

File Name: WCF 1060 Nomination 5 25 2017

MEMORANDUM TO: Specialty Crop Release & Recommendation Committee

FROM: David Wichman, Former MAES-CARC Research Agronomist/Superintendent

DATE: 5- 25- 2017

Proposal: Licensed cultivar release of reduced-awned/awnletted winter triticale line WCF 1060 for forage production

The following motion and supporting document is presented for consideration via 2017 electronic meeting of the specialty crops variety release committee.

[Need a member of the committee to make nomination;](#)

Motion: Move that WCF 1060 reduced-awned / awnletted winter triticale line be approved for licensed release by the Montana Agricultural Experiment Station. The pedigree of this line is not presented as it was not develop using a pedigree breeding procedures. The line was derived from one of five germplasms from crosses made amongst lines received from Oregon State University (OSU) triticale germ plasm and populations in the early 1990s.

Selection of the WCF 1060 line:

WCF 1060 was selected from within plants produced by a single half head. Half heads of 200 plants with reduced-awned / awnletted / awnless from selected lines exhibiting promise of good forage production potential and other desirable agronomic characters such as uniform intermediate to tall plant height, uniform heading date, slower leaf senescence, leaves remaining un-cupped post heading, and good winter survival. The other half of the head was planted the following May in an adjacent hill, to its respective fall planted half head hill. This provided for easy elimination of any lines exhibiting facultative, segregating, or obvious out crossing characters. Some hills exhibited good plant uniformity while others exhibited a mixture variations awn length and presence, plant height and heading dated. Similarly spring seeded hills had lines exhibited good uniformity for no reproductive growth while others had a range from a few plants heading to all the plants producing heads by August 1. At no time has head bagging been used to prevent crossing amongst lines and germplasms during the selection process.

Plant Facultative character:

The genetic makeup of some winter annual biotypes enable them to initiate reproductive floral tissue growth in the in absence of a vernalization (exposure to winter cold temperature) period. A facultative type winter triticale could become a difficult to control weed in cropping systems with a high frequency of wheat or other cereal grain, due to the ability for plants from both fall and late spring germinating seed, to produce seed during the current growing season. Under irrigated production, there has been less concern about facultative triticale because of the generally greater diversity of crop species provides for using graminicides to remove volunteer triticale plants.

## Methods:

From the 200 hills, 700 heads were planted in head rows. The head rows were grouped by the source hill. The line WCF 1060 was entered in 2010 and 2011 preliminary forage yield trial along with 48 other lines (data not presented). Due to WCF 1060 forage yield performance and its reduced-awned character in the Preliminary Yield Trial (yy223607), WCF 1060 was evaluated in the MAES Statewide Winter Cereal (yy2238loc) forage trials in 2013 to 2016. Initially, it was tested with the line id/code 10 PreWCF60. Bozeman, Havre and Moccasin have been the primary sites for MAES Statewide winter cereal forage trial. The MAES Statewide Winter Cereal trial (yy2238loc) was conducted at WARC-Corvallis, EARC-Sidney, Winifred (on-farm cooperator) and SREC-Sheridan WY, for one growing season, during 2013 to 2016 period. During this period, no extremely harsh winter growing conditions were experienced at any of the test locations. The only inference that can be made about the winter hardiness of WCF 1060 is that it progressed through a selection process, conducted at the CARC-Moccasin for more than ten years and was exposed to winter growing conditions at NARC-Havre and Bozeman for at least four years without any stark winter stand reduction. Further, it should be presently viewed as not being as winter hardy Willow Creek, Willow Creek is a reduced-awned hard red winter wheat, released by the Montana Agricultural Experiment Station, which is a winter cereal forage yield standard, widely grown in the northern USA plains and inter-mountain regions

The multi-year and multi-location yield performance data will show WCF 1060 provides acceptable to excellent forage yield levels while providing the desired attribute of reduced awn length, to total absence of awns or awnlettes, with a very low frequency of heads exhibiting awnlettes or short awns [See Illustrations 1 & 2]. Willow Creek and Trical 102, a reduced awn length and reduced awn frequency winter triticale, developed by Resource Seeds of Gilmore, California, are used as winter cereal forage yield standards for assessing the relative yield performance of WCF 1060 and other development lines in MAES winter cereal forage trials. The data presented does not support stating that WCF 1060 is consistently a superior forage producer when compared to the two standards and other development lines. The relative yield ranking of the standards, Willow Creek and Trical 102, and WCF 1060 varies across years for each location and within years across locations. Some locations had a single harvest date while others had two or more harvest dates to accommodate the difference in entry heading dates. For these trials, the objective was to harvest the winter wheat and triticale within five days after heading. Most researchers involved in MAES cereal forage variety and development line evaluations have other research responsibilities with greater priority, which precluded them from accomplishing multiple harvest dates. Not all WCF Statewide trial data was utilized in multi-location summary analysis and tables presented. Access to electronic field books at time of analysis influenced which location data were included here.

## Results and Discussion:

Tables 1 to 8 present the factorial analysis results for forage yield and other agronomic factors for two or more locations, using the factors entry and location, within the years 2016, 2015, 2014, and 2013. The factorial analysis was conducted with the AVMF program of the MSUStat package developed by Mr. Dick Lund, retired MAES Statistician. The ID for entries 7 & 14, in the 2016 data set, is blacked out because the line entered as entry 7 and 14 varied across locations due to limited available seed. Tables 9 and 10 present mean yields for each entry at each test location, plus each entries' numerical yield rank for each location for the crop years 2014 and

2013, respectively. Using the MSU Stat's MRegress program, projected WCF 1060 agronomic performance were calculated, relative to the given performance of Willow Creek, Trical 102 and the mean of all entries using 2013 to 2016 data [Table 13 and 14]. Individual location trial means data summaries are presented for the 2013 to 2016 period for NARC-Havre [Tables 15-18], 2013-2015 Bozeman [Tables 19-21], and 2013-2016 CARC- Moccasin [Tables 22-25]. NARC-Havre data table includes sawfly cutting scores. Forage quality information from four 2014 locations is presented in Tables 11 and 12 and is based on two replications per location.

The 2016 average forage dry matter yield across five locations, was 3.37 tons per acre (t/a) [Table 1]. The WCF 1060 yield was similar to Trical 102, 3.58 t/a, and greater than Willow Creek, 3.02 t/a, across the Corvallis, Havre, Moccasin, and Sidney locations. WCF 1060, (141.3 centimeters [cm]) and Trical 102 (138.1cm) were similar in height and significantly taller than Willow Creek (110.3 cm). The 2016 five location mean heading date of WCF 1060 was Julian day 155 which was 7d earlier than Willow Creek (d162) and 4d earlier than Trical 102 (d159). Julian day 160 was June 8, 2016. WCF 1060 averaged 4654 pounds per acre (lbs/a) of grain across the Havre and Moccasin fallow locations, compared to 3531 and 3260 lbs/a for Trical 102 and Willow Creek, respectively. The NARC-Havre location had significantly higher winter cereal forage yields (5.77 t/a) than the other four locations [Table 2]. WARC-Corvallis had the earliest heading date.

The 2015 Statewide winter cereal forage trial, 15223800, average yield, across five locations, was 3.86 t/a [Table 3]. The WCF 1060 forage yield (3.80 t/a) was similar to the yields of Willow Creek (3.45 t/a) and Trical 102 (3.83 t/a). Two experimental lines had four location mean yields statistically greater than the yields of WCF 1060, Trical 102, and Willow Creek. WCF 1060 was earlier to head than Willow Creek (8d) and Trical 102 (2.6 d). WCF 1060 was taller than both Willow Creek and Trical 102 by 21 and 6 centimeters, respectively. WCF 1060 three location grain yield was 2726 lbs/a which was greater than grain yield of Willow Creek (2152 lbs/a) and similar to Trical 102's (2682lbs/a) grain yield. WCF 1060 test weight was lower than all but one of the 16 entries. Its grain protein was near the trial mean. The Bozeman fallow location had the high forage and grain yields, latest head date and the tallest plants.

The 2014 WCF Statewide Trial (14223800) had a four location mean yield of 2.56 t/a, mean head date of 168 Julian day and 117 cm mean plant height [Table 5]. WCF 1060 had the high mean yield of 2.90 t/a with a mean plant height of 132 cm. Willow Creek had a mean yield of 2.65 t/a and height of 108 cm. Trical 102's mean yield was 2.70 t/a and its mean plant height was 123 cm. WCF 1060 had mean head date of 165 Julian day, while Willow Creek and Trical 102 head dates were 176 and 168, respectively.

In 2013, Willow Creek had the high mean yield across four locations, Moccasin-Fallow and Recrop, Winifred Fallow, and Sheridan, Wy fallow, at 3.83 t/a dry matter [Table 7]. WCF 1060 yield, 4.05 t/a, was similar to the Willow Creek yield. Trical 102 four location mean yield, 3.59 t/a, was significantly lower than the yields of both Willow Creek and WCF 1060.

The recent 40 years have seen an increased effort in breeding improved triticale and large advances have been made. However, the total triticale breeding effort is minuscule compared to

the total effort put into improving hard red wheat. Therefore, has been less concentration of desirable genes in any one triticale line compared to modern hard red wheat lines such as Yellowstone and Vida. Thus, it is not unexpected to see greater variation in order of yield rank across locations within a year, and across years within a location, than typically occurs with data for similar winter and spring wheat variety trials. Tables 9 & 10, exhibit the amount of variation in yield rank that occurred across multiple locations in 2013 and 2014, respectively. At the 2013 Sheridan WY location, the Willow Creek was harvested at 44% dry matter which is much higher and more mature with some grain fill, than the trials average dry matter content of 30% [Table 31].

2014 Forage quality for two replications from four locations is presented in Tables 11 & 12. The WCF 1060 was not statistically different from the forage quality of the standards, Willow Creek and Trical 102 [Tables 11 & 12]. The grain type winter wheat entries, Warhorse and Yellowstone, had higher protein content and lower ADF, NDF and lignin content scores than the forage type entries. Note that within the various trial locations, some had a single harvest dates and others had two or more harvest dates to accommodate the difference in heading dates. For these trials, the objective was to harvest the winter wheat and triticale within five days after heading. Often harvest date, growth stage, has a greater impact on forage quality than variety and sometimes species.

#### Pest Susceptibility, Tolerance and Resistance:

One of the initial goals of crossing wheat with rye, back in the 1870s, was to breed more disease resistance in wheat. That goal was attained in that triticale generally has more disease resistance than wheat. The 2016 CARC No-Till Continuous Crop trial (16223870) showed the tolerance of some triticale lines to wheat streak mosaic. The event was just noted, but no numerical data recorded. The trial was seeded near, within 60 feet, of the 2015 Winter Cereal Facultative Evaluation trial. The 2015 trial was not sprayed to provide the opportunity to harvest 'heads of non-facultative line' in 2016. Wheat streak mosaic severely infected the winter wheat entries in third rep (closest [ $< 40$  ft] to 2015 WCF Facultative Evaluation trial, and to a lesser degree the winter wheat in Reps 2 & 1. The WSMV infection reduced the 2016 wheat forage yields. The general tolerance of triticale to WSMV has been observed repeatedly, over years, in the "Evaluation of facultative character trials" and "Evaluation of spring seeded winter cereals for summer grazing forage trials." The winter triticale lines evaluated have not exhibited symptoms of WSMV. However, it should not be assumed that the winter triticale is not a green bridge host, infection source, for the curl mite or WSMV.

The Montana winter cereal forage trials have not had extensive exposure to sawfly. Data collected at the NARC-Harve, suggest the triticale is less attractive to sawfly than the trials wheat entries. The NARC data also suggest there may be some difference between triticale lines for sawfly attraction [See Tables 15-18]. Sawfly is more of a concern for those producing seed than growers harvesting the crop as a forage.

An information summary of an effort to project future performance of WCF 1060 and other development lines, relative to the performance of the average performance of all the entries in the trial, the performance of Willow Creek, and the performance of Trical 102 is presented Tables 11 & 12. This effort may be more curious entertainment than valid decision tool. A

regression analysis was used to generate the data presented. The number of locations used to calculate the projections is presented. At low yield levels, 1 t/a, WCF 1060 is projected to yield more than nursery average, Willow Creek and Trical 102. At high yield levels, 5 t/a, WCF is projected to yield the same as the trial average and Willow Creek, but less than Trical 102. WCF 1060 is projected to be taller, earlier to head, and have a lower test weight than the trial means. For grain yield, it will beat the average at low yields (2000 lbs/a) and below average at higher yields (5000 lbs/a). The hard red wheat entries' grain yield and test weight performance contribute to the relatively inferior projections for WCF 1060.

#### Seed Increase:

Seed was increased in a one acre field at the CARC-Moccasin in 2016. Two additional 3 acre fields, from different seed lots, were seeded in January 2016 NW of Cut Bank, in conjunction with Montech, LLC. One field Cut Bank field was rejected at initial inspection due to too many heads with full awns. The second field was allowed to go to harvest, with additional roguing, as there were some volunteer spring wheat and barley plants in the understory. The field was not inspected a second time. From the 2016 CARC production, a seed increase fields were seeded in September 2016 at the Post Farm and Circle S Seeds. Head hills were also planted in the fall of 2016 for 2017 harvest and future seed production. It is proposed that the Montana Foundation Seed program produce foundation seed under contract with the licensing enterprise. Tolerances for variation and frequency of heads with awnlettes (very short awns) and awnlette length has not been established.

#### Acknowledgement

I would like recognize and express appreciation for the contributing efforts of several researchers. Current and former MAES cooperators Peggy Lamb, Jim Berg, Marty Knox, and Pat Hensleigh, retired OSU plant breeder Mat Kolding, University of Wyoming-SREC Roger Hybner (retired) and Dan Smith, and other MAES staff who have contributed to the MAES cereal forage research effort. The commitment of these researchers to advancing cereal forage production was significant and is much appreciated. Participating in triticale research is not free of some angst due to triticale originating from a rye X wheat cross and rye having a notorious image. Most researchers who have worked with triticale view it as a crop with potential to provide opportunities for Montana forage and grain producers.

Illustration 1 WCF 1060 head type. Photo September 2016



Illustration 2. A variety of winter triticale head types.



Table 1 2016 Agronomic, forage and grain production performance of sixteen winter cereal forage entries across five locations: NARC-Havre Fallow, CARC-Moccasin Fallow and CC, WARC-Corvallis & EARC Sidney.

| Entry ID                     | Species   | Trt | N          | Dry Matter  |     |       |     | Plant Height |      | Head Date |       | Grain Yield |       |
|------------------------------|-----------|-----|------------|---|-----|-------|-----|--------------|------|-----------|-------|-------------|-------|
|                              |           |     |            | Yield   |     |       |     | content      |      | cm        |       | Julian      |       |
| wcf 1060                     | triticale | 1   | 15         | 3.37  | BCD | 0.27  | A   | 141.3        | CDEF | 155       | A     | 4654        | GH    |
| wcf 1020                     | triticale | 2   | 15         | 3.22  | AB  | 0.27  | A   | 143.8        | DEF  | 155       | A     | 4177        | FG E  |
| P0062                        | triticale | 3   | 15         | 3.26  | ABC | 0.27  | A   | 145.3        | EF   | 156       | B     | 3147        | A     |
| Willow Creek                 | wheat     | 4   | 15         | 3.02  | A   | 0.34  | F   | 110.3        | B    | 162       | D     | 3260        | AB    |
| Trical 102                   | triticale | 5   | 15         | 3.58  | D   | 0.30  | D C | 138.1        | CD   | 159       | C     | 3531        | ABCD  |
| MTF 1559                     | triticale | 6   | 15         | 3.03  | A   | 0.31  | DE  | 89.8         | A    | 162       | D     | 4841        | I H   |
| ██████████                   | triticale | 7   | 15         | <b>3.59</b>   | D   | 0.30  | D C | 140.7        | CDEF | 155       | A     | 4068        | F D E |
| MTF 1432                     | wheat     | 8   | 15         | 3.07  | A   | 0.33  | EF  | 91.73        | A    | 160       | C     | 5245        | I     |
| MTF 1435                     | wheat     | 9   | 15         | 3.12  | AB  | 0.33  | F   | 108.1        | B    | 159       | C     | 4194        | FG E  |
| wcf 1078                     | triticale | 10  | 15         | 3.13  | AB  | 0.28  | AB  | 146.3        | F    | 155       | A     | 3971        | DE    |
| wcf 1216                     | triticale | 11  | 15         | 3.41  | BCD | 0.28  | AB  | 142.9        | DEF  | 156       | AB    | 3941        | CDE   |
| WCF14adv114                  | triticale | 12  | 15         | 3.21  | AB  | 0.27  | A   | 143.4        | DEF  | 155       | A     | 3792        | BCDE  |
| wcf 1241A                    | triticale | 13  | 15         | 3.28  | ABC | 0.26  | A   | 135.9        | C    | 155       | A     | 4529        | FGH   |
| ██████████                   | triticale | 14  | 15         | <b>3.55</b>   | CD  | 0.29  | BC  | 139.1        | CDE  | 156       | B     | 3399        | ABC   |
| wcf 1310-230                 | triticale | 15  | 15         | 3.06  | A   | 0.26  | A   | 141.5        | CDEF | 155       | AB    | 3648        | ABCDE |
| wcf 1310-218                 | triticale | 16  | 15         | 3.13  | AB  | 0.26  | A   | 139.5        | CDE  | 155       | A     | 3965        | DE    |
| MEAN                         |           |     | N=240      | 3.251   |     | 0.289 |     | 131.1        |      | N=192     | 156.7 | 4023        |       |
| SE FOR MEAN                  |           |     |            | 0.1041  |     | 0.006 |     | 2.276        |      |           | 0.405 | 193.2       |       |
| SE FOR DIF                   |           |     |            | 0.1472  |     | 0.009 |     | 3.219        |      |           | 0.572 | 273.3       |       |
| LSD (cal by t)               |           |     |            | 0.2908  |     | 0.018 |     | 6.357        |      |           | 1.132 | 545.9       |       |
| DIF 0.9 POW                  |           |     |            | 0.4804  |     | 0.029 |     | 10.5         |      |           | 1.87  | 900.3       |       |
| SIGNIF LEVE                  |           |     |            | 0.05  |     | 0.050 |     | 0.05         |      |           | 0.05  | 0.05        |       |
| COUNT PER Mean               |           |     |            | 15  |     | 15    |     | 15           |      |           | 12    | 6           |       |
| Two entries were blacked out |           |     | ██████████ | because these entries were different for the Sidney location. |     |       |     |              |      |           |       |             |       |

