



The LODI RULES for Sustainable Winegrowing Certification Standards, Fourth Edition

*California's original sustainable viticulture
certification program, est. 1992*

LODI RULES

The text 'LODI RULES' is displayed in a large, bold, sans-serif font. The letters are white with a slight drop shadow, making them stand out against the background. The background is a close-up photograph of a person's hands harvesting dark blue grapes from a vine. The lighting is soft and natural, highlighting the texture of the grapes and the skin of the hands.

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Acknowledgements

The LODI RULES for Sustainable Winegrowing Certification Program builds upon a long history of Lodi growers progressively implementing integrated pest management and other sustainable farming practices in their vineyards. LODI RULES emerged from three successful Lodi Winegrape Commission education initiatives: an Integrated Pest Management program (early 1990s), a Biologically Integrated Farming Systems (BIFS) project (1996-2006), and the Lodi Winegrowers Workbook (1999) by Dr. Cliff Ohmart and Steve Matthiasson.

The creation of LODI RULES was mainly financed directly by Lodi growers through the Lodi Winegrape Commission, with additional funding coming from the US Environmental Protection Agency, California State Water Resources Control Board, USDA, Great Valley Center, CalFed Bay Delta Program, National IPM Foundation, Natural Resources Conservation Service, and UC Davis.

The first six growers to become LODI RULES certified in 2005 were Jerry and Bruce Fry (Mohr-Fry Ranches), John Ledbetter (Vino Farms), Joe Dexter, Keith Watts (Watts Vineyards), Robert Pirie (Colligere Farm Management), and Robert Abercrombie (Sutter Home Winery).



Each edition of the LODI RULES for Sustainable Winegrowing Certification Standards represents countless hours of work by dedicated members of the Lodi Winegrape Commission community, with input from numerous other growers, advisors, consultants, industry, and scientists:

The LODI RULES for Sustainable Winegrowing Certification Standards (2005, First Edition)

Bryan Anthony, E&J Gallo Winery
Mark Chandler, Lodi Winegrape Commission
Joe Cotta, Cotta Ranches
Steve Felten, Felten-Melhoff Ranch
Bruce Fry, Mohr-Fry Ranches
Jerry Fry, Mohr-Fry Ranches
Chuck Ingels, University of California
Randall Lange, LangeTwins Farms
John Ledbetter, Vino Farms
Kim Ledbetter-Bronson, Vino Farms
Larry Mettler, Arbor Vineyards

Cliff Ohmart, PhD, Lodi Winegrape Commission
Robert Pirie, Colligere Ranches
Terry Prichard, University of California
Steve Quashnick, Wilbur-Ellis
Kent Reeves, East Bay Municipal District
Craig Rous, Bear Creek Winery
Bob Schulenburg, Schulenburg Vineyards
Mark Shimosaki, Viticultural Services
Stuart Spencer, Lodi Winegrape Commission
Chris Storm, Lodi Winegrape Commission
Paul Verdegaal, University of California

The LODI RULES for Sustainable Winegrowing Certification Standards (2013, Second Edition)

Warren Bogle, Bogle Vineyards
Lee Caton, Nestor Enterprises
Bruce Fry, Mohr-Fry Ranches
Stan Grant, Progressive Viticulture
Matt Hoffman, PhD, Lodi Winegrape
Commission
Camron King, Lodi Winegrape Commission
Aaron Lange, LangeTwins Family Winery and
Vineyards

Stanton Lange, Stanton Lange Vineyard
Management
Cliff Ohmart, PhD, SureHarvest
Kevin Phillips, Michael David Winery
Steve Quashnick, Wilbur-Ellis
Stuart Spencer, Lodi Winegrape Commission
Chris Storm, Vino Farms

The LODI RULES for Sustainable Winegrowing Certification Standards (2017, Third Edition)

Warren Bogle, Bogle Vineyards
Stephanie Bolton, PhD, Lodi Winegrape
Commission
Lee Caton, Nestor Enterprises
Bruce Fry, Mohr-Fry Ranches
Stan Grant, Progressive Viticulture
Charlie Hamilton, Harvey Lyman Company
Madelyn Kolber, KG Vineyard Management
Stanton Lange, Stanton Lange Vineyard
Management

Heather Muser, Muser Consulting
Cliff Ohmart, PhD, SureHarvest
Kevin Phillips, Michael David Winery
Steve Quashnick, Wilbur-Ellis
Aaron Shinn, Round Valley Ranches
Stuart Spencer, Lodi Winegrape Commission
Chris Storm, Vino Farms
Jane Vandine, Protected Harvest

The LODI RULES for Sustainable Winegrowing Certification Standards (2022, Fourth Edition)

Phil Abba, Abba Vineyards
Kendra Altnow, LangeTwins Family Winery and
Vineyards
Charles Benbrook, Heartland Health Research
Alliance
Warren Bogle, Bogle Vineyards
Stephanie Bolton, PhD, Lodi Winegrape
Commission
Lee Caton, Nestor Enterprises
Bruce Fry, Mohr-Fry Ranches
Stan Grant, Progressive Viticulture
Charlie Hamilton, KG Vineyard Management
Eric Harris, PhD, SureHarvest

Dirk Heuvel, McManis Family Vineyards
Amy Hiser, Protected Harvest
Will Kerner, Lodi Winegrape Commission
Madelyn Kolber, KG Vineyard Management
Stanton Lange, Stanton Lange Vineyards
Pierre Mineau, PhD, Pierre Mineau Consulting
Heather Muser, EdD, Muser Consulting
Cliff Ohmart, PhD, Protected Harvest Board
Kevin Phillips, Michael David Winery
Steve Quashnick, Wilbur-Ellis
Aaron Shinn, Round Valley Ranches
Stuart Spencer, Lodi Winegrape Commission
Chris Storm, Starr & Storm Crop Solutions

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Dedication

Sustainability is about the future. The LODI RULES for Sustainable Winegrowing Certification program is dedicated to the next generation. May we farm in a way that meets the needs of today without compromising the ability of future generations to cultivate their own livelihoods.

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 2023, over 72,000 vineyard acres are "Certified Green." Within the Lodi appellation, 32,812 acres are certified and 39,193 acres are certified across over 25 other winegrowing regions throughout California, in Washington, and in Israel. Figure 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 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.”

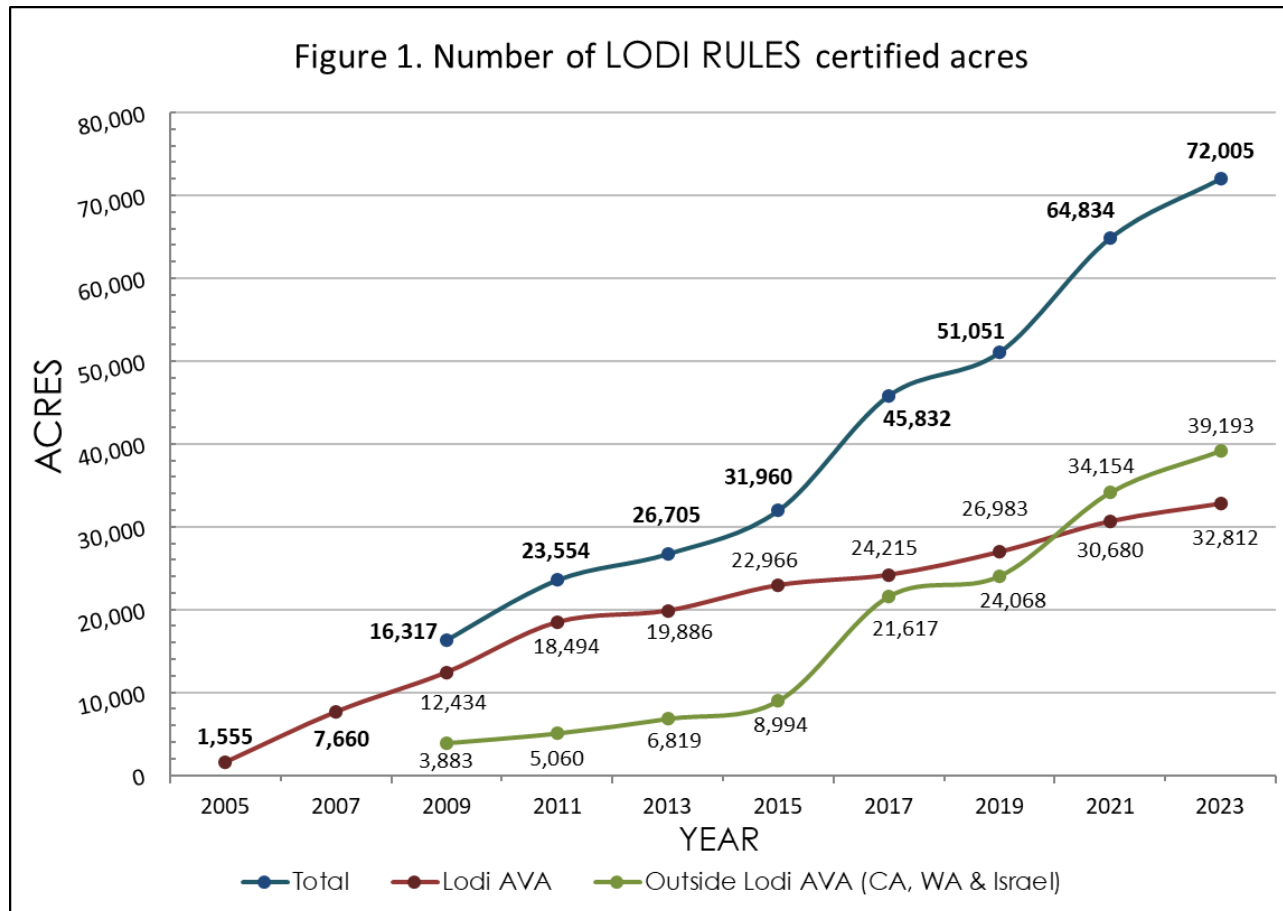
– American Agronomy Society



¹Hoffman, M, Hillis, A, and Lubell, M. "2011 Lodi Winegrape Grower Survey: Report of Results." Lodi Winegrape Commission. 2011.

²Hillis, A, Lubell, M, and Hoffman, M. "Winegrower Perceptions of Sustainability Programs in Lodi, California." Center for Environmental Policy and Behavior. University of California. Davis. 2011.

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. Figure 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 helping growers achieve sustainability certification. Over 65 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, with Bogle Vineyards, LangeTwins Winery and Vineyards, and others following suit. The future success of LODI RULES depends on 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 communication tool to help increase quality - in other words, there is inherent value in certification-level record keeping, beyond the sustainability benefits.

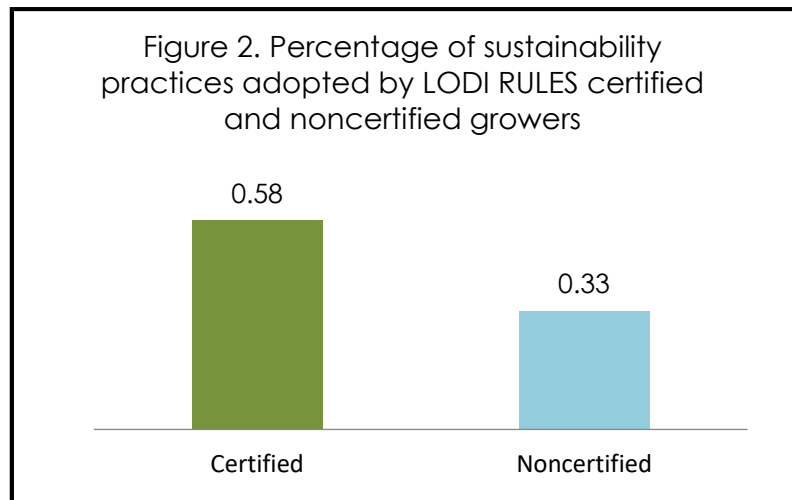
³Hillis, A, M Lubell, and Hoffman, M. "Practice Adoption and Management Goals of Lodi Winegrape Growers." Center for Environmental Policy and Behavior. University of California. Davis. 2011.

The LODI RULES program has two main components: farming practice standards and a pesticide risk model. First, LODI RULES promotes winegrower adoption of over 150 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 in 2017 (Third Edition) they were further edited for clarity and consistency. The current accredited Fourth Edition Standards (2022) represent the latest knowledge and science available, and they are continually reviewed to ensure they meet today’s needs.

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

Chapter 1. Business Management
Chapter 2. Human Resources Management
Chapter 3. Ecosystem Management

Chapter 4. Soil Management
Chapter 5. Water Management
Chapter 6. Pest Management



Every LODI RULES Standard must meet four criteria:

1. It is **measurable**.
2. It addresses at least one of the three aspects of **sustainability** (environmental health, social equity, and/or economic viability).
3. It is **economically feasible** to implement.
4. It is **based on sound science** and not a trend.

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 a pesticide risk model, called PEAS 2.0, used to quantify the total environmental and human impact of plant protectants applied to LODI RULES vineyards annually.

The PEAS 2.0 risk tool generates numeric scores for a total of 15 risk indices across the following categories:

- Risks to workers and consumers
- Acute risks to aquatic invertebrates, algae and fish
- Risks to earthworms
- Acute risks to small mammals
- Acute and reproductive risks to birds
- Risks to bees and beneficial insects (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, an independent nonprofit 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. "Fail Chapter" Standards represent practices that the Lodi Winegrape Commission, backed by Protected Harvest, believe are imperative for sustainability. A vineyard will not qualify for certification if it fails any chapter. Finally, growers must also score below a maximum threshold of pesticide risk. Winegrapes are certified by vineyard block on an annual basis, which means that the harvest from a particular vintage becomes certified. An independent auditor visits selected vineyards every year to ensure compliance. For the 2023 certification year, we are happy to report that over 1,250 vineyard blocks were certified through the LODI RULES program!

Companion Information

The Lodi Winegrape Commission publishes a 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.

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.

Resources describes helpful sources of information to earn the available points for certain Standards. Additionally, management plan Standards will typically have organizational tips.

References includes a list of literature and websites which provide further information about the Standards. The references are to be used by growers and others 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, 4.14, **5.1**, **6.1**, **6.11**, 6.17, 6.19, 6.21, 6.24, 6.27, and 6.29. The six 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/standards.

