USDA ARS CEREAL RUST BULLETIN

Final Report for 2012
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Reports from this list as well as all Cereal Rust Bulletins are maintained on the CDL website (*http://www.ars.usda.gov/mwa/cdl*)

- Wheat stem rust was widely scattered across areas east of the Rockies and widespread in the Palouse region of eastern Washington and northern Idaho.
- Wheat leaf rust was widespread across areas east of the Rockies with significant development in some areas.
- Wheat stripe rust was extremely widespread from the west to east coasts and from Texas to Canada.
- *Thanks to those who contributed rust observations, collections, etc. in 2012!*

For the original, detailed reports from our cooperators and CDL staff, please visit the Cereal Rust Situation (CRS) reports page on the CDL website or click the CRS link found throughout the bulletin.

Even though this is the final bulletin for the season, as we all know "rust never sleeps". If not subscribed to the Cereal Rust Survey listserv list, please check our Cereal Rust Situation (CRS) reports page for the latest on the rust situation in the U.S.

Small grain development and maturity was generally 2-3 weeks ahead of normal east of the Rockies in 2012 due to a mild winter and warm early spring.

Wheat stem rust. Wheat stem rust was widely scattered across areas east of the Rockies from Kansas east to North Carolina and from central Mississippi north to North Dakota (see Wheat Stem Rust Observation Map) in 2012. Generally, the rust was found at low levels, arriving late in the growing season causing minimal economic loss. Wheat stem rust was also found in the Palouse region of eastern Washington and northern Idaho in mid-July and became widespread in early August.

Arkansas, Mississippi
Wheat stem rust was first reported in 2012 in a varietal trial nursery in northwestern Mississippi in late April. Low to high levels of rust were found on Armor ARX 1107 while some plants of Pioneer 26R20, in a plot adjacent to a major hot spot, were also infected. Trace levels of stem rust were found in plots near leaf senescence in east Arkansas in late May and caused no apparent economic loss.

North Carolina
Low levels of wheat stem rust were found on multiple cultivars at an extension field day at Aurora in eastern North Carolina on May 11. The wheat crop was maturing and there were no apparent economic losses due to stem rust. Wheat stem rust is not commonly found in North Carolina.

Kansas
A few pustules of wheat stem rust were found on one stem of a McNair 701 plant in plots at Hutchinson in south central Kansas on May 16. The wheat was at milk to dough stage. Trace levels of stem rust were found in Winterhawk plots at three locations (Harper, Barber, and Ellsworth Counties) in central Kansas in mid-May.

Illinois, Indiana, Ohio
Stem rust was found in only six fields and at low levels in Illinois, Indiana and Ohio in an early June survey loop from southeastern Minnesota to Missouri, Illinois, Indiana, Ohio to Wisconsin.

Michigan
Stem rust was found in a few counties (Saginaw, Allegan, Lenawee, Ingham) of central and southern Michigan just prior to crop senescence in late June.

New York
Low levels of stem rust were found scattered in plots of winter and spring wheat in Tompkins County in south central New York in early July, but it was not reported in any commercial fields in the state.

Dakotas, Minnesota
Stem rust was widely distributed, but at very low levels in north central and northeastern South Dakota and southeastern North Dakota in mid-July. Low levels of stem rust were found on Baart in plots in southeastern and east central North Dakota the third week of July. Many fields in this area were treated with fungicides thereby reducing the incidence of stem, leaf and stripe rust. Stem rust was also present at low levels in plots in west central and south central Minnesota.

Idaho, Washington
A few stem rust pustules were found in a field adjacent to a barberry bush (alternate host for wheat stem rust) in northern Idaho on July 12. Stem rust hot spots were found in spring wheat nurseries in southeastern Washington on July 16. Later in July stem rust was found in spring wheat plots and fields in a 60-mile loop surveyed north of Pullman in eastern Washington. Many of the infections likely occurred during showers in late June with additional infections from showers in mid-July. By the second week of August, stem rust became widespread in the Palouse region (Whitman County and the southern part of Spokane County in Washington and Latah County in Idaho) and was also found in Stevens County (north of Spokane).

To date, race QFCSC, the predominantly identified race in recent years, is the only race identified from 2012 collections in areas east of the Rockies except for one collection made in a McNair 701 plot at Hutchinson, Kansas that was identified as MCCDC. Race QFCSC was identified from stem rust collections received from Arkansas, Illinois, Indiana, Kansas, Minnesota, Mississippi, North Carolina, North Dakota, New York, Ohio, and South Dakota. Races GCCDC, GFCSB, and GFCNC were identified from several early collections from wheat in the Palouse region. A large number of samples are yet to be processed and additional races will likely be found from this region.

Wheat leaf rust. Wheat leaf rust was widespread in areas east of the Rockies and was also found in southeastern Washington in 2012. Areas most impacted include parts of Texas, Kansas, Nebraska, Arkansas and eastern North Carolina and Virginia.

Texas – Significant rainfall and warm temperatures in March promoted wheat growth in most of the state with the exception of parts of the High Plains that were still dry in early spring. Leaf rust developed in the lower canopies of spreader rows at Castroville in south Texas by March 1 and by mid-March the rust had increased rapidly with severities of 60S-80S. By late March Jagger (*Lr17*) and Jagalene (*Lr24*) were rated at nearly 100S while TAM 112 *(Lr39/41*) was at 20S and TAM 111 *(Lr39/41*) had trace level of infection. At College Station in southeastern Texas leaf rust increased rapidly in plots by March 7 and in late March flag leaves of some lines had severities of 100S (TAM 110, TAM 112, Jagger and Jagalene). Low levels of leaf rust were found in plots in Uvalde in South Texas in early March. Spring wheat plots in the Rio Grande Valley in southern Texas had severe leaf rust on March 23. The highly susceptible cultivar Morocco was prematurely killed by leaf rust.

