



Enhancing Vine Acclimation Practices

Dr. Harrison Wright, Jeff Franklin & Shayne McLaughlin
Kentville Research and Development Centre
Nova Scotia



Agriculture and
Agri-Food Canada

Agriculture et
Agroalimentaire Canada



Agriculture and
Agri-Food Canada

Agriculture et
Agroalimentaire Canada

Canada



Outline

- Fall Vine Physiology – What is Happening?
- Wine Grape Winter Acclimation / Deacclimation
- Wine Grape Peak Hardiness / Mortality Risk
- 2023 (November) Wine Grape Hardiness
- Early Signs of a Failing Vineyard
- **ENHANCING Vine Acclimation**

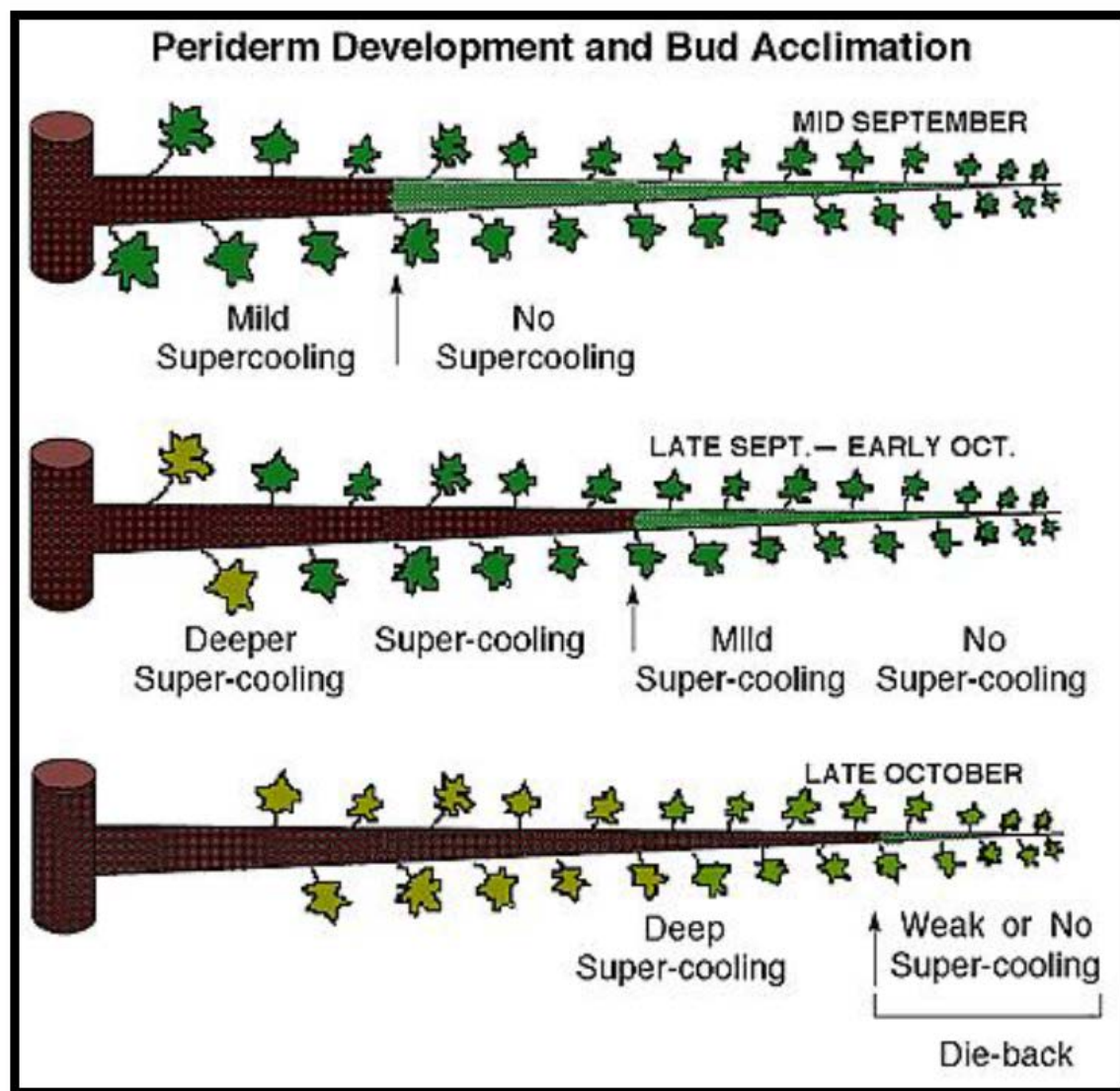


Fall Vine Physiology – What is Happening?

2 vine hardiness factors:

