

# Estimates of Wine Grape Crop Reduction due to Winter Injury in New York in 2014

Timothy Martinson, Senior Extension Associate, Dept. of Horticulture  
 Hans Walter-Peterson, Area Extension Educator, Finger Lakes Grape Program  
 Luke Haggerty, Area Extension Educator, Lake Erie Regional Grape Program  
 Jim O'Connell, Extension Educator, Eastern NY Horticulture Program  
 and Mike Colizzi, Community Educator, Finger Lakes Grape Program  
 Cornell Cooperative Extension

**Introduction.** A series of winter low temperature episodes, in January and early February 2014 produced significant bud injury in New York vineyards, affecting cold-sensitive premium *vinifera* grape varieties, and in the Thousand Islands region, cold-hardy Northern Grape varieties. Following the extreme low temperatures in February, we did a survey to determine bud mortality, and then followed up with mid-season surveys to estimate the percentage of crop reduction associated with winter injury.

**Temperatures.** The temperature at which buds freeze varies by time of year, cultivar, and vine condition. Maximum cold hardiness occurs in mid-winter, and low temperatures below 0°F can injure the most sensitive varieties. Table 1 provides general guidelines for low temperatures associated with winter injury.

**Table 1.** Temperatures below which winter bud mortality becomes significant.

Winter Low Temperature	Injury Hazard	Suitable Varieties
0°F	very low	almost any
-5°F	low	most northern vinifera (Riesling, Chardonnay)
-10°F	moderate	hardy vinifera/moderately hardy hybrids
-15°F	high	hardy hybrids/most American
<-15°F	very high	hardy American varieties; Minnesota varieties

**Finger Lakes.** Lows in the Finger Lakes (Fig 1, next page) ranged from -5.8 to -22.0° F, and all the lakes except Seneca and Cayuga had solid ice cover (photo at right). The North End of Cayuga Lake was also frozen down to approximately Varick. Ice cover reduced the amount of low temperature moderation we normally see in the Finger Lakes.

