PRAIRIE WIND TRAJECTORY AND CEREAL RUST RISK REPORT for June 4-10, 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.blogspot.com/p/cereal-rust-risk-report.html; https://prairiecropdisease.blogspot.com/).

ii. Previous reports from the PNW suggested an increased risk of stripe rust and observations of increased levels of symptoms, especially in breeding trials and nurseries. However, recent surveys by Dr. Chen at the end of May indicated no development in commercial winter wheat and spring wheat and barley fields (Dr. Chen, stripe rust update, May 31, 2024, https://www.wawg.org/stripe-rust-update-05-31-high-rust-pressure-present/). Dr. Chen indicated the lack of observations in commercial fields was likely related to the use of resistant varieties as well as fungicide application. However, significant symptoms of stripe rust were observed by Dr. Chen on goat grass in various locations including in and around commercial winter wheat fields, park areas and roadsides. Interestingly, Dr. Chen reported stripe rust in a winter barley research field in the Pullman region, although it was at lower levels as compared to winter wheat trials. In a previous report Dr. Chen noted the observation of a hot spot of elevated severity in a commercial field. In his May 31st report Dr. Chen indicated that there have been recent reports of stripe rust re-developing in commercial winter wheat fields that had been previously sprayed. Potential cool weather conditions may promote further development and Dr. Chen is encouraging farmers to think about a second fungicide application using products labeled for post head emergence and where the preharvest interval is suitable. Dr. Chen also cautions about potential stripe rust risk in spring wheat and barley and the potential need for fungicide application with susceptible varieties.

iii. **As of June 10, 2024, the relatively limited development of stripe rust in commercial fields suggests the PNW may not be a significant source of rust spores currently. However, potential further development in commercial PNW winter wheat fields could increase this risk.**

iv. Currently there are no reports of stripe rust symptoms in Prairie commercial winter or spring wheat crops although symptoms have been reported at AAFC Lethbridge by Dr. R. Aboukhaddour, AAFC Lethbridge (https://x.com/ReemWheat/status/1791567749489312080). Previously, 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).

b. **Texas/Oklahoma**

i. Earlier PCDMN cereal rust risk updates outlined previous observations and concerns regarding stripe rust in Texas and Oklahoma as well as reports of leaf and stem rust in wheat and crown rust in oat (https://prairiecropdisease.blogspot.com/p/cereal-rust-risk-report.html; https://prairiecropdisease.blogspot.com/).

ii. Stripe rust was a previous concern in Oklahoma, although a significant number of winter wheat acres had already been sprayed with fungicide (Dr. A De Oliveira Silva, Extension Specialist for Small Grains, OSU quoted in https://www.farmprogress.com/wheat/oklahoma-wheat-much-improved-in-2024).

iii. However, Texas and Oklahoma crops are moving towards maturity and harvest. In Texas as of June 9, 2024, 47% of the winter wheat crop has been harvested, while in Oklahoma 48% of the winter wheat crop has been harvested (https://quickstats.nass.usda.gov/results/218B6322-CB54-3AE4-899B-2B4BABAE1193; https://quickstats.nass.usda.gov/results/9FBE6ADA-AB95-38E8-8B75-FF059977266E). Given that Texas and Oklahoma winter wheat crops are mainly mature and harvesting is well underway, they no longer represent a significant source of rust inoculum for the Prairie region.

iv. **As of June 10, 2024, there is a low risk associated with the Texas/Oklahoma region being a significant source of stripe rust inoculum for dispersal into the Prairie region of Canada.**

c. **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.blogspot.com/p/cereal-rust-risk-report.html; https://prairiecropdisease.blogspot.com/).

ii. Many Kansas counties have low intensities of stripe rust, although some central regions have had more significant levels (Dr. E DeWolf and K. A. Onofre, KSU, Update on Rust Diseases from Kansas, Cereal Rust Survey <CEREAL-RUST-SURVEY@LISTS.UMN.EDU>). Figure 1 shows the most recent distribution of stripe rust in Kansas counties (https://wheat.agpestmonitor.org/stripe-rust/ (as of June 13, 2024). In addition, to stripe rust, leaf and stem rust have also been reported in Kansas winter wheat fields, but mainly in four counties in south central Kansas, while stem rust has also been reported in variety trials in north central Kansas. Dr. De Wolf commented that stem rust observations were earlier than usual.

iii. In his latest 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). 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.

iv. USDA crop progress reports indicate that as of June 9, 2024, 52% of the winter wheat crop is mature, with 5% of the crop being harvested in this region (https://quickstats.nass.usda.gov/results/7697AE4A-A089-347D-BD9E-C773202FAA83;

https://quickstats.nass.usda.gov/results/B84A3FA8-068A-3F77-ACDE-24B9ABCE69F5). In regions where the Kansas winter wheat crop is mature or harvested, stripe rust would no longer be active and thus these mature crops would no longer represent a significant source of rust inoculum.

v. In their May 30, 2024 update, Dr. S. Wegulo and colleagues reported further increases in the detection of stripe rust with 20 counties affected, with increased severities, especially where crops had not been sprayed and the varieties being grown were susceptible to stripe rust (Figure 2, https://cropwatch.unl.edu/2024/wheat-disease-update-may-30-2024).

vi. Previous reports as of May 24, 2024, indicated that leaf rust symptoms have not been observed in Nebraska (https://cropwatch.unl.edu/2024/wheat-disease-update-may-23-2024). However, the most recent report as of May 30, 2024 indicated leaf rust had been found in two Nebraska counties (Figure 3, https://cropwatch.unl.edu/2024/wheat-disease-update-may-30-2024).

vii. **As of June 10, 2024, there is a low-moderate 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.** As winter wheat matures in Kansas and harvest continues this region will no longer represent a significant source of stripe rust inoculum for the Prairie region in 2024.

viii. Of interest are the continuing numerous reports of stripe rust in southern Ontario winter wheat fields, where inoculum has likely arrived from neighbouring states south and west of Ontario, e.g. Louisiana through to Michigan and northwest New York State (Figure 1, https://www.canr.msu.edu/news/wheat-stripe-rust-outbreak-and-fusarium-head-scab-risk-prediction; https://www.topcropmanager.com/omafra-stripe-rust-management/; https://twitter.com/realagriculture/status/1791187946286002511; https://www.realagriculture.com/2024/05/identifying-and-managing-stripe-rust-in-winter-wheat/?utm_source=twitter&utm_campaign=May%2026%2C%202024&utm_medium=social; https://x.com/FarmsMarketing/status/1794088836491788406; https://twitter.com/AlyssaFarrelly/status/1797701352275218711; https://twitter.com/pmdelanghe/status/1796603389331243078);

d. **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. 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).

v. 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 a fairly early appearance (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.

1. **Given the close proximity of stripe rust affected wheat in North Dakota, Prairie wheat growers, especially in eastern Saskatchewan and Manitoba, should be extra vigilant regarding the appearance of stripe rust.**

2. Reverse trajectories (RT)

a. Since April 1, 2024 71% of reverse trajectories that have crossed the prairies have originated from the Pacific Northwest (Idaho, Oregon and Washington). The number of reverse trajectories that originated over Texas, Oklahoma, Kansas and Nebraska has been approximately half of the total number for the same time period in 2023. Overall, the number of trajectories that have passed over the prairies (from Idaho, Oregon, Washington, Nebraska, Kansas, Oklahoma and Texas) is 34% less than 2023. This past week (June 4-10, 2024) many reverse trajectories were observed to originate over Oregon and Washington before crossing the prairies. Over a five day interval, some reverse trajectories have originated in Japan and Russia before passing over western Canada (Figure 4).

b. **Pacific Northwest (Washington, Oregon, Idaho)** –Since April 1, 657 reverse trajectories have passed over the prairies from the Pacific Northwest. Since May 29 there has been a significant increase in the number of reverse trajectories that have originated from the Pacific Northwest (Figure 5). These trajectories have passed over southern Alberta, Saskatchewan and southwestern Manitoba, with a total of 73 trajectory events from June 4-10, 2024 (Figures 6 and 7; Table 1). Prairie locations with elevated numbers of trajectories from June 4-10, 2024 included LETHBRIDGE, AB with four trajectories, three trajectories each for MEDICINE HAT, OLDS, and VULCAN, AB, GAINSBOROUGH, GRENFELL, NAICAM, SWIFT CURRENT, and WATROUS, SK, and SELKIRK, MB (Table 1).

   i. **For the week of June 4 to 10, 2024, there was a low-moderate 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. However, locations with 3-4 trajectories would have a higher risk.**

c. **Oklahoma and Texas** –This past week, only two reverse trajectories originating over Oklahoma and Texas were reported to cross Weyburn and Gainsborough (Table 2; Figures 8 and 9).

   i. **For the week of June 4-10, 2024, there was low risk associated with the TX/OK region being a significant source of wind trajectories for dispersal of the stripe rust pathogen into the Prairie region of Canada.**

d. **Nebraska and Kansas –** Reverse trajectories, originating from Kansas and Nebraska, have primarily passed over Manitoba and Saskatchewan (April 1 – June 10, 2024) (Figures 10 and 11). Wind dispersal models predicted that most of this past week's eight reverse trajectories crossed over Manitoba and eastern Saskatchewan between June 4 and 6, with all Prairie locations only having one trajectory event (Table 3).

   i. **For the week of June 4-10, 2024, there is 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.**

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

a. **Winter wheat** – Winter wheat continues growth in early-mid June with fall-seeded crops progressing from the tillering and stem elongation stages to flag leaf emergence or heading growth stages, depending on the province and region (https://publications.saskatchewan.ca/api/v1/products/123595/formats/144124/download; https://www.gov.mb.ca/agriculture/crops/seasonal-reports/crop-report/pubs/crop-report-2024-06-11.pdf).

b. **Spring wheat** – Across the prairie region spring wheat has been mostly planted and crops are in the seedling stage or starting to tiller (https://open.alberta.ca/dataset/a8632ff6-a50d-496c-8dc6-7cee941b5977/resource/6a53b821-9113-4f49-ae1a-e67b1acad37d/download/agi-itrb-alberta-crop-report-2024-06-04.pdf; https://publications.saskatchewan.ca/api/v1/products/123595/formats/144124/download; https://www.gov.mb.ca/agriculture/crops/seasonal-reports/crop-report/pubs/crop-report-2024-06-11.pdf).

c. **Weather synopsis** – This past week cooler temperatures were observed across most of the prairies. Growing season temperatures have been lower than average while rainfall amounts continue to be above average. This past week (June 3-9, 2024) temperatures were 1.2 °C below climate normal values. The average temperature across the prairies was 12.5 °C (Figure 12). Warmest temperatures were observed across a large area that extended west of Winnipeg to Saskatoon and Lethbridge. Seven day cumulative rainfalls were highly variable (Figure 13). Average cumulative seven day rainfall was 16.3 mm. Lowest rainfall values were observed across southern and western regions of the prairies, while the Parkland region had higher rainfall amounts.

d. The average 30 day temperature (May 11 – June 9, 2024) was 11.4 °C and was 0.5 °C cooler than the long term average temperature. Warmest temperatures were observed south of an area extending from Winnipeg to Saskatoon and southwest to Lethbridge (Figure 14). Most of the prairies reported 30 day rainfall amounts that were normal to above normal. Average cumulative rainfall (mm) over the past 30 days was 65 mm and was 152% of climate normal values. The Peace River region continues to report the lowest rainfall totals (Figure 15). Cumulative rainfall continues to be greatest across most of Manitoba. Since April 1, the 2024 growing season has been 0.6 °C warmer than average. Warmest average temperatures were observed across the southern prairies (Figure 16). Growing season rainfall has been above normal across most of the prairies. Rain amounts have been 184% of climate normals (Figure 17). Highest cumulative rainfall has been reported for most of Manitoba and southern Alberta (Figure 18).

e. Currently, there are no reports of early season stripe rust development in winter wheat, which would suggest potential overwintering, especially of stripe rust (personal communication: S. Rehman, R. Aboukhaddour, AAFC Lethbridge; and H.R. Kutcher, U. of S.).