1. Photosynthates (starch / sugars)
2. Vine desiccation

Endormancy vs Ecodormancy

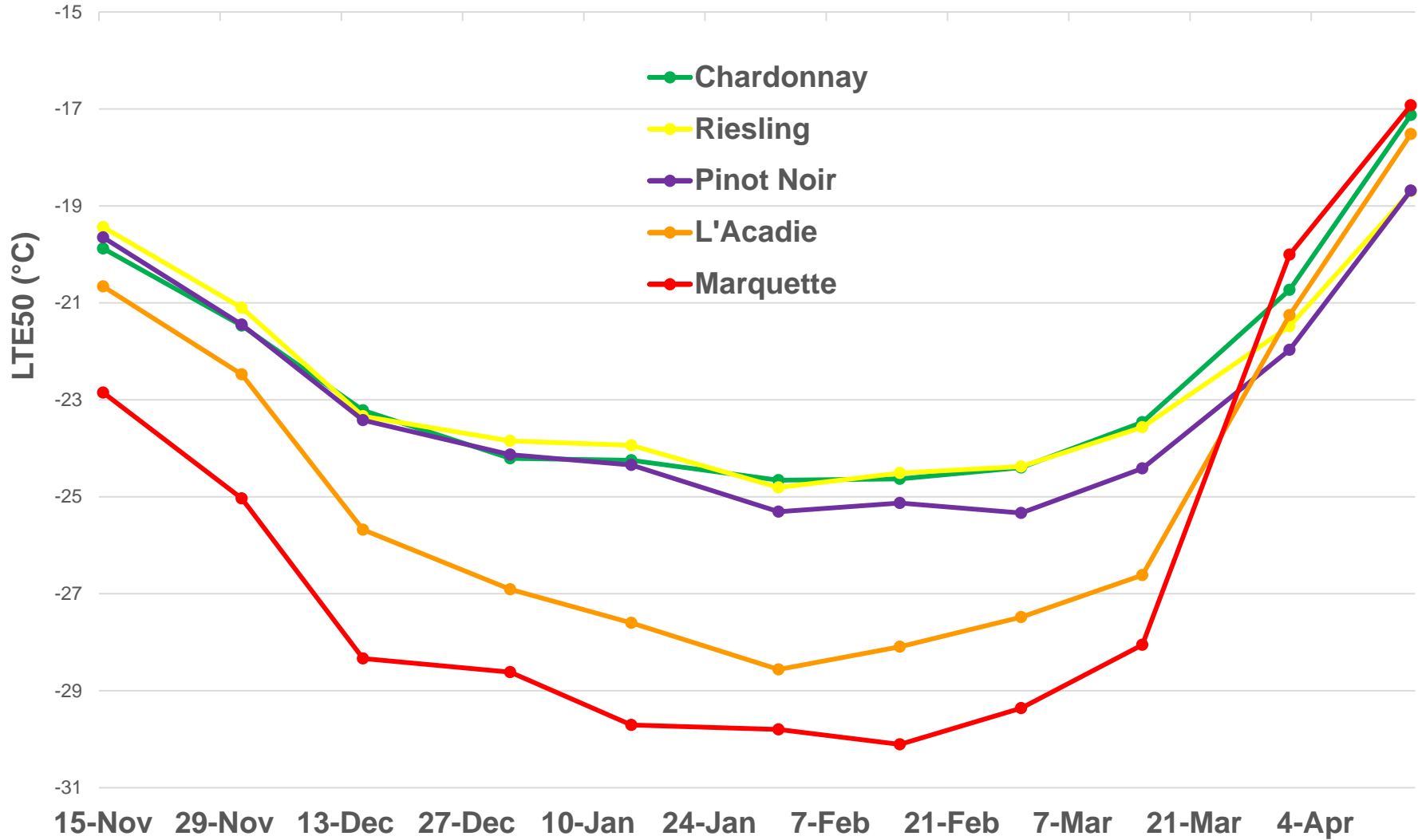


From Wine East 2001

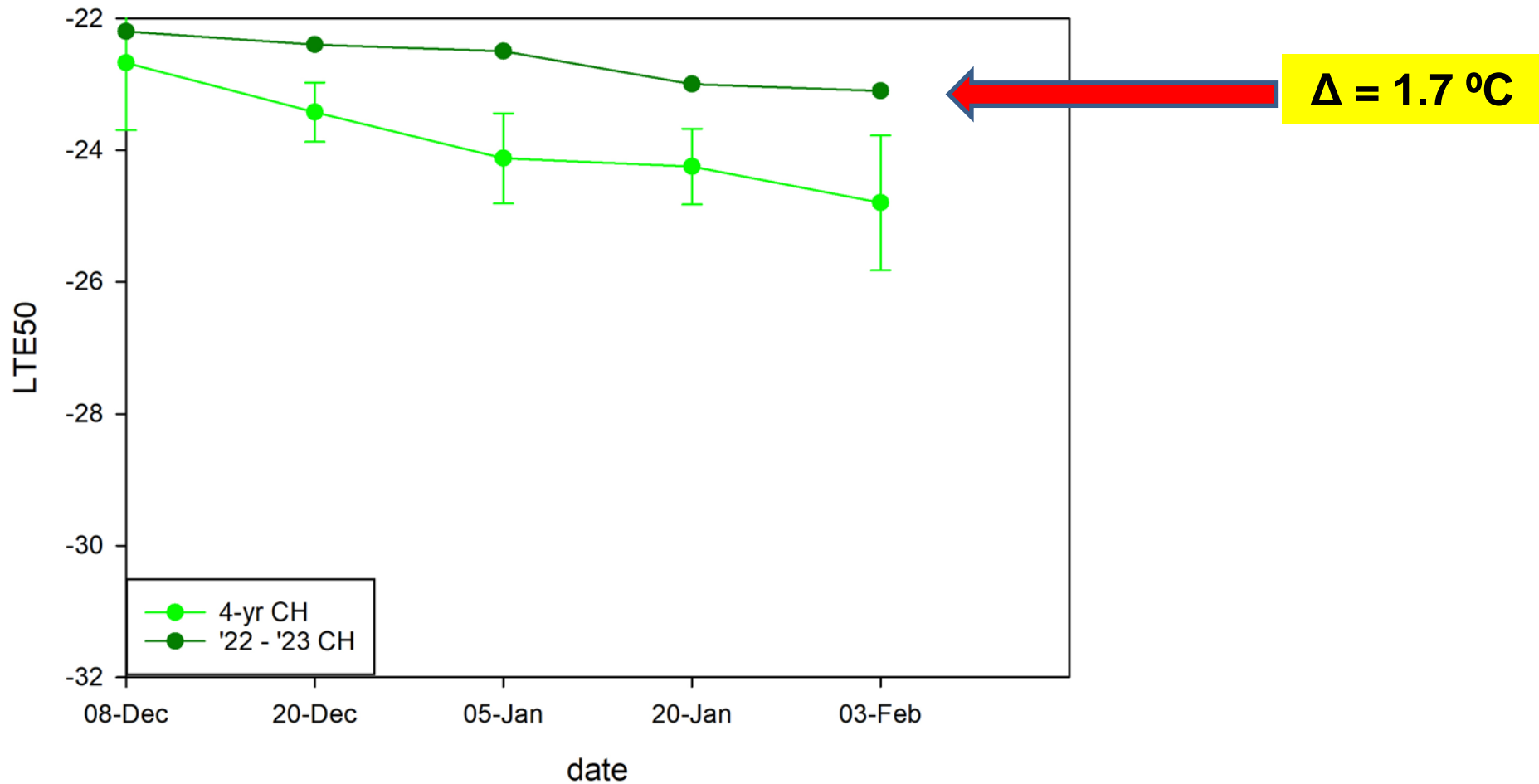


**Wine Grape Winter
Acclimation / Deacclimation:**

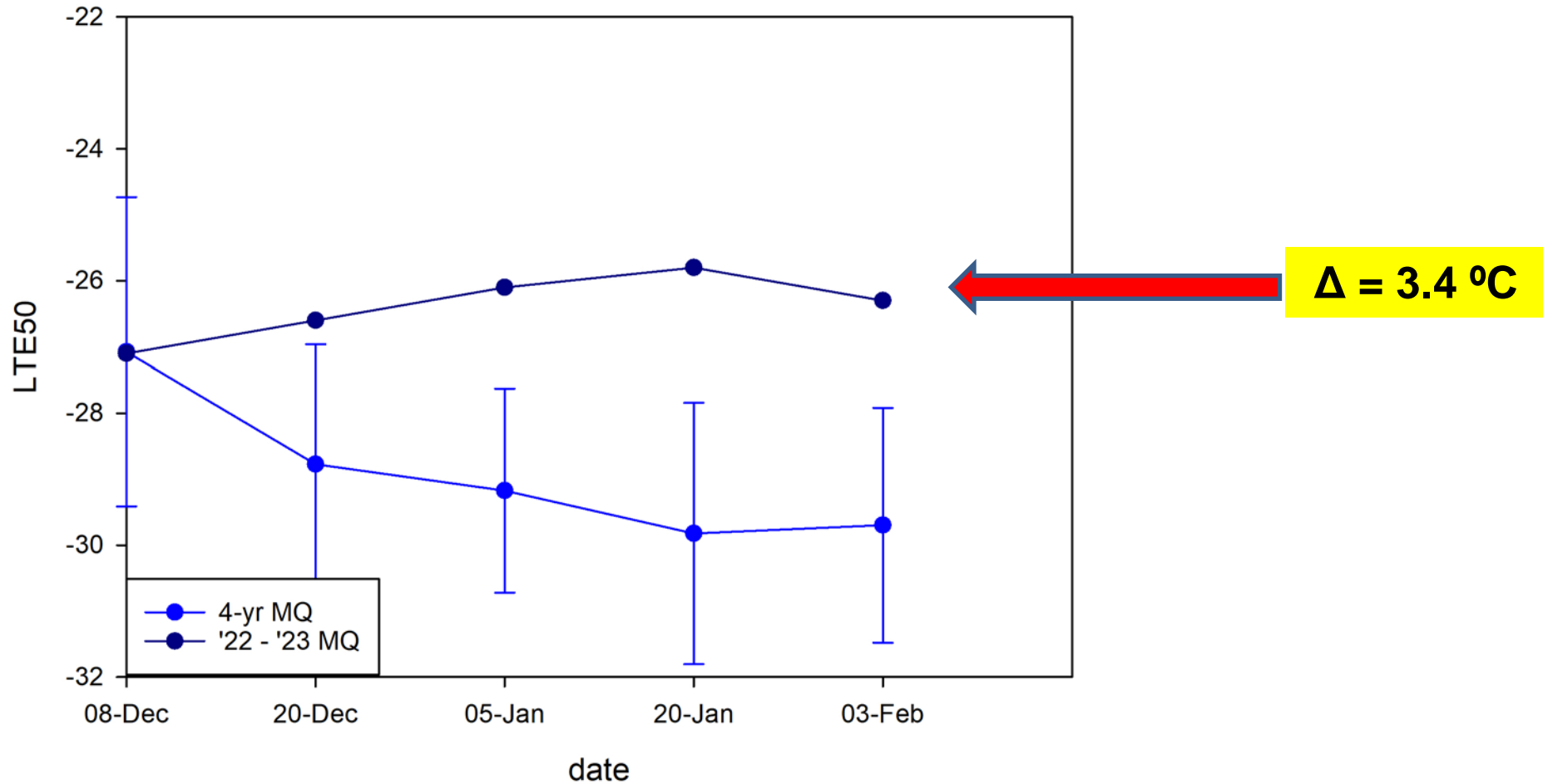
2017 – 2022



Chardonnay: 2022 – 2023 vs 4-Year AVG



Marquette: 2022 – 2023 vs 4-Year AVG





**Wine Grape Peak
Hardiness / Mortality Risk**

October 20, 2023

Winter minimum temperatures are the biggest factor in determining what cultivars can be grown at a site.

