Table 2. Field observations on a collection of *Triticum* and *Aegilops* species for leaf and stem rust, barley yellow dwarf, and heading date in the 2009–10 growing seasons. TA# indicates the accession number in the Wheat Genetic and Genomic Resources Center Gene Bank. The leaf and strip rust screening data is described in detail on p. 238. For barley yellow dwarf {BYD) and powdery mildew (PM) incidence; H = high, M = medium, L = low, and 0 = no disease; — = missing data. The country of origin for the accession is listed if known.

TA #	2010 Leaf rust 5/26	2010 Leaf rust 6/2	2010 Stripe rust 5/26	2010 Stripe rust 6/2	2010 BYD 5/13	2010 BYD 5/26	2010 HD	2009 Leaf rust 5/21	2009 Leaf rust 6/1	2009 Leaf rust 6/5	2009 BYD 5/21	2009 BYD 6/1	2009 PM 5/21	2009 HD	Species	Country of origin
2619	10R	15MR	5R	5R	L	L	28/5	0	5R	10R	0	L	0	25/5	triuncialis	Turkey
2661	10MR	NT	0	NT	M	M	10/5	0	5MR	5MR	L	H	0	12/5	biuncialis	Syria
2686	10R	10R	1R	5R	0	L	30/5	1R	1R	5MR	M	H	0	25/5	uniaristata	Russia
2688	5R	25MR	1R	10MR	M	M	28/5	0	5R	15MR	L	H	L	25/5	uniaristata	Greece
2774	5R	10R	20MR	25MR	L	L	30/5	0	1R	1R	L	M	0	5/20	speltoides	Turkey
2783	10R	20R	5R	5R	M	M	28/5	0	5R	1R	L	M	0	24/5	biuncialis	Bosnia
2790	10R	10R	5R	15MR	L	L	23/5	0	1R	10R	M	H	0	18/5	neglecta	Bosnia
2799	10R	30MR	5R	5MR	L	M	28/5	0	10MR	10R	M	H	0	24/5	cylindrica	Turkey
2805	10R	25MR	20MR	25MR	M	H	28/5	1R	10MR	10M	M	H	0	18/5	turgidum	Unknown
10059	30M	NT	10MR	NT	H	H	12/5	0	10R	NT	L	H	0	5/15	biuncialis	Turkey
10069	30MR	35M	30MR	30M	M	H	15/5	15R	15M	4OM	0	H	0	18/5	tauschii	Afghanistan
10099	25M	NT	20M	NT	M	H	25/5	1R	30MR	60M	L	H	0	24/5	tauschii	Armenia
10339	30MS	35MS	20MR	20M	M	M	30/5	20M	60M	60MS	M	H	0	22/5	crassa	Tajikistan
10348	20MR	30MR	5MR	20MR	L	M	15/6	1R	10R	20R	L	H	0	23/5	cylindrica	Tajikistan
10372	5R	15MR	5R	5R	L	L	15/6	0	5R	5R	L	H	0	18/5	triuncialis	Tajikistan
10426	30MR	35M	15MR	20MR	M	H	14/5	0	5MR	40MS	H	H	0	18/5	aestivum	Turkey
10570	10MR	20MR	10R	15MR	M	M	28/5								aegilopoides	Switzerland
	10R	20MR	0	5R	M	H	31/5									
10572	10MR	30MR	10MR	15MR	M	H	15/5								aegilopoides	Iran
	15M	15MR	10R	15MR	L	M	14/5									
10592	10R	20MR	5R	10MR	L	M	29/5								aegilopoides	Turkey
	5R	10MR	5MR	10MR	L	M	30/5									
10596	20MR	30MR	10R	10MR	M	H	3/6								aegilopoides	Turkey
	25R	25MR	0	10R	L	M	5/6									
10597	30R	40MR	5MR	10MR	L	H	3/6								aegilopoides	Turkey
	20R	30MR	0	5R	O	L	5/6									

MINNESOTA

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Wheat rusts in the United States in 2009.

Wheat stem rust (*Puccinia graminis f. sp. tritici*). Texas. The first report of wheat stem rust in 2009 was of low levels found on spelt wheat and barley planted as a windbreak for watermelons in Hidalgo County along the Rio Grande Valley in southeast Texas on 23 March. Low levels of wheat stem rust were found on flag leaves and stems in McNair 701 disease-detection plots in irrigated nurseries at Beeville and Castroville in south Texas on 9 April. The pustules developed from spores that were likely rain deposited approximately 10–14 days earlier. On 22 April, stem rust was developing slowly on susceptible cultivars (McNair 701), a few winter wheat lines, and on a winter triticale (Tamcale 5019) in the Castroville irrigated plots in south Texas. On 27 April, a few pustules of wheat stem rust were found in the McNair 701 stem rust trap plot at College Station in central Texas. In early May, wheat stem rust was found on the susceptible cultivar McNair 701 at McGregor and College Station and in plots of susceptible cultivars at Bardwell and Giddings in central Texas. On 6 May, low levels of stem rust were found in a field in Jones County in northwest Texas. In late June, low levels of stem rust were reported in a Texas Panhandle wheat plot.

Oklahoma. In late May, low levels of stem rust were found in plots of two susceptible cultivars at Stillwater, Oklahoma.

Kansas. In late May, low levels of stem rust were found in plots in Reno County in south-central Kansas. In early June, low levels of wheat stem rust were found on the susceptible hard red winter cultivar Winterhawk in central Kansas plots in Ellsworth and Stafford counties. On 3 June, low levels of wheat stem rust also were found on Winterhawk in plots at Belleville in north-central Kansas. In all cases, the infections were concentrated in small foci with lesions on both stems and leaves.

Colorado. In late June, low levels of stem rust were found on the varieties Winterhawk and Bill Brown in northeastern Colorado plots.

Nebraska. On 9 June severe levels of stem rust were found on a susceptible line in the Lincoln, Nebraska breeding nursery. In late June, severe levels of stem rust were found in a susceptible triticale in an irrigated nursery in Mead, Nebraska. Severe levels of stem rust also were observed on wheat and triticale in the Lincoln nursery. In late June, high levels (20% severity) of stem rust were found in susceptible winter wheat fields at the hard dough maturity stage in Nuckolls and Franklin counties in south central Nebraska.

South Dakota. During the second week in July, low levels of stem rust were found on an experimental line in a regional nursery near Brookings, South Dakota.

North Dakota. On 10–11 August, trace levels of wheat stem rust were found in plots of susceptible wheat in eastern and central North Dakota. In late July, no stem rust was found at the Minot plots in west-central North Dakota.

Minnesota. On 13 July, high levels of wheat stem rust were found on susceptible winter wheat near maturity in plots at Rosemount in southeastern Minnesota. Also on 13 July, light levels of wheat stem rust were found on an 'old timer', susceptible spring wheat cultivar Baart in plots at Rosemount, Waseca, and Lamberton experiment stations in southern Minnesota. On 29 July, trace levels of stem rust were found on Baart rust trap plots at Morris, in west-central Minnesota.

