



BC Centre for Disease Control
Provincial Health Services Authority



Provincial Health
Services Authority

Evaluating wind-borne transmission pathways of highly pathogenic avian influenza among poultry farms

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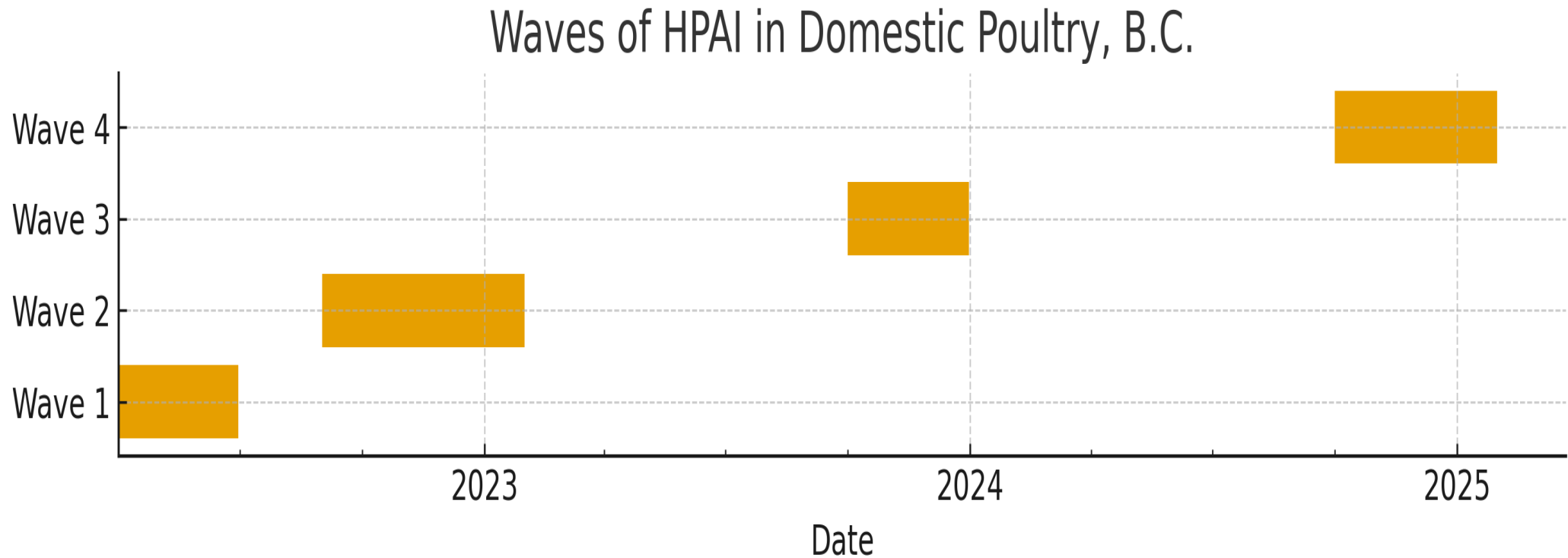
Land acknowledgement

This study is conducted within the traditional, unceded, ancestral territories of the x^wməθk^wəy̓əm (Musqueam), Sk̓wx̓wú7mesh (Squamish), and səlilwətəł (Tsleil-Waututh) Nations