Further Certification Resources

Protected Harvest provides LODI RULES growers with three resources, reviewed by the Lodi Winegrape Commission, 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”). Growers may coordinate with the auditor to upload verification documents to a free cloud-based storage system.

Remember to use the ***Audit Prep Checklist & Management Plan Examples*** (Tab 10) to prepare for a successful audit! Tab 10 also includes a list of Fail Chapter Standards.

Marketing Your Certified Sustainability

Following an increase of adoption by growers and wineries, the Lodi Winegrape Commission has created numerous tools for growers to communicate their commitment to sustainability. Marketing is in fact vital to keep sustainability sustainable. Check out the Marketing Tab in your LODI RULES Binder or lodigrowers.com/standards for more information and ideas. Once you are certified, you can get a sign for your vineyard, be listed on our lodirules.org website, get help telling your story, create a Vineyard Tech Sheet to pass out to potential winegrape buyers, and more.

Contacts

The Lodi Winegrape Commission, creators and owners of LODI RULES, is your first point of contact for questions and comments regarding the program. There is a wealth of information under the LODI RULES tab at lodigrowers.com and also at loderules.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
loderules.org

Protected Harvest administers the LODI RULES certification process, including managing the application process, collection of fees, the online self-assessment, and auditing. For questions related to applications, deadlines, payment, or the online self-assessment website, please contact:

Amy Hiser
LODI RULES Certification Administration
Protected Harvest
(831) 706-2097
certification@protectedharvest.org
protectedharvest.org

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

Heather Muser, EdD
LODI RULES Lead Auditor
Muser Consulting
(209) 810-1966
muserconsulting@gmail.com

For questions about Protected Harvest, please contact:

Cliff Ohmart, PhD
Board President
Protected Harvest
(530) 574-8098
cohmart@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 Lodi Winegrape Commission 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. March 6, 2016. lodigrowers.com/on-the-nature-of-vineyards-and-vineyard-management/

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

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

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

Sustainable Management Vision Plan Organization

The sustainable management vision plan, if given proper attention, can act as a powerful guiding document for decision making. Creating this plan makes us stop and think about the deep down reasons why we are farming and working so hard.

Decision makers & participants: The “who” of the vision. Who are the decision makers, and what are their shared values and quality of life goals? Shared values can be described as 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. All people involved in and/or affected by the vineyard operation could be participants.

Land base: The “where” of the vision. A comprehensive accounting of the agricultural land and its features. Describe the physical land base that is owned or managed. Are all of the vineyards becoming certified, or just specific varieties or blocks? Include natural areas not in production if they exist on the property.

Resources: The “what” of the vision. A thorough but general listing of inputs and their attributes, including natural, material, human, cultural, social, and financial inputs. What are your resources that generate revenue? What are the strengths and skills of the family and/or staff?

Vision statement: The “why” of the vision. 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.

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.

Monitoring and evaluation: The “how” of the vision, which includes challenges and strategies to address issues with evidence-based decision making and human creativity. 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).

Resources/References:

California FarmLink, Center for Land-Based Learning, and the University of California Cooperative Extension created a Farm Succession Guidebook with a USDA grant. 2011.

- californiafarmlink.org/knowledgebase_category/farm-succession/

Farm Bureau Financial Services. “Your Complete Guide to Farm Succession Planning.”

- fbfs.com/learning-center/what-you-need-to-know-about-farm-succession-planning

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

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. Lodi Winegrape Commission Coffee Shop Blog. November 18, 2013. lodigrowers.com/vineyard-management-self-evaluation/

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. 2008. lodigrowers.com/lodiwinegrowersworkbook/

1.4 Risk Management Plan

***REVISED* for 2023 certification year**

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, invasive pests); market risk (winery contracts, customer and farm/variety diversification); technical risk (access to technical information or expertise); risk of the unexpected (natural disasters, harvest interruptions, pandemics); labor risk (long-term procurement, shortage back-up plans, written contracts with labor contractors); 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 participants have thoroughly considered their business risks and addressed them.

Verification: Visual inspection of the risk management plan document. See examples of what to consider in a risk management plan on the following page.

Resources/References:

California Sustainable Winegrowing Alliance. *A winegrowers' guide to navigating risks*. 2nd Ed. 2016.

- sustainablewinegrowing.org/docs/Risk_Guide_Second_Edition.pdf

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. Sept/Oct 2005.

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

Seufer, JL. *Managing orchard and vineyard production risks*. United States Department of Agriculture. Risk Management Agency. Spokane Regional Office. February 2002.

- https://farmanswers.org/Library/Record/managing_orchard_and_vineyard_production_risk

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

United States Department of Agriculture. Risk Management Agency. *Risk Management Checklist*.

- rma.usda.gov/-/media/RMA/Publications/Risk-Management-Publications/risk_management_checklist.ashx?la=en

The Lodi Winegrape Commission's grower website includes an online directory, which contains contact information for insurance agencies: lodigrowers.com/directory/growerandsupplierdirectory/.

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. **Written contracts with labor contractors** reduce risk by providing clarity, communication, and a legal foundation in the event that it may be needed.

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, invasive pests)
- Market risk (winery contracts, customer and farm/variety diversification)
- Technical risk (access to technical information or expertise)
- Risk of the unexpected (natural disasters, harvest interruptions, pandemics)
- Labor risk (long-term procurement, shortage back-up plans, written contracts with labor contractors)
- 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.

Resources/References:

Grant, S. Monitoring Vineyard Business Economics. Lodi Winegrape Commission Coffee Shop Blog. December 12, 2022. lodigrowers.com/monitoring-vineyard-business-economics/

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

University of California. Agricultural & Resource Economics. Current Cost and Return Studies.

- coststudies.ucdavis.edu/en/current/commodity/grapeswine/

Washington Winegrowers. Cost-of-Production Calculators. wawinegrowers.org/page/CostofProduction

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.

References:

Farm Employers Labor Service. fels.net

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

Organizations Hosting Training Seminars and Educational Events

Ag CEU Online
AgSafe
American Society for Enology and Viticulture (ASEV)
American Society of Agronomy – California Chapter
American Vineyard Magazine
Association of Applied IPM Ecologists (AAIE)
California Association of Pest Control Advisors (CAPCA)
California Association of Winegrape Growers (CAWG)
California Farm Bureau
California State University – Fresno
Clarksburg Wine Growers & Vintners Association
Community Alliance with Family Farmers (CAFF)
Lodi Chamber Agribusiness Committee
Lodi District Grape Growers Association (LDGGA)
Lodi Winegrape Commission
Napa County Farm Bureau Foundation
Napa Valley Grapegrowers
San Joaquin Farm Bureau
San Joaquin Valley Winegrowers Association
Sonoma County Winegrowers
University of California Agriculture & Natural Resources (ANR)
University of California – Davis
Vineyard Team
Washington State University Extension
Washington Winegrowers Association
Western IPM
Wild Farm Alliance
Wine Business Monthly
Wine Industry Network
Wine Institute
World Ag Expo
Xerces Society

The Lodi Winegrape Commission hosts several grower outreach events throughout the year, which are listed online at lodigrowers.com – [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.

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, <i>does not have current memberships</i> in local growers and vintners associations, and <i>has not attended</i> a 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.

Resources/References:

American Society for Enology and Viticulture. asev.org

American Vineyard Magazine. americanvineyardmagazine.com

California Association of Winegrape Growers (CAWG). cawg.org

Farm Employers Labor Service. fels.net

Lodi District Grape Growers Association. ldgga.org

University of California – Davis Continuing & Professional Education. cpe.ucdavis.edu

Wine Business Monthly. winebusiness.com

Wines Vines Analytics. winesvinesanalytics.com

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.

Reference:

Chadwick, A. *The winegrape guidebook for establishing good neighbor and community relations*. California Association of Winegrape Growers. 2001.

- lodiwinegrowers.com/wp-content/uploads/2022/12/good-neighbor-guide-hires-CAWG-2001.pdf

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. Neither fuel nor electricity use 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, a necessary step to reduce energy use, save money, and lower greenhouse gas emissions.

Verification: Visual inspection of energy monitoring records.

Reference:

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. 2008.

- lodiwinegrowers.com/lodiwinegrowersworkbook/

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.

Resource:

The United States Department of Agriculture (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 in the USA.

- nrcs.usda.gov/getting-assistance/conservation-practices

Reference:

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

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 <i>OR</i> 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 <i>OR</i> 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, reducing greenhouse gas emissions, and minimizing soil compaction and erosion.

Verification: Visual inspection of mechanical operation records.

References:

Grant, S. Managing Mechanized Vineyard Equipment for Efficiency. Lodi Winegrape Commission Coffee Shop Blog. December 15, 2017.

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

Washington State Department of Ecology. Recycling Right Matters. ecology.wa.gov/recycleright

1.13 Knowledge Sharing

***REVISED* for 2023 certification year**

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
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: Visual inspection of physical documentation, which may include copies of emails or text messages to schedule the event/internship, a photo taken during the event/internship, and/or 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.

Reference:

Abel, A. Why Sustainable Education Is Crucial for the Next Generation. Spark-Y Youth Action Labs Blog. November 18, 2019.

- spark-y.org/blog/2019/11/18/why-sustainable-education-is-crucial-for-the-next-generation

1.14 On-Site Sustainable Viticulture Research Bonus Points

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 <u>OR</u> participated in on-site research in an area of sustainable viticulture <u>and</u> 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 and includes scientific surveys/interviews about the vineyard block.

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.

Resources:

California State University – Fresno Department of Viticulture & Enology. (559) 278-2089.

Lodi Winegrape Commission. (209) 367-4727.

United States Department of Agriculture’s National Resources Conservation Service Conservation Stewardship Program.

- nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/csp/

University of California – Davis Department of Viticulture & Enology. (530) 752-0380.

Washington State University Viticulture & Enology. (509) 372-7224.

Western SARE grants are available to growers for sustainable viticulture research. westernsare.org/Grants

Reference:

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

1.15 Sustainability Communication Meetings

***NEW* for 2023 certification year**

A. <i>Within the last two years</i> , the farming operation held a meeting for key participants (select employees, pest control advisors, consultants, clients, and/or buyers, etc.) 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 four years</i> , the farming operation held a meeting for key participants (select employees, pest control advisors, consultants, clients, and/or buyers, etc.) 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 a sustainability communication meeting for key participants in over four years.</i>	0

Companion Information

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

Purpose: Communication of the farming operation's values, goals, and commitment to sustainability for buy-in of key participants and continued company success.

Verification: Visual inspection of management meeting records. Note that a farming operation may choose to combine Standard 1.3 (Management Planning Meetings) with Standard 1.15 (Sustainability Communication Meetings) in the same meeting.

References:

Chan, B. 4 Steps to Engage Stakeholders on Your Sustainability Journey. Schneider Electric Blog.

- perspectives.se.com/blog-stream/4-steps-engage-stakeholders-sustainability-scope-3

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

Grant, S. Vineyard Management Self-Evaluation. Lodi Winegrape Commission Coffee Shop Blog. November 18, 2013. lodiwiners.com/vineyard-management-self-evaluation/

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. 2008. lodiwiners.com/lodiwinersworkbook/

1.16 Sustainability Marketing

NEW for 2023 certification year

Select all that apply:

1.16.1 Sustainability Marketing: Vineyard Signage	YES = 1
The farming operation publicly advertises their commitment to sustainability by displaying a LODI RULES, CALIFORNIA RULES, or CERTIFIED GREEN sign on their property.	NO = 0
1.16.2 Sustainability Marketing: Grape Marketing	YES = 1
The farming operation promotes their commitment to sustainability in their grape marketing materials, which may include a website, social media, a vineyard tech sheet, a brochure, business cards, and/or presentations.	NO = 0
1.16.3 Sustainability Marketing: Winery Communication	YES = 1
The farming operation has communicated the ability to use one of our three LODI RULES seals on a wine label with their grape buyer(s) by sharing a copy of the LODI RULES Winery Handbook* <u>AND/OR</u> the winegrapes from this vineyard block are already used in a wine label bearing a certified sustainable seal.	NO = 0

*Wineries may choose from three seal options (LODI RULES, CALIFORNIA RULES, or CERTIFIED GREEN). Winery Handbooks, in print and PDF form, are available from the Lodi Winegrape Commission by contacting (209) 367-4727 or visiting lodigrowers.com/standards. There is no extra cost for wineries to use a seal on a wine label, but the wine must contain at least 85% LODI RULES certified grapes and wineries need to sign a License Agreement with the Lodi Winegrape Commission before using a seal.

Companion Information

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

Purpose: The marketing of sustainability contributes to the sustainability of winegrowing and may enhance the profitability of the farming operation.

Verification: Visual inspection of applicable signage, marketing materials, emails about the Winery Handbook, or a photo of a wine label with a certified sustainable seal.

Resources/References:

Bolton, S. *LODI RULES Grower Marketing Tools Newsletter*. Lodi Winegrape Commission. February 2021.

- lodigrowers.com/wp-content/uploads/2021/02/LODI-RULES-Grower-Marketing-Tools-Feb-2021-with-hyperlinks.pdf

Grant, S. *Vineyard Business Identity and Marketing*. Lodi Winegrape Commission Coffee Shop Blog. October 19, 2017. lodigrowers.com/vineyard-business-identity-and-marketing/

Ikerd, J. *The Role of Marketing in Sustainable Agriculture*. University of Missouri. 1996-1997.

1.17 Automation Efficiencies

***NEW* for 2023 certification year**

The farming operation increases efficiency via a novel, innovative* automation of at least one practice (remote irrigation scheduling, using an autonomous tractor, drone application, aerial imagery, optical berry sorting, cloud-based communications, etc.).	YES = 1
	NO = 0

*Typical mechanization practices in common use are excluded, such as mechanical harvesting, mechanical leafing, mechanical pruning, etc.

Companion Information

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

Purpose: To award participants who utilize novel, innovative automation efficiencies. Examples of novel, innovative automation include: remote irrigation scheduling, using an autonomous tractor, drone application of a material or beneficials, aerial imagery, optical or on-board berry sorting, cloud-based communications, or robotics in the vineyard. In other words, any type of farming practice automation which reduces labor and increases efficiency but is not widely utilized at this time. Applicants may be awarded for the same novel efficiency across multiple certification years.

