrass	Smith Seed Services	15
Barmultra II	Italian Ryegrass	Barenbrug USA	15,16
Barprisma	Italian Ryegrass	Barenbrug USA	16
Centurion	Annual Ryegrass	Mountain View Seeds	15,16
Fria	Annual Ryegrass	SEEDWAY/GROWMARK FS	15
Grasshancer 100W	Italian Ryegrass	DLF Pickseed	15
Jackson	Annual Ryegrass	Wax Company	15,16
Kodiak	Annual Ryegrass	DLF Pickseed	15
Kospeed	Italian Ryegrass	Smith Seed Services	15
Kowinearly	Italian Ryegrass	Smith Seed Services	15
M2CVS	Annual Ryegrass	Wax Company	15
Marshall	Annual Ryegrass	Wax Company	15,16
McKinley	Annual Ryegrass	DLF Pickseed	15
ME-4	Annual Ryegrass	Wax Company	15
ME-94	Annual Ryegrass	Wax Company	15
Meroa	Italian Ryegrass	Smith Seed Services	15
MO-1	Annual Ryegrass	DLF Pickseed	15
Nelson	Annual Ryegrass	Wax Company	15,16
TetraPrime	Italian Ryegrass	Mountain View Seeds	15,16
Cereals			
Bolt	Triticale	King's AgriSeeds	17
Hy Octane	Triticale	SEEDWAY	17
Traction	Triticale	GROWMARK FS	17
Trical 336	Triticale	Syngenta	17
Trical 815	Triticale	Syngenta	17
Clover			
Border		S&W Seed Company	18
SunUp*			18
Hairy Vetch			
Purple Bounty		Allied Seed	18
Mixes			
FS Cover 1		GROWMARK FS	18
FS Cover 2		GROWMARK FS	18
FS Cover 3		GROWMARK FS	18
FS Cover 4		GROWMARK FS	18
King's Soil Builder Plus	Trical, Crimson clover (66.7%), hairy vetch, annual ryegrass, daikon radish	King's AgriSeeds	18

*Not commercially available.

Forage Grass Marketers Listed in This Report

Allied Seed
Macon, MO 63552
Phone: 800-880-8127
Web: www.alliedseed.com

Barenbrug USA
Tangent, OR 97321
Phone: 541-926-5801
Web: www.barusa.com

Cover Crop Solutions
Robesonia, PA 19551
Phone: 800-767-9441
Web: www.covercropsolutions.com

DLF Pickseed
Halsey, OR 97348
Phone: 800-445-2251
Web: www.pickseed.com

Grassland Oregon
Salem, OR 97305
Phone: 503-566-9900
Web: www.grasslandoregon.com

GROWMARK FS
York, PA 17402
Phone: 800-338-4769
Web: www.growmarkfs.com

King's AgriSeeds
Ronks, PA 17572
Phone: 717-687-6224
Web: kingsagriseeds.com

Mountain View Seeds
Salem, OR 97305
Phone: 503-588-7333
Web: www.mtviewseeds.com

S&W Seed Company
Fresno, CA 93720
Phone: 559-884-2535
Web: swseedco.com

SEEDWAY
Mifflinburg, PA 17844
Phone: 800-338-2137
Web: www.seedway.com

Smith Seed Services
Halsey, OR 97348
Phone: 541-369-2831
Web: www.smithseed.com

Syngenta
Minnetonka, MN 55305
Phone: 800-445-0956
Web: www.syngentaseeds.com

Wax Company
Amory, MS 38821
Phone: 662-256-3511

Table 15. Annual ryegrass—multiple cut.

