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Wheat rusts in the United States in 2008.

Wheat stem rust (*Puccinia graminis f. sp. tritici*). The first report of wheat stem rust in 2008 was from a plot of the susceptible soft wheat McNair 701 in South Texas at Castroville on 3 April. The pustules developed from spores that were likely rain deposited approximately a week earlier and the severity of the infections was low. On 9 April, wheat stem rust was found scattered throughout plots in south central Louisiana at Crowley. One soft wheat cultivar, CK 9553, had significant stem rust infection. Hot dry weather accelerated the crop to maturity in these plots.

On 22 April, low levels of wheat stem rust were found scattered throughout susceptible cultivars and experimental lines at Castroville in south Texas. On 24 April, low levels of wheat stem rust were found on the susceptible variety McNair 701 in plots at College Station in central Texas. On 28 April, traces of wheat stem rust were found in plots of McNair 701 and an unknown cultivar at Bardwell in central Texas. In late April, low levels of wheat stem rust were found in plots at Prosper in northern Texas. Traces of wheat stem rust were also found in a field near Abilene, Texas.

On 24 April, traces of stem rust were found at Baton Rouge, Louisiana. On 29 April, low levels of stem rust were found in plots at Quincy in the panhandle of Florida. In both cases, the wheat was near maturity and, therefore, rust did not increase much more.

The first wheat stem rust identifications of 2008 from Castroville, Texas, and Crowley, Louisiana, were identified as race QFCS. This race has been the most commonly identified race from U.S. collections in the past few years, and is avirulent to most of the winter and spring wheats in the U.S.

In mid May, low levels of stem rust were found on stems in plots of the cultivars Winmaster and Deliver at College Station, Texas. Uredinia were found on only 4–5 stems. In mid-May, low levels of stem rust were found in plots of McNair 701 at Stillwater, Oklahoma, and 40 miles west at Marshall. On 24 May, low levels of wheat stem rust were found in the susceptible McNair 701 plot at Lahoma in north-central Oklahoma. In late May, stem rust was severe in some wheat head-rows of a late planted nursery at Chillicothe in north Texas.

In late May, wheat stem rust was found in east-central and northeastern Arkansas. The disease developed too late to cause much damage, but these are the first reports of stem rust in Arkansas in the past 10 years.

On 8 May, low levels of stem rust were found in a wheat nursery at Blackville in south-central South Carolina. In late May, during harvest, wheat stem rust was found in a breeding nursery at Plains and in early June stem rust was found in a Pike County plot in west-central Georgia.

In summary, during the spring of 2008, low levels of stem rust were found in susceptible plots of soft and hard red winter wheat in the southern U.S. and in one field at Abilene, Texas.

On 10 June, a center of wheat stem rust infection was observed in a research plot at Owensboro in northwestern Kentucky. In early June, low levels of stem rust were found on the susceptible line Bezostaya at Hutchinson in south-central Kansas and on McNair 701 at Manhattan, Kansas. In mid-June, low levels of wheat stem rust were found in a plot at Lexington, Kentucky. In late June, high levels of wheat stem rust were found in varietal plots at Belleville in north-central Kansas. This was the most stem rust observed in these plots in the last 10 years. Also in late June, high levels of wheat stem rust were observed in the southern part of Nebraska in plots at Lincoln to low levels at North Platte and Sidney. In all cases, no wheat stem rust found on the commonly grown cultivars.

On 30 June, low levels of wheat stem rust were found in entries in the stripe rust winter wheat nursery at Brookings, South Dakota. The pustules had developed in the previous seven days. Pustules were primarily on the stems although some also were found on the leaves.

On 1 July, light levels of wheat stem rust were found on the leaves and stems of susceptible winter wheat cultivars (e.g., McNair 701) at the Rosemount, Minnesota nursery.

On 21 June, several infection sites of wheat stem rust were found in plots at Delphos in west-central Ohio.

In early July, low levels of stem rust were found in winter wheat plots at Lancaster in southwestern Wisconsin and Urbana, Illinois. On 10 July, low levels of wheat stem rust were found in a soft red winter wheat field and plots in Door County in northeastern Wisconsin.

High levels of wheat stem rust were found on flag leaves of susceptible spring wheats (e.g., Baart) in plots at Rosemount in southeastern Minnesota on 16 July. Wheat stem rust was also found on susceptible winter wheat, which had not reached maturity. During the week of 21 July, high levels of stem rust were found on the susceptible spring wheat cultivar Baart at Waseca, Lamberton, and Morris experiment stations in Minnesota.

During the second week in July, low levels of stem rust were detected on the winter wheat cultivar Radiant in a Ransom County plot in southeastern North Dakota and on a winter wheat line at the Waseca plots in south-central Minnesota. On 13 July, low levels of stem rust were found in plots of a rust-spreader mix (highly susceptible lines) at Groton and Redfield in northeastern South Dakota.

In summary, during the month of July, low levels of wheat stem rust were found in susceptible winter wheat and spring wheat plots from northeastern Wisconsin through Minnesota to northeastern South Dakota. Stem rust was not observed on any current wheat cultivars in research plots or in fields in this area.

In early August, trace levels of stem rust were found on susceptible spring wheats (Baart and Little Club) at Carrington in east-central North Dakota and at Crookston in northwestern Minnesota.

In early July, significant levels of wheat stem rust were found in a field of irrigated winter wheat in east central Colorado. In the second week of July, there were low levels of wheat stem rust in northeastern Colorado plots.

In early July, low levels of stem rust were found in winter wheat plots near Pullman, Washington. This was the only report of stem rust in the Palouse region of eastern Washington in 2008.

In 2008 there were more stem rust reports on susceptible cultivars in the northern winter wheat growing area than usual. The crop matured slower than normal, which allowed more stem rust than normal to develop.

The wheat stem rust observation maps are available on the CDL website (http://www.ars.usda.gov/SP2UserFiles/ad_hoc/36400500Cerealrustbulletins/2008wsr.pdf).

Stem rust race identifications. From collections made from the above locations race QFCS was identified as the predominant race. This is a common race that has been found in the U.S. the past several years. This race is relatively avirulent - the majority of the U.S. cultivars are resistant to QFCS.

Stem rust on barberry (Alternate host for stem rust). In early May, light pycnial infection were found on susceptible barberry (*Berberis vulgaris)* bushes growing in south central Wisconsin. The infection was lighter than in years past. In late May, severe aecial infection was found on susceptible barberry bushes growing in southeastern Minnesota. The infection was heavier than 2007.

Aecial collections from southeastern Minnesota and south-central Wisconsin were identified as rye stem rust, *P. graminis* f. sp. *secalis*. *P. graminis* f. sp. *tritici*, and *P. graminis* f. sp. *avenae* were not isolated from barberry samples**.**

Wheat leaf rust (*Puccinia triticina*). **Southern Plains – Texas**. In late February, low levels of leaf rust were reported in central Texas wheat plots. Moisture had been limited from late January to mid-March in western Texas. In mid-March, 30% leaf rust severities were found on the susceptible cultivars, Cutter (*Lr24* resistance), Jagger (*Lr17* resistance), Overley (*Lr41* resistance), and TAM 110 in the nursery at Castroville, Texas. During the fourth week in March in College Station plots, leaf rust severities ranged from 30% on TAM 110 to traces on Fuller (*Lr17*+*Lr41*).

