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Agricultural Experiment Station

Colorado State University

College of Agricultural Sciences | Department of Soil & Crop Sciences | Extension

Crops Testing

Making Better Decisions

2013 Colorado Winter Wheat Variety Performance Trials

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Additional Resources on the Web

http://www.csucrops.com- Colorado State University Crop Variety Testing Program
http://wheat.colostate.edu - Colorado State University Wheat Breeding Program
http://wheat.colostate.edu/vpt.html - Colorado Wheat Variety Performance Database (CSU Wheat Breeding Program).
http://www.coloradowheat.org - Colorado Wheat Administrative Committee (CWAC), Colorado Association of Wheat Growers (CAWG), and Colorado Wheat Research Foundation (CWRF) website.

2013 Eastern Colorado Winter Wheat Variety Performance Trials

Jerry Johnson and Scott Haley

The Colorado State University Crops Testing and Wheat Breeding and Genetics programs provide current, reliable, and unbiased wheat variety information as quickly as possible to Colorado producers for making better variety decisions. CSU has an excellent research faculty and staff, a focused breeding program, graduate and undergraduate students, and dedicated agricultural extension specialists. Wheat improvement in Colorado would not be possible without the support and cooperation of the entire Colorado wheat industry. On-going and strong producer support for our programs is critical for sustained public variety development and testing.

Our wheat variety performance trials and Collaborative On-Farm Test (COFT) represent the final stages of a wheat breeding program where promising and newly released experimental lines are tested under an increasingly broad range of environmental conditions. As a consequence of large environmental variation, Colorado State University annually conducts a large number of performance trials and on-farm tests. These trials serve to guide producer variety decisions and to assist our breeding program to more reliably select and advance the most promising lines toward release as new varieties.

There were 40 entries in the dryland performance trials (UVPT) and 28 entries in the irrigated performance trials (IVPT). All trials included a combination of public and private varieties and experimental lines from Colorado, Texas, Kansas, Oklahoma, Nebraska, and Montana. All dryland and irrigated trials were planted in a randomized complete block design with three replicates. Plot sizes were approximately 175 ft^2 (except the Fort Collins IVPT, which was 60 ft^2) and all varieties were planted at 700,000 viable seeds per acre for dryland trials and 1.2 million viable seeds per acre for irrigated trials. Yields were corrected to 12% moisture. Test weight information was obtained from an air blower-cleaned sample of the first replication or from a combine equipped with a Harvest Master measuring system.

2013 Dryland Variety Performance Trials

Without a doubt, 2013 will go down in the books as one of the toughest in history for winter wheat in eastern Colorado. As a result of an extremely dry spring and summer 2012, very dry planting conditions were experienced at most trial locations at planting time in fall 2012. In spite of extremely dry conditions, decent plant stands were achieved at several sites, in some cases due to timely rains that came after the trials had been “dusted in”. One trial location, Roggen, crusted in the fall due to rain after being “dusted in” and a new field location was replanted in early October. Unfortunately, incomplete or extremely variable plant stands at the Lamar, Arapahoe, and Genoa dryland trial locations led to abandonment of these trials.

Drought conditions persisted throughout the winter, most critically in southeast Colorado. In many areas of southeast Colorado, lack of precipitation coupled with very short subsoil moisture, led to complete stand loss as the crop came out of the winter. The dryland trial location at Sheridan Lake (Brandon) had decent stands in the fall (after being “dusted in”) but was abandoned in early spring due to complete death of the plants from extreme drought.

By early spring, dryland trials and the crop in many areas of northeast Colorado looked extremely good with high yield potentials. Subsoil moisture was not plentiful, yet expectations for above-average wheat yields were high. Unfortunately, the crop in many areas, including the trials at five of the seven remaining dryland locations in northeast Colorado (Akron, Julesburg, Orchard, Roggen, and Yuma), received inadequate precipitation to meet these expectations. While each of these five trial locations were successfully harvested, average trial yields were at least 50% less than visual estimates made during site visits in late April and early May. The remaining two dryland trials, Walsh and Burlington, also suffered from continued drought throughout the spring and although they were successfully harvested, the trial yields were extremely low. Very little or no hail affected the trials, with the exception of a light hail at Akron (estimated 10% damage) a week prior to harvest.

While 2012 and 2013 will both be remembered as "drought years", the patterns of the stresses and the temperature regimes experienced were markedly different. First, the 2012 crop emerged extremely well with good fall moisture conditions whereas the 2013 crop had a tough time moisture-wise from the start, hindering good fall root development. Second, warm temperatures in spring 2012 resulted in accelerated plant development and a crop that was 2-3 weeks early whereas in 2013 cool temperatures in early spring resulted in much delayed plant development and jointing that was roughly 2-3 weeks later than "average" (and thus three to four weeks later than in 2012). Interestingly, the wheat showed a remarkable ability to "catch up" (responding to the high temperatures in mid- and late-May), as heading dates recorded at the Fort Collins and Akron trial locations were right on the long-term average for these locations. Finally, several severe spring freezes occurred from March through May that damaged the 2013 crop. Although plant development was behind normal, it was far enough along in southeast Colorado to cause severe damage to the growing points of the plants, especially for wheat under irrigation. From east-central to northeast Colorado, due to delayed plant development, the growing point was still at or below ground when the freezes occurred and thus damage was restricted to burning off of the above-ground foliage, which undoubtedly reduced yields.

In 2013, there was a general lack of foliar disease pressure due to the drought conditions. Isolated leaf and stripe rust was observed only at the irrigated trial location at Fort Collins. With the prolonged drought, root rot symptoms were observed at several trial locations, though perhaps not as severe as in 2012. As has become common in eastern Colorado, dry conditions in early spring favored severe brown wheat mite infestations as the wheat came out of the winter. Russian wheat aphid and Bird cherry-oat aphids were observed at several locations and isolated wheat streak mosaic virus and barley yellow dwarf observations were recorded.

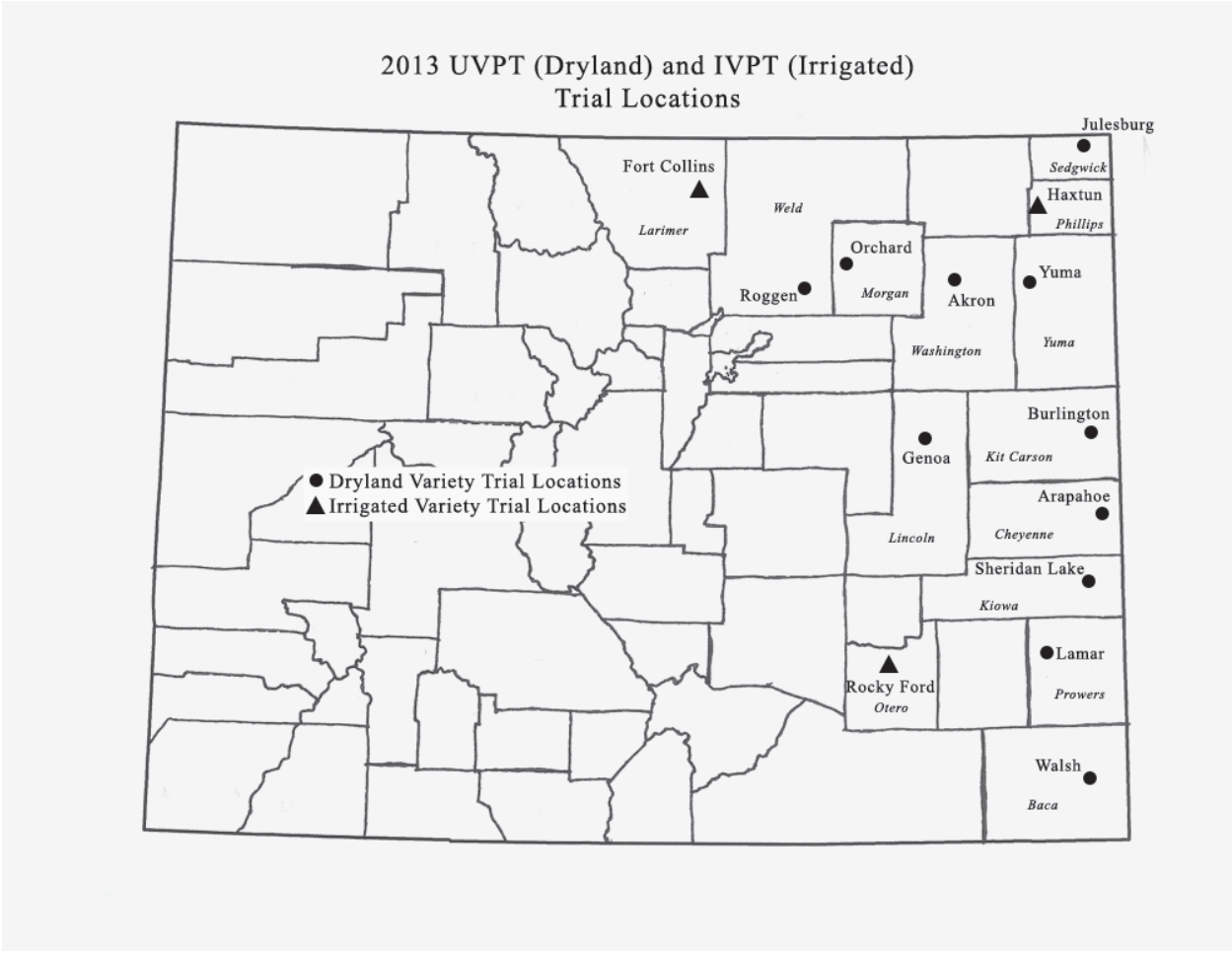
2013 Irrigated Variety Performance Trials

The Irrigated Variety Performance Trials (IVPT) also experienced a mixed bag of conditions. The worst of these occurred at Rocky Ford where severe brown wheat mite infestation, prior crop herbicide damage, and perennial weed infestation led to abandonment of the trial.

At Fort Collins, good stand emergence was achieved but a very dry fall and winter led to significant drought stress by late winter. While nearly four feet of snow came in late March to

early April to save the trial, inadequate irrigation and very warm temperatures throughout June limited yields (trial average 73 bu/a). No disease pressure was observed at Fort Collins, but light Russian wheat aphid pressure was observed. The freeze events, particularly the one in early April, damaged the above-ground foliage, although the growing points were not damaged.

Due to excellent management, very high yields (trial average 118 bu/a) were again achieved at the location near Haxtun, as has become common for this location. Significant lodging was observed in some entries in the first replication of the trial, but foliar diseases were completely lacking, due to lack of innoculum and timely fungicide application.



Summary of 2013 Dryland Variety Performance Results

Brand/Source	Variety[a]	Market Class[b]	Yield[c]	Yield	Test Weight[c]	Plant Height[c]
			bu/ac	% trial average	lb/bu	in
PlainsGold	Antero	**HWW**	27.5	114%	56.3	22
PlainsGold	Byrd	HRW	27.1	113%	55.3	23
Limagrain	LCS Mint	HRW	26.7	111%	57.9	24
PlainsGold	Brawl CL Plus	HRW	26.0	108%	56.2	23
Husker Genetics	Settler CL	HRW	26.0	108%	54.6	21
KS exp.	KS09H19-2-3	HRW	25.8	107%	56.6	22
CO State Univ. exp.	CO07W722-F5	**HWW**	25.7	107%	54.7	20
Oklahoma Genetics	Iba	HRW	25.4	105%	56.6	21
Watley Seed	TAM 112	HRW	25.3	105%	55.8	22
WestBred Monsanto	Winterhawk	HRW	25.3	105%	57.3	23
WestBred Monsanto	WB-Grainfield	HRW	25.1	104%	54.7	23
PlainsGold	Denali	HRW	25.0	104%	56.9	23
Limagrain	T154	HRW	25.0	104%	55.6	20
PlainsGold	Ripper	HRW	25.0	104%	54.4	22
Limagrain	T158	HRW	24.9	103%	55.0	21
CO State Univ. exp.	CO08W218	**HWW**	24.8	103%	56.7	22
KS Wheat Alliance	Clara CL	**HWW**	24.7	103%	56.9	23
PlainsGold	Above	HRW	24.7	103%	54.5	21
CO State Univ. exp.	CO05W111	**HWW**	24.5	102%	56.8	22
CO State Univ. exp.	CO08346	HRW	24.4	101%	57.3	21
Limagrain	T153	HRW	24.2	100%	54.8	20
PlainsGold	Bill Brown	HRW	24.1	100%	54.8	22
AgriPro Syngenta	TAM 111	HRW	24.1	100%	55.7	22
Husker Genetics	Robidoux	HRW	24.0	100%	55.3	22
Limagrain	T163	HRW	24.0	100%	56.1	22
AgriPro Syngenta	SY Wolf	HRW	23.8	99%	57.0	22
Oklahoma Genetics	Gallagher	HRW	23.7	98%	55.7	22
AGSECO	TAM 113	HRW	23.3	97%	55.7	21
Limagrain	LCH08-80	HRW	23.3	97%	55.0	20
Nebraska exp.	NI08708	HRW	23.0	95%	55.8	22
KS Wheat Alliance	1863	HRW	22.7	94%	56.4	21
PlainsGold	Hatcher	HRW	22.5	94%	56.0	21
PlainsGold	Bond CL	HRW	22.3	93%	53.2	22
Husker Genetics	Freeman	HRW	22.1	92%	54.3	22
Nebraska exp.	NE05496	HRW	22.1	92%	56.0	21
Husker Genetics	McGill	HRW	22.1	92%	54.6	23
AGSECO	Protection	HRW	21.8	91%	53.4	24
CO State Univ. exp.	CO08263	HRW	21.2	88%	54.6	19
PlainsGold	Snowmass	**HWW**	20.5	85%	53.9	23
Montana State Univ.	Bearpaw	HRW	19.4	81%	56.2	19
		Average	**24.1**		**55.6**	**22**

[a]Varieties ranked according to average yield in 2013.

[b]Market class: HRW=hard red winter wheat; **HWW**=hard white winter wheat.

[c]The 2013 average yield, test weight, and plant heights are based on seven 2013 trials.

Summary of 2-Yr (2012-2013) Dryland Variety Performance Results

Brand/Source	Variety[a]	Market Class[b]	2-Year Average[c] Yield	Yield	Test Weight	Plant Height
			bu/ac	% trial average	lb/bu	in
PlainsGold	Byrd	HRW	42.8	112%	58.9	26
PlainsGold	Antero	**HWW**	42.7	112%	59.6	26
CO State Univ. exp.	CO07W722-F5	**HWW**	40.8	107%	58.4	23
Watley Seed	TAM 112	HRW	40.1	105%	59.5	25
PlainsGold	Brawl CL Plus	HRW	40.0	105%	59.8	26
PlainsGold	Ripper	HRW	39.6	104%	57.9	25
CO State Univ. exp.	CO08W218	**HWW**	39.5	104%	60.1	25
Limagrain	T158	HRW	38.9	102%	59.0	25
AGSECO	TAM 113	HRW	38.8	102%	59.4	25
Husker Genetics	Settler CL	HRW	38.6	101%	58.6	24
PlainsGold	Denali	HRW	38.4	101%	60.0	26
WestBred Monsanto	Winterhawk	HRW	38.4	101%	60.1	26
PlainsGold	Above	HRW	38.4	100%	58.2	24
CO State Univ. exp.	CO08263	HRW	38.3	100%	58.4	23
AgriPro Syngenta	TAM 111	HRW	38.2	100%	59.1	26
AgriPro Syngenta	SY Wolf	HRW	38.1	100%	59.8	26
CO State Univ. exp.	CO05W111	**HWW**	38.0	100%	59.5	26
Limagrain	T163	HRW	37.8	99%	59.6	26
PlainsGold	Bill Brown	HRW	37.6	98%	59.2	24
Husker Genetics	Robidoux	HRW	37.5	98%	58.9	25
CO State Univ. exp.	CO08346	HRW	37.5	98%	60.5	24
PlainsGold	Hatcher	HRW	37.0	97%	59.1	24
AGSECO	Protection	HRW	36.9	97%	57.0	27
KS Wheat Alliance	Clara CL	**HWW**	36.7	96%	60.4	25
KS Wheat Alliance	1863	HRW	35.9	94%	58.9	24
PlainsGold	Bond CL	HRW	35.8	94%	56.4	26
Husker Genetics	McGill	HRW	35.4	93%	58.2	27
Nebraska exp.	NE05496	HRW	35.3	92%	58.9	24
PlainsGold	Snowmass	**HWW**	34.7	91%	58.2	26
		Average	**38.2**		**59.0**	**25**

[a]Varieties ranked according to average 2-year yield.