**Lake Erie and Niagara.** Winter lows in Lake Erie ranged from -8 to -10 in Niagara, and -10 to -15 in Chatauqua/Erie.

**North Country.** Temperatures ranged from -26.0° F to -34.0° (Clayton) and -40.0° (Philadelphia, Black Lake).

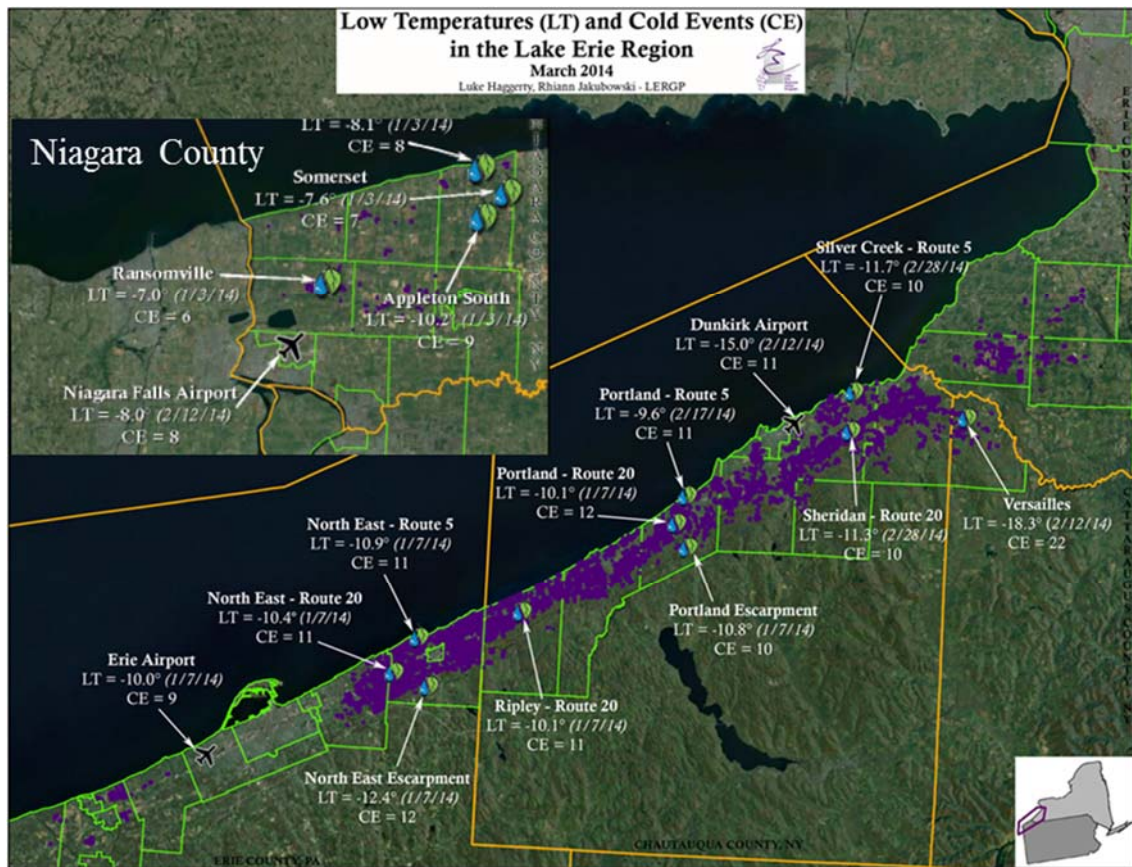
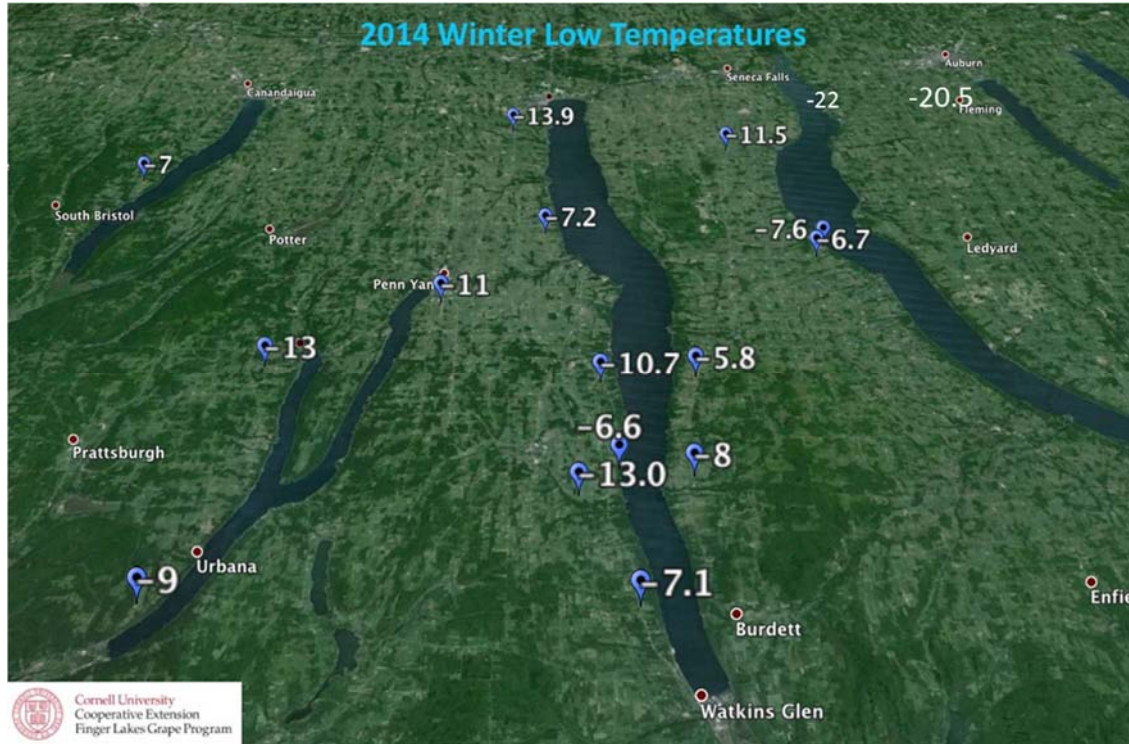
**Winter bud injury:** (See Appendix) Bud samples collected and dissected in February and March showed a wide range of bud mortality (15-100% for vinifera in the Finger Lakes; 41-91% in Lake Erie; and 27-100% in Hudson valley). Temperatures in the Thousand Island region were significantly lower than the median bud-killing temperatures of -24 to -30 F.

**Conclusion:** Significant bud injury in mid-winter led us to recommend pruning adjustments (more buds to compensate for winter injury) and to suspect that significant crop reduction would occur during the 2014 growing season.



Satellite image of Finger Lakes, March 10, 2014

Figure 1. Winter Low Temperatures in the Finger Lakes and Lake Erie Region



## I. Online Grower Survey.

We used an online survey instrument to ask growers statewide about their perception of how winter injury affected their crop potential.

The survey asked growers to report the a) estimated reduction in yield from a 'normal' crop; b) Their acreage of each variety, c) 3 year average tonnage from their vineyards by variety.

We received 65 responses (62 completed), representing 209 *Vinifera* and 159 hybrid blocks.

We divided up surveys by county into regions (Table 1):

Table 1. Response to online grower survey on crop reduction by variety in 2014.

Region	No. Responses	<i>Vinifera</i> Cultivars	Hybrid Cultivars	Counties Represented
Finger Lakes	40	133	110	Ontario, Seneca, Schuyler, Steuben, Yates, Cayuga, Onandaga, Wayne
Hudson Valley	3	25	10	Ulster, Orange, Essex
Lake Erie	7	22	15	Niagara, Erie, Chautauqua
Long Island	4	23	0	Suffolk
North Country	8	6	24	Clinton, Essex, Jefferson, Lewis
<b>Sum</b>	<b>62</b>	<b>209</b>	<b>159</b>	<b>19 Counties</b>

From the survey responses, we calculated 1) Average % crop reduction across all blocks by variety and range (minimum-maximum); 2) Average weighted by acreage represented; and 3) Number and proportion of each variety where % crop reduction exceeded 40%.