Variety	Species	Harvest Date	DM Yield (tons/acre)				First Cut Analysis	
			Cut 1	Cut 2	Cut 3	Total	CP (%)	30-hour NDFD
ME-4*	Ryegrass	5/2, 5/23, 6/13	3.66	1.12	1.55	**6.34**	14.7	77
Marshall	Ryegrass	5/2, 5/23, 6/13	3.40	1.01	1.41	**5.83**	14.3	66
Meroa	Italian	5/2, 5/23, 6/13	2.68	1.38	1.75	**5.81**	18.2	68
Centurion	Ryegrass	5/2, 5/23, 6/13	3.05	1.04	1.57	**5.65**	14.7	69
McKinley	Ryegrass	5/2, 5/23, 6/13	3.03	1.00	1.58	**5.61**	15.4	66
Jackson	Ryegrass	5/2, 5/23, 6/13	3.20	1.04	1.36	**5.60**	15.5	65
BAR LM 15427*		5/2, 5/23, 6/13	2.55	1.21	1.83	**5.59**	18.1	68
Allegro	Italian	5/2, 5/23, 6/13	2.42	1.33	1.75	**5.50**	16	64
DLFPS-LWT27*		5/2, 5/23, 6/13	2.53	0.98	1.98	**5.50**	18.7	66
BAR LM 15425*		5/2, 5/23, 6/13	2.48	1.24	1.55	**5.27**	17.8	69
Attain	Ryegrass	5/2, 5/23, 6/13	2.66	1.04	1.56	**5.26**	16.8	66
BAR LM 15426*		5/2, 5/23, 6/13	2.40	1.17	1.67	**5.24**	15.8	67
Grasshancer 100W	Italian	5/2, 5/23, 6/13	2.85	0.88	1.48	**5.22**	15	63
Nelson	Ryegrass	5/2, 5/23, 6/13	2.46	1.04	1.67	**5.16**	16.9	66
BAR LM 15371*		5/2, 5/23, 6/13	2.37	1.28	1.50	**5.15**	18.6	65
Fria	Ryegrass	5/2, 5/23, 6/13	2.87	0.89	1.37	**5.13**	15.4	66
M2CVS*		5/2, 5/23, 6/13	2.70	1.07	1.33	**5.11**	15.1	64
PPG-LMT 102*		5/2, 5/23, 6/13	1.62	1.59	1.89	**5.10**	23.1	67
Kodiak	Ryegrass	5/2, 5/23, 6/13	2.65	0.93	1.46	**5.05**	16.8	66
TetraPrime	Italian	5/2, 5/23, 6/13	1.56	1.75	1.61	**4.93**	18.5	68

Continued

Table 15. Annual ryegrass—multiple cut (continued).

Variety	Species	Harvest Date	DM Yield (tons/acre)				First Cut Analysis	
			Cut 1	Cut 2	Cut 3	Total	CP (%)	30-hour NDFD
Barmultra II	Italian	5/2, 5/23, 6/13	1.94	1.32	1.66	**4.93**	18.8	67
ME-94*		5/2, 5/23, 6/13	2.70	0.99	1.23	**4.92**	13.2	59
MO-1*	Ryegrass	5/2, 5/23, 6/13	2.86	0.83	1.17	**4.86**	14.9	66
Kowinearly	Italian	5/2, 5/23, 6/13	2.68	0.88	1.22	**4.78**	18	67
Kospeed	Italian	5/2, 5/23, 6/13	2.78	0.84	1.11	**4.73**	19.3	59
Andes	Ryegrass	5/2, 5/23, 6/13	2.07	0.97	1.55	**4.59**	17.6	70
PPG-TAR-113*		5/9, 6/6	1.88	1.75	n/a	**3.63**	17.3	64
GRAND MEAN			**2.59**	**1.13**	**1.53**	**5.20**	**16.8**	**66.0**
CV (%)			**11.09**	**11.75**	**12.52**	**8.66**		
LSD (p = 0.05)			**0.40**	**0.19**	**0.27**	**0.63**		

*Not commercially available.

CV = coefficient of variation
LSD = least significant difference

- Planted September 18, 2015.
- Yields are given in tons per acre (DM basis).
- Stand score is based on a scale of 1 to 100. A 100 is considered a perfect stand.
- Grand mean, CV, and LSD values represent 27 total entries.
- Means are derived from LSMeans.
- Varieties are ranked by total yield.

Table 16. Annual ryegrass—single cut.

Variety	Species	Harvest Date	Yield	First Cut Analysis	
				CP (%)	30-hour NDFD
Centurion	Ryegrass	5/13	**5.06**	12.5	77
BAR LM 15426*		5/13	**4.42**	13.3	74
Marshall	Ryegrass	5/11	**4.30**	12.6	73
Jackson	Ryegrass	5/11	**4.21**	13.4	72
TetraPrime	Italian	5/16	**4.06**	17.3	76
Barmultra II	Italian	5/13	**3.83**	14.7	73
Nelson	Ryegrass	5/11	**3.80**	14.1	72
BAR LM 15427*		5/11	**3.66**	15.1	74
BAR LM 15425*		5/11	**3.39**	15.8	77
BAR LM 15371*		5/11	**3.38**	13.8	77
GRAND MEAN			**3.72**	**14.3**	**75**
LSD (p = 0.05)			**0.21**		
CV (%)					

*Not commercially available.

