FINGER LAKES
Vineyard Notes
May 2015
Cornell University
Cooperative Extension
Finger Lakes Grape Program

# Optimizing Nitrogen Use in Vineyards

*Jamie Hawk and Tim Martinson*
*(Adapted for the Finger Lakes Vineyard Notes by Mike Colizzi and Hans Walter-Peterson)*

*Note: An extended version of this article originally appeared as the May 2006 issue of Sustainable Viticulture in the Northeast, also entitled "Optimizing Nitrogen Use in Vineyards". It can be found at http://www.vinebalance.com/pdf/newsletters/SustainableViticulture1.pdf*

Now that the snowdrifts have melted and we can actually see the vines, it's time to think about this season's nutrient management strategy. Nitrogen is the nutrient needed the most by grapevines for growth and productivity, but it can also be one of the hardest to manage. Understanding the role nitrogen plays in grapevine growth and development is imperative to growing a high-quality crop and having a healthy vineyard.

**Nitrogen in the Soil:** Soil microbes transform the nitrogen compounds in the soil, and their rates of activity are driven by temperature. During the winter months, relatively little decomposition occurs, but as the soils warm in the spring and early summer, microbial activity increases, releasing ammonium from organic matter breakdown and nitrifying the ammonium to nitrate for vine uptake. Moisture conditions also influence soil nitrogen levels. Repeated heavy rainfalls, particularly during spring and early summer when the bulk of nitrogen fertilizers are applied, may promote leaching. During periods of drought, leaching is less common, but vine uptake of nitrogen is diminished unless supplemental irrigation is used.

In strongly acidic soils, aluminum ($Al^{3+}$) becomes soluble and displaces the essential nutrient cations from the cation exchange sites. Raising the pH back into the optimal range for grape production (5.5-7.0) forces the aluminum to precipitate out, opening the cation exchange sites to the desired cations and restoring the soils' potential to hold nutrients. Soil pH also affects the activity of bacteria in the soil, impacting rates of nitrogen fixation, nitrification, and organic matter breakdown.

**Nitrogen in the Vines:** Research on Concord has shown that the majority (about 75%) of stored nitrogen in dormant vines is found in the roots, with the remainder stored in trunks and canes (Bates et al. 2002). These stored reserves supply the nitrogen for most of the vines' pre-bloom growth. Uptake of nitrogen from the soil doesn't begin in earnest until midway between budbreak and bloom, as soils warm and new root tips develop. Peak nitrogen demand is split into two distinct periods: the 2-3

***Inside this issue:***

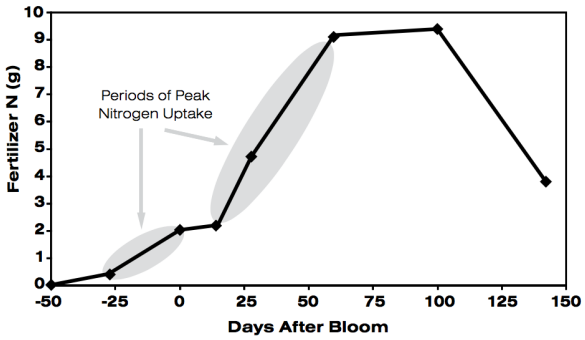


*Figure 1. Total vine uptake of fertilizer N by mature Concord vines fertilized with 50 lbs N as $^{15}$N-enriched ammonium nitrate at budbreak. Redrawn from Cheng et al. 2004.*

weeks prior to bloom and about a month-long stretch (the majority of the canopy development stage) starting 2 weeks after bloom (Figure 1). Overall, the annual nitrogen requirement of Concord vines corresponds to about 50 lbs/acre, with a portion derived from the breakdown of organic matter and the remainder supplied by the grower. After harvest, the vines sequester the remaining available nitrogen (found in the soil, leaves and shoots) into their roots and canes in preparation for the next growing season.

While there is no magic formula for determining how much nitrogen to apply, there is a strong case to be made for tailoring application rates and timing to the needs of individual vineyard blocks, rather than uniformly applying a standard rate to all of your vineyards. Doing so involves consideration of the leachability, organic matter content and water holding capacity of your soils, careful observation of vine vigor, and your management goals for the vineyard.

