Introduction to VineBalance

This workbook is designed to provide grape growers in New York and other regions of the northeastern United States with guidance in evaluating and adopting best management practices that minimize environmental impacts, reduce economic risks, and protect worker health and safety. These practices include: soil management to reduce erosion, runoff and leaching; use of integrated pest management (IPM) practices for insect, disease, and weed management; nutrient management, with a particular focus on nitrogen use; pesticide management and spray technology; and cultural practices used in viticulture.

Viticulture in New York and the Northeast is diverse. Wine and juice grape varieties are drawn from three general classes of cultivars - native *Vitis labrusca* type grapes, *Vitis vinifera*, and interspecific hybrids (also known as 'French Hybrids'). These cultivars have different growth habits, training systems, and disease and insect susceptibility, and are grown for different markets – from commodity-priced bulk wine and juice grapes to premium estate grown wine grapes. Moreover, the major grape growing regions – Champlain Valley, Finger Lakes, Hudson River Valley, Lake Erie, Long Island, and the Niagara Escarpment – have unique soils, slopes, and climates that greatly influence 'best management practices'.

The impetus for developing this workbook came from industry groups across New York State – from juice grape cooperatives and large wineries based in the Finger Lakes and Lake Erie to the small-winery segment in the Finger Lakes and on Long Island. All of these groups, represented on the steering committee, were looking for a way to promote and document the use of sustainable production practices by growers, processors and wineries.

The workbook's format and content evolved from three previous efforts. The first VineBalance workbook in 2007 was developed using The Long Island Sustainable Viticulture Program draft workbook developed by Cornell Cooperative Extension of Suffolk County and the New York Agricultural Environmental Management (AEM) vineyard worksheets developed by the Cornell Cooperative Extension Finger Lakes Grape Program and the Yates County Soil and Water Conservation District. This workbook represents a synthesis of these three previous efforts, as well as standards drawn from other respected certification programs. The workbook is designed to serve as a reference for all growers across New York – from bulk Concord and hybrid producers to premium V. vinifera growers.

Thank you to the authors of the original VineBalance grower self-assessment workbook from 2007 and the Long Island Sustainable Winegrowing workbook from 2015: Alice Wise, Tim Martinson, Jamie Hawk, Tim Wiegle, and Libby Tarletan. We would also like to thank the authors of the PA VinES workbook from 2017: Andy Munza, Tim Weigle, Luke Haggerty, Kevin Martin, Bryan Hed, and Jody Timer. Lastly, thank you to our Technical Review Committee: Justine Vanden Heuvel, Hans Walter-Peterson, Jennifer Russo, Tim Martinson, and Tom Eskildsen; and our Grower Sustainability Advisory Committee: Suzanne Hunt, Cameron Hosmer, Paul Brock, John Wagner, John Ingle, Josh Wig, Mike Colizzi, Rich Olsen-Harbich, Duncan Ross, Ria D'Aversa, J Steven Casscles, Matthew Spaccarelli, Andrew Knight, Norliah Asma-Kalmar, and Jordan Harris for their many contributions.

We hope this workbook will provide grape growers throughout New York with a valuable resource for identifying and adopting practices that protect the environment, are economically viable, and protect workers' health and safety.

A Note from Chris Serra, Executive Director of LIVE and editor of this edition of VineBalance

I am quite thrilled about the good work your industry is about to undertake.

My view of sustainability has expanded over the past few years from one of stewardship and conservation to one of an intense active improvement the lands and social conditions with which we interact. Further, I believe those of us who participate in good faith in this work must do so in a way that doubles and triples our past efforts. There is a critical urgency in our time and there exist good workable solutions to address these problems.

The serious environmental and social issues that exist as of the writing of these standards are well-known and can be dispiriting. I believe we must now move on from this deep feeling of despair to one of imagination, solutions, and an inclusivity. Industries tend to be careful with adopting new ideas and changing. What I appreciate about the grape industry is that it is a small (yet global), agile, and collaborative community that encourages movements away from agricultural status quos when they no longer serve to be healthy.

The work in these standards have been carefully stitched together from fine scientific minds and proven research. It is all available for us, right now. The job of certifying bodies is to aggregate this work, present it in an auditable and transparent format, and to get growers excited about improving their farms, crops, and communities. I hope that we have accomplished that, because our futures, especially those of marginalized communities, depend on getting this right. From my wonderful experiences working with grape growers around the world, I have every confidence we will.

LIVE is a 501(c)(3) not-for-profit certification of sustainable winegrowing in the Pacific Northwest.
Chris Serra has been with LIVE since 2007.

Program Objectives

Below are the nine objectives that the New York State Wine & Grape Foundation has defined for sustainable winegrowing. Click on an objective to access the portion of the VineBalance Workbook that pertains to it, or use the tabs at the bottom of this workbook to navigate. Many items that fall under each objective could easily fit into others within this workbook - sustainability is intersectional. Each item was assigned to the objective that best represents the goal of the practice.

1. **To promote the use of practices that reduce reliance on off-farm inputs.**
2. **To build, regenerate, and conserve healthy soils for future generations.**
3. **To protect surrounding reservoirs and waterways from pollution.**
4. **To improve energy efficiency and reduce greenhouse gas emissions.**
5. **To conserve natural resources, reduce waste streams, and recycle.**
6. **To encourage healthy ecosystems, biodiversity, and wildlife habitat.**
7. **To increase climate resiliency and promote climate-smart farming.**
8. **To provide education and pathways for continuous improvement.**
9. **To foster a socially equitable and economically viable industry.**

How to Use this Workbook

Read through the items under each objective. Give yourself the score (1-4) that most closely matches your current practice. Your final score will be automatically tallied both at the bottom of each Objective and at the end of the workbook. If you find that an item is not applicable to you, score that item a 3. In future versions of this standard, it is possible that those items will not be presented to you at all based on your vineyard profile.

To pass this workbook, a grower must earn 75% of the total available score.

After you have finished with this workbook, you will develop an action plan that outlines how you plan to address any lower-scoring items in future attempts, as well as how to ensure that the practices that lead to your high scores are maintained. Any items with scores of 1 must be remedied via corrective action prior to being eligible for certification.

Objective 1. Input Reduction

One of the benefits of sustainable management is the ability to do more with less through increased efficiency of vineyard operations. Through regular recordkeeping, testing, scouting, and maintenance, it is possible to reduce off-farm inputs. Thoughtful planning and Integrated Pest Management (IPM) practices can reduce the need for chemical intervention. This minimizes the risk that excess chemical inputs will drift, leach or runoff into the surrounding environment causing adverse ecological effects.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
1.1 Recordkeeping					
1.1.1 Vineyard Map	4	No map exists	A map exists but it is inaccurate or incomplete		A detailed map exists of the vineyard, allowing accurate calculation of acreage. The map includes varieties, drainage tiles, irrigation mains/submains, buildings, roads, areas of runoff, water bodies (lakes, ponds, streams) and wells. Map information is tied to production records.
1.1.2 Nutrients	4	No nutrient records are kept.	Records of nutrient applications are kept but are inaccurate or incomplete		The grower maintains detailed records of all nutrient applications. The records include date, location, acreage, product name and description, analysis of % NPK plus micronutrients, and amount applied per acre.
1.1.3 Pesticides	4	No pesticide records are kept. Chemicals used are known by memory or through invoices only.	Basic records of pesticide applications are kept.	The grower maintains detailed records of all pesticide applications (fungicide, insecticide, miticide, herbicide, rodenticide, etc.). Records include: • Active ingredient and trade name • EPA registration number • Mode of Action resistance code (MOA) • Location applied • Date(s) applied • Amount and rate applied • Method of application • Applicator's name • Target pest • Pre-Harvest Interval (PHI) and first date of harvest • Re-Entry Interval (REI)	The grower maintains detailed records of all pesticide applications (fungicide, insecticide, miticide, herbicide, rodenticide, etc.). Records include: • Active ingredient and trade name • EPA registration number • Mode of Action resistance code (MOA) • Location applied • Date(s) applied • Amount and rate applied • Method of application • Applicator's name • Target pest • Pre-Harvest Interval (PHI) and first date of harvest • Re-Entry Interval (REI) **AND** • Weather conditions • Stage of crop development • Stage of pest development • Apparent effectiveness

Objective 1. Input Reduction

One of the benefits of sustainable management is the ability to do more with less through increased efficiency of vineyard operations. Through regular recordkeeping, testing, scouting, and maintenance, it is possible to reduce off-farm inputs. Thoughtful planning and Integrated Pest Management (IPM) practices can reduce the need for chemical intervention. This minimizes the risk that excess chemical inputs will drift, leach or runoff into the surrounding environment causing adverse ecological effects.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
1.1.4 Irrigation	4	No irrigation records are kept.	Records of irrigation applications are kept but are inaccurate or incomplete		The grower maintains detailed records of all irrigation applications. Records include date and location, amount applied, method used to determine timing and quantity, and vine age. **OR** Irrigation was not needed and not applied.
1.1.5 Other Inputs	4	No other input records exists	Records of other inputs are kept but are inaccurate or incomplete		The grower maintains records of other inputs such as adjuvants, surfactants, EPA Reduced Risk Pesticides, irrigation line cleaner, etc.
1.2 Spray Equipment					
1.2.1 Type (Canopy)	4	Application equipment does not address drift. For example, an unmodified airblast sprayer.		Application equipment is used that increases target deposition and reduces drift. For example, a) airblast sprayer with low drift nozzles such as induction nozzles, b) modified airblast sprayer with deflectors, c) nozzle orientation adjusted to improve deposition.	Application equipment is used that increases target deposition (i.e. reduces drift) and allows for a reduction in the amount and/or rate of pesticides used. For example, a) recycling sprayer, b) tower sprayer, c) directed deposition sprayer.
More on Canopy Sprayers	The *NY and PA Pest Management Guidelines for Grapes* provide an overview of spray drift management and nozzle types, including air induction nozzles. Air induction nozzles are well-proven with herbicide applications and are recommended. Canopy application trials have been successful but further season-long trials are still needed. Top and bottom deflectors should be fitted to airblast sprayers to funnel the pesticide-laden air into the canopy. Correct nozzle orientation (to overcome the effects of the uneven airblast resulting from fan rotation) allows the spray plume to target the canopy.				
1.2.2 Type (Herbicide)	4	Application equipment is not designed to increase deposition or reduce drift.		A standard herbicide sprayer equipped with air induction nozzles and/or a shield in order to increase deposition and reduce drift is used.	Application equipment is used that increases deposition and reduces drift. For example, a Controlled Droplet Applicator (CDA) shielded sprayer. **OR** No chemical weed control is used

Objective 1. Input Reduction

One of the benefits of sustainable management is the ability to do more with less through increased efficiency of vineyard operations. Through regular recordkeeping, testing, scouting, and maintenance, it is possible to reduce off-farm inputs. Thoughtful planning and Integrated Pest Management (IPM) practices can reduce the need for chemical intervention. This minimizes the risk that excess chemical inputs will drift, leach or runoff into the surrounding environment causing adverse ecological effects.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
More on Herbicide Sprayers	Controlled Droplet Applicators (CDAs) use a spinning disc rotary atomizer that creates a mist of similar size droplets under the dome or shield. This technology allows ultra-low volumes to be used, minimizes drift, and places the herbicide efficiently. Efficient and timely placement of postemergence materials may allow a reduction in rate of material used. Practical experience dictates that these sprayers are less effective with dense stands of weeds. Air induction nozzles (discussed in the NY and PA Pest Management Guidelines for Grapes) are well proven with herbicide application and are recommended.				
1.2.3 Nozzles Improving Spray Efficiency	4	Nozzle size is not appropriate for canopy sprays. **AND** Nozzles are not replaced when worn or damaged.	Appropriate size nozzles are chosen. For canopy sprays, 150-200 micron nozzles are recommended. This is known as a “fine” spray classification. **BUT** Nozzles are not replaced when worn or damaged.		Appropriate size nozzles are chosen. For canopy sprays, 150-200 micron nozzles are recommended. This is known as a “fine” spray classification. **AND** Nozzles are replaced when worn or damaged.
More on Nozzles	Dr. Andrew Landers (see *Improving Spray Efficiency* above) notes that for nozzles <150 microns in size, droplets are likely to drift, and if temperature is high and humidity low, droplets will evaporate. All nozzles can be purchased with different spray classification characteristics from “fine” to “coarse”. These classifications appear in nozzle catalogs and will soon appear on pesticide labels. If nozzle output exceeds manufacturer recommendations by >10%, the nozzles need replacing.				
1.2.4 Calibration How to Calibrate Air Blast Sprayers	4	Sprayer is calibrated infrequently, only after repairs, or not at all.	Sprayer is calibrated before the start of each season.	Sprayer is calibrated before the start of each season. **AND** Sprayer is recalibrated for different types of applications when amounts of air or liquid are changed or nozzle orientation is adjusted (e.g. spray directed at canopy vs. clusters).	Sprayer is serviced and calibrated before the start of each season. **AND** Sprayer is recalibrated for major growth stages and/or different types of applications when amounts of air or liquid are changed and/or nozzle orientation is adjusted (e.g. spray directed at canopy vs. clusters). **AND** Calibration is repeated at least once during the growing season or before each application in the case of herbicides.
1.2.5 Maintenance Maintenance Checklist	4	Sprayer is not serviced annually. Service occurs only when equipment breaks.		Sprayer is serviced annually in addition to necessary repair work.	Sprayer is serviced annually in addition to necessary repair work. Routine maintenance is conducted after the conclusion of each application.