[b]Market class: HRW=hard red winter wheat; **HWW**=hard white winter wheat.

[c]The 2-year average yield, test weight, and plant height are based on nine 2012 trials and seven 2013 trials.

Summary of 3-Yr (2011-2013) Dryland Variety Performance Results

Brand/Source	Variety[a]	Market Class[b]	3-Year Average[c] Yield	Yield	Test Weight	Plant Height
			bu/ac	% trial average	lb/bu	in
PlainsGold	Byrd	HRW	46.4	112%	59.0	27
PlainsGold	Antero	**HWW**	46.0	111%	59.6	26
Watley Seed	TAM 112	HRW	42.9	103%	59.7	26
PlainsGold	Ripper	HRW	42.6	103%	58.0	25
PlainsGold	Denali	HRW	42.2	102%	59.8	27
Husker Genetics	Settler CL	HRW	41.8	101%	58.6	25
PlainsGold	Brawl CL Plus	HRW	41.6	100%	59.6	27
PlainsGold	Above	HRW	41.5	100%	58.2	25
PlainsGold	Hatcher	HRW	41.3	99%	59.1	25
PlainsGold	Bill Brown	HRW	41.2	99%	59.3	25
WestBred Monsanto	Winterhawk	HRW	41.1	99%	59.9	27
AgriPro Syngenta	SY Wolf	HRW	41.1	99%	59.4	26
CO State Univ. exp.	CO05W111	**HWW**	41.0	99%	59.2	27
Limagrain	T163	HRW	40.7	98%	59.2	26
Husker Genetics	Robidoux	HRW	39.9	96%	58.9	26
PlainsGold	Snowmass	**HWW**	39.0	94%	58.3	27
PlainsGold	Bond CL	HRW	38.7	93%	56.7	27
Husker Genetics	McGill	HRW	38.2	92%	58.2	27
		Average	**41.5**		**58.9**	**26**

[a]Varieties ranked according to average 3-year yield.

[b]Market class: HRW=hard red winter wheat; **HWW**=hard white winter wheat.

[c]The 3-year average yield, test weight, and plant height are based on six 2011 trials, nine 2012 trials, and seven 2013 trials.

Summary of 2013 Northeast Colorado Dryland Variety Performance Results

Brand/Source	Variety[a]	Market Class[b]	Yield[c]	Yield	Test Weight[c]	Plant Height[c]
			bu/ac	% trial average	lb/bu	in
PlainsGold	Antero	**HWW**	28.9	114%	56.3	22
PlainsGold	Byrd	HRW	28.4	112%	55.3	23
PlainsGold	Brawl CL Plus	HRW	27.5	108%	56.2	23
Limagrain	LCS Mint	HRW	27.3	107%	57.9	24
CO State Univ. exp.	CO07W722-F5	**HWW**	27.1	107%	54.7	20
Husker Genetics	Settler CL	HRW	26.9	106%	54.6	21
KS exp.	KS09H19-2-3	HRW	26.8	105%	56.6	22
WestBred Monsanto	Winterhawk	HRW	26.8	105%	57.3	23
PlainsGold	Denali	HRW	26.8	105%	56.9	23
Watley Seed	TAM 112	HRW	26.7	105%	55.8	22
Oklahoma Genetics	Iba	HRW	26.7	105%	56.6	21
Limagrain	T154	HRW	26.5	104%	55.6	20
Limagrain	T158	HRW	26.5	104%	55.0	21
PlainsGold	Ripper	HRW	26.5	104%	54.4	22
WestBred Monsanto	WB-Grainfield	HRW	26.2	103%	54.7	23
Limagrain	T153	HRW	26.0	102%	54.8	20
PlainsGold	Above	HRW	26.0	102%	54.5	21
Limagrain	T163	HRW	25.9	102%	56.1	22
AgriPro Syngenta	TAM 111	HRW	25.8	102%	55.7	22
CO State Univ. exp.	CO08346	HRW	25.8	101%	57.3	21
CO State Univ. exp.	CO05W111	**HWW**	25.7	101%	56.8	22
CO State Univ. exp.	CO08W218	**HWW**	25.6	100%	56.7	22
KS Wheat Alliance	Clara CL	**HWW**	25.5	100%	56.9	23
PlainsGold	Bill Brown	HRW	25.4	100%	54.8	22
Oklahoma Genetics	Gallagher	HRW	25.1	99%	55.7	22
Husker Genetics	Robidoux	HRW	25.1	99%	55.3	22
AgriPro Syngenta	SY Wolf	HRW	25.1	99%	57.0	22
AGSECO	Protection	HRW	24.7	97%	53.4	24
AGSECO	TAM 113	HRW	24.6	97%	55.7	21
Limagrain	LCH08-80	HRW	24.5	96%	55.0	20
PlainsGold	Hatcher	HRW	24.4	96%	56.0	21
Nebraska exp.	NI08708	HRW	24.3	95%	55.8	22
PlainsGold	Bond CL	HRW	24.1	94%	53.2	22
KS Wheat Alliance	1863	HRW	23.9	94%	56.4	21
Husker Genetics	McGill	HRW	23.4	92%	54.6	23
Husker Genetics	Freeman	HRW	23.3	92%	54.3	22
Nebraska exp.	NE05496	HRW	23.2	91%	56.0	21
CO State Univ. exp.	CO08263	HRW	22.3	88%	54.6	19
PlainsGold	Snowmass	**HWW**	22.2	87%	53.9	23
Montana State Univ.	Bearpaw	HRW	20.6	81%	56.2	19
		Average	**25.5**		**55.6**	**22**

[a]Varieties ranked according to average yield in 2013.

[b]Market class: HRW=hard red winter wheat; **HWW**=hard white winter wheat.

[c]The average yield, test weight, and plant heights are based on six trials in 2013 in northeast Colorado (north of I-70).

Summary of 2-Yr (2012-2013) Northeast Colorado Dryland Variety Performance Results

			2-Year Average[c]			
Brand/Source	Variety[a]	Market Class[b]	Yield	Yield	Test Weight	Plant Height
			bu/ac	% trial average	lb/bu	in
PlainsGold	Antero	**HWW**	45.8	113%	59.0	26
PlainsGold	Byrd	HRW	44.0	109%	58.4	26
CO State Univ. exp.	CO07W722-F5	**HWW**	43.2	106%	57.8	23
PlainsGold	Brawl CL Plus	HRW	42.8	106%	59.3	26
Watley Seed	TAM 112	HRW	42.4	105%	58.9	25
CO State Univ. exp.	CO08W218	**HWW**	41.8	103%	59.7	25
Limagrain	T158	HRW	41.7	103%	58.5	24
PlainsGold	Ripper	HRW	41.5	102%	57.4	25
PlainsGold	Denali	HRW	41.4	102%	59.6	26
AGSECO	TAM 113	HRW	41.1	101%	58.8	25
Husker Genetics	Settler CL	HRW	41.0	101%	58.0	24
AgriPro Syngenta	SY Wolf	HRW	40.9	101%	59.5	25
PlainsGold	Above	HRW	40.9	101%	57.5	24
WestBred Monsanto	Winterhawk	HRW	40.9	101%	59.7	26
AgriPro Syngenta	TAM 111	HRW	40.9	101%	58.6	26
CO State Univ. exp.	CO05W111	**HWW**	40.4	100%	59.2	26
AGSECO	Protection	HRW	40.3	99%	56.6	27
Limagrain	T163	HRW	40.0	99%	59.1	25
PlainsGold	Bill Brown	HRW	39.8	98%	58.5	25
CO State Univ. exp.	CO08263	HRW	39.7	98%	57.7	23
CO State Univ. exp.	CO08346	HRW	39.5	98%	60.1	24
Husker Genetics	Robidoux	HRW	39.4	97%	58.4	25
PlainsGold	Hatcher	HRW	38.9	96%	58.7	24
KS Wheat Alliance	Clara CL	**HWW**	38.7	95%	59.8	26
KS Wheat Alliance	1863	HRW	38.5	95%	58.8	24
Husker Genetics	McGill	HRW	38.3	94%	57.7	26
PlainsGold	Bond CL	HRW	38.2	94%	55.8	26
Nebraska exp.	NE05496	HRW	37.5	92%	58.6	24
PlainsGold	Snowmass	**HWW**	36.4	90%	57.6	26
		Average	**40.5**		**58.5**	**25**

[a]Varieties ranked according to average 2-year yield.

[b]Market class: HRW=hard red winter wheat; **HWW**=hard white winter wheat.

[c]The average yield, test weight, and plant heights are based on six 2013 trials and six 2012 trials in northeast Colorado (north of I-70).

Summary of 3-Yr (2011-2013) Northeast Colorado Dryland Variety Performance Results

Brand/Source	Variety[a]	Market Class[b]	3-Year Average[c] Yield	Yield	Test Weight	Plant Height
			bu/ac	% trial average	lb/bu	in
PlainsGold	Antero	**HWW**	48.2	111%	59.0	27
PlainsGold	Byrd	HRW	47.7	110%	58.6	27
Watley Seed	TAM 112	HRW	44.8	103%	59.2	26
PlainsGold	Denali	HRW	44.4	102%	59.3	28
PlainsGold	Ripper	HRW	44.2	102%	57.4	25
AgriPro Syngenta	SY Wolf	HRW	44.1	102%	59.2	26
PlainsGold	Brawl CL Plus	HRW	44.1	102%	59.0	27
Husker Genetics	Settler CL	HRW	43.7	101%	58.0	25
PlainsGold	Above	HRW	43.3	100%	57.5	25
WestBred Monsanto	Winterhawk	HRW	43.3	100%	59.5	27
CO State Univ. exp.	CO05W111	**HWW**	42.8	99%	58.9	27
PlainsGold	Bill Brown	HRW	42.7	99%	58.6	25
Limagrain	T163	HRW	42.7	98%	58.6	26
PlainsGold	Hatcher	HRW	42.5	98%	58.6	25
Husker Genetics	Robidoux	HRW	41.5	96%	58.3	26
PlainsGold	Bond CL	HRW	40.5	93%	56.1	27
Husker Genetics	McGill	HRW	40.3	93%	57.8	27
PlainsGold	Snowmass	**HWW**	40.1	92%	57.7	27
		Average	**43.4**		**58.4**	**26**

[a]Varieties ranked according to average 3-year yield.

[b]Market class: HRW=hard red winter wheat; **HWW**=hard white winter wheat.

[c]The average yield, test weight, and plant heights are based on six 2013 trials, six 2012 trials, and four 2011 trials in northeast Colorado (north of I-70).

Summary of 2-year (2012-2013) Southeast Colorado Dryland Variety Performance Results

Brand/Source	Variety[a]	Market Class[b]	2-Year Average[c] Yield	Yield	Test Weight	Plant Height
			bu/ac	% trial average	lb/bu	in
PlainsGold	Byrd	HRW	39.0	125%	61.5	26
CO State Univ. exp.	CO08263	HRW	34.2	110%	62.1	23
PlainsGold	Ripper	HRW	34.1	109%	60.7	25
CO State Univ. exp.	CO07W722-F5	**HWW**	33.8	108%	61.5	22
PlainsGold	Antero	**HWW**	33.4	107%	63.0	25
Watley Seed	TAM 112	HRW	33.0	106%	62.6	25
CO State Univ. exp.	CO08W218	**HWW**	32.7	105%	62.4	22
AGSECO	TAM 113	HRW	32.0	103%	62.8	26
Husker Genetics	Robidoux	HRW	31.9	102%	61.9	26
PlainsGold	Brawl CL Plus	HRW	31.6	101%	62.8	24
CO State Univ. exp.	CO08346	HRW	31.3	100%	62.8	24
Limagrain	T163	HRW	31.3	100%	62.5	28
Husker Genetics	Settler CL	HRW	31.3	100%	62.3	24
PlainsGold	Hatcher	HRW	31.3	100%	61.7	22
PlainsGold	Bill Brown	HRW	31.0	100%	63.0	21
WestBred Monsanto	Winterhawk	HRW	31.0	100%	62.4	28
CO State Univ. exp.	CO05W111	**HWW**	30.9	99%	61.2	23
PlainsGold	Above	HRW	30.8	99%	61.8	25
KS Wheat Alliance	Clara CL	**HWW**	30.7	99%	63.2	24
Limagrain	T158	HRW	30.4	98%	61.8	30
AgriPro Syngenta	TAM 111	HRW	30.1	97%	62.1	29
PlainsGold	Snowmass	**HWW**	29.7	95%	61.5	27
PlainsGold	Denali	HRW	29.7	95%	62.4	24
AgriPro Syngenta	SY Wolf	HRW	29.4	94%	61.3	27
Nebraska exp.	NE05496	HRW	28.8	92%	60.9	21
PlainsGold	Bond CL	HRW	28.7	92%	59.5	24
KS Wheat Alliance	1863	HRW	28.2	90%	59.3	29
Husker Genetics	McGill	HRW	27.0	87%	60.8	29
AGSECO	Protection	HRW	26.7	86%	59.5	26
		Average	**31.2**		**61.8**	**25**

[a]Varieties ranked according to average 2-year yield.

[b]Market class: HRW=hard red winter wheat; **HWW**=hard white winter wheat.

[c]The 2-year average yield, test weight, and plant height are based on three 2012 trials and one 2013 trial in southeast Colorado (south of I-70).

