



The 2016 New Mexico Alfalfa Variety Test Report



Agricultural Experiment Station
College of Agricultural, Consumer
and Environmental Sciences



The 2016 New Mexico Alfalfa Variety Test Report

Leonard Lauriault, Ian Ray, Chris Pierce, Owen Burney, Robert Flynn, Mark Marsalis, Mick O'Neill, Ashley Cunningham, Charles Havlik, and Margaret West¹

Introduction

In 2016, 190,000 acres of alfalfa (*Medicago sativa*) were in production in New Mexico, which was unchanged from 2015 despite 25,000 acres being planted. Hay yields were estimated at 931,000 tons reflecting a 4% increase in yield. At a January through November 2016 average of \$170/ton (down from \$211/ton in 2015), estimated gross returns from alfalfa hay produced in 2016 will total just over \$158 million. This is well below the \$188 million received in 2015, but alfalfa hay continues as New Mexico's No. 1 cash crop (New Mexico Agricultural Statistics Service, www.nass.usda.gov/nm). Alfalfa also is the legume of choice in irrigated perennial pastures. Whether used as pasture or hay, the value of alfalfa to New Mexico is greatly magnified by its contribution to livestock production and receipts from the sale of meat, milk, and other products generated by livestock enterprises.

Choosing a good alfalfa variety is a key step in establishing a highly productive stand of alfalfa, whether for hay or pasture. Differences between the highest- and lowest-yielding varieties in irrigated tests included in this report ranged from 0.59 to 3.05 tons per acre in 2016. If sold as hay, this translates to a potential difference in returns of \$100 to \$518 per acre due to variety, or an increase of at least \$19 million for the industry in 2016 alone.

This report, which is a collaborative effort of New Mexico State University scientists at agricultural science centers throughout the state, provides yield data for alfalfa varieties included in yield trials in New Mexico. While consistently high yields compared to other varieties over a number of years and locations within a region is the best indication of varietal adaptation and persistence, other factors should be considered in the variety selection process (see NMSU's Cooperative Extension Service Circular 654, *Selecting alfalfa varieties for New Mexico*). In addition to fall dormancy and winter hardiness, high levels of pest resistance are critical to protecting an alfalfa stand for long-term production. Alfalfa grown in New Mexico should have at least a resistant (R) rating for bacterial wilt, Fusarium wilt, anthracnose, Phytophthora root rot, spotted alfalfa aphid, blue alfalfa aphid, pea aphid, stem nematode, and southern rootknot nematode. Seed quality also should be high. Selecting an alfalfa variety based on seed cost is a gamble producers often lose. To be assured of achieving a long-lasting, highly productive stand, buy either certified or Plant Variety Protected (PVP) seed, which guarantees the genetics and performance. The best choice of seed of any variety is one that was treated with a fungicide and nitrogen-fixing bacteria before it was bagged.

Description of Tests

Replicated alfalfa variety tests included in this report were conducted under research controls at NMSU's Agricultural Science Centers at Las Cruces (2014 normal, drought, and early termination irrigation studies),

Artesia [2013, and 2014 (late spring planted)], Tucumcari (2015 irrigated with treated municipal wastewater), Los Lunas (2013), Mora (2013), and Farmington (2014). Weather data for 2016 and the long-term averages from all locations are presented in table 1.

Yield data (on a dry matter basis) are presented in tables 2-10. Varieties are listed in order from highest to lowest average annual production. Yields are given by cutting for 2016 and by year for each production year. Statistical analyses were performed on all alfalfa yield data (including experimental entries) to determine if the apparent differences are truly due to variety or just to chance. The variety with the highest numerical yield in each column is marked with two asterisks (**), and those varieties not significantly different from that variety are marked with one asterisk (*). Those are the varieties from which to make an initial selection. Otherwise, to determine if two varieties are truly different, compare the difference between the two varieties to the Least Significant Difference (LSD) at the bottom of the column. If the difference is equal to or greater than the LSD, the varieties are truly different in yield when grown under the conditions at a given location. If NS is given for the LSD, there was no statistical difference between the highest and lowest yielding varieties. The Coefficient of Variation (CV), which is a measure of the variability of the data, is included for each column of means. Low variability (<20 percent) is desirable, and increased variability within a study results in higher CVs and larger LSDs. There might be a difference between previously published data and the data given in this publication for the same tests because of differences in the programs used for statistical analysis.

Table 11 summarizes information about proprietors, Roundup Ready genetics, fall dormancy, winter survival (measured in the northern United States), pest resistance, and yield performance across years and locations for all varieties currently included in NMSU's alfalfa variety testing program. Varieties are listed alphabetically by fall dormancy category. As in the data tables, the variety with the highest numerical yield in each column is marked with two asterisks (**), and those varieties not significantly different from that variety are marked with one asterisk (*). Remember good performance across several years and locations is the best indicator of broad adaptation, pest resistance, and persistence.

Seed labeled "common," "variety not stated," or "variety unknown", particularly that from other states, is of unknown genetic background and may or may not have the necessary disease or insect resistance. New Mexico Common and African Common seed used in all tests throughout the state has come from the same supplier and seed fields in New Mexico. Seed purchased from other dealers may or may not be of the same quality and performance.

¹Forage Crop Management Scientist and Superintendent, NMSU Agricultural Science Center at Tucumcari; Alfalfa Breeder, NMSU, Las Cruces; Forage Research Scientist, NMSU, Las Cruces; Superintendent, NMSU John T. Harrington Forestry Research Center at Mora; Extension Agronomist, NMSU Agricultural Science Center at Artesia; Extension Forage Specialist and Superintendent, NMSU Agricultural Science Center at Los Lunas; Agronomist, NMSU Agricultural Science Center at Farmington; Research Assistant, NMSU Agricultural Science Center at Tucumcari; Senior Research Assistant, NMSU Agricultural Science Center at Los Lunas, and Agricultural Research Scientist, NMSU Agricultural Science Center at Farmington, respectively.

Summary

Consistent production of high alfalfa yields is the result of selecting good varieties and implementing good management techniques. Soil fertility should be maintained at recommended levels based on soil tests, irrigation should be properly applied, weeds and insects should be controlled using appropriate cultural and/or chemical methods, and harvest management should allow sufficient time to restock root energy prior to winter. For dormant (FD 1 to 3) and semidormant (FD 4 to 6) varieties, a 6-week rest period before a dormancy-inducing freeze (27°F) is recommended to allow plants to replenish root reserves for winter survival and initiate spring growth, after which harvesting might be done either mechanically or by grazing. Non-dormant (FD 7 to 9) varieties also might benefit from this rest period. Removing fall growth is beneficial to reducing weevil populations the following year as eggs are laid in and overwinter in stems. Harvesting established stands at early bloom would result in 3 to 5 cuttings per year before initiation of the rest period in most areas of New Mexico. More dormant varieties might not produce yields that can be baled during the rest period; however, these can still be grazed. For further information about alfalfa management, refer to the other NMSU Agricultural Experiment Station and Cooperative Extension Service publications listed in table 12.

Acknowledgements

The authors express appreciation to the following for their significant contribution to The New Mexico Alfalfa Variety Testing Program by helping with planting, maintaining, harvesting, or other data collection, and data entry: Dallen Begay, Nathan Begay, Jason Box, Servando Bustillos, Patty Cooksey, Josh Foster, Jared Jennings, Shane Jennings, Ruben Pacheco, Tom Place, Mario Segura, Anthony Williams, and the staff at University Communications who make publications such as this possible. Salaries and research support were provided by state and federal funds appropriated to the New Mexico Agricultural Experiment Station. Federal funds included those appropriated through the Hatch Act of 1887.

Table 1. Temperature and precipitation data for 2016 and the long-term averages for the New Mexico Alfalfa Variety Test locations.