### Results.

We divided results into *V. vinifera* (Tables 2-3) and hybrid wine grape (Table 4-5) varieties. *V. vinifera* cultivars are the most cold-sensitive, and also the most likely grapes to be available outside of New York for wineries to purchase.

Those varieties that exceeded the 40% crop reduction threshold are highlighted in red.

***Vinifera*:** Statewide (Table 2), Riesling, Cabernet franc, Pinot noir, Merlot, Lemberger, Gewurztraminer, Pinot gris, Sauvignon blanc, Syrah, and Gruner veltliner showed average crop reduction >40%. The statewide sample included all regions, including Long Island. Sample numbers (>10 responses) were greatest for Riesling, Cab franc, Chardonnay, Pinot noir, Cabernet Sauvignon, Merlot, Lemberger, Gewurztraminer, and Pinot gris. The regional summary (Table 3) highlighted some differences among regions. In general, growers reported more severe injury in the Lake Erie region. Long Island growers reported little or no winter injury-related crop reduction.

**Hybrids:** Growers reported results for 33 distinct cultivars (Table 4). Estimated percent crop reduction exceeded 40% overall for La Crescent, Frontenac Gris, Brianna, Chardonel, Eidelweiss, and Steuben. All of these are 'Cold Climate' cultivars grown primarily in the North country region. Regional summary (Table 5) highlights this trend, with >40% injury centered in the North Country region and varieties grown there.

**Table 2.** Statewide results of online grower survey for *V. vinifera* cultivars.

Cultivar	No. Blocks	Blocks with >40% Injury		Acres	% Crop Reduction Reported (Range)			% Crop Reduction Reported Weighted by Acreage (Range)		
		No.	%		Ave	(Min	Max)	Ave.	Min	Max
Riesling	39	13	33%	319	38	10	90	41	32	51
Cabernet franc	28	13	46%	73	47	10	90	33	23	42
Chardonnay	23	5	22%	187	31	10	90	30	20	39
Pinot Noir	22	9	41%	54	40	10	90	33	24	43
Cabernet sauvignon	16	4	25%	47	32	10	90	29	19	38
Merlot	15	8	53%	46	43	10	90	25	16	35
Lemberger	14	8	57%	12	53	10	90	54	44	63
Gewurztraminer	12	7	58%	24	53	10	90	40	30	49
Pinot Gris	10	5	50%	24	50	10	90	53	44	63
Sauvignon Blanc	8	3	38%	27	47	10	90	32	23	42
Syrah	6	3	50%	11	50	10	90	38	29	48
Gruner Veltliner	3	2	67%	3	63	30	90	68	58	77
Petite Verdot	2	0	0%	2	20	10	30	20	10	29
Dornfelder	1	1	100%	0	70	70	70	70	60	79
Malbec	1	0	0%	7	10	10	10	10	0	19
Pinot Blanc	1	0	0%	3	10	10	10	10	0	19
Trebbiano	1	0	0%	1	30	30	30	30	20	39
Zweigelt	1	0	0%	2	30	30	30	30	20	39



**Table 3.** Results of online grower survey for *V. vinifera* cultivars by region.

Region	Cultivar	No. Blocks	Blocks with >40% Reduction		Acre	% Crop Reduction Reported (Range)			% Crop Reduction Reported Weighted by Acreage (Range)		
			No.	%		Ave	Min	Max	Ave	Min	Max
Finger Lakes	Riesling	29	9	31%	279	35	10	90	38	29	48
	Cabernet franc	19	7	37%	47	41	10	90	36	27	46
	Pinot noir	15	6	40%	50	39	10	90	33	24	43
	Chardonnay	15	3	20%	140	32	10	90	31	22	41
	Lemberger	10	5	50%	9	48	10	90	48	38	57
	Merlot	9	5	56%	22	47	10	90	41	31	50
	Cabernet sauv.	9	1	11%	31	25	10	90	21	11	30
	Gewurztraminer	8	5	63%	18	52	10	90	30	20	39
	Pinot gris	6	3	50%	19	53	30	90	49	40	59
	Sauvignon blanc	4	2	50%	9	60	30	90	51	41	60
	Gruener Veltliner	3	2	67%	3	63	30	90	68	58	77
	Syrah	2	0	0%	4	20	10	30	27	17	36
	Petite Verdot	2	0	0%	2	20	10	30	20	10	29
	Zweigelt	1	0	0%	2	30	30	30	30	20	39
	Pinot Blanc	1	0	0%	3	10	10	10	10	0	19
Hudson Valley	Pinot noir	3	0	0%	1	16	10	30	10	1	20
	Cabernet franc	3	2	67%	2	63	30	90	74	64	83
	Riesling	2	0	0%	2	30	30	30	30	20	39
	Merlot	2	2	100%	0	70	50	90	79	69	89
	Chardonnay	2	1	50%	0	60	30	90	74	64	84
	Syrah	1	1	100%	0	70	70	70	70	60	79
	Sauvignon blanc	1	1	100%	0	90	90	90	90	80	100
	Pinot gris	1	0	0%	0	10	10	10	10	0	19
	Lemberger	1	1	100%	0	70	70	70	70	60	79
	Gewurztraminer	1	0	0%	0	30	30	30	30	20	39
	Dornfelder	1	1	100%	0	70	70	70	70	60	79
	Cabernet sauv.	1	0	0%	0	30	30	30	30	20	39
Lake Erie	Riesling	5	3	60%	32	58	10	90	74	65	84
	Cabernet franc	3	3	100%	4	77	50	90	85	75	95
	Syrah	2	2	100%	3	90	90	90	90	80	100
	Pinot noir	2	2	100%	1	70	50	90	73	63	83
	Lemberger	2	1	50%	3	50	10	90	74	64	84
	Gewurztraminer	2	2	100%	4	90	90	90	90	80	100
	Chardonnay	2	1	50%	13	40	10	70	65	55	74
	Cabernet sauv.	2	2	100%	7	70	50	90	87	77	97
	Pinot gris	1	1	100%	3	90	90	90	90	80	100
	Merlot	1	1	100%	1	50	50	50	50	40	59

