CEREAL RUST BULLETIN

Final Report
August 7, 2003

Issued by:

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- • Stem rust was found throughout the northern Great Plains on wheat, barley and oat, but developed too late to cause any yield loss.
- • Wheat leaf rust was widespread and severe in some areas of the U.S.
- • Wheat stripe rust developed early and was more severe than usual throughout the U.S
- • Oat stem and crown rust severities were light this year.
- • Stem rust infection on barberry in Minnesota was the most severe in the last 40 years.

Wheat stem rust. The first reports of wheat stem rust this year were in mid-April, when trace amounts were found in a plot of the susceptible cultivar McNair 701 in southern Texas at Uvalde. By late April, wheat stem rust was severe in plots of McNair 701 and Chinese Spring at Uvalde. In mid-May, late developing tillers provided good niches for the stem rust to develop in southern Texas. During late May, traces of stem rust were found in a plot of the susceptible cultivar McNair 701 in north central Oklahoma. In late May, stem rust was found in late maturing lines in the nursery at Baton Rouge, Louisiana. Wheat stem rust was very light throughout the southern U.S. this year.

By mid-July, traces of wheat stem rust were observed on the susceptible spring wheat cultivar Baart in south central Minnesota plots. In late July, trace-20% stem rust severities were observed on the susceptible spring cultivars Baart and Max in southeastern North Dakota. Trace-30% severities were observed on Baart in northwestern and north central Minnesota. Up to 30% severities were observed on the winter wheat cultivar Norstar in northeastern North Dakota. The incidence of wheat stem rust infections were lighter than normal in the northern Great Plains this year since little wheat stem rust developed in the southern and central U.S. Also, all of the current spring wheat cultivars and most of the winter wheat cultivars are resistant to the current stem rust race population.

Wheat leaf rust. **Southern Plains** - In mid-February, light amounts of leaf rust were found on wheat in the central and Rolling Plains areas of Texas. The most severe rust was on the cultivar Jagger. In early March, wheat leaf rust development was slowed in central Texas plots, because of the cool temperatures in late February. The most severe rust was in border rows of TAM 110 where 10-20% severities were observed on the lower leaves. In early-April, leaf rust infections were light in wheat fields and were at high levels on susceptible cultivars in nursery plots in southern and central Texas. In the last week of March in southern and central

Texas, leaf rust severities up to 60% were on the lower leaves of cultivars in breeding nurseries and trace-10% severity levels were on the lower leaves in fields. The dry and cool weather in late March and early April contributed to the slow leaf rust development in the southern U.S.

In mid-April, even with the dry conditions, leaf rust was increasing throughout Texas, but overall rust severities were lighter than normal for this time of the year (Fig. 1). In a central Texas nursery on the susceptible cultivar Jagger, the leaves were completely dead because of the rust. In mid-April, leaf rust was increasing in southern Oklahoma on susceptible cultivars. In early May, central Texas had moderate to light infection on susceptible cultivars, while in northern Texas wheat at the late flower to early dough growth stages did not have any leaf rust infection. In early May, traces of leaf rust were found in plots of susceptible cultivars in southwestern Oklahoma. Leaf rust in Oklahoma developed late when the crop was at the dough growth stage, which resulted in little loss due to leaf rust. Infection sites in the southern winter wheat provided inoculum for the northern wheat area.

Central Plains - In early May, wheat leaf rust was found in light amounts in south central Kansas fields. By the third week in May, severity levels as high as 10% were observed on flag leaves in a few fields of Jagger. During the last week in May, leaf rust was severe in plots and fields of susceptible cultivars from central Kansas to west central Missouri (Fig. 1). In fields of Jagger at the late berry stage in south central Kansas, 60% severities were found on flag leaves. In fields of Jagger in northeast Kansas, 10% severities were observed on flag leaves. In central Kansas varietal plots, rust severities ranged from trace to 60%. Throughout Kansas and Missouri wheat leaf rust and stripe rust were competing on many cultivars for the same leaf tissue. Usually stripe rust increases faster because it can develop earlier and increase at cooler temperatures than leaf rust. In southern Kansas, losses due to leaf rust were severe in cultivars like Jagger but in other leaf rust susceptible cultivars losses were light. During late May 20% leaf rust severities were observed on *Aegilops cylindrica* (goatgrass) growing in the roadside in south central Kansas.

In the second week in June in eastern Nebraska, low to moderate leaf rust severities were found in fields and plots. Drought-like conditions in areas like western Nebraska slowed leaf rust development.

Northern Plains - In late May, traces of wheat leaf rust were found in winter wheat plots in east central Minnesota. On May 28, traces of wheat leaf were observed in spring wheat fields in south central and eastern North Dakota. These spring wheat rust observations are earlier than normal for that date. In mid-June, low levels of leaf rust infections were observed on the flag leaves of hard red winter wheat at anthesis in an east central South Dakota nursery. In early June, leaf rust also was found in spring wheat cultivars in the South Dakota nursery.

