

The Northern Tornadoes Project:

Tornadoes and Derechoes – Event Data and Climatologies in Canada



21 May 2022 derecho damage / NTP

David Sills

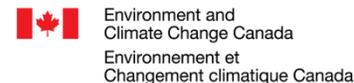
Executive Director – Northern Tornadoes Project

A severe weather community endeavour

- NTP founded by Western w/ ImpactWX (social impact fund)
 - Core NTP team composed of meteorologists *and* wind engineers
- Strategic partnerships with University of Manitoba, The Weather Network, Instant Weather, CatIQ; close collaboration with Environment Canada
- Advance knowledge of true tornado occurrence and risk across Canada
 - Detect, assess, document, make public
 - For climatology, risk assessment, climate change
- Research to improve event detection, assessment and prediction



University
of Manitoba



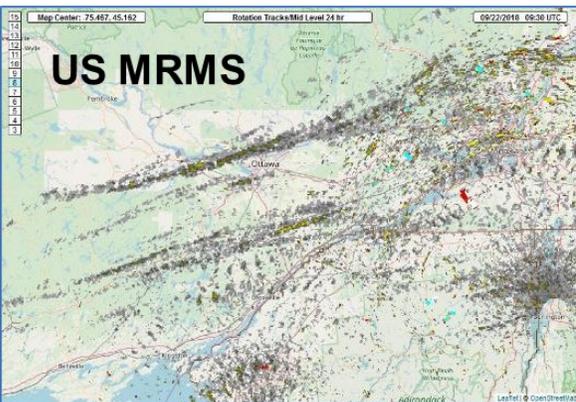
When you go looking for tornadoes...

- NTP follows up on all reports of wind damage, and looks for wind damage along the path of intense storms

NTP data sources



NTP on Twitter: @NTP_Reports
NTP 'Super-Contributors'

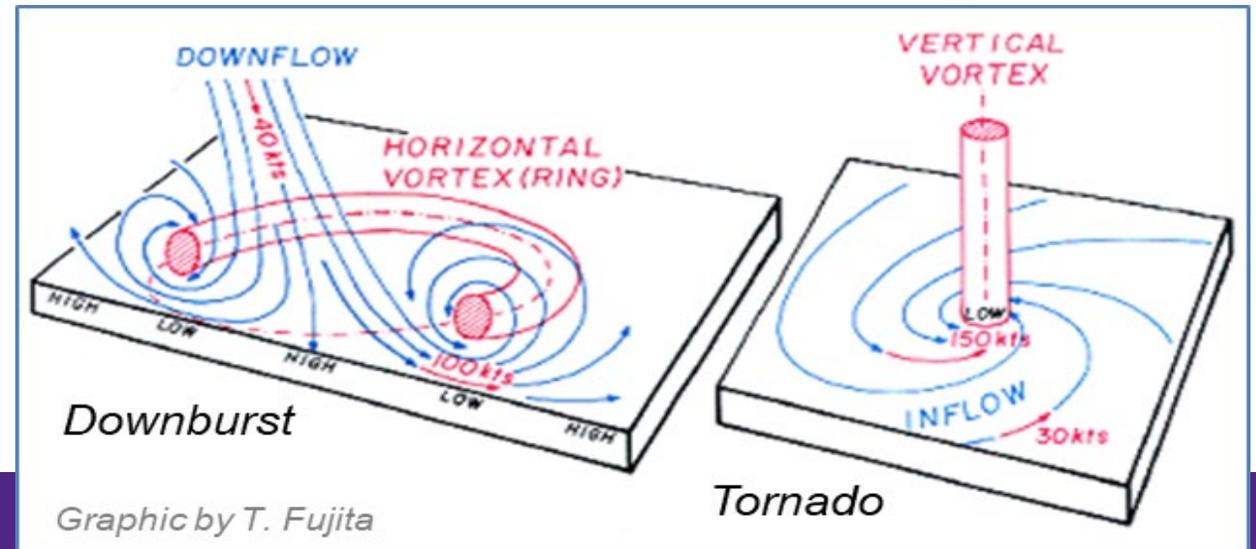


When you go looking for tornadoes...

- NTP follows up on all reports of wind damage, and looks for wind damage along the path of intense storms
- A lot of effort goes into classification of the wind damage – due to a tornado or due to a downburst?

What is a tornado?

- A violently rotating column of air that extends through the lower part of a thunderstorm to the surface (land or water). This vortex is often made visible by the presence of a funnel cloud and dust/debris (land) / a spray vortex (water).
- Downbursts are damaging storm downdrafts caused by precipitation evaporation / loading
- Tornado and downburst damage patterns are often quite different



When you go looking for tornadoes...

