Cornell University
Cooperative Extension

Lake Erie Regional Grape Program

PennState Extension

Newsletter June 2019

Grapes at Fredonia Lab, Photo- Jennifer Russo, Viticulturalist, LERGP at CLEREL

Building Strong and Vibrant New York Communities

Diversity and Inclusion are a part of Cornell University's heritage. We are a recognized employer and educator valuing AA/EEO, Protected Veterans, and Individuals with Disabilities.

In this Issue:

LERGP
2019 COFFEE POT MEETING SCHEDULE

Date	Time	Location	Address
May 1, 2019	10:00am	John Mason Farm	8603 West Lake Rd. Lake City PA 16423
May 8, 2019	10:00am	Sprague Farms	12435 Versailles Rd. Irving NY 14081
May 15, 2019	10:00am	Paul Bencal	2645 Albright Rd. Ransomville NY 14131
May 22, 2019	10:00am	Arrowhead Winery	12073 East Main Rd. North East PA 16428
May 29, 2019	10:00am	Militello Farm Supply	2929 Route 39 Forestville NY 14062
June 5, 2019	10:00am	North East Fruit Growers	2297 Klomp Rd. North East PA 16428
June 12, 2019	10:00am	Thompson Ag - Corner of Hanover & Dennison	Silver Creek NY 14136
June 19, 2019	10:00am	Kirk Hutchinson	4720 West Main St. Fredonia NY 14063
June 26, 2019		NO COFFEE POT	
July 3, 2019	10:00am	Betts Farm	7366 East Route 20 Westfield NY 14787
July 10, 2019	10:00am	Jim Vetter	12566 Versailles Rd. Irving NY 14081
July 17, 2019	10:00am	Trolley Line Vineyards	11480 E. Main St. North East PA 16428
July 24, 2019	10:00am	Brian Chess	10289 West Main Rd. Ripley NY 14775
July 31, 2019	10:00am	Tom Tower Farm	759 Lockport St. Youngstown NY 14174

The Lake Erie Regional Grape Program is a Cornell Cooperative Extension partnership between Cornell University and the Cornell Cooperative Extensions in Chautauqua, Erie and Niagara county NY and in Erie County PA.

Business Management

Kevin Martin, Penn State University, LERGP, Business Management Educator

Variable Rate Crop Load Management

Adoption of Technology

The adoption of Variable Rate Management (VRM) has picked up this year. We continue to see economic value of measuring, modeling and managing. Adoption looks different for all growers. I would encourage growers to go about adoption in a way that best suits their business needs and farming practices. The model of adoption that is beginning to emerge is analogous to a high dive into the deep end. These growers jumping in have invested, on average, just over $30,000 on technology that provides tools to measure and to manage. As the efficient vineyard project nears its end, the work on commercialization of VRM will continue. As adoption happens we hope to learn and share the lessons of early commercialization to maximize economic success.

To some the rush to adoption might seem fast, but many “early” adopters have been working with NDVI sensor technology for years. Dr. Bates started mapping NDVI over a decade ago. As research improved methods of modeling data and growers grew familiar with the data it became natural to use the data to manage production practices.

Research focused on crop load management with the theory that crop load offers the greatest return on investment. Data continues to support the theory but real-world adoption has been greater in scope. Growers are purchasing technology and making production decisions that extend beyond crop load management. Nutrient management, in particular, has been a focus of VRM.

Shown is an Ag Leader 1200 in this instance it is controlling a shoot thinner. With a simple ram mount and data/power cable, like any tractor display, it can be relocated to a harvester in minutes.

Recommended Path Toward VRM Viticulture: Crop Load

The least expensive way to introduce sensor technology is through the loaner sensor program. LERGP has loaner sensors available to LERGP member growers free of cost. Without purchasing any equipment that data can be modeled to improve crop and soil sampling. Any hand labor can be targeted in a variable way. Mechanized fertilization and fruit thinning can also be manually targeted by zone. These applications are not without their limitations. While some patterns lend themselves to manual manipulation, multiple zones in a single row would complicate significant changes in crop load without equipment and technology executing the decision-making.

Variable Rate Harvester

For most growers the easiest way to do late season crop load management is to remove fruit with a harvester. To accomplish VRM fruit thinning the hydraulic flow to the shakers is varied based on NDVI and crop yield samples. This will require a tractor display and GPS. While a high quality GPS is not necessary, it is better suited to communication with a tractor display. Total cost of the display and GPS were last quoted at $6,795. We have more experience with Ag Leader products, but other

providers do similar things. The GPS and display are easily removed from the harvester and installed on other tractors. This investment could be used for various other activities that include both measurement and management. Permanently installed hardware on the harvester will require another $2,000 - $3,000. This includes a module, wiring and other accessories. A conservative estimate of cost, which may vary based on harvester is $10,500.

This system is very basic and would use predicted yield, based on targeted hand sampling and NDVI data. Actual crop load would not be mapped as this grower would not have a yield monitor. However, a yield monitor is not as useful as NDVI for estimating and mapping predicted crop load. With this least cost system the grower has the tools necessary to variable rate manage crop load.

Measuring canopy with a crop circle sensor. Sensor is used to map relative vine size and other canopy attributes depending on the timing of the scan.

More Data: Purchasing a Canopy Sensor

To improve this system, the next upgrade would be an NDVI sensor. There are a number of commercial options. It's important to purchase a sensor that provides you with the data that you need. Some provide just NDVI, others provide additional data. It's also important that the device used to record and log data is compatible with the sensor. A dealer would typically provide you with that information. Buying used online can save a lot of money but does not provide compatibility information. When buying new a budget of $4,000 - $5,750 is adequate. Having your own sensor will allow you to scan more acres more frequently than using the loaner sensor program. As you build your database of scans you'll start to observe meaningful long-term patterns that improve your decision-making and management zone boundaries.

Thinning with variable rate shakers on Gregoire Harvester at Betts Vineyards

Mapping Crop Load: Commercially Available Yield Sensor

The next logical upgrade in a variable crop load management is a yield monitor. The commercially available yield monitor from Ag Leader is a modified impact plate that is essentially a load cell. It is available as an option on new Oxbo grape harvesters. The cost of this equipment on a new harvester is approximately $7,000 for the sensor. Another yield monitor is available from AVT. This Australian yield monitor uses load cells and requires significant modification of the discharge conveyor. Installed the cost of this system is approximately $17,000. Data is owned and processed by AVT in the dormant season.

Gregoire will be releasing a yield monitor. It appears to be available as they roll out their new line of harvesters. By 2020 Gregoire expects all GLS 7 and 8 models to have an optional yield monitor. Development of the G9 is a bit slower due to lower international volumes but may have yield monitoring technology when it is updated.

A yield monitor offers an actual crop load map at the end of the season. It is also a valuable tool for sampling, calibrating fruit thinning activities and allows the mapping of fruit thinned. If you're attempting to total the investment so far, depending on which brand of equipment is selected, the total

cost would be at least $23,000.

Last Upgrade: Brix

A brix monitor would be another excellent addition to this set up. It does help to ground truth crop load. It also can improve profitability by increasing truckload brix. Here at CLEREL we have a working brix sensor for mapping brix. We are beginning to have an understanding of the cost and functionality of that sensor. It will be inexpensive enough so that adoption is possible. At this time, it is not commercially available in a format that I would recommend investing in.