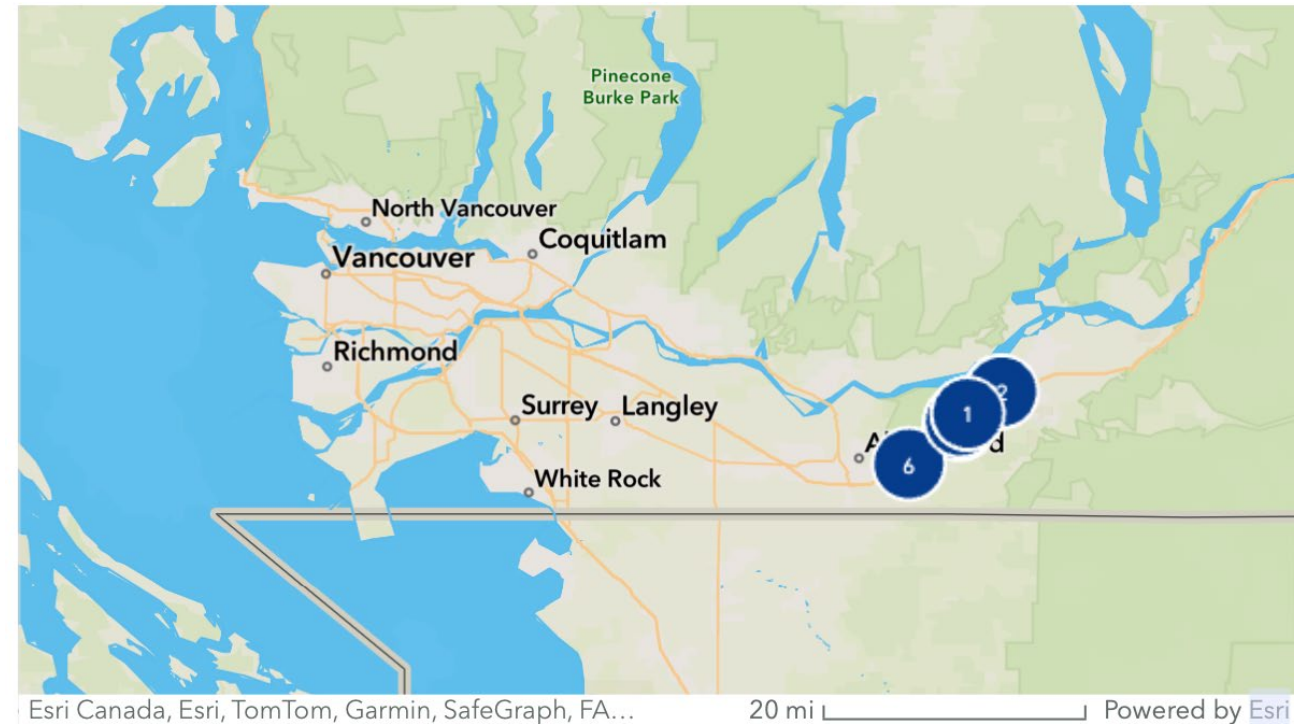
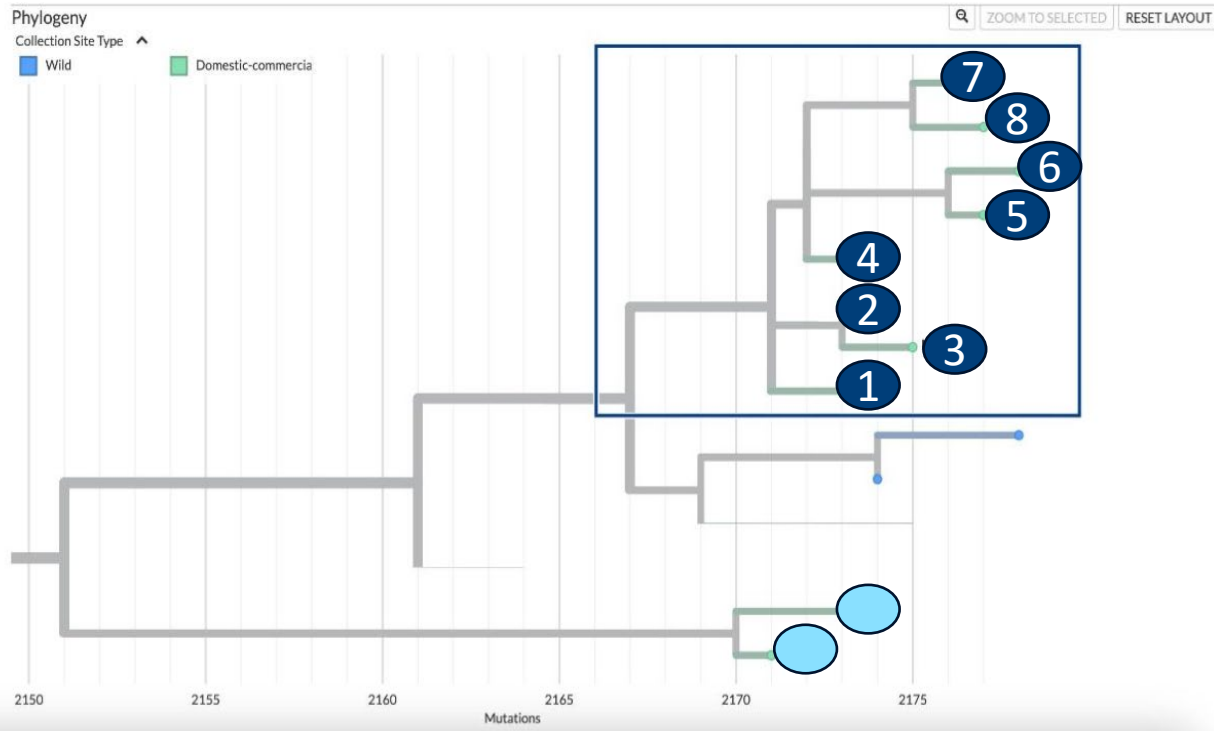


