



LODI RULES for Sustainable Winegrowing
*California's original sustainable viticulture certification
program, est. 1992*

LODI RULES

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** These exceptional people have continued on to support future standard editions.*

Dedication

Sustainability is about the future. This third edition of the *LODI RULES for Sustainable Winegrowing Certification Standards* is dedicated to the children of all farming families. May we farm in a way that meets the needs of today without compromising the ability of future farmers to cultivate their own livelihoods.



Stanton Lange, a Lodi RULES grower, and five of his grandchildren.

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Welcome to LODI RULES for Sustainable Winegrowing

Introduction

Established in 1992 as an integrated pest management (IPM) Program, LODI RULES for Sustainable Winegrowing is California's original sustainable viticulture program. LODI RULES certified growers make up an innovative community with a history and commitment to farming quality winegrapes through the implementation of viticulture practices which balance environmental, social, and economic goals. LODI RULES was designed to communicate these substantial efforts to wineries and to the general public.



The formal LODI RULES certification program has grown vigorously since its launch in 2005. As of 2021, over 64,000 vineyard acres are "Certified Green." Within the Lodi appellation, 30,680 acres are certified and 33,225 acres are certified across thirteen other Crush Districts throughout California, in Washington, and in Israel. Table 1 on the following page plots the number of certified acres over the years and shows continued growth and success.

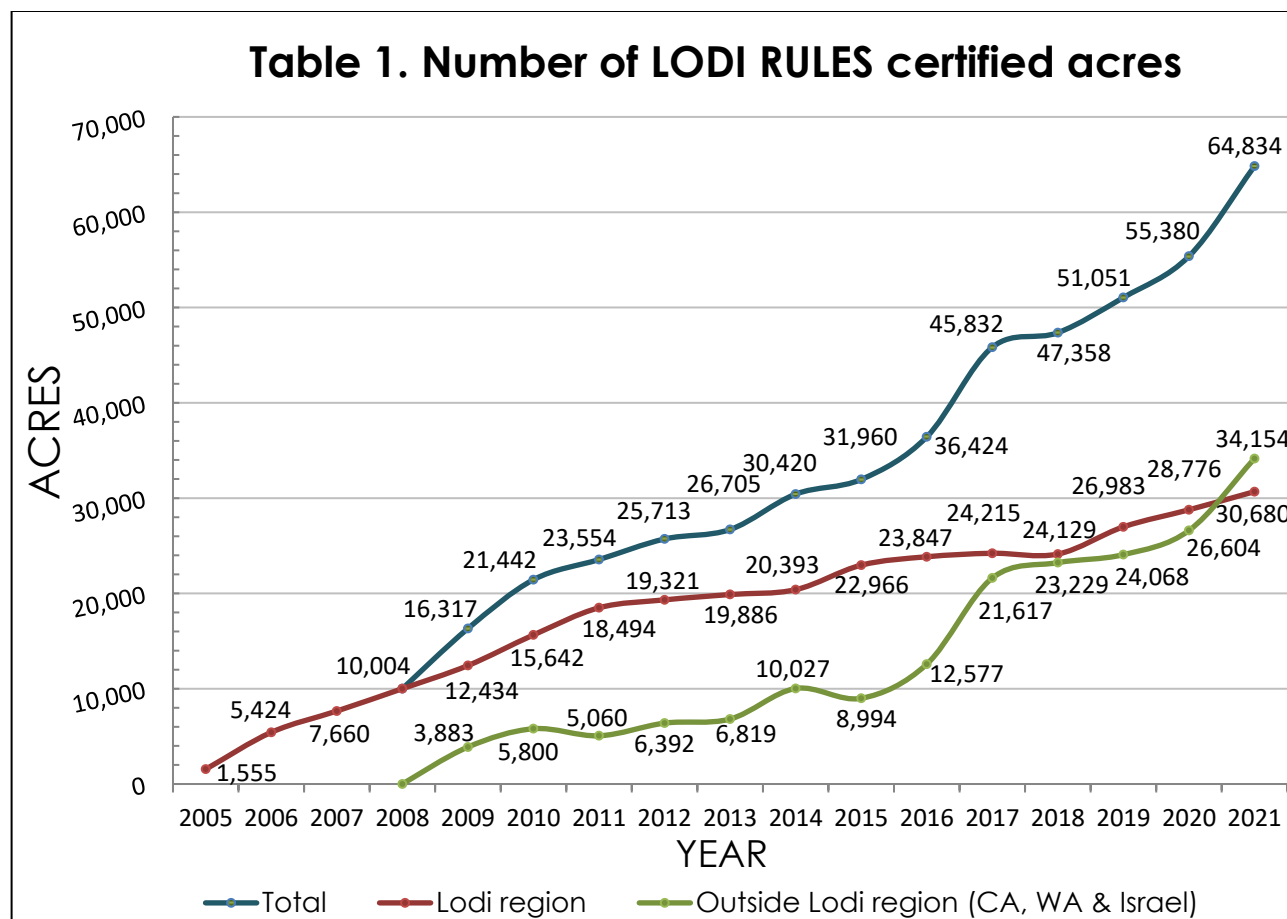
Research from UC Davis suggests that LODI RULES has helped the Lodi region make important strides toward sustainability^{1,2}. According to a formal Lodi Winegrowers Survey, Lodi growers - certified and noncertified alike - are supportive of the program. Surveyed growers perceive LODI RULES to be successful at achieving a number of goals, including improving consumer perception of the Lodi region, improving winegrape quality, reducing risk of agriculture's negative impact on the environment and human health, improving wildlife habitat and biodiversity, and improving Lodi's relationship with regulatory agencies.

A photograph of a vineyard. In the foreground, there is a large, dark tree trunk and some green foliage. In the background, there are rows of grapevines stretching into the distance under a clear sky.	<h3>What is sustainable viticulture?</h3> <p>Sustainable viticulture is applying the principles and practices of sustainable agriculture in the vineyard. In the words of the American Agronomy Society, "A sustainable agriculture is one that, over the long term, enhances environmental quality and the resource base on which agriculture depends; provides for basic human food and fiber needs; is economically viable; and enhances the quality of life for farmers and society as a whole."</p>	A photograph of a man wearing a light-colored long-sleeved shirt and a tan baseball cap. He is smiling and looking towards the camera. He is standing in a vineyard, with grapevines and leaves visible around him.
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¹Hoffman, M, A Hillis, and M Lubell. 2011. "2011 Lodi Winegrape Grower Survey: Report of Results." Lodi Winegrape Commission. environmentalpolicy.ucdavis.edu/files/cepb/IPM_Newsletter_0.pdf

²Hillis, A, M Lubell, and M Hoffman. 2011. "Winegrower Perceptions of Sustainability Programs in Lodi, California." Center for Environmental Policy and Behavior, UC Davis. environmentalpolicy.ucdavis.edu/files/cepb/Lodi%20program%20perceptions_0.pdf

The research also provides insight into whether LODI RULES is achieving one of its fundamental goals: to support grower implementation of sustainability practices³. The data suggests that this goal is, indeed, being realized. Table 2 (on the following page) reports that LODI RULES certified growers implement 58% of sustainability practices included in the survey while noncertified growers implement 33%. Backed by this research, we are proud to report that the LODI RULES certified green seal represents growers who go above and beyond to ensure the sustainability of our industry.



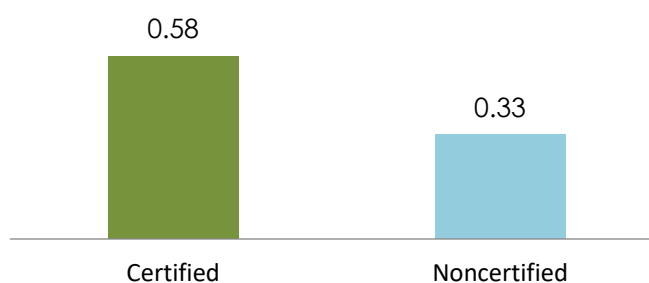
Wineries play a key role in growing the LODI RULES program. Over 60 wineries produce hundreds of wines with labels bearing a LODI RULES, CALIFORNIA RULES, or CERTIFIED GREEN sustainable seal. In 2007, Michael David Winery of Lodi was the first winery to offer a price premium for grapes produced in LODI RULES certified vineyards. In 2011, Michael David started purchasing grapes from LODI RULES vineyards exclusively, and Bogle Vineyards, along with their Clarksburg winery, followed suit in 2017. Bogle Vineyards, LangeTwins Winery and Vineyards, and other wineries also offer a price premium. The future success of LODI RULES depends on more wineries recognizing the merits of the program and incentivizing grower sustainability practices. One major benefit of LODI RULES to a grape buyer is that the LODI RULES Binder acts as a tool for quality viticultural communication between the grower and the buyer - in other words, there is inherent value in certification-level record keeping, above and beyond the sustainability benefits.

³Hillis, A, M Lubell, and M Hoffman. 2011. "Practice Adoption and Management Goals of Lodi Winegrape Growers." Center for Environmental Policy and Behavior. environmentalpolicy.ucdavis.edu/files/cepb/Lodi%20practices.pdf

The LODI RULES program has two main components: farming standards and a pesticide risk model. First, LODI RULES promotes winegrape grower adoption of over 120 sustainability practices, which are termed “Standards.” The original LODI RULES Standards (First Edition) were collaboratively developed by a team of Lodi winegrowers and viticulture professionals, and were accredited in 2005 by Protected Harvest, an independent third party. In 2013, the LODI RULES Standards were revised and accredited (Second Edition), and are continually reviewed to ensure they meet the current needs of a diverse group of grape growers. This third edition (2017) of accredited LODI RULES Standards represents the addition of two new bonus Standards - Viticultural Research (1.13) and Knowledge Sharing (1.14) - along with minor technical corrections for clarity and consistency.



Table 2. Percentage of sustainability practices adopted by LODI RULES certified and noncertified growers



The LODI RULES Standards, organized into six chapters, are the backbone of the program:

- | | |
|-------------------------------|---------------------|
| 1) Business Management | 4) Soil Management |
| 2) Human Resources Management | 5) Water Management |
| 3) Ecosystem Management | 6) Pest Management |

All Standards meet three criteria: first, they are **measurable**; second, they address at least one of the three aspects of **sustainability** (environmental health, social equity, and economic viability); and third, they are **economically feasible** to implement. It is widely accepted that the LODI RULES Standards are the most thoroughly and rigorously vetted set of sustainability practices in California’s viticulture history. Each Standard has been peer-reviewed by a true third party of scientists, members of the academic community, and environmental organizations.

The second key component of LODI RULES is the pesticide risk model: Pesticide Environmental Assessment System (PEAS). PEAS is a model used to quantify the total environmental and human impact of pesticides applied to LODI RULES vineyards annually. The PEAS model generates a measurable environmental impact score for each pesticide, which is based on the pesticide’s impact on acute risk to farm workers, dietary risks from acute and chronic exposure to people who consume the product, acute risks to small aquatic invertebrates, acute risk to birds, and acute risk to bees and pest natural enemies.

The LODI RULES program is steered by the Lodi Winegrape Commission's LODI RULES Committee. The certification, accreditation, and auditing process is administered by Protected Harvest (protectedharvest.org), an independent organization specializing in quantifiable sustainability certification.

Certification Requirements

A vineyard qualifies for certification if it meets several criteria. First, growers accumulate points through implementing sustainability practices, and must accumulate at least 50% of the total points available in each of the six chapters. Growers must also accumulate at least 70% of the total points available across all chapters. Implementation of some LODI RULES Standards is mandatory. Mandatory practices are included in "fail chapters," and they require growers to implement a sustainability practice to a certain degree. Fail chapter Standards represent practices that the designers of the Standards believe are imperative for sustainability. A vineyard will not qualify for certification if it fails any chapter. Finally, the PEAS environmental impact metric for the pesticides used in each vineyard for the year cannot exceed 50 units. Certification is awarded to an individual vineyard on an annual basis. An independent auditor visits selected vineyards every year to ensure compliance. For the 2021 certification year, we are happy to report that 1,302 vineyard blocks were certified through the LODI RULES program!

Companion Information

The Lodi Winegrape Commission publishes this user-friendly LODI RULES Binder. In addition to the Standards, this Binder includes "Companion Information." Companion Information helps with transparency of the certification process, as it provides background on why each Standard is important to sustainable viticulture, how each Standard is implemented in the vineyard, and how each Standard is verified by an independent auditor. The Companion Information is intended for use by growers and auditors. Addressed in the Companion Information are five areas: scope, purpose, verification, resources, and references, as well as management plan organization tips.

Scope describes whether the associated LODI RULES Standard is applicable to the entire farming operation or an individual vineyard block. Some Standards only need to be answered once for all vineyard blocks on a farm, while other Standards apply to each vineyard block and need to be answered individually.

Purpose explains why the associated LODI RULES Standard is relevant and important to sustainable viticulture and which aspect of sustainability the Standard addresses. The information included under *Purpose* lays out the rationale and justification for including the practice in the LODI RULES program.

Verification outlines the type of information the auditor needs to examine to ensure the LODI RULES Standard was met by the grower. Growers can use the verification section, along with the Audit Prep Checklist (Tab 10), to prepare for an audit.

References include a list of literature and websites which provide further information about the Standards. For Internet references, both the URL and Internet search terms are included when possible. The references are to be used by growers seeking deeper and more comprehensive understanding of the Standards and their implementation.

Some LODI RULES Standards refer to written management plans, which incorporate specific components along with a plan review and update schedule. These Standards are: 1.1, 1.2, 1.4, **2.1**, 3.2, **3.3**, 3.14, **4.1**, 4.2, 5.1, 6.1, 6.11, 6.17, 6.19, 6.21, 6.24, and 6.27. The only three mandatory LODI RULES management plans are in bold and underlined. For help with plan writing, please check Tab 10 in your LODI RULES binder or view the webinars and examples available at lodigrowers.com/growereducation/videospresentationshandouts/.

Certification Resources

Protected Harvest provides LODI RULES growers with three resources designed to expedite the certification process: the *Protected Harvest Certification Manual*, the *Online Self-Assessment User Guide*, and the *Online Self-Assessment Website*.

The ***Protected Harvest Certification Manual*** (Tab 8) includes information about application materials, fees, record-keeping, self-assessment, and auditing. This Manual is updated every certification year and the current version is always available at lodigrowers.com/standards.

The ***Online Self-Assessment User Guide*** (Tab 9) provides detailed step-by-step instructions (with pictures) for navigating the *Online Self-Assessment Website*.

The ***Online Self-Assessment Website*** (lodirules.protectedharvest.org) streamlines the LODI RULES application process. As opposed to a paper application, using the website greatly minimizes the time and cost associated with certification. The online assessment calculates the points needed to pass each chapter and the program as a whole and must be completed every year. Growers may easily copy their answers for each standard from vineyard to vineyard or from year to year within the system (called “cloning”).

Remember to use the ***Audit Prep Checklist*** (Tab 10), developed by Dr. Heather Muser and Jeff Fleak (LODI RULES auditors), to prepare for a successful audit! Tab 10 now includes Management Plan examples too.

Contacts

The Lodi Winegrape Commission is your first point of contact for questions and comments regarding the LODI RULES program. There is a wealth of information under the LODI RULES tab at lodigrowers.com and also at lodirules.org. For further assistance, please contact:

Stephanie Bolton, PhD

LODI RULES Sustainable Winegrowing Director

Lodi Winegrape Commission

(209) 367-4727

stephanie@lodiwine.com

lodigrowers.com/standards

lodirules.org

For questions related to the LODI RULES application, deadlines, payment, or the online self-assessment website, please contact:

Protected Harvest

(831) 477-7797 (office)

(831) 706-2097 (direct)

certification@protectedharvest.org

protectedharvest.org

To schedule an audit or to submit audit documents, please contact:

Heather Muser, EdD

Muser Consulting

(209) 810-1966

muserconsulting@gmail.com

For questions about Protected Harvest, please contact:

Amy Wolfe

Board Member

Protected Harvest

(530) 574-8098

awolfe@protectedharvest.org

Chapter 1: Business Management

1.1 Sustainability Vision

A farming operation representative attended a Lodi Winegrape Commission workshop for developing and writing a sustainable management vision plan for the farm <u>AND</u> the farming operation has a written vision statement .	YES = 6
	NO = 0

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: For **LODI RULES** participants to consider assets, resources, values, challenges, and priorities for sustaining their winegrape enterprise, promoting a sound environment in and around vineyards, and positively contributing to society, in a long-term business plan.

Verification: Visual inspection of LWC sustainable vision workshop certification of completion, sustainable management vision plan, and vision statement. See examples of what to consider in a vision plan on the following page.

For more information on **sustainable vision workshops**, contact the Lodi Winegrape Commission at (209) 367-4727. The workshop is offered one or two times per year based upon grower requests.

References:

Davidson, D. *The business of vineyards*. Davidson Viticultural Consulting Services, Glen Osmond, SA, Aust. 2001.

Grant, S. On the nature of vineyards and vineyard management. Lodi Winegrape Commission Coffee Shop Blog. lodigrowers.com/on-the-nature-of-vineyards-and-vineyard-management/. March 06, 2016.

Grant, S. Thoughts on sustainable vineyard management. Lodi Winegrape Commission Coffee Shop Blog. <http://www.lodigrowers.com/thoughts-on-sustainable-vineyard-management/>. July 14, 2016.

Grant, S. Vineyard longevity. Progressive Viticulture. www.progressivevit.com. March 26, 2015.

Ohmart, CP. *View from the vineyard: a practical guide to sustainable winegrape growing*. The Wine Appreciation Guild, South San Francisco. 2011.

Reeves, K. Chapter 1. Ecosystem Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

Rickel, D, and Francis, C. (Eds.). *Agroecosystem analysis*. American Society of Agronomy, Madison, WI. 2004.

Sustainable Management Vision Plan Organization:

Long-term vision: An explanation of how the vineyard operation should appear and function over a prolonged period of time with regard to goals, assets, resources, values, challenges, and priorities.

Vision statement: The vision statement may include creating a profitable vineyard business, quality winegrapes, satisfied customers, goodwill within the winegrape industry, a content work force, optimized resource use efficiency, environmental conservation, strong neighbor relations, positive contributions to the community, etc.

Participants: All people involved in and/or affected by the vineyard operation.

Land base: A comprehensive accounting of the agricultural land and its features.

Resources: A comprehensive listing of inputs and their attributes, including natural, material, human, cultural, social, and financial inputs.

Shared values: A statement of the qualities important to the farming operation and the other primary participants in the vineyard operation, such as integrity, mutual respect, technical expertise, business acumen, profitability, legacy, etc.

Challenges: Those factors that may inhibit efforts to achieve objectives, like market risks, resource availability and costs, and increasing government regulations.

Strategies: Planned actions designed to achieve stated objectives of production and long-term goals.

Monitoring and evaluation: Planned observations and measurements of progress towards achieving objectives of production and long-term goals.

1.2 Succession Plan

The farming operation has a written plan for management succession .	YES = 2
	NO = 0

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: To ensure participants have a plan for management succession and continuity in their vineyard business.

Verification: Visual inspection of the succession plan document or proof that participant has met with a financial advisor and has established a trust (title page of trust document).

References:

Farm Journal Legacy Project, agweb.com/legacyproject (Last accessed on 28Dec16)

- *Internet search terms:* legacy project succession planning

Succession planning process, opm.gov/policy-data-oversight/human-capital-management/reference-materials/leadership-knowledge-management/successionplanning.pdf (Last accessed on 28Dec16)

- *Internet search terms:* US office of personnel management succession planning process

Succession planning template, successionplanningtemplate.net (Last accessed on 28Dec16)

- *Internet search terms:* succession planning made easy

Thach, L. Chapter 7. Human Resources Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

Succession Plan Organization:

Identifying leadership: Use rational criteria to compare internal options versus recruiting from the outside based on long-term strategic goals (mission, vision, values) for the vineyard operation and personality traits of the candidate.

Matching talent and roles: Promote success by assigning responsibilities consistent with capabilities. Mentor candidates with planned job assignments, shadowing, assessment, and feedback.

Developing leadership: Provide opportunities and resources for leadership experience and increasing the competence of those selected for succession.

1.3 Management Planning Meetings

A. <i>Within the last year</i> , the farming operation held a meeting for owners/management to discuss winegrape growing philosophies, to review the company's sustainable vision plan and mission statement, and to review long- and short-term work goals.	2
B. <i>Within the last two years</i> , the farming operation held a meeting for owners/management to discuss winegrape growing philosophies, to review the company's sustainable vision plan and mission statement, and to review long- and short-term work goals.	1
C. The farming operation <i>has not held an owners/management meeting in over two years</i> .	0

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: Management self-evaluation and planning for continued company success.

Verification: Visual inspection of management meeting records.

References:

Davidson, D. *The business of vineyards*. Davidson Viticultural Consulting Services, Glen Osmond, SA, Aust. 2001.

Grant, S. Vineyard Management Self-Evaluation. lodigrowers.com/vineyard-management-self-evaluation/. (Last accessed on 2Feb17)

Kay, RD, and Edwards, WM. *Farm management*. McGraw-Hill, New York. 1994.

Ohmart, CP, Storm, CP, and Matthiasson, SK (Eds.). *Lodi Winegrower's Workbook*, 2nd Ed. Lodi Winegrape Commission. pp. 111-141. 2008.

1.4 Risk Management Plan

The farming operation has a written and implemented risk management plan that includes the following components: financial risk (access to capital); crop loss risk (crop insurance); market risk (winery contracts, customer diversification, variety diversification); technical risk (access to technical information or expertise); and a plan review and update schedule.	YES = 2
	NO = 0

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: To ensure participants have thoroughly considered their business risks and addressed them.

Verification: Visual inspection of the risk management plan document.

The Lodi Winegrape Commission publishes a printed Vineyard Supplier Directory every odd year, which includes local insurance agencies. This Directory can be picked up at the Commission offices (209) 367-4727 or accessed online: lodigrowers.com/directory/growerandsupplierdirectory/.

References:

Davidson, D. *The business of vineyards*. Davidson Viticultural Consulting Services, Glen Osmond, SA, Aust. 2001.

Hussey, C. *Risk management for vineyards*. Practical Winery and Vineyard. pp. 5-10. Sep/Oct 2005.

Kay, RD, and Edwards, WM. *Farm management*. McGraw-Hill, New York. 1994.

Seufer, JL. *Managing orchard and vineyard production risks*. USDA/Risk Management Agency, Spokane Regional Office.

- agriskmanagementforum.org/sites/agriskmanagementforum.org/files/Documents/Vineyard%20and%20Orchard%20Risks.pdf (Last accessed on 28Dec16)
- *Internet search terms:* managing orchard and vineyard production risks

Thrupp, A, Browde, J Francioni, L, and Jordan, A. *Reducing risks through sustainable winegrowing: A growers' guide*. California Sustainable Winegrowing Alliance, San Francisco, CA. 2008.

- sustainablewinegrowing.org/agrowersguide.php (Last accessed on 28Dec16)
- *Internet search terms:* California Sustainable Winegrowing Alliance publications

Risk Management Plan Background and Organization:

Risk management plans highlight critical aspects of a business that are insured, and thereby protected from risk. Relevant types of **insurance** include crop insurance, price insurance, yield insurance, theft insurance, and insurance against natural disasters.

Winery contracts reduce risk by securing economic return on investment and by enabling financial planning.

Diversification of the products produced and markets reached can reduce dependence on a single financial stream.

Knowledge is power. Consider describing efforts to increase understanding of risk factors such as weather patterns, market trends, ecological and biological processes, crop pest and disease trends, and/or innovative farming methods and technologies.