Actual Adoption Observed

Given the cost of technology and the challenges of modeling data, it is not surprising that the investment in variable rate technology has been relatively slow so far. Slow adoption is a great way to approach VRM. On one hand, we continue to show success in improving thinned yields. On the other hand, if growers purchase the technology but do not use it, we know it will not improve the bottom line. Sound data models improve the likelihood that growers have actionable data and make decisions with that data. Over the next year availability of user friendly data processing should significantly aid in the successful adoption of VRM technology. With the potential to simplify the modeling of data for vineyards, at least for NDVI and yield, the cost of adoption will be significantly reduced.

Actual adoption of technology has focused on variable rate soil management and farm management record-keeping. Mechanized variable rate fertilizer management might actually cost more than a variable rate harvester. Typical PTO driven machines need to be converted to hydraulics. Growers may realize this additional cost or may purchase an entirely new fertilizer spreader. A conversion will cost between $5,000 and $6,000. If this is the first step in VRM a display and GPS are also required. The appeal of variable rate fertilizer is the desire to reduce waste annually. Growers find the opportunity to reduce costs or utilize materials more accurately, more appealing than removing fruit. Research does tend to indicate that the payback period on this technology will likely be significantly longer. The ability to improve vine size through variable rate nutrient management has not yet been established.

The adoption of VRM nutrient management as an upgrade to VRM canopy management makes a lot of sense. If the display, GPS and hydraulic spreader are already owned, the cost to upgrade is relatively minimal. When the investment is an upgrade the more efficient use of fertilizer, potentially less fertilizer used, is enough to justify the cost. When adopting variable rate fertilizer as a stand-alone VRM strategy the return on investment requires an increase of vine size.

There are a number of ways to control crop load. There are also an infinite number of production practices that can be upgraded to variable rate. The focus on crop load action is a least cost alternative that appears to have the highest rate of return. For that reason, it has been the focus of research. The ease of measuring and manage canopy and yield also has advantages over soil health. As we continue to improve data modelling, it may become even more clear that this path toward adoption of VRM represents a leap in efficiency for the industry.

IPM

Tim Weigle, NYSIPM, Cornell University, LERGP Team Leader

Intrepid 2F receives Special Local Needs Label for Grape Berry Moth in New York

Grape growers in New York will now have an extra tool in their toolbox when it comes to grape berry moth management in vineyards thanks to a Special Local Needs label. Intrepid 2F, active ingredient Methoxyfenozide, has been used effectively in other grape growing regions in the United States for a number of years now. Unfortunately for growers on Long Island, this SLN label does not include use in Nassau or Suffolk Counties.

According to the New York and Pennsylvania Pest Management Guidelines for Grapes; Intrepid 2F is an insect growth regulator that interferes with larval development. It appears to be most effective when applied at the start of egg-laying rather than at egg-hatch. Hence, Intrepid 2F should be applied somewhat earlier than broad-spectrum materials. Intrepid has been shown to have long residual (several weeks). Latron B-1956 spreader/sticker is recommended to maximize coverage.

Some things to keep in mind when using Intrepid 2F in New York with the Special Local Needs Label;

- Use of Intrepid 2F is subject to all use precautions and limitations imposed by the label affixed to the container for Intrepid 2F
- The SLN label must be in possession of the user at the time of application
- You should refer to the Intrepid 2F label for General Use Precautions, Mixing and Application Instructions
- Intrepid 2F is a restricted use pesticide

A copy of the approved SLN label is posted to the NYSDEC's product registration website. Enter Intrepid 2F in the "Product name" search box to locate the SLN.

As seen in the snapshot of the SLN label, application rates vary depending on timing. At the full label rate of 8 – 16 fluid ounces per acre (a limit of 48 ounces total per acre per year) there is a 30 day preharvest interval. To reduce the preharvest interval to 21 days, a reduced rate of 8 – 12 fluid ounces per acre should be used.

Using Intrepid in a Grape Berry Moth Program

Growers in Pennsylvania have had the opportunity to use Intrepid for a number of years now so I consulted with Andy Muza to see how it was best implemented into a GBM management strategy. According to Andy, it is critical to time applications of Intrepid properly as it needs to be ingested to work properly. This means it must be on the surface of the berry before the larva hatches from the egg which means applications should be timed more like an Altacor rather than a broad spectrum insecticide like bifenthrin. You should use the grape berry moth model on NEWA to help you time your application http://newa.cornell.edu. The easiest way to get to the grape berry moth model is to choose a station and go to that stations home page (see graphic below) and bookmark it so you can quickly return to it on your next visit. Click on grape berry moth and you will get the model results.

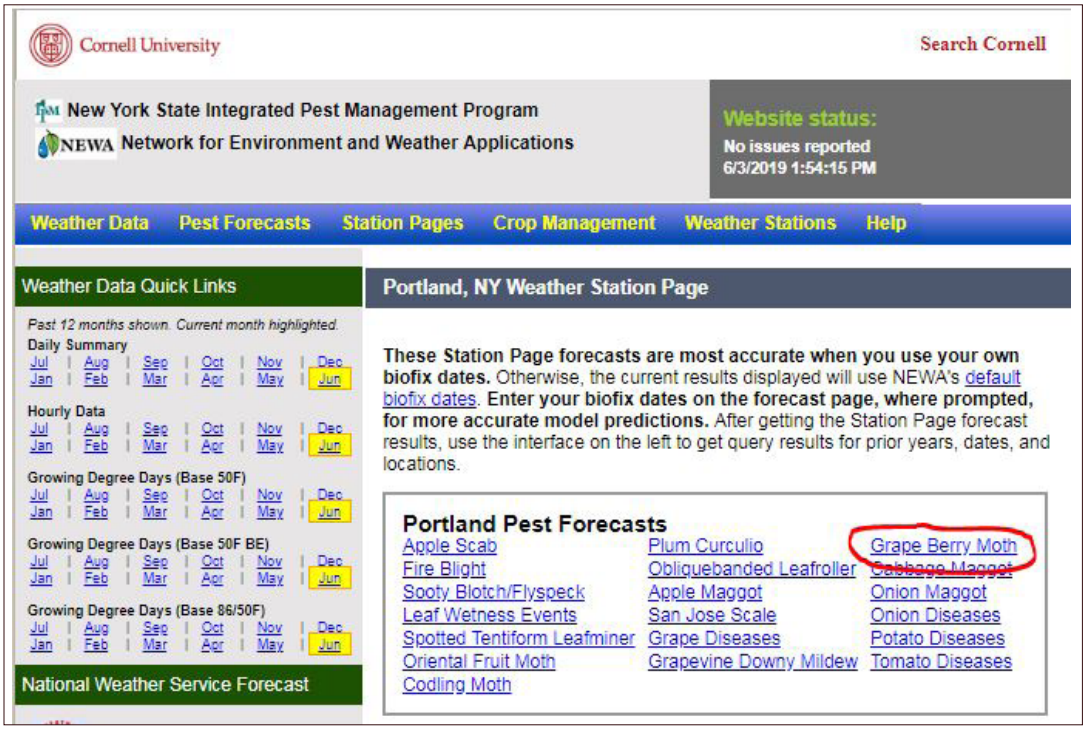
Application Rates, Application Timing and Restrictions:

Application Rate (fl oz/acre)	Application Timing	Restrictions
8 - 16 (0.12 – 0.25 lb ai/acre)	For internal feeding lepidoptera larvae, apply at initiation of egg hatch for each generation. Reapply within 10 to 18 days to ensure complete coverage of rapidly expanding fruits or foliage.	• **Preharvest Interval:** Do not apply within 30 days of harvest. • Do not apply more than 16 fl oz per acre per application or more than a total of 48 fl oz of Intrepid 2F (0.75 lb ai) per acre per year.

