The Perfect Freeze: 2004

(THIS TALK WAS PRESENTED AT THE GENEVA GRAPE FIELD DAY – JULY 2004)

Why was there so much vine damage in January, 2004?
What does it mean for the Finger Lakes?

Bob Pool , Tim Martinson, Steve Lerch, Bill Wilsey, David Chicoine

Winter cold injury is affected by several factors. The most important is the ability of a variety (or clone) to attain and retain cold hardiness. These factors determine the **potential** cold tolerance of a given block. The actual cold hardiness on any specific date is affected by the yield the previous season (in relation to vine capacity), the growing conditions during the previous season, and the weather conditions immediately preceding the day in question. The actual amount of cold damage will also be affected by any special measures a grower might take such as burying canes.

Growing conditions in 2003

The weather in 2003 was wet and cool. Figure 1 shows that total seasonal heat accumulation was much below the 104 year average. Importantly, there was almost no heat accumulation in October or November (Figure 2). This meant harvest was greatly delayed. Many acres of juice grapes were not harvested because the crop never ripened. As a result there was no opportunity for vines to accumulate carbohydrate reserves after harvest (figure 3)

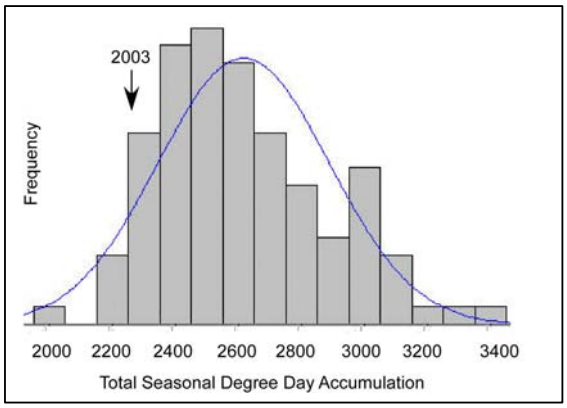


Figure 1. Total yearly degree day accumulation at Geneva, NY during the period 1900 – 2004.

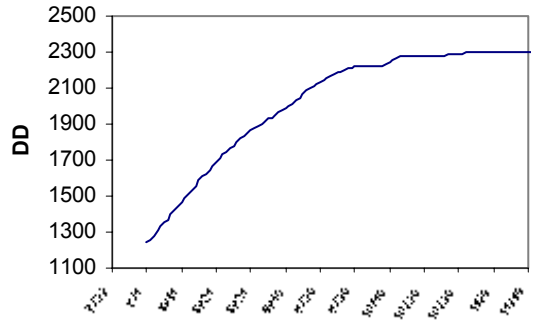


Figure 2. Heat accumulation at Geneva during August through November during 2003.

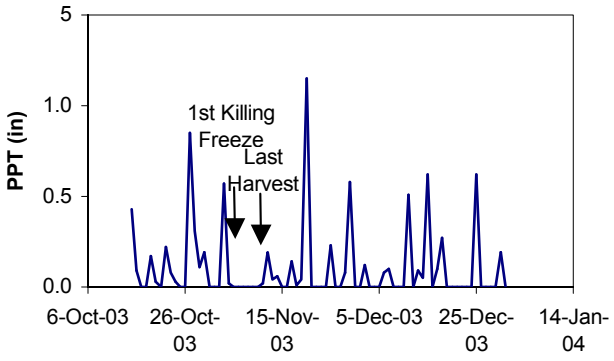


Figure 3 illustrates important facts about the 2003 growing season. The harvest was very late, extending through the second week of November. There was a killing freeze before harvest, meaning that there was no opportunity for post-harvest accumulation of vine carbohydrate reserves.

Also it can be seen that the soil was continuously wet after harvest. This meant there was no opportunity to hill up graft unions before snow fell.

Winter 2003/2004 conditions

As a result of the poor growing season, buds did not achieve full cold hardiness. Steve Lerch measured bud killing temperatures in the last week of December and found that the buds were about 2 – 4 degrees less hardy than expected.

