PRAIRIE WIND TRAJECTORY AND CEREAL RUST RISK REPORT for June 25 to July 1, 2024

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Agriculture and Agri-Food Canada (AAFC) and Environment and Climate Change Canada (ECCC) have been working together to study the potential of trajectories for monitoring insect movements since the late 1990s. Trajectory models are used to deliver an early-warning system for the origin and destination of migratory invasive species, including plant pathogens. Plant pathologists have shown that trajectories can assist with the prediction of plant disease infestations. We receive two types of model output from ECCC: reverse trajectories and forward trajectories.

'Reverse trajectories' refer to air currents that are tracked back in time from specified Canadian locations over a five-day period prior to their arrival date. If plant pathogens are present in the air currents that originate from these southern locations, they may be deposited on the Prairies at sites along the trajectory, depending on the local weather conditions at the time that the trajectories pass over our area (e.g. rain showers, etc.). Reverse trajectories are the best available estimate of the ''true'' 3D wind fields at a specific point. They are based on observations, satellite and radiosonde data.

Disclaimer

Information related to trajectory events based on forecast and diagnostic wind fields and cereal rust risk is experimental, and is **OFFERED TO THE PUBLIC FOR INFORMATIONAL PURPOSES ONLY**. Agriculture and Agri-Food Canada, Environment Canada, and their employees assume no liability from the use of this information.

1. RUST DEVELOPMENT IN SOURCE LOCATIONS

a. Pacific Northwest (PNW)

i. Earlier PCDMN cereal rust risk updates outlined previous stripe rust risk forecasts and symptom observations in the PNW by Dr. X Chen from USDA ARS/Washington State University (https://prairiecropdisease.com/cereal-rust-risk/; https://prairiecropdisease.com/).

ii. Dr. Chen (personal communication) provided a recent update (July 5, 2024) to the PCDMN and indicated assessments about two weeks ago in un-sprayed research nurseries showed moderate to high stripe rust severities on winter and spring wheat and barley at multiple locations. These included Mount Vernon, Walla Walla, Central Ferry, Lind, and Pullman, WA, although barley stripe rust was low to moderate on spring barley at Walla Walla and Central Ferry because of lower rainfall. He also indicated the presence of stripe rust in a few plots of winter wheat at Aberdeen, ID. Overall, stripe rust development is being well-managed in commercial wheat fields with some winter wheat crops receiving two applications of fungicide in the south-central region of WA. Dr. Chen also indicated that the winter wheat crop is starting to mature and forecast higher temperatures over the next 1-2 weeks will hasten crop maturity and limit further stripe rust development. However, he noted that further development may occur for spring crops grown at higher elevation regions. The PCDMN wishes to sincerely thank Dr. Xianming Chen, WSU/USDA for his recent insights regarding the stripe rust situation in the Pacific Northwest in late June and early July 2024.

iii. **As of July 6, 2024, the limited development of stripe rust in commercial fields and the maturity of the winter wheat crop indicate the PNW is currently not a significant source of rust spores.**

iv. As mentioned in a previous PCDMN report, a Montana State University (MSU) Ag Alert for June 14, 2024 mentioned the first report of stripe rust in MSU winter wheat research trials in Sidney and Creston, MT, while other stripe rust reports have come from Chouteau County, MT

(https://t.co/qfbJO8Qdos; https://www.ars.usda.gov/ARSUserFiles/50620500/CRBs/2024%20CRB%20June%2014.pdf).

v. Further Montana reports on June 24, 26 and 27, 2024 have been received regarding stripe rust observations and samples from Choteau County again, but also from wheat fields at MSU research facilities at Sidney and Creston, Montana (hhttps://x.com/MSU_Extension/status/1805359999775916211; ttps://www.lewistownnews.com/news/producers-should-be-alert-for-wheat-stripe-rust/article_af5e0938-331e-11ef-a4cb-378f4cc3cb51.htmlkhttps://www.roundupweb.com/story/2024/06/26/agriculture/stripe-rust-reported-in-the-area/20821.html).

vi. Towards the end of June the first report of stripe rust in Manitoba was received from south central Manitoba in a field of SY Manness, which has an intermediate level of resistance (D. Kaminski, Manitoba Agriculture, https://www.gov.mb.ca/agriculture/crops/seasonal-reports/crop-pest-update/pubs/crop-pest-update-2024-06-27.pdf; https://x.com/field2fieldag/status/1805614987030774175).

vii. On July 4, 2024 we have had the first report of stripe rust in winter wheat in the Rural Municipality of Stonehenge (Dr. Alireza Akhavan, Provincial Specialist, Plant Disease, Saskatchewan Ministry of Agriculture).

viii. Previous reports regarding symptoms were received from research trials at AAFC Lethbridge by Dr. R. Aboukhaddour, AAFC Lethbridge (https://x.com/ReemWheat/status/1791567749489312080). In addition, early development of stripe rust in disease nurseries at Abbotsford and Creston, BC was reported by Dr. G. Brar, U of Alberta, formerly of UBC, and likely reflect overwintering on winter wheat breeding lines (https://x.com/gurcharn_brar/status/1779910374051209644).

ix. Given the recent appearance of stripe rust in Montana, Prairie wheat producers in southern Alberta and southern Saskatchewan should be vigilant regarding the appearance of stripe rust, especially in susceptible varieties, although varieties with intermediate levels of resistance may also be at risk. Based on the late June report of stripe rust in Manitoba and the July 4, 2024 report of stripe rust in the RM of Stonehenge, wheat growers in these areas should be on the look out for stripe rust in fields planted to varieties with susceptible to intermediate stripe rust reactions.

b. **Kansas/Nebraska**

i. Earlier PCDMN cereal rust risk updates outlined previous observations and concerns regarding rusts in Kansas and Nebraska winter wheat crops (https://prairiecropdisease.com/cereal-rust-risk/; https://prairiecropdisease.com/).

ii. In a mid-June update Dr. DeWolf indicated that stripe rust has been found in most Kansas counties, with areas in central and western Kansas having increased levels (Dr. E. DeWolf, Update on Wheat Rusts in Kansas, Cereal Rust Survey CEREAL-RUST-SURVEY@LISTS.UMN.EDU, June 12, 2024; https://www.ars.usda.gov/ARSUserFiles/50620500/CRBs/2024%20CRB%20June%2014.pdf). Figure 1 shows the most recent distribution of stripe rust in Kansas counties (https://wheat.agpestmonitor.org/stripe-rust/ (as of July 6, 2024). Dr. DeWolf also indicated that leaf rust was found in a number of Kansas regions, but is not expected to cause significant damage, while some stem rust has also been noted, especially in relation to its earlier appearance in 2024. Finally, he also reported that oat crown rust was found in Riley County, Kansas.

iii. However, USDA crop progress reports indicate that as of June 30, 2024, 98% of the Kansas winter wheat crop is mature, with 80% of the crop being harvested (https://quickstats.nass.usda.gov/results/7697AE4A-A089-347D-BD9E-C773202FAA83; https://quickstats.nass.usda.gov/results/B84A3FA8-068A-3F77-ACDE-24B9ABCE69F5). **As a consequence, Kansas winter wheat crops no longer represent a significant source of rust inoculum.**

iv. The most recent update from Dr. S. Wegulo, UNL, indicates that stripe rust is present in all wheat producing areas of Nebraska, with up to severe levels being observed in irrigated fields or where rainfall occurred (Dr. S. Wegulo, Update from Nebraska, CEREAL-RUST-SURVEY@LISTS.UMN.EDU,

June 13, 2024; https://cropwatch.unl.edu/2024/wheat-disease-update-june-14-2024; https://www.ars.usda.gov/ARSUserFiles/50620500/CRBs/2024%20CRB%20June%2014.pdf). Dr. Wegulo also mentions that leaf rust at low levels was found 14 days previously and mainly in southern regions, but is not expected to affect productivity. Figures 2 and 3 provide updates on the distribution of stripe and leaf rust in Nebraska, respectively and as of July 6, 2024.

v. USDA crop progress reports indicate that as of June 30, 2024, 13% of the Nebraska winter wheat crop has been harvested (https://quickstats.nass.usda.gov/results/169297FC-CD7B-3C41-AB00-D274A38FB2E6). As Nebraska winter wheat crops continue to mature and are harvested, stripe rust is no longer active and thus Nebraska will no longer represent a significant source of rust inoculum.

vi. **As of July 6, 2024, there is a low risk associated with the Kansas/Nebraska region being a significant source of stripe and leaf rust inoculum for dispersal into the Prairie region of Canada.** The Kansas winter wheat harvest is nearing completion while harvest continues Nebraska, this region no longer represents a significant source of stripe rust inoculum for the Prairie region in 2024.

c. **The Dakotas, Wisconsin, and Minnesota**

i. On May 27, 2024, Dr. M. Shires reported the detection of stripe rust in multiple areas in Brookings County, South Dakota, while the SDSU Winter Wheat Breeding program reported stripe rust in a variety trial in the same county (https://x.com/maddishires/status/1795078948113563786; https://x.com/WheatInnovation/status/1794915400012206296).

ii. S. Thapa, SDSU Graduate Research Assistant, reported increased levels of stripe rust on SDSU winter wheat breeding plots, while Dr. M. Shires, SDSU Assistant Professor reported stripe rust at low levels in the Pierre region of SD and widespread low levels in the south central areas of SD on May 31, 2024 (https://twitter.com/SubashSDSU/status/1797005319253709055; https://twitter.com/maddishires/status/1796665662539964802; https://twitter.com/maddishires/status/1796585340767252918).

iii. Most recently T. Pawar, Research Associate, SDSU reported severe levels of stripe rust in plots at the SDSU Volga research farm (https://x.com/PawarTapish/status/1798442920711971315).