Verification: Visual inspection of novel, innovative equipment and/or inspection of the results generated by this equipment (e.g., pictures from the drone, printout of irrigation schedule, emails with a third-party innovative vendor, etc.).

References:

Matese, A, and Di Gennaro, SF. Technology in precision viticulture: a state of the art review. *International Journal of Wine Research*. 2015. 7:69-81. doi.org/10.2147/IJWR.S69405

Siegel, J. Vineyard Automation Will Help Growers Survive Ongoing Labor Shortages. *Wine Industry Network Advisor*. June 24, 2022.

1.18 Paper-Free LODI RULES Audit Bonus Point

***NEW* for 2023 certification year**

A. The farming operation is preparing for the next on-site LODI RULES audit to be conducted paper-free, with all information shared electronically.	+1 (bonus)
B. The farming operation <i>is not preparing for the next on-site LODI RULES audit to be conducted paper-free.</i>	0

Companion Information

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

Purpose: To award participants who create less waste and use less paper than occurs with a typical paper audit.

Verification: Visual inspection of paper-free, electronic audit documents submitted for on-site audit.

References:

Decisive Farming. 5 Key Advantages of Digitizing Your Farm Records. Precision Ag – Data Management. February 26, 2020. precisionag.com/digital-farming/5-key-advantages-of-digitizing-your-farm-records/

Saiz-Rubio, V, and Rovira-Más, F. From Smart Farming towards Agriculture 5.0: A Review on Crop Data Management. *Agronomy*. 10(2): 207. 2020.

1.19 The Carbon Cycle

***NEW* for 2023 certification year**

The owner(s) and/or farming operation employees are trained on the carbon cycle.	YES = 1
	NO = 0

Companion Information

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

Purpose: To award participants who empower themselves and their employees with carbon knowledge to make educated, environmentally friendly farming decisions.

Verification: Visual inspection of carbon cycle training materials and/or training records.

Resources/References:

California State University - Chico. Center for Regenerative Agriculture and Resilient Systems: Carbon Farm Planning. csuchico.edu/regenerativeagriculture/resources/carbon-farm-planning.shtml

Cornell University Cooperative Extension. Agronomy Fact Sheet Series: The Carbon Cycle and Soil Organic Carbon. Fact Sheet 91. 2016. nmsp.cals.cornell.edu/publications/factsheets/factsheet91.pdf

Schahczenski, J, and Hill, H. ATTRA – National Sustainable Agriculture Information Service: Agriculture, Climate Change and Carbon Sequestration. 2009.

- attra.ncat.org/publication/agriculture-climate-disruption-and-carbon-sequestration/

United States Carbon Cycle Science Program. “What is the carbon cycle?”

- carboncyclescience.us/what-is-carbon-cycle

LODI RULES growers and wineries may get a free carbon cycle training poster from the Lodi Winegrape Commission by contacting us at (209) 367-4727 or info@lodiwine.com.

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. See examples of what to consider in a human resources plan on the following page.

Resources/References:

Billikopf, G. *Labor management in agriculture: cultivating personnel productivity*, 3rd Ed. University of California Agriculture and Natural Resources. 2014. nature.berkeley.edu/ucce50/ag-labor/7labor/

California Labor Enforcement Task Force. (855) 297-5322. dir.ca.gov/letf

- dir.ca.gov/letf/Agriculture_Employer_Brochure.pdf (2022)

Iowa State University Extension and Outreach. Whole Farm Human Resources. Ag Decision Maker.

- extension.iastate.edu/agdm/wdhumanresources.html#management

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

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.

For an example plan, see “LODI RULES Management Plans & Requirements to Pass” in Tab 10 of the LODI RULES Binder, or visit lodigrowers.com/standards and scroll down to the “LODI RULES Management Plans & Audit Prep Checklist” section for a link to the document.

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*, 3rd Ed. University of California Agriculture and Natural Resources. 2014. nature.berkeley.edu/ucce50/ag-labor/7labor/

Farm Employers Labor Service. Ag Employer's Compliance Checkup and Handbook Service.

- fels.net/1/fels-services/personnel-audit-a-handbook-service.html

O'Rourke, M. Farm employee management: do we need an employee handbook? Iowa State University Extension and Outreach. Ag Decision Maker. File C1-72. May 2014.

- extension.iastate.edu/agdm/wholefarm/html/c1-72.html

Spano, S. Creating an Employee Handbook from Scratch. JazzHR Blog. January 27, 2020.

- jazzhr.com/blog/creating-an-employee-handbook-from-scratch/

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

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*, 3rd Ed. University of California Agriculture and Natural Resources. 2014. nature.berkeley.edu/ucce50/ag-labor/7labor/

JazzHR Blog. New-Hire Orientation Ideas: 7 Tried-and-True Onboarding Strategies. July 23, 2020.

- jazzhr.com/blog/new-hire-orientation-ideas-7-tried-and-true-onboarding-strategies/

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

O'Rourke, M. Farm employee management: new employee orientation. Iowa State University Extension and Outreach. Ag Decision Maker. File C1-78. August 2014.

- extension.iastate.edu/agdm/wholefarm/html/c1-78.html

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

2.4 Employee Job Descriptions

The farming operation has written descriptions 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*. Manual. fels.net

O'Rourke, M. Farm employee management: assembly of farm job descriptions. Iowa State University Extension and Outreach. Ag Decision Maker. File C1-73. May 2014.

- extension.iastate.edu/agdm/wholefarm/html/c1-73.html

O'Rourke, M. Farm employee management: put job descriptions to work on your farm. Iowa State University Extension and Outreach. Ag Decision Maker. File C1-74. June 2014.

- extension.iastate.edu/agdm/wholefarm/html/c1-74.html

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

Wright State University. Human Resources. Writing an Effective Job Description.

- wright.edu/human-resources/writing-an-effective-job-description

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*, 3rd Ed. University of California Agriculture and Natural Resources. 2014. nature.berkeley.edu/ucce50/ag-labor/7labor/

FreshBooks. How to Evaluate an Employee: A Performance Review Checklist. March 28, 2019.

- freshbooks.com/hub/leadership/evaluate-an-employee

Holz-Clause, M. Good communication can help solve problems. Iowa State University Extension and Outreach. Ag Decision Maker. File C6-56. November 2022.

- extension.iastate.edu/agdm/wholefarm/html/c6-56.html

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

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.

Resources/References:

AgSafe. agsafe.org

Baron, S, Estill, CF, Steege, A, and Lalich, N. Simple solutions: ergonomics for farm workers. National Institute for Occupational Safety and Health. 2001. [cdc.gov/niosh/docs/2001-111/default.html](https://www.cdc.gov/niosh/docs/2001-111/default.html)

Cal/OSHA provides free, confidential health and safety consultations in California: (800) 963-9424

California Department of Industrial Relations. Heat illness prevention.

- dir.ca.gov/DOSH/HeatIllnessInfo.html

California Environmental Protection Agency Department of Pesticide Regulation. Pesticides and human health information. cdpr.ca.gov/docs/dept/quicklinks/humanhea.htm

Israel Institute for Occupational Safety and Hygiene. osh.org.il/eng/eng_site/about_iiosh/training/

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

United States Department of Labor Occupational Safety and Health Administration (OSHA).

- [osha.gov/agricultural-operations](https://www.osha.gov/agricultural-operations)

University of California Agricultural Ergonomics Research Center.

Washington State Department of Labor & Industries. Agriculture.

- lni.wa.gov/safety-health/safety-topics/industry/agriculture

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.

Resources/References:

Bayer, D. The benefits of a farm safety program. *California Agriculture*. 38(1): 26-27. 1984.

Druley, K, Ferguson, A, and Bottino, B. Safety + Health. On the safe side podcast. Episode 18: Safety incentive programs and keeping workers safe behind the wheel. August 12, 2021.

- safetyandhealthmagazine.com/articles/21556-on-the-safe-side-podcast-episode-18-safety-incentives

Ferguson, A. Safety incentive programs. Safety + Health blog post. July 25, 2021.

- safetyandhealthmagazine.com/articles/21452-safety-incentive-programs

Safety by Design. Ideas for the best safety incentive programs for employees – examples. Blog post. January 28, 2020. safetybydesigninc.com/ideas-best-safety-incentive-programs-for-employees-examples/

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 their 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*, 3rd Ed. University of California Agriculture and Natural Resources. 2014. nature.berkeley.edu/ucce50/ag-labor/7labor/

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

Organizations Hosting Training Seminars and Educational Events

Ag CEU Online
AgSafe
American Society for Enology and Viticulture (ASEV)
American Society of Agronomy – California Chapter
American Vineyard Magazine
Association of Applied IPM Ecologists (AAIE)
California Association of Pest Control Advisors (CAPCA)
California Association of Winegrape Growers (CAWG)
California Farm Bureau
California State University – Fresno
Clarksburg Wine Growers & Vintners Association
Community Alliance with Family Farmers (CAFF)
Lodi Chamber Agribusiness Committee
Lodi District Grape Growers Association (LDGGA)
Lodi Winegrape Commission
Napa County Farm Bureau Foundation
Napa Valley Grapegrowers
San Joaquin Farm Bureau
San Joaquin Valley Winegrowers Association
Sonoma County Winegrowers
University of California Agriculture & Natural Resources (ANR)
University of California – Davis
Vineyard Team
Washington State University Extension
Washington Winegrowers Association
Western IPM
Wild Farm Alliance
Wine Business Monthly
Wine Industry Network
Wine Institute
World Ag Expo
Xerces Society

The Lodi Winegrape Commission hosts several grower outreach events throughout the year, which are listed online at lodigrowers.com – [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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

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*, 3rd Ed. University of California Agriculture and Natural Resources. 2014. nature.berkeley.edu/ucce50/ag-labor/7labor/

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

2.11 Employee Health Care Benefit

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:

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

United States Department of Agriculture. Economic Research Service. Farm household well-being: health insurance coverage. December 1, 2021.

- ers.usda.gov/topics/farm-economy/farm-household-well-being/health-insurance-coverage/

2.12 Employee Benefits Package

The farming operation offers a benefits package to full time employees in excess of government requirements, which includes <u>two or more of the following</u> : 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*, 3rd Ed. University of California Agriculture and Natural Resources. 2014. nature.berkeley.edu/ucce50/ag-labor/7labor/

Farm Employers Labor Service. *Summary of employment requirements for 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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

2.13 Salary Survey Participation

***REVISED* for 2023 certification year**

The farming operation participates in an annual salary survey (Wine Business Monthly/Western Management Group, Western Growers, AgCareers.com, 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, including a screenshot/print out of the completed survey prior to submission or a thank you email from the surveyor confirming participation during the current certification year.

Resources/References:

AgCareers.com. agcareers.com/compensation-benchmark-review

Farm Employers Labor Service. fels.net

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

Western Growers. agsalary.com

Western Management Group.

- wmgnnet.com/dnn8/Salary-Surveys/USA/Wine-Industry-Compensation-Survey

Wine Business Monthly. winebusiness.com/search/?q=salary+survey

2.14 Social Responsibility

***NEW* for 2023 certification year**

The farming operation has a written policy in place to prevent illegal child labor, to protect young workers, to report suspicious labor conditions (e.g., trafficked labor, illegal overtime), to prevent corruption, to protect the rights of all employees, to prevent sexual harassment, and to prevent discrimination <u>AND</u> this policy is reviewed and updated every year.	YES = 1
	NO = 0

Companion Information

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

Purpose: To ensure that employees and stakeholders are included and protected by the farming operation.

Verification: Visual inspection of written social responsibility policy.

References:

Billikopf, G. *Labor management in agriculture: cultivating personnel productivity*, 3rd Ed. University of California Agriculture and Natural Resources. 2014. nature.berkeley.edu/ucce50/ag-labor/7labor/

Hurst, P. Health and child labor in agriculture. *Food and Nutrition Bulletin*. Vol. 28, No. 2 (supplement). The United Nations University. 2007. journals.sagepub.com/doi/pdf/10.1177/15648265070282S216

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

University of California – Davis. Western Center for Agricultural Health and Safety. Training – Sexual Harassment Prevention. aghealth.ucdavis.edu/training/sexual-harassment

2.15 Employee Satisfaction Bonus Point

***NEW* for 2023 certification year**

A. The farming operation offers non-mandated safety and/or comfort enhancements to create a more comfortable work environment for vineyard employees (e.g., an enclosed cab tractor, a tie gun, a suckering wand, ergonomic pruning shears, cold drinking water, a dedicated break room, etc.).	+1 (bonus)
B. The farming operation <i>does not offer any non-mandated safety and/or comfort enhancements</i> for vineyard employees.	0

Companion Information

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

Purpose: To award participants who go above and beyond regulations to care for the wellbeing of their employees.

Verification: Visual inspection of safety or comfort enhancements (or photos of enhancements in use on the vineyard).

References:

Baron, S, Estill, CF, Steege, A, and Lalich, N. Simple solutions: ergonomics for farm workers. National Institute for Occupational Safety and Health. 2001. [cdc.gov/niosh/docs/2001-111/default.html](https://www.cdc.gov/niosh/docs/2001-111/default.html)

Billikopf, G. *Labor management in agriculture: cultivating personnel productivity*, 3rd Ed. University of California Agriculture and Natural Resources. 2014. nature.berkeley.edu/ucce50/ag-labor/7labor/

University of California Agricultural Ergonomics Research Center.

Wakula, J, Beckmann, T, Hett, M, and Landau, K. Ergonomic analysis of grapevine pruning and wine harvesting to define work and hand tools design requirements. *Occupational Ergonomics*. 2(3): 151-161. 1999.

- researchgate.net/publication/320021495_Ergonomic_analysis_of_grapevine_pruning_and_wine_harvesting_to_define_work_and_hand_tools_design_requirements

Chapter 3: Ecosystem Management

3.1 Watershed Management

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.

Resources/References:

California State Water Resources Control Board. Citizen and Community Monitoring Programs and Groups.
 • waterboards.ca.gov/water_issues/programs/swamp/clean_water_team/watershed_rel.html

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. 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. 2008.
 • lodigrowers.com/lodiwinegrowersworkbook/

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.

Resources/References:

Cotton Info Australia. My BMP. Developing a farm map. 2016.

