

NYWGF FINAL REPORT

Evaluating Cold Hardiness of Grapevines in New York

Fiscal Year 2025–26

Geneva (AgriTech Gates) and Portland (LERGP West), New York

Season: October 2025 – March 2026

Project Title:

Evaluating cold hardiness of grapevines in New York 2025–2026

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New Research Continued Research

Amount Funded:

\$20,000.00

Summary Impact Statement

This project monitors dormant bud cold hardiness of grapevine cultivars at key sites in the Finger Lakes (Geneva) and Lake Erie (Portland) regions to provide growers and producers with timely information on vine vulnerability to winter cold. Cold hardiness is assessed using differential thermal analysis of dormant bud tissue and results are reported weekly to the Cornell Bud Hardiness online tool, enabling growers to make informed management decisions during the dormancy season. The 2025–26 season included a significant mid-winter cold event (February 7–9) in which temperatures at Portland reached -22.4°C — near or below the cold tolerance of several assessed cultivars, suggesting potential bud injury at that site. Data collected through this monitoring program also support ongoing cold hardiness model validation and contribute to variety selection recommendations and freeze risk assessment across all New York wine production regions.

Objectives

Objective 1: Monitor the cold hardiness of regionally important vinifera and hybrid cultivars over the winter season of 2025–2026 using differential thermal analysis of dormant bud tissue collected from the Finger Lakes (Geneva) and Lake Erie (Portland) sites.

Objective 2: Process data and provide summary cold hardiness information to growers and producers through the Cornell Bud Hardiness online modeling tool and extension presentations.

Activities / Methods

Dormant cane samples were collected approximately weekly from November through March at Geneva (Cornell AgriTech Gates vineyard, 42.87°N / 77.06°W) and Portland (LERGP West, 42.37°N / 79.49°W). Sixteen cultivars were assessed at Geneva across 20 sampling dates, and twelve cultivars at Portland across 11 dates. Four cultivars were evaluated at both sites: Aravelle, Cabernet Franc, NY06, and Riesling. Originally, we had planned to have evaluations of cultivars at the Hudson Valley Lab as well. Unfortunately, the freezer and datalogger equipment at the HV lab suffered repeated failures during the sampling season, thus no data was collected. Future cold hardiness monitoring in the HV AVA will require upgrades to equipment.

Cold hardiness was measured using differential thermal analysis (DTA) of dormant bud tissue to detect the primary bud low temperature exotherm (LTE), which corresponds to the temperature at which intracellular water in primary bud cells freezes, causing cell death. LTE values were recorded using the BudFreezer/BudProcessor/BudLTE software package. The lethal temperature for 50% bud mortality (LTE50) was calculated as the median of replicate measurements on each sampling date.

Daily weather data were obtained from automated stations co-located at each vineyard site through the New York State Integrated Pest Management network. For Geneva, data are from the AgriTech Gates station (ny_geng, 42.87°N / 77.06°W). For Portland, data from the adjacent

por newa station (42.38°N / 79.49°W) were used due to instrument malfunction at the primary co-located station during a portion of the season. Temperatures recorded in °F were converted to °C. All data processing and visualization were performed in Python 3.10 using pandas and matplotlib.

Results / Progress / Next Steps

2025–26 Winter Weather

The season was characterized by a warm autumn, sustained freezing conditions from December through February, and a significant cold event on February 7–9. The season minimum at Geneva was -19.0°C (February 9); at Portland the adjacent station recorded -22.4°C on the same date. Portland recorded three days with minimum temperatures at or below -20°C (February 7–9), while Geneva did not reach that threshold at any point during the season. Despite these colder extremes, Portland accumulated fewer total below-freezing days than Geneva (106 vs. 119).

Table 1. Season-wide temperature summary, Geneva and Portland, Oct 2025–Mar 2026

Site	Station	Min temp (°C)	Date of min	Days min < 0°C	Days min < -20°C	Season avg (°C)
Geneva	AgriTech Gates (ny_geng)	-19.0	Feb 9, 2026	119	0	-2.5
Portland	Adjacent station (por newa)	-22.4	Feb 9, 2026	106	3	2.0

Season average is the mean of daily average temperatures. Portland data are from an adjacent station (por newa) due to instrument failure at the primary station.

Table 2. Geneva — Monthly Temperature Summary

Month	Avg temp (°C)	Avg min (°C)	Days < 0°C	Days < -20°C
Oct 2025	11.2	6.3	4	0
Nov 2025	4.0	0.2	16	0
Dec 2025	-2.8	-6.8	30	0
Jan 2026	-5.1	-8.3	25	0
Feb 2026	-3.8	-7.9	26	0
Mar 2026	3.6	-1.6	18	0

Table 3. Portland — Monthly Temperature Summary

Month	Avg temp (°C)	Avg min (°C)	Days < 0°C	Days < -20°C
Oct 2025	12.4	8.0	0	0
Nov 2025	5.1	2.3	10	0
Dec 2025	-1.4	-5.1	28	0
Jan 2026	-5.0	-8.2	26	1
Feb 2026	-3.3	-7.2	26	2

Month	Avg temp (°C)	Avg min (°C)	Days < 0°C	Days < -20°C
Mar 2026	4.1	-0.8	16	0

Avg temp and avg min are means of daily values for each month. Days < 0°C and < -20°C count days where the daily minimum fell below those thresholds.