During the second week in June, leaf rust infections were found in winter and spring wheat fields in the southeast and south central part of North Dakota. Leaf rust severities in the fields ranged from 1 to 25%, with most fields at lower severity levels. Warm temperatures and high humidity favored leaf rust development. In the third week in June, trace-10% leaf

rust severities were observed at anthesis in susceptible winter wheat plots in east central Minnesota. Infections were mostly on flag-1 and flag-2 leaves. In the final week in June, susceptible winter wheat cultivars from east central Minnesota to west central South Dakota had 60% rust severities. Susceptible cultivars like Jagger and Expedition, had severities of 60%, but most cultivars had only trace levels of infection on the flag leaves. The rust infections in South Dakota and Minnesota probably originated from inoculum sources in Oklahoma and Kansas.

In the last week of June, susceptible spring wheat cultivars in southern Minnesota plots had 20% rust severities, with most infections on the lower leaves. Traces of leaf rust were observed in many of the spring wheat fields in southern Minnesota. In mid-July, 20-40% wheat leaf rust severities were observed on flag leaves of spring wheat cultivars in fields from southeastern North Dakota, northwestern South Dakota to southwestern Minnesota. Many wheat fields were sprayed with fungicide to prevent losses due to rust.

In late July, trace-60% leaf rust severities were observed in spring wheat varietal plots in central and eastern North Dakota plots. In farm fields in central and southeastern North Dakota severity levels of up to 40% were observed on the commonly grown wheat cultivars. In the northern tier of counties in North Dakota leaf rust was at reduced levels because the crop maturity was later than normal. Many wheat fields in the Red River Valley of the north had been sprayed with fungicide to reduce fungal diseases like leaf rust.

This year leaf rust was severe and concentrated in the upper Midwest. Rust inoculum arrived from the south in late May and early June with rain showers and temperature and moisture conditions have been good for infection and spread of leaf rust. The spring wheat cultivars currently grown have less effective resistance to leaf rust than those that were popular 10-15 years ago. Losses to wheat leaf rust occurred in the most susceptible cultivars.

Canada - In early July, 20 to 40% leaf rust severities were observed on susceptible cultivars in plots and trace to 10% in winter wheat fields in southwestern and south central Ontario, Canada.

Southeast. - In late March, wheat leaf rust was light in plots in the southern soft red winter wheat area from Georgia to Louisiana. In mid-April, from central Louisiana to Georgia light amounts of leaf rust were observed in research plots and fields. In early May, the highest leaf rust severities (60%) were in plots of susceptible cultivars in central Louisiana and southwestern Georgia. Only trace levels of leaf rust were found in southeastern Arkansas wheat plots. In early May, leaf rust severities of 30% were reported in susceptible wheat plots in Louisiana and severities of 60-70% were reported in plots in south central Georgia. Wheat leaf rust was lighter and developed later than normal throughout the southern soft red winter wheat area and did not cause much yield loss. In late May in eastern Arkansas, leaf rust had developed late on several cultivars including 9663 that had been previously highly resistant. Stripe rust was present first in this area, which reduced the development of leaf rust.

Mideast - During the second week in June, trace-10% leaf rust severities were reported in plots, and traces in fields of soft red winter wheat cultivars from northeastern Missouri to northwestern Ohio. Leaf rust infections were reduced due to cooler than normal temperatures in the region and the presence of wheat stripe rust.

East - In early June, leaf rust severities ranged from trace to 15% on susceptible cultivars in a nursery on the eastern shore of Virginia. In mid-June, a plot of the cultivar Massey in northwestern Virginia had leaf rust severity of 80%. Wheat leaf rust was lighter than normal in the eastern U.S. this year.

California - In many areas of California in early May, wheat leaf rust was difficult to find because of the cool weather and abundance of stripe rust. However, leaf rust was severe in commercial fields in the Imperial Valley. Fields of the durum wheat cultivar Orita, at the soft dough stage, had 70-80% leaf rust severities in early May. By mid-late May, wheat leaf rust was severe (50-80% severity) on susceptible cultivars in yield trials and fields in the Central Valley of California. High levels were detected on the few susceptible cultivars that were not affected by stripe rust, but known leaf rust susceptible cultivars that had been severely damaged by stripe rust had no green tissue remaining for leaf rust to infect. No leaf rust was detected on durum wheat in the Central Valley. In late July 40% rust severities were observed in wheat growing in plots at Tulelake in northern California.

Wheat Leaf Rust Virulence - From leaf rust collections made in the southern plains, the following races were identified - MBDS, MBRJ, MDRJ, TBDS, TLRJ and TNRJ. Races MBDS, MCDS and TBDS are virulent to Jagger which has Lr17. TLRJ and TNRJ are virulent to cultivars with Lr9 (Lockett) and Lr41 (Thunderbolt).