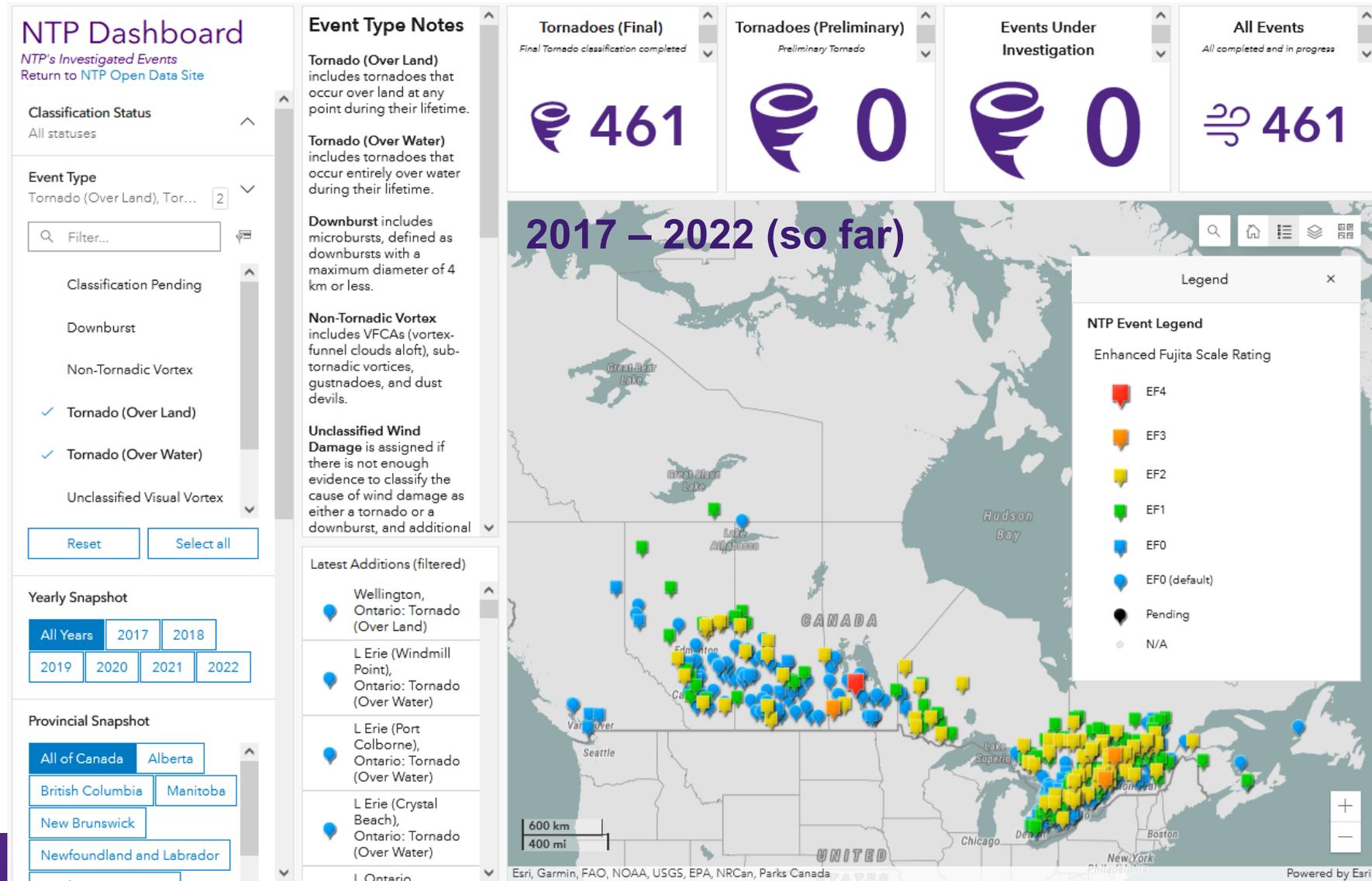
- NTP follows up on all reports of wind damage, and looks for wind damage along the path of intense storms
- A lot of effort goes into classification of the wind damage – due to a tornado or due to a downburst?
- Since 2017, 461 tornadoes and 310 downbursts
- If a swath of wind damage from downbursts is at least ~650 km long and ~100 km wide  *derecho!*
- Talk will focus on tornadoes, downbursts and derechos

Tornadoes

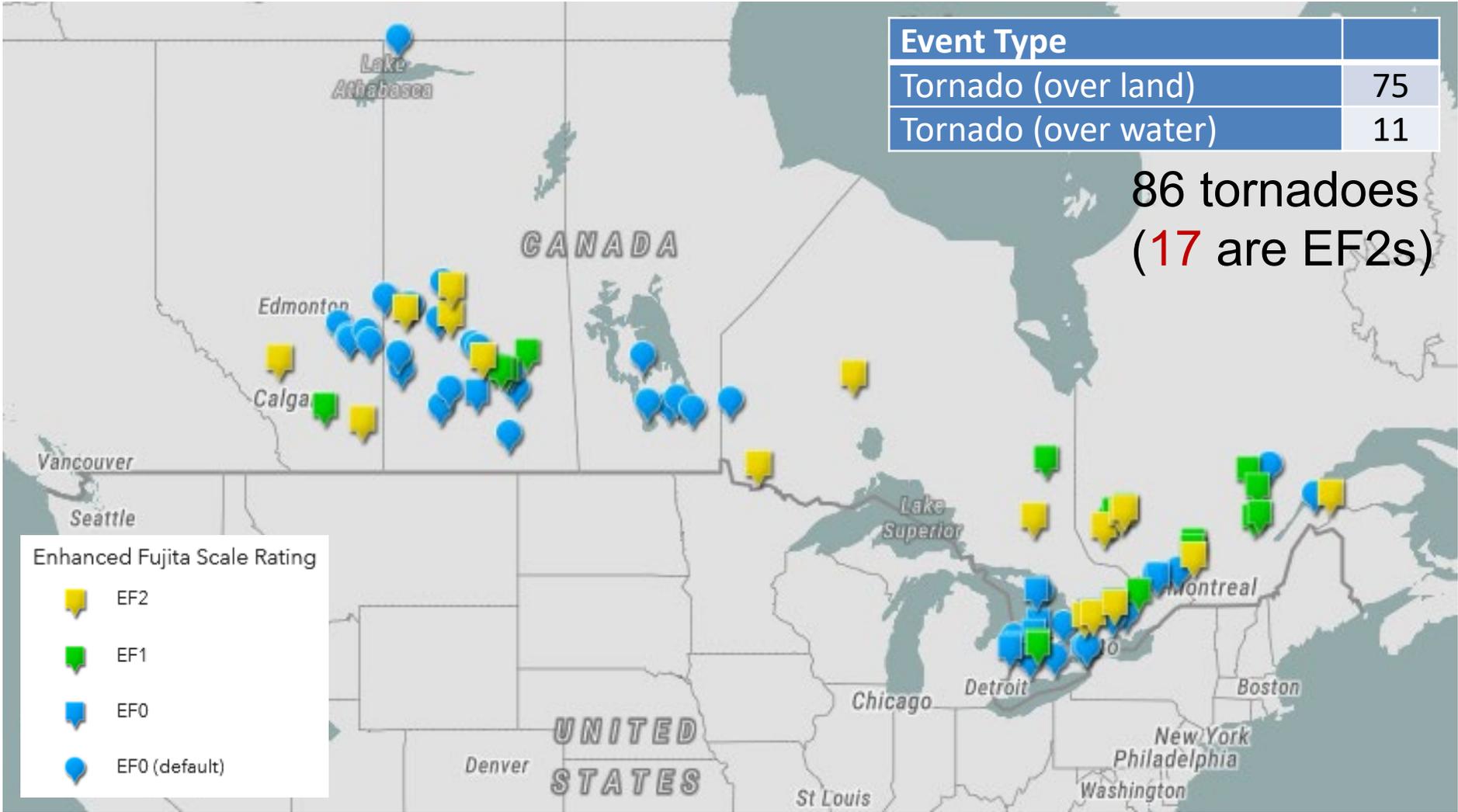
NTP Dashboard and Tornadoes

Interactive NTP Event Dashboard

- Integrated GIS back-end
- uwo.ca/ntp/dashboard



Tornadoes in 2022 (so far)