Leaf rust was not found in plots at Commerce in northeastern Texas on March 13, but by early April it could be found on the lower leaves of Jackpot (*Lr39/41*). Leaf rust levels were low in northeastern Texas fields the second week of April. Growth stages ranged from flowering to grain filling. Leaf rust infections remained at low levels in the area with the notable exception of the cultivar Jackpot that had significant wheat leaf rust infections.

Leaf rust was widespread and increasing in central and north central Texas the third week of April. Moderate to heavy infections were found throughout the area. Wheat in central Texas ranged from soft to hard dough while wheat in north central Texas it ranged from milk to soft dough. Many fields in central Texas were sprayed with fungicides.

Oklahoma – Scattered leaf rust pustules were found in Jackson County in southwestern Oklahoma in early March, this was the only report of wheat leaf rust in the state through late March. Leaf rust was found at very low incidence in southwestern to central Oklahoma in early April. Some plots at Stillwater in north central Oklahoma had leaf rust incidences of 40-65% in the second week of April. By April 21, leaf rust had increased slightly in fields around Stillwater, but was scarce in most fields. However, some fields of Jagger, at kernel forming growth stage, had severities as high as 80-90S. By the third week of April leaf rust was increasing in the south central part of the state. Most wheat in central, southern, southwestern and western Oklahoma had lost their leaves by May 4.

Kansas – Low levels of leaf rust were found on the cultivar 2137 in plots near Manhattan in northeastern Kansas on March 29. The rust was found in mid-canopy and the wheat was at flag leaf emergence stage. In early April, low levels of leaf rust were reported in south central and central areas of the state. The wheat ranged from flag leaf emergence to heading, approximately 2-3 weeks ahead of normal crop development. Leaf rust severities in the state increased significantly the last two weeks of April. Leaf rust was near 100% incidence and 10-15% severity on flag leaves in plots (watery ripe stage) of known susceptible cultivars at Hutchinson in south central Kansas in early May. By the second week of May, leaf rust was impacting wheat in many south central counties. Plots in south central Kansas had leaf rust severities greater than 40%. Cultivars with high levels of leaf rust included Overley (*Lr39/41*), Jagalene, Jagger, Fuller (*Lr17,Lr39/41*) and PostRock (*Lr39/41*). Fuller and PostRock are still grown on significant acreage in the state. By May 17, the cultivars Jagger, Jagalene, Overley, TAM110 (*Lr37*) and others were at 100S in the nursery in south central Kansas. Fields in eastern Kansas had leaf rust severity of trace to 20% and higher the third week of May. Leaf rust was most severe in central and northern Kansas.

Nebraska – Rust was not found in an April 5 survey of the southern tier of counties in the state. Wheat ranged from jointing to flag leaf emergence in the surveyed area. Trace severities of wheat leaf rust found in plots at Lincoln in southeastern Nebraska in early May increased to 5% to 30% severity by May 17.Many lines had both leaf and stripe rust on the flag leaves. Leaf rust was found in plots at Mead in southeastern Nebraska on May 15 and in fields in Clay County in south central Nebraska by May 18. By the last week of May leaf rust was widespread in southeastern Nebraska with low to moderate incidence and severities up to 60% on susceptible cultivars in field trial plots. Wheat in southeastern and south central Nebraska was at soft dough stage. Leaf rust on triticale ranged from trace to 50% in plots at Mead. Trace levels of wheat leaf rust were found in trial fields at North Platte in south central Nebraska. The wheat was at milky to soft dough stage.

Louisiana – Leaf rust was found at low severity and incidence in two plots at the Ben Hur Farm in Baton Rouge in southeastern Louisiana in early February, however, most of plots were rust free**.** By early March leaf rust was severe on susceptible entries in the plots.

Mississippi – Leaf rust was found in two fields in Noxubee County in eastern Mississippi in late February. The rust was found on volunteer plants in one field and at low levels in the other field. By early April leaf rust had been found throughout much of the state. Fungicides were applied to fields with susceptible cultivars. Leaf rust was still active in parts of the Delta in late April, however, telia were forming on wheat at most locations.

Arkansas **–** Wheat leaf rust was first reported in the state in plots at Fayetteville in northwestern Arkansas where a trace of leaf rust found on March 14. Traces of wheat leaf rust were found scattered about in a few areas of the state by late March. By April 13 leaf rust was widespread in the state. Timely rains in southeastern Arkansas created favorable conditions for leaf rust and rust severity increased to damaging levels on susceptible cultivars. Other areas of the state received little or no rain during April and May and leaf rust arrived just before senescence and caused little damage. Dry conditions and/or freeze damage likely accelerated maturity.

Missouri **–** Leaf rust was observed at trace to 10% severities and at higher severities in small hotspots in the state the third week in May. Generally, there were very low levels of wheat leaf rust in the state in 2012.

Georgia **–** Leaf rust was observed in commercial fields in central and southern Georgia in 2012. The incidence was localized to a few counties, but severity was high in a few fields in central and extreme southern Georgia. Leaf rust was found on susceptible cultivars and lines in plots in south, west central and northwestern Georgia in 2012. Due to the unusual weather patterns stripe and leaf rust were active at the same time in the state, normally stripe rust is active early followed by leaf rust.

North Carolina **–** Low levels of leaf rust were found in plots at Plymouth in eastern North Carolina on March 23. Leaf rust was widespread throughout the Coastal Plain and Tidewater areas by April 13. Low levels were present and starting to increase in Rowan County in central North Carolina. By the first week of May wheat leaf rust was widespread in eastern North Carolina. Susceptible lines in plots had 100% severity and resistant lines had intermediate to low infection levels. Wheat leaf rust developed to high levels in all regions of the state with exception of the Piedmont. Despite the widespread use of fungicides there was an estimated 5% yield loss statewide in 2012. Some cultivars that are normally highly resistant had heavy levels of leaf rust in some areas.