Wheat Stripe Rust. **Southern Plains** - In mid-February, many hot spots of stripe rust infection (1-3 feet in circumference) were found in central Texas wheat plots. This suggests stripe rust might have over wintered in this region. In a field 70 miles east of San Antonio, stripe rust was present in a commercial field of Ogallala, and in the nursery plots severities were high on Ogallala and Coronado. In late February, cold temperatures in central Texas slowed stripe rust in plots, but conditions were still good for stripe rust to increase since there was regular precipitation in late February and early March. By early March, stripe rust had spread throughout the central Texas nurseries. In early April, wheat stripe rust severities were high in wheat fields in southern and central Texas (Fig. 2). Stripe rust infections were high in several thousand acres of Coronado wheat in central Texas. In mid-March plants in a few fields of Coronado died because of stripe rust. Many of the fields in central Texas were sprayed for rust control. Stripe rust development slowed during the later part of March and early April because of dry field conditions. In early April, low levels of stripe rust infection were found in fields west of Dallas. The wheat cultivars Jagger, Cutter and Jagelene had the best stripe rust resistance in the Texas nurseries**.** In mid-April, stripe rust development was slowing in south Texas, but it still was possible to find some fresh pustules at all locations. In central and north central Texas, stripe rust was severe even

though much of the area had been under drought conditions. During the last week in April, wheat stripe rust infections were increasing on susceptible cultivars from central to northern Texas. This was the worst stripe rust epidemic ever seen in central Texas.

This year stripe rust over wintering sites occurred in more locations than in previous years throughout the southern U.S. wheat growing area. Where stripe rust spores are deposited and infect wheat in late fall and early winter, over wintering sites develop which are very critical to where stripe rust will occur the next year.

In early May, hot spots of stripe rust foci were found in central to north central Oklahoma plots. A wheat field in north central Oklahoma was heavily infected with stripe rust. In early May in southwestern Oklahoma, plots of the susceptible cultivars 2137, Above, AP502CL, Custer, Trego, and Intrada had lost their flag leaves because of a combination of stripe rust and moisture stress. Resistant cultivars Jagger, Cutter, Thunderbolt and several advanced lines from Oklahoma, still had green leaves. Cultivars with an intermediate resistance to stripe rust (Ok101, 2174, and 2145) also had green flag leaves. In northern Oklahoma, susceptible cultivars had lost their flag leaves due to the stripe rust and drought. Other cultivars which were resistant to stripe rust (e.g. Jagger) did much better in this area. Losses due to stripe rust in Oklahoma will be less than in 2001 because of the drought-like conditions in some areas of the state in May.

Central Plains - In mid-May, wheat stripe rust was prevalent throughout the entire state of Kansas at varying degrees of severity. The disease was most severe in the southern areas of the state. Cultivars Jagger, Big Dawg, and Betty were resistant. In some areas of Kansas, the more susceptible cultivars such as 2137, AGSECO 7853, Kalvesta, OK101, Stanton, Venango, Oro Blanco, Lakin, Trego, TAM 107 and TAM 110 had high stripe rust severities. Some estimates were for a 30-40% yield loss for the highly susceptible cultivars

In late May, stripe rust was severe (60% severities) in central and southern Kansas plots and fields (Fig. 2). There was much more stripe rust in Oklahoma and Kansas in 2003 than in 2002. In both 2003 and 2002, a cool spring with nighttime temperatures in the 40s and 50s plus humid weather were conducive for stripe rust development throughout the Great Plains. However, the rust inoculum load from Texas in 2003 was greater which caused more rust development this year. Wheat stripe rust development in 2003 in the southern and central Great Plains was comparable to 2001.

In late May, traces of stripe rust were found in plots of susceptible wheat in south central Nebraska. In mid-June, stripe rust was light in most fields in central and eastern Nebraska. During the last week of June, winter wheat fields and plots in western Nebraska had stripe rust severities from trace to 60%.

Northern Plains - During late May, trace amounts of stripe rust were found at the late jointing growth stage in east central South Dakota winter wheat plots. In the second week of June in east central Minnesota, winter wheat plots had trace levels of stripe rust. A focal

point of severe infection was found in a winter wheat plot in St. Paul. This indicates that stripe rust may have over wintered in Minnesota or arrived in late April or early May. During the third week of June, 60% severities were observed in susceptible winter wheat plots (e.g., Coker 9835) at the Rosemount Experiment Station in east central Minnesota. In other winter wheat plots severities ranged from 0 - 40%.

In early June, wheat stripe rust was found in winter wheat and spring wheat nurseries in eastern South Dakota. In some susceptible winter wheat lines (e.g., Trego) stripe rust severity was 100%. During the last week in June winter wheat fields and plots in south central South Dakota had stripe rust severities from trace to 60%.