| Location Elevation Latitude | Las Cruces 3832 ft. 32° 12' N | | | | Artesia 3366 ft. 32° 45' N | | | | Tucumcari 4091 ft. 35° 12' N | | | | Los Lunas 4840 ft. 34° 46' N | | | | Mora ¹ 7303 ft. 35° 58' N | | | | Farmington 5640 ft. 36° 41' N | | | |
|-----------------------------------|-------------------------------------|------|---------------|------|----------------------------------|------|---------------|-------|------------------------------------|------|---------------|-------|------------------------------------|------|---------------|------|--|------|---------------|-------|-------------------------------------|----|------|------|
| | Temp. (°F) | | Precip. (in.) | | Temp. (°F) | | Precip. (in.) | | Temp. (°F) | | Precip. (in.) | | Temp. (°F) | | Precip. (in.) | | Temp. (°F) | | Precip. (in.) | | | | | |
| Month | 2016 | Avg. | 2016 | Avg. | 2016 | Avg. | 2016 | Avg. | 2016 | Avg. | 2016 | Avg. | 2016 | Avg. | 2016 | Avg. | 2016 | Avg. | 2016 | Avg. | | | | |
| Nov-15 | 49 | 49 | 0.64 | 0.53 | 49 | 49 | 0.35 | 0.53 | 63 | 47 | 1.23 | 0.71 | 44 | 43 | 0.24 | 0.46 | - | 42 | 0.00 | 0.21 | 41 | 41 | 0.89 | 0.65 |
| Dec-15 | 40 | 41 | 0.82 | 0.68 | 41 | 41 | 0.50 | 0.51 | 42 | 39 | 2.85 | 0.67 | 35 | 35 | 0.94 | 0.53 | - | 32 | 1.06 | 0.48 | 30 | 31 | 0.65 | 0.47 |
| Jan-16 | 41 | 40 | 0.33 | 0.56 | 38 | 40 | 0.00 | 0.39 | 38 | 38 | 0.01 | 0.42 | 34 | 35 | 0.19 | 0.38 | - | 33 | 2.10 | 0.11 | 29 | 30 | 0.46 | 0.51 |
| Feb-16 | 48 | 45 | 0.08 | 0.37 | 47 | 45 | 0.31 | 0.42 | 47 | 42 | 0.94 | 0.49 | 42 | 40 | 0.05 | 0.41 | - | 33 | 0.70 | 0.30 | 38 | 36 | 0.34 | 0.48 |
| Mar-16 | 58 | 52 | 0.00 | 0.22 | 55 | 52 | 0.00 | 0.43 | 53 | 49 | 0.08 | 0.76 | 51 | 47 | 0.00 | 0.49 | - | 43 | 0.00 | 0.29 | 46 | 43 | 0.01 | 0.64 |
| Apr-16 | 62 | 60 | 0.35 | 0.21 | 61 | 60 | 0.53 | 0.62 | 57 | 58 | 0.67 | 1.14 | 54 | 55 | 0.61 | 0.45 | - | 49 | 2.55 | 0.31 | 51 | 51 | 0.80 | 0.58 |
| May-16 | 68 | 69 | 0.14 | 0.29 | 67 | 69 | 0.98 | 1.20 | 66 | 66 | 1.30 | 1.94 | 62 | 63 | 0.50 | 0.45 | - | 60 | 1.26 | 0.54 | 59 | 60 | 0.93 | 0.53 |
| Jun-16 | 80 | 78 | 0.27 | 0.72 | 79 | 78 | 1.02 | 1.40 | 78 | 76 | 3.28 | 1.98 | 77 | 72 | 0.75 | 0.54 | - | 67 | 3.39 | 1.33 | 76 | 70 | 0.00 | 0.26 |
| Jul-16 | 84 | 80 | 0.21 | 1.36 | 85 | 80 | 0.43 | 1.76 | 84 | 79 | 1.11 | 2.75 | 80 | 77 | 0.75 | 1.39 | - | 69 | 1.56 | 3.34 | 76 | 76 | 0.36 | 0.81 |
| Aug-16 | 77 | 78 | 2.08 | 2.29 | 78 | 78 | 4.17 | 1.67 | 77 | 77 | 2.33 | 2.78 | 73 | 75 | 0.50 | 1.67 | - | 68 | 5.37 | 2.19 | 72 | 74 | 1.37 | 1.05 |
| Sep-16 | 72 | 71 | 2.11 | 1.38 | 72 | 71 | 5.93 | 1.81 | 73 | 71 | 0.41 | 1.62 | 68 | 67 | 0.68 | 1.17 | - | 62 | 2.40 | 1.81 | 65 | 66 | 1.05 | 1.10 |
| Oct-16 | 64 | 61 | 0.01 | 0.91 | 65 | 61 | 1.42 | 1.16 | 66 | 60 | 0.00 | 1.31 | 60 | 56 | 0.70 | 1.05 | - | 51 | 0.00 | 0.64 | 58 | 54 | 0.28 | 0.97 |
| Annual | 62 | 60 | 7.04 | 9.52 | 61 | 60 | 15.64 | 11.90 | 62 | 58 | 14.21 | 16.57 | 57 | 55 | 5.91 | 8.99 | - | 51 | 20.39 | 11.55 | 53 | 53 | 7.14 | 8.05 |

¹Temperature data from Mora was not available due to technical difficulties with the automated station. December 2015 through February 2016 precipitation is 10% of measured snowfall.

Table 2. Dry matter yields (tons/acre) of alfalfa varieties sown October 7, 2014, at NMSU's Leyendecker Plant Science Research Center at Las Cruces and flood-irrigated twice per cutting to apply 56.95 inches (normal irrigation)†.

| Variety Name | 2015 Total | 2016 Harvests | | | | | | 2016 Total | 2-Yr Average |
|-------------------|---------------|---------------|--------|--------|--------|--------|--------|---------------|-----------------|
| | | 27-Apr | 1-Jun | 28-Jun | 28-Jul | 14-Sep | 26-Oct | | |
| AmeriStand 803T | 10.07** | 2.05* | 1.27** | 1.06* | 0.97* | 1.80* | 1.07** | 8.22** | 9.09** |
| NM14BMHS1 | 9.93* | 2.16** | 1.09 | 0.90 | 0.77 | 1.86** | 1.02* | 7.80* | 8.92* |
| NM14BMC0 | 9.85* | 2.07* | 1.03 | 0.86 | 0.79 | 1.79* | 1.05* | 7.59* | 8.71* |
| NM14MALHS3 | 9.85* | 2.14* | 0.99 | 0.86 | 0.76 | 1.77* | 0.99* | 7.49* | 8.62* |
| NM14GTAF07235 | 9.42* | 2.00* | 1.18* | 0.97* | 0.84* | 1.67* | 0.98* | 7.71* | 8.58* |
| WL 656HQ | 8.98 | 1.81 | 1.21* | 1.08** | 0.99** | 1.80* | 1.07** | 8.01* | 8.55* |
| NM14BMHS3 | 9.42* | 2.12* | 1.01 | 0.83 | 0.75 | 1.71* | 0.96* | 7.37* | 8.46* |
| FSG903 | 9.33* | 1.97* | 1.16* | 0.97* | 0.86* | 1.74* | 1.01* | 7.67* | 8.45* |
| 4N900 | 9.00 | 1.73 | 1.17* | 1.02* | 0.91* | 1.81* | 1.02* | 7.65* | 8.30 |
| Cisco II | 9.42* | 1.93* | 0.99 | 0.81 | 0.72 | 1.58 | 0.86 | 6.90* | 8.15 |
| NM14MLLS2 | 8.85 | 2.03* | 0.98 | 0.85 | 0.81 | 1.85* | 0.98* | 7.43* | 8.14 |
| NM14ALWLHQ | 9.06 | 1.80 | 1.07 | 0.92 | 0.78 | 1.58 | 0.94 | 7.18* | 8.11 |
| NM1407227 | 8.75 | 2.06* | 1.00 | 0.90 | 0.80 | 1.70* | 0.85 | 7.39* | 8.09 |
| NM14BMHR2 | 9.15 | 2.03* | 0.95 | 0.82 | 0.71 | 1.74* | 0.92 | 7.05* | 8.07 |
| AFX149092 | 8.80 | 1.81 | 1.11 | 0.94* | 0.81 | 1.59 | 0.94 | 7.19* | 8.03 |
| WL 440HQ | 8.99 | 1.99* | 1.00 | 0.84 | 0.70 | 1.53 | 0.85 | 6.97* | 8.02 |
| NuMex Bill Melton | 8.53 | 1.90* | 1.09 | 0.98* | 0.86* | 1.78* | 0.96* | 7.46* | 7.99 |
| Malone | 8.65 | 1.63 | 1.15* | 1.00* | 0.93* | 1.67* | 0.93 | 7.28* | 7.97 |
| NM14BM1008251 | 8.71 | 1.83 | 1.02 | 0.92 | 0.82 | 1.70* | 0.96* | 7.20* | 7.93 |
| Hi-Gest 660 | 8.88 | 1.87 | 1.08 | 0.92 | 0.77 | 1.48 | 0.85 | 6.98* | 7.89 |
| AFX148091 | 8.60 | 1.81 | 1.08 | 0.89 | 0.75 | 1.55 | 0.88 | 6.92* | 7.79 |
| Sandpiper | 8.52 | 1.86 | 0.92 | 0.82 | 0.76 | 1.65* | 0.95* | 7.01* | 7.77 |
| Wilson | 8.88 | 1.61 | 1.02 | 0.87 | 0.74 | 1.50 | 0.87 | 6.68* | 7.73 |
| 57Q53 | 7.90 | 1.76 | 0.98 | 0.81 | 0.69 | 1.46 | 0.84 | 6.56* | 7.26 |
| Mean | 9.06 | 1.92 | 1.07 | 0.91 | 0.80 | 1.68 | 0.95 | 7.32 | 8.19 |
| LSD (0.05) | 0.81 | 0.27 | 0.15 | 0.16 | 0.16 | 0.24 | 0.13 | NS | 0.76 |
| CV% | 6.08 | 9.87 | 10.26 | 12.12 | 13.99 | 9.98 | 9.65 | 8.82 | 9.33 |

†Data were analyzed using analysis of covariance where check plots of NuMex Bill Melton were used as the covariate.

2015 Harvest dates: 28-Apr, 12-Jun, 16-Jul, 12-Aug, 9-Sep, and 6-Nov.

**Highest numerical value in the column.

*Not significantly different from the highest numerical value in the column based on the 5% LSD.

NS means that there were no significant differences between the varieties within that column at the 5% level.