Summary of 3-year (2011-2013) Southeast Colorado Dryland Variety Performance Results

Brand/Source	Variety[a]	Market Class[b]	3-Year Average[c] Yield	Yield	Test Weight	Plant Height
			bu/ac	% trial average	lb/bu	in
PlainsGold	Byrd	HRW	42.9	117%	60.8	26
PlainsGold	Antero	**HWW**	40.2	110%	61.8	25
PlainsGold	Ripper	HRW	38.6	106%	60.0	24
PlainsGold	Hatcher	HRW	37.9	104%	61.0	22
Watley Seed	TAM 112	HRW	37.8	104%	61.4	25
PlainsGold	Bill Brown	HRW	37.2	102%	61.6	21
Husker Genetics	Settler CL	HRW	36.8	101%	60.8	23
PlainsGold	Above	HRW	36.4	100%	60.6	24
PlainsGold	Denali	HRW	36.3	100%	61.6	24
CO State Univ. exp.	CO05W111	**HWW**	36.2	99%	60.6	23
PlainsGold	Snowmass	**HWW**	35.9	98%	60.5	26
Husker Genetics	Robidoux	HRW	35.6	97%	61.0	25
WestBred Monsanto	Winterhawk	HRW	35.3	97%	61.4	27
Limagrain	T163	HRW	35.3	97%	61.2	26
PlainsGold	Brawl CL Plus	HRW	35.0	96%	61.8	24
PlainsGold	Bond CL	HRW	33.8	93%	59.0	24
AgriPro Syngenta	SY Wolf	HRW	33.2	91%	60.2	25
Husker Genetics	McGill	HRW	32.5	89%	59.6	28
		Average	**36.5**		**60.8**	**24**

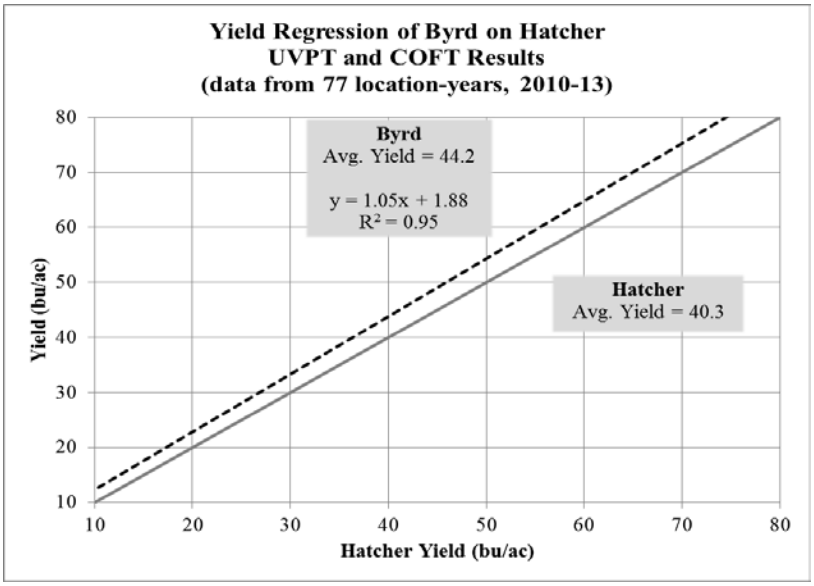
[a]Varieties ranked according to average 3-year yield.

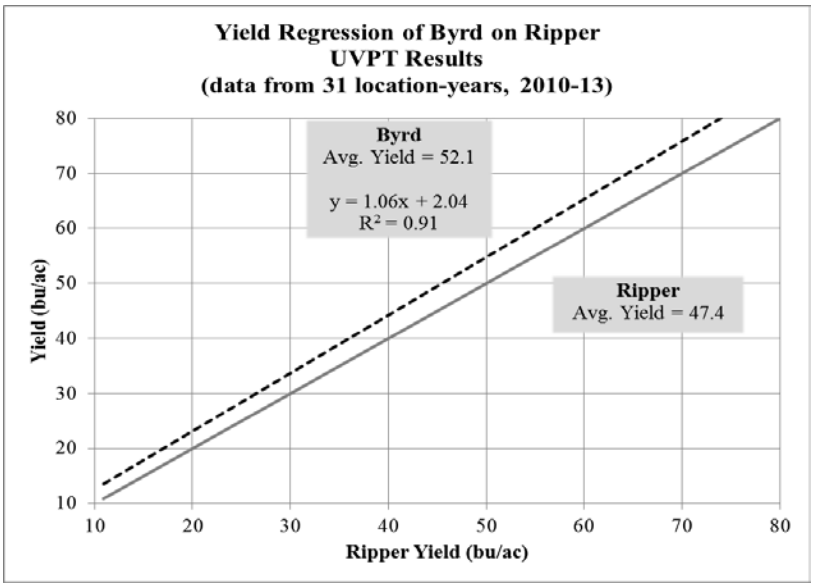
[b]Market class: HRW=hard red winter wheat; **HWW**=hard white winter wheat.

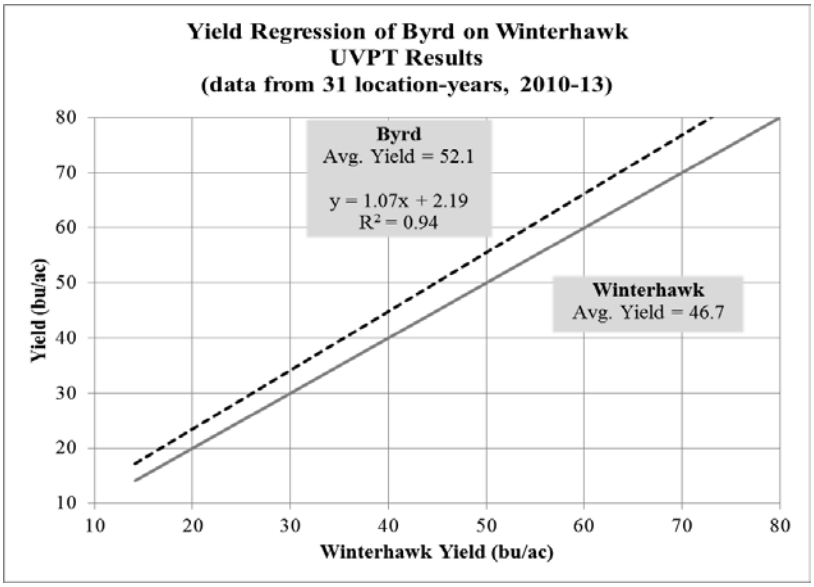
[c]The 3-year average yield, test weight, and plant height are based on two 2011 trials, three 2012 trials, and one 2013 trial in southeast Colorado (south of I-70).

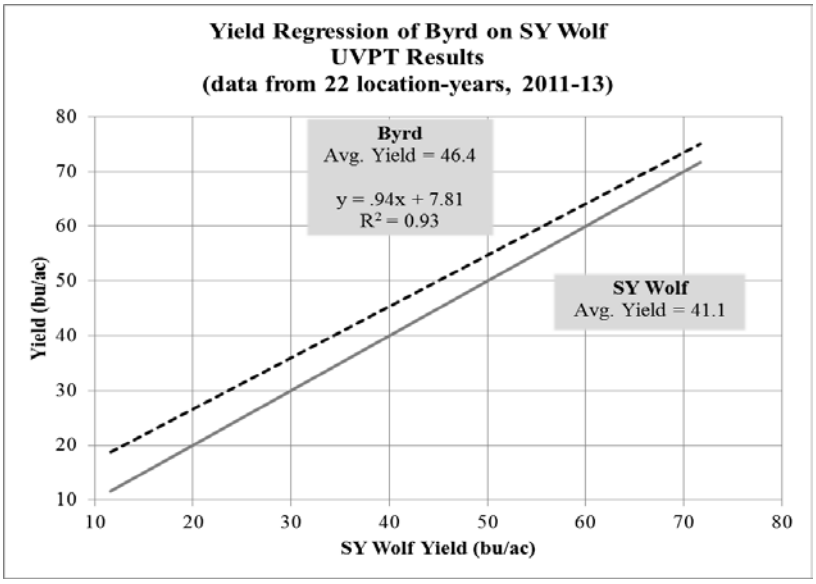
Yield Regressions to Compare Expected Performance of Varieties

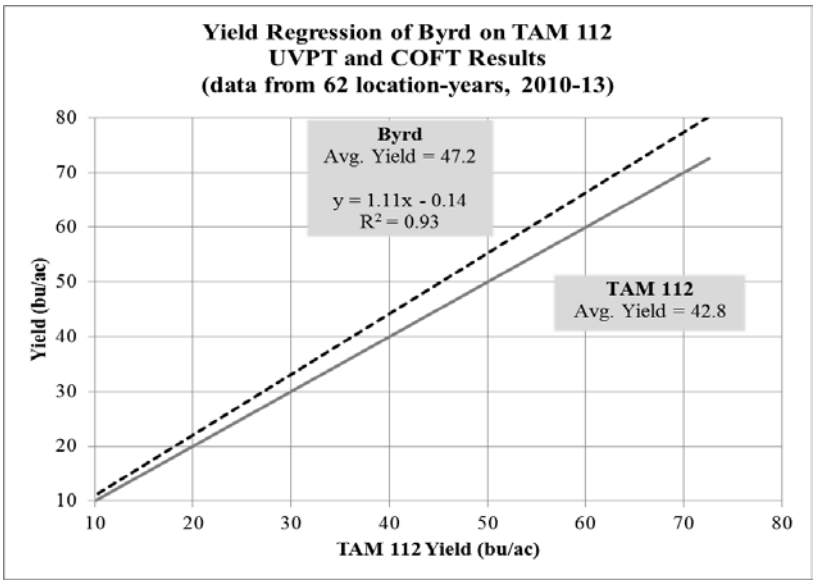
The following linear regressions are based on multiple Dryland Variety Performance Trials and Collaborative On-Farm Test results from 2008 through 2013. They can be used as a tool to help growers visualize the expected performance of each variety in low-to-high yielding environments. If the lines do not cross over one another, this means the yield of one variety would be expected to be consistently higher or lower than the yield of the other variety over all yield environments. Farmers can predict the yield of Byrd given the yield of Hatcher, which is shown on the first regression. The second regression can be used to predict the yield of Byrd given the yield of Ripper. The equation shown in each graph can be used to predict the expected yield of a variety, given a yield of the variety listed on the bottom (x-axis) of the graph. For example, in the first regression, the expected yield of Byrd = 1.05 *(yield of Hatcher) + 1.88 bu/ac. If the yield of Hatcher is 50 bu/ac then you would expect the yield of Byrd to be 54.4 bu/ac. The R^2 value of the regression is a statistical measure that represents how well a regression line fits the actual data points. R-squared values equal to 1.0 means the regression line fits the data perfectly. It is important to point out that the comparisons are expected to be more reliable when they include more results over multiple locations from different years. Additional testing of varieties might change the relationships portrayed in the following graphs.

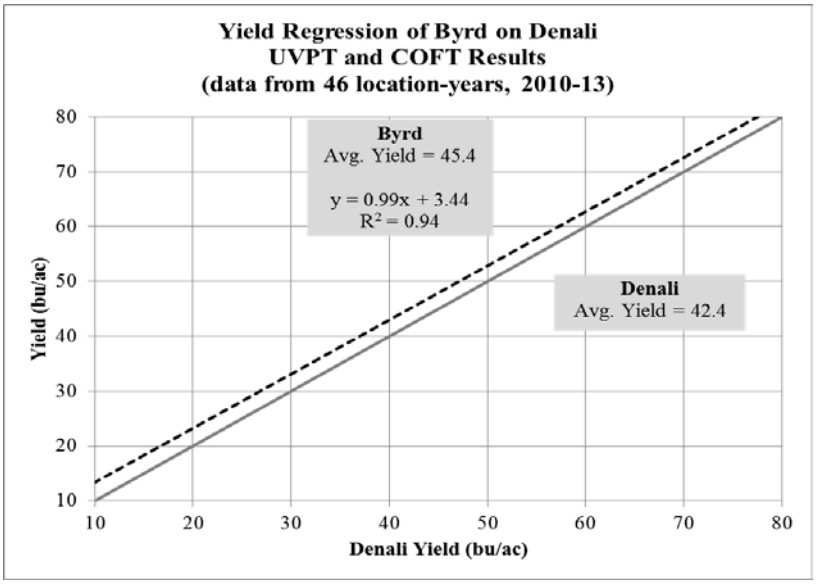

Yield Regression of Byrd on Hatcher
UVPT and COFT Results
(data from 77 location-years, 2010-13)
Byrd
Avg. Yield = 44.2
y = 1.05x + 1.88
R² = 0.95
Hatcher
Avg. Yield = 40.3
Yield (bu/ac)
Hatcher Yield (bu/ac)
10
20
30
40
50
60
70
80

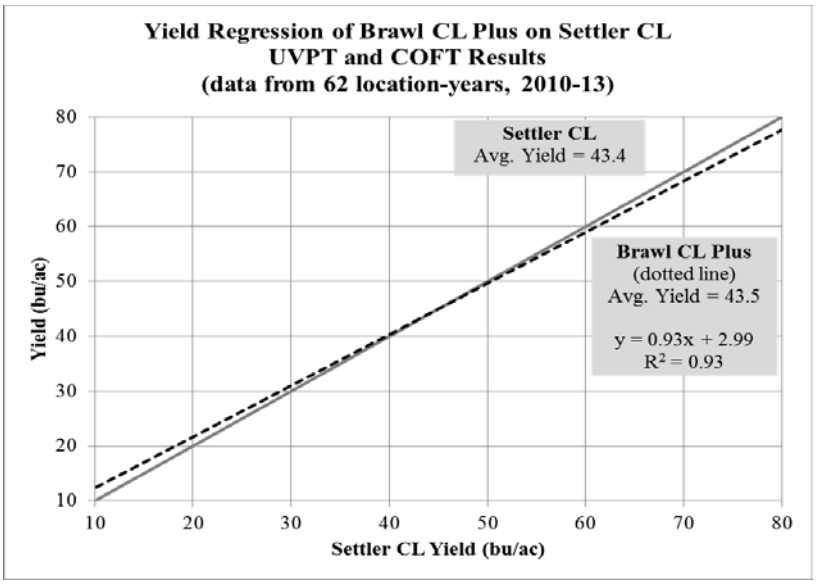

Yield Regression of Byrd on Ripper
UVPT Results
(data from 31 location-years, 2010-13)
Byrd
Avg. Yield = 52.1
y = 1.06x + 2.04
R² = 0.91
Ripper
Avg. Yield = 47.4
Yield (bu/ac)
Ripper Yield (bu/ac)
10
20
30
40
50
60
70
80

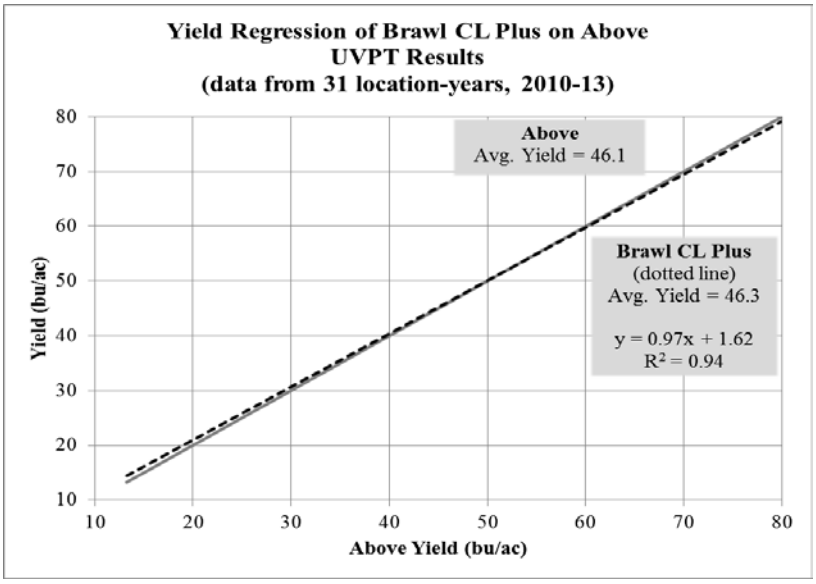

Yield Regression of Byrd on Winterhawk
UVPT Results
(data from 31 location-years, 2010-13)
Byrd
Avg. Yield = 52.1
y = 1.07x + 2.19
R² = 0.94
Winterhawk
Avg. Yield = 46.7
Yield (bu/ac)
Winterhawk Yield (bu/ac)
10
20
30
40
50
60
70
80