iv. Figure 1 shows the most recent distribution of stripe rust in South Dakota counties (https://wheat.agpestmonitor.org/stripe-rust/ (as of July 6, 2024).

v. During the week of May 20-24, 2024, Dr. D.L. Smith, University of Wisconsin-Madison, reported stripe rust in two Wisconsin counties (Figure 1 [note it appears that not all jurisdictions in the USA are using the Wheat AgPestMonitor reporting system] https://badgercropdoc.com/2024/05/24/wisconsin-winter-wheat-disease-update-may-24-2024/). There have been more recent reports of stripe rust in Wisconsin (S. Conley, Small Grain Specialist, University of Wisconsin, https://x.com/badgerbean/status/1799215404809679160). While on June 12, 2024, Dr. D. Smith reported increased stripe rust development on susceptible wheat varieties in the Arlington region of Wisconsin (https://twitter.com/badgercropdoc/status/1801012395822772261).

vi. In early June 2024, stripe rust was confirmed in Cass County Minnesota (https://x.com/arthuragronomy/status/1799501650765250916), while there have been several other reports from Dr. A. Friskop, Extension Plant Pathologist, NDSU, of stripe rust in winter wheat and spring wheat and these observations are thought to be fairly early for this disease (https://x.com/NDSUcerealpath/status/1798814635480748533; https://www.ndsu.edu/agriculture/sites/default/files/2024-06/6%20CPR%20June%2013%202024_F.pdf). Dr. Friskop indicates that predicted lower temperatures and rainfall may favour further development in North Dakota.

vii. Reports of stripe rust continue in Minnesota and North Dakota (M. Rugg, Wheat Breeder, The Arthur Companies, https://x.com/NPWheat/status/1804294566054343001).

viii. As of July 6, 2024, the PCDMN is not aware of any further rust reports from SD, ND, and MN; **however given their proximity to the central to eastern Prairie region and stripe rust reports from these States, these areas can represent a potential source of stripe rust spores. Prairie wheat growers, especially in eastern Saskatchewan and Manitoba, should be extra vigilant regarding the**

appearance of stripe rust, especially in spring wheat crops and perhaps later maturing winter wheat fields.

d. The third USDA Cereal Rust Bulletin (June 14, 2024, coordinated by Dr. Oluseyi Fajolu, USDA Cereal Disease Laboratory, St. Paul, MN, provides a general overview of observations of various rust issues and complements what is reported above for Kansas, Nebraska, South Dakota, North Dakota, Minnesota and Wisconsin (https://www.ars.usda.gov/ARSUserFiles/50620500/CRBs/2024%20CRB%20June%2014.pdf).

2. Reverse trajectories (RT)

a. Compared to the previous week, the number of reverse trajectories passing over the prairies has been greatly reduced for the period of June 25 to July 1, 2024.

b. **Pacific Northwest (Washington, Oregon, Idaho)** – Since April 1, 914 reverse trajectories have crossed into the prairies from the Pacific Northwest (Figure 4). This week (June 25 – July 1) most of these trajectories have passed over the southern prairies, although a few were predicted to cross Lacombe (n=4), Edmonton and locations in the Peace River region (Table 1). Relative to mid June, there has been a significant decrease in the number of reverse trajectories that have originated from the Pacific Northwest (Figure 5). Since June 2, most reverse trajectories have been predicted to pass over a large area south of the Trans-Canada Highway (Figure 6). Overall, there were a total of 58 trajectories from the PNW that passed over Prairie locations. The Prairie locations with elevated numbers of trajectories from June 25 to July 1, 2024 included LETHBRIDGE, AB, and LACOMBE and VULCAN, AB with five and four trajectories each, respectively (Table 1). BEISEKER and MEDICINE HAT, AB, GAINSBOROUGH and SWIFT CURRENT, SK, and BRANDON MB each had three trajectories.

   i. **For the week of June 25 to July 1, 2024, there was a low risk associated with the PNW region being a significant source of wind trajectories for dispersal of the stripe rust pathogen into the Prairie region of Canada. Note, locations with 3-6 trajectories would have a somewhat higher risk.**

c. **Nebraska and Kansas –** Since April 1, many of the reverse trajectories (n=232) from the KS/NE region have crossed over Manitoba and Saskatchewan (Figure 7). For the past 30 days, reverse trajectories, originating from Kansas and Nebraska, have primarily passed over Manitoba and southeastern Saskatchewan (Figure 8). Compared to the previous week (n=46), fewer reverse trajectories (n=6) crossed the prairies (Table 2). ECCC wind dispersal models predicted that pathway of these trajectories would occur over south central and eastern areas of Saskatchewan with only one trajectory for each of the six Saskatchewan locations from June 25 to July 1, 2024 (Table 2).

   i. **For the week of June 25 to July 1, 2024, there is a low risk associated with the KS/NE region being a significant source of wind trajectories for dispersal of the stripe rust pathogen into the Prairie region of Canada. Moreover, winter wheat crops in these regions have been harvested or are rapidly moving towards maturity and thus will no longer represent an important source of rust spores.**

3. Prairie Crop Development, Weather Conditions, and Overwintering of Rust

a. **Winter wheat** – Winter wheat continues growth in late June early July with fall-seeded crops finished flowering and progressing into the soft dough stage in many areas, depending on the crop (winter wheat versus fall rye), province and region (SK Crop Report, July 4, 2024; MB Crop Report, July 2, 2024). However, the latest Saskatchewan crop report indicates more variable winter wheat development with stages ranging from tillering to the dough stage, although most are headed and moving into the grain filling stage (SK Crop Report, July 4, 2024)

b. **Spring wheat** – Across the prairie region spring wheat is continuing to move towards head emergence depending on the province and region, although a small percentage of crops in Saskatchewan are still at the seedling stage (AB Crop Report, July 2 2024; SK Crop Report, July 4, 2024; MB Crop Report, July 2, 2024).

c. **Weather synopsis** – Last week (Jun 24-30, 2024) a number of locations had 7 day rainfall amounts that exceeded 50 mm. Most of the rain was observed across the central prairies extending from Oyen to Brandon. Beaverlodge and Grande Prairie had rain amounts that exceeded 45 mm. Growing season temperatures have been similar to climate normal values while rainfall amounts continue to be well above average. Manitoba continues to have warm temperatures and above normal precipitation.
d. The average 30 day temperature (June 1 - 30, 2024) was 13.9 °C and was almost 1°C cooler than long term average temperatures. Warmest temperatures were observed across Manitoba and the southern prairies (Figure 9). Most of the prairies have reported 30 day rainfall amounts were normal to above normal. Average cumulative rainfall (mm) over the past 30 days was 86 mm (71 mm last week) and was 150% of climate normal values. Rainfall amounts have been greatest for Manitoba as well as central and Parkland regions of Saskatchewan (Figure 10). Rain amounts for the area extending from Saskatoon to Kindersley has been 250% of normal for the past 30 days while cumulative 30 day rain totals for southwestern Saskatchewan and southern Alberta have been less than 65% of normal.
e. Since April 1, the 2024 growing season average temperature (10 °C) has been marginally greater than climate normal values. Warmest average temperatures were observed across a region extending from Winnipeg to Saskatoon and southwest to Lethbridge (Figure 11). Growing season rainfall (prairie wide average) was 194 mm and has been above normal across most of the prairies (Figure 12). Regions around Brandon and Saskatoon have been particularly wet. Near normal precipitation amounts occurred across southern Saskatchewan, western Alberta and western areas of the Peace River region. Current rain amounts have been 175% of climate normals. Cumulative rainfall has been lowest for a large region than is west of a line that extends from Regina to Grande Prairie (Figure 13).

4. Overall, Rust Risk Assessment and Need For In-Crop Scouting

a. **Pacific Northwest** – There were lower numbers of reverse wind trajectories that passed over the PNW region and into the Prairies versus previous weeks, while stripe rust development is limited in commercial fields. Prairie winter wheat crops are generally progressing from flowering to grain filling, while much of the spring wheat crop is moving into to the tillering, stem elongation, and heading stages. This past week (June 24-30, 2024) increased rainfall occurred mainly in Saskatchewan and Manitoba although rainfall events did occur in other regions. **Overall, as of July 3, 2024, the risk of stripe rust appearance from the PNW is low and scouting for this disease in the Prairie region resulting from PNW rust inoculum is generally not urgent, although areas with an increased number of trajectories may be at higher risk (Figure 14). The recent appearance of stripe rust in Montana brings the stripe rust issue very close to the Prairies, especially the central to western regions, so scouting for stripe rust is advised for fields planted to varieties that have susceptible to intermediate resistance ratings.**
b. **Kansas-Nebraska corridor** – There were a low number of reverse wind trajectories that passed over the KS/NE region and into the Prairies from June 25 to July 1, 2024. Although there were earlier reports of stripe and leaf rust in KS/NE, winter wheat crops in these two states are either harvested or moving rapidly towards maturity. **Therefore, the KS/NE winter wheat will no longer represent a significant source of rust inoculum.** Prairie winter wheat crops are generally progressing from flowering to grain filling, while much of the spring wheat crop is moving into to the tillering, stem elongation, and heading stages. This past week (June 24-30, 2024) increased rainfall occurred mainly in Saskatchewan and Manitoba although rainfall events did occur in other regions. Rainfall in regions with higher amounts could facilitate deposition of rust spores into cereal crops and subsequent disease development. **Overall, as of July 3, 2024, the risk of stem, leaf, stripe, and crown rust appearance from Kansas-Nebraska corridor inoculum is low and scouting for these diseases in the Prairies is generally not urgent, although areas with an increased number of trajectories may be at higher risk (Figure 15). Stripe rust observations from North Dakota, South Dakota, Minnesota and Wisconsin have brought the stripe rust issue very close to the Prairies, especially the central to eastern regions. Thus, scouting for stripe rust is advised for fields planted to varieties that have susceptible to intermediate resistance ratings, especially in the central to eastern Prairie regions.**