Four BC AIV waves

- HPAI H5N1 was first detected in poultry in B.C. in April 2022



Genetic clusters AIV across farms



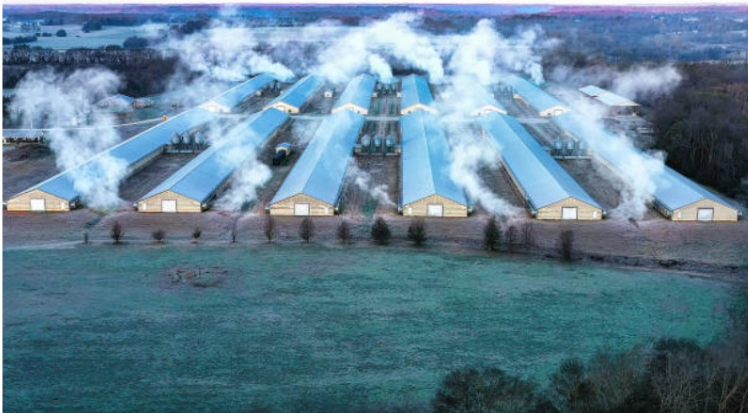
Why focus on wind?

- Shed in bird feces, saliva and can be aerosolized in dust
- Observational evidence suggests introduction through barn air intakes

Can avian flu spread via the wind? Can't be ruled out, experts say

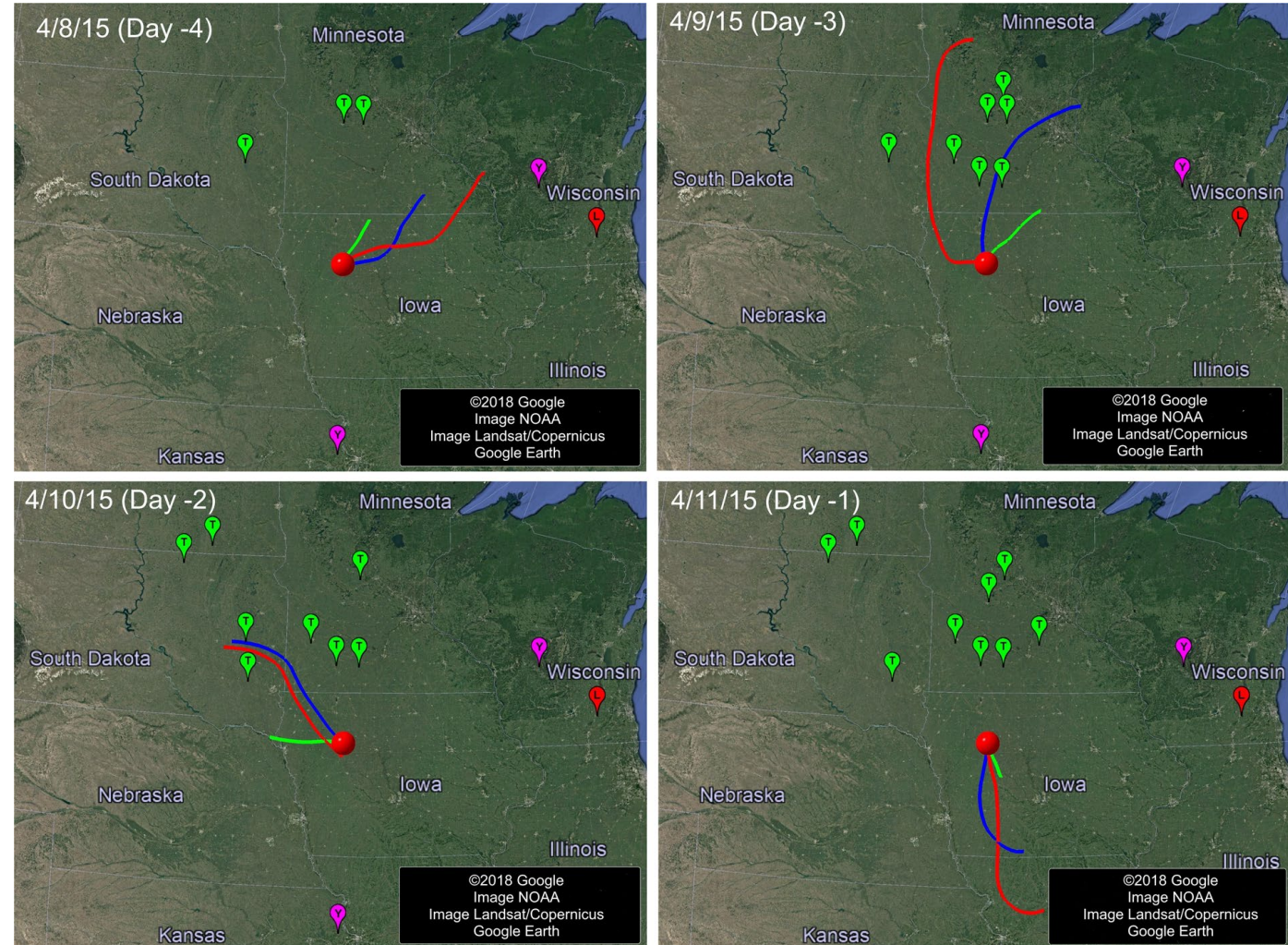
Mary Van Beusekom, MS, February 21, 2025