- cottoninfo.com.au/sites/default/files/documents/NRM%20myBMP%20fact%20sheet%20-%20farm%20map%20v2.pdf

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

- lodigrowers.com/lodiwinegrowersworkbook/

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 management team.

Verification: Visual inspection of the ecosystem management plan document. See examples of what to consider in an ecosystem management plan on the following page.

References:

Altieri, MA, Nicholls, CA, Ponti, L, and York, A. Designing biodiverse, pest resilient vineyards through habitat management. Practical Winery and Vineyard. 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 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 diversity 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. 2008.

• lodigrowers.com/lodiwinegrowersworkbook/

Rickel, D, and Francis, C. (Eds.). *Agroecosystems 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.

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.

For an example plan template, see “LODI RULES Management Plans & Requirements to Pass” in Tab 10 of the LODI RULES Binder, or visit lodigrowers.com/standards and scroll down to the “LODI RULES Management Plans & Audit Prep Checklist” section for a link to the document.

3.4 Enhancing Plant and Soil Inhabitant Biodiversity Within the Vineyard

A. A permanent cover crop (non-tilled), composed of multiple native species , is maintained between at least every other vine row.	4
B. A cover crop , composed of multiple species (permanent/non-tilled OR resident/non-planted), is maintained between at least every other vine row.	3
C. An annually seeded cover crop of multiple species is maintained between at least every other vine row AND tilling does not take place during the winter months.	2
D. An annual resident species cover crop (non-planted) is maintained between at least every other vine row AND 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. See Standard 3.8 for a definition of *native*.

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

Resources:

California – USDA Natural Resources Conservation Service. Lockeford Plant Materials Center.

- nrcs.usda.gov/wps/portal/nrcs/main/plantmaterials/pmc/west/capmc/

Israel – Agricultural Research Organization. Neve Ya'ar Research Center. Model Farm for Sustainable Agriculture: Soil Conservation and Planning.

- modelfarm-aro.org/subject-areas-and-activity/soil-conservation-and-planning/?lang=en

Washington – USDA Natural Resources Conservation Service. Pullman Plant Materials Center.

- nrcs.usda.gov/wps/portal/nrcs/main/plantmaterials/pmc/west/wapmc/

References:

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

- lodigrowers.com/maximizing-cover-crop-benefits-through-selection-and-management/

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

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

3.5.1 Woodland Buffer Type

A. The farming operation has enhanced the buffer around woodlands* with <u>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
The farming operation <i>does not have woodlands*</i> that are under company control in or adjacent to the vineyard block on company property.	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. See Standard 3.8 for a definition of *native*.

Purpose: To protect and preserve woodlands, if applicable, 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 Agriculture and Natural Resources Publication 8263. 2007.

Olsen, R, Francis, C, and Kaffla, S. (Eds.). *Exploring the role of diversity 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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

University of California. Oak Woodland Management. oaks.cnr.berkeley.edu/

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
The farming operation <i>does not have woodlands*</i> that are under company control in or adjacent to the vineyard block on company property.	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 protect and preserve woodland trees, if applicable, 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 Agriculture and Natural Resources Publication 8263. 2007.

Olsen, R, Francis, C, and Kaffla, S. (Eds.). *Exploring the role of diversity 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. 2008.

- lodiwinegrowers.com/lodiwinegrowersworkbook/

University of California. Oak Woodland Management. oaks.cnr.berkeley.edu/

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
<i>There are no individual, preserved trees</i> under company control in or adjacent to the vineyard block on company property.	N/A

Companion Information

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

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

Verification: Visual inspection of individual trees.

References:

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.

Olsen, R, Francis, C, and Kaffla, S. (Eds.). *Exploring the role of diversity 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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

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
<i>There are no individual, preserved trees</i> under company control in or adjacent to the vineyard block on company property.	N/A

Companion Information

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

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

Verification: Visual inspection of individual trees.

References:

Olsen, R, Francis, C, and Kaffla, S. (Eds.). *Exploring the role of diversity 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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

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

REVISED for 2023 certification year

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. May/June 2005.

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

Nicholls, CI, and Altieri, MA. Designing species-rich, pest suppressive agroecosystems through habitat management. In: *Agroecosystems analysis*. Rickel, D, and Francis, C. (Eds.). American Society of Agronomy. Madison, WI. 2004.

Olsen, R, Francis, C, and Kaffla, S. (Eds.). *Exploring the role of diversity 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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

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

3.8 Native Vegetation Adjacent to Vineyards Bonus Points

Select all that apply:

3.8.1 Native Vegetation: Maintained Vegetation Bonus Point Native vegetation is maintained on headlands.	YES = +1 (bonus)
	NO = 0
3.8.2 Native Vegetation: Maintained Hedgerows Bonus Point Hedgerows of native vegetation are maintained along the edges of headlands (e.g., fence lines) <u>AND</u> roadsides.	YES = +1 (bonus)
	NO = 0
3.8.3 Native Vegetation: Planted Buffers Bonus Point Buffers of native vegetation are planted around individual, preserved trees.	YES = +1 (bonus)
	NO = 0

Companion Information

Scope: Individual vineyard management units submitted for LODI RULES certification. The US Dept. of Agriculture defines *native plants* as “the indigenous terrestrial and aquatic species that have evolved and occur naturally in a particular region, ecosystem, and habitat” (see reference below).

Purpose: To reward the use of 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.

Resources/References:

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

Ornduff, R, Faber, M, and Keeler-Wolf, T. *Introduction to California plant life*. University of California Press. Berkeley. 2003.

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/vegetation

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

United States Department of Agriculture. “What Are Native Plant Materials?” 2023. fs.usda.gov

Washington Native Plant Society. Native Plant Directory. wnps.org/native-plant-directory

Xerces Society, The. Plant Lists. xerces.org/publications/plant-lists

3.9.1 Delineated Seasonal Wetland (including vernal pools) Management

A. Seasonal wetlands are preserved with a <u>permanent vegetative buffer strip around the entire perimeter</u> , which includes <u>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
There are <i>no delineated seasonal wetlands</i> under company control in or adjacent to the vineyard block.	N/A

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. See Standard 3.8 for a definition of *native*.

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

Verification: Visual inspection of seasonal wetlands in or adjacent to individual vineyard management units submitted for LODI RULES certification.

References:

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

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

- lodigrowers.com/lodiwinegrowersworkbook/

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

United States Environmental Protection Agency. Wetlands: Vernal Pools. epa.gov/wetlands/vernal-pools

Witham, 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. vernalpools.ucmerced.edu/education/vernal-pools-ecology

3.10.1 Riparian Habitat Management

A. Riparian vegetation adjacent to perennial waterways, including <u>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
Riparian habitat associated with perennial water bodies, such as rivers that flow all year during most years, <i>does not exist on company property</i> .	N/A

Companion Information

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

Purpose: If applicable, to preserve riparian vegetation and protect adjacent perennial waters. A *riparian habitat* is an area next to a body of water which houses a unique ecosystem that plays an important role in conservation efforts. See Standard 3.8 for a definition of *native*.

Verification: Visual inspection of riparian areas.

References:

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

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

Olsen, R, Francis, C, Kaffla, S. (Eds.). *Exploring the role of diversity 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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

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/vegetation

3.11.1 Intermittent Water Body Habitat Management

A. There is a <u>native vegetation</u> buffer strip <i>at least 9 feet wide</i> between vineyards and intermittent water bodies.	3
B. There is a <u>vegetative</u> buffer strip <i>at least 9 feet wide</i> between vineyards and intermittent water bodies.	2
C. There is a <u>non-vegetative</u> 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
There are <i>no intermittent water bodies</i> , such as streams and ponds that are dry during most summers, under company control on company property.	N/A

Companion Information

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

Purpose: To preserve and protect intermittent waters, if applicable, and the habitat they provide. See Standard 3.8 for a definition of *native*.

Verification: Visual inspection of intermittent water bodies.

References:

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

Kocher, SD, and Harris, R. Forestry stewardship series 10: riparian vegetation. University of California 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 Publication 8403. 2010.

Ornduff, R, Faber, M, and Keeler-Wolf, T. *Introduction to California plant life*. University of California Press. Berkeley. 2003.

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

• lodigrowers.com/lodiwinegrowersworkbook/

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

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

3.12 Agrobiodiversity: Beneficial Species Habitat

NEW for 2023 certification year, 3.12.6 and 3.12.7

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: Bees	YES = 1
<u>Bee boxes, bee gardens, and/or shelters for native loner bees</u> are present on company property.	NO = 0
3.12.7 Habitat: Snakes	YES = 1
<u>Natural nesting sites for beneficial snakes</u> (garter snakes, gopher snakes, California mountain king snakes, etc.) are present on company property.	NO = 0

Companion Information**Scope:** Individual vineyard management units submitted for LODI RULES certification.**Purpose:** To support populations of birds, bats, snakes, and bees, plus 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.**Resources/References** (continued on the following page):

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.

Lee-Mäder, E, Hopwood, J, Vaughan, M, Hoffman Black, S, and Morandin, L. *Farming with Native Beneficial Insects: Ecological Pest Solutions*. The Xerces Society. 2014.

Ecosystem Management

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

- lodigrowers.com/lodiwinegrowersworkbook/

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

Sonoma County Reptile Rescue. sonomacountyreptilerescue.com

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

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



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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 access to sink holes, unprotected wells, or other direct conduits to groundwater 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 rivers, streams, and other surface water bodies.</i>	0
Livestock <i>are not used</i> for vineyard grazing.	N/A

Companion Information

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

Purpose: To protect waters from the effects of livestock, if applicable.

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

Reference:

Rinehart, L. Pasture, rangeland, and grazing management. ATTRA - National Sustainable Agriculture Information Service. Updated November 2008.

- rangemanagement.extension.colostate.edu/wp-content/uploads/sites/42/2020/07/Pasture_Range_Grazing_Management.pdf

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
Livestock <i>are not used</i> for vineyard grazing.	N/A

Companion Information

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

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

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*. United States Department of the Interior. Bureau of Land Management. National Applied Resources Sciences Center. 1997.

Lodi Winegrape Commission. Sheep Grazing in Lodi Vineyards. YouTube video. January 2022.

- [youtube.com/watch?v=4UVImBipnM](https://www.youtube.com/watch?v=4UVImBipnM)

3.15 Invasive Species Training and Recognition

***NEW* for 2023 certification year**

The farming operation trains people working on the property how to identify and report the sighting of major potential invasive pests and plants of concern in the region (e.g., spotted lanternfly and nutria), including knowledge of their preferred habitat.	YES = 2
	NO = 0

Companion Information

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

Purpose: To help protect your vineyard and community ecosystem from potentially devastating invasive pests and plants.

Verification: Visual inspection of written training documents, including meeting agendas and signature lists for attending employees, with date of training and topics covered. Please note that training may be provided by a source outside of the farming operation – e.g., through a webinar or a grower outreach meeting.

Resources/References:

Society for the Protection of Nature in Israel. natureisrael.org/EPD/Biodiversity/Impact-on-Environment

University of California Riverside Center for Invasive Species Research. FAQs about Invasive Species in California. civr.ucr.edu/invasive-species

Washington Invasive Species Council. invasivespecies.wa.gov

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aphis.usda.gov/hungrypests/sifbiz



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 management team.

Verification: Visual inspection of the mineral nutrient management plan document. See examples of what to consider in a nutrient management plan on the following page.

References (continued on the following page):

Burt, C, O'Connor, K, and Ruehr, T. *Fertigation*. California Polytechnic State University. Irrigation Training and Research Center. 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 Press. 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. September 29, 2015.

- lodigrowers.com/managing-vineyard-mineral-deficiency-beyond-the-four-rs/

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

Soil Management

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

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, nutrientstewardship.org/4rs/).

Monitoring activities: Mineral nutrient management requires monitoring of vine condition, both externally with visual observations and internally through tissue analysis.

A plan review and update schedule.

For an example plan template, see “LODI RULES Management Plans & Requirements to Pass” in Tab 10 of the LODI RULES Binder, or visit lodigrowers.com/standards and scroll down to the “LODI RULES Management Plans & Audit Prep Checklist” section for a link to the document.

Soil Management

4.2 Soil Erosion and Compaction: Soil Conservation Plan

***REVISED* for 2023 certification year**

The farming operation is aware of the erosion and compaction risks to 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 (including the wind erodibility group and water erodibility or K_w factor), best management practices to minimize soil erosion and compaction, 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 and compaction 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 their management team to minimize the off-site movement of soil.

Verification: Visual inspection of the soil conservation plan document. See examples of what to consider in a soil conservation plan on the following page.

Resources/References (continued on the following page):

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 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 Agriculture and Natural Resources Publication 8202. 2006.

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

Peacock, B. Managing Compacted Soils in Vineyards. University of California Cooperative Extension Publication GV8-97. 2002.

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

Sonoma County Agricultural Commissioner's Office. Best Management Practices for Agricultural Erosion and Sediment Control. 2017.

- soilhub.org/update/best-management-practices-for-ag-erosion-and-sediment-control/

Soil Management

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

United States Department of Agriculture. Natural Resources Conservation Service. Soils.

- nrcs.usda.gov/conservation-basics/natural-resource-concerns/soil

United States Department of Agriculture. Soil Compaction: Detection, Prevention, and Alleviation. Natural Resources Conservation Service. Soil Quality Institute. Soil Quality – Agronomy Technical Note No. 17. June 2003.

United States Department of Agriculture. Web Soil Survey.

- websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

Soil Conservation Plan Organization

Summary of erosion and compaction 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.

Best management practices to minimize soil compaction: May include measuring and minimizing tractor passes, using a documented and easily measurable soil moisture threshold to determine when it is safe for machines to enter vine rows (also think about a post-discing re-entry interval, when the soil can be vulnerable to compaction), checking for compaction underneath drip irrigation, and incorporating ground cover into seasonal floor management.

A plan review and update schedule.

For an example plan template, see “LODI RULES Management Plans & Requirements to Pass” in Tab 10 of the LODI RULES Binder, or visit lodigrowers.com/standards and scroll down to the “LODI RULES Management Plans & Audit Prep Checklist” section for a link to the document.

Soil Management

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

*NRCS stands for the United States Department of Agriculture's Natural Resources Conservation Services.

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

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

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

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.

United States Department of Agriculture. Natural Resources Conservation Service Web Soil Survey.