Table 3 continued...

Region	Cultivar	No. Blocks	Blocks with >40% Reduction		Acre	% Crop Reduction Reported (Range)			% Crop Reduction Reported Weighted by Acreage (Range)		
			No.	%		Ave	Min	Max	Ave	Min	Max
Long Island	Chardonnay	4	0	0%	34	10	10	10	10	0	19
	Sauvignon blanc	3	0	0%	18	16	10	30	23	13	32
	Merlot	3	0	0%	23	10	10	10	10	0	19
	Cabernet sauv.	3	0	0%	9	10	10	10	10	0	19
	Riesling	2	0	0%	6	10	10	10	10	0	19
	Cabernet franc	2	0	0%	20	10	10	10	10	0	19
	Trebbiano	1	0	0%	1	30	30	30	30	20	39
	Syrah	1	0	0%	4	10	10	10	10	0	19
	Pinot noir	1	0	0%	1	10	10	10	10	0	19
	Pinot gris	1	0	0%	1	10	10	10	10	0	19
	Malbec	1	0	0%	7	10	10	10	10	0	19
	Gewurztraminer	1	0	0%	1	10	10	10	10	0	19
North Country	Riesling	1	1	100%	1	90	90	90	90	80	100
	Pinot noir	1	1	100%	0	90	90	90	90	80	100
	Pinot gris	1	1	100%	1	70	70	70	70	60	79
	Lemberger	1	1	100%	0	90	90	90	90	80	100
	Cabernet sauv.	1	1	100%	1	90	90	90	90	80	100
	Cabernet franc	1	1	100%	0	90	90	90	90	80	100

**Table 4.** Statewide results of online grower survey for hybrid wine grape cultivars.

Cultivar	No Responses	Acreage	% Crop Loss (Unweighted Average)			% Crop Loss (Weighted by Acreage)		
			Ave	Low	High	Ave	Low	High
Vidal blanc	15	68	30	20	39	24	14	33
Cayuga	13	92	39	29	48	37	28	47
Niagara	12	12	30	20	39	30	20	39
Catawba	10	10	18	8	27	18	8	27
Marquette	9	8	23	13	32	27	18	37
Aurore	8	166	27	18	37	15	5	24
Baco Noir	7	100	15	6	25	15	5	24
Corot Noir	7	22	10	0	19	10	0	19
Delaware	7	7	21	11	30	21	11	30
Foch	7	20	12	3	22	13	3	22
Frontenac	6	6	33	23	43	32	23	42
La Crescent	6	3	43	33	53	54	44	64
Noiret	6	20	20	10	29	30	21	40
Chambourcin	5	23	30	20	39	25	15	34
Frontenac Gris	4	3	40	30	49	48	39	58
Seyval Blanc	4	21	15	5	24	16	6	25
Traminette	4	9	25	15	34	24	14	33
Valvin Muscat	4	2	25	15	34	25	15	34
Chancellor	3	16	10	0	19	10	0	19
Geneva Red	3	33	16	7	26	20	11	30
Rougeon	3	35	16	7	26	18	8	27
Vignoles	3	14	30	20	39	33	24	43
Concord	2	2	20	10	29	20	10	29
Elvira	2	2	50	40	59	50	40	59
Brianna	1	1	50	40	59	50	40	59
Chardonel	1	1	90	80	100	90	80	100
DeChaunac	1	7	10	0	19	10	0	19
Diamond	1	1	10	0	19	10	0	19
Edelweiss	1	1	90	80	100	90	80	100
Sabrevois	1	1	10	0	19	10	0	19
St. Pepin	1	1	10	0	19	10	0	19
Steuben	1	1	90	80	100	90	80	100