South Carolina **–** Wheat leaf rust (20% incidence) was found on USG 3209 in Barnwell County in southern South Carolina and a sample from Horry County in eastern South Carolina on April 6.

Illinois **–** Leaf rust was at low severity on several cultivars in plots in Fayette County in south central Illinois the second week of May. Low to moderate levels of wheat leaf rust were found in west central Illinois in early June.

Indiana **–** Leaf rust was observed at low incidence and severity in several fields in Gibson County in southern Indiana the second week of April. By early June, leaf rust had been reported across the state with 50% severities on susceptible cultivars not treated with fungicides in some areas. Leaf rust development progressed in northern Indiana, but was not severe. Winter wheat suffered from drought stress and frost damage early and many fields were replanted to corn or soybean.

Virginia **–** Susceptible lines were heavily infected with leaf rust in plots at Warsaw in eastern Virginia in late April. The infection was mostly on lower leaves and had not spread much, likely due to the very dry conditions in April. Very little leaf rust was found in plots at Blacksburg in western Virginia. In the second week of May, leaf rust was at low levels, but widespread at Blackstone (Piedmont area) and Holland (Tidewater are) in southeastern. High levels of leaf rust infections were found at Painter on the Eastern Shore area of the state.

Maryland **–** Leaf rust may have overwintered in the state as pustules were found on susceptible cultivars in February, but remained at low levels until late April. In May, leaf rust developed rapidly with premature senescence of flag leaves of susceptible cultivars in a research plot by late May. Wheat matured rapidly in 2012.

Minnesota – Trace levels of leaf rust were found on lower leaves in winter wheat plots (boot to heading stage) at St. Paul and in spring wheat spreader rows in plots at Rosemount in southeastern Minnesota the fourth week of May.

Plants of the cultivar Morocco had high incidence of leaf rust infections at St. Paul on June 5. Leaf rust was found at low incidence in a spring wheat field near Barrett in west central Minnesota in early June. By late June, low levels of leaf rust were found in areas in the southern Red River Valley. Leaf rust was found at lower incidences, but one field had 30% severity, in Norman County in northwestern Minnesota. Leaf rust was also observed at low levels in plots in southeastern Minnesota. In mid-July, low to moderate levels of leaf rust were found in resistant plots in west central Minnesota. Plots of Faller (*Lr21*) had leaf rust severity of 30S while susceptible cultivars had severities of 50-60S. Wheat leaf rust had generally increased in the state with high incidences and severity reported in Otter Tail County in west central Minnesota.

Wisconsin – Trace levels of wheat leaf rust were found in a few fields in northeastern Wisconsin in late June. Conditions were very dry in the area.

North Dakota – The first confirmed observations of wheat leaf rust in the state were on June 18 in Cass and Slope Counties in eastern and southwestern North Dakota, respectively. The leaf rust was at trace levels in both locations. In mid-July, low levels of wheat leaf rust were found in fields and plots in southeastern areas of the state. Baart had 60S leaf rust severity in plots at Casselton in southeastern North Dakota. Leaf rust was prevalent across drill strips in plots at Carrington in central North Dakota; Baart had 60S leaf rust severity. No leaf rust was found on Faller, Prosper or RB07 while the newly released cultivar Elgin was 30MRMS. Low levels of leaf rust were found on winter wheat and trace levels on spring wheat at Minot in north central area of the state. At Langdon in northeastern North Dakota, leaf rust was mostly found on winter wheat lines. Leaf rust was scattered in the research plots with 10-30% severities. Seed increase plots of Prosper had 20-30 MS reactions in areas not fungicide treated. Leaf rust was not found in cultivar drill strips.

Michigan – Leaf rust appeared in fields in west central Michigan by May 23**.** Most wheat in central Michigan was in heading to early flower stages. Generally, leaf rust appeared late in the season and impacted the most susceptible cultivars to a limited extent.

Ohio – Leaf rust generally appeared in the state after anthesis in most areas in late May. Low to moderate levels of wheat leaf rust were found in northwestern Ohio in early June.

New York – Leaf rust at low severity and incidence was found in fields in Orleans County in northwestern New York and in plots in Tompkins County in south central New York in late May. In early July, leaf rust was found at low levels in spring wheat plots in Tompkins County in south central New York. Leaf rust generally developed near crop maturity and had no impact on winter wheat yield.

Manitoba, Canada – Leaf rust was observed in winter wheat plots at Carman in south central Manitoba in late July, lower leaves of some plants showed heavy infection.

Wheat leaf rust races identified to date from 2012 collections.

Virulence code	Virulences	No. of isolates
MBDSD	1,3,17,B,10,14,39/41	3
MBTNB	1,3,,3ka,11,17,30,B,14a	3
MCDSB	1,3,26,17,B,10,14a	3
MCDSD	1,3,26,17,B,10,14a,39/41	2
MCNSB	1,3,26,3ka,17,B,10,14a	1
MCRJG	1,3,26,3ka,11,30,10,14a,28	1
MCTNB	1,3,26,3ka,11,17,30,B,14a	4
MDNSB	1,3,24,3ka,17,B,10,14a	2
MFBSB	1,3,24,26,B,10,14a	1
MFDSB	1,3,24,26,17,B,10,14a	4
MFNSB	1,3,24,26,3ka,17,B,10,14a	2
MFPSB	1,3,24,26,3ka,17,30,B,10,14a	3
MLDSD	1,3,9,17,B,10,14a,39/41	7
MMPSD	1,3,9,26,3ka,17,30,39/41	1
PCDQG	1,2c,3,26,17,B,10,28	1
TBBGJ	1,2a,2c,3,10, 28,39/41	6
TBBQJ	1,2a,2c,3,B,10,28,39/41	1
TBRKG	1,2a,2c,3,3ka,11,30,10,14a,18,28	3
TCGJG	1,2a,2c,3,26,11,10,14a,28	1
TCRKG	1,2a,2c,3,26,3ka,11,30,10,14a,18,28	5
TDBGJ	1,2a,2c,3,24,10,28,39/41	1
TFGJG	1,2a,2c,3,24,26,11,10,14a,28	1
TFPSB	1,2a,2c,3,24,26,3ka,17,30,B,10,14a	1
TNBGJ	1,2a,2c,3,9,24,10,28,39/41	12
TNBJJ	1,2a,2c,3,9,24,10,14a,28,39/41	5
TPBGD	1,2a,2c,3,9,24,26,10,39/41	1
TPBGJ	1,2a,2c,3,9,24,26,10,28,39/41	3
TPBQJ	1,2a,2c,3,9,24,26,B,10,28,39/41	1
Total		79

