

FINGER LAKES Vineyard Notes

Newsletter 11

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WINTER PROTECTION IN THE FINGER LAKES - 2005

Timothy E. Martinson

Following winter injury in 2004 and 2005, growers have returned to hilling up vineyards, and many are experimenting with burying canes for the most cold-sensitive varieties. In this article, I will discuss various options and equipment used in winter protection, along with experimentation that growers are doing for this important task.

Hilling up is the traditional method for protecting renewal tissue near the graft union from winter injury. While it has worked well and provides important protection for renewing vines, it does not protect the vine's fruiting potential for the coming crop year. Burying canes is an additional step that may protect fruiting canes and buds, allowing at least a partial crop following winter injury episodes.

Despite its demonstrated usefulness as a winter protection strategy, growers generally dislike the process of hilling up and take out, because it takes a lot of time, equipment wears out fast, and its easy to 'take out' a few vines with the 'takeout' hoe. Through the mild 90s, I often heard the comment that 'I lose more vines to the takeout hoe than I do to winter

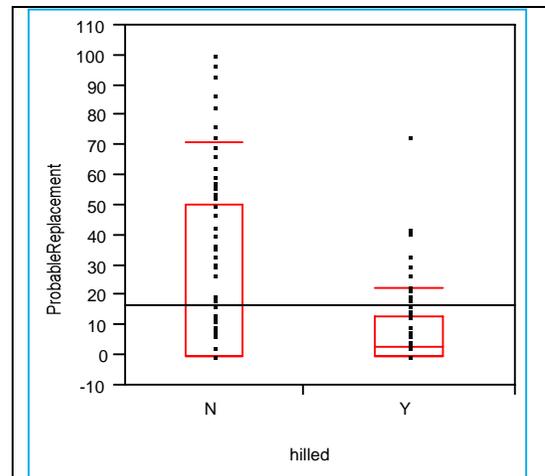


Figure 1. % Vine Replacement as affected by hilling up. The boxes show the range of expected replants for unhilled (n) versus hilled (y) vines. Vines that were hilled up have much lower estimated % vine replacement than those that were left unhilled. Number of blocks examined was 185.

injury'. While they recognized the need to do it in young vineyards, many growers stopped hilling up after the fourth or fifth year of production. Its safe to say that attitude has changed after 2004.

Value of Hilling Up - 2004 experience. In 2004 we completed a survey of 252 vineyard blocks for winter injury. Of this total, 185 were grafted *vinifera* varieties. Between 200 and 300 acres of vines were killed, and many more lost fruiting potential when aboveground portions of the vines were killed, but renewals were present. Most of these vines had partial production in 2005, and should return to full production for 2006. We kept track of which blocks were hilled up, and which were not.

Hilling up clearly prevented loss of vines (**Figure 1**). Hilled-up vineyards averaged 8.5% dead vines, while unhilled vineyards averaged 27.5% dead vines.

Moreover, the range of winter injury was much greater in unhilled vineyards (total range = 0 to 100%, 90% fell between 0-70%) than in hilled vineyards (total range= 0-50%; 90% fell between 0 to 20%). Based on average vine loss, hilling up reduced crop loss and wine value by \$4800 and \$18,600 per acre, respectively. If hilling up protects against vine loss in only one year out of ten, the returns from this investment would still be considerable.

Value of a missing vine. What is the value of production from a missing vine? I calculated some numbers for *V. vinifera* and hybrid varieties, assuming yields of 3.5 T at \$1400 per ton for *vinifera* and 5 T for hybrids at \$400 per ton. For *V. vinifera* growers, each killed vine accounts for about \$32 in lost production and replanting costs, while each hybrid vine showed \$15.50 in per-vine losses. This assumes immediate replacement of vines, and full production in the 3rd year after planting. For wineries that grow their own grapes, associated losses in wine production (Assuming \$12 retail for *vinifera* and \$7 retail for hybrids, with about 70% sold ‘retail’ and 30% sold ‘wholesale’) were much greater. Added value of wine per missing vine totaled \$123 for *vinifera* and \$110 for hybrids. This brought the total cost per missing vine - from vineyard to bottle - to \$155 for *vinifera* and \$125 for hybrids.

Cost of hilling up. According to Jerry White’s estimates of vineyard establishment and growing costs, hilling up takes about 1.7 hours of labor per acre at a cost of \$38, while ‘take out’ involves 2.5 hours of labor and costs \$66. Thus the total cost of this operation is around \$104 per acre. This is a significant cost, but when weighed against the potential losses to unprotected vines, it is well worth the time and efforts growers devote to it.