CV = coefficient of variation
LSD = least significant difference

- Planted September 18, 2015.
- Yields are given in tons per acre (DM basis).
- Stand score is based on a scale of 1 to 100. A 100 is considered a perfect stand.
- Grand mean, CV, and LSD values represent 10 total entries.
- Means are derived from LSMeans.
- Varieties are ranked based on total yield.

Table 17. Short-season cereals forage trial.

Variety	Species	Harvest Date	Yield	First Cut Analysis	
				CP (%)	30-hour NDFD
505*	Triticale	5/9	**4.62**	11.4	74
Trical 815	Triticale	5/6	**4.15**	15.5	77
504*	Triticale	5/9	**4.13**	15.3	77
154	Triticale	5/2	**4.03**	14.7	69
Trical 336	Triticale	5/6	**3.94**	14.9	72
511*	Triticale	5/9	**3.93**	14.7	74
501*	Triticale	5/6	**3.73**	14.1	75
503*	Triticale	5/11	**3.67**	13.2	76
Traction	Triticale	5/6	**3.66**	14.7	75
Hy Octane	Triticale	5/2	**3.59**	15.7	77
502*	Triticale	5/2	**3.39**	17.2	80
Bolt	Triticale	5/2	**3.27**	17.1	73
509*	Triticale	5/2	**2.94**	17.4	79
Rye Check VNS**	Rye	4/29	**2.75**	18.6	78
508*	Triticale	5/2	**2.62**	15.2	73
512*	Triticale	5/2	**2.52**	14.7	74
513*	Triticale	5/9	**2.46**	12	74
510*	Triticale	5/2	**2.44**	15.9	77
BCWR15WR1*	Rye	4/29	**2.24**	21.1	81
GRAND MEAN			**3.54**	**15.4**	**75**
LSD (p = 0.05)			**0.41**		
CV (%)			**8.32**		

*Not commercially available.
**Variety not stated.

CV = coefficient of variation
LSD = least significant difference

- Planted September 18, 2015.
- Yield is given in tons per acre (DM basis).
- Stand score based on a scale of 1 to 100. A 100 is considered a perfect stand.
- Grand mean, CV, and LSD values represent 19 total entries.
- Means are derived from LSMeans.
- Varieties are ranked based on yield.

Table 18. Short-season forage mixes.

Variety (Multiple Cut)	Species	Harvest Date	Yield				First Cut Analysis	
			Cut 1	Cut 2	Cut 3	Total	CP (%)	30-hour NDFD
FS Cover 1	Mix	5/2, 5/23, 6/13	2.54	1.29	2.22	**6.05**	17	67
FS Cover 4	Mix	5/2, 5/23, 6/13	2.13	1.18	1.88	**5.19**	19.9	67
Purple Bounty	Hairy vetch	5/13, 6/13	2.23	0.82	n/a	**3.05**	23.8	71
SunUp*	Clover	5/16, 6/13	1.27	0.87	n/a	**2.13**	22.5	45
FS Cover 3	Mix	5/16, 6/17	0.61	0.65	n/a	**1.25**	25.7	59
Border	Clover	5/16	0.65	n/a	n/a	**0.65**	24.4	70
GRAND MEAN			**1.57**	**0.96**	**2.05**	**3.53**	**21.8**	**62**
CV (%)			**14.25**	**13.33**	**5.96**	**7.79**		
LSD (p = 0.05)			**0.34**	**0.20**	**0.28**	**0.37**		

*Not commercially available.

Variety (Single Cut)	Species	Harvest Date	Yield	First Cut Analysis	
				CP (%)	30-hour NDFD
King's Soil Builder Plus	Trical, crimson clover (66.7%), Hairy vetch, annual ryegrass, daikon radish	5/2	**3.69**	18.7	79
FS Cover 2	Mix	5/9	**3.11**	14.4	56
GRAND MEAN			**3.41**	**16.6**	**68**
CV (%)			**15.45**		
LSD (p = 0.05)			**ns**		

CV = coefficient of variation
LSD = least significant difference
ns = not significant

- Planted September 18, 2015.
- Yields are given in tons per acre (DM basis).
- Stand score is based on a scale of 1 to 100. A 100 is considered a perfect stand.
- Means are derived from LSMeans.
- Varieties are ranked based on total yield.

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