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

a. **Pacific Northwest** – There were moderate numbers of reverse wind trajectories that passed over the PNW region and into the Prairies, while the most recent reports available indicate that stripe rust development is limited in commercial fields although there are concerns that it could restart in previously sprayed commercial crops. Prairie winter wheat crops are progressing past the stem elongation stages and into flag leaf emergence, booting and in some regions heading, while much of the spring wheat crop has now been seeded and is at the seedling to tillering stage. Rainfall amounts were limited in the central to southern Alberta and southwest and south central Saskatchewan. **Overall, as of June 12, 2024, the risk of stripe rust appearance from the PNW is relatively low and scouting for this disease in the Prairie region as a result of PNW rust inoculum is generally not urgent (Figure 18).**

b. **Texas-Oklahoma corridor** – There were only two reverse wind trajectories that passed over the TX/OK region and into the Prairies from June 4-10, 2024, while stripe and leaf rust have been reported. However, Texas and Kansas winter wheat crops are either mature or will be shortly with harvesting close to 50% complete. As a consequence winter wheat crops in these regions no longer represent a significant source of rust inoculum for the Prairie region. Prairie winter wheat crops are progressing past the stem elongation stages and into flag leaf emergence, booting and in some regions heading, while much of the spring wheat crop has now been seeded and is at the seedling to tillering stage. **Overall, as of June 12, 2024, the risk of**

stem, leaf, stripe, and crown rust appearance from the Texas-Oklahoma corridor is relatively low and scouting for these diseases in the Prairie region based on inoculum from TX/OK is not urgent (Figure 19).

c. **Kansas-Nebraska corridor** – There were only eight reverse wind trajectories that passed over the KS/NE region and into the Prairies from June 4-10, 2024, while stripe and leaf rust (Kansas) development have been reported in commercial winter wheat fields in this region, with numerous reports of low levels in Nebraska, although elevated levels have been reported in unsprayed fields, especially where the variety planted was susceptible. Note, Kansas winter wheat crops are progressing towards maturity with a small percentage being harvested. As a consequence over the next 1-2 weeks Kansas winter wheat will no longer represent a significant source of rust inoculum. Prairie winter wheat crops are progressing past the stem elongation stages and into flag leaf emergence, booting and in some regions heading, while much of the spring wheat crop has now been seeded and is at the seedling to tillering stage. Rainfall amounts in southern Saskatchewan and the central regions of Manitoba were reduced, although some regions in central to northern Saskatchewan and west central, northwestern and the southeastern corner of Manitoba had higher rainfall amounts. The rainfall in regions with higher amounts could facilitate deposition of rust spores into cereal crops and subsequent disease development**. Overall, as of June 12, 2024, the risk of stem, leaf, stripe, and crown rust appearance from Kansas-Nebraska corridor inoculum is low-moderate and scouting for these diseases in the Prairies is generally not urgent (Figure 20).**

d. **The early and widespread appearance of stripe rust in the PNW, TX/OK and KS/NE regions is still concerning, while the recent stripe rust observations from North Dakota, South Dakota, Minnesota and Wisconsin bring the stripe rust issue very close to the Prairies, especially the central to eastern regions.** Over the next 1-3 weeks if favourable weather conditions (especially more rainfall) occur in these source US regions, further rust development could occur. This would result in more rust spores being available to be blown into the Prairie region, as well as more northerly rust development into the Dakotas and Minnesota/Wisconsin. Currently, Prairie winter wheat fields are most at risk, but 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 (https://www.seed.ab.ca/variety-data/cereals/; https://saskseed.ca/wp-content/uploads/2020/12/2024-Varieties-of-Grain-Crops.pdf; https://www.seedmb.ca/pdf-editions-and-separate-section-pdfs/). 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 especially and follow further PCDMN cereal risk updates (https://prairiecropdisease.blogspot.com/).**

e. Where farmers or consultants noticed stripe rust development on winter wheat in the fall of 2023, it is recommended to scout winter wheat fields that have resumed growth in spring 2024. Scouting is especially critical where the variety being grown is susceptible/moderately susceptible to stripe rust. Currently, there have been no early to mid spring reports of stripe rust on winter wheat.

5. <u>Contacts for rust research and extension expertise</u>
   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.

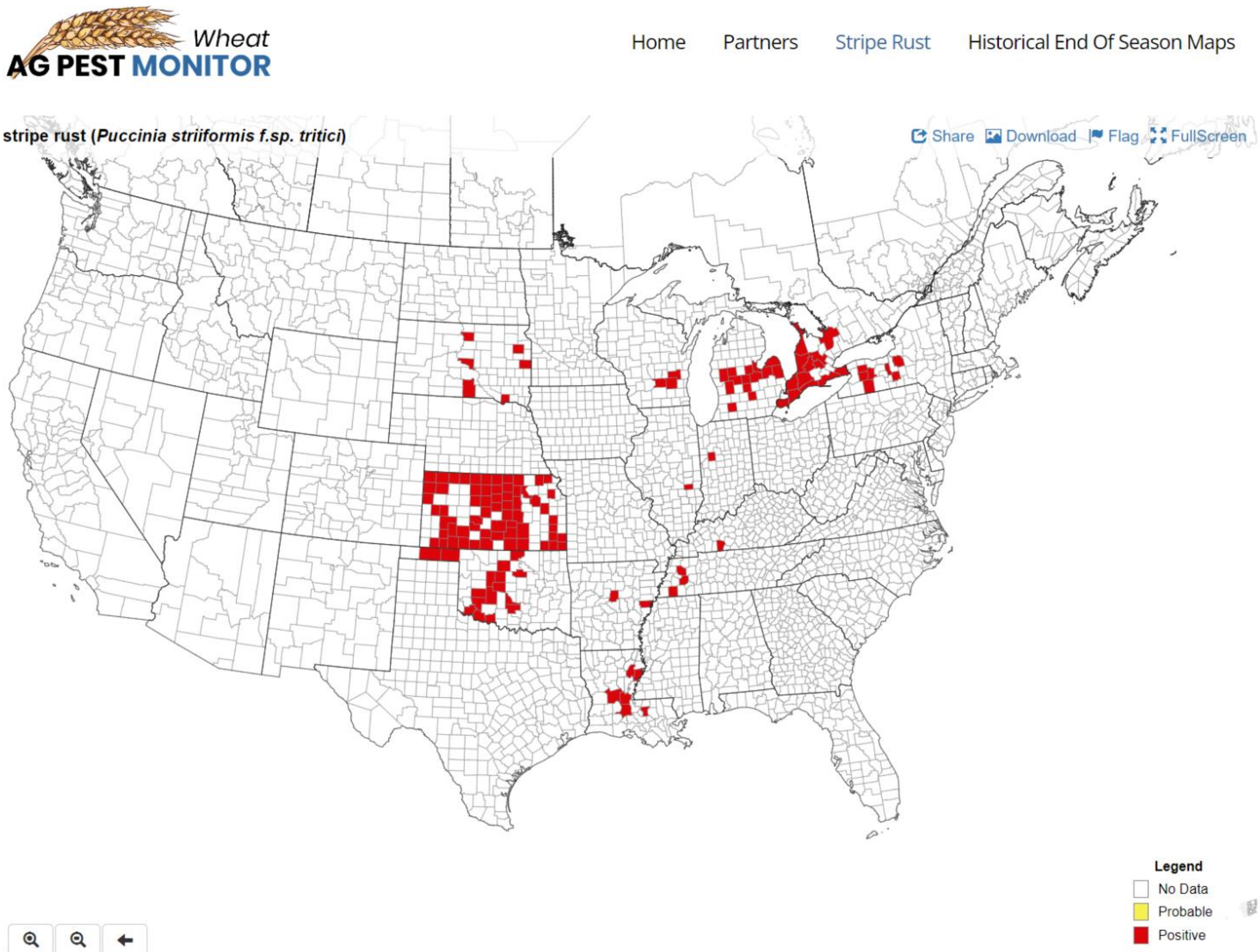

Figure 1. USA stripe rust observations, June 13, 2024 query of the AG PEST MONITOR: Wheat, https://wheat.agpestmonitor.org/stripe-rust/.

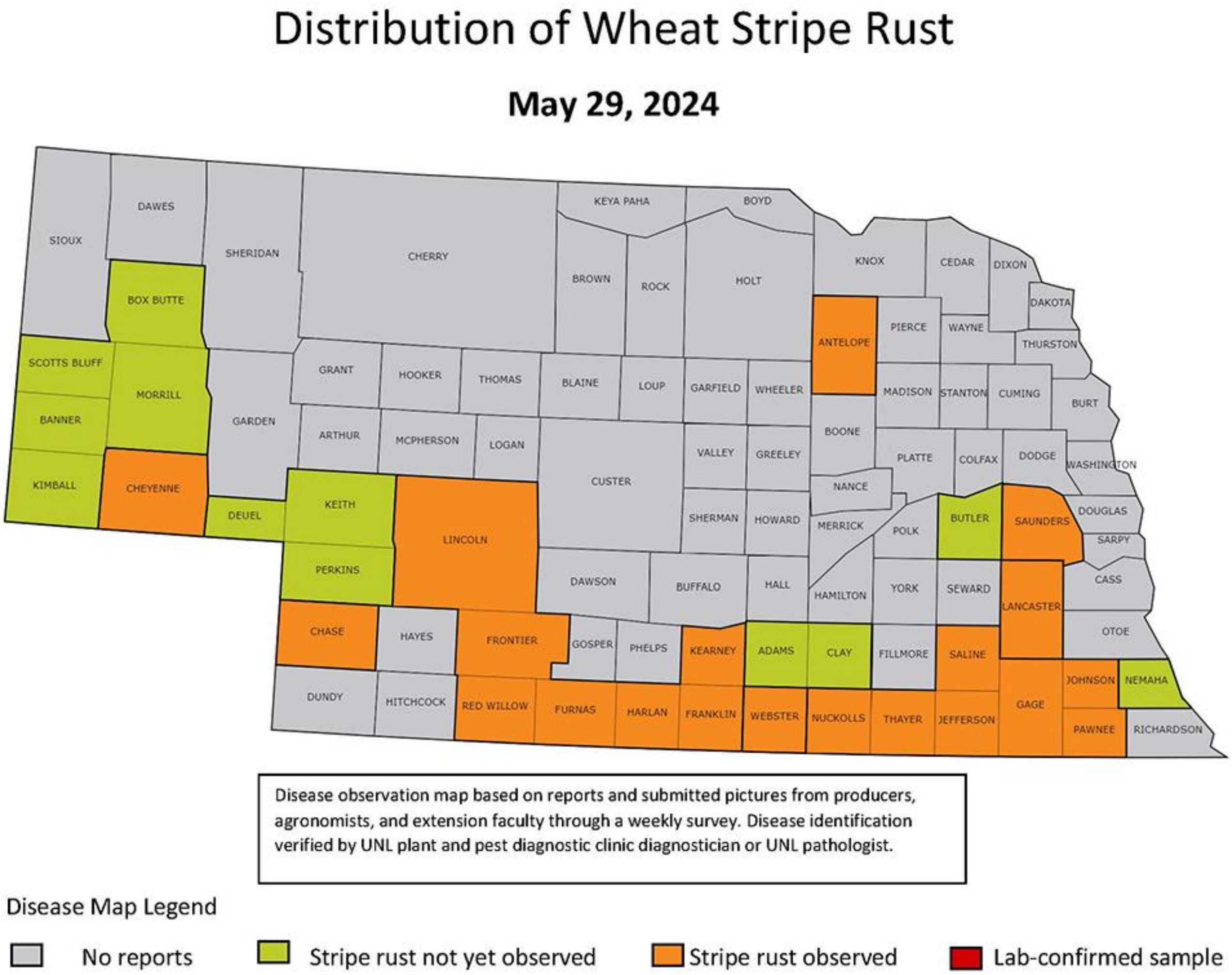

Figure 2. Stripe rust detections in Nebraska counties as of May 29, 2024 (Dr. S. Wegulo et al. May 30, 2024, https://cropwatch.unl.edu/2024/wheat-disease-update-may-30-2024).