Table 2 2016 Agronomic, forage and grain production performance of sixteen winter cereal forage entries across Exp. 152238 five locations: NARC-Havre Fallow, CARC-Moccasin Fallow & CC, WARC-Corvallis & EARC Sidney.

| Entry ID       | Field  | N     | Dry Matter Yield |   | Dry Matter content |    | Plant Height |   | Head Date |       | Grain Yield |        |
|----------------|--------|-------|------------------|---|--------------------|----|--------------|---|-----------|-------|-------------|--------|
|                |        |       | t/a              |   |                    |    | cm           |   | Julian    |       | lbs/a       |        |
| NARC-Havre     | Fallow | 48    | 5.774            | D | 0.3044             | D  | 170.7        | D | 156       | B     | 4268        | B      |
| CARC-Mocc.     | Fallow | 48    | 2.964            | C | 0.301              | CD | 133.5        | C | 163       | C     | 3778        | A      |
| CARC-Mocc.     | CC     | 48    | 2.451            | B | 0.294              | CB | 123          | B | 162       | C     |             |        |
| WARC-Corvallis | Fallow | 48    | 3.11             | C | 0.2844             | B  | 120.8        | B | 146       | A     |             |        |
| EARC -Sidney   | Fallow | 48    | 1.956            | A | 0.2596             | A  | 107.6        | A |           |       |             |        |
| Mean           |        | n=240 | 3.251            |   | 0.2887             |    | 131.1        |   | N=192:    | 156.7 |             | 4023   |
| SE FOR Mean    |        |       | 0.058            |   | 0.004              |    | 1.272        |   |           | 0.202 |             | 68.31  |
| SE FOR DIF     |        |       | 0.082            |   | 0.005              |    | 1.799        |   |           | 0.286 |             | 96.61  |
| LSD (cal by t) |        |       | 0.163            |   | 0.010              |    | 3.554        |   |           | 0.566 |             | 193.00 |
| DIF 0.9 PO     |        |       | 0.269            |   | 0.016              |    | 5.871        |   |           | 0.935 |             | 318.30 |
| SIGNIF Level   |        |       | 0.05             |   | 0.05               |    | 0.05         |   |           | 0.05  |             | 0.05   |
| COUNT PER Mean |        |       | 48               |   | 48                 |    | 48           |   |           | 48    |             | 48     |



Table 3 2015 Agronomic, forage and grain production performance of sixteen winter cereal forage entries across four Montana locations: NARC-Havre Fallow, WWBP- Bozeman Fallow, CARC-Moccasin Fallow and CC.

| Entry ID                     | Species   | Head         | Mature   |              | Dry      |              | Grain    |               | Grain    |             | Grain    |             |
|------------------------------|-----------|--------------|----------|--------------|----------|--------------|----------|---------------|----------|-------------|----------|-------------|
|                              |           | Date         | Plant    | Plant        | Matter   | Matter       | Yield    | Yield         | Test     | Test        | Protein  |             |
|                              |           | Julian       |          | Height       |          | Yield        |          | Yield         |          | Weight      |          | Content     |
|                              |           |              |          | cm           |          | tnsac        |          | lbsac         |          | lbsbu       |          | %           |
| wcf 1060                     | triticale | 157.3        | AB       | 140.3        | EDF      | 3.80         | BCDE     | 2726          | CBD      | 47.7        | AB       | 11.4        |
| wcf 1020                     | triticale | 157.4        | ABC      | 147.8        | JH GI    | 3.93         | F DE     | 3162          | DEFG     | 53.0        | E        | 10.7        |
| P0062                        | triticale | 157.8        | BC       | 149.2        | JH I     | 4.31         | FG       | 2650          | B        | 53.9        | FE       | 11.4        |
| Willow Creek                 | wheat     | <b>165.8</b> | <b>G</b> | 118.5        | C        | 3.45         | AB       | 2152          | A        | <b>60.6</b> | <b>I</b> | <b>12.3</b> |
| Trical 102                   | triticale | 159.9        | D        | 134.3        | D        | 3.83         | BCDE     | 2682          | CB       | 49.2        | C        | 11.3        |
| MTF 1559                     | wheat     | 162.5        | F        | <b>93.9</b>  | A        | 3.67         | ABCD     | 3368          | FG       | 58.5        | G        | 10.6        |
| MTF 1232                     | wheat     | 161.5        | E        | 105.6        | B        | 3.36         | A        | 2694          | CB       | 59.7        | HI       | 10.8        |
| MTF 1432                     | wheat     | 162.3        | FE       | 97.0         | A        | 3.45         | ABC      | <b>3538</b>   | <b>G</b> | 59.2        | HG       | 11.1        |
| MTF 1435                     | wheat     | 160.3        | D        | 106.9        | B        | 3.49         | ABC      | 2896          | CBDE     | 59.5        | H        | 11.1        |
| wcf 1078                     | triticale | 157.3        | AB       | 151.7        | J I      | 4.02         | FG DE    | 2894          | CBDE     | 53.2        | E        | 10.7        |
| wcf 1216                     | triticale | <b>156.5</b> | <b>A</b> | 145.2        | HFGI     | <b>4.36</b>  | <b>G</b> | 2963          | CBDEF    | 48.3        | BC       | 11.1        |
| wcf 1310-221                 | triticale | 157.3        | AB       | <b>152.3</b> | <b>J</b> | 3.86         | CDE      | 2789          | CBD      | 53.1        | E        | 11.0        |
| wcf 1241A                    | triticale | 156.9        | AB       | 136.7        | ED       | 4.03         | FG DE    | 3525          | G        | 51.3        | D        | 11.2        |
| wcf 1310-219                 | triticale | 158.3        | C        | 137.8        | ED       | 4.04         | FG DE    | 3320          | EFG      | 51.9        | D        | 11.4        |
| wcf 1310-230                 | triticale | 158.3        | C        | 142.2        | E FG     | 3.96         | FG DE    | 3469          | G        | 54.6        | F        | 10.9        |
| wcf 1310-218                 | triticale | 156.9        | AB       | 143.2        | EHFG     | 4.16         | FG E     | 3115          | C DEFG   | 46.8        | A        | 11.6        |
| Mean (n=192 except TW n=160) |           | <b>159.1</b> |          | <b>131.4</b> |          | <b>3.857</b> |          | <b>2996</b>   |          | <b>53.6</b> |          | 11.2        |
| SE FOR MEAN                  |           | 0.35         |          | 2.44         |          | 0.15         |          | 162.10        |          | 0.33        |          |             |
| SE FOR DIF                   |           | 0.5          |          | 3.452        |          | 0.2076       |          | 229.3         |          | 0.472       |          |             |
| LSD (cal by t)               |           | <b>0.99</b>  |          | <b>6.83</b>  |          | <b>0.41</b>  |          | <b>453.70</b> |          | <b>0.94</b> |          |             |
| DIF 0.9 POWER                |           | 1.63         |          | 11.28        |          | 0.68         |          | 749.30        |          | 1.55        |          |             |
| SIGNIF LEVEL                 |           | 0.05         |          | 0.05         |          | 0.05         |          | 0.05          |          | 0.05        |          |             |
| COUNT PER MEAN               |           | 12           |          | 12           |          | 12           |          | 12            |          | 4           |          | 3           |

Table 4 2015 Agronomic and forage production performance of 16 winter cereal entries at four locations

| Location                     | Head Date |   | Mature Plant Height |   | Dry Matter Yield |   | Grain Yield |   | Grain Test Weight |   |
|------------------------------|-----------|---|---------------------|---|------------------|---|-------------|---|-------------------|---|
|                              | Julian    |   | cm                  |   | tnsac            |   | lbsac       |   | lbsbu             |   |
| NARC - Havre                 | 154.7     | A | 113.9               | A | 2.99             | A | 2927        | B | 53.05             | A |
| WWBP-Bozeman                 | 162.1     | C | 145.7               | D | 5.75             | C | 3932        | C | 52.77             | A |
| CARC- Fallow                 | 161.7     | C | 130.1               | B | 3.60             | B | 2718        | B | 55.73             | C |
| CARC NTRC                    | 158.0     | B | 136.0               | C | 3.09             | A | 2409        | A | 53.53             | B |
| Mean (n=192 except TW n=160) | 159.1     |   | <b>131.4</b>        |   | <b>3.857</b>     |   | <b>2996</b> |   | <b>53.6</b>       |   |
| SE FOR MEAN                  | 0.1768    |   | 1.221               |   | 0.073            |   | 81.06       |   | 0.1668            |   |
| SE FOR DIF                   | 0.25      |   | 1.726               |   | 0.1038           |   | 114.6       |   | 0.2358            |   |
| LSD (cal by t)               | 0.4947    |   | 3.416               |   | 0.2054           |   | 226.8       |   | 0.4682            |   |
| DIF 0.9 POWER                | 0.817     |   | 5.641               |   | 0.3393           |   | 374.6       |   | 0.7729            |   |
| SIGNIF LEVEL                 | 0.05      |   | 0.05                |   | 0.05             |   | 0.05        |   | 0.05              |   |
| COUNT PER MEAN               | 48        |   | 48                  |   | 48               |   | 48          |   | 16                |   |

Table 5 2014 Mean forage production of sixteen winter cereals across four Montana-Wyoming locations.  
Exp. 142238

| Entry ID            | Species          | N       | Dry Matter Yield |       | Dry Matter Content |      | Plant N-height |            |     | Head N Date |            |      |
|---------------------|------------------|---------|------------------|-------|--------------------|------|----------------|------------|-----|-------------|------------|------|
|                     |                  |         | t/a              |       | %                  |      | cm             |            |     | Julian      |            |      |
| Yellowstone         | wheat            | 12      | 1.96             | A     | 0.30               | AB   | 9              | 77         | A   | 6           | 167        | D CE |
| Warhorse            | wheat            | 12      | 2.14             | AB    | 0.31               | BC   | 9              | <b>76</b>  | A   | 6           | 167        | D CE |
| Newturk             | wheat            | 12      | 2.32             | BC    | 0.29               | A    | 9              | 133        | F   | 6           | 168        | E    |
| <b>Willow Creek</b> | wheat            | 12      | 2.65             | DG EF | 0.35               | F    | 9              | 108        | D   | 6           | <b>176</b> | G    |
| <b>Trical 102</b>   | triticale        | 12      | 2.70             | G EF  | 0.31               | DBC  | 9              | 123        | E   | 6           | 168        | D E  |
| MTF 1232            | wheat            | 12      | 2.56             | D CEF | 0.33               | DF E | 9              | 107        | D   | 6           | 172        | F    |
| MTF1435             | wheat            | 12      | 2.36             | DBC   | 0.31               | DBC  | 9              | 96         | C   | 6           | 168        | E    |
| MTF 1432            | wheat            | 12      | 2.44             | DBCE  | 0.33               | F E  | 9              | 89         | B   | 6           | 172        | F    |
| MTF 1434            | wheat            | 12      | 2.63             | DGCEF | 0.35               | F    | 9              | 106        | D   | 6           | 173        | F    |
| <b>WCF 1060</b>     | <b>triticale</b> | 12      | <b>2.90</b>      | G     | 0.31               | ABC  | 9              | 132        | F   | 6           | <b>165</b> | AB   |
| 10WCF 81            | triticale        | 12      | 2.69             | G EF  | 0.30               | AB   | 9              | 142        | G H | 6           | 166        | DBC  |
| 108 WCF 28          | triticale        | 12      | 2.62             | DGCEF | 0.32               | D CE | 9              | 132        | F   | 6           | 166        | BC   |
| WCF 1012            | triticale        | 12      | 2.73             | G EF  | 0.30               | AB   | 9              | 136        | GF  | 6           | 166        | DBC  |
| WCF 1020            | triticale        | 12      | 2.84             | G F   | 0.31               | DBC  | 9              | 136        | GF  | 6           | <b>165</b> | AB   |
| 111 WCF 57a         | triticale        | 12      | 2.79             | G F   | 0.31               | DBCE | 9              | 136        | GF  | 6           | <b>165</b> | A    |
| 111 WCF 57b         | triticale        | 12      | 2.69             | G EF  | 0.31               | DBCE | 9              | <b>145</b> | H   | 6           | 166        | AB   |
| Mean                |                  | (N=192) | <b>2.56</b>      |       | 0.315              |      | (N=144)        | <b>117</b> |     | (N=96)      | <b>168</b> |      |
| SE for Mean         |                  |         | 0.115            |       | 0.007              |      |                | 2.4        |     |             | 0.49       |      |
| SE for DIF          |                  |         | 0.163            |       | 0.010              |      |                | 3.3        |     |             | 0.69       |      |
| LSD (cal by t)      |                  |         | 0.323            |       | 0.021              |      |                | 6.6        |     |             | 1.37       |      |
| DIF 0.9 Power       |                  |         | 0.533            |       | 0.034              |      |                | 11         |     |             | 2.26       |      |
| Signif Level        |                  |         | 0.05             |       | 0.05               |      |                | 0.1        |     |             | 0.05       |      |
| Count per mean:     |                  |         | 12               |       | 12                 |      |                | 9          |     |             | 6          |      |

Table 6 2014 Mean forage production of sixteen winter cereals at four Montana-Wyoming locations.

| Location        | Dry Matter Yield |             | Dry Matter Content |         | Plant Height | Head Date         |
|-----------------|------------------|-------------|--------------------|---------|--------------|-------------------|
|                 | t/a              |             | %                  |         | cm           | Julian            |
| NARC Fallow     | 48               | 2.88 C      | 0.36 C             |         | 103 A        | 165 A             |
| CARC Fallow     | 48               | 3.11 D      | 0.3 A              |         | 121 B        | 172 B             |
| CARC Recrop     | 48               | 2.31 B      | 0.29 A             |         | 127 C        |                   |
| SREC Fallow     | 48               | 1.94 A      | 0.31 B             |         |              |                   |
| Mean            | (N=192)          | <b>2.56</b> | 0.31               | (N=144) | <b>117</b>   | <b>(N=96) 168</b> |
| SE for Mean     |                  | 0.058       | 0.004              |         | 1            | 0.17              |
| SE for DIF      |                  | 0.082       | 0.005              |         | 1.4          | 0.24              |
| LSD (cal by t)  |                  | 0.161       | 0.010              |         | 2.9          | 0.49              |
| DIF 0.9 Power   |                  | 0.27        | 0.017              |         | 4.8          | 0.8               |
| Signif Level    |                  | 0.05        | 0.05               |         | 0.1          | 0.05              |
| Count per mean: |                  | 48          | 48                 |         | 48           | 48                |