**Table 5.** Results of online grower survey for *hybrid* wine grape cultivars by region.

Region	Cultivar	No. Blocks	Blocks with >40% Reduction		Acres	% Crop Reduction Reported (Range)			% Crop Reduction Reported Weighted by Acreage (Range)		
			No.	%		Ave	Min	Max	Ave	Min	Max
Finger Lakes	Vidal blanc	12	3	25%	50	31	10	90	27	18	37
	Cayuga	11	5	45%	85	35	10	90	33	24	43
	Catawba	9	0	0%	9	12	10	30	12	2	21
	Aurore	8	3	38%	166	27	10	50	15	5	24
	Niagara	8	2	25%	8	30	10	90	30	20	39
	Baco Noir	6	0	0%	99	16	10	30	15	5	24
	Corot Noir	6	0	0%	22	10	10	10	10	0	19
	Delaware	6	0	0%	6	23	10	30	23	13	32
	Chambourcin	5	1	20%	12	30	10	70	25	15	34
	Foch	5	0	0%	11	14	10	30	16	7	26
	Marquette	4	0	0%	3	10	10	10	10	0	19
	Noiret	4	0	0%	9	10	10	10	10	0	19
	Valvin Muscat	4	0	0%	2	25	10	30	25	15	34
	Chancellor	2	0	0%	2	10	10	10	10	0	19
	Elvira	2	1	50%	2	50	30	70	50	40	59
	Frontenac Gris	2	0	0%	1	10	10	10	10	0	19
	Geneva Red	2	0	0%	33	20	10	30	20	11	30
	Rougeon	2	0	0%	21	10	10	10	10	0	19
	Seyval Blanc	2	0	0%	7	10	10	10	10	0	19
	Traminette	2	0	0%	4	20	10	30	15	6	25
	Vignoles	2	1	50%	5	30	10	50	41	31	50
	Concord	1	0	0%	1	10	10	10	10	0	19
	DeChaunac	1	0	0%	7	10	10	10	10	0	19
	Diamond	1	0	0%	1	10	10	10	10	0	19
Frontenac	1	0	0%	1	10	10	10	10	0	19	
La Crescent	1	0	0%	0	10	10	10	10	0	19	
Hudson Valley	Baco Noir	1	0	0%	1	10	10	10	10	0	19
	Cayuga	1	0	0%	1	30	30	30	30	20	39
	Corot Noir	1	0	0%	0	10	10	10	10	0	19
	Foch	1	0	0%	0	10	10	10	10	0	19
	Geneva Red	1	0	0%	0	10	10	10	10	0	19
	La Crescent	1	0	0%	0	10	10	10	10	0	19
	Noiret	1	0	0%	0	30	30	30	30	20	39
	Rougeon	1	0	0%	14	30	30	30	30	20	39
	Traminette	1	0	0%	4	30	30	30	30	20	39
	Vidal blanc	1	0	0%	10	10	10	10	10	0	19



Table 5 continued...

Region	Cultivar	No. Blocks	Blocks with >40% Reduction		Acres	% Crop Reduction Reported (Range)			% Crop Reduction Reported Weighted by Acreage (Range)		
			No.	%		Ave	Min	Max	Ave	Min	Max
Lake Erie	Niagara	3	0	0%	3	10	10	10	10	0	19
	Seyval Blanc	2	0	0%	14	20	10	30	19	10	29
	Vidal blanc	2	1	50%	8	30	10	50	20	10	29
	Cayuga White	1	1	100%	6	90	90	90	90	80	100
	Chancellor	1	0	0%	14	10	10	10	10	0	19
	Concord	1	0	0%	1	30	30	30	30	20	39
	Delaware	1	0	0%	1	10	10	10	10	0	19
	Foch	1	0	0%	10	10	10	10	10	0	19
	Noiret	1	1	100%	10	50	50	50	50	40	59
	Traminette	1	0	0%	2	30	30	30	30	20	39
	Vignoles	1	0	0%	10	30	30	30	30	20	39
	North Country	Frontenac	5	2	40%	5	38	10	90	37	27
Marquette		5	2	40%	6	34	10	90	35	25	45
La Crescent		4	3	75%	3	60	10	90	62	52	71
Frontenac Gris		2	2	100%	2	70	50	90	70	60	80
Brianna		1	1	100%	1	50	50	50	50	40	59
Catawba		1	1	100%	1	70	70	70	70	60	79
Chardonel		1	1	100%	0	90	90	90	90	80	100
Edelweiss		1	1	100%	1	90	90	90	90	80	100
Niagara		1	1	100%	1	90	90	90	90	80	100
Sabrevois		1	0	0%	1	10	10	10	10	0	19
St. Pepin		1	0	0%	1	10	10	10	10	0	19
Steuben		1	1	100%	0	90	90	90	90	80	100

## II. Cornell Cooperative Extension 30-vine Survey.

**Methods.** We visited 188 vineyard blocks across NY, and did a 30-vine sample in each one. For each vine, we rated them on a 0-5 scale by estimating the number of clusters per vine.

