

WEEKLY WIND TRAJECTORY REPORT for May 5, 2021 – Weiss¹, Vankosky¹, Trudel²

- 1 Agriculture and Agri-Food Canada
- 2 Environment and Climate Change Canada

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, such as diamondback moth. In addition, plant pathologists have shown that trajectories can assist with the prediction of plant disease infestations and are also beginning to utilize these same data. 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. Of particular interest are those trajectories that, prior to their arrival in Canada, originated over northwestern and southern USA and Mexico, anywhere diamondback moth populations overwinter and adults are actively migrating. If diamondback adults are present in the air currents originating from these southern locations, the moths 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.

‘Forward trajectories’ have a similar purpose; however, the modelling process begins at sites in USA & Mexico. The model output predicts the pathway of a trajectory. Again, of interest to us are the winds that eventually end up passing over the Prairies.

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1. Reverse trajectories

- a. Pacific Northwest (Idaho, Oregon, Washington) – The majority of Pacific Northwest reverse trajectories have been reported to pass over southern Alberta (Fig. 1).

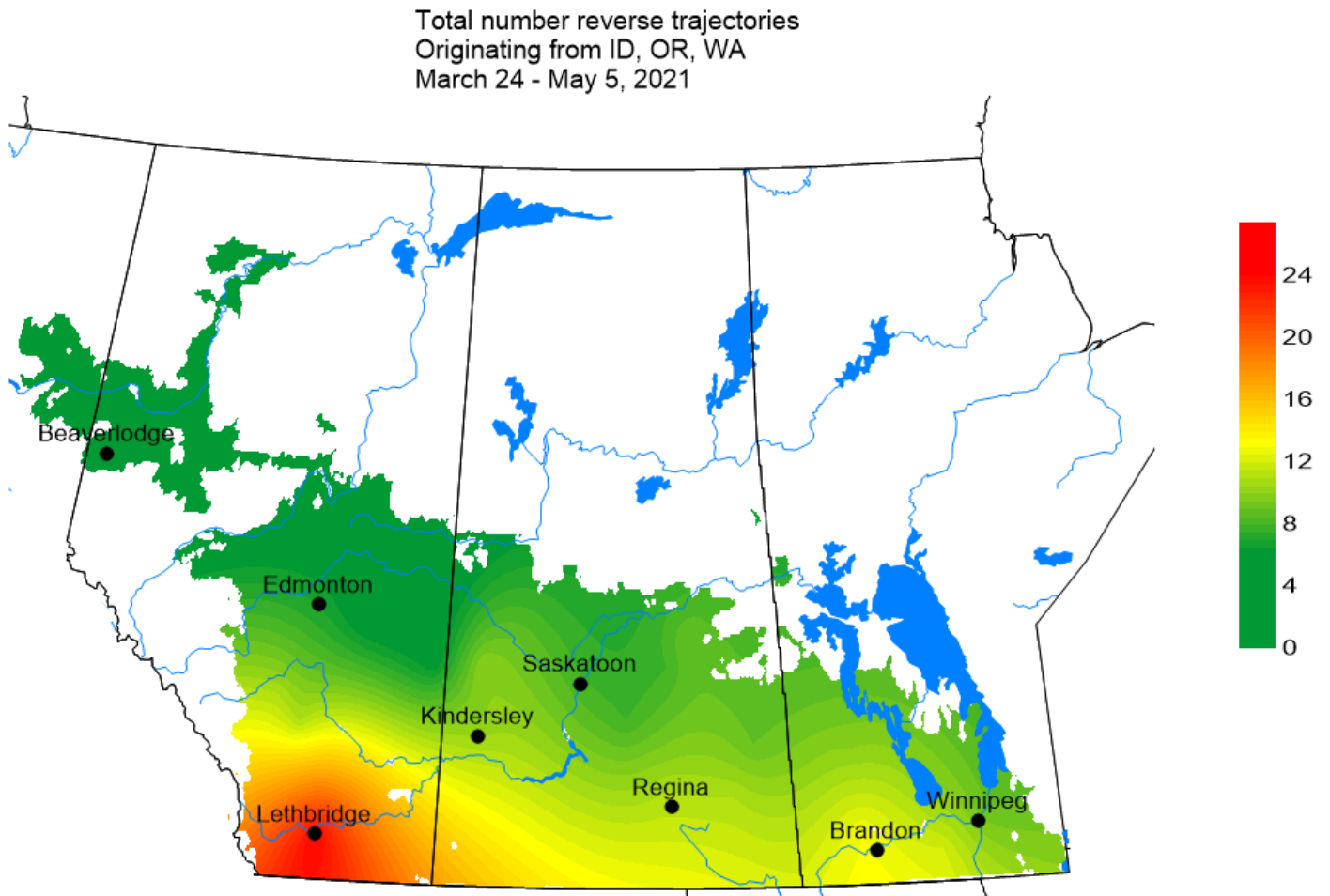


Figure 1. Total number of dates when reverse trajectories originating over Pacific Northwest (PNW) (Idaho, Oregon, and Washington) and have crossed the prairies between March 24 and May 5, 2021.

- b. Mexico and southwest USA (Texas, California) – Since March 24, 2021 four reverse trajectories, originating over Mexico, Texas or California have crossed Manitoba (Fig. 2).
- c. Oklahoma and Texas – Since March 24, 2021 all reverse trajectories originating over Oklahoma and Texas have crossed Manitoba and Saskatchewan (Fig. 2).