Louisiana. In early April, a center of stem rust was found in a disease detection plot of Panola at the Jeanerette experiment station in southern Louisiana. Severities ranged from trace to 40% in a '2 m x 2 m' foci. On 8 April, severe levels of stem rust were found in several wheat plots at the Winnsboro experiment station in northeastern Louisiana. The rust had not spread evenly across the nursery. Weather conditions had been ideal for rust development with adequate moisture (rain, dew, and fog) and ideal temperatures across much of Louisiana. On 22 April, low levels of wheat stem rust were found in the Crowley plots in south-central Louisiana on the susceptible cultivar Panola and other varietal trial entries. The cultivars matured rapidly and, therefore, rust did not have much time to increase. In early May, wheat stem rust was increasing in plots at Winnsboro in northeast Louisiana. Many of the soft red winter wheats had severities of 40 to 60%.

Alabama. On 21 April, low to moderate levels of stem rust were found in a plot of the susceptible cultivar McNair 701 at Headland in southeastern Alabama. By early May, severe levels of stem rust were found in the plots.

In summary, during the early spring of 2009, low levels of stem rust were found in susceptible plots of barley and soft and hard red winter wheat in many southern states.

Arkansas. In early May, wheat stem rust was found in plots in Crawford and Pope Counties (northeastern Arkansas) on Delta King 9577 and Panola, respectively. In the southeastern part of the state, light levels of stem rust were found in a field.

Tennessee. In late May, moderate levels of wheat stem rust were found in a field near Jackson in west central Tennessee. This is the most stem rust seen in this area in the last 30 years.

Missouri. In early June, a stem rust collection was made in soft red winter wheat in Barton County in southwestern Missouri. On 8 July, high levels of stem rust were found in a field of mature winter wheat in Harrison County in northwestern Missouri. Incidence was 100% and severity was more than 40%. The grain was severely shriveled, likely resulting in a significant yield loss in this field.

Illinois. In early June, low levels of stem rust were found in plots in Madison, Champaign, and Montgomery Counties in southern Illinois. In late June, moderate levels of stem rust were found in plots in DeKalb County in north-central Illinois.

Indiana. In early June, low levels of wheat stem rust were found on a commercial cultivar in research plots in Posey, Spencer, and Vanderburgh Counties in southwest Indiana.

Michigan. On 23 June, low levels of stem rust were reported in wheat research plots in Lenawee County in southeastern Michigan. On 10 July, low levels of stem rust were found in soft winter wheat plots in Ingham and Saginaw counties in central Michigan.

Wisconsin. In late July, low levels of wheat stem rust were found in a soft red winter wheat plot in Door County in northeastern Wisconsin.

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

Idaho. On 23 June 23, 20% rust severities were reported in a spring wheat field close to barberry bushes (alternate host of wheat stem rust) in Latah County, Idaho. Plants with rust pustules were 20 feet from the bushes. Spring wheat and barley crops were planted later this year so stem rust will likely develop more than in the last two years in the Palouse region. On 7 July, low levels of stem rust were found on an experimental line at the soft dough growth stage in the soft white winter wheat nursery in Aberdeen, Idaho.

Washington. Between late July and late August, a large number of stem rust samples collected from nursery plots in Whitman and Steptoe counties in Washington.

California. In early August, stem rust infection was observed on barley plants in Sonoma county, California. This was the first observation of stem rust on barley in the state of California in recent years.

This year there were more stem rust reports on susceptible cultivars in the winter wheat-growing area than recent years. The crop matured slower than normal, which allowed more stem rust than normal to develop.

Preliminary race identifications. In 2009, race QFCSC was identified as the predominant race in states of east of Rocky Mountains. This common race 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 QFCSC. A second race, RFCSC, was found in low frequencies from OK, IL, IN, NE, and MN. This race was first isolated from Texas in 2007. Virulence of race RFCSC is identical to that of race QFCSC except for virulent to *Sr7b*, a likely mutant of race QFCSC.

From stem rust collections made in a spring wheat field in Latah County, Idaho, preliminary race-typing identified the following Pgt races: JCCDC, QFCDC, QFCJC, QFCNC, QFCSC , QCMNC, QFMNC, and SCCSC. These races are relatively avirulent to most wheat cultivars east of the Rocky Mountains. However, race SCCSC has virulence to *Sr9e* and *Sr13*, a resistance gene combination that has served as the main component of stem rust resistane in durum cultivars of the northern Great Plains.

From stem rust collections made in Steptoe and Whitman counties, Washington, preliminary race typing identified 17 races, including BCCSC, GCCDB, GCCDC, GCCNC, GFCSB GFCNC, LCCJB, LCCSC, QCCDC, QCCNC, QFCDC, QFCNS, QFCJC, QFCSB, QFCSC, QCMSC, HCCJC, and MCCJB. Similar to the races in ID, these races are relatively avirulent to the majority of wheat cultivars east of the Rocky Mountains.

The diverse races in the Palouse region bordering Idaho and Washington are likely a part of a sexual population known to be present in the region due to the presence of common barberry plants and other *Berberis* spp. From the races identified in the 2009 season, virulence to *Sr9g*, *Sr10*, and *Sr17* appeared fixed in the population. Virulence frequencies were high to *Sr5*, *Sr8a*, *Sr9a*, *Sr9d*, *Sr13*, *Sr21*, and *SrMcN* and were low to *Sr7b*, *Sr9e*, and *Sr36*.

The 2009 U.S. stem rust observation map and results of race identification to date can be found at the CDL website (http://www.ars.usda.gov/Main/docs.htm?docid=9757).

Stem rust on barberry. In mid-May, light pycnial infections were found on common barberry bushes growing in south central Wisconsin. In late May, moderate numbers of aecial infections were found on susceptible barberry bushes growing in southeastern Minnesota and Wisconsin. Aecial infections on common barberry from Latah County, Idaho, were observed in mid June. In mid-July, light aecial infections were found on four common barberry bushes near Colville, in Stevens County, Washington. Infection occurred mostly on young fruits. This is the first time stem rust infections were observed on common barberry bushes located in this area.

Aecial infections from western Idaho, eastern Washington, southeastern Minnesota, and south-central Wisconsin were identified as rye stem rust. Three wheat races, BCCBC, BLBBB and GCCJC, were recovered from aecial collections from Idaho, Washington, and Wisconsin.

New barberry/stem rust web resource. In addition to the CDL's Barberry and stem rust pages, APHIS has created a new website for their Barberry/Black Stem Rust program. The page can be found at http://www.aphis.usda.gov/plant_health/plant_pest_info/barberry/index.shtml.

Wheat leaf rust. Texas. In mid-February, low levels of leaf rust were found in central Texas. In late February, leaf rust was observed in irrigated plots in south Texas at Castroville. The most severe leaf rust was found on the Jagger (*Lr17* resistance), Jagalene (*Lr24*), and TAM 112 (*Lr41*) cultivars. By mid-March, leaf rust was severe in the plots. The rust in these irrigated plots was much more severe than in the past two years. In late February, low levels of leaf rust were found on the lower leaves of wheat growing in irrigated fields in the Rio Grande Valley. Dryland fields had lower incidences of leaf rust. In early March, low levels of leaf rust were found in southern and central Texas fields. By mid-March, leaf rust was severe on susceptible cultivars in the College Station nursery in central Texas. The severe drought in the 2008–09 winter throughout much of Texas limited rust development. Mid-March rains improved conditions for rust development in Texas.