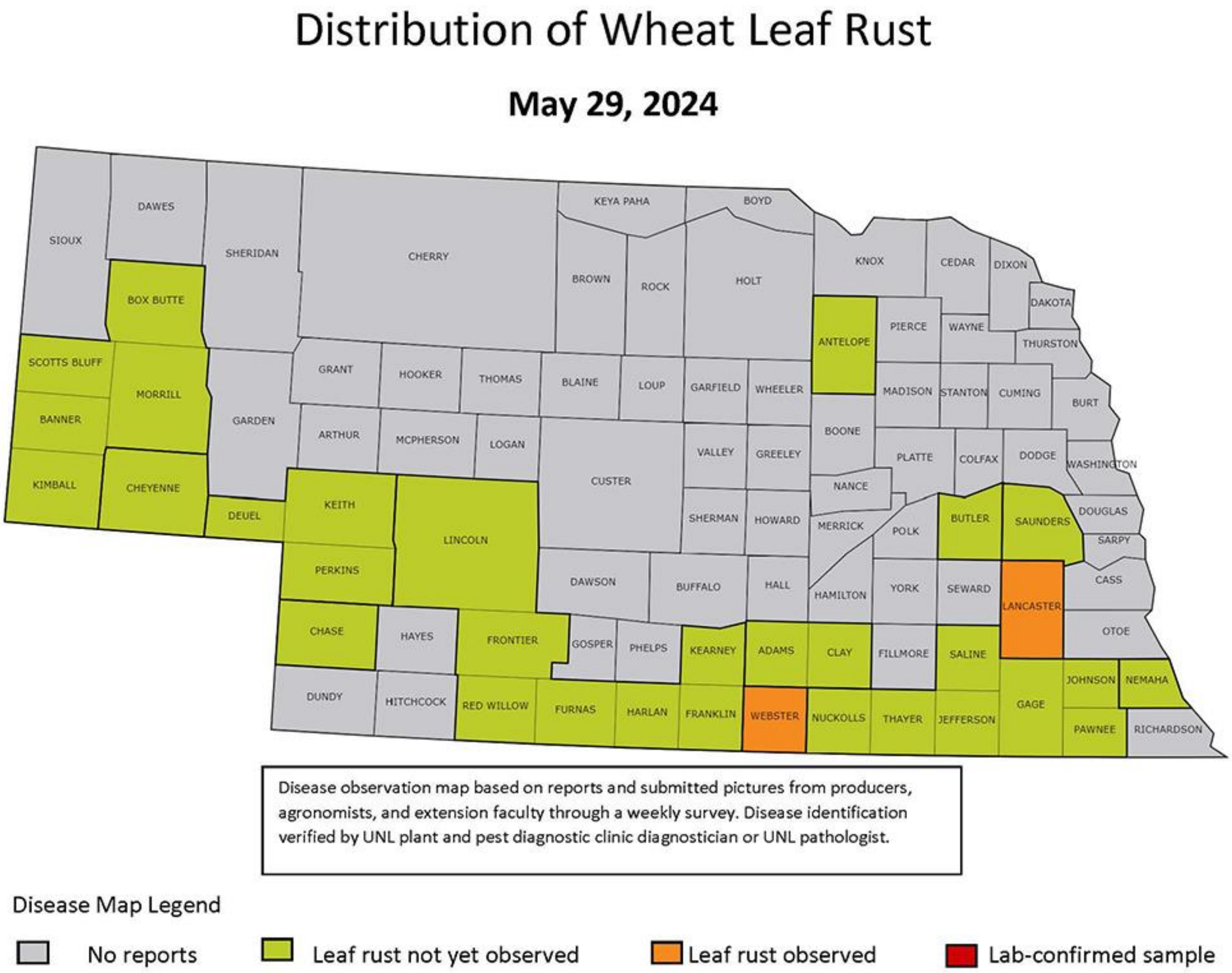

Figure 3. Leaf rust detections in Nebraska counties as of May 29, 2024 (Dr. S. Wegulo et al. May 30, 2024, https://cropwatch.unl.edu/2024/wheat-disease-update-may-30-2024).

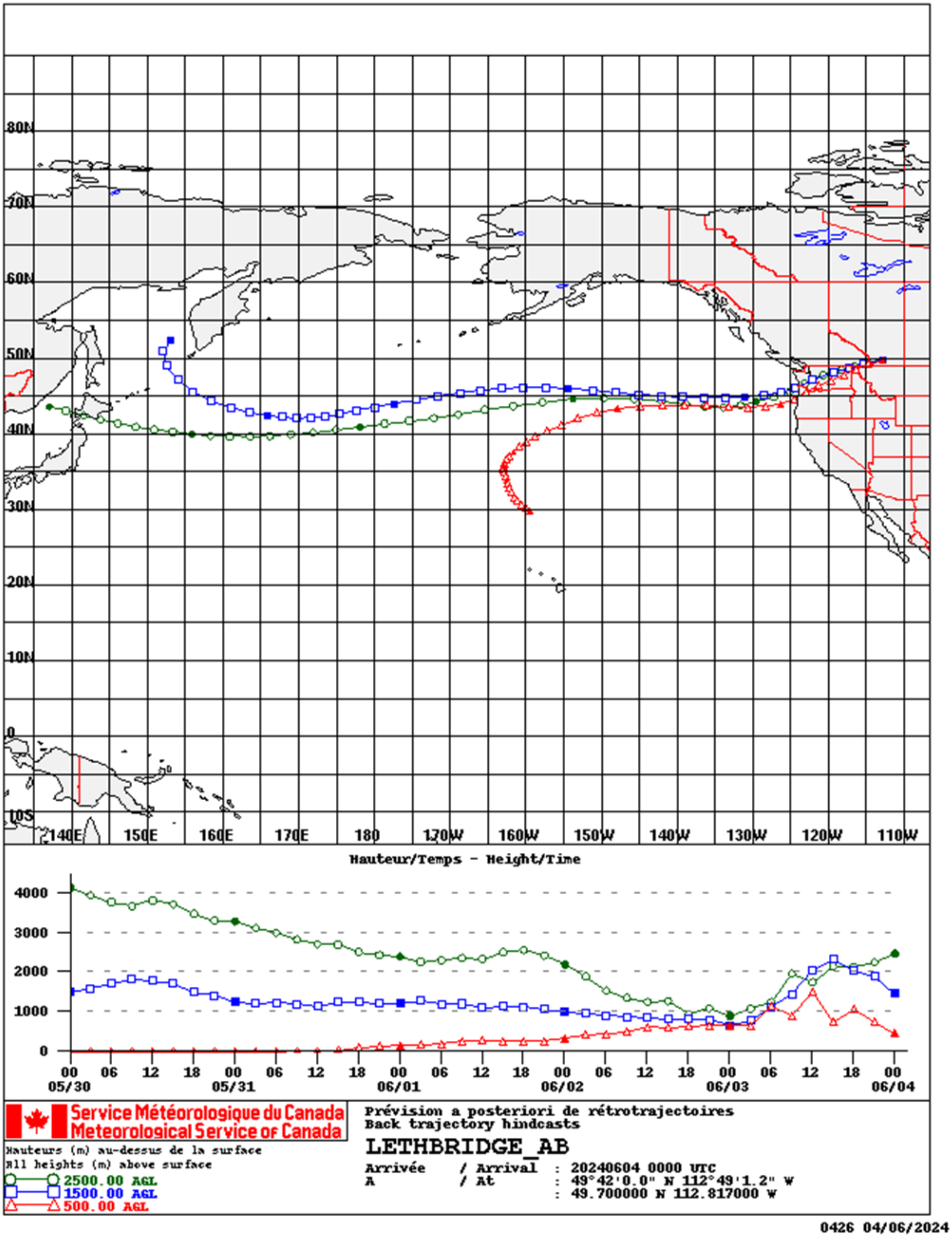

Figure 4. Reverse trajectories for Lethbridge, AB for the period of May 30 to June 4, 2024.

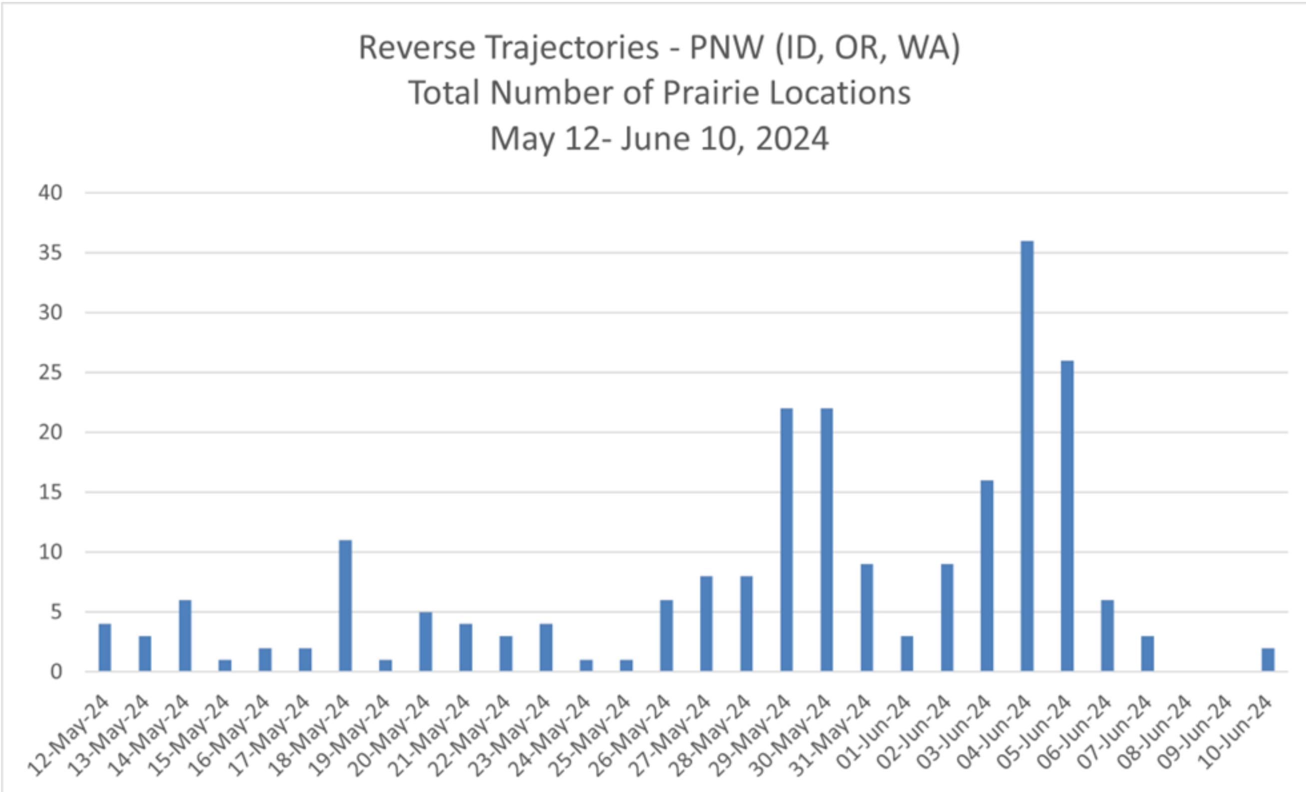

Figure 5. Reverse trajectory locations and number of events, for reverse trajectory events originating from the Pacific Northwest region of the USA, May 12 – June 10, 2024.

