



## Viticulture and Enology Major Capstone Requirement

### OVERVIEW

Beginning with the incoming class in Fall 2010, every student graduating from the Viticulture and Enology major must complete a capstone experience that demonstrates synthesis of knowledge across course requirements.

- Projects for fulfilling the requirement are flexible. Options range from a research project to extension of an internship.
- Students will identify a faculty mentor and submit a Short Proposal in the spring of their Junior year and a Full Proposal in the fall of their Senior year to Andrea Elmore, VIEN undergraduate coordinator ([vien@cornell.edu](mailto:vien@cornell.edu)). The full proposal should include a brief statement by the faculty mentor, indicating his/her consent and support of the project and proposal.
- Students will submit progress reports in November and March of their Senior year
- Final reports are due in April, and final presentations will occur in May.

### EXAMPLE PROJECTS

- Construct a detailed plan for starting a winery, distillery, or vineyard in an area where these have not already been established.
- Investigate an ongoing problem at a local winery/vineyard
- Construct a detailed plan for a new wine or related product, including development of a marketing strategy
- Develop and publicize an online extension/outreach tool (e.g., a calculator to assist with winemaking additions)
- Perform a survey of chemical or microbiological parameter(s) in a region
- Address a widely-applicable research question pertinent to viticulture or enology

### TIMELINE

<b>3<sup>rd</sup> year – Spring</b>	
January-March	Discuss potential capstone project plans with faculty
April 1	Short Proposal due. Proposal should identify a faculty mentor
1 <sup>st</sup> week of April	VIEN faculty will meet to discuss Short Proposals
April 15	Comments on Short Proposal returned to student
May 1	Revised Short Proposal due, if requested.
May 15	Students receive confirmation of Short Proposal acceptance

<b>4<sup>th</sup> year – Fall</b>	
Sept 1	Full Proposal due to faculty mentor
Sept 15	Faculty mentor return comments on Full Proposal
Sept 30	Revised Full Proposal due, if requested
Nov 30	Progress Report #1 due to faculty mentor

<b>4<sup>th</sup> year – Spring</b>	
March 1	Progress Report #2 due to faculty mentor
April 15	Final Reports due
April 30	Faculty advisors return comments on Final Report
May 15	Revised Final Report due, if requested
Early May, TBD	Presentations of capstone projects

### CHECKLIST

Date	Item	Completed?
<b>3<sup>rd</sup> year</b>		
April 1 (draft) May 1 (revisions)	Short Proposal	

<b>4<sup>th</sup> year</b>		
Sept 1 (draft) Sept 30 (revisions)	Full Proposal	
Nov 30	Progress Report #1	
March 1	Progress Report #2	
Apr 15 (draft) May 15 (revisions)	Final Report	
Early May, TBD	Presentations of capstone projects	

### FORMAT FOR PROPOSALS (\* = long proposal only)

- Title
- Faculty Mentor
- Summary\*
- Objectives
- Justification: Why is this work necessary? Has it not already been done?
- Background\*
- Methods
- Expected outcomes and benefits
- Resources needed

## CREDITS AND GRADING FOR CAPSTONE PROJECT

- Students must register for VIEN 4970 (Individual Study in Viticulture and Enology) for 1 or more credits in at least 2 semesters while performing their capstone project. Usually, this will be the fall and spring semesters of their senior years.
- Letter grade
- The number of credits assigned for VIEN 4970 will vary, and will be at the discretion of the student's mentor. According to CALS guidelines, 1 credit in independent study is equivalent to 45 hours over the semester, or an average of 3 hours per week (<http://cals.cornell.edu/cals/teaching/course-proposals/cals-definition-of-course-credits.cfm>).

Assignment	% of grade	Evaluators
Short and Full Proposals	10	Faculty Mentor
Progress Reports	10	Faculty Mentor
Final Report	50	Faculty Mentor and 2 other VIEN faculty
Final Presentation	30	All VIEN faculty

### Notes on Final Presentation

- The presentations will be scheduled during the final exam period
- Presentations will be 12 minutes in length, with 3 minutes for questions.
- Presentations will be evaluated by all VIEN faculty present
- The following parts of the presentation will be evaluated for clarity, appropriateness, and thoroughness
  - Objectives and rationale for the project
  - Background review
  - Methods or approach used
  - Discussion of outcomes and/or results
  - Long-term outcomes expected or future directions for further work

### Notes on Final Report

- Final reports will be evaluated by three faculty: the faculty mentor and two other VIEN faculty selected at random.
- The following parts of the report will be evaluated for clarity, appropriateness, and thoroughness
  - Abstract (summary of project and outcomes, <300 words)
  - Objectives. If the objectives changed during the course of the project, the student should note both the original and revised objectives
  - Rationale
  - Background/Literature Review
  - Methods
  - Outcomes and results
  - Discussion
  - Conclusions and suggestions for future work
  - Literature Cited