In early April, susceptible cultivars TAM 110, Jagalene (*Lr24*), and Jagger (*Lr17*) in nurseries at Castroville and College Station, Texas, had 60% leaf rust severities on lower leaves. On the highly resistant cultivars Fannin and Endurance, no infections were found. In the first week in April, light to moderate levels of leaf rust were noted in fields in north central Texas. In early April, no rust was found in the Rolling Plains, Texas Panhandle, or North Texas High Plains fields (Fig. 1).

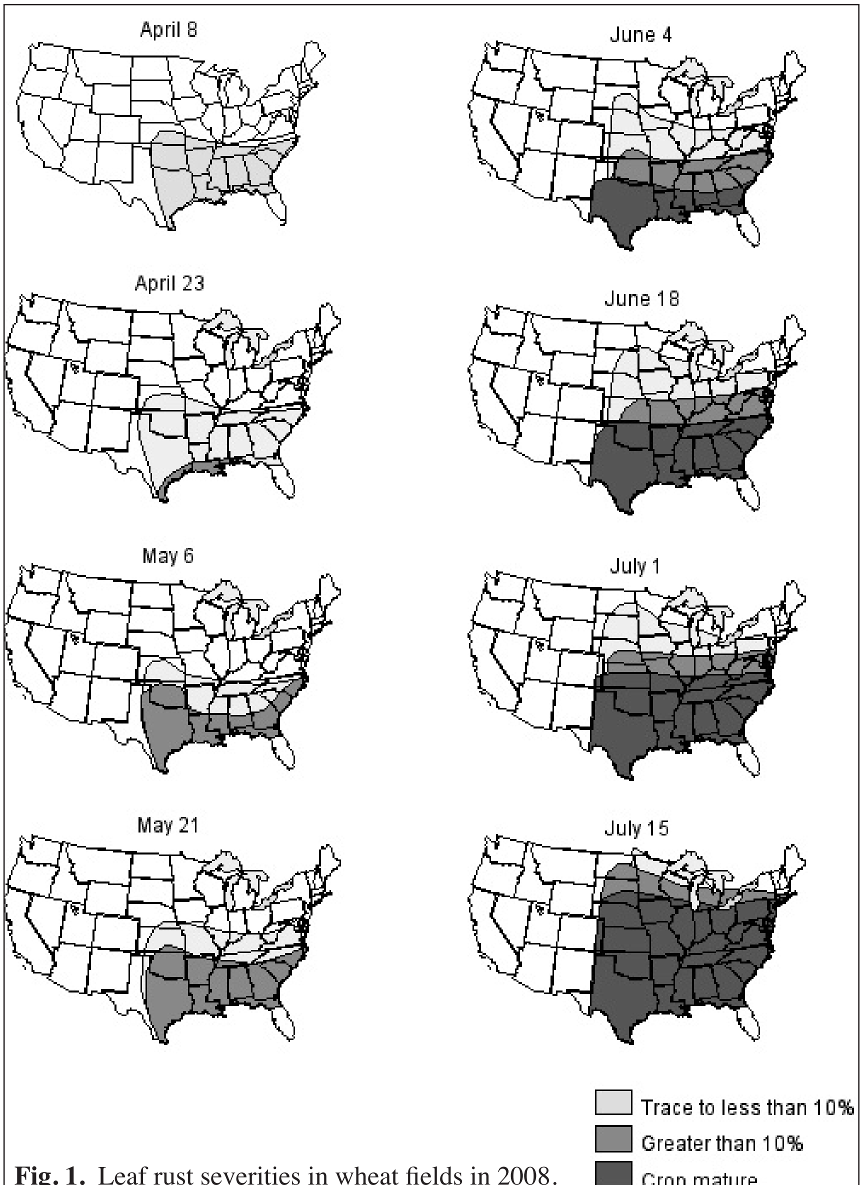

Fig. 1. Leaf rust severities in wheat fields in 2008.

By the third week of April, the susceptible cultivars TAM 110, Jagalene (*Lr24*), and Jagger (*Lr17*) had 60% leaf rust severities on flag leaves in nurseries at Castroville Texas. In northeastern Texas, leaf rust was beginning to appear on susceptible wheat varieties (Pio 25R78, Terral 8558, Coker 9553). Most of the fields received a foliar fungicide application. In 2008, leaf rust appeared much earlier than normal in this area. In late April, plots of susceptible wheat cultivars had leaf rust severities up to 80%, in central Texas.

In early May, fields of Jagger (*Lr17*) and Jagalene (*Lr24*) in northern Texas had severities up to 30% (Fig. 1), while the majority of the fields had traces of leaf rust.

Oklahoma. In mid-March, no leaf rust was found in the Stillwater, Oklahoma plots. In mid-April, scattered pustules of leaf rust were found on susceptible cultivars in central Oklahoma and the highest severity (10–20%) was found on the lowest leaves in plots at Minco. On 21 April, leaf rust was found in many fields in southwestern Oklahoma. The rust was visible on most of the lower leaves with flecking occurring on the upper leaves. In central Oklahoma, widely scattered pustules of leaf rust were found on lower yellowing/dying leaves.

In late April, leaf rust was observed on Jagalene and Jagger in commercial fields and cultivar evaluations in northern Oklahoma. By early May, leaf rust was increasing rapidly in plots near Stillwater and Lahoma, Oklahoma, with severity levels of 65% on flag leaves of Jagger and Jagalene.

During early May, wheat leaf rust was severe on susceptible varieties in plots, trials and fields in Oklahoma where conditions (moisture and temperature) have favored rust development. In 2008, 5% losses to leaf rust were reported in Oklahoma (Table 3, p. 225). In central Oklahoma, leaf rust was covering the flag leaves of unsprayed fields of Jagger. In western Oklahoma, the incidence and severity of rust decreased dramatically.

Central Plains – Kansas. In late February, leaf rust infections that had overwintered were found in plots at Manhattan, Kansas. In mid-March, traces of leaf rust were found in central Kansas fields. The leaf rust pustules were actively producing spores.

In early April, low levels of rust were found in a wheat field of Jagger in south-central Kansas. In fields near Manhattan, Kansas, leaf rust was increasing. Leaf rust was actively producing spores at both locations. The top three wheat cultivars in the state (Jagalene (*Lr24*), Overley (*Lr41*), and Jagger (*Lr17*)) are susceptible to leaf rust. Severe levels of rust were observed in south Texas plots of these three cultivars, which provided inoculum for wheat further north. The susceptibility of these cultivars, the apparent over wintering of leaf rust, and delay in crop maturity all increased the risk of severe disease in Kansas in 2008.

In early May, leaf rust was observed in additional counties from south-central Kansas to north-central Kansas. The highest rust severities were found on Jagger and Jagalene with traces levels on Overley (*Lr41*) and Fuller (*Lr17, Lr41*). The rust on Fuller was not completely unexpected because small hot spots of rust were found on Fuller the last two years.

In mid-May, wheat leaf rust was increasing in fields of susceptible cultivars (e.g. Jagger and Jagalene) throughout the state of Kansas. Many fields were sprayed with fungicide to control the rust.