Concords and bulk hybrid varieties are generally managed to maximize cropping level and production, and their responses to N fertilization are well understood. *V. vinifera* grapes and premium hybrids are managed for moderate yields and wine quality, generally at less than their maximum cropping capacity. Therefore, rates for Concord production represent the high end of N requirements in New York vineyards.

**Upper Limits:** For soils with at least 2% organic matter, there is no yield or vine size response to more than 50 lbs/acre of nitrogen. A long-term experiment called the 'West Tier Factorial' has measured the impact of rootstock, cover crops, nitrogen fertilization, and training system on Concord yield and quality over the past 40 years. Three N fertilization rates (0, 50 and 100 lbs./acre of actual N) were used on deep, gravelly soils at the Fredonia Vineyard Laboratory. Yield and vine size (as measured by pruning weights) increased with 50 lbs./acre of actual nitrogen, but increasing the rate to 100 lbs./acre had no effect on yield and increased pruning weight by only 0.1 lbs. per vine.

More recently, direct measurement of nitrogen in mature Concord vines indicated that each vine incorporates about 40 grams of N into each season's growth - equivalent to about 53 lbs./acre (Bates et al. 2002). In the same study it was found that of the 50 lbs./acre actual N applied, about 12 lbs./acre was derived from the fertilizer, with the remainder supplied by the 2% organic matter in the soil.

**Nitrogen and Vine Size:** Although nitrogen promotes vine growth and can lead to excess vigor, it doesn't follow that applying more nitrogen will automatically increase vine size. Inadequate water supply, rooting depth, or drainage, disease and insect infestations, inappropriate cropping levels (too much fruit), low soil pH or other nutrient deficiencies can limit vine size, and applying excess nitrogen won't overcome other factors that limit vigor.

On the other hand, excess vigor caused by over application of nitrogen promotes shaded canopies, reducing fruit quality, promoting disease development, and reducing bud fruitfulness.

**Organic Matter and Nitrogen Supply:** The breakdown of organic matter is a major source of nitrogen. It is important to measure the percentage of soil organic matter in each block of your vineyard, as every 1% supplies 15 to 20 lbs./acre/year of nitrogen. This nitrogen is released slowly, and its rate of production increases as soils warm-up and microbial activity increases.

| | Soil Organic Matter | | | |
|---|---|---|---|---|
| | 1% | 2% | 3% | 4% |
| Vine nitrogen need (lb/acre) | 50 | 50 | 50 | 50 |
| Nitrogen from organic matter | 20 | 40 | 60 | 80 |
| N needed | 30 | 10 | (10) | (30) |
| Fertilizer N at 25% Efficiency | 120 | 40 | 0 | 0 |

* Information supplied by Terry Bates

*Table 1. Estimated contribution by soil organic matter to vine nitrogen needs for mature Concord vines.*

Table 1 illustrates the relative contribution of different organic matter levels to N needs. Note that above 3% organic matter, the soil's nitrogen-supplying ability exceeds annual vine demand, though during peak canopy development, a small supplemental application (as low as 10 lbs./acre) may still be necessary to match demand.

As inorganic nitrogen costs continue to rise, deriving a greater share of nutrients from organic sources makes good business sense. Pomace, mulch, cover crops, cane prunings and herbaceous plant tissues can all improve soil organic matter over time. The amount of these materials to be applied or utilized will depend upon availability and desired level of amendment.

**Timing:** From budburst to bloom, vines support the majority of new growth by mobilizing nitrogen and carbohydrates stored in roots, canes, and trunks. It is not necessary nor is it desirable to apply fertilizer nitrogen early. It's better to apply it just ahead of when the vine's demand starts to increase. Delaying soil application until a few weeks before bloom is likely to improve N availability at the time vines start to need it. In New York, this would correspond to a 2-week window between 15 May and June 1. For heavier soils with adequate depth and high silt and clay content, a single application should be sufficient.

**Split Applications, Soil Texture and Leaching:** Soil texture influences both the leaching and water holding capacity of soils. Coarse-textured, excessively well-drained soils, such as gravelly loams and sandy soils suffer more N losses via leaching than heavier soils. Split applications, with 1/3 to 1/2 of the total amount applied before bloom and 2/3 to 1/2 applied 1-2 weeks after bloom, should provide extended uptake while limiting losses to leaching.