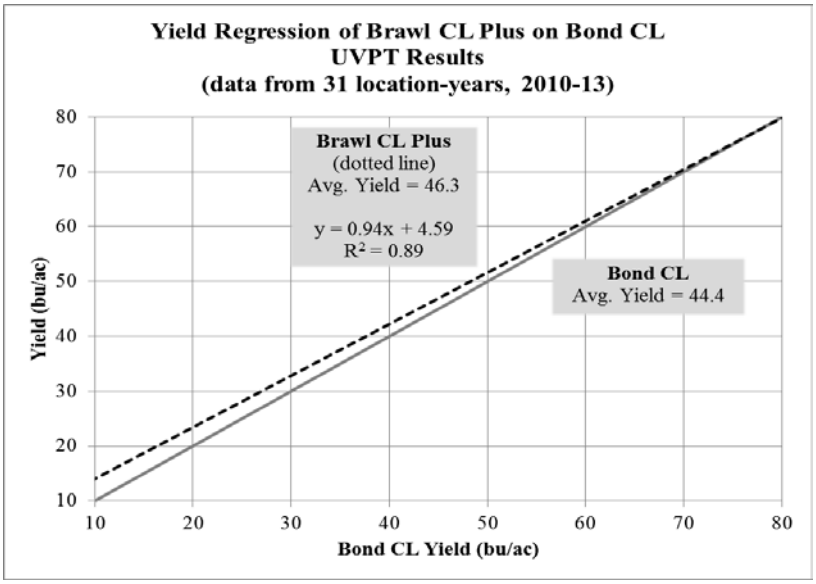

Yield Regression of Byrd on SY Wolf
UVPT Results
(data from 22 location-years, 2011-13)
Byrd
Avg. Yield = 46.4
y = .94x + 7.81
R² = 0.93
SY Wolf
Avg. Yield = 41.1
Yield (bu/ac)
SY Wolf Yield (bu/ac)
10
20
30
40
50
60
70
80

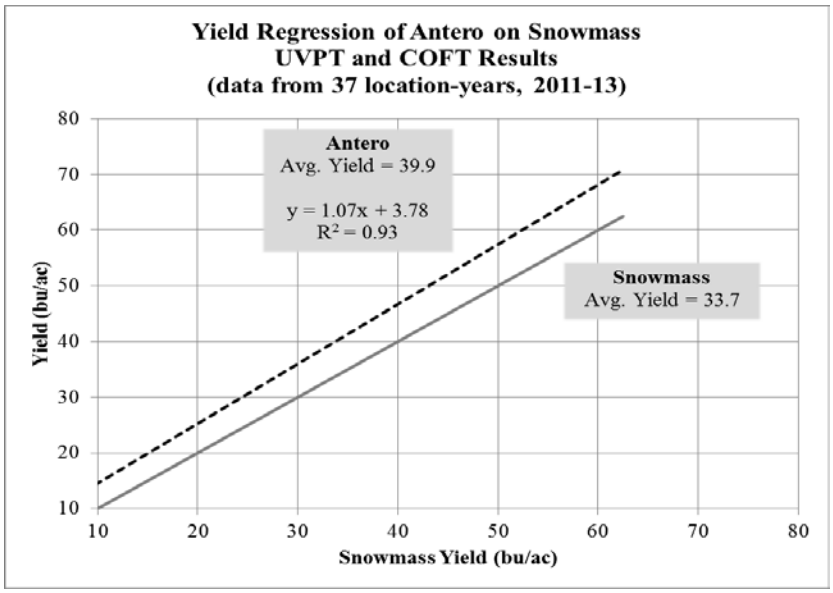

Yield Regression of Byrd on TAM 112
UVPT and COFT Results
(data from 62 location-years, 2010-13)
Byrd
Avg. Yield = 47.2
y = 1.11x - 0.14
R² = 0.93
TAM 112
Avg. Yield = 42.8
Yield (bu/ac)
TAM 112 Yield (bu/ac)
10
20
30
40
50
60
70
80

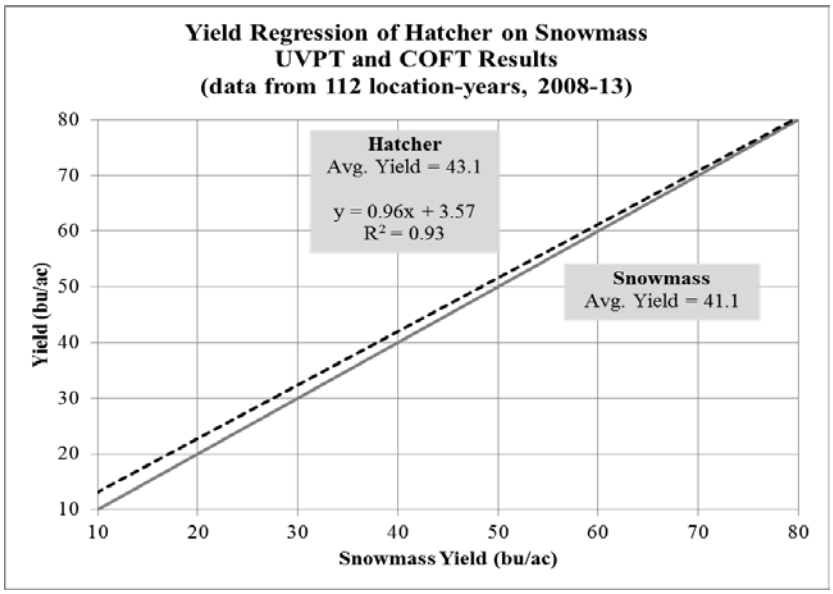

Yield Regression of Byrd on Denali
UVPT and COFT Results
(data from 46 location-years, 2010-13)
Byrd
Avg. Yield = 45.4
y = 0.99x + 3.44
R² = 0.94
Denali
Avg. Yield = 42.4
Yield (bu/ac)
Denali Yield (bu/ac)
10
20
30
40
50
60
70
80


Yield Regression of Brawl CL Plus on Settler CL
UVPT and COFT Results
(data from 62 location-years, 2010-13)
Settler CL
Avg. Yield = 43.4
Brawl CL Plus
(dotted line)
Avg. Yield = 43.5
y = 0.93x + 2.99
R² = 0.93
Yield (bu/ac)
Settler CL Yield (bu/ac)
10
20
30
40
50
60
70
80


Yield Regression of Brawl CL Plus on Above
UVPT Results
(data from 31 location-years, 2010-13)
Above
Avg. Yield = 46.1
Brawl CL Plus
(dotted line)
Avg. Yield = 46.3
y = 0.97x + 1.62
R² = 0.94
Yield (bu/ac)
Above Yield (bu/ac)
10
20
30
40
50
60
70
80


Yield Regression of Brawl CL Plus on Bond CL
UVPT Results
(data from 31 location-years, 2010-13)
Brawl CL Plus
(dotted line)
Avg. Yield = 46.3
y = 0.94x + 4.59
R² = 0.89
Bond CL
Avg. Yield = 44.4
Yield (bu/ac)
Bond CL Yield (bu/ac)
10
20
30
40
50
60
70
80


Yield Regression of Antero on Snowmass
UVPT and COFT Results
(data from 37 location-years, 2011-13)
Antero
Avg. Yield = 39.9
y = 1.07x + 3.78
R² = 0.93
Snowmass
Avg. Yield = 33.7
Yield (bu/ac)
Snowmass Yield (bu/ac)
10
20
30
40
50
60
70
80


Yield Regression of Hatcher on Snowmass
UVPT and COFT Results
(data from 112 location-years, 2008-13)
Hatcher
Avg. Yield = 43.1
y = 0.96x + 3.57
R² = 0.93
Snowmass
Avg. Yield = 41.1
Yield (bu/ac)
Snowmass Yield (bu/ac)
10
20
30
40
50
60
70
80

2013 Collaborative On-Farm Test (COFT) Variety Performance Results

The objective of the 2013 COFT was to compare performance and adaptability of popular and newly released CSU varieties (Byrd, Brawl CL Plus, Denali, and Antero) with a proven high-yielding variety (Hatcher), and with a variety with a grower price-premium (Snowmass) under unbiased, field-scale testing conditions. The COFT program is in its 15th year and the majority of Colorado's 2013 wheat acreage was planted to winter wheat varieties that have been tested in the COFT program.

In the fall of 2012, thirty-three eastern Colorado wheat producers planted on-farm tests in Baca, Bent, Prowers, Kiowa, Cheyenne, Kit Carson, Washington, Yuma, Phillips, Sedgwick, Lincoln, Logan, Adams, and Weld counties. Each collaborator planted the six varieties in side-by-side strips (approximately one acre per variety) at the same seeding rate as they seeded their own wheat. Fifteen viable harvest results were obtained from the thirty-three tests due to the extremely dry conditions farmers experienced during the growing season. The COFT results need to be interpreted based on all tests within a year and not on the basis of a single variety comparison on a single farm in one year.

Colorado extension wheat educators who conducted the COFT program in 2013:

Jerry Johnson – Extension Specialist-Crop Production, Fort Collins
Bruce Bosley – Extension Agronomist, Logan County
Wilma Trujillo – Extension Agronomist, Prowers County
John Deering – Extension Specialist-Ag. Business Management, Washington County
Ron Meyer – Extension Agronomist, Golden Plains Area

2013 Collaborative On-Farm Test (COFT) Variety Performance Results

	2013 Varieties[a]													
	Byrd		Antero		Brawl CL Plus		Denali		Hatcher		Snowmass		COFT Average	
County/Nearest Town	Yield[b]	Test Weight	Yield[b]	Test Weight	Yield[b]	Test Weight	Yield[b]	Test Weight	Yield[b]	Test Weight	Yield[b]	Test Weight	Yield[b]	Test Weight
	bu/ac	lb/bu	bu/ac	lb/bu	bu/ac	lb/bu	bu/ac	lb/bu	bu/ac	lb/bu	bu/ac	lb/bu	bu/ac	lb/bu
Baca/Vilas	8.2	56.1	10.0	55.2	6.5	57.9	5.2	57.1	5.7	56.0	6.3	54.6	*7.0*	*56.2*
Kit Carson/Burlington	15.0	57.9	12.5	59.0	16.5	58.6	14.2	59.1	11.5	59.1	11.4	58.2	*13.5*	*58.7*
Lincoln/Arriba	32.8	57.5	36.3	56.6	34.8	56.6	37.0	55.6	31.6	55.8	28.4	55.4	*33.5*	*56.3*
Logan/Leroy	25.6	59.0	24.2	59.5	24.2	62.0	26.9	59.0	23.4	59.5	21.1	58.0	*24.2*	*59.5*
Logan/Peetz	30.1	59.0	30.8	59.0	19.6	59.0	37.8	58.0	36.3	57.2	29.6	58.0	*30.7*	*58.4*
Logan/Sterling W	34.8	55.0	32.0	56.0	35.3	55.5	31.5	56.0	33.8	56.5	27.2	53.5	*32.4*	*55.4*
Phillips/Haxtun	48.0	53.8	43.3	54.1	46.7	55.4	44.5	55.8	43.5	52.8	36.3	52.4	*43.7*	*54.1*
Washington/Akron S	39.0	60.0	36.3	60.0	40.5	61.5	34.8	62.0	30.5	60.0	37.8	60.0	*36.5*	*60.6*
Washington/Akron W	16.7	55.0	19.8	55.0	18.1	56.0	17.0	56.0	15.6	55.0	15.5	55.0	*17.1*	*55.3*
Washington/Central	21.3	55.5	22.6	58.5	22.0	56.9	21.7	58.2	20.4	57.5	19.8	55.3	*21.3*	*57.0*
Washington/Otis	48.8	58.5	39.9	58.5	42.5	60.5	41.7	61.0	40.2	59.0	34.8	59.0	*41.3*	*59.4*
Weld/Keenesburg	37.7	56.0	33.1	57.0	35.3	56.5	27.9	58.0	34.7	59.0	25.2	57.0	*32.3*	*57.3*
Weld/New Raymer	26.8	56.5	33.0	57.0	24.9	58.0	25.3	57.0	26.2	56.0	26.7	56.0	*27.1*	*56.8*
Weld/Roggen	49.8	59.0	56.6	60.0	48.4	60.0	52.2	60.0	49.4	61.0	41.0	60.0	*49.6*	*60.0*
Yuma/Yuma	37.8	59.6	34.1	60.3	37.0	61.5	33.7	61.2	32.8	59.4	27.8	59.1	*33.9*	*60.2*
Average	**31.5**	**57.2**	**31.0**	**57.7**	**30.1**	**58.4**	**30.1**	**58.3**	**29.0**	**57.6**	**25.9**	**56.8**	**29.6**	**57.7**
Significance[c]	A		A,B		B,C		B,C		C		D			

LSD $_{(P<0.30)}$ for yield = 1.2 bu/ac

LSD $_{(P<0.30)}$ for test weight = 0.3 lb/bu

[a]Varieties are ranked left to right by highest average yield.

[b]All yields are corrected to 12% moisture.

[c]Significance: Varieties with different letters have yields that are significantly different from one another.

Summary of 2-year (2012-2013) Limited Irrigation Variety Performance Results at Fort Collins

			2-Year Average				
Brand/Source	Variety[a]	Market Class[b]	Yield	Yield	Test Weight	Plant Height	Heading
			bu/ac	% trial average	lb/bu	in	days from trial average
PlainsGold	Byrd	HRW	77.4	115%	59.7	29	-1
PlainsGold	Antero	**HWW**	75.0	111%	59.7	30	0
Watley Seed	TAM 112	HRW	73.5	109%	59.8	28	-3
Scott Seed	TAM 304	HRW	73.3	108%	57.7	25	-3
CO State Univ. exp.	CO07W722-F5	**HWW**	72.0	107%	58.5	25	0
Limagrain	T158	HRW	71.8	106%	58.9	24	-2
Husker Genetics	Robidoux	HRW	70.9	105%	59.3	26	1
AgriPro Syngenta	SY Gold	HRW	69.9	103%	58.2	25	-1
CO State Univ. exp.	CO08263	HRW	69.9	103%	59.6	28	1
PlainsGold	Brawl CL Plus	HRW	69.2	102%	59.4	30	-2
Husker Genetics	Settler CL	HRW	67.4	100%	58.6	28	1
CO State Univ. exp.	CO08346	HRW	66.7	99%	60.8	27	3
PlainsGold	Bond CL	HRW	66.6	98%	56.4	27	-1
AGSECO	TAM 113	HRW	66.4	98%	59.3	26	1
CO State Univ. exp.	CO08W218	**HWW**	66.2	98%	59.0	29	0
PlainsGold	Thunder CL	**HWW**	65.7	97%	59.1	26	0
AgriPro Syngenta	SY Wolf	HRW	64.2	95%	58.5	26	3
CO State Univ. exp.	CO05W111	**HWW**	64.0	95%	60.9	31	3
WestBred Monsanto	Armour	HRW	63.3	94%	58.1	23	-2
PlainsGold	Hatcher	HRW	63.0	93%	58.4	24	1
PlainsGold	Denali	HRW	62.9	93%	59.9	29	4
CO State Univ.	Yuma	HRW	62.5	92%	57.7	27	1
WestBred Monsanto	WB-Cedar	HRW	61.7	91%	56.7	25	-5
Husker Genetics	McGill	HRW	59.0	87%	57.0	31	2
		Average	**67.6**		**58.8**	**27**	

[a]Varieties ranked according to average 2-year yield at Fort Collins.

[b]Market class: HRW=hard red winter wheat; **HWW**=hard white winter wheat.