Rating	Number of clusters
0	0
1	1-10
2	11-20
3	20-30
4	31-40
5	>40

We then used ratings to calculate ‘% of a Full Crop’, based on the assumption that >40 clusters per vine (roughly equal to 8 lb/vine of fruit, at 0.2 lb/cluster, or 3.2 tons per acre at 6x9 ft spacing) would be the equivalent of a full crop.

**By region:** We surveyed 91 blocks in the Finger Lakes, 18 blocks in the Hudson Valley, 63 blocks in the Lake Erie Region, and 16 in the North Country. We did not survey in the Long Island region, because Long Island didn’t suffer any significant winter injury.

**Results** (Table 6-7 below) showed an overall lower estimate than did the grower self-reporting surveys. Those sites with an estimated >40% crop reduction are highlighted in **Red**.

**V. vinifera.** All 11 *V. vinifera* varieties (146 blocks surveyed) showed cluster counts indicating >40% crop reduction on average (Table 6). Regional breakdowns (Table 7) showed the same results, with the exception of the three Merlot blocks in the Hudson Valley, which were nonetheless close (39%) to the 40% threshold.

**Hybrids** We surveyed 42 blocks, with a significant concentration in the North Country (Table 7). Overall, four hybrid varieties (Brianna, Frontenac, La Crescent and Noiret) exceeded the 40% threshold. Regional breakdown (Table 7) showed that in the North Country (Thousand Islands region), Brianna, Frontenac, La Crescent, and Marquette exceeded the 40% threshold.

**Table 6.** Statewide “30-vine” survey estimates, based on cluster number per vine of *V. vinifera*, Hybrid, and *Labrusca*-type wine grape varieties.

Class	Variety	No Blocks	Blocks with >40% Crop Reduction		Estimated Average Clusters Per vine (>40=full crop)			Estimated Percent Crop Reduction		
			No.	%	Ave	High	Low	Ave	Low	High
<i>V. vinifera</i>	Riesling	37	21	57%	19	23	16	53%	44%	61%
	Cabernet Franc	23	15	65%	17	20	14	58%	50%	65%
	Pinot noir	20	17	85%	11	14	8	73%	65%	79%
	Chardonnay	18	15	83%	15	18	12	63%	54%	71%
	Gewurztraminer	14	10	71%	14	17	12	66%	59%	71%
	Merlot	12	8	67%	16	19	13	60%	53%	67%
	Pinot gris	7	5	71%	10	13	8	75%	69%	80%
	Cabernet Sauvignon	6	4	67%	16	19	13	61%	53%	68%
	Lemberger	6	5	83%	15	18	12	64%	55%	71%
	Syrah	2	1	50%	15	17	13	62%	57%	67%
	Gamay Noir	1	1	100%	0	0	0	100%	99%	100%

Hybrid/ <i>Labrusca</i>	Marquette	7	3	43%	26	29	22	35%	26%	45%
	Brianna	4	3	75%	17	21	14	57%	48%	65%
	Frontenac	4	2	50%	22	26	18	46%	35%	56%
	La Crescent	4	3	75%	11	15	9	72%	64%	78%
	Noiret	4	4	100%	15	20	12	62%	51%	71%
	Seyval blanc	3	0	0%	34	37	30	15%	7%	24%
	Vidal blanc	3	1	33%	27	30	23	33%	24%	42%
	Niagara	2	0	0%	39	41	35	3%	0%	13%
	Traminette	2	1	50%	27	30	23	33%	24%	43%
	Aurore	1	0	0%	35	38	31	13%	5%	23%
	Catawba	1	0	0%	37	39	33	8%	2%	18%
	Concord	1	0	0%	25	30	21	38%	26%	48%
	Delaware	1	0	0%	32	36	28	21%	11%	31%
	Diamond	1	0	0%	36	39	32	11%	4%	21%
	Edelwiss	1	0	0%	43	44	39	0%	0%	3%
	Elvira	1	0	0%	42	43	38	0%	0%	6%
	Frontenac gris	1	0	0%	36	39	32	10%	2%	20%
	Vignoles	1	0	0%	33	36	29	19%	11%	28%