In late May, high severity (60%) levels of wheat leaf rust were found in fields of Jagalene (*Lr24*), Jagger (*Lr17*), and Overley (*Lr41*) throughout north-central Oklahoma and southeastern and south-central Kansas (Fig. 1, p. 217). In some fields of susceptible cultivars there was a significant loss to leaf rust. In 2008, 4.7% losses where reported to leaf rust in Kansas (Table 3, p. 225). In varietal plots in south-central Kansas, leaf rust was light in the resistant cultivars Fuller, Santa Fe, and Duster. In north-central Kansas fields of Jagger, etc., leaf rust severities on flag leaves were much lower, but with continued favorable conditions for rust development, leaf rust increased throughout this area. Only trace levels of leaf rust were reported in western Kansas because of the drought-like conditions.

In mid-June, leaf rust was increasing in north-central and northwestern Kansas where environmental conditions were conducive for rust increase.

Central Plains – Nebraska. In mid-May, traces levels of leaf rust were found in south-central Nebraska fields in counties that border Kansas. During the fourth week in June, plots of susceptible winter wheat cultivars such as Jagalene in southern Nebraska had high levels of rust severities, whereas resistant cultivars had 0 to trace levels of infection on the upper leaves. In late June, high levels of wheat leaf rust were found in fields of susceptible cultivars in southern Nebraska. Throughout this area, fungicide usage on winter wheat was very common in 2008 with many fields receiving multiple applications.

Northern Plains – Minnesota, South Dakota, North Dakota, Montana. In late May, light levels of leaf rust were reported in a field of Jagalene at Reliance, in central South Dakota. In mid-June, low levels of leaf rust were found in the winter wheat nursery at Brookings in east-central South Dakota on older susceptible varieties (e.g., Scout 66). On 13 June, low levels of leaf rust were found in winter wheat plots at Lamberton in southwestern Minnesota and in spring wheat plots at St. Paul. Minnesota.

On 16 June, low levels of leaf rust were found in two spring wheat fields in Richland County in southeastern North Dakota. Scouts in North Dakota found wheat leaf rust in 11 of the 117 fields they surveyed the fourth week of June. Five of the fields with wheat leaf rust were winter wheat fields; the other six were spring wheat fields. The spring wheat fields were in east-central North Dakota and had severities of 1% or less; the winter wheat fields were in southeastern and south-central North Dakota and had severities as high as 25%.

In late June, high levels of wheat leaf rust were found in plots of susceptible winter wheat cultivars in east-central South Dakota and east-central Minnesota (e.g. Jagalene 60%). In late June, susceptible spring wheat cultivars had leaf rust severities of trace to 5% on lower leaves in southern Minnesota and southern South Dakota fields (Fig. 1).

During the second week in July, leaf rust was increasing in spring wheat fields and plots throughout southern Minnesota, eastern South Dakota and southeastern North Dakota. In susceptible winter wheat fields in southeastern North Dakota, average severities were close to 10%. Many of the wheat fields in the spring wheat region were treated with fungicide, which helped prevent losses due to leaf rust and FHB. High levels of wheat leaf rust were found on susceptible spring wheats at Rosemount, Minnesota, on 16 July.

Wheat leaf rust was widespread in 2008, but the rust was at lighter levels than 2007 in the northern plains on both spring and winter wheat. High amounts of rust inoculum arrived from the southern plains winter wheat region, but because the crop matured slower than normal the rust also developed at slower rate.

More leaf rust was expected since some of the northern spring wheat cultivars currently grown have less effective resistance to leaf rust than those commonly grown 10-15 years ago. Therefore, many of the wheat fields in the spring wheat region were treated with fungicide, which prevented losses due to leaf rust and FHB.

In early July, low levels of leaf rust were found in irrigated spring wheat plots near Billings in south central Montana.

Louisiana. In mid-February, leaf rust was increasing on susceptible varieties, McCormick (*Lr24* resistance) in Baton Rouge, Louisiana, plots. In early March, leaf rust was active and at significant levels in the Baton Rouge plots and growers were starting to apply fungicides in fields that were infected with leaf rust.

During the first week in April, wheat plots in south-central Louisiana had high levels of leaf rust on the lower leaves. In the plots at Baton Rouge leaf rust was moderately heavy on susceptible lines. In mid-April, leaf rust was increasing in plots and fields throughout southern and central Louisiana. In late April, plots of susceptible wheat cultivars had leaf rust severities up to 80%, in northern Louisiana.

Arkansas. In mid-March, low levels of leaf rust were found on susceptible cultivars in southeastern Arkansas fields. Rust was severe in susceptible cultivars in disease-management plots that were planted very early and were more mature than most of the wheat in the state.

In early April, leaf rust was heavy on the lower leaves of early-planted wheat fields (early October) and traces on late-planted fields (early November) and plots in central and southern Arkansas. In west-central Arkansas, 10% severity levels were reported on lines in a nursery.

A significant amount of leaf rust over wintered in southern Arkansas. Most of the commonly grown cultivars appear to have some resistance and by mid-April some fields had been sprayed with a fungicide. The leaf rust epidemic developed slowly in Arkansas.

In early May, a few very small pustules were found on older leaves, but upper leaves were free of leaf rust. In mid-May, the Arkansas wheat crop was in good shape, but high levels of leaf rust were found in many fields that were not sprayed with fungicide. In some fields the fungicides were applied too early and therefore they were not effective when the rust arrived. Wheat matured rapidly, so impact was minimal. On 20 May, severe levels of leaf rust were reported in varietal plots in northeastern Arkansas at Kibler.

Southeast – Mississippi, Georgia, Alabama, South Carolina. In mid-March, low levels of leaf rust were found in southern Mississippi fields.

In mid-April, plots of susceptible wheat cultivars in southern and central Alabama and southern Georgia had severe levels of infection on the lower leaves and a few pustules were noted on the flag leaves. Good rainfall in March and April made conditions more conducive for rust development in this area than in the past two years.

In late April, severities of 40% were observed on flag leaves in fields of susceptible cultivars from southern Alabama to southern Georgia. Many fields in the southern U.S. were sprayed with fungicide to control rust development. Dry conditions in early May slowed rust development throughout much of the southern U.S.

Mid-Atlantic – North Carolina, Virginia. In mid-March, leaf rust was widespread but not severe in plots at Kinston and Plymouth, North Carolina.

Leaf rust was present in lower canopies of susceptible varieties such as Saluda (*Lr*11) since late March at Plymouth in eastern North Carolina. In late April, rust moved up the canopy and covered 15% of the flag leaf area on cultivars such as Saluda, McCormick (*Lr24*), and USG 3209 (*Lr11, Lr26*). Rust covered approximately 1% of the mid-canopy of Tribute (*Lr9, Lr24*) and Coker 9511 (*Lr9*). Leaf rust likely over wintered in the region and developed faster than normal.

In early May, in the eastern soft red winter wheat region, leaf rust was found from South Carolina to Maryland. In South Carolina it was found in the Coastal Plain, where it was more severe at Blackville than at Florence, but mostly because Blackville was more advanced in maturity. In Maryland, a few widely scattered fields with leaf rust were found on the Delmarva Peninsula, in Caroline and Queen Anne counties. Only a few pustules developed on the flag leaves, but conditions were good for continued development. Much of the acreage was sprayed for wheat diseases. In late May, leaf rust was increasing in some Maryland fields.