Table 7 2013 Mean forage production of sixteen winter cereals across  
 Exp. 132238 four Montana-Wyoming locations. data: 132238ML.DBF

| Entry ID             | Species   | Entry | N             | Dry Matter   |      | Dry Matter   |      |
|----------------------|-----------|-------|---------------|--------------|------|--------------|------|
|                      |           |       |               | Yield        |      | Content      |      |
|                      |           |       |               | t/a          |      | %            |      |
| WCF 1060             | triticale | 1     | 12            | 4.05         | GEDF | 0.34         | DF E |
| 10 PreWcf 78         | triticale | 2     | 12            | 3.76         | C D  | 0.33         | D CE |
| 12 wcf A18 (P0029)   | triticale | 3     | 12            | 4.02         | EDF  | 0.34         | F E  |
| 10 PreWcf 68         | triticale | 4     | 12            | 4.01         | EDF  | 0.34         | DF E |
| 110 WCF 57           | triticale | 5     | 12            | 3.83         | CED  | 0.32         | BC   |
| 12 WCF A21 (P0059)   | triticale | 6     | 12            | 4.32         | G F  | 0.35         | GF   |
| 12 WCF A 41 (P1085)  | triticale | 7     | 12            | 4.00         | EDF  | 0.35         | GF   |
| 111 WCF 57           | triticale | 8     | 12            | 4.14         | GE F | 0.35         | GF   |
| 12 WCF A35 (11Adv10) | triticale | 9     | 12            | 3.99         | EDF  | 0.34         | DFCE |
| 12 WCF A27 (P0086)   | triticale | 10    | 12            | 3.76         | C D  | 0.33         | DBC  |
| Willow Creek         | wheat     | 11    | 12            | <b>4.37</b>  | G    | 0.38         | H    |
| Trical 102           | wheat     | 12    | 12            | 3.59         | CB   | 0.31         | A    |
| Yellowstone          | wheat     | 13    | 12            | 3.01         | A    | 0.31         | AB   |
| MTF1232              | wheat     | 14    | 12            | 3.38         | B    | 0.32         | BC   |
| MTF1229              | wheat     | 15    | 12            | 3.00         | A    | 0.31         | A    |
| Newturk              | wheat     | 16    | 12            | 3.62         | CB   | 0.36         | G    |
| Mean                 |           |       | <b>n= 192</b> | <b>3.803</b> |      | <b>0.334</b> |      |
| SE for Mean          |           |       |               | 0.1204       |      | 0.0048       |      |
| SE for DIF           |           |       |               | 0.1703       |      | 0.0068       |      |
| LSD (cal by t)       |           |       |               | 0.3370       |      | 0.0135       |      |
| DIF 0.9 Power        |           |       |               | 0.5565       |      | 0.0223       |      |
| Signif Level         |           |       |               | 0.05         |      | 0.05         |      |
| Count per mean:      |           |       |               | 12           |      | 12           |      |

Table 8  
Exp. 132238

2013 Mean forage production of sixteen winter cereals across  
four Montana-Wyoming locations.

| Location       | N       | Dry Matter |   | Dry Matter |   |
|----------------|---------|------------|---|------------|---|
|                |         | Yield      |   | Content    |   |
|                |         | t/a        |   | %          |   |
| CARC Fallow    | 48      | 4.094      | B | 0.379      | C |
| CARC NTRC      | 48      | 1.923      | A | 0.3052     | A |
| Winifred       | 48      | 4.334      | C | 0.3519     | B |
| Sheridan WY    | 48      | 4.861      | D | 0.3012     | A |
| MEAN           | (N=192) | 3.803      |   | 0.3343     |   |
| SE FOR MEAN    |         | 0.06       |   | 0.00       |   |
| SE FOR DIF     |         | 0.09       |   | 0.00       |   |
| LSD (cal by t  |         | 0.17       |   | 0.01       |   |
| DIF 0.9 POWER  |         | 0.28       |   | 0.01       |   |
| SIGNIF LEVEL   |         | 0.05       |   | 0.05       |   |
| Count per mean |         | 48         |   | 48         |   |

Table 9

## 2014 Winter cereal forage statewide trial at: Bozeman, Havre, Moccasin, MT and Sheridan, WY.

| Exp. 14223800               |                  | Dry Matter Yield   |                |                |                 |                   |      | Location Yield Rank |                |                |                 |                   |                 |
|-----------------------------|------------------|--------------------|----------------|----------------|-----------------|-------------------|------|---------------------|----------------|----------------|-----------------|-------------------|-----------------|
| Entry ID                    | Location:<br>trt | Sheridan<br>Fallow | CARC<br>Fallow | CARC<br>Recrop | Havre<br>Fallow | Bozeman<br>Fallow | Ave  | Sheridan<br>Fallow  | CARC<br>Fallow | CARC<br>Recrop | Havre<br>Fallow | Bozeman<br>Fallow | Average<br>Rank |
|                             |                  | t/a                | t/a            | t/a            | t/a             | t/a               | t/a  |                     |                |                |                 |                   |                 |
| <b>WCF 1060</b>             | 14WCF10          | <b>2.13</b>        | <b>3.62</b>    | <b>2.80</b>    | <b>3.14</b>     | 3.172             | 2.97 | 7                   | 1              | 2              | 5               | 4                 | 3.8             |
| <b>WCF 1020</b>             | 14WCF14          | <b>2.25</b>        | <b>3.11</b>    | <b>2.77</b>    | <b>3.15</b>     | 3.209             | 2.90 | 3                   | 8              | 3              | 4               | 3                 | 4.2             |
| <b>Trical 102</b>           | 14WCF05          | <b>2.14</b>        | <b>3.23</b>    | <b>2.37</b>    | <b>3.32</b>     | 3.225             | 2.86 | 6                   | 6              | 8              | 2               | 2                 | 4.8             |
| <b>111 WCF 57B</b>          | 14WCF16          | <b>2.29</b>        | <b>3.05</b>    | <b>2.82</b>    | 2.58            | 3.395             | 2.83 | 1                   | 11             | 1              | 12              | 1                 | 5.2             |
| <b>111 WCF 57A</b>          | 14WCF15          | <b>2.26</b>        | 2.78           | <b>2.74</b>    | <b>3.36</b>     | 2.916             | 2.81 | 2                   | 14             | 4              | 1               | 8                 | 5.8             |
| <b>10Pre WCF 81</b>         | 14WCF11          | <b>2.17</b>        | <b>3.18</b>    | <b>2.61</b>    | <b>2.94</b>     | 3.086             | 2.80 | 5                   | 7              | 6              | 8               | 6                 | 6.4             |
| <b>WCF 1012</b>             | 14WCF13          | <b>2.12</b>        | <b>3.36</b>    | <b>2.61</b>    | 2.82            | 3.124             | 2.81 | 8                   | 3              | 5              | 11              | 5                 | 6.4             |
| <b>Willow Creek</b>         | 14WCF04          | 1.46               | <b>3.52</b>    | <b>2.35</b>    | <b>3.08</b>     | 2.793             | 2.64 | 15                  | 2              | 9              | 6               | 11                | 8.6             |
| <b>108 WCF 28</b>           | 14WCF12          | <b>2.23</b>        | 2.88           | <b>2.53</b>    | 2.84            | 2.878             | 2.67 | 4                   | 13             | 7              | 10              | 9                 | 8.6             |
| <b>MTF1434</b>              | 14WCF09          | <b>1.90</b>        | <b>3.11</b>    | 2.10           | <b>3.24</b>     | 2.671             | 2.60 | 11                  | 9              | 11             | 3               | 13                | 9.4             |
| <b>MTF1432<sup>1/</sup></b> | 14WCF08          | 1.65               | <b>3.31</b>    | 1.85           | 2.87            | 2.740             | 2.48 | 13                  | 5              | 14             | 9               | 12                | 10.6            |
| <b>MTF1232</b>              | 14WCF06          | <b>1.92</b>        | <b>2.98</b>    | <b>2.17</b>    | <b>2.97</b>     | 2.516             | 2.51 | 10                  | 12             | 10             | 7               | 15                | 10.8            |
| <b>MTF1435<sup>1/</sup></b> | 14WCF07          | 1.56               | <b>3.33</b>    | 1.96           | 2.53            | 2.830             | 2.44 | 14                  | 4              | 13             | 14              | 10                | 11              |
| <b>P0062</b>                | 14WCF03          | <b>1.96</b>        | <b>3.07</b>    | 2.02           |                 |                   | 2.35 | 9                   | 10             | 12             | 15              | 7                 | 10.6            |
| <b>Yellowstone</b>          | 14WCF01          | 1.20               | 2.60           | 1.68           | 2.54            | 2.543             | 2.11 | 16                  | 15             | 16             | 13              | 14                | 14.8            |
| <b>Warhorse</b>             | 14WCF02          | <b>1.87</b>        | 2.60           | 1.74           | 2.34            | 2.281             | 2.17 | 12                  | 16             | 15             | 16              | 16                | 15              |
| Mean                        |                  | 1.94               | 3.11           | 2.32           | 2.88            | 2.97              | 2.64 |                     |                |                |                 |                   |                 |

Table 10

2013 Statewide winter cereal forage dry matter yields and dry matter yield rank at six locations.

| Exp. 13223800        |       | Dry Matter Yield |        |        |      |        |             |        | Dry Matter Yield Rank |        |        |      |        |        |        |
|----------------------|-------|------------------|--------|--------|------|--------|-------------|--------|-----------------------|--------|--------|------|--------|--------|--------|
| Entry ID             | entry | ShrdsnWy         | Wnfrd  | Mocc   | Mocc | Bzmn   | Havre       | 6 Loc. | ShrdsnWy              | Wnfrd  | Mocc   | Mocc | Bzmn   | Havre  | 6 Loc. |
|                      |       | Fallow           | Fallow | Fallow | CC   | Fallow | Fallow      | Ave.   | Fallow                | Fallow | Fallow | CC   | Fallow | Fallow | Ave    |
|                      |       | t/a              | t/a    | t/a    | t/a  | t/a    | t/a         | t/a    | rnk                   | rnk    | rnk    | rnk  | rnk    | rnk    | rnk    |
| 12 WCF A21 (P0059)   | 6     | 3.88             | 5.35   | 4.57   | 2.13 | 3.56   | 3.19        | 3.76   | 7                     | 1      | 1      | 2    | 15     | 8      | 6      |
| 12 wcf A 18 (P0029)  | 3     | 4.23             | 4.76   | 3.88   | 2.11 | 3.72   | <u>3.91</u> | 3.68   | 3                     | 5      | 11     | 3    | 13     | 1      | 6      |
| WCF 1060             | 1     | 3.77             | 4.91   | 4.35   | 1.96 | 3.83   | <b>3.41</b> | 3.69   | 11                    | 3      | 4      | 7    | 10     | 6      | 7      |
| 110 WCF 57           | 5     | 3.86             | 4.53   | 4.54   | 1.86 | 4.59   | 3.14        | 3.73   | 9                     | 8      | 2      | 11   | 1      | 11     | 7      |
| 12 WCF A35 (11Adv10) | 9     | 4.40             | 4.68   | 4.29   | 1.87 | 4.03   | 2.95        | 3.56   | 2                     | 7      | 5      | 9    | 8      | 12     | 7      |
| 12 WCF A 27 (P0086)  | 10    | 4.21             | 4.26   | 4.28   | 2.07 | 3.84   | 3.18        | 3.53   | 4                     | 11     | 6      | 5    | 9      | 9      | 7      |
| 10 PreWcf 68         | 4     | 3.87             | 4.73   | 3.96   | 2.10 | 3.65   | <b>3.62</b> | 3.61   | 8                     | 6      | 10     | 4    | 14     | 3      | 8      |
| 111 WCF 57           | 8     | 3.28             | 5.13   | 4.44   | 2.20 | 3.36   | 3.16        | 3.66   | 13                    | 2      | 3      | 1    | 16     | 10     | 8      |
| Willow Creek         | 11    | 4.98             | 3.47   | 3.45   | 2.05 | 3.76   | <b>3.89</b> | 3.32   | 1                     | 14     | 14     | 6    | 11     | 2      | 8      |
| MTF1232              | 14    | 3.94             | 3.53   | 3.71   | 1.87 | 4.32   | <b>3.53</b> | 3.39   | 6                     | 13     | 12     | 10   | 4      | 4      | 8      |
| 12 WCF A 41 (P1085)  | 7     | 4.03             | 4.40   | 4.11   | 1.93 | 4.23   | 2.73        | 3.48   | 5                     | 9      | 8      | 8    | 6      | 16     | 9      |
| 10 PreWcf 78         | 2     | 3.69             | 4.89   | 4.13   | 1.80 | 3.73   | <b>3.38</b> | 3.58   | 12                    | 4      | 7      | 12   | 12     | 7      | 9      |
| Trical 102           | 12    | 3.06             | 4.33   | 3.15   | 1.76 | 4.38   | <b>3.42</b> | 3.41   | 16                    | 10     | 16     | 14   | 3      | 5      | 11     |
| Newturk              | 16    | 3.82             | 3.87   | 4.11   | 1.77 | 4.13   | 2.93        | 3.36   | 10                    | 12     | 9      | 13   | 7      | 14     | 11     |
| MTF1229              | 15    | 3.16             | 3.25   | 3.42   | 1.72 | 4.53   | 2.93        | 3.17   | 14                    | 15     | 15     | 15   | 2      | 13     | 12     |
| Yellowstone          | 13    | 3.09             | 3.24   | 3.69   | 1.56 | 4.28   | 2.81        | 3.12   | 15                    | 16     | 13     | 16   | 5      | 15     | 13     |
| Average              |       | 3.83             | 4.33   | 4.01   | 1.92 | 4.00   | 3.26        | 3.50   |                       |        |        |      |        |        |        |



**Table 11** Four quality factors of 16 cereal forages grown at four locations in 2014.  
Exp 14223800 Moccasin Fallow, Moccasin Recrop, Havre Fallow, Sheridan WY Fallow

| Entry ID            | C.Pro. dry  |          | ADF dry     |            | NDF dry     |             | Lignin dry  |             |
|---------------------|-------------|----------|-------------|------------|-------------|-------------|-------------|-------------|
|                     | %           |          | %           |            | %           |             | %           |             |
| <b>Warhorse</b>     | <b>14.3</b> | <b>E</b> | <b>28.5</b> | <b>A</b>   | <b>56.2</b> | <b>A</b>    | <b>2.56</b> | <b>A</b>    |
| <b>Yellowstone</b>  | 13.9        | DE       | 28.8        | AB         | 58.1        | AB          | <b>2.53</b> | <b>A</b>    |
| <b>111 WCF 57</b>   | 12.1        | ABC      | 30.1        | BC         | 62.0        | DECF        | 3.10        | CB          |
| <b>WCF 1012</b>     | 13.0        | D C      | 30.5        | D C        | 61.6        | D C         | 3.27        | CBD         |
| <b>MTF 1432</b>     | 11.6        | AB       | 30.8        | DEC        | 60.1        | BC          | 3.03        | B           |
| <b>111 WCF 57B</b>  | 11.5        | AB       | 31.1        | DECF       | 62.7        | DE F        | 3.21        | CBD         |
| <b>WCF 1020</b>     | 12.6        | BC       | 31.4        | DECF       | 64.0        | GF          | 3.31        | C DE        |
| <b>108 WCF 28</b>   | 12.3        | ABC      | 31.7        | DE F       | 62.5        | DE F        | 3.44        | FDE         |
| <b>WCF 1060</b>     | <b>11.3</b> | <b>A</b> | <b>32.0</b> | <b>EGF</b> | <b>62.1</b> | <b>DE F</b> | <b>3.33</b> | <b>C DE</b> |
| <b>Trical 102</b>   | 12.2        | ABC      | 32.0        | EGF        | 62.7        | DE F        | 3.21        | CBD         |
| <b>MTF 1232</b>     | 11.8        | ABC      | 32.4        | H GF       | 62.0        | DECF        | 3.28        | CBD         |
| <b>MTF1435</b>      | 11.6        | AB       | 32.4        | H GF       | 61.9        | DEC         | 3.33        | C DE        |
| <b>10Pre WCF 81</b> | 11.8        | AB       | 32.4        | H GF       | 64.8        | G           | 3.56        | F E         |
| <b>MTF 1434</b>     | 11.8        | ABC      | 33.0        | H G        | 63.8        | EGF         | 3.34        | C DE        |
| <b>Newturk</b>      | 12.1        | ABC      | 33.1        | H G        | <b>65.6</b> | <b>G</b>    | <b>3.61</b> | <b>F</b>    |
| <b>Willow Creek</b> | <b>11.3</b> | <b>A</b> | <b>33.4</b> | <b>H</b>   | 62.7        | DE F        | 3.35        | CFDE        |
| Mean                | 12.2        |          | 31.47       |            | 62.04       |             | 3.22        |             |
| LSD (cal by t)      | 1.212       |          | 1.31        |            | 2.04        |             | 0.27        |             |
| SIGNIF LEVEL        | 0.05        |          | 0.05        |            | 0.05        |             | 0.05        |             |
| COUNT PER Mn        | 8           |          | 8           |            | 8           |             | 8           |             |

| <b>Table 12</b> |           | Four quality factors of 16 cereal forages grown at four locations in 2014. |        |   |        |   |        |   |  |
|-----------------|-----------|--|--------|---|--------|---|--------|---|--|
| Exp 14223800    | Crude     |  | ADF    |   | NDF    |   | Lignin |   |  |
|                 | Prot. dry |  | dry    |   | dry    |   | dry    |   |  |
|                 | %         |  | %      |   | %      |   | %      |   |  |
| Mbcc 07         | 14.95     | C  | 31.75  | B | 63.36  | B | 3.39   | C |  |
| Mbcc 70         | 13.74     | B  | 29.64  | A | 59.61  | A | 2.70   | A |  |
| NARC            | 10.12     | A  | 31.58  | B | 62.39  | B | 3.18   | B |  |
| SREC WY         | 9.972     | A  | 32.92  | C | 62.82  | B | 3.59   | D |  |
| MEAN (N = 12    | 12.2      |  | 31.47  |   | 62.04  |   | 3.216  |   |  |
| SE FOR MEAN     | 0.2145    |  | 0.232  |   | 0.3606 |   | 0.048  |   |  |
| SE FOR DIF      | 0.3034    |  | 0.3282 |   | 0.51   |   | 0.067  |   |  |
| LSD (cal by     | 0.6062    |  | 0.6556 |   | 1.019  |   | 0.1347 |   |  |
| DIF 0.9 POWER   | 0.9997    |  | 1.081  |   | 1.68   |   | 0.2221 |   |  |
| SIGNIF LEVEL    | 0.05      |  | 0.05   |   | 0.05   |   | 0.05   |   |  |
| COUNT PER ME    | 32        |  | 32     |   | 32     |   | 32     |   |  |