Wheat leaf rust map. *Please visit:* (http://www.ars.usda.gov/Main/docs.htm?docid=9757).

Wheat cultivar *Lr* gene postulation database. *Please visit*: Leaf rust resistance gene postulation in current U.S. wheat cultivars.

Wheat stripe rust. In 2012, stripe rust was very widely distributed in the U.S. much as it was in 2010, reaching from the west coast to the east coast and from Texas to North Dakota. Stripe rust damage in the south central U.S. was less than in 2010 due to the warm weather in March which induced adult-plant resistance (mostly temperature sensitive) while in 2010 wet and cool conditions prevailed.

Texas – An isolated stripe rust hot spot was found in a plot of Cedar at College Station on March 1. By March 24 the stripe rust hot spot had dried up and no other stripe rust was found in the nursery. A stripe rust hot spot was found in a Uvalde nursery on March 6.

Some plots of the susceptible cultivar Patton at Commerce in northeastern Texas were heavily infected with stripe rust in early March. By late March, stripe rust was widespread on Patton, but at low levels on most cultivars in the plots. Cultivar USG 3295, which previously showed good resistance in the field, had heavy stripe rust infection in some fields in northeastern Texas in early April. Perhaps this reflects a race change in the area.

Stripe rust severities ranged from 30S-70S on the Patton borders at McGregor in central Texas on March 19. TAM 111 had the highest plot reading at 40S while Jagger and Jagalene had trace severities. Stripe rust continued to develop and spread in plots at McGregor in late March. The rust had moved to the upper canopies of two cultivars (TAM 111 and Garrison) that were resistant in 2010. Stripe rust was active in central Texas the third week of April, but development slowed while leaf rust rapidly increased. In north central Texas both stripe and leaf rust were active and increasing.

Oklahoma **–** Stripe rust was reported across southwestern, central and west central Oklahoma, but less frequently reported across north central and northwestern Oklahoma in late March. The rust was widely scattered throughout southwestern Oklahoma in early April, however, at no spot surveyed was it heavy or widespread. The hot temperatures two weeks prior halted stripe rust development, but with the cool wet weather the previous week pustules once again sporulated. Stripe rust could still be found around Stillwater in north central Oklahoma in late April, but development has mostly ceased. In south central Oklahoma stripe rust was active and increasing the third week of April. In southwestern Oklahoma, where some plants still had leaves on April 28, leaf rust was the most prevalent disease, but some stripe rust could also be found. Most wheat in central, southern, southwestern and western Oklahoma had lost their leaves by May 4.

Kansas **–** Stripe rust was found at trace levels in plots at Manhattan in northeastern Kansas on March 29**.** Low levels of stripe rust were reported in south central and central Kansas by early April. The wheat in these areas ranges from flag leaf emergence to heading, approximately 2-3 weeks ahead of normal crop development. Stripe rust increased in south central and central Kansas throughout April and was most severe on cultivars previously thought to be resistant, suggesting a race change in the Great Plains (see CRS). Stripe rust was the primary wheat disease in the state by late April. By the first week of May, stripe rust development had slowed in south central and central Kansas. In north central and northwestern Kansas, where it was slightly cooler, stripe rust was still active the second week of May. Stripe rust was generally inactive in fields and plots in southern and central Kansas by the fourth week of May, though some late sporulation was usually found at trace levels.

Nebraska **–** Stripe rust was widespread in fields in southeastern and south central Nebraska in mid-April. Severities from trace to 70% or higher were found on lower leaves in hot spots in the southern-most counties. Trace severities were found in the south central counties surveyed where incidences ranged from trace to 50%. Most fields were at Feekes 8-9 stage while a few fields were at Feekes 10. Conditions the previous week or so were very conducive for stripe rust development (cool and moist). Low levels of stripe rust were found in plots at Mead and Lincoln in southeastern Nebraska on April 24. The wheat ranged from flag leaf emerged to full heading in the plots. Stripe rust was generally at low incidence and severity throughout fields in south central and southwestern Nebraska on May 3. A few hot spots with high severities were found in some fields. Most fields were at full heading or flowering while a few fields were in boot stage. Trace to low levels of stripe rust were found in fields in the southern Nebraska Panhandle on May 4-5. Traces were found in the central Panhandle while the northern Panhandle was free of stripe rust. Stripe rust was the predominant foliar disease in plots at Lincoln in southeastern Nebraska on May 17. Many leaves, however, had both wheat stripe rust and wheat leaf rust. Wheat was mostly in dough stages of development. Stripe rust development had slowed with the recent dry, warm weather. Stripe rust was found at Alliance and Sidney in the northern and southern Panhandle, respectively on May 23. Infections at North Platte in west central Nebraska were severe on May 24. By this time stripe rust had now been found in all wheat growing areas of the state. Stripe rust was prevalent (along with leaf rust) in southeastern Nebraska the last week in May with severities up to 60% on susceptible

cultivars in trial fields in Saunders, Lancaster and Saline counties. By early June, stripe rust development had slowed and telia were forming on wheat in fields in south central Nebraska.