Table 3. Dry matter yields (tons/acre) of alfalfa varieties sown October 7, 2014, at NMSU's Leyendecker Plant Science Research Center at Las Cruces and flood-irrigated once per cutting to apply 30.87 inches (drought irrigation)†.

| Variety Name | 2015 | 2016 Harvests | | | | | | 2016 | 2-Yr |
|-------------------|--------|---------------|--------|--------|--------|--------|--------|--------|---------|
| | Total | 27-Apr | 27-May | 30-Jun | 27-Jul | 13-Sep | 21-Oct | Total | Average |
| NM14BMHS1 | 7.29* | 1.19** | 0.46 | 0.32 | 0.19 | 0.65* | 0.70* | 3.51* | 5.43** |
| AmeriStand 803T | 7.07* | 1.06 | 0.66** | 0.44* | 0.25* | 0.66* | 0.83* | 3.83* | 5.39* |
| NM14BMHS3 | 7.44** | 1.17* | 0.51 | 0.35 | 0.18 | 0.52* | 0.58* | 3.32* | 5.34* |
| FSG903 | 6.69* | 1.05 | 0.61* | 0.43* | 0.25* | 0.73** | 0.78* | 3.84** | 5.31* |
| NM14BM1008251 | 6.95* | 1.02 | 0.56 | 0.38* | 0.24* | 0.60* | 0.73* | 3.52* | 5.21* |
| Wilson | 6.45* | 1.01 | 0.57* | 0.39* | 0.28* | 0.73** | 0.80* | 3.75* | 5.20* |
| AFX149092 | 6.80* | 0.98 | 0.61* | 0.39* | 0.20 | 0.57* | 0.68* | 3.40* | 5.20* |
| NM14MALHS3 | 6.67* | 1.18* | 0.43 | 0.33 | 0.22 | 0.65* | 0.67* | 3.50* | 5.11* |
| 4N900 | 6.78* | 0.97 | 0.64* | 0.41* | 0.25* | 0.57* | 0.70* | 3.56* | 5.09* |
| NuMex Bill Melton | 6.27* | 1.00 | 0.53 | 0.46** | 0.30** | 0.69* | 0.83* | 3.79* | 5.03* |
| NM1407227 | 6.85* | 1.06 | 0.45 | 0.32 | 0.18 | 0.60* | 0.66* | 3.28* | 5.02* |
| NM14GTAF07235 | 6.44* | 0.95 | 0.62* | 0.41* | 0.24* | 0.57* | 0.69* | 3.50* | 4.91* |
| WL 656HQ | 5.86 | 0.98 | 0.60* | 0.44* | 0.24* | 0.62* | 0.84** | 3.73* | 4.83* |
| NM14ALWLHQ | 6.31* | 1.03 | 0.51 | 0.39* | 0.21 | 0.54* | 0.63* | 3.33* | 4.83* |
| NM14BMC0 | 6.39* | 1.07 | 0.49 | 0.33 | 0.21 | 0.57* | 0.72* | 3.40* | 4.82* |
| NM14BMHR2 | 6.07 | 1.11* | 0.43 | 0.29 | 0.20 | 0.68* | 0.68* | 3.41* | 4.77* |
| Malone | 5.77 | 0.84 | 0.61* | 0.44* | 0.30** | 0.63* | 0.80* | 3.64* | 4.75* |
| AFX148091 | 5.50 | 0.87 | 0.60* | 0.39* | 0.23* | 0.61* | 0.72* | 3.43* | 4.46 |
| NM14MLLS2 | 5.83 | 1.05 | 0.38 | 0.31 | 0.18 | 0.47* | 0.61* | 2.97 | 4.44 |
| 57Q53 | 5.95 | 0.95 | 0.47 | 0.32 | 0.17 | 0.45* | 0.57* | 2.94 | 4.44 |
| Hi-Gest 660 | 5.69 | 0.80 | 0.47 | 0.35 | 0.23* | 0.51* | 0.61* | 2.99 | 4.35 |
| Sandpiper | 5.64 | 0.92 | 0.40 | 0.25 | 0.18 | 0.56* | 0.61* | 2.94 | 4.30 |
| Cisco II | 5.72 | 0.94 | 0.36 | 0.31 | 0.16 | 0.41* | 0.55* | 2.75 | 4.16 |
| WL 440HQ | 5.32 | 0.85 | 0.36 | 0.27 | 0.17 | 0.50* | 0.57* | 2.71 | 3.99 |
| Mean | 6.32 | 1.00 | 0.51 | 0.36 | 0.22 | 0.59 | 0.69 | 3.38 | 4.85 |
| LSD (0.05) | 1.29 | 0.12 | 0.11 | 0.11 | 0.08 | NS | NS | 0.65 | 0.82 |
| CV% | 13.93 | 8.19 | 14.67 | 21.10 | 24.81 | 26.33 | 20.78 | 13.54 | 16.95 |

†Data were analyzed using analysis of covariance where check plots of NuMex Bill Melton were used as the covariate.
2015 Harvest dates: 30-Apr, 6-Jun, 7-Jul, 13-Aug, 10-Sep, and 28-Oct.

**Highest numerical value in the column.

*Not significantly different from the highest numerical value in the column based on the 5% LSD.

NS means that there were no significant differences between the varieties within that column at the 5% level.

Table 4. Dry matter yields (tons/acre) of alfalfa varieties sown October 7, 2014, at NMSU's Leyendecker Plant Science Research Center at Las Cruces and flood-irrigated twice per cutting from March 31 until July 1 to apply 33.01 inches, after which irrigation was terminated (irrigation termination)†.

| Variety Name | 2015 | 2016 Harvests | | | 2016 | 2-Yr |
|-------------------|--------|---------------|--------|--------|--------|---------|
| | Total | 28-Apr | 2-Jun | 29-Jun | Total | Average |
| NM14BMHS1 | 7.15** | 1.96* | 0.95* | 0.84* | 3.76** | 5.40** |
| NM14BMC0 | 7.08* | 1.93* | 0.87* | 0.80* | 3.59* | 5.35* |
| NM14BMHR2 | 6.96* | 2.01** | 0.90* | 0.81* | 3.73* | 5.35* |
| NM14MALHS3 | 6.89* | 1.91* | 0.90* | 0.79* | 3.60* | 5.25* |
| AmeriStand 803T | 6.63 | 1.56 | 1.04* | 1.02* | 3.61* | 5.16* |
| NM14MLLS2 | 6.80* | 1.81 | 0.87* | 0.80* | 3.47* | 5.16* |
| NM1407227 | 6.69* | 1.87* | 0.88* | 0.82* | 3.56* | 5.15* |
| NM14BMHS3 | 6.79* | 1.81 | 0.91* | 0.82* | 3.55* | 5.12* |
| NM14BM1008251 | 6.60 | 1.76 | 0.97* | 0.91* | 3.64* | 5.12* |
| NM14ALWLHQ | 6.65 | 1.64 | 0.93* | 0.86* | 3.42* | 5.03* |
| AFX148091 | 6.45 | 1.54 | 0.96* | 1.00* | 3.49* | 5.01* |
| AFX149092 | 6.47 | 1.57 | 0.95* | 0.87* | 3.37* | 4.96 |
| FSG903 | 6.61 | 1.62 | 0.90* | 0.80* | 3.33* | 4.95 |
| 4N900 | 6.48 | 1.60 | 0.96* | 0.86* | 3.42* | 4.94 |
| NM14GTAF07235 | 6.18 | 1.65 | 1.05** | 1.03* | 3.74* | 4.94 |
| Cisco II | 6.39 | 1.74 | 0.88* | 0.86* | 3.48* | 4.92 |
| NuMex Bill Melton | 6.30 | 1.69 | 0.92* | 0.89* | 3.51* | 4.89 |
| Sandpiper | 6.27 | 1.77 | 0.90* | 0.86* | 3.54* | 4.88 |
| Hi-Gest 660 | 6.45 | 1.57 | 0.86* | 0.83* | 3.25* | 4.86 |
| Wilson | 6.16 | 1.67 | 0.96* | 0.88* | 3.50* | 4.84 |
| WL 656HQ | 6.23 | 1.49 | 0.89* | 0.84* | 3.21* | 4.74 |
| WL 440HQ | 6.18 | 1.61 | 0.81* | 0.75* | 3.17* | 4.67 |
| 57Q53 | 6.02 | 1.56 | 0.84* | 0.81* | 3.21* | 4.61 |
| Malone | 5.63 | 1.51 | 1.04* | 1.06** | 3.62* | 4.60 |
| Mean | 6.50 | 1.70 | 0.92 | 0.87 | 3.49 | 5.00 |
| LSD (0.05) | 0.49 | 0.18 | NS | NS | NS | 0.43 |
| CV% | 5.66 | 7.44 | 12.40 | 15.45 | 9.62 | 8.58 |

†Data were analyzed using analysis of covariance where check plots of NuMex Bill Melton were used as the covariate.

2015 Harvest dates: 30-Apr, 12-Jun, 17-Jul, and 12-Aug.

**Highest numerical value in the column.

*Not significantly different from the highest numerical value in the column based on the 5% LSD.

NS means that there were no significant differences between the varieties within that column at the 5% level.