Please follow the use directions below for a reduced PHI for Grape to 21 days

Application Rate (fl oz/acre)	Application Timing	Restrictions
8 - 12 (0.12 – 0.19 lb ai/acre)	For internal feeding lepidoptera larvae, apply at initiation of egg hatch for each generation.	• **Preharvest Interval:** Do not apply within 21 days of harvest. • Do not apply more than 12 fl oz per acre per application or more than a total of 48 fl oz of Intrepid 2F (0.75 lb ai) per acre per year. • Do not make more than 4 applications per season. • Do not reapply less than 21 days apart

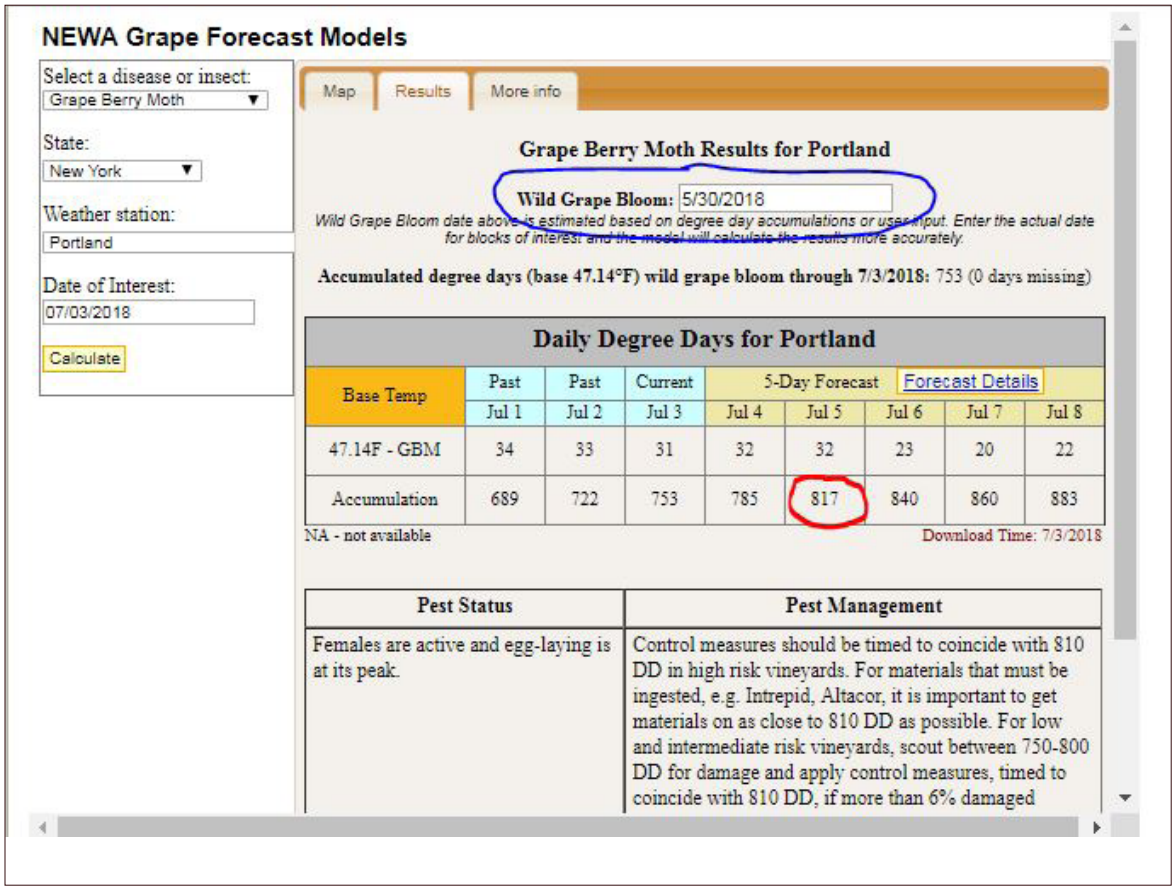
With ten new stations added in the Lake Erie region in 2018 your vineyard should be close enough to one of the sites to get good information. And speaking of good information, the GBM model on NEWA relies on a biofix date of wild grape bloom. The biofix date is the date when the degree days (DD) for the GBM model will start to collect. It is important to realize that the DD for the GBM model are different than the GDD we typically use as DD are calculated using a biofix date and a base temperature of 47.14º F rather than the typical 50º F base temperature and any starting date identified by the user (typically the first of a month) for GDD. The GBM model does provide a predicted wild grape bloom date based on degree day accumulations and phenology data for Concord in the Lake Erie region. However, to improve accuracy, the model also provides the opportunity to fine tune model results by inputting the observed wild grape bloom date found near a specific vineyard site(s).



N*ote: It should be noted that if you access the GBM model on NEWA at this point in the growing season it provides you growing degree day accumulations using base 50º F. Once the wild grape bloom date (biofix) has been input into the model, either automatically from the database, or through user observed input, the model switches over to DD accumulation base 47.14º F.*

Because Intrepid must be ingested, excellent coverage is key to the efficacy of this material. For this reason, use during the first insecticide application for GBM at 810 DD is recommended. The longevity of Intrepid also makes this a good time for an application as it can provide extended coverage to limit the survivability of the second generation of GBM (research has indicated that, except in severe cases, insecticide applications aimed at the first generation are not necessary) which should help reduce the size of future generations. If Intrepid is used against GBM at 1620 DD, or later, it is recommended to take the time to ensure that the sprayer being used is capable of getting the material to the grape cluster and providing excellent coverage. The reason for this is that if the material is not present to be ingested as the larva leaves the egg and starts eating there will be no effect on the larva.

The five day forecast feature of the GBM model provides a look into the future to plan insecticide applications according to their properties. As seen in the graphic below, in 2018, 810 DD fell between July 4 and July 5 at the Portland, NY site. If using Intrepid, it would be best to have it applied prior to July 5 to ensure the majority of emerging larvae will encounter it. The 810 DD application should be made in blocks classified as being at intermediate or high risk for damage from grape berry moth. Low risk vineyard blocks should be scouting between 750 and 800 DD to determine if cluster damage is at the economic threshold of 6% damaged clusters or above (one sting or more equals a damaged cluster).



And a special thanks to Mark Amidon of National Grape Cooperative who led the effort in getting this material available for grape growers in New York.

If you have questions on how to incorporate Intrepid 2F into your grape berry moth management strategy please give me a call at 716.792.2800 or email me at thw4@cornell.edu

Viticulture

Jennifer Russo, Viticulture Extension Specialist, LERGP

Nutrition Addition ?

Nutrition remains an important part of managing a vineyard since it impacts vine growth, crop yield, berry composition and ultimately, juice and wine quality. Most vineyards have some variability making a “one program fits all” approach not efficient. Fertilizer applications should be tailored to variety, rootstock, vine age, soil type, water availability, production and quality expectations, and management history. With the increased cost of fertilizers and concerns about the adverse environmental impacts, there is a need to fine-tune fertilizer management. The goal is to match application source, rate, timing and method to meet the grapevines’ needs.