Colorado **–** Stripe was found at low levels in Phillips County in eastern Colorado in early May.

Louisiana **–** A few reports of stripe rust were noted in commercial fields in early March, but stripe rust was not a major disease in the state in 2012.

Mississippi **–** Stripe rust was found on a few plants in winter wheat fields in Bolivar County in northwestern Mississippi in late January. This is likely the earliest report of stripe rust in the state ever. By late February, large hot spots (20-60 sq feet) were found in many fields in northwestern Mississippi. Stripe rust was found in 18 counties in the state by early April. Fungicides were applied to most fields containing susceptible cultivars. Wheat in the state was three weeks ahead of normal development. Stripe rust was still active and rapidly developing in areas of state the second week of April. Rain and cool weather continued through the third week of April. Stripe rust was still active throughout parts of the Delta in late April, however, at most locations telia had formed.

Arkansas **–** Stripe rust was first found in a wheat field in Cross County in northeastern Arkansas on January 20, two months earlier than the previous state record. By March 1, stripe was confirmed in 9 counties in east central Arkansas and by March 8 it was reported in 17 counties in the eastern part of the state. The infections ranged from individually infected leaves to large hot spots. The initial infections likely occurred in the fall and the mild winter allowed the infections to increase and spread. Most cultivars grown are susceptible in the early growth stage and hot spots developed in these cultivars. These cultivars were rated resistant at later growth stages due to adult plant resistance. Generally, fields with hot spots were sprayed with fungicides and that in combination with warm, dry weather and adult plant resistance stopped the stripe rust development before much damage was done.

Tennessee – Stripe rust appeared in several fields in western Tennessee and was increasing by late March. Wheat ranged from boot to heading stage.

Kentucky **–** Traces of stripe rust were found in the state in late March, but warm temperatures appeared to keep development in check**.**

Georgia **–** Stripe rust was first reported in a field in Taylor County in east central Georgia in mid April. Stripe rust was observed in commercial fields in a few counties in central and southern Georgia in 2012. High severities occurred in a few fields in central and extreme southern Georgia. Stripe rust was observed in susceptible borders and commercial cultivars in research stations in southern Georgia (Plains), west central Georgia (Griffin) and northwestern Georgia (Calhoun). Due to the unusual weather patterns stripe and leaf rust were active at the same time in the state, normally stripe rust is active early followed by leaf rust.

North Carolina **–** Wheat stripe was first observed in Robeson County in south central North Carolina in early April. In mid-April, stripe rust was widely observed on susceptible cultivars in the Coastal Plain. Stripe rust developed rapidly in fields in Greene County in east central North Carolina by April 20. Fungicides were applied in the Coast Plain due to the early and widespread stripe rust.

Virginia **–** Isolated foci of stripe rust were found in plots at Mt Holly and at Warsaw in eastern Virginia in late April and early May, respectively. In the second week of May isolated stripe rust infection foci were found in plots at Blackstone and Painter in southeastern Virginia and Eastern Shore, respectively.

Delaware **–** Stripe rust was found scattered in a few fields in Kent Count in central Delaware in early May.

Maryland **–** Stripe rust was first found in Maryland the week of May 7. It was observed to the east as well as to the west of the Chesapeake Bay. Conditions in May were more favorable for leaf rust development and the stripe rust developed on and off during May rapidly producing telia. Stripe rust appeared to have caused minimal damage in the state.

Illinois **–** Stripe rust was observed across several counties in southern Illinois on April 19. Wheat in the southern counties ranged from the onset of heading to flowering. By May 10, stripe rust was reported across the southern two thirds of the state. Depending on the cultivar, stripe rust severities ranged from 0 to 75% on flag leaves.

Indiana **–** Stripe rust was observed at low incidence and severity in a field in Gibson County in southern Indiana the second week of April. Stripe rust was severe in fields in west central Indiana in late May with the worst stripe rust seen in the area in more than thirty years. By early June, stripe rust was reported across the state and was most prevalent in southern and west central Indiana, but was observed at low incidence and severity in northern Indiana.

Missouri **–** Stripe rust was inactive in fields in southern and central Missouri in late May, though some late sporulation was usually found at trace levels. Stripe rust appeared to have been very severe before becoming inactive in many fields. Unsprayed variety plots at Novelty, in northeastern Missouri, displayed over 60% severities on a few unknown lines. Overall, stripe rust severities were low to moderate (5-20%) in the yield trial nursery.

South Dakota **–** Wheat stripe rust was found on the cultivars McGill, Robidoux, Jagalene and Smoky Hill in plots in Tripp County in south central South Dakota on May 23 and was also found in Lyman County (fields) and Hughes County (plots) in south central South Dakota and Pennington County (fields) in southwestern South Dakota by May 24. Small stripe rust lesions were appearing on the penultimate leaves of the winter wheat cultivar Wesley in plots at Volga in Brookings County in east central South Dakota on May 30. Wesley was at Feekes 10.5 stage. Traces of stripe rust were found in a field (early milk stage) in Bon Homme County in southeastern South Dakota in early June. Traces of old stripe rust infections were found in some fields in southeastern South Dakota the second week of July, it appeared most fields were earlier sprayed with fungicides.

North Dakota **–** Stripe rust was found in a field of the cultivar Mayville west of Grand Forks in east central North Dakota the fourth week of May. By late June, stripe rust had been reported across the state both in winter and spring wheat cultivars. In some winter wheat fields stripe rust was severe, e.g. on Ideal in Cass County (east central); Jerry in Cavalier County (northeast) and Matlock in McHenry County (central). Stripe rust developed on spring wheat in the northern counties where conditions were more favorable (cool, more moisture, heavy dews). Spring cultivars affected included Faller, Prosper, Vantage and RB07; trace levels were found on Velva and Rollag. Fungicides were applied in areas of the state that had received substantial rain. Stripe rust development in the southern part of the state had slowed by late June due to warmer and drier conditions, however, traces of active stripe rust were still found in two fields in southeastern North Dakota the second week of July.