Tornado event summary map (24 Jul 2022)



Event Summary for Rockdale-Actinolite

Province: Ontario
Local Date: 24/7/2022
Local Time: 2000 Time Zone: EDT
Classification: tornado_over_land
Path Length: 55.80 km
Max Path Width: 1,420 m
Motion From: W (250 degrees)
EF-scale DI/DOD: C-T/DOD-6 (LB)
EF-scale rating: ef2
Max Wind Speed: 190 km/h
Surveys: ground,drone
Status: final_classification_completed
Parent Storm Type: Supercell
Fatalities: 0
Injuries: unknown
Damage Cost: unknown

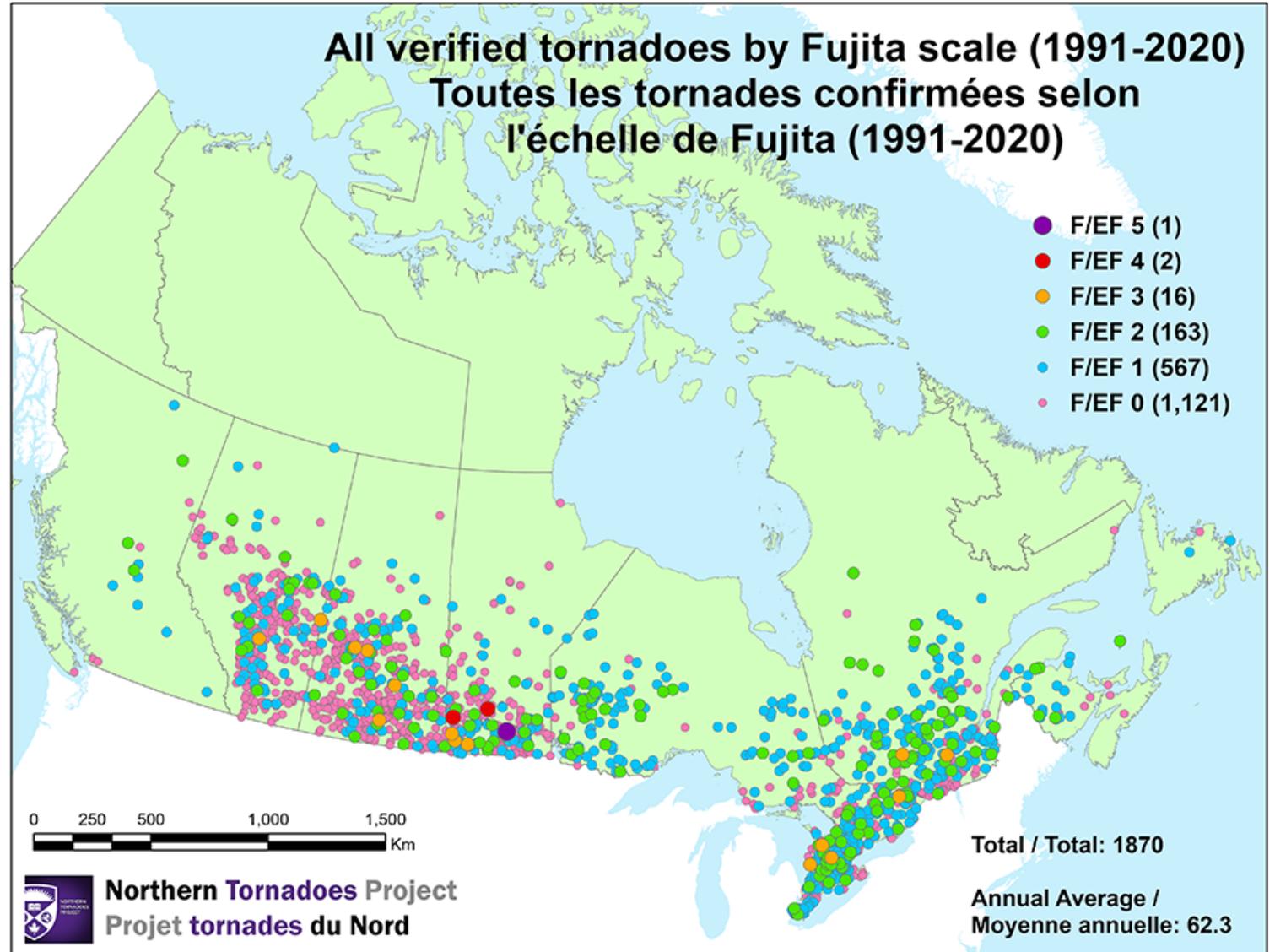
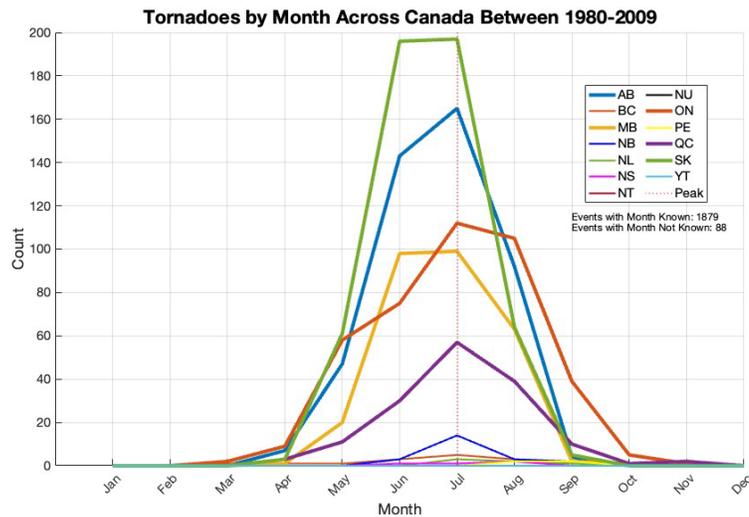
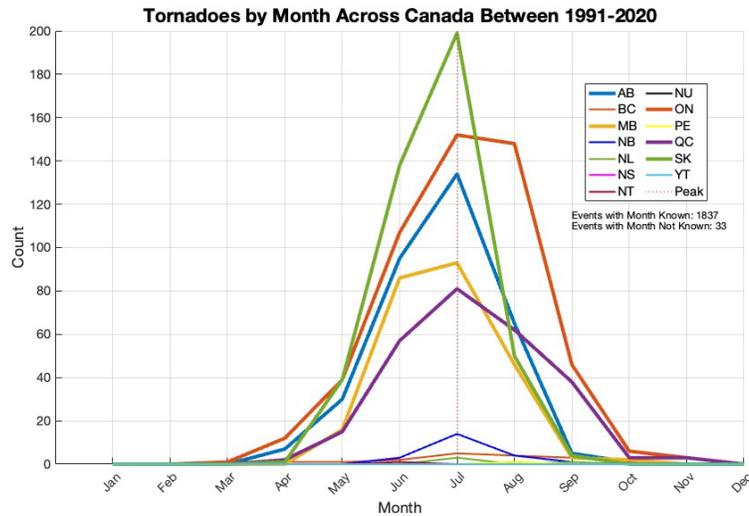
Witnesses captured video and photos of a multi-vortex supercell tornado that developed at Rockdale and tracked ENE. Extensive tree damage and widespread structural damage were reported along much of the damage path.