In early May, leaf rust developed in the nurseries at Blacksburg (southwestern Virginia) and Warsaw (northeastern Virginia). In late May, trace to low levels of leaf rust were reported at the northern (Blackstone, VA) and southern (Orange, VA) Piedmont experiment stations. The heaviest rust was found at the eastern shore station (Painter, VA) where cultivars with *Lr26* (USG 3209, Sisson) and *Lr24* (McCormick) were heavily infected. At the Warsaw station leaf rust was light to moderate while severe leaf rust was observed at the Blacksburg (western Virginia) location. In early June, severe leaf rust was observed at the Blacksburg experiment station in western Virginia.

Pennsylvania. In mid-June, moderate levels of leaf rust were found in winter wheat plots in south-central Pennsylvania.

New York. In early July, wheat leaf rust was present at light to moderate levels on flag leaves across western and central New York. The crop matured rapidly.

Kentucky. In late May, leaf rust was light in central and western Kentucky wheat fields. In much of this area, many of the fields were sprayed with fungicide to control the rust. In early June, leaf rust levels ranged from low to severe in western Kentucky plots.

Midwest – Ohio, Indiana, Illinois, and Wisconsin. In early June, wheat leaf rust was found in fields from northeastern Missouri to southern Illinois to southern Indiana to west central Ohio at 20 to 60% severities on flag leaves. There were yield losses to leaf rust in the soft red winter cultivars in this area. In early June, light levels of leaf rust were found on flag leaves in wheat fields and plots from northwestern Ohio, northwestern Indiana, to south-central Wisconsin.

In mid-June, low to moderate levels of leaf rust were found in a winter wheat plots in east-central and southwestern Wisconsin. In early July, high levels of leaf rust were found in winter wheat plots in Grant County in southwestern Wisconsin. On 10 July, high levels of wheat leaf rust were found in soft red winter wheat fields and plots in Door County in northeastern Wisconsin.

California. In mid-May, a foci of leaf rust (50% severity) was found in wheat plots near Fresno, California.

Washington. In late April, leaf rust was observed on the lower wheat leaves in a field in Horse Heaven Hills in southeastern Washington.

Canada. In early June, leaf rust infection levels ranged from trace to 30% in plots in southwestern Ontario, Canada. In early July, low levels of leaf rust were found on hard red spring wheat in the Red River Valley in Southern Manitoba, Canada.

Table 1. Number and frequency (%) of virulence phenotypes of *Puccinia triticina* in the United States in 2008 identified by virulence to 20[a] lines of wheat with single genes for leaf rust resistance.

Phenotype	Virulences	AL, AR, FL, GA, LA, MS, SC		NY, PA, VA		IL, IN, KY, MO, OH, WI		OK, TX		KS, NE		MN, ND, SD		WA		Total	
		#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
BBBDB	14a	1	0.4	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1
BBBGB	10	2	0.9	0	0	0	0	0	0	0	0	0	0	0	0	2	0.3
FLBDB	2c,3,9,14a	1	0.4	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1
MBBJG	1,3,10,14a,28	2	0.9	0	0	0	0	0	0	0	0	0	0	0	0	2	0.3
MBDSB	1,3,17,B,10,14a	3	1.3	2	3.6	0	0	0	0	0	0	0	0	0	0	5	0.7
MBGJG	1,3,11,10,14a,28	1	0.4	1	1.8	2	3.6	0	0	0	0	0	0	0	0	4	0.5
MBPTB	1,3,3ka,17,30,B,10,14a,18	5	2.2	0	0	0	0	0	0	0	0	0	0	0	0	5	0.7
MBSNB	1,3,3ka,11,17,B,14a	2	0.9	0	0	0	0	0	0	0	0	0	0	0	0	2	0.3
MCBGG	1,3,26,10,28	0	0	0	0	0	0	0	0	0	0	0	0	2	100	2	0.3
MCDSB	1,3,26,17,B,10,14a	9	3.9	2	3.6	2	3.6	0	0	3	3	0	0	0	0	16	2.2
MCGJG	1,3,26,11,10,14a,28	2	0.9	0	0	1	1.8	0	0	0	0	0	0	0	0	3	0.4
MCPSB	1,3,26,3ka,17,30,B,10,14a	2	0.9	0	0	0	0	2	1	0	0	0	0	0	0	4	0.5
MCPTB	1,3,26,3ka,17,30,B,10,14a,18	4	1.8	0	0	0	0	0	0	0	0	0	0	0	0	4	0.5
MCRJG	1,3,26,3ka,11,30,10,14a,28	2	0.9	0	0	2	3.6	0	0	0	0	0	0	0	0	4	0.5
MCRKG	1,3,26,3ka,11,30,10,14a,18,28	4	1.8	0	0	0	0	0	0	1	1	0	0	0	0	5	0.7
MCTSB	1,3,26,3ka,11,17,30,B,10,14a	3	1.3	4	7.3	0	0	0	0	0	0	0	0	0	0	7	1
MFGJG	1,3,24,26,11,10,14a,28	5	2.2	5	9.1	0	0	0	0	0	0	0	0	0	0	10	1.4
MFGJH	1,3,24,26,11,10,14a,28,42	0	0	8	14.5	1	1.8	0	0	0	0	0	0	0	0	9	1.2
MFPSC	1,3,24,26,3ka,17,30,B,10,14a,42	30	13.2	0	0	1	1.8	13	6.6	7	7.1	2	2.2	0	0	53	7.3
MFRJH	1,3,24,26,3ka,11,30,10,14a,28,42	1	0.4	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1
MLDSD	1,3,9,17,B,10,14a,41	4	1.8	0	0	0	0	32	16.2	24	24.2	20	21.5	0	0	80	11
MLNSD	1,3,9,3ka,17,B,10,14a,41	0	0	0	0	0	0	6	3	0	0	0	0	0	0	6	0.8
TBDGH	1,2a,2c,3,17,10,28,42	0	0	0	0	0	0	0	0	2	2	0	0	0	0	2	0.3
TBDSB	1,2a,2c,3,17,B,10,14a	2	0.9	0	0	0	0	0	0	0	0	0	0	0	0	2	0.3
TBJDG	1,2a,2c,3,11,17,14a,28	0	0	2	3.6	0	0	0	0	0	0	0	0	0	0	2	0.3
TBRJG	1,2a,2c,3,3ka,11,30,10,14a,28	0	0	0	0	2	3.6	0	0	0	0	0	0	0	0	2	0.3
TBRKG	1,2a,2c,3,3ka,11,30,10,14a,18,28	25	11	12	21.8	9	16.1	0	0	2	2	1	1.1	0	0	49	6.7

Table 1. Number and frequency (%) of virulence phenotypes of *Puccinia triticina* in the United States in 2008 identified by virulence to 20[a] lines of wheat with single genes for leaf rust resistance.