- websoilsurvey.nrcs.usda.gov/app/

United States Department of Agriculture. Soil Survey of Sacramento County, California. Soil Conservation Service. 1992.

Soil Management

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 (continued on the following page):

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 Press. 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. 2008.

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Magdoff, FR, Tabatabai, MA, and Hanlon, EA, Jr. (Eds.). *Soil organic matter: analysis and interpretation*. Soil Science Society of America Special Publication Number 46. 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.

Soil Management

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.

Soil Management

4.5.1 Non-Tillage (every row) 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.	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.	1
Non-tillage is practiced in every other row <u>OR</u> every row is tilled.	N/A

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. October 12, 2015.

- lodiwinegrowers.com/maximizing-cover-crop-benefits-through-selection-and-management/

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. 2008.

- lodiwinegrowers.com/lodiwinegrowersworkbook/

Ingels, CA, Bugg, RL, McGourty, GT, and Christensen, LP. (Eds.). *Cover cropping in vineyards*. University of California 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.

Sever, M. Strategic tillage has its place in no-till agriculture. American Society of Agronomy. Crop & Soils Magazine. November-December 2021.

Soil Management

4.5.2 Partial Tillage (every other row) 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 and after furrow or sprinkler irrigations.	1
D. Every other middle is tilled <i>without concern for vineyard floor surface or soil conditions</i> .	0
Non-tillage is practiced in every row <u>OR</u> every row is tilled.	N/A

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, S. Maximizing cover crop benefits through selection and management. Lodi Winegrape Commission Coffee Shop. October 12, 2015.

- lodiwinegrowers.com/maximizing-cover-crop-benefits-through-selection-and-management/

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. 2008.

- lodiwinegrowers.com/lodiwinegrowersworkbook/

Ingels, CA, Bugg, RL, McGourty, GT, and Christensen, LP. (Eds.). *Cover cropping in vineyards*. University of California 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.

4.5.3 Complete Tillage (every row) 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 and after furrow or sprinkler irrigations.	1
D. Every middle is tilled <i>without concern for vineyard floor surface or soil conditions</i> .	0
Non-tillage is practiced in every other row <u>OR</u> in every row.	N/A

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. Madison, WI. 1987.

Snyder, RL, Paw, U, KT, and Thompson, JF. Passive frost protection of trees and vines. University of California Agriculture and Natural Resources Leaflet 21429. 1992.

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

Soil Management

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</u> <i>every year</i> 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 8.0 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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

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.

Soil Management

4.7 Organic Matter

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 for: 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*. Sustainable Agriculture Research and Education Program. University of California Agriculture and Natural Resources Publication 21505. 1992.

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. Madison, WI. 1987.

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

- lodiwinegrowers.com/maximizing-cover-crop-benefits-through-selection-and-management/

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. 2008.

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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.

Soil Management

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. 2008.

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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.

Soil Management

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, 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, nutrient management 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. 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 Press. 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. 2008.

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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.

Soil Management

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 Press. 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. 2008.

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

Soil Management

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 4.13 (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 Type

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
Nitrogen is applied as a manufactured or mined source . OR 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.	N/A

*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 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*. Sustainable Agriculture Research and Education Program. University of California 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. January 4, 2017.

- lodigrowers.com/nitrogen-fertilizer-forms/

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

4.12.3 Non-Mined, Biologically Sourced Nitrogen Application

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
Nitrogen is applied as a <u>manufactured or mined source</u> . <u>OR</u> 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.	N/A

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.

Resources/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. January 4, 2017.

- lodigrowers.com/nitrogen-fertilizer-forms/

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.

United States Department of Agriculture. Natural Resources Conservation Service. Soils.

- nrcs.usda.gov/conservation-basics/natural-resource-concerns/soil

Soil Management

4.12.4 Manufactured or Mined Nitrogen Application

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
Nitrogen is applied as a <u>non-mined, biological source</u> . <u>OR</u> 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.	N/A

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 (continued on the following page):

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.

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

Grant, S. Nitrogen Fertilizer Forms. Lodi Winegrape Commission Coffee Shop Blog. January 4, 2017.

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Grant, S. Nitrogen Part II: Effective Nitrogen Management for Vineyards. Lodi Winegrape Commission Coffee Shop Blog. November 24, 2015.

- lodigrowers.com/nitrogen-part-ii-effective-nitrogen-management-for-vineyards/

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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. 2008.

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

4.13 Soil Erosion by Wind

***NEW* for 2023 certification year**

Select all that apply:

4.1: Vineyard Floor	YES = 1
The vineyard floor is never cultivated under dry, windy conditions (>10 mph) <u>OR</u> a permanent vegetative cover is maintained between every row.	NO = 0
4.13.2 Soil Erosion by Wind: Headlands	YES = 1
A perennial cover crop or native vegetative cover is maintained on the headlands of the vineyard.	NO = 0
4.13.3 Soil Erosion by Wind: Windbreaks	YES = 1
A hedgerow of trees on the upwind edge of the vineyard serves as a windbreak.	NO = 0

Companion Information

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

Purpose: To prevent and/or minimize soil erosion by wind. See Standard 3.8 for a definition of *native*.

Verification: Visual inspection of vineyard floor, headlands, and windbreaks (photos acceptable) and/or copies of bag tags for cover crop seeds if manually seeded.

References:

Grant, S. The ultimate goal of vineyard soil management: optimized root zone function. Lodi Winegrape Commission Coffee Shop Blog. December 20, 2021. lodigrowers.com/optimized-root-zone-function/

Sonoma County Agricultural Commissioner's Office. Best Management Practices for Agricultural Erosion and Sediment Control. 2017.

- soilhub.org/update/best-management-practices-for-ag-erosion-and-sediment-control/

United States Department of Agriculture. Natural Resources Conservation Service. Rangeland Soil Quality: Wind Erosion. May 2001.

United States Department of Agriculture. Natural Resources Conservation Service. Soil Quality Resource Concerns: Soil Erosion. April 1996. eeinwisconsin.org/content/eeui/101706/SoilErosion.pdf

Soil Management

4.14 Soil Erosion by Water

***NEW* for 2023 certification year**

A. All slopes in the vineyard are less than 10% <u>OR</u> there are slopes in the vineyard which are 10%* or greater <u>AND</u> the vineyard follows an erosion control plan created by Fish Friendly Farming, a Resource Conservation District, or a registered civil engineer.	Take 4 points (Standard 4.14.1 is N/A)
B. There are slopes in the vineyard which are 10%* or greater but the vineyard <i>does not follow an erosion control plan created by Fish Friendly Farming, a Resource Conservation District, or a registered civil engineer.</i>	Go to Standard 4.14.1

*10% slope: for every 100 feet (or meters) of horizontal distance, the altitude changes by 10 feet (or meters).

Companion Information

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

Purpose: To acknowledge the greater capacity for water soil erosion in sloped vineyards and award points for professional soil erosion plans in those instances.

Verification: Visual inspection of professionally written erosion control plan document(s) and/or official document specifying the slope of the vineyard (including a Google Earth report).

Resources:

Fish Friendly Farming, a certification program run by the California Land Stewardship Institute. Based in Napa County, California. (707) 253-1226. fishfriendlyfarming.org

Luna, M. "Deriving slope in Google Earth." YouTube video. youtube.com/watch?v=PqiNyGq6b3U. Google Earth (free). earth.google.com/web

United States Department of Agriculture. Natural Resources Conservation Services. National Association of Resource Conservation Districts. nrcs.usda.gov/

References:

Battany, MC, and Grismer, ME. Rainfall Runoff and Erosion in Napa Valley Vineyards: Effects of Slope, Cover and Surface Roughness. *Hydrological Processes*. 14(7): 1289-1304. 2000.

Grant, S. The ultimate goal of vineyard soil management: optimized root zone function. Lodi Winegrape Commission Coffee Shop Blog. December 20, 2021. lodigrowers.com/optimized-root-zone-function/

United States Department of Agriculture. Natural Resources Conservation Service. Soil Quality Resource Concerns: Soil Erosion. April 1996. eeinwisconsin.org/content/eeui/101706/SoilErosion.pdf

Soil Management

4.14.1 Soil Erosion by Water – Sloped Vineyards

***NEW* for 2023 certification year**

Select all that apply:

4.14.1.1 Soil Erosion by Water – Sloped Vineyards: Vineyard Floor A permanent vegetative cover is maintained between every row.	YES = 1 NO = 0
4.14.1.2 Soil Erosion by Water – Sloped Vineyards: Headlands During the rainy season, the farming operation maintains waterbars, straw wattles, or some other device to inhibit and direct overland flow on the sloped headlands of the vineyard.	YES = 1 NO = 0
4.14.1.3 Soil Erosion by Water – Sloped Vineyards: Berms Cross slope berms in the vineyard restrict overland water flow <u>OR</u> the vineyard rows follow the contour of the sloping land.	YES = 1 NO = 0
4.14.1.4 Soil Erosion by Water – Sloped Vineyards: Downslope Edge A vegetative filter strip is maintained on the downslope edge of the vineyard.	YES = 1 NO = 0
All slopes in the vineyard are less than 10% <u>OR</u> there are slopes in the vineyard which are 10%* or greater <u>AND</u> the vineyard follows an erosion control plan created by Fish Friendly Farming, a Resource Conservation District, or a registered civil engineer.	N/A

* 10% slope: for every 100 feet (or meters) of horizontal distance, the altitude changes by 10 feet (or meters).

Companion Information

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

Purpose: To minimize soil erosion by water in sloped vineyards.

Verification: Visual inspection of photos to document the practices listed and/or copies of bag tags for cover crop seeds if manually seeded.

References:

Battany, MC, and Grismer, ME. Rainfall Runoff and Erosion in Napa Valley Vineyards: Effects of Slope, Cover and Surface Roughness. *Hydrological Processes*. 14(7): 1289-1304. 2000.

Grant, S. The ultimate goal of vineyard soil management: optimized root zone function. Lodi Winegrape Commission Coffee Shop Blog. December 20, 2021. lodi growers.com/optimized-root-zone-function/

Sonoma Co. Ag Commissioner's Office. Best Management Practices for Agricultural Erosion and Sediment Control. 2017. soilhub.org/update/best-management-practices-for-ag-erosion-and-sediment-control/

United States Department of Agriculture. Natural Resources Conservation Service. Soil Quality Resource Concerns: Soil Erosion. April 1996. eeinwisconsin.org/content/eewi/101706/SoilErosion.pdf

Soil Management

Chapter 5: Water Management

5.1 Water Management Plan

***REVISED* for 2023 certification year**

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 = Fail Chapter

*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 their management team.

Verification: Visual inspection of the water management plan document. See examples of what to consider in a water management plan on the following page.

References (continued on the following page):

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

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

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

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. Davis, CA. 2004.

- lodi growers.com/wp-content/uploads/2022/12/Deficit-Irrigation-of-Quality-Winegrapes-Using-Micro-Irrigation-2004.pdf

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

Water Management

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

Williams, LE, and Matthews, MA. Grapevine. In: *Irrigation of Agricultural Crops*. Stewart, BA, and Nielsen, DR. (Eds.). American Society of Agronomy. Madison, WI. 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 them 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.

For an example plan template, see “LODI RULES Management Plans & Requirements to Pass” in Tab 10 of the LODI RULES Binder, or visit lodigrowers.com/standards and scroll down to the “LODI RULES Management Plans & Audit Prep Checklist” section for a link to the document.

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, 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 (Standard 5.1).

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, 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. 2008.

• lodigrowers.com/lodiwinegrowersworkbook/

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

5.4 Irrigation System

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

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.

Reference:

Hanson, B. Irrigation performance in California. *Irrigation Journal* (Irrigation Association). October 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
The vineyard is not irrigated (other than one post-harvest irrigation) because soil moisture is adequate for production goals.	N/A

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

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

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

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
The vineyard is not irrigated (other than one post-harvest irrigation) because soil moisture is adequate for production goals.	N/A

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, CA. 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)
The vineyard is not irrigated (other than one post-harvest irrigation) because soil moisture is adequate for production goals.	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.

Water Management

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
<p>The vineyard is not irrigated (other than one post-harvest irrigation) because soil moisture is adequate for production goals.</p> <p style="text-align: center;"><u>OR</u></p> <p>The vineyard is irrigated, but not with a low volume - surface system.</p>	N/A

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, CA. 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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

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

University of California: Maintenance of Microirrigation Systems. micromaintain.ucanr.edu

5.7.2 Maintenance for Low Volume - Subsurface Irrigation Systems

A. <i>At least every irrigation</i> , flow meters, pressure gauges, and relief valves are checked <u>AND</u> leaks are repaired.	3
B. <i>At least every fourth irrigation</i> , flow meters, pressure gauges, and relief valves are checked <u>AND</u> leaks are repaired.	2
C. <i>At least once every year</i> , flow meters, pressure gauges, and relief valves are checked <u>AND</u> leaks are repaired.	1
D. <i>No type of system maintenance</i> has been completed <i>in the last year</i> .	Fail Chapter
The vineyard is not irrigated (other than one post-harvest irrigation) because soil moisture is adequate for production goals. <u>OR</u> The vineyard is irrigated, but not with a low volume - subsurface system.	N/A

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, CA. 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. 2008.

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

University of California: Maintenance of Microirrigation Systems. micromaintain.ucanr.edu

5.7.3 Maintenance for Overhead 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
<p>The vineyard is not irrigated (other than one post-harvest irrigation) because soil moisture is adequate for production goals.</p> <p style="text-align: center;"><u>OR</u></p> <p>The vineyard is irrigated, but not with an overhead sprinkler system.</p>	N/A

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

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

5.7.4 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
<p>The vineyard is not irrigated (other than one post-harvest irrigation) because soil moisture is adequate for production goals.</p> <p style="text-align: center;"><u>OR</u></p> <p>The vineyard is irrigated, but not with a flood or furrow system.</p>	N/A

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*. University of California Agricultural Sciences 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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

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
The vineyard is not irrigated (other than one post-harvest irrigation) because soil moisture is adequate for production goals.	N/A

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*. Irrigation Program. University of California, 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. 2008.