**Adjusting for Cropping Level:** Premium *V. vinifera* and hybrid wine varieties are often managed for a moderate crop to maximize quality. These vines will take less nitrogen to maintain vine size than heavily cropped natives and bulk hybrids. Thirty lbs. N/acre or less is generally a good starting point for premium varieties. Also, growers can omit nitrogen for vines with a small crop due to winter injury.

**Observing Vine Nitrogen Status:** Direct observation of vine growth is an important indicator of vine nitrogen status and the need for supplemental nitrogen. Growers need to recognize the signs of both excessive nitrogen uptake and nitrogen deficiency and use these signs to plan their N fertilization programs. It's important to note that excess or inadequate vine vigor may or may not be related to vine nitrogen status, as detailed in an earlier section.

**Soil and Petiole Tests:** Soil samples and grape tissue tests can be tools for determining soil N status or the vine tissue N content, but they have important limitations. Soil nitrate levels can change between sample collection and analysis, due to microbial activity, and may not be good indicators of available nitrogen. Petiole samples, taken at bloom from petioles in the cluster zone, can give some indication of vine N status, but are best used to compare problem areas within vineyards to more 'normal' vines. Many factors, including whether samples are collected on a sunny or cloudy day, cause N content in petioles to fluctuate. Petiole samples collected at 70 days post-bloom are not good indicators of vine nitrogen status. Sampling soils and tissues should always be accompanied by visual estimates of vine vigor.

**Nitrogen Cost in 2015:** Calcium Ammonium Nitrate (CAN) and urea are the two most commonly

*Table 2. Cost per unit of nitrogen from CAN and Urea.*

| | % Nitrogen | Cost Per Ton* | $/lb of N |
|---|---|---|---|
| Urea | 46% | $425.00 | $ 0.46 |
| CAN | 27% | $428.00 | $ 0.79 |

* Price as of April 2015 from Hall Fertilizer, Hall NY.



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used nitrogen fertilizers in the Finger Lakes region, and prices for both are close to $430.00 per bulk ton. With prices at this level, and with more attention being paid to reducing the impacts of farming practices on the surrounding environment, tailoring nitrogen use is quickly becoming an increasingly important aspect of grape growing. Both CAN and urea cost about the same per ton, however urea supplies significantly more pounds of N per ton of fertilizer, therefore making its cost per unit of N much lower than CAN right now (Table 2).

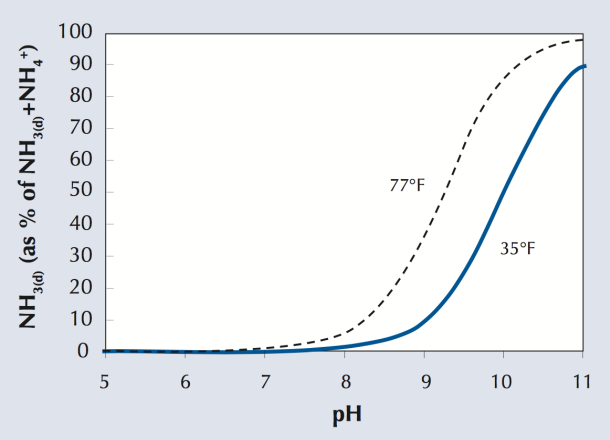


*Figure 2. Percentage of $NH_3$ in total of $NH_3$ and $NH_4^+$ after urea application. Higher percentage of $NH_3$ in the soil solution can result in higher rates of volatilization. Rates increase above soil pH of 8.0 and with warmer temperatures.*

*Credit: Jones, C. A. et al., 2007.*

**What About Urea Volatilization?** All ammonium -based fertilizers have the potential to volatilize to some extent, but urea generally has the greatest potential for N losses due to volatilization of ammonia gas ($NH_3$). The amount of volatilization is dependent on the temperature and soil pH. The percentage of ammonia dissolved in the soil water (which is the form that can escape into the atmosphere) increases dramatically if the soil pH is 8.0 or higher (Figure 2), which we see very little of in the Finger Lakes. Once it is applied to the soil surface, urea breaks apart and converts to ammonium ($NH_4^+$) and carbon dioxide. This can occur in 2 to 4 days and happens more quickly on high pH soils. In general, our conditions here are not overly favorable to high amounts of volatilization.