Outline:

- Financial risk (access to capital)
- Crop loss risk (crop insurance)
- Market risk (winery contracts, customer diversification, and variety diversification)
- Technical risk (access to technical information or expertise)
- A plan review and update schedule

1.5 Operating Budget

The farming operation has an annual operating budget*.	YES = 2
	NO = 0

* An *annual operating budget* is an estimate of expenditures and income for the year.

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: To promote thoughtful expenditures and operating efficiency, and in so doing, promote the long-term stability of the vineyard endeavor.

Verification: Visual inspection of the operating budget.

References:

Kay, RD, and Edwards, WM. *Farm management*. McGraw-Hill, New York. 1994.

1.6 Management Training and Development

A. <i>Within the last year</i>, a farming operation representative has attended <u>at least six</u> training seminars or other educational programs* .	2
B. <i>Within the last year</i>, a farming operation representative has attended <u>at least three</u> training seminars or other educational programs* .	1
C. <i>Within the last year</i>, a farming operation representative has attended <u>less than three</u> training seminars or other educational programs* .	0

*See list of organizations hosting training seminars and educational events on the following page.

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: To promote management excellence through increased education.

Verification: Visual inspection of seminar and educational attendance records.

For more information on training seminars and educational meetings, contact the Lodi Winegrape Commission (lodigrowers.com, (209) 367-4727) or the Lodi District Grape Growers Association (ldgga.org/events.php).

References:

Farm Employers Labor Service, fels.net (Last accessed on 28Dec16)

Thach, L. Chapter 7. Human Resources Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

Organizations Hosting Training Seminars and Educational Events:

Ag Safe Conference
American Society for Enology and Viticulture (ASEV) annual meeting
American Vineyard Grape Expo
Association of Applied IPM Ecologists (AAIE) annual conference
California Plant and Soil Conference (California Chapter of the ASA)
California State University-Fresno Biennial Grape Day
California Association of Pest Control Advisors (CAPCA) Meetings and Workshops
Clarksburg Grape Day
Dollars and Sense Tradeshow and Seminar
Foothill Grape Day
Lodi Farm Safety Day
Lodi Grape Day (every February)
Lodi District Grape Growers Association Seminars and Workshops
Lodi Winegrape Commission Seminars and Workshops
Napa Valley Viticulture Fair
Rootstock: Napa Valley Grapegrowers
San Joaquin Farm Bureau Seminars and Workshops
San Joaquin Valley Grape Symposium
San Joaquin Valley Winegrowers Association Annual Meeting and Industry Forum
Sonoma Grape Day
Sustainable Ag Expo (San Luis Obispo every fall)
University of California-Davis extension courses and seminars (RAVE, etc.)
Unified Wine and Grape Symposium (every January in Sacramento)
Vineyard Economics Seminar
Wine Industry Financial Symposium
WINexpo
World Ag Expo (every February)

1.7 Staying Informed With Industry

A. The farming operation subscribes to trade journals <u>AND</u> has current memberships in local growers and/or vintners associations <u>AND</u> attended <u>at least one</u> local, regional, statewide, or national industry meeting <i>within the last year</i> .	2
B. The farming operation subscribes to trade journals <u>OR</u> has current memberships in local growers and vintners associations <u>OR</u> attended <u>at least one</u> local, regional, statewide, or national industry meeting <i>within the last year</i> .	1
C. The farming operation <i>does not subscribe to</i> trade journals, does not have current memberships in local growers and vintners associations, and <i>has not attended a</i> local, regional, statewide, or national industry meeting <i>within the last year</i> .	0

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: To promote management excellence.

Verification: Visual inspection of trade journal subscription receipts, membership fee receipts or certificates, and receipts for meeting, seminar, workshop, or symposium fees.

References:

American Society for Enology and Viticulture, asev.org (Last accessed on 28Dec16)

American Vineyard Magazine, americanvineyardmagazine.com (Last accessed on 28Dec16)

California Association of Winegrape Growers (CAWG), cawg.org (Last accessed on 28Dec16)

Farm Employers Labor Service, fels.net (Last accessed on 28Dec16)

Lodi District Grape Growers Association, ldgga.org (Last accessed on 28Dec16)

Practical Winery, practicalwinery.com (Last accessed on 28Dec16)

University of California-Davis Extension, extension.ucdavis.edu (Last accessed on 28Dec16)

Wine Business Monthly, winebusiness.com (Last accessed on 28Dec16)

Wines and Vines Magazine, winesandvines.com (Last accessed on 28Dec16)

Winery and Vineyard Management Magazine, vwmmmedia.com (Last accessed on 28Dec16)

1.8 Neighbor Relations

The farming operation has a process to build and maintain good neighbor relations (distributing wine or gifts, exchanging information, notification of vineyard activities, etc.).	YES = 2
	NO = 0

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: To build strong relationships with neighbors, foster a sense of community in the neighborhood, and encourage cooperation.

Verification: Visual inspection of records of neighbor relation activities.

References:

Chadwick, A. *The winegrape guidebook for establishing good neighbor and community relations*. California Association of Winegrape Growers. 2001. <http://cawg.org/images/stories/pdf/good-neighbor-guide-hires.pdf>. (Last accessed on 28Dec16)

1.9 Energy Management

A. All fuel and electricity use for the farming operation are tracked.	3
B. On-farm diesel <u>AND</u> electricity use for the farming operation are tracked.	2
C. On-farm diesel <u>OR</u> electricity use for the farming operation is tracked.	1
D. <i>Neither fuel nor electricity use</i> for the farming operation are tracked.	0

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: To promote monitoring and awareness of energy resource consumption for vineyard operations.

Verification: Visual inspection of energy monitoring records.

References:

Storm, CP, and Ohmart, CP. Chapter 8. Shop and Yard Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

1.10 Alternative Energy Use Bonus Points

A. The farming operation uses <u>two or more</u> forms of alternative energy*.	+2 (bonus)
B. The farming operation uses <u>at least one</u> form of alternative energy*.	+1 (bonus)
C. The farming operation <i>does not use</i> alternative energy.	0

*Examples of forms of *alternative energy* include solar, wind, hydroelectric, biofuel (biodiesel and ethanol), propane, natural gas, and green energy purchases.

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: To award participants who have made financial investments in the use of alternative forms of energy.

Verification: Visual inspection of support facilities for the vineyard operation.

USDA National Resources Conservation Service (NRCS) may provide financial assistance for the adoption of conservation practices such as the use of alternative energy through the EQIP or CSP programs. <https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/> (Last accessed 28Dec16)

References:

Storm, CP, and Ohmart, CP. Chapter 8. Shop and Yard Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

1.11 Mechanical Operation Efficiency

A. <i>At least twice per year</i> , the farming operation increases efficiency of mechanical operations by treating more than one row at a time <u>OR</u> by combining two or more mechanical tasks into a single vineyard pass*.	2
B. <i>Once per year</i> , the farming operation increases the efficiency of mechanical operations by treating more than one row at a time <u>OR</u> by combining two or more mechanical tasks into a single vineyard pass*.	1
C. The farming operation <i>does not treat multiple rows or multitask</i> for any mechanical operation.	0

*One example of *mechanical operation multitasking* is combining berm sweeping with shredding of prunings. Other examples are: hedging combined with disking or mowing; sweeping combined with weed spraying.

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: To promote vineyard machinery multitasking and potentially reduce equipment passes through the vineyard, thereby conserving fuel and minimizing soil compaction and erosion.

Verification: Visual inspection of mechanical operation records.

References:

Hunt, D. *Farm power and machinery management*. Iowa State University Press, Ames. 1977.

Kay, RD, and Edwards, WM. *Farm management*. McGraw-Hill, New York. 1994.

Morris, JR, and Brady, PL. *Vineyard mechanization: development and status in the United States and in major grape producing regions of the world*. American Society for Horticultural Science, Alexandria, VA. 2011.

1.12 Disposal of Materials

The importance of recycling is a part of employee orientation and training <u>AND</u> the farming operation recycles metal, paper, cardboard, glass, and plastic in designated recycling containers.	YES = 2
	NO = 0

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: To award participants who recycle and who promote recycling.

Verification: Visual inspection of support facilities for the vineyard operation.

References:

Storm, CP, and Ohmart, CP. Chapter 8. Shop and Yard Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

1.13 Knowledge Sharing Bonus Points

***NEW* Standard for 2017**

A. <i>Within the last year</i> , a farming operation representative shared sustainable viticulture knowledge with people outside of the operation by hosting an educational vineyard tour, hosting an intern, speaking as part of an educational event, or a similar activity.	+2 (bonus)
B. <i>Within the last year</i> , a farming operation representative <i>did not share</i> sustainable viticulture knowledge with anyone outside of the farming operation.	0

Companion Information

Scope: Anyone working for the farming operation and any part of the farming operation.

Purpose: To award participants who share and promote sustainable viticulture knowledge.

Verification: A written explanation of the knowledge sharing experience, including the date and number of people who learned from the experience (one paragraph).

To place an intern job posting, see winejobs.com or wineserver.ucdavis.edu/careers/venjobs/.

Contact your local grape grower organization or tourism office to become involved in hosting vineyard tours.

If you are interested in speaking on grower panels at educational events, contact your local grape grower education coordinator or the LWC (209) 367-4727.

1.14 On-Site Sustainable Viticulture Research Bonus Points

***NEW* Standard for 2017**

A. <i>Within the last year</i> , the farming operation participated in on-site research in an area of sustainable viticulture, through collaboration with academics, scientists, and/or industry <i>OR</i> participated in on-site research in an area of sustainable viticulture <i>and</i> shared the results with academics, scientists, and/or industry.	+2 (bonus)
B. <i>Within the last year</i> , the farming operation <i>did not participate</i> in collaborative on-site research in an area of sustainability.	0

Companion Information

Scope: Any part of the farming operation submitted for **LODI RULES** certification. Research must be conducted or data analyzed during the certification year. Sustainable viticulture research refers to grape growing research in an area of business management, human resources management, ecosystem management, soil management, water management, and/or pest management. *On-site* refers to at the vineyard site.

Purpose: To award participants who conduct on-site sustainable viticulture research and share the results.

Verification: Visual inspection of dated data records from the research.

The Lodi Winegrape Commission may be contacted for research involvement, (209) 367-4727 or lwwc@lodiwine.com.

Western SARE grants are available to growers for sustainable viticulture research: <http://www.westernsare.org/Grants>.

The USDA's National Resources Conservation Service offers a Conservation Stewardship Program, which many **LODI RULES** growers are eligible to participate in: <http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/csp/>.

UC Davis Department of Viticulture & Enology can be contacted at (530) 752-0380.

The California State University - Fresno Department of Viticulture & Enology can be contacted at (559) 278-2089.

References:

Norman, DW, Bloomquist, LE, Freyenberger, SG, Regehr, DL, Schurle, BW, and Janke, RR. 1998. Farmers Attitudes Concerning On-Farm Research: Kansas Survey Results. *J. Nat. Resour. Life Sci. Educ.* 27: 35-41. agronomy.org/files/jnrlse/issues/1998/e96-25.pdf.

Chapter 2: Human Resources Management

Note: In the instance that the farming operation has no employees other than yourself, you have no payroll, and you have not received any IRS I-9 Forms, skip this Chapter and proceed to Chapter 3.

2.1 Human Resources Plan

The farming operation has a written and implemented human resources plan containing the following components: company mission, vision, and values; company strategy for human resources; staffing and recruiting procedures; training and development protocols; employee performance management and employee relations strategies; compensation and benefits; record keeping policies; and a plan review and update schedule.	YES = 6
	NO = Fail Chapter

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: To clearly define overall company objectives and strategies for managing, empowering, and compensating employees.

Verification: Visual inspection of the human resources plan document.

References:

Billikopf, G. *Labor management in agriculture: cultivating personnel productivity*, 2nd Ed. University of California, Agriculture and Natural Resources, Agricultural Issues Center Publication 3417. 2003.

Farm Employers Labor Service. Summary of employment requirements for California winegrape growers.

- fels.net (Last accessed on 30Dec16)
- *Internet search terms:* FELS summary employment requirements California winegrape growers

Kay, RD, and Edwards, WM. *Farm management*. McGraw-Hill, New York. 1994.

Thach, L. Chapter 7. Human Resources Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

Human Resources Plan Organization:

Company mission: For example, to promote high morale and efficiency within the work force.

Company vision: For example, to become among the most effective vineyard operations in California.

Company values: Characteristics such as integrity, team building, management expertise, etc.

Company strategy for human resources: For example, hire, train, and direct employees for optimum effectiveness. Ensure that employees always know they are valued as individuals and that they understand their job responsibilities. Create a respectful work environment.

Staffing and recruiting procedures: For example, use the company reputation as a desirable place to work with generous employee compensation to draw highly qualified individuals.

Training and development protocols: For example, ensure each employee reaches his or her full potential and is able to make significant contributions to the company through regular training and empowerment. Discover what skills employees are interested in developing and offer them resources to learn more about these topics.

Employee performance management and employee relations strategies: For example, clearly state company policies and performance expectations for each employee, regularly provide feedback to employees regarding their performance, and as appropriate, provide rewards to excellence and discipline for failure to adhere to company policies.

Compensation and benefits: For example, strive to at least meet and when feasible, exceed industry standards for employee compensation.

Record keeping policies: For example, maintain a database of written records for employee activities and personnel management actions.

A plan review and update schedule.

2.2 Employee Handbook

A. The farming operation provides an employee handbook, <u>in languages understood by all employees</u> , which includes information on the company's policies and practices.	2
B. The farming operation provides an employee handbook.	1
C. The farming operation <i>does not provide</i> an employee handbook.	0

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: To ensure managers and employees have a reference document that clearly states company personnel policies and practices.

Verification: Visual inspection of the employee handbook.

References:

Billikopf, G. *Labor management in agriculture: cultivating personnel productivity*, 2nd Ed. University of California, Agriculture and Natural Resources, Agricultural Issues Center Publication 3417. 2003.

Farm Employers Labor Service. Personnel audit and employee handbook service.

- fels.net/1/fels-services/personnel-audit-a-handbook-service.html (Last accessed on 30Dec16)
- *Internet search terms:* FELS personnel audit and employee handbook service

Farm Employers Labor Service. *Summary of employment requirements for California winegrape growers*.

- *Internet search terms:* Farm Employers Labor Service summary employment requirements California winegrape growers

Thach, L. Chapter 7. Human Resources Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

2.3 Employee Orientation

A. The farming operation has a <u>formal orientation program</u> for new employees, which <u>includes</u> an overview of work performance standards, employee benefits, and company policies, as well as meetings with key employees and/or a tour of the operations.	2
B. The farming operation has a <u>formal orientation program</u> for new employees, which <u>may include</u> an overview of work performance standards, employee benefits, and company policies.	1
C. The farming operation provides <i>informal employee orientation</i> .	0

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: To ensure employees have a solid understanding of the company and its policies, their role in the company, performance expectations, and compensation.

Verification: Visual inspection of personnel records.

References:

Billikopf, G. *Labor management in agriculture: cultivating personnel productivity*, 2nd Ed. University of California, Agriculture and Natural Resources, Agricultural Issues Center Publication 3417. 2003.

Farm Employers Labor Service. New employee orientation.

- fels.net/1/supply-catalog/hr-materials.html#HRIndex (Last accessed on 30Dec16)
- *Internet search terms:* FELS human resources labor relations

Kay, RD, and Edwards, WM. *Farm management*. McGraw-Hill, New York. 1994.

Thach, L. Chapter 7. Human Resources Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

2.4 Employee Job Descriptions

The farming operation has <u>written descriptions</u> for each job or job family*.	YES = 2
	NO = 0

*A *job family* is a set of related tasks, such as tractor driver, which includes disking, harrowing, chiseling, and ripping.

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: To provide employees with a written document which clearly states their role in the company and their performance expectations.

Verification: Visual inspection of job description documents.

References:

Farm Employers Labor Service. Job descriptions: a reference for employers.

- fels.net/1/supply-catalog/hr-materials.html#HRIndex (Last accessed on 30Dec16)
- *Internet search terms:* FELS human resources labor relations

Thach, L. Chapter 7. Human Resources Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

2.5 Employee Performance Evaluation

The farming operation has a written employee evaluation process <u>AND</u> written records of each employee evaluation.	YES = 2
	NO = 0

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: To promote effective employee evaluation and performance feedback.

Verification: Visual inspection of the employee evaluation process document and records of employee evaluations.

References:

Billikopf, G. *Labor management in agriculture: cultivating personnel productivity*, 2nd Ed. University of California, Agriculture and Natural Resources, Agricultural Issues Center Publication 3417. 2003.

Farm Employers Labor Service, www.fels.net (Last accessed on 30Dec16)

Kay, RD, and Edwards, WM. *Farm management*. McGraw-Hill, New York. 1994.

Thach, L. Chapter 7. Human Resources Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

2.6 Safety Training

A. <i>At least 6 times per year</i> , the farming operation conducts training and safety meetings <u>AND</u> session dates and attendance are documented <u>AND</u> safety statistics, such as lost time accidents, are tracked.	2
B. <i>At least 3 times per year</i> , the farming operation conducts training and safety meetings <u>AND</u> session dates and attendance are documented.	1
C. The farming operation <i>complies with legal requirements</i> for employee safety training.	0

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: To promote safety in the workplace above and beyond what is required by law.

Verification: Visual inspection of safety training records and statistics.

References:

AgSafe, agsafe.org (Last accessed on 30Dec16)

Cal/OSHA, dir.ca.gov/occupational_safety.html (Last accessed on 30Dec16)

California Department of Industrial Relations. Heat illness prevention.

- dir.ca.gov/DOSH/HeatIllnessInfo.html (Last accessed on 30Dec16)
- *Internet search terms:* California department of industrial relations heat illness prevention

California EPA Department of Pesticide Regulation. Pesticides and human health information.

- cdpr.ca.gov/docs/dept/quicklinks/humanhea.htm (Last accessed on 30Dec16)
- *Internet search terms:* California pesticides human health information

Farm Employers Labor Service. Summary of employment requirements for California winegrape growers.

- fels.net (Last accessed on 30Dec16)
- *Internet search terms:* Farm Employers Labor Service summary employment requirements California winegrape growers

Thach, L. Chapter 7. Human Resources Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

University of California Agricultural Ergonomics Research Center.

- ag-ergo.ucdavis.edu (Last accessed on 30Dec16)

2.7 Safety Rewards Program

A. The farming operation has a <u>written incentives program</u> which recognizes individuals for safe job performance.	2
B. The farming operation provides <u>written recognition or bonuses</u> for safe job performance.	1
C. The farming operation provides <i>no incentives or recognition</i> for safe job performance.	0

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: To promote safety in the workplace.

Verification: Visual inspection of the safety incentives program document.

2.8 Employee Training and Development

A. <i>Within the last year</i> , a farming operation employee has attended <u>at least three</u> training seminars or other educational programs*.	2
B. <i>Within the last year</i> , a farming operation employee has attended <u>at least one</u> training seminar or other educational program*.	1
C. <i>Within the last year</i> , no farming operation employee has attended any training seminar or other educational program.	0

*See list of organizations hosting training seminars and educational events on the following page.

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: To help each employee reach his or her full potential with regard to workplace competency.

Verification: Visual inspection of seminar and educational attendance records (these can be the same documents as used for Standard 1.6).

References:

Billikopf, G. *Labor management in agriculture: cultivating personnel productivity*, 2nd Ed. University of California, Agriculture and Natural Resources, Agricultural Issues Center Publication 3417. 2003.

Farm Employers Labor Service. *Summary of employment requirements for California winegrape growers*.

- fels.net (Last accessed on 30Dec16)
- *Internet search terms:* Farm Employers Labor Service summary employment requirements California winegrape growers

Kay, RD, and Edwards, WM. *Farm management*. McGraw-Hill, New York. 1994.

Thach, L. Chapter 7. Human Resources Management. In: Lodi Winegrower's Workbook, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

Organizations Hosting Training Seminars and Educational Events:

Ag Safe Conference
American Society for Enology and Viticulture (ASEV) annual meeting
American Vineyard Grape Expo
Association of Applied IPM Ecologists (AAIE) annual conference
California Plant and Soil Conference (California Chapter of the ASA)
California State University-Fresno Biennial Grape Day
California Association of Pest Control Advisors (CAPCA) Meetings and Workshops
Clarksburg Grape Day
Dollars and Sense Tradeshow and Seminar
Foothill Grape Day
Lodi Farm Safety Day
Lodi Grape Day (every February)
Lodi District Grape Growers Association Seminars and Workshops
Lodi Winegrape Commission Seminars and Workshops (see below)
Napa Valley Viticulture Fair
Rootstock: Napa Valley Grapegrowers
San Joaquin Farm Bureau Seminars and Workshops
San Joaquin Valley Grape Symposium
San Joaquin Valley Winegrowers Association Annual Meeting and Industry Forum
Sonoma Grape Day
Sustainable Ag Expo (San Luis Obispo every fall)
University of California-Davis extension courses and seminars (RAVE, etc.)
Unified Wine and Grape Symposium (every January in Sacramento)
Vineyard Economics Seminar
Wine Industry Financial Symposium
WINexpo
World Ag Expo (every February)

The Lodi Winegrape Commission hosts several grower outreach events throughout the year, which are listed online at lodigrowers.com under Education → Local Opportunities. Everyone is welcome to attend. You can also join our email or physical mailing lists by sending an email to stephanie@lodiwine.com.

2.9 Teambuilding

<i>Within the last year</i> , the farming operation provided a formal teambuilding activity (post-harvest party, holiday party, spontaneous rewards during the growing season, employee lunches, etc.).	YES = 1
	NO = 0

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: To strengthen relationships among staff members and promote teamwork.

Verification: Visual inspection of team building activity records.

References:

Kay, RD, and Edwards, WM. *Farm management*. McGraw-Hill, New York. 1994.

Thach, L. Chapter 7. Human Resources Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

2.10 Employee Bonus System

<i>Within the last year</i> , the farming operation provided bonuses to employees (holiday bonus check, turkey, harvest bonus, wine, gift cards, etc.).	YES = 2
	NO = 0

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: To enhance employee compensation and in so doing, incentivize employees and build employee loyalty towards the company.

Verification: Visual inspection of employee bonus records.

References:

Billikopf, G. *Labor management in agriculture: cultivating personnel productivity*, 2nd Ed. University of California, Agriculture and Natural Resources, Agricultural Issues Center Publication 3417. 2003.

Kay, RD, and Edwards, WM. *Farm management*. McGraw-Hill, New York. 1994.

2.11 Employee Health Care Benefit

***CHANGED* in 2017**

A. The farming operation offers some form of health insurance benefit to employees.	2
B. The farming operation has verified that employees have healthcare coverage from a source other than their employer.	1
C. The farming operation offers <i>no health insurance benefit</i> .	0

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: To provide employees with a benefit that is essential to their wellbeing and in so doing, incentivize employees and build employee loyalty towards the company.

Verification: Visual inspection of health care documentation.

References:

Farm Employers Labor Service. *Summary of employment requirements for California winegrape growers*.

- fels.net (Last accessed on 30Dec16)
- *Internet search terms:* Farm Employers Labor Service summary employment requirements California winegrape growers

Thach, L. Chapter 7. Human Resources Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

2.12 Employee Benefits Package

The farming operation offers a benefits package to full time employees in excess of government requirements, which includes two or more of the following : retirement plan, profit sharing, paid time off, one or more electronic devices (cellular phone, portable computer, etc.), company vehicle, employee housing, and/or a company expense account.	YES = 3
	NO = 0

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: To enhance employee compensation and in so doing, incentivize employees and build employee loyalty towards the company.