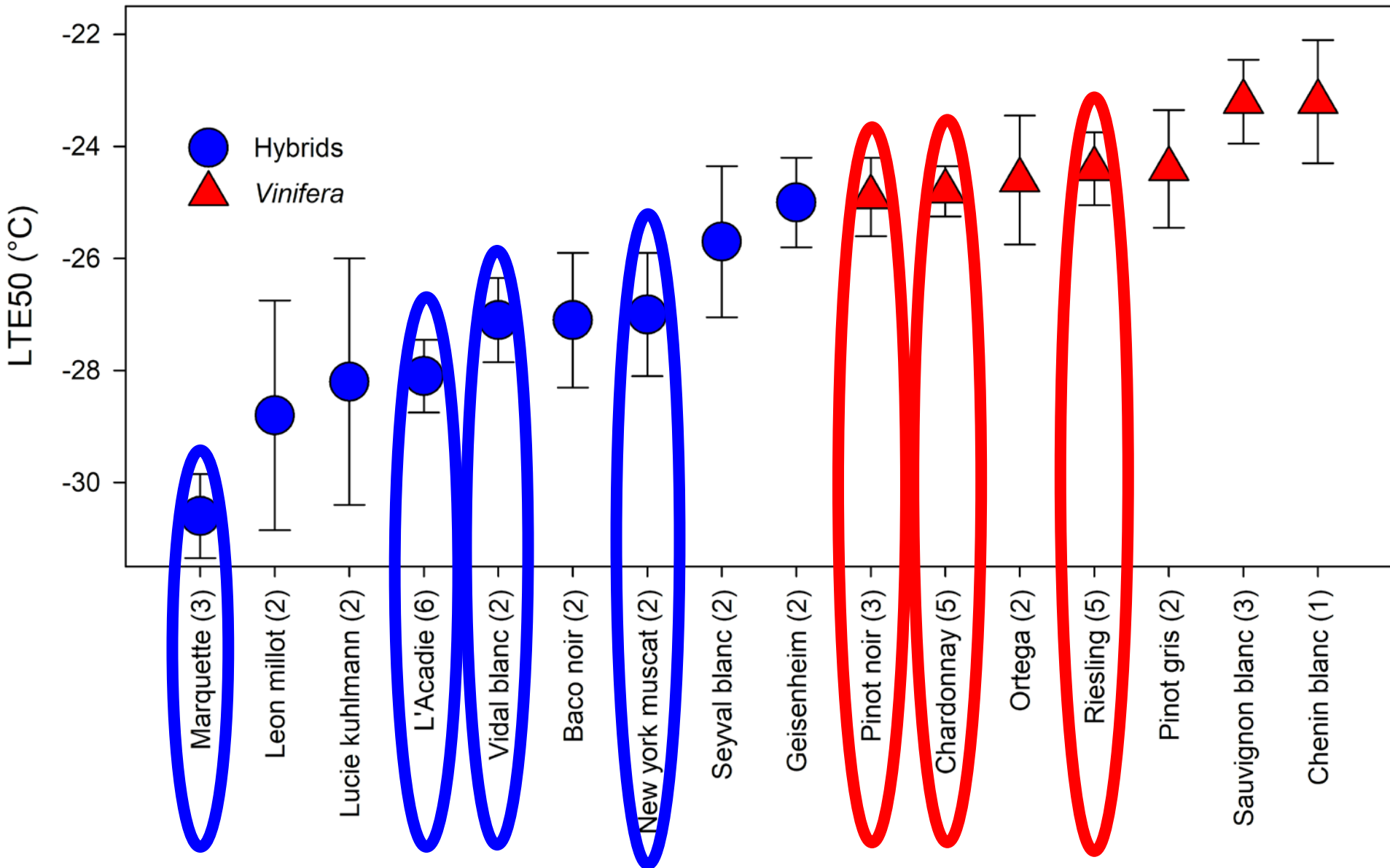
Reminder:

LTE50 = Temp. where 50% of the buds die

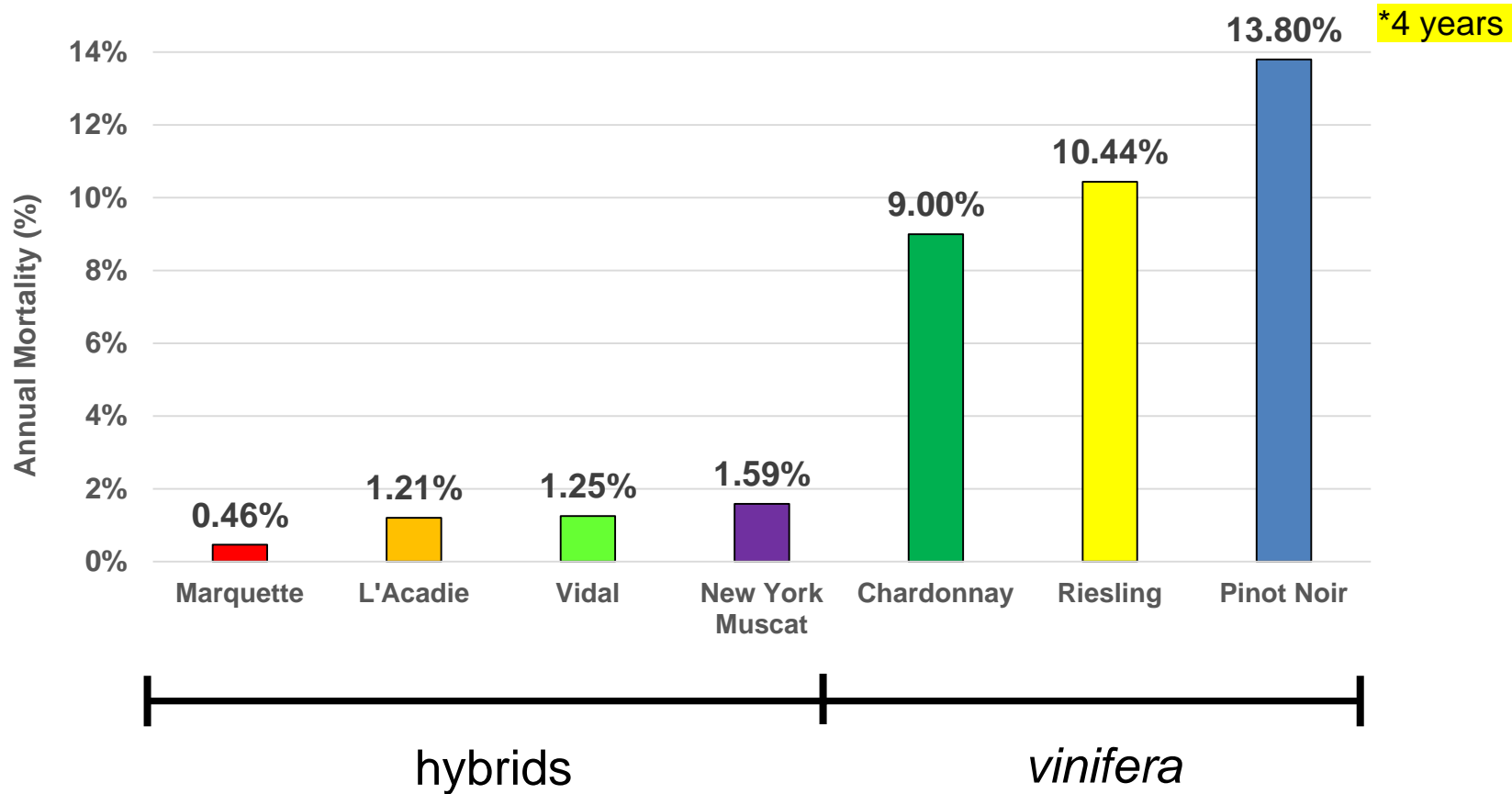


2020 – year of (Flooding for a good one) → Feb < -25 °C event)