Total number reverse trajectories
Originating from OK, TX
March 24 - May 5, 2021

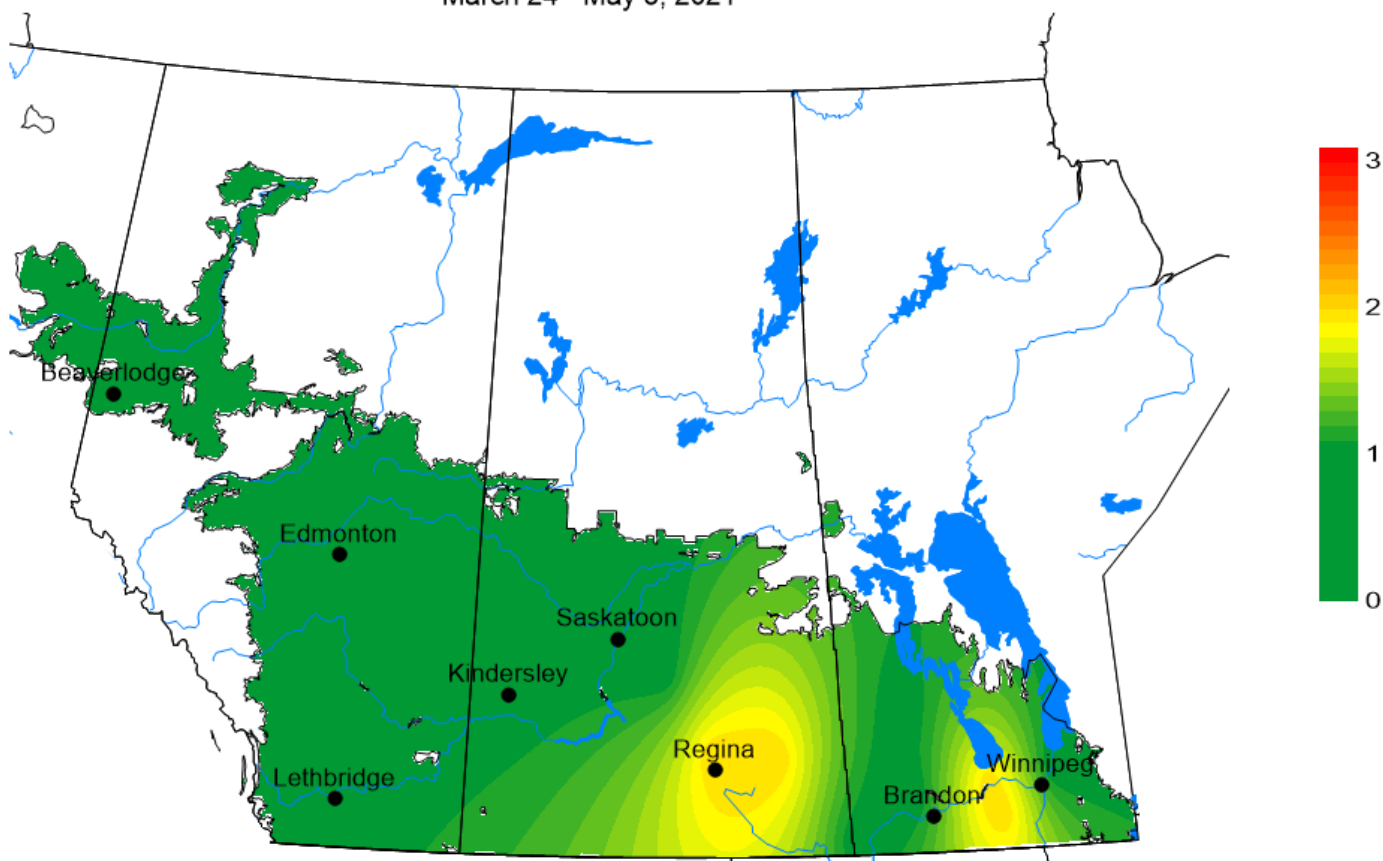


Figure 2. The total number of dates when reverse trajectories originating over Oklahoma and Texas and have crossed the prairies between March 24 and May 5, 2021.

- d. Kansas and Nebraska – Most of these reverse trajectories were predicted to have crossed southern Manitoba, eastern Saskatchewan and western Alberta (Fig. 3).