Verification: Visual inspection of benefit package documentation and/or records.

References:

Billikopf, G. *Labor management in agriculture: cultivating personnel productivity*, 2nd Ed. University of California, Agriculture and Natural Resources, Agricultural Issues Center Publication 3417. 2003.

Farm Employers Labor Service. *Summary of employment requirements for California winegrape growers*.

- fels.net (Last accessed on 30Dec16)
- *Internet search terms*: Farm Employers Labor Service summary employment requirements California winegrape growers

Kay, RD, and Edwards, WM. *Farm management*. McGraw-Hill, New York. 1994.

Thach, L. Chapter 7. Human Resources Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

2.13 Salary Survey Participation

The farming operation participates in an annual salary survey (Wine Business Monthly, CAWG, FELS, etc.).	YES = 1
	NO = 0

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: To make a positive contribution to the industry salary database.

Verification: Visual inspection of salary survey documentation.

References:

California Association of Winegrape Growers, cawg.org (Last accessed on 30Dec16)

Farm Employers Labor Service, fels.net (Last accessed on 30Dec16)

Thach, L. Chapter 7. Human Resources Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

Wine Business Monthly, winebusiness.com/search/?q=salary+survey (Last accessed on 30Dec16)

Chapter 3: Ecosystem Management

3.1 Watershed Management

***CHANGED* in 2017**

A. <i>During the last year</i>, a farming operation representative attended <u>at least four meetings</u> of a local watershed stewardship group*.	3
B. <i>During the last year</i>, a farming operation representative attended <u>at least three meetings</u> of a local watershed stewardship group*.	2
C. <i>During the last year</i>, a farming operation representative attended <u>at least two meetings</u> of a local watershed stewardship group*.	1
D. <i>During the last year</i>, a farming operation representative <i>attended one or no meetings</i> of a local watershed stewardship group*.	0

*Examples of *water resource meetings* that would qualify for this standard include: watershed stewardship group meetings, irrigation district meetings, reclamation district meetings, State Water Resources Control Board meetings, California Water Commission meetings, water quality coalition meetings, regional water board meetings, and water conservation district meetings.

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: To encourage active participation in watershed workgroups for the betterment of local watersheds. (Watersheds are the regional environments with common surface water flows affected by local agricultural activities, especially those activities impacting water quality.)

Verification: Visual inspection of watershed workgroup membership list and attendance records.

References:

Ohmart, CP. *View from the vineyard: a practical guide to sustainable winegrape growing*. The Wine Appreciation Guild, South San Francisco. 2011.

Poirier Locke, J. *Vineyards in the watershed: sustainable winegrowing in Napa County*. Napa Sustainable Winegrowing Group, Napa. 2002.

Reeves, K. Chapter 1. Ecosystem Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

3.2 Environmental Survey

The farming operation uses a written environmental survey and monitoring program to determine and document the presence of environmental features (vernal pools and swales, trees, woodlands, drainages, and riparian areas) that affect farming and farmable acres.	YES = 4
	NO = 0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To inventory environmental features and risks associated with individual vineyard management units and the lands adjacent to them.

Verification: Visual inspection of environmental survey documentation.

References:

Reeves, K. Chapter 1. Ecosystem Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

3.3 Ecosystem Management Plan

The farming operation has a written and implemented ecosystem management plan based on the findings of the environmental survey (Standard 3.2), which includes consideration of vegetation, wildlife, soil, surface waters, adjacent infrastructure (roads, etc.), adjacent neighboring properties, and other environmental features. The plan is organized into the following components: ecosystem management goals, challenges, and strategies, as well as a plan review and update schedule.	YES = 6
	NO = Fail Chapter

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To thoroughly consider environmental features and factors identified in the environmental survey, and to state ecosystem management goals, challenges, and strategies, which will serve as guidelines for the activities of the vineyard manager and his/her management team.

Verification: Visual inspection of the ecosystem management plan document.

References:

Altieri, MA, Nicholls, CA, Ponti, L, and York, A. *Designing biodiverse, pest resilient vineyards through habitat management*. Practical Winery and Vineyard. pp. 16-29. May/June 2005.

Garrett, HE. (Ed.). *North American agroforestry: an integrated science and practice*. American Society of Agronomy, Madison, WI. 2009.

Grismer, ME. *Vegetation filter strips for nonpoint source pollution control in agriculture*. University of California Division of Agriculture and Natural Resources Publication 8195. 2006.

Inghan, ER, Moldenke, AR, and Edwards, CA. *Soil biology primer*. Soil and Water Conservation Society, Ankeny, IA. 2000.

Ohmart, CP. *View from the vineyard: a practical guide to sustainable winegrape growing*. The Wine Appreciation Guild, South San Francisco. 2011.

Olsen, R, Francis, C, and Kaffla, S. (Eds.). *Exploring the role of biodiversity in sustainable agriculture*. American Society of Agronomy, Madison, WI. 1995.

Reeves, K. Chapter 1. Ecosystem Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

Robins, P, Holmes, RB, and Laddish, K. *Bring farm edges back to life!* Yolo County Resource Conservation District. 2001.

Rickel, D, and Francis, C. (Eds.). *Agroecosystem analysis*. American Society of Agronomy, Madison, WI. 2004.

Ecosystem Management Plan Organization:

Ecosystem inventory and resources: For example, presence or absence of a cover crop in the vineyard; individual trees, vernal pools, and vernal swales in and adjacent to vineyards; woodlands, riparian vegetation, and other vegetative adjacent to the vineyards; wild animals in the area; adjacent operational infrastructure (e.g. roads, yards, pump stations) and buildings (shop, homes), and neighboring properties.

A summary of the environmental survey results.

Ecosystem management goals: For example, to maximize the stability of vineyard agroecosystems, while protecting and conserving natural resources.

Ecosystem management challenges: For example, the inherent instability of vineyard agroecosystems due to the limited biodiversity within them and costs and risks associated with the requirement for applied resources to sustain the economic viability of vineyard businesses.

Ecosystem management strategies: For example, to increase vineyard agroecosystem stability through enhanced biodiversity, especially that of soil microbial populations and above ground insects, and to reduce the need for applied resources through habitat preservation, maintenance, and enhancement.

Ecosystem management activity scheduling: For example, to conduct ecosystem management activities to optimize benefits and minimize impacts on vineyard operations.

3.4 Enhancing Plant and Soil Inhabitant Biodiversity Within the Vineyard

A. A <u>permanent cover crop</u> (non-tilled), composed of <u>multiple California native species</u> , is maintained between at least every other vine row.	4
B. A <u>cover crop</u> , composed of <u>multiple species</u> (permanent/non-tilled <u>OR</u> resident/non-planted), is maintained between at least every other vine row.	3
C. An <u>annually seeded cover crop of multiple species</u> is maintained between at least every other vine row <u>AND</u> tilling does not take place during the winter months.	2
D. An <u>annual resident species</u> cover crop (non-planted) is maintained between at least every other vine row <u>AND</u> tilling does not take place during the winter months.	1
E. <i>No cover crop</i> is allowed to grow between the vine rows.	0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To promote the stability of vineyard agroecosystems through enhanced biodiversity, especially with regards to soil inhabitants.

Verification: Visual inspection of the floors or floor management records for individual vineyard management units submitted for **LODI RULES** certification.

References:

Grant, S. Maximizing cover crop benefits through selection and management. Lodi Winegrape Commission Coffee Shop Blog. lodigrowers.com/maximizing-cover-crop-benefits-through-selection-and-management/. October 12, 2015.

Inghan, ER, Moldenke, AR, and Edwards, CA. *Soil biology primer*. Soil and Water Conservation Society, Ankeny, IA. 2000.

Olsen, R, Francis, C, and Kaffla, S. (Eds.). *Exploring the role of biodiversity in sustainable agriculture*. American Society of Agronomy, Madison, WI. 1995.

Scow, KM, and Werner, MR. Soil ecology. In: *Cover cropping in vineyards: a grower's handbook*. Ingels, CA, Bugg, RL, McGourty, GT, and Christensen, LP. (Eds.). University of California Division of Agriculture and Natural Resources Publication 3338. 1998.

3.5 Woodlands

The farming operation has woodlands* that are under company control in or adjacent to the vineyard block on company property.	If YES , go to Standards 3.5.1 & 3.5.2
	If NO , go to Standard 3.6 (Standards 3.5.1 & 3.5.2 are N/A)

*A *woodland* is defined as at least three adjacent trees with 10% tree cover on non-farmed land.

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To ascertain the presence of woodlands and to direct the participant to the appropriate Ecosystem Management standard.

Verification: Visual inspection of areas adjacent to individual vineyard management units submitted for **LODI RULES** certification.

3.5.1 Woodland Buffer Type

A. The farming operation has enhanced the buffer around woodlands with <u>California native vegetation</u> .	3
B. <u>Non-native vegetation</u> grows around the woodlands.	2
C. There is a <u>non-vegetative buffer</u> around the woodlands.	1
D. The farming operation <i>does not use buffer strips</i> in woodland management.	0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To protect and preserve woodlands, and the wildlife habitat they provide.

Verification: Visual inspection of woodlands.

References:

Garrett, HE. (Ed.). *North American agroforestry: an integrated science and practice*. American Society of Agronomy, Madison, WI. 2009.

McCreary, DD. How to grow California oaks. In: *Bring farm edges back to life!* Robins, P, Holmes, RB, Laddish, K. (Eds.). Yolo County Resource Conservation District. 2001.

McCreary, DD, and Nader, G. *Small-parcel landowner's guide to woodland management*. University of California Division of Agriculture and Natural Resources Publication 8263. 2007.

Olsen, R, Francis, C, and Kaffla, S. (Eds.). *Exploring the role of biodiversity in sustainable agriculture*. American Society of Agronomy, Madison, WI. 1995.

Pavlik, BM, Muick, PC, Johnson, SG, and Popper, M. *Oaks of California*. Cachuma Press, Los Olivos. 1991.

Reeves, K. Chapter 1. Ecosystem Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

University of California Oak Woodland Management.

- ucanr.org/sites/oak_range/ (Last accessed on 23Jan17)
- *Internet search terms:* UC California oak woodland management

3.5.2 Woodland Buffer Dimensions

A. Woodlands are preserved with a buffer that extends <u>at least to the outer edges of the tree canopies</u> (i.e. drip line) on the woodland perimeter.	3
B. Woodlands are preserved with a buffer that extends <u>at least halfway to the outer edges of the tree canopies</u> (i.e. drip line) on the woodland perimeter.	2
C. In the woodlands, there is a buffer that extends <u>less than halfway to the outer edges of the tree canopies</u> (i.e. drip line).	1
D. The farming operation <i>does not use buffer strips</i> in woodland management.	0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To protect and preserve woodland trees, and the wildlife habitat they provide.

Verification: Visual inspection of woodlands.

References:

Garrett, HE. (Ed.). *North American agroforestry: an integrated science and practice*. American Society of Agronomy, Madison, WI. 2009.

McCreary, DD, and Nader, G. *Small-parcel landowner's guide to woodland management*. University of California Division of Agriculture and Natural Resources Publication 8263. 2007.

Olsen, R, Francis, C, and Kaffla, S. (Eds.). *Exploring the role of biodiversity in sustainable agriculture*. American Society of Agronomy, Madison, WI. 1995.

Pavlik, BM, Muick, PC, Johnson, SG, and Popper, M. *Oaks of California*. Cachuma Press, Los Olivos. 1991.

Reeves, K. Chapter 1. Ecosystem Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

University of California Oak Woodland Management.

- ucanr.org/sites/oak_range/ (Last accessed on 23Jan17)
- *Internet search terms:* UC California oak woodland management

3.6 Individual Trees

There are individual, preserved trees under company control in or adjacent to the vineyard block on company property.	If YES , go to Standards 3.6.1 & 3.6.2
	If NO , Standards 3.6.1 & 3.6.2 are N/A and go to Standard 3.7

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To ascertain the presence of individual trees and to direct the participant to the appropriate Ecosystem Management standard.

Verification: Visual inspection of areas adjacent to individual vineyard management units submitted for **LODI RULES** certification.

3.6.1 Individual Tree Buffer Type

A. <u>Vegetation is planted and maintained</u> around individual, preserved trees.	3
B. <u>Vegetation (other than noxious weeds) grows</u> around individual, preserved trees.	2
C. There is <u>an uncultivated buffer</u> around individual, preserved trees.	1
D. <i>Buffers are not used</i> in the management of individual, preserved trees.	0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To protect and preserve individual trees, and the benefits they provide.

Verification: Visual inspection of individual trees.

References:

Olsen, R, Francis, C, and Kaffla, S. (Eds.). *Exploring the role of biodiversity in sustainable agriculture*. American Society of Agronomy, Madison, WI. 1995.

McCreary, DD. How to grow California oaks. In: *Bring farm edges back to life!* Robins, P, Holmes, RB, and Laddish, K. (Eds.). Yolo County Resource Conservation District. 2001.

Pavlik, BM, Muick, PC, Johnson, SG, and Popper, M. *Oaks of California*. Cachuma Press, Los Olivos. 1991.

Reeves, K. Chapter 1. Ecosystem Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

3.6.2 Individual Tree Buffer Dimensions

A. Individual, preserved trees are protected by a buffer that extends <u>at least to the outer edges of the tree canopies</u> (i.e. drip line).	3
B. Individual, preserved trees are protected by a buffer that extends <u>at least halfway to the outer edges of the tree canopies</u> (i.e. drip line).	2
C. Individual, preserved trees have a buffer that extends <u>less than halfway to the outer edges of the tree canopies (i.e. drip line)</u> .	1
D. Buffers <i>are not used</i> in the management of individual, preserved trees.	0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To protect and preserve individual trees, and the benefits they provide.

Verification: Visual inspection of individual trees.

References:

Olsen, R, Francis, C, and Kaffla, S. (Eds.). *Exploring the role of biodiversity in sustainable agriculture*. American Society of Agronomy, Madison, WI. 1995.

Pavlik, BM, Muick, PC, Johnson, SG, and Popper, M. *Oaks of California*. Cachuma Press, Los Olivos. 1991.

Reeves, K. Chapter 1. Ecosystem Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

3.7 Vegetation (other than trees) Adjacent to Vineyards

Low stature vegetation (hedgerows, shrubs, etc.) is maintained around the vineyard block on company property.	If YES , go to Standard 3.7.1
	If NO , Standard 3.7.1 is N/A and go to Standard 3.8

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To ascertain the presence of vegetation other than trees and to direct the participant to the appropriate Ecosystem Management standard.

Verification: Visual inspection of areas adjacent to individual vineyard management units submitted for **LODI RULES** certification.

3.7.1 Management of Vegetation (other than trees) Adjacent to Vineyards

A. Low-stature vegetation (hedgerows, shrubs, etc.) is maintained on headlands <u>AND</u> there are shrubs and/or trees on the outer edges of headlands <u>and</u> along roadsides.	3
B. Vegetation is maintained along the outer edges of headlands <u>AND/OR</u> along roadsides.	2
C. Headlands are <i>kept clean of</i> any vegetation.	0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To promote non-farm vegetative covers, regardless of the presence or absence of trees, for environmental benefits.

Verification: Visual inspection of areas adjacent to individual vineyard management units submitted for **LODI RULES** certification.

References:

Altieri, MA, Nicholls, CA, Ponti, L, and York, A. *Designing biodiverse, pest resilient vineyards through habitat management*. Practical Winery and Vineyard. pp. 16-29. May/June 2005.

Grismer, ME. Vegetation filter strips for nonpoint source pollution control in agriculture. University of California Division of Agriculture and Natural Resources Publication 8195. 2006.

Nicholls, CI, and Alrieri, MA. *Designing species-rich, pest suppressive agroecosystems through habitat management*. Agroecosystem analysis. American Society of Agronomy, Madison, WI. 2004.

Robins, P, Holmes, RB, and Laddish, K. *Bring farm edges back to life!* Yolo County Resource Conservation District. 2001.

Olsen, R, Francis, C, and Kaffla, S. (Eds.). *Exploring the role of biodiversity in sustainable agriculture*. American Society of Agronomy, Madison, WI. 1995.

Reeves, K. Chapter 1. Ecosystem Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

3.8 California Native Vegetation Adjacent to Vineyards Bonus Points

Select all that apply:

3.8.1 Native Vegetation: Maintained Vegetation California native vegetation is maintained on headlands.	YES = +1 (bonus)
3.8.2 Native Vegetation: Maintained Hedgerows Hedgerows of California native vegetation are maintained along the edges of headlands (e.g. fence lines) <u>AND</u> roadsides.	YES = +1 (bonus)
3.8.3 Native Vegetation: Planted Buffers Buffers of California native vegetation are planted around individual, preserved trees.	YES = +1 (bonus)

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To reward the use of California native plants in non-farmed areas adjacent to vineyards.

Verification: Visual inspection of areas adjacent to individual vineyard management units submitted for **LODI RULES** certification.

References:

Long, RF, and Anderson, JH. *Establishing hedgerows on farms in California*. University of California Agricultural and Natural Resources Publication 8390. 2010.

Ornduff, R. *Introduction to California plant life*. University of California Press, Berkeley. 1974.

Robins, P, Holmes, RB, and Laddish, K. *Bring farm edges back to life!* Yolo County Resource Conservation District. 2001.

Sawyer, J, Keeler-Wolf, T, and Evens, J. *A manual of California vegetation*, 2nd Ed. California Native Plant Society. 2009.

- cnps.org/cnps/vegetation/manual.php (Last accessed on 23Jan17)
- *Internet search terms:* manual of California vegetation native plant society

Schoenherr, AA. *A natural history of California*. University of California Press, Berkeley. 1992.

3.9 Delineated Seasonal Wetlands (including vernal pools)

There are <u>delineated seasonal wetlands</u> under company control located in and/or adjacent to the vineyard block.	If YES , go to Standard 3.9.1
	If NO , Standard 3.9.1 is N/A and go to Standard 3.10

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification. A *delineated seasonal wetland* can be defined as a verified seasonal wetland with hydrophytic vegetation, hydric soils, and wetland hydrology.

Purpose: To ascertain the presence of seasonal wetlands and to direct the participant to the appropriate Ecosystem Management standard.

Verification: Visual inspection of areas adjacent to individual vineyard management units submitted for **LODI RULES** certification.

3.9.1 Delineated Seasonal Wetland Management

A. Seasonal wetlands are preserved with a <u>permanent vegetative buffer strip around the entire perimeter</u> , which includes <u>California native vegetation</u> .	3
B. Seasonal wetlands are preserved with a <u>buffer strip of vegetation</u> around the entire perimeter.	2
C. Seasonal wetlands are preserved with a <u>non-vegetative buffer strip</u> around the entire perimeter.	1
D. There is <i>no buffer strip</i> around seasonal wetlands.	0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To protect and preserve seasonal wetlands, and their habitat functions.

Verification: Visual inspection of seasonal wetlands.

References:

Grismer, ME. *Vegetation filter strips for nonpoint source pollution control in agriculture*. University of California Division of Agriculture and Natural Resources Publication 8195. 2006.

California vernal pools: a collection of information and resources.

- vernalpools.org/ (Last accessed on 24Jan17)
- *Internet search terms:* California vernal pools information resources

Withan, CW, Bauder, ET, Belck, D, Ferren, WR, and Ornduff, R. (Eds.). *Ecology, conservation, and management of vernal pool ecosystems: proceedings from a 1996 Conference*. California Native Plant Society. 1998.

- cnps.org/cnps/conservation/vernalpools.php
- *Internet search terms:* California native plant society conservation program

Reeves, K. Chapter 1. Ecosystem Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

Sawyer, J, Keeler-Wolf, T, and Evens, J. *A manual of California vegetation*, 2nd Ed. California Native Plant Society. 2009.

- cnps.org/cnps/vegetation/manual.php (Last accessed on 24Jan17)
- *Internet search terms:* manual of California vegetation native plant society

Schoenherr, AA. *A natural history of California*. University of California Press, Berkeley. 1992.

3.10 Riparian Habitat

Riparian habitat associated with perennial water bodies, such as rivers that flow all year during most years, exists on company property.	If YES , go to Standard 3.10.1
	If NO , Standard 3.10.1 is N/A and go to Standard 3.11

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To ascertain the present riparian wildlife habitat and to direct the participant to the appropriate Ecosystem Management standard.

Verification: Visual inspection of areas adjacent to individual vineyard management units submitted for **LODI RULES** certification.

Riparian habitat is explained here by Mindy Pratt of Utah State University: <http://articles.extension.org/pages/62490/what-is-a-riparian-area> (Last accessed 27Jan17). Basically, it's an area next to a body of water which houses a unique ecosystem that plays an important role in conservation efforts.

3.10.1 Riparian Habitat Management

A. Riparian vegetation adjacent to perennial waterways, including <u>California native trees and shrubs</u> , shades part or the entire watercourse.	3
B. Riparian vegetation adjacent to perennial waterways, <u>including trees and shrubs</u> , shades part or the entire watercourse.	2
C. Riparian vegetation <i>is not preserved</i> along watercourses <u>BUT non-woody vegetative buffer strips</u> are adjacent to perennial waterways.	1
D. Riparian vegetation <i>is not preserved</i> along watercourses <u>AND</u> non-woody vegetative buffer strips <i>are not adjacent</i> to perennial waterways.	0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To preserve riparian vegetation (plants growing on stream banks) and thereby, protect adjacent perennial waters.

Verification: Visual inspection of riparian areas.

References:

Garrett, HE. (Ed.). *North American agroforestry: an integrated science and practice*. American Society of Agronomy, Madison, WI. 2009.

Grismer, ME. *Vegetation filter strips for nonpoint source pollution control in agriculture*. University of California Division of Agriculture and Natural Resources Publication 8195. 2006.

Kocher SD, and Harris, R. *Forestry stewardship series 10: riparian vegetation*. University of California Division of Agriculture and Natural Resources Publication 8240. 2007.

Long, RL, Fulton, A, and Hanson, B. *Protecting surface water from sediment-associated pesticides in furrow-irrigated crops*. University of California Agriculture and Natural Resources. 2010.

Olsen, R, Francis, C, Kaffla, S. (Eds.). *Exploring the role of biodiversity in sustainable agriculture*. American Society of Agronomy, Madison, WI. 1995.

Reeves, K. Chapter 1. Ecosystem Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

Robins, P. Riparian enhancements on sloughs. In: *Bring farm edges back to life!* Robins, P, Holmes, RB, and Laddish, K. (Eds.). Yolo County Resource Conservation District. 2001.

Sawyer, J, Keeler-Wolf, T, and Evens, J. *A manual of California vegetation*, 2nd Ed. California Native Plant Society. 2009.

- cnps.org/cnps/vegetation/manual.php (Last accessed on 24Jan17)

Schoenherr, AA. *A natural history of California*. University of California Press, Berkeley. 1992.

3.11 Intermittent Water Body Habitat

There are intermittent water bodies, such as streams and ponds that are dry during most summers, under company control on company property.	If YES , go to Standard 3.11.1
	If NO , Standard 3.11.1 is N/A and go to Standard 3.12

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To ascertain the presence of intermittent water bodies and to direct the participant to the appropriate Ecosystem Management standard.

Verification: Visual inspection of areas adjacent to individual vineyard management units submitted for **LODI RULES** certification.