On June 20, winter wheat plots in east central Minnesota had wheat stripe rust severities between trace levels to 60%. Coker 9835 was very susceptible, with severity between 40-60%. Cultivars with Lr26/Yr9/Sr31 genes on the wheat-rye 1B-1R translocation also tended to have higher stripe rust severities. Many cultivars had a resistant response characterized by necrotic strips; moderately resistant cultivars had necrotic strips with stripe rust pustules; moderately susceptible cultivars had chlorotic strips with pustules; and susceptible cultivars had strips of pustules without necrosis or chlorosis. Cultivars known to have Lr34/Yr18 had a moderately resistant response.

In late June, stripe rust infections were in spring wheat plots in east central Minnesota. Some of the cultivars (e.g. Briggs and Walworth) had stripe rust severities of 10%. The cooler temperatures with sufficient moisture levels were conducive for stripe rust development in the north central region.

In late June, severe stripe rust was found in spring wheat fields in east central North Dakota. Fields sprayed with fungicides in the eastern North Dakota area were rust free. In mid-July, 40% stripe rust severities were found on flag leaves in some wheat fields at the early berry stage in southeastern North Dakota. The rust pustules on the leaves were still sporulating, since the nighttime temperatures were less than 60 F in that area. In late July, active stripe rust pustules were observed in wheat varietal plots throughout the state of North Dakota.

Canada - In early July, stripe rust severities ranged from trace to 10% in southwestern Ontario winter wheat fields. In winter wheat trials at Ridgetown College severities ranged from trace to 5% severities but some cultivars such as Sisson had upwards to 30% severity.

Louisiana, Georgia, Arkansas, and Missouri - In early March, stripe rust was increasing on a few cultivars in south central Louisiana. Stripe rust was light but increasing in spots. Weather conditions were ideal for rust infection in early March. In early April, stripe rust infections were increasing throughout plots in southern Louisiana. Many wheat fields in Louisiana were sprayed for stripe rust.

By mid-April, stripe rust was severe in southern Louisiana nurseries, with 80% severities in susceptible cultivars. Throughout Louisiana stripe rust was increasing and many fields

were sprayed with fungicides to reduce yield losses. Wheat cultivars Terral LA422 and AGS 2000, which are widely grown in Louisiana, were susceptible to stripe rust. Heavy infections of stripe rust have occurred in four of the last six years in Louisiana.

In early April, a focal point of stripe rust infection that had over wintered was found in wheat plots in northwestern Arkansas. In mid-April, stripe rust was increasing in southern and eastern Arkansas fields and many of the fields were sprayed with fungicides. Rust was found on most of the commonly grown cultivars. Numerous hot spots (foci) of rust infection were found throughout the area. In southeast Arkansas, wheat plots of susceptible cultivars had 20-30% stripe rust infection. There was a wide range in the amount of stripe rust on the cultivars in the breeding plots; some soft red winter wheat cultivars were highly resistant to stripe rust, while others were relatively susceptible. Stripe rust infection in Arkansas fields was reported to be scattered and light during the last week of April. In late May in west-central Missouri, 20% wheat stripe rust severities were observed on flag leaves of soft red cultivars at the early berry stage. In mid-June fields of soft red winter wheat cultivars from northeastern Missouri to southern Indiana had 40 - 80% stripe rust severities.

In both 2003 and 2002, stripe rust was severe in the soft wheat area growing areas of Arkansas and Missouri. This year favorable weather conditions and stripe rust inoculum from infection sites in Louisiana and Texas led to increased stripe rust in Arkansas and Missouri.

In mid-April, 20% stripe rust severities were common in fields from northeastern Louisiana to central Georgia. However, the dry weather during the last two weeks of April slowed stripe rust development in many parts of the southern U.S. In late April, wheat plots with stripe rust severities of 20% were in central Mississippi and central Alabama, however, stripe infections were light in the commercial fields in this area. In mid-April, severe stripe rust was found in southern Georgia varietal plots at Plains with the most susceptible lines at 80-100% severity. Entire plots were rusted indicating a uniform spore shower, not just isolated disease foci. Stripe rust (less than 5% severity) was also found at Griffin, Georgia April 14 on a few susceptible lines. By the end of the first week in May, stripe rust severities of 100% were observed on susceptible cultivars in the south central Georgia wheat plots. This was the most severe wheat stripe rust ever seen in Georgia.

Mideast. In late May, stripe rust severities of 80% were in a few fields in southern Illinois. In many of these wheat fields, stripe rust destroyed the flag leaves. In mid-June, from northwestern Ohio to north central Illinois, traces of stripe rust were observed in wheat fields. Stripe rust development in the northern soft red winter wheat growing area was greater than last year. This year favorable weather conditions (cool temperatures and moisture) and stripe rust inoculum from many infection sites in the southern soft red winter wheat areas, allowed stripe rust to develop in the northern soft wheat area. The soft red winter wheat cultivars ranged from very resistant to fully susceptible to stripe rust.