Table 5. Dry matter yields (tons/acre) of sprinkler-irrigated alfalfa varieties sown September 23, 2013, at NMSU's Agricultural Science Center at Artesia†.

| Variety Name | 2014 Total | 2015 Total | 2016 Harvests | | | | | 2016 Total | 3-Yr Average | |
|------------------|---------------|---------------|---------------|--------|--------|--------|--------|---------------|-----------------|--------|
| | | | 12-May | 20-Jun | 12-Jul | 8-Aug | 28-Sep | | | 22-Nov |
| NM Common | 8.50* | 9.83* | 1.87 | 2.44* | 1.67* | 2.36* | 1.85* | 0.69* | 10.87* | 9.73** |
| African Common | 8.20* | 9.22* | 1.92 | 2.46** | 1.91** | 2.40* | 1.88** | 0.68* | 11.26** | 9.56* |
| Malone | 8.00* | 10.08** | 1.74 | 2.23* | 1.41 | 2.28* | 1.85* | 0.79** | 10.29* | 9.45* |
| 56S82 | 8.63** | 9.00* | 2.18* | 2.31* | 0.89 | 2.09* | 1.81* | 0.36 | 9.63 | 9.09* |
| WL 535HQ | 8.12* | 9.41* | 1.88 | 2.43* | 1.06 | 2.18* | 1.70* | 0.37 | 9.62 | 9.05* |
| Wilson | 8.02* | 9.24* | 2.29** | 2.05* | 1.37 | 2.17* | 1.50* | 0.44 | 9.81 | 9.02* |
| Zia | 7.94* | 9.29* | 1.61 | 1.92* | 1.37 | 2.45** | 1.81* | 0.53* | 9.69 | 8.97 |
| 58N57 | 7.64 | 9.53* | 1.88 | 2.06* | 1.29 | 2.23* | 1.71* | 0.45 | 9.61 | 8.93 |
| Dona Ana | 7.99* | 9.76* | 1.62 | 1.66 | 1.09 | 2.14* | 1.67* | 0.53* | 8.70 | 8.82 |
| Artesian Sunrise | 8.54* | 8.87* | 1.63 | 2.19* | 0.97 | 2.15* | 1.71* | 0.23 | 8.88 | 8.76 |
| 55Q27 | 7.54 | 9.27* | 1.81 | 1.90* | 1.14 | 2.31* | 1.73* | 0.25 | 9.13 | 8.65 |
| DG9212 | 7.93* | 8.94* | 1.46 | 1.44 | 1.08 | 2.19* | 1.82* | 0.67* | 8.67 | 8.51 |
| 55VR05 | 6.88 | 8.45* | 1.50 | 2.08 | 0.83 | 2.01* | 1.71* | 0.08 | 8.21 | 7.84 |
| Mean | 7.99 | 9.30 | 1.80 | 2.09 | 1.24 | 2.23 | 1.75 | 0.47 | 9.57 | 8.95 |
| LSD (0.05) | 0.82 | NS | 0.32 | 0.59 | 0.48 | NS | NS | 0.27 | 1.35 | 0.75 |
| CV% | 7.17 | 7.86 | 12.49 | 19.61 | 27.02 | 11.60 | 14.69 | 40.47 | 9.85 | 10.15 |

†Data were analyzed using analysis of variance.

2014 Harvest dates: 20-May, 18-Jul, 20-Aug, and 2-Oct.

2015 Harvest dates: 8-May, 19-Jun, 17-Jul, 20-Aug, and 29-Sep.

**Highest numerical value in the column.

*Not significantly different from the highest numerical value in the column based on the 5% LSD.

NS means that there were no significant differences between the varieties within that column at the 5% level.

Table 6. Dry matter yields (tons/acre) of sprinkler-irrigated alfalfa varieties sown March 31, 2014, at NMSU's Agricultural Science Center at Artesia†.

| Variety Name | 2014 Total | 2015 Total | 2016 Harvests | | | | | 2016 Total | 3-Yr Average |
|-------------------|------------|------------|---------------|--------|--------|--------|--------|------------|--------------|
| | | | 8-Jun | 11-Jul | 8-Aug | 30-Sep | 28-Nov | | |
| 58N57 | 4.42* | 7.57* | 1.86* | 1.97** | 1.29* | 2.15** | 2.15** | 9.41** | 7.13** |
| Malone | 4.28* | 7.97* | 1.76* | 1.78* | 1.32* | 2.07* | 2.07* | 9.00* | 7.08* |
| Wilson | 4.30* | 7.84* | 1.81* | 1.90* | 1.34* | 2.02* | 2.02* | 9.10* | 7.08* |
| NuMex Bill Melton | 4.06* | 8.03* | 2.12* | 1.87* | 1.39* | 1.78* | 1.78* | 8.93* | 7.01* |
| 56S82 | 4.15* | 8.37** | 1.75* | 1.74* | 1.29* | 1.85* | 1.85* | 8.49* | 7.00* |
| NM Common | 4.36* | 8.13* | 1.96* | 1.71* | 1.25* | 1.78* | 1.78* | 8.47* | 6.99* |
| SW 8357 | 4.09* | 8.00* | 1.84* | 1.81* | 1.17 | 1.95* | 1.95* | 8.71* | 6.93* |
| SW 7410 | 4.18* | 7.69* | 2.12* | 1.94* | 1.47** | 1.65* | 1.65* | 8.82* | 6.89* |
| Artesian Sunrise | 4.16* | 7.56* | 2.40** | 1.60* | 1.20 | 1.79* | 1.79* | 8.77* | 6.83* |
| SW 8421S | 3.82* | 8.09* | 1.86* | 1.43* | 1.11 | 2.05* | 2.05* | 8.49* | 6.80* |
| WL 535HQ | 4.08* | 7.51* | 2.11* | 1.69* | 1.25* | 1.87* | 1.87* | 8.79* | 6.79* |
| DG9212 | 4.45* | 7.66* | 1.97* | 1.68* | 1.01 | 1.88* | 1.67* | 8.21* | 6.77* |
| SW 8208 | 4.49** | 7.50* | 1.80* | 1.73* | 1.08 | 1.82* | 1.82* | 8.24* | 6.74* |
| Zia | 4.32* | 7.37* | 1.64* | 1.58* | 1.37* | 1.98* | 1.98* | 8.54* | 6.74* |
| African Common | 4.28* | 7.18* | 1.83* | 1.69* | 1.28* | 1.89* | 1.89* | 8.57* | 6.68* |
| Dona Ana | 3.98* | 7.41* | 1.80* | 1.68* | 1.01 | 1.94* | 1.94* | 8.37* | 6.59* |
| 55VR05 | 3.68* | 7.00* | 1.92* | 1.78* | 1.17 | 1.53* | 1.53* | 7.93* | 6.20* |
| Mean | 4.18 | 7.70 | 1.91 | 1.74 | 1.23 | 1.88 | 1.87 | 8.64 | 6.84 |
| LSD (0.05) | NS | NS | NS | NS | 0.27 | NS | NS | NS | NS |
| CV% | 9.91 | 9.50 | 20.66 | 16.76 | 15.45 | 12.31 | 14.39 | 7.57 | 9.74 |

†Data were analyzed using analysis of variance.

2014 Harvest dates: 24-Jun, 2-Sep, and 3-Oct.

2015 Harvest dates: 26-May, 13-Jul, 12-Aug, and 30-Sep.

**Highest numerical value in the column.

*Not significantly different from the highest numerical value in the column based on the 5% LSD.

NS means that there were no significant differences between the varieties within that column at the 5% level.

Table 7. Dry matter yields (tons/acre) of alfalfa varieties sown May 12, 2015, at NMSU's Agricultural Science Center at Tucumcari and sprinkler-irrigated twice per week with treated municipal wastewater†.

| Variety Name | 2016 Harvests | | | | | 2016 Total |
|-------------------|---------------|--------|--------|--------|--------|------------|
| | 24-May | 22-Jun | 9-Aug | 13-Sep | 8-Nov | |
| NuMex Bill Melton | 1.25* | 0.60** | 1.04* | 1.10** | 0.63** | 4.62** |
| 6829R | 1.16* | 0.57* | 1.07** | 1.00* | 0.60* | 4.38* |
| NM14BMHS1 | 1.31* | 0.50* | 0.84* | 1.01* | 0.54* | 4.19* |
| NM14BMHR2 | 1.38** | 0.50* | 0.80* | 0.99* | 0.49 | 4.17* |
| NM14BMC0 | 1.28* | 0.47* | 0.84* | 0.95 | 0.46 | 3.99* |
| Mallard 5 | 1.38** | 0.45* | 0.82* | 0.88 | 0.46 | 3.98* |
| NM14BM1008251 | 1.04 | 0.52* | 0.93* | 0.93 | 0.53* | 3.94* |
| Malone | 0.87 | 0.60** | 0.94* | 0.92 | 0.44 | 3.77 |
| NM14MALHS3 | 1.11 | 0.42* | 0.74* | 0.90 | 0.53* | 3.69 |
| African Common | 0.86 | 0.44* | 0.93* | 0.95 | 0.47 | 3.65 |
| NM14MLLS2 | 1.16 | 0.38* | 0.79* | 0.89 | 0.43 | 3.65 |
| NM Common | 0.87 | 0.49* | 0.89* | 0.87 | 0.41 | 3.52 |
| ICON | 0.88 | 0.37* | 0.86* | 0.82 | 0.41 | 3.33 |
| SW 5909 | 0.89 | 0.43* | 0.77* | 0.86 | 0.34 | 3.27 |
| SW 5213 | 0.80 | 0.45* | 0.77* | 0.91 | 0.34 | 3.27 |
| Zia | 0.74 | 0.45* | 0.83* | 0.83 | 0.39 | 3.23 |
| Red Falcon BR | 0.99 | 0.41* | 0.74* | 0.78 | 0.27 | 3.19 |
| SW 4113 | 0.85 | 0.40* | 0.73* | 0.81 | 0.31 | 3.10 |
| Roadrunner | 0.98 | 0.34* | 0.72* | 0.71 | 0.28 | 3.03 |
| Mean | 1.04 | 0.46 | 0.84 | 0.90 | 0.44 | 3.68 |
| LSD (0.05) | 0.27 | NS | NS | 0.15 | 0.13 | 0.72 |
| CV% | 18.26 | 25.38 | 19.81 | 11.97 | 20.99 | 13.85 |

†Data were detrended using nearest neighbor analysis and analyzed using analysis of variance.