Table 13 Projected yields of nine winter cereal forage lines determined from their multi performance in evaluation trials at Bozeman, Corvallis, Havre, Sidney and Moccasin.

| Trial Mean:  | Trial Loc. | Given:      | Trial Mean DM yield |           | Willow Crk DM Yld |           | Trical 102 DM. Yld |           |
|--------------|------------|-------------|---------------------|-----------|-------------------|-----------|--------------------|-----------|
|              |            |             | 1.00 t/ ac          | 5.00 t/ac | 1.00 t/ ac        | 5.00 t/ac | 1.00 t/ ac         | 5.00 t/ac |
| WCF 1060     | 21         | Est. Yield: | 1.58                | 5.0       | 1.95              | 5.02      | 2.23               | 4.53      |
| WCF 1241A    | 17         |             | 1.00                | 5.2       | 1.30              | 5.43      | 1.80               | 4.66      |
| WCF 1216     | 11         |             | 1.63                | 5.4       | 2.04              | 5.69      | 2.29               | 4.82      |
| WCF 1020     | 15         |             | 0.99                | 5.1       | 0.98              | 5.57      | 1.66               | 4.45      |
| P0062        | 13         |             | 1.01                | 5.2       | 1.21              | 5.53      | 1.70               | 4.59      |
| 111WCF57     | 11         |             | 1.26                | 5.1       | 1.91              | 4.57      | 1.87               | 4.65      |
| Willow Creek | 21         |             | 1.72                | 4.3       | 1.00              | 5.00      | 2.03               | 3.99      |
| Trical 102   | 21         |             | 0.70                | 5.3       | 0.61              | 5.78      | 1.00               | 5.00      |

Table 14

Projected means of nine winter cereal forage lines determined from their multi-year performance in evaluation trials at Bozeman, Corvallis, Havre, Sidney and Moccasin.

| Given Trial Mean:  | Loc. | Height |     | Loc. | Head date |     | Loc. | Grain Yield |      | Loc. | Test Weight |      |
|--------------------|------|--------|-----|------|-----------|-----|------|-------------|------|------|-------------|------|
|                    |      | cm.    |     |      | Julian    |     |      | lbs/a       |      |      | lbs/bu      |      |
|                    |      | 100    | 150 |      | 150       | 170 |      | 2000        | 5000 |      | 50          | 56   |
| WCF 1060 Estimate: | 18   | 113    | 163 | 11   | 147       | 168 | 10   | 2033        | 4638 | 10   | 48.9        | 53.8 |
| WCF 1241A Est.:    | 14   | 103    | 156 | 8    | 147       | 166 | 8    | 2005        | 6173 | 8    | 48.8        | 53.7 |
| WCF 1216 Est.:     | 9    | 117    | 164 | 3    | 148       | 168 | 6    | 1886        | 5135 | 6    | 42.3        | 53.0 |
| WCF 1020 Est.:     | 13   | 118    | 168 | 7    | 148       | 168 | 8    | 2010        | 5173 | 8    | 49.9        | 54.7 |
| P0062 Est.:        | 11   | 112    | 169 | 5    | 150       | 169 | 6    | 1763        | 4187 | 6    | 48.9        | 56.1 |
| 111WCF57 Est.:     | 10   | 115    | 169 | 8    | 144       | 167 | 5    | 2252        | 4900 | 5    | 46.6        | 56.0 |
| Willw Creek Est.:  | 18   | 89     | 137 | 11   | 156       | 178 | 10   | 2170        | 2870 | 10   | 58.0        | 60.8 |
| Trical 102 Est.:   | 18   | 105    | 157 | 11   | 151       | 170 | 10   | 1777        | 4723 | 10   | 44.6        | 51.6 |

Table 15 2016 NARC – Havre Statewide Winter Cereal Forage Trial Results.

| NARC, 2016 Winter Cereal Forage Data Summary |         |  |           |                   |                          |                          |                           |              |                        |                    |                     |                      |              |             |                    |  |
|--|---------|--|-----------|-------------------|--------------------------|--------------------------|---------------------------|--------------|------------------------|--------------------|---------------------|----------------------|--------------|-------------|--------------------|--|
| ENTRY  | Code    | ID   | Species   | FORAGE COMPONENTS |                          |                          |                           |              | SEED COMPONENTS        |                    |                     |                      |              |             |                    |  |
|  |         |  |           | Heading Date      | Forage Cut Plant Ht (in) | Dry Matter Yield (lb/ac) | Dry Matter Yield (ton/ac) | Moisture (%) | Maturity Plant Ht (in) | Seed Yield (lb/ac) | Seed Yield (bu/ac)* | Test Weight (lb/bu)* | Moisture (%) | Protein (%) | Sawfly Cutting (%) |  |
| 3  | 16WCF03 | P0062  | triticale | 155.0             | 73.8                     | 10,735                   | 5.37                      | 69.2%        | 74.83                  | 3,587              | 71.7                | 53.2                 | 13.3         | 13.0        | 0.0                |  |
| 5  | 16WCF05 | Trical 102   | triticale | 156.7             | 67.9                     | <b>13,213</b>            | <b>6.61</b>               | 69.2%        | 69.13                  | 3,140              | 62.8                | 50.3                 | 12.7         | 13.2        | 0.0                |  |
| 2  | 16WCF02 | wcf 1020   | triticale | 154.7             | 73.0                     | 11,460                   | 5.73                      | 68.6%        | 73.66                  | 4,887              | 97.7                | 54.5                 | 13.3         | 11.3        | 0.0                |  |
| 1  | 16WCF01 | wcf 1060   | triticale | 154.3             | 72.7                     | 10,853                   | 5.43                      | 68.2%        | 73.57                  | <b>5,715</b>       | <b>114.3</b>        | 49.6                 | 12.8         | 13.2        | 0.0                |  |
| 10   | 16WCF10 | wcf 1078   | triticale | 154.7             | 73.9                     | 11,821                   | 5.91                      | 68.6%        | 74.57                  | 4,477              | 89.5                | 54.2                 | 13.4         | 11.3        | 0.0                |  |
| 11   | 16WCF11 | wcf 1216   | triticale | 154.7             | 73.1                     | 12,345                   | 6.17                      | 70.3%        | 73.99                  | 4,642              | 92.8                | 52.6                 | 13.0         | 13.1        | 0.0                |  |
| 13   | 16WCF13 | wcf 1241A  | triticale | 154.0             | 69.1                     | 11,117                   | 5.56                      | 71.1%        | 69.45                  | 5,266              | 105.3               | 52.7                 | 12.9         | 12.3        | 0.0                |  |
| 16   | 16WCF16 | wcf 1310-218   | triticale | 154.7             | 71.0                     | <b>11,942</b>            | <b>5.97</b>               | 69.3%        | 72.15                  | 4,541              | 90.8                | 54.8                 | 13.5         | 11.5        | 0.0                |  |
| 14   | 16WCF14 | wcf 1310-219   | triticale | 155.3             | 70.1                     | <b>11,923</b>            | <b>5.96</b>               | 70.3%        | 71.65                  | 3,690              | 73.8                | 53.2                 | 13.4         | 12.9        | 0.0                |  |
| 15   | 16WCF15 | wcf 1310-230   | triticale | 154.7             | 73.5                     | <b>11,841</b>            | <b>5.92</b>               | 70.9%        | 74.67                  | 3,704              | 74.1                | 55.5                 | 13.6         | 11.6        | 0.0                |  |
| 7  | 16WCF07 | WCF 1440   | triticale | 155.0             | 72.5                     | <b>12,900</b>            | <b>6.45</b>               | 69.4%        | 73.40                  | 4,785              | 95.7                | 54.7                 | 13.5         | 12.1        | 0.0                |  |
| 12   | 16WCF12 | WCF14adv114  | triticale | 154.3             | 74.7                     | 10,844                   | 5.42                      | 69.5%        | 75.89                  | 4,501              | 90.0                | 54.9                 | 13.6         | 11.7        | 0.0                |  |
| 8  | 16WCF08 | MTF 1432   | wheat     | 160.3             | 42.7                     | 11,050                   | 5.52                      | 72.3%        | 43.58                  | 4,788              | 79.8                | 60.0                 | 12.8         | 10.9        | 0.0                |  |
| 9  | 16WCF09 | MTF 1435   | wheat     | 158.7             | 50.8                     | 10,915                   | 5.46                      | 68.5%        | 52.10                  | 3,308              | 55.1                | 60.2                 | 12.4         | 12.1        | 0.0                |  |
| 6  | 16WCF06 | MTF 1559   | wheat     | 162.0             | 41.7                     | <b>12,566</b>            | <b>6.28</b>               | 69.9%        | 43.48                  | 4,426              | 73.8                | 58.5                 | 12.5         | 11.2        | 0.0                |  |
| 4  | 16WCF04 | Willow Creek   | wheat     | 163.3             | 56.6                     | 9,239                    | 4.62                      | 66.9%        | 58.36                  | 2,824              | 47.1                | 60.0                 | 12.4         | 12.7        | 0.0                |  |
|  |         | EXPERIMENTAL MEANS   |           | 156.4             | 66.08                    | 11,548                   | 5.77                      | 69.5%        | 67.16                  | 4,267.51           | 82.15               | 54.93                | 13.06        | 12.13       | 0.00               |  |
|  |         | LSD (0.05)   |           | 0.89              | 2.51                     | 1345.70                  | 0.67                      | 0.02         | 2.27                   | 273.12             | 5.23                | 0.63                 | 0.50         | 0.76        | -                  |  |
|  |         | C.V.: ( S / MEAN)*100  |           | 0.34              | 2.28                     | 6.99                     | 6.99                      | 2.09         | 2.03                   | 3.84               | 3.82                | 0.69                 | 2.28         | 3.75        | -                  |  |
|  |         | P-VALUE (Entries)  |           | <.0001            | <.0001                   | 0.0002                   | 0.0002                    | 0.0216       | <.0001                 | <.0001             | <.0001              | <.0001               | <.0001       | <.0001      | -                  |  |
|  |         | *Bu/ac seed yield and test weight is reported as 60 lb/bu for winter wheat and 50 lb/bu for Triticale. |           |                   |                          |                          |                           |              |                        |                    |                     |                      |              |             |                    |  |

Table 16 2015 NARC-Havre Statewide Winter Cereal Forage Results.

NARC, 2015 Winter Cereal Forage Data Summary

| ENTRY                 | ID           | Species   | FORAGE COMPONENTS |            |            |            |          | SEED COMPONENTS |            |            |          |        |          |        |
|-----------------------|--------------|-----------|-------------------|------------|------------|------------|----------|-----------------|------------|------------|----------|--------|----------|--------|
|                       |              |           | Heading           | Forage Cut | Dry Matter | Dry Matter | Moisture | Maturity        | Seed Yield | Seed Yield | Test     |        |          | Sawfly |
|                       |              |           | Date              | Plant Ht   | Yield      | Yield      |          |                 |            |            | Plant Ht | Weight | Moisture |        |
| (in)                  | (lb/ac)      | (ton/ac)  | (%)               | (in)       | (lb/ac)    | (bu/ac)    | (lb/bu)  | (%)             | (%)        | (%)        |          |        |          |        |
| 1                     | wcf 1060     | triticale | 153.3             | 47.17      | 5926.77    | 2.96       | 74.3%    | 48.23           | 3,184      | 63.69      | 47.90    | 9.43   | 16.30    | 2.33   |
| 2                     | wcf 1020     | triticale | 153.0             | 44.12      | 4124.24    | 2.06       | 74.9%    | 49.71           | 2,736      | 54.73      | 51.70    | 10.57  | 15.23    | 2.33   |
| 3                     | P0062        | triticale | 153.0             | 46.72      | 5520.43    | 2.76       | 73.3%    | 48.86           | 2,323      | 46.47      | 50.83    | 10.17  | 16.93    | 7.00   |
| 5                     | Trical 102   | triticale | 155.7             | 43.77      | 7766.92    | 3.88       | 69.8%    | 44.75           | 2,504      | 50.08      | 47.43    | 9.60   | 16.33    | 7.00   |
| 10                    | wcf 1078     | triticale | 153.0             | 47.93      | 5370.70    | 2.69       | 71.5%    | 49.84           | 2,529      | 50.59      | 51.43    | 10.70  | 15.50    | 2.00   |
| 11                    | wcf 1216     | triticale | 152.3             | 49.80      | 6531.46    | 3.27       | 73.4%    | 50.51           | 3,091      | 61.82      | 48.73    | 9.67   | 16.33    | 3.33   |
| 12                    | wcf 1310-221 | triticale | 153.3             | 47.94      | 6163.79    | 3.08       | 73.4%    | 49.62           | 2,653      | 53.05      | 52.40    | 10.67  | 15.33    | 2.00   |
| 13                    | wcf 1241A    | triticale | 152.3             | 45.80      | 5636.19    | 2.82       | 74.4%    | 45.49           | 3,169      | 63.38      | 51.57    | 9.77   | 15.77    | 11.67  |
| 14                    | wcf 1310-219 | triticale | 154.0             | 48.28      | 5824.43    | 2.91       | 73.5%    | 43.82           | 3,231      | 64.62      | 50.87    | 9.70   | 16.17    | 5.33   |
| 15                    | wcf 1310-230 | triticale | 154.3             | 48.29      | 6451.80    | 3.23       | 72.3%    | 48.52           | 3,275      | 65.50      | 52.63    | 10.70  | 15.10    | 0.67   |
| 16                    | wcf 1310-218 | triticale | 152.7             | 47.61      | 5431.73    | 2.72       | 74.0%    | 51.61           | 3,315      | 66.31      | 46.70    | 9.47   | 16.43    | 4.00   |
| 4                     | Willow Creek | ww        | 160.3             | 38.57      | 7142.12    | 3.57       | 64.3%    | 40.84           | 2,579      | 42.98      | 59.20    | 9.37   | 14.70    | 8.67   |
| 6                     | MTF 1559     | ww        | 158.0             | 31.17      | 5094.30    | 2.55       | 69.5%    | 34.40           | 3,435      | 57.26      | 57.90    | 9.33   | 13.07    | 2.33   |
| 7                     | MTF 1232     | ww        | 156.7             | 38.66      | 5705.68    | 2.85       | 70.1%    | 38.23           | 2,867      | 47.79      | 59.50    | 9.63   | 13.37    | 2.33   |
| 8                     | MTF 1432     | ww        | 157.7             | 33.73      | 6858.13    | 3.43       | 67.7%    | 35.49           | 3,182      | 53.04      | 59.60    | 9.57   | 12.67    | 1.67   |
| 9                     | MTF 1435     | ww        | 155.7             | 38.67      | 6056.62    | 3.03       | 69.9%    | 37.35           | 2,752      | 45.87      | 60.47    | 9.67   | 12.67    | 0.67   |
| EXPERIMENTAL MEANS    |              |           | 154.7             | 43.64      | 5975.33    | 2.99       | 71.6%    | 44.83           | 2,927      | 55.45      | 53.05    | 9.88   | 15.12    | 3.96   |
| LSD (0.05)            |              |           | 1.43              | 3.52       | 905.02     | 0.45       | 0.02     | 4.59            | 372.60     | 6.87       | 1.07     | 0.30   | 0.69     | 6.96   |
| C.V.: ( S / MEAN)*100 |              |           | 0.55              | 4.84       | 9.08       | 9.08       | 1.98     | 6.14            | 7.63       | 7.43       | 1.21     | 1.83   | 2.74     | 105.41 |
| P-VALUE (Entries)     |              |           | <.0001            | <.0001     | <.0001     | <.0001     | <.0001   | <.0001          | <.0001     | <.0001     | <.0001   | <.0001 | <.0001   | 0.1067 |