Tornado event (24 Jul 2022)

- Drone image
- Clear evidence of rotation

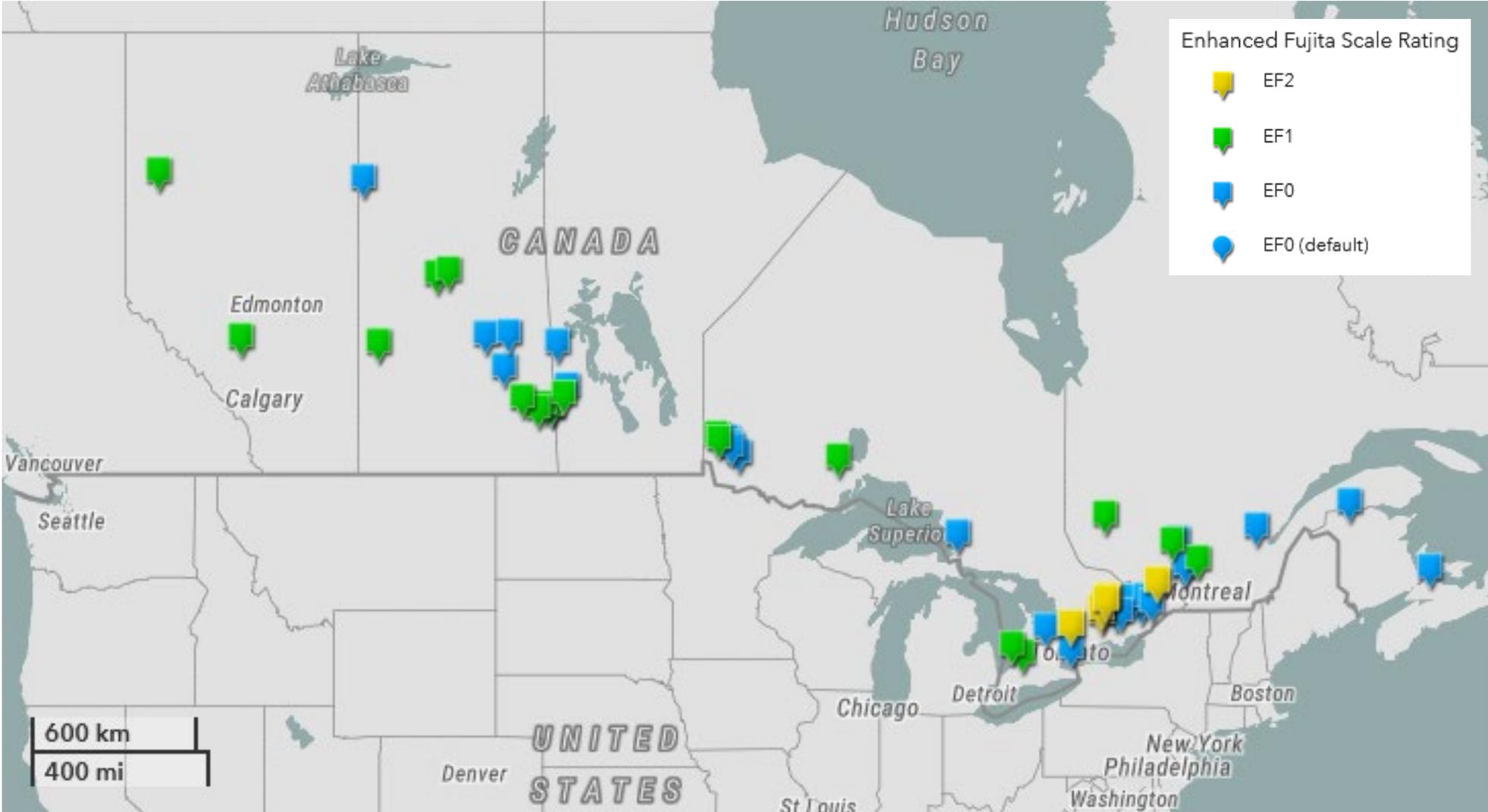


New Tornado Climatology