**Highest numerical value in the column.

*Not significantly different from the highest numerical value in the column based on the 5% LSD.

NS means that there were no significant differences between the varieties within that column at the 5% level.

Table 8. Dry matter yields (tons/acre) of flood-irrigated alfalfa varieties sown September 30, 2013, at NMSU's Agricultural Science Center at Los Lunas†.

| Variety Name | 2014 Total | 2015 Total | 2016 Harvests | | | | 2016 Total | 3-Yr Average |
|-------------------|---------------|---------------|---------------|--------|--------|--------|---------------|-----------------|
| | | | 7-Jun | 18-Jul | 17-Aug | 16-Nov | | |
| NuMex Bill Melton | 8.33*** | 8.57* | 1.95 | 2.70* | 1.98* | 1.37* | 8.00** | 8.30*** |
| WL 454HQ.RR | 7.28* | 8.59** | 1.86 | 2.68* | 1.90* | 1.32* | 7.75* | 7.87** |
| Artesian Sunrise | 7.65** | 7.93* | 1.97 | 2.68* | 1.85 | 1.40** | 7.90* | 7.83* |
| Meadowlark | 7.13 | 7.98* | 2.00* | 2.62* | 1.71 | 1.12 | 7.45* | 7.52* |
| Cimarron VL600 | 7.10 | 7.52 | 2.18** | 2.65* | 1.71 | 1.35* | 7.89* | 7.50* |
| Wilson | 7.53* | 7.57 | 1.74 | 2.57* | 1.81 | 1.16 | 7.27 | 7.45 |
| Transition 6.10RR | 7.29* | 7.71 | 1.78 | 2.60* | 1.75 | 1.22 | 7.35 | 7.45 |
| Malone | 7.19* | 7.73 | 1.68 | 2.62* | 2.02* | 1.10 | 7.41 | 7.44 |
| Dona Ana | 7.15 | 7.73 | 1.68 | 2.56* | 1.86 | 1.21 | 7.30 | 7.39 |
| Roadrunner | 6.79 | 7.47 | 2.13* | 2.72** | 1.82 | 1.25* | 7.91* | 7.39 |
| PGI 424 | 7.13 | 7.31 | 2.04* | 2.50* | 1.89* | 1.27* | 7.69* | 7.38 |
| WL 440HQ | 6.87 | 7.68 | 1.81 | 2.52* | 1.89* | 1.24* | 7.45* | 7.33 |
| NM Common | 7.13 | 7.16 | 1.71 | 2.58* | 2.06** | 1.14 | 7.49* | 7.26 |
| HybriForce-2400 | 7.23* | 6.80 | 1.93 | 2.66* | 1.75 | 1.20 | 7.53* | 7.19 |
| 55Q27 | 6.84 | 7.34 | 1.84 | 2.61* | 1.82 | 1.10 | 7.36 | 7.18 |
| Mallard 5 | 6.44 | 7.44 | 1.95 | 2.61* | 1.80 | 1.26* | 7.61* | 7.16 |
| Archer III | 6.45 | 7.33 | 1.89 | 2.46* | 1.68 | 1.16 | 7.19 | 6.99 |
| PGI 557 | 6.57 | 7.21 | 1.77 | 2.42 | 1.65 | 1.21 | 7.05 | 6.94 |
| Bluejay HR | 6.63 | 6.83 | 1.92 | 2.47* | 1.54 | 1.22 | 7.14 | 6.87 |
| DG4210 | 6.27 | 7.16 | 1.84 | 2.47* | 1.74 | 1.12 | 7.17 | 6.87 |
| 55VR05 | 6.06 | 6.75 | 1.72 | 2.19 | 1.73 | 0.96 | 6.59 | 6.47 |
| Bluejay 2 | 5.67 | 6.93 | 1.78 | 2.17 | 1.46 | 1.14 | 6.54 | 6.38 |
| Mean | 6.94 | 7.49 | 1.87 | 2.55 | 1.79 | 1.20 | 7.41 | 7.28 |
| LSD (0.05) | 0.50 | 0.78 | 0.20 | 0.29 | 0.19 | 0.18 | 0.56 | 0.39 |
| CV% | 5.06 | 7.38 | 7.64 | 7.94 | 7.62 | 10.41 | 5.34 | 6.49 |

†Data were detrended using nearest neighbor analysis, and analyzed using analysis of variance.

2014 Harvest dates: 28-May, 30-Jun, 18-Aug, and 4-Nov.

2015 Harvest dates: 17-Jun, 23-Jul, 21-Aug, 12-Oct, and 12-Nov.

***Highest numerical value in the column; significantly higher than all other varieties.

Second highest numerical value in the column where * is shown.

*Not significantly different from the highest numerical value in the column based on the 5% LSD.

NS means that there were no significant differences between the varieties within that column at the 5% level.

Table 9. Dry matter yields (tons/acre) of sprinkler-irrigated alfalfa varieties sown August 28, 2013, at NMSU's John T. Harrington Forestry Research Center at Mora†.

| Variety Name | 2014 Total | 2015 Total | 2016 Harvests | | | 2016 Total | 3-Yr Average |
|--------------|---------------|---------------|---------------|--------|--------|---------------|-----------------|
| | | | 24-Jun | 11-Aug | 12-Oct | | |
| SS 120 | 3.77* | 2.43* | 1.29* | 0.94** | 0.44** | 2.67* | 2.96** |
| DG4210 | 3.30* | 2.65* | 1.53** | 0.87* | 0.42* | 2.82** | 2.92* |
| 55VR05 | 3.49* | 2.63* | 1.43* | 0.76* | 0.36* | 2.56* | 2.89* |
| WL 319HQ | 3.16* | 2.66* | 1.52* | 0.75* | 0.32 | 2.59* | 2.81* |
| Dona Ana | 4.06** | 2.36* | 0.94 | 0.58 | 0.27 | 1.79 | 2.73* |
| 55Q27 | 2.72* | 2.69* | 1.51* | 0.91* | 0.31 | 2.72* | 2.71* |
| WL 354HQ | 3.32* | 2.65* | 1.30* | 0.59 | 0.23 | 2.12 | 2.70* |
| Wilson | 3.00* | 2.44* | 1.40* | 0.87* | 0.39* | 2.66* | 2.70* |
| FG27C102 | 3.28* | 2.48* | 1.11 | 0.67 | 0.36* | 2.14 | 2.63* |
| Ladak | 2.45* | 2.80** | 1.48* | 0.86* | 0.29 | 2.63* | 2.63* |
| Spredor 5 | 2.77* | 2.44* | 1.29* | 0.66 | 0.21 | 2.16 | 2.46* |
| Ranger | 2.65* | 2.47* | 0.94 | 0.54 | 0.30 | 1.77 | 2.30* |
| Mean | 3.16 | 2.56 | 1.31 | 0.75 | 0.32 | 2.39 | 2.70 |
| LSD (0.05) | NS | NS | 0.35 | 0.25 | 0.12 | 0.63 | NS |
| CV% | 24.25 | 16.65 | 18.49 | 23.35 | 25.05 | 18.38 | 28.10 |

†Data were detrended using nearest neighbor analysis, and analyzed using analysis of variance.

2014 Harvest dates: 22-Jul, 2-Sep, and 14-Oct.

2015 Harvest dates: 22-Jun, 14-Aug, and 5-Nov.

**Highest numerical value in the column.

*Not significantly different from the highest numerical value in the column based on the 5% LSD.

NS means that there were no significant differences between the varieties within that column at the 5% level.