East - In late May, wheat stripe rust foci were observed in plots at the Blacksburg, Virginia experiment station. The incidence of stripe rust in the plots were trace to 5% while the severity in the major foci was 15-50%. The VA cultivar Sisson that has 1B/1R translocation had high stripe rust severity suggesting that stripe rust races with virulence to *Yr9* are common.

In early June, several major foci of stripe rust and frequent secondary foci were found in the eastern shore nursery plots at Painter, Virginia. In mid-June, one small infection focus was found in plots in Warsaw, Virginia. This year stripe rust was found throughout Virginia but developed too late to cause significant damage to the wheat crop.

California - Stripe rust on wheat was first detected on Feb. 20 in nurseries in Davis, California, which was the earliest onset of stripe rust in a number of years. Infection foci were at 50% severity. By late February, wheat stripe rust was increasing on susceptible cultivars in nurseries and fields in the Sacramento Valley and was severe on early planted forage wheat (Dirkwin) in the northern San Joaquin Valley. Low levels of infection also were detected in wheat nurseries and commercial fields throughout the San Joaquin Valley on March 4-5. Fields ranged from early joint to boot stage. In early April, wheat stripe rust infections had increased throughout much of the Central Valley of California and surrounding areas. Most of the current wheat cultivars in California, including many durum cultivars, are susceptible to stripe rust. A mild winter with moisture and early infection of very susceptible cultivars produced an abundant inoculum load. Susceptible cultivars, such as Dirkwin, Cavalier, Yecora Rojo, Eldon, Yolo, and Klasic had 100% stripe rust severities. A larger proportion of wheat fields in California were sprayed with fungicides than in previous years. The fungicide Tilt was used early in the growing season but Quadris was applied after the emergence of the flag leaves.

In mid-April, in the Central Valley (Sacramento and San Joaquin valleys) of California, stripe rust was severe in plots of susceptible wheat cultivars. In the first week of May stripe rust was severe in fields in the Central Valley due to favorable conditions. By the fourth week in May, wheat stripe rust continued to increase on common and durum wheat in nurseries throughout the Central Valley of California. This year stripe rust was more severe in California than last year because the moist conditions and cool temperatures were much favorable for rust development throughout the growing season. Losses to stripe rust were significant this year in California.

Pacific Northwest - In late April, stripe rust was severe in susceptible winter wheat fields in southeastern Washington and northeastern Oregon. Infection foci with 60% rust severities that were up to several hundred feet in diameter were found in wheat fields. The ground under the plants was covered with rust spores. Some fields in the area were sprayed with fungicides. By late April, stripe rust was also occurring on early-planted spring wheat cultivars in the Pendleton area of Oregon.

This year, in much of the Pacific Northwest, there were favorable conditions for over wintering of wheat stripe rust and the cool, moist conditions in late April and early May was favorable for rust development. In early May, severities of 90% were observed on susceptible entries in the winter wheat nursery near Mt. Vernon in northeastern Washington. By mid-May, wheat stripe rust was severe in southeastern Washington winter wheat plots and fields. Many fields in eastern Washington were sprayed with fungicides. In irrigated spring wheat fields in southeastern Washington, rust severities of trace to 1% were observed. Since abundant rust inoculum was in the region with favorable weather for rust development, stripe rust continued to spread and develop in eastern Washington and northern Idaho. By late May, 5 to 20% wheat stripe rust severities were observed on susceptible winter wheat cultivars growing in fields and plots in the Palouse region of eastern Washington. In fields of soft white winter wheat, stripe rust infections were common, but mostly with resistant to moderately resistant reactions. In late May, light stripe rust was found in a winter wheat field in northwestern Idaho.

In mid-June, wheat stripe rust was developing rapidly in fields of susceptible spring wheat in eastern Washington. Some fields had incidence levels of 60% stripe rust with severity levels up to 20%. In mid-June, growers applied fungicides on susceptible spring wheat fields. In mid- June, 50% severity levels were in irrigated plots of susceptible winter wheat cultivars in the dry land area of central Washington. Susceptible lines had 60% severities in plots in a winter wheat nursery near Pullman, Washington, and fields in the area had only traces of rust. In July, dry conditions in Washington slowed stripe rust development.

Oat Stem Rust. In mid-February, traces of oat stem rust were found on the upper leaves of Harrison in a plot 70 miles east of San Antonio, Texas. This is the earliest report of oat stem rust in the last ten years. In mid-March, low levels of stem rust infections were found on oat in southern and central Texas plots. A few pustules were found on the upper leaves of oat planted for roadside erosion control in central Texas. During the third week in March traces of stem rust were found on wild oat (*Avena fatua*) in central Texas. In mid-April, stem rust was increasing in southern Texas nurseries. In late April, severe rust was observed on oat in plots in a south Texas irrigated nursery and in central Texas oat plots. In mid-May, oat stem rust was severe on green plants in the south Texas nursery at Uvalde. Late developing tillers are the best niches for the stem rust to develop. From oat collections made in south Texas in late March and April, races NA-27, NA-29 and NA-67 were identified. These races also were identified in this area last year.