Cold Hardiness — Geneva

Sixteen cultivars were examined at Geneva across 20 dates beginning October 30, 2025. The three Frontenac cultivars (noir, gris, and blanc) and Verona were the hardiest, each reaching LTE50 values below -30°C in January with seasonal means between -26.1 and -27.2°C. Marquette, Itasca, and Clarion formed a second tier of hardy hybrids (seasonal means -24.7 to -25.9°C). Crimson Pearl and Aravelle were moderately hardy, bridging the hybrid and vinifera groups.

The vinifera cultivars occupied the tender end of the spectrum. Gewurztraminer had the least cold hardiness (mean -19.8°C), followed by Sauvignon blanc, Merlot, Cabernet Sauvignon, and Chardonnay (all near -20.6°C). Riesling, Cabernet Franc, and NY06 were modestly hardier within this group. The season minimum at Geneva (-19.0°C) remained 3°C or more above the LTE50 of all assessed cultivars, indicating no significant bud injury risk at this site.

Table 4. Geneva — Monthly Maximum Cold Hardiness (LTE50, °C)

Cultivar	Oct 2025	Nov 2025	Dec 2025	Jan 2026	Feb 2026	Mar 2026
Aravelle	-16.6	-22.8	-26.8	-26.9	-25.2	-23.8
Cabernet_Franc	—	-20.6	-23.5	-23.4	-24.1	-21.4
Cabernet_Sauvignon	—	-19.6	-23.4	-23.6	-23.3	-21.8
Clarion	-19.0	-25.5	-26.9	-28.6	-26.3	-24.6
Crimson_Pearl	-18.2	-24.0	-27.6	-27.6	-28.0	-22.4
Frontenac_blanc	-20.5	-25.8	-29.4	-32.1	-29.5	-27.0
Frontenac_gris	-21.0	-26.4	-29.6	-32.2	-30.7	-27.2
Frontenac_noir	-22.3	-26.1	-28.9	-32.9	-30.2	-27.3
Gewurztraminer	—	-19.4	-22.1	-22.4	-21.3	-21.6
Itasca	-23.5	-24.2	-28.2	-29.6	-28.1	-25.4
Marquette	-24.0	-25.0	-28.4	-30.4	-28.2	-24.5
Merlot	—	-21.1	-21.7	-23.8	-23.3	-21.6
NY06	-12.8	-20.6	-26.0	-27.4	-25.2	-23.6
Riesling	—	-21.6	-24.8	-26.3	-25.2	-24.2
Sauvignon_blanc	—	-21.1	-22.4	-23.3	-22.8	-21.3
Verona	-16.8	-25.2	-29.5	-30.3	-29.8	-27.9

Most negative LTE50 within each month per cultivar. Em-dash (—) = no sampling that month.

Cold Hardiness — Portland

Twelve cultivars were assessed at Portland across 11 dates beginning November 4, 2025. Concord was the hardiest (peak -27.1°C in February, though only 5 sampling dates were available). Rkatsatelli and NY06 were the next hardiest (seasonal means -22.5 to -22.7°C). Aravelle, Riesling, Caminante Blanc, Regent, Fleuratai, and Sorelli formed a mid-range group (-21.1 to -21.9°C mean). Chardonnay and Saperavi were the least hardy (near -20.6°C).

The season minimum of -22.4°C on February 9 was near or below the February LTE50 of Chardonnay (-23.2°C), Saperavi (-23.8°C), and Sorelli (-24.1°C). Bud injury in these cultivars at Portland during the February 7–9 cold event is plausible and warrants post-season confirmation through bud viability assessment.

Table 5. Portland — Monthly Maximum Cold Hardiness (LTE50, $^{\circ}\text{C}$)

Cultivar	Nov 2025	Dec 2025	Jan 2026	Feb 2026	Mar 2026
Aravelle	-18.9	-25.2	-26.3	-24.3	-17.8
Cabernet Franc	-17.0	-24.2	-25.4	-24.2	-18.7
Caminante Blanc	-20.1	-24.5	-26.6	-23.7	-18.8
Chardonnay	-17.8	-21.5	-23.2	-24.2	-17.9
Concord	-21.3	-24.5	—	-27.1	—
Fleuratai	-20.2	-25.3	-25.9	-25.4	-16.7
NY06	-19.1	-26.4	-27.3	-27.0	-18.0
Regent	-19.9	-23.8	-24.3	-25.9	-17.9
Riesling	-17.8	-24.9	-26.6	-24.7	-20.5
Rkatsatelli	-20.3	-26.6	-25.8	-26.0	-20.5
Saperavi	-20.1	-24.3	-23.8	-22.9	-18.2
Sorelli	-20.5	-24.7	-24.1	-24.7	-18.6

Most negative LTE50 within each month per cultivar. Em-dash (—) = no sampling. Concord data were unavailable for January and March.