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5.9 Distribution Uniformity

***REVISED* for 2023 certification year**

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. Irrigation system distribution uniformity <i>has not been tested and recorded within the last 3 years</i> <u>OR</u> the vineyard subsurface drip and relief valves <i>are not checked at least once every month.</i>	Fail Chapter
<p>The vineyard is not irrigated (other than one post-harvest irrigation) because soil moisture is adequate for production goals.</p> <p style="text-align: center;"><u>OR</u></p> <p>The vineyard is irrigated with a flood or furrow system.</p>	N/A

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, CA. 1994.

Merriam, JL, and Keller, J. *Farm irrigation system evaluation: a guide for management*. Department of Agricultural and Irrigation Engineering. Utah State University. Logan, UT. 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. 2008.

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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> <i>the pump is never tested</i> .	0
The vineyard is not irrigated (other than one post-harvest irrigation) because soil moisture is adequate for production goals.	N/A

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 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. 2008.

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Schwankl, L, Hanson, B, and Prichard, T. *Micro-irrigation of trees and vines: a handbook for water managers*. University of California Irrigation Program. Davis, CA. 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) <i>OR</i> 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 and uses this knowledge to determine the need for 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. April 8, 2014.

- lodigrowers.com/soil-moisture-monitoring/

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. Davis, CA. 2004.

- lodigrowers.com/wp-content/uploads/2022/12/Deficit-Irrigation-of-Quality-Winegrapes-Using-Micro-Irrigation-2004.pdf

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

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
The vineyard is not irrigated (other than one post-harvest irrigation) because soil moisture is adequate for production goals.	N/A

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. Davis, CA. 2004.

- lodigrowers.com/wp-content/uploads/2022/12/Deficit-Irrigation-of-Quality-Winegrapes-Using-Micro-Irrigation-2004.pdf

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

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
The vineyard was planted less than 5 years ago.	N/A

Companion Information

Scope: Individual vineyard management units submitted for LODI RULES certification which were planted more than 5 years ago.

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

Verification: Inspection of irrigation records.

References:

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. August 4, 2014. lodigrowers.com/regulated-deficit-irrigation-part-ii/

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. Davis, CA. 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. 2008.

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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. <u>OR</u> The amount of water used by the vines <i>on a weekly basis</i> is not estimated.	0
The vineyard was planted more than 5 years ago.	N/A

Companion Information

Scope: Individual vineyard management units submitted for LODI RULES certification which were planted less than 5 years ago.

Purpose: To determine the level of water conservation efforts within the limits of sound vineyard establishment practices and award sustainable farming points 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 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. 2008.

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5.14 Offsite Irrigation Water Movement

A. Irrigation practices create <u>no runoff</u> * or <u>runoff is recycled</u> .	2
B. <u>Runoff</u> * occurs during irrigation and <i>is not recycled</i> .	0
The vineyard is not irrigated (other than one post-harvest irrigation) because soil moisture is adequate for production goals.	N/A

*Runoff 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 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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

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

Schwankl, LJ, Prichard, TL, and Hanson, BR. Managing existing sprinkler irrigation systems. University of California 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 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

***REVISED* for 2023 certification year**

The farming operation has a written and implemented insect and mite pest management plan containing the following components: goals; guidelines for written vineyard scouting/pest monitoring reports; 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 = Fail Chapter

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 their management team.

Verification: Visual inspection of the pest management plan document. See examples of what to consider in an insect and mite pest management plan on the following page.

References (continued on following page):

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. Reviewed 2015.

- ipm.ucdavis.edu/PMG/r302300111.html

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. Revised 2011.

- ipm.ucdavis.edu/PMG/PESTNOTES/pn7405.html

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 Agriculture and Natural Resources Publication 3343. 1992.

Pest Management

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

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

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. Reviewed 2015.

- ipm.ucdavis.edu/PMG/r302900611.html

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 Agriculture and Natural Resources Publication 3343. 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 efficacy with negligible undesirable side effects. The farming operation practices in-season vine management for growth balance and moderate water stress, minimizes dust and maximizes beneficial insect activity, and pesticide selection and application for effective control.

Guidelines for written vineyard scouting/pest monitoring reports, 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. When an insect or mite treatment is necessary, only that portion of the vineyard where a problem exists is treated, such as edges or hotspots, and not the whole vineyard.

A plan review and update schedule.

For an example plan template, see “LODI RULES Management Plans & Requirements to Pass” in Tab 10 of the LODI RULES Binder, or visit lodigrowers.com/standards and scroll down to the “LODI RULES Management Plans & Audit Prep Checklist” section for a link to the document.

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 reports.	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 reports.	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 reports.	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 reports.	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 reports.	0
F. <i>No vineyard monitoring reports</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 reports, during appropriate time periods for risk and proactive management as outlined in the insect and mite pest management plan (Standard 6.1).

References (continued on the following page):

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. Reviewed 2015.

- ipm.ucdavis.edu/PMG/r302300111.html

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. Revised 2011.

- ipm.ucdavis.edu/PMG/PESTNOTES/pn7405.html

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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. 2008.

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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. Reviewed 2015.

- ipm.ucdavis.edu/PMG/r302900611.html

For an example of vineyard scouting/pest monitoring reports, see “LODI RULES Management Plans & Requirements to Pass” in Tab 10 of the LODI RULES Binder, or visit lodigrowers.com/standards and scroll down to the “LODI RULES Management Plans & Audit Prep Checklist” section for a link to the document.

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 reports 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 (Standard 6.1).

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. Reviewed 2015.

- ipm.ucdavis.edu/PMG/r302300111.html

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. 2008.

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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 Agriculture and Natural Resources Publication 3343. 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 reports 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 (Standard 6.1).

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. Revised 2011.

- ipm.ucdavis.edu/PMG/PESTNOTES/pn7405.html

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 Agriculture and Natural Resources Publication 3343. 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. 2008.

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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 hotspots, 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 or spot sprays of vineyards and associated reduced insecticide and/or miticide use.

Verification: Visual inspection of insecticide and miticide application records.

Reference:

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. 2008.

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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. Revised 2011.

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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 Agriculture and Natural Resources Publication 3343. 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. 2008.

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6.7 Dust Abatement for Mite Management for On-Farm Roads and Avenues

A. <i>During the growing season</i> , <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. <i>During the growing season</i> , an <u>oil alternative sealant</u> (eSoil-Sement®, EnviroKleen®, etc.) is used on vineyard roads and avenues.	2
D. <i>During the growing season</i> , <u>oil, water, or magnesium chloride</u> is used on vineyard roads and avenues.	1
E. <i>During the growing season</i> , 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. Revised 2011.

- ipm.ucdavis.edu/PMG/PESTNOTES/pn7405.html

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 Agriculture and Natural Resources Publication 3343. 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. 2008.

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6.8 Dust Abatement for Mite Management for Headlands

A. A <i>year-round</i> <u>hedgerow and/or vegetative cover</u> is grown on headlands.	2
B. <i>During the growing season</i> , <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. Webspinning spider mites. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. Revised 2011.

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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 Agriculture and Natural Resources Publication 3343. 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. 2008.

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6.9 Training for Recognition of Pests and Their Natural Enemies

***REVISED* for 2023 certification year**

A. The owner(s) and/or farming operation employees are trained for recognition of vineyard pests <u>AND</u> natural enemies.	3
B. The owner(s) and/or farming operation employees are trained for recognition of vineyard pests <u>OR</u> natural enemies.	2
C. <i>Neither the farming operation owner(s) nor any employees are trained for pest or natural enemy recognition.</i>	0

Companion Information

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

Purpose: To increase the intensity of pest and natural enemy monitoring by training owners and/or farm employees instead of solely relying on a pest control advisor or consultant for this task.

Verification: Visual inspection of pest and/or natural enemy recognition training records, including meeting agendas and signature lists for attending employees.

References:

Lee-Mäder, E, Hopwood, J, Vaughan, M, Hoffman Black, S, and Morandin, L. *Farming with Native Beneficial Insects: Ecological Pest Solutions*. The Xerces Society. 2014.

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

6.9.1 Beneficial Insects

***NEW* for 2023 certification year**

Select all that apply:

6.9.1.1 Beneficial Insects: Releases	YES = 1
The farming operation released beneficial insects (predatory mites, <i>Cryptolaemus</i> beetles, and/or <i>Anagyrus</i> wasps, etc.) in the vineyard <i>during this certification year</i> .	NO = 0
6.9.1.2 Beneficial Insects: Monitoring	YES = 1
To ensure that no or minimal harm is done to beneficial insect populations, the farming operation reviews pesticide risk <i>before application</i> and monitors beneficial insect populations <i>after any applications which may pose a concern for beneficials</i> .	NO = 0

Companion Information

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

Purpose: To enhance biocontrol activities for integrated pest management.

Verification: Visual inspection of beneficial insect application records (including purchase invoices), written monitoring reports included or separate from standard pest monitoring reports, pictures of beneficials taken in the vineyard, and/or a beneficial insect risk chart used for application decisions.

Resources/References:

Altieri, MA, Nicholls, CI, Wilson, H, and Miles, A. *Habitat Management in Vineyards: A growers manual for enhancing natural enemies of pests*. College of Natural Resources. University of California Press. Berkeley. 2010.

Lee-Mäder, E, Hopwood, J, Vaughan, M, Hoffman Black, S, and Morandin, L. *Farming with Native Beneficial Insects: Ecological Pest Solutions*. The Xerces Society. 2014.

Lodi Winegrape Commission. Mealybug Biocontrol Research Focus Group. Don't Kill the Good Insects! Beneficial Insect Risk Chart. 2017.

- lodigrowers.com/wp-content/uploads/2014/01/BIOCONTROL-good-bug-risk-table-2017.pdf

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. Relative Toxicities of Insecticides and Miticides Used in Grapes to Natural Enemies and Honey Bees. Updated 2016.

- ipm.ucanr.edu/agriculture/grape/relative-toxicities-of-insecticides-and-miticides-used-in-grapes-to-natural-enemies-and-honey-bees

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

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. 1988.

6.11 Powdery Mildew Management Plan

***REVISED* for 2023 certification year**

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, monitoring, and a plan review and update schedule.	YES = 4
	NO = Fail Chapter

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 management team.

Verification: Visual inspection of the powdery mildew management plan. See examples of what to consider in a powdery mildew management plan on the following page.

References:

Fungicide Resistance Action Committee. frac.info

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 Agriculture and Natural Resources Publication 3343. 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. Corrected 2016.

- ipm.ucdavis.edu/PMG/r302100311.html

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

Pearson, RC. Powdery mildew. In: *Compendium of Grape Diseases*. Pearson, RC, and Goheen, AC. (Eds.). APS Press, St. Paul, MN. 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), the ease of pathogen resistance developing for fungicides with a single mode of action, and coordinating with neighbors for resistance management.

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.

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.

A monitoring protocol and schedule.

Treatment measures: Include how you determine the effectiveness of a treatment.

A plan review and update schedule.

For an example plan template, see “LODI RULES Management Plans & Requirements to Pass” in Tab 10 of the LODI RULES Binder, or visit lodigrowers.com/standards and scroll down to the “LODI RULES Management Plans & Audit Prep Checklist” section for a link to the document.

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

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 initiate and schedule fungicide applications only after there is evidence that they are needed.

Verification: Visual comparison of Gubler-Thomas (or similar) 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. Corrected 2016.

- ipm.ucdavis.edu/PMG/r302100311.html

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

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, which may include PEAS and/or pesticide use reports.

References:

Adaskaveg, JE, Gubler, WD, and Michailides, T. General Properties of Fungicides Used in Grapes. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. 2015.

- ipm.ucanr.edu/agriculture/grape/general-properties-of-fungicides-used-in-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. Updated 2016.

- ipm.ucdavis.edu/PMG/r302902111.html

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. Corrected 2016.

- ipm.ucdavis.edu/PMG/r302100311.html

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

6.15.2 Bunch Rot Management

Select all that apply:

6.15.2.1 Bunch Rot: Early Season Thinning	YES = 1
<i>Early in the growing season, <u>shoots are thinned</u> to increase air movement within the fruit zone.</i>	NO = 0
6.15.2.2 Bunch Rot: Gibberellin Application	YES = 1
<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>	NO = 0
6.15.2.3 Bunch Rot: Leaf and Shoot Removal	YES = 1
<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>	NO = 0
6.15.2.4 Bunch Rot: Fungicide Application	YES = 1
<i>During and following bloom, a <u>fungicide is applied</u> to reduce bunch rot inoculum when dead flower parts adhere to clusters.</i>	NO = 0
Historically, there <i>has not been a bunch rot problem</i> in the vineyard.	N/A

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 (continued on the following page):

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. 1988.

Fungicide Resistance Action Committee. frac.info

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. Updated 2016. ipm.ucdavis.edu/PMG/r302100111.html

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. Updated 2016.

• ipm.ucdavis.edu/PMG/r302902111.html

Pest Management

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. Updated 2016.

- ipm.ucdavis.edu/PMG/r302100211.html

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 Agriculture and Natural Resources Publication 3343. 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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

Wilcox, W. Understanding and controlling Botrytis. Practical Winery and Vineyard. Mar/Apr 2007.

6.16 Canker Disease Management

***REVISED* for 2023 certification year**

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 or cane 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

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 (continued on the following page):

Carter, MV. Eutypa dieback. In: *Compendium of Grape Diseases*. Pearson, RC, and Goheen, AC. (Eds.). APS Press, St. Paul, MN. 1988.

Fungicide Resistance Action Committee. frac.info

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 Agriculture and Natural Resources Publication 3343. 1992.

Gubler, WD, Smith, RJ, Varela, LG, Vasquez, S, Stapleton, JJ, and Purcell, AH. *Botryosphaeria* Dieback. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. Reviewed 2014. ucdavis.edu/PMG/r302101011.html

Pest Management

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. Updated 2014.

- ipm.ucdavis.edu/PMG/r302100611.html

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. Updated 2016.

- ipm.ucdavis.edu/PMG/r302902111.html

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

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 their management team.

Verification: Visual inspection of the soil borne pest management plan. See examples of what to consider in a soil borne pest management plan on the following page.

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. Reviewed 2015.

- ipm.ucdavis.edu/PMG/r302300811.html

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 Agriculture and Natural Resources Publication 3343. 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 Agriculture and Natural Resources Publication 3343. 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 Agriculture and Natural Resources Publication 3343. 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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

Raski, DJ. Nematode parasites of grapes. In: *Compendium of Grape Diseases*. Pearson, RC, and Goheen, AC. (Eds.). APS Press, St. Paul, MN. 1988.