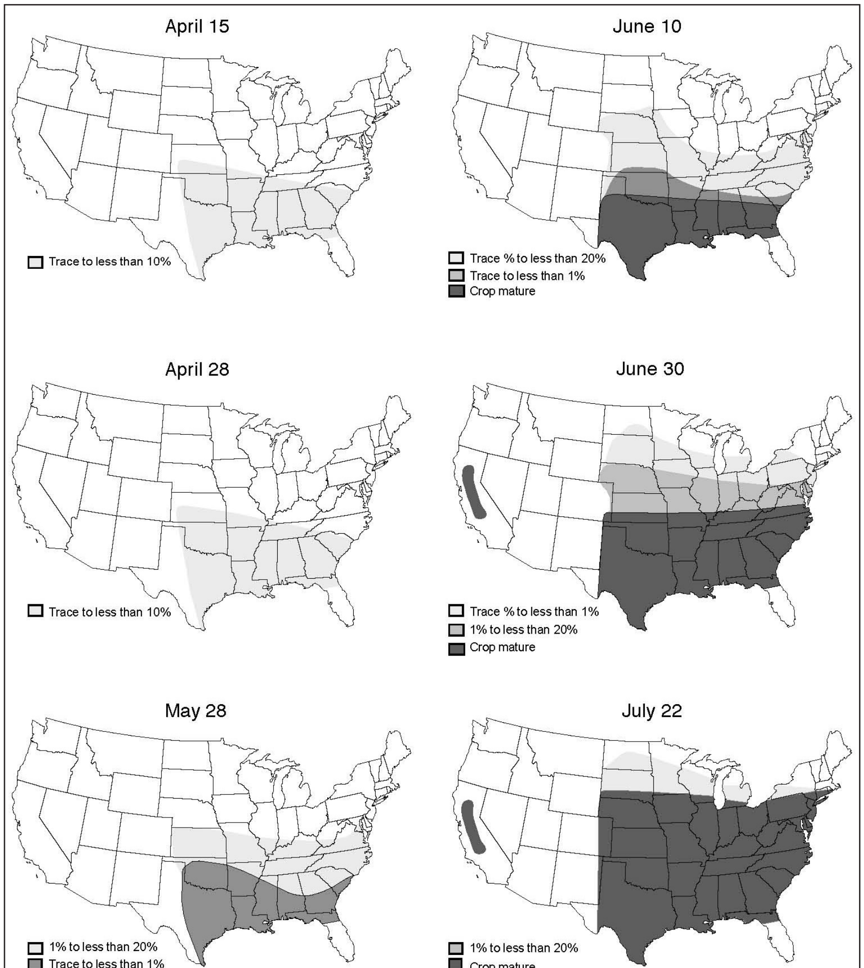

Fig. 1. Leaf rust severities in wheat fields in 2009.

In early April, susceptible varieties Overley (*Lr41*), Jagalene (*Lr24*), and Jagger (*Lr17*) growing in nurseries at Castroville, Beeville, College Station, and McGregor, Texas, had 60% leaf rust severities on lower leaves. In more resistant cultivars, such as Fuller and Fannin, lower infection severities were observed. Fields in southern Texas were under drought stress, and rust was found only in irrigated plots in the region. During the first week in April, low to moderate levels of leaf rust were noted in central Texas fields (Fig. 1).

In early May, high levels of leaf rust were found in plots of susceptible wheat while low levels were found in fields in central and northern Texas. In late May, low levels of leaf rust were found in fields in the Rolling Plains, the Texas Panhandle, and North Texas High

Plains fields. In much of Texas, drought-like conditions hampered the crop and rust development. These Texas locations provided less rust inoculum for areas further north than usual.

Oklahoma. In mid-February, leaf rust was at trace to low levels in Oklahoma plots. In mid-March, low levels of leaf rust were found throughout Oklahoma. The most severe leaf rust was in early-planted Jagalene. In late April, only low levels of leaf rust were observed in Oklahoma. In 2008, by late April, leaf rust was much more prevalent and severe throughout Oklahoma.

In early May, leaf rust was found in the canopy of Jagalene (*Lr24*) and Jagger (*Lr17*) plots at Stillwater, Oklahoma. Leaf rust was at the 15% severity level on flag leaves and at the 40–65 MS/S level on leaves below the flag. By early May, leaf rust increased with the ideal temperatures and abundance of free moisture. In mid-May, high levels of leaf rust were found on flag leaves of susceptible cultivars Jagger and Jagalene in the Stillwater plots. By late May, the incidence and severity of rust throughout Oklahoma increased dramatically. Leaf rust approached severity levels in the 65–90% range during the last week in May at locations where leaves were still green. In early June, high severity (60%) levels of wheat leaf rust were found in fields of Jagalene, Jagger, and Overley throughout north-central Oklahoma. In most cases, the rust arrived too late to cause significant rust losses.

Kansas. In mid-February, traces of wheat leaf rust that overwintered were found in a southeast Kansas field. In late February, traces of leaf rust were detected in northeastern Kansas plots near Manhattan. In mid-March, low levels of leaf rust were found in an eastern Kansas field.

In early April, leaf rust was at low levels throughout south-central and central Kansas. In early April, the lower leaves of the wheat in northeastern Kansas plots naturally deteriorated with age taking some of the over wintering leaf rust with it. Despite this decrease in incidence, leaf rust was still found at trace levels in research plots of susceptible cultivars. In late April, leaf rust remained at low levels throughout south-central and central Kansas. There were no reports of leaf rust in western Kansas in late April.

In mid-May, low levels of leaf rust were found on flag leaves in north-central Kansas plots and fields. The rust infections originated from spores from rust infected wheat further to the south, which were deposited with rainfall.

In early June, high severity (60%) levels of wheat leaf rust were found in fields of Jagalene, Jagger, and Overley in southeastern and south-central Kansas (Fig. 1, p. 248). Some fields had been sprayed with fungicide to control the rust. In unsprayed fields, leaf rust caused yield losses in susceptible varieties in south central and central Kansas. In varietal plots in south-central Kansas, leaf rust was low in the resistant cultivars Fuller, Santa Fe, and Art. In western Kansas, rust severity was less than 5% on most leaves. In early June, in north central Kansas fields of Overley, etc., leaf rust severities on flag leaves were increasing because of the ideal conditions for rust development. These areas provided more rust inoculum for areas further north. Losses due to leaf rust for 2009 in Kansas were estimated to be 1.37%. This estimate is considerably lower than the 20-year average of nearly 4%. The reduced losses due to leaf rust in 2009 were likely due to less leaf rust being produced in drought and freeze damaged wheat fields in Texas and Oklahoma.