Summary of 3-year (2011-2013) Limited Irrigation Variety Performance Results at Fort Collins

Brand/Source	Variety[a]	Market Class[b]	3-Year Average Yield	3-Year Average Yield	3-Year Average Test Weight	3-Year Average Plant Height	3-Year Average Heading	Lodging[c]
			bu/ac	% trial average	lb/bu	in	days from trial average	scale (1-9)[d]
PlainsGold	Byrd	HRW	87.0	114%	60.1	33	-1	3
Husker Genetics	Robidoux	HRW	83.8	110%	59.9	32	1	3
Husker Genetics	Settler CL	HRW	79.6	104%	59.4	32	1	2
PlainsGold	Hatcher	HRW	78.8	103%	59.1	30	1	2
AgriPro Syngenta	SY Gold	HRW	78.6	103%	59.1	31	-1	1
AgriPro Syngenta	SY Wolf	HRW	78.4	103%	59.3	32	3	2
CO State Univ. exp.	CO05W111	**HWW**	76.2	100%	60.9	35	3	1
WestBred Monsanto	Armour	HRW	75.9	100%	58.9	29	-3	2
PlainsGold	Bond CL	HRW	75.8	99%	57.8	32	-2	2
PlainsGold	Denali	HRW	75.3	99%	60.4	33	3	2
PlainsGold	Brawl CL Plus	HRW	73.5	96%	59.9	34	-2	1
CO State Univ.	Yuma	HRW	73.0	96%	58.6	31	0	2
PlainsGold	Thunder CL	**HWW**	72.3	95%	59.6	31	0	1
Husker Genetics	McGill	HRW	71.4	94%	58.0	35	1	1
WestBred Monsanto	WB-Cedar	HRW	64.4	84%	57.9	30	-4	1
		Average	**76.3**		**59.3**	**32**		**2**

[a]Varieties ranked according to average 3-year yield at Fort Collins.

[b]Market class: HRW=hard red winter wheat; **HWW**=hard white winter wheat.

[c]Lodging scores based on 2011 trial data.

[d]Lodging scale: 1=no lodging, 9=severe lodging.

Summary of 2-year (2012-2013) Irrigated Variety Performance Results at Haxtun

Brand/Source	Variety[a]	Market Class[b]	2-Year Average				
			Yield	Yield	Test Weight	Plant Height	Lodging
			bu/ac	% trial average	lb/bu	in	scale (1-9)[c]
WestBred Monsanto	WB-Cedar	HRW	132.9	108%	61.5	32	2
CO State Univ. exp.	CO07W722-F5	**HWW**	132.2	108%	61.0	35	3
PlainsGold	Brawl CL Plus	HRW	130.0	106%	63.0	37	2
Scott Seed	TAM 304	HRW	129.3	105%	59.3	34	1
PlainsGold	Denali	HRW	128.6	105%	60.6	38	4
Limagrain	T158	HRW	126.8	103%	61.3	35	3
PlainsGold	Antero	**HWW**	126.7	103%	60.3	37	5
CO State Univ. exp.	CO08W218	**HWW**	125.6	102%	60.8	39	5
CO State Univ. exp.	CO08346	HRW	125.5	102%	60.3	37	2
AgriPro Syngenta	SY Wolf	HRW	125.3	102%	60.3	36	3
PlainsGold	Byrd	HRW	124.4	101%	60.5	38	5
Husker Genetics	Settler CL	HRW	124.4	101%	60.1	37	3
PlainsGold	Thunder CL	**HWW**	124.0	101%	60.9	36	3
WestBred Monsanto	Armour	HRW	122.1	99%	60.8	33	2
CO State Univ. exp.	CO08263	HRW	122.1	99%	58.2	36	4
PlainsGold	Bond CL	HRW	120.1	98%	58.6	39	3
AgriPro Syngenta	SY Gold	HRW	119.2	97%	60.8	37	3
CO State Univ.	Yuma	HRW	118.6	96%	60.9	38	3
Husker Genetics	Robidoux	HRW	113.2	92%	59.6	37	4
PlainsGold	Hatcher	HRW	113.0	92%	60.7	37	5
CO State Univ. exp.	CO05W111	**HWW**	112.0	91%	58.9	40	3
Husker Genetics	McGill	HRW	109.5	89%	58.8	41	5
		Average	**123.0**		**60.3**	**37**	**3**

[a]Varieties ranked according to average 2-year yield at Haxtun.

[b]Market class: HRW=hard red winter wheat; **HWW**=hard white winter wheat.

[c]Lodging scale: 1=no lodging, 9=severe lodging. Scores are based on 2012 and 2013 data.

Summary of 3-year (2011-2013) Irrigated Variety Performance Results at Haxtun

			3-Year Average				
Brand/Source	Variety[a]	Market Class[b]	Yield	Yield	Test Weight	Plant Height	Lodging
			bu/ac	% trial average	lb/bu	in	scale (1-9)[c]
AgriPro Syngenta	SY Wolf	HRW	125.2	104%	60.7	36	3
PlainsGold	Denali	HRW	124.8	103%	61.1	39	4
PlainsGold	Brawl CL Plus	HRW	124.8	103%	62.3	38	2
WestBred Monsanto	WB-Cedar	HRW	124.7	103%	60.9	34	2
WestBred Monsanto	Armour	HRW	124.4	103%	61.2	34	2
PlainsGold	Byrd	HRW	122.8	102%	61.6	39	4
Husker Genetics	Settler CL	HRW	122.2	101%	60.8	38	3
PlainsGold	Bond CL	HRW	120.9	100%	59.6	39	3
CO State Univ.	Yuma	HRW	120.8	100%	61.4	39	3
AgriPro Syngenta	SY Gold	HRW	120.2	100%	61.1	37	2
Husker Genetics	McGill	HRW	117.7	97%	59.9	41	4
PlainsGold	Thunder CL	**HWW**	117.4	97%	61.6	36	3
CO State Univ. exp.	CO05W111	**HWW**	117.1	97%	60.3	40	3
PlainsGold	Hatcher	HRW	114.4	95%	61.1	38	5
Husker Genetics	Robidoux	HRW	113.9	94%	61.1	39	4
		Average	**120.7**		**61.0**	**38**	**3**

[a]Varieties ranked according to average 3-year yield at Haxtun.

[b]Market class: HRW=hard red winter wheat; **HWW**=hard white winter wheat.

[c]Lodging scale: 1=no lodging, 9=severe lodging. Scores are based on 2011-2013 data.

Summary of 2-Yr (2011-2012) Irrigated Variety Performance Results at Rocky Ford

Brand/Source	Variety[a]	Market Class[b]	2-Year Average Yield	2-Year Average Yield	Test Weight	Plant Height	Lodging[c]
			bu/ac	% trial average	lb/bu	in	scale (1-9)[d]
PlainsGold	Byrd	HRW	117.2	112%	60.7	37	4
Husker Genetics	Robidoux	HRW	113.4	109%	61.7	38	3
Husker Genetics	Settler CL	HRW	113.0	108%	59.4	37	3
PlainsGold	Ripper	HRW	112.3	108%	59.1	35	2
PlainsGold	Bond CL	HRW	110.6	106%	58.5	38	2
PlainsGold	Denali	HRW	110.1	106%	59.8	38	3
WestBred Monsanto	Armour	HRW	105.4	101%	61.3	32	1
Oklahoma Genetics	Billings	HRW	104.9	101%	60.5	35	1
WestBred Monsanto	WB-Cedar	HRW	102.3	98%	61.0	30	1
Husker Genetics	McGill	HRW	102.2	98%	60.4	42	4
PlainsGold	Thunder CL	**HWW**	101.2	97%	61.3	36	2
PlainsGold	Hatcher	HRW	99.9	96%	60.1	37	4
PlainsGold	Brawl CL Plus	HRW	98.9	95%	60.1	35	1
AgriPro Syngenta	SY Wolf	HRW	94.9	91%	58.7	36	3
CO State Univ.	Yuma	HRW	92.7	89%	58.2	36	2
AgriPro Syngenta	SY Gold	HRW	88.6	85%	59.5	37	2
		Average	**104.2**		**60.0**	**36**	**2**

[a]Varieties ranked according to average 2-year yield at Rocky Ford.

[b]Market class: HRW=hard red winter wheat; **HWW**=hard white winter wheat.

[c]Lodging scores based on 2011 trial data.

[d]Lodging scale: 1=no lodging, 9=severe lodging.

Winter Wheat Variety Selection in Colorado for Fall 2013 Planting

Our variety performance summary tables are intended to provide useful information to farmers, seed producers, and wheat industry representatives in Colorado and surrounding states. Variety selection and planting should be based on some general guidelines.

- Producers should focus on multi-year and multi-location yield summary results when selecting a new variety. Over time, the best buffer against making poor variety decisions has been to select varieties based on three-year average performance and not on performance in a single year – and especially not on performance at a single location in a single year.

- Producers should strongly consider planting more than one variety in order to minimize production risks from variable weather conditions and unexpected pest outbreaks. Recent surveys have indicated that many wheat producers in eastern Colorado do typically plant more than one variety.

- Producers should pay attention to other "non-yield" characteristics in making their variety selection decisions, including ratings for maturity, plant height, coleoptile length, disease and insect resistance, and end-use quality characteristics. These "non-yield" traits are useful to spread production risks due to the unpredictability of weather conditions and pest problems. Refer to the *Description of Winter Wheat Varieties in Eastern Colorado Trials* for variety-specific information for these and other traits (pages 33-36).

- Producers should control volunteer wheat and weeds to avoid the negative effects of a green bridge that could lead to serious virus disease infections vectored by the wheat curl mite (wheat streak mosaic virus, High Plains virus, Triticum mosaic virus) or aphids (barley yellow dwarf virus).

- Producers should soil sample to determine optimum fertilizer application rates. Sampling should be done prior to planting so nitrogen and phosphorus fertilizer requirements can be met. The CSU Extension factsheet entitled *Fertilizing Winter Wheat* is available online at http://tinyurl.com/c88u3x2 for assistance with wheat fertilization.

- Producers should consider monitoring seed size in order to adjust planting rates for abnormally large or small seed size. Varieties and different seed-lots can vary widely and planting small-seeded or large-seeded varieties can result in plant populations much different than desired. Refer to the *How to Calibrate Your Drill* for information on the importance of seed size and tips on how planter adjustments can be easily made (pages 40-41).

- Producers should be aware that new races of stripe rust emerged in 2010 and again in 2012 and many varieties that were resistant before are now susceptible. Farmers should refer to the *Description of Winter Wheat Varieties in Eastern Colorado Trials* (pages 33-36) for updated information on variety susceptibility. If variety resistance/susceptibility, market prices, expected yield levels, and fungicide and application costs warrant an application, farmers should consult the *North Central Regional Committee on Management of Small Grain Diseases* (NCERA-184) fungicide efficacy chart. Regular updates to this chart can be found on the CSU Wheat Breeding Program "Wheat Links" page (http://wheat.colostate.edu/links.html).

Variety Selection For Dryland Production Conditions

Many new varieties possessing multiple valuable traits and high dryland or irrigated yields are currently available. The first six varieties are described in greater detail below, ranked based on their three-year average yield performance. Snowmass and Brawl CL Plus are also highlighted because of specific traits they possess.

Byrd – A medium-maturing, medium-height hard red winter (HRW) wheat, marketed by PlainsGold. Byrd was the top-yielding variety across locations in the UVPT in 2010, 2011, and 2012 and second to Antero in 2013. In addition to being the top-yielding variety in the 2012 and 2013 three-year averages and the top yielder in the 2012 and 2013 COFT, Byrd has excellent drought stress tolerance and excellent milling and baking qualities. It has average test weight and an intermediate reaction to stripe rust. Byrd has relatively small kernels, similar to Bill Brown, so seed size should be monitored so that planting rates can be adjusted to avoid excessive plant populations.

Antero – A new hard white wheat (HWW), released in 2012, marketed by PlainsGold. Has shown three-year average dryland yield in the UVPT essentially equivalent to Byrd. Good drought stress tolerance, good test weight, good stripe rust resistance, and moderate sprouting tolerance (similar to Hatcher). For the 2014 crop, a grower premium will not be offered by ConAgra Mills for Antero grown in Colorado.

TAM 112 – An early-maturing HRW with good dryland adaptation, marketed by Watley Seed. TAM 112 has excellent wheat streak mosaic virus tolerance, high test weight and good baking quality. It is very susceptible to stripe rust. It has done very well in recent years whenever drought stress has been an important factor in trial results, as in 2012 and 2013.

Ripper – An early-maturing HRW variety, marketed by PlainsGold. Ripper is high yielding, very drought stress tolerant, and has good baking quality. It has relatively lower test weight, and is very susceptible to stripe rust. Ripper has shown extremely stable yields, being in the top four of the three-year dryland yield averages every year from 2005 to 2013.

Denali – A medium-late maturing HRW variety, marketed by PlainsGold for production in Colorado and in Kansas through the Kansas Wheat Alliance. It has "photoperiod sensitivity" which caused excessive late heading in 2012. It is medium-tall, has excellent test weight and average milling and baking quality, and is moderately susceptible to the new races of stripe rust.

Settler CL – A later maturing HRW single-gene Clearfield® winter wheat, marketed by Husker Genetics. It has medium height, good test weight, good milling and baking quality, and is moderately susceptible to the new races of stripe rust. Very strong combined dryland and irrigated performance in CSU variety trials.

Brawl CL Plus – A two-gene HRW Clearfield variety, marketed by PlainsGold. In combination with methylated seed oil (MSO), control of feral rye with Beyond® herbicide is much improved relative to control achieved with single-gene Clearfield wheat varieties. Brawl CL Plus has early maturity, medium height, excellent test weight, an intermediate reaction to stripe rust, and excellent milling and baking quality. Brawl CL Plus has shown excellent yield in 2012 and 2013 in dryland variety trials and the COFT, though it's long term average is equivalent to Hatcher.

Snowmass – A hard white wheat (HWW) variety, marketed by PlainsGold through the CWRF ConAgra Mills Ultragrain® Premium Program. Snowmass has a very strong and unique quality profile, making it extremely valuable in whole-grain flour applications. It is medium maturing, has good test weight, and is a taller semi-dwarf which provides additional crop residue. It has excellent resistance to wheat streak mosaic virus, moderate sprouting tolerance (similar to Hatcher), and moderate susceptibility to the new races of stripe rust. It has shown lower yields in 2012 and 2013 dryland variety trials and the COFT, though it's long term average is equivalent to Hatcher.

Variety Selection For Irrigated Production Conditions at Haxtun, Rocky Ford, and Fort Collins

The most important variety selection criteria for irrigated varieties are yield, straw strength, and stripe rust resistance. Under limited-irrigation conditions, drought stress tolerance can also be important. The top five yielding varieties at each trial location based on a three-year average are emphasized below.

Haxtun

SY Wolf – A medium-maturing HRW, marketed by AgriPro Syngenta. It has a very broad disease resistance package, with good protection for leaf spotting diseases (tan spot and Septoria), leaf rust, and stripe rust. Good straw strength and milling and baking quality.

Brawl CL Plus – See dryland description above. It has above average straw strength and an intermediate reaction to stripe rust.

Denali – See dryland description above. It has average straw strength and an intermediate reaction to stripe rust.

WB-Cedar – An early-maturing HRW, marked by WestBred Monsanto. It has good leaf and stripe rust resistance and excellent straw strength for high-input irrigated conditions. Does not perform well under limited-irrigation situations.

Armour – An early-maturing HRW, marked by WestBred Monsanto. It has good straw strength, good leaf rust resistance, and an intermediate reaction to stripe rust. Has shown lower test weight in dryland trials, but this is not an issue under irrigation.

Rocky Ford (based on 2010, 2011, 2012 Three-Year Average)

Byrd – See dryland description above. Straw strength is only average for high-input irrigated conditions, though it has performed extremely well under limited-irrigation due to its drought stress tolerance. Intermediate reaction to stripe rust. Byrd is also susceptible to many North American races of stem rust, which would be more of a risk with later-maturing irrigated wheat.