Cross-Site Cultivar Comparison

The four cultivars shared between both sites showed somewhat greater seasonal mean cold hardiness at Portland than at Geneva. All four had comparable seasonal trajectories, with peak hardiness in January followed by deacclimation in February–March. For Cabernet Franc and Riesling, peak January LTE50 at Portland was -25.4 and -26.6°C respectively vs. -23.4 and -26.3°C at Geneva — both comfortably above the season minimum at either site, indicating no significant injury risk for these cultivars.

Key Patterns

- All cultivars showed the expected seasonal arc: gradual acclimation through November–December, peak hardiness in January, and progressive deacclimation from late February onward.
- Verona at Geneva performed comparably to the Frontenac group in mid-winter hardiness (peak -30.3°C , mean -26.1°C). This result merits continued monitoring to determine whether it is a consistent cultivar trait or was season-specific.
- NY06 showed strong acclimation at Geneva (January peak -27.4°C), substantially harder than Riesling (-26.3°C) and the other vinifera cultivars at that site.

- A mid-January warming episode at Portland (January 8–9, daily max 15.6°C) may have triggered partial deacclimation; however, all cultivars recovered and reached their annual hardiness maxima within the following weeks.
- Deacclimation in March was rapid and consistent at both sites, with LTE50 values rising 3–6°C between the January peak and final March sampling dates.

Next Steps

- Complete seasonal data collection through the end of dormancy.
- Upload complete season dataset to the Cornell Bud Hardiness application.
- Validate cold hardiness model predictions against observed LTE50 values for core cultivars.

Technology Transfer Plan

Cold hardiness data have been posted weekly throughout the dormancy season to the Cornell Bud Hardiness application, including LTE10, LTE50, and LTE90 values and model predictions. In addition to our posting of cold hardiness data to the Cornell cold hardiness application, we have also migrated our cold hardiness prediction models to the NEWA system at <https://newa.cornell.edu/grape-cold-hardiness/>. An example of the model interface is shown below.

Grape Cold Hardiness Risk Assessment

Based on research at [Cornell University](#) and [University of Wisconsin-Madison](#), with funding from [USDA National Institute of Food and Agriculture Grant #2023-68008-39274](#). Web app developed by [Cornell IPM](#) and [NRCC](#).

Use with caution. This model is for demonstration and testing purposes. Check with your local extension or university specialist before making management decisions. Updated 1/9/2025.

Location details

Choose a Data Source
 NEWA Station Grid Data

Stations
 Geneva (AgriTech Gates), NY

Model details

Select a Unit of Temperature
 Fahrenheit (°F) Celsius (°C)

Choose the Current Date

Model Start Date

Select a Grape Cultivar

Download this dataset

Visual results

Temperature (°F)

2026-03-25

Aug Aug 25 Sep 22 Oct 19 Nov 13 Dec 9 Jan 4 Jan 30 Feb 23

→ LTE50 (°F) → Min T (°F) → Max T (°F)