Phenotype	Virulences	AL, AR, FL, GA, LA, MS, SC		NY, PA, VA		IL, IN, KY, MO, OH, WI		OK, TX		KS, NE		MN, ND, SD		WA		Total	
		#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
TCBJG	1,2a,2c,3,26,10,14a,28	2	0.9	0	0	0	0	4	2	0	0	0	0	0	0	6	0.8
TCDSB	1,2a,2c,3,26,17,B,10,14a	9	3.9	2	3.6	1	1.8	1	0.5	0	0	0	0	0	0	13	1.8
TCRKG	1,2a,2c,3,26,3ka,11,30,10,14a,18,28	69	30.3	8	14.5	2 5	44.6	14	7.1	6	6.1	0	0	0	0	122	16.7
TCSBB	1,2a,2c,3,26,3ka,11,17	2	0.9	0	0	0	0	0	0	0	0	0	0	0	0	2	0.3
TDBGG	1,2a,2c,3,24,10,28	0	0	0	0	0	0	0	0	0	0	7	7.5	0	0	7	1
TDBGH	1,2a,2c,3,24,10,28,42	15	6.6	3	5.5	6	10.7	59	29.9	3 1	31.3	34	36.6	0	0	148	20.3
TDBJG	1,2a,2c,3,24,10,14a,28	0	0	0	0	0	0	0	0	5	5.1	6	6.5	0	0	11	1.5
TDBJH	1,2a,2c,3,24,10,14a,28,42	10	4.4	2	3.6	0	0	29	14.7	0	0	11	11.8	0	0	52	7.1
TDRKG	1,2a,2c,3,24,3ka,11,30,10,14a,18,28	0	0	0	0	4	7.1	0	0	0	0	0	0	0	0	4	0.5
TFBDB	1,2a,2c,3,24,26,14a	1	0.4	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1
TFBGG	1,2a,2c,3,24,26,10,28	0	0	0	0	0	0	0	0	0	0	3	3.2	0	0	3	0.4
TFBGH	1,2a,2c,3,24,26,10,28,42	1	0.4	0	0	0	0	2	1	2	2	0	0	0	0	5	0.7
TFBJH	1,2a,2c,3,24,26,10,14a,28,42	1	0.4	0	0	0	0	17	8.6	3	3	3	3.2	0	0	24	3.3
TFDSB	1,2a,2c,3,24,26,17,B,10,14a	2	0.9	0	0	0	0	0	0	0	0	0	0	0	0	2	0.3
TFRJG	1,2a,2c,3,24,26,3ka,11,30,10,14a,28	4	1.8	0	0	0	0	0	0	0	0	0	0	0	0	4	0.5
TJBGH	1,2a,2c,3,16,24,10,28,42	0	0	0	0	0	0	6	3	7	7.1	0	0	0	0	13	1.8
TJBJH	1,2a,2c,3,16,24,10,14a,28,42	0	0	0	0	0	0	3	1.5	3	3	4	4.3	0	0	10	1.4
TJDSC	1,2a,2c,3,16,24,17,B,10,14a,42	0	0	0	0	0	0	2	1	1	1	0	0	0	0	3	0.4
TLBFJ	1,2a,2c,3,9,14a,18,28,41	0	0	0	0	0	0	2	1	2	2	0	0	0	0	4	0.5
TLBJJ	1,2a,2c,3,9,10,14a,28,41	0	0	0	0	0	0	1	0.5	0	0	0	0	0	0	1	0.1
TLGJG	1,2a,2c,3,9,11,10,14a,28	0	0	0	0	0	0	0	0	0	0	2	2.2	0	0	2	0.3
TLMJD	1,2a,2c,3,9,3ka,30,10,14a,41	0	0	2	3.6	0	0	0	0	0	0	0	0	0	0	2	0.3
TNBJJ	1,2a,2c,3,9,24,10,14a,28,41	0	0	0	0	0	0	2	1	0	0	0	0	0	0	2	0.3
TNRJF	1,2a,2c,3,9,24,3ka,11,30,10,14a,41,42	0	0	0	0	0	0	2	1	0	0	0	0	0	0	2	0.3
TNRJJ	1,2a,2c,3,9,24,3ka,11,30,10,14a,28,41	2	0.9	2	3.6	0	0	0	0	0	0	0	0	0	0	4	0.5
Total		228		55	5	6		197	9	9		93		2		730	

[a] Lines tested were Thatcher lines with genes *Lr1*, *Lr2a*, *Lr2c*, *Lr3a*, *Lr9*, *Lr16*, *Lr24*, *Lr26*, *Lr3ka*, *Lr11*, *Lr17*, *Lr30*, *LrB*, *Lr10*, *Lr14a*, *Lr18*, *Lr21*, *Lr28*, and winter wheat lines with genes *Lr41*, and *Lr42*.

Wheat leaf rust race identifications. In 2008, 52 races of wheat leaf rust were described in the United States (Table 1, pp. 221-222). Races TDBGH (20.3%), TCRKG (16.7%), MLDSD (11.0%), TDBJH (7.1%) and TBRKB (6.7%) were the five most common races. Races TDBGH and TDBJH with virulence to *Lr24* were most common in the Great Plains region. Races TCRKG (*Lr26, Lr11,* and *Lr18* virulence) and TBRKB (*Lr11,* and *Lr18* virulence) increased in 2008 and were found mostly in the southeastern states. Race MLDSD (*Lr9, Lr17, Lr41/Lr39* virulence) was found mostly in the Great Plains region. Races with virulence to genes *Lr24, Lr26, Lr17,* and *Lr41/Lr39* that are present in the hard red winter wheats were common in the Great Plains region (Table 2). Races with virulence to *Lr24, Lr26, Lr11,* and *Lr18* that are present in the soft red winter wheats were common in the southeastern states. Races with virulence to *Lr16* that is present in the hard red spring wheats were at low frequencies in the Great Plains region. Races with virulence to *Lr21* that is present in hard red spring wheats were not detected. The 2008 wheat leaf rust survey results may be found at http://www.ars.usda.gov/Main/docs.htm?docid=10493.

Table 2. Number and frequency (%) of isolates of *Puccinia triticina* in the United States in 2008 virulent to 20 lines of wheat with single resistance genes for leaf rust resistance.

Resistance gene	AL, AR, FL, GA, LA, MS, SC		NY, PA, VA		IL, IN, KY, MO, OH, WI		OK, TX		KS, NE		MN, ND, SD		WA		Total	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Lr1	224	98.2	55	100	56	100	197	100	99	100	93	100	2	100	726	99.5
Lr2a	145	63.6	33	60	47	83.9	144	73.1	64	64.6	71	76.3	0	0	504	69
Lr2c	146	64	33	60	47	83.9	144	73.1	64	64.6	71	76.3	0	0	505	69.2
Lr3	225	98.7	55	100	56	100	197	100	99	100	93	100	2	100	727	99.6
Lr9	7	3.1	4	7.3	0	0	45	22.8	26	26.3	22	23.7	0	0	104	14.2
Lr16	0	0	0	0	0	0	11	5.6	11	11.1	4	4.3	0	0	26	3.6
Lr24	72	31.6	20	36.4	12	21.4	135	68.5	59	59.6	70	75.3	0	0	368	50.4
Lr26	153	67.1	29	52.7	33	58.9	53	26.9	22	22.2	8	8.6	2	100	300	41.1
Lr3ka	155	68	28	50.9	43	76.8	37	18.8	16	16.2	3	3.2	0	0	282	38.6
Lr11	122	53.5	42	76.4	46	82.1	16	8.1	9	9.1	3	3.2	0	0	238	32.6
Lr17	77	33.8	12	21.8	4	7.1	56	28.4	37	37.4	22	23.7	0	0	208	28.5
Lr30	151	66.2	28	50.9	43	76.8	31	15.7	16	16.2	3	3.2	0	0	272	37.3
LrB	75	32.9	10	18.2	4	7.1	56	28.4	35	35.4	22	23.7	0	0	202	27.7
Lr10	221	96.9	53	96.4	56	100	195	99	97	98	93	100	2	100	717	98.2
Lr14a	208	91.2	52	94.5	50	89.3	130	66	57	57.6	49	52.7	0	0	546	74.8
Lr18	107	46.9	20	36.4	38	67.9	16	8.1	11	11.1	1	1.1	0	0	193	26.4
Lr21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lr28	146	64	43	78.2	52	92.9	139	70.6	64	64.6	71	76.3	2	100	517	70.8
Lr41	6	2.6	4	7.3	0	0	45	22.8	26	26.3	20	21.5	0	0	101	13.8
Lr42	58	25.4	13	23.6	8	14.3	133	67.5	56	56.6	54	58.1	0	0	322	44.1
Total	228		55		56		197		99		93		2		730	