3.11.1 Intermittent Water Body Habitat Management

A. There is a California native vegetation buffer strip <i>at least 9 feet wide</i> between vineyards and intermittent water bodies.	3
B. There is a vegetative buffer strip <i>at least 9 feet wide</i> between vineyards and intermittent water bodies.	2
C. There is a non-vegetative buffer strip <i>at least 9 feet wide</i> between vineyards and intermittent water bodies.	1
D. <i>No buffer strip exists</i> around intermittent water bodies.	0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To preserve and protect intermittent waters and the habitat they provide.

Verification: Visual inspection of intermittent water features.

References:

Grismer, ME. *Vegetation filter strips for nonpoint source pollution control in agriculture*. University of California Division of Agriculture and Natural Resources Publication 8195. 2006.

Kocher, SD, and Harris, R. *Forestry stewardship series 10: riparian vegetation*. University of California Division of Agriculture and Natural Resources Publication 8240. 2007.

Long, RL, Fulton, A, and Hanson, B. *Protecting surface water from sediment-associated pesticides in furrow-irrigated crops*. University of California Agriculture and Natural Resources. 2010.

Ornduff, R. *Introduction to California plant life*. University of California Press, Berkeley. 1974.

Reeves, K. Chapter 1. Ecosystem Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

Sawyer, J, Keeler-Wolf, T, and Evens, J. *A manual of California vegetation*, 2nd Ed. California Native Plant Society. 2009.

- cnps.org/cnps/vegetation/manual.php (Last accessed on 24Jan17)
- *Internet search terms:* manual of California vegetation native plant society

Schoenherr, AA. *A natural history of California*. University of California Press, Berkeley. 1992.

3.12 Habitat for Birds and Bats

Select all that apply:

3.12.1 Habitat: Nesting Boxes for Raptors	YES = 2
<u>Nesting boxes for raptors</u> (owls, hawks, kestrels, etc.) are established and maintained in or around the vineyard.	NO = 0
3.12.2 Habitat: Natural Nesting Sites for Raptors	YES = 2
<u>Natural nesting sites and perches</u> (e.g. oak trees) for raptors are present in or around the vineyard.	NO = 0
3.12.3 Habitat: Nesting Boxes for Bats	YES = 1
<u>Nesting boxes for bats</u> are established and maintained in or around the vineyard.	NO = 0
3.12.4 Habitat: Nesting Boxes for Non-Raptor Birds	YES = 2
<u>Nesting boxes for non-raptor bird species</u> (western blue birds, wood ducks, etc.) are established and maintained in or around company property.	NO = 0
3.12.5 Habitat: Nesting Habitat for Non-Raptor Birds	YES = 1
<u>Natural nesting sites for non-raptor bird species</u> (western blue birds, wood ducks, etc.) are present on company property.	NO = 0
3.12.6 Habitat: No Nesting Boxes or Perches	0
There are <i>no nesting boxes</i> on company property and <i>no perches</i> are established or exist for birds of prey or bats.	

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To support populations of birds and bats, and their activities in and around vineyards, including predation of vineyard pests.

Verification: Visual inspection of nesting boxes, perches, and other nesting habitat in and adjacent to individual vineyard management units.

References:

Heaton, E, Long, R, Ingels, C, and Hoffman, T. *Songbird, bat, and owl boxes: vineyard management with an eye toward wildlife*. University of California Agriculture and Natural Resources Publication 21636. 2008.

Reeves, K. Chapter 1. Ecosystem Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

Robins, P, Holmes, RB, and Laddish, K. *Bring farm edges back to life!* Yolo County Resource Conservation District. 2001.

Tatarian, G. *Barn owls in the vineyard: forging a partnership with nature's rodent control specialists*. Practical Winery and Vineyard. pp. 23-28. May/June 1995.

Tartarian, G. *Creating habitat: raptors in your vineyard*. Practical Winery and Vineyard. pp. 49-54. July/August 1995.

3.13 Managing Livestock Access

A. When livestock graze in the vineyard, access to rivers, streams, other surface water bodies, sink holes, unprotected wells, or other direct conduits to groundwater <u>is prevented by using fencing or other exclusionary devices.</u>	3
B. When livestock graze in the vineyard, access to rivers, streams, and other surface water bodies <u>is limited to only a small portion of the water body AND</u> access to sink holes, unprotected wells, or other direct conduits to groundwater <u>is prevented by using fencing or other exclusionary devices.</u>	2
C. When livestock graze in the vineyard, <i>no measures are taken to exclude or limit access to</i> rivers, streams, and other surface water bodies.	0
Livestock <i>are not used</i> for vineyard grazing.	Standards 3.13 & 3.14 are N/A and go to Chapter 4

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To protect waters from the effects of livestock.

Verification: Visual inspection of livestock exclusion measures around vineyards and adjacent lands.

References:

National Sustainable Agriculture Information Service. Pasture, rangeland, and grazing management.

- attra.ncat.org/attra-pub/livestock/pasture.html (Last accessed on 24Jan17)
- *Internet search terms:* ATTRA national sustainable agriculture information service pasture rangeland grazing

3.14 Livestock Grazing Management Plan

The farming operation has a written and implemented livestock grazing management plan which contains the following components: goals, a site description, and measures for maintaining or enhancing the health and vigor of the plant communities, of water quality and soil conditions, and of food and cover for wildlife species.	YES = 4
	NO = 0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To include environmental protection as elements of livestock management.

Verification: Visual inspection of the livestock grazing plan document.

References:

Bellows, BC. *Managed grazing in riparian areas*. The National Sustainable Agriculture Information Service - ATTRA. 2003.

Leonard, S, Kinch, G, Elsbernd, V, Borman, M, and Swanson, S. *Riparian area management: grazing management for riparian-wetland areas*. U. S. Department of the Interior, Bureau of Land Management, National Applied Resources Sciences Center. 1997.

Chapter 4: Soil Management

4.1 Nutrient Management Plan

The farming operation has a written and implemented comprehensive nutrient management plan containing the following components: field parameters and vineyard design specifications; vine nutrient demand considerations (growth, recent yields, and target yield); mineral nutrient supply considerations (soil analysis, water analysis); planned mineral nutrient applications (form, rate, timing, placement); monitoring activities (visual observations, tissue analysis); and a plan review and update schedule.	YES = 6
	NO = Fail Chapter

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To inventory mineral nutrient resource factors and clearly state mineral nutrient management goals, challenges, and strategies, including a vineyard monitoring strategy, which will serve as guidelines for the activities of the vineyard manager and his/her management team.

Verification: Visual inspection of the mineral nutrient management plan document.

References:

Burt, C, O'Connor, K, and Ruehr, T. *Fertigation*. Irrigation Training and Research Center, California Polytechnic State University, San Luis Obispo, CA. 1998.

California Fertilizer Association. *Western fertilizer handbook*. Interstate Publishers, Danville, IL. 1998.

Christensen, LP, Kasimatis, AN, and Jensen, FL. *Grapevine nutrition and fertilization in the San Joaquin Valley*. University of California, Berkeley. 1978.

Grant, S. *Balanced soil fertility management in wine grape vineyards*. Practical Winery and Vineyard. 24(1): 7-24. May/June 2002.

Grant, S. *Fertilizer efficiency for wine grape vineyards*. Practical Winery and Vineyard. 28(1): 35-41. March/April 2006.

Grant, S. Managing vineyard mineral nutrient efficiency beyond the 4 R's. Lodi Winegrape Commission Coffee Shop Blog. lodigrowers.com/managing-vineyard-mineral-defficiency-beyond-the-four-rs/. September 29, 2015.

Grant, S. Micronutrient management in vineyards. Lodi Winegrape Commission Coffee Shop Blog. lodigrowers.com/micronutrient-management-in-vineyards/. December 16, 2015.

Hanson, B, O'Connell, N, Hopmans, J, Simunek, J, and Beede, R. *Fertigation with microirrigation*. University of California Agricultural and Natural Resources Publication 21620. 2006.

Horwath, W, Ohmart, CP, and Storm, CP. Chapter 4. Soil Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

Tisdale, SL, Nelson, WL, Beaton, JD, and Havlin, JL. *Soil fertility and fertilizers*, 5th Ed. Macmillan Publishing Company, New York. 1993.

Nutrient Management Plan Organization:

Field parameters and vineyard design specifications: For example, vineyards with a large amount of vine biomass per unit land (e.g. divided trellis-training systems and high-density plantings) require more mineral nutrients than vineyards with a small amount of vine biomass per acre (e.g. widely spaced head trained vineyards).

Vine nutrient demand considerations:

- **Recent and targeted yields:** Consider that for well managed vineyards, nutrient loss is mainly proportionate to the fruit removed at harvest (≈ 3 lb N per ton and ≈ 5 lb K per ton).
- **Growth vigor:** While low vigor vineyards benefit from applications of most mineral nutrients, high vigor vineyards benefit from selected nutrients required for mineral nutrient balance (micronutrients, etc.).

Mineral nutrient supply considerations:

- **Soil analysis:** Vineyard soils are typically low in one or more mineral nutrients.
- **Water nutrient content:** Some irrigation waters contain significant amounts of mineral nutrients that have fertilizer value, while others are very low in dissolved minerals and with repeated applications, strip mineral nutrients from soils.

Planned mineral nutrient applications: Optimum fertilizer benefits with minimum undesirable side effects depend on proper fertilizer formulation, application timing, application rate, and placement within the vineyard (i.e. the 4 R's of mineral nutrient stewardship: right source, right rate, right time, and right place, ipni.net/4r, Last accessed on 24Jan17).

Monitoring activities: As with the management of all vineyard inputs, mineral nutrient management requires monitoring of vine condition, both externally with visual observations and internally through tissue analysis.

A plan review and update schedule.

4.2 Soil Erosion: Soil Conservation Plan

The farming operation is aware of the erosion risks of the vineyard soils and has a written and implemented soil conservation plan which addresses these risks and includes the following components: site and soil factors contributing to soil erosion by water and air, best management practices to minimize soil erosion, and a plan review and update schedule.	YES = 6
	NO = 0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To inventory soil erosion factors and risks, and to clearly state soil conservation objectives and strategies, which will serve as guidelines for the activities of the vineyard manager and his/her management team to minimize the off-site movement of soil.

Verification: Visual inspection of the soil conservation plan document.

References:

Follet, RF, and Stewart, BA. *Soil erosion and crop productivity*. American Society of Agronomy. Madison, WI. 1985.

O'Geen, AT, Elkins, R, and Lewis, D. *Erodibility of agricultural soil, with examples in Lake and Mendocino Counties*. University of California Division of Agriculture and Natural Resources Publication 8194. 2006.

O'Geen, AT, Prichard, TL, Elkins, R, and Pettygrove, GS. *Orchard floor management practices to reduce erosion and protect water quality*. University of California Division of Agriculture and Natural Resources Publication 8202. 2006.

O'Geen, AT, and Schwankl, LJ. *Understanding soil erosion in irrigated agriculture*. University of California Division of Agriculture and Natural Resources Publication 8196. 2005.

Peterson, AE, and Swan, JB. *Universal soil loss equation: past, present, and future*. SSSA Special Publication Number 8. Soil Science Society of America, Madison, WI. 1979.

Shepard, H, and Grismer, M. *Quantifying erosion rates for various vineyard management practices*. Practical Winery and Vineyard. 29(1): 50-54, 56-58, 60-62, 64. Jan/Feb 2007.

Stimson, D, and O'Connor, K. *Multiple benefits in vineyard erosion control*. Practical Winery and Vineyard. 27(1): 62-70. Jan/Feb 2005.

Soil Survey of Sacramento County, California, U.S.D.A. Soil Conservation Service. 1992.

U.S.D.A. Natural Resources Conservation Service - California website.

- ca.nrcs.usda.gov (Last accessed on 24Jan17)

Soil Conservation Plan Organization:

Summary of erosion risks.

Soil conservation goals: For example, to conserve topsoil, to promote the use of on-site mineral nutrient resources through organic matter additions and associated soil microbial activities, and to optimize the efficiency of applied resources.

Site and soil factors contributing to soil erosion by wind and air.

- **Soil resource and use inventory:** May include a table of pertinent NRCS soil survey information, a soil map, an NRCS generated soil conservation plan, the presence or absence of a cover crop and its composition, and soil, water, and plant tissue analysis results, followed by a written summary of significant soil factors identified in them.
- **Soil management challenges:** May include factors identified in the soil resource inventory, such as extreme texture (sand or clay), slow permeability, restricted drainage, limited water and/or nutrient holding capacity, acidity or alkalinity, very low or very high salinity, and low or high levels of specific mineral nutrients.
- **Best management practices to minimize soil erosion:** May include measures to improve the conditions listed as challenges, such as organic and/or mineral amendment additions, deep cultivation, cover cropping, and a mineral nutrient application schedule designed to accommodate soil conditions and vine mineral nutrient demand.

A plan review and update schedule.

4.3 Soil Mapping

A. Soils in the vineyard have been characterized by the NRCS Soil Survey or another mapping method (Veris, SIS, etc.) <u>AND</u> this information <u>has been physically confirmed</u> using a soil auger or soil pits.	2
B. Soils in the vineyard have been characterized by the NRCS Soil Survey or another mapping method (Veris, SIS, etc.).	1
C. There is <i>no soil map</i> for the vineyard.	0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To acquire a full understanding of soil characteristics and spatial soil variability within individual vineyard management units, and to consider their implications on grapevine growth, fruit production, applied resources, soil management strategies, and other aspects of vineyard operations.

Verification: Visual inspection of vineyard soil maps.

References:

Grant, S. NRCS soil survey information important to vineyards. Lodi Winegrape Commission Coffee Shop Blog. lodigrowers.com/nrcs-soil-survey-information-important-to-vineyards/. January 20, 2016.

Grant, S. Evaluating vineyard soils in trenches. Lodi Winegrape Commission Coffee Shop Blog. lodigrowers.com/evaluating-vineyard-soils-in-trenches/. February 17, 2016.

Horwath, W, Ohmart, CP, and Storm, CP. Chapter 4. Soil Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

Logsdon, S, Clay, D, Moore, D, and Tsegaye, T. (Eds.). *Soil science: step-by-step field analysis*. Soil Science Society of America. Madison, Wisconsin. 2008.

Soil Survey of Sacramento County, California, U.S.D.A. Soil Conservation Service. 1992.

U.S.D.A. Natural Resources Conservation Service Web Soil Survey.

- websoilsurvey.nrcs.usda.gov/app/ (Last accessed on 24Jan17)

4.4 Soil Analysis for General Soil Characteristics

A. <i>Within the last 2 years</i> , soil samples from the vineyard have been analyzed for pH, EC, CEC, OM, and base saturation <u>AND</u> the results are incorporated into the nutrient management plan.	3
B. <i>Within the last 4 years</i> , soil samples from the vineyard have been analyzed for pH, EC, CEC, OM, and base saturation <u>AND</u> the results are incorporated into the nutrient management plan.	2
C. <i>Within the last 6 years</i> , soil samples from the vineyard have been analyzed for pH, EC, CEC, OM and base saturation.	1
D. Soil samples from the vineyard <i>have not been analyzed</i> for general soil characteristics <i>for over 6 years</i> .	0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To ascertain the general chemical character of the vineyard soil for informed selection of mineral soil amendments, fertilizer formulations, and organic amendments.

Verification: Visual inspection of soil analysis reports and if appropriate, soil amendment and fertilization records.

Additional considerations: The sampling intervals used in this standard are general. Vineyards with deep, medium textured, neutral pH, and fertile soils typically do not require as frequent soil sampling as do vineyards with soils that are shallow, light or heavy textured, acid or alkaline, infertile or challenged by extreme mineral nutrient imbalances or salinity.

References:

California Plant Health Association. *Western fertilizer handbook*. 9th Ed. Interstate Publishers, Danville, IL. 2002.

Christensen, LP, Kasimatis, AN, and Jensen, FL. *Grapevine nutrition and fertilization in the San Joaquin Valley*. University of California, Berkeley. 1978.

Horwath, W, Ohmart, CP, and Storm, CP. Chapter 4. Soil Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

Magdoff, FR, Tabatbai MA, and Halnlon, EA, Jr. (Eds.). *Soil organic matter: analysis and interpretation*. Soil Science Society of America Special Publication Number 46. Soil Science Society of America, Madison, WI. 1996.

Neja, RA, Ayers, RS, and Kasimatis, AN. *Salinity appraisal of soil and water for successful production of grapes*. University of California Division of Agricultural Science Leaflet 21056. 1978.

Peacock, WL, and Christensen, LP. Soil and Water Analysis. In: *Raisin Production Manual*. Christensen, LP. (Ed). University of California Agriculture and Natural Resources Communication Services. Oakland, CA. 2000.

Reisenauer, HM. (Ed.). *Soil and plant tissue testing in California*. University of California Division of Agricultural Science Bulletin 1879. 1983.

4.5 Tillage of Vineyard Floors Between Vine Rows

A. Non-tillage is practiced in <u>every row</u> .	Go to Standard 4.5.1 , Standards 4.5.2 & 4.5.3 are N/A
B. Non-tillage is practiced in <u>every other row</u> .	Go to Standard 4.5.2 , Standards 4.5.1 & 4.5.3 are N/A
C. <i>Every row is tilled.</i>	Go to Standard 4.5.3 , Standards 4.5.1 & 4.5.2 are N/A

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To identify the type of tillage used and direct the participant to the proper Soil Management standard.

Verification: Visual inspection of the floors of individual vineyard management units submitted for **LODI RULES** certification.

4.5.1 Non Tillage for Maximum Erosion Control and Dust Suppression

A. Throughout the growing season, vegetative cover is maintained between every vine row, which gets fertilized, aerated, over seeded, and/or mowed to eliminate weeds as needed to promote a complete and uniform stand.	YES = 3
B. Throughout the growing season, vegetative cover is maintained between every vine row, but <i>no actions are taken</i> to promote a complete and uniform stand.	NO = 1

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To recognize appropriate vineyard floor management practices where topsoil conservation and/or dust suppression are primary concerns.

Verification: Visual inspection of the floors or floor management records for individual vineyard management units submitted for **LODI RULES** certification.

References:

Follet, RF, and Stewart, BA (Eds.). *Soil erosion and crop productivity*. American Society of Agronomy, Madison, Wisconsin. 1985.

Grant, J, Kelly-Anderson, K, Prichard, T, Hasey, J, Bugg, RL, Thomas, F, and Johnson, T. *Cover crops for walnut orchards*. University of California Agriculture and Natural Resources Publication 21627. 2006.

Grant, S. Maximizing cover crop benefits through selection and management. Lodi Winegrape Commission Coffee Shop Blog. lodigrowers.com/maximizing-cover-crop-benefits-through-selection-and-management/. October 12, 2015.

Horwath, W, Ohmart, CP, and Storm, CP. Chapter 4. Soil Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

Ingels, CA, Bugg, RL, McGourty, GT, and Christensen, LP. (Eds.). *Cover cropping in vineyards*. University of California Division of Agriculture and Natural Resources Publication 3338. 1998.

Kaspar, TC, and Singer, JW. The use of cover crops to manage soil. In: *Soil management: building a stable base for agriculture*. Hatfield, JL, and Sauer, TJ (Eds.). Agronomy Society of America and Soil Science Society of America, Madison, Wisconsin. 2011.

4.5.2 Partial Tillage for Vineyard Access and Dust Suppression with Substantial Addition of Organic Matter

A. <i>Early in the growing season</i> , every other middle is tilled <u>only as needed</u> to incorporate vegetation <u>AND</u> only after excess moisture has drained from the topsoil.	3
B. <i>Early in the growing season</i> , every other middle is tilled <u>only as needed</u> to incorporate vegetation <u>AND</u> only after excess moisture has drained from the topsoil <u>AND</u> to remove any weeds present after rains.	2
C. Every other middle is tilled <u>only as needed</u> to incorporate vegetation <u>AND</u> only after excess moisture has drained from the topsoil <u>AND</u> to remove any weeds present after rains <u>and</u> after furrow or sprinkler irrigations.	1
D. Every other middle is tilled <i>without concern for vineyard floor surface or soil conditions</i> .	0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To recognize appropriate vineyard floor management practices where simultaneous management concerns include prompt access after rains with minimum soil compaction, dust suppression, and increasing soil humus.

Verification: Visual inspection of the floors or floor management records for individual vineyard management units submitted for **LODI RULES** certification.

References:

Grant, J, Kelly-Anderson, K, Prichard, T, Hasey, J, Bugg, RL, Thomas, F, and Johnson, T. *Cover crops for walnut orchards*. University of California Agriculture and Natural Resources Publication 21627. 2006.

Grant, S. Maximizing cover crop benefits through selection and management. Lodi Winegrape Commission Coffee Shop. lodigrowers.com/maximizing-cover-crop-benefits-through-selection-and-management/. October 12, 2015.

Horwath, W, Ohmart, CP, and Storm, CP. Chapter 4. Soil Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

Ingels, CA, Bugg, RL, McGourty, GT, and Christensen, LP. (Eds.). *Cover cropping in vineyards*. University of California Division of Agriculture and Natural Resources Publication 3338. 1998.

Kaspar, TC, and Singer, JW. The use of cover crops to manage soil. In: *Soil management: building a stable base for agriculture*. Hatfield, JL, and Sauer, TJ. (Eds.). Agronomy Society of America and Soil Science Society of America, Madison, Wisconsin. 2011.

Wildman, WE, Meyer, JL, and Neja, RA. *Managing and modifying problem soils*. University of California Division of Agricultural Sciences Leaflet 2791. 1982.

4.5.3 Complete Tillage for Frost Protection and Maximum Organic Matter Addition to the Soil

A. <i>Early in the growing season</i> , every middle is tilled <u>only as needed</u> to incorporate vegetation <u>AND</u> only after excess moisture has drained from the topsoil.	3
B. <i>Early in the growing season</i> , every middle is tilled <u>only as needed</u> to incorporate vegetation <u>AND</u> only after excess moisture has drained from the topsoil <u>AND</u> to remove any weeds present after rains.	2
C. Every middle is tilled <u>only as needed</u> to incorporate vegetation <u>AND</u> only after excess moisture has drained from the topsoil <u>AND</u> to remove any weeds after rains <u>and</u> after furrow or sprinkler irrigations.	1
D. Every middle is tilled <i>without concern for vineyard floor surface or soil conditions</i> .	0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To recognize appropriate vineyard floor management practices where avoiding frost damage to grapevine shoot tissues, conserving moisture stored from winter rains, and increasing soil humus are paramount concerns.

Verification: Visual inspection of the floors or floor management records for individual vineyard management units submitted for **LODI RULES** certification.

References:

Chancellor, WJ. *Compaction of soil by agricultural equipment*. University of California Division of Agricultural Sciences Leaflet 1881. 1977.

Dregne, HE, and Willis, WO. (Eds.). *Dryland agriculture*. American Society of Agronomy, Madison, WI. 1983.

Follett, RF, Steward, JWB, Cole, CV, and Power, JF. (Eds.). *Soil fertility and organic matter as critical components of production systems*. Soil Science Society of America Special Publication Number 19. Soil Science Society of America, Madison, WI. 1987.

Snyder, RL, Paw U, KT, and Thompson, JF. *Passive frost protection of trees and vines*. Cooperative Extension, University of California Division of Agriculture and Natural Resources Leaflet 21429. Undated.

Wildman, WE, Meyer, JL, and Neja, RA. *Managing and modifying problem soils*. University of California Division of Agricultural Sciences Leaflet 2791. 1982.

Winkler, AJ, Cook, JA, Kliewer, WM, and Lider, LA. *General viticulture*. UC Berkeley. 1974.