Settler CL – See dryland description above. It has good straw strength and is moderately susceptible to new races of stripe rust.

Ripper – See dryland description above. It has good straw strength and is very susceptible to stripe rust. Has shown lower test weight in dryland trials, but this is not an issue under irrigation.

Bond CL – A medium maturing HRW single-gene Clearfield variety, marketed by PlainsGold. Is medium-tall with only average straw strength. Very susceptible to stripe rust. Has shown lower test weight in dryland trials, but this is not an issue under irrigation.

Denali – See dryland description above. It is medium-tall, has only average straw strength, and is moderately susceptible to stripe rust.

Fort Collins

Byrd – See descriptions above.

Robidoux – A medium-height, medium-maturing HRW variety, marketed by Husker Genetics. It has excellent test weight, average straw strength, and moderate resistance to stripe rust.

Settler CL – See descriptions above.

Hatcher – A medium-height, medium-maturing HRW variety, marketed by PlainsGold. Historical yield record under irrigation has shown that its lower straw strength is a risk for high-input irrigated conditions but its drought stress tolerance favors its performance under limited-irrigation. Moderate resistance to stripe rust.

SY Gold – A medium-maturing HRW, marketed by AgriPro Syngenta. Good test weight, average straw strength, and is susceptible to new races of stripe rust (similar resistance as Jagger and Jagalene).

Description of Winter Wheat Varieties in Eastern Colorado Trials (2012 and 2013)

Name, Class, and Pedigree	Origin	RWA*	HD	HT	SS	COL**	YR	LR	WSMV	TW	MILL	BAKE	Comments
1863 Hard red winter KS940786-6-4/Karl92//Cutter	KSU 2012	S	5	4	--	2	3	7	--	3	3	3	KSU-Manhattan release (2012). First entered into CSU Variety Trials in 2012. Medium height and medium maturing, good test weight, intermediate reaction to stripe rust, moderately susceptible to leaf rust. Good quality characteristics.
Above Hard red winter TAM 110*4/FS2	CSU-TX 2001	S	3	5	3	8	8	9	5	7	4	7	CSU/Texas A&M release (2001), marketed by PlainsGold. Single-gene Clearfield* wheat. Early maturing semidwarf. Leaf and stripe rust susceptible. Marginal baking quality.
Antero Hard white winter KS01HW152-1/TAM 111	CSU 2012	S	4	5	4	6	2	8	--	3	4	6	CSU release (2012), marketed by PlainsGold. High dryland and irrigated yield, medium height and maturity, good test weight, good straw strength, good resistance to stripe rust. Moderate sprouting tolerance.
Armour Hard red winter B1551-WH/KS94U326	Westbred 2008	S	1	1	3	8	7	5	7	8	4	5	Westbred release (2008). Early maturing short semidwarf, heavy tillering, good leaf rust resistance, moderate susceptibility to new races of stripe rust. Lower test weight.
Bearpaw Hard red winter DMS/Rampart//Pronghorn/3/2*Rampart	MT 2011	S	9	1	--	2	--	--	--	4	--	--	Montana State University release (2011). First entered in CSU Variety Trials in 2013. Carries solid stem trait conferring some protection against wheat stem sawfly damage. Short plant stature, late maturing.
Bill Brown Hard red winter Yumar/Arlin	CSU 2007	R*	4	3	4	2	6	2	7	4	6	3	CSU release (2007), marketed by PlainsGold. High test weight, good leaf rust resistance, moderate susceptibility to new races of stripe rust. Very susceptible to stem rust. Good baking quality, short coleoptile.
Bond CL Hard red winter Yumar//TXGH12588-120*4/FS2	CSU 2004	R*	5	6	5	3	8	6	8	8	6	3	CSU release (2004), marketed by PlainsGold. Single-gene Clearfield* wheat. Slightly later, slightly taller than Above. High irrigated yields, good baking quality. Low test weight, leaf and stripe rust susceptible.
Brawl CL Plus Hard red winter Teal 11A/Above//CO99314	CSU 2011	S	2	5	2	8	5	5	--	2	3	2	CSU release (2011), marketed by PlainsGold. Two-gene Clearfield* wheat. Excellent test weight, straw strength, milling and baking quality. Early maturity, medium height, long coleoptile. Intermediate reaction to stripe rust.
Byrd Hard red winter TAM 112/CO970547-7	CSU 2011	S	4	5	4	7	5	6	--	5	3	2	CSU release (2011), marketed by PlainsGold. High dryland and irrigated yield, excellent drought stress tolerance and quality. Medium height, maturity, coleoptile length. Average test weight and straw strength. Intermediate reaction to stripe rust.
Clara CL Hard white winter KS03HW154(TREGO/CO960293)/KS03HW1(FIDEL/97HW150//97HW349/3/TGO)	KSU 2011	S	7	5	6	4	5	2	2	2	4	4	KSU-Hays release (2011). First entered in CSU Variety Trials in 2012. Single-gene hard white Clearfield* wheat. Carries same WSMV resistance as RonL and Snowmass. Moderate resistance to stripe rust, excellent test weight.

Russian wheat aphid resistance (RWA), heading date (HD), plant height (HT), straw strength (SS), coleoptile length (COL), stripe rust resistance (YR), leaf rust resistance (LR), wheat streak mosaic virus tolerance (WSMV), test weight (TW), milling quality (MILL), and baking quality (BAKE). Rating scale: 1 - very good, very resistant, very early, or very short to 9 - very poor, very susceptible, very late, or very tall.

* RWA rating denotes resistance to the original biotype (biotype 1) of RWA. All available cultivars are susceptible to the new biotypes of RWA.

** Coleoptile length ratings range from 1=very short (~ 50 mm or ~2 in) to 9=very long (~100 mm or ~4 in). Coleoptile lengths should be interpreted for relative variety comparisons only.

Description of Winter Wheat Varieties in Eastern Colorado Trials (2012 and 2013)

Name, Class, and Pedigree	Origin	RWA*	HD	HT	SS	COL**	YR	LR	WSMV	TW	MILL	BAKE	Comments
Denali Hard red winter CO980829/TAM 111	CSU 2011	S	8	7	5	7	6	7	7	2	4	5	CSU release (2011), marketed by PlainsGold and KWA in Kansas. High yields, excellent test weight. Medium tall, medium-late, medium-long coleoptile. Average straw strength and quality. Moderate susceptibility to stripe rust.
Freeman Hard red winter KS92-946-B-15-1=(ABI86*3414/JAG//K92)/ALLIANCE	NE 2012	S	4	6	6	3	5	5	--	9	8	5	Nebraska release (2012), first entered in CSU Variety Trials in 2013. Lower test weight.
Gallagher Hard red winter OK93P656-(RMH 3299)/OK99711	OK 2012	S	6	5	6	2	2	3	--	5	5	5	Oklahoma State release (2012), first entered in CSU Variety Trials in 2013. Good leaf disease resistance.
Hatcher Hard red winter Yuma/PI 372129//TAM-200/3/4*Yuma/4/KS91H184/Vista	CSU 2004	R*	6	2	6	5	3	7	8	4	4	3	CSU release (2004), marketed by Plainsgold. Medium maturing semidwarf. Good test weight, moderate resistance to stripe rust. Excellent High Plains yield record, good milling and baking quality. Develops “leaf speckling” condition.
Iba Hard red winter OK93P656-(RMH 3299)/OK99621	OK 2012	S	6	3	5	8	5	3	--	2	2	5	Oklahoma State release (2012), first entered in CSU Variety Trials in 2013. Good stripe rust resistance, good test weight.
KS09H19-2-3 Hard red winter Above/Danby//KS03HW10	KSU 2013	S	6	5	--	6	2	7	2	3	--	--	KSU-Hays release (2013, yet to be named). First entered in CSU Variety Trials in 2013. Single-gene hard red Clearfield* wheat. Good test weight, good stripe rust resistance, carries same WSMV resistance as Clara CL and Snowmass.
LCH08-80 Hard red winter S6742/92PAN1#33//92PIN#107	Limagrain 2013	S	7	1	2	5	--	--	--	6	4	8	Limagrain release (2013, yet to be named). First entered in CSU Variety Trials in 2013. Very good straw strength for irrigation. Marginal baking quality.
LCS Mint Hard red winter Overley/CO980829	Limagrain 2011	S	4	8	4	3	3	8	--	2	2	2	Limagrain release (2011). First entered in CSU Variety Trials in 2013, previously tested in 2010 under experimental designation CO050175-1. Moderately resistant to stripe rust, good test weight, good milling and baking quality.
McGill Hard red winter NE92458/Ike	NE 2010	S	5	8	8	3	6	4	--	7	5	4	Nebraska release (2010). First entered in CSU Variety Trials in 2011. Medium maturity, medium height. Lower test weight, poor straw strength. Intermediate reaction to new races of stripe rust.
Protection Hard red winter Jagger//TXGH12588-120*4/FS2	AGSECO/CSU 2004	S	2	7	3	4	7	9	5	8	4	6	CSU release (2004), marketed by AGSECO. Single-gene Clearfield* wheat. Lower yield relative to Bond CL in CSU Variety Trials. Taller plant stature, susceptible to stripe rust. Low test weight.

Russian wheat aphid resistance (RWA), heading date (HD), plant height (HT), straw strength (SS), coleoptile length (COL), stripe rust resistance (YR), leaf rust resistance (LR), wheat streak mosaic virus tolerance (WSMV), test weight (TW), milling quality (MILL), and baking quality (BAKE). Rating scale: 1 - very good, very resistant, very early, or very short to 9 - very poor, very susceptible, very late, or very tall.

* RWA rating denotes resistance to the original biotype (biotype 1) of RWA. All available cultivars are susceptible to the new biotypes of RWA.

** Coleoptile length ratings range from 1=very short (~ 50 mm or ~2 in) to 9=very long (~100 mm or ~4 in). Coleoptile lengths should be interpreted for relative variety comparisons only.

Description of Winter Wheat Varieties in Eastern Colorado Trials (2012 and 2013)

Name, Class, and Pedigree	Origin	RWA*	HD	HT	SS	COL**	YR	LR	WSMV	TW	MILL	BAKE	Comments
Ripper Hard red winter CO940606/TAM107R-2	CSU 2006	R*	2	4	4	8	9	9	7	8	4	4	CSU release (2006), marketed by PlainsGold. Excellent stress tolerance, high dryland yields in Colorado, good baking quality. Very good recovery from stand reduction. Leaf and stripe rust susceptible, lower test weight.
Robidoux Hard red winter NE96644/Wahoo (sib)	NE 2010	S	5	4	6	7	4	6	8	5	5	3	Nebraska release (2010). First entered in CSU Variety Trials in 2011. Medium maturity, medium short. Moderate resistance to stripe rust.
Settler CL Hard red winter N95L164/3/MILLENNIUM SIB//TXGH125888-120*4/FS2	NE 2008	S	7	4	2	5	6	8	7	6	3	4	Nebraska release (2008). Single-gene Clearfield* wheat. Good dryland and irrigated yield in CSU Variety Trials. Later maturing, medium height. Moderately susceptible to new races of stripe rust.
Snowmass Hard white winter KS96HW94//Trego/CO960293	CSU 2009	S	6	8	8	5	5	6	2	7	6	2	CSU release (2009), marketed by PlainsGold. Hard white winter wheat (HWW). Medium-maturing, medium-tall. Good WSMV resistance, moderately susceptible to stripe rust, moderate sprouting tolerance. Grown under contract with ConAgra.
SY Gold Hard red winter W95-301/W98-151	Agripro 2010	S	4	5	5	2	8	2	6	3	5	5	Agripro release (2010). First entered in CSU Variety Trials in 2009. Good leaf rust resistance, susceptible to stripe rust.
SY Wolf Hard red winter W99-331/97x0906-8	Agripro 2010	S	6	4	3	4	5	1	--	3	4	4	Agripro release (2011). First entered in CSU Variety Trials in 2011. Good resistance to tan spot, septoria, and leaf rust. Moderate resistance to stripe rust.
T153 Hard red winter T136//T81/KS93U206	Limagrain 2008	S	2	2	1	7	1	7	--	6	7	6	Limagrain release (2008). First entered in CSU Variety Trials in 2013. Good resistance to stripe rust.
T154 Hard red winter T88/2180//T811	Limagrain 2008	S	1	2	--	5	3	7	--	3	--	--	Limagrain release (2008). First entered in CSU Variety Trials in 2013. Good resistance to stripe rust.
T158 Hard red winter KS93U206/2*T81	Limagrain 2009	S	1	5	5	3	2	7	--	4	3	5	Trio (Limagrain) release (2009). First entered in CSU Variety Trials in 2012. Good stripe rust resistance, top dryland yields on a three-year average in Western KS trials.
T163 Hard red winter 93WGRC27/T811	Limagrain 2010	S	2	6	8	4	5	7	4	5	3	2	Trio (Limagrain) release (2010). First entered in CSU Variety Trials in 2011. Some plants carry resistance to wheat streak mosaic virus. Moderate resistance to stripe rust. Poor straw strength, good quality.

Russian wheat aphid resistance (RWA), heading date (HD), plant height (HT), straw strength (SS), coleoptile length (COL), stripe rust resistance (YR), leaf rust resistance (LR), wheat streak mosaic virus tolerance (WSMV), test weight (TW), milling quality (MILL), and baking quality (BAKE). Rating scale: 1 - very good, very resistant, very early, or very short to 9 - very poor, very susceptible, very late, or very tall.

* RWA rating denotes resistance to the original biotype (biotype 1) of RWA. All available cultivars are susceptible to the new biotypes of RWA.

** Coleoptile length ratings range from 1=very short (~ 50 mm or ~2 in) to 9=very long (~100 mm or ~4 in). Coleoptile lengths should be interpreted for relative variety comparisons only.

Description of Winter Wheat Varieties in Eastern Colorado Trials (2012 and 2013)

Name, Class, and Pedigree	Origin	RWA*	HD	HT	SS	COL**	YR	LR	WSMV	TW	MILL	BAKE	Comments
TAM 111 Hard red winter TAM-107//TX78V3630/CTK78/3/TX87V1233	TX 2002	S	6	7	3	8	8	8	7	3	4	5	Texas A&M release (2002), marketed by Agripro. Medium maturing, taller wheat. Good test weight, good straw strength, good irrigated yield. Leaf rust susceptible, intermediate reaction to stripe rust.
TAM 112 Hard red winter U1254-7-9-2-1/TXGH10440	TX 2005	S	2	4	7	7	8	7	3	3	4	2	Texas A&M release (2005), marketed by Watley Seed. Early maturing semi-dwarf. Good test weight, good quality, excellent wheat streak mosaic virus tolerance. Susceptible to leaf and stripe rust, poor straw strength.
TAM 113 Hard red winter TX90V6313/TX94V3724	TX 2010	S	6	4	8	3	4	3	--	4	4	5	Texas A&M release (2010), marketed by AGSECO. First entered in CSU Variety Trials in 2012. Good leaf and stripe rust resistance, good test weight. Poor straw strength.
TAM 304 Hard red winter TX92U3060/TX91D6564	TX 2006	S	4	2	2	7	8	2	--	7	6	4	Texas A&M release (2006), marketed by Scott Seed Co. First entered in CSU Variety Trials in 2012. Good straw strength, susceptible to stripe rust, lower test weight.
Thunder CL Hard white winter KS01-5539/CO99W165	CSU 2008	R*	4	4	3	7	3	5	4	6	5	2	CSU release (2008), marketed by PlainsGold. Single-gene HWW Clearfield* wheat. Good straw strength for irrigation. Excellent quality, moderate stripe rust resistance, moderate sprouting susceptibility. Grown under contract with ConAgra.
WB-Cedar Hard red winter TAM 302/B1551W	Westbred 2010	S	2	2	1	5	3	5	7	7	3	5	Westbred release (2010). First entered in CSU Variety Trials in 2011. Hard red selection from Aspen hard white wheat. Good stripe rust resistance, excellent straw strength for high-input irrigation. Very drought susceptible, lower test weight.
WB-Grainfield Hard red winter G982231/G982159//KS920709W	Westbred 2012	S	2	7	--	2	3	2	--	7	5	5	Westbred release (2012). First entered into CSU Trials in 2013. Early maturing tall semi-dwarf. Good leaf and stripe rust resistance, lower test weight, shorter coleoptile.
Winterhawk Hard red winter 474S10-1/X87807//HBK736-3	Westbred 2007	S	4	7	5	8	5	7	7	2	2	4	Westbred release (2007). Medium maturing, medium tall, long coleoptile. Intermediate reaction to new races of stripe rust, susceptible to leaf rust, very susceptible to stem rust. Good test weight, good quality.
Yuma Hard red winter NS14/NS25//2*Vona	CSU 1991	S	6	3	3	1	5	5	6	6	5	3	CSU release (1991). Medium maturity, semidwarf, short coleoptile, good baking quality characteristics. Moderate resistance to stripe rust. Higher yield under irrigation.