Minnesota **–** Traces of wheat stripe rust were found on winter wheat at late boot to heading stage in plots at St. Paul, on May 21. Stripe rust was found at low incidence and severity in fields in Lyon County in southwestern Minnesota the fourth week of May. Trace amounts of stripe rust were found in spring wheat spreader rows in plots at Rosemount in southeastern Minnesota on May 25. Recent rains and cool weather were conducive for stripe rust development. By early June, stripe rust was common in southern Minnesota with nearly 100% incidence found on the spring wheat cultivar Faller; in some fields the severity approached 10%. By late June, stripe rust had been found at varying levels throughout the state, the highest incidence (75%) was found in a field in west central Minnesota. The cultivar Faller is one of the most impacted cultivars in the state, but stripe rust has also been found on Vantage. Stripe rust was still prevalent across the state the second week of July, but development had slowed considerably by the third week of July due to high temperatures.

Wisconsin – Low levels of stripe rust were found on flag leaves in a winter wheat field in Dodge County in southeastern Wisconsin on May 18. No rust was found in 14 other wheat fields scouted. In mid-May, stripe rust was observed in northeastern Wisconsin fields, but stripe rust development in the area stopped due to the dry conditions. In early June, high levels of stripe rust were found in a field in Iowa County in southwestern Wisconsin.

Michigan – Stripe rust appeared in central Michigan fields by May 24. Stripe rust was widespread in Michigan, found in all counties where significant amounts of wheat are grown. Differences in cultivar response were evident.

Ohio – Stripe rust was found in areas in Ohio, but was not widespread in all fields and on all cultivars. This was, however, the most stripe rust seen in the state in many years. The cultivar Malabar, as well as several lines in the scab nursery at Wooster in east central Ohio, was heavily infected. Fields of Malabar in the Sandusky area in north central Ohio were impacted by stripe rust, however, some of the fields were sprayed with fungicides. After an early warm spring the weather cooled for several weeks and stripe rust rapidly developed and it continued to develop even as temperatures warmed in late May. The winter wheat crop was about 2-3 weeks ahead of normal.

Washington – No stripe rust was found in a survey of fields in Whitman, Columbia, Walla Walla, Benton, and Franklin counties in southeastern Washington in early March. In northwestern Washington, stripe rust developed to 100% prevalence and 60% severity on susceptible entries in experimental nurseries by the end of March as is often the case in the area. Stripe rust appeared in eastern Washington in late April, but was still difficult to find.

Stripe rust developed to significant levels in south central, central and eastern Washington and northern Idaho by early June. Commercial fields in Adams County in eastern Washington had severities up to 40% with 20% incidence. Stripe rust was difficult to find in commercial fields in the Palouse region except for some fields in Whitman County where 10% incidence and severities were observed. Hot spots were found in a nursery in Whitman County and based on the stripe rust development the rust had overwintered. Stripe rust reached 100% severity on susceptible winter wheat entries in plots near Walla Walla and Pullman in southeastern Washington by late June. Stripe rust reached 50% severity in the Walla Walla spring wheat plots and 30% in the Pullman spring wheat plots. Despite the heavy disease pressure low levels of stripe rust were found in commercial spring and winter wheat fields in the area due to cultivar resistance and fungicide applications.

Oregon – In western Oregon, stripe rust was observed in a couple of lines in a breeding nursery near Corvallis in the first week of April. Stripe rust continued to develop in the nursery and was heavy on fall-planted susceptible cultivars, however, previously resistant cultivars continued to be resistant. Stripe rust was found in northeastern Oregon in late April, but was difficult to find.

California **–** Wheat stripe rust was found throughout the Central Valley by early May. By May 23, stripe rust increased in distribution, incidence and severity. Stripe rust was most severe in plots in the Sacramento/San Joaquin Delta (site west of Stockton) and the UC Davis Agronomy Farm and later in the growing season, in Fresno and King counties in the San Joaquin Valley. Among the cultivars grown on significant acreage in California, Joaquin was most severely affected. Other cultivars with severe stripe rust included Anza, Mika, Joaquin, Redwing, Cristallo and several advanced breeding lines (see CRS). Among previously resistant cultivars, Redwing showed moderately severe levels of stripe rust at the widely separated locations of the Sacramento/San Joaquin Delta site and the Kings county site (Corcoran). Also, for the first time, infection (though only of moderate severity) was detected on the variety Blanca Fuerte.

Idaho – No overwintering stripe rust was found in plots at Aberdeen in southeastern Idaho when checked in early April. By late May there had been no reports of stripe rust from southeastern to western Idaho. Stripe rust was found

in three fields of the winter wheat cultivar Brundage in the Magic Valley in south central Idaho in early June. The upper leaves were infected indicating the infection occurred this spring and was not an overwintered infection. The fields were sprayed with fungicide. Winter wheat in the area was in heading to flowering stage. Low levels of stripe rust were found in plots at Parma in southwestern Idaho. In early June, low levels of stripe rust were found on susceptible cultivars in plots at the Parker Farm and in one commercial field in Latah County in northwestern Idaho. Low levels of stripe rust were found in winter and spring wheat in southeastern Idaho in early July.

Montana – Stripe rust was found in winter wheat nurseries in Kalispell in northwestern Montana on May 10. The disease levels were low and not progressing rapidly. Stripe rust developed and spread quickly resulting in a severe outbreak in areas south of Richland in Valley County in northeastern Montana in late June. The winter wheat cultivar Jerry was most severely impacted while Buteo had some lesions and Yellowstone was not yet affected. Stripe rust at Kalispell in northwestern Montana was still at low levels but developing in early June. Most wheat in the area was past heading. Low levels of stripe rust were found in Hardin in south central Montana on June 6.