4.6 Amendments for pH

A. The pH of the vineyard soil is between 5.5 and 8.0.	2
B. If soil pH is less than 5.5 (acid), or above 8.0 (alkaline), action has been taken to bring the pH closer to 7, such as adding a liming amendment (agricultural lime, dolomite) if soil pH is less than 5.5 or an acidifying agent (sulfuric acid, soil sulfur) if soil pH is above 8.0 <u>AND every year</u> soil pH is measured to monitor the progress of the amendment program.	2
C. The pH of the vineyard soil <i>has not been measured</i> <u>OR</u> the soil pH is less than 5.5 or above 8.5 and <i>no action has been taken to improve the pH</i> .	0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To recognize soil management that promotes root zone chemical environments near neutral, which contributes to optimum mineral nutrient availability and a diverse microbial community.

Verification: Visual inspection of soil analysis reports and if appropriate, inspection of mineral amendment or acidifying agent application records.

References:

California Plant Health Association. *Western fertilizer handbook*. 9th Ed. Interstate Publishers, Danville, IL. 2002.

Horwath, W, Ohmart, CP, and Storm, CP. Chapter 4. Soil Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

Pearson, RW, and Adams, F (Eds.). *Soil acidity and liming*. American Society of Agronomy, Madison, Wisconsin. 1967.

Tisdale, SL, Nelson, WL, Beaton, JD, and Havlin, JL. *Soil fertility and fertilizers*, 5th Ed. Macmillan Publishing Company, New York. 1993.

4.7 Organic Matter (OM)

A. <i>Within the last 12 months</i> , organic matter has been added to the vineyard soil using a cover crop, compost*, or manure (applied to every row or every other row).	3
B. <i>Within the last 30 months</i> , organic matter has been added to the vineyard soil using a cover crop, compost*, or manure (applied to every row or every other row).	2
C. <i>No organic matter has been added</i> to the vineyard soil except for vineyard prunings and fallen grape leaves.	0

*Do not apply winegrape pomace from vineyards infested with vine mealybug.

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To recognize efforts taken to maximize soil organic matter and its associated benefits on soil microorganisms; soil nutrient release, cycling, and holding capacity; chemical buffering against changes in soil pH and salinity; soil particle aggregation, porosity, and permeability; resistance to erosion; and soil water holding capacity.

Verification: Inspection of cover crop and/or organic soil amendment records.

References:

Chaney, DE, Drinkwater, LE, and Pettygrove, GS. *Organic soil amendments and fertilizers*. UC Sustainable Agriculture Research and Education Program, University of California Division of Agriculture and Natural Resources Publication 21505. 1992.

Grant, S. Maximizing cover crop benefits through selection and management. Lodi Winegrape Commission Coffee Shop. lodigrowers.com/maximizing-cover-crop-benefits-through-selection-and-management/. October 12, 2015.

Follett, RF, Steward, JWB, Cole, CV, and Power, JF. (Eds.). *Soil fertility and organic matter as critical components of production systems*. Soil Science Society of America Special Publication Number 19. Soil Science Society of America, Madison, WI. 1987.

Horwath, W, Ohmart, CP, and Storm, CP. Chapter 4. Soil Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

Kaspar, T, and Singer, JW. The use of cover crops to manage soil. In: *Soil management: building a stable base for agriculture*. Hatfield, JL, and Sauer, TJ (Eds.). Agronomy Society of America and Soil Science Society of America, Madison, WI. 2011.

Larney, FJ, Hao, X, and Topp, E. Manure management. In: *Soil management: building a stable base for agriculture*. Hatfield, JL, and Sauer, TJ (Eds.). Agronomy Society of America and Soil Science Society of America, Madison, WI. 2011.

4.8 Water Penetration Mitigation

A. <u>Water penetration is adequate</u> in the vineyard (water does not puddle or run off when soil is dry underneath).	2
B. If irrigation and/or rain water penetration is poor (water puddles and runs off when soil is dry underneath), <u>two or more of the following techniques are applied to improve water penetration</u> : shorter and more frequent irrigations; incorporating gypsum, compost, manure, and/or a cover crop in the middles; and/or soil ripping between vine rows.	2
C. If irrigation and/or rain water penetration is poor (water puddles and runs off when soil is dry underneath), <u>one of the following techniques is applied to improve water penetration</u> : shorter and more frequent irrigations; incorporating gypsum, compost, manure, and/or a cover crop in the middles; and/or soil ripping between vine rows.	1
D. Irrigation and/or rainwater penetration is poor (water puddles and runs off when soil is dry underneath), but <i>no corrective action is being taken</i> .	0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To recognize appropriate efforts, when necessary, to enhance water infiltration and thereby, soil water storage.

Verification: Inspection of soil amendment, cover crop, irrigation, and/or ripping records.

References:

Horwath, W, Ohmart, CP, and Storm, CP. Chapter 4. Soil Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

Oster, JD, Singer, MJ, Fulton, A, Richardson, W, and Prichard, T. *Water penetration problems in California soils - diagnosis and solutions*. Kearney Foundation of Soil Science, University of California Division of Agriculture and Natural Resources. Undated.

4.9 Water Analysis

A. <i>Within the last year</i> , irrigation water was tested for irrigation suitability* <u>AND</u> soil amendment programs and nutrient management plans were altered according to the results.	3
B. <i>Within the last 2 years</i> , irrigation water was tested for irrigation suitability* <u>AND</u> soil amendment programs and nutrient management plans were altered according to the results.	2
C. <i>Within the last 5 years</i> , irrigation water was tested for irrigation suitability* <u>AND</u> soil amendment programs and nutrient management plans were altered according to the results.	1
D. Irrigation water <i>has not been tested for irrigation suitability* for over 5 years.</i>	0

**Irrigation suitability* refers to a water panel analysis available from most agricultural laboratories in California, which typically includes pH, electrical conductivity, sodium adsorption ratio, calcium, magnesium, bicarbonate, iron, manganese, sodium, chloride, boron, nitrate-nitrogen, sulfate-sulfur, and/or bacterial counts.

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To ascertain the chemical character of applied irrigation water and its potential impact on soil characteristics, and to determine if efforts were made to use this knowledge to enhance the physical character, chemical character, and balance of mineral nutrients in the soil.

Verification: Visual inspection of water analysis reports, mineral nutrient plans, and if appropriate, fertilization and soil amendment records.

Additional Considerations: The chemistries of some irrigation waters change over the course of a growing season and these changes may significantly impact vineyard soils and grapevines. Although this may be true for any irrigation water source, it is most common for surface waters. For such waters, more frequent analysis is appropriate for optimum management.

References:

Grant, S. *Balanced soil fertility management in wine grape vineyards*. Practical Winery and Vineyard. 24(1): 7-24. May/June 2002.

Neja, RA, Ayers, RS, and Kasimatis, AN. *Salinity appraisal of soil and water for successful production of grapes*. University of California Division of Agricultural Science Leaflet 21056. 1978.

Peacock, WL, and Christensen, LP. Soil and Water Analysis. In: *Raisin Production Manual*. Christensen, LP. (Ed). University of California Agriculture and Natural Resources Communication Services. Oakland, CA. 2000.

Reisenauer, HM. (Ed.). *Soil and plant tissue testing in California*. University of California Division of Agricultural Science Bulletin 1879. 1983.

4.10 Soil Analysis for Mineral Nutrients

A. <i>Within the last 4 years</i> , soil samples from the vineyard were analyzed for macronutrients and micronutrients <u>AND</u> the results are incorporated into the nutrient management plan.	6
B. <i>Within the last 6 years</i> , soil samples from the vineyard were analyzed for macronutrients and micronutrients <u>AND</u> the results are incorporated into the nutrient management plan.	4
C. Soil samples from the vineyard were analyzed for macronutrients and micronutrients at some point since the vineyard was planted, but <i>over 6 years ago</i> .	2
D. Soil samples from the vineyard <i>have never been analyzed</i> for mineral nutrients.	0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To ascertain soil fertility and the presence of mineral nutrient imbalances, and to determine if this knowledge was used to enhance the use of mineral nutrient resources.

Verification: Visual inspection of soil analysis reports and mineral nutrient management plan.

References:

California Plant Health Association. *Western fertilizer handbook*. 9th Ed. Interstate Publishers, Danville, IL. 2002.

Christensen, LP, Kasimatis, AN, and Jensen, FL. *Grapevine nutrition and fertilization in the San Joaquin Valley*. University of California, Berkeley. 1978.

Grant, S. *Balanced soil fertility management in wine grape vineyards*. Practical Winery and Vineyard. 24(1): 7-24. May/June 2002.

Horwath, W, Ohmart, CP, and Storm, CP. Chapter 4. Soil Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

Peacock, WL, and Christensen, LP. Soil and Water Analysis. In: *Raisin Production Manual*. Christensen, LP. (Ed). University of California Agriculture and Natural Resources Communication Services. Oakland, CA. 2000.

Reisenauer, HM. (Ed.). *Soil and plant tissue testing in California*. University of California Division of Agricultural Science Bulletin 1879. 1983.

4.11 Plant Analysis

A. <u>A petiole or leaf blade sample</u> has been sent to a lab for analysis <i>more than once during the last year</i> .	3
B. A <u>bloom-time petiole or leaf blade sample</u> has been sent to a lab for analysis <i>within the last year</i> .	2
C. <u>A bloom-time petiole or leaf blade sample</u> has been sent to a lab for analysis <i>within the last 2 years</i> .	1
D. No petiole or leaf blade samples have been sent to a lab <i>in over 2 years</i> .	0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To ascertain some indication of grapevine mineral nutrient status.

Verification: Visual inspection of tissue analysis reports.

References:

California Plant Health Association. *Western fertilizer handbook*. 9th Ed. Interstate Publishers, Danville, IL. 2002.

Christensen, LP, Kasimatis, AN, and Jensen, FL. *Grapevine nutrition and fertilization in the San Joaquin Valley*. University of California, Berkeley. 1978.

Grant, S. *Balanced soil fertility management in wine grape vineyards*. Practical Winery and Vineyard. 24(1): 7-24. May/June 2002.

Horwath, W, Ohmart, CP, and Storm, CP. Chapter 4. Soil Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

Reisenauer, H. M. (Ed.). *Soil and plant tissue testing in California*. University of California Division of Agricultural Science Bulletin 1879. 1983.

4.12.1 Nitrogen Application

A. Nitrogen is applied as a <u>non-mined, biological source</u> .	Take 5 points and go to Standards 4.12.2 & 4.12.3 (Standard 4.12.4 is N/A)
B. Nitrogen is applied as a <u>manufactured or mined source</u> .	Take 6 points and go to Standard 4.12.4 (Standards 4.12.2 & 4.12.3 are N/A)
C. Nitrogen is applied as a <u>combination of non-mined, biological, manufactured, and/or mined sources</u> .	Go to Standards 4.12.2, 4.12.3, & 4.12.4
D. Nitrogen will not be applied this certification year because adequate amounts are provided by a cover crop and/or irrigation water, and vine tissue analysis indicates that the vines contain adequate amounts of nitrogen.	Take 12 points and go to Chapter 5 (Standards 4.12.2, 4.12.3, & 4.12.4 are N/A)

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To direct the participant to the appropriate nitrogen management standard.

Verification: Inspection of vineyard observation records, tissue analysis reports, water analysis reports, and nitrogen application records.

4.12.2 Non-mined Biologically Sourced Nitrogen

Select all that apply:

4.12.2.1 Nitrogen from Finished Compost	YES = 2
In the vineyard, finished compost (dairy, steer, and/or poultry manure, green waste, grape pomace*, or any combination of these) is used as a nitrogen source.	NO = 0
4.12.2.2 Nitrogen from Non-Composted Material	YES = 1
In the vineyard, non-composted grape pomace*, manure, and/or legume-rich green manure cover crop is used as a nitrogen source.	NO = 0

*Do not apply wine grape pomace from vineyards infested with vine mealybug.

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To determine if relatively slow nitrogen release from compost or relatively quick release nitrogen from pomace, manure, or legume rich cover crop were used to supply nitrogen to the grapevines.

Verification: Inspection of organic amendment records.

References:

Chaney, DE, Drinkwater, LE, and Pettygrove, GS. *Organic soil amendments and fertilizers*. UC Sustainable Agriculture Research and Education Program, University of California Division of Agriculture and Natural Resources Publication 21505. 1992.

Grant, J, Kelly-Anderson, K, Prichard, T, Hasey, J, Bugg, RL, Thomas, F, and Johnson, T. *Cover crops for walnut orchards*. University of California Agriculture and Natural Resources Publication 21627. 2006.

Grant, S. Nitrogen Fertilizer Forms. Lodi Winegrape Commission Coffee Shop Blog. lodigrowers.com/2017/01/. January 04, 2017.

Hirschfeld, DJ. Soil fertility and vine nutrition. In: *Cover cropping in vineyards*. Ingels, CA, Bugg, RL, McGourty, GT, and Christensen, LP. (Eds.). University of California Division of Agriculture and Natural Resources Publication 3338. 1998.

4.12.3 Non-mined, Biologically Sourced Nitrogen

Select all that apply:

4.12.3.1 Fertility Analysis Report	YES = 1
For each nitrogen source material, records of the fertility analysis report are kept.	NO = 0
4.12.3.2 Incorporation of Material	YES = 1
Compost, pomace, or manure is incorporated after application <u>AND/OR</u> green manure cover crops are incorporated immediately after chopping.	NO = 0
4.12.3.3 Material Spreader Calibrated	YES = 1
The spreader is calibrated so that the application rate is known.	NO = 0
4.12.3.4 Material Application Timing	YES = 1
Compost, pomace, or manure is applied after harvest in the fall <u>AND/OR</u> in the spring before bud break.	NO = 0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To recognize responsible use of soil amendments as sources of nitrogen.

Verification: Inspection of soil amendment analysis reports and/or application and incorporation records.

References:

Follett, RF, Keeney, DR, and Cruse, RM (Eds.). *Managing nitrogen for groundwater quality and farm profitability*. Soil Science Society of America, Madison, WI. 1991.

Grant, S. Nitrogen Fertilizer Forms. Lodi Winegrape Commission Coffee Shop Blog. lodigrowers.com/2017/01/. January 04, 2017.

Larney, FJ, Hao, X, and Topp, E. Manure management. In: *Soil management: building a stable base for agriculture*. Hatfield, JL, and Sauer, TJ. (Eds.). Agronomy Society of America and Soil Science Society of America, Madison, WI. 2011.

4.12.4 Manufactured or Mined Nitrogen

A. <u>No more than 10 units of N</u> are applied per application and never when the vine is dormant.	5
B. <u>No more than 15 units of N</u> are applied per application and never when the vine is dormant.	3
C. <u>No more than 25 units of N</u> are applied per application and never when the vine is dormant.	1
D. Nitrogen is applied <i>when the vine is dormant</i> .	0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To determine if nitrogen fertilizer was applied for enhanced efficiency and minimum risk of environmental harm.

Verification: Inspection of fertilizer application records.

References:

California Plant Health Association. *Western fertilizer handbook*. 9th Ed. Interstate Publishers, Danville, IL. 2002.

Follett, RF, Keeney, DR, and Cruse, RM (Eds.). *Managing nitrogen for groundwater quality and farm profitability*. Soil Science Society of America, Madison, Wisconsin. 1991.

Grant, S. *Balanced soil fertility management in wine grape vineyards*. Practical Winery and Vineyard. 24(1): 7-24. May/June 2002.

Grant, S. *Fertilizer efficiency for wine grape vineyards*. Practical Winery and Vineyard, 28(1): 35-41. March/April 2006.

Grant, S. Nitrogen Part II. Effective Nitrogen Management in Wine Grape Vineyards. Lodi Winegrape Commission Coffee Shop Blog. lodigrowers.com/nitrogen-part-ii-effective-nitrogen-management-for-vineyards/. November 24, 2015.

Grant, S. Nitrogen Fertilizer Forms. Lodi Winegrape Commission Coffee Shop Blog. lodigrowers.com/2017/01/. January 04, 2017.

Horwath, W, Ohmart, CP, and Storm, CP. Chapter 4. Soil Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 111-141. 2008.

Tisdale, SL, Nelson, WL, Beaton, JD, and Havlin, JL. *Soil fertility and fertilizers*, 5th Ed. Macmillan Publishing Company, New York. 1993.

Chapter 5: Water Management

5.1 Water Management Plan

The farming operation has a written and implemented water management plan containing the following components: soil moisture management goals and strategies; soil water holding capacity, water intake rate, and water permeability; irrigation suitability* analysis of applied water; irrigation system design and performance; and a plan review and update schedule.	YES = 6
	NO = 0

*See standards **4.9** and **5.3** for more information on *irrigation suitability*.

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: To inventory water resource factors and to clearly state water management goals, challenges, and strategies, including vineyard monitoring strategy, which will serve as guidelines for the activities of the vineyard manager and his/her management team.

Verification: Visual inspection of the water management plan document.

References:

Goldhammer, DA, and Snyder, RL. *Irrigation scheduling: a guide for efficient on-farm water management*. University of California, Division of Agriculture and Natural Resources. Publication 1989.

Grant, S. *Five-step irrigation schedule: promoting fruit quality and vine health*. Practical Winery and Vineyard. 21(1):46-52, 75. May/June 2000.

Grant, S. Comprehensive vineyard water management. Lodi Winegrape Commission Coffee Shop Blog. lodigrowers.com/comprehensive-vineyard-water-management/. August 18, 2015.

Hanson, B, Orloff, S, and Sanden, B. *Monitoring soil moisture for irrigation water management*. University of California Agriculture and Natural Resources Publication 21635. 2007.

Prichard, TL, Hanson B, Schwankl, L, Verdegaal, P, and Smith, R. *Deficit irrigation of quality winegrapes using micro-irrigation techniques*. University of California Cooperative Extension, Department of Land, Air, Water Resources, University of California, Davis. 2004.

Prichard, T, Storm, CP, and Ohmart, CP. Chapter 5, Water Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 142-186. 2008.

Prichard, TL. *Irrigation of quality winegrapes*. 49th Annual Lodi Grape Day Proceedings. pp. 31-44. 2001.
Williams, LE, and Matthews, MA. Grapevine. In: *Irrigation of Agricultural Crops*. Stewart, BA, and Nielsen, DR. (Eds.). Madison, WI. American Society of Agronomy. pp. 1019-1055. 1990.

Water Management Plan Organization:

Soil moisture management goals and strategies: For example, to optimize vineyard water use while practicing water conservation. Other goals may be ensuring maximum moisture storage from winter rains, optimizing irrigation water application efficiency, and irrigation initiation and scheduling based on the condition of the vineyard moisture continuum: grapevine moisture status, atmospheric moisture demand, and available soil moisture supply in the root zone. What are the challenges faced in this vineyard system? Perhaps there is surface water that is too pure and with repeated applications, diminishes soil permeability to water and air, or well water that contains excessive salts, requiring additional applied water (a leaching fraction) to avoid water stress in grapevines.

Water intake rate and permeability: Take an overall water resource and use inventory. Identify the water source (well and/or surface (district, river, and/or reservoir)), **root zone soil water holding capacity** when full, soil permeability and water infiltration rate, presence or absence of a cover crop, and type and efficiency of the irrigation system.

Early in the season, monitor grapevines for threshold moisture status (e.g. arrested shoot growth or water potential < -10 bars) and after the onset of irrigations, regularly (at some specified time interval) monitor grapevine moisture status, atmospheric moisture demand (evapotranspiration or ET), and level of moisture in the soil reservoir.

Irrigation suitability analysis of applied water: At a specified time interval, collect irrigation water samples and submit for analysis, and based on the analysis results, modify irrigation schedule and irrigation system maintenance actions as needed.

Irrigation system design and performance: Using a specified time interval, regularly monitor irrigation system flow and pressure both before and after the filters, and inject materials to prevent clogging based on stated criteria.

A plan review and update schedule.

5.2 Irrigation Water Source

Choose the best answer below for the vineyard block's irrigation source.

A. Surface water.	2
B. Some surface and some groundwater.	1
C. Groundwater only.	0
D. Reclaimed or recaptured water.	+1 (bonus)

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To identify the type of irrigation water source and to award sustainable farming points according to the impact of irrigation on the local water resource base (i.e. groundwater).

Verification: Visual inspection of irrigation design plans and/or in-field inspection of the actual irrigation system.

5.3 Monitoring Water Quality

A. <i>Within the last year</i> , irrigation water was tested for irrigation suitability* <u>AND</u> the results are incorporated into the water management plan.	3
B. <i>Within the last 2 years</i> , irrigation water was tested for irrigation suitability* <u>AND</u> the results are incorporated into the water management plan.	2
C. <i>Within the last 5 years</i> , irrigation water was tested for irrigation suitability* <u>AND</u> the results are incorporated into the water management plan.	1
D. Irrigation water <i>has not been tested</i> for irrigation suitability* <i>for over 5 years.</i>	0

**Irrigation suitability* refers to a water panel analysis available from most agricultural laboratories in California, which typically includes pH, electrical conductivity, sodium adsorption ratio, calcium, magnesium, bicarbonate, iron, manganese, sodium, chloride, boron, nitrate-nitrogen, sulfate-sulfur, and/or bacterial counts.

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To determine levels of clogging agents and salts. These data indicate the need for irrigation water treatment, the specific type of water treatment, the leaching fraction, if any, required to limit the impact of salts on grapevine water uptake, and the likelihood of mineral nutrient removal due to a high degree of water purity.

Verification: Inspection of laboratory water analysis reports, which ought to be a part of the water management plan.

Additional Considerations: The chemistries of some irrigation waters change over the course of a growing season and these changes may significantly impact vineyard soils and grapevines. Although this may be true for any irrigation water source, it is most common for surface waters. For such waters, more frequent analysis is appropriate for optimum management.

References:

Ayers, RS. Irrigation water quality. In: *Soil and plant tissue testing in California*. Reisenauer, HM. (Ed.). University of California Division of Agricultural Sciences Bulletin 1879. 1983.

Neja, RA, Ayers, RS, and Kasimatis, AN. *Salinity appraisal of soil and water for successful grape production*. University of California Division of Agricultural Sciences Leaflet 21056. 1978.

Prichard, TL. *Water quality and soil salinity guidelines*. Unpublished survey.

Prichard, T, Storm, CP, and Ohmart, CP. Chapter 5, Water Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK (Eds.). Lodi Winegrape Commission. pp. 142-186. 2008.

Schwankl, L, Hanson, B, Prichard, T. *Micro-irrigation of trees and vines: a handbook for water managers*. University of California Irrigation Program. UC Davis. 1995.

5.4 Irrigation System

<p>A. The vineyard is not irrigated (other than one post-harvest irrigation) because soil moisture is adequate for production goals.</p>	<p>Take 17 points and go to Standard 5.11 before proceeding to Chapter 6 (all other remaining Standards in Chapter 5 are N/A)</p>
<p>B. The vineyard is irrigated during the growing season.</p>	<p>Go to Standard 5.5</p>

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To identify and reward points to those participants whose vineyards require negligible in-season vineyard moisture management and no in-season water applications, and to direct participants to the next Water Management Standard(s).

Verification: Inspection of soil moisture sensor records for the growing season.

References:

Hanson, B. *Irrigation performance in California*. Irrigation Journal (Irrigation Association). pp. 20-22. Oct, 1995.

5.5 Irrigation Power Plant

Which type of irrigation power plant is used to deliver water to the vineyard?

A. Electric power plant with renewable energy.	3
B. Water delivered by gravity flow without supplemental power.	3
C. Electric power plant <u>equipped with time of use plan if available</u> from a utility district, propane, or diesel plant (Tier 2 or greater).	2
D. Electric power plant <u>not equipped with time of use meter if available</u> from a utility district.	1
E. All other power plants.	0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: Identify irrigation system power plant and award sustainable farming points according to potential energy use efficiency.