Topics: Avian Influenza (Bird Flu)



Nagy A., et al. (2025)

Carl Banks / iStock



Zhao, Y., Richardson, B., Takle, E. et al (2019)

SPRAWL-BC in the bigger picture

SPRAWL: Sequencing of Poultry Related Avian influenza virus for a Wind-Borne Link

- Systematic literature review
- Air sampling at poultry barn intakes
- Drone air pattern mapping around barns and impacts of ventilation on air flow
- **Meteorological modeling**



Study design

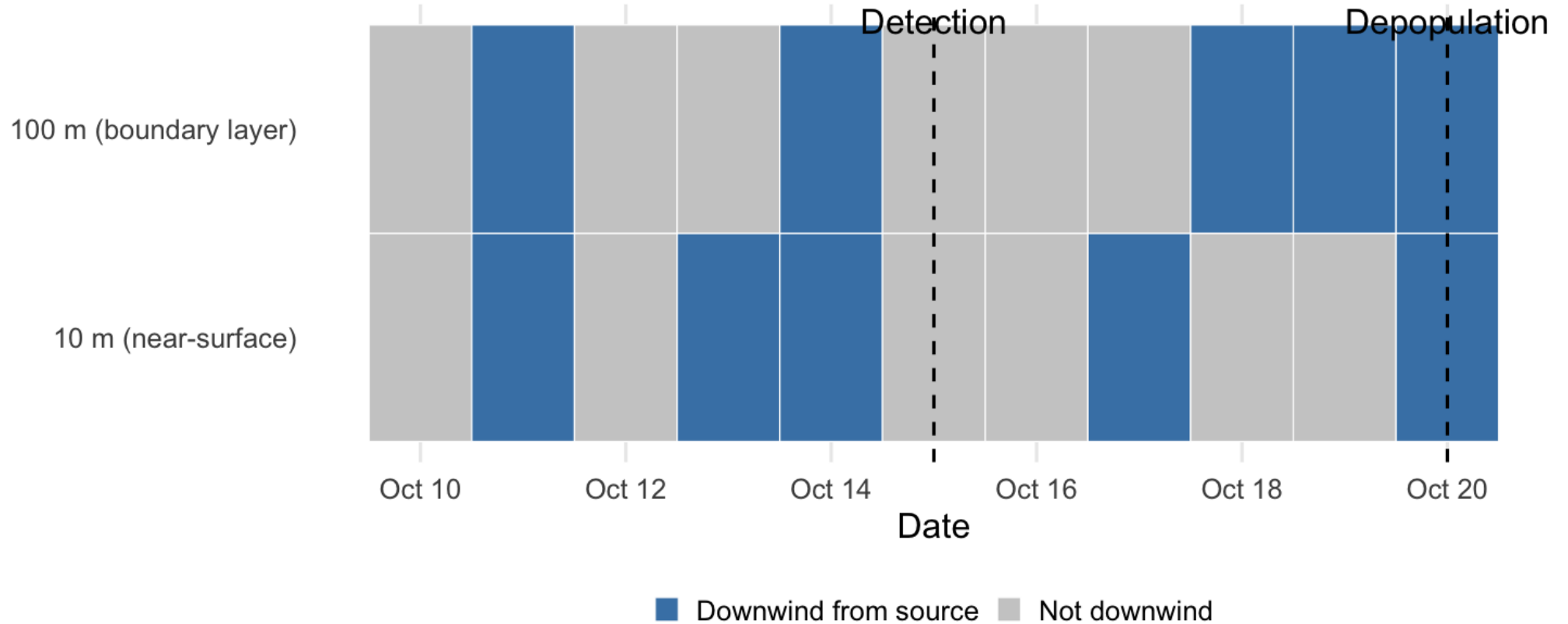
- **Time period:** 2022-2025
- **Location:** Fraser Valley, British Columbia
- **Outcome data:** Infected and non-infected poultry farms
- **Exposure data:** High-resolution hourly wind data (1km grid)
- **Study design:** Matched case-control study