c. Prairie winter wheat fields continue to be at risk as they have mostly headed and are moving into the grain filling period although rust impacts start to decrease versus if rust appears prior to head emergence. Fortunately most current winter wheat varieties have intermediate to high levels of resistance, although AC Radiant, CDC Buteo, AAC Elevate, Broadview, and CDC Falcon are rated as susceptible (2024 AB Variety Guide; 2024 Variety Guide; 2024 MB Variety Guide). In terms of spring wheat (various classes) and durum the following varieties are either an S or MS: 5700PR, AAC Cameron, AAC Iceberg, AAC Tisdale, AAC Tomkins, AAC Warman, AAC Whitefox, AC Foremost , Cardale, CDC Abound, CDC Adamant, CDC Flare, CDC Pilar, Faller, Prosper, SY Natron, SY Rorke, SY Torach, and Unity. **If you are growing a stripe rust susceptible variety, it will be important to keep an eye on your crops for stripe rust and follow further PCDMN cereal risk updates (https://prairiecropdisease.com/cereal-rust-risk/).**

d. **Given the recent appearance of stripe rust in commercial fields in south central Manitoba and south-central Saskatchewan, local sources of stripe rust spores are now an important consideration. Thus, wheat producers in these regions are encouraged to be on the look out for stripe rust in fields planted to varieties with susceptible to intermediate stripe rust reactions.**

5. Contacts for rust research and extension expertise

a. **Research**

i. Reem Aboukhaddour, A. Laroche, AAFC Lethbridge, AB, reem.aboukhaddour@agr.gc.ca, andre.laroche@agr.gc.ca. Stripe rust;
ii. H.R. Kutcher, University of Saskatchewan, Saskatoon, SK, randy.kutcher@usask.ca. Stripe rust;
iii. B. McCallum, AAFC Morden, MB, brent.mccallum@agr.gc.ca. Leaf rust and stripe rust;
iv. J. Menzies, AAFC Brandon/Morden, MB, jim.menzies@agr.gc.ca. Stem rust of wheat and oat, crown rust of oat.
v. S. Rehman, Western Crop Innovations (formerly Olds College), Field Crop Development Centre, Lacombe, AB, srehman@oldscollege.ca. Stripe and leaf rust;
vi. G. Brar, University of Alberta, gurcharn.brar@ualberta.ca. Stripe rust.

b. **Extension**

i. Alberta Ministry of Agriculture and Irrigation, Mike Harding, michael.harding@gov.ab.ca;
ii. Saskatchewan Ministry of Agriculture, Alireza Akhavan, alireza.akhavan@gov.sk.ca;
iii. Manitoba Ministry of Agriculture, David Kaminski, david.kaminski@gov.mb.ca.

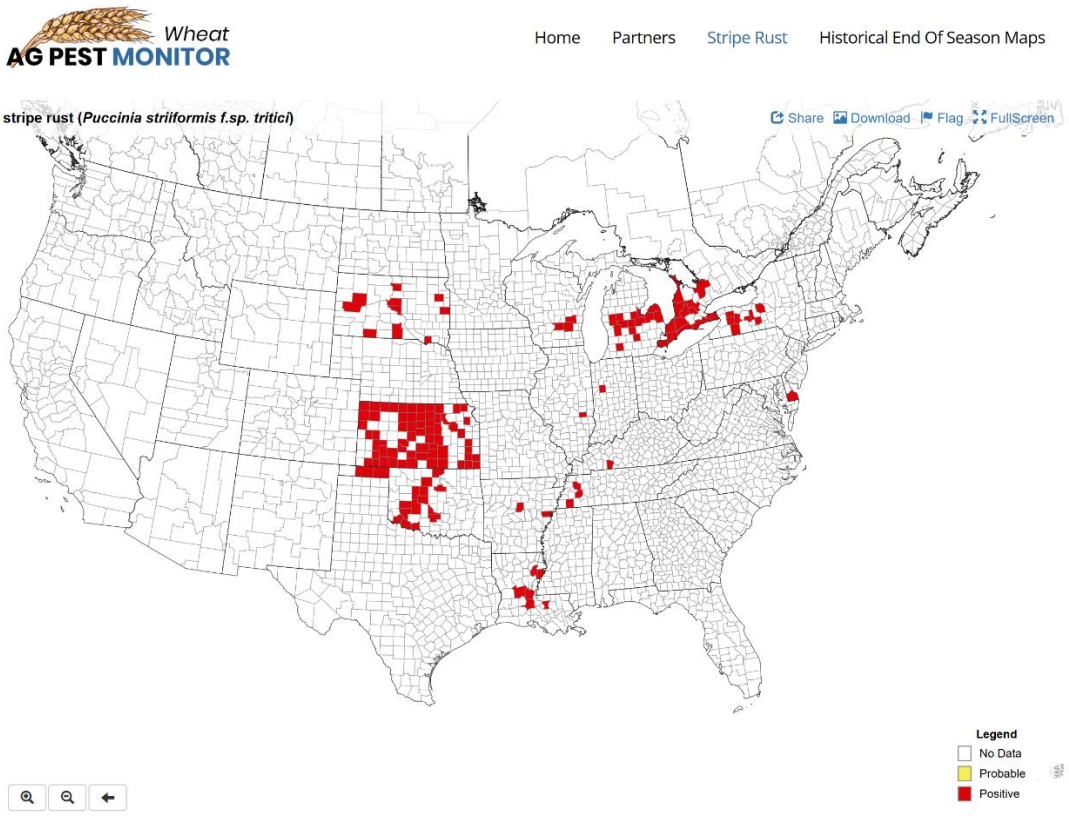

Figure 1. USA stripe rust observations, July 6, 2024 query of the AG PEST MONITOR: Wheat, https://wheat.agpestmonitor.org/stripe-rust/. Note, not all jurisdictions use the Ag Pest Monitor to indicate the presence of rust infections in wheat.

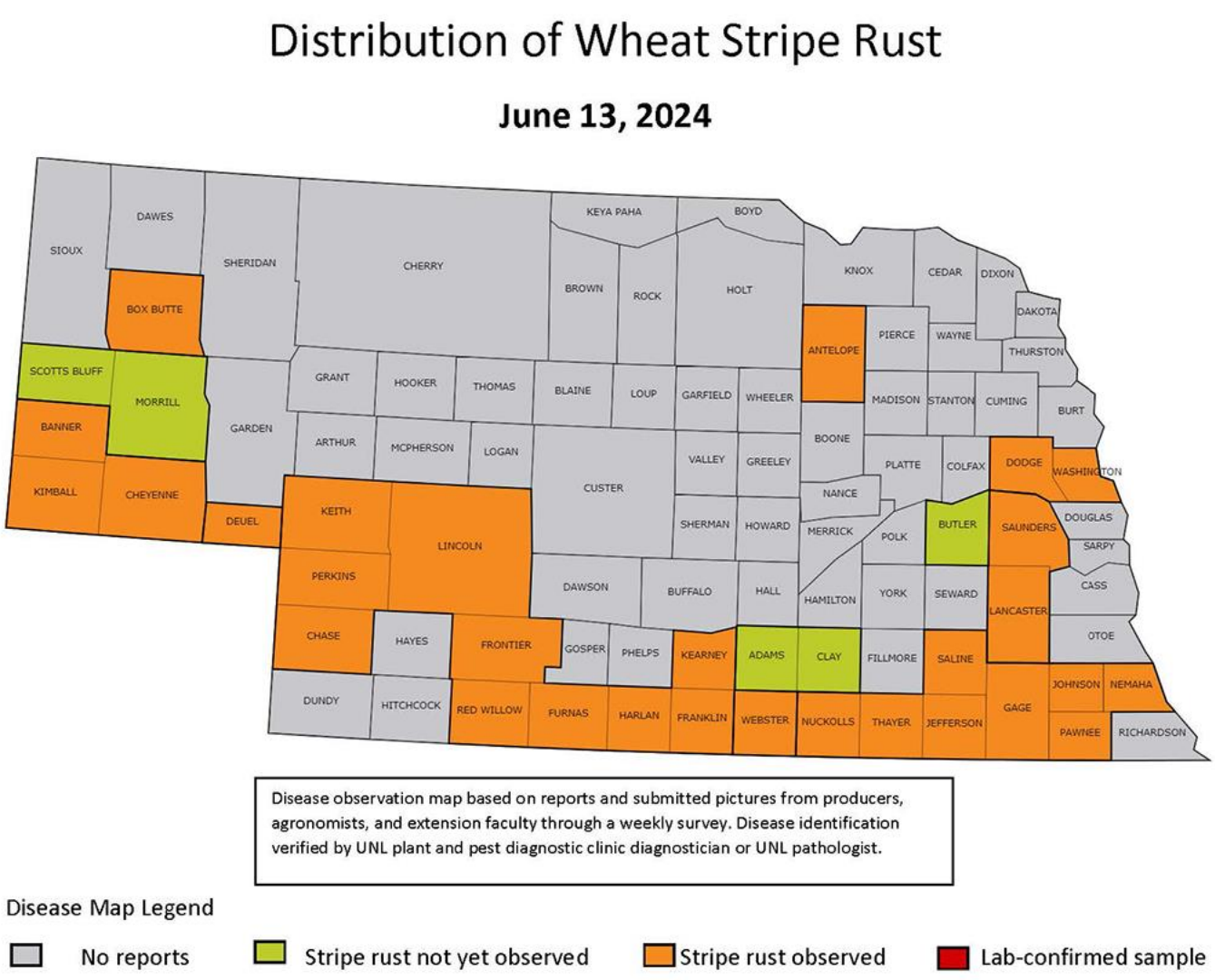

Figure 2. Stripe rust detections in Nebraska counties as of June 13, 2024 (Dr. S. Wegulo et al. June 14, 2024, https://cropwatch.unl.edu/2024/wheat-disease-update-june-14-2024).