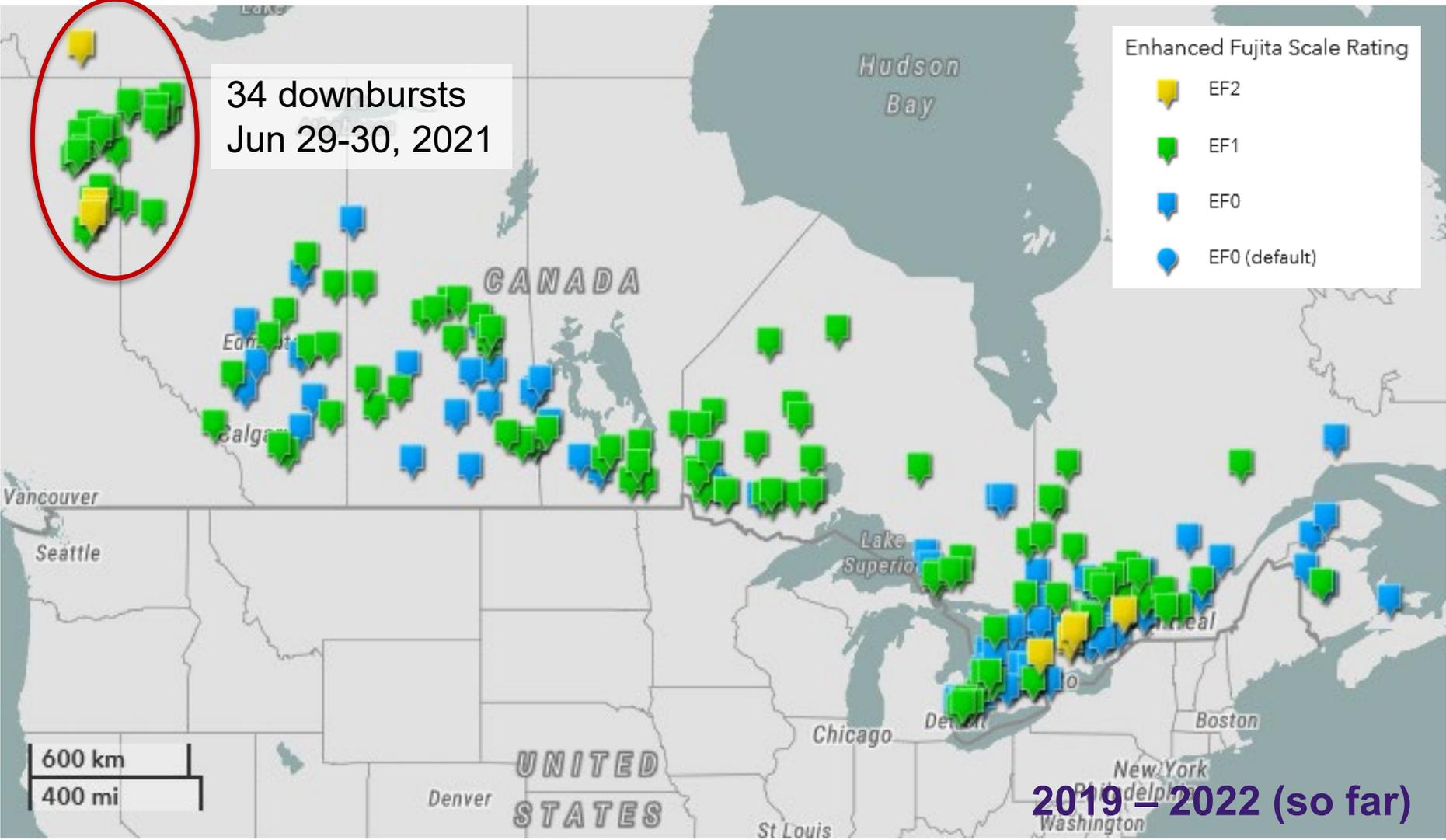


Downbursts

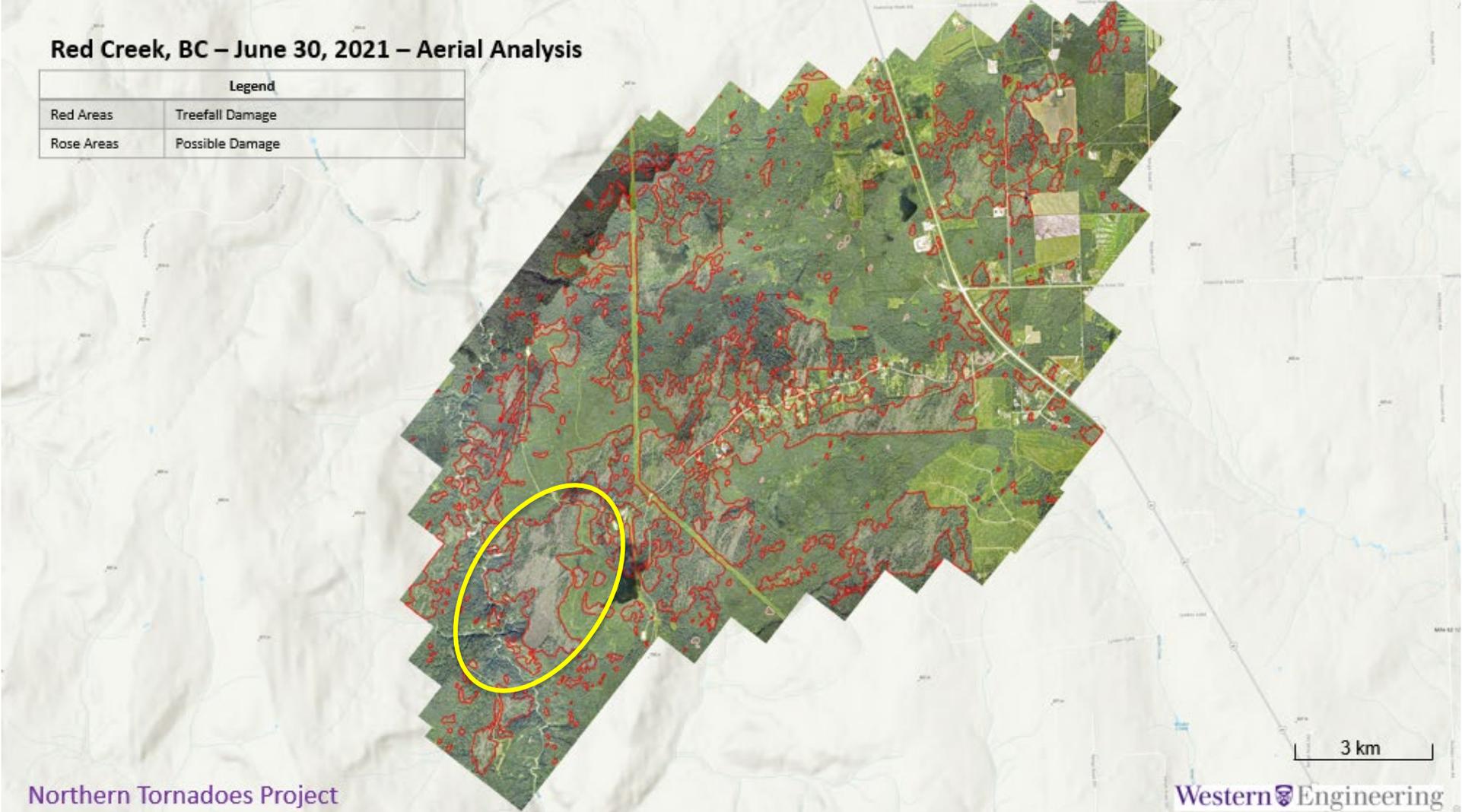
Downbursts in 2022 (53 so far)



Downburst climatology (in progress...)