Objective 1. Input Reduction

One of the benefits of sustainable management is the ability to do more with less through increased efficiency of vineyard operations. Through regular recordkeeping, testing, scouting, and maintenance, it is possible to reduce off-farm inputs. Thoughtful planning and Integrated Pest Management (IPM) practices can reduce the need for chemical intervention. This minimizes the risk that excess chemical inputs will drift, leach or runoff into the surrounding environment causing adverse ecological effects.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
More on Maintenance	**Additional comments from Dr. Andrew Landers**: Tractor speed should be fast enough to provide a good output per hour while ensuring canopy penetration; speeds too fast result in poor penetration in a full canopy, and moving too slowly results in poor output per day. Growers should also minimize the volume of air displaced by their sprayer if possible. The airflow should be adequate to displace the air in the canopy with pesticide-laden air from the sprayer. The volume of spray should provide acceptable coverage though the grower should not spray to the point where the leaves are dripping. Grower should apply sufficient spray for the developing canopy as the season progresses. Alternative row spraying (a common early season practice with airblast sprayers) provides inadequate coverage in many instances, and where disease pressure is highest, research has shown that spraying every row is preferable.				
1.2.6 Drift	4	Spraying is done in conditions where significant drift will occur.		Most of the time spraying is not done if winds are >10 mph unless using a sprayer that is designed/modified to improve deposition and reduce drift.	No spraying is done if winds are >10 mph unless using a sprayer that is designed/modified to improve deposition and reduce drift.
1.3 Nutrition					
1.3.1 Tissue Analysis Cornell Plant Sampling Guide	4	Tissue analysis is not done.	Tissue analysis is done only when there is a problem.	Tissue analysis is done on most blocks every one to two years.	Tissue analysis is done on all blocks every one to two years. Results are used in planning future fertilization.
1.3.2 Soil Analysis Cornell Soil Health Laboratory	4	Soil analysis is not done.	Soil analysis is done less than every three years and/or only in problem areas.	Soil analysis is done on most blocks every three years.	Soil analysis is done every other year, or more often if problems arise. Results are used in planning fertilization and liming as well as organic matter amendments.
1.3.3 Determining N Rate	4	N rates are not adjusted for variety, crop level, soil organic matter, winter injury or any other criteria.	Soil applied N rates are based on 2 or 3 of the criteria in the Low Risk category.	Soil applied N rates are adjusted based on 4 or 5 of the criteria in the Low Risk category.	Soil applied N rates are adjusted based on at least 6 of the following: • Variety • The previous year's crop level (Fruit removes approximately 4 lbs of N/ton of fruit produced.) • Vine pruning weights • % soil organic matter • Visual clues of N deficiency or excess • Canopy fill • Degree of winter injury • Historical records on amount of N used. • Leaf blade and/or petiole analysis

Objective 1. Input Reduction

One of the benefits of sustainable management is the ability to do more with less through increased efficiency of vineyard operations. Through regular recordkeeping, testing, scouting, and maintenance, it is possible to reduce off-farm inputs. Thoughtful planning and Integrated Pest Management (IPM) practices can reduce the need for chemical intervention. This minimizes the risk that excess chemical inputs will drift, leach or runoff into the surrounding environment causing adverse ecological effects.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
More on Nitrogen		Nitrogen is the plant nutrient most susceptible to loss by leaching (movement through soil) into groundwater. Specific health problems are associated with nitrate contamination of drinking water supplies. Nitrate levels higher than 10 mg/l (designated the Maximum Contaminant Level by the US EPA and NYS) have been found in groundwater in several areas of New York, often in association with spring runoff or heavy rainfall events. It is therefore absolutely essential for grape growers to use nitrogen in a thoughtful and sparing manner. • If winter injury has occurred, delay N decisions until after fruit set to allow evaluation of vigor level and fruit set. • N deficiency symptoms: pale green leaves, small leaves, spindly shoots, short internodes, poor fruit set. • N excess symptoms: dark green, “dinner plate” leaves, bullwood, succulent shoots with long internodes, poor fruit set.			
1.3.4 Supplemental N	4	Vinifera and premium hybrids: >40lbs/acre actual N is applied in a given year. Bulk hybrids and natives: >100lbs/acre actual N is applied in a given year.	Vinifera and premium hybrids: 20-40lbs/acre actual N is applied in a given year. Bulk hybrids and natives: 70-100lbs/acre actual N is applied in a given year.	Vinifera and premium hybrids: <20lbs/acre actual N is applied in a given year. Bulk hybrids and natives: 50-70lbs/acre actual N is applied in a given year.	Vinifera and premium hybrids: All N is derived from soil organic matter and/or cover crops. No supplemental N is necessary. Bulk hybrids and natives: <50lbs/acre actual N is applied in a given year.
1.3.5 Other Sources of N Estimating PAN Release from Cover Crops Compost C:N Ratio Considerations	4	Although N is required, no legumes or other organic sources are used to fix N (i.e. all N is purchased and applied). **OR** A component of the cover crop fixes N, but the total N supplied by the cover crop is not calculated. **AND** Vines show excess vigor.		If vineyard requires additional N, a component of the cover crop fixes N. **BUT** Total N supplied by the cover crop is not calculated. **AND** Vines show balanced growth, no excess vigor.	If vineyard has a N requirement and a component of cover crop fixes N (e.g. legumes such as clover and vetch), the fixed N is taken into account when calculating the application rate of additional N. N contributions from compost, legumes, mulch and cover crop residues help reduce N fertilizer rates.
1.3.6 Rates/Timing	4	TBD			
1.3.7 Organic Fertilizer	4	Only synthetic fertilizers are used.		Over 50% fertilizers used by weight and/or volume are OMRI Listed®	All fertilizers, foliar and ground applied, are OMRI Listed®.

Objective 1. Input Reduction

One of the benefits of sustainable management is the ability to do more with less through increased efficiency of vineyard operations. Through regular recordkeeping, testing, scouting, and maintenance, it is possible to reduce off-farm inputs. Thoughtful planning and Integrated Pest Management (IPM) practices can reduce the need for chemical intervention. This minimizes the risk that excess chemical inputs will drift, leach or runoff into the surrounding environment causing adverse ecological effects.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
1.3.8 Spring N Application	4	N is applied >2 weeks prior to budbreak.	N is applied up to 2 weeks prior to budbreak when vines are still dormant. **OR** All N is applied in the period between fruit set and veraison.	N is applied during the period of maximum uptake - budbreak to fruit set **AND** Split applications are not used.	N is applied during the period of maximum uptake - budbreak to fruit set. **AND** Split applications are used with the 30-50% of the N applied prebloom and the remainder applied postbloom.
More on Spring N Application	There is little absorption of N by roots prior to budbreak. The soil is cold and roots are inactive. Early vine growth depends almost entirely on N stored in the woody parts of the vine. It is unclear whether pre-budbreak application of slower release organic fertilizers confers an advantage in terms of N availability to the plant.				
1.3.9 On Irrigated Farms	4	Only ground or foliar applied N is used.		A combination of fertigation and ground applied N is used. **OR** The farm does not have drip irrigation.	If drip irrigation is installed, fertigation is used to efficiently apply small doses of N to vines.
1.3.10 Foliar N	4	Foliar N is included in most tank mixes automatically.	Foliar N is used several times, its use based on the calendar.		Foliar N is used only when necessary or not at all. Use is based on visual cues from vines and/or tissue analyses reporting <1.0% N in spring.
More on Foliar N	Early season foliar N is common in winegrape vineyards and may benefit N deficient vineyards. However, N needs are best addressed through addition of organic matter and/or ground application of N fertilizers. Clusters have a fairly high N demand around veraison. Foliar-applied urea (or other foliar feeds containing N) applied several times around veraison can increase yeast-assimilable nitrogen (YAN) in musts, particularly when drought has limited N uptake from the soil. In Cornell trials over the last few years, up to 10 lb urea in 100 gallons (5 lb actual N) has been used without burning the foliage. This is not a panacea for eliminating Atypical Aging ATA, a wine defect associated with limited N uptake in drought years in white wines), but has had a secondary role (the more major effect occurring with irrigation) in reducing ATA. It is effective in bumping up the YAN values, which may help winemakers avoid stuck fermentations. It does not appear to prolong or 'restart' shoot growth, nor delay wood maturation.				

Objective 1. Input Reduction

One of the benefits of sustainable management is the ability to do more with less through increased efficiency of vineyard operations. Through regular recordkeeping, testing, scouting, and maintenance, it is possible to reduce off-farm inputs. Thoughtful planning and Integrated Pest Management (IPM) practices can reduce the need for chemical intervention. This minimizes the risk that excess chemical inputs will drift, leach or runoff into the surrounding environment causing adverse ecological effects.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
1.3.10 Macronutrients (P, Ca, MG, K)	4	Fixed amounts of macronutrients are applied annually.	Macronutrient levels in soil are adjusted only when deficiencies occur.	Macronutrients are maintained at acceptable ranges based on soil and petiole results.	Macronutrients are maintained at acceptable ranges based on soil and petiole results. **AND** Vineyard manager can identify deficiency symptoms.
More on Macronutrients	The application of Ca, Mg, and K as foliar nutrients is not well understood. Use can be based in part on soil/tissue analysis and visual clues. Magnesium deficiency is often addressed through the use of foliar applied Epsom salts. In general, due to the relatively large quantities required by vines, macronutrient nutrition is best addressed through the root system. Excessive amounts of P in surface water promote the growth of algae and other aquatic organisms, potentially depleting oxygen levels in surrounding water bodies. This can have profound impacts on aquatic life. Because P is less available in acid soils, simply increasing soil pH to 6.0-6.5 will increase P availability. Generally, P fertilization has not been found to benefit NY vineyards in part due to the immobility of the nutrient.				
1.3.11 Micronutrients (B, Mn, Zn)	4	Fixed amount of micronutrients are applied annually without regard to petiole and soil results.	Micronutrient levels in soil are adjusted only when deficiencies occur.	Micronutrients are maintained at acceptable ranges based on soil and petiole results.	Micronutrients are maintained at acceptable ranges based on soil and petiole results. **AND** Vineyard manager can identify both deficiency and toxicity symptoms.
More on Micronutrients	There are many types of micronutrient fertilizers. The most commonly applied are boron, manganese and zinc. Because these elements are required in small quantities and petiole analyses sometimes do not reflect a deficiency (due to time of sampling, type of tissue sampled, dilution effects due to vigorous growth, etc.), it is sometimes necessary to use these fertilizers based on historical knowledge of the vineyard. It is often hard to gauge efficacy of micronutrient fertilizers as they are used in small quantities and the elements are involved in specific enzyme systems and chemical pathways. If possible, leave a section of the vineyard untreated. To judge potential benefits, evaluate subsequent fruit quality and quantity. Examine soil and petiole analyses. Over a period of time, the benefits may or may not become clear.				
1.4 Canopy, Vines, and Crop					
1.4.1 Plant Material Foundation Plant Service	4	Vine scion and rootstock are non-certified material.	The nursery harvests scion material from a reputable grower whose vines were certified.	A reputable nursery is used; either the scion or the rootstock is certified.	A reputable or licensed nursery providing certified plant material (scion + rootstock) is used.

Objective 1. Input Reduction

One of the benefits of sustainable management is the ability to do more with less through increased efficiency of vineyard operations. Through regular recordkeeping, testing, scouting, and maintenance, it is possible to reduce off-farm inputs. Thoughtful planning and Integrated Pest Management (IPM) practices can reduce the need for chemical intervention. This minimizes the risk that excess chemical inputs will drift, leach or runoff into the surrounding environment causing adverse ecological effects.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
More on Plant Material	The use of certified plant material can reduce the incidence of virus. However, certification is not a 100% guarantee against viral infection due to many issues including the difficulty in detecting virus in vines, the possibility of transmission by nematodes or mealybugs and transmission from non-certified virus infected material. Native varieties are included in certification programs. FPS offers Concord, Niagara, Ontario, Catawba and others in limited quantities, as these varieties are not grown in CA. Several nurseries also offer crown gall-free Niagara vines.				
1.4.2 Variety and Rootstock	4	No consideration is given to the appropriateness of variety/rootstock to the specific site or region.		Variety and rootstock are appropriate for the region. The variety and rootstock chosen do not require excessive inputs to ripen or maintain.	Variety and rootstock are carefully considered for appropriateness to the site based on winter hardiness, soil, type and site characteristics and a plan is in place to address and mitigate risks associated with each choice.
More on Rootstock	On replant sites, hybrid varieties susceptible to tomato ringspot virus should be grafted onto resistant rootstock. This includes varieties such as Vidal blanc, Baco noir and DeChaunac.				
1.4.3 Fungal Resistance	4	Vinifera varieties that are highly susceptible to fungal diseases are selected. **AND** The spray program is given no consideration to resistance management.	Vinifera varieties that are highly susceptible to fungal diseases are selected. **BUT** Risk is considered in a well-planned spray program to prevent resistance.	Fungal resistance is considered and varieties moderately resistant to some fungal diseases are selected.	Fungal resistance is considered and varieties resistant to most fungal diseases are selected.
1.4.4 Row Orientation	4	Row orientation is not appropriate for the site.	Rows run parallel to slopes but erosion risks are addressed.		Rows are oriented N-S to maximize sunlight interception. **AND** Where necessary, rows are perpendicular to slopes to minimize erosion.
1.4.5 Training Systems	4	Training system is not suitable.	Training system accommodates vine vigor but remedial steps are necessary to deal with vine vigor.		Training system accommodates vine vigor allowing optimum canopy density and fruit exposure without extensive canopy manipulation.
More on Training Systems	Most *vinifera* and many hybrid winegrapes are suited to Vertical Shoot Positioned (VSP) systems. More vigorous winegrapes may be trained using the Scott Henry system. Native and bulk hybrids with procumbent growth habits are suited to top wire systems such as the Hudson River Umbrella or Geneva Double Curtain (GDC). The optimum shoot density for single curtain systems is 4-5 shoots/ft of row. Systems with more than one curtain, such as GDC and Scott Henry will have twice the shoot number.				

Objective 1. Input Reduction

One of the benefits of sustainable management is the ability to do more with less through increased efficiency of vineyard operations. Through regular recordkeeping, testing, scouting, and maintenance, it is possible to reduce off-farm inputs. Thoughtful planning and Integrated Pest Management (IPM) practices can reduce the need for chemical intervention. This minimizes the risk that excess chemical inputs will drift, leach or runoff into the surrounding environment causing adverse ecological effects.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
1.4.6 Viticultural Practices Cornell Extension	4	Basic viticultural practices (pruning, shoot thinning, canopy management, monitoring vine size, etc.) are not adequate to maintain a balanced and low input crop.		Basic viticultural practices (pruning, shoot thinning, canopy management, monitoring vine size, etc.) are performed well, but could be improved.	All basic viticultural practices (pruning, shoot thinning, canopy management, monitoring vine size, etc.) are performed according to the latest best management practices recommended by university extension.
1.4.7 Crop Management	4	Sound crop management guidelines are not followed.		Crop management guidelines in Appendix A are generally followed but improvements can be made. **OR** Other crop management practices are used in conjunction with formal research experiments.	All crop management guidelines in Appendix A are followed. **OR** Other crop management practices are used in conjunction with formal research experiments.
1.4.8 Hilling Up Vines	4	For all NY regions except LI, cold sensitive grafted vinifera and hybrid vines are not hilled up.	For all NY regions except LI, grapevines are hilled up for the first 4 years but sporadically thereafter.	For all NY regions except LI, vinifera varieties are hilled up every year. **AND** Grafted hybrids are hilled up for the first 4 years.	For all NY regions except Long Island, all grafted vines are hilled up every year.
More on Hilling Up	Although time consuming, hilling up prevents exposing the vineyard to an unacceptable risk of vine and production losses. Hills should be removed during the growing season to avoid scion rooting. Hilling up is generally not necessary on Long Island though periodic episodes of winter injury do occur.				
1.4.9 Missing Vines	4	Missing vines are replaced sporadically or not at all.	Missing vines are replaced every few years; layering is practiced every few years.	Missing vines are replaced every other year; where appropriate, layering is practiced every other year. **AND** Yield records are adjusted to account for missing vines.	Missing vines are counted and replaced every year. For non-grafted vines, layering is done to replace vines. **AND** Yield records are adjusted to account for missing vines.
More on Missing Vines	Missing vines reduce vineyard profitability and lead to inefficiency in use of pesticides and fertilizers. Yield must be estimated with missing vines taken into consideration. If overall yield is 4 tons/acre but 50% of vines are missing, functional crop is therefore 8 tons/acre, a potential overcrop.				
1.4.10 Vineyard Profitability	4	Overall farm income and expenses are recorded only when tax returns are filled out.	Vineyard expenses and income are not broken out by variety and block but overall farm income and expenses are known.	Vineyard expenses and income are recorded by variety but not by individual block.	Vineyard expenses and income are recorded for each individual block.