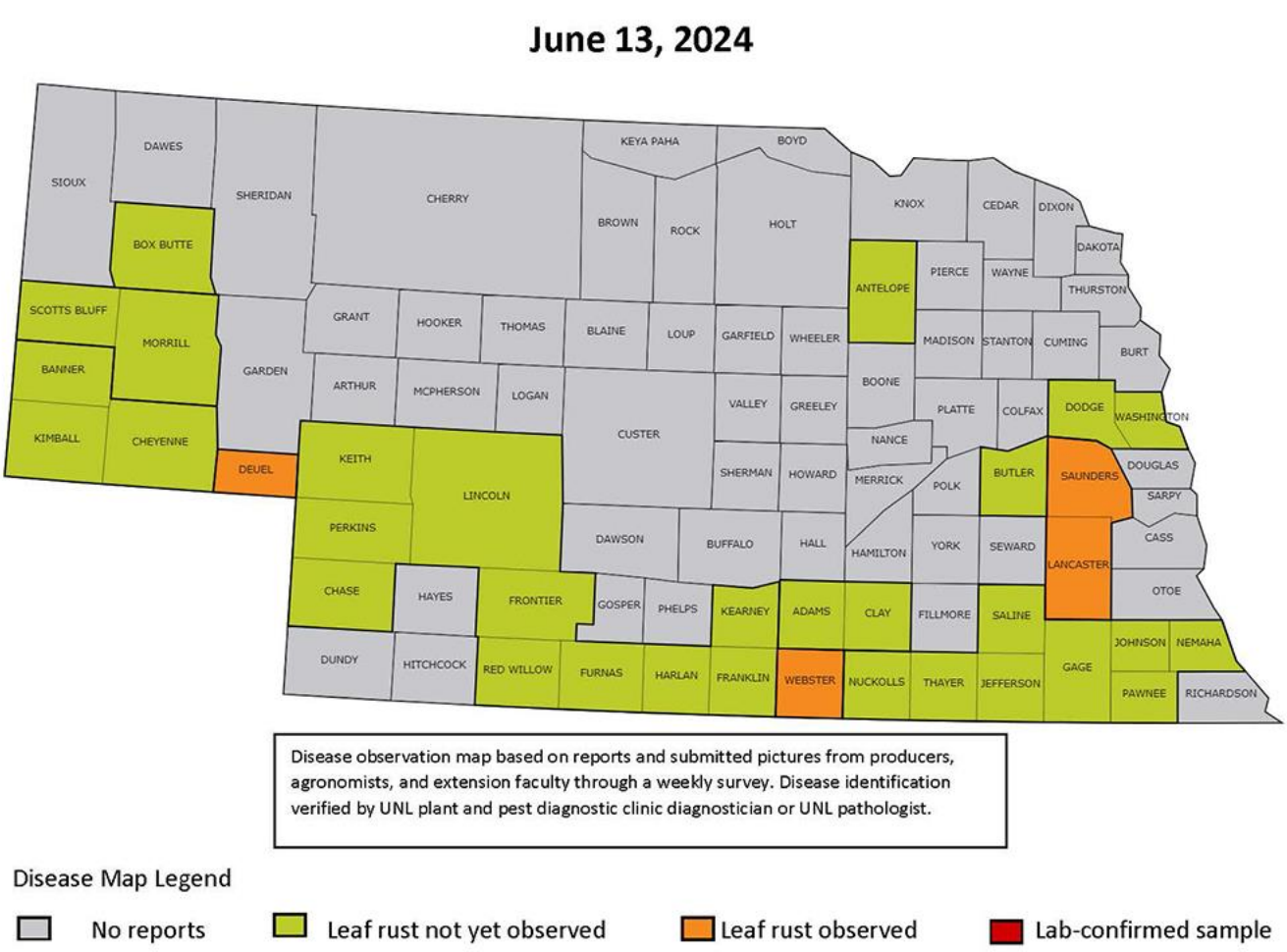

Figure 3. Leaf rust detections in Nebraska counties as of June 13, 2024 (Dr. S. Wegulo et al. June 14, 2024, https://cropwatch.unl.edu/2024/wheat-disease-update-june-14-2024).

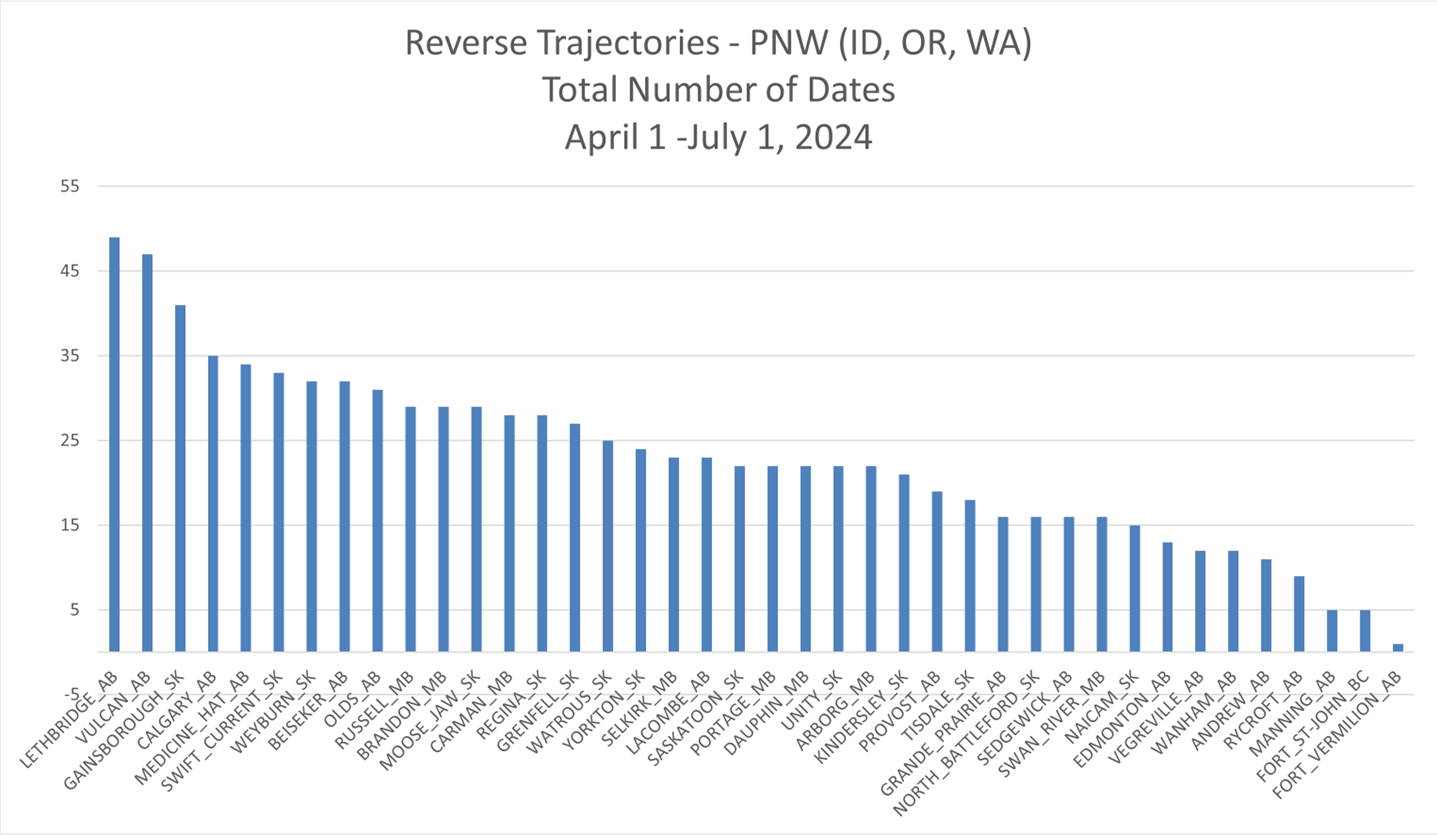

Figure 4. Reverse trajectory locations and number of events, for reverse trajectory events originating from the Pacific Northwest region of the USA, April 1 – July 1, 2024.