EF2 Downburst event – 30 Jun 2021



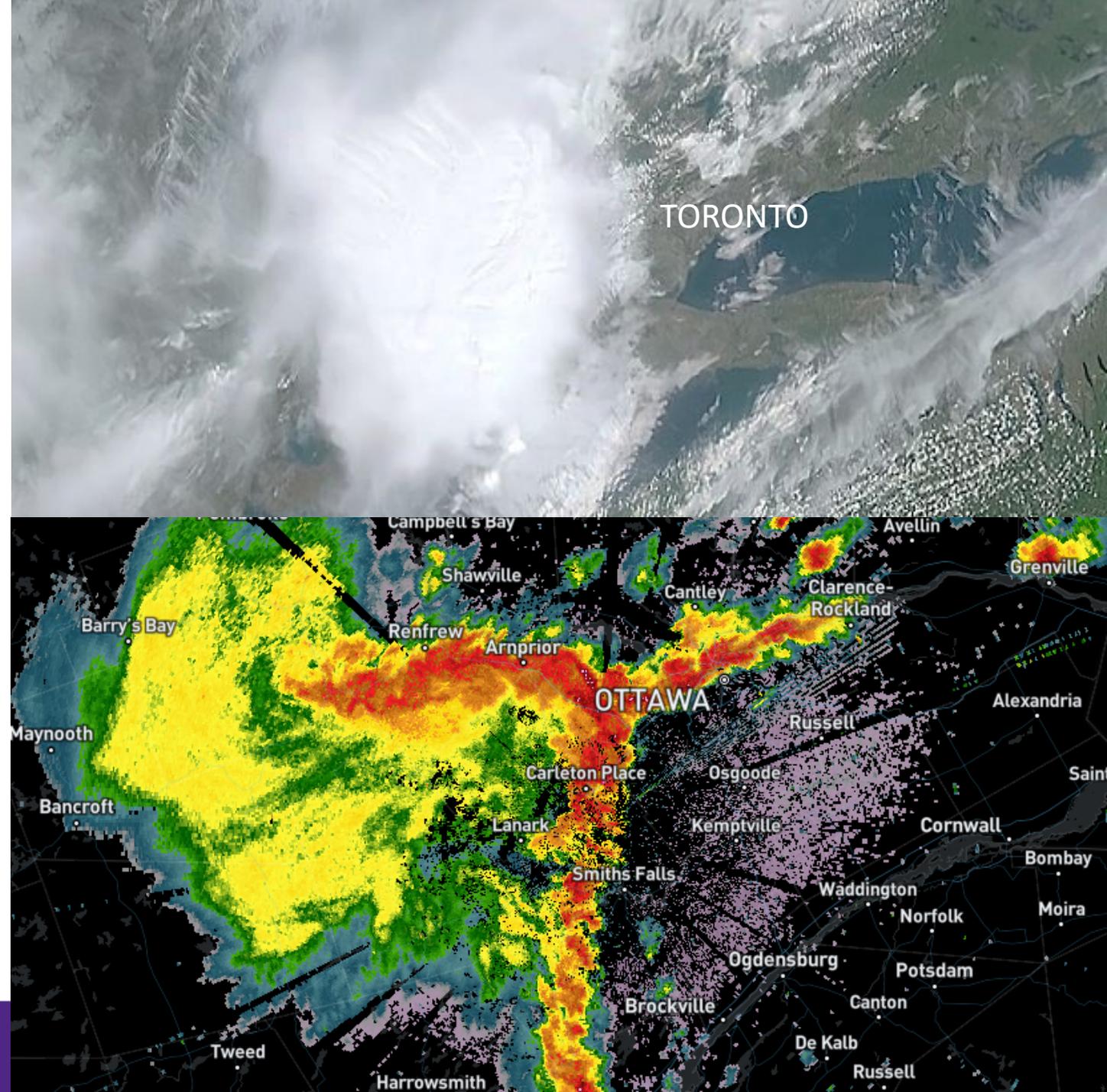
EF2 Downburst event – 30 Jun 2021



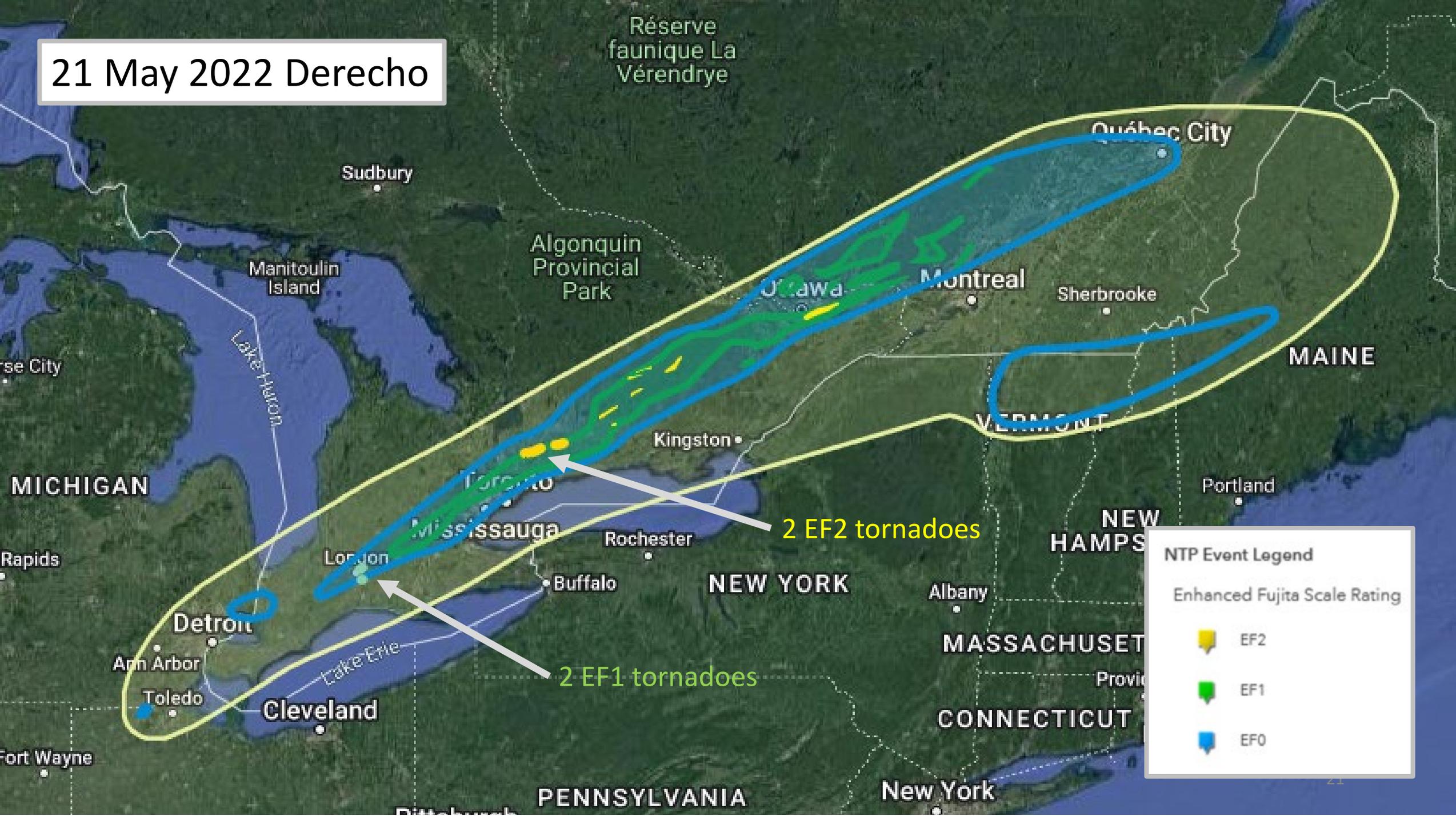
Derechos

21 May 2022 Derecho

- Several downbursts causing EF2 damage w/ max wind speed 195 km/h
- Max recorded wind gust 131 km/h
- Continuous damage path near 1000 km long, max width near 100 km, lasted over a period of 9 hours
- 12 fatalities / 12 injuries – deadliest derecho in Canadian history
- \$1 Billion+ (CDN) in insured losses – the 5th most costly natural disaster in Canadian history