Westerdahl, BB. Nematodes. UC IPM Pest Management Guidelines. University of California Agriculture and Natural Resources Statewide Integrated Pest Management Program. Reviewed 2016.

- ipm.ucdavis.edu/PMG/r302200111.html

Pest Management

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.

For an example plan template, see “LODI RULES Management Plans & Requirements to Pass” in Tab 10 of the LODI RULES Binder, or visit lodigrowers.com/standards and scroll down to the “LODI RULES Management Plans & Audit Prep Checklist” section for a link to the document.

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. Reviewed 2015.

- ipm.ucdavis.edu/PMG/r302300811.html

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 Agriculture and Natural Resources Publication 3343. 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 Agriculture and Natural Resources Publication 3343. 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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

Raski, DJ. Nematode parasites of grapes. In: *Compendium of Grape Diseases*. Pearson, RC, and Goheen, AC. (Eds.). APS Press, St. Paul, MN. 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 management team.

Verification: Visual inspection of the weed management plan. See examples of what to consider in a weed management plan on the following page.

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 Agriculture and Natural Resources Publication 3343. 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 Agriculture and Natural Resources Publication 3343. 1992.

Herbicide Resistance Action Committee. hracglobal.com

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 Agriculture and Natural Resources Publication 3343. 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 Agriculture and Natural Resources Publication 3343. 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 Agriculture and Natural Resources Publication 3343. 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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

Pest Management

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. Reviewed 2015. ipm.ucdavis.edu/PMG/r302700111.html

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. Consider including understanding weed biology and life cycles to best prevent noxious weeds from reproducing and spreading, therefore decreasing the cost to you and your neighbors for weed management. Also consider vineyard age and your tolerance for the presence of different species of weeds.

Monitoring techniques and record keeping: Indicate how weeds are scouted for (visually, using aerial technology, etc.), how often this occurs (weekly, etc.), the general procedure for documenting weed presence (part of your vineyard scouting records/monitoring reports), and which species of weeds are of greatest concern.

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, mechanical controls, etc.

Herbicide resistance avoidance strategies: For example, state which herbicides are used with their modes of action and how they are rotated plus mechanical controls. Record weed resistance information.

A plan review and update schedule.

For an example plan template, see “LODI RULES Management Plans & Requirements to Pass” in Tab 10 of the LODI RULES Binder, or visit lodigrowers.com/standards and scroll down to the “LODI RULES Management Plans & Audit Prep Checklist” section for a link to the document.

Pest Management

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</u> AND <u>at least once a month</u> <i>during the winter season</i> AND written reports 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</u> AND <u>at least once every two months</u> <i>during the winter season</i> AND written reports 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</u> AND <u>at least once during the winter season</u> AND written reports 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</u> AND <u>at least once during the winter season</u> AND written reports 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</u> AND <u>at least once during the winter season</u> AND written reports are kept.	0
F. <i>No vineyard weed monitoring reports</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 reports.

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

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. Reviewed 2015. ipm.ucdavis.edu/PMG/r302700111.html

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 management team.

Verification: Visual inspection of the vertebrate management plan. See examples of what to consider in a vertebrate management plan on the following page.

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 Agriculture and Natural Resources Publication 3343. 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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

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 Agriculture and Natural Resources Publication 3343. 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.

For an example plan template, see “LODI RULES Management Plans & Requirements to Pass” in Tab 10 of the LODI RULES Binder, or visit lodigrowers.com/standards and scroll down to the “LODI RULES Management Plans & Audit Prep Checklist” section for a link to the document.

Pest Management

6.22 Vineyard Monitoring for Vertebrate Pests

A. <i>During the growing season</i> , the PCA and/or a company representative monitors the vineyard for vertebrate pests <u>at least once every 7 days</u> <u>AND</u> written reports are kept.	4
B. <i>During the growing season</i> , the PCA and/or a company representative monitors the vineyard for vertebrate pests <u>at least once every 10 days</u> <u>AND</u> written reports are kept.	3
C. <i>During the growing season</i> , the PCA and/or a company representative monitors the vineyard for vertebrate pests <u>at least once every 14 days</u> <u>AND</u> written reports are kept.	2
D. <i>During the growing season</i> , the PCA and/or a company representative monitors the vineyard for vertebrate pests <u>at least once every 21 days</u> <u>AND</u> written reports are kept.	1
E. <i>During the growing season</i> , the PCA and/or a company representative monitors the vineyard for vertebrate pests <u>at least once a month</u> <u>AND</u> written reports are kept.	0
F. <i>No vineyard monitoring reports</i> 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 reports.

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 Agriculture and Natural Resources Publication 3343. 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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

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 Agriculture and Natural Resources Publication 3343. 1992.

Pest Management

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.

Reference:


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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/


LODI BARN OWL RESEARCH UPDATE


Mark Browning, "Prey Consumption by a Large Aggregation of Barn Owls in an Agricultural Setting" partially funded by the Lodi Winegrape Commission with efforts supported by Chris Storm & Vino Farms

PHOTO: Amy Blagg


34¢


WANT TO LOWER LABOR COSTS? PUT BARN OWLS TO WORK!
OVER A 3-YEAR TIME PERIOD, BARN OWLS COST
\$0.34/GOPHER COMPARED TO **\$8.11/GOPHER** VIA TRAPPING.

\$8.11




BARN OWLS ATE A CONSERVATIVE ESTIMATE OF
30,020 RODENTS (POCKET GOPHERS & VOLES)
OVER 100 ACRES DURING THREE YEARS



THE MOST ACTIVE HUNTING TIME IS THE **HOUR AFTER SUNSET**

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. See examples of what to consider in a sprayer/duster maintenance plan below.

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 Agriculture and Natural Resources Publication 3343. 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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

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.

For an example plan template, see “LODI RULES Management Plans & Requirements to Pass” in Tab 10 of the LODI RULES Binder, or visit lodigrowers.com/standards and scroll down to the “LODI RULES Management Plans & Audit Prep Checklist” section for a link to the document.

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 Agriculture and Natural Resources Publication 3343. 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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

Pest Management

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.

Reference:

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

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 management team.

Verification: Visual inspection of the spray/dust drift management plan. See examples of what to consider in a spray/dust drift management plan on the following page.

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. ipm.ucanr.edu/legacy_assets/pdf/pubs/reducingpesticiderisks.pdf

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. 2008.

- lodigrowers.com/lodiwinegrowersworkbook/

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.

For an example plan template, see “LODI RULES Management Plans & Requirements to Pass” in Tab 10 of the LODI RULES Binder, or visit [lodigrowers.com/standards](https://lodi growers.com/standards) and scroll down to the “LODI RULES Management Plans & Audit Prep Checklist” section for a link to the document.

6.28 Mealybug Management

NEW for 2023 certification year

Select all that apply:

6.28.1 Mealybug Management: Monitoring Effectiveness	YES = 1
The farming operation records applicable mealybug*, mealybug predator, and mealybug parasite levels over time <u>AND</u> uses these reports to monitor the effectiveness of their management program.	NO = 0
6.28.2 Mealybug Management: Mitigating Spread	YES = 1
The farming operation ensures that equipment and workers entering the vineyard move from less-infested to more-infested vineyards during a workday <u>OR</u> equipment and workers practice disinfection/sanitation in between vineyards.	NO = 0
6.28.3 Mealybug Management: Marking Hotspots	YES = 1
The farming operation marks and treats any mealybug hotspots during the growing season and closely monitors these locations the following season.	NO = 0
6.28.4 Mealybug Management: Mating Disruption	YES = 1
Pheromone mating disruption is applied as a mealybug preventative measure if the vineyard is at risk for infestations, as a treatment if the vineyard has low populations of mealybugs, or as a spread mitigation strategy if the vines are infected with leafroll virus and/or vitiviruses.	NO = 0

*Trapping alone may be ineffective – close visual inspection in addition to trapping is recommended.

Companion Information

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

Purpose: To apply integrated pest management for mealybugs, especially the invasive vine mealybug, since mealybugs can vector leafroll virus and vitiviruses.

Verification: Visual inspection of vineyard scouting/pest monitoring reports, pertinent vineyard and/or labor records for the above practices, and/or a map with any hotspots marked or a photo showing hotspot marking in the vineyard.

Resources/References (continued on the following page):

Bolton, SL. *What Every Winegrower Should Know: Viruses*. Lodi Winegrape Commission. 2020.

- lodigrowers.com/growereducation/viruses/

Daane, KM, Almeida, RPP, Bell, VA, Walker, JTS, Botton, M, Fallahzadeh, M, Mani, M, Miano, JL, Sforza, R, Walton, VM, and Zaviezo, T. Chapter 12: Biology and Management of Mealybugs in Vineyards. In *Arthropod Management in Vineyards: Pests, Approaches, and Future Directions*. 2012.

- nature.berkeley.edu/almeidalab/wp-content/uploads/2015/11/Daane12.pdf

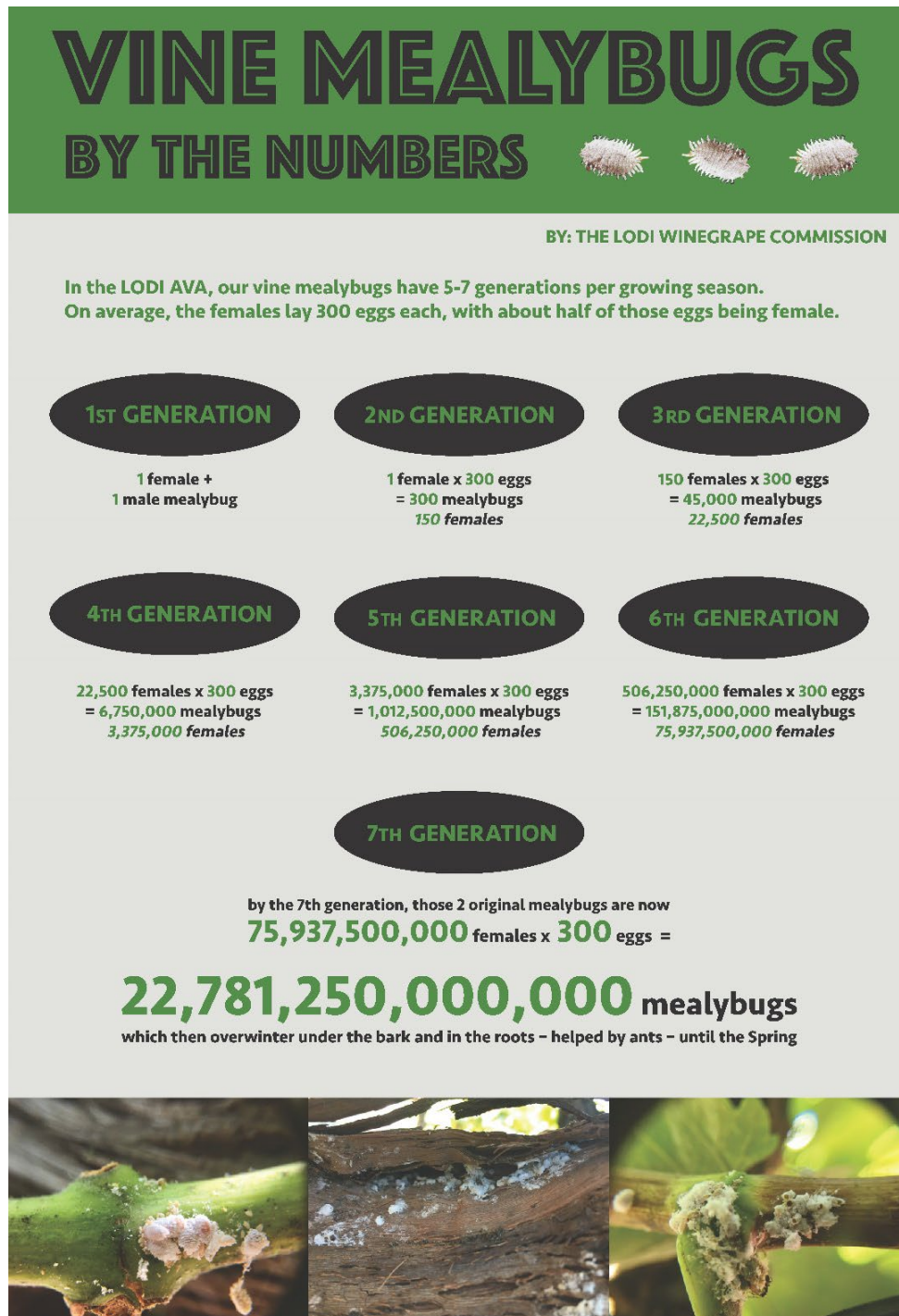
Pest Management

Daane, KM. "Managing Vine Mealybugs in Grapes." Presentation at Lodi Mealybug & Virus Outreach Meeting. Lodi Winegrape Commission. 2019. [youtube.com/watch?v=d4-1I84QB8I&t=2s](https://www.youtube.com/watch?v=d4-1I84QB8I&t=2s)

Varela, LG, et al. UC IPM. Vine Mealybug. Updated 2019. ipm.ucanr.edu/agriculture/grape/vine-mealybug/

"Vine Mealybug Biocontrol in Lodi Vineyards." Video. Lodi Winegrape Commission. 2020.

- [youtube.com/watch?v=QF4hc1hS3-I](https://www.youtube.com/watch?v=QF4hc1hS3-I)



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6.29 Grapevine Virus Management Plan

***NEW* for 2023 certification year**

The farming operation has a written and implemented virus management plan (for leafroll virus and red blotch virus, plus any other economically important viruses of concern – fanleaf virus, vitiviruses/sudden vine collapse, etc.) which includes training employees who work in the vineyard, staying informed, scouting, testing, mapping, vine removal, and prevention of spread to other vineyards, plus 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 virus management factors and to clearly state virus management goals, challenges, and strategies, including vineyard monitoring, which will serve as guidelines for the activities of the vineyard manager and their management team.

Verification: Visual inspection of the grapevine virus management plan. See examples of what to consider in a virus management plan on the following page.