Tips and Equipment Used. The objective of hilling up is to provide an insulating barrier of soil that will buffer temperature changes in above-ground trunks, canes, and buds exposed to the atmosphere. Most growers adjust equipment to maintain a 2-4 inch layer of soil above the graft union. Equipment used to do this varies, but most growers seem to use an offset plow (Figure - A&B) mounted behind the rear wheel of the tractor. Several growers have ‘Baldwin’ hoes (C), which can also be used for takeout, and have the advantage that its easy for the operator to see what the plow is doing. Unfortunately, it was designed for, and only fits vintage ‘farmall’ offset cultivating tractors. Finally, Finger Lakes Harvester and Lakeview Harvesters of Canada recently demonstrated a harvester-mounted (D) implement that does one row in



A



B



C



D

Hilling Up equipment. (A & B) Offset plow; (C) ‘Baldwin’ takeout mounted on offset cultivating tractor. (D) Coulters mounted on Gregoire harvester, for one-pass hilling up.

a single pass - at speeds of 4 miles per hour, which would significantly speed up the amount of acres that could be covered in a day.

With a conventional offset plow, it's necessary to hill up on both sides of the vine (2 passes) to get complete coverage of the graft union. Don't do it when the soil is too wet, as the soil may lump up and leave air pockets that will persist during the winter.

The 'takeout' operation must be done with some sort of pivoting grape hoe (not the offset plow), and requires more skill. I hope to cover it in detail in a future article.

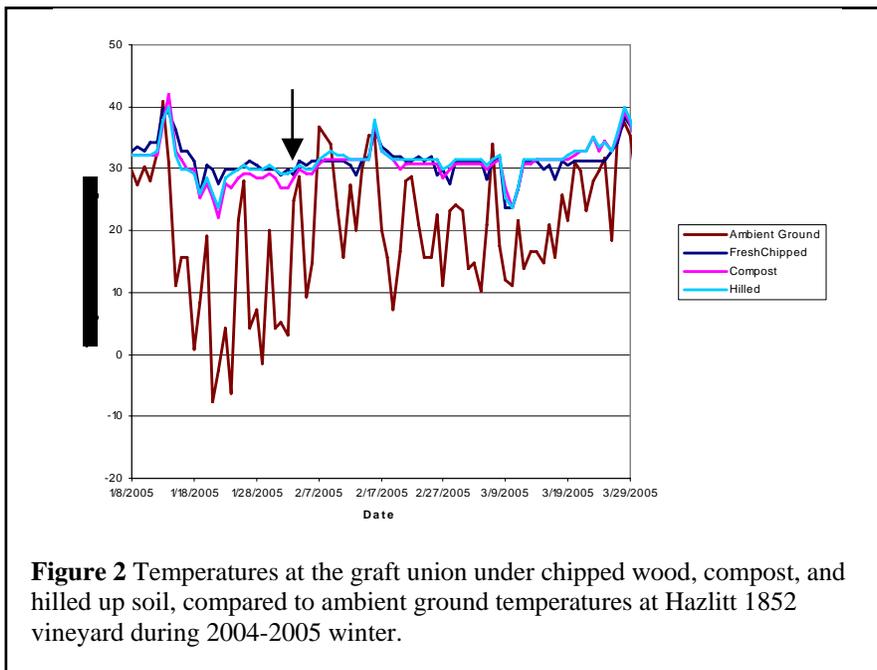


Figure 2 Temperatures at the graft union under chipped wood, compost, and hilled up soil, compared to ambient ground temperatures at Hazlitt 1852 vineyard during 2004-2005 winter.

Alternatives to Hilling Up. For various reasons, several growers and wineries have experimented with other ways of covering up graft unions. Most commonly this involves hand-shoveling sawdust, wood chips, and pumice (hopefully composted) to form a mound over the graft union. Does this provide adequate protection and how much does it cost?

We tried to answer some of these questions in a small study last winter. Taking advantage of what growers were planning on doing anyway, we measured how temperatures under 'mounded' materials compared to those under hilled-up soil. We also tried to get some estimates of the time, materials and labor involved in mounding up.

Hazlitt 1852 Seneca Rd Vineyard. John Santos established several different mulch treatments at a vineyard just north of Valois. He applied five alternate materials with a side-discharge mulch applicator (Mill Creek machine), as well as hilling up conventionally with a Rinaldi grape hoe. Materials applied included Compost, fresh wood chips, aged wood chips, sawdust, and black bark chips. (Pictures on following page).