Objective 1. Input Reduction

One of the benefits of sustainable management is the ability to do more with less through increased efficiency of vineyard operations. Through regular recordkeeping, testing, scouting, and maintenance, it is possible to reduce off-farm inputs. Thoughtful planning and Integrated Pest Management (IPM) practices can reduce the need for chemical intervention. This minimizes the risk that excess chemical inputs will drift, leach or runoff into the surrounding environment causing adverse ecological effects.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
1.4.11 On-Farm Experiments SARE How to Conduct Research	4		No experimentation is being done.	Experimental varieties, rootstocks and/or training systems are being evaluated on a small scale. Evaluation is anecdotal, data is not taken.	Experimental varieties, rootstocks and/or training systems are being evaluated on a small scale. Data is taken to evaluate performance.
More on Experiments	On-farm experimentation can encompass almost anything from informal evaluations to formal, replicated field trials. Key ingredients that must be used to make field comparisons useful are: 1) vary only one practice at a time; 2) leave a portion of the same vineyard block 'untreated' or with your standard practice; 3) measure something objective; and 4) record your observations. Area extension programs may be useful in helping growers design informal or formal trials.				
1.5 Vineyard Floor					
1.5.1 Monitoring Weeds of the Northeast	4	Weed composition monitored rarely if ever.	Weeds are monitored periodically.	Grower or vineyard manager monitors weeds periodically. **AND** Weed occurrences are recorded, mapped, and their potential impact or benefit is considered.	Grower or vineyard manager monitors weeds at least three times during the season. **AND** Weed occurrences are recorded, mapped, and their potential impact or benefit is considered.
1.5.2 Ground Cover	4	<50 % of the area between rows is covered. **OR** Row middles are tilled.	50-75% of the area between rows is covered.	75-99% of the area between rows is covered.	100% of the area between rows contains permanent ground cover.

Objective 1. Input Reduction

One of the benefits of sustainable management is the ability to do more with less through increased efficiency of vineyard operations. Through regular recordkeeping, testing, scouting, and maintenance, it is possible to reduce off-farm inputs. Thoughtful planning and Integrated Pest Management (IPM) practices can reduce the need for chemical intervention. This minimizes the risk that excess chemical inputs will drift, leach or runoff into the surrounding environment causing adverse ecological effects.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
1.5.3 Non-chemical Methods	4	The grower uses only chemical weed control.		The grower uses one or more of the weed control methods in Column 4 in rotation with chemical weed control. **OR** The grower relies solely on undervine mowing or minimally disruptive mechanical cultivation to control weeds and erosion is controlled.	The grower has employed one or more of the following non-chemical weed control methods to fully replace chemical weed control: • Hand hoeing/removal • Grazing animals • Biological control with arthropods or other bioherbicides • Culinary Oils • Solarization • Flaming • Steam • Mulching - mow and blow, burlap, paper, wood chips, etc. • Allelopathic/competitive cultivars and/or other living mulch (low growing vegetation undervine) **OR** Undervine mowing or minimally disruptive mechanical cultivation is supplemented by one or more of the above and erosion is controlled.
1.5.4 Soil-Applied Herbicides	4	Herbicides with high leaching potential are used regardless of soil type or water table risk.	Simazine (Princep), diuron (Karmex), or norflurazon (Solicam) have been used, but not in areas of gravelly or sandy soils with high leaching potential or in areas with high water tables. **AND** Based on knowledge of soil types within your vineyard and characteristics of soil-applied herbicides, application rates are adjusted to apply proper amounts for each vineyard block.		Herbicides with high leaching potential are never used regardless of soil type or water table risk. These include Simazine (Princep), diuron (Karmex), and norflurazon (Solicam).
1.5.5 Glyphosate	4	Glyphosate is used indiscriminately.	Glyphosate is used but rotated with other methods and modes of action.		Glyphosate is not used.
1.5.6 Post-Emergent Type	4	Post-emergent herbicides are used that have a high toxicity and/or long persistence (dt90 > than 1 vegetation period for instance)		Post emergent herbicides are used that have a low toxicity and/or rapid breakdown in environment.	Herbicides are not used.

Objective 1. Input Reduction

One of the benefits of sustainable management is the ability to do more with less through increased efficiency of vineyard operations. Through regular recordkeeping, testing, scouting, and maintenance, it is possible to reduce off-farm inputs. Thoughtful planning and Integrated Pest Management (IPM) practices can reduce the need for chemical intervention. This minimizes the risk that excess chemical inputs will drift, leach or runoff into the surrounding environment causing adverse ecological effects.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
1.5.7 Post-Emergent Frequency	4	Post-emergent herbicide is applied more than two times.	If post-emergent herbicide is used, it is applied, it is applied twice at appropriate times.	If post-emergent herbicide is used, it is applied once at appropriate time.	No post-emergence herbicide is needed or applied.
1.5.8 Spot Treatments	4	Spray is applied to the entire vineyard without regard to the presence of visible weeds.		Visible weeds are treated with a manual hand gun sprayer. **OR** Machine sprayer is manually turned off when no weeds are present.	No post-emergence herbicide is needed or applied.
1.5.9 Rotation HRAC Lookup	4	Herbicides used are always the same mode of action.	Every fourth year, herbicides are rotated to another mode of action.	Every third year, herbicides are rotated to another mode of action.	No chemical herbicide is used.
1.5.10 Mowing Reference Document	4	Vineyard is mowed weekly.	Vineyard is mowed more than monthly during entire season. **AND** Mowing heights are not considered.	Vineyard is mowed monthly from bloom to harvest. **AND** Mowing heights are used that allow beneficial fauna to escape (>4in).	An alternate row mowing regime is used monthly from bloom to veraison, and only thereafter for worker comfort and safety. **AND** Mowing heights are used that allow beneficial fauna to escape (>4in).
More on Mowing	In regions where Lyme disease is a concern, more frequent mowing is warranted as a safety measure for workers. Mowing should be restricted to the amount necessary to allow normal vineyard operations, worker safety, or other carefully considered vineyard objectives. Mowing does not reduce water use during droughts, and excessive mowing wastes fuel, tractor time, and management time better devoted to other tasks. Using high mowing heights can greatly reduce beneficial insect and pollinator fatalities. Mowing early (before 7am) or later (after 6pm) can also protect bees and reptiles.				

1.6 Plant Protection and IPM

1.6.1 Canopy Management	4		Canopy management practices are insufficient and result in a large canopy with poor light, air, and spray penetration.		Canopy management practices in item 1.4.5 result in increased sunlight, air, and spray penetration. This will minimize fungal disease pressure.
1.6.2 Block History	4		Historical susceptibility to disease is not taken into account when planning a fungal disease management program.		Historical susceptibility to disease is taken into account when planning a fungal disease management program.

Objective 1. Input Reduction

One of the benefits of sustainable management is the ability to do more with less through increased efficiency of vineyard operations. Through regular recordkeeping, testing, scouting, and maintenance, it is possible to reduce off-farm inputs. Thoughtful planning and Integrated Pest Management (IPM) practices can reduce the need for chemical intervention. This minimizes the risk that excess chemical inputs will drift, leach or runoff into the surrounding environment causing adverse ecological effects.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
1.6.3 Dormant Practices	4	Pruning is done without regard to the presence of overwintering inoculum, and spray program is not adjusted.	Wood infected by significant amounts of overwintering Phomopsis cane and leaf spot, black rot, and/or powdery mildew is sometimes pruned off . **BUT** Spray program is not adjusted to reflect the level of overwintering inoculum.	Wood infected by significant amounts of overwintering Phomopsis cane and leaf spot, black rot, and/or powdery mildew is sometimes pruned off . **AND** Spray program is adjusted to reflect the level of overwintering inoculum.	Wood infected by significant amounts of overwintering fungi is pruned off to minimize sources of inoculum. Old cluster stems may harbor overwintering Botrytis; mummified fruit - black rot and/or Phomopsis; scabby spurs and canes (particularly the basal 2-3 nodes) - Phomopsis. **AND** Spray program is adjusted to reflect the level of overwintering inoculum
1.6.4 Dormant Fungicide Sprays	4	Two or more dormant sprays are applied to vines with the general goal of reducing overwintering inoculum of powdery mildew or Phomopsis.	A single dormant spray is applied.		Due to data indicating marginal benefits and high costs, dormant sprays are NOT routinely applied to the vineyard
More on Dormant Sprays	According to Dr. Wayne Wilcox, a single dormant spray MAY be appropriate if extreme levels of powdery mildew or Phomopsis are present on canes, but only if spray coverage is maximized with an efficient sprayer. Any benefits derived from such a spray are highly unlikely if a low efficiency sprayer, such as an unmodified airblast sprayer, is used. Experiments conducted in upstate NY in the 1980s showed that dormant applications of lime sulfur reduced the viability of overwintering inoculum of the powdery mildew and Phomopsis fungi, and sometimes improved the efficacy of the standard spray program that followed. However, these trials were conducted using a rate of over 30 gal/acre of lime sulfur in 300 gal/acre of water. (Note that lime sulfur is not a mix of lime + sulfur but rather calcium polysulfide, a completely different material.) This rate is extremely expensive and impractical. Lower rates (e.g. 10-12 gal lime sulfur in 100 gal water per acre) have been advocated in California, but data on their efficacy is very limited. In one NY trial, they provided only modest benefits at a relatively high cost. Most conventional fungicides should have little or no activity if applied during the dormant season, nor are they labeled for use at that time of year.				
1.6.5 Scouting for Disease/Virus uspest.org MyPest	4	Scouting is not done.	Scouting is done informally (eg. tractor scouting) or on an irregular basis. No records are kept.	Scouting is done occasionally, often targeting hot spots. Records of scouting results are kept and entered into a historical database.	Scouting is done every other week or at key phenological times preferably by the same person. Scouting results are recorded and entered into a historical database. Vines are scouted May through September. **AND** Disease models are consulted for additional predictive planning.

Objective 1. Input Reduction

One of the benefits of sustainable management is the ability to do more with less through increased efficiency of vineyard operations. Through regular recordkeeping, testing, scouting, and maintenance, it is possible to reduce off-farm inputs. Thoughtful planning and Integrated Pest Management (IPM) practices can reduce the need for chemical intervention. This minimizes the risk that excess chemical inputs will drift, leach or runoff into the surrounding environment causing adverse ecological effects.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
More on Disease Scouting	Monitoring of fungal and viral diseases requires vigilance. Particularly with fungal diseases, it is important to address any problems as soon as possible. Remedial steps tend to be much more effective in the early stages of infection. Ideally, in a given vineyard block, 5% of the vines or a minimum of 10 vines are examined weekly for signs of disease. These vines can be chosen using historical records to ensure that hotspots are the first to be scouted. Other options are randomly chosen vines or vines that are permanently tagged. Permanent tags offer the additional advantage of charting a range of measurements (e.g. vine pruning weight, disease status, etc.) from year to year. Both foliage and fruit should be examined for signs of disease.				
1.6.6 Identifying Disease/Virus UC Davis IPM	4	The Vineyard Manager cannot ID and symptoms of fungal and viral diseases.	The Vineyard Manager cannot identify most of the fungal and viral disease symptoms and does not use publications or fact sheets to ensure proper identification.	The Vineyard Manager can identify most of the aforementioned fungal and viral disease symptoms and life cycles with the aid of publications and fact sheets.	The Vineyard Manager can identify on leaves, shoots and fruit all of the following diseases: • Fungal - black rot, Phomopsis, powdery and downy mildews and Botrytis • Viral - leaf roll, fanleaf • Any unknown disease is ID'd with outside input. **AND** Vineyard Manager has knowledge of life cycles and crop susceptibility at different times in the growing season.
1.6.7 Virus-Infected Vines	4	Nothing is known of viruses and therefore no action plans are in place.	Even if vines are not producing sufficient quality and quantity of fruit, there is no systematic removal of virus-infected material and/or there is no attempt to renovate sites where virus-infected vines grow.	Vines diagnosed with viral infection are immediately removed if the vines are not producing sufficient quality and quantity of fruit. If vineyard removal is necessary, the site is left fallow for less than three years.	Vines diagnosed with viral infection are immediately removed if the vines are not producing sufficient quality or quantity of fruit. If vineyard removal is necessary, the site is replanted with resistant rootstock or left fallow for a minimum of three years. When vines are rogued, as much of the root system as possible is removed.
1.6.8 Field Staff Training	4	Training on identification of grape diseases and insects is not done.		raining on identification of grape diseases and insects has been provided once or twice but not on a regular basis.	The Vineyard Manager annually provides training to field staff on identification of grape diseases and insects.
1.6.9 Trunk Diseases	4	Trunk diseases are not managed.			Trunk diseases are managed according to the guidelines in Appendix B.
1.6.10 *Botrytis cinerea*	4	Botrytis management relies on fungicides alone.	Three or fewer of the six guidelines in Appendix B are followed for Botrytis control.	Four or five of the six guidelines in Appendix B are followed for Botrytis control.	A Botrytis management plan follows all points in Appendix B.

Objective 1. Input Reduction

One of the benefits of sustainable management is the ability to do more with less through increased efficiency of vineyard operations. Through regular recordkeeping, testing, scouting, and maintenance, it is possible to reduce off-farm inputs. Thoughtful planning and Integrated Pest Management (IPM) practices can reduce the need for chemical intervention. This minimizes the risk that excess chemical inputs will drift, leach or runoff into the surrounding environment causing adverse ecological effects.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
1.6.11 Leaching Potential Reference Document	4	Leaching potential is not taken into account when selecting fungicides.		Materials with high leaching potential are avoided except where no alternatives exist.	Materials with high leaching potential are avoided. See Environmental Hazard section of fungicide label for more information.
1.6.12 Fungicides Reduced Risk Minimum Risk Biopesticides OMRI (Organic) Approved FRAC	4	Reduced risk, minimum risk, biopesticides, and/or OMRI approved materials are never used. **AND/OR** Fungicide rotation is ignored.	Reduced risk, minimum risk, biopesticides, and/or OMRI approved materials are used once or twice. **AND** All fungicides are rotated properly to avoid resistance.	Reduced risk, minimum risk, biopesticides, and/or OMRI approved materials are used for control of fungal diseases and total at least 20% of the spray materials used. **AND** All fungicides are rotated properly to avoid resistance.	Reduced risk, minimum risk, biopesticides, and/or OMRI approved materials are used for control of fungal diseases and total >50% of the spray materials used. **AND** All fungicides are rotated properly to avoid resistance.
More on Fungicides	**Additional comments from Dr. Wayne Wilcox:** Reducing the application rates of fungicides can save money and reduce the potential for short-term environmental pollution. However, this is not a long-term sustainable practice for certain fungicides. Specifically, reducing rates of the DMI fungicides (also called SIs or sterol inhibitors - Elite, Nova, Procure, and Rubigan) and the strobilurins (Abound, Flint, Sovran) is known to promote the development of resistance to these materials. In contrast, reducing the rates of traditional protectant materials (Dithane, Manex, Penncozeb, coppers, sulfurs, etc.) has no impact on resistance development but can shorten the duration of their active period. Also, note that pesticide rates are typically expressed on a per-acre basis for both legal purposes and convenience, although target organisms actually respond to a rate per unit area of canopy volume. Thus, a rate of 3 oz/acre applied to a thin canopy early in the season may provide the same level of activity as 6 oz/acre applied to a thick canopy in mid-summer. In short, efforts to reduce pesticide rates should be governed not only by the particular materials in use but also by the canopy volume.				