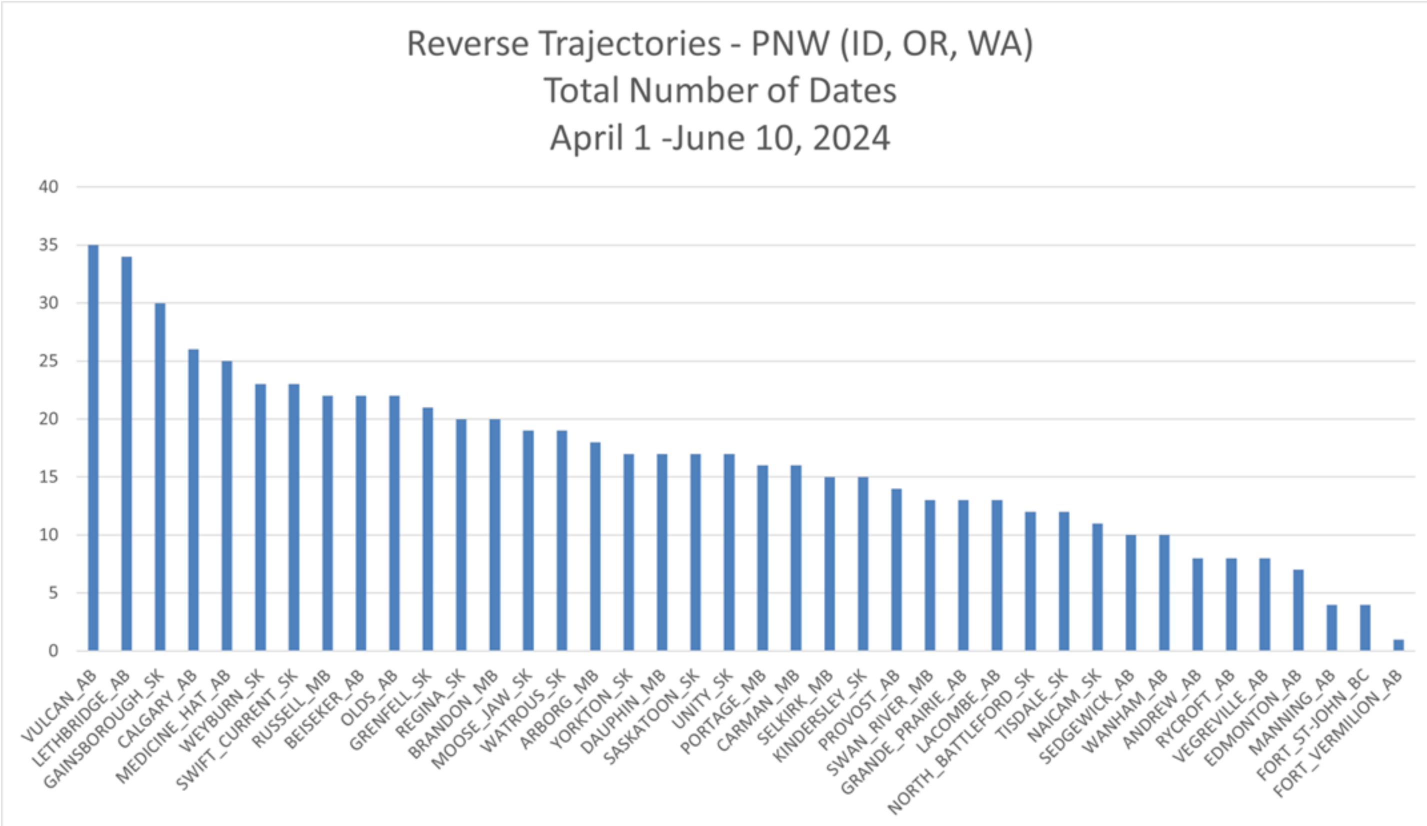

Figure 6. Reverse trajectory locations and number of events, for reverse trajectory events originating from the Pacific Northwest region of the USA, April 1 – June 10, 2024.

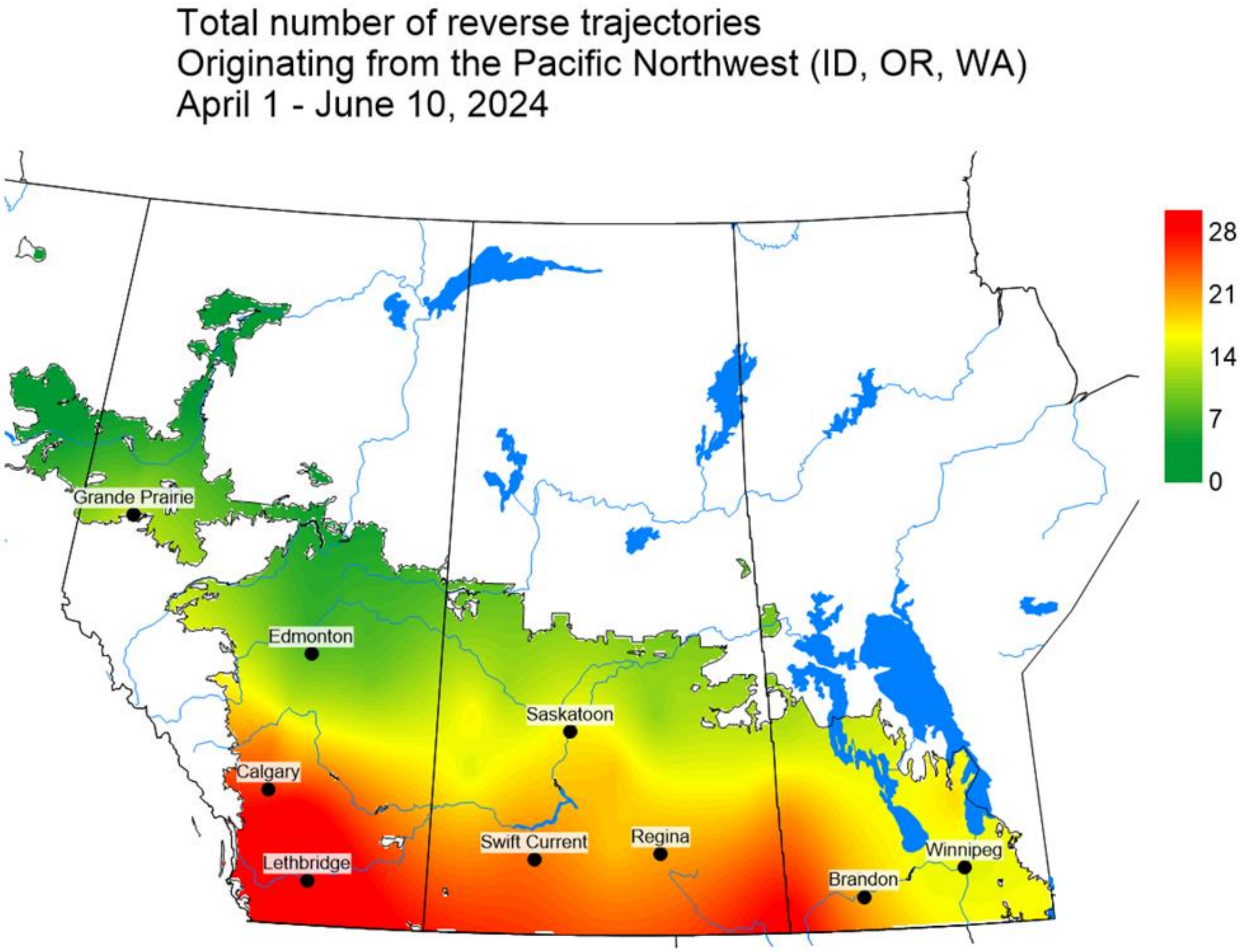

Figure 7. Total number of dates with reverse trajectories originating from the Pacific Northwest region of the USA that have crossed the prairies between April 1 – June 10, 2024.

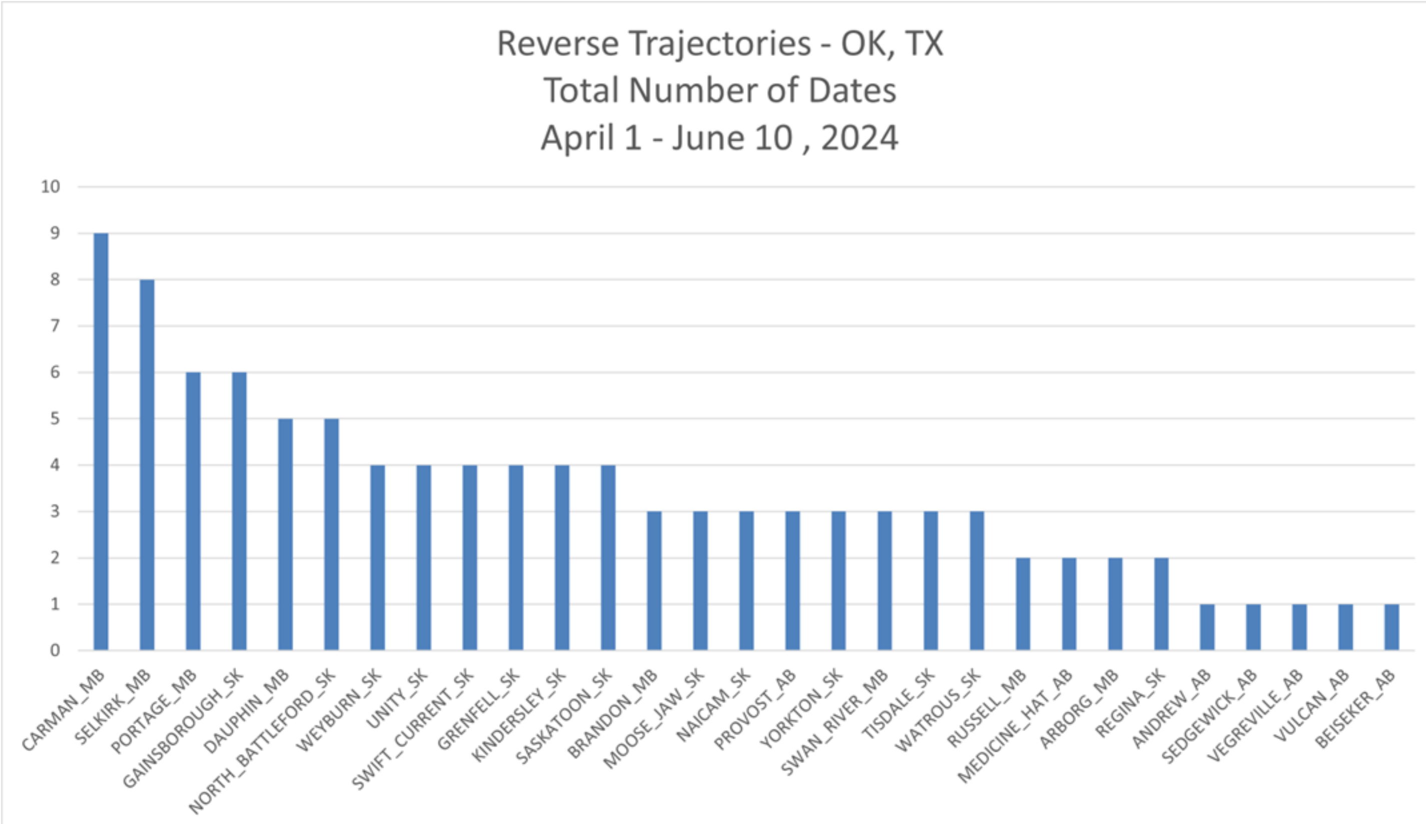

Figure 8. Reverse trajectory locations and number of events, for reverse trajectory events originating from Oklahoma and Texas, USA, April 1 – June 10, 2024.