Insulation. We put datalogging thermometers right at the graft union underneath the mounds, and also at ground level exposed to ambient air temperature. Figure 2 shows resulting temperatures. Temperatures under the mounds hovered around 28-30 degrees F for most of the winter, dropping down to the low 20s during the January 18-19 cold episode, when air

temperature got down to -8 degrees. At that time, temperatures under the fresh chipped wood were slightly higher than under 'compost' or 'hilled' treatments, indicating it was slightly better as an insulator. All treatments (hilled vs. various mounded materials) essentially insulated the graft unions equally well.

How much material was applied? Using a bucket and scale, we estimated the weight per vine and acre and the volume (yards) of materials applied. Both of these, of course, are of interest where hauling and application is involved.

Table 1. Quantity (Tons /acre) and Volume (Yards/acre) of materials applied to Hazlitt 1852 Seneca Rd. Vineyard in 2004.

Material	lb/ vine	Tons, /acre	Lb per Yard	Yd per acre
Shredded Bark Mulch	44.1	17.8	749	47
Sawdust	34.8	14.0	559	50
Aged Wood chips	41.7	16.8	582	58
Fresh Wood chips	36.0	14.5	475	61
Compost	45.3	18.3	1224	30

We estimated that between 14 and 18 T/acre of materials were hauled in and applied to the vineyard, or about 35-45 lb/vine. The materials varied in density, so the number of yards per acre (volume) of material ranged from 30 to 60 yards. This is a lot of material, if we consider a semi-truckload to be about 30 yards.

Table 1. Cost for applying mulching materials to mounds over graft unions at a Pinot noir vineyard near Valois, NY in 2004

material	Material cost/acre	cost per vine	cost per acre	labor cost/acre	Machine cost/acre
manure @ \$50/load	\$490	\$1.29	\$891	\$159	\$242
shredded bark @ 39 yards/load	\$835	\$1.79	\$1,236	\$159	\$242
bark @ 27.78 yards/load	\$1,045	\$2.09	\$1,446	\$159	\$242
sawdust @ 27.78 yards/load	\$1,152	\$2.25	\$1,552	\$159	\$242
aged wood chips @ 27.78 yards/load	\$1,075	\$2.14	\$1,475	\$159	\$242
fresh wood chips @ 27.78 yards/load	\$1,092	\$2.16	\$1,493	\$159	\$242

Cost estimates provided by John Santos, vineyard manager at Hazlitt 1852 Vineyards, Hector, NY

Cost. At the Seneca Road Pinot Noir vineyard, materials were applied with a rented ‘Mill Creek’ row mulcher. Labor (@ \$10/hour) was estimated at about 15 hours per acre, while the per-acre machine cost was \$242 (including tractor costs). According to John Santos, the application procedure was more time-consuming than hilling-up, because the machine had to stop at every vine, and it was necessary to do both sides to obtain adequate coverage. There was hand followup labor as well. Costs of purchase and trucking of the materials, obtained locally, ranged from \$500 to \$1000 per acre. If the materials were free, it would still cost \$400 per acre in machinery and labor to apply materials in this manner.

At two Cayuga Lake vineyards (Swedish Hill and Buttonwood Creek), materials were applied by hand. Swedish Hill has covered about 4 acres of *vinifera* with aged pomace for several years, while Buttonwood Creek owner Ken Riemer has materials available through his Trumansburg-based landscaping and garden store business. Applying mulch or composted pomace involved 3 workers (1 on tractor, 2 behind wagon shoveling material on to vines) for about 1 day per acre. It provided excellent protection to the graft union (see picture from 2004 below).



Regrowth following pomace for graft protection 2004

Straw mulch under rows. At the convention last March, Tom Zabadal described application of straw mulch, both to cover graft unions and also to insulate canes that are laid down on the ground for the winter. A few Finger Lakes growers are trying it this year. He reported using 125 small square bales per acre, with total costs per acre (including laying down canes, labor, twine for ‘tucking’ canes) of about \$590 per acre (not counting cost of straw) or \$943 per acre with straw @\$2.50 per bale.



Applying chopped straw mulch at a farm in Michigan. Photo courtesy Tom Zabadal.