However, if you are concerned about reducing the potential for volatilization, you might want to consider timing your unhilling pass, or a cultivation pass, for right after applying urea. Covering the material with soil will help to reduce the escape of any ammonia that does form during the conversion process. You can also consider applying urea during a period of cooler weather.

Growers that modify the timing, rate and form of nitrogen applied can greatly limit the loss of nitrogen from their farms. In many vineyards, nitrogen application rates can be dramatically reduced without affecting yield or vine size, but doing so requires an understanding of nitrogen sources, seasonal variations in vine demand, and an ability to use data on soils and vine vigor to estimate nitrogen needs within vineyard blocks.

**References:**

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Acknowledgement: This work was supported by the New York Farm Viability Institute project entitled *Promoting the documentation and adoption of sustainable viticulture practices for New York vineyards through extension and industry outreach.* Project #EIN 06 002.

# Grape Crown Gall

*Tom Burr, Plant Pathology and Plant-Microbe Biology Section, School of Integrated Plant Sciences*
*Tim Martinson, Horticulture Section, School of Integrated Plant Sciences*

*This article was originally published as a fact sheet for the National Clean Plant Network. The fact sheet can be found at http://ncpngrapes.org/files/211121.pdf.*

Crown gall of grapevines is caused by the bacterium *Agrobacterium vitis*. During infection, the bacterium transfers a component of its DNA into the plant which upon expression in the grapevine results in gall formation. Infection and gall formation occur at wound sites, such as those caused by freeze injuries on trunks (Figure 1) and at grafting sites (Figure 2). The pathogen can survive systemically in grapevines and be spread in propagation material. Strains of *A. vitis* that form galls (tumorigenic) and those that are non-tumorigenic both exist in grapevines. All strains have the ability to cause a necrosis on grapevine roots (Figure 3). The disease cycle of crown gall on grape is shown in Figure 4.

*Figure 1. Crown gall on a trunk*

*Figure 2. Crown gall at graft union*

*Figure 3. Grape root necrosis due to A. vitis.*

The bacterium is present in xylem vessels, and infected, necrotic root tissue. As such it can be spread through infected cuttings, or survive in root tissue or soils for several years where grapes have been previously grown. The recent development of a highly specific and sensitive method for detection of *A. vitis* has greatly enhanced our knowledge of survival of the pathogen in grapevines. The new method is about 1000-fold more sensitive than previous methods. In addition to detecting the pathogen in asymptomatic dormant cuttings from vineyards we have recently shown that pathogenic *A. vitis* survive in wild grapevines (*V. riparia*) in New York. The new detection method was also used to demonstrate presence of the pathogen on shoot tips in vineyards with crown gall. From 240 shoot tips that were collected, 16 tested positive for the pathogen. We are currently exploring survival on leaf surfaces, in dormant buds, standing water near vineyards and in vineyard soil.

*Impacts to vineyards*

Crown gall in nurseries results in losses due to unsaleable symptomatic plants and may also lead to spread of the pathogen in asymptomatic plants. In young vineyards, infected vines may be killed to the graft union, or they may be stunted with reduced growth and production. Economic losses are therefore associated with reduced productivity and costs of vine or trunk replacement. Because the pathogen can survive in infected grapevine roots, even after vine replacement, contaminated soils may remain so for a period of years. Currently a study is underway to document the economic impact of crown gall in vineyards.