Colorado. In early June, low levels of leaf rust were widespread in northeastern Colorado plots and by late June, severe levels of leaf rust were found in the same plots.

Nebraska. In early June, low levels of leaf rust were found in fields and plots in southeastern and the central Panhandle of Nebraska. In plots at Lincoln, severities ranged up to 80% in plots of the susceptible cultivar Overley (*Lr41*). In late June, high levels of wheat leaf rust were found in susceptible winter wheat fields from southern to northwestern Nebraska. In early July, high levels of wheat leaf rust were found in plots of susceptible wheat cultivars in the Nebraska Panhandle.

South Dakota. In early June, leaf rust was found on winter wheat at very low levels in the mid-canopy of several fields in southeastern South Dakota. In late June, low levels of wheat leaf rust were found in plots and fields of susceptible winter wheat cultivars in southern South Dakota. In early July, leaf rust was limited to only the most susceptible winter wheat cultivars in fields and plots in South Dakota. During the third week in July, leaf rust was at trace levels in spring wheat fields throughout eastern South Dakota.

North Dakota. In late June, trace levels of leaf rust were found in a plot of the susceptible winter wheat Jagalene in Dickey County in southeastern North Dakota. In early July, leaf rust was limited to only the most susceptible winter wheat cultivars in fields and plots in North Dakota. On 13 July in susceptible winter wheat plots in Ramsey County in southeastern North Dakota, 10–40% leaf rust severities were found on the flag leaves at the soft dough stage. Fungicide application at the flowering growth stage had effectively controlled leaf rust at this North Dakota location. During the third week in July, leaf rust was at trace levels in spring wheat fields throughout North Dakota. Low to moderate levels of leaf rust were found in plots of susceptible spring wheat cultivars in eastern and central North Dakota on 10–11 August. Increased amounts of leaf rust were found in plots of the cultivars Knudson and Briggs, which were highly resistant in previous years. No leaf rust was observed on cultivars with *Lr21*, e.g., Faller, Glenn, Steele, RB07, and others. Leaf rust was at trace levels on susceptible cultivars at Minot and Langdon in mid-August.

Minnesota. In late June, low levels of wheat leaf rust were found in plots and fields of susceptible winter wheat cultivars in west-central Minnesota. In early July, leaf rust was limited to only the most susceptible winter wheat cultivars in fields and plots in northwestern Minnesota. In plots of unsprayed susceptible spring wheat, high levels of leaf rust were found at Rosemount, Waseca, Lamberton, and Morris on 13–15 July. On 29 July, wheat leaf rust was severe in plots of susceptible cultivars at Morris in west-central Minnesota, whereas leaf rust was low on currently grown cultivars. In late July, leaf rust was not observed in susceptible wheat plots in northwest Minnesota or in the northern tier of counties in North Dakota.

Northern Plains. In 2009, wheat leaf rust was widespread, but cool and dry conditions in May and June delayed the arrival and drastically slowed the development of wheat leaf rust. The loss of many winter wheat fields in North and South Dakota due to winterkill also removed a susceptible early source of leaf rust in this region. Many of the wheat fields in the spring wheat region were treated with fungicide, which reduced losses due to leaf rust and Fusarium head blight.

Louisiana. In early March, infection levels of wheat leaf rust were much lower than normal in southern Louisiana. During the fourth week in March, low to moderate levels were found in plots and fields throughout Louisiana. Growers sprayed with fungicides to control the leaf rust. In late March, weather conditions were ideal for rust development with considerable moisture (rain, dew and fog) and ideal temperatures across Louisiana for a couple weeks. In mid-April, wheat leaf rust was severe on many susceptible lines and cultivars in the Louisiana plots.

In early May, high levels of leaf rust were observed in susceptible wheat plots in central and northeastern Louisiana. Significant levels of leaf rust were found in fields of LA841 in northern Louisiana. This cultivar has occupied a large portion of the acreage in the region for the last five years and has the *Yr17*/*Lr37*/*Sr38* gene complex. The *Yr17* gene appears to still be effective against stripe rust in the region, but virulence on *Lr37* exists in the current leaf rust population.

Arkansas. In early March, low levels of wheat leaf rust were found in southwest Arkansas. In early April, low levels of wheat leaf rust were reported across southern Arkansas.

In early May, low levels of leaf rust were reported throughout northern Arkansas fields. In mid May, high levels of leaf rust were reported on a few susceptible lines and cultivars throughout Arkansas plots. Leaf rust was at lower levels than the past several years in Arkansas plots and fields. Little leaf rust over wintered in Arkansas and less rust arrived from southern locations (i.e., south Texas and Louisiana).

Mississippi. In mid-March, leaf rust was found on wheat in southern Mississippi plots. In early May, moderate levels of leaf rust were found in central Mississippi plots.

Alabama. In mid-April, leaf rust severities ranged from 1 to 70% in wheat varietal plots in Fairhope and Headland in southern Alabama. In early May, high levels (60–80%) of leaf rust were found in plots of susceptible wheat in central Alabama and in fields in southwestern Alabama. Leaf rust from this area provided leaf rust inoculum for northern wheat areas.

Georgia. In mid-March, leaf rust was found on the lower leaves of the most susceptible soft red winter wheat lines at the Plains nursery in southern Georgia. In early May, high levels of leaf rust were found in plots while low levels were found in fields in southwestern Georgia.

Illinois. In early June, low levels of leaf rust were found in fields and severe levels were found in plots of soft red winter wheat in southern Illinois. In mid-June, moderate levels of leaf rust were found in soft red winter wheat plots in east-central Illinois. In late June, low levels of leaf rust were found in north-central Illinois plots.

Indiana. In early June, low levels of leaf rust were found in fields in southwest and east-central Indiana. In southwest Indiana plots, infection on the flag leaves ranged from 5–15% severity on Pioneer 25R47.

Michigan. In mid-June, moderate levels of leaf rust were found in southeastern Michigan soft red winter wheat plots. In late June, low levels of leaf rust were found in southwestern Michigan plots.

Wisconsin. In mid-June, moderate levels of leaf rust were found in southeastern Wisconsin soft red winter wheat plots. In early July, high levels of leaf rust were found in fields of susceptible soft red winter wheat in Door County in north-eastern Wisconsin.

South Carolina. In mid-April, low to moderate levels of leaf rust were observed in plots at Blackville in south-central South Carolina.

North Carolina. In mid-May, severe levels of leaf rust were found on susceptible lines and cultivars in plots and light levels in fields in eastern North Carolina. Much of the acreage had been sprayed for wheat diseases.

Virginia. In mid-May, severe levels of leaf rust were found on susceptible lines and cultivars in plots and low levels in fields in northeastern Virginia. Many of the wheat fields had been sprayed for wheat diseases.

Maryland. In mid-May low levels of leaf rust were found in plots on the Delmarva Peninsula. Only a few pustules developed on the flag leaves, but conditions were good for continued development. Much of the acreage had been sprayed for wheat diseases.

Delaware. In mid-June, low levels of leaf rust were found in Delaware winter wheat plots and fields.