Exposure definition – source-point metrics

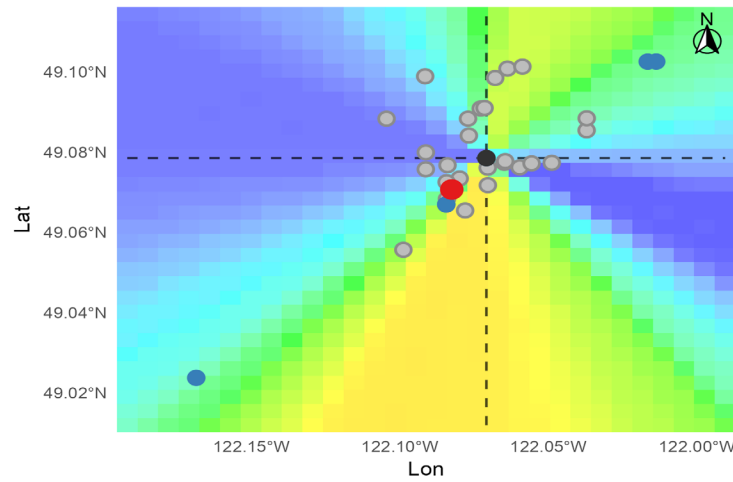


Hourly wind from source → recipient during infectious period



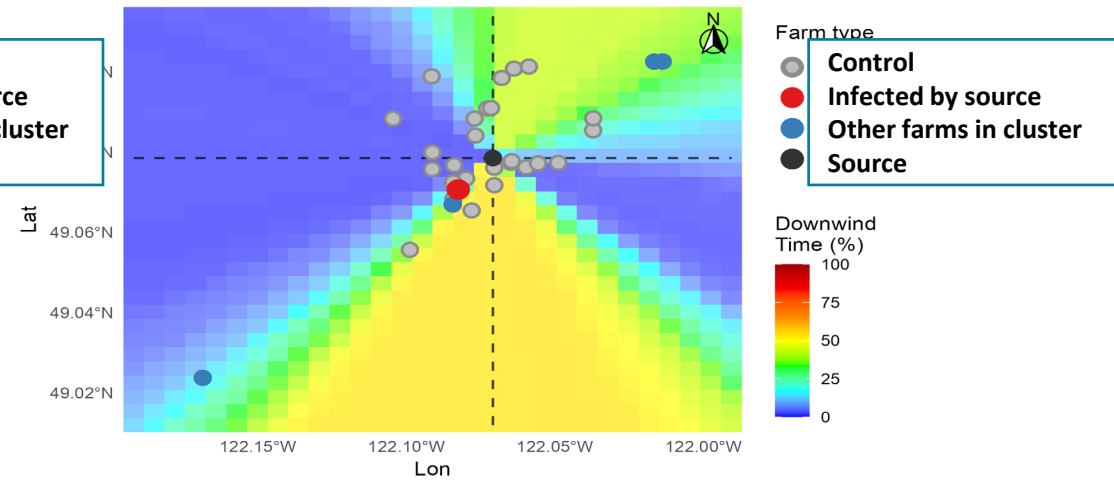
Farm IP-064 – 10 m wind

Source: IP-036 · Infection: 2022-11-15 · 14-day window