## **SHORT PROPOSAL EXAMPLE 1**

**Title: Evaluation of Oxygen Pickup during Bottling Operations in Small and Medium Sized Wineries**

Faculty Mentor: Gavin Sacks

Objectives: 1) Evaluate the total amount of oxygen introduced into the wine bottle during packaging at twenty (20) local wineries and the potential effects on free SO<sub>2</sub> concentrations. 2) Identify the most likely sources of oxygen pickup during packaging. 3) Provide feedback to wineries on their bottling operations.

Justification: Exposure of white wines to oxygen generally causes deleterious changes in aroma and color profile. Oxygen pickup during bottling is of particular concern, as the oxygen cannot be readily removed once the closure is inserted or applied. There are a few reports that have quantified oxygen pickup in larger wineries, but it is not known if these values are similar in bottling operations used in smaller and medium sized wineries. As a result, many wineries prophylactically add excess sulfites prior to bottling, even when unwarranted, potentially leading to unwanted sensory effects.

Methods:

Objective 1, twenty cooperating wineries will be identified. During bottling, a hand-held dissolved oxygen meter will be used to measure oxygen concentrations will be quantified prior to filling, in the wine liquid, and in the liquid following equilibration with the headspace. At least 10 replicate analyses will be performed. Total oxygen pickup will be calculated from these results. Potential SO<sub>2</sub> loss will be calculated from this data.

Objective 2, The amount of oxygen picked up during transfer to the bottling line, in the headspace, and in the wine liquid will be calculated. Parameters about the bottling line (design, age, manufacturer) will also be recorded. The correlation between bottling line parameters and oxygen pickup will be determined using appropriate statistical tools, e.g. ANOVA.

Objective 3: A 'results' form will be provided to all participating wineries, describing oxygen pickup in their bottling operations and the potential consequences on sulfite loss and wine qualities. Where possible, suggestions will be provided for improving bottling operations.

Expected outcomes and benefits: This work will determine the range of oxygen pickup occurring in small and medium sized regional wineries, as well as key control points for reducing oxygen pickup during bottling. This should allow wineries to better manage wine oxidation and improve wine quality.

Resources needed: Dissolved oxygen meter, personal vehicle.

## **SHORT PROPOSAL EXAMPLE 2**

### **Title: Developing a Detailed Plan for Starting and Managing a Vineyard in the Thousand Islands Region**

Faculty mentor: Justine Vanden Heuvel

Objectives: 1) Evaluate a site in the Thousand Islands Region of NY state to determine its potential for wine grape production; 2) Determine an appropriate five-year development plan for the site including startup costs; 3) Detail an appropriate five-year management plan for each planted block including production costs.

Justification: The Thousand Islands region is a relatively new addition to the New York State wine and grape industries. Unlike more established regions, like the Finger Lakes and Long Island, there are few examples to consider when establishing a vineyard and in this region. This may lead to slower growth or more challenging decisions for nascent operations. The situation is more challenging because many people interested in starting vineyards/wineries do not have prior experience in viticulture or enology. The purpose of this project is to prepare a detailed analysis of all major decisions to be made in the development of a small winegrape vineyard in the Thousand Islands region appropriate for use by an aspiring vineyard/winery owner. The outline will consider site evaluation, vineyard development, and vineyard management. For each major decision point, options and their pros and cons will be presented, and all decisions will be justified based on the specific site/conditions. For areas that require external expertise, the consultation will be documented with signatures (e.g., for financing a letter from a Farm Credit advisor will be secured). The main outcome will be completion of the written comprehensive plan which will be shared with Cornell Extension agents, who may utilize the report for providing guidance to their clients.

#### Methods:

Objective 1, Determine if a specific site is appropriate for growing wine grapes by studying the topography, soil maps, nearby NEWA station reports (including GDD, FFD, SFI, minimum winter temperatures), water availability, water drainage, potential pest pressures.

Objective 2, Perform an in-depth analysis of each potential block on a block-by-block basis, including analysis of topography, required soil preparation, potential installation of irrigation/drainage, required nutrient amendments, scion/rootstock selection, row spacing, row orientation, vine spacing, planting plan, training system selection, trellis construction, including details on all costs for each block in the first year of development.

Objective 3, Based on the vineyard design, prepare a complete management plan for each block in each of the first five years of production, including pruning/training, canopy management, crop management, nutrient management, water relations/irrigation, insect/disease management, floor management, harvest plans, and economic analysis of costs of production for each year.