Table 10. Dry matter yields (tons/acre) of sprinkler-irrigated alfalfa varieties sown August 21, 2014, at NMSU's Agricultural Science Center at Farmington†.

| Variety Name | 2015 | 2016 Harvests | | | | 2016 | 2-Yr |
|-----------------|---------|---------------|--------|--------|--------|---------|---------|
| | Total | 2-Jun | 11-Jul | 17-Aug | 5-Oct | Total | Average |
| Raven | 10.48* | 3.20* | 2.89* | 2.50* | 1.54* | 10.13* | 10.31** |
| Mallard 5 | 10.50* | 3.13* | 2.98* | 2.54* | 1.44* | 10.07* | 10.29* |
| Ranger | 10.23* | 3.42** | 2.97* | 2.39* | 1.54* | 10.31* | 10.27* |
| MagnaGraze II | 9.87* | 3.40* | 2.95* | 2.51* | 1.64** | 10.50** | 10.18* |
| Arrowhead II | 10.18* | 3.06* | 2.97* | 2.71** | 1.42 | 10.15* | 10.16* |
| Lahonton | 10.32* | 2.85 | 2.84* | 2.58* | 1.59* | 9.86* | 10.09* |
| Roadrunner | 10.77** | 2.99* | 2.57 | 2.31* | 1.44* | 9.30 | 10.03* |
| 4S417 | 10.04* | 2.94 | 3.00** | 2.54* | 1.45* | 9.92* | 9.98* |
| WL 363HQ | 9.90* | 3.12* | 2.94* | 2.52* | 1.40 | 9.98* | 9.94* |
| Archer III | 10.48* | 2.71 | 2.97* | 2.41* | 1.25 | 9.34 | 9.91* |
| Mountaineer 2.0 | 9.81* | 2.82 | 2.96* | 2.24* | 1.60* | 9.61* | 9.71* |
| GrandStand | 9.52 | 3.25* | 2.95* | 2.31* | 1.39 | 9.90* | 9.71* |
| PGI 424 | 10.04* | 2.86 | 2.87* | 2.29* | 1.36 | 9.37 | 9.70* |
| Hi-Gest 360 | 9.87* | 3.06* | 2.75* | 2.19* | 1.54* | 9.54* | 9.70* |
| NM Common | 9.90* | 3.13* | 2.46 | 2.21* | 1.56* | 9.35 | 9.62* |
| WL 354HQ | 9.86* | 3.03* | 2.71* | 2.27* | 1.18 | 9.19 | 9.53* |
| Gunner | 9.61 | 2.82 | 2.75* | 2.26* | 1.36 | 9.18 | 9.39 |
| Dona Ana | 9.52 | 2.97* | 2.61 | 2.15* | 1.49* | 9.22 | 9.37 |
| 54VR03 | 9.64 | 2.46 | 2.64* | 2.37* | 1.29 | 8.75 | 9.20 |
| Wilson | 9.33 | 2.57 | 2.39 | 2.30* | 1.57* | 8.82 | 9.07 |
| Malone | 8.87 | 2.63 | 2.28 | 2.32* | 1.48* | 8.71 | 8.79 |
| Zia | 8.87 | 2.19 | 2.17 | 2.23* | 1.54* | 8.12 | 8.49 |
| Mean | 9.89 | 2.94 | 2.75 | 2.37 | 1.46 | 9.51 | 9.70 |
| LSD (0.05) | 1.06 | 0.48 | 0.38 | NS | 0.22 | 0.98 | 0.81 |
| CV% | 7.55 | 11.67 | 9.78 | 13.78 | 10.55 | 7.26 | 8.36 |

†Data were detrended using nearest neighbor analysis, and analyzed using analysis of variance. 2015 Harvest dates: 2-Jun, 6-Jul, 17-Aug, and 9-Oct.

**Highest numerical value in the column.

*Not significantly different from the highest numerical value in the column based on the 5% LSD.

NS means that there were no significant differences between the varieties within that column at the 5% level.

| Table 11. Characteristics and performance of alfalfa varieties across years and tests in New Mexico. | | Varietal Characteristics ¹ | | | | | | | | | | | Las Cruces | | | | | | Artesia | | | Tucumcari | Los Lunas | | | Mora | | | Farmington | | | | | | | |
|--|--------------------------|---------------------------------------|------------|-----|-----|-----|-----------------|-----|-----|-----|-----|-----|-------------------|-----------------|----------------|----|----|----|---------|----|------|-----------|-----------|------|------|------|------|------|------------|----|------|------|----|------|---|---|
| | | | | | | | | | | | | | 2014 ² | | | | | | 2013 | | | 2014 | | | 2015 | 2013 | | | 2013 | | | 2014 | | | | |
| | | Variety | Proprietor | RR | FD | WS | Pest resistance | | | | | | | | N ³ | | D | | ET | | 2013 | | | 2014 | | | 2015 | 2013 | | | 2013 | | | 2014 | | |
| BW | FW | | | | | | AN | PRR | SAA | PA | BAA | SN | RKN | 15 ⁴ | 16 | 15 | 16 | 15 | 16 | 14 | 15 | 16 | 14 | 15 | 16 | 16 | 14 | 15 | 16 | 14 | 15 | 16 | 15 | 16 | | |
| Arrowhead II | Alforex Seeds | | 2 | 2 | HR | HR | HR | HR | n/r | R | n/r | HR | n/r | | | | | | | | | | | | | | | | | | | | | | * | * |
| FG 27C102 | Forage Genetics Int. | | 2 | 1 | HR | HR | HR | h | n/r | R | n/r | n/r | n/r | | | | | | | | | | | | | | | | | | | | * | * | | |
| Spreader 5 | Nexgrow Alfalfa | | 2 | 1 | HR | HR | HR | n/r | R | n/r | n/r | n/r | n/r | | | | | | | | | | | | | | | | | | | * | * | | | |
| Hi-Gest 360 | Alforex Seeds | | 3 | n/r | HR | HR | HR | HR | n/r | n/r | R | n/r | n/r | | | | | | | | | | | | | | | | | | | * | * | | | |
| Ladak | USDA | | 3 | n/r | R | n/r | n/r | n/r | n/r | n/r | n/r | R | n/r | | | | | | | | | | | | | | | | | | * | ** | * | | | |
| MagnaGraze II | Sharp Brothers | | 3 | 2 | HR | HR | HR | n/r | R | n/r | n/r | R | n/r | | | | | | | | | | | | | | | | | | * | * | | | | |
| Ranger | USDA/Univ. of Nebraska | | 3 | n/r | R | n/r | n/r | n/r | R | n/r | n/r | R | n/r | | | | | | | | | | | | | | | | | | * | * | * | | | |
| SS120 | Seed Solutions | | 3 | 3 | HR | R | R | R | R | R | R | n/r | n/r | | | | | | | | | | | | | | | | | | * | * | * | | | |
| WL 319HQ | W-L Research | | 3 | 1 | HR | HR | HR | HR | R | n/r | HR | n/r | n/r | | | | | | | | | | | | | | | | | | * | * | * | | | |
| 4S417 | Mycogen Seeds | | 4 | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | | | | | | | | | | | | | | | | | | * | * | | | | |
| 54VR03 | Pioneer HiBred Int'l | Y | 4 | n/r | HR | HR | HR | HR | n/r | HR | n/r | n/r | n/r | | | | | | | | | | | | | | | | | | | | | | | |
| Bluejay 2 | Blue River Hybrids | | 4 | 2 | HR | HR | HR | HR | R | HR | n/r | n/r | n/r | | | | | | | | | | | | | | | | | | | | | | | |
| Bluejay HR | Blue River Hybrids | | 4 | 2 | HR | HR | HR | HR | R | HR | n/r | R | n/r | | | | | | | | | | | | | | | | | | | | | | | |
| DG4210 | Crop Production Services | | 4 | 1 | HR | HR | HR | HR | HR | R | n/r | R | n/r | | | | | | | | | | | | | | | | | | * | * | ** | | | |
| GrandStand | Crop Production Services | | 4 | 2 | HR | HR | HR | HR | R | HR | n/r | MR | n/r | | | | | | | | | | | | | | | | | | | | | * | | |
| HybriForce-2400 | Sharp Brothers | | 4 | 2 | HR | HR | HR | HR | n/r | n/r | n/r | HR | R | | | | | | | | | | | * | | * | | | | | | | | | | |
| Meadowlark | Blue River Hybrids | | 4 | 2 | HR | HR | HR | HR | R | HR | n/r | R | n/r | | | | | | | | | | | | | | * | * | * | | | | | | | |
| PGI 424 | Alforex Seeds | | 4 | 2 | HR | HR | HR | HR | R | R | n/r | R | n/r | | | | | | | | | | | | | | * | | | | * | * | * | | | |
| Raven | Blue River Hybrids | | 4 | 2 | HR | R | R | R | R | HR | R | R | n/r | | | | | | | | | | | | | | | | | | * | * | * | | | |
| Red Falcon BR | Blue River Hybrids | | 4 | 2 | HR | HR | HR | HR | n/r | n/r | n/r | R | n/r | | | | | | | | | | | | | | | | | | | | | | | |
| Roadrunner | Blue River Hybrids | | 4 | 2 | HR | HR | HR | HR | HR | LR | n/r | R | n/r | | | | | | | | | | | | | * | | | | ** | ** | ** | ** | | | |
| SW 4113 | S & W Seeds | | 4 | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | | | | | | | | | | | | | | | | | | | | | | | |
| WL 354HQ | W-L Research | | 4 | 1 | HR | HR | HR | HR | HR | HR | n/r | R | n/r | | | | | | | | | | | | | | | | | | * | * | * | | | |
| 55Q27 | Pioneer HiBred Int'l | | 5 | n/r | HR | HR | HR | HR | R | R | n/r | HR | n/r | | | | * | | | | | | | | | | | | | * | * | * | * | | | |
| 55VR05 | Pioneer HiBred Int'l | Y | 5 | n/r | HR | HR | HR | HR | n/r | n/r | n/r | HR | n/r | | | | * | | * | * | * | * | | | | | | | | * | * | * | * | | | |
| Archer III | America's Alfalfa | | 5 | 2 | HR | HR | HR | HR | n/r | HR | n/r | HR | HR | | | | | | | | | | | | | | | | | | * | * | * | | | |
| Gunner | Croplan Genetics | | 5 | 1 | HR | HR | HR | HR | HR | R | n/r | R | n/r | | | | | | | | | | | | | | | | | | | | | | | |
| Mallard 5 | Blue River Hybrids | | 5 | 2 | HR | HR | HR | HR | R | HR | n/r | R | n/r | | | | | | | | | | | | * | | * | | | * | * | * | * | | | |