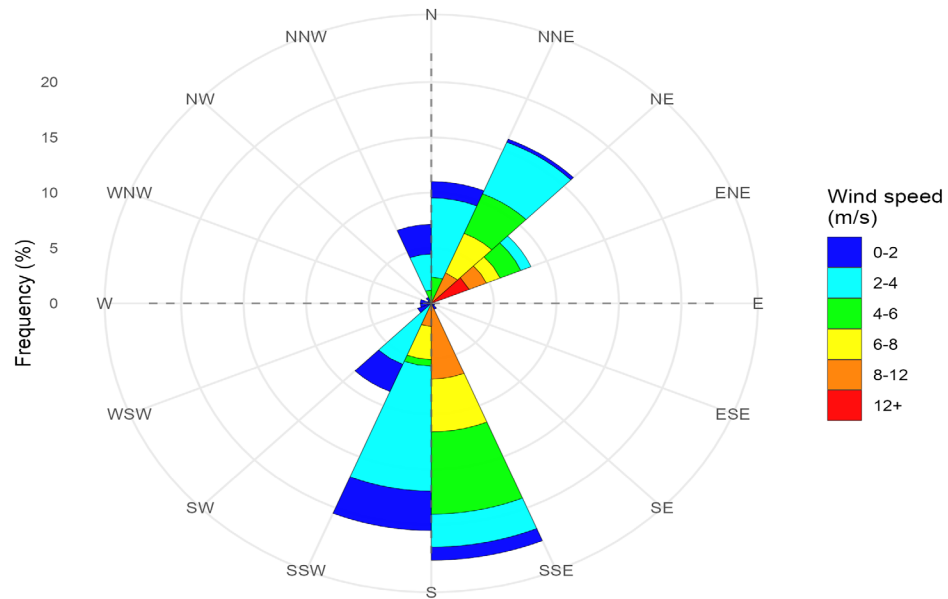
Farm IP-064 – 100 m wind

Source: IP-036 · Infection: 2022-11-15 · 14-day window



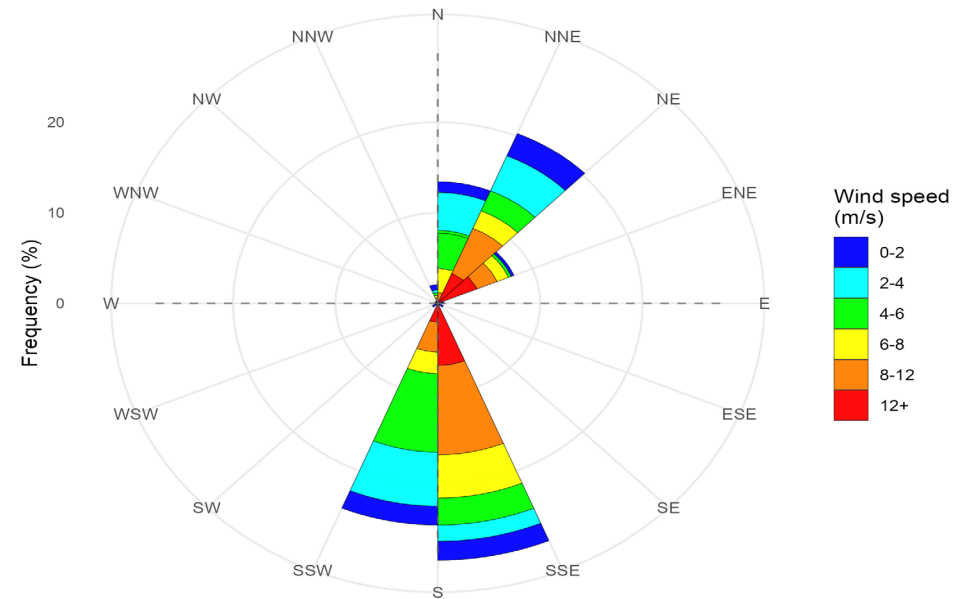
Wind-rose – SOURCE farm IP-036 – 10 m

Directions show wind at source farm blowing towards each direction (Petals sum to 100% for 14-day window)