*Current and future management options*

Growers should assume that *A. vitis* is likely to be present in at least some nursery stock and in existing vineyard blocks. Yet this does not mean that crown gall disease will be expressed or cause economic injury. Experience in cool climate regions such as New York and Washington has shown that widespread galling occurs relatively

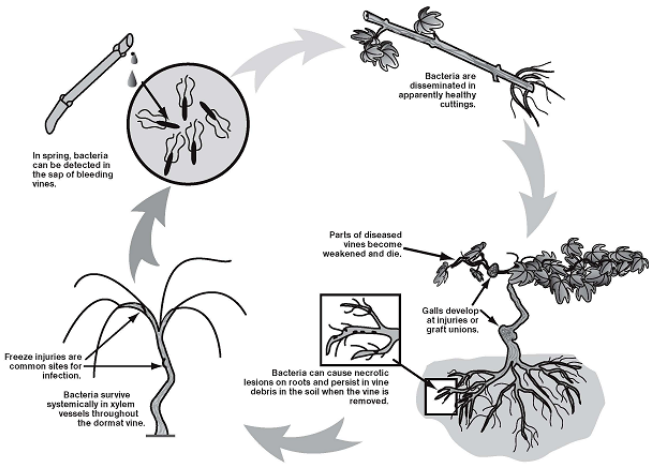


*Figure 4. Crown gall disease cycle.*

infrequently, and often in association with significant cold injury to trunks during the dormant season (In New York, crown gall expression was common after winter injury in 2004 and 2014, but rare in intervening years). Cultural methods – starting with site selection – are the key to minimizing losses from crown gall. Cultural practice recommendations include:

- **Cultivar choice.** Plant varieties and rootstocks that are tolerant of the disease.
- **Site Selection.** Plant vineyards on sites that have good air drainage and well-drained soils to minimize freeze injury.
- **Hilling up.** Mounding soil over the graft union in the fall protects it from extreme cold events, and ensures survival of scion buds for trunk renewal.
- **Multiple trunks.** Establishing multiple trunks allows growers to remove and replace galled trunks while maintaining production.
- **Regular monitoring and replacement or renewal.** Evaluate trunk and vine health on a regular basis, mark and replace trunks and vines promptly.
- **Cropping levels and fertility.** Manage cropping levels, irrigation and nutrition such that active vegetative growth ceases or slows by veraison.

As crown gall-tested foundation vines become available and are propagated by nurseries, and if clean vines can be maintained through careful nursery practices, then use of clean planting stock should provide growers with a tool to avoid early problems during vineyard establishment, even if vines acquire *A. vitis* from environmental sources in the field.

There are no available chemical treatments effective for disease control. Biological control of grape crown gall is being studied and shows promise for providing an effective option for protecting graft unions and other wounds on vines.

# Worker Protection Standards: Reminders Before the Season

*Alice Wise and Sandra Menasha, Long Island Horticulture Research & Extension Center*

*Note: The following article is based on a two-part series of articles that appeared in the Long Island Fruit & Vegetable Update earlier this month. We thank Alice and Sandra for allowing us to adapt their articles for our newsletter.*


As the 2015 growing season approaches, it's a good time to be reviewing making sure you are in compliance with the Worker Protection Standards. You can download a copy of the WPS 'How to Comply Manual' at http://www.epa.gov/oecaagct/epa-735-b-05-002.pdf. These observations are based on a mock inspection held in February, 2014.

First of all, as a reminder, in February 2014 the EPA proposed updates and revisions to the existing WPS and the comment period ended in August 2014. To date, the rule stands as is - none of the proposed updates and revisions to the existing WPS rule has been published or finalized. We will keep you informed of any changes as they appear. For more information, visit the EPA website at http://www.epa.gov/agriculture/twor.html. Alternatively, you can contact the Region 8 DEC office at 607-776 -2165.

*Personal protection and decontamination equipment*

Make sure all handlers and workers know where the decontamination sites are and what they contain. Decontamination kits must be within a quarter mile of all workers. Portable kits might be an option for growers with a large operation. Put out fresh water, enough for routine washing (at least 1 gallon per *worker* using the site) and emergency eye flushing. If the decontamination kit might be used by a pesticide handler, there must be enough water for washing of the entire body in case of an emergency - at least 3 gallons per handler using the site. A bathroom with running water that is within a quarter mile will suffice for a decontamination station as long as it has all the necessary items. Kits should also include coveralls, soap and a stack of single use towels. See the ***How to Comply Manual***, p.54-55, for the official list of decontamination supplies.