Russian wheat aphid resistance (RWA), heading date (HD), plant height (HT), straw strength (SS), coleoptile length (COL), stripe rust resistance (YR), leaf rust resistance (LR), wheat streak mosaic virus tolerance (WSMV), test weight (TW), milling quality (MILL), and baking quality (BAKE). Rating scale: 1 - very good, very resistant, very early, or very short to 9 - very poor, very susceptible, very late, or very tall.

* RWA rating denotes resistance to the original biotype (biotype 1) of RWA. All available cultivars are susceptible to the new biotypes of RWA.

** Coleoptile length ratings range from 1=very short (~ 50 mm or ~2 in) to 9=very long (~100 mm or ~4 in). Coleoptile lengths should be interpreted for relative variety comparisons only.

Farmers Have a New Tool to Fight Feral Rye
Brawl CL Plus Takes Clearfield® Weed Control to the Next Level

Glenda Mostek
Colorado Wheat Research Foundation

Since the introduction of the Clearfield® system, wheat farmers have turned to Beyond® herbicide to control problematic grassy weeds in their fields and now PlainsGold is excited to offer a new two-gene Clearfield winter wheat – **Brawl CL Plus**. This new PlainsGold variety combines yields comparable with Hatcher with improved weed control when used with Beyond herbicide.

Brawl CL Plus is a two-gene Clearfield variety that provides a greater degree of tolerance to Beyond herbicide compared to single-gene varieties. This improves the effectiveness of broad-spectrum weed control, including problematic winter annual grassy weeds. Brawl CL Plus is the first publicly-developed two-gene Clearfield winter wheat that permits the use of methylated seed oil (MSO) in the tank mix with Beyond herbicide to increase the effectiveness of the herbicide, particularly on feral rye, which is tougher to control once it starts to tiller and develop.

Brawl CL Plus, developed by Colorado State University (CSU), will be available from PlainsGold seed growers in Colorado, Wyoming, Nebraska, Kansas, and Montana for planting this fall.

Wheat contains three different genomes from ancestral species. Above (and other single-gene CL wheat varieties) carry a single gene on the D genome. As a two-gene Clearfield wheat variety, Brawl CL Plus carries this gene and an additional gene that is carried on the B genome, which gives it greater crop herbicide tolerance and safety than single-gene Clearfield wheat varieties.

Brawl CL Plus has dryland yields comparable to the popular variety Hatcher and single-gene Clearfield wheat varieties Above and Bond CL. It has excellent test weight (higher than Above and Bond CL); good straw strength (similar to Above and Thunder CL); medium-tall plant stature (slightly taller than Hatcher and Ripper); a heading date two days earlier than Hatcher (similar to Above); medium-long coleoptile, good fall stand establishment, an intermediate reaction to stripe rust, good milling, and exceptional bread baking quality characteristics.

Colorado State University
Extension

Wheat Stem Sawfly: A New Pest of Colorado Wheat

Fact Sheet No. **5.612** Insect Series | **Crops**

B. Irell and F. Peairs*

Introduction

The wheat stem sawfly is a native grass-feeding insect that has long been a threat to spring wheat production in the northern plains. In the early 1980s, however, it emerged as a significant pest of winter wheat as well. Since then, sawfly infestations in winter wheat have spread from North Dakota and Montana into southeastern Wyoming, the Nebraska Panhandle, and, most recently, northeastern Colorado. Damage to winter wheat was first reported in Colorado in 2010, from areas along Colorado Highway 14 in Weld County.

Identification/Life Cycle

The wheat stem sawfly produces one generation per year. Adults emerge in late May or early June and are generally active when winds are calm and field temperatures are above 50° F. The adult wheat stem sawfly (Figure 1) is about ¾ of an inch long with smoky-brown wings. It is wasplike in appearance, with a shiny black body with three yellow bands around the abdomen. When not in flight they often are found on wheat stems, positioned with the head pointed downward.

Figure 1: Adult wheat stem sawfly.

Figure 2: Sawfly larva in stub.

Females lay eggs immediately upon emergence and typically live about one week. The adult emergence and flight period continues for 3-6 weeks. They are not strong fliers and usually only fly until they find the nearest wheat field or other suitable host grasses. In wheat, this often results in more serious problems occurring at the field margins closest to the adult emergence site, which is the previous year's wheat field. They preferentially select the largest wheat stems available and insert eggs into the first available internode or when a stem is fully developed, below the uppermost node. If sawflies are abundant, eggs may be laid in smaller stems, and multiple eggs may be laid in a single stem. However, only one larva will survive in each stem due to cannibalism. Females lay an average of 30-50 eggs, depending on the size of available host stems. Eggs are difficult to detect because they occur inside the stem.

Sawfly larvae are always found within the stem and will assume an S-shaped position when taken out of the stem. They move slowly down the stem as they feed, for approximately 30 days. Sawfly larvae (Figure 2) are cream colored, have a broad head, and are ½ to ¾ of an inch in length when fully grown. When they are mature they move down towards soil level and cut a V-shaped

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Quick Facts

- The wheat stem sawfly is a native grass-feeding insect that emerged as a significant pest of winter wheat in Colorado in 2010.
- Adults emerge in late May or early June and are generally active when winds are calm and field temperatures are above 50° F.
- Several parasitic wasps attack wheat stem sawfly but the presence and effectiveness of natural enemies in Colorado has not been determined.

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notch around the interior of the stem. They then seal the interior of the stem just below the notch with frass and move down near the crown. The upper stem often breaks at this weakened notch just prior to harvest, and the remaining stem containing the overwintering chamber is referred to as the 'stub' (Figure 3). The larvae overwinter in the stubs, slightly below soil level, before pupating in early spring. They produce a clear protective covering that protects them from excess moisture and moisture loss.

Figure 3: Stubs in which wheat stem sawfly larvae overwinter.

Host Plants and Damage

The wheat stem sawfly has traditionally infested spring wheat, but over the last few decades the damage is becoming increasingly common in winter wheat. It also feeds in several hollow-stemmed non-cultivated grasses, including quackgrass, smooth brome and various wheatgrasses. It does not attack corn or broad leaf crops. Although the sawfly may lay eggs in other cereals, including barley, oat, and rye, larvae rarely mature in barley and rye and do not survive in oat.

Darkened areas on the stem, just beneath the node, indicate larval infestation. To verify the presence of the sawfly in a suspected plant, split the stem from top to bottom. A stem filled with a sawdust-like substance indicates feeding activity. The larva will most likely be located in a chamber within the stem, just above the crown.

The most visible wheat stem sawfly damage is stem breakage or lodging just prior to harvest (Figure 4). The stem is greatly weakened by the groove the larva cuts around the base of the plant. Lodging becomes more obvious as harvest approaches and results in yield loss of five to ten percent due to unrecoverable wheat heads because the combine cannot pick up the lodged stems. In addition, physiological damage caused by feeding activity results in yield losses of ten to twenty percent in infested heads that are harvested.

Management

Cultural Controls:

Tillage reduces wheat stem sawfly survival, however, its impact on overall sawfly abundance and on damage to the next wheat crop is variable. Shallow tillage after harvest lifts the crowns and loosens the soil around them. This maximizes the larvae's exposure to the late summer dryness and winter cold, increasing mortality. Intense tillage that buries stubble also reduces sawfly survival, but to a lesser degree. Intense tillage may interfere with important biological control agents and will increase the risk of soil erosion. No-till has been linked to many of the recent wheat stem sawfly problems in the region. However, the advantages of controlling the sawfly with tillage must be weighed against the considerable benefits of no-till.

Planting attractive varieties of trap crops such as barley, oat or rye along the edge of wheat fields may be effective in decreasing damage and reducing the number of sawflies the following year. The sawflies will oviposit in the trap crop, but the larvae will be unable to complete development. This method is especially effective when sawfly abundance is low to moderate and significant infestations are limited to the field margins. However, when sawflies are abundant, females may move past the trap crop and into the wheat to oviposit, resulting in significant damage.

Figure 4: Lodging caused by wheat stem sawfly.

Planting wheat in larger blocks as opposed to narrow strips is another cultural practice that may reduce sawfly damage potential. This minimizes the amount of field border adjacent to stubble where sawfly adults will be emerging, and thus, the part of the field most vulnerable to infestation. Sawflies are not strong fliers and tend to fly only until they reach a stem that is suitable for egg-laying, which is the basis for this practice. Though the soil erosion benefits of planting in narrow strips may be reduced, larger fields are still a viable option if erosion is addressed by no-till practices.

Resistant Wheat Varieties:

Solid stem varieties of wheat have been shown to be effective in reducing damage caused by the wheat stem sawfly. The availability of several adapted solid-stemmed wheat cultivars provides a viable management option for parts of the northern High Plains. In areas where the sawfly is a recent arrival, wheat breeding programs are beginning to focus on incorporation of the solid stem characteristic into adapted varieties, using both conventional selection and linked DNA markers. The program at Colorado State University also is initiating long term research into novel methods for making the wheat plant less attractive to the sawfly.

Biological Control:

Several parasitic wasps attack wheat stem sawfly on the northern plains, and these are thought to be important mortality factors. The presence and effectiveness of natural enemies in Colorado has not been determined.

Chemical Control:

Currently available insecticides are ineffective and cost-prohibitive. The most promising strategy seems to be control of adults to prevent egg-laying. However, the prolonged flight period likely would require repeated treatments and there is no evidence for the effectiveness of this approach. Using solid-stemmed cultivars and cultural controls are currently the most effective alternatives.

How to Calibrate Your Drill to Plant Seeds per Acre

Jerry Johnson and Sally Sauer
Department of Soil & Crop Sciences

There are advantages to planting seeds per acre instead of pounds per acre due to the potentially large difference in seed size among seed lots. A farmer planting 35 pounds per acre could be planting 350,000 seeds per acre or 630,000 seeds per acre depending on the number of seeds per pound. Another advantage of planting seeds per acre is that you know how many seeds were planted per linear foot of row so stand counts can be taken after emergence to determine what percent of planted seed actually emerged. Actual stands often turn out to be much lower than expected – even under seemingly good planting conditions. You don't have to know how many seeds per pound of seed to be able to plant seeds per acre.

The following table will assist you in calibrating your drill to plant seeds per linear row foot (seeds per acre).

STEP 1: (see table) estimate your percent emergence rate based upon your planting conditions. Emergence rate is not the germination percentage of your seed, but rather what percent of seed planted will actually emerge. A guideline is provided to help you determine your estimated emergence rate, which ranges from very poor to excellent planting conditions.

STEP 2: (see table) determine desired plant population depending on the date of planting. For example, if planting in early September, you might want 500,000 plants per acre to avoid having too many plants and tillers the next spring that might exhaust available soil moisture. Plants emerging in early September will tiller profusely. If planting in mid-late October you might want to have 1,100,000 plants per acre as tillering will be greatly reduced.

STEP 3: (see table) find the row spacing for your drill and read across to the column you found in STEP 1 to find the number of seeds per linear foot. Set your drill accordingly.

Note that drills will need to be recalibrated if planting conditions improve (it rains) or become worse (hot and dry) or if your planting season is extended to a later date requiring a heavier seeding rate.We are interested in your experience. Send me and/or Sally an email message or feel free to call either of us with comments or questions.

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Sally Sauer (970) 491-1914 or Sally.Sauer@colostate.edu

Planting Rate in Seeds Per Linear Foot of Row

Seeding Date	*Step 2:* Desired Plant Population	*Step 3:* Row Spacing	*Step 1:* Planting Conditions and Farmer Estimated Emergence Rate					
			Very Poor	Poor		Average	Excellent	
			40%	50%	60%	70%	80%	90%
	plants/acre	inches	seeds/linear foot of row					
Late Aug.	300,000	6.0	9	7	6	5	4	4
	300,000	7.5	11	9	7	6	5	5
	300,000	10.0	14	11	10	8	7	6
	300,000	12.0	17	14	11	10	9	8
Early Sept.	500,000	6.0	14	11	10	8	7	6
	500,000	7.5	18	14	12	10	9	8
	500,000	10.0	24	19	16	14	12	11
	500,000	12.0	29	23	19	16	14	13
Mid-Sept.	700,000	6.0	20	16	13	11	10	9
	700,000	7.5	25	20	17	14	13	11
	700,000	10.0	33	27	22	19	17	15
	700,000	12.0	40	32	27	23	20	18
Late Sept./Early Oct.	900,000	6.0	26	21	17	15	13	11
	900,000	7.5	32	26	22	18	16	14
	900,000	10.0	43	34	29	25	22	19
	900,000	12.0	52	41	34	30	26	23
Mid/Late Oct.	1,100,000	6.0	32	25	21	18	16	14
	1,100,000	7.5	39	32	26	23	20	18
	1,100,000	10.0	53	42	35	30	26	23
	1,100,000	12.0	63	51	42	36	32	28

Table can also be accessed at: www.tinyurl.com/d2hbpgb

Importance of Variety Selection and Short- and Long-Term Benefits of Purchasing Certified Seed

Rick Novak
Department of Soil and Crop Sciences

The annual survey of the Colorado Ag Statistics Service indicated that 2.2 million acres of winter wheat were planted in Colorado in the fall of 2012. This was 200,000 fewer acres planted to winter wheat than in 2011. However, there has been a continuing trend of farmers increasing their purchases of Colorado Certified seed as the graph on the following page indicates. The first certified seed that a farmer often purchases is for a newly released variety. Farmers often rely on their past experiences while at the same time they consult other informational resources to make more informed and educated decisions with regards to their seed purchase decisions. Farmers have experienced increases in grain yields over time as a result of continued research and development of new wheat varieties. As the cost of an average farming operation continues to increase, better management decisions can make significant differences in the bottom line at the end of the year.

There are many reasons why farmers purchase certified seed regularly and it is worthwhile to recognize these benefits. It is important to identify the short- and long-term benefits of using certified seed every year.