Manitoba, Canada – Stripe rust was observed in winter wheat plots at Carman in south central Manitoba in late July. Lower leaves of some plants showed heavy infection. In late July, stripe rust was found on one spring wheat plant at low severity at Brandon in southwestern Manitoba.

Ontario, Canada – Stripe rust was found in a 100 acre commercial field of Pioneer 25R47 in the Chatham area (~ 50 miles east of Detroit) on May 22. The field incidence was 2-3% with severities ranging from 0 to 60%. The wheat ranged from Feekes 10.0 to 10.5. The stripe rust was only found on the flag leaves. There were issues with the Nitrogen application to the field resulting strips of high N and low N. Stripe rust was only found in the high N areas. Stripe rust was also found in another field 10 miles away.

Alberta, Canada – After a dry, warm winter spring rains rejuvenated the winter wheat crop. Rust was first found in a commercial field of Radiant (*Yr10*), the predominant winter wheat cultivar in most of Alberta, in mid-May at levels that warranted immediate fungicide application. A light stripe rust infection was found in a winter wheat field at Lethbridge in southern Alberta in late May. The winter wheat was at flag leaf stage. By the first week of July a large area of winter wheat in southern Alberta was showing stripe rust infections.

Wheat stripe rust races identified to date from 2012 collections.

To date, four stripe rust races have been identified. PSTv-37 with virulences to *Yr6*, *Yr7*, *Yr8*, *Yr9*, *Yr17*, *Yr27*, *Yr43*, *Yr44*, *YrTr1* and *YrExp2* and avirulences to *Yr1*, *Yr5*, *Yr10*, *Yr15*, *Yr24*, *Yr32*, *YrSP*, and *YrTye* was the most predominant race, detected in Arkansas, California, Kansas, Louisiana, Mississippi, Oklahoma, Texas and Washington. The second most frequent race was PSTv-14, virulent to *Yr1*, *Yr6*, *Yr7*, *Yr8*, *Yr9*, *Yr17*, *Yr27*, *Yr43*, *Yr44*, *YrTr1*, *YrExp2* and *YrTye*, but avirulent to *Yr5*, *Yr10*, *Yr15*, *Yr24*, *Yr32* and *YrSP*, detected in Arkansas, Texas and Washington. PSTv-11, different from PSTv-14 only by the avirulence to *YrTr1*, was detected in California, Kansas, Louisiana, Oregon, Texas and Washington. This was the first detection of PSTv-11 and PSTv-14 in states east of the Rockies. In addition, PSTv-34, differing from PSTv-37 only by its avirulence to *Yr43*, was detected in Arkansas.

Wheat stripe rust map. *Please visit:* (http://www.ars.usda.gov/Main/docs.htm?docid=9757).

Oat stem rust. Oat, in a seed mix windbreak in Rio Grande Valley in extreme southern Texas, had stem rust severities from trace to 80S on March 23. Moderate to severe oat stem rust was found on black oats (*Avena strigosa*) planted as a green manure crop. On March 24, oat stem rust was found on a few leaves and stems in plots at College Station in east central Texas.

Very low levels of oat stem rust were found widely scattered in north central and northeastern South Dakota and southeastern North Dakota the second week of July. As is typical, the stem rust arrived late in the growing season and the infection was found on the upper leaves. Moderate levels of oat stem rust were observed in plots in south central Minnesota the second week in July. Oat stem rust was severe in plots at St. Paul in southeastern Minnesota on July 19. Oat stem rust was found in an isolated field in Oneida County in central New York in mid-July. Oat stem rust was found in unknown oat plot and on *Avena fatua* in a nursery in southeastern Washington in early August.

Oat crown rust. Oat crown rust was found scattered throughout susceptible spreader rows in Baton Rouge in southeastern Louisiana on February 25. Most lines were just jointing. By March 7, the crown rust had spread rapidly in the nursery with 10% severity and 90% incidence in the spreader rows. Oat crown rust was found in multiple spots in borders of Nora in College Station Texas on March 7. In 2011, with persistent drought conditions, no crown rust was found in this nursery for the first time in 34 years. By late March, oat crown rust was increasing in the plots and on oat in road ditches. Oat, in a seed mix windbreak in Rio Grande Valley in extreme southern Texas, had crown rust severities from trace to 80S on March 23.

Buckthorn buds broke open on lower limbs of the buckthorn (alternate host for oat crown rust) hedges in the Matt Moore Buckthorn Plots at St. Paul, Minnesota on March 20. Small pycnia and aecia were found on the some of the small emerging new leaves on April 9. This is more than a month ahead of the average for pycnia and aecia appearance. Due to cooler temperatures in mid-April aecial development on the buckthorn slowed somewhat, however, significant infection was found and continued to develop on the bushes.

Oat crown rust was found in plots near Raleigh in central North Carolina in early April. By the first week of May, crown rust on oats was present at moderate to high levels in plots in eastern North Carolina resulting in significant losses in some Coastal Plain fields.

Low levels of crown rust were found in plots in Alabama in late April. Oat crown rust was found on oat planted as an alfalfa nurse crop in southern and central Kansas and southwestern Missouri in mid-May. In early July, oat crown rust with up to 50% severity was found in plots at Mead in southeastern Nebraska. Crown rust was found on oat in Renville County in south central Minnesota and in Oneida County in central New York in late June. Crown rust was prevalent on the oat cultivar Pennuda, however, little or no rust was found on other cultivars and lines in plots in south central New York in early July. Scattered crown rust was also reported in isolated fields in Oneida and Seneca Counties in central New York, but was not widespread in the state's spring oat crop.