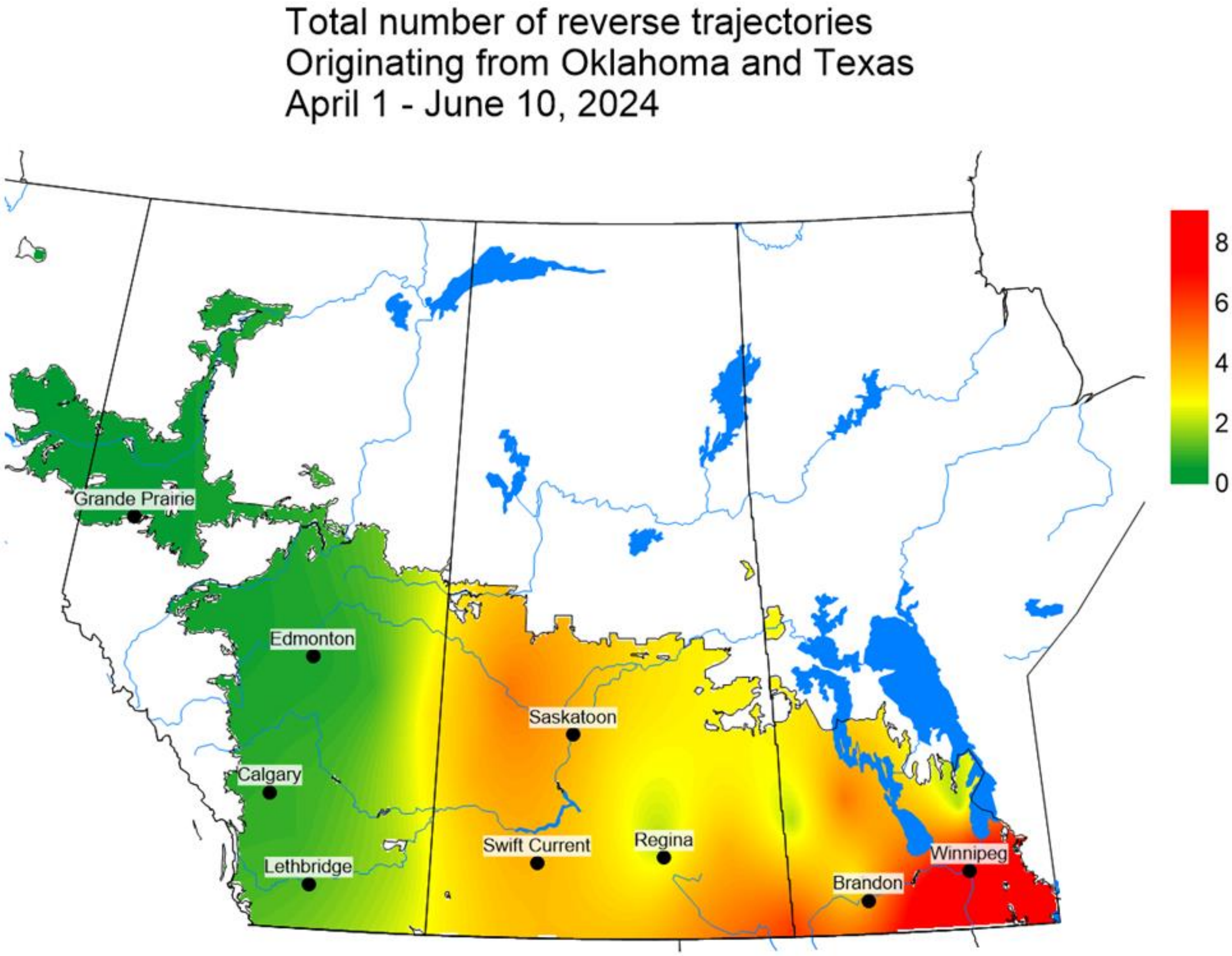

Figure 9. Total number of dates with reverse trajectories originating from Oklahoma and Texas that have crossed the prairies between April 1 – June 10, 2024.

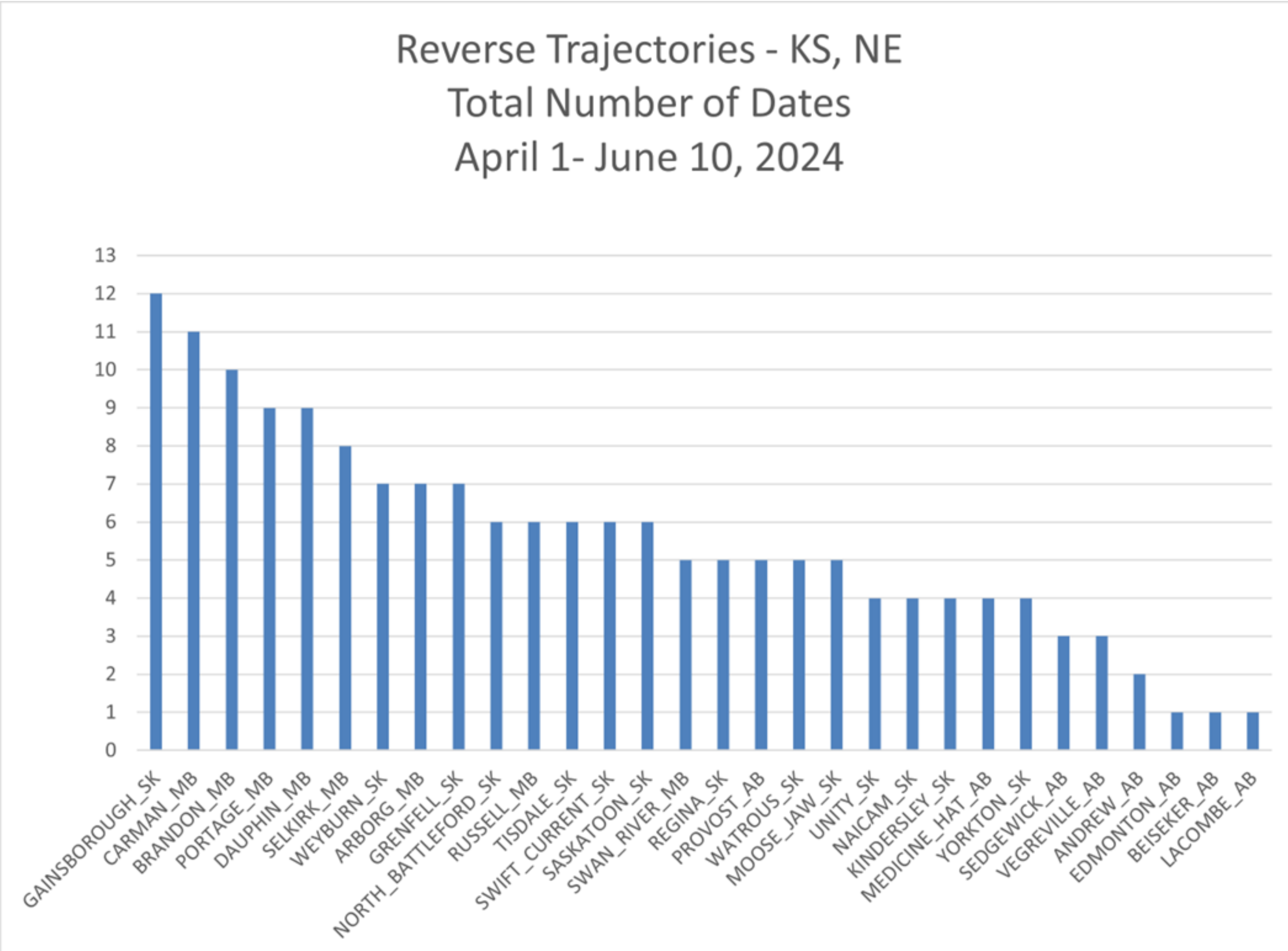

Figure 10. Reverse trajectory locations and number of events, for reverse trajectory events originating from Kansas and Nebraska, USA, April 1 – June 10, 2024.

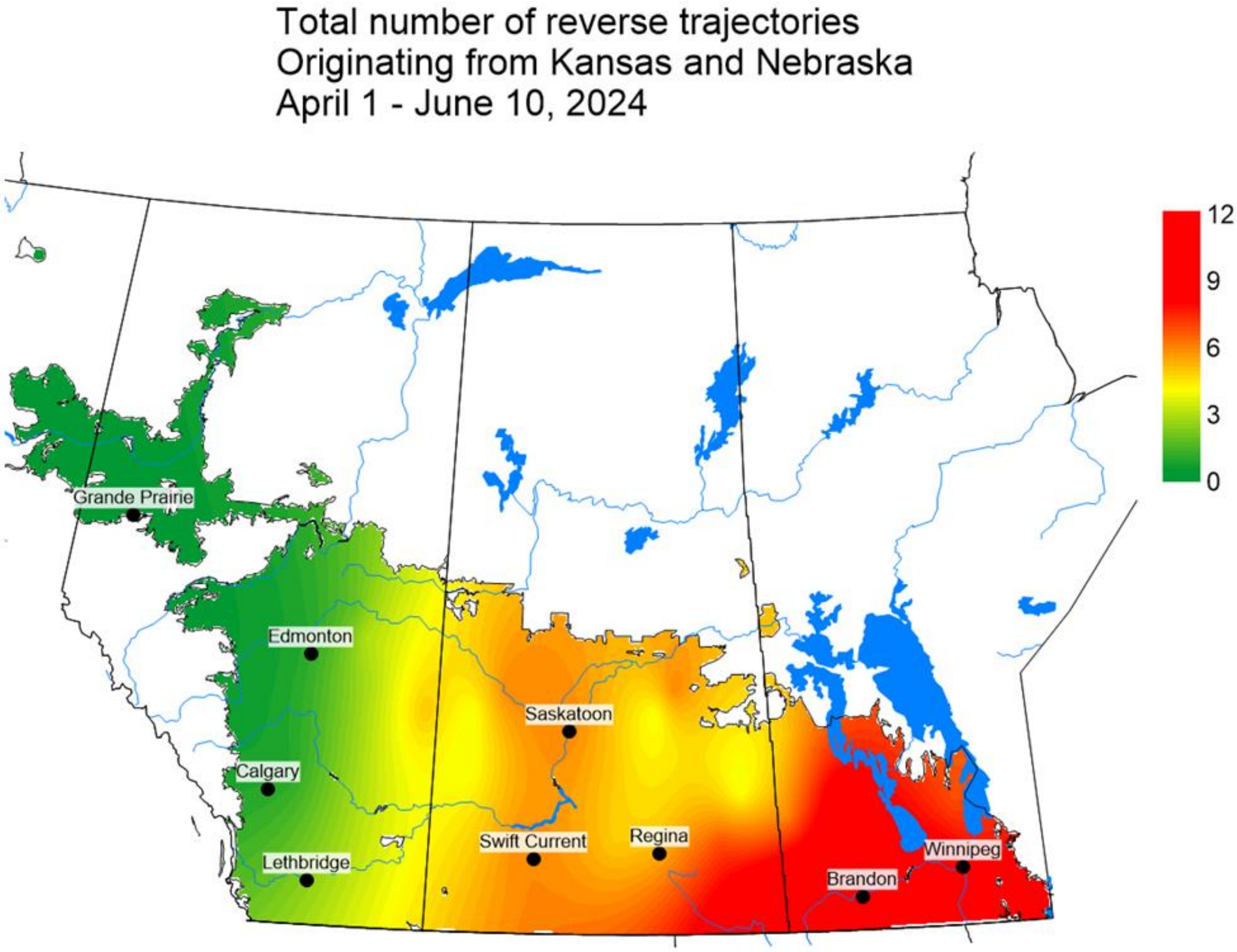

Figure 11. Total number of dates with reverse trajectories originating from Kansas and Nebraska that have crossed the prairies between April 1 – June 10, 2024.