The short-term benefits for farmers purchasing certified seed are the following:

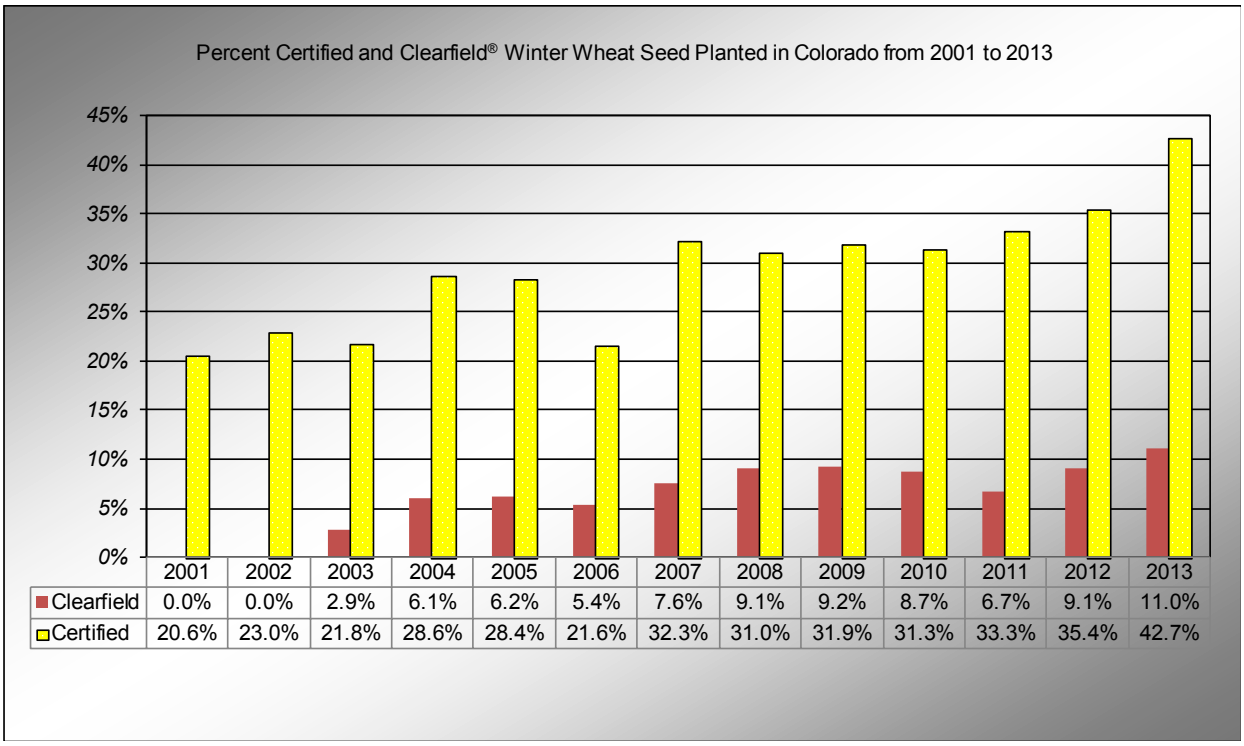
1. Farmers are able to maintain grain sales and reduce their risk.
2. Farmers do not have to transport, store, handle, and condition the grain intended for seed.
3. Farmers do not have to be concerned about purity, weeds, and germination of their seed.
4. Farmers are able to purchase a more desirable variety with superior agronomic traits.
5. Farmers are able to purchase the most productive varieties available.
6. Farmers are able to purchase seed that has been field inspected for weeds and genetic purity.
7. Farmers will receive a seed tag providing documented verification of the purity and germination.
8. Farmers have the option in many cases to have seed treatment applied to their purchased seed.
9. Farmers are able to save time and labor and purchase the exact amount of seed required.
10. Farmers are given the opportunity to grow Identity Preserved varieties for specialty markets and grower price-premiums.
11. Farmers often will experience an increase in their productivity by using certified seed.

There are long-term benefits of certified seed as well:

1. Farmers have experienced an increase in average grain yields over a number of years.
2. Farmers have witnessed breeding programs making large investments in plant varietal development.
3. Farmers have captured value from Identity Preserved program products in the market place.
4. Farmers have seen several new technologies adopted in varietal development.

Purchasing certified seed provides the needed funding that supports research and varietal development for the future. The development of new varieties generally took 10-12 years in the past, but with the implementation of new technologies in the area of wheat breeding, such as doubled-haploids and marker-assisted selection, the timeline of bringing new varieties to the farmer is being reduced. Each time a farmer makes a decision to purchase Certified seed they are also supporting research and varietal development that will benefit them in the future.

In mid-August, the university or private wheat breeding teams will be presenting their trial results during the wheat planting decision meetings. If you are growing wheat or just interested in wheat as a crop, mark your calendar and attend a wheat planting decision meeting in your area. This is one of the best ways for you to become informed about wheat varieties. The first-hand experience of attending a meeting along with a review of trial results after harvest will help you make informed variety selection decisions. As a farmer, use all available field trial information as another tool in your toolbox to help you achieve a successful farming operation!



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Clearfield	0.0%	0.0%	2.9%	6.1%	6.2%	5.4%	7.6%	9.1%	9.2%	8.7%	6.7%	9.1%	11.0%
Certified	20.6%	23.0%	21.8%	28.6%	28.4%	21.6%	32.3%	31.0%	31.9%	31.3%	33.3%	35.4%	42.7%

Herbicide Resistant Kochia in Colorado

Phil Westra
Department of Bioagricultural Sciences and Pest Management

Kochia is a tumbleweed that can be found in most Colorado cropping systems- including those based on dryland wheat production. Significant progress has been made in use of reduced till or no-till cropping systems that were successful due to the availability of glyphosate, 2,4-D, and dicamba mixes for weed control, particularly in wheat stubble. For the past 3-4 years, reports circulated in the weed management community about stubborn kochia that was no longer controlled with these herbicides, even when a 3-way combination of these were sprayed in fallow fields. Several Colorado kochia samples collected in 2011 did in fact show glyphosate resistance when tested in glyphosate dose response studies in the CSU weed science greenhouse. Some individual plants survived up to 1.25 gallons of glyphosate, although the general level of increased resistance appears to be in the 3-6 fold range. Andrew Wiersma, a CSU graduate student, conducted molecular kochia work that showed glyphosate resistance was due to gene amplification. When a weed uses this resistance mechanism, it produces an excess amount of the enzyme that glyphosate normally blocks. At a commercial glyphosate field rate, not enough glyphosate can enter the plants to block all the enzyme in resistant plants.

The 2013 cropping season appears to be the year that glyphosate resistant kochia has "blown up" in Colorado. We have received multiple requests from around the state to test suspected herbicide resistant kochia, and in fact, most of these suspected samples are shown to be resistant. Frequently these samples come from fields where growers had already sprayed glyphosate or glyphosate tank mixes 2 or more times on the kochia. The CSU weed science program has now documented glyphosate resistant kochia populations from TX, KS, CO, NE, SD, ND, MT, as well as Alberta and Saskatchewan, Canada. All of these populations exhibit the same mechanism of glyphosate resistance. This problem is amplified by the tumbleweed nature of kochia where resistant plants drop their seeds as they roll across fields in strong winds. Frequently this leaves a meandering "trail" of resistant kochia in otherwise clean fallow fields. The CSU weed science program is conducting numerous studies to look for other herbicides that can be used to control this resistant kochia.

Making Fertilizer Decisions During Drought

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Department of Soil & Crop Sciences

As the drought continues, many farmers are looking for ways to reduce risk and optimize yields. It may be tempting to cut back on your fertilizer program in order to reduce your costs this year. However, good nutrient management is key to optimizing water use, so be careful not to rush into any hasty decisions.

If you fertilized normally last season but experienced limited yields due to drought, there may be some nutrient storage leftover from last year's applications. Soil sampling is extra important in a year like 2013 because of uncertainties about how much of last year's nutrients may still be available for this year's crops. In particular, there may be more nitrate (NO_3-N) leftover than usual because of less rainfall, less crop uptake, and less leaching. So you may be able to cut back on your N fertilizer this year. But be sure to soil sample prior to making this decision!

Many studies on a variety of crops over the past 50 plus years have shown that optimal water use efficiency cannot be achieved without optimizing nutrient management. They are intimately linked. Proper fertilization removes limitations to plant growth, so plants are better able to respond to whatever rainfall or irrigation they do get. Applying fertilizer to move soil concentrations out of the deficient category and into the sufficient category will allow your crop to get the most yield out of every drop of water.

Nutrient management doesn't only supply nutrients to crops, but can also improve soil quality and alter the way that water cycles through soils. In particular, applying manure or compost has been shown to improve water infiltration into soils and reduce runoff losses from the soil surface. Reducing runoff increases potentially available water for crops. In addition, manure and compost applications also increase soil water retention, especially at field capacity, effectively increasing the amount of rainfall that is stored in the soil for crops to access.

Having a healthy root system is critical to maximizing the plants' access to stored soil water. Healthy roots need Nitrogen (N) and Phosphorus (P) to mine the water from the soil. A single N and P fertilizer application to the soil surface can increase wheat root growth down to a 3 foot depth! And, that increased rooting is directly related to enhanced water uptake and better yields.

Overall, be sure to avoid tunnel vision about rainfall. Of course, we need rain to get good yields, especially in our dryland crops. But rain, by itself, doesn't solve all of our problems (even though it may feel like it would!). We need to pay attention to soil fertility so the plants can perform their best with the water that they do have.

Wheat Virus Research

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Department of Bioagricultural Sciences and Pest Management, and CSU Extension

Wheat curl mite-transmitted viruses are estimated to cause 3 to 5% annual yield loss in Colorado with greater losses occurring in certain years. At least three different mite-transmitted viruses are found in Colorado. They are wheat streak mosaic virus (WSMV), High Plains virus (HPV), and Triticum mosaic virus (TriMV). Both WSMV and HPV have long been known to occur in the state; however, TriMV was only discovered in 2006 in Kansas and then subsequently found in Colorado. A survey was conducted to determine the distribution the prevalence and incidence of TriMV in Colorado as well as surrounding states. WSMV was found in 35% of the approximately 13,000 samples sampled and it remains the most prevalent mite transmitted virus in the Great Plains (1). TriMV was detected in all states and from 4% of the samples tested. Interestingly, 91% of TriMV-positive samples were co-infected with WSMV, whereas WSMV and HPV were primarily detected as single infections. Studies in Nebraska have shown that co-infection of TriMV with WSMV causes more severe damage in certain susceptible varieties than infection with just a single virus (2). Furthermore, co-infection may complicate breeding for resistance to mite transmitted viruses. For example, a variety may be resistant to WSMV, but not to co-infection by WSMV and TriMV.

Colorado State University is currently participating in a USDA-NIFA grant program awarded to the University of Nebraska to continue research on mite-transmitted viruses. A major challenge with mite transmitted diseases is to determine the parameters that will result in a virus outbreak. We hope to develop a disease forecasting model that can be used to predict the risk for virus disease development. This model will include the impact of environmental conditions, alternate hosts, and management tactics on vector population dynamics and subsequent disease incidence and risk in geographically and environmentally diverse production regions across the Great Plains, We also hope to identify primary interactions that occur in this wheat-mite-virus complex across the region, and increase producer implementation of integrated management principles for the wheat-mite-virus complex across the Great Plains.

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Colorado Wheat Research Foundation (CWRF) is proud to continue the long-standing partnership with ConAgra Mills to offer wheat growers premiums for select hard white winter wheat varieties. The demand for hard white wheat continues to grow as consumers look for the health benefits of whole grain products from hard white wheat varieties.

A Powerful Pair of Hard White Wheat Varieties

Snowmass

Snowmass hard white winter wheat is the flagship variety in the CWRF ConAgra Mills Ultragrain® Premium Program. Snowmass is in high demand with millers and bakers because of its unparalleled milling and baking quality. In addition to the base premium, protein premium and seed rebate, Snowmass features good dryland yields with good test weights, excellent wheat streak mosaic resistance and medium-tall plant height for increased crop residue.

Thunder CL

Thunder CL is another PlainsGold hard white winter wheat variety. Thunder CL is a one-gene Clearfield® hard white winter wheat variety that is tolerant to Beyond™ herbicide for broad-spectrum weed control, including problematic winter annual grassy weeds. In addition, Thunder CL combines good yields, good stress tolerance, good disease resistance, good test weights and superior milling and baking qualities.

How can you join the program?

1. Contact your local seed grower
Snowmass and Thunder CL can be purchased directly from local PlainsGold seed growers right in your area. They'll also help you with necessary paperwork to enroll in the program.

Snowmass Seed Growers:

Anderson Wheat Farms, Haxtun 970-774-4143
Brooks Seeds, Walsh (719) 523-4473
Cooksey Farms, Roggen 303-849-5214
CSF Farms, Seibert 970-664-2281
Jim Dolezal, Julesburg 308 889-5365
Eagle Farms, Holyoke 970-854-5328
Johnston Family Farms, Erie 303-591-8830
Kochis Farms, Matheson 719-775-2596
Curtis Lewton, Bennett 303-644-4327
Jim and Cole Mertens, New Raymer 970-437-5358
Niswonger & Son, Inc., Wallace, KS 620-375-2597
Pachner Agri-Enterprises, Akron, 970-554-0645
Progressive Farms, Byers 720-244-6775
Gary Rafert, Amherst 970-854-2607
Sand Creek, Inc., Sheridan Lake 719-729-3367
Wagers Seed, Woodrow 970-842-2022
Wickstrom, Inc., Orchard 970-656-3483
Randy Wilks, Burlington 719-346-7314

Thunder CL Seed Growers:

Cooksey Farms, Roggen 303-849-5214
Frank Fry, Grand Junction 970-858-7181
Johnston Family Farms, Erie 303-591-8830
Ryan Weaver, Burlington 719-346-7779

2. Join the Program
After you talk to your local seed grower, they will help you finalize all the necessary contracts to join the program, including:
• Grain Pricing Schedule with ConAgra Mills detailing the contract terms.
• Wheat Seed Agreement with CWRF that requires the planting of certified seed and the delivery of all production to designated delivery points, listed below.
• Clearfield® Wheat Stewardship Grower Agreement with BASF (for Thunder CL).

3. Updated Program for 2013-14: Earn premiums of 50–85 cents/bushel

All Snowmass grown under the premium program is eligible for a minimum premium of 65 cents per bushel (more than double last year's minimum premium), regardless of protein levels. An additional bonus of 20 cents per bushel will be paid if the wheat has 13 percent protein or higher. You will also receive a $3 per bushel seed rebate (after harvest) on Snowmass.

All Thunder CL grown under the premium program is eligible for a minimum premium of 50 cents per bushel, regardless of protein levels. An additional bonus of 20 cents per bushel will be paid if the wheat has 13 percent protein or higher. No seed rebate will be available on Thunder CL.

Delivery Points
Wheat raised under the CWRF ConAgra Mills Ultragrain® Premium Program must be grown under contract and delivered to one of the following delivery points:

Colorado
Anton – Anton Coop
Amherst – Grainland Coop
Arriba – Flagler Coop
Bennett – Roggen Coop
Brush – Roggen Coop
Burlington – Stratton Equity Coop
Commerce City/Denver – ConAgra
Flagler – Flagler Coop
Fort Morgan - Wildcat Dairy
Genoa – Flagler Coop
Haxtun – Grainland Coop
Holyoke – Grainland Coop
Hugo – Flagler Coop
Nunn – Roggen Coop
Peetz – Peetz Coop
Pierce – Roggen Coop
Roggen – Roggen Coop
Springfield - Elkhart Coop
Stratton – Stratton Equity Coop
Wildcat Dairy – Roggen Coop

Nebraska
Lodgepole – Frenchman Valley Coop
Dix – Frenchman Valley Coop

Kansas
Coolidge – Scoular Co.
Colby – Cornerstone Ag

Additional delivery points pending

For more information about participating in the CWRF ConAgra Ultragrain® Premium Program for hard white wheat, contact the Colorado Wheat Research Foundation at (970) 449-6994 or visit www.plainsgold.com.

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