Figure 4 shows the daily maximum and minimum temperatures at Geneva during January, 2004. Temperatures above 50 degrees will cause buds to lose cold hardiness. Temperatures at Geneva exceeded 60 degrees during the first week of 2004. This not only caused a loss of hardiness, it also melted any snow cover, leaving graft unions exposed.

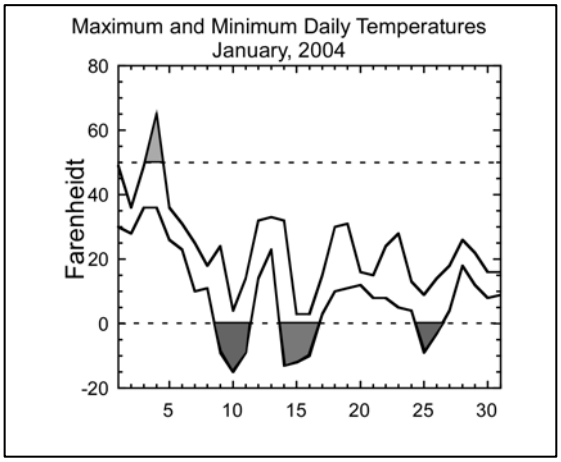


Figure 4. Daily maximum and minimum temperatures at Geneva during January, 2004

Temperatures below zero were frequent in 2004, but the official low temperature at Geneva on January 10 of –15 degrees was sufficient to kill many buds and vines. We recorded a range of temperatures from –16 to –13 in our various vineyard blocks..

Table 1 shows that cluster thinning was able to reduce the amount of cold injury.

Table 1. Effect of Thinning on winter survival of Riesling grapevines at Geneva

Thinning Treatment	2003 Tons/ Acre		Shoots/ Vine		Fruitful Shoot/ Vine		% Live Nodes
1 clu/shoot	2.9	b	48.5	a	21.8	a	17.7
2 clu/shoot	4.5	a	40.2	b	15.4	b	11.3
Not Thinned	4.9	a	36.0	b	12.9	b	13.3

Report from the Finger Lakes

As a result of the extensive injury, Cornell Cooperative Extension, in cooperation with Geneva colleagues, undertook a major evaluation of vineyard injury. There were two different approaches. In one, growers were sent a form and asked to evaluate their injury. A second approach used scouts to make counts and assess damage in a large sample of regional vineyards. This second approach emphasized vinifera varieties.

Table 2. Variety-specific injury and vine loss percentage and estimated 2004 crop loss in the Finger Lakes, based on the **grower survey** of 328 vineyard blocks. (2144 acres, 604 vinifera, 592 hybrid, 948 natives).

Variety	*Total Acres Reported in survey*	*% Replant*	*Overall % of potential crop*	*Replant acres reported*	*Replant acres Extra-polated*
Catawba	301	0%	100%	0	0
Elvira	111	0%	100%	0	0
Other Native	68	0%	94%	0	0
Concord	283	0%	93%	0	0
Delaware	27	0%	86%	0	0
Niagara	158	0%	86%	0	0
Natives	**948**	**0%**	**95%**	**0**	**0**
Marechal Foch	14	0%	100%	0	0
Other Hybrid	162	0%	89%	0	0
Vignoles	16	0%	81%	0	0
Seyval	23	0%	68%	0	0
Vidal	38	1%	65%	1	1
Baco Noir	59	0%	62%	0	0
Aurore	84	0%	55%	0	0
Cayuga White	79	0%	51%	0	0
Chambourcin	10	0%	47%	0	0
Traminette	16	4%	43%	1	1
Rougeon	40	0%	34%	0	0
DeChaunac	51	14%	21%	7	19
Hybrids	**592**	**1%**	**63%**	**8**	**32**
Riesling	181	17%	43%	31	58
Cabernet Franc	66	23%	30%	15	32
Chardonnay	141	22%	24%	31	92
Cabernet Sauv.	42	40%	19%	17	25
Pinot Noir	68	25%	18%	17	35
Other *V. Vinifera*	30	22%	18%	7	9
Gewurztraminer	32	41%	13%	13	19
Pinot Gris	17	9%	12%	2	2
Merlot	27	51%	8%	14	26
V. vinifera	**604**	**24%**	**27%**	**146**	**297**