Wheat stripe rust (*Puccinia striiformis* f. sp. *tritici*). ***Southern Plains.*** As of mid-March, no stripe rust had been reported in Texas or Oklahoma. In early April, low amounts of stripe rust were found on flag leaves of wheat in south central Texas plots at Castroville (Fig. 2). The pustules developed from spores that were likely rain deposited approximately 7–14 days earlier. In early April, traces to high levels of stripe rust were found in north Texas plots. As of early April, no stripe rust had been found in Oklahoma or states to the north. In late April, hot spots of stripe rust were found in a breeder line planted at the Lahoma and Stillwater experiment stations in Oklahoma. They appeared to be limited to a relatively small area of rust at each of these stations. These were the first reports of stripe rust in Oklahoma in 2008.

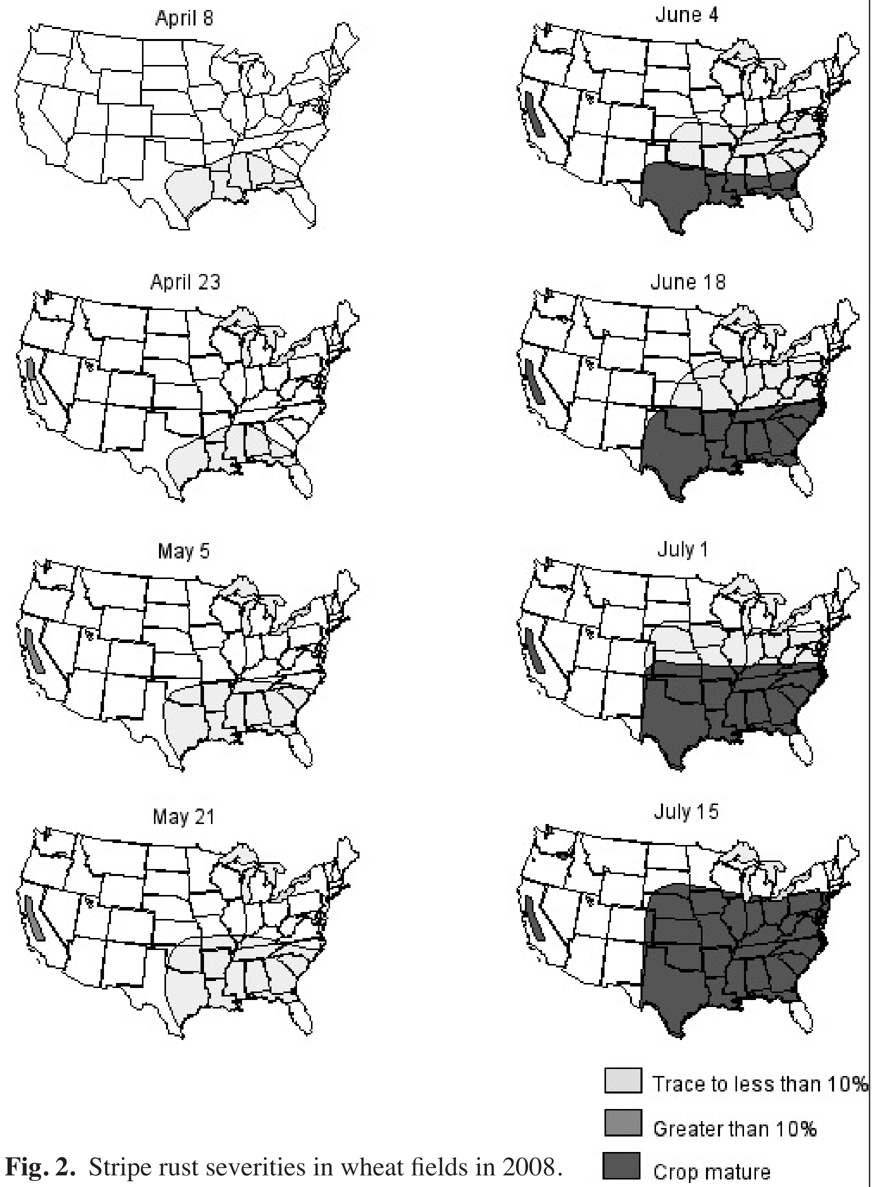

Fig. 2. Stripe rust severities in wheat fields in 2008.

Central Plains. On 8 May, wheat stripe rust was found for the first time this season in Kansas in Sedgwick County in the south central part of the state. The rust was light on the cultivar 2137, which is known to be susceptible to the disease. Most cultivars of wheat grown in Kansas are resistant to stripe rust and, as the weather got warmer and drier, the disease did not cause any major losses in the state. In late May, low to moderate levels of stripe rust were found in cultivar demonstration plots in south-central and central Kansas. The disease was limited to susceptible cultivars such as 2137, 2174, and Above which are grown on limited acreage. In a few fields in central Kansas near Lincolnville, hot spots of 60–80% severity were observed. In 2008, stripe rust arrived too late to cause widespread infections and yield loss in Kansas. In mid-June, low levels of stripe rust were found in susceptible entries in northeastern Colorado plots. In late June, light levels of wheat stripe rust were found at Sidney in the southern Panhandle of Nebraska.

Northern Plains. In early June, light levels of stripe rust were found in one plot at Aberdeen in east-central South Dakota. In late June, light levels of wheat stripe rust were found south central South Dakota winter wheat plots. By late June, hot temperatures slowed stripe rust infections to almost a complete remission in the Great Plains states.

In mid-June, low levels of stripe rust were found in field plots near Bozeman, Montana, in the southwestern part of the state. In early July, stripe rust was found on susceptible winter wheat cultivars in fields at Bozeman, Montana. There were low severities (<10% of leaf area) on flag leaves and incidences were high in infection sites but low through the field.

Louisiana. In mid-March, stripe rust was increasing in Baton Rouge and Winnsboro plots. Growers applied fungicides in fields that were infected with rust. In Louisiana, stripe rust epidemics usually develop in the first half of March and

Table 3. Estimated losses in winter wheat due to rust in 2008 (T = trace).