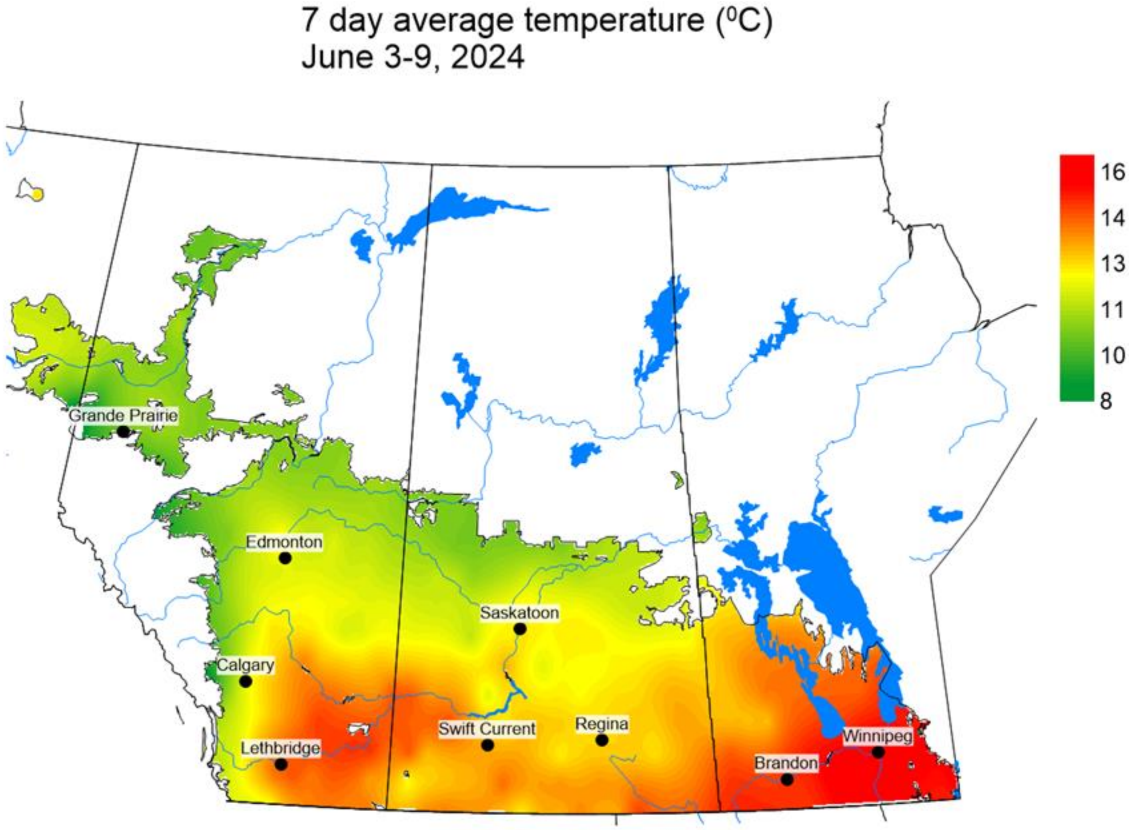

Figure 12. Seven day average temperature (^{0}C) observed across the Canadian prairies for the period of June 3-9, 2024.

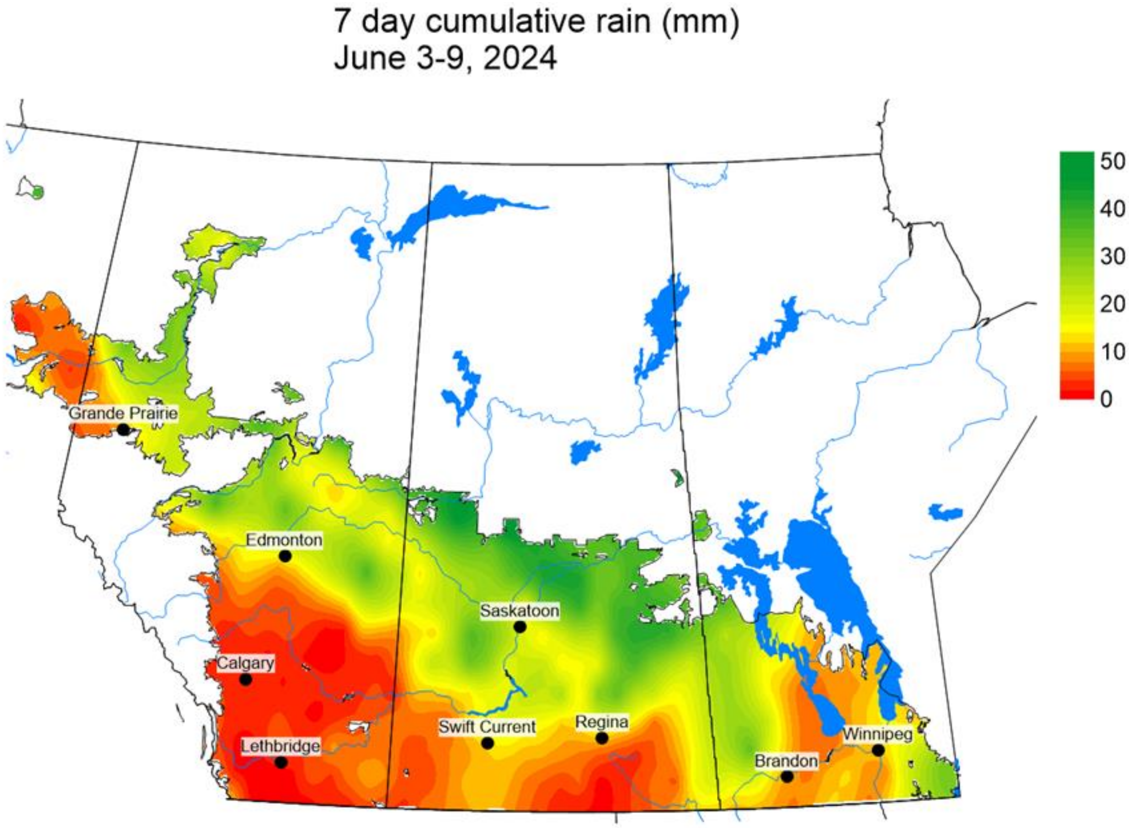

Figure 13. Seven day cumulative rainfall (mm) observed across the Canadian prairies for the period of June 3-9, 2024.

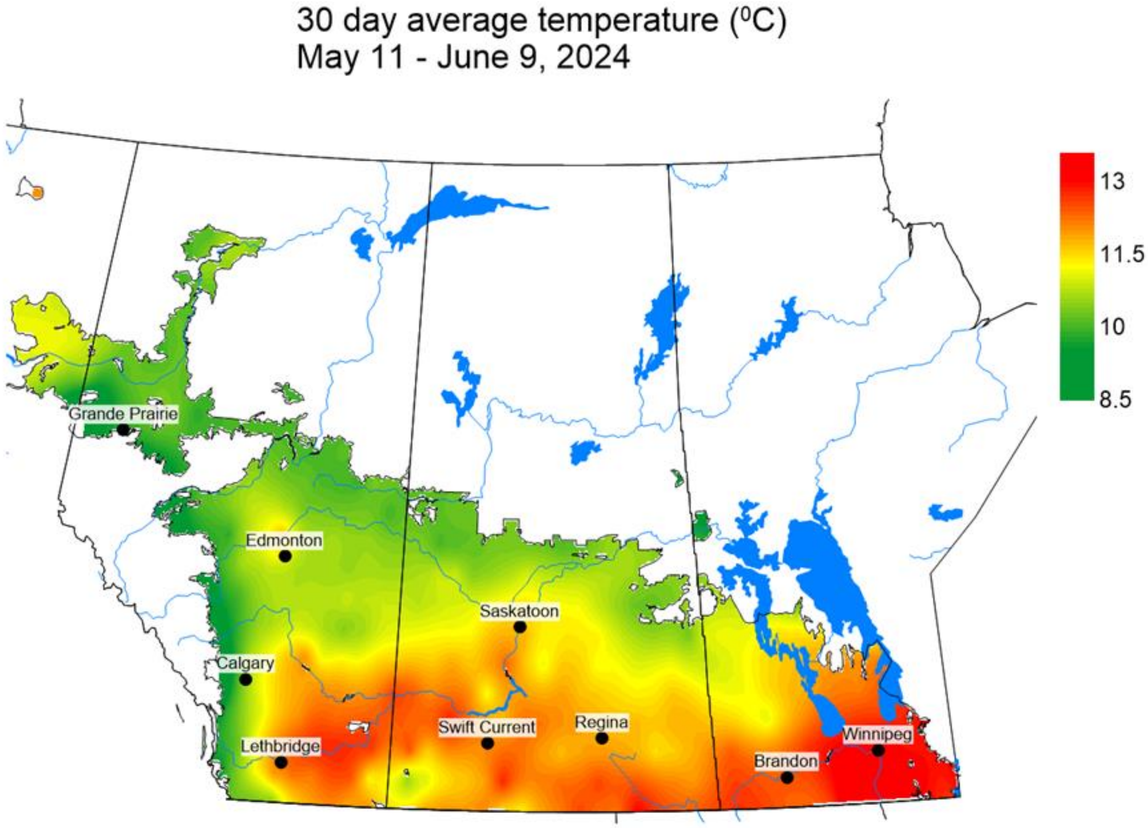

Figure 14. 30-day average temperature (^{0}C) observed across the Canadian prairies for the period of May 11-June 9, 2024.

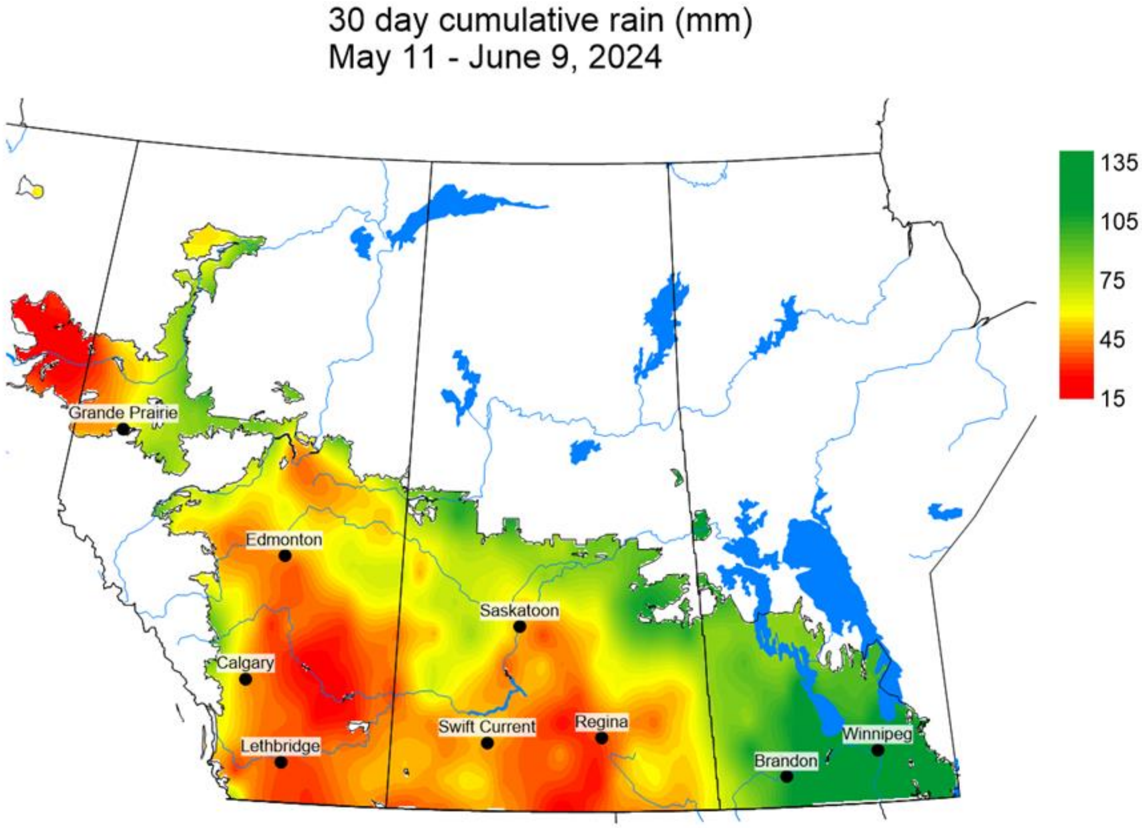

Figure 15. 30-day cumulative rainfall (mm) observed across the Canadian prairies for the period of May 11 – June 9, 2024.