Grapevines require soil minerals to sustain growth. Although the mineral elements are needed in different quantities, each one plays an essential role in completing the vine’s life cycle. Macronutrients such as nitrogen, phosphorous, potassium, and magnesium are used in relatively large quantities by vines. When one or more of these elements is deficient, grapevines may exhibit reduced growth or yield and may have greater susceptibility to diseases and winter injury. Conversely, too much of certain nutrients and minerals can lead to toxicity.

It is very important to monitor your vine nutrition on a continual basis for optimal vine health and productivity. Growers and vineyard managers should implement a soil testing and tissue analysis (petiole or leaf blades) program. The information gained from these programs in regards to nutrient levels and availability combined with boots on the ground in the same sampled area to visually observe the vine health can be powerful tools to avoid deficiencies and unnecessary fertilizer applications.

Nutrient cycling is the core function associated with soil fertility. During decomposition, any living organism that dies and falls to the vineyard floor releases the nutrients (organic nutrient compounds) that it was composed of. These organic nutrient compounds (nutrients) are rarely in a form readily available for vine uptake and need to be converted into available forms through mineralization. A community of organisms that live in healthy soils (bacteria, fungi, protozoa, nematodes, mites, earthworms and arthropods) drive part of this process. As these organisms feed on the organic matter, they essentially break it down from complex carbon (organic) compounds into the nutrient building blocks that composed it. While the organisms gain energy for their growth, the elements of the organic matter are mineralized and ready for vines to use.

As previously mentioned, there are many factors that contribute to vine nutrition such as floor management strategies, rootstock, vine size, soil type, water availability, and over time the nutrient depletion can occur, and vineyards may require fertilizer applications to correct it. This article focuses on nitrogen application, but it is relevant for other essential nutrients as well. There is no single method for accurately assessing the nutrient needs of established vines. Instead, a combination of soil analysis, plant tissue analysis, and visual observation is used.

Soil Samples

Soil samples should be taken every two to three years. Sampling from any given area should be done at about the same time as in previous years. Samples must also be representative of the area in question. If using a management zone map, samples should be taken from all zones.

For the 2019 growing season, the Lake Erie Regional Grape Program offers a Free Loaner Sensor Program for mapping variation within vegetative growth (NDVI) and we can run our soil sled sensor through your vineyard. The information collected by these sensors is then turned into data-driven management zones. Growers can then use these maps as a guide for management decisions, such as where to sample your soil. Please contact our office at (716) 792-2800 to take advantage of the NDVI Loaner Sensor Program or schedule a time for soil sensing.

The grower or vineyard manager should collect samples when the soil is moist, not saturated, and each sample should consist of ten to twenty subsamples from the area that are thoroughly mixed. Do not include surface litter, sod, large pebbles, and stones because they also contain mineral nutrients that are not part of the soil and can skew your results; keep a total of about one pound of sample for testing. Because soil profiles can differ at different depths, take some sample material around eight inches and others at 16 inches to cover the soil profile. Soil test results will indicate whether adjustments to pH and mineral nutrients are necessary.

Plant Tissue Analysis

Tissue analysis is a tool that reveals the concentration of essential nutrients (elements absorbed, or taken up, by vine tissues). Samples collected are then compared to standard grapevine tissue references from healthy vines at the lab and classified as either adequate, high, or low/deficient. Once you receive your results, fertilizer recommendations to adjust nutrients that are low can be made with guidance from your viticulturist or the lab that processed your samples.

Ideally, a grower should sample at different times during the growing season (bloom and veraison) to evaluate different nutrients since they fluctuate over the course of the growing season. However, that is both inconvenient and expensive. It is recommended to sample as close to full bloom as possible because this is a well-defined stage of vine development that provides useful information for the majority of plant essential nutrients.

For plant tissue analysis, collect 100 petioles from leaves located opposite the first or second flower cluster of the shoot. If using a management zone map, be sure to collect samples from each zone for total representation. Growers and vineyard managers should also collect their samples from the same area as the soil samples. Immediately separate petioles from leaf blades and place petioles in a small paper bag or envelope. Plastic bags will promote decomposition of your plant tissue samples and may alter test results.

Leaf blades can also be collected for tissue samples, especially when trouble-shooting suspected nutrient deficiencies. It has been suggested that leaf blades may be superior to petioles because they reflect a cumulative storage of nutrients. However, currently there is a much stronger database of bloom and fall petiole samples than leaf blades.

The following table is the Sufficiency ranges for nutrient concentrations guidelines found in chapter eight of Tony K. Wolf's, *Wine Grape Production Guide for Eastern North America,* that was published in 2008 by Natural Resource, Agriculture, and Engineering Service (NRAES) Cooperative Extension.

Table 8.4 • Sufficiency ranges for nutrient concentrations

Nutrient	Chemical symbol	Target values		
		Soil	Bloom petiole	Late-summer petiole (70–100 days after bloom)
Total Nitrogen	N	—[a]	1.2%–2.2%	0.8%–1.2%
Phosphorus	P	20–50 ppm	0.17%–0.30%	0.14%–0.30%
Potassium	K	75–100 ppm	1.5%–2.5%	1.2%–2.0%
Calcium	Ca	500–2,000 ppm[b]	1.0%–3.0%	1.0%–2.0%
Magnesium	Mg	100–250 ppm	0.3%–0.5%	0.35%–0.75%
Boron	B	0.3–2.0 ppm	25–50 ppm	25–50 ppm
Iron	Fe	20 ppm	30–100 ppm	30–100 ppm
Manganese	Mn	20 ppm	25–1,000 ppm	100–1,500 ppm
Copper	Cu	0.5 ppm	5-15 ppm	5–15 ppm
Zinc	Zn	2 ppm	30-60 ppm	30–60 ppm
Molybdenum	Mo	—[c]	0.5 ppm	0.5 ppm
Aluminum	Al	< 100 ppm[b]		
Organic matter		3–5%		
pH		5.5 (*V. labrusca*) 6.0 (hybrids) 6.5 (*V. vinifera*)		

Note: ppm is parts per million.

[a] Soil nitrogen is not normally evaluated for vineyards in eastern North America.

[b] Calcium level is normally adequate when pH is in the proper range for the grape variety. The same is true for aluminum.

[c] Adequacy of soil molybdenum for grapevines is uncertain.

Visual Observations

Observations of vine vigor, crop size, and foliar symptoms are all important indicators of stress and possible nutrient deficiencies. In general, there are three different patterns of symptoms to observe:

1. Patterns with the vineyard
2. Patterns on a given vine
3. Patterns on a particular leaf

Patterns within a vineyard can provide useful clues. If there are hills in your vineyard, nutrient deficiencies tend to occur on the higher sites where erosion occurs and reduced soil moisture (do to it running downhill) that aids the movement of nutrients to the roots. Also, nutrient deficiencies tend to occur in a portion of the vineyard, and rarely on a vine “here or there” basis. If symptoms are on an occasional vine, here or there, it is generally pest related.

Patterns on a given vine can also provide information about which nutrient might be causing the deficiency problem. If there is a deficiency of elements such as nitrogen, potassium, and magnesium, symptoms will appear on older or mid-shoot leaves. Deficiencies of iron and zinc first appear on the youngest leaves of the shoot.

The diagnosis of nutrient deficiency depends on the experience of the one diagnosing it and should be confirmed with a combination of visual observations and laboratory tests.

The Role of Nitrogen

Nitrogen is the essential element used in greatest amounts by vines for growth and development. Nitrogen is required in the synthesis of amino acids, nucleic acids, proteins, and pigments including chlorophyll of leaves and anthocyanins for color. Unfortunately, nitrogen deficiency is not as easily recognized as other nutrient deficiencies.