Verification: In-field inspection of the irrigation power plant.

References:

Hanson, BR, Weigand, C, and Orloff, S. *Variable-frequency drives for elective irrigation pumping plants save energy*. California Agriculture. 50, 36-39. 1996.

Hanson, B. *Irrigation pumping plants*. University of California Irrigation Program. UC Davis. 1994.

Hanson, BR. *Improving pumping plant efficiency does not always save energy*. California Agriculture. 56, 123-127. 2002.

5.6 Back Flow Prevention

A. There is a back flow prevention device installed on the irrigation pump.	2
B. <i>A back flow prevention device is not</i> installed on the irrigation pump.	Fail Chapter

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To be certain that irrigation water sources have adequate protection against contamination from materials injected into the irrigation system.

Verification: In-field inspection of irrigation system pump station. Acceptable back-flow prevention devices include an air gap, double-check valves, and siphon breakers.

References:

Hanson, B, O'Connell, N, Hopmans, J, Simunek, J, and Beede, R. *Fertigation with microirrigation*. University of California Agriculture and Natural Resources Publication 21620. 2006.

Zoldoske, DF, Jacobsen, T, and Norum, EM. *Grower training manual for backflow prevention in chemigation of pesticides*. The Center for Irrigation Technology, California Agricultural Technology Institute, California State University, Fresno. 2004.

5.7 Irrigation System Maintenance

Which type of irrigation system does the vineyard use?

Choose the answer representing the majority of the vineyard block.

A. Low volume - surface.	Go to Standard 5.7.1 (Standards 5.7.2 , 5.7.3 , & 5.7.4 are N/A)
B. Low volume - subsurface.	Go to Standard 5.7.2 (Standards 5.7.1 , 5.7.3 , & 5.7.4 are N/A)
C. Overhead sprinkler.	Go to Standard 5.7.3 (Standards 5.7.1 , 5.7.2 , & 5.7.4 are N/A)
D. Flood or furrow.	Go to Standard 5.7.4 (Standards 5.7.1 , 5.7.2 , 5.7.3 & 5.9 are N/A)

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To direct participants to the appropriate irrigation system maintenance farming Standard.

Verification: Visual inspection of the vineyard.

5.7.1 Maintenance for Low Volume - Surface Irrigation Systems

A. <i>At least every other irrigation</i> , filters, gauges (flow meters and/or pressure gauges), submains, drip lines, and emitters are checked, line leaks and breaks are repaired, and clogs are freed.	3
B. <i>At least every fourth irrigation</i> , filters, gauges (flow meters and/or pressure gauges), submains, drip lines, and emitters are checked, line leaks and breaks are repaired, and clogs are freed.	2
C. <i>At least once per year</i> , filters, gauges (flow meters and/or pressure gauges), submains, drip lines, and emitters are checked, line leaks and breaks are repaired, and clogs are freed.	1
D. <i>No type of irrigation system maintenance</i> has been completed <i>in the last year.</i>	Fail Chapter

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To determine the thoroughness and intensity of irrigation system maintenance efforts for optimized use of water and water applied resources.

Verification: Inspection of irrigation maintenance records.

References:

Burt, CM, and Styles, SW. *Drip and microirrigation for trees vines and row crops (with special sections on buried drip)*. Irrigation Training and Research Center, Department of Agricultural Engineering, California Polytechnic State University, San Luis Obispo. 1994.

Prichard, T, Storm, CP, and Ohmart, CP. Chapter 5, Water Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 142-186. 2008.

Rible, JM, Meyer, JL, Aljibury, FK, and Schulbach, H. Chapter 6. Clogging and filtration. In: *Drip Irrigation Management*. Ferewres, E. (Ed.). University of California Division of Agricultural Sciences Leaflet 21259. 1981.

Schwankl, L, Hanson, B, and Prichard, T. *Micro-irrigation of trees and vines: a handbook for water managers*. University of California Irrigation Program, UC Davis. 1995.

University of California: Maintenance of Microirrigation Systems, micromaintain.ucanr.edu (Last accessed on 3Feb17)

5.7.2 System Maintenance for Low Volume - Subsurface Irrigation Systems

A. At least every irrigation , flow meters, pressure gauges, and relief valves are checked <u>AND</u> leaks are repaired.	3
B. At least every fourth irrigation , flow meters, pressure gauges, and relief valves are checked <u>AND</u> leaks are repaired.	2
C. At least once every year , flow meters, pressure gauges, and relief valves are checked <u>AND</u> leaks are repaired.	1
D. No type of system maintenance has been completed <i>in the last year.</i>	Fail Chapter

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To determine the thoroughness and intensity of irrigation system maintenance efforts for optimized use of water and water applied resources.

Verification: Inspection of irrigation maintenance records.

References:

Burt, CM, and Styles, SW. *Drip and microirrigation for trees vines and row crops (with special sections on buried drip)*. Irrigation Training and Research Center, Department of Agricultural Engineering, California Polytechnic State University, San Luis Obispo. 1994.

Prichard, T, Storm, CP, and Ohmart, CP. Chapter 5, Water Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 142-186. 2008.

Schwankl, L, Hanson, B, and Prichard, T. *Micro-irrigation of trees and vines: a handbook for water managers*. University of California Irrigation Program, U C Davis. 1995.

University of California: Maintenance of Microirrigation Systems, micromaintain.ucanr.edu (Last accessed on 3Feb17)

5.7.3 Maintenance for Sprinkler Systems

A. <i>At least every irrigation</i> , pressure gauges on filters, head rotation, and nozzle clogging is checked, line leaks and breaks are repaired, clogs are freed, and head rotation problems are fixed.	3
B. <i>At least every other irrigation</i> , pressure gauges on filters, head rotation, and nozzle clogging is checked, line leaks and breaks are repaired, clogs are freed, and head rotation problems are fixed.	2
C. <i>At least once every year</i> , pressure gauges on filters, head rotation, and nozzle clogging is checked, line leaks and breaks are repaired, clogs are freed, and head rotation problems are fixed.	1
D. <i>No type of system maintenance</i> has been completed <i>in the last year</i> .	Fail Chapter

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To determine the thoroughness and intensity of irrigation system maintenance efforts for optimized use of water and water applied resources.

Verification: Inspection of irrigation maintenance records.

References:

Meyer, JL, and Marsh, AW. *A permanent sprinkler system for deciduous orchards and vineyards*. University of California Division of Agricultural Sciences Leaflet 2435. 1981

Prichard, T, Storm, CP, and Ohmart, CP. Chapter 5, Water Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 142-186. 2008.

Schwankl, LJ, Prichard, TL, and Hanson, BR. *Managing existing sprinkler irrigation systems*. University of California Division of Agriculture and Natural Resources Publication 8215. 2007.

5.7.4 System Maintenance for Flood and Furrow Irrigation Systems

A. <i>At least every irrigation</i> , the system is monitored for leaks, breaks, clogging, and flow distribution, and if problems are found, repairs and adjustments are made.	3
B. <i>At least every other irrigation</i> , the system is monitored for leaks, breaks, clogging, and flow distribution, and if problems are found, repairs and adjustments are made.	2
C. <i>At least once every year</i> , the system is monitored for leaks, breaks, clogging, and flow distribution, and if problems are found, repairs and adjustments are made.	1
D. <i>No type of system maintenance</i> has been completed <i>in the last year.</i>	Fail Chapter

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To determine the thoroughness and intensity of irrigation system maintenance efforts for optimized use of water and water applied resources.

Verification: Inspection of irrigation maintenance records.

References:

Hanson, B. Furrow irrigation. *Drought Tips*. No. 92-23. California Department of Water Resources, Water Conservation Office. 1993.

Marr, JC. *Furrow irrigation*. Division of Agricultural Sciences, University of California Publication 4027. 1967.

Prichard, T, Storm, CP, and Ohmart, CP. Chapter 5, Water Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 142-186. 2008.

5.8 Pump Efficiency

Pump efficiency has been measured <i>within the last 5 years</i> <u>OR</u> the pump is <i>less than 5 years old</i> .	YES = 3
	NO = 0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To determine the thoroughness and intensity of irrigation system performance monitoring efforts for efficient use of energy resources.

Verification: Inspection of pump efficiency monitoring records.

References:

Hanson, B. *Irrigation pumping plants*. University of California Irrigation Program, UC Davis. 1994.

Prichard, T, Storm, CP, and Ohmart, CP. Chapter 5, Water Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 142-186. 2008.

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5.9 Distribution Uniformity

(N/A if using flood and furrow irrigation systems)

A. <i>Within the last year</i> , irrigation system distribution uniformity has been tested and recorded <u>OR</u> the vineyard uses subsurface drip and relief valves are checked <i>at least once every week</i> .	3
B. <i>Within the last 3 years</i> , irrigation system distribution uniformity has been tested and recorded <u>OR</u> the vineyard uses subsurface drip and relief valves are checked <i>at least once every month</i> .	2
C. <i>At least once in its lifetime</i> , irrigation system distribution uniformity has been tested <u>OR</u> the vineyard uses subsurface drip and relief valves were checked <i>at least once in the last year</i> .	1
D. Irrigation system distribution uniformity <i>has never been tested</i> .	Fail Chapter

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To determine the thoroughness and intensity of microirrigation system performance monitoring efforts for optimized use of water and water applied resources, as well as uniformity of vine growth and productivity across the vineyard management unit.

Verification: Inspection of irrigation system maintenance and distribution uniformity monitoring records.

References:

Burt, CM, and Styles, SW. *Drip and microirrigation for trees vines and row crops (with special sections on buried drip)*. Irrigation Training and Research Center, Department of Agricultural Engineering, California Polytechnics State University, San Luis Obispo. 1994.

Merriam, JL, and Keller, J. *Farm irrigation system evaluation: a guide for management*. Department of Agricultural and Irrigation Engineering, Utah State University, Logan. 1978.

Prichard, T, Storm, CP, and Ohmart, CP. Chapter 5, Water Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 142-186. 2008.

5.10 Flow Meters

A. Flow meters are installed on wells or other pumps <u>AND</u> flows are monitored and recorded <i>at least once every month during the irrigation season</i> <u>AND</u> flow meters are in proper working order.	3
B. Flow meters are installed on wells or other pumps <u>AND</u> flows are monitored and recorded <i>at the beginning and end of the irrigation season</i> <u>AND</u> flow meters are in proper working order.	2
C. There is <i>no flow meter</i> installed on wells or other pumps <u>BUT the pump is tested and water flow is calculated</u> by recording the pumping time and multiplying this by the results of the pump test.	1
D. There is <i>no flow meter</i> installed on wells or other pumps <u>AND</u> the pump is never tested.	0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To determine the thoroughness and intensity of irrigation system performance monitoring for optimized use of water and water applied resources.

Verification: In-field inspection of the pump station and inspection of irrigation system flow records.

References:

Hanson, BR, Schwankl, LJ, and Prichard, TL. *Measuring irrigation flows in a pipeline*. University of California Division of Agriculture and Natural Resources Publication 8213. 2007.

Prichard, T, Storm, CP, and Ohmart, CP. Chapter 5, Water Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 142-186. 2008.

Schwankl, L, Hanson, B, and Prichard, T. *Micro-irrigation of trees and vines: a handbook for water managers*. University of California Irrigation Program, UC Davis. 1995.

Scott, VH, and Houston, CE. *Measuring irrigation water*. University of California Division of Agricultural Sciences Leaflet 2956. 1977.

5.11 Soil Water-Holding Capacity

Soil moisture content is known (from a neutron probe, capacitance sensor, or by feel using a probe or auger to collect the soil sample) <u>OR</u> soil moisture tension full point (i.e. field capacity) is known (from a resistance block or tensiometer).	YES = 2
	NO = 0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To ensure the participant knows the water storage capacity of the vineyard soil, uses this knowledge in initiating and scheduling irrigations, and thereby, enhances water use efficiency.

Verification: Inspection of soil moisture monitoring records, including identification of the full point or field capacity.

References:

Grant, S. Soil moisture monitoring. Lodi Winegrape Commission Coffee Shop Blog. lodigrowers.com/soil-moisture-monitoring/. April 8, 2014.

Prichard, TL, Hanson B, Schwankl, L, Verdegaal, P, and Smith, R. *Deficit irrigation of quality winegrapes using micro-irrigation techniques*. University of California Cooperative Extension, Department of Land, Air, Water Resources, UC Davis. 2004.

Prichard, T, Storm, CP, and Ohmart, CP. Chapter 5, Water Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 142-186. 2008.

5.12 Irrigation Initiation and Scheduling

Which of the following techniques are used to monitor vineyard moisture?

Select all that apply:

5.12.1 Irrigation: Soil Moisture Depletion Monitoring	YES = 1
<u>Soil moisture depletion</u> as determined by soil monitoring devices (resistance blocks, tensiometers, neutron probes, capacitance sensors, etc.) or the bucket auger/shovel method (judging moisture by feel) is used to assist in deciding when and how much to irrigate.	NO = 0
5.12.2 Irrigation: Vine Water Status Monitoring	YES = 1
<u>Vine water status</u> using a device (pressure chamber, etc.) or visual observations is used to assist in deciding when and how much to irrigate.	NO = 0
5.12.3 Irrigation: Evapotranspiration (ET_c) Usage	YES = 1
<u>Evapotranspiration</u> (ET _c) determined by a local weather station or a nearby CIMIS station with similar climatic conditions is used to assist in deciding when and how much to irrigate.	NO = 0
5.12.4 Irrigation: Irrigation Scheduled by Calendar	0
Irrigations are <i>scheduled by the calendar</i> or water needs are <i>not monitored</i> at all.	

Companion Information

Scope: Individual vineyard management unit submitted for **LODI RULES** certification.

Purpose: To determine the thoroughness of vineyard moisture monitoring in the course of scheduling irrigations for optimum water use efficiency.

Verification: Inspection of vineyard monitoring records.

References:

Prichard, TL, Hanson B, Schwankl, L, Verdegaal, P, and Smith, R. *Deficit irrigation of quality winegrapes using micro-irrigation techniques*. University of California Cooperative Extension, Department of Land, Air, Water Resources, UC Davis. 2004.

Prichard, T, Storm, CP, and Ohmart, CP. Chapter 5, Water Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 142-186. 2008.

5.13 Water Budget

How long ago was the vineyard planted?

A. Less than 5 years ago.	Go to Standard 5.13.2 (Standard 5.13.1 is N/A)
B. More than 5 years ago.	Go to Standard 5.13.1 (Standard 5.13.2 is N/A)

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To direct participants to the appropriate irrigation scheduling farming Standard.

5.13.1 Water Budget for Mature Vines

A. The amount of water used by the vines <i>on a weekly basis</i> is estimated and recorded (cumulative ET _c , allowable soil moisture depletion, or plant monitoring) <u>AND less than this amount is applied to the vines</u> during the next week (unless a heat wave is forecasted or varietal requirements necessitate the use of more water).	3
B. The amount of water used by the vines <i>on a weekly basis</i> is estimated and recorded (cumulative ET _c , allowable soil moisture depletion, or plant monitoring) <u>AND this amount is applied to the vines</u> during the next week (unless a heat wave is forecasted or varietal requirements necessitate the use of more water).	2
C. The amount of water used by the vines <i>on a weekly basis</i> is estimated and recorded (cumulative ET _c , allowable soil moisture depletion, or plant monitoring) <u>AND more than this amount is applied to the vines</u> during the next week, even if weather forecasts do not predict it is needed. <u>OR</u> The amount of water used by the vines <i>on a weekly basis</i> is not estimated.	0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To determine the level of irrigation water conservation efforts within the limits of sound regulated deficit irrigation.

Verification: Inspection of irrigation records.

References:

Goldhammer, DA, and Snyder, RL. *Irrigation scheduling: a guide for efficient on-farm water management*. University of California, Division of Agriculture and Natural Resources Publication 21454. 1989.

Grant, S. *Five-step irrigation schedule: promoting fruit quality and vine health*. Practical Winery and Vineyard. 21(1):46-52 and 75. May/June 2000.

Grant, S. Regulated deficit irrigation, part II. Lodi Winegrape Commission Coffee Shop Blog. lodigrowers.com/regulated-deficit-irrigation-part-ii/. August 04, 2014.

Hanson, B, Orloff, S, and Sanden, B. *Monitoring soil moisture for irrigation water management*. University of California Agriculture and Natural Resources Publication 21635. 2007.

Prichard, TL, Hanson B, Schwankl, L, Verdegaal, P, and Smith, R. *Deficit irrigation of quality winegrapes using micro-irrigation techniques*. University of California Cooperative Extension, Department of Land, Air, Water Resources, UC Davis. 2004.

Prichard, T, Storm, CP, and Ohmart, CP. Chapter 5, Water Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 142-186. 2008.

Prichard, TL. *Irrigation of quality winegrapes*. 49th Annual Lodi Grape Day Proceedings. pp. 31-44. 2001.

5.13.2 Water Budget for Young Vines

A. The amount of water used by the vines <i>on a weekly basis</i> is estimated and recorded (cumulative ET _c , allowable soil moisture depletion) <u>AND this amount is applied to the vines</u> during the next week (unless a forecasted heat wave necessitates the use of more water).	2
B. The amount of water used by the vines <i>on a weekly basis</i> is estimated and recorded (cumulative ET _c , allowable soil moisture depletion) <u>AND less than this amount is applied to the vines</u> during the next week (unless a forecasted heat wave necessitates the use of more water).	1
C. The amount of water used by the vines <i>on a weekly basis</i> is estimated and recorded (cumulative ET _c , allowable soil moisture depletion) <u>AND more than this amount is applied to the vines</u> during the next week, even if weather forecasts do not predict it is needed.	0
D. The amount of water used by the vines <i>on a weekly basis</i> is not estimated.	0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To determine the level of water conservation efforts within the limits of sound vineyard establishment practices and award sustainable farming point accordingly.

Verification: Inspection of irrigation records.

References:

Goldhammer, DA, and Snyder, RL. *Irrigation scheduling: a guide for efficient on-farm water management*. University of California, Division of Agriculture and Natural Resources Publication 21454. 1989.

Hanson, B, Orloff, S, and Sanden, B. *Monitoring soil moisture for irrigation water management*. University of California Agriculture and Natural Resources Publication 21635. 2007.

Prichard, T, Storm, CP, and Ohmart, CP. Chapter 5, Water Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 142-186. 2008.

5.14 Offsite Irrigation Water Movement

A. Irrigation practices create <u>no run-off*</u> or <u>runoff is recycled</u> .	2
B. <u>Run-off* occurs</u> during irrigation and <i>is not recycled</i> .	0

*Run-off is defined as overland water movement off of the vineyard site.

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To determine the level of irrigation water conservation, topsoil conservation, and pollution containment efforts, and award sustainable farming points accordingly.

Verification: Inspection of vineyard floor management records, including cover crops and amendments applied to promote maximum water infiltration, and records of irrigation frequency and duration.

References:

O'Geen, TA, Prichard, TL, Elkins, R, and Pettygrove, GS. *Orchard floor management practices to reduce erosion and protect water quality*. University of California, Division of Agriculture and Natural Resources Publication 8202. 2006.

Prichard, T, Storm, CP, and Ohmart, CP. Chapter 5, Water Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 142-186. 2008.

Schwankl, LJ, Hanson, BR, and Prichard, TL. *Causes and management of runoff from surface irrigation in orchards*. University of California, Division of Agriculture and Natural Resources Publication 8214. 2007.

Schwankl, LJ, Prichard, TL, and Hanson, BR. *Managing existing sprinkler irrigation systems*. University of California, Division of Agriculture and Natural Resources Publication 8215. 2007.

Schwankl, LJ, Prichard, TL, and Hanson, BR. *Soil intake rates and application rates in sprinkler-irrigated orchards*. University of California, Division of Agriculture and Natural Resources Publication 8216. 2007.

Chapter 6: Pest Management

This Chapter includes several management plans addressing specific pests and pathogens, which for expediency, may be combined into a single pest and disease management plan document.

6.1 Insect and Mite Pest Management Plan

The farming operation has a written and implemented insect and mite pest management plan containing the following components: goals; guidelines for written monitoring records; frequency and location of monitoring; action and economic thresholds for each pest based on pest numbers, natural enemy type/number considerations, amount of leaf and/or fruit damage present, time of year, canopy vigor, winegrape variety; timing of treatments; and a plan review and update schedule.	YES = 6
	NO = 0

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: To inventory pest management factors and to clearly state pest management goals, challenges, and strategies, including vineyard monitoring, which will serve as guidelines for the activities of the vineyard manager and his/her management team.

Verification: Visual inspection of the pest management plan document.

References:

Bentley, WJ, Varela, LG, Zalom, FG, Smith, RJ, Purcell, AH, Phillips, PA, Haviland, DR, Daane, KM, and Battany, MC. *Leafhoppers*. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. 2008. Reviewed 2015.

- ipm.ucdavis.edu/PMG/r302300111.html (Last accessed on 30Jan17)
- *Internet search terms:* UC pest management guidelines grape leafhopper

Bentley, WJ, Varela, LG, Zalom, FG, Smith, RJ, Purcell, AH, Phillips, PA, Haviland, DR, Daane, KM, and Battany, MC. *Webspinning spider mites*. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. 2008. Revised 2011.

- ipm.ucdavis.edu/PMG/PESTNOTES/pn7405.html (Last accessed on 30Jan17)
- *Internet search terms:* UC pest management guidelines spider mites

Flaherty, DL, Wilson, LT, Welter, SC, Lynn, CD, and Hanna, R. Spider mites. In: *Grape Pest Management*, 2nd Ed. Flaherty, DL, Christensen, LP, Lanini, WT, Marois, JJ, Phillips, PA, and Wilson, LT. (Eds.). University of California Division of Agriculture and Natural Resources Publication 3343. pp. 180-192. 1992.

Flint, ML, and Dreistadt, S. *Natural enemies handbook: an illustrated guide to biological pest control*. University of California Agriculture and Natural Resources Publication 3386. 1998.

Insecticide Resistance Action Committee, irac-online.org (Last accessed on 30Jan17)

Ohmart, CP, Storm, CP, and Gubler, WD. Chapter 6, Pest Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 187-267. 2008.

Varela, LG, Bentley, WJ, Haviland, DR, Phillips, PA, Smith, RJ, and Shrestha, A. *Monitoring insects and pest mites*. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. 2008. Reviewed 2015.

- ipm.ucdavis.edu/PMG/r302900611.html (Last accessed on 30Jan17)
- *Internet search terms*: UC pest management guidelines monitoring insect spider mite

Wilson, LT, Flaherty, DL, and Peacock, WL. Grape leafhopper. In: *Grape Pest Management*, 2nd Ed. Flaherty, DL, Christensen, LP, Lanini, WT, Marois, JJ, Phillips, PA, and Wilson, LT (Eds.). University of California Division of Agriculture and Natural Resources Publication 3343. pp. 140-152. 1992.

Insect and Mite Pest Management Plan Organization:

Insect and mite pest management goals: For example, to optimize cultural and biological control of insect and mite pests and when chemical control becomes necessary, to ensure maximum insecticide or miticide efficacy with negligible undesirable side effects. The farming operation practices in-season vine management for growth balance and moderate water stress, environment management for minimum dust and maximum beneficial insect activity, and pesticide selection and application for effective control.

Guidelines for written monitoring records, including frequency and location: For example, the vineyard is monitored every 7 days during the growing season for insects and mites and written monitoring records are kept.