PPE for handlers (applicators): Check labels to make sure handlers and applicators have the required PPE as per the pesticide label. Note that some labels (Manzate ProStick, for example) have a requirement for a pesticide resistant apron. Make sure there is an apron in the mixing & loading area. A Tyvek suit is a coverall - it is not a substitute for an apron.

Respirators: Do not store your respirator where pesticides are stored, do not nail it to the wall, make sure it is clean, and that the respirator cartridges have not expired (they should be dated). Cartridges should be stored in an air-tight container to ensure a longer life. Cartridges exposed to the air will continue to filter. Refer to the manufacturer's label for change out requirements or cartridge lifespan.

*Eye Protection*

Where eye protection is required on a pesticide label, the WPS guidelines say the eyewash must be "immediately accessible" to a pesticide handler. The need for eye protection will be listed on the pesticide label in the box entitled "Agricultural Use Requirements", in the section listing PPE (personal protective equipment). The emergency eyewash water (1 pint) must be carried on the tractor. However, if the applicator gets off the tractor, the eyewash must be carried on their person.

The DEC prefers the commercially available saline eyewash. Make sure the bottle has not expired, as this is a violation. Alternatively, use a pint of clean water in a container labeled 'eyewash'. An eyewash station is also acceptable as long as it is within ¼ mile. For each **handler** (applicator), 1 pint is

required. For each **worker performing early entry activities**, 1 pint per worker is also required.

*Worker Training*

Train new workers within 5 days. Handlers and early entry workers who will come in contact with anything treated during the REI must be trained before they do work. Remember also that handlers and workers must be trained at least once every 5 years – check your records on long term employees**.** All training must be done by a licensed pesticide applicator. Further information on training requirements can be found in the *How to Comply Manual* on pages 21-23.

*Postings, Notifications, Recordkeeping*

Check your central posting area and make sure it is easily seen, accessible and the information posted is legible. This has been a source of violations in years past. Make sure emergency contact information is accurate. If the WPS safety poster is in poor condition, get a new one. Have your blank pesticide application forms together – they need to have:

- location and description of area to be treated
- product name, EPA registration no., active ingredient(s)
- date and time pesticide is scheduled to be applied
- the restricted entry interval (REI)

You are required to post this information before each application begins. Note that the 30-day posting requirement for all applications starts after the REI expires. The DEC has forms on their website that will satisfy the NYSDEC requirements, the 30-day WPS notification requirement as well as the USDA requirements. Note that wind speed is not required by the state or federal governments. The forms are located at http://www.dec.ny.gov/docs/materials_minerals_pdf/privatercdfrm.pdf**.**

A farm map is suggested for the central posting area so that workers can easily ID the location of all farm fields. Some growers use names (Main Road Chardonnay block), some use numbers or letters (block 2 Chardonnay). The point being that if a DEC inspection occurs, your workers understand and are able to communicate the location of the applications and a farm map makes this easier.

Start accumulating copies of pesticide labels. All applicators must have a copy of the label immediately accessible. Some growers deal with individual labels, some put together a notebook to be carried with the tractor. When making an application, the applicator must have the following items immediately accessible:

- Applicator's license
- Labels for all materials being applied
- Appropriate PPE (see individual labels for what is required)

Tidy up your pesticide storage area. A disorganized, messy storage area is a red flag to an inspector. Pesticide storage guidelines can be found at http://www.dec.ny.gov/regulations/8871.html.

# International Scientists and Grape Producers to Discuss Recent Advances in Vineyard Mechanization July 26-29 in Fredonia, New York

The Second International Workshop on Vineyard Mechanization and Grape and Wine Quality will be held July 26 to July 29, 2015, in Fredonia New York. The event is sponsored by the International Society for Horticulture Science, in conjunction with the Eastern Section of the American Society for Enology and Viticulture, and follows the successful inaugural event held in Italy in 2012. The workshop brings together international experts in grape mechanization and grape producers to report and discuss the latest research on grapevine mechanization, precision viticulture and the use of mechanization and technology to improve grape and wine quality. Technical focus areas will include engineering advancements and mechanized tools for vineyard operations, the application of remote and proximal sensing technologies for monitoring vine performance, variable rate and zonal vineyard management for improving vineyard productivity and the economic impact of mechanized systems on fruit yield and quality. This is the first time that the workshop will be held in the US. Scientists and grape growers from over 20 countries are expected to participate in the event.