State	1,000 acres harvested	Yields in bushels per acre	Production in 1,000 of bushels	Losses due to: Stem rust %	Stem rust 1,000 bu	Leaf rust %	Leaf rust 1,000 bu	Stripe rust %	Stripe rust 1,000 bu
AL	200	71.0	14,200	0.0	0.0	1.0	143.4	T	T
AR	980	57.0	55,860	T	T	0.5	280.7	T	T
CA	400	85.0	34,000	0.0	0.0	0.0	0.0	2.0	693.9
CO	1,900	30.0	57,000	T	T	1.0	575.8	T	T
DE	79	77.0	6,083	0.0	0.0	T	T	0.0	0.0
FL	23	55.0	1,265	0.0	0.0	1.0	12.8	0.0	0.0
GA	400	56.0	22,400	0.0	0.0	1.0	226.3	T	T
ID	800	75.0	60,000	0.0	0.0	T	T	T	T
IL	1,150	64.0	73,600	0.0	0.0	3.0	2,276.3	T	T
IN	560	69.0	38,640	0.0	0.0	1.0	3,903.0	T	T
IA	35	48.0	1,680	0.0	0.0	T	T	0.0	0.0
KS	8,900	40.0	356,000	0.0	0.0	4.7	17,557.2	T	T
KY	460	71.0	32,660	0.0	0.0	0.1	32.7	0.1	32.7
LA	385	57.0	21,945	T	T	1.0	225.1	1.5	337.6
MD	180	73.0	13,140	0.0	0.0	0.5	66.0	0.0	0.0
MI	710	69.0	48,990	0.0	0.0	2.0	999.8	0.0	0.0
MN	70	52.0	3,640	0.0	0.0	2.0	74.3	0.0	0.0
MS	485	62.0	30,070	0.0	0.0	1.0	303.7	T	T
MO	1,160	48.0	55,680	0.0	0.0	2.0	1,136.3	T	T
MT	2,420	39.0	94,380	0.0	0.0	T	T	T	T
NE	1,670	44.0	73,480	0.0	0.0	1.0	742.2	0.0	0.0
NJ	33	61.0	2,013	0.0	0.0	0.0	0.0	0.0	0.0
NM	140	30.0	4,200	0.0	0.0	0.0	0.0	0.0	0.0
NY	122	63.0	7,686	0.0	0.0	1.0	77.6	0.0	0.0
NC	720	60.0	43,200	0.0	0.0	0.5	217.1	0.0	0.0
ND	550	41.0	22,550	0.0	0.0	2.0	460.2	0.0	0.0
OH	1,090	68.0	74,120	T	T	1.0	748.7	0.0	0.0
OK	4,500	37.0	166,500	0.0	0.0	5.0	8,763.2	T	T
OR	775	58.0	44,950	0.0	0.0	T	T	T	T
PA	185	64.0	11,840	0.0	0.0	0.5	59.5	0.0	0.0
SC	205	54.0	11,070	0.0	0.0	0.5	55.6	0.0	0.0
SD	1,890	55.0	103,950	0.0	0.0	1.0	1,050.0	T	T
TN	520	63.0	32,760	0.0	0.0	T	T	T	T
TX	3,300	30.0	99,000	T	T	1.8	1,822.1	0.4	404.9
UT	120	41.0	4,920	0.0	0.0	0.0	0.0	0.0	0.0
VA	280	71.0	19,880	0.0	0.0	0.5	99.9	0.0	0.0
WA	1,720	56.0	96,320	T	T	T	T	0.3	289.8
WV	8	60.0	480	0.0	0.0	T	T	0.0	0.0
WI	335	66.0	22,110	T	T	2.0	451.2	0.0	0.0
Total	39,595	41.7	1,866,042		T		42,360.7		1,758.9
U.S. % loss				T		2.22		0.09	
U.S. total	39,614	47.2	1,867,903						

peak by early April when temperatures surpass the optimum for stripe rust development. In mid-March, traces of stripe rust were found in wheat plots at Crowley in south central Louisiana but by late March no stripe rust was found.

Arkansas. In mid-March, stripe rust was confirmed in southeastern Arkansas plots. By early April, stripe rust was found in plots and fields in central Arkansas. Stripe rust was scattered with little evidence of hot spots and most of the commonly planted cultivars have some resistance. One hot spot of stripe rust was found in a plot in west-central Arkansas. Stripe rust over wintered in Arkansas in 2008, but at a much lower level than leaf rust. Very susceptible cultivars are no longer grown, and the acreage planted to susceptible cultivars is small. Most cultivars have adult-plant resistance to the current pathogen population. The combination of resistance and fungicides controlled stripe rust. By early May, conditions were still favorable for stripe rust development north of I-40 in Arkansas. Most cultivars have some resistance, except for a few fields in northeast Arkansas that were planted with susceptible cultivars. Stripe rust was still active in plots at Fayetteville.

Southeast. In mid-March, very low levels of stripe rust were found in a southern Mississippi field. In late March, hot spots of stripe rust were reported in Griffin, Georgia fields and low levels were reported in the Tifton, Georgia area. In mid-April, in southern Alabama and southwestern Georgia low levels of wheat stripe rust were found in a few plots (Fig. 2, p. 224). In these locations most of the stripe rust infections had occurred earlier in mid to late winter when temperatures were cooler. As day and nighttime temperatures continued to increase, the conditions for stripe rust development were less favorable. This lead to a reduced amount of stripe rust inoculum for the northern wheat growing regions of the U.S. In late April, hot and dry conditions slowed stripe rust development in plots and fields throughout the southern U.S. (Fig. 2, p. 224). Hot spots of severe stripe rust were observed in late maturing susceptible cultivars in nurseries in southwestern Georgia and north central Louisiana. Most of the infections had occurred when conditions were cooler. In early May, stripe rust levels were fairly high in many fields in western Tennessee.

Midwest. In early May, a field in southwest Kentucky had very low levels of stripe rust. In late May, stripe rust was at low levels in central and western Kentucky wheat fields. In much of this area many of the fields had been sprayed with fungicide to control the rust.

On 20 May, a few stripe rust hot spots were found in research plots at Mount Vernon, Illinois. In late May, low levels of stripe rust were found in southwestern Missouri fields. In early June, low levels of stripe rust were found in northeastern Missouri and west-central Indiana fields and plots. On 10 June, a center of wheat stripe rust infection was observed in a research plot at Napoleon in northwestern Ohio. In mid-June, low levels of stripe rust were found in susceptible entries in plots in southwestern Wisconsin (Fig. 2, p. 224).

Virginia. Trace amounts of stripe rust were found in wheat breeding nurseries at Blacksburg and Warsaw, Virginia in early June.

California. On 27 February, two infection foci of 25 ft^2 and 50 ft^2 were detected in plots of D6301 in Davis, California. The foci were severely diseased, so the initial infections probably occurred at least two weeks previous to detection. In mid-March, stripe rust was confirmed in a few commercial fields in the Yolo and Colus counties in the Sacramento Valley on susceptible cultivars (Blanca Grande, Summit) and on the previously resistant cultivar Cal Rojo. Disease severity was relatively light overall, but within the infection foci severity was up to 50%. In early April, stripe rust was found in the Central Valley of California.

By the second week in April, wheat stripe rust was increasing in the northern part of the Central Valley of California (Sacramento Valley and the Sacramento/San Joaquin Delta), but the rust was not uniformly severe. Only a few commercial fields were not treated with a fungicide and these fields had severe infection levels (80%). Only light infections were observed in the southern part of the Valley (San Joaquin Valley).