**Table 7.** Results of Cornell 30-vine survey with cluster estimates by region.

Region	Variety	No. Sites	Sites with >40% crop reduction		Estimated Average Clusters Per vine (>40=full crop)			Estimated Percent Crop Reduction		
			No	%	Ave	High	Low	Ave	Low	High
Finger Lakes	Riesling	21	8	38%	24	27	20	41%	32%	50%
	Cabernet franc	16	10	63%	19	22	15	53%	45%	61%
	Chardonnay	13	10	77%	17	21	14	57%	48%	66%
	Pinot noir	13	10	77%	12	15	10	70%	62%	76%
	Gewurztraminer	11	7	64%	18	21	15	56%	48%	63%
	Merlot	8	6	75%	15	17	12	63%	57%	70%
	Lemberger	5	4	80%	17	21	14	58%	48%	66%
	Pinot gris	4	2	50%	16	20	14	59%	50%	66%
Hudson Valley	Riesling	5	4	80%	17	21	14	58%	48%	65%
	Cabernet franc	3	2	67%	13	15	11	67%	63%	73%
	Pinot noir	3	3	100%	11	14	9	72%	64%	78%
	Chardonnay	2	2	100%	9	12	7	77%	71%	82%
	Concord	1	0	0%	25	30	21	38%	26%	48%
	Gamay noir	1	1	100%	0	0	0	100%	99%	100%
	Gewurztraminer	1	1	100%	0	0	0	100%	100%	100%
	Marquette	1	1	100%	14	19	10	65%	53%	75%
	Merlot	1	1	100%	0	0	0	100%	100%	100%

Lake Erie	Riesling	11	9	82%	11	14	9	72%	64%	78%
	Cabernet sauvignon	6	4	67%	16	19	13	61%	53%	68%
	Cabernet franc	4	3	75%	12	16	9	69%	60%	76%
	Noiret	4	4	100%	15	20	12	62%	51%	71%
	Pinot noir	4	4	100%	7	10	4	84%	76%	90%
	Chardonnay	3	3	100%	9	13	6	77%	68%	85%
	Merlot	3	1	33%	24	28	21	39%	30%	48%
	Pinot gris	3	3	100%	1	3	0	96%	93%	99%
	Seyval blanc	3	0	0%	34	37	30	15%	7%	24%
	Vidal blanc	3	1	33%	27	30	23	33%	24%	42%
	Gewurztraminer	2	2	100%	0	0	0	100%	100%	100%
	Marquette	2	0	0%	41	42	37	0%	0%	8%
	Niagara	2	0	0%	39	41	35	3%	0%	13%
	Syrah	2	1	50%	15	17	13	62%	57%	67%
	Traminette	2	1	50%	27	30	23	33%	24%	43%
	Aurore	1	0	0%	35	38	31	13%	5%	23%
	Catawba	1	0	0%	37	39	33	8%	2%	18%
	Delaware	1	0	0%	32	36	28	21%	11%	31%
	Diamond	1	0	0%	36	39	32	11%	4%	21%
	Edelwiss	1	0	0%	43	44	39	0%	0%	3%
Elvira	1	0	0%	42	43	38	0%	0%	6%	
Frontenac gris	1	0	0%	36	39	32	10%	2%	20%	
Lemberger	1	1	100%	3	5	1	93%	88%	97%	
Vignoles	1	0	0%	33	36	29	19%	11%	28%	
North Country	Brianna	4	3	75%	17	21	14	57%	48%	65%
	Frontenac	4	2	50%	22	26	18	46%	35%	56%
	La Crescent	4	3	75%	11	15	9	72%	64%	78%
	Marquette	4	2	50%	21	26	18	46%	36%	55%

### Summary:

Results of both the online grower survey and '30-vine' CCE survey are in general agreement, and the tables highlight which varieties passed the 40% crop reduction threshold, according to our estimates. Where the two surveys disagree, we have more confidence in our 30-vine survey results, where we actually did formal estimates of crop reduction. We don't know what information grower survey respondents used to make their overall estimates, which tended to be lower than ours.

There may be biases in the survey that slightly overestimate the overall percentage of crop reduction. We based these estimates on cluster counts, and thereby got an accurate index of how cluster number was reduced and in what proportion of the vineyards surveyed, but we cut off the maximum at 40 clusters per vine. Although 40-45 clusters per vine is a good indicator of a 'full crop', some undamaged blocks could have up to 60-80 clusters per vine. We also didn't take into consideration the potential increase in cluster size (berry weight and berry number) that typically occurs when vines have a small crop.

Even with these potential biases, we're confident that our results are consistent, and the best we could practically accomplish based cluster counts alone. Cluster number typically explains 70-80% of the variation in yield, with the other 20-30% of variation being due to cluster weight.

## Appendix

### Winter Bud Injury in the Finger Lakes, Lake Erie and Hudson Valley Regions

Hans Walter-Peterson, Luke Haggerty, Mike Collizi, Jim O'Connell and Tim Martinson  
Finger Lakes, Lake Erie, and Statewide Viticulture Extension Programs  
Cornell University

Several sub-zero winter cold events have led to varying levels of grapevine bud injury, primarily in central and Western NY. Regional extension programs have collected and dissected buds from 74 (Lake Erie) and 130 (Finger Lakes) vineyards, respectively.