Chlorophyll is the green pigment on leaves that is required for photosynthesis. A classic symptom of nitrogen deficiency is a uniform light green color of leaves, due to lack of nitrogen to create the healthy dark green pigment. Nitrogen deficiency is considered severe if leaves show this symptom. Other visual symptoms of nitrogen deficiency may present as slow shoot growth, short inter-nodal length, small leaves, and an unusually red color of leaf petioles and shoot stems. It is important to note that drought, insects and mites, and overcropping can also cause these symptoms, so soil and tissue samples are recommended.

There are basically three nitrogen sources for grapevine growth: mineralization of nitrogen from organic matter, remobilization of stored nitrogen from storage in perennial tissues, and inorganic nitrogen fertilizers. By far, the largest pool of nitrogen for grapevine growth comes from the mineralization of organic matter. This is where knowing your soil sample results is important. A basic rule of thumb is that for every 1% or organic material in your vineyard soil, about 15-20 pounds of nitrogen per acre is made available to the vines for uptake. If nitrogen is deficient, we recommend that the vines get 30-50 pounds. If you have only 1% organic matter in your soils, that means that you only need to apply 10-30 pounds per acre because the mineralization nutrient pool.

If there is too much nitrogen in your vineyards, you will see excessive vine growth. This can create over vigorous canopies that can shade fruit and leaves, decrease spray efficiencies, and delay wood maturation. Yield can be adversely affected by excess nitrogen through reduced bud fruitfulness caused by over vigorous shading in the previous year. The vigorous shoot tip growth can essentially steal carbohydrates, nitrogen compounds, and hormones required by the flower clusters causing inadequate fruit set.

What can cause nitrogen deficiencies?

Once absorbed, nitrogen can be physically removed from your vineyard through fruit harvest and annual pruning. A grape berry is 0.18% nitrogen. If you remove 5 tons of grapes per acre, with a little math, you will remove 18 pounds of nitrogen per acre from the vineyard. You further deplete nitrogen if you remove the canes that you pruned. Taking this nitrogen out of your vineyard and not replacing it will eventually lead to nitrogen depletion. This is accelerated on soils with low organic matter.

Correcting Nitrogen Deficiency

Maintaining an appropriate nitrogen status is based on experience, vine performance observation, and use of bloom-time petiole analysis of nitrogen concentration. Once a deficiency is detected, it will require time to correct.

The graph showing Total N in correlation with Days after Bloom is from Dr. Terry Bates' research on Grapevine Mineral Nutrition. Note the beginning of the curve on the graph is at 0, which is bloom. Concord vines demand and will take up large amounts of nitrogen during periods of rapid growth and with sufficient transpiration rates. More specifically, bloom to veraison, which corresponds well with the curve beginning at bloom on the graph above. Remember that the nutrition reserve in the roots have fed the vines up to this point. We supplement nutrition during this period of rapid growth. If

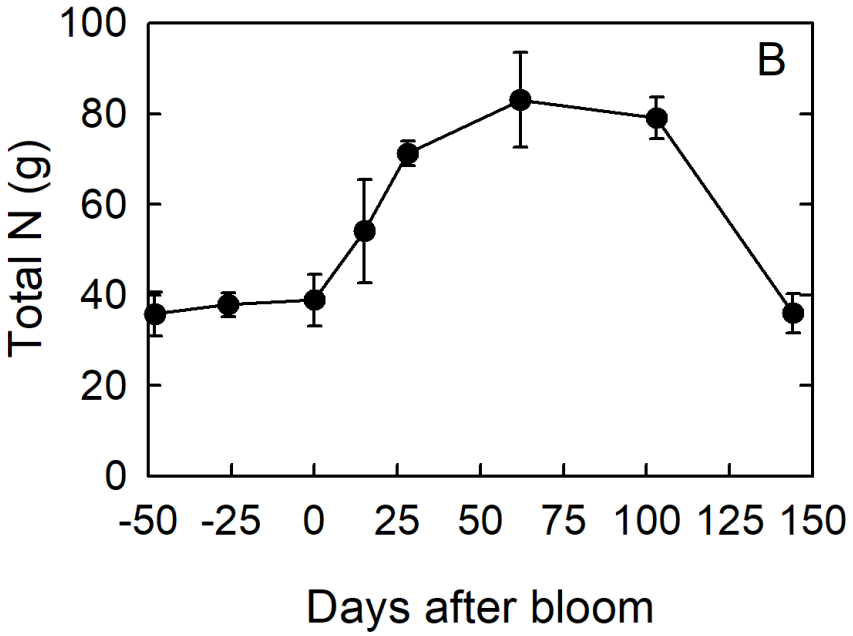
Vine Nitrogen Status Observations

Nitrogen-Deficient	Adequate Nitrogen	Excess Nitrogen
Vines consistently fail to fill available trellis with foliage by August 1	Vines fill available trellis with foliage by August 1	Shoots fill trellis with an excess of foliage: shoots 8 to 10 feet long by mid-July
Crop yield is chronically low	Crop yields are acceptable	Fruit yields are low because there are few clusters, poor fruit set, or both
Cane pruning weights are consistently less than 0.25 lbs. per foot of row or per foot of canopy for divided-canopy training systems	Cane pruning weights average 0.3 to 0.4 lb per linear foot of canopy	Cane pruning weights consistently exceed 0.4 lbs. per linear foot of canopy (ex. 2.8 or more pounds of cane prunings for vines spaced 7 feet apart in the row)
Mature leaves are uniformly small and light green or yellow; leaf reddening may occur with red-fruited varieties, and leaf petioles may be unusually red	Mature leaves are of a size characteristic for the variety and are uniformly green	Mature leaves are exceptionally large and very deep green
Shoots grow slowly and have short internodes	Shoots grow rapidly and have internodes 4 to 6 inches long	Shoot groweth is rapid, and internodes are long (6 inches or more) and possibly flattened
Shoot elongation ceases in midsummer	Shoots cease growth in late summer or early fall	Shoot growth does not cease until very late in the fall
Fruit quality may be poor, including poor pigmentation with red-fruited varieties	Fruit quality and time to maturation are normal for the variety	Fruit maturation is delayed
Bloom-time petiole nitrogen concentration is less than 1.0%	Bloom-time petiole nitrogen concentration is between 1.2% and 2.2%	Bloom-time petiole nitrogen concentration is greater than 2.5%

Information from *Wine Grape Production Guide for Eastern North America,* Tony K. Wolf, Virginia Tech. NRAES 2008.

nitrogen application is required, a good stating point is a rate of 30 to 50 pounds of actual nitrogen per acre. Research out of Michigan by Stan Howell indicates that mature, healthy Concord vines need approximately 70 pounds of nitrogen per year. Further research (again out of Michigan) by Tom Zabadal and Eric Hansen shows that bud break applied N fertilizer is only 10% efficient and bloom applied N fertilizer is a bit more efficient at 15-20%. Meaning for every 100 pounds of nitrogen applied at bud break, only about 10 pounds is making it to the vines.

Dr. Terry Bates gave a scenario in 2003 that fits this newsletter perfectly. “Say I have a healthy, mature Concord vineyard with 3% organic matter. I figure that the vines need 70 pounds of N per year, and that my soil is releasing approximately 60 pounds from mineralization. I need to make up 10 pounds of nitrogen through inorganic fertilizers. If I apply fertilizer only at bud break and get only 10% uptake efficiency, I need to put on 100 pounds of fertilizer nitrogen just to make up the needed 10 pounds. If I rely on reserves and organic matter in the pre-bloom period and apply nitrogen around bloom and increase fertilizer efficiency to 20%, then I only need to apply 50 pounds of fertilizer nitrogen to make up the needed 10 pounds.”