Bottom line on hilling alternatives: Insulating graft unions and renewal buds above the graft union is an economically important task for ensuring that cold-sensitive vines survive winter cold temperature episodes. Hilling up soil to protect graft unions is still the least expensive way to do this, at somewhere between \$100 and \$200 per acre for the ‘hill-up’ and ‘takeout’ operations. Bringing in material, whether straw or other mulch material, is costly, and the quantities required for more than small plantings may be prohibitive. It may require many loads of material per acre, which if purchased will run \$300 to \$1000 per acre. Unless you have a ready source of free stuff (like pomace) nearby and don’t have to pay for the materials, it will cost you more to haul and apply it. Soil, after all is right there in the vineyard, and doesn’t need to be moved more than a foot or two.

GROWERS EXPERIMENT WITH BURYING CANES

Timothy E. Martinson

Growers of grafted, cold-tender varieties (mostly *V. vinifera*, but also a few of the hybrids) in the Finger Lakes have returned to diligently hilling up vineyards following severe winter injury in 2004. I'd say it's practiced on the overwhelming majority of grafted vineyards. However, the practice has a big drawback - you may save the vine, but if the top dies back, you lose at least a year's crop, and probably a partial crop in the 2nd year after the injury occurs.

In an effort to extend protection to fruiting canes, several growers have been experimenting with burying canes in their vineyards. One grower successfully did so with Pinot Noir, Syrah, Merlot and Gewurztraminer last year, and I know of at least 5 vineyards where this is being done this winter.

Two situations are shown in the photos at the right. In the first Seneca Lake vineyard (A & B), extra suckers have been retained as well as the complete above-ground vine. A wire was run along the ground (may be one of the moveable catch wires), and several canes were bent in the same direction and wrapped or tied around the wire. This was photographed before soil was hilled up to cover these canes. In the second Pinot Gris vineyard (C&D) the entire vine was buried, after the grower had trimmed them down to 5 or six canes. Again, they were all bent in the same direction (C) and then soil was hilled over the top. The arch (C) extended 4-6 inches above the graft union, so a large hill was required (D), with some hand followup to cover this arch. Again, a wire was laid down and the shoots were tucked and wrapped around the wire. (D) shows the buried vines adjacent to a conventionally-hilled up Cabernet Franc block.

Costs. Growers are reporting costs of around \$500 per acre for labor to lay down the canes, in addition to normal 'hill-up' costs. Getting the canes back up in the spring will probably be as costly (above normal pruning, tying costs), and will probably involve an extra pass to loosen the hill at 'takeaway' time before pulling up the wire and canes. So this option isn't inexpensive, either, but if it allows a crop of close to 2-3 T of grapes selling for around \$1500 per ton, it may prove to be worthwhile for high value grapes in winery-associated vineyards.

A.



B.



C.



D.



Treatments applied at Hazlitt 1852 Seneca Road Vineyard



Compost



Fresh Wood chips



Aged wood chips



Hilled up conventionally



Sawdust



Bark chips

USDA GRAPE GENETICS RESEARCH IN GENEVA EXPANDS WITH NEW SCIENTISTS AND PROGRAMS

*Peter Cousins
USD ARS Geneva*

[Ed. Note: Most growers are aware of the work of Cornell scientists associated with viticulture and enology at the NYS Agricultural Experiment Station. Fewer are aware that a major US Department of Agriculture (USDA) unit focused on grape genetic improvement is also headquartered at the Station. The unit has expanded over the past few years, and now has four new research scientists working on many aspects of grape genetics and genetic improvement. They are soon to be housed at a new building in Geneva's Ag Tech Business Park. I asked Peter Cousins to provide an overview of their goals and programs for the Harvest Newsletter. We missed the deadline on that, so I'm including it in this newsletter - TEM]

USDA Agricultural Research Service (ARS) research in grape improvement is centered at the Grape Genetics Research Unit, located at the New York State Agricultural Experiment Station in Geneva. The scientists investigating grape genetics, genomics, proteomics, and bioinformatics work with growers, breeders, germplasm curators and other researchers to understand the control of important genetic characteristics and use this information in variety improvement and the development of new management practices.

The Grape Genetics Research Unit is located in the heart of a vibrant viticultural area. The Finger Lakes—and New York and the Northeast—are important grape growing and processing and wine making regions. Cornell University, with faculty and staff on the Ithaca and Geneva campuses and a statewide extension team, is a world leader in viticulture and enology research, education, and extension. Cornell's strengths in viticulture include physiology, pathology, breeding and genetics, and production practices and systems research. The USDA maintains a national grape germplasm collection vineyard as a component of the fruit variety repository at Geneva. The concentration of production, processing, research, extension, and education make Geneva an excellent place for grape genetic improvement.