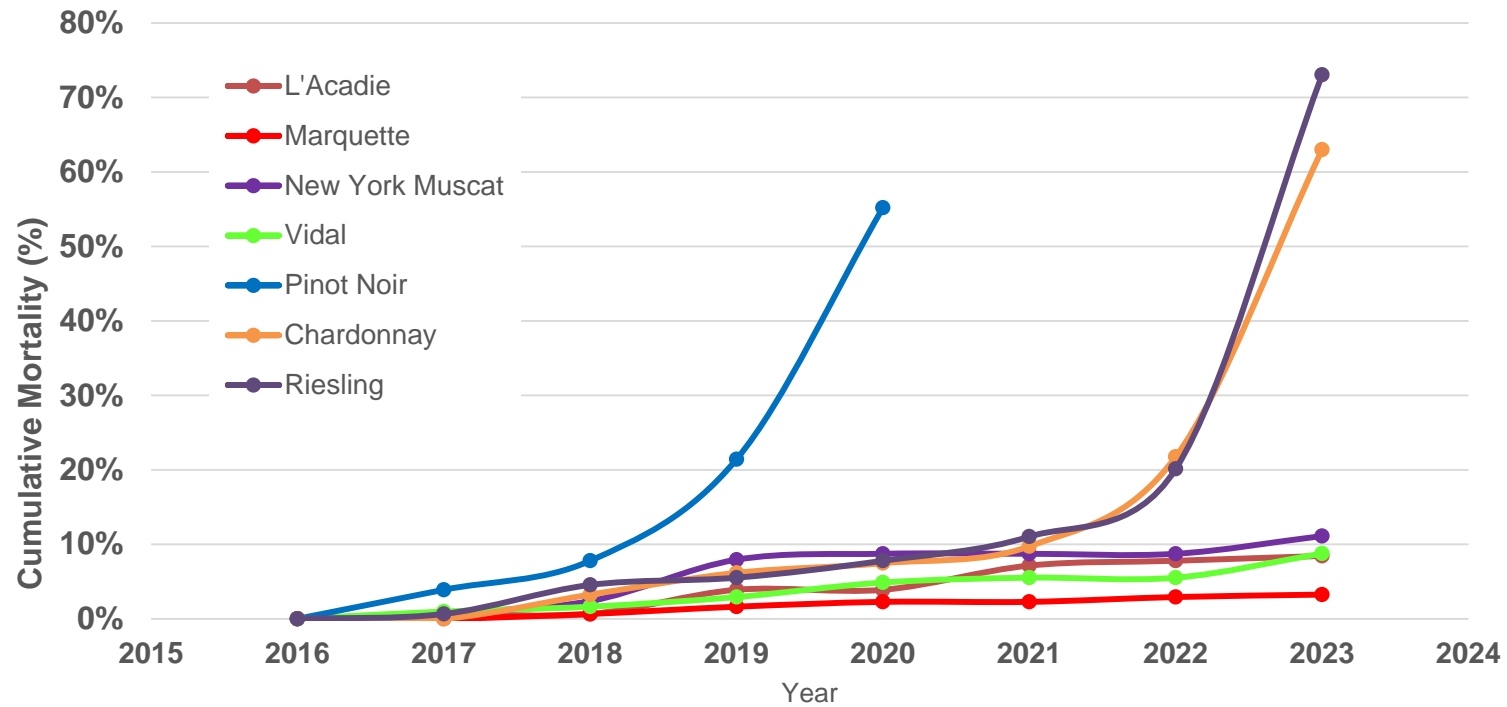
Variety	Panel	Row	Cultivar																			dead	Cultivar TOTA % loss																																																									
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19																																																											
'L'Acadie Blanc' (own root)	1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	9	
	2	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	4	13
'Vidal' (C3309)	11	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	4	
	12	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	6	
	13	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	8	
	14	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	9	27
			667 (Riparia Gloire)																			828 (Riparia Gloire)																																																										
'Marquette' (own root)	19	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	2	
	20	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	4	
	21	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	3	
	22	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	1	10
'New York Muscat' (own root)	23	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	7															
	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	7	14	11.11%													





16 cultivars, 44 sites, 2 years



8 years



Interspecific Hybrids versus *Vitis vinifera* L. Bud Hardiness, Viability, and Postfreeze Pruning Implications in Cane-Pruned Vines

A. Harrison Wright ^{1,*}, Jeffrey L. Franklin ¹, and Dale J. Hebb¹

Abstract

Background and goals

Winter temperature inversions in 2020 and 2022 saw much of Nova Scotia drop below -20°C , with the coldest vineyards registering below -25°C . With sizable plantings of both interspecific hybrids and *Vitis vinifera* L., we examined both in terms of bud hardiness, viability, and the regional historical frequency of like events. A pruning study using one hybrid and one *V. vinifera* site tested whether minimal pruning should remain the recommendation in a highly damaged cane-pruned system.

Methods and key findings

Bud hardiness measurements using differential thermal analysis across 44 sites, 16 cultivars, and two years showed regional hybrids to be 3°C hardier, on average, than *V. vinifera*. Pre- and postfreeze bud viability data reflected this difference. Historical data indicates that the frequency of winter events equal in severity or worse than recent damaging winter events has decreased from occurring annually 100 years ago, to once every five years today. Pruning trials using a range of pruning severities showed that no treatment produced a marketable crop in the more damaged Chardonnay, while retaining extra canes was as effective as minimal pruning in Vidal blanc. Minimal pruning reduced vigor, limited pruning options, and greatly increased pruning time the following year. Carryover treatment effects in year two were nuanced and nominal in both cultivars.