Objective 1. Input Reduction

One of the benefits of sustainable management is the ability to do more with less through increased efficiency of vineyard operations. Through regular recordkeeping, testing, scouting, and maintenance, it is possible to reduce off-farm inputs. Thoughtful planning and Integrated Pest Management (IPM) practices can reduce the need for chemical intervention. This minimizes the risk that excess chemical inputs will drift, leach or runoff into the surrounding environment causing adverse ecological effects.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
1.6.13 Labrusca Management	4	Disease management does not begin until after bloom, requiring use of an eradicant material in an attempt to manage established infections.	Disease management consists of two sprays around the bloom period but the interval between sprays exceeds 14 days.	Disease management consists of two sprays, one at the immediate pre-bloom period and another post-bloom with spray intervals not exceeding 10 to 14 days. **AND** Spraying focused on periods of peak cluster susceptibility.	Disease management consists of two sprays, one at the immediate pre-bloom period and another postbloom with spray intervals not exceeding 10 to 14 days. **AND** Spraying focused on periods of peak cluster susceptibility. **AND** Disease management concentrates on limiting infection by primary inoculums of black rot, powdery mildew, downy mildew, and Phomopsis cane and leaf spot.
More on Labrusca Management	Over-wintering inoculum of black rot and Phomopsis should be minimized by pruning and disposing of infected canes and bunches during the dormant season. Fungicide sprays should include a minimum of an immediate pre-bloom application and a post-bloom application 10 to 14 days later with materials providing protection against all four diseases. For varieties (e.g. Niagara) and locations subject to severe Phomopsis infections, an effective material is often required soon after cluster emergence as well. The need for additional applications (either pre- or post-bloom) are determined each year depending on weather conditions, over-wintered inoculum potential, and the presence of current-season infections as determined by scouting.				
1.6.14 Identifying Insect Pests UC Davis IPM	4	The grower cannot ID any insect pests or the damage they cause.	The grower has difficulty identifying more than three insect and mite pests and the damage they cause.	Using fact sheets and websites, the grower can identify a majority of the insect and mite pests and the damage they cause and has knowledge of crop susceptibility and insect life cycles.	The grower can identify all of the following insect/mite pests and the damage they cause: • Major insects • Minor insects • Mites • Any unknown pest is ID'd with outside help **AND** The grower has knowledge of crop susceptibility and insect life cycles.
1.6.15 Scouting for Insects	4	Scouting is not done for insect and mite pests.		Informal scouting or scouting less frequent than every other week takes place.	Scouting takes place on a regular basis (every other week and/or at the first signs of the pest) for major insect pests such as European Red Mite, Potato Leafhopper, Japanese Beetles, Grape Berry Moth, Grape Leafhopper and Rose Chafer.

Objective 1. Input Reduction

One of the benefits of sustainable management is the ability to do more with less through increased efficiency of vineyard operations. Through regular recordkeeping, testing, scouting, and maintenance, it is possible to reduce off-farm inputs. Thoughtful planning and Integrated Pest Management (IPM) practices can reduce the need for chemical intervention. This minimizes the risk that excess chemical inputs will drift, leach or runoff into the surrounding environment causing adverse ecological effects.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
1.6.16 Thresholds Reference Document	4	An insecticide is applied routinely with most spray applications.	Economic thresholds are disregarded when deciding the need for a treatment.	Economic thresholds are sometimes used to help determine the need for a treatment.	Where economic thresholds exist, scouting results are used to help determine the need for treatment. Currently, informal thresholds exist for Grape Berry Moth, European Red Mite, Potato Leafhopper, Grape Leafhopper, Climbing Cutworm and flea beetles.
1.6.17 Spot Treatments	4	Spot treatment is never done. If an insect or mite outbreak occurs, the entire vineyard is treated.		Spot treatment is sometimes done.	If infestations are localized, only the vineyard areas with economically damaging levels of a pest are treated. For example, only the block by the wooded edge is treated for berry moth; blocks A&B but not C are treated for European Red Mite.
1.6.18 Insecticides Reduced Risk Minimum Risk Biopesticides OMRI (Organic) Approved IRAC	4	Reduced risk, minimum risk, biopesticides, and/or OMRI approved materials are never used. **AND/OR** Insecticide rotation is ignored.		Where effective and economically feasible, reduced risk, minimum risk, biopesticides, and/or OMRI approved materials are used for insect and mite control. **AND** All insecticides are rotated properly to avoid resistance.	Reduced risk, minimum risk, biopesticides, and/or OMRI approved materials are always used for insect/mite control. **AND** All insecticides are rotated properly to avoid resistance.
1.6.19 European Red Mite	4	More than half of the spray materials used is rated as harmful to mite predators. **AND/OR** Two or more mancozeb sprays are applied in the period during or after bloom.	Only a few pesticides in the spray schedule are known to be detrimental to mite predators **AND/OR** Regardless of the application of mancozeb in the prebloom period, only one mancozeb spray is applied in the period during or after bloom.	Mancozeb is only used in sprays applied prior to bloom.	The spray materials are adjusted so that only pesticides (fungicides, insecticides and miticides) with a low to moderate negative impact on ERM predators are used. **AND** Mancozeb is not used.

1.7 Irrigation

Objective 1. Input Reduction

One of the benefits of sustainable management is the ability to do more with less through increased efficiency of vineyard operations. Through regular recordkeeping, testing, scouting, and maintenance, it is possible to reduce off-farm inputs. Thoughtful planning and Integrated Pest Management (IPM) practices can reduce the need for chemical intervention. This minimizes the risk that excess chemical inputs will drift, leach or runoff into the surrounding environment causing adverse ecological effects.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
1.7.1 Off-Site Water Movement	4	Runoff occurs when irrigating and/or during rainfall events.	Irrigation practices result in no runoff but runoff and erosion occurs during high rainfall events. **AND/OR** Conservation practices need major improvement.	Irrigation practices result in no runoff . **AND** Conservation practices are present but some need improvement.	Irrigation practices result in no runoff . **AND** Conservation practices are in place to minimize runoff (e.g. perennial cover crops, undervine vegetation, subsoiling, buffer/filter strips, diversions, grass waterways).
1.7.2 Irrigation System	4	A low volume system is not used.		A low volume system such as drip is installed but no design was used.	A low volume system such as drip is installed. **AND** System has been designed by a technician with experience in irrigation to ensure uniform distribution of water.
1.7.3 Distribution Uniformity How to Measure	4	Distribution uniformity is never checked.		Distribution uniformity is tested irregularly by measuring emitter outflows and pressure differential in each zone.	System is checked at the beginning of each growing season by measuring emitter outflows and pressure differential in each zone.
1.7.4 System Maintenance Drip Irrigation Checklist	4	Water filters are not regularly inspected or cleaned, and irrigation lines are not flushed at all.		Water filters are inspected and cleaned whenever pressure differences indicate, and irrigation lines are flushed at the beginning of the irrigation season each year.	Water filters are inspected and cleaned whenever pressure differences indicate, and irrigation lines are flushed at the beginning and end of each season. **AND** Treatment of the water is completed if tests show a problem (e.g. to prevent precipitate buildup and kill algae or bacteria present in the system)."
1.7.5 Flow Meter	4	Flow meter is not installed.		Flow meter is installed but not regularly used to monitor the system.	Flow meter is installed and used to monitor application rates throughout the season.

Objective 1. Input Reduction

One of the benefits of sustainable management is the ability to do more with less through increased efficiency of vineyard operations. Through regular recordkeeping, testing, scouting, and maintenance, it is possible to reduce off-farm inputs. Thoughtful planning and Integrated Pest Management (IPM) practices can reduce the need for chemical intervention. This minimizes the risk that excess chemical inputs will drift, leach or runoff into the surrounding environment causing adverse ecological effects.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
1.7.6 Soil Moisture Monitoring	4	An irrigation schedule is maintained regardless of soil moisture or weather conditions.	Soil moisture monitoring devices are not installed. **BUT** Weather data is recorded and seasonal rainfall amounts are considered when deciding when to irrigate and how much water to apply.	Soil moisture monitoring is done by bucket auger (judging by feel). **AND** Weather data is recorded and seasonal rainfall amounts are considered when deciding when to irrigate and how much water to apply.	Soil moisture monitoring devices (e. g. neutron gauge, tensiometer or gypsum blocks) are installed and used to track soil moisture depletion. **AND** Weather data is recorded and seasonal rainfall amounts are considered when deciding when to irrigate and how much water to apply.
More on Moisture Monitoring	Tensiometers reveal soil moisture potential in a specific area. They read changes in soil moisture by measuring the vacuum created by water movement through a ceramic tip. This mimics how soil moisture moves into the root zone of a plant. Tensiometers can help determine when to irrigate but not how much water should be applied. Begin irrigation when the tensiometer reads between 30 and 40 centibars. Observe the response on the tensiometer after irrigating. If it shows that the soil is wet (a gauge reading of 0-10), the system is working well. Operation times can be adjusted based upon the response of the tensiometer. There are a number of other methods for measuring soil moisture such as neutron probes and gypsum blocks. Alternatively, a more accurate method may be to measure vine water potential using pressure bombs.				
1.7.7 Determining Schedule USDA Web Soil Survey	4	Irrigation water is applied systematically without regard to weather conditions, or water holding capacity of the soil.	Irrigation water is applied systematically when conditions are dry.	Water is applied according to the water holding capacity of the soil, vine demand and weather conditions at that time. Soil moisture is not measured. **AND** Application time is calculated according to the application rate of the system.	Water is applied according to the water holding capacity of the soil and rooting depth, soil moisture measurement, vine demand and weather conditions at that time. **AND** Application time is calculated according to the application rate of the system and the measured depletion in the root zone.
Objective 1 Score	280				

Objective 2. Soil Health

Healthy soil is the foundation of a healthy vineyard. It is important to keep soils under vegetation throughout the year to reduce erosion, improve infiltration, sequester carbon, and foster a diverse soil microbiome to maximize nutrient uptake in the vine.

2.1 Leaching, Runoff, Erosion

	My Score	1 (High Risk)	2	3	4 (Low Risk)
2.1.1 Minimizing Leaching	4	Pesticide, herbicide, and fertilizer applications are made with no consideration to leaching potential.	Pesticide, herbicide, and fertilizer application rates are adjusted to limit movement. **AND** Applications of ground directed fertilizers and herbicides are delayed when heavy rains are expected.	Pesticides, herbicides and fertilizers with high leaching potential are not used, and appropriate application rates are used to limit movement. **AND** Applications of ground directed fertilizers and herbicides are delayed when heavy rains are expected.	Pesticides, herbicides and fertilizers with high leaching potential are not used, and appropriate application rates are used to limit movement. **AND** Applications of ground directed fertilizers and herbicides are delayed when rainfall is forecasted. **AND** Permanent cover crops are maintained in row middles.
2.1.2 Minimizing Runoff Building Soils for Better Crops	4	Soil conservation practices are not considered in vineyard layout and management.		A conservation plan over five years old is in place that addresses runoff with appropriate soil conservation structures (e.g. diversions, filter strips, drainage) and permanent cover crops are maintained in row middles.	A conservation plan less than five years old is in place that addresses runoff with appropriate soil conservation structures (e.g. diversions, filter strips, drainage) and permanent cover crops are maintained in row middles.
2.1.3 Slopes	4	Vineyard rows run up and down the slope. **AND** Slopes are >6%.	Vineyard rows are perpendicular to the main slope. **AND** Substantial side slopes are present (slope direction is not uniform). **OR** If rows run up and down the slope, adequate measures are taken to minimize soil erosion and runoff.	Vineyard rows run perpendicular to the slope. **AND** Slope along rows is <6%; hill slope is <12%. **AND** Some side slopes present.	Vineyard rows run perpendicular to the slope (across slope). **OR** Slope along rows is <3% hill slope is <12%. **AND** Direction of the slope is uniform. **AND** There is undervine cover crop to minimize erosion.
More on Slopes	Vineyard rows can reduce the effective slope by channeling water across it. Such protection is less effective when the slope *along vineyard rows* exceeds 3%, when slope direction is not uniform (side hills present), or when the main slope exceeds 12%.				

Objective 2. Soil Health

Healthy soil is the foundation of a healthy vineyard. It is important to keep soils under vegetation throughout the year to reduce erosion, improve infiltration, sequester carbon, and foster a diverse soil microbiome to maximize nutrient uptake in the vine.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
2.1.4 Erosion Yates County SWCD NRCS	4	No cover crop is established. **AND/OR** Erosion is evident and no corrective measures are taken.	"Winter annual cover crops are established in vine row middles. **BUT** Some minor erosion is still evident in spite of corrective measures."		Permanent cover crops are established in vine row middles and maintained over the years. **AND** Straw mulch or other semi-permeable material is applied to row middles where needed. **AND** Where erosion is evident corrective measures are taken (e.g. grass waterway, diversions, filter strips, replanting bare soil).
2.1.5 Mulch Management	4	Row middles are never mulched. **AND** Slopes are >12%, and permanent sod is not well established. **OR** Soils are eroded or low in organic matter.		Mulch is applied to alternate row middles in vineyard blocks with >12% slope. **OR** Mulch is applied every other row to vineyards with runoff or leaching potentials.	Mulch is applied to every row middle on eroded areas as needed. **OR** Mulch is applied to all vineyard blocks with slopes >12%.
More on Mulch	Application of straw mulch to row middles is a highly beneficial practice, particularly on eroded hillside vineyards. It conserves moisture, adds organic matter to the soil, and is highly effective in reducing erosion and runoff. It is commonly applied to alternate row middles, and often applied in the fall after harvest. Straw mulch can supply significant amounts of potassium to soils. It is most cost effective to use when growers bale the straw themselves and have open land that they can devote to producing it. Round bales are most often rolled out using self-fabricated tractor-mounted equipment to unroll the bales.				
2.1.6 Drainage	4	Soils are poorly drained, and no tile drainage is utilized even in wet spots and low areas. **AND** Standing water persists after rain events.	Soils are moderately drained to poorly drained. **AND** Tile lines extend only to observably wet areas.	Soils are well drained to excessively well drained. **OR** Tile drainage is installed on poorly drained low areas or heavy soils.	Pattern tiling is established with tile lines at adequate density for the soil texture and varietal.