**TABLE 17. WINTER CEREAL FORAGE - forage components. Winter Cereal Forage Evaluation Grown Under No-Till Dryland Fallow Conditions. Northern Agricultural Research Center. Havre, Montana. 2014. (Exp# 14-FR02-FR)**

| entry                 | Species      | CULTIVAR<br>or SELECTI | FORAGE DRY YIELD |             | FORAGE        | HEADING DATE |          | PLANT HT<br>inches | SAWFLY<br>% Cut | PROTEIN<br>% | ADF<br>% | NDF<br>% | TDN<br>% | NITRATES   |
|-----------------------|--------------|------------------------|------------------|-------------|---------------|--------------|----------|--------------------|-----------------|--------------|----------|----------|----------|------------|
|                       |              |                        | Lb/Ac            | Ton/Ac      | MOISTURE<br>% | Julian       | Calendar |                    |                 |              |          |          |          | NO3<br>ppm |
| 12                    | Triticale    | 108 WCF 28             | 5681.2           | 2.84        | 63.2%         | 162.7        | 12-Jun   | 47.6               | 1.0             | 10.0         | 30.9     | 60.9     | 67.4     | na         |
| 11                    | Triticale    | 10Pre WCF {            | <b>5871.0</b>    | <b>2.94</b> | 66.6%         | 162.3        | 11-Jun   | 49.3               | 1.0             | 8.1          | 34.2     | 66.2     | 63.6     |            |
| 10                    | Triticale    | 10PreWCF 6             | <b>6273.7</b>    | <b>3.14</b> | 66.3%         | 162.0        | 11-Jun   | 47.2               | 1.0             | 9.9          | 30.1     | 61.3     | 68.2     |            |
| 15                    | Triticale    | 111 WCF 57;            | <b>6720.2</b>    | <b>3.36</b> | 64.4%         | 159.7        | 9-Jun    | 50.0               | 1.0             | 10.3         | 29.7     | 62.3     | 68.7     |            |
| 16                    | Triticale    | 111 WCF 57I            | 5153.8           | 2.58        | 64.4%         | 161.3        | 10-Jun   | 51.8               | 1.0             | 9.9          | 30.6     | 61.4     | 67.7     |            |
| 13                    | Triticale    | 12 10Advwc             | 5635.9           | 2.82        | 67.0%         | 162.7        | 12-Jun   | 47.8               | 1.0             | 11.8         | 28.6     | 58.0     | 70.1     |            |
| 14                    | Triticale    | 20 10AdvWC             | <b>6299.4</b>    | <b>3.15</b> | 64.9%         | 160.7        | 10-Jun   | 49.9               | 1.0             | 9.9          | 31.8     | 64.7     | 66.4     |            |
| 6                     | Triticale    | MGF 1232               | <b>5938.8</b>    | <b>2.97</b> | 62.3%         | 170.0        | 19-Jun   | 36.1               | 2.3             | 10.0         | 33.3     | 64.2     | 64.7     |            |
| 8                     | Triticale    | MGF 1432               | 5744.7           | 2.87        | 60.5%         | 169.0        | 18-Jun   | 31.4               | 1.0             | 9.9          | 30.6     | 60.3     | 67.7     |            |
| 9                     | Triticale    | MGF 1434               | <b>6470.5</b>    | <b>3.24</b> | 59.3%         | 170.3        | 19-Jun   | 40.2               | 1.0             | 8.8          | 35.5     | 67.5     | 62.1     |            |
| 7                     | Triticale    | MGF1435                | 5055.5           | 2.53        | 65.4%         | 164.7        | 14-Jun   | 31.5               | 1.0             | 10.0         | 31.5     | 60.5     | 66.7     |            |
| 5                     | Triticale    | Trical 102             | <b>6632.3</b>    | <b>3.32</b> | 63.3%         | 164.3        | 13-Jun   | 43.6               | 1.0             | 10.0         | 31.0     | 61.3     | 67.4     |            |
| 3                     | Winter Wheat | Newturk                | 4904.3           | 2.45        | 67.2%         | 164.3        | 13-Jun   | 48.9               | 1.0             | 10.3         | 33.7     | 66.8     | 64.2     |            |
| 2                     | Winter Wheat | Warhorse               | 4677.0           | 2.34        | 66.3%         | 164.3        | 13-Jun   | 26.1               | 1.0             | 11.5         | 30.4     | 59.2     | 67.9     |            |
| 4                     | Winter Wheat | Willow Creek           | <b>6152.7</b>    | <b>3.08</b> | 59.1%         | 172.0        | 21-Jun   | 42.5               | 5.0             | 9.8          | 34.2     | 64.2     | 63.6     |            |
| 1                     | Winter Wheat | Yellowstone            | 5078.3           | 2.54        | 65.7%         | 163.3        | 12-Jun   | 30.2               | 2.3             | 12.0         | 29.6     | 59.8     | 68.9     |            |
| EXPERIMENTAL MEANS    |              |                        | 5768.1           | 2.88        | 64.1%         | 164.6        | 14-Jun   | 42.12              | 1.42            | 10.12        | 31.58    | 62.39    | 66.55    |            |
| LSD (0.05)            |              |                        | 876.7            | 0.44        | 0.0           | 1.6          | -        | 3.40               | 1.32            | 1.58         | 3.03     | 4.87     | 3.47     |            |
| C.V.: ( S / MEAN)*100 |              |                        | 9.1              | 9.1         | 2.8           | 0.6          | -        | 4.8                | 55.7            | 7.3          | 4.5      | 3.7      | 2.4      |            |
| P-VALUE (Entries)     |              |                        | 0.0003           | 0.0003      | <.0001        | <.0001       | -        | <.0001             | <.0001          | 0.0106       | 0.0061   | 0.0172   | 0.0059   |            |

**Bold** Indicates highest yielding cultivar within a column.

**Bold** Indicates cultivars yielding equal to the highest yielding entry based on Fisher's Protected LSD at the 0.05 probability level.

\* Indicates cultivars yielding equal to the highest yielding entry based on Fisher's Protected LSD at the 0.05 probability level.

Sawfly rating is reported as percentage of cut stems.

Quality data are presented on a Dry Matter Basis.

Management Information (14-FR02-WCF)

Seeding Date October 3, 2013

Harvest Date variable

Fertility: 100-20-10 side banded

System: no till

Herbicide: Goldsky, 16 oz/ac

Insecticide: none

Previous Cro Chemical Fallow - Spring Barley

Precipitation: 4.67" (April 1 - June 30)

**TABLE 18 WINTER CEREAL FORAGE - forage components. Winter Cereal Forage Evaluation Grown Under No-Till Dryland Fallow Conditions. Northern Agricultural Research Center. Havre, Montana. 2013. (Exp# 13-FR02-FR)**

| Species               | CULTIVAR<br>or SELECTION | FORAGE           |             |          |              | PLANT HT<br>inches | SAWFLY<br>% Cut | 1/         |               | MOISTURE<br>% | TEST WT<br>Lbs/Bu | 2/<br>PROTEIN<br>% |       |
|-----------------------|--------------------------|------------------|-------------|----------|--------------|--------------------|-----------------|------------|---------------|---------------|-------------------|--------------------|-------|
|                       |                          | FORAGE DRY YIELD |             | MOISTURE | HEADING DATE |                    |                 | SEED YIELD |               |               |                   |                    |       |
|                       |                          | Lb/Ac            | Ton/Ac      | %        | Julian       |                    |                 | Calendar   | Lb/Ac         |               |                   |                    | Bu/Ac |
| Triticale             | 10 PreWcf 68             | <b>7242.9</b>    | <b>3.62</b> | 73.2     | 160.3        | 7-Jun              | 58.5            | 0.7        | 3770.1        | 75.4          | 13.7              | 51.8               |       |
| Triticale             | 10 PreWcf 78             | <b>6757.4</b>    | <b>3.38</b> | 73.5     | 160.7        | 7-Jun              | 59.1            | 1.0        | 2530.5        | 50.6          | 13.5              | 52.5               |       |
| Triticale             | 10PreWCF 60              | <b>6815.1</b>    | <b>3.41</b> | 74.1     | 160.0        | 7-Jun              | 56.0            | 0.3        | 3381.1        | 67.6          | 12.5              | 48.0               |       |
| Triticale             | 110 WCF 57               | 6281.1           | 3.14        | 76.1     | 162.3        | 9-Jun              | 45.2            | 0.0        | <b>4676.2</b> | <b>93.5</b>   | 12.7              | 48.4               |       |
| Triticale             | 111 WCF 57               | 6311.3           | 3.16        | 72.8     | 160.0        | 7-Jun              | 54.5            | 0.7        | 3352.2        | 67.0          | 13.5              | 50.6               |       |
| Triticale             | 12 WCF A 18 (P0029)      | <b>7816.2</b>    | <b>3.91</b> | 72.4     | 160.3        | 7-Jun              | 59.6            | 1.0        | 3148.1        | 63.0          | 12.8              | 55.1               |       |
| Triticale             | 12 WCF A 21 (P0059)      | 6372.0           | 3.19        | 72.1     | 160.0        | 7-Jun              | 58.6            | 0.3        | 2706.5        | 54.1          | 13.4              | 52.2               |       |
| Triticale             | 12 WCF A 27 (P0086)      | 6355.0           | 3.18        | 75.3     | 161.7        | 8-Jun              | 49.6            | 0.0        | 3685.4        | 73.7          | 12.4              | 46.6               |       |
| Triticale             | 12 WCF A 35(11Adv10)     | 5901.4           | 2.95        | 74.1     | 160.7        | 7-Jun              | 54.1            | 0.0        | 3798.4        | 76.0          | 13.0              | 49.9               |       |
| Triticale             | 12 WCF A 41 (P1085)      | 5463.3           | 2.73        | 73.0     | 160.0        | 7-Jun              | 52.8            | 1.7        | 3408.8        | 68.2          | 13.1              | 49.7               |       |
| Triticale             | M7F1229                  | 5868.6           | 2.93        | 71.7     | 165.7        | 12-Jun             | 35.9            | 0.0        | 3927.2        | 78.5          | 12.9              | 57.6               |       |
| Triticale             | M7F1232                  | <b>7054.1</b>    | <b>3.53</b> | 71.2     | 166.7        | 13-Jun             | 43.7            | 2.0        | 3733.2        | 74.7          | 12.8              | 58.0               |       |
| Triticale             | Trical 102               | <b>6835.9</b>    | <b>3.42</b> | 72.5     | 163.0        | 10-Jun             | 51.4            | 1.0        | 2393.4        | 47.9          | 12.6              | 46.3               |       |
| Wheat                 | Newturk                  | 5864.3           | 2.93        | 71.7     | 163.0        | 10-Jun             | 46.5            | 0.7        | 2979.2        | 59.6          | 12.8              | 58.6               |       |
| Wheat                 | Willow Creek             | <b>7784.5</b>    | <b>3.89</b> | 67.0     | 172.3        | 19-Jun             | 59.9            | 2.3        | 2653.4        | 44.2          | 12.7              | 58.9               |       |
| Wheat                 | Yellowstone              | 5628.2           | 2.81        | 72.2     | 164.7        | 11-Jun             | 34.6            | 0.3        | 3989.3        | 66.5          | 13.0              | 59.5               |       |
| EXPERIMENTAL MEANS    |                          | 6522.0           | 3.26        | 72.7     | 162.6        | 9-Jun              | 51.3            | 0.8        | 3383.3        | 66.28         | 13.0              | 52.7               |       |
| LSD (0.05)            |                          | 1250.2           | 0.63        | 1.6      | 1.7          | -                  | 4.1             | 1.9        | 607.5         | 12.08         | 0.3               | 0.9                |       |
| C.V.: ( S / MEAN)*100 |                          | 11.5             | 11.5        | 1.3      | 0.6          | -                  | 4.8             | 152.4      | 10.8          | 10.93         | 1.2               | 1.0                |       |
| P-VALUE (Entries)     |                          | 0.0097           | 0.0097      | <.0001   | <.0001       | -                  | <.0001          | 0.3191     | <.0001        | <.0001        | <.0001            | <.0001             |       |

1/ Volumetric yields are based on plot weights adjusted to uniform 12 percent grain moisture and 60 lbs/bu as the standard test weight for winter wheat & 50 lbs/bu as the standard test weight for triticale.

2/ Protein values are adjusted to 12 percent grain moisture.

3/ Sawfly rating is reported as the percentage of cut stems.

**Bold** Indicates highest yielding cultivar within a column.

**Bold** Indicates cultivars yielding equal to the highest yielding entry based on Fisher's Protected LSD at the 0.05 probability level.



**Table 19.** 2015 Winter Cereal Forages (Exp. WCF1): Post Farm R3 Field

| Entry #                    | Cultivar/Line  | Pedigree                           | Grain yield lb/a | Test weight lb/bu | Heading date Julian | Plant height in  | 3ft <sup>2</sup> forage sample (harv = 18-Jun-15) |               | Protein %   |
|----------------------------|----------------|------------------------------------|------------------|-------------------|---------------------|------------------|---|---------------|-------------|
|                            |                |                                    | RCB              | RCB               | RCB                 | RCB              | Dry wt  |               | bulk        |
|                            |                |                                    |                  |                   |                     |                  | tons/a  | g             |             |
| 1                          | wcf 1060       |                                    | 2941             | 45.6              | 161.3               | 59.3             | 5.437   | 340           | 14.8        |
| 2                          | wcf 1020       |                                    | <b>4175*</b>     | 51.7              | 160.7               | 62.2             | <b>6.098*</b>                                     | <b>381</b>    | 13.5        |
| 3                          | + P0062        |                                    | 3332             | 52.4              | 161.0               | 64.4             | <b>6.380*</b>                                     | <b>399</b>    | 14.4        |
| 4                          | Willow Creek   | Montana, 2005                      | 2612             | <b>60.6**</b>     | 170.7               | 53.0             | 4.872   | 305           | 16.4        |
| 5                          | Trical 102     | Resource Seeds, Inc., 1994         | 3802             | 49.1              | 163.3               | 58.5             | <b>6.386**</b>                                    | <b>399</b>    | 13.3        |
| 6                          | + MTF1559      | Yellowstone*2/98X168E1             | <b>4482*</b>     | 57.0              | 166.0               | 43.7             | 5.234   | 327           | 12.7        |
| 7                          | MTF1232        | Yellowstone/MT0684                 | 3391             | <b>59.1*</b>      | 162.7               | 47.5             | 5.181   | 324           | 13.3        |
| 8                          | MTF1432        | Yellowstone*2/98X168E1             | <b>4901*</b>     | 58.0              | 165.0               | 45.5             | 5.107   | 319           | 12.7        |
| 9                          | MTF1435        | MT08186//Yellowstone(L)*2/98X168E1 | <b>4178*</b>     | <b>58.8*</b>      | 163.3               | 48.2             | <b>5.741*</b>                                     | <b>359</b>    | 13.6        |
| 10                         | + wcf 1078     | 10PPreWcf78                        | 3791             | 51.4              | 160.3               | 65.9             | <b>5.890*</b>                                     | <b>368</b>    | 14.1        |
| 11                         | + wcf 1216     | 12WCF 16                           | 3525             | 47.3              | 159.7               | 63.0             | <b>5.634*</b>                                     | <b>352</b>    | 14.4        |
| 12                         | + wcf 1310-221 | 13Pre10-221                        | 3586             | 50.4              | 160.0               | 66.0             | <b>5.965*</b>                                     | <b>373</b>    | 15.0        |
| 13                         | + wcf 1241A    | 12WCFA41                           | <b>5014**</b>    | 51.0              | 159.0               | 60.2             | <b>6.333*</b>                                     | <b>396</b>    | 13.0        |
| 14                         | + wcf 1310-219 | 13Pre10-219                        | <b>4593*</b>     | 52.0              | 160.7               | 58.9             | <b>5.869*</b>                                     | <b>367</b>    | 13.5        |
| 15                         | + wcf 1310-230 | 13Pre10-230                        | <b>4940*</b>     | 55.1              | 161.0               | 61.9             | <b>6.093*</b>                                     | <b>381</b>    | 12.7        |
| 16                         | + wcf 1310-218 | 13Pre10-218                        | 3650             | 44.8              | 159.7               | 59.2             | <b>5.794*</b>                                     | <b>362</b>    | 14.7        |
| <b>Average</b>             |                |                                    | <b>3932</b>      | <b>52.8</b>       | <b>162.1</b>        | <b>57.4</b>      | <b>5.751</b>                                      | <b>360</b>    | <b>13.9</b> |
| <b>LSD (0.05)</b>          |                |                                    | <b>1172</b>      | <b>1.9</b>        | <b>2.3</b>          | <b>5.4</b>       | <b>0.941</b>                                      | <b>59</b>     |             |
| <b>C.V. (%)</b>            |                |                                    | <b>17.9</b>      | <b>2.2</b>        | <b>0.8</b>          | <b>5.7</b>       | <b>9.8</b>  | <b>9.8</b>    |             |
| <b>P-value (Varieties)</b> |                |                                    | <b>0.0037</b>    | <b>&lt;.0001</b>  | <b>&lt;.0001</b>    | <b>&lt;.0001</b> | <b>0.0407</b>                                     | <b>0.0407</b> |             |
| planted: 10/8/2014         |                |                                    |                  |                   |                     |                  |   |               |             |
| harvested: 8/21/2015       |                |                                    |                  |                   |                     |                  |   |               |             |