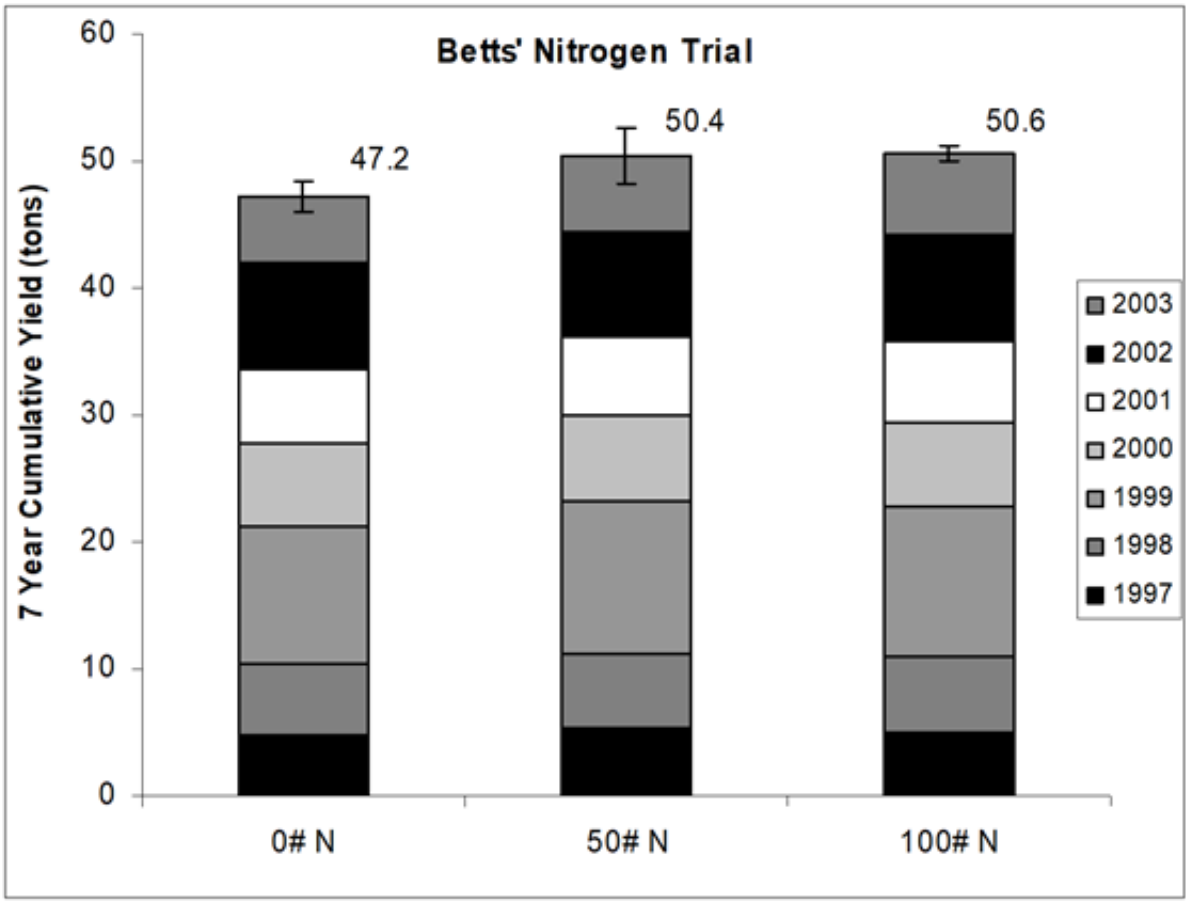
Dr. Bates’ long term research from the West Tier in Fredonia, NY shows that own-rooted Concord vines on soil with 2-3% organic matter achieve **maximum** productivity with 50 pounds of nitrogen fertilizer. Putting on more nitrogen did not produce more crop. Further nitrogen research was conducted on heavy clay soil at the Betts’ vineyard, where the organic matter is a bit higher at 4-5%. There were no differences in vine growth with 0, 50, or 100 pounds of nitrogen applied. Note the graph below of Betts’ Nitrogen Trial 7-year Cumulative Yield in tons; there is not a drastic difference in the sums. This suggests that there was enough mineralization in that soil to provide vine nutrition, and adding 100 pounds of nitrogen on that particular vineyard was wasteful.

The research validates the importance of establishing soil and plant tissue sampling programs; those in combination with management zone maps will go a long way to getting the best out of your vines and more efficient input applications.

When supplemental nitrogen is required, Urea will likely be the most economical form of fertilizer application. It needs to be incorporated into the soil to minimize volatilization (changing into vapor and lost) of ammonia. Rain within one or two days of application certainly helps to get it into your soils, however, the weather is very unpredictable therefore soil cultivation may be necessary. De-hilling of grafted vines is an acceptable cultivation.

Applications of actual nitrogen must be translated into rates based on commercial formulations. For example, a recommendation of 40 pounds of actual nitrogen per acre would require 87 pounds of urea per acre, 190 pounds of ammonium sulfate per acre, or 250 pounds of calcium nitrate per acre.

Nitrogen fertilizer should be applied only during periods of active uptake to decrease the occurrence of leaching. These include from bud break to veraison, and right after fruit harvest in the fall. In our cool climate, we recommend that you apply fertilizer between two weeks before bloom and four weeks after. In instances where more than 70 pounds of actual nitrogen are required, a split application should be applied with 50% of actual nitrogen applied at bloom and the remainder applied six weeks after bloom, if necessary.



Be conscious to apply nitrogen where the vine roots are concentrated in the weed-free strip under the trellis in vineyards that have sodded row middles. In vineyards that have bare or herbicide managed row middles, fertilizer should be broadcasted over the vineyard floor to reach the roots that may have spread into the middle without competition. Fertigation is another form of fertilizer application through the irrigation driplines, however, it is much easier to keep nutrients out of the water supply than to remove it from water, so take care to use this application correctly. In some short-term correction of deficiency cases, nitrogen can be applied to the foliage, but it should be applied independently of other chemicals and sufficiently researched to avoid injury to your vines.

Nitrate leaching is an agricultural concern because excess leaching leads to soil acidification and potential groundwater pollution. Industrial and organic fertilizers provide ammonium to the soil where the ammonium is oxidized to nitrate and potentially leached. Grower and vineyard managers should take advantage of all the tools available to guide our nutrient additions when needed. Efforts should be made to make the most efficient use of nitrogen fertilizers by using the appropriate material, rate, and timing for the individual vineyard goals.

In the commercial management of vineyards, obviously guaranteeing the success of flowering is key to the production of fruit, wine, or juice and ultimately profit. The vineyard manager has options to intervene in the growth cycle and either increase or decrease the amount of fruit produced. The period of extreme activity during May through July in our region is the time when the vine must be properly fed, properly watered, properly managed for pests and properly managed for crop level. Please contact our office if you require assistance with any of your fertilization management decisions.