Fungal diseases are one of the most serious challenges to the production of quality grapes. **Lance Cadle-Davidson** is identifying novel sources of resistance and elucidating the mechanisms of



Peter Cousins, Rootstock Breeder with the USDA Agricultural Research Service in Geneva (Associated with the NYS Agricultural Experiment Station) shows visiting scientists how he screens grape seedlings for resistance to root-damaging nematodes.

resistance to key fungal pathogens, including powdery mildew, *Botrytis*, and *Phomopsis*. By screening germplasm collections, mapping, breeding, and other experimental populations, varieties that differ in disease resistance and resistance mechanisms are identified. Non-temporal as well as developmentally regulated (or ontogenic) resistance has been described in many genetic backgrounds and the biochemical basis of this resistance is being characterized through genomic and proteomic approaches. This will contribute to the development of improved disease resistant varieties.

Fruit quality is determined by the interaction of grape variety, environment, and management practices. **Christopher Owens** seeks to understand the genetic control of grape ripening and fruit quality in order to maximize fruit quality in improved varieties. A single gene has been characterized that influences fruit color, aroma, and tannin accumulation and the role of this gene in regulating fruit color and other quality aspects is being investigated. Additional candidate genes that condition fruit ripening and quality aspects are being examined. Once the role of the genes is understood, breeding and manipulation of these characters will be facilitated. He also investigates the genetic control of cold hardiness in order to improve winter survival—critical to viticulture's success in challenging environments like the Finger Lakes.

The interaction of grapevines with their environment is a primary driver of success in the vineyard and in the market. Budbreak, anthesis, fruit set, veraison,

leaf fall, and dormancy have large effects on survival, fruit quality, and market value of grapes. However, the genetic basis for the timing of these events with environmental cues is poorly understood. **Amanda Garris** is investigating the genetic control of the interaction of grapevines with their environment. She is using molecular approaches to characterize the difference among varieties and clones that differ for critical traits. Once the essential genetic difference is understood, breeding and improvement of varieties for that characteristic will be much easier; for example, the development of earlier ripening wine grapes or maturation accelerating rootstocks. Amanda also is researching the origin and genetic basis of clonal variation in grapevine varieties.

Peter Cousins is breeding rootstocks with enhanced resistance to nematodes. Nematodes are the primary root pest on more vineyard acres in the United States than any other pest, including phylloxera. Contemporary nematode resistant rootstocks, such as Freedom and Harmony, are being attacked by new aggressive and virulent nematode populations. New rootstock varieties with resistance to the aggressive virulent nematodes are needed. Screening germplasm for superior nematode resistance identifies suitable parents and hybridization among those parents produces candidate rootstock populations. Since 2001, more than 12,000 seedlings have been screened for resistance to nematodes and over 250 nematode resistant seedlings have been planted to the vineyard. Fifteen selections were grafted to Syrah and planted in vineyard trials in 2005. In addition to breeding new rootstocks, Peter is evaluating currently available rootstocks for juice, table, and raisin grapes in vineyards across the country.

Future directions: A new research facility dedicated to grape improvement is planned for the Geneva campus. The facility will provide Grape Genetics Research Unit scientists with improved and expanded laboratory and greenhouse space. Experimental vineyards for the evaluation of candidate varieties and research populations are on the horizon. Currently the USDA grape improvement team in Geneva has four scientists. Our plan is to expand the team to eight scientists, all dedicated to grape improvement. The precise research responsibility for the new scientists has not been determined; like the present scientific staff, their mandate will be to address key challenges facing the grape industry and apply modern genetics towards the solution of these problems.

How can grape growers get involved in grape improvement? If you see something unusual in your vineyard, please let us know! The new varieties, clones, and bud sports discovered by growers in their vineyards are essential to grape improvement. For example, gray colored fruit sports of several varieties were found by sharp eyed growers and are now a component of our viticultural palette (for example, Pinot gris). Distinct and unusual types that arise as bud sports or clones are a useful tool for genetic research. Of particular interest are bud sports with distinct or unusual characteristics; for example, changes in leaf shape or fruit color or size. The scientists of the Grape Genetics Research Unit conduct many types of cooperative projects in grape improvement, including vineyard trials of varieties, clones, rootstocks, and germplasm and other grape improvement experiments. Contact the Grape Genetics Research Unit scientists for more details.