In early April, traces of oat stem rust were found in plots at Baton Rouge, Louisiana. During the last week in April, over wintering foci of oat stem rust infections were found in southwestern Alabama and central Louisiana cultivar plots of Chapman and Horizon 474. Severities in the middle of the infection foci ranged from 20-60%, while a meter from the center severities were trace-1%. By early May, stem rust severities of 100% were reported in the oat nursery at Baton Rouge, Louisiana. From oat collections made in Louisiana race NA-27 was identified while in NA-29 was identified in Alabama. Oat stem rust development was less than normal throughout the southern U.S. this year.

In late May, traces of oat stem rust were found in the spring oat plots at Hutchinson in south central Kansas.

During mid-July, trace to 10% severities of oat stem rust were found in fields and plots at the late berry maturity growth stage throughout southern Minnesota. Oat stem rust infections were scattered throughout the northern oat-growing area. Inoculum arrived from locations further south in late May and early June with the frequent rains. In late July, trace-40% stem rust severities were observed in spring oat varietal plots in eastern North Dakota and northwestern Minnesota. Most current oat cultivars are not highly resistant to stem rust.

By mid-May, oat stem rust was severe in plots of susceptible cultivars (e.g., Swan) at Davis, California. In late July 60% rust severities were observed in oat growing in plots at Tulelake in northern California.

Oat Crown Rust - In mid-February, traces of oat crown rust were reported on the lower and middle leaves of the cultivars Dallas and Nora in central Texas plots**.** In mid-March, oat crown rust infections were at 30-60% in plots and fields in southern Texas. The oats planted in roadside ditches provided an excellent habitat for crown rust development and spread throughout central Texas. In early April low amounts of crown rust infections were found in oat nurseries and fields in central Texas. The dry weather in late March and early April slowed increase of rust infections. By mid-April, oat crown rust severities were heavier than normal across central and southern Texas, despite the dry conditions, with higher severity on some lines than last year. Heavy crown rust infections on oat were reported from southern Texas in late April. In early May, trace amounts of crown rust were found in varietal plots in north central Texas.

During the last week in April, oat plants with 60% severities were observed in plots of different cultivars in central Louisiana, southwestern Alabama and northwestern Florida. In a field in southeastern Alabama, 60% crown rust severities were reported. In early May, oat crown rust pressure was moderate at the Baton Rouge nursery and light in northern Louisiana.

In the last week in June, lower leaves of oat in south central Minnesota had trace to 5% severities of crown rust. Crown rust on oats in the buckthorn nursery at St. Paul, Minnesota was severe with severity levels up to 80%. In oat fields in northwestern Iowa and southeastern South Dakota, trace to 20% crown rust severities were found at the early berry stage. During the third week in July, trace to 60% oat crown rust severities were found in fields and plots at the late berry maturity growth stage throughout southern Minnesota. By late July, trace-30% crown rust severities were found in oat plots in central and eastern North Dakota.

Much of the primary inoculum originated from buckthorn, the alternate crown rust host, and common throughout the Upper Midwest. Conditions were good for crown rust development throughout much of the oat growing area in Minnesota and Wisconsin but crown rust development was less than previous years because of the cooler than normal spring temperatures.

In mid May, oat crown rust was severe in plots of susceptible cultivars (Montezuma, Kanota) at Davis, California. During mid and late May crown rust was found on late plants of wild oat (*Avena fatua)* growing alongside trails in the Rohnert Park area (north of San Francisco).

Buckthorn. In late April, buds on buckthorn, the alternate host for oat crown rust, were just beginning to break in the buckthorn nursery at St. Paul, Minnesota. This was later than normal. Moderate to heavy pycnial and aecial infections were observed on emerging buckthorn leaves in the nursery at St. Paul, Minnesota on May 6. In mid-May, aecial development was heavy on buckthorn, the alternate host for oat crown rust, at the St. Paul, Minnesota nursery. Despite the slow leafing out of the buckthorn due to the prolonged cool temperatures in April, pycnial infections and aecial development was heavier than normal. In late May, crown rust aecial infections were moderate to severe at the St. Paul, Minnesota buckthorn nursery. Uredinial infections were observed on oat spreader rows in the nursery on May 29. The good moisture and warm temperatures were ideal for infection. Light aecial infections were found on buckthorn bushes at Red Wing, MN and Grantsburg, WI in late May and early June, respectively. Moderate crown rust infection was observed on upper leaves of oat in spreader rows close to the St. Paul, Minnesota buckthorn nursery.

Aecial development was less than in previous years in the buckthorns growing near the Cornell campus in Ithaca, New York.

