Improved grape and wine quality in a challenging environment:
An eastern US model for sustainability and economic vitality
Executive Summary (2010-2013)

Funding for this five-year project was awarded in September 2010 and we recently completed the third fiscal year of performance. Research is on track with the originally proposed timeline. Personnel retirements and one resignation over the past 12 months have necessitated some changes in Principal Investigators, but this has had minimal or no impact on the research objectives or deliverables. Project expenses at the prime, and six sub-contracting institutions, is essentially on track with proposed budgets.

Objective #1a involves field experiments in NC, NY and VA that use either perennial or annual vineyard floor cover crops, rootstocks, and other means of vine vegetative growth suppression to create a desirable canopy architecture and improve wine quality potential. The VA study has shown that root restriction and under-trellis cover crop (UTCC) were independently effective in suppressing vegetative development of vines as measured by rate and seasonal duration of shoot growth, lateral shoot development, trunk circumference, and dormant pruning weights. The net effect was that less time was needed for specific canopy management practices, such as lateral shoot and leaf removal and shoot hedging. Certain components of yield, including berry weight, were reduced by vineyard floor management and root restriction; the UTCC also generally increased juice and wine color density and total phenolics, but depressed must Yeast Assimilable Nitrogen (YAN) levels. Wines have been made from the various treatments and both preference tests and sensory descriptive analyses have revealed modest but positive impacts of improved fruit exposure on finished wines. We have published one peer-reviewed article on this work and have two additional manuscripts in preparation. Initial findings have been presented at industry as well as professional meetings.

The comparable vine size management experiment in the Finger Lakes of NY was engineered to collect soil leachate to assess how vineyard floor management system affected the movement of nitrogen and applied agrochemicals through the soil profile. White clover ground cover was associated with a surprising, bi-modal release of nitrogen in late-winter and again in autumn, 2012, presumably from seasonal decomposition of the legume. A subset of soil solution samples will be analyzed for neonicotinoid insecticides applied to vines at the site in 2012.

The related NC study has generally shown a positive correlation between the width of the weed-free area under the trellis and the extent of grapevine vegetative growth, again illustrating some benefits are obtained by decreasing the width of the herbicide strip in terms of canopy management. Expected outcomes with all three experiments include a strategy for predictably managing both the extent and duration of vine vegetative growth, which will directly reduce canopy management labor and have the potential to improve fruit composition and wine quality. We expect to see less soil leaching of nutrients and herbicides with a more comprehensive use of either perennial or annual cover crops.

Cover crops also compete with grapevines for essential nutrients, thereby requiring increased attention to the nutrient management program. The research in Virginia is exploring various forms, rates, and timings of nitrogen application to grapevines in order to optimize vine N status and berry YAN in situations where cover crops are used over the entire vineyard floor. The
expected outcomes of this work will be a strategy to more efficiently use nitrogen fertilizer to benefit the vine (and fermentation).

Objective #1 also includes field research to define and accurately measure the variability that exists in cluster exposure within grapevine canopies. The definition of variability is an important step towards reducing variability. This work demonstrated the potential to reduce required samples sizes by nearly 70% in a vineyard by sampling according to Normalized Difference Vegetation Index (NDVI) imagery, resulting in savings in labor and lab materials.

Additional studies of objective 1, also replicated in NY, VA and NC, seek to discover how cluster exposure in a given variety (Cabernet franc) impacts certain secondary metabolites associated with aroma and other wine sensory attributes. This work commenced in 2012, is being repeated in 2013, and some aspects will likely be conducted in the 2014 growing season as well.

An additional line of investigation in NY explores means of regulating shoot vigor, again with the overall aim of improving vine “balance”. Increasing shoot number per vine effectively reduced individual shoot (cane) mass; however, canopy division, such as Scott Henry or Lyre training, might be needed to properly expose all shoots on vines carrying higher shoot numbers. Additionally, shoot vigor has been found to be much more uniform with spur pruning than with cane pruning. These results illustrate several practical means of regulating vine size and vigor.