Expected outcomes and benefits: This work will identify the detailed information required to start a vineyard in the Thousand Islands region including start up and management costs, and will be shared with extension personnel and industry newcomers to assist with vineyard planning.

Resources needed: Internet/library access, access to Google Earth.

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*Last update: 12/7/11*

## **FULL PROPOSAL EXAMPLE 1**

**Title: Quality Points Program Development for Finger Lakes Winery**

Faculty Mentor: Kathy Arnink

**Project Summary:** A quality points (QP) program will be developed for a local winery in Geneva, NY to improve winery sanitation. An initial survey of native microflora in the winery will be conducted to determine which may be most important to control. During harvest, microflora in grapes, juices, fermenting musts, and finished wine samples will be characterized. This information will be used to develop the QP program, which will be used by the winery partner and made publicly available through the Cornell Enology Extension program.

**Objectives:**

- 1) Produce a report summarizing microorganisms currently in their fermentations from swipes of drains, valves, etc., including those that may cause potential spoilage problems and create complications during the production process.
- 2) Develop a QP program that can be executed by the winery. This document can be amended as necessary, and will be posted online for other regional wineries to adapt.

**Justification:** Microbial spoilage of wine reduces consumer acceptance and results in economic losses to wineries. A QP program arms wineries with a process control plan that includes counteractive measures in the case of divergence due to less than ideal conditions. Currently, there are no publicly available QP programs designed specifically for the Finger Lakes region or similar climates. Using data on microflora populations in the winery before and during fermentation, an effective QP program can be developed.

**Background:** Hazard analysis and critical control points (HACCP) is a program that was developed for the food industry to reduce food microbiological hazards that may lead to human illness or death. Since wines do not normally contain these pathogenic microorganisms, HACCP-based approaches cannot be directly applied to the wine industry. Alternatively, wineries can implement a quality points (QP) program that can improve process control and potentially result in higher, more consistent quality.

The general steps to develop a QP program are as follows (Fugelsang & Edwards, 2007):

- (a) Development of an operational sequence or flow diagram, beginning with raw material (grapes) and continuing through to the bottled wine and case goods storage.
- (b) Conduct an analysis of each step in processing and identify potential quality issues (quality points) at each juncture.
- (c) Establish critical limits for each critical quality point.
- (d) Develop monitoring procedures and records.
- (e) Establish corrective actions when the process deviates from a critical limit.
- (f) Establish procedures for recordkeeping and documentation.
- (g) Develop a verification plan to show that the QP program has been effectively implemented and monitors important quality factors.

Good manufacturing practices must be in place in a winery prior to implementation of a QP program, including production records, pest control strategies, maintenance schedules and records, sanitation protocols, schedules, and records. Although not the focus of this project,

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aspects of production can also be addressed. A comprehensive QP program outlining procedures a winery can choose to take at all stages of production, on a situational basis, will be created. The QP program will include a set of quality points and critical limits at each step of production. A critical limit (CL) is an objective measurement that is taken at a specified point in production. CLs include a process specification, a measurement on a process or finished product sample, or a yes/no decision. Monitoring procedures should be developed to prevent, reduce, or minimize threats to wine quality. Corrective actions and preventative measures must also be included to control biological, chemical, and physical hazards.

#### Methods:

Objective 1) Sterile swipes from tanks, drains, valves, etc. will be collected and evaluated to identify the yeasts and bacteria present in the winery. Prior to harvest, grape samples will be collected aseptically and microorganisms native to the vineyard will be identified. Identifications will be performed by use of differential media. Throughout the production process, samples will be taken and plated on differential media to monitor wine flora.

Objective 2) A QP program, as described in the background section, will be prepared as an annotated Powerpoint document. Preparation of the QP program will be facilitated by collaboration with the winemakers, owners, and vineyard manager. Any potential microbial problems will be covered, including protocols to monitor for the presence of each wine spoilage microbe or conditions likely to encourage the growth of these microbes, determining corrective actions and good record-keeping protocols.

Expected outcomes and benefits: Upon completion of this project, the cooperating winery will be armed with a QP program ready for implementation. The microbial survey of the winery is expected to identify the microorganisms that are native to the winery and vineyard and thus facilitate the development of a more valuable QP program. The winery will have a plan for proactively monitoring and effectively acting on microbial spoilage issues when they first arise. This program can also be used by other Finger Lakes wineries, since the potential spoilage microorganisms would be the same. Following the monitoring steps outlined in this QP program would allow other wineries to identify their particular problems.

Fugelsang, K.C. and C. G. Edwards. 2007. *Wine Microbiology: Practical Applications and Procedures*, 2<sup>nd</sup> edition. Springer Science and Business Media, NY.