Objective 2. Soil Health

Healthy soil is the foundation of a healthy vineyard. It is important to keep soils under vegetation throughout the year to reduce erosion, improve infiltration, sequester carbon, and foster a diverse soil microbiome to maximize nutrient uptake in the vine.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
2.2 Soil Analysis					
2.2.1 Pre- or Re-Plant	4	Prior to planting or re-planting, only pH is tested: a complete soil analysis is not done. **OR** No soil analyses are done	Only one complete soil analysis is/was done. **OR** There is no history of pre-plant soil analysis but grower has analysis from within last 6 years.	More than one soil analysis is/was done, but the site has not been thoroughly sampled.	Soil analyses are/were done on all distinct portions of the site - the slope is sampled separately from the flat area and different soil types are sampled separately. **AND** Results are incorporated into the nutrient management plan.
2.2.2 Nematodes	4	Nematode analysis is not done. **AND** The vineyard grows *V. vinifera.*			Prior to planting, samples are collected according to laboratory instructions and sent for nematode analysis. **OR** The vineyard only grows labrusca or nematode-tolerant hybrid varietals.
More on Nematodes	In the Finger Lakes, the dagger nematode *Xiphinema index* has been found to vector ringspot viruses, a disease of concern for hybrid varieties. Consequently, assessing the soil nematode populations may help to address a later problem. One of the best defenses against nematode injury is excellent early care of the vineyard, as healthy vines are better able to tolerate an infestation than compromised vines.				
2.2.3 pH Adjustment	4	Soil pH is not adjusted before planting. **OR** Soil pH is not known. **OR** More than 3 tons per acre of lime is applied after planting.	In the spring just before planting, soil pH is adjusted with lime so the top 16” of soil is approximately 6.5 for *V. vinifera*, 6.0 for hybrids and 5.5 for natives. **OR** Less than 3 tons per acre of lime is applied after planting.	In the year prior to planting, soil pH is adjusted with lime so the top 16” of soil is approximately 6.5 for *V. vinifera*, 6.0 for hybrids and 5.5 for natives. **AND** Lime applications are not split if >6 tons per acre is required.	In the year prior to planting, soil pH is adjusted with lime so the top 16” of soil is approximately 6.5 for *V. vinifera*, 6.0 for hybrids and 5.5 for natives. **AND** If the total amount recommended is >6 tons per acre, the lime is split between two applications in the year prior to planting.

Objective 2. Soil Health

Healthy soil is the foundation of a healthy vineyard. It is important to keep soils under vegetation throughout the year to reduce erosion, improve infiltration, sequester carbon, and foster a diverse soil microbiome to maximize nutrient uptake in the vine.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
More on pH	Three major types of grapevines are grown in New York: natives, hybrids, and *V. vinifera*. Native labrusca are adapted to acid soils, with optimum pH around 5.5. *V. vinifera* are more adapted to neutral soil pH (6.5-7.0) and can exhibit nutrient deficiencies in acid soils. Interspecific hybrid varieties are hybrids of American (often acid-adapted) *Vitis spp.* and *V. vinifera*, so are thought to have an adaptation to intermediate soil pH (6.0) somewhere between the European and American parents. Although this idea hasn't been rigorously tested for every hybrid, these guidelines seem to work reasonably well in practice. Application of lime should be done in the year prior to planting. Additions of large amounts of lime just before planting can induce manganese, potassium, or magnesium deficiencies in vines. Also, lime applied immediately preplant may not have time to react with soil particles.				
2.3 Compaction					
2.3.1 Pre-Plant Compaction Reference Document	4	Soil compaction is not directly evaluated. **AND** Preplant subsoiling is not done. **AND** Soils have silt or clay layers, and/or perched water tables.	Soil compaction is not directly evaluated. **AND** Preplant subsoiling is not done. **BUT** Soils are well-drained gravels or gravelly loams in hydrologic classes A and B, which are less prone to compaction.	Soil compaction is directly evaluated. **AND** If soils have impermeable platy layers or hard pans, subsoiling is performed the year prior to planting.	Soil compaction is directly evaluated. **AND** If soils have impermeable platy layers or hard pans they are addressed via biological and cultural methods. **OR** Soils are gravelly with no perched water tables or clay layers requiring subsoiling.
2.3.2 Equipment Use	4	Compaction status is not known. **AND** Equipment is used when soil is saturated.	Compaction status is not known. **BUT** Equipment is never used when soil is saturated.		Equipment is chosen or modified to minimize compaction (e.g. lightweight equipment, over the row equipment, wider or larger diameter tires, high flotation tires). **AND** Equipment use is avoided when soils are saturated.
2.4 Tilth					
2.4.1 Cultivation	4	Row middles are clean cultivated.	Row middles are shallow cultivated.	Every other row middle is shallow cultivated.	Row middles are not cultivated.

Objective 2. Soil Health

Healthy soil is the foundation of a healthy vineyard. It is important to keep soils under vegetation throughout the year to reduce erosion, improve infiltration, sequester carbon, and foster a diverse soil microbiome to maximize nutrient uptake in the vine.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
More on Cultivation	Cultivation, whether in the row middle or under the trellis, can have negative consequences particularly if done in excess. It renders soils more prone to erosion, destroys soil organic matter and can alter the quantity and diversity of soil microbial populations. Under Long Island conditions, row middle tillage may negate the benefits of a row middle cover crop (no net increase in organic matter). However, row middle tillage can and should be done to periodically renovate row middles (reduces weed populations such as dandelions) and as a vine management tool in dry years (reduces competition for water).				
2.4.2 Cover Establishment NRCS Code 340 Cover Crop Decision Tool	4	Cover crops are not seeded or established.	Annual cover crops are established following cultivation.	Annual cover crops are seeded at an appropriate time with a no-till drill. **AND** Cover is established most of the year.	Permanent cover crop is established.
2.5 Amendments					
2.5.1 Compost	4	No organic matter is added to the vineyard where needed. **AND** Vine pruning wood is removed from vineyard.	No organic matter is added to the soil where needed. **BUT** Vine pruning wood is chopped and remains in vineyard.	Where needed, organic matter, such as compost, hay mulch, or composted pomace, is banded to the soil under the vine row. Compost is not analyzed. **AND** Vine pruning wood is chopped and remains in vineyard.	Where needed, organic matter, such as compost, hay mulch, or composted pomace, is banded to the soil under the vine row annually. Compost is analyzed for nutritional composition as well as contaminants. **AND** Vine pruning wood is chopped and remains in vineyard.
More on Compost	It is most practical to apply compost to a swath under the trellis rather than a broadcast application. Reasons include limited availability of high quality compost, the fact that large quantities are needed, and the expense involved. Dr. Ian Merwin, of Cornell University's Department of Horticulture, has documented that compost application increases soil microbial activity (CO_2 evolution), CEC (Cation Exchange Capacity), and available P, Ca, and K. Compost application can also result in shifts in microbial community structure. Chopping the prunings may aid movement through the vineyard rows. On rare occasions, removal of vine prunings is warranted to reduce fungal disease inoculum.				
2.5.2 Pomace	4	Pomace is not returned to the vineyard	Pomace is spread in the vineyard fresh.	Pomace is composted off the farm and returned to the vineyard as mature compost.	Pomace is composted on site, away from adjacent waterways, and returned to the vineyard.

Objective 2. Soil Health

Healthy soil is the foundation of a healthy vineyard. It is important to keep soils under vegetation throughout the year to reduce erosion, improve infiltration, sequester carbon, and foster a diverse soil microbiome to maximize nutrient uptake in the vine.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
More on Pomace	Recycling of organic matter back into the vineyard is important to maintain soil organic matter and soil biodiversity. Pomace can be combined with a carbon source – leaves, for example – to create a more nutritionally balanced product that enhances the soil over and above the addition of fresh pomace. Though difficult to totally eliminate, even through proper composting, grapevine seedlings will proliferate from the spreading of fresh pomace. These seedlings are often infected by downy mildew, but are generally controlled through standard floor management practices.				

Objective 2 Score **60**

Objective 3. Water Protection

New York State has a wealth of freshwater resources including lakes, rivers, streams, ponds, and aquifers. Protective measures and sustainable irrigation practices ensure quality drinking water for all residents. The incorporation of vegetative buffers adjacent to waterways, wetlands, and riparian zones, is also essential to conserving aquatic habitat for all organisms.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
3.1 Buffer Zones					
3.1.1 Mixing/Loading NRCS Code 702	4	Mixing/loading is within 100 ft of a well, surface water or watercourse.	Mixing/loading area is done down slope and at least 100 ft from any well, surface water or watercourse.	Mixing/loading area is done down slope and at least 100 ft from any well, surface water or watercourse, and as far as practical from streams and ditches, on an approved agrochemical mixing facility.	Mixing and loading is done down slope and at least 200 ft from any well, surface water or watercourse on an approved agrichemical mixing facility.
3.1.2 Fertilizer Storage NRCS Code 590	4	There is less than 100 ft between the fertilizer storage and the nearest surface water body, well, or other ecologically sensitive area.	Storage is at least 100 ft from nearest surface water body, well, or other ecologically sensitive area and building is not curbed with a concrete pad.	Storage is 100-200 ft from nearest surface water body, well, or other ecologically sensitive area, and building is curbed with a concrete pad designed to contain 125% of the volume of the stored products.	Storage is greater than 200 ft from nearest surface water body, well, or other ecologically sensitive area, and building is curbed with a concrete pad. **OR** No fertilizer is stored on the farm.
3.1.3 Spray Applications	4	Spray is applied adjacent to or over top of open water.	Spray is applied less than 35ft from an open water source.	Label restrictions are followed, or if not stated on label, spray is applied at least 35ft from open water source.	Spray is applied at least 50ft from open water source.
3.1.4 Filter Strips NRCS Code 393	4	Sediment directly enters a watercourse. **AND/OR** No filter strips are in place.	Filter strips are present along some vineyard borders.	Vegetative buffers are at least 20ft wide and meet NRCS Code 393. Filter strips are present and along most vineyard borders. **AND** No sediment is entering a major watercourse	Vegetative buffers are over 35ft wide and meet NRCS Code 393. Filter strips surround all water courses and vineyard borders.
3.2 Water Sources					

Objective 3. Water Protection

New York State has a wealth of freshwater resources including lakes, rivers, streams, ponds, and aquifers. Protective measures and sustainable irrigation practices ensure quality drinking water for all residents. The incorporation of vegetative buffers adjacent to waterways, wetlands, and riparian zones, is also essential to conserving aquatic habitat for all organisms.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
3.2.1 Pesticide Application	4	Water is obtained from a well used for drinking water. **OR** Pond water filling area is adjacent to the pond. **AND** A Reduced Pressure Zone (RPZ) device or suitable air gap is not in place. **AND** Spray tanks are filled directly from the well or pond.	Water is obtained from a well used for drinking water. **OR** Pond water filling area is <100 ft from open water. **AND** A RPZ device or an air gap equal to twice the diameter of the filler source pipe above the sprayer tank is in place to prevent backflow. **BUT** Spray tanks are filled directly from the well or pond.	Water is obtained from a well dedicated to farm use, and spray tanks are filled directly from the well. **OR** Water is brought directly from a pond but the filling area is at least 100 ft from open water. **AND** A RPZ device or air gap equal to twice the diameter of the filler source pipe above the sprayer tank is in place to prevent backflow.	Water is obtained from a well dedicated to farm use and water used to fill the spray tank is from a nurse tank. **OR** Water from farm pond fills nurse tank at least 100 ft from open water (pond or stream). **AND** A RPZ device is in place or an air gap equal to twice the diameter of the filler source pipe above the sprayer tank is installed to prevent backflow.
3.2.2 Irrigation Source	4	Irrigation water is obtained from non-sustainable, protected, or illegal sources.	Where treated sewage water is used, water quality must comply with the WHO Guidelines on Safe Use of Wastewater and Excreta in Agriculture and Aquaculture.	Irrigation water is obtained from sustainable sources, (i.e. sources that supply enough water under normal conditions).	Irrigation water is obtained from sustainable sources, (i.e. sources that supply enough water under normal conditions) or from legal rainwater harvesting. **AND** Water is analyzed at least every five years for irrigation suitability or an adequate water quality report is obtained from the source authority.
More on Water Sources	Regulations concerning use of surface water (ponds) for filling sprayers vary. Long Island vineyards exclusively use wells or municipal water supplies. In other areas, growers commonly use water pumped from ponds, particularly where wells or municipal water supply are not available. When ponds are used as a source, the filling area should be below the grade of the pond, and at least 100 feet away from surface water. Nurse tanks are recommended, because they reduce the amount of time it takes to fill spray tanks. An acceptable Reduced Pressure Zone (RPZ) device contains a minimum of two independently acting check valves with an automatically operated pressure differential relief valve between the two check valves.				

3.3 Riparian Habitat

Objective 3. Water Protection

New York State has a wealth of freshwater resources including lakes, rivers, streams, ponds, and aquifers. Protective measures and sustainable irrigation practices ensure quality drinking water for all residents. The incorporation of vegetative buffers adjacent to waterways, wetlands, and riparian zones, is also essential to conserving aquatic habitat for all organisms.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
3.3.1 Vegetative Buffers Over 150 feet recommended	4	Riparian vegetation is not preserved along watercourses. **AND** Non-woody vegetative buffer strips are not adjacent to perennial waterways.	Riparian vegetation is not preserved along watercourses **BUT** non-woody vegetative buffer strips are adjacent to perennial waterways.	Riparian vegetation adjacent to perennial waterways, including trees and shrubs, shades part or the entire watercourse.	Riparian vegetation adjacent to perennial waterways, including native trees and shrubs, shades part or the entire watercourse.
3.4 Wetlands					
3.4.1 Vegetative Buffers Over 150 feet recommended	4	Wetlands are not protected by buffer strips.	There is a non-vegetative buffer strip around the entire perimeter of the seasonal and/or permanent wetlands and/or any vernal pools.	There is a permanent vegetative buffer around the entire perimeter of the seasonal and/or permanent wetlands and/or any vernal pools.	There is a permanent vegetative buffer of native plants around the entire perimeter of the seasonal and/or permanent wetlands and/or any vernal pools.
3.5 Engagement					
3.5.1 Local Conservation Yates County SWCD Finger Lakes Land Trust Canandaigua Lake Watershed Assoc. Cayuga Lake Watershed Network Keuka Lake Assoc. Otisco Lake Preservation Assoc. Owasco Watershed Lake Assoc. Seneca Lake Pure Waters Assoc. Skaneateles Lake Assoc. Lake Champlain Basin Program Riverkeeper DEC Great Lakes Peconic Land Trust	4		Grower is not engaged with local water conservation/protection organizations.	Grower is occasionally engaged with at least one local water conservation/protection organization.	Grower is actively engaged with one or more local water conservation/protection organizations.
Objective 3 Score	36				