Contact Information:

Lance Cadle-Davidson, Peter Cousins, Amanda Garris, and Christopher Owens are in the USDA-ARS Grape Genetics Research Unit, 630 W. North St., Geneva, NY 14456; phone (315) 787-2244. E-mail: led8@cornell.edu [Cadle-Davidson], psc9@cornell.edu [Cousins], ajl34@cornell.edu [Garris], clo5@cornell.edu [Owens].

Upcoming Events

January 20. Viticulture Session, Long Island Agricultural Forum. Suffolk Community College in Riverhead, NY. 9 a.m. to noon. Featured speaker is Dr. Doug Gubler, plant pathologist from UC Davis and Dr. Harold Van Es, soil scientist from Cornell. For more information, call Linda Holm at 631-727-7850, ext 341

January 24-26 Unified Grape and Wine Symposium. Sacramento Convention Center, Sacramento, CA. The largest wine and grape meeting and trade show of the year is sponsored by ASEV and CAWG. Seminars focus on practical wine growing information. The trade show is HUGE. For more information, visit their web site at <http://www.unifiedsymposium.org/>

January - March 2006. Winter Pesticide Certification and Training courses. This year, Cooperative extension-sponsored classes will be held at Rochester, Newark, and Canandaigua, Taught by Russ Welsler. There will be no recertification classes in Yates County this year. Mike Dennis, of Cornell Cooperative Extension in Seneca County will be conducting training at a location and times to be determined. Expect a notice about Seneca Co. classes shortly. We will forward it to you.

January, February and March, 2006. Cornell Cooperative Extension Pesticide Training and Recertification Series.

- Cooperative Extension Center, 249 Highland Ave., Rochester, Jan. 24, 31, Feb. 7, 14, 1:00 - 3:30 pm. Exam: February 21 @ 1:00 - 5:00 pm
- Cooperative Extension Office, 1581 NYS Route 88N, Newark. Jan. 27, Feb. 3, 10, 17, 1:00 - 3:30 pm. Exam: February 24 @ 1:00 - 5:00 pm
- Cooperative Extension Center, 480 North Main St., Canandaigua. Feb. 28, Mar. 7, 14, 21 7:00 - 9:30 pm. Exam: March 28 @ 7:00 - 11:00 pm

For registration forms or questions, contact Russ Welsler, Cornell Cooperative Extension Center, Canandaigua at 585-394-3977 ext. 31 or 38.

Friday, February 24, 2006, Cornell University. Wineries and vineyard owners are invited to this new event, in which you will have a chance to meet students and discuss their needs for summer and/or full-time employment. If you are interested in hosting interns from the Enology/Viticulture program, this will be an excellent opportunity to meet potential interns. Look for further information as we get closer to the date. For more information, contact the Finger Lakes Grape Program or Amy Benedict-Augustine, Career Development Office, College of Agriculture and Life Sciences, Cornell University, at alb44@cornell.edu or 607/255-2215.

March 3 and 4. 56th Annual Finger Lakes Grape Growers Convention and Trade Show. Holiday Inn. Waterloo, NY. Practical information for growers and wine makers as well as latest research from NYSAES. Breakout sessions on soil health and root biology, grower technology innovations, sprayer technology, business management issues and 'the basics' for new growers on Friday, research, pest management updates and trade show on Saturday. For more information, please call 315-536-5134 or visit <http://flg.cce.cornell.edu/>

Complete details and registration form will be posted in January Vineyard Notes.

March 12-15, 2006 30th Anniversary Wineries Unlimited, Lancaster Host Resort, Lancaster, PA. Trade show dates: March 13-14. The largest trade show and seminar program in the East will have a special anniversary program, with Decanter Man of the Year Ernst Loosen to give keynote address and speak in seminars on the major varietal theme, riesling. Sustainability is the conference theme, with one day workshops for newcomers (3/12) and for bottling issues (3/15). Trade show features 175 exhibitors, 250 booths. For more information and online registration, visit www.vwm-online.com/wu.

March 30. Lake Erie Grape Growers Convention. Fredonia State University, Fredonia, NY. Breakout sessions with information on process and wine grapes with a trade show. For information call Linda Aures at 715-672-5296 or visit <http://lenewa.netsync.net/public/lergphom.htm>

April 5-7. 35th Annual New York Wine Industry Workshop. NYSAES, Geneva, NY. The program includes seminars on wine marketing hosted by NY Wine and Grape Foundation and the annual Unity Dinner. Also included is a trade show and technical seminar focus on wine bottling. Information and registration at <http://www.nysaes.cornell.edu/fst/faculty/henick/events.html>

Cornell Cooperative Extension

Finger Lakes Grape Program

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