**Table 20.** 2014 Winter Cereal Forages (Exp. WCF1): Fort Ellis NW Runway Field

| Entry #                    | Cultivar/ Line              | Pedigree                           | Grain yield<br>lb/a<br>RCB | Test weight<br>lb/bu<br>RCB | Heading date<br>Julian<br>RCB | Plant height<br>in<br>RCB | 3ft <sup>2</sup> forage sample (harv = 3-Jul-14) |               | Protein %<br><br>bulk |
|----------------------------|-----------------------------|------------------------------------|----------------------------|-----------------------------|-------------------------------|---------------------------|--|---------------|-----------------------|
|                            |                             |                                    |                            |                             |                               |                           | Dry wt   |               |                       |
|                            |                             |                                    |                            |                             |                               |                           | tons/a   | g             |                       |
| 1                          | <b>Yellowstone</b>          | Montana, 2005                      | <b>4914*</b>               | 58.7                        | 174.3                         | 33.5                      | 2.543  | 159           | 8.7                   |
| 2                          | <b>Warhorse</b>             | Montana, 2013                      | <b>5440**</b>              | 59.1                        | 174.3                         | 30.7                      | 2.281  | 143           | 10.4                  |
| 3                          | <b>Newturk</b>              | wheat (changed from original)      | <b>3859*</b>               | 52.3                        | 176.0                         | 60.1                      | 3.028  | 189           | 8.5                   |
| 4                          | <b>Willow Creek</b>         | Montana, 2005                      | <b>3970*</b>               | 59.7                        | 182.0                         | 54.2                      | 2.793  | 175           | 10.9                  |
| 5                          | <b>Trical 102</b>           | Resource Seeds, Inc., 1994         | 3805                       | 52.3                        | 174.3                         | 57.7                      | 3.225  | 202           | 7.5                   |
| 6                          | <b>MTF1232</b>              | Yellowstone/MT0684                 | <b>4181*</b>               | 60.3                        | 178.0                         | 45.1                      | 2.516  | 157           | 10.1                  |
| 7                          | <b>MTF1435<sup>1/</sup></b> | MT08186//Yellowstone(L)*2/98X168E1 | 703                        | 58.4                        | 178.3                         | 39.9                      | 2.830  | 177           | 9.0                   |
| 8                          | <b>MTF1432<sup>1/</sup></b> | Yellowstone*2/98X168E1             | 2480                       | 59.5                        | 178.0                         | 37.3                      | 2.740  | 171           | 8.2                   |
| 9                          | <b>MTF1434</b>              | Yellowstone*2//WillowCreek/MT06129 | 3796                       | 60.3                        | 180.7                         | 48.3                      | 2.671  | 167           | 10.6                  |
| 10                         | <b>10PreWCF 60</b>          |                                    | <b>4166*</b>               | 53.4                        | 174.0                         | 64.0                      | 3.172  | 198           | 7.6                   |
| 11                         | <b>10Pre WCF 81</b>         |                                    | 3484                       | 53.4                        | 174.7                         | 65.9                      | 3.086  | 193           | 8.8                   |
| 12                         | <b>108 WCF 28</b>           |                                    | <b>3978*</b>               | 53.7                        | 174.7                         | 60.4                      | 2.878  | 180           | 7.1                   |
| 13                         | <b>12 10Advwcf12</b>        |                                    | 3589                       | 53.0                        | 174.0                         | 65.4                      | 3.124  | 195           | 7.5                   |
| 14                         | <b>20 10AdvWCF20</b>        |                                    | 2866                       | 54.6                        | 172.7                         | 64.4                      | 3.209  | 201           | 6.7                   |
| 15                         | <b>111 WCF 57</b>           |                                    | 3667                       | 55.0                        | 174.3                         | 65.5                      | 2.916  | 182           | 7.5                   |
| 16                         | <b>111 WCF 57</b>           |                                    | 3720                       | 54.9                        | 175.0                         | 66.8                      | 3.395  | 212           | 7.1                   |
| <b>Average</b>             |                             |                                    | <b>3664</b>                | <b>54.6</b>                 | <b>176.2</b>                  | <b>53.7</b>               | <b>2.900</b>                                     | <b>181</b>    | <b>8.5</b>            |
| <b>LSD (0.05)</b>          |                             |                                    | <b>1622</b>                | <b>1.4</b>                  | <b>2.8</b>                    | <b>5.0</b>                | <b>ns</b>  | <b>ns</b>     |                       |
| <b>C.V. (%)</b>            |                             |                                    | <b>26.6</b>                | <b>1.5</b>                  | <b>0.9</b>                    | <b>5.6</b>                | <b>15.1</b>                                      | <b>15.1</b>   |                       |
| <b>P-value (Varieties)</b> |                             |                                    | <b>0.0008</b>              | <b>&lt;.0001</b>            | <b>&lt;.0001</b>              | <b>&lt;.0001</b>          | <b>0.1991</b>                                    | <b>0.1991</b> |                       |

planted: 10/9/2013  
harvested: 9/3/2014

1/ - heavy bird damage

**Table 21.** 2013 Winter Cereal Forages (Exp. WCF1): Fort Ellis West Airplane Field

| Entry #             | Cultivar/ Line       | Pedigree                      | Grain yield<br>lb/a<br>RCB | Test weight<br>lb/bu<br>RCB | Heading date<br>Julian<br>RCB | Plant height<br>in<br>RCB | Lodging score<br>(0-9)<br>RCB | 3ft <sup>2</sup> forage sample (harv = 6/21, 6/28) |        | Protein %<br><br>bulk |
|---------------------|----------------------|-------------------------------|----------------------------|-----------------------------|-------------------------------|---------------------------|-------------------------------|--|--------|-----------------------|
|                     |                      |                               |                            |                             |                               |                           |                               | Dry wt   |        |                       |
|                     |                      |                               |                            |                             |                               |                           | 2-Jul                         | tons/a   | g      |                       |
| 1                   | 10PreWCF60           |                               | 5937*                      | 51.1                        | 175.0                         | 57.1                      | 5.3                           | 3.832  | 240    | 14.4                  |
| 2                   | 10PreWCF78           |                               | 5361                       | 52.8                        | 175.3                         | 60.4                      | 4.0                           | 3.725  | 233    | 15.6                  |
| 3                   | 12WCF A 18 (P0029)   |                               | 6107*                      | 57.0                        | 174.3                         | 53.3                      | 5.0                           | 3.724  | 233    | 13.5                  |
| 4                   | 10PreWCF68           |                               | 6797**                     | 53.1                        | 175.0                         | 53.3                      | 6.0                           | 3.649  | 228    | 13.2                  |
| 5                   | 110 WCF 57           | Triticale                     | 5663                       | 49.7                        | 176.7                         | 51.8                      | 1.3                           | 4.588  | 287    | 13.6                  |
| 6                   | 12WCF A 21 (P0059)   |                               | 5468                       | 52.5                        | 175.3                         | 53.7                      | 5.0                           | 3.556  | 222    | 15.0                  |
| 7                   | 12WCF A 41 (P1085)   |                               | 6213*                      | 52.3                        | 174.0                         | 54.2                      | 3.7                           | 4.230  | 265    | 12.9                  |
| 8                   | 111 WCF 57           | Triticale                     | 5100                       | 51.8                        | 175.3                         | 52.2                      | 5.7                           | 3.364  | 210    | 14.0                  |
| 9                   | 12WCF A 35 (11Adv10) |                               | 5663                       | 53.8                        | 174.0                         | 55.2                      | 1.3                           | 4.029  | 252    | 13.1                  |
| 10                  | 12WCF A 27 (P0086)   |                               | 4961                       | 49.1                        | 176.3                         | 53.8                      | 3.7                           | 3.843  | 240    | 15.2                  |
| 11                  | Willow Creek         | wheat                         | 2276                       | 57.5                        | 183.7                         | 58.0                      | 3.7                           | 3.757  | 235    | 13.6                  |
| 12                  | Trical 102           | Triticale                     | 5288                       | 50.9                        | 177.3                         | 53.8                      | 7.0                           | 4.375  | 274    | 14.4                  |
| 13                  | Yellowstone          |                               | 5327                       | 58.7                        | 176.7                         | 41.2                      | 0.3                           | 4.278  | 268    | 13.0                  |
| 14                  | MTF1232              | Yellowstone/MT0684            | 5562                       | 61.1**                      | 179.3                         | 46.5                      | 1.7                           | 4.318  | 270    | 14.8                  |
| 15                  | MTF1229              | Yellowstone*2/98X168E1        | 4456                       | 55.1                        | 178.7                         | 49.2                      | 0.0                           | 4.534  | 284    | 11.9                  |
| 16                  | Newturk              | wheat (changed from original) | 3007                       | 59.4                        | 178.0                         | 47.4                      | 4.3                           | 4.128  | 258    | 13.2                  |
| Average             |                      |                               | 5199                       | 54.1                        | 176.6                         | 52.6                      | 3.6                           | 3.996  | 250    | 13.8                  |
| LSD (0.05)          |                      |                               | 1044                       | 1.6                         | 0.8                           | 7.4                       | 2.7                           | ns   | ns     |                       |
| C.V. (%)            |                      |                               | 12.0                       | 1.8                         | 0.3                           | 8.4                       | 45.4                          | 12.5   | 12.5   |                       |
| P-value (Varieties) |                      |                               | <.0001                     | <.0001                      | <.0001                        | 0.0022                    | 0.0001                        | 0.1295   | 0.1295 |                       |

planted: 10/2/2012  
harvested: 8/16/2013

**Table 22 2016 Evaluation of winter cereal forages seeded no-till on fallow at the Central Agricultural Research Center, Moccasin, Montana.**

Exp 16223807

| Entry ID     | Trt     | species   | Head   |      | 13-Jun      |       | 13-Jun |        | 17-Jun |        | 22-Jun   |         | Hay     |      | Dry          |         | Dry         |        | Grain       |       | Grain  |        |
|--------------|---------|-----------|--------|------|-------------|-------|--------|--------|--------|--------|----------|---------|---------|------|--------------|---------|-------------|--------|-------------|-------|--------|--------|
|              |         |           | Date   |      | Growth      | Stage | Plant  | Height | Plant  | Height | Plant    | Height  | Harvest | Date | Matter       | Content | Matter      | Yield  | Yield       | Yield | Weight | Weight |
|              |         |           | Julian |      | Feekes      |       | cm     |        | cm     |        | calendar |         |         | t/ac |              | lbs/ac  |             | lbs/bu |             |       |        |        |
| wcf 1060     | 16WCF01 | triticale | 160.3  | A    | <b>10.4</b> | D     | 130    | 140    | D      | 147    | CB       | Jun 13. | 0.28    | AB   | <b>3.45</b>  | BC      | 3594        | AB     | 48.9        | A     |        |        |
| wcf 1020     | 16WCF02 | triticale | 161.7  | ABCD | <b>10.2</b> | CD    | 126    | 140    | D      | 148    | C        | Jun 13. | 0.28    | A    | 2.75         | AB      | 3467        | AB     | 54.2        | CBD   |        |        |
| P0062        | 16WCF03 | triticale | 162.0  | BCDE | <b>10.2</b> | CD    | 126    | 135    | CD     | 139    | CB       | Jun 13. | 0.28    | A    | <b>2.86</b>  | ABC     | 2707        | A      | 55.7        | CD    |        |        |
| Willow Creek | 16WCF04 | wheat     | 167.0  | H    | 9.2         | A     | nh     | 82     | AB     | 96     | A        | Jun 22. | 0.38    | F    | 2.80         | AB      | 3697        | AB     | <b>61.7</b> | F     |        |        |
| Trical 102   | 16WCF05 | triticale | 163.3  | F E  | 10.1        | CB    | nh     | 129    | CD     | 142    | CB       | Jun 17. | 0.32    | E D  | <b>3.59</b>  | C       | 3922        | B      | 49.8        | A     |        |        |
| MTF 1559     | 16WCF06 | wheat     | 166.0  | GH   | 9.3         | A     | nh     | 65     | A      | 83     | A        | Jun 22. | 0.34    | E    | <b>2.89</b>  | ABC     | 5255        | C      | <b>59.5</b> | EF    |        |        |
| WCF 1440     | 16WCF07 | triticale | 161.7  | ABCD | <b>10.2</b> | CD    | 125    | 141    | D      | 151    | C        | Jun 13. | 0.29    | AB   | <b>3.01</b>  | ABC     | 3351        | AB     | 53.7        | CB    |        |        |
| MTF 1432     | 16WCF08 | wheat     | 164.7  | FG   | 9.9         | B     | nh     | 69     | AB     | 86     | A        | Jun 17. | 0.32    | ECD  | 2.64         | A       | <b>5702</b> | C      | <b>60.0</b> | EF    |        |        |
| MTF 1435     | 16WCF09 | wheat     | 163.0  | DE   | 10.1        | CB    | nh     | 86     | B      | 122    | B        | Jun 17. | 0.31    | BCD  | 2.94         | ABC     | <b>5079</b> | C      | <b>60.7</b> | EF    |        |        |
| wcf 1078     | 16WCF10 | triticale | 162.3  | CDE  | <b>10.2</b> | CD    | 128    | 140    | D      | 152    | C        | Jun 13. | 0.29    | ABC  | 2.51         | A       | 3464        | AB     | 54.8        | CBD   |        |        |
| wcf 1216     | 16WCF11 | triticale | 162.7  | CDE  | <b>10.2</b> | CD    | nh     | 137    | CD     | 145    | CB       | Jun 17. | 0.31    | BCD  | <b>3.04</b>  | ABC     | 3239        | AB     | 53.7        | CB    |        |        |
| WCF14adv114  | 16WCF12 | triticale | 160.7  | AB   | <b>10.3</b> | D     | 119    | 141    | D      | 152    | C        | Jun 13. | 0.27    | A    | <b>2.87</b>  | ABC     | 3083        | AB     | 54.9        | CBD   |        |        |
| wcf 1241A    | 16WCF13 | triticale | 161.3  | ABC  | <b>10.3</b> | CD    | 123    | 135    | CD     | 142    | CB       | Jun 13. | 0.28    | AB   | <b>3.62</b>  | C       | 3793        | B      | 55.3        | CBD   |        |        |
| wcf 1310-219 | 16WCF14 | triticale | 162.0  | BCDE | <b>10.2</b> | CD    | 125    | 117    | C      | 130    | CB       | Jun 13. | 0.29    | AB   | 2.80         | AB      | 3108        | AB     | <b>58.8</b> | E     |        |        |
| wcf 1310-230 | 16WCF15 | triticale | 161.7  | ABCD | <b>10.2</b> | CD    | 130    | 142    | D      | 150    | C        | Jun 13. | 0.27    | A    | <b>2.91</b>  | ABC     | 3593        | AB     | 56.1        | D     |        |        |
| wcf 1310-218 | 16WCF16 | triticale | 161.3  | ABC  | <b>10.3</b> | CD    | 127    | 139    | D      | 150    | C        | Jun 13. | 0.29    | AB   | 2.74         | AB      | 3389        | AB     | 53.0        | B     |        |        |
| Mean         |         |           | 162.6  |      | 10.09       |       |        | 121.1  |        | 133.3  |          |         | 0.3005  |      | <b>2.964</b> |         | 3778        |        | 55.65       |       |        |        |
| P-Value      |         |           | 0.00   |      | 0.00        |       |        | 0.00   |        | 0.00   |          |         | 0.00    |      | 0.1877 ns    |         | 0.00        |        | 0.00        |       |        |        |
| CV1          |         |           | 0.4963 |      | 1.214       |       |        | 10.05  |        | 11.32  |          |         | 5.88    |      | 15.66        |         | 16.79       |        | 2.02        |       |        |        |
| LSD (0.05)   |         |           | 1.346  |      | 0.2041      |       |        | 20.3   |        | 25.17  |          |         | 0.03    |      | 0.7741       |         | 1058        |        | 2.396       |       |        |        |

nh: height not recorded      **Seed Date:** 26-Sep-15      No-till into chem-fallow 2014 barley stubble. **Fertilizer:** 10-15-10-05 NPKS w/seed, 60 N as spring top dress urea.  
 June 9 equals day 160