Barley stem rust. The first reports of barley stem rust this year were trace severities in plots of susceptible two-row cultivars in plots in southern Minnesota. This year stem rust has not been found on wild barley (*Hordeum jubatum*). In previous years stem rust was easily found on wild barley in the northern Great Plains. By late July, trace-40% stem rust severities with very low incidence were observed in spring barley varietal plots throughout North Dakota and traces were observed in fields in the state. In plots in northwestern Minnesota 10% rust severities were observed. Most infections were on late tillers. Stem rust caused minimal losses on barley since it arrived so late in the growing season.

Barley leaf rust. In mid-May, 60% severities were observed on barley in a nursery in the San Joaquin Valley of California. In mid-late May, low levels of barley leaf rust were observed in yield trials in the Central Valley of California. By late May, leaf rust was severe on susceptible lines in nurseries at Davis, California.

In early June, 100% severities readings of leaf rust in barley were in susceptible lines in the eastern shore nursery in Painter, Virginia. Barley leaf rust was much more severe than wheat leaf rust at this location

In early July, traces of barley leaf rust were reported on lower leaves in susceptible spring barley plots in southern Minnesota and in field in southeastern North Dakota. In late July, traces of barley leaf rust were observed in plots in southeast North Dakota. This year losses to barley leaf rust were minimal in the U.S.

Barley crown rust. In mid-June, light barley crown rust was found in plots growing near the buckthorn in the St. Paul, Minnesota nursery**.** In late June in east central South Dakota and in south central Minnesota, lower leaves of oats had trace levels of crown rust infection. Wild barley (*Hordeum jubatum*) in south central South Dakota had 20% crown rust severities. Susceptible barley cultivars in the buckthorn nursery at St. Paul, Minnesota had trace to 5% crown rust severities. In mid-July, trace to 40% severities were observed in plots in west central Minnesota. The plots were near a shelterbelt that included common buckthorn with many crown rust infection sites. In mid-July, trace of crown rust were found in barley plots in southern Minnesota. In late July, trace to 10% severities of barley crown rust were found in plots and fields throughout the state of North Dakota.

In early June, centers of crown rust infection were observed on smooth brome grass (*Bromus inermis*) in southeastern Minnesota. In late July, crown rust on smooth brome grass was widespread in North Dakota and northwestern Minnesota.

Stripe rust on barley. Barley stripe rust was first detected in Davis California nurseries on February 27, which was earlier than normal. In early May, in the Western Regional Spring Barley Nursery at Davis, California, susceptible lines had 50-80% severities at early dough stage. By late May, barley stripe rust had increased in nurseries at Davis, California to 100% severity on susceptible lines. Susceptible cultivars (Max, Commander) also had 100% severity by late May in yield trials in the Central Valley.

In early May, stripe rust was increasing in the barley nursery in northwestern Washington near Mount Vernon. No stripe rust was found on barley in eastern Washington since most of the spring barley grown in this area is resistant to stripe rust. In late May, stripe rust was severe on winter barley and was developing quickly on spring barley in northwestern Washington fields and nurseries. The first report of barley stripe rust in eastern Washington (regions east of the Cascade Mountains) was on May 29 in a winter barley field of 'Hoody' at the Othello Experiment Station. At the station, plots of the spring barleys 'Bob' and 'Calpso' had traces of stripe rust on the lower leaves. In one of the spring barley nurseries near Pullman, Washington, one pustule of stripe rust was found on May 28. In mid-June, stripe rust was increasing in experimental plots of susceptible barley cultivars in the Palouse region of eastern Washington. Stripe rust was not a problem in most barley fields in eastern Washington where moderately resistant cultivars are commonly planted.

Rye stem rust. The first report of rye stem rust this year was in late July in spring rye plots in northwestern North Dakota at Williston and in plots in northwestern Minnesota. Trace to 20% severities were reported at both locations.

Rye Leaf Rust. Leaf rust was detected on Merced rye cover crops in the Salinas Valley in California on Feb 20, which was earlier than normal. By February 26, rye fields had severe leaf rust infections and 90-100% incidence.

During the last week in April, traces of leaf rust were observed in rye fields in southern Georgia. In late May, light leaf rust was observed on rye in a field in south central Kansas. In mid-June, traces of leaf rust were reported in a rye field in southeastern Indiana. By late June, 10% severities of leaf rust were found on upper leaves of winter rye and trace severities in spring rye in east central Minnesota plots. By mid-July, trace to 1% severities of leaf rust were found on upper leaves of spring rye in plots in southern and west central Minnesota.

Stem rust on Barberry. In mid-May, aecial collections were made from barberry bushes (alternate host for stem rust) in south central Wisconsin and southeastern Minnesota. The aecial collections in southeastern Minnesota were made from a heavily rusted *Berberis koreana* hedge. In late May, severe stem rust was observed on susceptible common barberry bushes (alternate host for stem rust) in southeastern Minnesota. The bushes were infected with rust spores early in the season and the infections were so heavy that they defoliated the bushes. According to Bob Laudon (retired barberry eradication expert) this is the heaviest infection of rust seen on bushes in the last 40 years. In the 1950s and early 60s it was common to see bushes this badly rusted, but not in recent years.