Freeze risk assessment

Cabernet Sauvignon
 NYUS1 ColdSnap Model

March 25, 2026
 Forecast

LOW FREEZE RISK

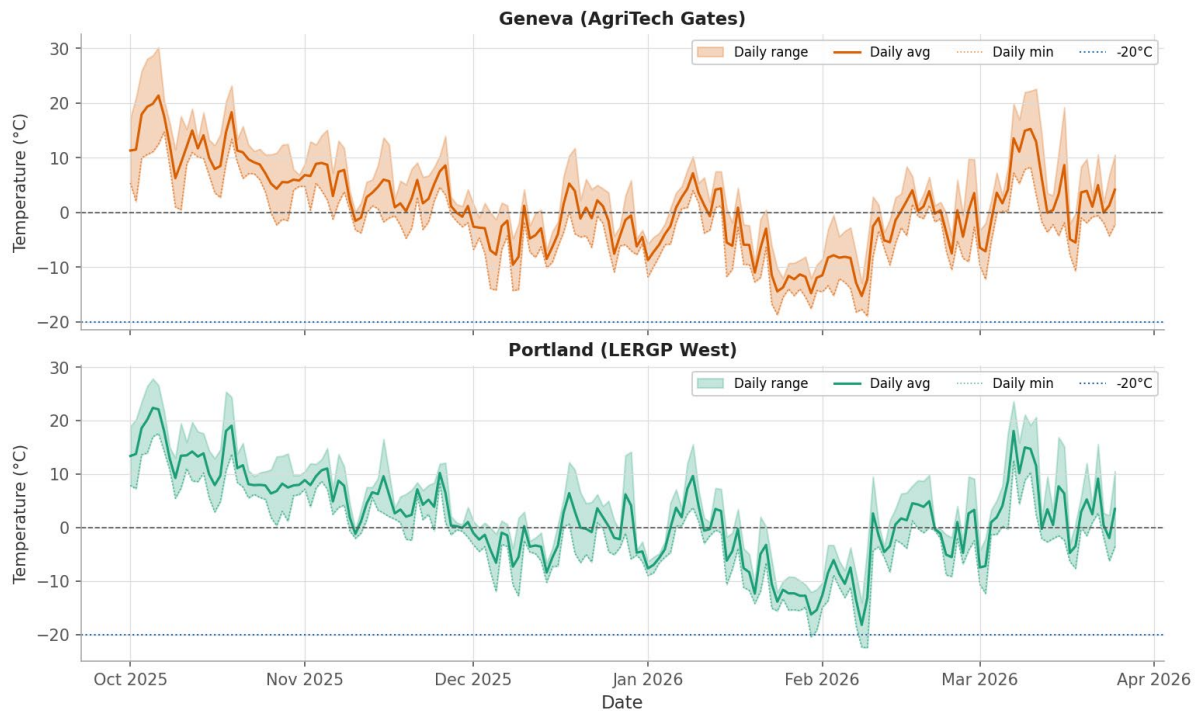
LT50*	Daily low temperature	Daily high temperature
-2 °F	28 °F	51.1 °F

*Predicted temperature at which 50% of buds will be damaged.

Attachments

Figure 1. Daily Air Temperatures — Geneva and Portland

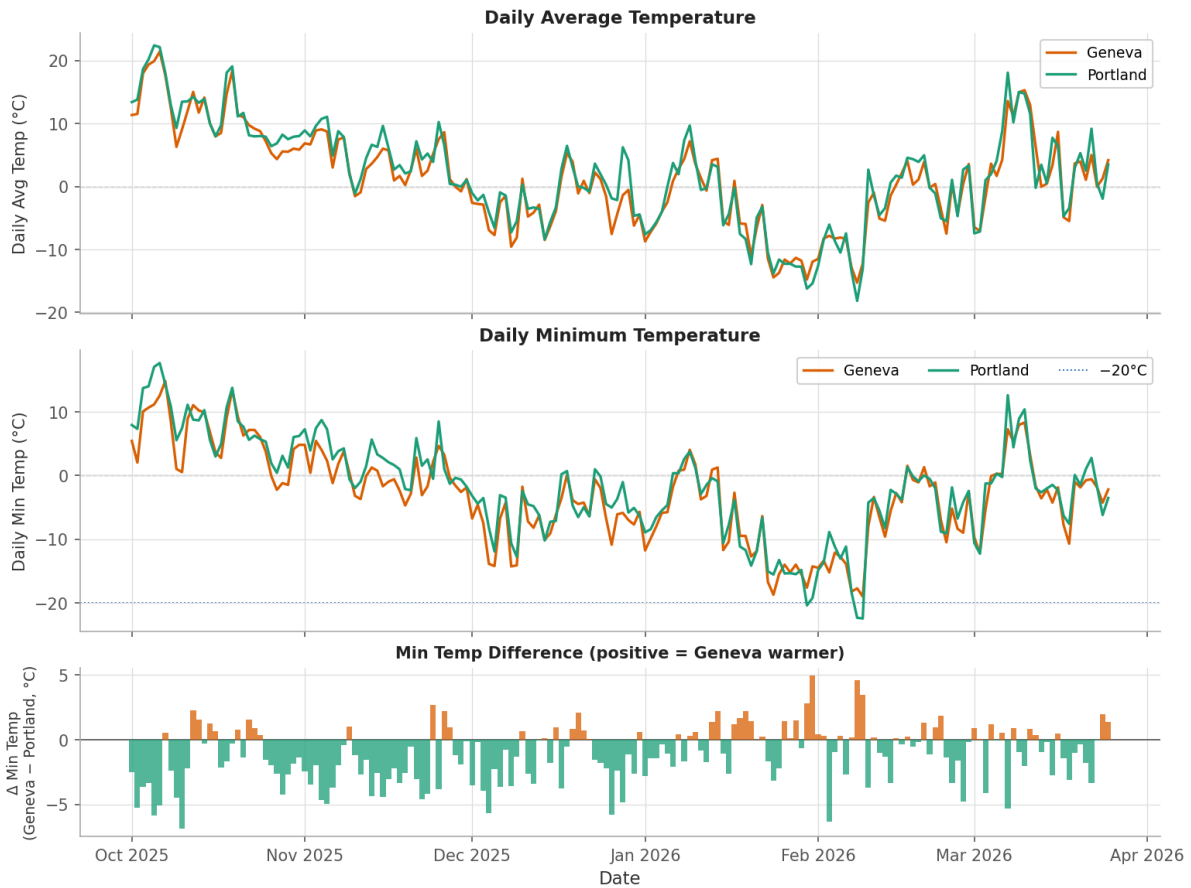
Winter Air Temperatures 2025–26 — Geneva and Portland, NY