¹RR=Roundup Ready if "Y"; WS=Winter Survival (1=No injury, 6=Dead plants), FD=Fall Dormancy (1 & 2 Very dormant; 3 & 4 Dormant; 5 Moderately dormant; 6 & 7 Semi-dormant; 8 & 9 Non-dormant; 10 & 11 Very non-dormant), BW=Bacterial wilt, PRR=Phytophthora root rot, FW=Fusarium wilt, AN=Anthracnose, SAA=Spotted alfalfa aphid, PA=Pea aphid, BAA=Blue alfalfa aphid, SN=Stem nematode, RKN=Rootknot nematode (southern); (S=Susceptible, LR=Low resistance, MR=Moderate resistance, R=Resistant, HR=High resistance, n/r indicates either that the variety was not rated for that characteristic or no rating was available).

²Establishment year.

³N, D, and ET signify normal irrigation, drought irrigation, and early termination irrigation, respectively.

⁴Harvest year.

Shaded boxes indicate that the variety was not in the test.

***Significantly higher than all other values in the column.

**Highest yielding variety in the test for that year, except for Los Lunas 2013 test when it is the second highest yielding variety.

*Not significantly different from the highest yielding variety in the test for that year, except for Los Lunas 2013 test in 2014 when it is not significantly different from the second highest yielding variety.

L.M. Lauriault, I.M. Ray, C.A. Pierce, O. Burney, R.P. Flynn, M.A. Marsalis, M.K. O'Neill, A.E. Cunningham, C. Havlik, and M.M. West

New Mexico St. Univ. College of Agricultural, Consumer and Environmental Sciences. Agric. Exp. Stn and Coop. Ext. Ser.

| Table 11 (cont.). Characteristics and performance of alfalfa varieties across years and tests in New Mexico. | | Varietal Characteristics ¹ | | | | | | | | | | | Las Cruces | | | | | | Artesia | | | Tucumcari | Los Lunas | Mora | Farmington | | | | | | | | | | | |
|--|-----------------------------|---------------------------------------|------------|-----|-----|-----|-----------------|-----|-----|-----|-----|-----|-------------------|-----------------|----------------|----|----|----|---------|----|------|-----------|-----------|------|------------|------|----|------|------|----|------|----|------|----|--|--|
| | | | | | | | | | | | | | 2014 ² | | | | | | 2013 | | | 2014 | | | 2015 | 2013 | | | 2013 | | 2014 | | | | | |
| | | Variety | Proprietor | RR | FD | WS | Pest resistance | | | | | | | | N ³ | | D | | ET | | 2013 | | | 2014 | | | 16 | 2013 | | | 2013 | | 2014 | | | |
| BW | FW | | | | | | AN | PRR | SAA | PA | BAA | SN | RKN | 15 ⁴ | 16 | 15 | 16 | 15 | 16 | 14 | 15 | 16 | 14 | 15 | 16 | 16 | 14 | 15 | 16 | 14 | 15 | 16 | 15 | 16 | | |
| Mountaineer 2.0 | Croplan Genetics | | 5 | 2 | HR | HR | HR | HR | R | HR | n/r | HR | R | | | | | | | | | | | | | | | | | | | | * | * | | |
| PGI 557 | Alforex Seeds | | 5 | 2 | HR | HR | HR | HR | n/r | R | R | HR | n/r | | | | | | | | | | | | | | | | | | | | | | | |
| SW 5213 | S & W Seeds | | 5 | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | | | | | | | | | * | * | | | | | | | | | | | | | |
| SW 5909 | S & W Seeds | | 5 | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | | | | | | | | | * | * | | | | | | | | | | | | | |
| WL 363HQ | W-L Research | | 5 | 2 | HR | HR | HR | HR | R | R | MR | MR | MR | | | | | | | | | | | | | | | | | | | * | * | | | |
| Zia | NMSU/Roswell Seed | | 5 | n/r | MR | MR | S | S | MR | S | S | MR | n/r | | | | | * | * | * | * | * | * | | | | | | | | | | | | | |
| 56S82 | Pioneer HiBred Int'l | | 6 | 5 | HR | HR | HR | HR | HR | HR | HR | HR | HR | | | | | ** | * | * | * | ** | * | | | | | | | | | | | | | |
| Cimarron VL600 | Cimarron USA | | 6 | n/r | R | R | R | HR | HR | HR | R | R | n/r | | | | | | | | | | | | | | | | | | | * | | | | |
| Cisco II | Alforex Seeds | | 6 | 2 | HR | HR | HR | R | n/r | HR | n/r | R | R | * | * | | | | | * | | | | | | | | | | | | | | | | |
| Hi-Gest 660 | Alforex Seeds | | 6 | n/r | R | HR | HR | R | n/r | n/r | R | n/r | n/r | | | | | * | | | | | | | | | | | | | | | | | | |
| ICON | S & W Seeds | | 6 | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | | | | | | | | | | | | | | | | | | | | | | | |
| Lahontan | USDA/Univ. of Nevada | | 6 | n/r | R | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | | | | | | | | | | | | | | | | | | * | * | | | | |
| Transition 6.10RR | Croplan Genetics | Y | 6 | n/r | R | R | R | HR | R | HR | n/r | MR | n/r | | | | | | | | | | | | | | | | | * | | | | | | |
| Wilson | NMSU/Roswell Seed | | 6 | n/r | R | R | n/r | n/r | MR | R | n/r | MR | n/r | * | * | * | * | * | * | * | * | * | * | * | | | * | * | * | * | * | * | * | | | |
| WL 440HQ | W-L Research | | 6 | n/r | HR | HR | R | HR | HR | HR | HR | HR | HR | * | | | | * | | | | | | | | | | | | | | * | | | | |
| WL 454HQ.RR | W-L Research | Y | 6 | n/r | R | HR | HR | HR | R | HR | n/r | HR | n/r | | | | | | | | | | | | | | * | ** | * | | | | | | | |
| 57Q53 | Pioneer Hi-Bred Int'l. | | 7 | n/r | MR | HR | HR | R | MR | HR | R | R | MR | * | | | * | | | | | | | | | | | | | | | | | | | |
| Artesian Sunrise | Croplan Genetics | | 7 | n/r | MR | HR | R | HR | HR | HR | R | R | n/r | | | | | * | * | * | * | * | * | * | | | | ** | * | * | | | | | | |
| Dona Ana | NMSU/Roswell Seed | | 7 | n/r | MR | MR | LR | R | MR | R | n/r | n/r | n/r | | | | | * | * | * | * | * | * | * | | | | | | ** | * | | | | | |
| Malone | NMSU/Roswell Seed | | 7 | n/r | R | HR | R | R | R | HR | S | MR | n/r | * | * | * | * | * | * | * | * | * | * | * | | | * | | | | | | | | | |
| NuMex Bill Melton | New Mexico State University | | 7 | n/r | MR | R | R | R | R | MR | MR | n/r | n/r | * | * | * | * | * | * | * | * | * | * | | | ** | | ** | * | * | * | * | * | * | | |
| SW 7410 | S & W Seeds | | 7 | n/r | R | R | HR | MR | HR | R | R | MR | R | | | | | | | | | | * | * | | | | | | | | | | | | |
| 58N57 | Pioneer HiBred Int'l | | 8 | n/r | LR | R | HR | HR | R | HR | HR | MR | HR | | | | | * | * | * | * | * | * | | | | | | | | | | | | | |
| AmeriStand 803T | America's Alfalfa | | 8 | n/r | MR | HR | m | h | r | HR | HR | HR | HR | ** | ** | * | * | * | * | * | * | * | * | | | | | | | | | | | | | |
| Sandpiper | Blue River Hybrids | | 8 | 4 | HR | HR | HR | H | R | HR | R | HR | n/r | * | | | | * | | | | | | | | | | | | | | | | | | |
| SW 8421S | S & W Seeds | | 8 | n/r | HR | HR | n/r | R | HR | R | R | n/r | R | | | | | | | | | | * | * | | | | | | | | | | | | |
| WL 535HQ | W-L Research | | 8 | n/r | n/r | HR | n/r | HR | HR | n/r | n/r | R | R | | | | | * | * | * | * | * | * | | | | | | | | | | | | | |
| 4N900 | Mycogen Seeds | | 9 | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | * | * | * | * | * | * | * | * | * | * | | | | | | | | | | | | | |

¹RR=Roundup Ready if "Y"; WS=Winter Survival (1=No injury, 6=Dead plants), FD=Fall Dormancy (1 & 2 Very dormant; 3 & 4 Dormant; 5 Moderately dormant; 6 & 7 Semi-dormant; 8 & 9 Non-dormant; 10 & 11 Very non-dormant), BW=Bacterial wilt, PRR=Phytophthora root rot, FW=Fusarium wilt, AN=Anthracnose, SAA=Spotted alfalfa aphid, PA=Pea aphid, BAA=Blue alfalfa aphid, SN=Stem nematode, RKN=Rootknot nematode (southern); (S=Susceptible, LR=Low resistance, MR=Moderate resistance, R=Resistant, HR=High resistance, n/r indicates either that the variety was not rated for that characteristic or no rating was available).