Other stem rust grass hosts. In early June, centers of stem rust infection were observed on quackgrass (*Elytrigia repens)* southeastern Minnesota. By mid-July, 5-40% stem rust severities were observed on quackgrass, redtop (*Agrostis gigantea*), and timothy (*Phleum pratense*) in southeastern Minnesota.

This is the last issue of the Cereal Rust Bulletin for the 2002-2003 growing season. I would like to thank all of those who helped with the bulletin this year, especially Mark Hughes who coordinates its distribution through the CDL website (http://www.cdl.umn.edu) and Jim Kolmer for his editorial comments (jkolmer@umn.edu). All rust situation reports were greatly appreciated. All messages from our cereal rust survey mail list are placed on our web page and used in the preparation of the Cereal Rust Bulletins.

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Fig. 1. Leaf rust severities in wheat fields in 2003.

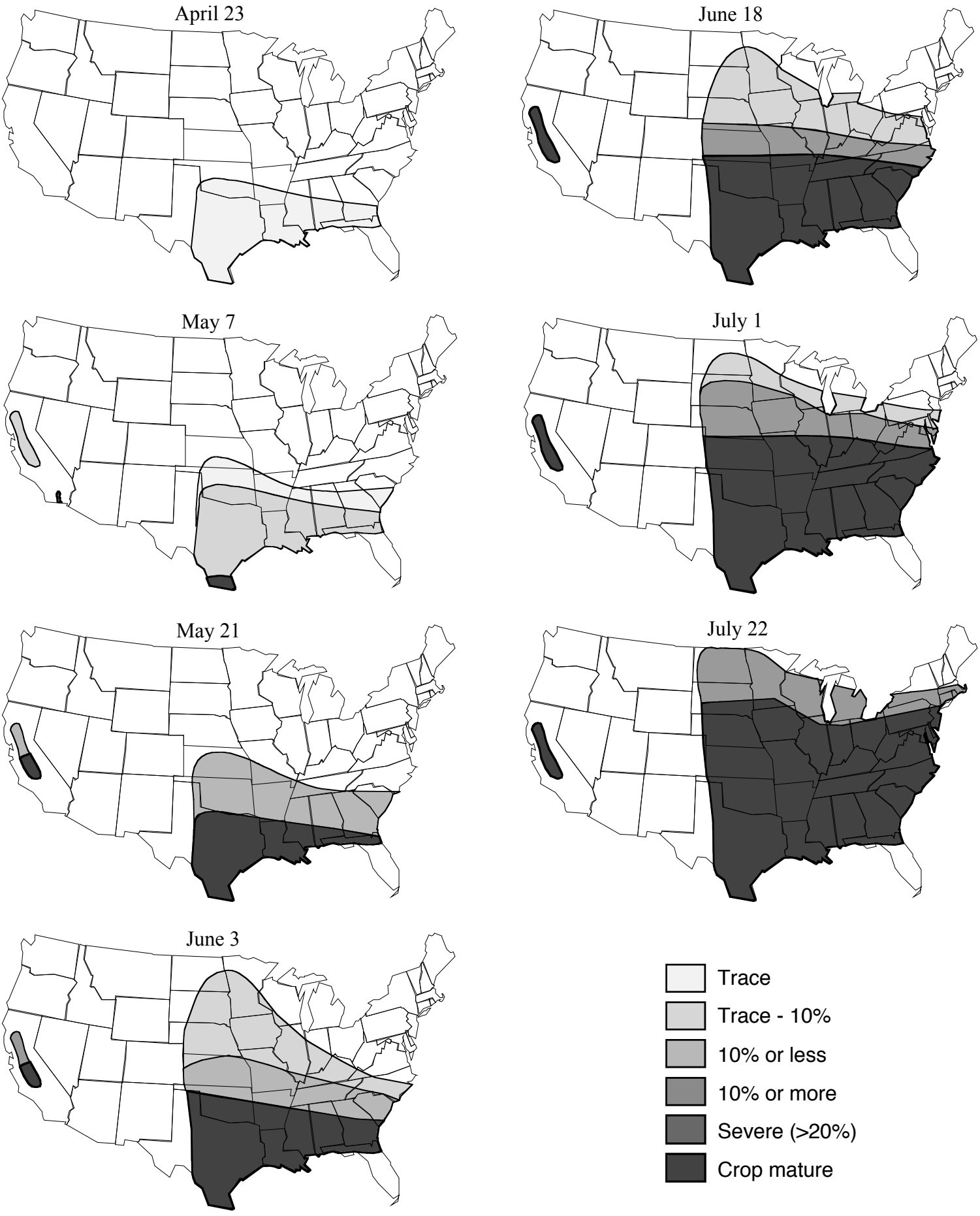

Fig. 2. Stripe rust severities in wheat fields in 2003.