New York. On 22 May, low levels of leaf rust were reported in Monroe County west of Rochester and along Lake Ontario. In mid-June, low levels of leaf rust were found in central and western New York winter wheat plots and fields.

California. During the second week in May, leaf rust was detected in plots in the nursery at Davis and by the third week in May 60% severities were reported in susceptible lines.

Washington. In late June, low levels of leaf rust were observed in wheat nurseries at Mt. Vernon and Walla Walla.

Ontario, Canada. Low levels of leaf rust (trace to 3%) were found in southwestern Ontario fields in late June.

Leaf rust race identifications. In 2009, 41 races of wheat leaf rust were described in the United States (Table 1, pp. 252-253). Races MLDSD (28.9%), TCRKG (16.8%), TDBGG (14.4%), MCTSB (7.4%), and MFPSB (4.9%) were the five most common races. Races MLDSD (*Lr9*, *Lr17*, *Lr41*/*Lr39* virulence), TDBGG (*Lr24* virulence), and MFPSB (*Lr17*, *Lr24*, and *Lr26*) were most common races in the Great Plains region. Races TCRKG (*Lr26*, *Lr11*, and *Lr18* virulence) and MCTSB (*Lr11*, *Lr17*, and *Lr26* virulence) increased in 2009 and were found mostly in the southeastern states.

Races with virulence to genes *Lr24*, *Lr26*, *Lr17*, and *Lr41*/*Lr39* that are present in the hard red winter wheat were common in the Great Plains region (Table 2, p. 254). Races with virulence to *Lr24*, *Lr26*, *Lr11*, and *Lr18* that are present in the soft red winter wheat were common in the southeastern states. Races with virulence to *Lr16* that is present in the hard red spring wheat were at low frequencies in the Great Plains region. Races with virulence to *Lr21* that is present in hard red spring wheat was not detected (http://www.ars.usda.gov/Main/docs.htm?docid=10493).

Lr gene postulations of current soft red winter, hard red winter, and hard red spring wheat cultivars are available in a searchable database at: http://160.94.131.160/fmi/iwp/cgi?-db=Lr%20gene%20postulations&-loadframes.

Wheat stripe rust (*Puccinia striiformis* f. sp. *tritici*). Texas. During the fourth week in March, low levels of stripe rust were found in southeastern Texas. The severe drought during the winter throughout much of Texas limited rust develop-

Table 1. Number and frequency (%) of virulence phenotypes of *Puccinia triticina* in the United States in 2009 identified by virulence to 19[a] lines of wheat with single genes for leaf rust resistance. [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 gene *Lr41*.

Pheno-type	Virulences	AL, AR, GA, LA, MS, NC, SC		MD, NY, PA, VA		IL, MI, WI		OK, TX		KS, NE		MN, ND, SD		AZ, CA		ID, WA		Total	
		#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
BBBQB	B,10	0	0	0	0	0	0	0	0	0	0	0	0	4	33.3	0	0	4	0.7
CCPMB	3,26,3ka,17,30,B,18	0	0	2	3.3	0	0	0	0	0	0	0	0	0	0	0	0	2	0.3
FCPNB	2c,3,26,3ka,17,30,B,14a	0	0	0	0	0	0	2	1.2	0	0	0	0	0	0	0	0	2	0.3
MBBJG	1,3,10,14a,28	0	0	2	3.3	0	0	0	0	0	0	0	0	0	0	0	0	2	0.3
MBDSB	1,3,17,B,10,14a	1	0.6	0	0	0	0	0	0	0	0	0	0	2	16.7	0	0	3	0.5
MBGJG	1,3,11,10,14a,28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	20	2	0.3
MBPTB	1,3,3ka,17,30,B,10,14a,18	2	1.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.3
MBRKG	1,3,3ka,11,30,10,14a,18,28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	10	1	0.2
MBTSB	1,3,3ka,11,17,30,B,10,14a	1	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2
MCDSB	1,3,26,17,B,10,14a	12	7.3	0	0	0	0	2	1.2	0	0	0	0	5	41.7	0	0	19	3.2
MCGDG	1,3,26,11,14a,28	2	1.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.3
MCPQG	1,3,26,3ka,17,30,B,10,28	0	0	2	3.3	0	0	0	0	0	0	0	0	0	0	0	0	2	0.3
MCPSB	1,3,26,3ka,17,30,B,10,14a	5	3	0	0	0	0	2	1.2	2	2.9	0	0	0	0	0	0	9	1.5
MCRJG	1,3,26,3ka,11,30,10,14a,28	0	0	1	1.7	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2
MCRKG	1,3,26,3ka,11,30,10,14a,18,28	0	0	2	3.3	0	0	0	0	0	0	0	0	0	0	0	0	2	0.3
MCTSB	1,3,26,3ka,11,17,30,B,10,14a	21	12.8	11	18.3	6	20	2	1.2	2	2.9	2	2.6	0	0	0	0	44	7.4
MDBJG	1,3,24,10,14a,28	0	0	12	20	0	0	0	0	0	0	0	0	0	0	0	0	12	2
MFBJG	1,3,24,26,10,14a,28	0	0	8	13.3	0	0	0	0	0	0	0	0	0	0	0	0	8	1.4
MFGJG	1,3,24,26,11,10,14a,28	0	0	2	3.3	0	0	3	1.8	0	0	0	0	0	0	0	0	5	0.8
MFPSB	1,3,24,26,3ka,17,30,B,10,14a	6	3.7	2	3.3	4	13.3	6	3.6	6	8.8	5	6.4	0	0	0	0	29	4.9
MLDSD	1,3,9,17,B,10,14a,41	12	7.3	2	3.3	1	3.3	80	47.3	38	55.9	35	44.9	1	8.3	2	20	171	28.9
NBBKG	1,2c,10,14a,18,28	0	0	2	3.3	0	0	0	0	0	0	0	0	0	0	0	0	2	0.3
PBBHG	1,2c,3,10,18,28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	50	5	0.8
PCMJG	1,2c,3,26,3ka,30,10,14a,28	0	0	2	3.3	0	0	0	0	0	0	0	0	0	0	0	0	2	0.3
SBBGG	1,2a,2c,10,28	0	0	0	0	0	0	1	0.6	0	0	0	0	0	0	0	0	1	0.2
TBBJG	1,2a,2c,3,10,14a,28	2	1.2	0	0	0	0	0	0	3	4.4	2	2.6	0	0	0	0	7	1.2

Table 1. Number and frequency (%) of virulence phenotypes of *Puccinia triticina* in the United States in 2009 identified by virulence to 19[a] lines of wheat with single genes for leaf rust resistance. [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 gene *Lr41*.