Action and economic thresholds for each pest: Base thresholds on pest numbers, natural enemy type/number considerations, amount of leaf and/or fruit damage present, time of year, canopy vigor, and/or winegrape variety. Include **treatment timings**. For example, treatments for leafhoppers are applied only when the number of nymphs per leaf is greater than 5 OR there is moderate to heavy leaf damage due to leafhopper feeding and a moderate to heavy population of adults present. The farming operation treats for mites when greater than 60% of the leaves are infested OR greater than 20% of the leaves are infested and a miticide, such as Agrimek, is used which requires treating before numbers get too high. When an insect or mite treatment is necessary, only that portion of the vineyard where a problem exists is treated, such as edges or hot spots, and not the whole vineyard.

6.2 Vineyard Monitoring for Insect and Mite Pests

A. The PCA and/or a company representative monitors the vineyard for insect and mite pests <i>at least once every 7 days</i> during the growing season <u>AND</u> keeps written monitoring records.	8
B. The PCA and/or a company representative monitors the vineyard for insect and mite pests <i>at least once every 10 days</i> during the growing season <u>AND</u> keeps written monitoring records.	6
C. The PCA and/or a company representative monitors the vineyard for insect and mite pests <i>at least once every 14 days</i> during the growing season <u>AND</u> keeps written monitoring records.	4
D. The PCA and/or a company representative monitors the vineyard for insect and mite pests <i>at least once every 21 days</i> during the growing season <u>AND</u> keeps written monitoring records.	1
E. The PCA and/or a company representative monitors the vineyard for insect and mite pests <i>at least once every month</i> during the growing season <u>AND</u> keeps written monitoring records.	0
F. <i>No vineyard monitoring records</i> are kept for insect and mite pests.	Fail Chapter

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To ascertain the presence and intensity of insect and mite pest populations for informed pest management decisions.

Verification: Visual inspection of insect and mite pest monitoring records, during appropriate time periods for risk and proactive management as outlined in the insect and mite pest management plan.

References:

Bentley, WJ, Varela, LG, Zalom, FG, Smith, RJ, Purcell, AH, Phillips, PA, Haviland, DR, Daane, KM, and Battany, MC. *Leafhoppers*. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. 2008. Reviewed 2015.

- ipm.ucdavis.edu/PMG/r302300111.html (Last accessed on 30Jan17)
- *Internet search terms:* UC pest management guidelines grape leafhopper

Bentley, WJ, Varela, LG, Zalom, FG, Smith, RJ, Purcell, AH, Phillips, PA, Haviland, DR, Daane, KM, and Battany, MC. *Webspinning spider mites*. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. 2008. Revised 2011.

- ipm.ucdavis.edu/PMG/PESTNOTES/pn7405.html (Last accessed on 30Jan17)
- *Internet search terms:* UC pest management guidelines spider mites

Ohmart, CP, Storm, CP, and Gubler, WD. Chapter 6, Pest Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 187-267. 2008.

Varela, LG, Bentley, WJ, Haviland, DR, Phillips, PA, Smith, RJ, and Shrestha, A. *Monitoring insects and pest mites*. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. 2008. Reviewed 2015.

- ipm.ucdavis.edu/PMG/r302900611.html (Last accessed on 30Jan17)
- *Internet search terms*: UC pest management guidelines monitoring insect spider mite

6.3 Economic Threshold for Leafhoppers

A. The farming operation does not need to treat for leafhoppers <u>BECAUSE</u> leafhopper numbers do not exceed the treatment thresholds specified in the insect and mite pest management plan.	5
B. Treatments for leafhoppers are applied <u>WHEN</u> the number of nymphs per leaf is greater than 5 <u>OR</u> there is moderate to heavy leaf damage due to leafhopper feeding <u>and</u> a moderate to heavy population of adults present.	5
C. Treatments for leafhoppers are applied <u>WHEN</u> the number of nymphs per leaf is between 3 and 5.	3
D. Treatments for leafhoppers are applied <u>WHEN</u> the number of nymphs per leaf is between 1 and 3.	1
E. Treatments for leafhoppers are applied <u>WHEN</u> there is <i>less than 1 nymph per leaf</i> .	Fail Chapter

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To specify leafhopper tolerance and action thresholds for insecticide treatment, and to give credit for treatment for higher tolerances or non-treatment due to control of populations.

Verification: Visual comparison of leafhopper monitoring records and insecticide application records, made during appropriate time periods for risk and proactive management of leafhoppers as outlined in the insect and mite pest management plan.

References:

Bentley, WJ, Varela, LG, Zalom, FG, Smith, RJ, Purcell, AH, Phillips, PA, Haviland, DR, Daane, KM, and Battany, MC. *Leafhoppers*. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. 2008. Reviewed 2015.

- ipm.ucdavis.edu/PMG/r302300111.html (Last accessed on 30Jan17)
- *Internet search terms:* UC pest management guidelines grape leafhopper

Ohmart, CP, Storm, CP, and Gubler, WD. Chapter 6, Pest Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 187-267. 2008.

Wilson, LT, Flaherty, DL, and Peacock, WL. *Grape leafhopper*. In: *Grape Pest Management*, 2nd Ed. Flaherty, DL, Christensen, LP, Lanini, WT, Marois, JJ, Phillips, PA, and Wilson, LT. (Eds.). University of California Division of Agriculture and Natural Resources Publication 3343. pp. 140-152. 1992.

6.4 Economic Threshold for Spider Mites

A. The farming operation does not need to treat for mites <u>BECAUSE</u> mite numbers do not exceed the treatment thresholds specified in the insect and mite pest management plan <u>OR</u> predatory mites are used as a biological control tactic.	5
B. The farming operation treats for mites <u>WHEN</u> greater than 60% of the leaves are infested <u>OR</u> greater than 20% of the leaves are infested <u>and</u> a miticide, such as Agrimek, is used which requires treating before numbers get too high.	5
C. The farming operation treats for mites <u>WHEN</u> greater than 40% of the leaves are infested <u>OR</u> greater than 10% of the leaves are infested <u>and</u> a miticide, such as Agrimek, is used which requires treating before numbers get too high.	3
D. The farming operation treats for mites <u>WHEN</u> greater than 20% of the leaves are infested <u>OR</u> greater than 10% of the leaves are infested <u>and</u> the vineyard consists of head trained spur pruned vines.	1
E. The farming operation treats for mites <u>WHEN</u> <i>none are found during monitoring.</i>	Fail Chapter

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To specify pest mite tolerance and action threshold for miticide treatment or the use of preemptive miticide controls, and to give credit for higher tolerances and non-treatment due to effective population control.

Verification: Visual comparison of pest mite monitoring records and miticide application records, during appropriate time periods for risk and proactive management of mites as outlined in the insect and mite pest management plan.

References:

Bentley, WJ, Varela, LG, Zalom, FG, Smith, RJ, Purcell, AH, Phillips, PA, Haviland, DR, Daane, KM, and Battany, MC. *Web-spinning spider mites*. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. 2008. Revised 2011.

- ipm.ucdavis.edu/PMG/PESTNOTES/pn7405.html (Last accessed on 30Jan17)
- *Internet search terms:* UC pest management guidelines spider mites

Flaherty, DL, Wilson, LT, Welter, SC, Lynn, CD, and Hanna, R. *Spider mites*. In: *Grape Pest Management*, 2nd Ed. Flaherty, DL, Christensen, LP, Lanini, WT, Marois, JJ, Phillips, PA, and Wilson, LT. (Eds.). University of California Division of Agriculture and Natural Resources Publication 3343. pp. 180-192. 1992.

Ohmart, CP, Storm, CP, and Gubler, WD. Chapter 6, Pest Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 187-267. 2008.

6.5 Prescriptive Treatments

When an insect or mite treatment is necessary, <u>only that portion of the vineyard where a problem exists is treated</u> , such as edges or hot spots, and not the whole vineyard.	YES = 2
	NO = 0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To give credit for partial spray of vineyards and associated reduced insecticide and/or miticide use.

Verification: Visual inspection of insecticide and miticide application records.

References:

Ohmart, CP, Storm, CP, and Gubler, WD. Chapter 6, Pest Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 187-267. 2008.

6.6 Dust Abatement for Mite Management within the Vineyard

A. <i>During the growing season</i> , vegetative cover is maintained in <u>every vineyard row</u> .	3
B. <i>During the growing season</i> , vegetative cover is maintained in <u>at least every other vineyard row</u> .	2
C. <i>During the growing season</i> , the vineyard floor is disked and <i>no vegetative cover is maintained</i> .	0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To reduce dust produced in the vineyard and in so doing, reduce dust deposition on grapevine leaves, which encourages pest mites.

Verification: Visual inspection of the vineyard floors and/or vineyard floor management records.

References:

Bentley, WJ, Varela, LG, Zalom, FG, Smith, RJ, Purcell, AH, Phillips, PA, Haviland, DR, Daane, KM, and Battany, MC. *Webspinning spider mites*. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. 2008. Revised 2011.

- ipm.ucdavis.edu/PMG/PESTNOTES/pn7405.html (Last accessed on 30Jan17)
- *Internet search terms:* UC pest management guidelines spider mites

Flaherty, DL, Wilson, LT, Welter, SC, Lynn, CD, and Hanna, R. *Spider mites*. In: *Grape Pest Management*, 2nd Ed. Flaherty, DL, Christensen, LP, Lanini, WT, Marois, JJ, Phillips, PA, and Wilson, LT. (Eds.). University of California Division of Agriculture and Natural Resources Publication 3343. pp. 180-192. 1992.

Ohmart, CP, Storm, CP, and Gubler, WD. Chapter 6, Pest Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 187-267. 2008.

6.7 Dust Abatement for Mite Management for On-Farm Roads and Avenues

A. During the growing season, <u>vegetative cover</u> is maintained on vineyard roads and avenues.	4
B. Vineyard roads and avenues are <u>paved</u> (asphalt or concrete) or <u>graveled</u> .	3
C. During the growing season, an <u>oil alternative sealant</u> (eSoil-Sement®, EnviroKleen®, etc.) is used on vineyard roads and avenues.	2
D. During the growing season, <u>oil, water, or magnesium chloride</u> is used on vineyard roads and avenues.	1
E. During the growing season, no dust abatement measures are used on vineyard roads and avenues.	0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To reduce dust produced in and adjacent to the vineyard, and in so doing, reduce dust deposition on grapevine leaves, which encourages pest mites.

Verification: Visual inspection of road surfaces and/or road maintenance records.

References:

Bentley, WJ, Varela, LG, Zalom, FG, Smith, RJ, Purcell, AH, Phillips, PA, Haviland, DR, Daane, KM, and Battany, MC. *Webspinning spider mites*. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. 2008. Revised 2011.

- ipm.ucdavis.edu/PMG/PESTNOTES/pn7405.html (Last accessed on 30Jan17)
- *Internet search terms:* UC pest management guidelines spider mites

Flaherty, DL, Wilson, LT, Welter, SC, Lynn, CD, and Hanna, R. *Spider mites*. In: *Grape Pest Management*, 2nd Ed. Flaherty, DL, Christensen, LP, Lanini, WT, Marois, JJ, Phillips, PA, and Wilson, LT. (Eds.). University of California Division of Agriculture and Natural Resources Publication 3343. pp. 180-192. 1992.

Ohmart, CP, Storm, CP, and Gubler, WD. Chapter 6, Pest Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 187-267. 2008.

6.8 Dust Abatement for Mite Management for Headlands

A. A year round <u>hedgerow and/or vegetative cover</u> is grown on headlands.	2
B. During the growing season, <u>resident vegetation</u> is allowed to grow on headlands.	1
C. Headlands are kept <i>free of all vegetation</i> .	0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To reduce dust produced in the vineyard and in so doing, reduce dust deposition on grapevine leaves, which encourages pest mites.

Verification: Visual inspection of vegetation in and around the vineyard and/or non-farm vegetation maintenance records.

References:

Bentley, WJ, Varela, LG, Zalom, FG, Smith, RJ, Purcell, AH, Phillips, PA, Haviland, DR, Daane, KM, and Battany, MC. *Web-spinning spider mites*. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. 2008. Revised 2011.

- ipm.ucdavis.edu/PMG/PESTNOTES/pn7405.html (Last accessed on 30Jan17)
- *Internet search terms:* UC pest management guidelines spider mites

Flaherty, DL, Wilson, LT, Welter, SC, Lynn, CD, and Hanna, R. *Spider mites*. In: *Grape Pest Management*, 2nd Ed. Flaherty, DL, Christensen, LP, Lanini, WT, Marois, JJ, Phillips, PA, and Wilson, LT. (Eds.). University of California Division of Agriculture and Natural Resources Publication 3343. pp. 180-192. 1992.

Ohmart, CP, Storm, CP, and Gubler, WD. Chapter 6, Pest Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 187-267. 2008.

6.9 Training of Employees for Pest Recognition

Farming operation employees are trained for recognition of vineyard pests <u>OR</u> there are no employees, but the owner is trained in pest recognition.	YES = 2
	NO = 0

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: To increase the intensity of pest monitoring by training farm employees to recognize pests or at least, ensuring the vineyard operator has sufficient pest recognition training.

Verification: Visual inspection of pest recognition training records, including meeting agendas and signature lists for attending employees.

References:

Ohmart, CP, Storm, CP, and Gubler, WD. Chapter 6, Pest Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 187-267. 2008.

6.10 Vineyard Sanitation for Disease Inoculum Reduction

Vineyard sanitation measures, such as cleaning berms, chopping prunings and cluster mummies, and pruning out infected and dead wood and removing it from the vineyard, are practiced <i>every year</i> .	YES = 2
	NO = 0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To reduce disease inoculum and thereby, the risk of disease.

Verification: Visual inspection of the vineyard and/or labor records for pruning, chopping, berm cleaning, and wood removal.

References:

Ohmart, CP, Storm, CP, and Gubler, WD. Chapter 6, Pest Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 187-267. 2008.

Pool, RM, Kasimatis, AN, and Christensen, LP. Part IV. Effects of cultural practices on disease. In: *Compendium of Grape Diseases*. Pearson, RC, and Goheen, AC. (Eds.). APS Press, St. Paul, MN. pp. 72-73. 1988.

6.11 Powdery Mildew Management Plan

The farming operation has a written and implemented powdery mildew management plan which contains the following components: goals, preventative measures, varietal susceptibility, canopy characteristics, treatment decision factors, treatment measures, and a plan review and update schedule.	YES = 4
	NO = 0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To inventory powdery mildew management factors and to clearly state powdery mildew management goals, challenges, and strategies, including vineyard monitoring, which will serve as guidelines for the activities of the vineyard manager and his/her management team.

Verification: Visual inspection of the powdery mildew management plan.

References:

Fungicide Resistance Action Committee, frac.info (Last accessed on 30Jan17)

Gubler, WD, and Hirschfeld, DJ. Powdery mildew. In: *Grape Pest Management*, 2nd Ed. Flaherty, DL, Christensen, LP, Lanini, WT, Marois, JJ, Phillips, PA, and Wilson, LT. (Eds.). University of California Division of Agriculture and Natural Resources Publication 3343. pp. 57-62. 1992.

Gubler, WD, Smith, RJ, Varela, LG, Vasquez, S, Stapleton, JJ, and Purcell, AH. Powdery mildew. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. 2008. Corrected 2016.

- ipm.ucdavis.edu/PMG/r302100311.html (Last accessed on 30Jan17)
- *Internet search terms:* UC pest management guidelines grape powdery mildew

Ohmart, CP, Storm, CP, and Gubler, WD. Chapter 6, Pest Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 187-267. 2008.

Pearson, RC. Powdery mildew. In: *Compendium of Grape Diseases*. Pearson, RC, and Goheen, AC. (Eds.). APS Press, St. Paul, MN. pp. 9-11. 1988.

Powdery Mildew Management Plan Organization:

Powdery mildew management goals: To maximize efficacy while controlling the cost of powdery mildew management. Challenges may include the ubiquitous presence of the pathogen, the high susceptibility of succulent, juvenile foliar tissues (especially the tissues of certain varieties), and the ease of pathogen resistance developing for fungicides with a single mode of action.

Preventative measures and treatment decision factors: For example, treat as needed, indicated by the Gubler-Thomas powdery mildew development model or protect susceptible tissues with prophylactic fungicide applications, rotating fungicides as necessary to prevent fungicide resistance developing in the powdery mildew population.

Varietal susceptibility and canopy characteristics: Indicate which varieties in this vineyard block are most and least susceptible to powdery mildew. Take into account canopy characteristics too.

Treatment measures: Include how you determine the effectiveness of a treatment.

A plan review and update schedule.

6.12 Deciding When to Initiate First Powdery Mildew Treatments for the Season

A disease model such as the Gubler-Thomas powdery mildew model is referred to for initiation of <i>the season's first</i> powdery mildew fungicide application.	YES = 2
	NO = 0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To initiate fungicide applications only after there is evidence that they are needed.

Verification: Visual comparison of Gubler-Thomas powdery mildew development model records and fungicide application records.

References:

Gubler, WD, Smith, RJ, Varela, LG, Vasquez, S, Stapleton, JJ, and Purcell, AH. *Powdery mildew*. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. 2008. Corrected 2016.

- ipm.ucdavis.edu/PMG/r302100311.html (Last accessed on 30Jan17)
- *Internet search terms:* UC pest management guidelines grape powdery mildew

Ohmart, CP, Storm, CP, and Gubler, WD. Chapter 6, Pest Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 187-267. 2008.

6.13 Timing of Powdery Mildew Treatments

A disease model such as the Gubler-Thomas powdery mildew model is referred to for scheduling of <i>any</i> powdery mildew treatments.	YES = 2
	NO = 0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To schedule fungicide applications during periods when there is evidence that they are needed.

Verification: Visual comparison of Gubler-Thomas powdery mildew development model records and fungicide application records.

References:

Gubler, WD, Smith, RJ, Varela, LG, Vasquez, S, Stapleton, JJ, and Purcell, AH. *Powdery mildew*. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. 2008. Corrected 2016.

- ipm.ucdavis.edu/PMG/r302100311.html (Last accessed on 30Jan17)
- *Internet search terms:* UC pest management guidelines grape powdery mildew

Ohmart, CP, Storm, CP, and Gubler, WD. Chapter 6, Pest Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 187-267. 2008.

6.14 Choice of Powdery Mildew Fungicides for Resistance Management

For fungicides other than those with negligible risk of resistance development (sulfur, bicarbonate, oils, etc.), resistance management is practiced by rotating fungicides and not using chemicals with the same mode of action consecutively*.	YES = 2
	NO = 0

*See the FRAC (Fungicide Resistance Action Committee) website for fungicide resistance prevention information: frac.info.

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To promote the long-term viability of fungicides through responsible stewardship.

Verification: Visual inspection of fungicide application records.

References:

Adaskaveg, JE, Gubler, WD, and Michailides, T. *Fungicides, Bactericides, and Biologicals for Deciduous Tree Fruit, Nut, Strawberry, and Vine Crops*. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. 2015.

- ipm.ucdavis.edu/PMG/r302900211.html (Last accessed on 30Jan17)
- *Internet search terms:* UC pest management guidelines general properties of fungicides grapes

Gubler, WD, Smith, RJ, Varela, LG, Vasquez, S, Stapleton, JJ, and Purcell, AH. *Fungicide efficacy and treatment timing*. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. 2010. Updated 2016.

- ipm.ucdavis.edu/PMG/r302902111.html (Last accessed on 30Jan17)
- *Internet search terms:* UC pest management guidelines fungicide efficacy treatment guidelines

Gubler, WD, Smith, RJ, Varela, LG, Vasquez, S, Stapleton, JJ, and Purcell, AH. *Powdery mildew*. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. 2008. Corrected 2016.

- ipm.ucdavis.edu/PMG/r302100311.html (Last accessed on 30Jan17)
- *Internet search terms:* UC pest management guidelines grape powdery mildew

Ohmart, CP, Storm, CP, and Gubler, WD. Chapter 6, Pest Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 187-267. 2008.

6.15.1 Bunch Rot Susceptibility

A. Historically, there has <u>not been a bunch rot problem</u> in the vineyard.	Go to Standard 6.16 (Standard 6.15.2 is N/A)
B. Historically, <u>bunch rot has been a problem</u> in the vineyard.	Go to Standard 6.15.2

Companion Information

Purpose: To direct the participant to their next **LODI RULES** Standard.

6.15.2 Bunch Rot Management

Select all that apply:

6.15.2.1 Bunch Rot: Early Season Thinning <i>Early in the growing season, <u>shoots are thinned</u> to increase air movement within the fruit zone.</i>	1
6.15.2.2 Bunch Rot: Gibberellin Application <i>While clusters are elongating, <u>gibberellin is applied</u> to stretch clusters, reduce contact between berries, and enhance cuticle development on berry exteriors.</i>	1
6.15.2.3 Bunch Rot: Leaf and Shoot Removal <i>As soon as possible after fruit set, but before bunch closure, <u>leaves and/or lateral shoots in the fruit zone are removed</u> to increase air movement.</i>	1
6.15.2.4 Bunch Rot: Fungicide Application <i>During and following bloom, a <u>fungicide is applied</u> to reduce bunch rot inoculum when dead flower parts adhere to clusters.</i>	1
6.15.2.5 Bunch Rot: No Bunch Rot Control <i>There is a history of bunch rot in the vineyard, but <i>no actions are taken</i> to control this problem.</i>	0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To foster bunch rot control through the integrated use of several low impact management practices.

Verification: Visual inspection of shoot thinning, leaf removal, and/or lateral shoot removal in the field, and growth regulator and fungicide application records.

References:

Bulit, J, and Dobos, B. Botrytis bunch rot and blight. In: *Compendium of Grape Diseases*. Pearson, RC, and Goheen, AC. (Eds.). APS Press, St. Paul, MN. pp. 13-14. 1988.

Fungicide Resistance Action Committee, frac.info (Last accessed on 30Jan17)

Gubler, WD, Smith, RJ, Varela, LG, Vasquez, S, Stapleton, JJ, and Purcell, AH. *Botrytis bunch rot*. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. 2008. Reviewed 2014.

- ipm.ucdavis.edu/PMG/r302100111.html (Last accessed on 30Jan17)
- *Internet search terms:* UC pest management guidelines grape botrytis bunch rot

Gubler, WD, Smith, RJ, Varela, LG, Vasquez, S, Stapleton, JJ, and Purcell, AH. *Summer bunch rot (sour rot)*. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. 2008. Reviewed 2014.

- ipm.ucdavis.edu/PMG/r302100211.html (Last accessed on 30Jan17)
- *Internet search terms*: UC pest management guidelines grape summer bunch sour rot

Gubler, WD, Smith, RJ, Varela, LG, Vasquez, S, Stapleton, JJ, and Purcell, AH. *Fungicide efficacy and treatment timing*. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. 2010. Updated 2016.

- ipm.ucdavis.edu/PMG/r302902111.html (Last accessed on 30Jan17)
- *Internet search terms*: UC pest management guidelines fungicide efficacy treatment guidelines

Marois, JJ, Bledsoe, AM, and Bettiga, LJ. Bunch rots. In: *Grape Pest Management*, 2nd Ed. Flaherty, DL, Christensen, LP, Lanini, WT, Marois, JJ, Phillips, PA, and Wilson, LT. (Eds.). University of California Division of Agriculture and Natural Resources Publication 3343. pp. 63-70. 1992.

Ohmart, CP, Storm, CP, and Gubler, WD. Chapter 6, Pest Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 187-267. 2008.

Wilcox, W. *Understanding and controlling Botrytis*. Practical Winery and Vineyard. pp. 30- 38. Mar/Apr 2007.