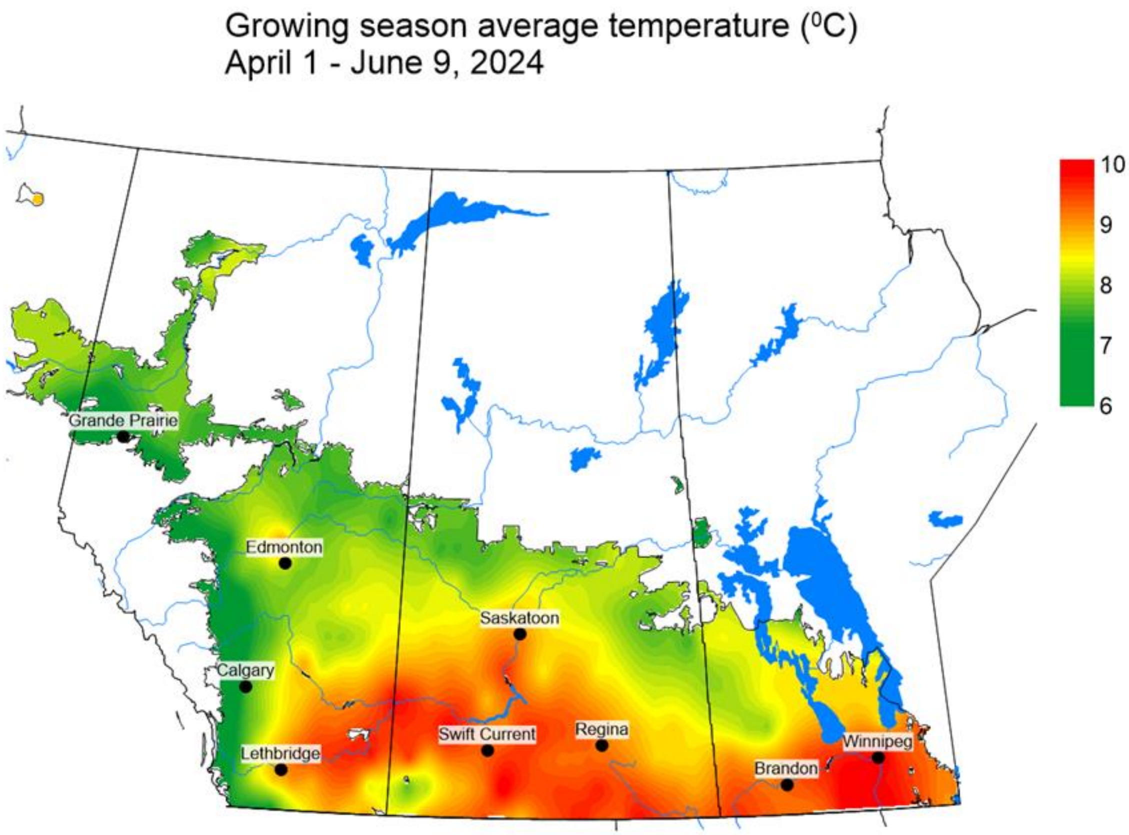

Figure 16. Growing season average temperature (0C) observed across the Canadian prairies for the period of April 1 – June 9, 2024.

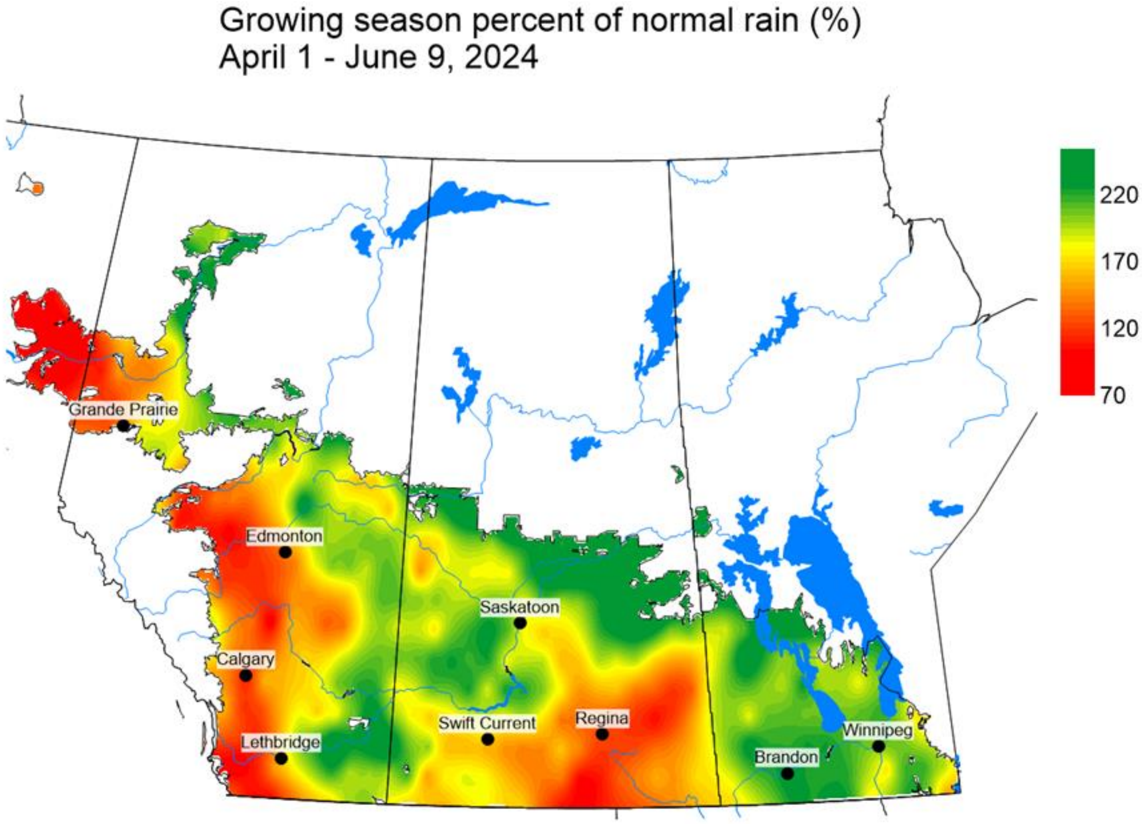

Figure 17. Growing season percent of normal rain (%) observed across the Canadian prairies for the period of April 1 – June 9, 2024.

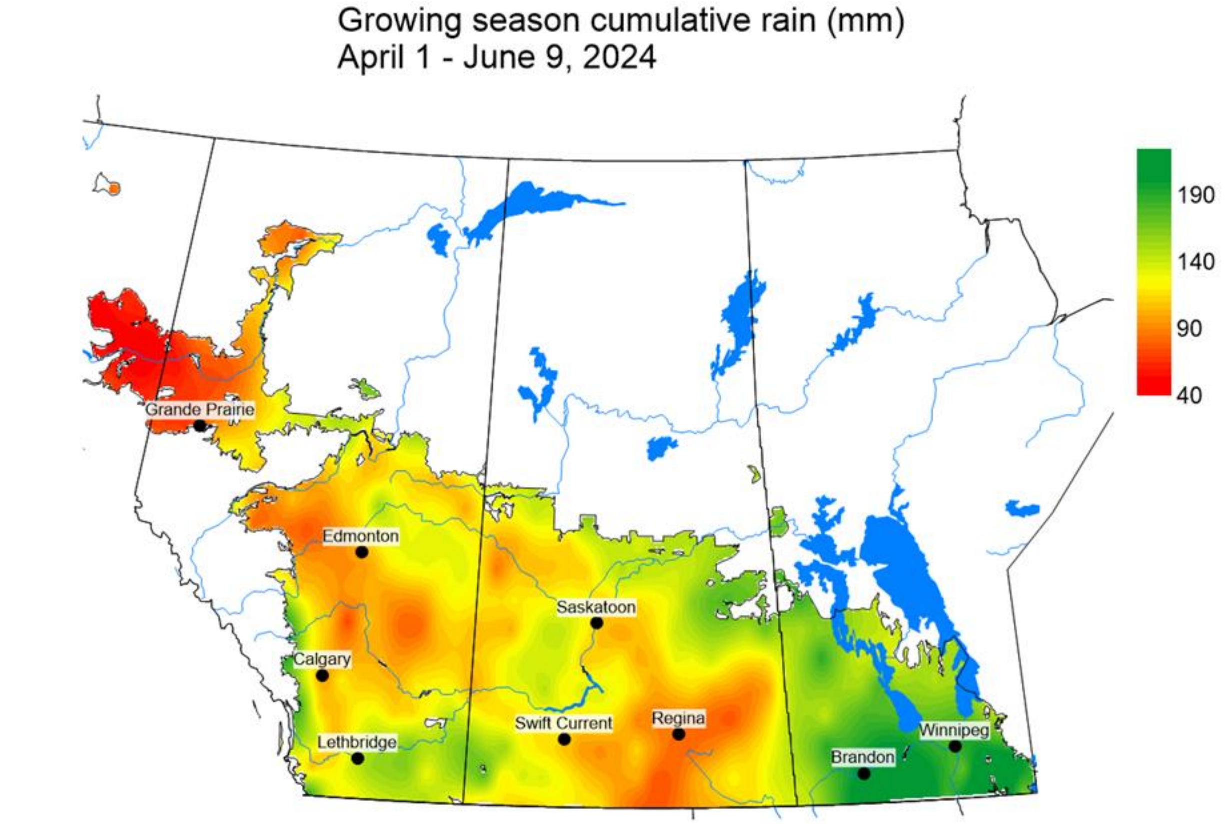

Figure 18. Growing season cumulative rainfall (mm) observed across the Canadian prairies for the period of April 1 – June 9, 2024.

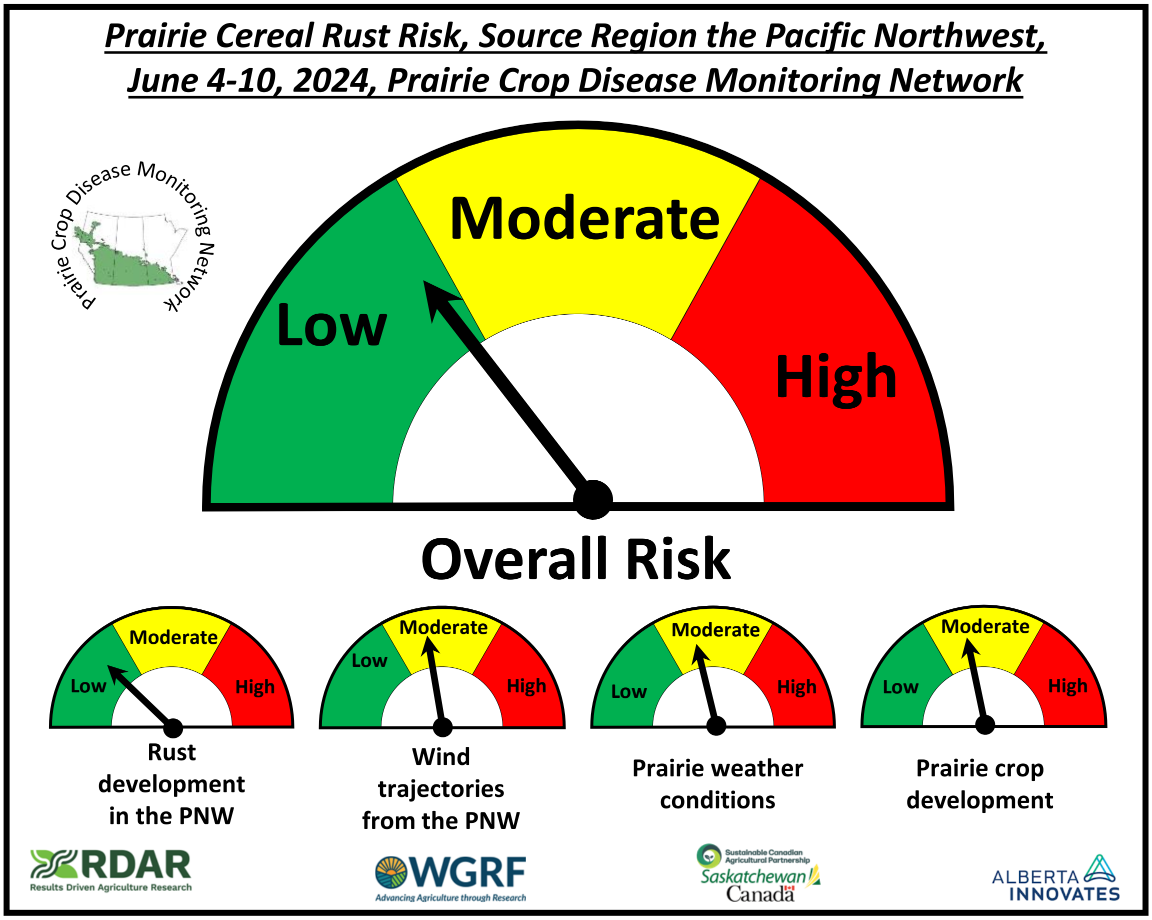

Figure 19. Prairie cereal risk speedometers for stripe rust from the Pacific Northwest, June 4-10, 2024.