Pheno-type	Virulences	AL, AR, GA, LA, MS, NC, SC		MD, NY, PA, VA		IL, MI, WI		OK, TX		KS, NE		MN, ND, SD		AZ, CA		ID, WA		Total	
		#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
TBGJG	1,2a,2c,3,11,10,14a,28	2	1.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.3
TBRKG	1,2a,2c,3,3ka,11,30,10,14a,18,28	9	5.5	0	0	0	0	1	0.6	0	0	0	0	0	0	0	0	10	1.7
TCDSB	1,2a,2c,3,26,17,B,10,14a	0	0	2	3.3	0	0	0	0	0	0	0	0	0	0	0	0	2	0.3
TCJDB	1,2a,2c,3,26,11,17,14a	1	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2
TCQJG	1,2a,2c,3,26,3ka,11,10,14a,28	1	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2
TCRKG	1,2a,2c,3,26,3ka,11,30,10,14a,18,28	70	42.7	4	6.7	17	56.7	5	3	1	1.5	2	2.6	0	0	0	0	99	16.8
TCTJG	1,2a,2c,3,26,3ka,11,17,30,10,14a,28	2	1.2	2	3.3	0	0	0	0	0	0	0	0	0	0	0	0	4	0.7
TDBGB	1,2a,2c,3,24,10	0	0	0	0	0	0	2	1.2	0	0	0	0	0	0	0	0	2	0.3
TDBGG	1,2a,2c,3,24,10,28	4	2.4	0	0	0	0	43	25.4	9	13.2	29	37.2	0	0	0	0	85	14.4
TDBJG	1,2a,2c,3,24,10,14a,28	8	4.9	2	3.3	2	6.7	7	4.1	3	4.4	0	0	0	0	0	0	22	3.7
TDRKG	1,2a,2c,3,24,3ka,11,30,10,14a,18,28	0	0	0	0	0	0	4	2.4	0	0	0	0	0	0	0	0	4	0.7
TFBGG	1,2a,2c,3,24,26,10,28	0	0	0	0	0	0	4	2.4	0	0	1	1.3	0	0	0	0	5	0.8
TFBJG	1,2a,2c,3,24,26,10,14a,28	3	1.8	0	0	0	0	0	0	2	2.9	0	0	0	0	0	0	5	0.8
TJBGG	1,2a,2c,3,16,24,10,28	0	0	0	0	0	0	2	1.2	2	2.9	2	2.6	0	0	0	0	6	1
TNRJJ	1,2a,2c,3,9,24,3ka,11,30,10,14a,28,41	0	0	0	0	0	0	3	1.8	0	0	0	0	0	0	0	0	3	0.5
Total		164		60		30		169		68		78		12		10		591	

ment. On 27 March, low levels of stripe rust were detected in the lower canopy of susceptible Pioneer 25R78 wheat fields in Hunt, Rockwall, and Fannin counties in north-central Texas. Weather conditions were conducive for the rust to move upwards to the F-2 and F-1 leaves. Detection of stripe rust in north Texas was similar in date to 2008.

In early April, low to heavy levels of stripe rust were observed in a field of Pioneer 26R61 near College Station in central Texas. On 22 April, low levels of stripe rust were found on a few winter wheat lines in the irrigated nursery at Castroville, Texas (Fig. 2, p. 255). Stripe rust was extremely light and hard to find in the nursery at College Station.

Oklahoma. In early June, severe levels of stripe rust were found in a field in the Panhandle of Oklahoma. The rust arrived so late that it did not affect the wheat yield.

Kansas. On 22 May, stripe rust was observed at trace levels in Saline County (central Kansas). In early June, low levels of stripe rust were observed in Reno county (central Kansas) and Sumner county (south-central Kansas) plots of cultivars known to be susceptible to stripe rust. Lesions were 2 to 3 cm long and actively producing spores suggesting that the infections had taken place at least three weeks earlier. On 8 June, several small foci of stripe rust were found in the susceptible cultivars 2137, TAM 110, and TAM ll2 in northwest Kansas. A few stripe rust lesions were identified on cultivars previously identified as moderately resistant. This observation on the MR cultivars has been reported late in the growing season the past two years. Losses to stripe rust were light in Kansas in 2009.

Colorado. In early June, low levels of wheat stripe rust were found at Julesburg, in northeastern Colorado plots.

Table 2. Number and frequency (%) of isolates of *Puccinia triticina* in the United States in 2009 virulent to 20 lines of wheat with single resistance genes for leaf rust resistance.

Resistance gene	AL, AR, GA, LA, MS, NC, SC		MD, NY, PA, VA		IL, MI, WI		OK, TX		KS, NE		MN, ND, SD		AZ, CA		ID, WA		Total	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Lr1	164	100.0	58	96.7	30	100.0	167	98.8	68	100.0	78	100.0	8	66.7	10	100.0	583	98.6
Lr2a	102	62.2	10	16.7	19	63.3	72	42.6	20	29.4	36	46.2	0	0.0	0	0.0	259	43.8
Lr2c	102	62.2	14	23.3	19	63.3	74	43.8	20	29.4	36	46.2	0	0.0	5	50.0	270	45.7
Lr3	164	100.0	58	96.7	30	100.0	168	99.4	68	100.0	78	100.0	8	66.7	10	100.0	584	98.8
Lr9	12	7.3	2	3.3	1	3.3	83	49.1	38	55.9	35	44.9	1	8.3	2	20.0	174	29.4
Lr16	0	0.0	0	0.0	0	0.0	2	1.2	2	2.9	2	2.6	0	0.0	0	0.0	6	1.0
Lr24	21	12.8	26	43.3	6	20.0	74	43.8	22	32.4	37	47.4	0	0.0	0	0.0	186	31.5
Lr26	123	75.0	40	66.7	27	90.0	26	15.4	13	19.1	10	12.8	5	41.7	0	0.0	244	41.3
Lr3ka	117	71.3	28	46.7	27	90.0	25	14.8	11	16.2	9	11.5	0	0.0	1	10.0	218	36.9
Lr11	109	66.5	22	36.7	23	76.7	18	10.7	3	4.4	4	5.1	0	0.0	3	30.0	182	30.8
Lr17	63	38.4	23	38.3	11	36.7	94	55.6	48	70.6	42	53.8	8	66.7	2	20.0	291	49.2
Lr30	116	70.7	28	46.7	27	90.0	25	14.8	11	16.2	9	11.5	0	0.0	1	10.0	217	36.7
LrB	60	36.6	21	35.0	11	36.7	94	55.6	48	70.6	42	53.8	12	100	2	20.0	290	49.1
Lr10	161	98.2	58	96.7	30	100.0	167	98.8	68	100.0	78	100.0	12	100	10	100.0	584	98.8
Lr14a	160	97.6	56	93.3	30	100.0	117	69.2	57	83.8	46	59.0	8	66.7	5	50.0	479	81.0
Lr18	81	49.4	10	16.7	17	56.7	10	5.9	1	1.5	2	2.6	0	0.0	6	60.0	127	21.5
Lr21	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Lr28	103	62.8	41	68.3	19	63.3	73	43.2	20	29.4	36	46.2	0	0.0	8	80.0	300	50.8
Lr41	12	7.3	2	3.3	1	3.3	83	49.1	38	55.9	35	44.9	1	8.3	2	20.0	174	29.4
Total	164		60		30		169		68		78		12		10		591	

Nebraska. In early June, trace levels of stripe rust were found in the central Panhandle of Nebraska. In late June, significant levels (40% severities) of wheat stripe rust were found in fields from Hemingford to Gordon in the northern panhandle of Nebraska (Fig. 2).