PA Update

Andy Muza, LERGP Extension Educator, Penn State University

Rose Chafer

Rose chafer is a beetle in the same Family (Scarabaeidae) as the Japanese Beetle. Rose chafer adults feed on a variety of host plants (e.g., roses, tree fruit, small fruit, etc.) but in our area the preferred host is grape. Although rose chafers are not a widespread problem, in a majority of vineyards across the Lake Erie Region, these beetles **can cause significant crop loss** in vineyard blocks where they occur. Vineyard blocks with sandy soils (particularly sandy sites from the lake front to just south of Route 5 in North East, Pennsylvania) have the most persistent problem with this pest. I have also seen spotty problems on sandy knolls in some blocks in the grape belt.

Figure 1. Rose chafer feeding injury on young cluster. Photo – Andy Muza, Penn State.

Every year in early June (about 7-10 days before bloom) in the Lake Erie Region, large numbers of rose chafer beetles emerge from the soil at the same time and begin mating and feeding extensively on tender flower clusters (Figure 1). Beetles will also feed on grape leaves but over the years I have only seen minimal injury on Concord leaves. Feeding continues to occur in vineyards for about a 3 week period.

Figure 2. Rose chafer adult. Photo – Andy Muza

Fortunately, there is only 1 generation per year.

Adult beetles are about ½ inch long, have a light brown-tan body coloration and long, spiny legs (Figure 2). Females prefer laying eggs in grassy areas with sandy soils. Rose chafer grubs are C-shaped and have a white body with a brown head capsule. They are similar in appearance to Japanese beetle grubs. These larvae feed on roots of grasses, weeds and other plants during the summer.

Vineyards with a history of this pest or blocks with sandy soils should begin scouting about 10 days before bloom. Scouting for this pest should be conducted daily, if possible, but at a minimum of 3 times/week and should continue for about 2 weeks after bloom. Infested areas can lose extensive numbers of flower clusters if beetles are not detected early and treated. Research from Ohio State recommends an insecticide application if a threshold of 2 beetles per vine is reached. Blocks with high populations of rose chafers may require a second insecticide application.

Insecticides for management of rose chafer listed in the 2019 New York and Pennsylvania Pest Management Guidelines for Grapes, page 87) include Assail, Danitol and Sevin.

The VMech-2220: Costs and Benefits Breakdown

By Heather Barrett

Mechanization begins replacing manual labor when the cost of operating, maintaining, and purchasing the equipment is cheaper and/or more dependable than hiring workers to complete the same task. The labor force for vineyard work has both declined in availability and quality over the last several years and so mechanization has become more common. A response to this trend is the development of technology to perform vineyard maintenance with as few workers as possible, in many cases only requiring a single person. These are generally single row tool attachments for tractors that apply uniform treatment to a vineyard block.

The VMech-2220 is a **two-row** tool carrier that can be used for pruning, shoot thinning and suckering. This machine has been featured in several demonstrations out in California vineyards, two of which included research plots for the Efficient Vineyard Project. Both arms are independent of each other and can be adjusted to each row as the tractor moves through the vineyard. It has also been adapted to be used in tandem with variable rate technology to enable variable rate management plans which have been shown to increase vineyard health and yield compared with uniform management. All numbers listed reflect Lake Erie Region averages using a two row trailer (a single row unit is not currently available from VMech).

For **WINE** grapes:

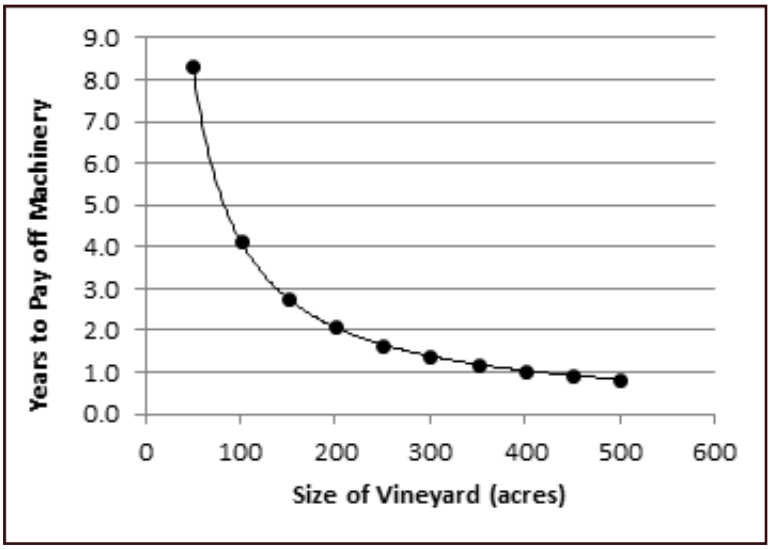
Cost/Acre	*Manual*	**Machine*
Pruning	$225 (35¢/vine)	$60
Hand Follow-up	$0	$75 (12¢/vine)
Suckering	$250 (38¢/vine)	$0*
Shoot Thinning	$200 (30¢/vine)	$60
Total	$675	$195
Savings/Acre		**$480**

*Costs do not reflect machine maintenance.

*Suckering is completed at the same time as shoot thinning using this setup, therefore no extra cost associated with labor or fuel is incurred through this vineyard activity.

So for a **hypothetical scenario** of a vineyard with varieties growing in an upright growing pattern (VSP) with 100 acres, the total savings per year would be **~$48,000**. At this rate of savings, the VMech-2220 pays for itself in just over 4 years. These numbers are for wine growers in the Lake Erie Region; in areas where the cost of labor is higher or lower the length of time for the machine to pay for itself could be different. The cost to operate the machine is based on having two people to

operate the trailer and one person driving the tractor at a rate of $20/hour. This number is an average for the pay of an equipment operator. If variable rate technology is in use and a prescription map is loaded then the trailer operators only need to make sure the arms are lined up properly with the grape rows. Uniform rates can also be set for the operators but they will not change according to the location or needs of the vine without input from a prescription map.



The VMech-2220 and all of its components are listed for $199,500 not including freight or taxes. The 2220 suite comes with the trailer ($82,000), pruning heads ($76,000), and cordon brush/shoot thinning heads ($41,500). In addition to the cost of the machine, it would cost around $15,000 to add variable rate technology. All of the suite components can be bought separately at the same price.

VMech continues to look into other add-ons for the trailer to make it more versatile in the vineyard. Future additions might include: leaf puller attachment, sprayer attachment, rake attachment, and automation (reducing human input and necessary labor). Feel free to come in and speak to our viticulturist about steps towards mechanization and variable rate management plans at the Lake Erie Regional Grape Program office in Portland, New York.

ASEV-ES Conference Information

Conference

The 44th Annual ASEV-ES Conference with Nelson J. Shaulis Symposium will be July 16-18, 2019 in Geneva, NY at Hobart and William Smith Colleges. The **ASEV-ES conference** will begin with technical/research presentations on Tuesday, July 16 and include the awards/lunch and Oenolympics with Wines of the East Reception. On Wednesday, July 17 there will be a **New York Digital Viticulture Tour and Equipment Demonstrations** in vineyards on Keuka and Seneca Lakes. The **Nelson J. Shaulis Symposium** on Thursday, July 18 will feature invited speakers to discuss "Digital Viticulture: New Tools for Precision Management of Vineyards".

For more information on the schedule contact **Dr. Paul Read,** Professor, University of Nebraska (402-472-5136, pread@unl.edu).