Cool conditions were favorable for continued development of wheat stripe rust in California's Central Valley and surrounding areas through the middle of May. Several cultivars that were not infected earlier in the season had susceptible infection types in mid-May, possibly indicating that new races have become established. With few exceptions, fungicides were applied to fields of known susceptible cultivars, so yield losses were minimal. Five consecutive days of extremely hot weather (high 90s and 100s) beginning on 15 May terminated the epidemic and hastened the Central Valley's crop toward maturity. Many entries in the wheat stripe rust screening nurseries at the UC Davis Agronomy Farm had final disease severities of 60–100%.

Table 4. Estimated losses in spring and durum wheat due to rust in 2008 (T = trace).

SPRING WHEAT									
				Losses due to:					
	1,000 acres	Yields in bushels	Production in 1,000	Stem rust		Leaf rust		Stripe rust	
State	harvested	per acre	of bushels	%	1,000 bu	%	1,000 bu	%	1,000 bu
CO	36.0	75.0	2,700.0	0.0	0.0	T	T	0.0	0.0
ID	520.0	72.0	37,440.0	0.0	0.0	T	T	T	T
MN	1,800.0	56.0	100,800.0	0.0	0.0	T	T	0.0	0.0
MT	2,480.0	24.0	59,520.0	0.0	0.0	T	T	T	T
NV	4.0	95.0	380.0	0.0	0.0	0.00	0.0	0.0	0.0
ND	6,400.0	38.5	246,400.0	0.0	0.0	T	T	0.0	0.0
OR	170.0	45.0	7,650.0	0.0	0.0	T	T	0.0	0.0
SD	1,520.0	45.0	68,400.0	0.0	0.0	1.00	690.9	0.0	0.0
UT	19.0	44.0	836.0	0.0	0.0	0.00	0.0	0.0	0.0
WA	505.0	42.0	21,210.0	T	T	T	T	1.5	323.0
WI	22.0	41.0	902.0	0.0	0.0	T	T	0.0	0.0
WY	11.0	46.0	506.0	0.0	0.0	0.00	0.0	0.0	0.0
Total	13,487.0	40.5	546,744.0		T		690.6		323.0
U.S. % Loss				T		0.13		0.1	
U.S. Total	13,487.0	40.5	546,744.0						

DURUM WHEAT									
				Losses due to:					
	1,000 acres	Yields in bushels	Production in 1,000	Stem rust		Leaf rust		Stripe rust	
State	harvested	per acre	of bushels	%	1,000 bu	%	1,000 bu	%	1,000 bu
AZ	149.0	98.0	14,602.0	0.0	0.0	0.0	0.0	0.0	0.0
CA	155.0	105.0	16,275.0	0.0	0.0	0.0	0.0	0.0	0.0
ID	10.0	73.0	730.0	0.0	0.0	0.0	0.0	0.0	0.0
MT	570.0	19.0	10,830.0	0.0	0.0	0.0	0.0	0.0	0.0
ND	1,690.0	25.0	42,250.0	0.0	0.0	0.0	0.0	0.0	0.0
SD	10.0	19.9	190.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	2,584.0	32.8	84,877.0		0.0		0.0		0.0
U.S. % Loss				0.0		0.0		0.0	
U.S. Total	2,584.0	32.8	84,877.0						

Pacific Northwest. In early April, wheat stripe rust had not been found in the major eastern wheat-growing areas of the Pacific Northwest. In the first week in April, susceptible cultivars in winter wheat nurseries in northwestern Washington had 50% levels of stripe rust infection. Similar levels of rust severities were observed in commercial fields that were planted with susceptible cultivars. In the second week of April, low levels of stripe rust were found in central Washington fields, which was much less rust than was found in 2007 in the same area. In late April, stripe rust was found in southeastern Washington. Some early-planted fields had severities up to 10% incidence and 5% severity. In general, stripe rust developed slowly in eastern Washington. In the Mount Vernon area in western Washington, stripe rust had developed up to 100% severity on highly susceptible entries by 24 April.

On 14 May, trace levels of stripe rust were found on a susceptible spreader row in a winter wheat nursery near Pullman, Washington. This was the first observation of stripe rust in the Washington/Idaho Palouse region in 2008.

On 10 June, no stripe rust was found in the Mosses Lake area in central Washington. Low levels of stripe rust were found in the susceptible spreader rows in the rust-monitoring nursery at the Lind Dryland Experiment Station in east central Washington. In mid-June, wheat stripe rust was severe on susceptible spreader rows in the winter wheat nurseries near Pullman, Washington but few winter wheat entries in the nurseries had stripe rust. No stripe rust was found in the spring wheat and barley nurseries or fields near Pullman. In general, stripe rust infections were low in the eastern Pacific Northwest.

In early July, wheat stripe rust was developing at a slow pace in the Pacific Northwest due to the dry and hot weather conditions. No rust was found in winter wheat fields in the Palouse area. Low levels of stripe rust were found in spring wheat fields in east central Washington. On 1 July, highly susceptible winter wheat entries in experimental fields at Walla Walla in southeastern Washington had 80% stripe rust severities.

In mid-June, high levels of wheat stripe rust were reported on susceptible winter wheat and low levels on spring wheat plants in nurseries at the Pendleton Experiment Station in northeastern Oregon. In late June, high levels of stripe rust were found in susceptible winter wheat entries in nurseries at Corvalis, Oregon, and Moscow, Idaho. In Pendleton and Hermiston, Oregon, nurseries susceptible spring wheat entries had stripe 20% rust severities.

NEBRASKA

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Wheat production.

In 2008, 1,750,000 acres of wheat were planted in Nebraska and 1,670,000 were harvested with an average yield of 44 bu/acre for a total production of 73,500,000 bu. The autumn generally was conducive to good emergence in these parts of the state. Planting in eastern Nebraska was subject to heavy rains that delayed planting and hurt emergence after planting. Hence, the eastern wheat crop got off to a bad start that unfortunately carried forward through the rest of the growing season. The winter was relatively mild and winterkilling was minor. The spring growing season began and stayed on the dry side in parts of western Nebraska, thus reducing diseases other than viruses, but did cause concerns for drought damage. However, much of eastern Nebraska had ample moisture during flowering and grainfill leading to leaf diseases, and Fusarium head blight, which again was a major concern. In the south-central and eastern parts of the state, early season diseases included powdery mildew, tan spot, and Septoria leaf blotch. Despite the wetness, leaf rust did not develop to damaging levels (except in some susceptible lines or cultivars) because the inoculum (rust spores) blown into Nebraska from southern states was limited. In western Nebraska, wheat streak mosaic virus was present as was loose smut and common bunt (syn. stinking smut). For the first time, *Triticum* mosaic virus was confirmed in Nebraska. Wheat stem sawfly in the panhandle continued to expand its presence with severe infestations being found for the first time in central Box Butte County.

In 2009, the most popular and most widely grown wheat cultivar was Agripro Jagalene (13.8% of the state) followed by Millennium (13.2%), Pronghorn (12.1%), TAM 111 (6.5%), Alliance (6.1%), Goodstreak (5.0%), and Wesley (4.8%). Pronghorn and Goodstreak are tall (conventional height) wheat cultivars that have consistently done well in the drought prone areas of western Nebraska where tall wheat cultivars are increasingly being planted.