South Dakota. In early July, low levels of stripe rust were found in a spring wheat plot at the Beresford research station in southeastern South Dakota.

North Dakota. On 11 August, stripe rust was at trace levels on wheat cultivars with *Lr21*, in central North Dakota.

Montana. In early July, conditions were favorable for stripe rust development in the Gallatin Valley at the Post Research farm in Bozeman, Montana. Rust was first observed 4 June. Plots that were sprayed with fungicide had minimal disease development.

Louisiana. During the fourth week in March in northeastern Louisiana at Winnsboro, high levels of stripe rust were observed in one wheat plot; surrounding plots were relatively clean. By late March, stripe rust had not been reported in other areas of the state. In Louisiana, stripe rust epidemics usually develop in the first half of March and peak by early April when temperatures surpass the optimum for stripe rust development. In early

April, wheat rust stripe levels were lower than normal in Louisiana.

Arkansas. As of 25 March, no stripe rust had been reported in Arkansas. In mid-April, wheat stripe rust was at lower levels than in the past several years in Arkansas. Extension personnel reported light stripe rust in southwest Arkansas. In early May, no additional stripe rust was found in Arkansas. The threat of more stripe rust was low. because the wheat crop was past the most favorable time for stripe rust development and most of the acreage was planted with varieties that have resistance.

Georgia. In late March, low levels of stripe rust were found in susceptible wheat fields from southwest to south-central Georgia. During April, stripe rust developed slowly in this area, because conditions were not conducive for rust development. In early May, severe levels of stripe rust were found in susceptible cultivars at the Plains, Georgia, nursery. Stripe rust had been artificially inoculated in these plots.

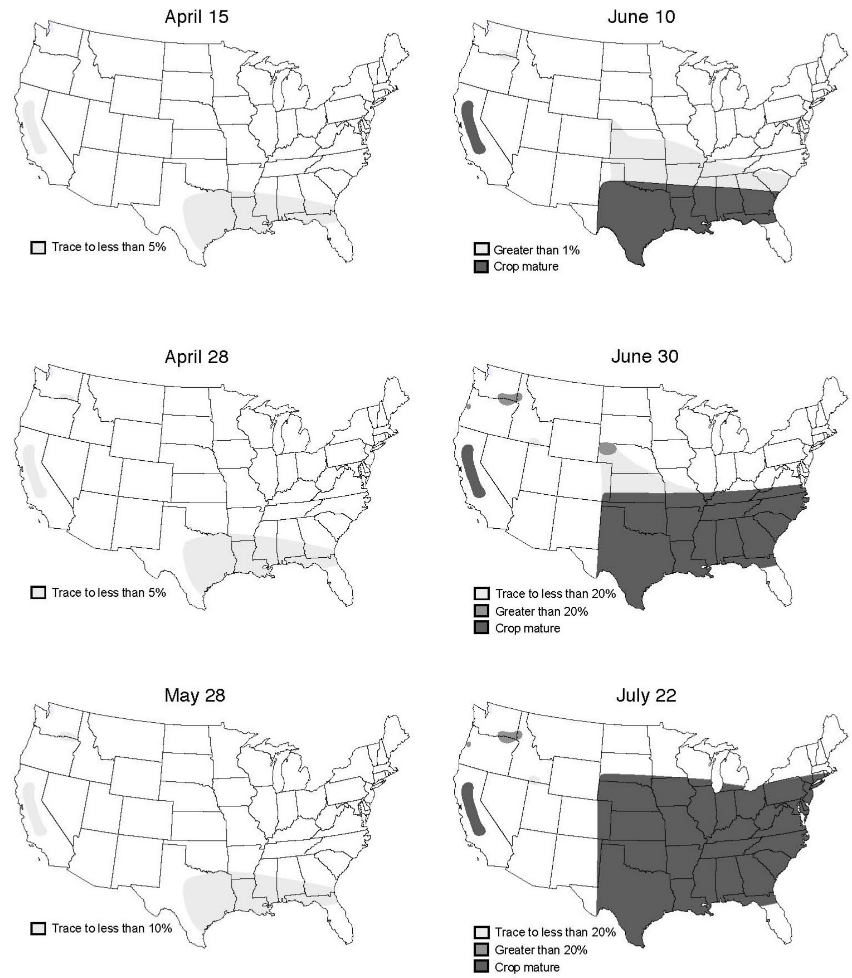

Fig. 2. Stripe rust severities in wheat fields in 2009.

Virginia. In mid-June, low levels of stripe rust were found on soft wheat cultvars in the Montgomery, Virginia nursery.

Ontario, Canada. With the cooler than usual May and June weather, wheat stripe rust in late June was more prevalent in Essex and Chatham/Kent counties Ontario (adjacent to Detroit, Michigan) than in recent years.

California. In late March, stripe rust was found in nurseries in the Sacramento and San Joaquin Valleys. From 20–23 April, high levels of wheat stripe rust were found in nurseries in the Sacramento Valley. Severities higher than 50% were observed on the susceptible wheat D6301 at Davis. During early May, conditions were conducive for rust increase and stripe rust severities of up to 60% were found in the susceptible cultivars Anza and Yecora Rojo at Colusa. The resistance of the commonly grown wheat cultivars was holding up.

Pacific Northwest. In late February, wheat stripe rust was found in the Mount Vernon area of northwestern Washington. In early April, 30% wheat stripe rust severities were reported on susceptible entries in nurseries and 2–5% severities in some Mount Vernon area fields. The rust severities were less than normal for the time of the year. In mid-June in the Mt. Vernon nursery, 80% stripe rust severities were reported in susceptible winter wheat varieties and by late June 100% severities were reported in susceptible spring wheat entries.

In mid-April, low levels of stripe rust were found in the Horse Heaven Hills area in south-central Washington and on a susceptible check in the winter wheat nursery near Walla Walla. In mid-May, foci of stripe rust (10–80% severity) were found in winter wheat nurseries in the Washington/Idaho Palouse region. In rust nurseries in Umatilla County, Oregon, stripe rust was developing on susceptible entries with 80% severities in foci. No stripe rust was found in any fields in the above area. In the Horse Heaven Hills area (Benton County) stripe rust development was under control after fungicide application.

On June 2, stripe rust on susceptible entries was found in the experimental plots near Pullman, Washington. The incidence was less than 1% and severity less than 5%. The first appearance of stripe rust near Pullman was about two weeks later than 2008. In late June, wheat stripe rust had increased rapidly (100% severities) on susceptible cultivars growing in winter wheat nurseries in the Palouse region (Whitman County, Washington, and Latah County, Idaho). At the Pendleton experiment station in Oregon, stripe rust reached 60% severity on susceptible entries. In the spring wheat nurseries, 40% severities were reported on susceptible entries. In the western Pacific Northwest area stripe rust was very

Table 3. Estimated losses in winter wheat due to rust in 2009 (T = trace).