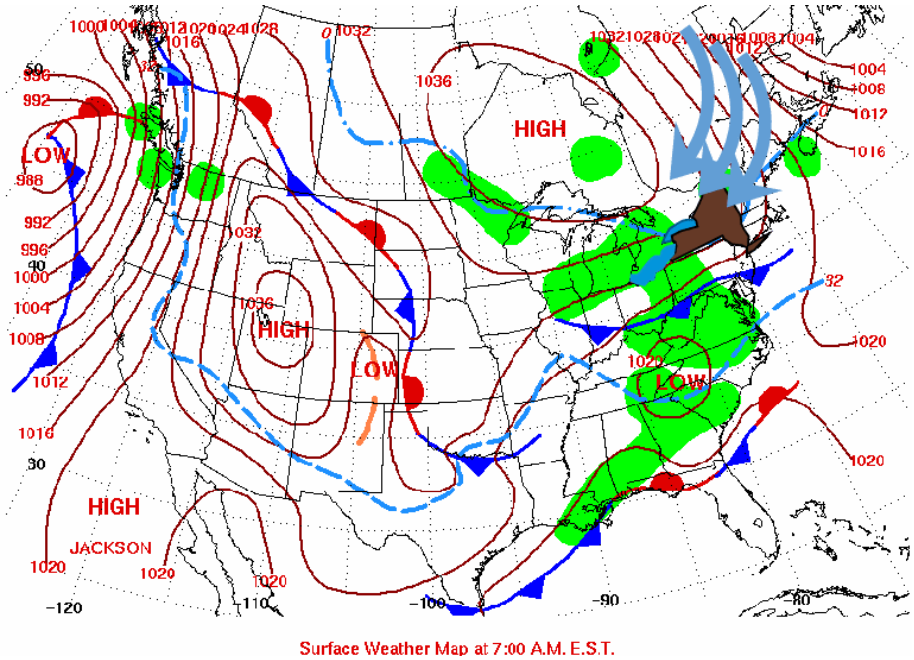
Table 3. Grape Program Survey of estimated crop loss and replant acres based on 30-vine samples from 182* *V. vinifera* and 34 hybrid vineyard blocks.

	No. Blocks	Estimated % of normal crop	% Dead Vines
Merlot	13	13	27
Pinot Gris	6	42	13
Gewurztraminer	17	14	18
Pinot Noir	24	19	22
Cabernet Sauvignon	15	25	24
Chardonnay	36	25	18
CabFranc	31	28	16
Riesling	40	41	9
Other *V. vinifera*	-	18	22
SUM *V. vinifera*	**182***		
Aurore	6	63	2
Baco	4	80	0
CayugaWhite	16	52	2
Chambourcin	1	16	10
DeChaunac	2	56	0
Traminette	5	28	19
Sum Selected Hybrids	**34**		

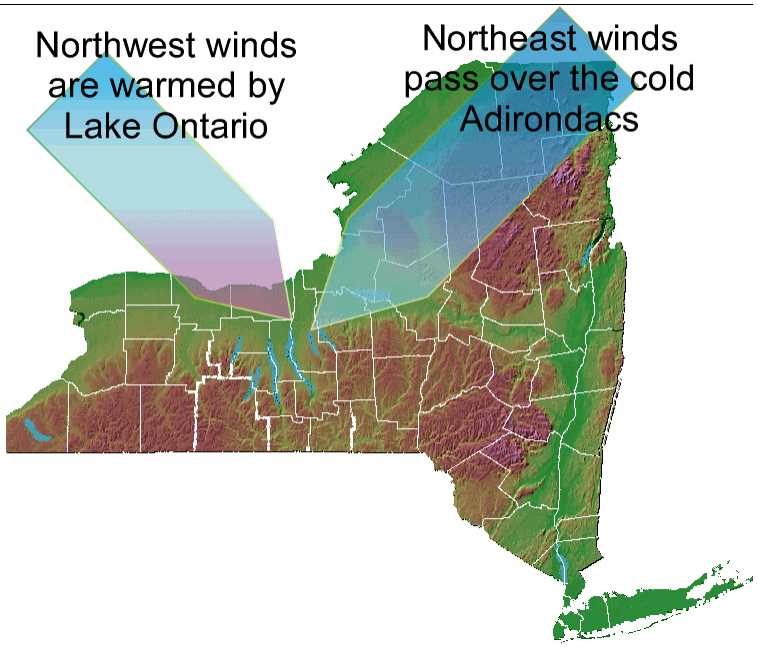
The results of the two surveys were in substantial agreement. Overall, it looks like there will be about a 16% reduction in total tons of grapes produced in the Finger Lakes in 2004, and a 75% reduction in vinifera tons. Because of the impact of the higher value vinifera, it is estimated that the dollar value of grapes produced in the Finger Lakes will be down by 1/3 in 2004. Economic estimates based on the second survey data estimate that growers would suffer a direct loss of almost $6 million in fruit sales in 2004. Depending on the extent of trunk injury and vine death, it may be several years before normal crops will be produced. Future reduced tonnage, replanting and re-training costs may add an additional $3 million to the grower's bill for cold damage.