Daily air temperatures (°C) at Geneva (top) and Portland (bottom), Oct 2025–Mar 2026. Shaded bands show the daily temperature range (min–max); solid line = daily average; dotted line = daily minimum. Dashed horizontal lines mark 0°C and -20°C. Portland data from adjacent station por newa.

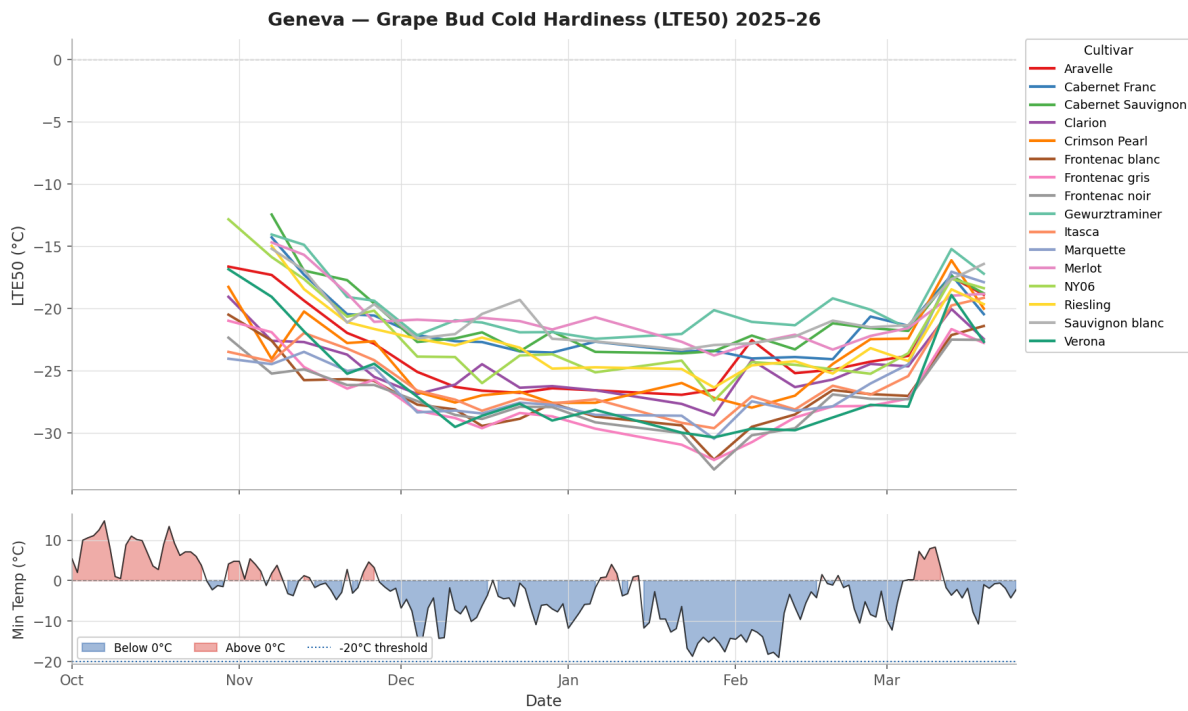
Figure 2. Geneva and Portland Temperature Overlay