Oenolympics Reception, Tuesday, July 16, 2019

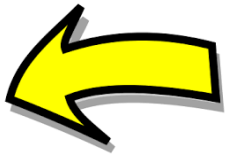
Conference attendees to the Reception are invited to cheer your favorite team at the Eighth Annual Oenolympics, a student competition designed to promote fun, fellowship, and creative thinking with enology and viticulture-themed games. The Oenolympics, comprised of student teams, is a true spectator's event, not to be missed! All ASEV-ES students registered for the conference are invited to compete in the Oenolympics. **Back again this year!** A faculty/industry team will participate in the event, challenging the students!

For more information on the Oenolympics contact **Dr. Anna Katharine Mansfield**, Associate Professor of Enology, NYSAES, Cornell University (315-787-2268, akm87@cornell.edu).

New York Digital Viticulture Tour and Demonstrations, Wednesday, July 17, 2019

The New York Digital Viticulture Tour and Demonstrations will include visits to two sites on Keuka and Seneca Lake for extensive demonstrations of equipment and tools for precision vineyard management. The morning will focus on currently available technology in hybrid and Concord vineyards on Keuka Lake, and the afternoon will focus on emerging technologies in a *Vinifera* block on West Seneca Lake. Lunch and a wine tasting by the Keuka Wine Trail will be served, and the day will close with a reception and Seneca Lake wine tasting at Anthony Road Vineyards. Technology demonstrated will include:

- Tractor-mounted and drone sensors for measuring canopy fill and vine size
- Variable-rate equipment for shoot thinning and crop thinning
- Yield monitors and spatial refractometers for producing spatial yield and brix maps
- Sensors for continual monitoring of vine water status
- Networked temperature sensors
- New equipment for precision viticulture from manufacturers and suppliers



For more information on the tour contact **Dr. Tim Martinson,** Senior Extension Associate, Cornell University (315-787-2448, tem2@cornell.edu).

Nelson J. Shaulis Symposium, Thursday, July 18

DIGITAL VITICULTURE Nelson J Shaulis Symposium

The Nelson J. Shaulis Symposium, **Digital Viticulture: New Tools for Precision Management of Vineyards,** will be held Thursday, July 18. Dr. Nelson Shaulis and others developed principles of vine physiology that form the basis of modern viticulture. His focus on the importance of light interception, canopy density, and balanced cropping have been applied worldwide. However, growers have lacked the tools to apply these principles on a vine-by-vine basis to manage variable vineyards. New technologies such as inexpensive sensors, digital imaging, geographical information systems, and precision machinery are converging to make precision viticulture possible. These technologies offer producers the prospect of applying management to individual vines to maximize quality and yield.

New York vineyard and winery owners can attend the July 16 conference at ASEV-ES member rate.

For more information on the schedule contact **Chris Gerling,** Enology Extension Associate, Cornell University (315-787-2277, cjg9@cornell.edu) or **Dr. Tim Martinson,** Senior Extension Associate, Cornell University (315-787-2448, tem2@cornell.edu).

Registration Form

44th Annual

American Society for Enology and Viticulture-

Eastern Section Conference with Nelson J. Shaulis Symposium

"Digital Viticulture: New Tools for Precision Management of Vineyards"

July 16-18, 2019, Geneva, New York

PLEASE PRINT:

Name (as desired on name badge)_____

Name of Spouse (if attending functions)_____

Company/Affiliation: _____

Address: _____

City_____ State/Province_____ Zip/Postal Code_____

Phone _____ Email _____

Events	Number Attending	Rate	Total
Tuesday, July 16: Conference Registration *(includes Business Lunch/Awards and Oenolympics with Wines of the East Reception)*			
Eastern Section Member/ New York Vineyard or Winery Owners		**$150**	
Non-Member		**$275**	
Student Member/Spouse of Full Registrant		**$100**	
Tuesday, July 16: Extra Ticket Oenolympics Reception		**$45**	
Wednesday, July 17: New York Digital Viticulture Tour & Demonstrations *(includes Lunch and Reception, maximum capacity 100 people)*		**$100**	
Thursday, July 18: Nelson J. Shaulis Symposium Registration *(includes Lunch and Reception)*		**$150**	
LATE FEE: ***(after July 2)***		**$100**	
TOTAL AMOUNT ENCLOSED			
___ *I request a* vegetarian/vegan entrée for meals. Please contact ASEV-ES with other diet restrictions. ___ I would like to participate in the Oenolympics. Students and nonstudents can participate.			

PAYMENT BY CREDIT CARD, CHECK OR MONEY ORDER; US OR CANADIAN CURRENCY

PAYABLE TO: ***ASEV-Eastern Section, Inc.***

Pay for ASEV-ES conference activities with credit cards or PayPal
on our website at http://www.asev-es.org/ or Click here to pay.

CREDIT CARD INFORMATION: MasterCard ____ Visa _____ *(AmEx not accepted)*

Card Number: _____ Expiration Date: _____ CSC (security code): _____

Card Holder Name: _____Total Amount: _____

Signature: _____ Zip Code (*associated with credit card*): _____

Email, Mail or FAX completed registration form to:

Nancy Long, ASEV-ES Registration, Cornell University Jordan Hall, 630 W. North St., Geneva, NY 14456
Questions?? Phone: (315)787-2288 FAX: (315)787-2488 Email: NPL1@cornell.edu

Registration and Cancellation Policy: Registration is required for all events. Registration can be cancelled by written request to ASEV-ES. No refunds after July 1. Substitutions are allowed. "No shows" will not receive a refund.

Seeder Loaner Program: For Vineyard Use

Purpose: Cover crops can be a useful tool in improving soil physical, chemical, and biological properties. The purpose of this no-till seeder loaner program is for grape growers to gain experience with cover crop seeding in their own vineyard operations.

The Cornell Lake Erie Research and Extension Laboratory acquired this five-foot seeder from Chautauqua County Soil and Water and our intent is to loan out the implement at no charge to Lake Erie Regional Grape Program members for vineyard use. Since this is a no-fee program, we need to minimize the burden on CLEREL staff. We ask that you pick up and drop off the seeder by your own means, operate the equipment as if it were your own, and return it in good working order.

Thank you for your cooperation in this program for your fellow growers. If the seeder becomes abused, broken, or unsafe to operate, the CLEREL Director will discontinue the program.

Criteria:

- Must be a member of the LERGP
- To be used in Vineyards for moderate amounts of acreage
- Maximum 3 days/ use
- Must pick up and return by own means- we do not deliver or pick up
- Must return in same working condition as picked up

Procedure-
Grower will call LERGP at (716) 792-2800 ext 201 (Katie) and schedule a time to come get the seeder. Once here, grower will inspect the equipment and, if needed, attain basic instructions of use for the seeder. A profile sheet will be filled out to gather grower information and signed agreeing on terms. Upon return of the equipment, an inspection of condition will occur.

6592 W. Main Rd.
Portland NY 14769

Lake Erie Regional Grape Program Team Members:

Andy Muza, (ajm4@psu.edu) Extension Educator, Erie County, PA Extension, 814.825.0900
Tim Weigle, (thw4@cornell.edu) Grape IPM Extension Associate, NYSIPM, 716.792.2800 ext. 203
Jennifer Russo, (jjr268@cornell.edu) Viticulture Extension Specialist, 716.792.2800 ext 204
Kevin Martin, (kmm52@psu.edu) Business Management Educator, 716. 792.2800 ext. 202

THE LAKE ERIE REGIONAL GRAPE PROGRAM at CLEREL
6592 West Main Road
Portland, NY 14769
716-792-2800

Cornell University Cooperative Extension

PennState Extension