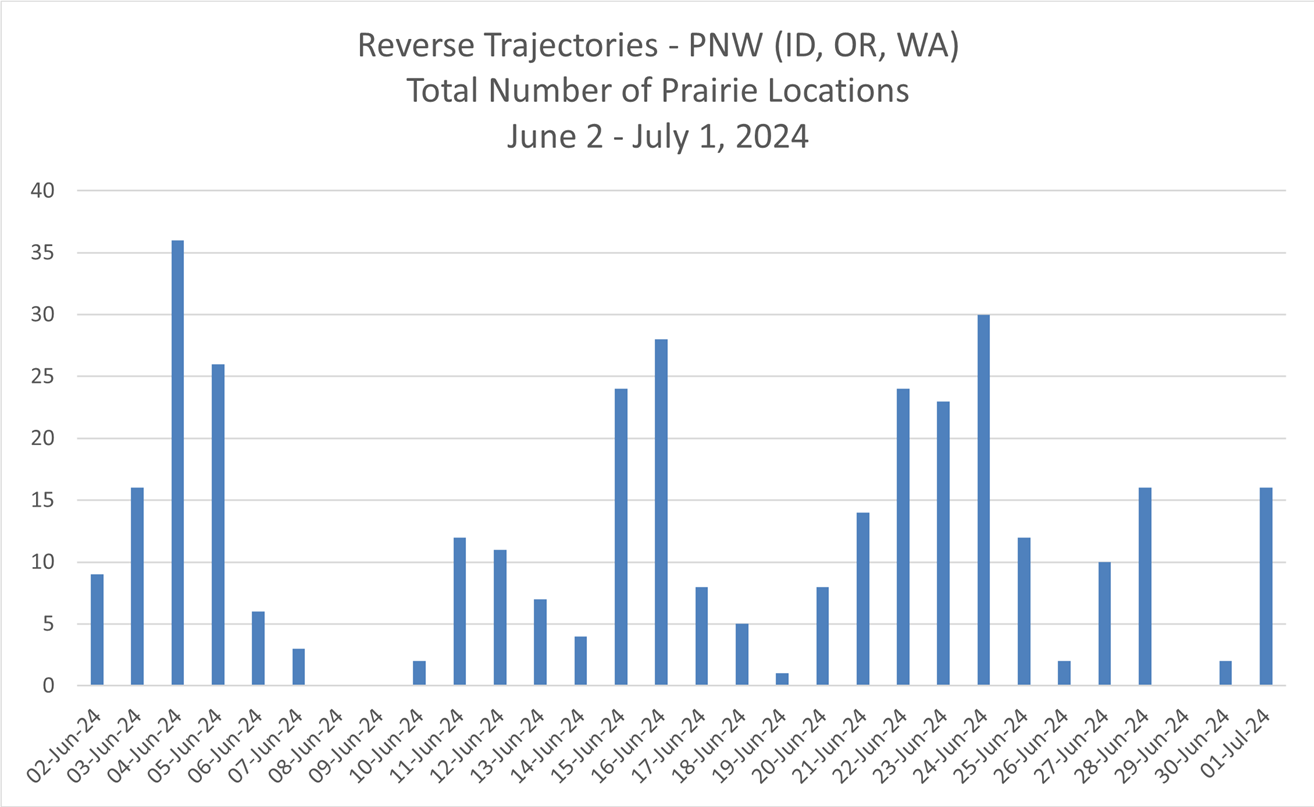

Figure 5. Reverse trajectory locations and number of events, for reverse trajectory events originating from the Pacific Northwest region of the USA, June 2 - July 1, 2024.

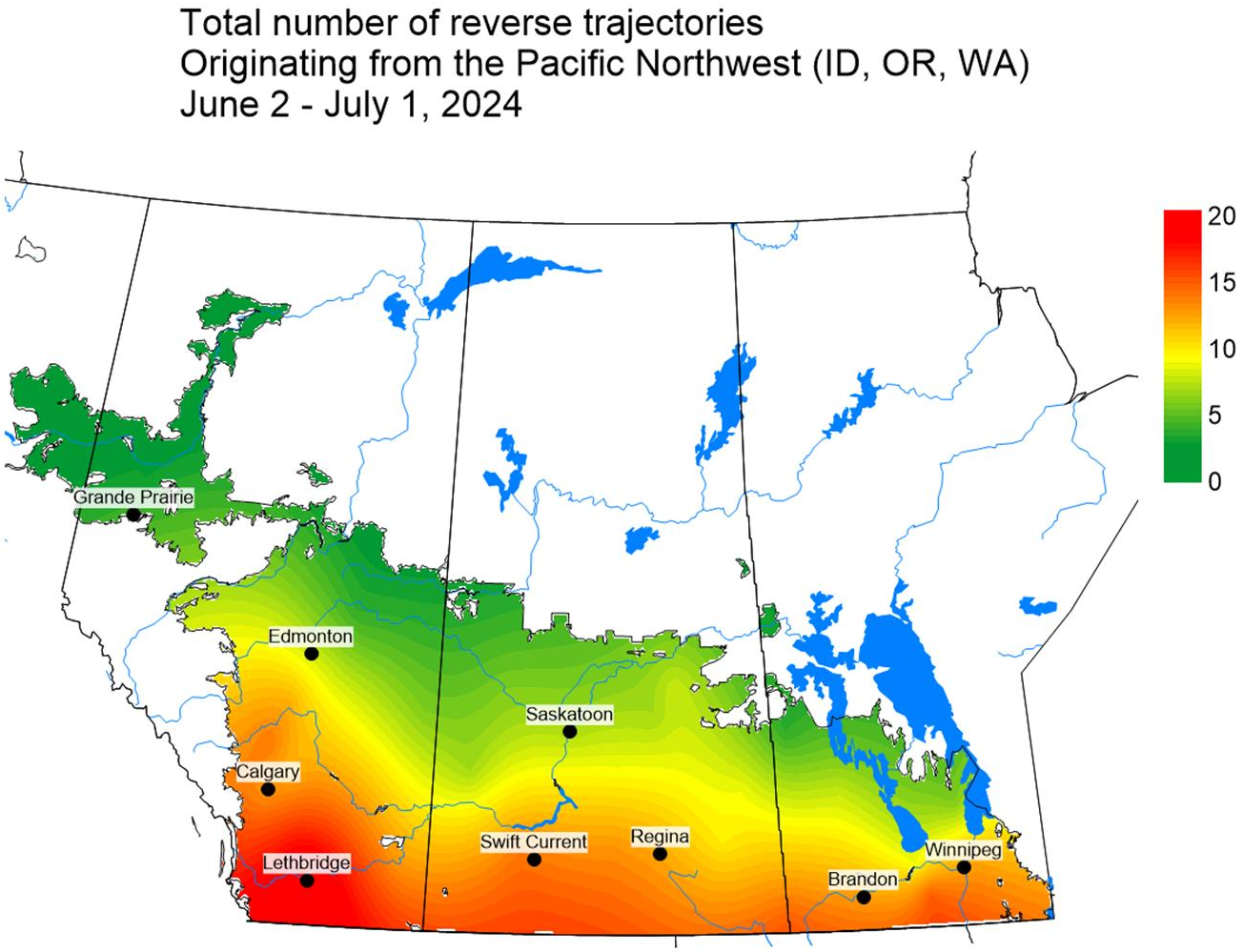

Figure 6. Total number of dates with reverse trajectories originating from the Pacific Northwest region of the USA that have crossed the Prairies between June 2 – July 1, 2024.

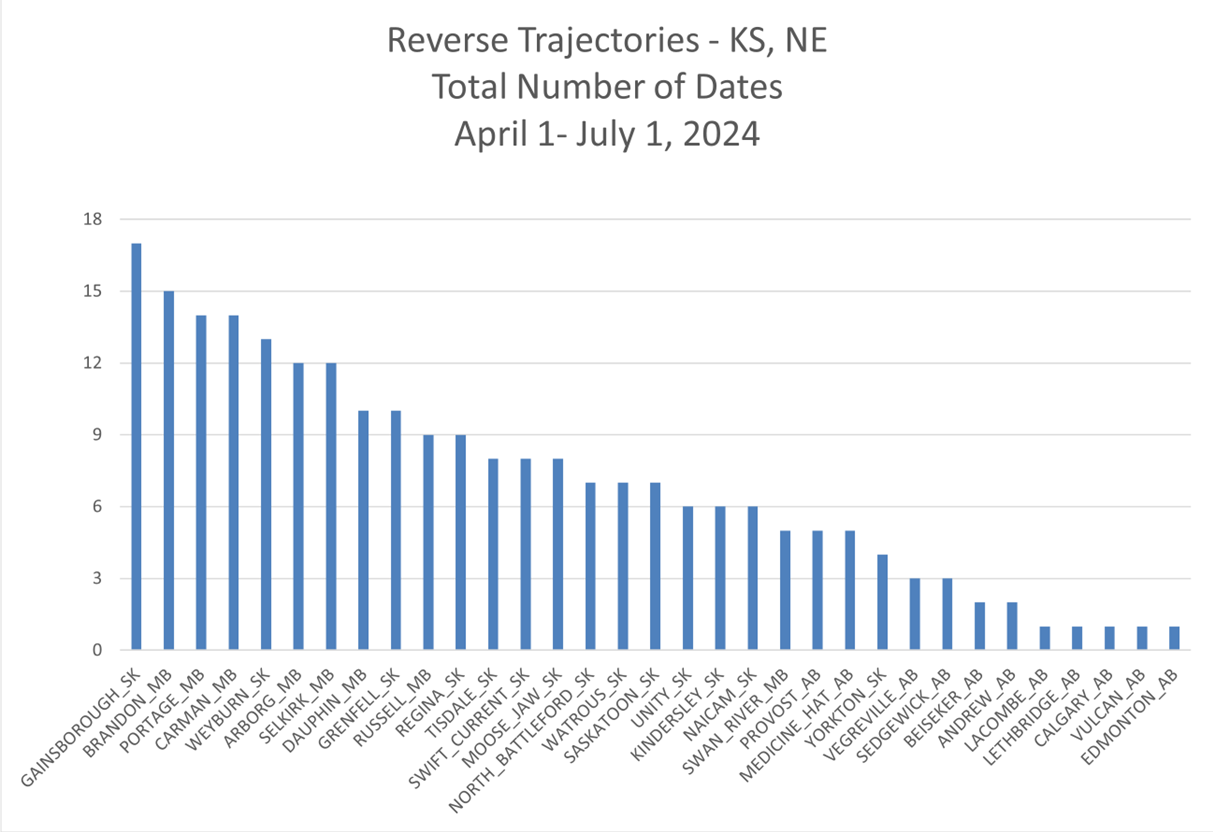

Figure 7. Reverse trajectory locations and number of events, for reverse trajectory events originating from Kansas and Nebraska, USA, April 1 – July 1, 2024.