Wind-rose – SOURCE farm IP-036 – 100 m

Directions show wind at source farm blowing towards each direction (Petals sum to 100% for 14-day window)



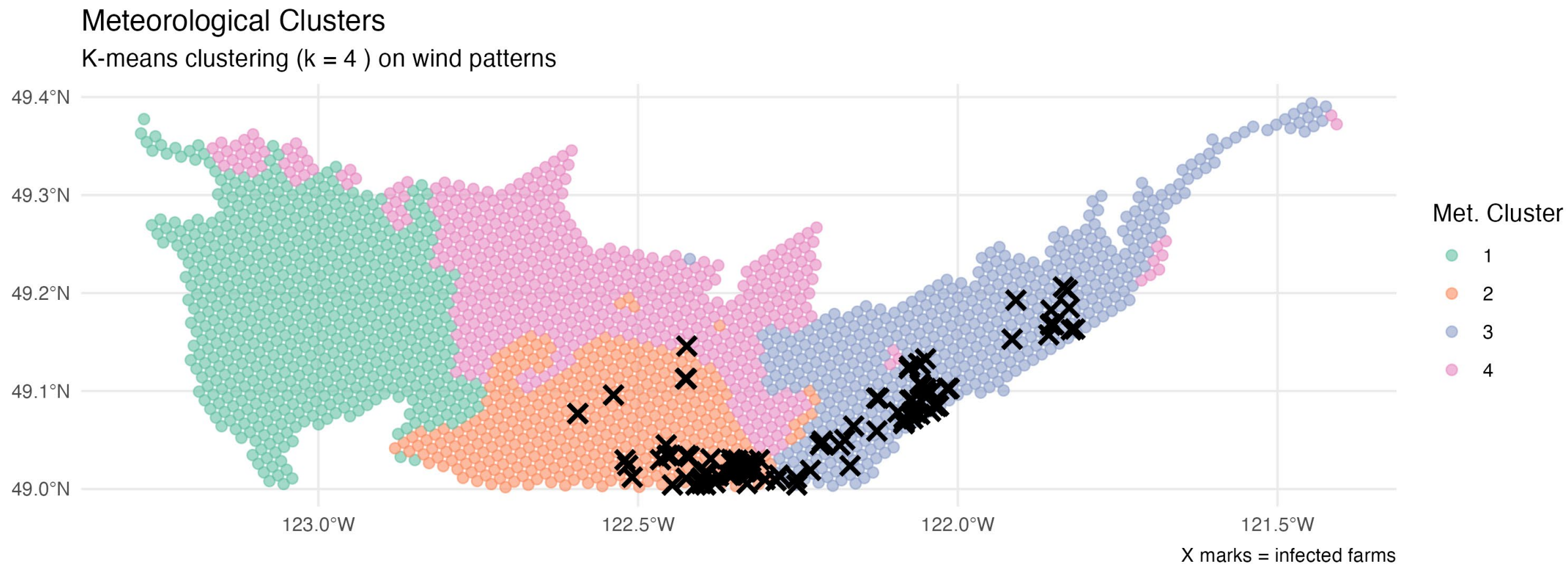
Covariates

- Mean wind speed at source and average between source and sink farm
- Wind consistency (%)
- Mean daily temperature
- Hourly cumulative precipitation (mm)
- Hourly mean surface air pressure (hPa)
- Farm elevation (m)
- Flock type
- Flock size
- Meteorological cluster
- Epidemic wave



Meteorological clustering

K-means clustering to identify and group locations that share similar long-term wind patterns



Study design: Case-control matching

- **Source farms:** Plausible **sources** from genetic lab analyses
- **Cases (recipients):** **Likely recipients** of lateral transmission from a specific source farm
- **Controls:** For each case farm, selected 4 **control farms** that:
 - Geographically close
 - At risk during the same wave
 - Uninfected during the case's incubation period



Next steps

- **Modeling:** Multivariable mixed effect logistic regression
- **Secondary exposure:** Path-averaged metrics
- **Sensitivity analyses:** Different downwind angle tolerances



Acknowledgement

- **Study team:** Drs. Chelsea Himsworth and Michael Lee
- **Data:** Wind data from the Weather Forecast Research Team at UBC led by Dr. Roland Stull
- **Research support:** BCCDC and Dr. Sarah Henderson
- **Funder:** Genome BC



Thank you

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