6.16 Canker Disease Management

Select all that apply:

6.16.1 Canker: Pruning Schedule	YES = 1
The <u>pruning schedule</u> is prioritized based on canker disease risk.	NO = 0
6.16.2 Canker: Pruning Methods	YES = 1
<u>One or more of the following pruning methods</u> are used to minimize infection: double pruning, cane pruning, or box/minimum pruning.	NO = 0
6.16.3 Canker: Protecting Pruning Wounds	YES = 1
<u>Pruning wounds</u> are protected with one or more fungicides or wound sealant.	NO = 0
6.16.4 Canker: Remove/Dispose of Infected Wood	YES = 1
<i>Before the next growing season, <u>infected wood is removed and disposed of</u> to reduce inoculum.</i>	NO = 0
6.16.5 Canker: Shoot Thinning	YES = 1
<i>Early in the growing season, <u>shoots are thinned</u> to reduce the number of pruning wounds.</i>	NO = 0
6.16.6 Canker: No Controls	0
<i>No actions to control canker diseases are taken.</i>	

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To promote the long-term viability of vineyards through the integrated use of several low impact management practices.

Verification: Visual inspection of pruning records, vine pruning in the field, fungicide application records, wood disposal records, and shoot thinning.

References:

Carter, MV. Eutypa dieback. In: *Compendium of Grape Diseases*. Pearson, RC, and Goheen, AC. (Eds.). APS Press, St. Paul, MN. pp. 32-34. 1988.

Fungicide Resistance Action Committee, frac.info (Last accessed on 30Jan17)

Gubler, WD, Smith, RJ, Varela, LG, Vasquez, S, Stapleton, JJ, and Purcell, AH. *Bot canker*. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. 2008. Reviewed 2014.

- ucdavis.edu/PMG/r302101011.html (Last accessed on 30Jan17)
- *Internet search terms:* UC pest management guidelines grape bot canker

Gubler, WD, and Leavitt, GM. Eutypa dieback. In: *Grape Pest Management*, 2nd Ed. Flaherty, DL, Christensen, LP, Lanini, WT, Marois, JJ, Phillips, PA, and Wilson, LT. (Eds.). University of California Division of Agriculture and Natural Resources Publication 3343. pp. 71-75. 1992.

Gubler, WD, Smith, RJ, Varela, LG, Vasquez, S, Stapleton, JJ, and Purcell, AH. Eutypa dieback. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. 2008. Updated 2014.

- ipm.ucdavis.edu/PMG/r302100611.html (Last accessed on 30Jan17)
- *Internet search terms*: UC pest management guidelines grape eutypa dieback

Gubler, WD, Smith, RJ, Varela, LG, Vasquez, S, Stapleton, JJ, and Purcell, AH. *Fungicide efficacy and treatment timing*. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. 2010. Updated 2016.

- ipm.ucdavis.edu/PMG/r302902111.html (Last accessed on 30Jan17)
- *Internet search terms*: UC pest management guidelines fungicide efficacy treatment guidelines

Ohmart, CP, Storm, CP, and Gubler, WD. Chapter 6, Pest Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 187-267. 2008.

6.17 Soil Borne Pest Management Plan

The farming operation has a written and implemented soil borne pest management plan , focusing on nematodes and <i>Phylloxera</i> , which contains the following components: management goals, a post-planting soil sampling program, site-specific control measures, and a plan review and update schedule.	YES = 4
	NO = 0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To inventory soil borne pest management factors, and to clearly state soil-borne pest management goals, challenges, and strategies, including vineyard monitoring, which will serve as guidelines for the activities of the vineyard manager and his/her management team.

Verification: Visual inspection of the soil borne pest management plan.

References:

Bentley, WJ, Varela, LG, Zalom, FG, Smith, RJ, Purcell, AH, Phillips, PA, Haviland, DR, Daane, KM, and Battany, MC. Grape *Phylloxera*. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. 2008. Reviewed 2015.

- ipm.ucdavis.edu/PMG/r302300811.html (Last accessed on 30Jan17)
- *Internet search terms:* UC pest management guidelines grape phylloxera

Granett, J, Christensen, LP, Bettiga, LJ, and Peacock, WL. Grape *Phylloxera*. In: *Grape Pest Management*, 2nd Ed. Flaherty, DL, Christensen, LP, Lanini, WT, Marois, JJ, Phillips, PA, and Wilson, LT. (Eds.). University of California Division of Agriculture and Natural Resources Publication 3343. pp. 153-158. 1992.

McKenry, MV. Nematodes. In: *Grape Pest Management*, 2nd Ed. Flaherty, DL, Christensen, LP, Lanini, WT, Marois, JJ, Phillips, PA, and Wilson, LT. (Eds.). University of California Division of Agriculture and Natural Resources Publication 3343. pp. 281-285. 1992.

McKenry, MV. Monitoring guidelines: all nematodes. In: *Grape Pest Management*, 2nd Ed. Flaherty, DL, Christensen, LP, Lanini, WT, Marois, JJ, Phillips, PA, and Wilson, LT. (Eds.). University of California Division of Agriculture and Natural Resources Publication 3343. pp. 285-293. 1992.

Ohmart, CP, Storm, CP, and Gubler, WD. Chapter 6, Pest Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 187-267. 2008.

Raski, DJ. Nematode parasites of grapes. In: *Compendium of Grape Diseases*. Pearson, RC, and Goheen, AC. (Eds.). APS Press, St. Paul, MN. pp. 55-59. 1988.

Westerdahl, BB. *Nematodes*. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. 2008. Reviewed 2016.

- ipm.ucdavis.edu/PMG/r302200111.html (Last accessed on 30Jan17)
- *Internet search terms:* UC pest management guidelines grape nematodes

Soil Borne Pest Management Plan Organization:

Soil borne pest management goals: To minimize soil borne pest activities and damage to grapevines.

Post-planting soil sampling program: Indicate when, why, and how soil will be sampled for pests.

Site-specific control measures: For example, to prune, thin, irrigate, fertilize, and protect the foliage and otherwise manage grapevines as necessary to maintain their health and growth vigor; grow a cover crop composed of diverse species that will support a large and diverse populations of soil microbes suppressive to soil borne pest activity; and if necessary, apply a nematicide at an appropriate rate and timing.

A plan review and update schedule.

6.18 Soil Borne Pest Control Strategies

If soil borne pests need to be treated, control strategies are based upon lab assay results for nematodes and/or visual confirmation for <i>Phylloxera</i> .	YES = 2
	NO = 0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To ensure soil borne pest control measures are implemented only as needed.

Verification: Visual inspection of nematode assay results and/or *Phylloxera* monitoring records, and corresponding nematicide and insecticide records.

References:

Bentley, WJ, Varela, LG, Zalom, FG, Smith, RJ, Purcell, AH, Phillips, PA, Haviland, DR, Daane, KM, and Battany, MC. Grape *Phylloxera*. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. 2008. Reviewed 2015.

- ipm.ucdavis.edu/PMG/r302300811.html (Last accessed on 30Jan17)
- *Internet search terms:* UC pest management guidelines grape phylloxera

Granett, J, Christensen, LP, Bettiga, LJ, and Peacock, WL. Grape *Phylloxera*. In: *Grape Pest Management*, 2nd Ed. Flaherty, DL, Christensen, LP, Lanini, WT, Marois, JJ, Phillips, PA, and Wilson, LT. (Eds.). University of California Division of Agriculture and Natural Resources Publication 3343. pp. 153-158. 1992.

McKenry, MV. Monitoring guidelines: all nematodes. In: *Grape Pest Management*, 2nd Ed. Flaherty, DL, Christensen, LP, Lanini, WT, Marois, JJ, Phillips, PA, and Wilson, LT. (Eds.). University of California Division of Agriculture and Natural Resources Publication 3343. pp. 285-293. 1992.

Ohmart, CP, Storm, CP, and Gubler, WD. Chapter 6, Pest Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 187-267. 2008.

Raski, DJ. Nematode parasites of grapes. In: *Compendium of Grape Diseases*. Pearson, RC, and Goheen, AC. (Eds.). APS Press, St. Paul, MN. pp. 55-59. 1988.

6.19 Weed Management Plan

The farming operation has a written and implemented weed management plan containing the following components: management goals, monitoring techniques and record keeping, control measures, herbicide resistance avoidance strategies, and a plan review and update schedule.	YES = 4
	NO = 0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To inventory weed management factors, and to clearly state weed management goals, challenges, and strategies, including vineyard monitoring, which will serve as guidelines for the activities of the vineyard manager and his/her management team.

Verification: Visual inspection of the weed management plan.

References:

Agamalian, HS. Vegetation management guidelines. In: *Grape Pest Management*, 2nd Ed. Flaherty, DL, Christensen, LP, Lanini, WT, Marois, JJ, Phillips, PA, and Wilson, LT. (Eds.). University of California Division of Agriculture and Natural Resources Publication 3343. pp. 326-330. 1992.

Donaldson, DR, and Lanini, WT. Special weed problems. In: *Grape Pest Management*, 2nd Ed. Flaherty, DL, Christensen, LP, Lanini, WT, Marois, JJ, Phillips, PA, and Wilson, LT. (Eds.). University of California Division of Agriculture and Natural Resources Publication 3343. pp. 338-339. 1992.

Herbicide Resistance Action Committee, hracglobal.com (Last accessed on 30Jan17)

Kempen, HM. Herbicides for established vineyards. In: *Grape Pest Management*, 2nd Ed. Flaherty, DL, Christensen, LP, Lanini, WT, Marois, JJ, Phillips, PA, and Wilson, LT. (Eds.). University of California Division of Agriculture and Natural Resources Publication 3343. pp. 333-334. 1992.

Lange, AH. Use of herbicides. In: *Grape Pest Management*, 2nd Ed. Flaherty, DL, Christensen, LP, Lanini, WT, Marois, JJ, Phillips, PA, and Wilson, LT. (Eds.). University of California Division of Agriculture and Natural Resources Publication 3343. pp. 331-332. 1992.

Lanini, WT, and Bendixen, WE. Characteristics of important vineyard weeds. In: *Grape Pest Management*, 2nd Ed. Flaherty, DL, Christensen, LP, Lanini, WT, Marois, JJ, Phillips, PA, and Wilson, LT. (Eds.). University of California Division of Agriculture and Natural Resources Publication 3343. pp. 321-325. 1992.

Ohmart, CP, Storm, CP, and Gubler, WD. Chapter 6, Pest Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 187-267. 2008.

Shrestha, A, Humbree, KJ, Ingels, CA, and Lanini, WT. *Integrated weed management*. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. 2008. Reviewed 2015.

- ipm.ucdavis.edu/PMG/r302700111.html (Last accessed on 30Jan17)
- *Internet search terms*: UC pest management guidelines grape integrated weed management

Weed Management Plan Organization:

Weed management goals: For example, to optimize cultural control of weeds in the tractor/equipment rows and chemical control of weeds in the vine row despite on-going emergence of new weeds from the seed bank in the vineyard soil and the development of herbicide resistance in some weed populations.

Monitoring techniques and record keeping: Indicate how weeds are scouted for (visually, using aerial technology, etc.) and how often this occurs (weekly, etc.), as well as the general procedure for documenting weed presence.

Control measures: For example, to grow and maintain a vigorous, easy to manage cover crop that occupies the open niche in the tractor/equipment rows and thereby, denies weeds the opportunity for emergence and growth; and in the vine rows, apply a mix of pre-emergent herbicides that covers the spectrum of weeds occurring in the vineyard, annually rotating the herbicide mix to prevent resistance in the weed population.

Herbicide resistance avoidance strategies: For example, state which herbicides are used with their modes of action and how they are rotated.

A plan review and update schedule.

6.20 Vineyard Monitoring for Weeds

A. <i>During the growing season</i> , the PCA and/or a farming operation representative monitors the vineyard for weeds <u>at least once every 7 days AND at least once a month during the winter season AND</u> written records are kept.	4
B. <i>During the growing season</i> , the PCA and/or a farming operation representative monitors the vineyard for weeds <u>at least once every 10 days AND at least once every two months during the winter season AND</u> written records are kept.	3
C. <i>During the growing season</i> , the PCA and/or a farming operation representative monitors the vineyard for weeds <u>at least once every 14 days AND at least once during the winter season AND</u> written records are kept.	2
D. <i>During the growing season</i> , the PCA and/or a farming operation representative monitors the vineyard for weeds <u>at least once every 21 days AND at least once during the winter season AND</u> written records are kept.	1
E. <i>During the growing season</i> , the PCA and/or a farming operation representative monitors the vineyard for weeds <u>at least once a month AND at least once during the winter season AND</u> written records are kept.	0
F. <i>No vineyard weed monitoring records</i> are kept.	Fail Chapter

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To ascertain the presence and intensity of weed populations for informed weed management decisions.

Verification: Visual inspection of weed monitoring records.

References:

Ohmart, CP, Storm, CP, and Gubler, WD. Chapter 6, Pest Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 187-267. 2008.

Shrestha, A, Humbree, KJ, Ingels, CA, and Lanini, WT. *Integrated weed management*. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. 2008. Reviewed 2015.

- ipm.ucdavis.edu/PMG/r302700111.html (Last accessed on 30Jan17)
- *Internet search terms:* UC pest management guidelines grape integrated weed management

6.21 Vertebrate Management Plan

The farming operation has a written and implemented vertebrate management plan containing the following components: management goals, species of concern, monitoring strategies, control strategies, and a plan review and update schedule.	YES = 4
	NO = 0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To inventory vertebrate (an animal with a backbone and a skeleton) pest management factors, and to clearly state vertebrate pest management goals, challenges, and strategies, including vineyard monitoring, which will serve as guidelines for the activities of the vineyard manager and his/her management team.

Verification: Visual inspection of the vertebrate management plan.

References:

Clark, WR, and Crabb, AC. Birds. In: *Grape Pest Management*, 2nd Ed. Flaherty, DL, Christensen, LP, Lanini, WT, Marois, JJ, Phillips, PA, and Wilson, LT. (Eds.). University of California Division of Agriculture and Natural Resources Publication 3343. pp. 312-317. 1992.

Ohmart, CP, Storm, CP, and Gubler, WD. Chapter 6, Pest Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 187-267. 2008.

Salmon, TP, Clark, WR, and Clark, DO. Mammals. In: *Grape Pest Management*, 2nd Ed. Flaherty, DL, Christensen, LP, Lanini, WT, Marois, JJ, Phillips, PA, and Wilson, LT. (Eds.). University of California Division of Agriculture and Natural Resources Publication 3343. pp. 297-311. 1992.

Vertebrate Management Plan Organization:

Vertebrate pest management goals: For example, to optimize cultural and biological control vertebrate pests and minimize the need for other control measures.

Species of concern: State the main vertebrates which are of concern. (A vertebrate is an animal with a backbone and a skeleton - for example, gophers and squirrels.)

Monitoring strategies: Describe how each vertebrate is scouted for and which early signs appear as an indication that there is a problem.

Control strategies: For example, to construct barriers around the vineyard and provide shelters and other structures, such as perches, to promote healthy populations of predators, especially raptors. When and where these management measures are insufficient, trap or bait as necessary.

A plan review and update schedule.

6.22 Vineyard Monitoring for Vertebrate Pests

A. During the growing season , the PCA and/or a company representative monitors the vineyard for vertebrate pests <u>at least once every 7 days AND</u> written records are kept.	4
B. During the growing season , the PCA and/or a company representative monitors the vineyard for vertebrate pests <u>at least once every 10 days AND</u> written records are kept.	3
C. During the growing season , the PCA and/or a company representative monitors the vineyard for vertebrate pests <u>at least once every 14 days AND</u> written records are kept.	2
D. During the growing season , the PCA and/or a company representative monitors the vineyard for vertebrate pests <u>at least once every 21 days AND</u> written records are kept.	1
E. During the growing season , the PCA and/or a company representative monitors the vineyard for vertebrate pests <u>at least once a month AND</u> written records are kept.	0
F. No vineyard monitoring records for vertebrate pests are kept.	Fail Chapter

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To ascertain the presence and intensity of vertebrate pest populations for informed vertebrate pest management decisions.

Verification: Visual inspection of vertebrate pest monitoring records.

References:

Clark, WR, and Crabb, AC. Birds. In: *Grape Pest Management*, 2nd Ed. Flaherty, DL, Christensen, LP, Lanini, WT, Marois, JJ, Phillips, PA, and Wilson, LT. (Eds.). University of California Division of Agriculture and Natural Resources Publication 3343. pp. 312-317. 1992.

Ohmart, CP, Storm, CP, and Gubler, WD. Chapter 6, Pest Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 187-267. 2008.

Salmon, TP, Clark, WR, and Clark, DO. Mammals. In: *Grape Pest Management*, 2nd Ed. Flaherty, DL, Christensen, LP, Lanini, WT, Marois, JJ, Phillips, PA, and Wilson, LT. (Eds.). University of California Division of Agriculture and Natural Resources Publication 3343. pp. 297-311. 1992.

6.23 Predatory Birds

Owl boxes, kestrel boxes, and/or raptor perches are provided and maintained.	YES = 2
	NO = 0

Companion Information

Scope: Individual vineyard management units submitted for **LODI RULES** certification.

Purpose: To promote predatory bird populations and their activities in vineyards, including vertebrate pest predation.

Verification: Visual inspection of predatory bird boxes and/or perches in and around the vineyard.

References:

Ohmart, CP, Storm, CP, and Gubler, WD. Chapter 6, Pest Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 187-267. 2008.

6.24 Sprayer/Duster Maintenance Plan

The farming operation or the custom applicator has a written and implemented sprayer/duster maintenance plan containing a cleaning and maintenance regime for filters, pumps, control units, pressure gauges, nozzles, hoses, the power take off (PTO), booms, and tanks, and a plan review and update schedule.	YES = 4
	NO = 0

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: To ensure pesticide application equipment is in proper operating condition, which helps to maximize pesticide efficacy and minimize risks associated with use.

Verification: Visual inspection of the sprayer and duster maintenance plan.

References:

Dibble, JE, and Steinke, WE. Principles and techniques of vine spraying. In: *Grape Pest Management*, 2nd Ed. Flaherty, DL, Christensen, LP, Lanini, WT, Marois, JJ, Phillips, PA, and Wilson, LT. (Eds.). University of California Division of Agriculture and Natural Resources Publication 3343. pp. 343-355. 1992.

Ohmart, CP, Storm, CP, and Gubler, WD. Chapter 6, Pest Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 187-267. 2008.

Sprayer/Duster Maintenance Plan Organization:

Cleaning and maintenance regime for filters, pumps, control units, pressure gauges, nozzles, hoses, the power take off (PTO), booms, and tanks: Ensure optimum sprayer and/or duster performance and thereby, pesticide efficacy, by maintaining a regular, systematic, and thorough sprayer and duster maintenance program, and checking the sprayer and/or duster performance before each use. Include information about timing of general maintenance.

A plan review and update schedule.

6.25 Sprayer/Duster Calibration

A. <i>During each application</i> , the amount of spray/dust being applied per acre is monitored to ensure that the correct amount is being applied <u>AND</u> this procedure includes immediate calibration of the sprayer/duster if any correction is indicated.	4
B. <i>During at least every other application</i> , the amount of spray/dust being applied per acre is monitored to ensure that the correct amount is being applied <u>AND</u> this procedure includes immediate calibration of the sprayer/duster if any correction is indicated.	3
C. <i>At least once every three months</i> , the amount of spray/dust being applied per acre is monitored to ensure that the correct amount is being applied <u>AND</u> this procedure includes immediate calibration of the sprayer/duster if any correction is indicated.	2
D. <i>At least once every year</i> , the amount of spray/dust being applied per acre is monitored to ensure that the correct amount is being applied <u>AND</u> this procedure includes immediate calibration of the sprayer/duster if any correction is indicated.	1
E. The sprayer/duster <i>has not been calibrated within the last year</i> .	Fail Chapter

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: To ensure pesticide application equipment is accurately calibrated, which helps to maximize pesticide efficacy and minimize risks associated with their use.

Verification: Visual inspection of sprayer and duster calibration records.

References:

Dibble, JE, and Steinke, WE. Principles and techniques of vine spraying. In: *Grape Pest Management*, 2nd Ed. Flaherty, DL, Christensen, LP, Lanini, WT, Marois, JJ, Phillips, PA, and Wilson, LT. (Eds.). University of California Division of Agriculture and Natural Resources Publication 3343. pp. 343-355. 1992.

Ohmart, CP, Storm, CP, and Gubler, WD. Chapter 6, Pest Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 187-267. 2008.

6.26 Spray Coverage

A. <i>At least once within the last 6 months</i> , sprayer coverage has been checked with moisture sensitive paper, kaolin clay, or dye.	4
B. <i>At least once within the last 12 months</i> , sprayer coverage has been checked with moisture sensitive paper, kaolin clay, or dye.	3
C. <i>At least once within the last 18 months</i> , sprayer coverage has been checked with moisture sensitive paper, kaolin clay, or dye.	1
D. Sprayer coverage <i>has not been checked in over 18 months</i>.	0

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: To ensure pesticide application equipment is precisely targeted, which helps to maximize pesticide efficacy and minimize risks associated with use.

Verification: Visual inspection of spray coverage monitoring records.

References:

Ohmart, CP, Storm, CP, and Gubler, WD. Chapter 6, Pest Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 187-267. 2008.

6.27 Spray/Dust Drift Management Plan

The farming operation has a written and implemented spray/dust drift management plan containing the following components: spray/dust drift management goals, identified sensitive areas, good neighbor policies, established buffers, pesticide rate selection guidelines, equipment operation, weather condition considerations, timing of applications, drift reduction adjuvants, and a plan review and update schedule.	YES = 4
	NO = 0

Companion Information

Scope: The entirety of the vineyard operation submitted for **LODI RULES** certification.

Purpose: To inventory pesticide drift management factors, and to clearly state pesticide drift management goals, challenges, and strategies, including atmospheric monitoring, which will serve as guidelines for the activities of the vineyard manager and his/her management team.

Verification: Visual inspection of the spray and drift management plan.

References:

O'Connor-Marer, PJ, and Weber, JL. *Reducing pesticide risks: an interactive program for training pesticide handlers*. University of California Statewide Integrated Pest Management Project Pesticide Education Program. Davis, CA. 2001.

Ohmart, CP, Storm, CP, and Gubler, WD. Chapter 6, Pest Management. In: *Lodi Winegrower's Workbook*, 2nd Ed. Ohmart, CP, Storm, CP, and Matthiasson, SK. (Eds.). Lodi Winegrape Commission. pp. 187-267. 2008.

Spray/Dust Drift Management Plan Organization:

Spray/dust drift management goals: For example, to ensure the vast majority of materials emanating from sprayers and dusters land on their targets and that there is minimum loss of these materials to the atmosphere.

Identified sensitive areas: For example, areas near urban development or windy areas.

Good neighbor policies: Describe efforts to reduce drift concern from neighbors.

Established buffers: Describe any existing spray buffers.

Pesticide rate selection guidelines: For example, use the lowest effective pesticide application rate.

Equipment operation: For example, before each application, ensure sprayers and dusters are working correctly and are properly calibrated with appropriate nozzles directed towards the targeted parts of the grapevines, and slow tractor engines or shut off sprayer or duster at end of vine rows before turning and resume spraying when adjacent to the first vine in the next row.

Weather condition considerations: For example, ensure atmospheric conditions are not conducive to drift.

Timing of applications: When possible, make applications near sensitive areas during the night or on weekends.

Drift reduction adjuvants: Describe the use of any drift reduction adjuvants.

A plan review and update schedule.