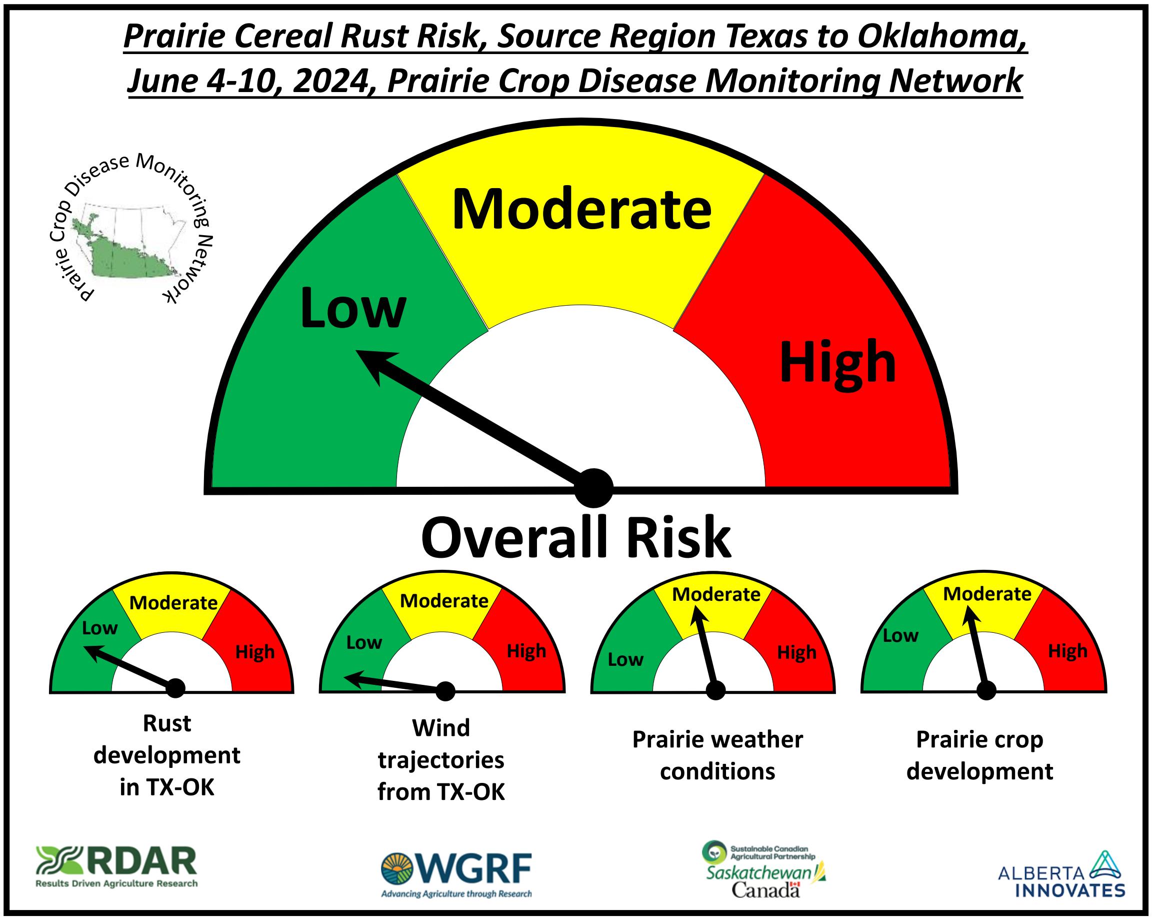

Figure 20. Prairie cereal risk speedometers for stripe/leaf rust from the Texas to Oklahoma region, June 4-10, 2024.

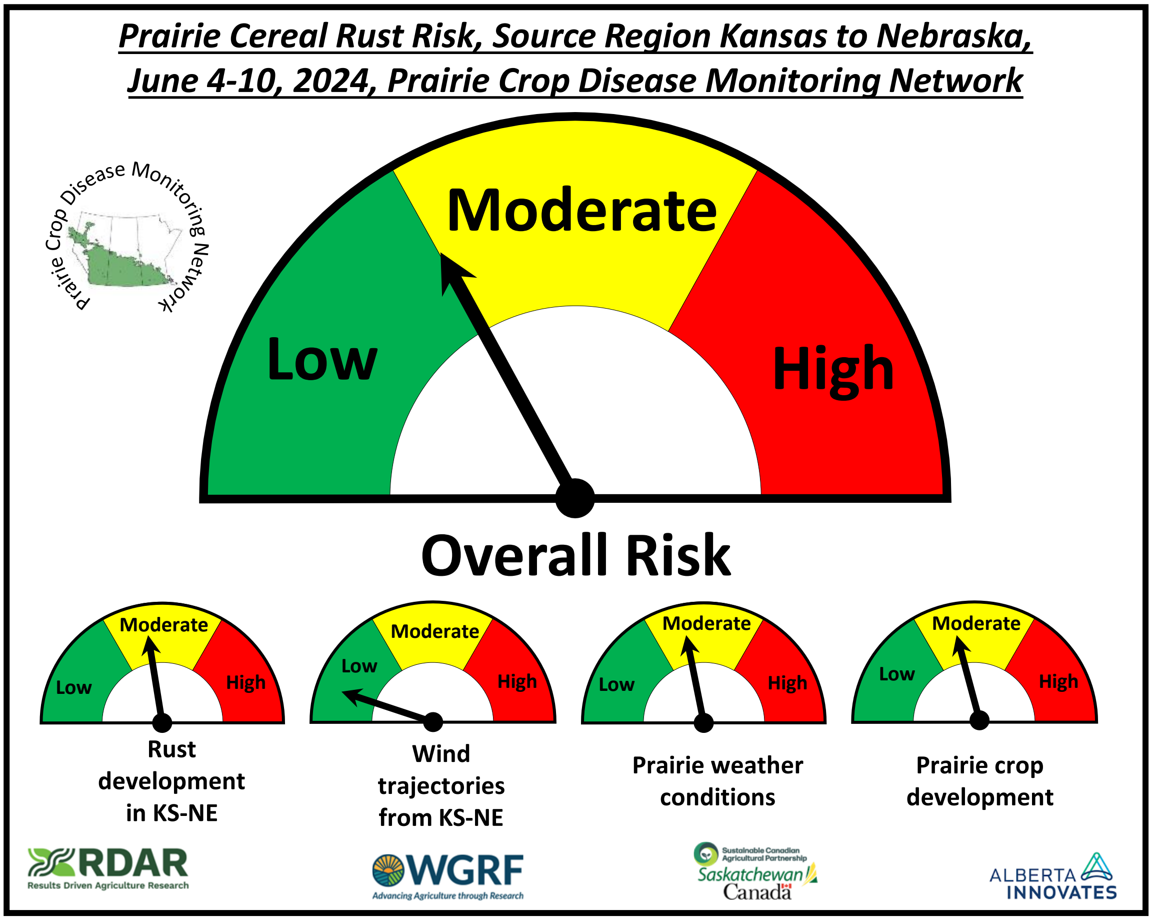

Figure 21. Prairie cereal risk speedometers for stripe/leaf rust from the Kansas/Nebraska region, June 4-10, 2024.

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 4-10, 2024.

Location	Province	4-Jun-24	5-Jun-24	6-Jun-24	7-Jun-24	8-Jun-24	9-Jun-24	10-Jun-24	Total trajectories/location
ANDREW	AB	1							1
ARBORG	MB		1						1
BEISEKER	AB	1							1
BRANDON	MB	1	1						2
CALGARY	AB	1	1						2
CARMAN	MB	1	1						2
DAUPHIN	MB	1	1						2
EDMONTON	AB	1							1
GAINSBOROUGH	SK	1	1	1					3
GRANDE PRAIRIE	AB	1							1
GRENFELL	SK	1	1	1					3
KINDERSLEY	SK	1							1
LACOMBE	AB	1	1						2
LETHBRIDGE	AB	1	1		1			1	4
MANNING	AB	1							1
MEDICINE HAT	AB	1	1		1				3
MOOSE JAW	SK	1	1						2
NAICAM	SK	1	1	1					3
NORTH BATTLEFORD	SK	1	1						2
OLDS	AB	1	1	1					3
PORTAGE	MB	1	1						2
PROVOST	AB	1							1
REGINA	SK	1	1						2
RUSSELL	MB	1	1						2
RYCROFT	AB	1	1						2
SASKATOON	SK	1	1						2
SEDGEWICK	AB	1							1
SELKIRK	MB	1	1	1					3
SWAN RIVER	MB		1						1
SWIFT CURRENT	SK	1	1					1	3
TISDALE	SK	1	1						2
UNITY	SK	1							1
VEGREVILLE	AB	1							1
VULCAN	AB	1	1		1				3
WANHAM	AB	1							1
WATROUS	SK	1	1	1					3
WEYBURN	SK	1	1						2
YORKTON	SK	1							1
Total trajectories per date		**36**	**26**	**6**	**3**	**0**	**0**	**2**	**73**

Table 2. Reverse trajectory locations and number of events, for reverse trajectory events originating from Oklahoma and Texas, USA, June 4-10, 2024.

Location	Province	4-Jun-24	5-Jun-24	6-Jun-24	7-Jun-24	8-Jun-24	9-Jun-24	10-Jun-24	Total trajectories/location
GAINSBOROUGH	SK	1							1
WEYBURN	SK	1							1
Total trajectories per date		**2**	**0**	**0**	**0**	**0**	**0**	**0**	**2**

Table 3. Reverse trajectory locations, arrival dates, and number of events, for reverse trajectory events originating from Kansas and Nebraska, USA, June 4-10, 2024.

Location	Province	4-Jun-24	5-Jun-24	6-Jun-24	7-Jun-24	8-Jun-24	9-Jun-24	10-Jun-24	Total trajectories/location
CARMAN	MB	1							1
DAUPHIN	MB			1					1
GRENFELL	SK	1							1
NORTH BATTLEFORD	SK			1					1
RUSSELL	MB	1							1
SASKATOON	SK			1					1
TISDALE	SK	1							1
WATROUS	SK		1						1
Total trajectories per date		**4**	**1**	**3**	**0**	**0**	**0**	**0**	**8**