Resources/References:

Almeida, RPP, Daane, KM, Bell, VA, Blaisdell, GK, Cooper, ML, Herrbach, E, and Pietersen, G. Ecology and management of grapevine leafroll disease. *Frontiers in Microbiology*. 2013.

- frontiersin.org/articles/10.3389/fmicb.2013.00094/full

Bettiga, LA (Ed). *Grape Pest Management*, 3rd Ed. University of California Agriculture and Natural Resources Publication 3343. 2013.

Bolton, SL. *What Every Winegrower Should Know: Viruses*. Lodi Winegrape Commission. 2020.

- lodigrowers.com/growereducation/viruses/

Fuchs, M. “Viruses.” Presentation at Lodi Mealybug & Virus Outreach Meeting. Lodi Winegrape Commission. 2019. youtube.com/watch?v=tqxuvej2WAY

Pietersen, G. “Grapevine leafroll disease.” Presentation at Lodi Mealybug & Virus Outreach Meeting. Lodi Winegrape Commission. 2019. youtube.com/watch?v=7yKLfJwx2lw

Grapevine Virus Management Plan Organization

Identifying viruses of concern: It is crucial to understand which virus(es) the vineyard is at risk for and/or currently infected with in order to maximize the vineyard investment and to reduce the spread of virus. List the virus(es) by name and include the means of transmission (vectors, etc.) for each type. Estimate the current year's percentage of infection for each virus to the best of your ability.

Grapevine virus education: Indicate any virus-related trainings and write down how the farming operation stays informed about current grapevine viruses and their management, which may include attending seminars, reading articles and websites, or being a member of a group who meets regularly to discuss pest and disease issues.

Scouting, testing, mapping, rogueing (vine removal): List the farming operation's protocols for scouting the vineyard for virus symptoms, testing, mapping and rogueing/removing infected vines based upon the economic feasibility of the vineyard block. Include pertinent contact information and timing. Note that removal of virus inoculum is a best practice for viruses that are easily spread, but it may not be economically feasible or desirable in certain cases. Knowing where your infections exist is also important, and mapping can be as simple or as sophisticated as is economically feasible. Record keeping is crucial for virus management.

Preventative measures: State the measures in place to prevent new virus infections and/or to prevent the spread of current infections as much as possible. Especially in instances where there is no rogueing/removal of virus inoculum, vector management and mitigation of spread to neighboring vines and vineyards is crucial.

Rootstock and neighboring vineyard or regional susceptibility: Risk from certain viruses may increase based upon rootstock type, vineyard location, and the frequency of contracted equipment and laborers entering the vineyard block. Note any risk factors and how these risks are being mitigated.

A plan review and update schedule.

For an example plan template, see “LODI RULES Management Plans & Requirements to Pass” in Tab 10 of the LODI RULES Binder, or visit lodi growers.com/standards and scroll down to the “LODI RULES Management Plans & Audit Prep Checklist” section for a link to the document.

6.30 Virus Status of Vineyard Block

***NEW* for 2023 certification year**

<p>A. A high (greater than 25%) percentage of the vineyard is estimated to have a transmissible virus infection (such as leafroll, vitiviruses, or in some regions, red blotch) based upon testing <u>AND</u> vectors are controlled to mitigate the spread to healthy vines and other vineyards until it is economically feasible to remove the infected vineyard.</p>	<p>Take 3 points and go to Standard 6.31 (Standard 6.30.1 is N/A)</p>
<p>B. A high (greater than 25%) percentage of the vineyard is estimated to have a transmissible virus infection (such as leafroll, vitiviruses, or in some regions, red blotch) based upon testing, but <i>no actions are taken to control the spread of vectors and viruses to healthy vines or other vineyards.</i></p>	<p>Go to Standard 6.31 (Standard 6.30.1 is N/A)</p>
<p>C. The vineyard has a partial (less than 25%) or unknown percentage of transmissible virus infections (such as leafroll, vitiviruses, or in some regions, red blotch) <u>OR</u> appears not to be infected with transmissible viruses at the present time.</p>	<p>Go to Standard 6.30.1</p>

Companion Information

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

Purpose: To estimate the grapevine virus status for transmissible viruses, which will inform the activities of the vineyard manager, management team, and the overall vineyard economics.

Verification: Visual inspection of written lab results for transmissible viruses, emails shared among management discussing virus presence, labor records/invoices for vector spread mitigation practices, and/or photos taken during rogueing/removal of infected vines.

Resources/References:

Almeida, RPP, Daane, KM, Bell, VA, Blaisdell, GK, Cooper, ML, Herrbach, E, and Pietersen, G. Ecology and management of grapevine leafroll disease. *Frontiers in Microbiology*. 2013.

- frontiersin.org/articles/10.3389/fmicb.2013.00094/full

Bettiga, LA (Ed). *Grape Pest Management*, 3rd Ed. University of California Agriculture and Natural Resources Publication 3343. 2013.

Bolton, SL. *What Every Winegrower Should Know: Viruses*. Lodi Winegrape Commission. 2020.

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Fuchs, M. “Viruses.” Presentation at Lodi Mealybug & Virus Outreach Meeting. Lodi Winegrape Commission. 2019. youtube.com/watch?v=tqxuvej2WAY

Pietersen, G. “Grapevine leafroll disease.” Presentation at Lodi Mealybug & Virus Outreach Meeting. Lodi Winegrape Commission. 2019. youtube.com/watch?v=7yKLfJwx2lw

Pest Management

6.30.1 Virus Management – Partially Infected, Unknown Virus Status, or Healthy Vineyard

***NEW* for 2023 certification year**

Select all that apply:

6.30.1.1 Virus Management: Scouting	YES = 1
The vineyard is scouted during the late summer/fall for symptoms of leafroll virus and red blotch virus such as reduced yield, leaf discoloration, and poor ripening.	NO = 0
6.30.1.2 Virus Management: Testing	YES = 1
<i>At least once in the past three years</i> , the vineyard has been tested for the presence of economically important viruses of concern, including both leafroll and red blotch <u>AND</u> samples collected from healthy-appearing vines were included in the testing.	NO = 0
6.30.1.3 Virus Management: Rogueing Vines Infected With Leafroll	YES = 1
When vines test positive for leafroll virus, they are removed from the vineyard in well-irrigated soil as soon as is economically feasible <u>AND</u> vectors are controlled to mitigate the spread of virus to other vineyards until the vines can be removed.	NO = 0
6.30.1.4 Virus Management: Rogueing Vines Infected With Red Blotch	YES = 1
When vines test positive for red blotch virus and a vector is assumed present in the region, they are removed from the vineyard as soon as is economically feasible.	NO = 0
A high (greater than 25%) percentage of the vineyard is estimated to have a transmissible virus infection (such as leafroll, vitiviruses, or in some regions, red blotch) based upon testing.	N/A

Companion Information

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

Purpose: To mitigate the spread of transmissible viruses to maintain economic viability of the vineyard.

Verification: Visual inspection of virus scouting records, written lab results, emails shared among management discussing virus presence, labor records/invoices for vector spread mitigation practices, photos taken during rogueing/removal of infected vines, and/or invoices of purchases of replacement vines from a nursery.

Resources/References (continued on the following page):

Almeida, RPP, Daane, KM, Bell, VA, Blaisdell, GK, Cooper, ML, Herrbach, E, and Pietersen, G. Ecology and management of grapevine leafroll disease. *Frontiers in Microbiology*. 2013.

- [frontiersin.org/articles/10.3389/fmicb.2013.00094/full](https://www.frontiersin.org/articles/10.3389/fmicb.2013.00094/full)

Bettiga, LA (Ed). *Grape Pest Management*, 3rd Ed. University of California Agriculture and Natural Resources Publication 3343. 2013.

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Pest Management

Bolton, SL. *What Every Winegrower Should Know: Viruses*. Lodi Winegrape Commission. 2020.

- lodigrowers.com/growereducation/viruses/

Fuchs, M. “Viruses.” Presentation at Lodi Mealybug & Virus Outreach Meeting. Lodi Winegrape Commission. 2019. youtube.com/watch?v=tqxuvej2WAY

Pietersen, G. “Grapevine leafroll disease.” Presentation at Lodi Mealybug & Virus Outreach Meeting. Lodi Winegrape Commission. 2019. youtube.com/watch?v=7yKLfJwx2lw



6.31 Neighborhood Pest and Disease Communication

NEW for 2023 certification year

The farming operation communicates with neighboring growers about transmissible pest and disease issues that may affect them — including powdery mildew resistance, vine mealybugs, and viruses <i>OR</i> if isolated, the farming operation communicates with other growers in their region about transmissible pest and disease issues.	YES = 1
	NO = 0

Companion Information

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

Purpose: To enhance efficiency and effectiveness of any pest and disease management programs.

Verification: Visual inspection of written communication records such as emails, texts, phone call logs, and/or pictures of neighborhood communication events.

Resources/References:

Almeida, RPP, Daane, KM, Bell, VA, Blaisdell, GK, Cooper, ML, Herrbach, E, and Pietersen, G. Ecology and management of grapevine leafroll disease. *Frontiers in Microbiology*. 2013.

- frontiersin.org/articles/10.3389/fmicb.2013.00094/full

Bettiga, LA (Ed). *Grape Pest Management*, 3rd Ed. University of California Division of Agriculture and Natural Resources Publication 3343. 2013.

Bolton, SL. *What Every Winegrower Should Know: Viruses*. Lodi Winegrape Commission. 2020.

Daane, KM. “Managing Vine Mealybugs in Grapes.” Presentation at Lodi Mealybug & Virus Outreach Meeting. Lodi Winegrape Commission. 2019. youtube.com/watch?v=d4-1I84QB8I&t=2s

Mahafee, W. Here comes the mildew again: the challenges of managing powdery mildew in the era of fungicide resistance. Lodi Winegrape Commission Coffee Shop Blog. March 22, 2018.

- lodigrowers.com/here-comes-the-mildew-again-the-challenges-of-managing-powdery-mildew-in-the-era-of-fungicide-resistance/.

Ohmart, CP, Storm, CP, and Matthiasson, SK (Eds.). *Lodi Winegrower’s Workbook*, 2nd Ed. Lodi Winegrape Commission. 2008. lodigrowers.com/lodiwinegrowersworkbook/

Pietersen, G. “Grapevine leafroll disease.” Presentation at Lodi Mealybug & Virus Outreach Meeting. Lodi Winegrape Commission. 2019. youtube.com/watch?v=7yKLfJwx2lw

6.32 Replants

***NEW* for 2023 certification year**

A. Any new vines planted or grafted to the vineyard <i>during this certification year</i> were/will be CDFA-certified (or similar) virus tested or otherwise tested for economically important viruses (both rootstock and scion) before planting/grafting <u>AND</u> they were/will be inspected upon arrival for pests, disease, and quality.	3
B. Any new vines planted or grafted to the vineyard <i>during this certification year</i> were/will be CDFA-certified (or similar) virus tested or otherwise tested for economically important viruses (both rootstock and scion) before planting/grafting <u>OR</u> they were/will be inspected upon arrival for pests, disease, and quality.	1
C. Any new vines planted or grafted to the vineyard <i>during this certification year</i> were not/will not be CDFA-certified (or similar) or otherwise tested for economically important viruses nor were they/will they be inspected for pests, disease, or quality.	0
No new vines were/will be planted or grafted to the vineyard <i>during this certification year</i> .	N/A

Companion Information

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

Purpose: To mitigate the introduction of pests and diseases to maintain economic viability of the vineyard.

Verification: Visual inspection of written CDFA (or similar) certification documentation from the nursery (rootstock and scion), written lab tests (rootstock and scion) for economically important viruses, labor records and/or written protocol for inspection upon arrival of replants.

Resources/References:

Bolton, SL. "Nursery Ordering 101" Chapter in *What Every Winegrower Should Know: Viruses*. Lodi Winegrape Commission. 2020. lodigrowers.com/growereducation/viruses/

Pietersen, G. "Grapevine leafroll disease." Presentation at Lodi Mealybug & Virus Outreach Meeting. Lodi Winegrape Commission. 2019. youtube.com/watch?v=7yKLfJwx2lw

Stamp, J. "Planting Material." Presentation at Lodi Mealybug & Virus Outreach Meeting. Lodi Winegrape Commission. 2019. youtube.com/watch?v=0gMd_tMOBL4

6.33 Pesticide Risk Threshold

***NEW* for the 2023 certification year**

The farming operation meets the requirements of the pesticide risk threshold for LODI RULES certification.	YES = 1
	NO = Fail Chapter

Companion Information

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

Purpose: To provide a method for calculating environmental and human health risks and to formally include the pesticide risk threshold component of the LODI RULES certification program in the LODI RULES Standards.

Verification: Submission of PEAS reports with calculation of pesticide risk using the provided scoring system and template, which can be found at lodigrowers.com/standards.

References:

Mineau, P. Pesticide Risk Mitigation Engine Risk Index White Papers. 2010-2015.

- Aquatic: pesticiderisk.org/materials/PRiME_Aquatic_Risk_white_papers_110910.pdf
- Avian Acute: pesticiderisk.org/materials/PRiME_Avian_Acute_white_paper_092410.pdf
- Avian Reproductive: pesticiderisk.org/materials/PRiME_Avian_Reproduction_white_paper_092410.pdf
- Cancer: pesticiderisk.org/materials/PRiME_Cancer%20Risk_white_paper_092315.pdf
- Dermal: pesticiderisk.org/materials/PRiME_Dermal_Index_white_paper_080213.pdf
- Dietary Exposure: pesticiderisk.org/materials/PRiME_Dietary_Risk_Index_white_paper_090111.pdf
- Earthworm: pesticiderisk.org/materials/PRiME_Earthworms_white_paper_092410.pdf
- Inhalation: pesticiderisk.org/materials/PRiME_Inhalation_Index_white_paper_092910.pdf
- Pollinator: pesticiderisk.org/materials/PRT_Bees_index_October_%202014_For%20release.pdf
- Small Mammal: pesticiderisk.org/materials/PRiME_Small_Mammal_white_paper_092410.pdf

Ohmart, C. Lodi Growers Reduce Pesticide Risk. Lodi Winegrape Commission Coffee Shop Blog. September 7, 2020. lodigrowers.com/lodi-growers-reduce-pesticide-risk/

Pesticide Risk Tool™. IPM Institute of North America. Madison, WI. pesticiderisk.org/