When the total Finger Lakes grape and wine industry is considered, the impact is even greater. The reduced supply may translate into a loss of as much as $50,000,000 unless some way can be found to make grapes available to wineries with a NY Farm license. Such wineries cannot buy fruit or wine grown outside NY State. Faced with a 2 to 4 year prospect of insufficient grapes, many small wineries may choose to go out of business rather than invest in replanting.

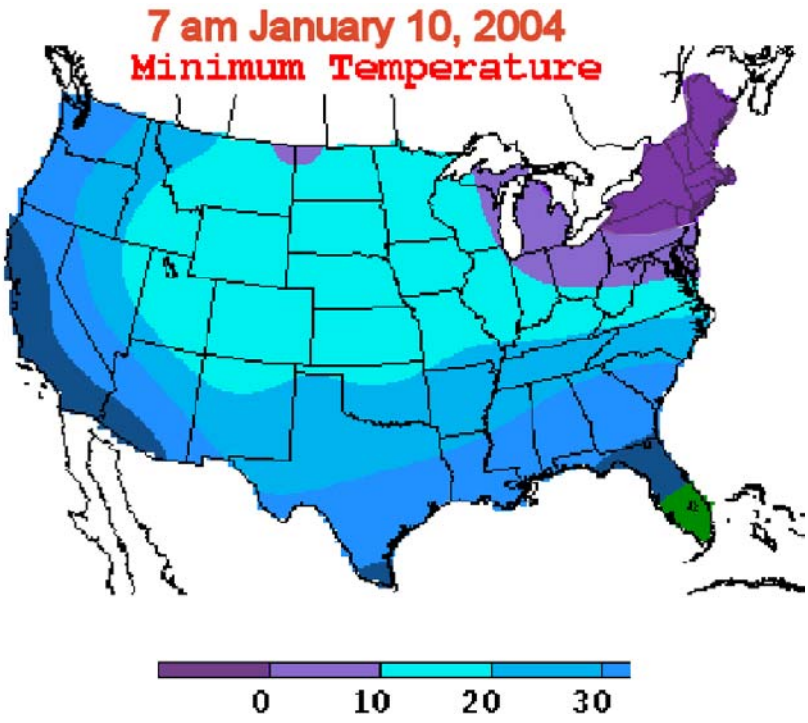
Addendum – data from NOAA regarding Jan 10, 2004 weather



Surface pressure. Note the high pressure in Ontario. The cyclonic winds rotate clock-wise resulting in north-west air flow over northern, NY.



Winter air temperatures in the Finger Lakes are greatly affected by wind direction. Winds from the northwest are warmed when they pass over Lakes Ontario and Erie. Winds from the northeast are not warmed. For vineyards along the margins of the Finger Lakes are also affected by those lakes, but to a lesser extent. When the wind is from the northwest, eastern shores benefit. Winds from the northeast aid vineyards on the western shore.



The US weather map for that day show that lowest temperatures were in NY.