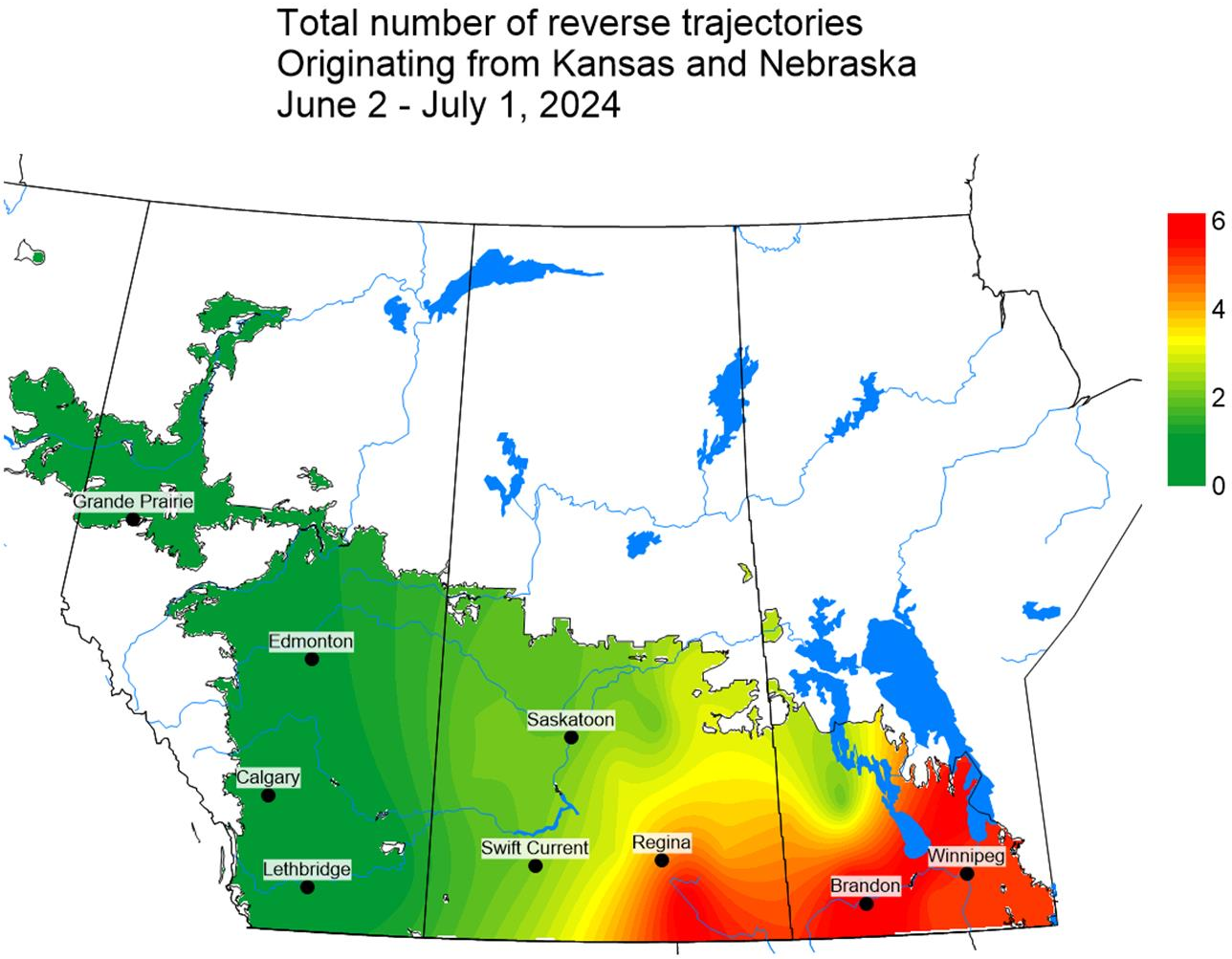

Figure 8. Total number of dates with reverse trajectories originating from Kansas and Nebraska that have crossed the Prairies between June 2 – July 1, 2024.

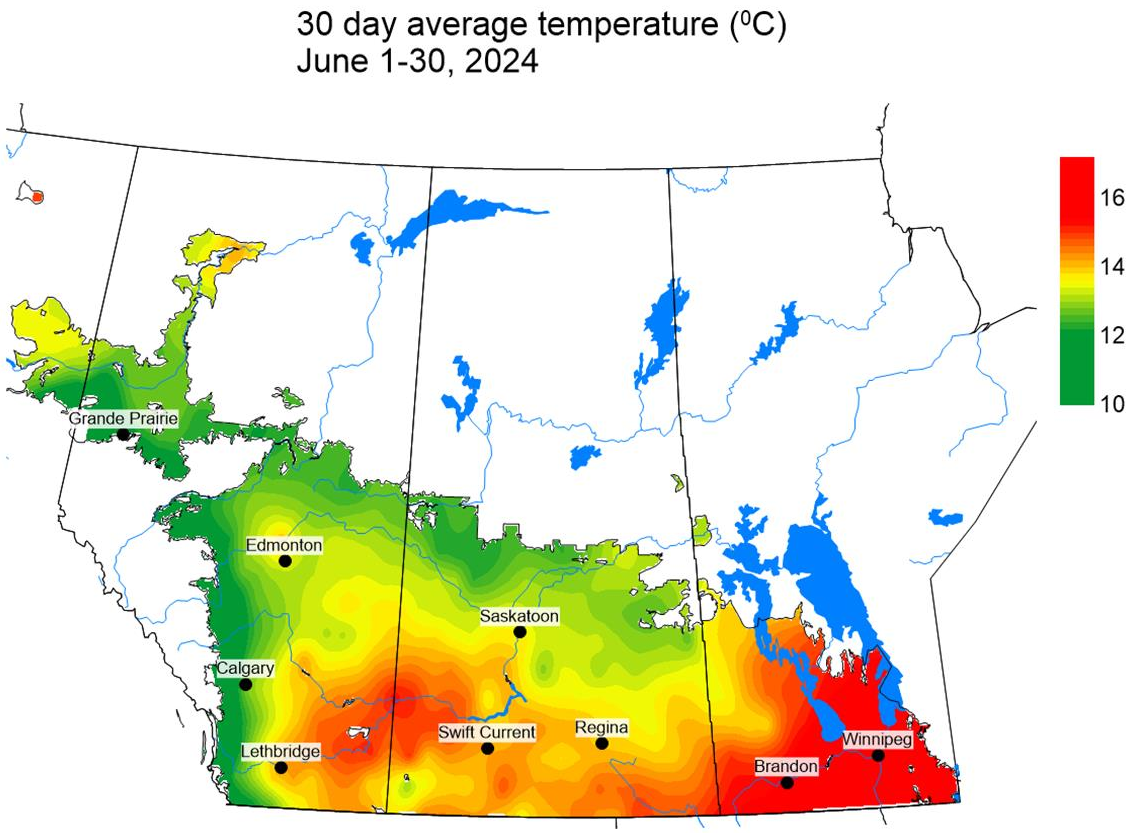

Figure 9. 30-day average temperature (°C) observed across the Canadian prairies for the period of June 1-30, 2024.

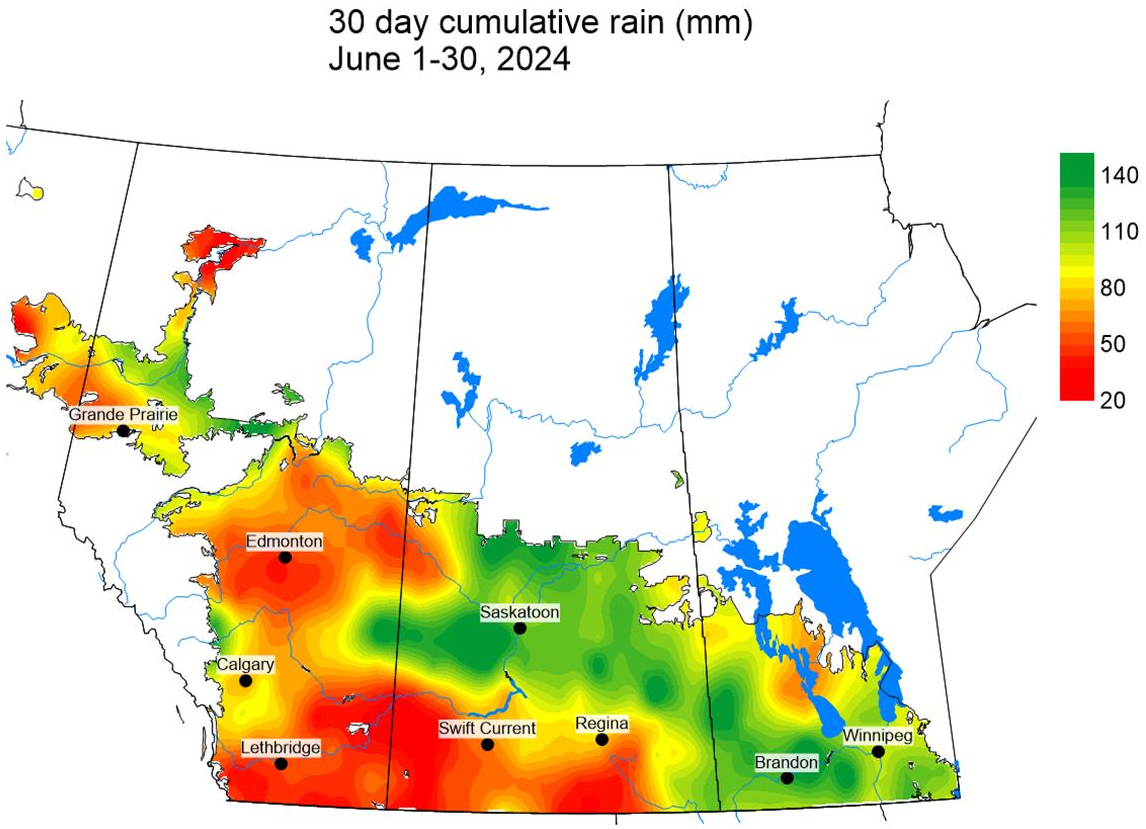

Figure 10. 30-day cumulative rainfall (mm) observed across the Canadian prairies for the period of June 1-30, 2024.