Objective 4. Energy Conservation

Reducing carbon emissions is a state, federal, and personal goal for many Americans. From enhanced fuel efficiency to renewable energy generation, there are many ways for growers to reduce their carbon footprint.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
4.1 Fuel and Emissions					
4.1.1 Benchmarking	4	Neither fuel nor electricity use for the farming operation are tracked. **AND** No plan is in place to reduce usage.	On-farm diesel OR electricity use for the farming operation is tracked. **AND** No plan is in place to reduce usage.	On-farm diesel AND electricity use for the farming operation are tracked. **AND** A plan is in place to reduce usage that has been communicated to farm staff.	All fuel and electricity use for the farming operation are tracked. **AND** There is a comprehensive plan in place to reduce fuel usage and emissions across operations that has been communicated to farm staff.
4.1.2 Alternative Energy	4		The grower uses or sources only fossil energy sources.	The grower uses or sources at least one form of non-fossil energy sources such as solar, wind, biodiesel, etc.	The grower uses or sources only renewable energy sources including solar, wind, hydro, tidal, geothermal, or sustainably produced biomass.
4.1.3 Efficiencies	4		The grower does not treat multiple rows or multitask for any mechanical operation.	Once per year, the grower treats more than one row at a time or combines two or more mechanical tasks into a single vineyard pass.	At least twice per year, the grower treats more than one row at a time or combines two or more mechanical tasks into a single vineyard pass.
Objective 4 Score	12				

Objective 5. Natural Resource Conservation and Waste Streams

It is essential to reduce waste streams and resource utilization through safe handling, storage, and disposal. Proper waste stream management helps farms to prevent pollution and save costs.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
5.1 Pesticide Storage					
5.1.1 Shelving	4	Shelving is bare wood with no lip, heavy containers are on the highest shelves. **OR** There are no shelves, pesticide containers are on the floor.	Shelving is wood covered with epoxy paint or plastic sheet, heavy containers are on high and low shelves.		Shelving is metal or plastic, with lips to prevent tumbles, heavy containers on lowest shelves. **AND** Powders are stored on upper shelves, liquids on lowest shelves.
5.1.2 Flooring	4	The floor is permeable (e.g. gravel, dirt or wood).	The floor is impermeable but without curbs or dikes to contain leaks.	The floor is impermeable without curbs or dikes, but containment pallets or spill-proof trays with lips are used.	A spill kit should contain personal protection equipment (PPE), shovel, broom, dustpan, absorbent material, heavy-duty detergent, a sturdy plastic container and emergency telephone numbers. Source: AEM Tier II Worksheets for the Long Island Agricultural Stewardship Program.
5.1.3 Security	4	Area is open to other activities that could damage containers or spill chemicals or allow entry of unwanted persons.	Area is separate from other activities. **AND** Used only for pesticides.	Area is separate from other activities. **AND** Used only for pesticides. **AND** Posted with appropriate signage.	Area is locked or fenced. **AND** Separate from all other activities. **AND** Used only for pesticides. **AND** Posted with appropriate signage.
5.1.4 Storage Duration	4	Pesticides are stored for more than two seasons.	Pesticides are stored for two seasons.	Pesticides are stored during the growing season.	Pesticides are purchased and used in full as needed.

Objective 5. Natural Resource Conservation and Waste Streams

It is essential to reduce waste streams and resource utilization through safe handling, storage, and disposal. Proper waste stream management helps farms to prevent pollution and save costs.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
5.1.5 Container Condition	4	Pesticides are not in their original containers. **OR** Containers have rust, holes or tears that allow chemicals to leak.	Pesticides are in their original containers but have unreadable or missing labels. **AND/OR** Most pesticides are purchased in containers that require special handling or treatment before disposal.	Pesticides are in their original containers and are clearly labeled – there are no holes, tears, weak seams or missing lids/caps. **AND** Some pesticide products are purchased in recyclable or returnable containers.	Pesticides are in their original containers and are clearly labeled – there are no holes, tears, weak seams or missing lids/caps. **AND** Where available, all pesticide products are purchased in recyclable or returnable containers to reduce the number of empty containers that require disposal.
5.1.6 Container Disposal	4	Unrinsed containers or empty bags are stored or disposed of on the farm. **OR** Pesticide containers are burned on the farm.	Triple-rinsed containers are stored or disposed of on the farm.	Triple-rinsed containers are disposed of through an appropriate waste collection service as per label instructions.	Triple-rinsed or power-rinsed containers are returned to a supplier for recycling. Bags are returned to a supplier, or an appropriate waste collection service is used.
5.1.7 Unwanted Pesticides	4	The grower disposes of unused or banned pesticides on the farm or at a local garbage dump. **OR** Unused or banned pesticides are stored indefinitely on the farm.			The grower participates in an EPA/DEC return program, and unused or banned pesticides are returned to a dealer or disposed of through a hazardous waste collection service. NYS labeled materials may be given to an appropriate user for use on labeled crops.
5.2 Fertilizer Storage					
5.2.1 Dry Formulations	4	Dry formulations have no cover, soils are sandy. **AND/OR** Spills are not collected.	Dry formulations have partially covered storage on permeable surface (on other than sandy soils). **AND/OR** Spills are not collected.	Dry formulation have covered storage on permeable surface (other than sandy soils). Spills are collected.	Dry formulations have covered storage on impermeable surface such as concrete or asphalt. Spills are collected.
5.2.2 Security	4	Area is open to activities that could damage containers or spill fertilizer.		Area is fenced or locked and separate from most other activities.	Area is fenced or locked and separate from all other activities or valves are locked.

Objective 5. Natural Resource Conservation and Waste Streams

It is essential to reduce waste streams and resource utilization through safe handling, storage, and disposal. Proper waste stream management helps farms to prevent pollution and save costs.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
5.2.3 Storage Duration	4	Fertilizers are stored for more than one season.	Fertilizers are stored during the season.		No fertilizers are stored at any time.
5.2.4 Container Condition	4	Bags/containers are old and in need of repair. Metal containers show signs of rusting. No labels or secondary containment.	Labels are missing or hard to read. Bags are old with no holes or tears unless there is secondary containment.		Tanks or bags are clearly labeled. There are no holes, tears, weak seams or leaks unless there is secondary containment.
5.3 Disposal of Other Waste					
5.3.1 Recycling	4	The grower does not take steps to recycle waste where programs are available.		The grower recycles metal, paper, cardboard, glass, and plastic in designated recycling containers. where programs are available. **OR** Recycling programs are not available to the grower.	The grower recycles metal, paper, cardboard, glass, and plastic in designated recycling containers where programs are available. **AND** New employees are trained on recycling procedures.
5.4 Loading and Mixing					
5.4.1 Station Type	4	There is no mixing/loading pad. **AND** Mixing and loading done in the same location every time.	Most mixing and loading is done in the field at a different location most of the time or switched frequently.	All mixing and loading is done on an impermeable pad without curb or sump, or on a pad that conformed to engineering standards when built. **OR** In-field mixing is done in a different appropriate location every time. Mixing is not performed next to a ditch.	All mixing and loading is done on an impermeable pad with a curb that keeps spills contained and holds 125% of maximum chemical volume. Sumps allow collection and transfer to storage or back into sprayer for field application. The facility meets or exceeds the most current standard for an approved agrichemical mixing facility.
5.4.2 Spills	4	No spill kit is available. **AND/OR** Spills are not dealt with until major time has elapsed or not at all.	Operator has a spill kit, but it is not readily accessible.	A spill kit is readily available but used and remaining contents are depleted or unknown.	A spill kit is readily available and fully stocked. **AND** Spills are cleaned up immediately

More on Spill Kits A spill kit should contain personal protection equipment (PPE), shovel, broom, dustpan, absorbent material, heavy-duty detergent, a sturdy plastic container and emergency telephone numbers.

Objective 5. Natural Resource Conservation and Waste Streams

It is essential to reduce waste streams and resource utilization through safe handling, storage, and disposal. Proper waste stream management helps farms to prevent pollution and save costs.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
5.4.3 Filling	4	Supervision is provided seldom or never.	Supervision is provided most of the time.	A certified applicator has provided appropriate training for mixers and loaders and is available for consultation as needed.	A certified applicator does the mixing and loading. **OR** A certified applicator provides constant supervision.
5.4.4 Rinsate	4	Sprayer is washed at the farmstead. Rinsate is dumped at farmstead or in field sump or adjacent to streams or waterways or is sprayed along a fence line or hedgerow.	Sprayer is washed at the farmstead (not on a pad), and rinsate is sprayed back onto the vineyard following label recommendations.	Sprayer is washed on a pad at the farmstead. Rinsate is applied to labeled crops.	An in-field cleaning system is used. Rinsate is applied to labeled crops.
5.4.5 Inspections	4	Plumbing and well connections are never inspected. **AND/OR** No emergency plan or phone numbers are in place.	Plumbing and well connections are inspected only when there are breaks and leaks. Emergency plan and telephone numbers known but not posted. Equipment for fire or spills is in place but not reviewed or checked.		Plumbing and well connections are inspected before each day of use for breaks and leaks. Emergency plan is centrally posted with telephone numbers as per WPS regulation. Equipment for fire or spills is reviewed and checked annually.
Objective 5 Score	68				

Objective 6. Ecosystem Health

Sustainable farming is a holistic approach that acknowledges the interconnection between agriculture and natural ecosystems. Encouraging a healthy ecosystem in and around the vineyard is essential to soil health, biodiversity, and pollinator habitat.

6.1 Biodiversity

	My Score	1 (High Risk)	2	3	4 (Low Risk)
6.1.1 Ecological Areas Reference Document	4	The entire farm is clean cultivated year-round and there are no ecological areas.	There is little or no permanent habitat. **AND/OR** Temporary habitat between rows is terminated before 50% flowering.	The grower relies mainly on temporary flowering habitat between rows for ecological areas if the permanent habitat totals less than 5% of the farm's surface.	The grower dedicates multiple portions of the farm to permanent ecological areas. Ideally this area would be a patchwork of at least 15% of the farms total area with increased ecological function as the farm approaches a variegated landscape. **AND** There is ample temporary habitat that flowers during various times throughout the year.
6.1.2 Soil Micro/Macrofauna	4		The grower uses vineyard management practices that could negatively affect the diversity of beneficial soil micro and macrofauna such as earthworms, millipedes, spiders, snails, etc.		The grower actively works to increase the diversity of beneficial soil macrofauna such as earthworms with vineyard management practices. This biodiversity helps with carbon, nutrient, and water cycling.
6.1.3 Soil Microorganisms HRAC Lookup	4		The grower uses none of the methods in column 4 to increase and diversify the soil microbial population.	The grower actively works to increase and diversify the soil microbial populations with at least two of the methods in column 4.	The grower actively works to increase and diversify the soil microbial populations with at least four of the following methods: • Use of compost or other organic matter • Minimal row middle tillage • Reduction in or elimination of preemergence herbicides • Avoiding the overuse of postemergence herbicides • Avoiding the overuse of herbicide with the Group 9 mode of action. • Avoiding the overuse of copper as a fungicide • Increase the diversity of plant material on the vineyard floor to more than ten non-noxious plant species

Objective 6. Ecosystem Health

Sustainable farming is a holistic approach that acknowledges the interconnection between agriculture and natural ecosystems. Encouraging a healthy ecosystem in and around the vineyard is essential to soil health, biodiversity, and pollinator habitat.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
6.1.4 Mycorrhizae HRAC Lookup	4	The grower actively discourages arbuscular mycorrhizal fungi development through multiple detrimental vineyard management practices.	The grower does not actively encourage arbuscular mycorrhizal fungi development.		The grower actively encourages arbuscular mycorrhizal fungi development to enhance phosphorus and water uptake. Practices include using leguminous cover crops, avoidance of fumigation, avoidance of luxury consumption, and avoidance of the overuse of herbicide with the Group 9 mode of action.
6.1.5 Wildlife Corridors	4		The farm is fully fenced and wildlife has no passage through.	The farm is not fenced or fenced in a way to allow for free passage of wildlife.	The farm has dedicated corridors to allow for free passage of wildlife.
6.1.6 Enhancements	4	The grower has implemented no practices to preserve or enhance biodiversity on the farm.	The grower has implemented at one of the management practices in column 4 to enhance biodiversity on the farm.	The grower has implemented at least two of the management practices in column 4 to enhance biodiversity on the farm.	The grower has implemented at least three of the management practices below to enhance biodiversity on the farm: • Farm equipment is selected and operated in a way to reduce environmental impacts. • The farm has at least one patch of beneficial plant species of at least 15 square feet in size, maintained within 150 feet of crop area • The farm has ecological infrastructure outside the crop area with high diversity. • The grower maintains nesting boxes and/or perches for birds annually. • The farm has a minimum of ten suitable and alternating non-noxious plant species in the alleyway/intervine strip. • The grower takes steps to control weeds on the local state/provincial noxious weed list that are consistent with best management practices for IPM.
6.2 Pollinator Protection					
6.2.1 Forage Sources	4		The farm provides no pollinator food and water sources throughout the season.		The farm provides pollinator food and water sources throughout the season and the grower protects these as sensitive areas.

Objective 6. Ecosystem Health

Sustainable farming is a holistic approach that acknowledges the interconnection between agriculture and natural ecosystems. Encouraging a healthy ecosystem in and around the vineyard is essential to soil health, biodiversity, and pollinator habitat.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
6.2.2 Nesting	4		The grower does not identify and/or provide bee nest sites.		The grower identifies and/or provides bee nest sites and protects these as sensitive areas.
6.2.3 Neonicotinoids	4	The grower has applied nitroguanidine neonicotinoids (clothianidin, dinotefuran, imidacloprid, and thiamethoxam) without considering method or timing.	The grower has applied nitroguanidine neonicotinoids (clothianidin, dinotefuran, imidacloprid, and thiamethoxam) through drip irrigation in the last two years, but has done so only if no flowering plants are nearby and when no bees are present as a part of the farm's IPM program.		The grower has used no nitroguanidine neonicotinoids (clothianidin, dinotefuran, imidacloprid, and thiamethoxam) in the previous two years. Application includes the planting of seeds treated with nitroguanidine neonicotinoids
6.2.4 Other Pesticides UC IPM Bee Precaution	4		The grower does not take into account pollinator protections when applying other pesticides.		The grower uses no pesticides that are rated as Level I under the Bee Precaution system maintained by the University of California IPM Program during bloom of crop or adjacent plants.
6.2.5 Bats and Beetles	4		There are no nesting boxes for bats or beetle banks in or around the vineyard	Nesting boxes for bats are established and maintained in or around the vineyard. **OR** Beetle banks are used.	Nesting boxes for bats are established and maintained in or around the vineyard. **AND** Beetle banks are used.
6.3 Woodlands					
6.3.1 Buffers	4	There are no buffers between the farm and the adjacent woodland.	There is a non-vegetative buffer around the woodland that may or may not extend to the outer edge of the tree canopies. **OR** The farm has no adjacent woodlands and does not use bird boxes to enhance avian habitat and promote rodent predation.	The buffer around the woodland is primarily non-native vegetation and extends to the outer edge of the tree canopies. **OR** The farm has no adjacent woodlands but uses bird boxes to enhance avian habitat and promote rodent predation.	If there is woodland on or adjacent to the farm, the grower has enhanced buffer between the farm and woodland with native vegetation. The buffer extends to the outer edge of the tree canopies. **AND** The farm supplements any woodland habitat with bird boxes to enhance avian habitat and promote rodent predation.