- Impacted ~15.6 million people (~41% of Canada's population)
- 'Extreme thunderstorm' event



21 May 2022 Derecho



NTP OPEN DATA: Event Summary Map

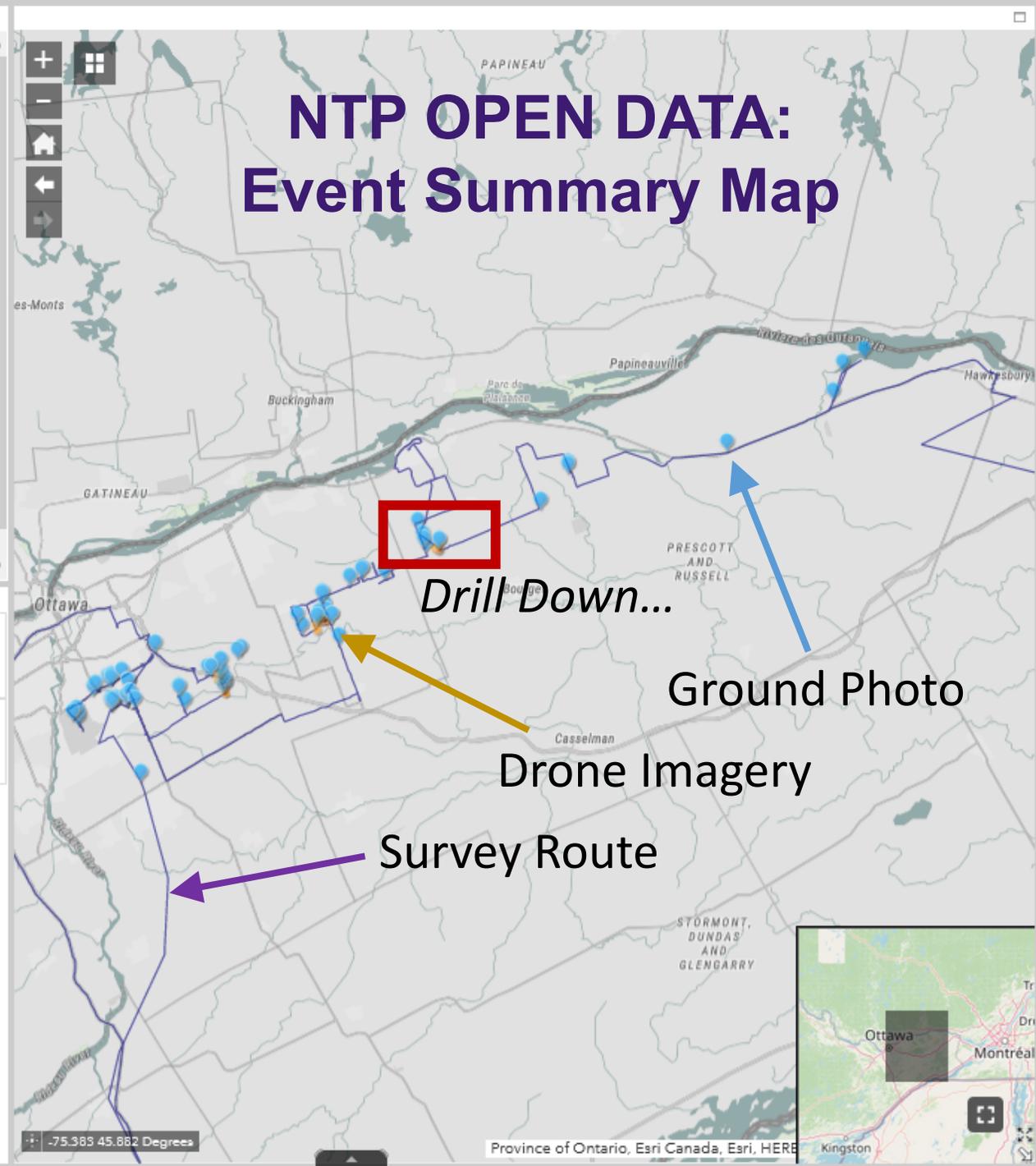
NTP Investigation Layers

Layers

- Ground Photos ...
- Drone Photos ...
- Survey Route ...
- Drone Flight Paths ...
- Downburst Area ...
- Worst Damage ...
- NTP - Event Summaries ...
- Orthomosaic (Piperville) ...
- Orthomosaic (Navan) ...
- Orthomosaic (Vinette - Part 1) ...