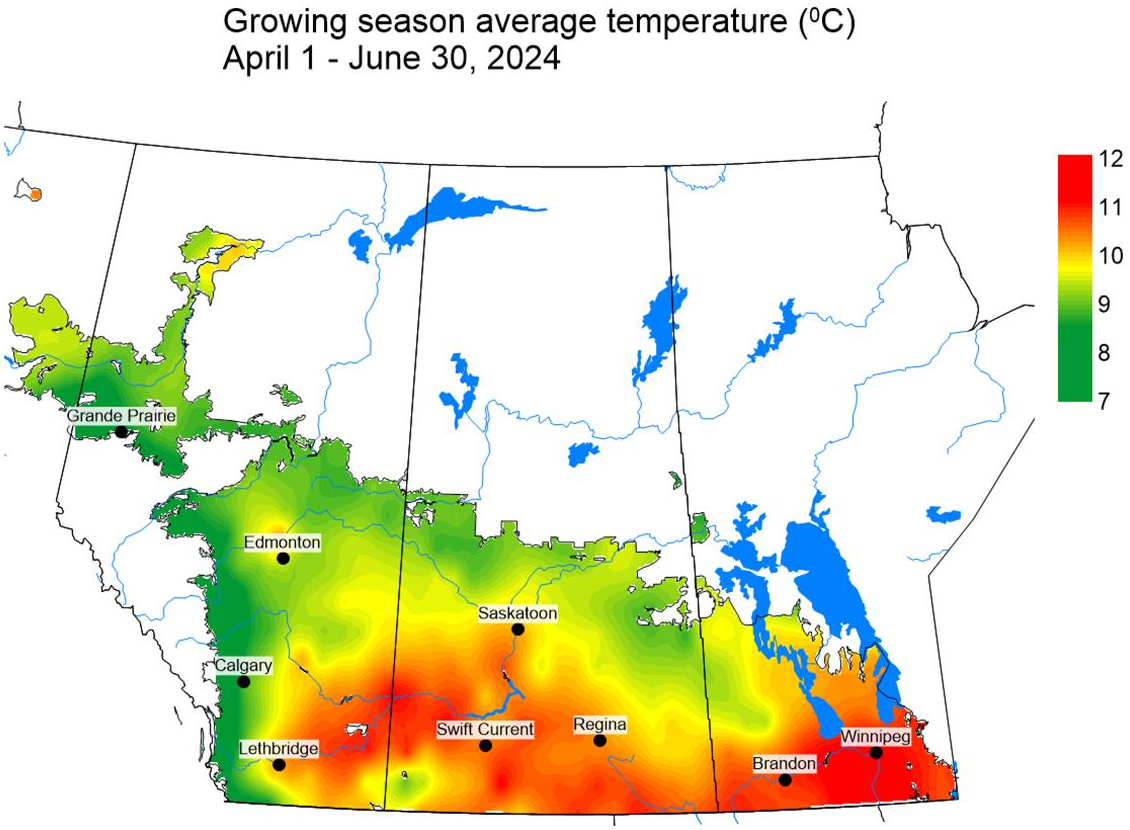

Figure 11. Growing season average temperature (⁰C) observed across the Canadian prairies for the period of April 1 – June 30, 2024.

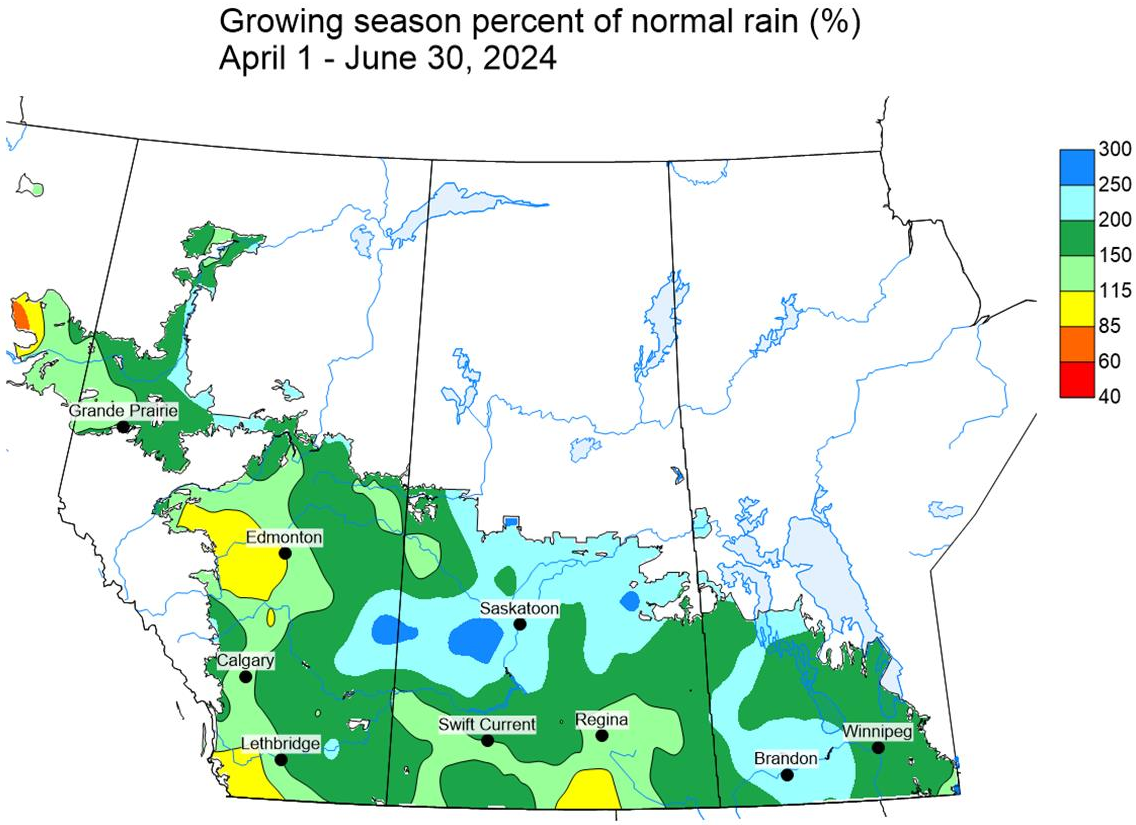

Figure 12 Growing season percent of normal rain (%) observed across the Canadian prairies for the period of April 1 – June 30, 2024.

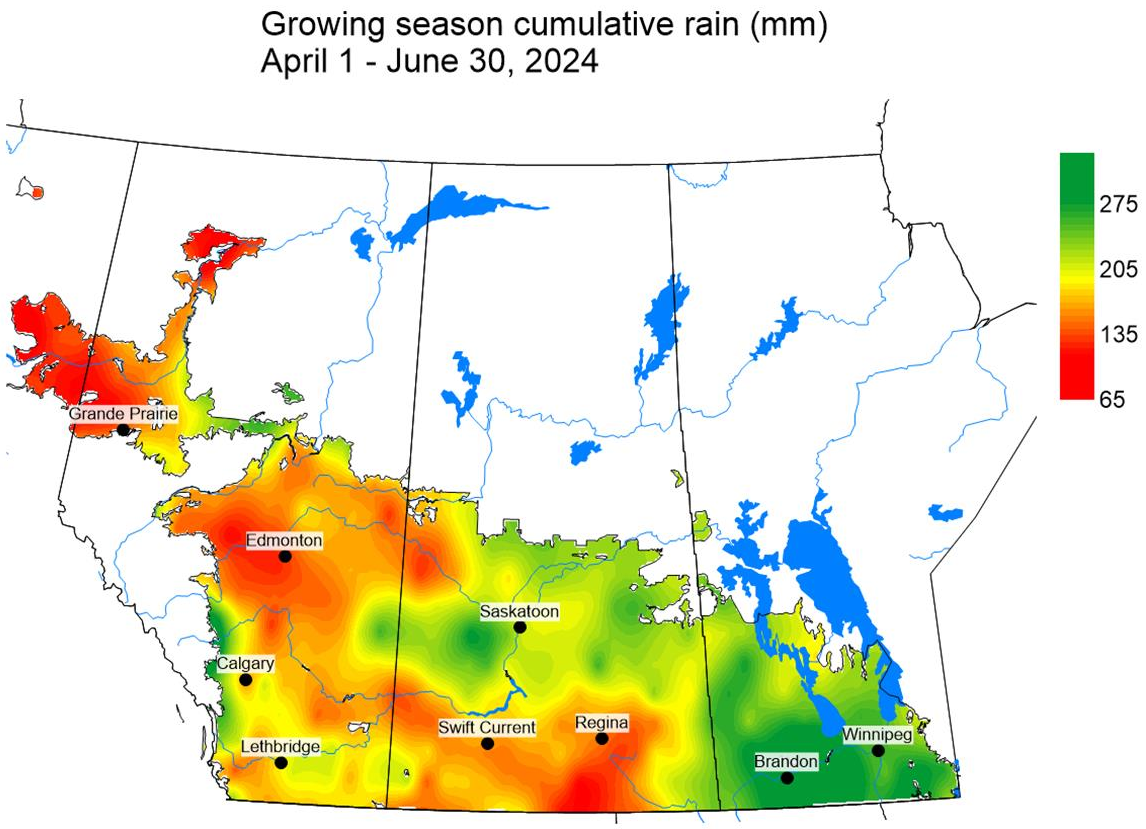

Figure 13. Growing season cumulative rainfall (mm) observed across the Canadian prairies for the period of April 1 – June 30, 2024.