Objective 6. Ecosystem Health

Sustainable farming is a holistic approach that acknowledges the interconnection between agriculture and natural ecosystems. Encouraging a healthy ecosystem in and around the vineyard is essential to soil health, biodiversity, and pollinator habitat.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
6.3.2 Individual Trees	4	There are no buffers around individual trees on the farm.	There is non-native vegetation (other than noxious weeds) around individual trees that does not extend to the outer edge of the tree canopies.	There is non-native vegetation (other than noxious weeds) around individual trees that extends to the outer edge of the tree canopies.	There is appropriate native vegetation around individual trees that extends to the outer edge of the tree canopies.
6.3.3 Dead/Dying Trees	4		All dead or dying trees are removed.	Some dead or dying trees are removed but most are left alone.	Dead or dying trees are not removed, leaving habitat and natural cycles intact unless there is imminent danger to farm workers.
6.4 Headlands					
6.4.1 Buffers	4	There is no vegetation on any headlands or along roadsides.		Headlands and roadsides have some vegetation, either native or non-native.	Headlands and roadsides are planted with native low-stature vegetation such as hedgerows and shrubs.
Objective 6 Score	60				

Objective 7. Climate Resiliency

Climate resiliency involves a set of practices and capacities that are known to help withstand climate change at the farm level through carbon sequestration, adaptation, and risk mitigation. It is important for growers to understand the science of climate change and build resiliency measures into their environmental, social, and economic management strategies.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
7.1 Regenerative Practices					
7.1.1 Land Management Project Drawdown Regenerative Organic Certification	4		The grower implements none of the practices in column 4.	The grower implements one of the practices in column 4.	The grower implements more than one of the following practices: • Low or no-till • Conservation cover • Planting for forage and biomass • Planting for biodiversity • Dynamic crop rotation in non-perennial areas • Managed grazing • Multi-story cropping • Reforestation or appropriate aforestation
7.1.2 Vineyard Applications	4		The grower uses none of the applications in column 4.	The grower uses one application in column 4.	The grower applies more than one of the following: • Compost • Manure • Biochar • Mulch
7.1.3 Soil Organic Carbon	4		The grower does not know the Soil Organic Carbon SOC level.	The grower knows the SOC level and has a plan to increase and maximize it.	The grower knows the SOC level and has a plan to increase and maximize it. **AND** Measures progress annually and adjusts the plan according to the results.
7.2 Climate Risk					
7.2.1 Exposure Cornell Climate Smart Farming	4		The grower does not have knowledge of the changing climate patterns in the region.		The grower has knowledge of the changing climate patterns and trends in the region including annual temperature and precipitation, changes to the length of the growing season, hot/wet/cold/freeze days, and hot/dry spells.

Objective 7. Climate Resiliency

Climate resiliency involves a set of practices and capacities that are known to help withstand climate change at the farm level through carbon sequestration, adaptation, and risk mitigation. It is important for growers to understand the science of climate change and build resiliency measures into their environmental, social, and economic management strategies.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
7.2.2 Sensitivity	4		The grower does not have knowledge of the effects of climate change on any aspect of farming.	The grower has general knowledge of the effects of climate change on farming.	The grower has knowledge of the the effects of changing temperature, soil moisture, and increasing CO2 levels on the phenology of their specific cultivars, pests and diseases, and pest management regimes and any livestock on the farm.
7.2.3 Adaptive Capacity	4		The grower currently has no adaptive capacities and is not working to develop them.	The grower is actively working toward meeting all adaptive capacities in column 4	The grower is prepared to adjust or has already adjusted cultivar choice and pest management regimes in response to changing climate conditions. **AND** Has healthy soils with a high infiltration rate. **AND** Has access to physical resources that can buffer temperature and moisture extremes.
7.3 Resilience Capacities					
7.3.1 Response	4		The grower implements none of the options in column 4.	The grower implements one of the options in column 4.	The grower implements more than one of the following: • Choice of appropriate cover crop cocktails for the region (either drought- or moisture- tolerant) • Diversification of crops and cultivars, species and age, that are well-suited to the region, across the landscape and through time • Reduced tillage • On-farm waste recycling • Ecosystem restoration • Integration of livestock • Dynamic crop rotation in non-perennial areas • Diversified marketing strategies

Objective 7. Climate Resiliency

Climate resiliency involves a set of practices and capacities that are known to help withstand climate change at the farm level through carbon sequestration, adaptation, and risk mitigation. It is important for growers to understand the science of climate change and build resiliency measures into their environmental, social, and economic management strategies.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
7.3.1 Recovery	4		The grower has no abundance/reserve of any options in column 4.	The grower has an abundance/reserve of one of the options in column 4.	The grower has cultivated an abundance/reserve of more than one of the following: • Soil health • Biodiversity • Management experience • Training on ease with loss and change • Community support • Knowledge and skills • Public assistance • Insurance • Savings • Access to capital • Alternative energy sources • Water resources • Storage • Shelf-stable products
7.3.2 Transformation	4		The grower is not prepared to transform operational systems if necessary and is not working toward this goal.	The grower is not prepared to transform operational systems if necessary but is working toward this goal.	The grower is prepared to transform operational systems if necessary. For instance, switching from a monoculture to a diversified farming operation, integrating livestock, restructuring marketing strategies, etc.
Objective 7 Score	36				

Objective 8. Education and Continuous Improvement

Continuous improvement is an critical concept of sustainability that can be achieved through grower education, goal-setting and cooperation. Together we can learn to grow, adapt, and improve as industry.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
8.1 Education					
8.1.1 Publications	4	The grower does not maintain any publications relating to winegrowing or sustainability.			The grower maintains and regularly uses the most current publications on various topics relating to viticulture, grape diseases, IPM, soil management, weeds, sustainability, etc.
8.1.2 Subscriptions	4	The grower subscribes to no trade magazines or newsletters.		The grower subscribes to one newsletter or trade magazine, preferably from within the NY region.	The grower subscribes to multiple industry newsletters and trade magazines.
8.1.3 Grower Meetings	4	The grower does not attend any grower meetings.	The grower attends one regional grower meeting per season.	The grower attends at least two regional grower meetings per season.	The grower attends all regional grower meetings every season as well as at least one outside the region.
8.1.4 IPM and Extension	4	The grower has not attended any additional integrated pest management (IPM), Worker Protection Standard (WPS), pesticide compliance, or extension meetings.	The grower occasionally attends WPS, IPM, or pesticide compliance meetings, but not every year.	The grower attends at least two WPS, IPM, or pesticide compliance meetings per year.	The grower attends all locally held WPS, IPM, or pesticide compliance meetings or every year **AND** The grower is enrolled in the local extension program.
8.2 Continuous Improvement					
8.2.1 Projects	4	The grower has not defined continuous improvement projects to be completed within the next year.	The grower has defined one continuous improvement project to be completed within the next year.	The grower has defined two continuous improvement projects to be completed within the next year.	The grower has defined three or more continuous improvement projects to be completed within the next year and offers to share methods and results with other growers.
8.2.2 VineBalance	4	The grower has achieved one or more High Risk scores on this workbook and has no plans to address them in future attempts.		The grower has completed this workbook and used it to develop a written plan with benchmarks, goals, and a timeline to increase the total score in future attempts.	The grower has achieved a perfect score on this workbook and volunteers to assist other VineBalance participants.
Objective 8 Score	24				

Objective 8. Education and Continuous Improvement

Continuous improvement is an critical concept of sustainability that can be achieved through grower education, goal-setting and cooperation. Together we can learn to grow, adapt, and improve as industry.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
8.1 Education					
8.1.1 Publications	4	The grower does not maintain any publications relating to winegrowing or sustainability.			The grower maintains and regularly uses the most current publications on various topics relating to viticulture, grape diseases, IPM, soil management, weeds, sustainability, etc.
8.1.2 Subscriptions	4	The grower subscribes to no trade magazines or newsletters.		The grower subscribes to one newsletter or trade magazine, preferably from within the NY region.	The grower subscribes to multiple industry newsletters and trade magazines.
8.1.3 Grower Meetings	4	The grower does not attend any grower meetings.	The grower attends one regional grower meeting per season.	The grower attends at least two regional grower meetings per season.	The grower attends all regional grower meetings every season as well as at least one outside the region.
8.1.4 IPM and Extension	4	The grower has not attended any additional integrated pest management (IPM), Worker Protection Standard (WPS), pesticide compliance, or extension meetings.	The grower occasionally attends WPS, IPM, or pesticide compliance meetings, but not every year.	The grower attends at least two WPS, IPM, or pesticide compliance meetings per year.	The grower attends all locally held WPS, IPM, or pesticide compliance meetings or every year **AND** The grower is enrolled in the local extension program.
8.2 Continuous Improvement					
8.2.1 Projects	4	The grower has not defined continuous improvement projects to be completed within the next year.	The grower has defined one continuous improvement project to be completed within the next year.	The grower has defined two continuous improvement projects to be completed within the next year.	The grower has defined three or more continuous improvement projects to be completed within the next year and offers to share methods and results with other growers.
8.2.2 VineBalance	4	The grower has achieved one or more High Risk scores on this workbook and has no plans to address them in future attempts.		The grower has completed this workbook and used it to develop a written plan with benchmarks, goals, and a timeline to increase the total score in future attempts.	The grower has achieved a perfect score on this workbook and volunteers to assist other VineBalance participants.
Objective 8 Score	24				

Objective 9. Social Equity

Social equity addresses the “people” component of the so-called Three P’s of Sustainability: people, planet, and prosperity. This can be achieved through thoughtful human resource management, employee benefits, and worker health and safety measures.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
9.1 Worker Health					
9.1.1 Responsible Party	4	There is no member of management clearly identified as the responsible person for worker safety, health, and welfare issues.			A member of the management is clearly identified as the responsible person for worker safety, health and welfare issues.
9.1.2 Hazard Program	4	There is no hazard communication program.			A hazard communications program is actively communicated to the workforce.
9.1.3 Dangerous Work	4	Workers operate dangerous or complex equipment, or in enclosed spaces without training.			Each worker operating dangerous or complex equipment or in enclosed spaces have received formal training. This training can be performed by a vineyard employee authorized to do so.
9.1.4 Hygiene	4	Handwashing and restroom facilities are inadequate.			Workers have access to hand washing equipment and clean toilet facilities located at a distance less than that required by state health and safety requirements.
9.1.5 Drinking Water	4	Workers are not given adequate drinking water or breaks during hot weather.			Adequate drinking water is available to workers as required by state law. Workers are encouraged to take hydration breaks during hot weather.
9.1.6 Right to Know	4	New employees are given no training.			New employees receive orientation training including Workers' Right to Know, and all training is documented. See Worker Protection Standard for Agricultural Pesticides for details.
9.2 Worker Safety					
9.2.1 First Aid Kits	4	There are no first aid kits available in the vicinity of the work area.			First aid kits are available and accessible in the vicinity of the work area.

Objective 9. Social Equity

Social equity addresses the “people” component of the so-called Three P’s of Sustainability: people, planet, and prosperity. This can be achieved through thoughtful human resource management, employee benefits, and worker health and safety measures.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
9.2.2 Written Procedures	4	There are no written accident or emergency procedures - all communication of them is verbal.		Written accident and emergency procedures describe how to act in the event of an accident or emergency. They must clearly identify the contact persons, indicate the location of the nearest phone, display an updated list of relevant phone numbers (doctor, ambulance, fire-department, hospital, police, etc) and make the phone accessible all the time.	Written accident and emergency procedures describe how to act in the event of an accident or emergency. They must clearly identify the contact persons, indicate the location of the nearest phone, display an updated list of relevant phone numbers (doctor, ambulance, fire-department, hospital, police, etc) and make the phone accessible all the time. **AND** Is accessible within 30 feet of the pesticide storage facilities and all mixing areas.
9.2.3 PPE	4	Workers are not offered personal protective equipment (PPE).			Workers applying pesticides in open cab tractors have a set of personal protective equipment (PPE).
9.2.4 Applicators	4	Applicators have no official qualifications.			All personnel who apply pesticides can demonstrate their competence via official qualifications or specific training course attendance certificates.
9.2.5 Hazard Signage	4	There are no permanent and legible signs posted that indicate potential hazards (e.g. waste pits, fuel tanks, electrical equipment, toxic material, pesticide and fertilizer storage facilities).			Permanent and legible signs are posted that indicate potential hazards (e.g. waste pits, fuel tanks, electrical equipment, toxic material, pesticide and fertilizer storage facilities).
9.3 On-Site Living					
9.3.1 State of Housing	4	On site living quarters are substandard.			The living quarters for the workers on the farm are habitable, have a sound roof, windows and doors, and the basic services of drinking water, clean toilets, free-flowing drains, and waste collection.
9.3.2 Rent	4	Rent charged to workers living on site is in excess of comparable housing in nearby communities	Rent charged to workers living on site is not in excess of comparable housing in nearby communities	Rent charged to workers living on site is only for basic utility expenses.	No rent is charged.

Objective 9. Social Equity

Social equity addresses the “people” component of the so-called Three P’s of Sustainability: people, planet, and prosperity. This can be achieved through thoughtful human resource management, employee benefits, and worker health and safety measures.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
9.3.3 Children of Workers	4		Workers' children have limited or no access to education and healthcare.		Workers' children have access to education and healthcare.
9.4 Rights and Benefits					
9.4.1 Child Labor	4	If illegal child or forced labor has been found to be used, the certification body reserves the right to permanently deny certification.		Illegal child labor is not used. Any workers under the age of 18 must not handle hazardous chemicals or undertake work that jeopardizes their schooling, or physical, mental, or emotional wellbeing.	Illegal child labor is not used. Any workers under the age of 18 must not handle hazardous chemicals or undertake work that jeopardizes their schooling, or physical, mental, or emotional wellbeing. **AND** The grower posts conditions for employment of young workers and the precise prohibitions regarding child labor.
9.4.2 Forced Labor	4	If illegal child or forced labor has been found to be used, the certification body reserves the right to permanently deny certification.			Forced or coerced labor is not used.
9.4.3 Base Compensation	4	If wages are found to be below minimum or wage reduction/denial is used as a punitive measure, the certification body reserves the right to deny certification.	The local minimum wage is paid. **OR** Hourly equivalent for piecework is equal or greater than the legal minimum wage.	Wages paid for regular working hours exceed legal minimums.	Workers are paid a living wage based on local conditions. Growers can find the living wage for Yates County and Suffolk County using MIT's Living Wage Calculator. **AND** Agricultural exempt employees are paid overtime wages.

Objective 9. Social Equity

Social equity addresses the “people” component of the so-called Three P’s of Sustainability: people, planet, and prosperity. This can be achieved through thoughtful human resource management, employee benefits, and worker health and safety measures.