Conclusions and significance

A reduction in winter damage risk resulting from warming is being offset by an increase in plantings of less-hardy *V. vinifera* cultivars in the region. Be-

Introduction

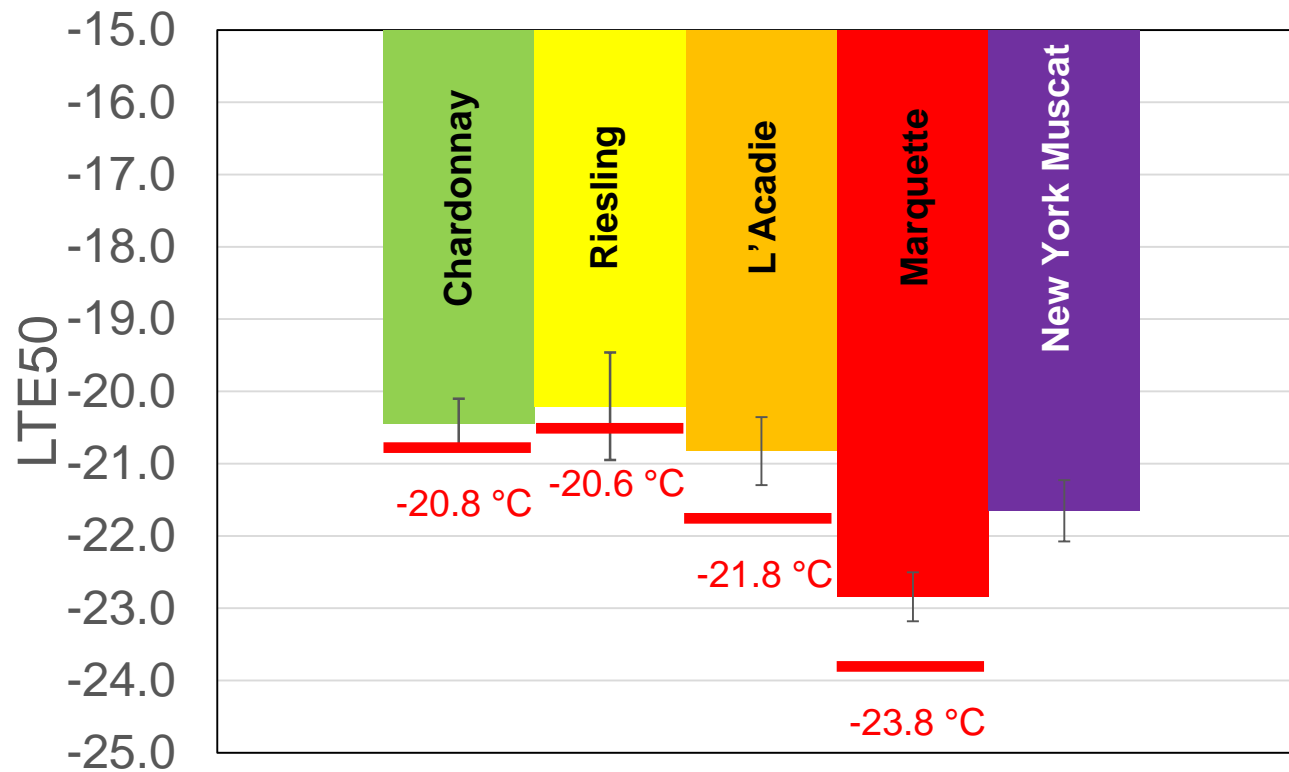
One of the most significant factors determining whether winegrapes can be grown in a region, as well as what cultivars can be grown, is the absolute minimum temperature experienced each winter (Willwerth et al. 2014, Shaw 2017). A single lethal low temperature event can determine whether a vineyard will produce a crop that year or not. The rapid growth of the Nova Scotian winegrape industry over the last two decades coincides with a general warming trend and a rapid expansion into less-hardy *Vitis vinifera* cultivars. After several years of relatively mild winters, lethal, winter low-temperature events have occurred in several vineyards in Nova Scotia in two of the last three years. On 15 Feb 2020 and on 22 Jan 2022, temperatures dropped below -20°C across much of Nova Scotia, and in some vineyards, below -25°C . Different winegrape cultivars possess a wide range of dormant bud hardiness levels. The buds of most hybrid cultivars, which normally include some level of American *Vitis* species parentage crossed with *V. vinifera*, typically freeze at colder levels, and therefore are more winter hardy than most European *V. vinifera* cultivars (Dami et al. 2012, Willwerth et al. 2014). Winegrape regions with a low risk of winter damage typically focus on *V. vinifera* cultivars, while regions with cold winters and a high risk of winter damage often rely on hybrids. The modern Nova Scotia winegrape industry is now somewhere in the middle, with sizable commercial plantings of both hybrids and *V. vinifera*.

The extracellular regions of woody perennials, including grapevines, are the first to freeze and generally do so routinely throughout the winter in cool climate regions. While the formation of extracellular ice is harmless, the formation of intracellular ice is lethal (Keller 2015, Rende et al. 2018). The tissues that make up the grapevine buds are the least tolerant of winter low temperatures, and the larger primary bud is typically the most vulnerable of the buds contained in the compound bud (Zabadal et al. 2007, Willwerth et al. 2014).



2023 (November) Wine Grape Hardiness

Late November Bud Hardiness - 2023



- Long, warm, damp fall
- Late start / secondary & tertiary buds
- Damaged vines
- 2022 acclimation issues were not apparent in late November