Results are shown in the following tables from each region. In each block, 100 buds were dissected to determine whether the primary bud was alive or dead. For each variety we report:

1. The number of vineyards surveyed
2. The range of bud mortality (Lowest-Highest % bud injury)
3. The overall average % bud mortality.
4. Variety 'class' – Varieties are grouped into Native (more hardy), Hybrids (moderately hardy) and Vinifera (more tender)

#### 2014 Finger Lakes Grape Bud Damage

Variety	Samples Collected	Range of Bud Damage (%)	Average % Primary Bud Damage
<b>Native</b>			
Catawba	1	N/A	9
Concord	12	1-43	21
Niagara	8	5-18	9
<b>Hybrid</b>			
Cayuga White	15	12-95	43
Traminette	3	40-62	48
<b>Vinifera</b>			
Cabernet Franc	16	15-100	58
Cabernet Sauvignon	4	71-100	85
Chardonnay	13	44-100	75
Gewürztraminer	12	14-86	64
Grüner Veltliner	3	47-99	81
Lemberger	5	19-100	57
Merlot	8	42-99	76
Pinot Gris	7	9-98	57
Pinot Noir	14	17-100	66
Riesling	20	13-94	70
Sauvignon Blanc	1	N/A	39



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## 2014 Lake Erie Region Grape Bud Damage

Variety	Samples Collected	Range of Bud Damage (%)	Average % Primary Bud Damage
<b>Native</b>			
Catawba	2	18-44	34%
Concord	18	7-37	14%
Diamond	2	24-45	34%
Fredonia	3	22-30	26%
Niagara	16	7-49%	26%
<b>Hybrid</b>			
Aurore	1	N/A	26%
Chambourcin	1	N/A	60%
Noiret	3	18-62	44%
Seyval	3	31-43	41%
Traminette	4	29-36	34%
Vidal	2	42-48	44%
Vignoles	2	13-17	15%
<b>V. vinifera</b>			
Cabernet Franc	4	62-91	76%
Cabernet Sauvignon	4	67-87	73%
Gewurztraminer	1	N/A	83%
Lemberger	1	N/A	87%
Merlot	1	N/A	97%
Pinot Gris	3	47-72	67%
Riesling	6	41-70	61%



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Hudson Valley

*Jim O'Connell, Eastern NY Horticulture Team*

2014 Lower Hudson Valley Bud Damage (Excluding HVL)			
Variety-Vinifera	Samples Collected	Range of Bud Damage (%)	Average % Primary Bud Damage
Cabernet Franc	5	27-100	71
Chardonnay	4	20-89	41
Pinot Noir	4	20-90	53
Riesling	3	21-55	36



**Discussion.**

- **Vinifera.** as expected, had the highest overall bud injury average. In the Finger Lakes by variety the average ranged from 57%-58% (Cab Franc and Pinot Gris) to 85% (Cabernet Sauvignon). Riesling averaged 70% (20 vineyards sampled). Overall average across varieties (table below) was **66%**. In the Lake Erie and Niagara co. region, the range was 61% (Riesling) to 93% (Merlot, only 1 vineyard sampled).
- **Hybrids.** In FL only Cayuga white and Traminette sampled, average was 43-48%. Lake Erie: wider range sampled, range 15% (Vignoles) to 60% (Chambourcin). Overall average was **43%**.
- **Natives.** In Finger Lakes, variety averages ranged from 9% (Niagara) to 21% (Concord, several blocks). In Lake Erie, range was 14% (Concord) and 26% (Niagara). Overall FL average was **16%**.
- **Variability:** There is a lot of variability, even in the *Vinifera* cultivars. The table below shows histograms with the distribution of % bud mortality in 10% increments (Finger Lakes only). Note that most of the Natives are 0-20%; Hybrids in 10-40%, and the *Vinifera* has two peaks: one at 40-50% bud injury and one at 80-90% bud injury. That means we have two distinct situations. One set of vineyards has ‘moderately severe’ injury (30-60%) and the other has ‘severe injury’ (70-100%).
- **Temperature maps:** Maximum low temperatures in the Finger Lakes (See map on last page) ranged from -6 to -13 °F. This map only covers W Cayuga to Canandaigua lake, and sites closest to the lakes. E Cayuga and Skaneateles Lake vineyards were reported to have lows in the -16 to -18 °F range. Lake Erie winter lows (see map) ranged from -9.6 to -18.3 °F.

**Impact:**

- We consider 10% bud mortality to be ‘normal’, and that vines will compensate for anything < 20% bud injury (no adjustment needed).
- From 20-70%, we recommend leaving an equivalent amount of ‘extra buds’ to compensate.
- Above 70%, we recommend only minimal pruning, with adjustments after budburst.
- Even when growers leave extra buds, yield will probably be lowered (i.e. if I leave 60 buds instead of 30 buds when 50% of buds are injured, I may get 70 or 80% of a normal crop, but not 100%)
- With over 50% bud injury, it’s likely that growers will have to plan on renewing (replacing) trunks.
- We will not know how much the bud injury has affected the crop until sometime in late May to early June, after the vines have started growing. There may be trunk injury (harder to evaluate in the winter) and some injured vines may develop crown gall lesions and mid-season vine collapse if the trunk vascular tissue is injured.

Table: Distribution of % Bud injury from Native, Hybrid, and Vinifera varieties in the Finger Lakes