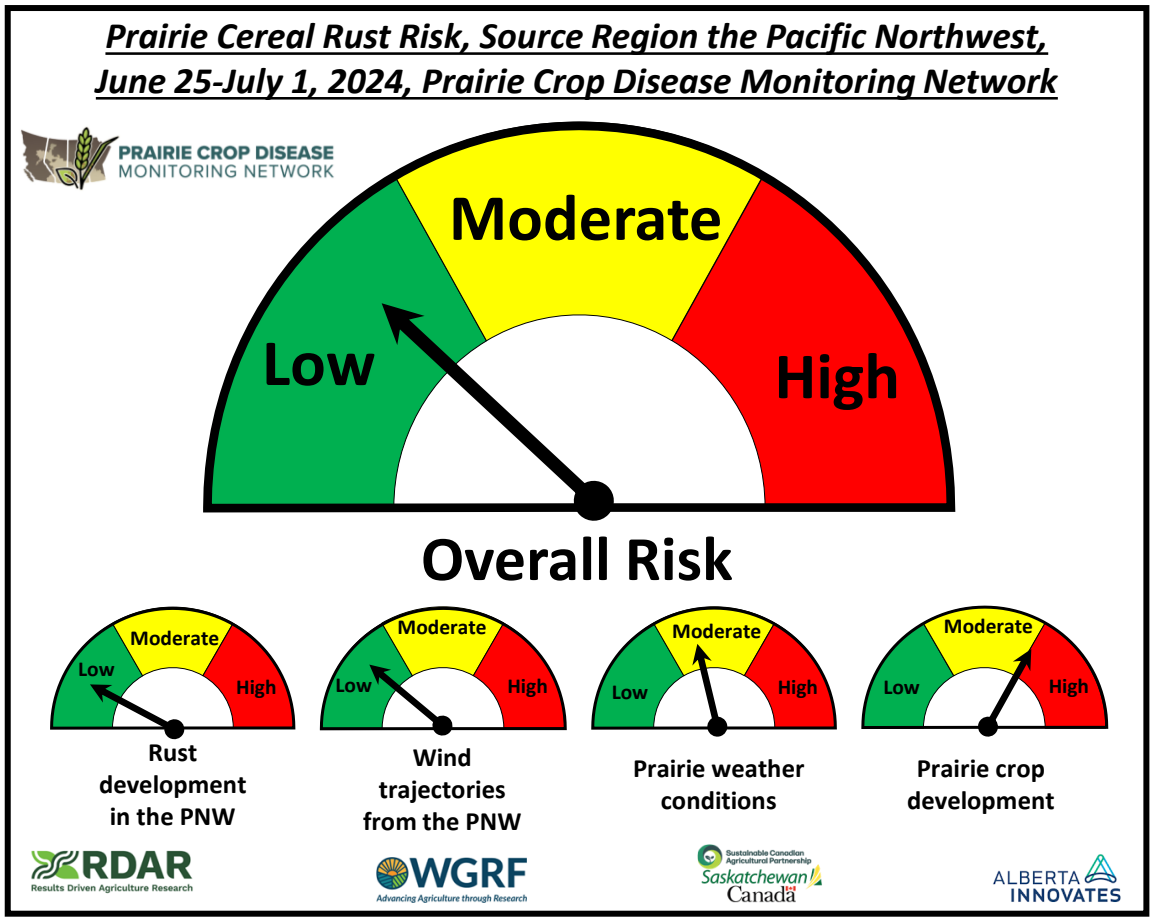

Figure 14. Prairie cereal risk speedometers for stripe rust from the Pacific Northwest, June 25 to July 1, 2024.

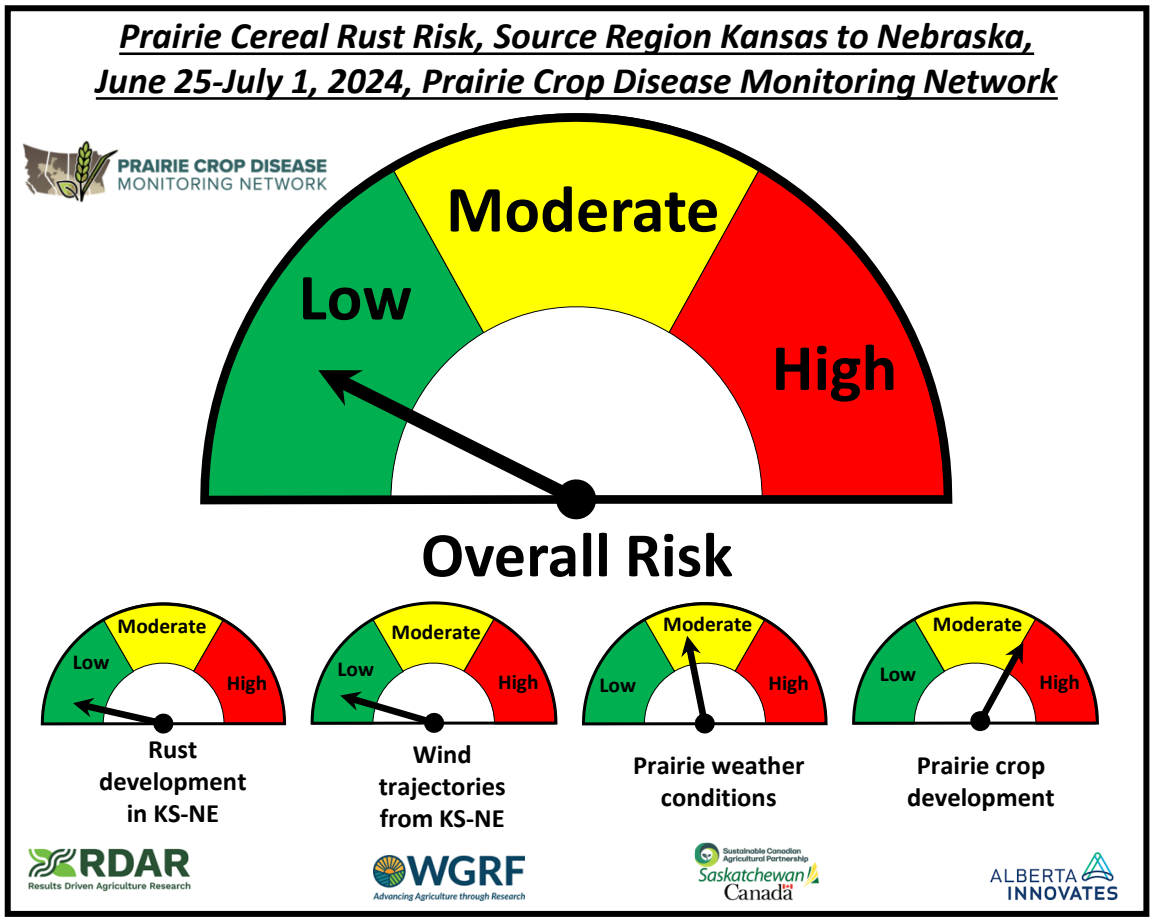

Figure 15. Prairie cereal risk speedometers for stripe/leaf rust from the Kansas/Nebraska region, June 25 to July 1, 2024.

Table 1. Reverse trajectory locations, arrival dates, and number of events, for reverse trajectory events originating from the Pacific Northwest region of the USA, June 25 to July 1, 2024.

Location	Province	25-Jun-24	26-Jun-24	27-Jun-24	28-Jun-24	29-Jun-24	30-Jun-24	1-Jul-24	Total trajectories/ location
LETHBRIDGE	AB	1	1	1	1			1	5
LACOMBE	AB			1	1		1	1	4
VULCAN	AB	1		1	1			1	4
BEISEKER	AB			1	1			1	3
MEDICINE HAT	AB	1		1	1				3
BRANDON	MB	1			1			1	3
GAINSBOROUGH	SK	1			1			1	3
SWIFT CURRENT	SK	1		1	1				3
CALGARY	AB				1			1	2
GRANDE PRAIRIE	AB			1			1		2
OLDS	AB			1				1	2
SEDGEWICK	AB			1	1				2
CARMAN	MB	1			1				2
SELKIRK	MB	1	1						2
MOOSE JAW	SK	1						1	2
REGINA	SK	1						1	2
WATROUS	SK				1			1	2
ANDREW	AB							1	1
EDMONTON	AB			1					1
PROVOST	AB				1				1
RYCROFT	AB							1	1
PORTAGE	MB	1							1
RUSSELL	MB	1							1
GRENFELL	SK							1	1
KINDERSLEY	SK							1	1
NAICAM	SK				1				1
NORTH BATTLEFORD	SK				1				1
WEYBURN	SK							1	1
YORKTON	SK				1				1
Total trajectories per date		**12**	**2**	**10**	**16**		**2**	**16**	**58**

Table 2. Reverse trajectory locations, arrival dates, and number of events, for reverse trajectory events originating from Kansas and Nebraska, USA, June 25 to July 1, 2024.

Location	Province	25-Jun-24	26-Jun-24	27-Jun-24	28-Jun-24	29-Jun-24	30-Jun-24	1-Jul-24	Total trajectories/ location
GAINSBOROUGH	SK				1				1
GRENFELL	SK							1	1
MOOSE JAW	SK				1				1
REGINA	SK				1				1
WATROUS	SK				1				1
WEYBURN	SK							1	1
Total trajectories per date					4			2	6