2017 to 2022 LTE averages



Early Signs of a Failing Vineyard

Early Signs of a Failing Vineyard

- Dead fruiting canes / shoots
- Oblong trunks
- Crown gall





Enhancing Acclimation

Enhancing acclimation – early harvest

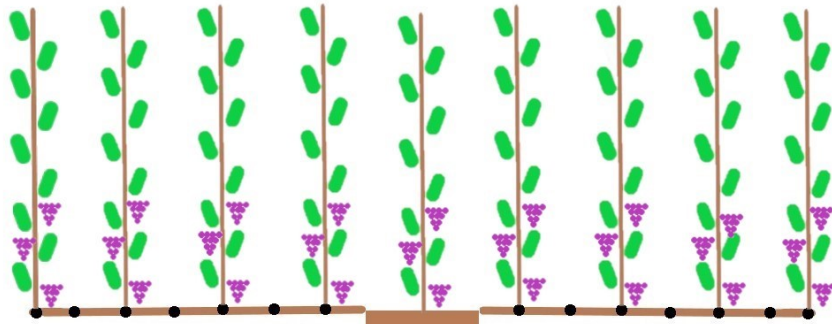
Riesling

**Early
harvest**

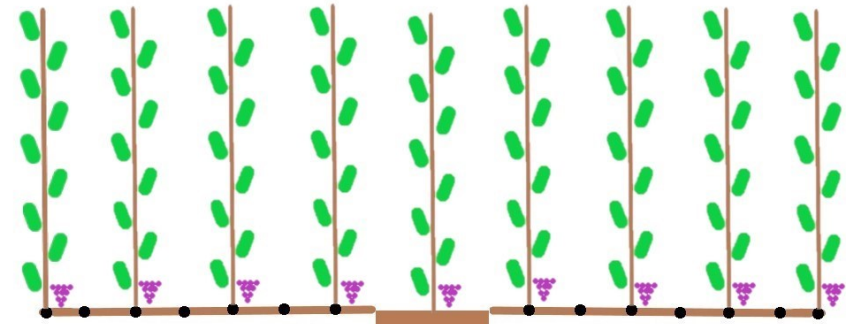


**Late
harvest**

Enhancing acclimation – vine balance?

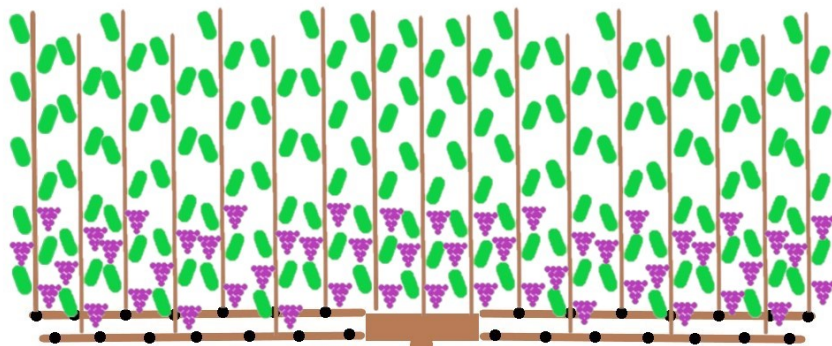


single cane / no thinning

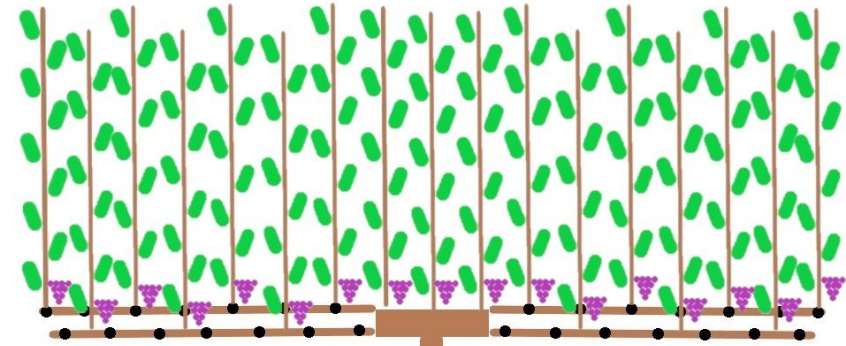


single cane / thinning

All Literature May Not be Applicable to NS Growing Conditions!