	My Score	1 (High Risk)	2	3	4 (Low Risk)
9.4.4 Benefits	4	No benefits are given to workers.	Workers are offered basic healthcare and legally-required paid time off.	Workers are offered two of the following (including where normally exempt): - Healthcare - Childcare - Additional paid time off - Paid Maternity/Paternity leave	Workers are offered all of the following (including where normally exempt): - Healthcare - Childcare - Additional paid time off - Paid Maternity/Paternity leave **AND** The grower offers professional development opportunities, including continuing education.
9.4.5 Well-being	4	Labor and management never meet.	Labor and management meet once before the start of the season.	Regular meetings are held between labor and management at which general health, safety, and welfare matters are discussed.	Regular meetings are held between labor and management at which general health, safety, and welfare matters are discussed. **AND** Worker well-being is regularly assessed and documented, and corresponding workplace improvements are made.
Objective 9 Score	76				

Appendix A: Crop Management Guidelines

Yield Adjustment

Yield should be adjusted for the following:
Variety
Vine size
Vine health
Historical yield/quality data

Labrusca and bulk hybrids: yield is determined by crop estimation at 30 days post-bloom. Crop reduction takes place at that time if necessary. For every 3 days the bloom date is earlier or later than the long-term average, an additional ton of fruit can be ripened (when it's early) or must be removed (when it's late).

***Vinifera* and premium hybrids**: Yields are adjusted according to the parameters above. In general, due to cooler eastern climate, lower yields are necessary to ripen late-maturing varieties such as Cabernet sauvignon.

Crop Thinning

Labrusca:
• Thinning is done between 30 days postbloom and veraison.
• If done mechanically, there is minimal leaf removal and damage to berries and shoots.
• Crop is adjusted to ensure ripening to processor quality standards.

Vinifera:
• Thinning is done soon after fruit set. Prebloom cluster thinning is avoided except where improvements in berry set are desired.
• When thinning takes place, diseased or damaged clusters are first removed, overlapping clusters are thinned to facilitate airflow and drying, and clusters on short shoots are thinned or removed totally.
• A target number of clusters per vine is determined based on estimated cluster weight. The number is adjusted up or down depending on vine size.

Yield Estimation

Labrusca*:*
Yield estimation is based on crop estimation practices done 30 days postbloom.

Vinifera: In the Finger Lakes, long-term records are used in conjunction with average cluster weights taken at 1200 growing degree days (50°F base). At that point, clusters should weigh approximately half of their final weight. This method is somewhat less reliable on Long Island due to heavy cluster thinning and the use of irrigation.

Vigor

To increase vine size: leave fewer buds at pruning, increase nitrogen fertilization, reduce crop level, till row middle cover in spring, and/or increase irrigation.

To decrease vine size: leave more buds at pruning, reduce nitrogen fertilization, delay cluster thinning until veraison, establish permanent cover in row middles, and/or decrease irrigation.

Appendix B: Pest and Disease Management

Trunk Diseases

Eutypa dieback: vines are double pruned and/or cut well below the canker. Vines are flagged during the growing season for future observation. Dead wood and prunings are removed each year and disposed of by burying or burning.

According to Dr. Wayne Wilcox (Dept. of Plant Pathology, NYSAES, Geneva), Eutypa canker has long been known as a cause of declining grapevines. More recently, vine decline has been recognized as a disease complex associated with a number of potential trunk-infecting fungi. Eutypa and some other fungi typically infect through pruning wounds, and then cause cankers that slowly expand down and around the infected arm, cordon or trunk. A cross-section through such cankers typically reveals a distinctive wedge-shaped zone of dead wood radiating from the center of the cylinder. Another group of vine-decline fungi do not cause such cankers. Rather, cross sections through trunks of symptomatic vines often display black spotting or gumming whereas longitudinal sections reveal black streaks through the water-conducting vessels of the wood. Current research suggests that decline symptoms from these infections are unlikely to occur unless the vines are subjected to stress. Therefore, viticultural practices designed to minimize vine stress should help to prevent/minimize the occurrence of such forms of vine decline. These practices would include timely irrigation, balanced nutrition, minimized trunk injury from machine implements and so on.

Crown gall: Vines, or portions of vines, rendered unproductive by crown gall are either removed or a new trunk is trained up. Preparations designed to rid the vine of crown gall should not be used, as efficacy has been poor in both research and grower trials.

According to Dr. Tom Burr (Dept. of Plant Pathology, NYSAES, Geneva) scion and rootstocks differ in their susceptibility to crown gall. In addition, the younger the vine is at infection, the greater the impact on the vine. Crown gall compromises the wound healing process by preventing normal differentiation of cells that are generated in the cambial zone following wounding.

Fungal Diseases

Botrytis cinerea:
• Conscientious canopy management is done; especially leaf pull to improve light, air and spray penetration into the cluster zone.
• Cluster thinning is done in such a way that clumps of overlapping clusters are loosened/thinned.
• Only susceptible varieties are treated, unless extreme weather conditions warrant otherwise.
• Particularly during bloom, a treatment is applied only if weather conditions warrant.
• Sprays are directed at the cluster zone; GPA of water and the need for a surfactant follow pesticide label recommendations.
• N fertilizers applied so that vine growth is balanced.

Major Insect Pests

European Red Mite
Potato Leafhopper
Japanese Beetle
Grape Berry Moth
Grape Leafhopper
Rose Chafer

Minor Insect Pests

Cutworms
Flea Beetle
Thrips
Aphids
Girdlers
Gallmakers
Scale
Grape Plume Moth
Grape Cane Borer
Banded Grape Bug
Grape Rootworm

Mites

European Red Mite
Two Spotted Spider Mite

A note on dormant miticide sprays: Dormant oils, when applied properly, can provide some control of overwintering European Red Mites (ERM) in tree fruit, particularly apples. High water gallonage (200-300 gal/acre) and rates based on time of year/stage of growth are used. In apples, mites become progressively more susceptible to control with dormant oil as spring arrives.

Horticultural oil research has been conducted statewide. Sprays were applied at multiple timings with a backpack sprayer. Treatments were unsuccessful in controlling subsequent mite populations. Grower experience with airblast sprayers has been similarly disappointing. The location of mites in cracks and crevices and under bark makes control more difficult than in tree fruit. For areas with potentially high overwintering ERM populations, an efficient sprayer that achieves excellent coverage would be the best choice for dormant oil application. Coverage must be sufficient to penetrate areas where overwintering mites reside. Be sure to use an oil product labeled for dormant use in vineyards.

Until specific guidelines for the VineBalance participants in various growing regions of New York, IPM for insect/mite pests can be found in the latest version of the *New York and Pennsylvania Pest Management Guidelines for Grapes*, available for purchase here: https://cropandpestguides.cce.cornell.edu/.

Scores

Objective 1	280	of 284
Objective 2	60	of 56
Objective 3	36	of 36
Objective 4	12	of 12
Objective 5	68	of 68
Objective 6	60	of 60
Objective 7	36	of 36
Objective 8	24	of 24
Objective 9	76	of 76

Total Score

652 **492 To Pass**

PASS!

Definitions

arbuscular mycorrhizal fungi: a soil fungal network that uses hyphae as the site of nutrient exchange with plants called an arbuscule. AMF help plants to capture nutrients such as phosphorus, sulfur, nitrogen and micronutrients from the soil.

biomass: energy generated from the burning or processing of carbon rich feedstocks such as agricultural waste, waste from mills, or sustainably grown perennial plants that are then replenished after burned. Biomass energy is a true solution only if it uses Using annual grain crops like corn and sorghum depletes groundwater and requires high inputs of energy. Using native forests as feedstock, especially from the Global South, is not sustainable.

conservation cover: establishing and maintaining perennial vegetative cover to protect soil and water resources on land retired from agricultural production or other lands needing permanent protective cover that will not be used for forage production

ecological [area/infrastructure/compensation area]: interchangeable terms that refer to areas on the farm that are used to preserve or increase its biodiversity and ecological function. As a reference, the following areas are recognized for direct payments to growers in Switzerland: low intensity grassland; litter meadows; conservation headland; wildflower strips; rotational fallows; hedges; woodland patches; hedges; high-stem fruit trees. Other areas could include: low intensity pasture; silvopasture; large single trees or tree alleys; ditches and ponds; stone heaps or walls; unpaved farm trails

headland: the area at the end of a vineyard row

hydro: hydroelectric power; energy generated from the harnessing of moving water via a turbine, either on a large utility-level or small farm-level scale

luxury consumption: the absorption and accumulation of nutrients by a plant far in excess of its actual immediate needs, sometimes due to over-fertilization

macrofauna: small insects and arthropods visible to the naked eye; groups include organisms like earthworms, millipedes, centipedes, ants, spiders, slugs, snails, termites. They perform important ecological functions such as soil bioturbation and litter removal.

microfauna: small springtails and mites, nematodes, and protozoa, among others, that generally live in the soil-water film and feed on microflora, plant roots, other microfauna and sometimes larger organisms. These organisms help to release immobilized nutrients.

riparian: the area bordering surface watercourses such as rivers or streams

tidal: energy generated from the harnessing of rising and falling ocean tides via large turbines placed on the seafloor

variegated landscape: Landscape types include *intact (*where over 90% of the landscape is still under the original native habitat); *variegated* (where 60-90% of the native habitat remains); *fragmented* (where 10-60% of the native habitat remain); and *relict* (where less than 10% of the native habitat remains). Most agriculture falls under the fragmented and relictual categories. These definitions are based on a model of ecosystem fragmentation by Sue McIntyre and Richard Hobbs.

vernal pool: seasonal depressional wetlands

wetland: permanently or seasonally flooded ecosystem

References

Boller, Ernst, Fritz Häni & Hans-Michael Poehling. *Ecological Infrastructures - Ideabook on Functional Biodiversity at the Farm Level*. Lindau, Switzerland, Swiss Centre for Agricultural Extension and Rural Development (LBL), 2004.

Casscles, J. Stephen. *Grapes of the Hudson Valley.* Coxsackie NY, Flint Mine Press, 2015.

Gaspar, Adam, Ph.D. *Base Saturation and Cation Exchange Capacity.* https://www.pioneer.com/us/agronomy/Base-Saturation-Cation-Exchange-Capacity.html#Conclusion_6. Accessed 7 September 2021.

Harvey, Celia A. 2007. "Designing Agricultural Landscapes for Biodiversity Conservation." *Farming with Nature,* edited by Sara Scherr and Jeffrey McNeely, Island Press, 2007. pp. 146-165.

Holland, John & Storkey, Jonathan & Lutman, P & Henderson, I & Orson, J. (2013). *The Farm4Bio project: managing uncropped land for biodiversity.*

Hooven, Louisa, Ramish Sagili, & Erik Johansen. *How to Reduce Bee Poisoning from Pesticides*. A Pacific Northwest Extension Publication PNW 591. Oregon State University, University of Idaho, Washington State University. Published December 2006, Revised September 2013.

International Organization of Vine and Wine. Stefanucci, Stefano, et al. *Functional Biodiversity in the VIneyard.* Paris, France, OIV publications, 1st Edition: November 2018.

Jabran, Khawar and Bhagirath Chauhan, editors. *Non-Chemical Weed Control*. London, UK., Academic Press, 2018.

Lengnick, Laura. *Cultivating Climate Resilience on Farms and Ranches.* SARE Outreach, 2018. Accessed 8 September 2021.

Lodi Winegrape Commission. 2017. The LODI RULES for Sustainable Winegrowing Certification Standards, Third Edition. Lodi Winegrape Commission, Lodi, CA.

Low Input Viticulture & Enology, Inc (LIVE). 2021. LIVE Checklist and Green and Yellow Lists. www.livecertified.org/standards. Salem, OR.

Martinson, Timothy. "Optimizing Nitrogen Use in Vineyards." *Sustainable Viticulture in the Northeast*. Cornell Cooperative Extension. May 2006.

Merfield, C. N. (2018). *Culinary oils as herbicides*. Report number 08-2018. The BHU Future Farming Centre, Lincoln, New Zealand.

Other Sustainability Certification Programs

Certified California Sustainable
californiasustainablewine.com

LIVE (Oregon, Washington, Idaho)
livecertified.org

Lodi Rules (California)
lodigrowers.com

Long Island Sustainable Wine
lisustainablewine.org

Napa Green
napagreen.org

SIP (California)
sipcertified.org

Sonoma County Sustainable Winegrowing
sonomawinegrape.org/scw/sustainability/

Sustainable Winegrowing New Zealand
nzwine.com

Sustainable Wine South Africa
wosa.co.za/swsa/en/Integrity/

VIVA (Italy)
viticolturasostenibile.org/EN/Home.aspx

Mollah, Mahabubur, and Alison MacGregor. *Review of the Potential for Agrochemicals Used in Viticulture to Impact on the Environmen*t. Department of Natural Resources and Environment, Victoria Australia, 2002.

Moscovici, Daniel & Alastair Reed (2018): "Comparing wine sustainability certifications around the world: history, status and opportunity." *Journal of Wine Research*.

Muza, Andrew J. (editor). *2021 New York and Pennsylvania Pest Management Guidelines for Grapes*. Ithaca, NY, Cornell University, Pesticide Management Education Program, 2021.

Sardiñas, Hillary, et al. for the Xerces Society. Bee Better Certified™ Production Standards, Version 1.4. Portland, OR, January 2021. .

Schreiner, R.P. 2019. "Managing mycorrhizal fungi and soil health in vineyards: Pre-plant and post-plant considerations." *Wine Business Monthly*. Aug 2019 Issue.

Singh, R., Tiwari, A.K. & Singh, G.S. *Managing riparian zones for river health improvement: an integrated approach*. Landscape Ecol Eng 17, 195–223 (2021).

Skinkis, Patty. *Basic Concept of Vine Balance*. Oregon State University, June 20, 2019. https://grapes.extension.org/basic-concept-of-vine-balance/. Accessed 8 September, 2021.

Smart, R. and M. Robinson. *Sunlight into Wine: A Handbook for Winegrape Canopy. Management*. Adelaide, Australia, Winetitles, 1991.

Vanden Heuvel J and Centinari M (2021) *Under-Vine Vegetation Mitigates the Impacts of Excessive Precipitation in Vineyards*. Front. Plant Sci. 12:713135. doi: 10.3389/fpls.2021.713135

Wilcox, Wayne, Walter D. Gubler, Jerry K. Uyemoto (eds.). *Compendium of Grape Diseases, Second Edition*. St. Paul, MN, The American Phytopathological Society Press, 2015.

Wise, Alice, Andy Senesac and Rick Dunst. "Alternate Weed Management in New York Vineyards." Sustainable Viticulture in the Northeast. Cornell Cooperative Extension. May 2007

Natural Resources Conservation Service Conservation Practice Standards

Code 340 Cover Crop
https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1263176.pdf

Code 393 Filter Strip
https://efotg.sc.egov.usda.gov/references/public/NY/nyps393.pdf

Code 449 Irrigation Water Management
https://efotg.sc.egov.usda.gov/references/public/NY/nyps449.pdf

Code 550 Nutrient Management
https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_027006.pdf

Code 702 Agrichemical Handling Facility
https://efotg.sc.egov.usda.gov/references/Delete/2009-4-4/Agchem_Facility_702_(Interim)_6-20-06.pdf