Browse Photos

- Ground Photos 81
- Drone Photos 29



Event Summary for Ottawa

Province: Ontario
Local Date: 21/5/2022
Local Time: 1545 Time Zone: EDT
Classification: downburst
Motion From: W (degrees)
EF-scale DI/DOD: C-T/DOD6 (LB)
EF-scale rating: ef2
Max Wind Speed: 190 km/h
Surveys: satellite,ground,drone
Status: final_classification_completed
Tornado Type: QLCS
Fatalities: 1
Injuries: 2
Damage Cost: unknown

Structural and tree damage was reported in Ottawa and surrounding areas following a storm passing through. One fatality and two injuries related to the strong winds were reported in Ottawa (and another fatality reported on the Ottawa River near Masson-Angers, QC). An NTP ground and drone survey team visited the area on May 22-23, 2022, documenting damage to numerous structures and forested areas in Nepean, Ottawa South and rural areas further south and east to Hawkesbury. Damage caused by

Download Data

A variety of datasets are maintained for NTP events. These are organized as 'layers' and can be downloaded through the [NTP Open Data Main Page](#) or through one of the links below:

- The [Event Summaries](#) layer contains summary information for all NTP events. Click on 'data', apply desired filters, then click on 'download options'.
- The [Damage Tracks](#) layer contains location data for all tornado start/worst/end points, tornado centrelines, and downburst extents. Work on this layer is in progress.
- To access [Event-Specific Files](#), select the layer you want to download, then click on 'download options'.

Additional Resources (Coming Soon)

- Radar Viewer

Event Summary Map – Drilling Down

Ground Photo

Drone Orthomosaic

Drill Down...

Damage Survey Form: 2995

Ottawa
5/23/2022, 4:45 PM

Damage Indicator: One- or Two- Family Residences: 100-500 m2 (FR12)
Degree of Damage: 4 - Uplift of roof deck and loss of significant roof covering material (more than 20%); collapse of chimney; garage doors collapse inward; failure of porch or carport

For damage surveys before 2020, photo attachments can be viewed by selecting 'Show Related Records' below.

Attachments:
[DamagePhoto1-20220523-204632.jpg](#)

[Zoom to](#) ...

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Event Summary Map – Drilling Down More



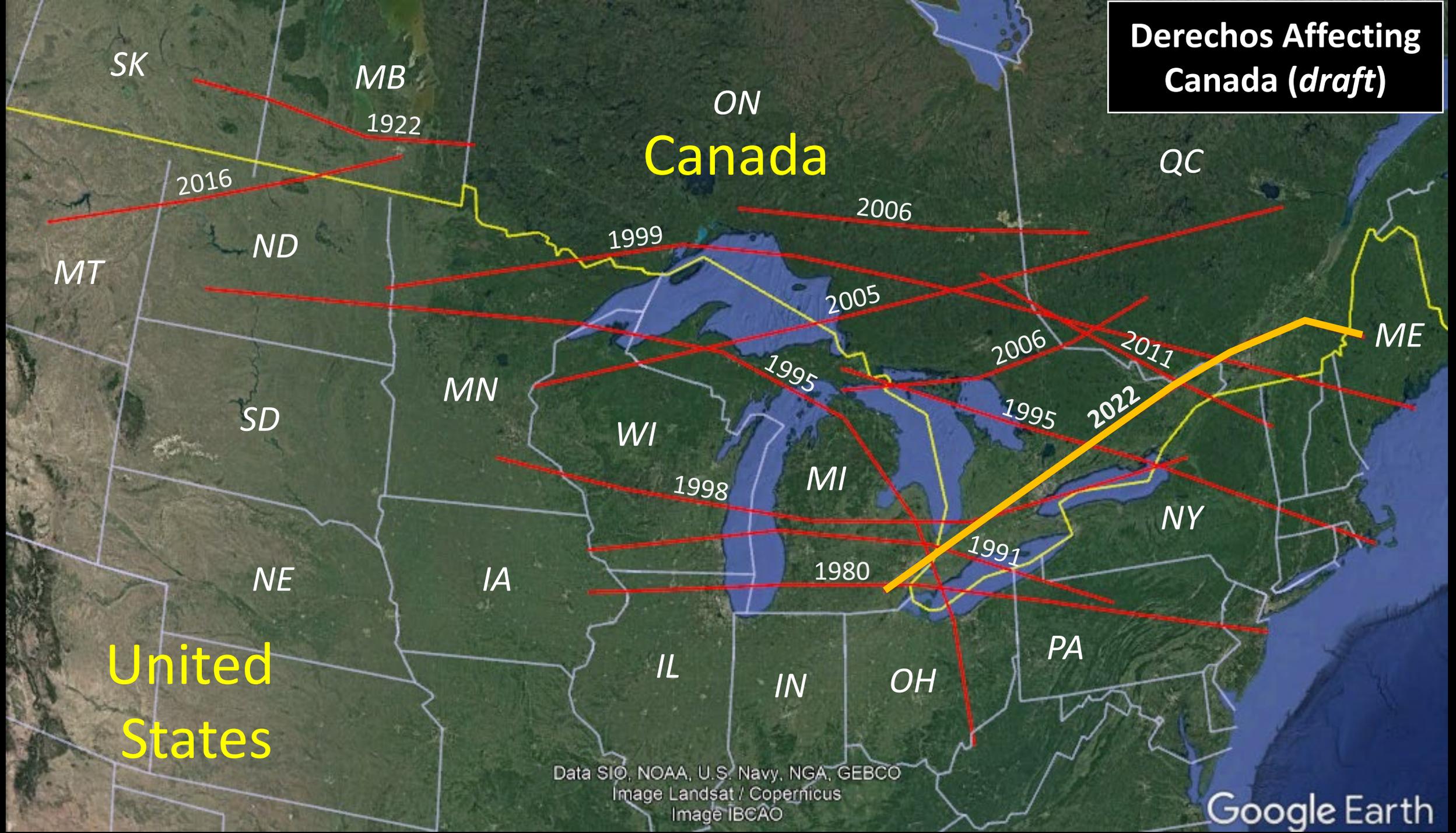
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**Derechos Affecting
Canada (draft)**



Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Image IBCAO

Google Earth

Summary

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- The understanding of Canada's national tornado climatology is improving as NTP endeavours to detect, assess and document every tornado event that occurs in Canada (uwo.ca/ntp)
- While investigating tornadoes, we also find downbursts (and for the first time a derecho in 2022), and this is leading toward climatologies as well

Historical Tornadoes

- Examined historical high-resolution satellite imagery to find 'tornado scars' in forests across Canada
- Identified >230 tornadoes *not in the records* back to 1980's, mostly ON/QC
- Added to national and Ontario tornado databases...