double cane / no thinning



double cane / thinning

Enhancing acclimation – preserving canopy



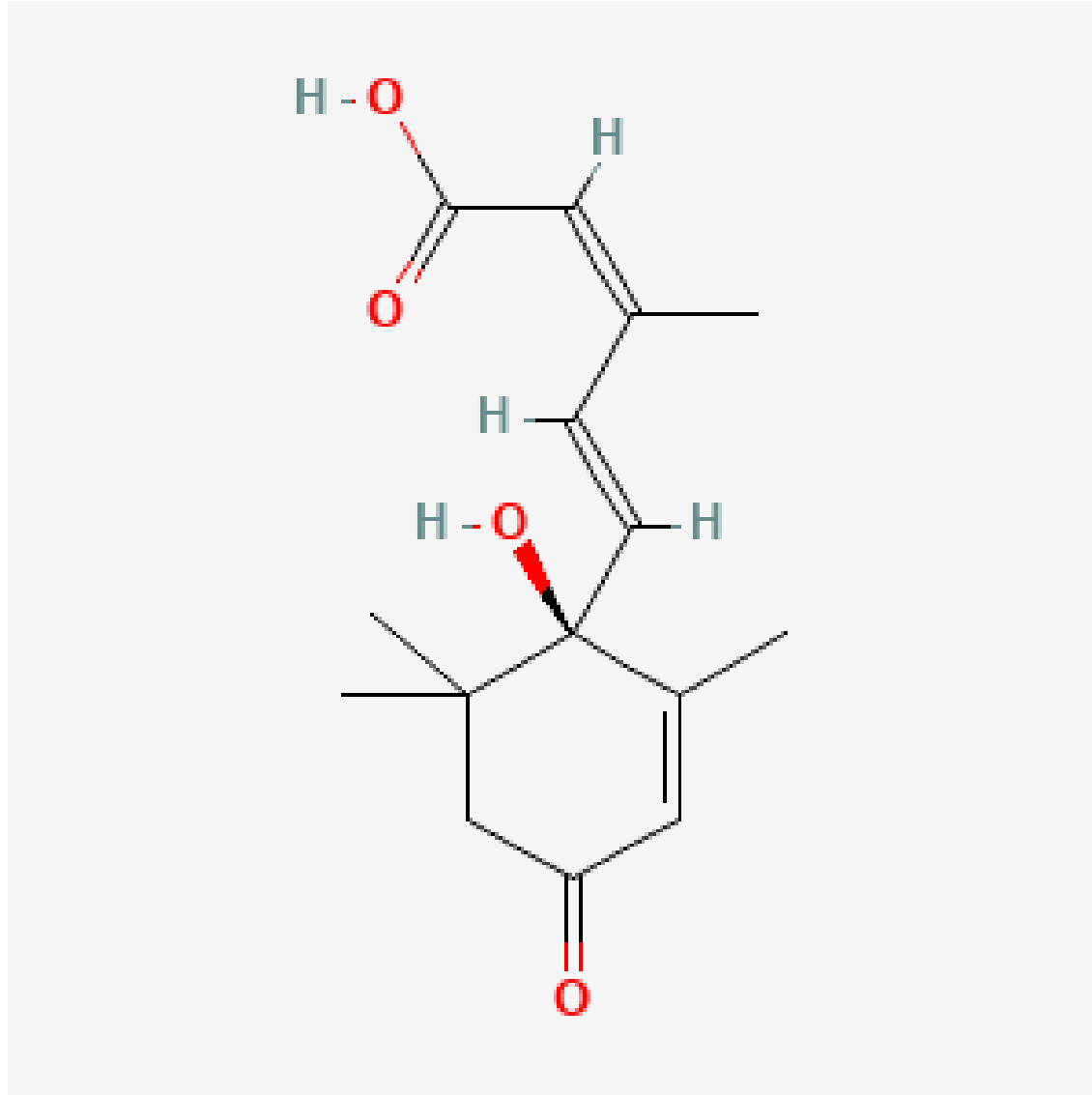
Enhancing acclimation – disease control

Chardonnay cane
October 20, 2023



Downy Mildew /
Late August
Defoliation

Enhancing acclimation – abscisic acid (ABA)

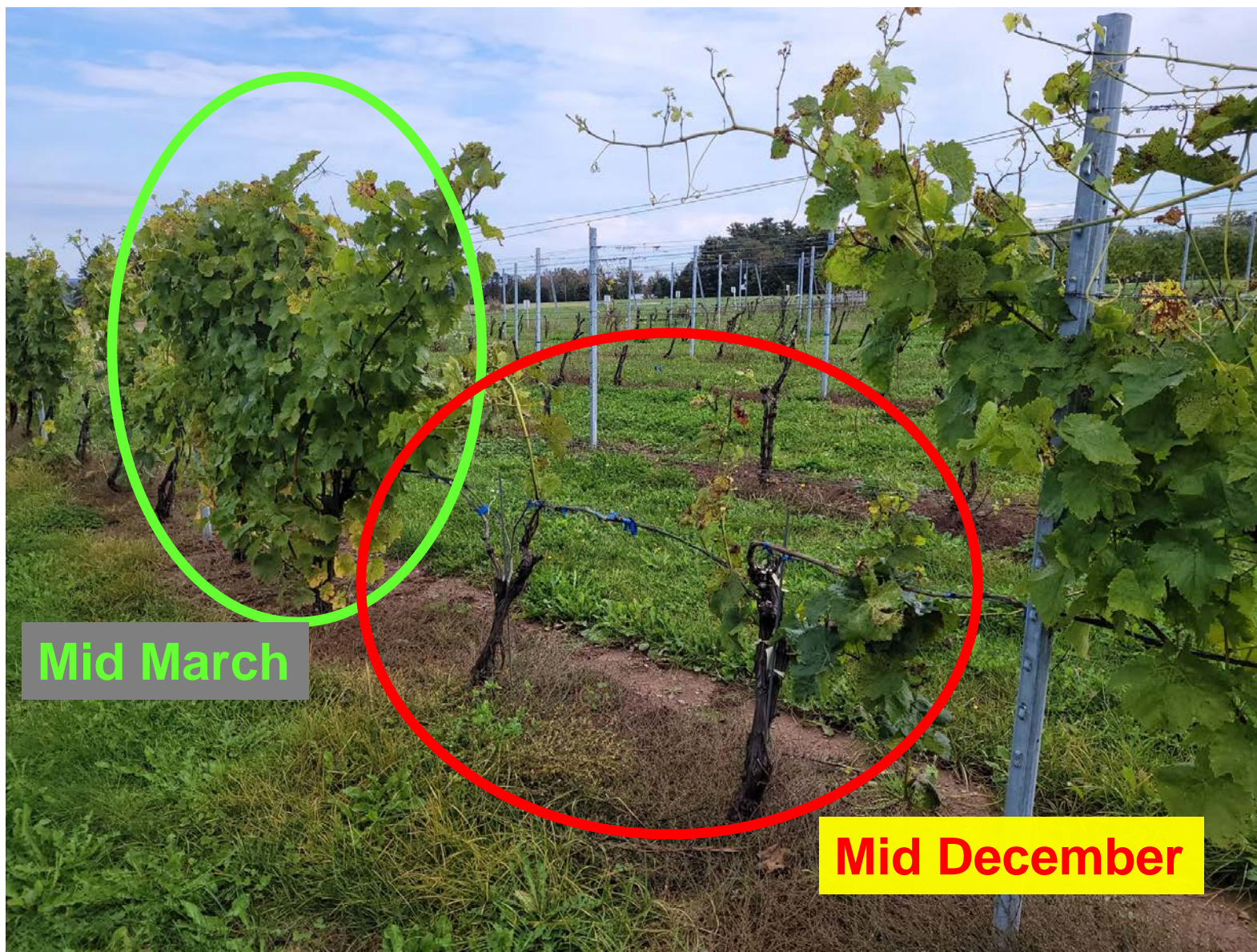


Enhancing acclimation – virus status?

Vinifera vs Hybrid Differences?



Enhancing acclimation – Pruning timing?



Enhancing acclimation – water?

All
Literature
May Not be
Applicable
to NS!



Acknowledgements / contact / questions?

Canadian Grapevine Certification Network
CGCN · RCCV
Réseau canadien de certification de la vigne



Grape Growers'
Association of Nova Scotia



Agriculture and
Agri-Food Canada

Agriculture et
Agroalimentaire Canada



Contact: harrison.wright@agr.gc.ca



Agriculture and
Agri-Food Canada

Agriculture et
Agroalimentaire Canada

Canada