Dr. Terry Bates, Research Scientist and Director of the Cornell University Lake Erie Research Center, is co-organizing the workshop. "Grape producers in all major growing regions of the world are increasingly affected by the increased cost and reduced availability of labor" said Bates. He added, "improved mechanization methods are needed to reduce the cost of production and improve grape and wine quality…[t]he future sustainability of the grape and wine industries depends on the advancement of vineyard mechanization and related technologies".

*Dr. Nelson Shaulis*

The three-day workshop will begin on Sunday, July 26, with a symposium to honor the late Dr. Nelson Shaulis, a long time Professor and world-renowned viticulturist from Cornell University. Shaulis, a member of the Cornell Faculty from 1944 to 1978, was widely recognized as the preeminent viticulture scientist of his generation. His major contributions included the design of the Geneva Double Curtain (GDC) grapevine training system, as well as the development of the mechanical grape harvester. In 1997, Shaulis was given the Merit Award by the American Society for Enology and Viticulture, the highest honor presented by the society. "We hope to honor the memory of Dr. Shaulis and his many outstanding contributions to our industry by highlighting recent advancements in grape mechanization and precision viticulture during the symposium" said Dr. Nick Dokoozlian of E&J Gallo Winery and co-organizer of the event. The symposium will feature leading grape mechanization scientists from throughout the world, including Dr. Stefano Poni of the University of Piacenza in Italy, and Dr. Rob Bramley of the CSIRO in Adelaide, Australia.

The symposium and workshop will be held on the campus of the State University of New York in Fredonia. The campus is located in the heart of the Lake Erie grape growing region, consisting of over 30,000 acres of vineyards dedicated to wine and juice production. Regional vineyard and winery tours, as well as wine tastings and evening social events, are planned. Fees for the three-day workshop, including the Shaulis Symposium, are $515 per person for ISHS members and $600 per person for non-ISHS members, when registered prior to June 19, 2015. Registration fees increase to $565 (ISHS members) /$650 (non-ISHS members) following June 19, 2015. Registration fees include a copy of the full symposium proceedings as well as lunches, dinners and social events associated with the three-day workshop. A single day registration fee for the Shaulis Symposium is available for $150 (prior to June 19) and $175 (after June 19) and includes lunch and dinner.

Registration and program details many be found by visiting http://events.cals.cornell.edu/ishs

# Upcoming Events

For more information about these and other events relevant to the Finger Lakes grape industry, visit the 'Events' page on our website (http://flgp.cce.cornell.edu/events.php) or call our office at 315-536-5134.


**Tailgate Meetings**
*Every other Tuesday, starting Tuesday, May 5*
*5:00 – 6:30 PM*
*Multiple locations around the Finger Lakes*

See our website or call for information about dates and locations during the growing season.

**Spring Grape IPM Meeting**

*Tuesday, May 12*
*4:30 – 6:15 PM (dinner following)*
*Ravines Wine Cellars*
*400 Barracks Road, Geneva, NY*

See our website for the meeting agenda and to register (required). No cost for 2015 FLGP enrollees, $15 per person for those not enrolled. If you are interested in being a sponsor for this year's meeting, please contact Karen in our office at 315-536-5134.

**American Society for Enology & Viticulture – Eastern Section Annual Meeting**

*July 23-25, 2015*
*Clarion Hotel and Conference Center*
*Dunkirk, NY*

This year's ASEV-Eastern Section Annual Meeting is being held just prior to the ISHS Vineyard Mechanization Symposium – come for one, stay for both! For information, visit http://asev-es.org.

**2nd International Workshop on Vineyard Mechanization and Grape and Wine Quality**

*July 26-29, 2015*
*State University of New York at Fredonia*
*Fredonia, NY*

See the announcement in this issue of the *Vineyard Notes* for further information about this important international viticulture meeting happening right in our backyard. Registration and program details can be found by visiting http://events.cals.cornell.edu/ishs.

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*Visit our website, http://flg.cce.cornell.edu, for more information on grape growing, pest management, educational events and more.*

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# FINGER LAKES VINEYARD NOTES

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