Objective #2, like the first objective, involves several sub-objectives. We are using two approaches to help match suitable grape varieties with specific vineyard sites in this objective. First, information from a national winegrape variety evaluation (NE-1020) will be analyzed with respect to viticulture performance and enological evaluation of resultant wines. The NE-1020 is a coordinated, national research project that uses uniform research protocols among member institutions to generate an extensive database of grape, grapevine, and wine data. An additional component of the variety evaluation explores means of altering tannin concentrations in finished wines with selected white and red grape varieties. A feature of many of the hybrid and American-type red wine varieties used in the eastern US is low tannin concentrations in wine. Conversely, some of the hybrid white cultivars (e.g., Traminette) common in the East, often exhibit somewhat bitter phenolic finishes.

The second aim of Objective 2 is to develop a web-based Geographical Information System (GIS) tool that incorporates the variety performance data with climatic, topographic, and edaphic parameters to improve “site-cultivar” selection. The eastern US GIS tool, which we expect to launch in early 2014, will build upon state-specific tools that our research teams have deployed in Virginia and New York. In practice, anyone with internet connectivity will be able to evaluate the potential vineyard suitability of a parcel of land, and obtain general recommendations on varieties that would be expected to perform well at the site. We envision the tool as a high-resolution, first step in the vineyard site evaluation process.

Perhaps some of the most important questions and problems for the eastern wine industry are those that relate to consumer perceptions of eastern US wines. Multifaceted research at Cornell University and at North Carolina State University seeks to explore consumers’ perceptions,
motives to purchase, and satisfaction with eastern US wines in Objective #3. Research at Cornell has shown two important findings. First, drawing attention to AVAs for wines from emerging regions does not seem to impact consumers’ valuation, even among consumers that are relatively familiar with wine. However, efforts to highlight AVAs in emerging regions as part of a larger package of information may be a critical component of developing a long-term strategy for building reputations of new wine appellations. Second, point-of-sales information that drew references to well-established regions in France resonated well with buyers, indicating that making such links to famous regions may prove to be an effective marketing strategy for emerging wine regions, notably among consumers with greater familiarity with wine.

A telephonic consumer survey of nearly 3,000 wine consumers was conducted in North Carolina, Virginia and New York in early 2013 under the direction of Charles Safley at North Carolina State University. Survey respondents were asked questions about the wine industry in their respective state, including how they first learned about any local wineries, why they visited the winery, and whether they purchased wines. The data are now being analyzed to develop consumer profiles, wine purchase patterns, prices paid for wine at various market outlets, and consumption habits. The final industry report will present and discuss the survey results, conclusions and recommendations for retailers to improve their market position or take advantage of current trends. Finally, we will conduct demand analysis for wine cultivars and brands with the goal of enhancing managers’ decisions.

The solutions and resources created by this project have the potential to improve the profitability and sustainability of the eastern wine industry. However, those solutions must be transformed into practices and delivered to the eastern wine industry in order to realize this potential. Objective #4 is aimed at transforming the knowledge created by this project into commercially sustainable practices using a variety of resources. Extension workshops and short courses are principal means of delivering research based information. These workshops allow for direct contact between investigators and growers/vintners as well as important networking opportunities for the industry. For example, project investigators worked with the Virginia Vineyard Association in 2012 to host a canopy management and vine balance workshop, in which over 140 growers participated. A series of 4 “research summits” is now planned for February 2014. These summits will highlight research that is coming to fruition and will be conducted in concert with industry meetings in North Carolina, Virginia, Ohio and New York.

Educational events for Cooperative Extension agents/educators will also be provided under the auspices of this project. For example, Virginia Tech hosted 31 extension agents from the southeastern US on 12 June 2013 for an in-service training workshop on grapevine canopy assessment and modification. And while the project is not intended to directly train a labor workforce for the wine industry, the project will deliver educational tools useful to that goal. Examples include the online site suitability tool and the Wine Production Guide for Eastern North America (Wolf, 2008). The majority of project investigators are involved in the Grape Community of Practice which develops material for eXtension’s grape content: http://eviticulture.org/. The site has seen overwhelming traffic – the grapes component has had 522,770 visitors since going online with an average of two minutes and eight seconds spent per page.