²Establishment year.

³N, D, and ET signify normal irrigation, drought irrigation, and early termination irrigation, respectively.

⁴Harvest year.

Shaded boxes indicate that the variety was not in the test.

***Significantly higher than all other values in the column.

**Highest yielding variety in the test for that year, except for Los Lunas 2013 test when it is the second highest yielding variety.

*Not significantly different from the highest yielding variety in the test for that year, except for Los Lunas 2013 test in 2014 when it is not significantly different from the second highest yielding variety.

L.M. Lauriault, I.M. Ray, C.A. Pierce, O. Burney, R.P. Flynn, M.A. Marsalis, M.K. O'Neill, A.E. Cunningham, C. Havlik, and M.M. West

New Mexico St. Univ. College of Agricultural, Consumer and Environmental Sciences. Agric. Exp. Stn and Coop. Ext. Ser.

| Table 11 (cont.). Characteristics and performance of alfalfa varieties across years and tests in New Mexico. | | Varietal Characteristics ¹ | | | | | | | | | | | Las Cruces | | | | | | Artesia | | | | | | Tucumcari | | | Los Lunas | | | Mora | | | Farmington | | | |
|--|-----------------------------|---------------------------------------|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------------------|----|-----|-----------------|----|----|---------|----|----|------|----|----|-----------|----|----|-----------|----|----|------|----|----|------------|----|----|--|
| | | | | | | | | | | | | | 2014 ² | | | | | | 2013 | | | | | | 2015 | | | 2013 | | | 2013 | | | 2014 | | | |
| | | Pest resistance | | | | | | | | | | | N ³ | | D | | ET | | 2013 | | | 2014 | | | 2015 | | | 2013 | | | 2013 | | | 2014 | | | |
| | | Variety | Proprietor | RR | FD | WS | BW | FW | AN | PRR | SAA | PA | BAA | SN | RKN | 15 ⁴ | 16 | 15 | 16 | 15 | 16 | 14 | 15 | 16 | 14 | 15 | 16 | 16 | 14 | 15 | 16 | 14 | 15 | 16 | 15 | 16 | |
| DG9212 | Crop Production Services | | 9 | n/r | LR | HR | HR | HR | HR | HR | HR | HR | n/r | | | | | | | * | * | * | * | * | * | | | | | | | | | | | | |
| FSG903 | Farm Science Genetics | | 9 | n/r | n/r | HR | HR | MR | R | R | HR | n/r | n/r | * | * | * | ** | * | * | | | | | | | | | | | | | | | | | | |
| AFX148091 | Alforex Seeds | | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | | * | * | * | * | * | | | | | | | | | | | | | | | | | | |
| AFX149092 | Alforex Seeds | | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | | * | * | * | * | * | | | | | | | | | | | | | | | | | | |
| NM Common | Roswell Seed | | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | | | | | | | * | ** | * | * | * | * | | | | * | | | | * | * | | | |
| NM1407227 | New Mexico State University | | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | | * | * | * | * | * | | | | | | | | | | | | | | | | | | |
| NM14ALWLHQ | New Mexico State University | | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | | * | * | * | * | * | | | | | | | | | | | | | | | | | | |
| NM14BM1008251 | New Mexico State University | | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | | * | * | * | * | * | | | | | | | | * | | | | | | | | | | |
| NM14BMC0 | New Mexico State University | | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | | * | * | * | * | * | | | | | | | | * | | | | | | | | | | |
| NM14BMHR2 | New Mexico State University | | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | | * | * | * | * | * | | | | | | | | * | | | | | | | | | | |
| NM14BMHS1 | New Mexico State University | | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | | * | * | * | * | ** | ** | | | | | | | * | | | | | | | | | | |
| NM14BMHS3 | New Mexico State University | | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | | * | * | ** | * | * | * | | | | | | | | | | | | | | | | | |
| NM14GTAF07235 | New Mexico State University | | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | | * | * | * | * | * | | | | | | | | | | | | | | | | | | |
| NM14MALHS2 | New Mexico State University | | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | | * | * | * | * | * | | | | | | | | | | | | | | | | | | |
| NM14MALHS3 | New Mexico State University | | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | | * | * | * | * | * | | | | | | | | | | | | | | | | | | |
| NM14MLLS2 | New Mexico State University | | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | | * | | | * | * | | | | | | | | | | | | | | | | | | |
| SW 8208 | S & W Seeds | | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | | | | | | | | | | | | | | | | | | | | | | | | |
| SW 8357 | S & W Seeds | | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | n/r | | | | | | | | | | | | | | | | | | | | | | | | |

¹RR=Roundup Ready if "Y"; WS=Winter Survival (1=No injury, 6=Dead plants), FD=Fall Dormancy (1 & 2 Very dormant; 3 & 4 Dormant; 5 Moderately dormant; 6 & 7 Semi-dormant; 8 & 9 Non-dormant; 10 & 11 Very non-dormant), BW=Bacterial wilt, PRR=Phytophthora root rot, FW=Fusarium wilt, AN=Anthracnose, SAA=Spotted alfalfa aphid, PA=Pea aphid, BAA=Blue alfalfa aphid, SN=Stem nematode, RKN=Rootknot nematode (southern); (S=Susceptible, LR=Low resistance, MR=Moderate resistance, R=Resistant, HR=High resistance, n/r indicates either that the variety was not rated for that characteristic or no rating was available).

²Establishment year.

³N, D, and ET signify normal irrigation, drought irrigation, and early termination irrigation, respectively.

⁴Harvest year.

Shaded boxes indicate that the variety was not in the test.

***Significantly higher than all other values in the column.

**Highest yielding variety in the test for that year, except for Los Lunas 2013 test when it is the second highest yielding variety.

*Not significantly different from the highest yielding variety in the test for that year, except for Los Lunas 2013 test in 2014 when it is not significantly different from the second highest yielding variety.

L.M. Lauriault, I.M. Ray, C.A. Pierce, O. Burney, R.P. Flynn, M.A. Marsalis, M.K. O'Neill, A.E. Cunningham, C. Havlik, and M.M. West
 New Mexico St. Univ. College of Agricultural, Consumer and Environmental Sciences. Agric. Exp. Stn and Coop. Ext. Ser.

Table 12. New Mexico State University Agricultural Experiment Station and Cooperative Extension Service publications related to alfalfa management.

| Number | Title |
|---------------|---|
| A-114 | Test your soil |
| A-122 | Soil test interpretations |
| A-123 | Sampling for plant tissue analysis |
| A-129 | Nitrogen fixation by legumes |
| A-130 | Inoculation of legumes |
| A-131 | Certified seed |
| A-137 | Soil analysis: A key to soil nutrient management |
| A-145 | Certified noxious weed free program |
| A-229 | Phymatotrichum root rot |
| A-325 | Managing weeds in alfalfa |
| A-326 | Downy mildew on alfalfa |
| A-333 | User manual of the alfalfa yield predictor |
| A-334 | Beet armyworm in New Mexico Hay |
| A-335 | Variegated cutworm in New Mexico Hay |
| A-336 | Managing Roundup Ready alfalfa and conventional or organic alfalfa hay in nearby fields in New Mexico |
| A-337 | Recommendations for Roundup Ready alfalfa weed management and stand removal in New Mexico |
| A-338 | Alfalfa weevil control options in New Mexico |
| A-339 | Alfalfa integrated pest management: Aphids |
| H-158 | How to collect and send plant specimens for disease diagnosis |
| CR-536 | Blister beetles in alfalfa |
| CR-633 | Using a computer application to predict irrigated alfalfa yield |
| CR-641 | Hay quality, sampling and testing |
| CR-644 | Assessing alfalfa stands after winter injury, freeze damage, or any time renovation is considered in New Mexico |
| CR-646 | Managing alfalfa during drought |
| CR-654 | Selecting alfalfa varieties for New Mexico |
| CR-659 | Whitefringed beetle in New Mexico alfalfa |
| CR-668 | Reducing harvest and post-harvest losses of alfalfa and other hay |
| RR-766 | Furrow-irrigated alfalfa dry matter yield is not affected by different seeding rates in the Southern High Plains, USA |
| RR-772 | Observations on how cowpea aphid affects alfalfa |

These publications, and alfalfa variety test reports from previous years, are available from your county office of the NMSU Cooperative Extension Service or online at <http://forages.nmsu.edu/resources.html> and aces.nmsu.edu/pubs/