Winter Air Temperature Comparison — Geneva vs. Portland, NY 2025-26



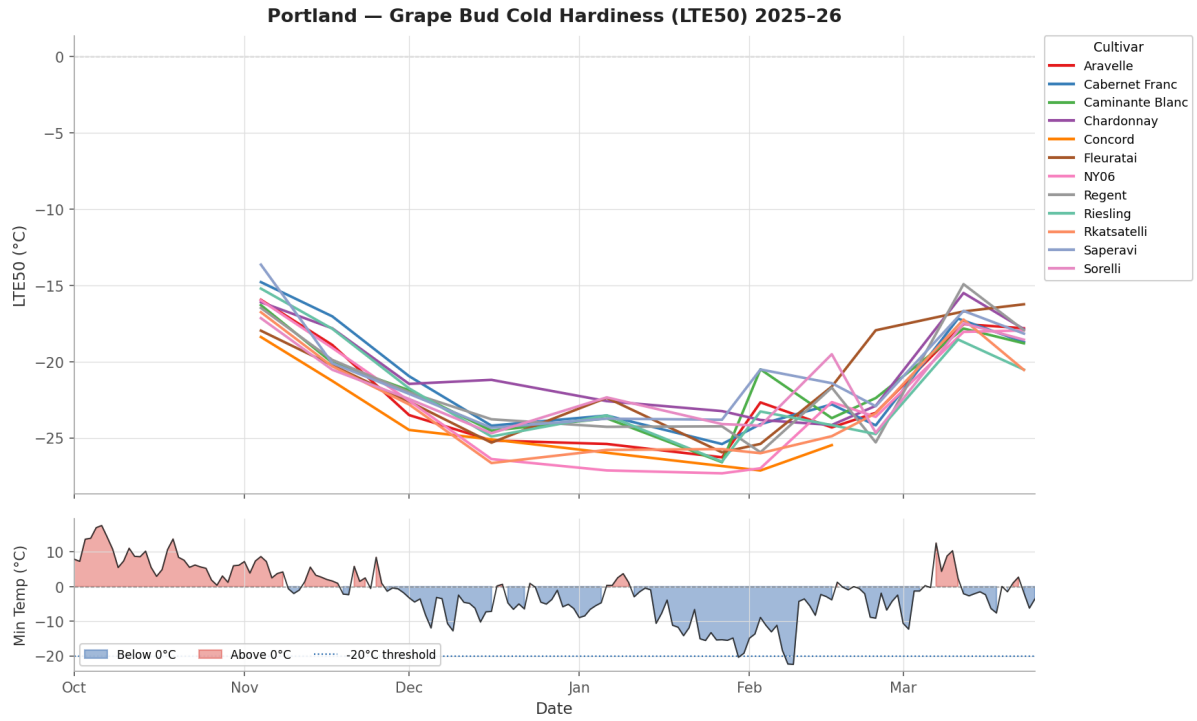
Direct comparison of daily temperatures at Geneva (blue) and Portland (orange), Oct 2025–Mar 2026. Top: daily average temperature; middle: daily minimum temperature; bottom: difference in daily average (Geneva – Portland); positive values indicate Geneva warmer.

Figure 3. Cold Hardiness — Geneva, All Cultivars



LTE50 (°C) for all cultivars at Geneva, 2025–26. Each line is the median LTE of replicate DTA measurements. Lower values on the y-axis indicate colder temperatures (greater cold hardiness). The lower panel shows daily minimum air temperature; blue fill = below-freezing, red fill = above-freezing.

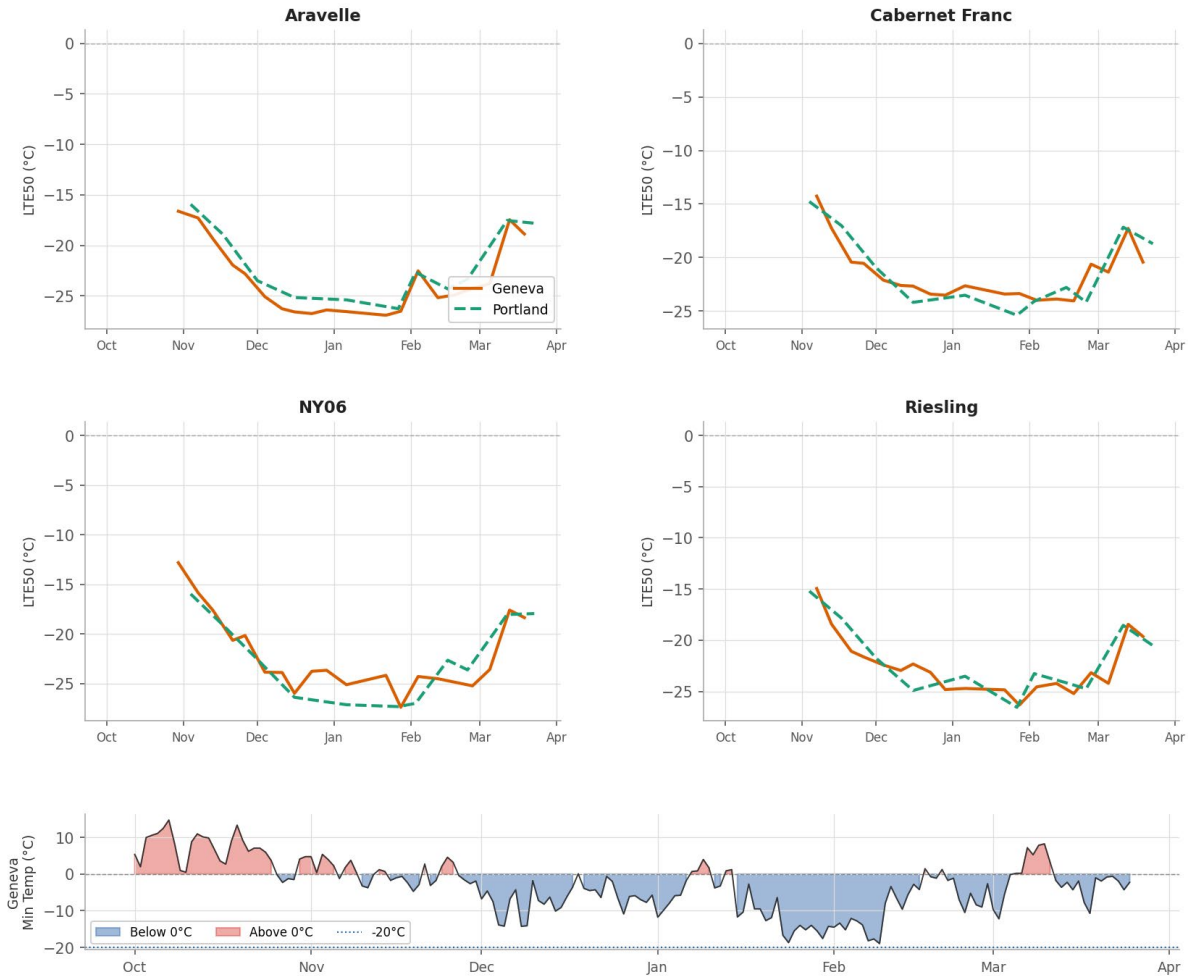
Figure 4. Cold Hardiness — Portland, All Cultivars