Table 23 2016 Evaluation of winter cereal forages seeded no-till on continuous crop at the Central Agricultural Research Center, Moccasin, Montana.  
Exp 16223870

| Entry ID     | Trt     | species   | 7-Jun         |           | 9-Jun      | 9-Jun        | 10-Jun       | 10-Jun           | 10-Jun         | 20-Jun       | 22-Jun           | 22-Jun         | 22-Jun       | Uniform Hrvst Stage |        |
|--------------|---------|-----------|---------------|-----------|------------|--------------|--------------|------------------|----------------|--------------|------------------|----------------|--------------|---------------------|--------|
|              |         |           | Visible Heads | Head Date | Grow Stage | Plant Height | Plant Height | Dry Mat. content | Dry Mat. Yield | Plant Height | Dry Mat. Content | Dry Mat. Yield | Plant Height | Dry Matter          |        |
|              |         |           | %             | Julian    | Feekes     | cm           | cm           |                  | tnsac          | cm           |                  | tnsac          | cm           | Content             | Yield  |
| wcf 1060     | 16WCF01 | triticale | 60.0          | 161       | 10.2       | 115          | 113          | 0.26             | 3.02           | 130          | 0.40             | 3.22           | 138          | 0.26                | 3.02   |
| wcf 1020     | 16WCF02 | triticale | 56.7          | 160       | 10.4       | 111          | 121          | 0.27             | 2.77           | 138          | 0.42             | 3.17           | 143          | 0.27                | 2.77   |
| P0062        | 16WCF03 | triticale | 51.7          | 161       | 10.3       | 105          | 120          | 0.25             | 2.51           | 130          | 0.42             | 3.26           | 145          | 0.25                | 2.51   |
| Willow Creek | 16WCF04 | wheat     | 0.0           | 167       | 9.5        | 54           | 65           | 0.25             | 0.94           | 68           | 0.34             | 2.80           | 80           | 0.34                | 2.80   |
| Trical 102   | 16WCF05 | triticale | 20.0          | 163       | 10.2       | 104          | 107          | 0.27             | 2.12           | 129          | 0.40             | 2.03           | 132          | 0.27                | 2.12   |
| MTF 1559     | 16WCF06 | wheat     | 0.0           | 166       | 9.7        | 49           | 59           | 0.26             | 1.16           | 60           | 0.34             | 1.33           | 68           | 0.34                | 1.33   |
| WCF 1440     | 16WCF07 | triticale | 60.0          | 160       | 10.4       | 109          | 120          | 0.28             | 2.84           | 133          | 0.44             | 3.29           | 136          | 0.32                | 2.99   |
| MTF 1432     | 16WCF08 | wheat     | 0.0           | 165       | 9.8        | 55           | 59           | 0.26             | 1.16           | 74           | 0.35             | 1.83           | 80           | 0.35                | 1.83   |
| MTF 1435     | 16WCF09 | wheat     | 0.0           | 165       | 9.8        | 58           | 71           | 0.27             | 1.52           | 93           | 0.38             | 1.68           | 87           | 0.38                | 1.68   |
| wcf 1078     | 16WCF10 | triticale | 53.3          | 160       | 10.4       | 112          | 119          | 0.20             | 2.64           | 134          | 0.43             | 3.78           | 148          | 0.30                | 2.64   |
| wcf 1216     | 16WCF11 | triticale | 33.3          | 161       | 10.3       | 104          | 104          | 0.20             | 2.59           | 125          | 0.41             | 2.87           | 141          | 0.29                | 2.59   |
| WCF14adv114  | 16WCF12 | triticale | 56.7          | 160       | 10.4       | 116          | 119          | 0.28             | 2.70           | 131          | 0.43             | 3.43           | 135          | 0.28                | 2.70   |
| wcf 1241A    | 16WCF13 | triticale | 71.7          | 161       | 10.3       | 105          | 110          | 0.27             | 2.60           | 124          | 0.44             | 3.39           | 129          | 0.27                | 2.60   |
| wcf 1310-219 | 16WCF14 | triticale | 63.3          | 161       | 10.3       | 117          | 126          | 0.20             | 2.97           | 135          | 0.43             | 3.41           | 142          | 0.35                | 3.27   |
| wcf 1310-230 | 16WCF15 | triticale | 31.7          | 162       | 10.2       | 106          | 113          | 0.25             | 2.11           | 128          | 0.42             | 2.96           | 138          | 0.29                | 2.11   |
| wcf 1310-218 | 16WCF16 | triticale | 50.0          | 161       | 10.3       | 106          | 124          | 0.26             | 2.54           | 132          | 0.41             | 3.30           | 133          | 0.26                | 2.54   |
| Mean         |         |           | 38.02         | 162.2     | 10.16      | 95.18        | 103.1        | 0.245            | 2.261          | 116.4        | 0.404            | 2.859          | 123.4        | 0.30                | 2.468  |
| P-Value      |         |           | 0.000         | 0.000     | 0.000      | 0.000        | 0.000        | 0.284            | 0.000          | 0.000        | 0.004            | 0.001          | 0.000        | 0.0098              | 0.001  |
| CV1          |         |           | 54.86         | 0.7625    | 1.444      | 9.339        | 9.763        | 28.87            | 17.62          | 9.266        | 8.34             | 23.41          | 6.93         | 14.03               | 19.18  |
| LSD (0.05)   |         |           | 34.78         | 2.062     | 0.2445     | 14.82        | 16.78        | 0.12             | 0.6644         | 17.99        | 0.06             | 1.12           | 14.25        | 0.07                | 0.7893 |

Seed Date: 27-Sep-15

No-till into 2015 barley stubble. Fertilizer: 10-15-10-05 NPKS w/seed, 80 N as spring top dress urea.

The winter wheat entries were impacted by wheat streak mosaic. The third rep had severe wsmv symptoms.

Table 24

## 2015 Winter cereal forage cultivar evaluations on no-till crop-fallow at CARC,, Moccasin, MT.

| 15223807     |         |           |        |         |        |        |        |        |                   |       |        |        |        |        |
|--------------|---------|-----------|--------|---------|--------|--------|--------|--------|-------------------|-------|--------|--------|--------|--------|
| Entry ID     | Trt     | Species   | Head   | Leaning | 12-Jun | 24-Jun | 12-Jun | 12-Jun | Near Uniform Hrvs |       | 24-Jun | 24-Jun | Grain  | Test   |
|              |         |           | Date   | Stems   | Plant  | Plant  | Dry    | Dry    | Dry               | Dry   | Dry    | Dry    |        |        |
|              |         |           | Julian | %       | cm     | cm     |        |        | t/ac              | t/ac  |        | t/ac   | lbs/ac | lbs/bu |
| wcf 1060     | 15WCF01 | triticale | 159    | 21      | 117    | 141    | 0.24   | 3.56   | 0.24              | 3.56  | 0.37   | 4.76   | 2456   | 49.5   |
| wcf 1020     | 15WCF02 | triticale | 160    | 19      | 118    | 150    | 0.24   | 3.52   | 0.24              | 3.52  | 0.36   | 4.35   | 3146   | 55.4   |
| P0062        | 15WCF03 | triticale | 160    | 16      | 115    | 151    | 0.25   | 4.02   | 0.25              | 4.02  | 0.36   | 4.35   | 2428   | 56.7   |
| Willow Creek | 15WCF04 | wheat     | 168    | 11      | 89     | 116    | 0.30   | 2.99   | 0.36              | 3.26  | 0.36   | 3.26   | 1866   | 62.6   |
| Trical 102   | 15WCF05 | triticale | 162    | 18      | 109    | 135    | 0.27   | 3.71   | 0.27              | 3.71  | 0.35   | 4.24   | 2536   | 50.7   |
| MTF 1559     | 15WCF06 | wheat     | 166    | 3       | 70     | 85     | 0.28   | 2.73   | 0.34              | 3.26  | 0.34   | 3.26   | 2512   | 60.1   |
| MTF 1232     | 15WCF07 | wheat     | 165    | 11      | 76     | 100    | 0.28   | 2.67   | 0.35              | 3.38  | 0.35   | 3.38   | 2514   | 61.8   |
| MTF 1432     | 15WCF08 | wheat     | 164    | 4       | 69     | 87     | 0.29   | 2.82   | 0.35              | 3.07  | 0.35   | 3.07   | 3283   | 60.7   |
| MTF 1435     | 15WCF09 | wheat     | 162    | 15      | 77     | 105    | 0.24   | 2.88   | 0.28              | 3.19  | 0.36   | 3.67   | 2724   | 60.9   |
| wcf 1078     | 15WCF10 | triticale | 160    | 17      | 118    | 153    | 0.24   | 3.49   | 0.24              | 3.49  | 0.35   | 4.37   | 2755   | 56.2   |
| wcf 1216     | 15WCF11 | triticale | 159    | 23      | 121    | 150    | 0.26   | 5.00   | 0.26              | 5.00  | 0.38   | 4.84   | 2691   | 50.6   |
| wcf 1310-221 | 15WCF12 | triticale | 160    | 24      | 111    | 154    | 0.23   | 3.28   | 0.23              | 3.28  | 0.35   | 4.58   | 2379   | 55.6   |
| wcf 1241A    | 15WCF13 | triticale | 159    | 9       | 112    | 127    | 0.25   | 3.84   | 0.25              | 3.84  | 0.37   | 4.22   | 3082   | 52.1   |
| wcf 1310-219 | 15WCF14 | triticale | 162    | 9       | 104    | 139    | 0.24   | 3.80   | 0.24              | 3.80  | 0.34   | 4.13   | 2903   | 53.4   |
| wcf 1310-230 | 15WCF15 | triticale | 162    | 7       | 105    | 142    | 0.23   | 3.61   | 0.23              | 3.61  | 0.35   | 4.35   | 3176   | 56.7   |
| wcf 1310-218 | 15WCF16 | triticale | 160    | 28      | 119    | 145    | 0.24   | 3.78   | 0.24              | 3.78  | 0.34   | 4.56   | 3030   | 49.1   |
| Mean         |         |           | 161.7  | 14.7    | 101.9  | 130.1  | 0.25   | 3.48   | 0.27              | 3.61  | 0.35   | 4.09   | 2718.0 | 55.73  |
| P-VALUE TRT  |         |           | 0.000  | 0.000   | 0.000  | 0.000  | 0.000  | 0.000  | 0.000             | 0.003 | 0.003  | 0.000  | 0.060  | 0.000  |
| CV (S/MEAN)  |         |           | 0.62   | 39.36   | 3.21   | 5.56   | 6.86   | 11.59  | 8.80              | 12.15 | 3.00   | 11.77  | 17.16  | 0.82   |
| LSD(0.05 by  |         |           | 1.66   | 9.63    | 5.45   | 12.06  | 0.03   | 0.67   | 0.04              | 0.73  | 0.02   | 0.80   | 777.80 | 0.97   |

Seed Date: 8-Oct-14

No-till into 2013 barley stubble. Powerflex was applied early spring to control downy brome.

Fertilizer: 10-115-10-5 NPKS w/seed and 45 N as urea spring topdress.

Table 25

## 2015 Winter cereal forage cultivar evaluations on no-till continuous crop at CARC,, Moccasin, MT.

| Entry ID     | Trt               | 12-Jun<br>Head<br>Date | 12-Jun<br>Growth<br>Stage | 8-Jun<br>Plant<br>Height | 12-Jun<br>Plant<br>Height | 24-Jun<br>Plant<br>Height | 12-Jun<br>Dry<br>Matter | 12-Jun<br>Dry Mat.<br>Yield | near<br>Dry Mat.<br>Content | Uniform<br>Dry Mat.<br>Yield | stage<br>24-Jun<br>Dry<br>Matter | 24-Jun<br>Dry Mat.<br>Yield | Grain<br>Yield | Grain<br>Test<br>Weight |
|--------------|-------------------|------------------------|---------------------------|--------------------------|---------------------------|---------------------------|-------------------------|-----------------------------|-----------------------------|------------------------------|----------------------------------|-----------------------------|----------------|-------------------------|
|              |                   | Julian                 | Feekes                    | cm                       | cm                        | cm                        |                         | tns/ac                      |                             | tns/ac                       |                                  | tns/ac                      | lbs/ac         | lbs/bu                  |
| wcf 1060     | 15WCF01 triticale | 156                    | 10.3                      | 99                       | 127                       | 147                       | 0.24                    | 3.90                        | 0.24                        | 3.90                         | 0.36                             | 4.19                        | 2321           | 47.8                    |
| wcf 1020     | 15WCF02 triticale | 156                    | 10.3                      | 104                      | 129                       | 157                       | 0.25                    | 2.76                        | 0.25                        | 2.76                         | 0.36                             | 3.87                        | 2590           | 53.1                    |
| P0062        | 15WCF03 triticale | 157                    | 10.2                      | 98                       | 117                       | 158                       | 0.25                    | 3.67                        | 0.25                        | 3.67                         | 0.33                             | 3.56                        | 2517           | 55.6                    |
| Willow Creek | 15WCF04 wheat     | 164                    | 9.3                       | 75                       | 92                        | 119                       | 0.28                    | 2.18                        | 0.28                        | 2.18                         | 0.35                             | 2.82                        | 1550           | 60.1                    |
| Trical 102   | 15WCF05 triticale | 159                    | 10.0                      | 93                       | 112                       | 139                       | 0.23                    | 2.43                        | 0.23                        | 2.43                         | 0.35                             | 3.03                        | 1884           | 49.5                    |
| MTF 1559     | 15WCF06 wheat     | 160                    | 9.9                       | 59                       | 70                        | 93                        | 0.26                    | 2.07                        | 0.26                        | 2.07                         | 0.34                             | 2.89                        | 3044           | 59.2                    |
| MTF 1232     | 15WCF07 wheat     | 162                    | 9.7                       | 67                       | 82                        | 105                       | 0.25                    | 1.72                        | 0.25                        | 1.72                         | 0.31                             | 2.47                        | 2003           | 58.5                    |
| MTF 1432     | 15WCF08 wheat     | 162                    | 9.7                       | 60                       | 72                        | 95                        | 0.28                    | 2.51                        | 0.28                        | 2.51                         | 0.32                             | 2.68                        | 2783           | 58.7                    |
| MTF 1435     | 15WCF09 wheat     | 160                    | 9.9                       | 73                       | 86                        | 105                       | 0.26                    | 2.47                        | 0.26                        | 2.47                         | 0.32                             | 1.97                        | 1928           | 58.0                    |
| wcf 1078     | 15WCF10 triticale | 156                    | 10.3                      | 104                      | 133                       | 159                       | 0.25                    | 3.47                        | 0.25                        | 3.47                         | 0.37                             | 3.49                        | 2499           | 53.8                    |
| wcf 1216     | 15WCF11 triticale | 155                    | 10.4                      | 112                      | 140                       | 142                       | 0.26                    | 4.14                        | 0.26                        | 4.14                         | 0.37                             | 3.92                        | 2547           | 46.8                    |
| wcf 1310-221 | 15WCF12 triticale | 156                    | 10.3                      | 104                      | 132                       | 161                       | 0.20                    | 3.20                        | 0.20                        | 3.20                         | 0.34                             | 3.65                        | 2536           | 53.9                    |
| wcf 1241A    | 15WCF13 triticale | 157                    | 10.2                      | 92                       | 122                       | 151                       | 0.25                    | 2.87                        | 0.25                        | 2.87                         | 0.34                             | 3.61                        | 2833           | 50.5                    |
| wcf 1310-219 | 15WCF14 triticale | 156                    | 10.3                      | 98                       | 123                       | 151                       | 0.24                    | 3.10                        | 0.24                        | 3.10                         | 0.34                             | 3.76                        | 2554           | 51.2                    |
| wcf 1310-230 | 15WCF15 triticale | 156                    | 10.3                      | 95                       | 121                       | 146                       | 0.22                    | 2.82                        | 0.22                        | 2.82                         | 0.34                             | 3.25                        | 2487           | 53.8                    |
| wcf 1310-218 | 15WCF16 triticale | 156                    | 10.3                      | 107                      | 133                       | 147                       | 0.25                    | 4.22                        | 0.25                        | 4.22                         | 0.35                             | 3.66                        | 2465           | 46.6                    |
| Mean         |                   | 158                    | 10.09                     | 90.06                    | 112.00                    | 136.00                    | 0.25                    | 2.97                        | 0.25                        | 2.97                         | 0.34                             | 3.30                        | 2408.7         | 53.53                   |
| P-VALUE TRT  |                   | 0.000                  | 0.000                     | 0.000                    | 0.000                     | 0.000                     | 0.008                   | 0.000                       | 0.008                       | 0.000                        | 0.000                            | 0.002                       | 0.013          | 0.000                   |
| CV (S/MEAN)  |                   | 0.82                   | 1.38                      | 6.21                     | 5.60                      | 7.16                      | 7.95                    | 17.37                       | 7.95                        | 17.37                        | 4.23                             | 16.97                       | 17.40          | 2.28                    |
| LSD(0.05 by  |                   | 2.15                   | 0.23                      | 9.33                     | 10.45                     | 16.24                     | 0.03                    | 0.86                        | 0.03                        | 0.86                         | 0.02                             | 0.93                        | 698.70         | 2.60                    |

Seed Date: 8-Oct-14

No-till into 2014 barley stubble. Powerflex was applied early spring to control downy brome.