Low levels of oat crown rust were found in fields in north central and northeastern South Dakota and southeastern North Dakota the second week of July. Oat crown rust was found at 100% incidence and 40-60% severity in several plots at Minot in north central North Dakota in early August. Moderate levels of oat crown rust were found on susceptible lines in plots in west central Minnesota in mid-July.

Barley stem rust. Low levels of barley stem rust were found in scattered spring barley plots in Tompkins County in south central New York on July 9. This was the first report of barley stem rust in 2012. In mid-July, barley stem rust was found in commercial spring barley fields in southeastern Washington. The rust was at 20-100% incidence and 1-10% severity. Barley stem rust was also found in fields of the spring barley Lenetah south of Spokane in east central Washington in late July. Rains in late June and mid-July were conducive for spore showers and rust increase. Some barley fields were sprayed with a fungicide to control stem rust in late July and early August. By the second week of August, stem rust could be found in all spring barley fields in the Palouse region (Whitman County and the southern part of Spokane County in Washington and Latah County in Idaho) and further north in Spokane and Stevens counties. Yield loss was estimated to be 3% on average and up to 10% in some barley fields. Spring barley in the Palouse region was generally planted later than normal. A late barley crop, in combination with excessive moisture during June and July and stem rust inoculum from winter wheat crop, might have contributed widespread infection on spring barley.

Barley leaf rust. Barley leaf rust was heavy on lower leaves in barley plots at Mount Holly in eastern Virginia on March 22, suggesting the rust overwintered in the nursery. High levels of barley leaf rust were found in plots in Blacksburg in west central Virginia in late April. The rust increased significantly and was at low to moderate levels in plots at Warsaw in eastern Virginia the first week of May. The second week of May, barley leaf rust was at low severity, but very widespread in plots at Blackstone and Holland in southeastern Virginia. At Painter on the Eastern Shore, heavy barley leaf rust infections were found in plots. Barley leaf rust was at low to moderate levels in plots in eastern North Carolina the first week of May. Typically, barley leaf rust is found in the eastern half of North Carolina every year. At plots in Raleigh and Kinston and in commercial fields in widely separated regions, barley leaf rust was prevalent causing an estimated 1% loss. Barley leaf rust at low severity and incidence was found in fields of Thoroughbred in southern Delaware in late March.

Barley leaf rust was severe on 2- and 6-rowed barley (at heading stage) used as a windbreak in the Rio Grande Valley in extreme southern Texas on March 23. The rust was found in a commercial field in Emanuel County in east central Georgia in mid-April. Barley leaf rust at moderate severities was found in a couple plots in Fresno County in the southern San Joaquin Valley and plots at UC Davis in California by early May. By late May, the rust had increased to moderate levels on some cultivars in the Central Valley. Barley leaf rust was found on volunteer barley growing on the side of the road in Cooper County in central Missouri in mid-May. Barley leaf rust was prevalent at low severities in plots at Mead in southeastern Nebraska in early June.

Barley leaf rust was found in a spring barley field (unknown cultivar) in northwestern Wisconsin the first week of July. The rust was distributed unevenly in the field, from trace amount in some areas to 90S in other areas. The crop was at the late boot to heading stage. Barley leaf rust was also found on experimental plots of barley planted in Minnesota, South Dakota, and New York.

Barley leaf rust was severe in susceptible winter barley plots in southern Ontario in early June, some plots showed good resistance.

Barley stripe rust. Barley stripe rust was at low severities in nurseries in the Sacramento and San Joaquin Valleys by late May. Barley stripe rust was also found in western Oregon and western Washington by late May. In late June, barley stripe rust was found on susceptible entries in plots near Walla Walla in southeastern Washington. No barley stripe rust was observed in commercial fields at the time. In mid-July, barley stripe rust developed to 40% severity on a couple of germplasm lines in experimental plots near Pullman in southeastern Washington. Stripe rust was very low in commercial barley fields through the second week of August in eastern Washington and northern Idaho.

Rye stem rust. Significant levels of rye stem rust were found in winter rye plots in south central New York the first week of July. Rye stem rust was found at one location in South Dakota the second week of July and at low levels in plots in west central Minnesota the second week of July.

Rye leaf rust. Rye leaf rust was found in Parke County in west central Indiana on June 6. This was the first report of rye leaf rust in 2012. Rye leaf rust was found in many areas of north central and eastern South Dakota and southeastern North Dakota and western Minnesota the second week of July. Severities ranged from 10-60% in areas not sprayed with fungicides.

Rust on barberry. Moderate aecial infection on common barberry (*Berberis vulgaris*) with mature aecia were observed in southeastern Minnesota and eastern and southeastern Wisconsin in late April to June. Results of inoculation experiments indicated the aecial infections were of rye stem rust (*Puccinia graminis* f. sp. *secalis*). Moderate to heavy aecial infection on *B. chinensis*, *B. koreana*, and Emerald Carousel (an interspecific hybrid between *B. koreana* and *B. thunbergii*) was observed in Chaska, Minnesota. This is likely due to infections by the stripe rust

pathogen (*Puccinia striiformis*) of Kentucky bluegrass (*Poa pratensis*). Pycnia were found on leaves of a barberry bush near Potlach in northern Idaho on May 14. The pycnia appeared about the same time as in 2011 which is about a week later than normal. In early June, abundant aecia were found on barberry plants near Potlatch in northern Idaho and near Colfax in eastern Washington. The aecia were identified as stem rust.

Thank you!

This is the final Cereal Rust Bulletin for 2012. We would particularly like to thank the following people for their timely observations, comments and collections. Without our cooperators' help, the bulletins and race surveys would simply not be possible.

Cooperator	State	Cooperator	State	Cooperator	State
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Our sincere apologies if by oversight we did not include someone in the list.