LTE50 (°C) for all cultivars at Portland, 2025–26. Panel conventions same as Figure 3. Lower panel uses weather data from the adjacent por newa station.

Figure 5. Cross-Site Comparison — Shared Cultivars

Cold Hardiness (LTE50) — Cultivars at Both Sites, 2025–26



LTE50 (°C) for the four cultivars present at both sites (Aravelle, Cabernet Franc, NY06, Riesling), 2025–26. Orange lines = Geneva; green dashed lines = Portland. Lower values indicate greater cold hardiness. The lower panel shows Geneva daily minimum air temperature for seasonal context.

Table A1. Full Season Hardiness Rankings — All Cultivars

Seasonal mean and minimum LTE50 for all cultivars at both sites, sorted hardest first.

Cultivar	Site	Mean LTE50 (°C)	Min LTE50 (°C)	Sampling dates
Frontenac noir	Geneva	-27.2	-32.9	20
Frontenac gris	Geneva	-27.1	-32.2	20
Frontenac blanc	Geneva	-26.7	-32.1	20

Cultivar	Site	Mean LTE50 (°C)	Min LTE50 (°C)	Sampling dates
Verona	Geneva	-26.1	-30.3	20
Marquette	Geneva	-25.9	-30.5	20
Itasca	Geneva	-25.6	-29.6	20
Clarion	Geneva	-24.7	-28.6	20
Crimson Pearl	Geneva	-24.2	-28.0	20
Concord*	Portland	-23.3	-27.1	5
Aravelle	Geneva	-23.3	-26.9	20
Rkatsatelli	Portland	-22.7	-26.6	11
NY06	Portland	-22.5	-27.3	11
Riesling	Geneva	-22.5	-26.3	19
NY06	Geneva	-22.0	-27.4	19
Riesling	Portland	-21.9	-26.6	11
Aravelle	Portland	-21.9	-26.3	11
Regent	Portland	-21.5	-25.9	11
Caminante Blanc	Portland	-21.5	-26.6	11
Cabernet Franc	Geneva	-21.5	-24.1	19
Sorelli	Portland	-21.4	-24.7	11
Cabernet Franc	Portland	-21.2	-25.4	11
Fleuratai	Portland	-21.1	-25.9	11
Cabernet Sauvignon	Geneva	-20.8	-23.6	19
Saperavi	Portland	-20.7	-24.3	11
Merlot	Geneva	-20.6	-23.8	19
Chardonnay	Portland	-20.6	-24.2	11
Sauvignon blanc	Geneva	-20.6	-23.3	19
Gewurztraminer	Geneva	-19.8	-22.4	19

Season-long cold hardiness sorted by mean LTE50 (most negative = hardest). *Concord had only 5 sampling dates.

Section 3 — Grower-Facing Summary

Project Objectives

The goal of this project is to track how cold-hardy the buds of wine grape varieties are throughout the winter season at two research vineyards in New York — one in the Finger Lakes (Geneva) and one along the Lake Erie shore (Portland). By collecting dormant canes regularly and testing them at controlled freezing temperatures, we determine exactly how cold it must get to kill 50% of the primary buds on each variety. This information is updated weekly on a public website (Cornell Bud Hardiness application) throughout the dormancy season, helping growers decide whether to check their own vineyards when cold weather is forecast.