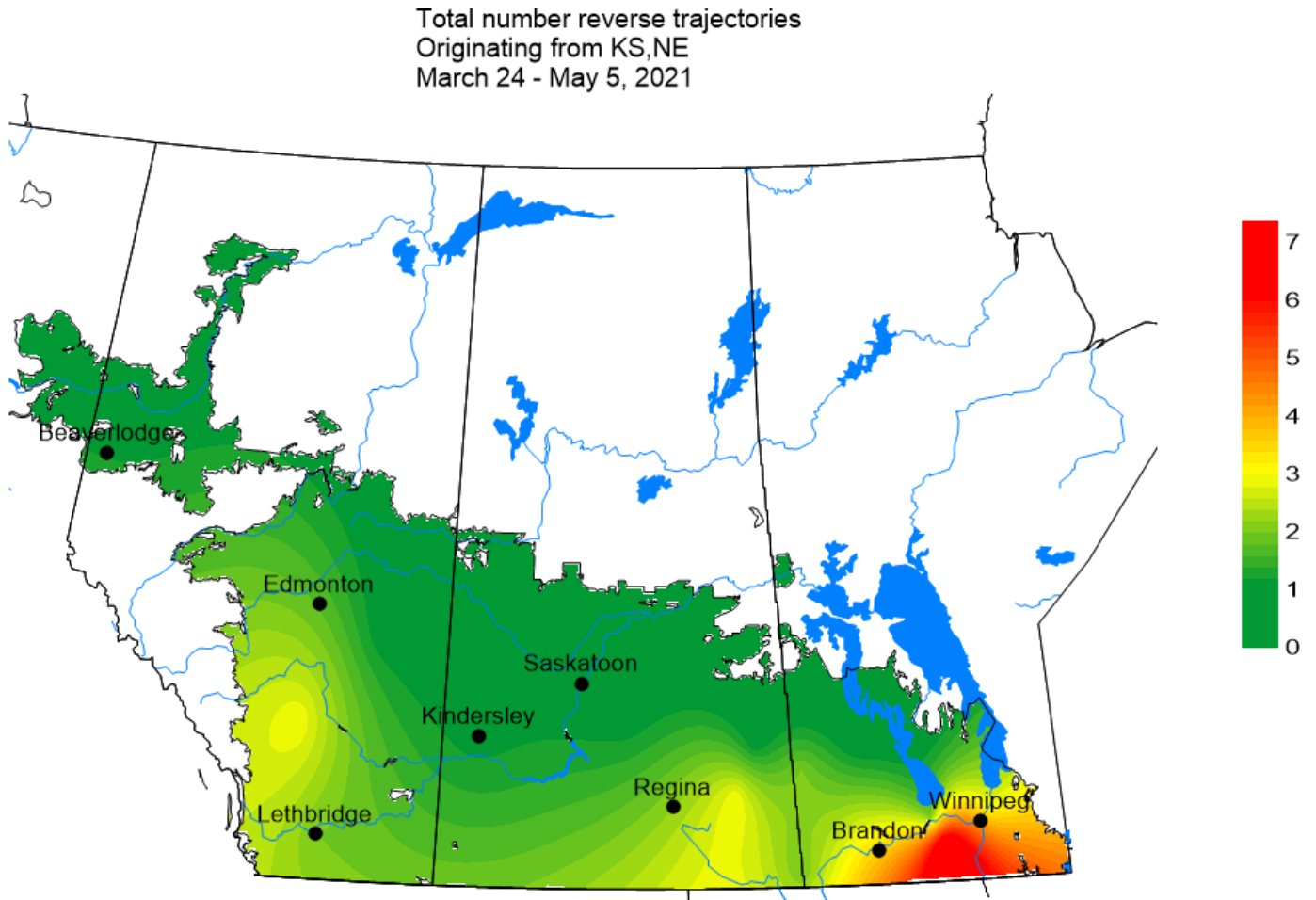
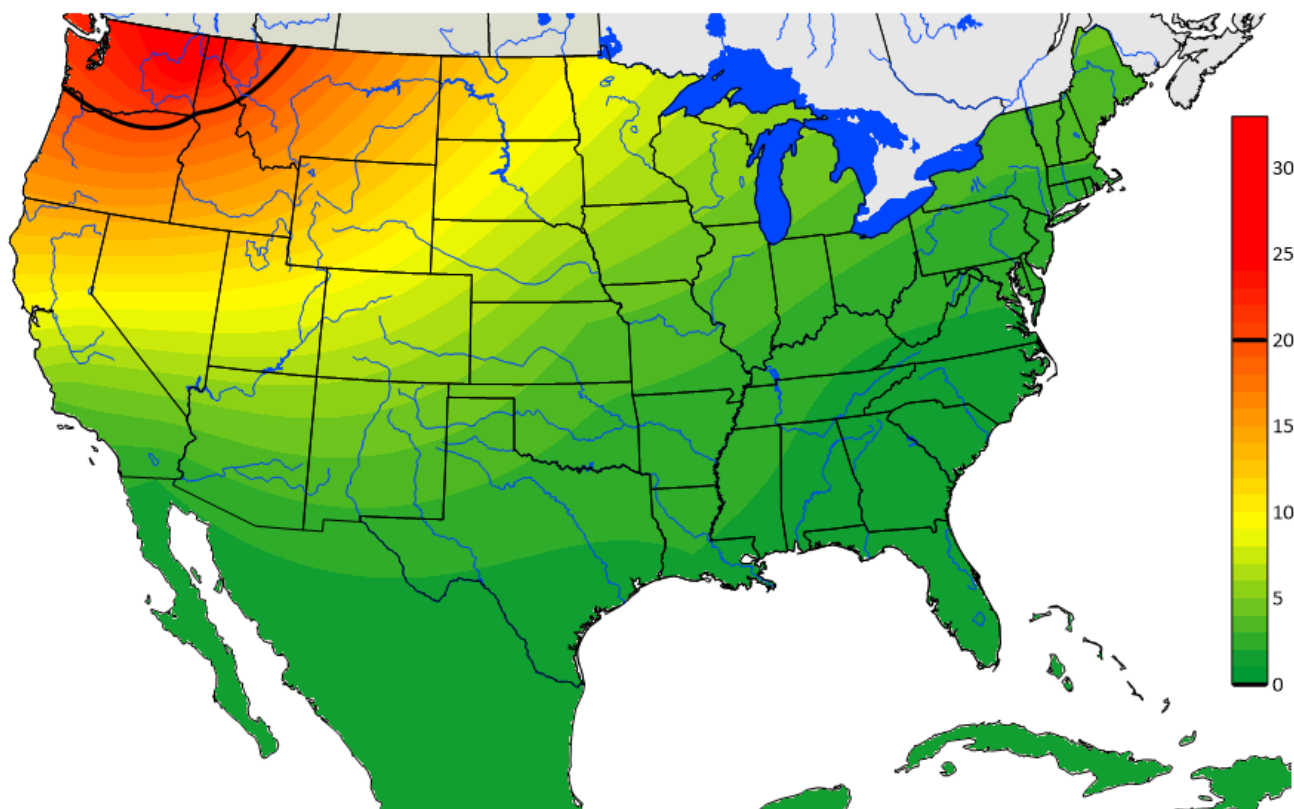


Figure 3. The total number of dates when reverse trajectories originating over Kansas and Nebraska and have crossed the prairies between March 24 and May 5, 2021.

2. Forward trajectories (FT) –

The map represents the total number of dates (since March 24, 2021) with forward trajectories that have crossed the prairies from the Canadian prairies. Results indicate that the greatest number of forward trajectories entering Canada originate from the Pacific Northwest (Idaho, Oregon, Washington) (Fig. 4).

Total number forward trajectories
crossing the prairies
March 24 - May 5, 2021



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Figure 4. The total number of dates when forward trajectories, originating from various regions of the United States and Mexico, crossed the prairies between March 24 and May 5, 2021.