State	1,000 acres harvested	Yields in bushels per acre	Production in 1,000 of bushels	Losses due to:					
				Stem rust		Leaf rust		Stripe rust	
				%	1,000 bu	%	1,000 bu	%	1,000 bu
AL	180	55.0	9,900	0.0	0.0	1.00	100.0	0.0	0.0
AR	390	44.0	17,160	T	T	T	T	T	T
CA	315	80.0	25,200	0.0	0.0	T	T	1.0	254.5
CO	2,450	40.0	98,000	0.0	0.0	T	T	T	T
DE	67	62.0	4,154	0.0	0.0	0.00	0.0	0.0	0.0
FL	14	43.0	602	0.0	0.0	T	T	0.0	0.0
GA	250	42.0	10,500	0.0	0.0	1.00	106.1	T	T
ID	700	81.0	56,700	T	T	0.00	0.0	T	T
IL	820	56.0	45,920	0.0	0.0	1.00	463.8	0.0	0.0
IN	450	67.0	30,150	0.0	0.0	1.00	304.5	0.0	0.0
IA	22	45.0	990	0.0	0.0	0.00	0.0	0.0	0.0
KS	8,800	42.0	369,600	T	T	1.37	5,133.9	T	T
KY	390	57.0	22,230	0.0	0.0	T	T	0.0	0.0
LA	175	56.0	9,800	T	T	0.75	73.5	1.0	99.8
MD	195	60.0	11,700	0.0	0.0	T	T	0.0	0.0
MI	560	69.0	38,640	0.0	0.0	1.00	390.3	0.0	0.0
MN	45	45.0	2,025	0.0	0.0	1.00	20.5	0.0	0.0
MS	165	50.0	8,250	0.0	0.0	0.50	41.5	0.0	0.0
MO	730	47.0	34,310	T	T	1.50	522.5	T	T
MT	2,420	37.0	89,540	0.0	0.0	0.00	0.0	0.0	0.0
NE	1,600	48.0	76,800	T	T	0.70	541.4	T	T
NJ	29	51.0	1,479	0.0	0.0	0.00	0.0	0.0	0.0
NM	140	25.0	3,500	0.0	0.0	0.00	0.0	0.0	0.0
NY	105	65.0	6,825	0.0	0.0	1.00	68.9	0.0	0.0
NC	600	49.0	29,400	0.0	0.0	0.00	0.0	0.0	0.0
ND	545	48.0	26,160	0.0	0.0	2.00	533.9	0.0	0.0
OH	980	72.0	70,560	0.0	0.0	1.00	712.7	0.0	0.0
OK	3,500	22.0	77,000	0.0	0.0	6.00	4,914.9	T	T
OR	750	56.0	42,000	0.0	0.0	T	T	T	T
PA	175	56.0	9,800	0.0	0.0	T	T	0.0	0.0
SC	150	47.0	7,050	0.0	0.0	T	T	0.0	0.0
SD	1,530	42.0	64,260	0.0	0.0	1.00	649.1	0.0	0.0
TN	340	51.0	17,340	T	T	T	T	0.0	0.0
TX	2,450	25.0	61,250	T	T	1.10	681.2	T	T
UT	135	50.0	6,750	0.0	0.0	0.00	0.0	0.0	0.0
VA	210	58.0	12,180	0.0	0.0	T	T	0.0	0.0
WA	1,640	59.0	96,760	T	T	T	T	0.5	486.2
WV	5	50.0	240	0.0	0.0	T	T	0.0	0.0
WI	315	68.0	21,420	0.0	0.0	1.00	216.4	0.0	0.0
WY	132	38.0	5,016	0.0	0.0	T	T	0.0	0.0
Total above	34,469	44.1	1,521,161		T		15,475.1		840.5
U.S. % loss				T		1.00		0.06	
U.S. total	34,485	44.2	1,522,718						

Table 4. Estimated losses in spring and durum wheat due to rust in 2009 (T = trace).

SPRING WHEAT									
				Losses due to:					
	1,000 acres harvested	Yields in bushels per acre	Production in 1,000 of bushels	Stem rust		Leaf rust		Stripe rust	
State				%	1,000 bu	%	1,000 bu	%	1,000 bu
CO	29.0	90.0	2,610	0.0	0.0	0.0	0.0	0.00	0.00
ID	530.0	77.0	40,810	0.0	0.0	0.0	0.0	T	T
MN	1,550.0	53.0	82,150	0.0	0.0	T	T	0.00	0.00
MT	2,350.0	30.0	70,500	0.0	0.0	0.5	712.1	0.00	0.00
NV	2.0	75.0	150	0.0	0.0	0.0	0.0	0.00	0.00
ND	6,300.0	46.0	289,800	0.0	0.0	1.0	2,927.3	0.00	0.00
OR	127.0	54.0	6,858	0.0	0.0	0.0	0.0	T	T
SD	1,470.0	44.0	64,680	0.0	0.0	T	T	0.00	0.00
UT	12.0	44.0	528	0.0	0.0	0.0	0.0	0.00	0.00
WA	585.0	45.0	26,325	T	T	0.0	0.0	1.00	265.90
Total above	12,955.0	45.1	584,411		T		3,639.4		265.90
U.S. % Loss				T	0.6		0.04		
U.S. Total	12,955.0	45.1	584,411						
DURUM WHEAT									
				Losses due to:					
	1,000 acres harvested	Yields in bushels per acre	Production in 1,000 of bushels	Stem rust		Leaf rust		Stripe rust	
State				%	1,000 bu	%	1,000 bu	%	1,000 bu
AZ	124.0	100.0	12,400	0.0	0.0	0.0	0.0	0.00	0.00
CA	170.0	100.0	17,000	0.0	0.0	0.0	0.0	0.00	0.00
ID	20.0	81.0	1,620	0.0	0.0	0.0	0.0	0.00	0.00
MT	535.0	31.0	16,585	0.0	0.0	0.0	0.0	0.00	0.00
ND	1,570.0	39.0	61,230	0.0	0.0	0.0	0.0	0.00	0.00
SD	9.0	23.0	207	0.0	0.0	0.0	0.0	0.00	0.00
Total above	2,428.0	44.9	109,042		0.0		0.0		0.00
U.S. % Loss				0.0		0.0		0.00	
U.S. Total	2,428.0	44.9	109,420						

severe in nurseries in Corvallis, Oregon. In late June, no stripe rust had been observed in spring wheat fields in eastern Washington and northern Idaho. Stripe rust did not cause significant damage to the winter wheat crop in this region.

In early July, low levels of wheat stripe rust were found in spring wheat fields in the Palouse and Dayton region of southeastern Washington.

Idaho. In late June, stripe rust was moderate in winter wheat fields and plots in southeastern Idaho and northern Utah. In early July, low levels of stripe rust were found in a soft white spring wheat Jubilee plot at Aberdeen, Idaho.

In summary, stripe rust did not cause significant damage to the winter and spring wheat crop in the Pacific Northwest.