Importance of Research to the NY Wine Industry

Winter cold is one of the most significant threats to grapevine survival and productivity in New York. When temperatures drop below the cold tolerance of a variety's buds, the primary buds are killed and the crop for that season is severely reduced or lost entirely. Because cold tolerance changes throughout the winter knowing a variety's current hardiness level is essential for assessing risk in real time. A variety that was well protected in December may be vulnerable after a mid-winter warming event causes partial deacclimation.

This monitoring program provides the only source of measured, real-time cold hardiness data for New York growers. The data support day-to-day decisions about whether to perform bud cutting to assess damage, whether to adjust pruning strategies, and which varieties to plant in higher-risk sites. The multi-year dataset also underpins the Cornell cold hardiness prediction models, which now estimate hardiness for 56 varieties at any location across the state.

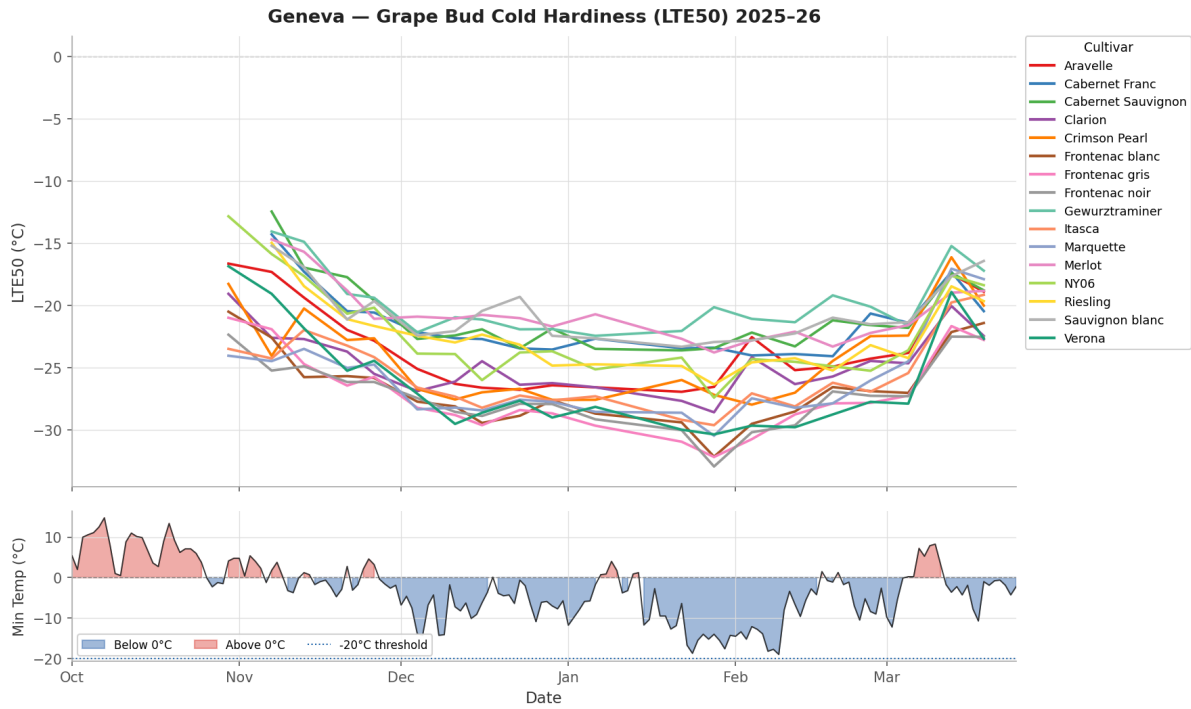
Project Results / Next Steps

The 2025–26 winter included a significant cold event on February 7–9, when temperatures fell to -19°C at Geneva and -22°C at Portland. At Geneva, all assessed cultivars had built up sufficient cold hardiness to survive this event safely. The hardy hybrid varieties — particularly the Frontenac family and Verona — reached mid-winter hardiness levels well below -30°C , providing a large safety margin. Vinifera varieties were more vulnerable but still protected at Geneva this season.

At Portland, the colder February temperatures approached or exceeded the cold tolerance of several cultivars, including Chardonnay, Saperavi, and Sorelli. Some bud injury at Portland during the February cold event is possible. Growers of these varieties in the Lake Erie region should consider performing bud cutting this spring to assess the extent of any damage before finalizing pruning plans.

Complete season data for all cultivars has been posted to the Cornell Bud Hardiness website and a mobile friendly cold hardiness model and prediction application has been deployed at <https://newa.cornell.edu/grape-cold-hardiness/>.

Supporting Figure



Cold hardiness (LTE50, °C) for all assessed cultivars at Geneva, Oct 2025–Mar 2026. Each line shows the temperature at which 50% of that variety’s buds would be killed — lower values mean the buds can tolerate colder temperatures. The lower panel shows daily minimum air temperature. The season minimum at Geneva remained above the LTE50 of all varieties, indicating no significant bud injury at this site during the 2025–26 winter.

Report prepared: March 25, 2026