Fertilizer: 10-115-10-5 NPKS w/seed and 80 N as urea spring topdress.

Table 26 2014 Statewide winter cereal forage variety and advance line evaluation under fallow near Moccasin.  
 Exp: 14223807 Central Agricultural Research Center. Moccasin, Montana.

| Entry         | Code    | Head Date | In 9 Agron. Score | lly 12 Agror Score | Jn 24 Plant Ht | Jly 7 Plant Ht | Harvest Date | Dry Mat. Content | Dry Mat. Yield |
|---------------|---------|-----------|-------------------|--------------------|----------------|----------------|--------------|------------------|----------------|
|               |         | Julian d  | 0-8               | 0-6                | cm             | cm             |              | %                | t/a            |
| Yellowstone   | 14WCF01 | 170.7     | 4.0               | 3.0                | 74             | 80             | 22-Jun       | 30.3             | 2.60           |
| Warhorse      | 14WCF02 | 170.1     | 3.0               | 3.0                | 68             | 76             | 21-Jun       | 31.7             | 2.60           |
| Newturk       | 14WCF03 | 172.0     | 3.7               | 4.0                | 119            | 133            | 22-Jun       | 27.5             | 3.07           |
| Willow Creek  | 14WCF04 | 180.0     | 6.7               | 5.3                | 73             | 111            | 30-Jun       | 35.8             | 3.52           |
| Trical 102    | 14WCF05 | 171.0     | 4.0               | 4.3                | 110            | 134            | 22-Jun       | 29.9             | 3.23           |
| MTF 1232      | 14WCF06 | 173.7     | 5.3               | 4.7                | 75             | 109            | 25-Jun       | 30.9             | 2.98           |
| MTF1435       | 14WCF07 | 171.0     | 5.3               | 5.0                | 82             | 105            | 22-Jun       | 29.9             | 3.33           |
| MTF 1432      | 14WCF08 | 175.3     | 5.7               | 4.7                | 70             | 92             | 25-Jun       | 32.6             | 3.31           |
| MTF 1434      | 14WCF09 | 174.7     | 6.0               | 5.0                | 75             | 104            | 25-Jun       | 34.5             | 3.11           |
| WCF1060       | 14WCF10 | 168.7     | 4.0               | 4.3                | 125            | 129            | 21-Jun       | 29.4             | 3.62           |
| 10Pre WCF 81  | 14WCF11 | 170.3     | 4.0               | 4.0                | 123            | 142            | 22-Jun       | 29.5             | 3.18           |
| 108 WCF 28    | 14WCF12 | 169.7     | 4.0               | 5.0                | 116            | 141            | 22-Jun       | 29.2             | 2.88           |
| 12 10Advwcf12 | 14WCF13 | 170.0     | 3.3               | 4.0                | 114            | 141            | 22-Jun       | 27.6             | 3.36           |
| 20 10AdvWCF20 | 14WCF14 | 169.7     | 4.3               | 4.3                | 128            | 146            | 21-Jun       | 26.2             | 3.11           |
| 111 WCF 57    | 14WCF15 | 169.7     | 4.0               | 4.0                | 120            | 142            | 21-Jun       | 26.8             | 2.78           |
| 111 WCF 57a   | 14WCF16 | 169.7     | 5.0               | 4.3                | 129            | 157            | 21-Jun       | 25.8             | 3.05           |
| Mean          |         | 171.6     | 4.521             | 4.313              | 100.2          | 121.4          |              | 29.85            | 3.108          |
| P-Value       |         | 0.00      | 0.00              | 0.001              | 0.00           | 0.00           |              | 0.00             | 0.094          |
| CV (S/MEAN)   |         | 0.7343    | 15.96             | 13.83              | 5.682          | 6.603          |              | 4.874            | 12.49          |
| LSD(0.05 by   |         | 2.105     | 1.203             | 0.9943             | 9.495          | 13.37          |              | 2.426            | 0.6476         |

Seeded: October 1, 2013



Table 27 2014 Statewide winter cereal forage variety and advance line evaluation under CC near Moccasin.  
 Exp: 14223870 Central Agricultural Research Center. Moccasin, Montana.

| Entry         | Code    | 27-Jun<br>Plant Ht<br>cm | 7-Jul<br>Plant Ht<br>cm | Harvest<br>Date | Dry Mat.<br>Content<br>% | Dry Mat.<br>Yield<br>t/a |
|---------------|---------|--------------------------|-------------------------|-----------------|--------------------------|--------------------------|
| Yellowstone   | 14WCF01 | 70                       | 76                      | 27-Jun          | 0.26                     | 1.50                     |
| Warhorse      | 14WCF02 | 69                       | 78                      | 27-Jun          | 0.26                     | 1.74                     |
| Newturk       | 14WCF03 | 111                      | 147                     | 27-Jun          | 0.23                     | 1.79                     |
| Willow Creek  | 14WCF04 | 72                       | 109                     | 7-Jul           | 0.37                     | 2.53                     |
| Trical 102    | 14WCF05 | 111                      | 133                     | 27-Jun          | 0.24                     | 2.11                     |
| MTF 1232      | 14WCF06 | 82                       | 113                     | 7-Jul           | 0.32                     | 2.36                     |
| MTF1435       | 14WCF07 | 80                       | 104                     | 27-Jun          | 0.31                     | 2.01                     |
| MTF 1432      | 14WCF08 | 102                      | 95                      | 7-Jul           | 0.34                     | 1.93                     |
| MTF 1434      | 14WCF09 | 62                       | 113                     | 7-Jul           | 0.36                     | 2.27                     |
| WCF1060       | 14WCF10 | 126                      | 147                     | 27-Jun          | 0.28                     | 2.72                     |
| 10Pre WCF 81  | 14WCF11 | 131                      | 165                     | 27-Jun          | 0.25                     | 2.48                     |
| 108 WCF 28    | 14WCF12 | 125                      | 138                     | 27-Jun          | 0.30                     | 2.52                     |
| 12 10Advwcf12 | 14WCF13 | 131                      | 151                     | 27-Jun          | 0.27                     | 2.61                     |
| 20 10AdvWCF20 | 14WCF14 | 142                      | 148                     | 27-Jun          | 0.30                     | 2.85                     |
| 111 WCF 57    | 14WCF15 | 132                      | 151                     | 27-Jun          | 0.29                     | 2.74                     |
| 111 WCF 57a   | 14WCF16 | 134                      | 158                     | 27-Jun          | 0.30                     | 2.82                     |
| Mean          |         | 105.1                    | 126.6                   |                 | 0.292                    | 2.311                    |
| P-Value       |         | 0.00                     | 0.00                    |                 | 0.003                    | 0.036                    |
| CV (S/MEAN)   |         | 17.99                    | 4.569                   |                 | 13.39                    | 21.55                    |
| LSD(0.05 by   |         | 31.51                    | 9.649                   |                 | 0.065                    | 0.831                    |

Seeded: October 24, 2013

Harvested June 27 and July 7, 2014

Table 28  
Exp 13223807

2013 Winter cereal cultivar evaluation under crop **fallow** near Moccasin.  
Central Agricultural Research Center. Moccasin, Montana.

| Cultivar ID          | trt | Head<br>Date | Height<br>10-Jul | Dry<br>Matter | Forage<br>Yield | Grain<br>Yield | Test<br>Weight | Forage<br>Yield Rank |
|----------------------|-----|--------------|------------------|---------------|-----------------|----------------|----------------|----------------------|
|                      |     | Julin        | cm               | %             | t/a             | lbs/a          | lbs/bu         | #                    |
| WCF 1060             | 1   | 168          | 150              | 38            | 4.135           | 2181           | 46.1           | 6                    |
| 10 PreWcf 78         | 2   | 169          | 161              | 38            | 4.125           | 2146           | 54.1           | 7                    |
| 12 wcf A 18 (P0029)  | 3   | 168          | 157              | 35            | 3.885           | 2873           | 55.5           | 11                   |
| 10 PreWcf 68         | 4   | 168          | 153              | 35            | 3.961           | 2578           | 50.7           | 10                   |
| 110 WCF 57           | 5   | 170          | 141              | 38            | 4.381           | 2690           | 48.1           | 2                    |
| 12 WCF A 21 (P0059)  | 6   | 169          | 165              | 37            | 4.497           | 2407           | 54.5           | 1                    |
| 12 WCF A 41 (P1085)  | 7   | 165          | 144              | 38            | 3.989           | 2627           | 50.8           | 9                    |
| 111 WCF 57           | 8   | 168          | 151              | 38            | 4.060           | 2554           | 49.4           | 8                    |
| 12 WCF A 35 (11Adv1) | 9   | 166          | 149              | 38            | 4.242           | 2599           | 52.3           | 3                    |
| 12 WCF A 27 (P0086)  | 10  | 170          | 157              | 38            | 4.213           | 2092           | 47.0           | 4                    |
| Willow Creek         | 11  | 178          | 130              | 37            | 3.452           | 2053           | 59.3           | 15                   |
| Trical 102           | 12  | 170          | 147              | 38            | 4.168           | 2053           | 44.8           | 5                    |
| Yellowstone          | 13  | 172          | 90               | 37            | 3.693           | 3557           | 59.1           | 13                   |
| MTF1232              | 14  | 176          | 117              | 37            | 3.697           | 3007           | 58.0           | 12                   |
| MTF1229              | 15  | 175          | 92               | 35            | 3.422           | 3183           | 56.1           | 16                   |
| Newturk              | 16  | 173          | 128              | 37            | 3.640           | 2440           | 60.0           | 14                   |
| Mean                 |     | 170          | 140              | 37.2          | 3.972           | 2565           | 52.9           |                      |
| P value              |     | 0.00         | 0.00             | 0.00          | 0.00            | 0.00           | 0.00           |                      |
| CV1                  |     | 0.5          | 4.1              | 1.8           | 7.3             | 12.0           | 1.3            |                      |
| LSD(0.05 by t)       |     | 1.56         | 9.62             | 1.00          | 0.49            | 515.10         | 1.17           |                      |

Table 29  
Exp 13223870

2013 Winter cereal cultivar evaluation under **contiuous-crop** near Moccasin.  
Central Agricultural Research Center. Moccasin, Montana.

| Cultivar ID          | trt | Head Date | Height 10-Jul | Dry Matter % | Forage Yield t/a | Grain Yield lbs/a | Test Weight lbs/bu | Forage Yield Rank # |
|----------------------|-----|-----------|---------------|--------------|------------------|-------------------|--------------------|---------------------|
| WCF 1060             | 1   | 167       | 121           | 29           | 1.961            |                   |                    | 7                   |
| 10 PreWcf 78         | 2   | 168       | 117           | 28           | 1.798            |                   |                    | 12                  |
| 12 wcf A 18 (P0029)  | 3   | 168       | 121           | 32           | 2.106            |                   |                    | 3                   |
| 10 PreWcf 68         | 4   | 167       | 121           | 31           | 2.096            |                   |                    | 4                   |
| 110 WCF 57           | 5   | 169       | 97            | 27           | 1.863            |                   |                    | 11                  |
| 12 WCF A 21 (P0059)  | 6   | 169       | 123           | 31           | 2.131            |                   |                    | 2                   |
| 12 WCF A 41 (P1085)  | 7   | 165       | 106           | 32           | 1.929            |                   |                    | 8                   |
| 111 WCF 57           | 8   | 168       | 113           | 32           | 2.204            |                   |                    | 1                   |
| 12 WCF A 35 (11Adv1) | 9   | 169       | 106           | 30           | 1.875            |                   |                    | 9                   |
| 12 WCF A 27 (P0086)  | 10  | 169       | 114           | 30           | 2.069            |                   |                    | 5                   |
| Willow Creek         | 11  | 182       | 77            | 39           | 2.052            |                   |                    | 6                   |
| Trical 102           | 12  | 170       | 106           | 28           | 1.761            |                   |                    | 14                  |
| Yellowstone          | 13  | 171       | 74            | 29           | 1.557            |                   |                    | 16                  |
| MTF1232              | 14  | 174       | 82            | 30           | 1.872            |                   |                    | 10                  |
| MTF1229              | 15  | 173       | 77            | 30           | 1.716            |                   |                    | 15                  |
| Newturk              | 16  | 170       | 95            | 31           | 1.773            |                   |                    | 13                  |
| MEAN TRT MEANS=      |     | 170       | 103           | 30.5         | 1.923            |                   |                    |                     |
| P-VALUE TRTS =       |     | 0.00      | 0.00          | 0.00         | 0.00             |                   |                    |                     |
| CV (S/MEAN) % =      |     | 0.6       | 5.0           | 2.9          | 6.3              |                   |                    |                     |
| LSD(0.05 by t)=      |     | 1.71      | 8.6           | 1.0          | 0.203            |                   |                    |                     |

Table 30  
Exp: 13223874

2013 Statewide WCF Bold Winifred Ranch  
Central Agricultural Research Center. Moccasin MT

| Entry ID             | Plant Height | Dry Mat. Content | Dry Mat Yield |
|----------------------|--------------|------------------|---------------|
|                      | "            |                  | t/a           |
| WCF 1060             | 63           | 0.24             | 4.91          |
| 10 PreWcf 78         | 67           | 0.36             | 4.89          |
| 12 wcf A 18 (P0029)  | 63           | 0.38             | 4.76          |
| 10 PreWcf 68         | 67           | 0.37             | 4.73          |
| 110 WCF 57           | 54           | 0.35             | 4.54          |
| 12 WCF A 21(P0059)   | 67           | 0.38             | 5.35          |
| 12 WCF A 41 (P1085)  | 57           | 0.36             | 4.40          |
| 111 WCF 57           | 63           | 0.37             | 5.13          |
| 12 WCF A 35(11Adv10) | 64           | 0.37             | 4.68          |
| 12 WCF A 27 (P0086)  | 64           | 0.36             | 4.26          |
| Willow Creek         | 51           | 0.32             | 3.47          |
| Trical 102           | 60           | 0.33             | 4.33          |
| Yellowstone          | 35           | 0.32             | 3.24          |
| M7F1232              | 47           | 0.33             | 3.53          |
| M7F1229              | 40           | 0.32             | 3.25          |
| Newturk              | 47           | 0.36             | 3.87          |
| Mean                 | 56.81        | 0.34             | 4.334         |
| P-Value              |              | 0.234            | 0.00          |
| CV 1                 |              | 15.3             | 7.87          |
| LSD(0.05 by t)       |              | 0.09             | 0.57          |

Seed Date: 29 Sep 2012

Harvest Date: 28-Jun-13

Table 31 2013 Evaluation of winter cereal forages in fallow environment.  
Exp. 132238WY Sheridan Research & Extension Center, Sheridan Wyoming

| Entry                 | ID code | Dry Matter % | Forage Yield t/a |
|-----------------------|---------|--------------|------------------|
| Willow Creek          |         | 44.2         | 4.37             |
| 12 WCF A 35 (11Adv10) |         | 29.0         | 4.01             |
| 12 WCF A 41 (P1085)   |         | 31.8         | 3.96             |
| 12 WCF A 27 (P0086)   |         | 25.3         | 3.96             |
| 12 wcf A 18 (P0029)   |         | 30.5         | 3.96             |
| 111 WCF 57            |         | 27.3         | 3.93             |
| 10 PreWcf 68          |         | 31.3         | 3.82             |
| 12 WCF A 21 (P0059)   |         | 31.3         | 3.78             |
| WCF 1060              |         | 30.3         | 3.74             |
| 110 WCF 57            |         | 27.8         | 3.60             |
| MTF1232               |         | 28.3         | 3.53             |
| 10 PreWcf 78          |         | 28.0         | 3.44             |
| Newturk               |         | 31.7         | 3.38             |
| Trical 102            |         | 26.8         | 3.11             |
| MTF1229               |         | 26.7         | 3.06             |
| Yellowstone           |         | 27.0         | 3.01             |
| Mean                  |         | 29.84        | 3.667            |
| P-value               |         | 0.00         | 0.00             |
| CV1                   |         | 7.8          | 9.1              |
| LSD(0.05)             |         | 3.89         | 0.558            |

Harvest: June 10 and 25 (Willow Creek)